Shanlax International Journal of Arts, Science and Humanities

(A PEER-Reviewed-Refereed/Scholarly Quarterly Journal with Impact Factor)

Vol. 4 Special Issue 1 January, 2017 Impact Factor: 2.95 ISSN: 2321 – 788X

UGC Sponsored One day

ज्ञान-विज्ञानं विमुक्तये

NATIONAL SEMINAR ON INNOVATIVE TEXTILES

28TH January 2017

DEPARTMENT OF HOME SCIENCE

SEETHALAKSHMI RAMASWAMI COLLEGE

(Autonomous & Affiliated To Bharathidasan University)

Accredited with 'A' Grade (3rdCycle) by NAAC

TIRUCHIRAPPALLI – 620002

TAMILNADU

www.srcollege.edu.in

EDITORIAL BOARD

ORGANISING COMMITTEE

SEETHALAKSHMI RAMASWAMI COLLEGE
THIRUCHIRAPPALLI

DEPARTMENT OF HOMESCIENCE

UGC SPONSORED ONE DAY NATIONAL SEMINAR ON INNOVATIVE TEXTILES

PATRONS

Shri **R.Panchapakesan,** Secretary
Shri **P.Ramani,** Executive Director
Dr.**P.Kannan,** Director – Academics
Dr.**M.Jayanthi,** Principal

ORGANISING SECRETARIES

Ms.P.Thenmozhi, ***Head***
And *Associate Professor*
Ms.A.Shakila, *Associate Professor*

CO-ORDINATORS

Ms.C.Anitha, *Assistant Professor /Sr*
Ms.A.Lavanya, *Assistant Professor*

Email ID: *homescience1961@gmail.com*

MESSAGE

R. Panchapakesan, B.Sc., B.L.,
MANAGING TRUSTEE & SECRETARY

Phone: 2703955, 2704855
Seethalakshmi Ramaswami College,
(Autonomous & Accredited by NAAC
with "A" Grade (3rd Cycle))
P.B.No. 349, Tiruchirappali-620 002.

23. 1. 17

MESSAGE

I am extremely happy to learn that the Dept. of Home Science is conducting a UGC Sponsored **One day National Seminar on Innovative Textiles** on 28th inst. Conducting such seminars not only boosts the image of the concerned department but also of the College.

I wish the Seminar All Success.

R.Panchapakesan,
Managing Trustee &
Secretary.

MESSAGE

Dr.M.Jayanthi
Principal,
Seethalakshmi Ramaswami College,
Tiruchirappalli

Greetings!

I am immensely happy that the Department of Home Science of Seethalakshmi Ramaswami College is organizing a National Seminar on INNOVATIVE TEXTILES on 28 th of January 2017 and has planned to bring out a collection of various technical papers in the proceedings.

With the advent of technology, search for basic clothing from crude covering with animal skin has changed to choice of trend setting clothing with modern fabrics. I am sure that this seminar would certainly induce innovative ideas among the participants and the society at large, paving way for new inventions and new technologies in the Textile sector.

It is certainly heartening to note that the event has attracted academicians, research scholars, students and industry experts. I am convinced that the discussions of this seminar will contribute new dimensions in the field of Textile Technology and its applications in various fields. I take this opportunity to congratulate the organizing team, the Head of the Department, faculty members and the students for the efforts taken by each one of them to make this National Seminar a reality.

I wish the organizers and the participants a meaningful onward journey.

MESSAGE

I congratulate the Head, faculty members and students of the Department of Homescience, Seethalakshmi Ramaswami College for their meticulous work in organising the UGC sponsored one day seminar on **"Innovative Textiles."**

Textiles play major roles in the social, economic and religious lives of communities and it may be viewed as the products of technology, as cultural symbols, as work of art or as item of trade.Hope that this seminar is an eye opener in textile technology and motivate the participants towards research in this field .

I wish success for the team and looking forward to many more laurels to the Department of Homescience .

Dr.R.SELVAMEENA
Vice Principal
Head, Department of Chemistry

PREFACE

Ms.P.Thenmozhi
Associate Professor & Head
Department of Home Science
Seethalakshmi Ramaswami College
Tiruchirappalli-2

Fill the brain with high thoughts, highest ideals, place them day and night before you, and out of that will come Great Work. -Swami Vivekananda.

It is my pleasure and privilege to appreciate our Department Faculties for the production of this ISSN Publication which includes excellent papers presented by the distinguished participants of this UGC Sponsored One Day National level Seminar entitled "Innovative Textiles", organized by the Department of Home Science on 28-01-2017.

The department of Home Science was started in 1961. Regular Seminars, workshops, field visits and Internships are arranged for our students to enhance their skill in varied areas which would enable them to choose from a wide range of options not only in career but also in the pursuit of research. Ever since its inception, it has scaled greater heights rendering valuable service to the students' community. The syllabus of UG course Home Science has been planned with the objective of applying the knowledge of Home Science to upgrade the standard and quality of life, family and the society as a whole and to reach the extremities in all activities of life with their skills and talent. This year with the Grace of Almighty we were able to organize a National Seminar on one of our Core courses, "Textiles".

Textile is the creative centre for every designer, product, trend and home. It is a large and growing sector and supports a vast array of other industries.

The main purpose of the Seminar is to exchange ideas between senior officials, faculties, high level experts of international repute & students including research so that at the end of the day everyone should leave as a winner. This issue provides the platform for the young researchers to publish their research work. Relevant research and review papers are included in this edition.

I would like to thank all our well-wishers, especially the support and encouragement of Management, Principal and Staff. At this point I would like to thank all our contributors and members who helped in producing this innovative work. Last but not least, I would like to thank all authors for the timely submission of article.

I am sure that all can learn a lot of new information from this publication. In conclusion, I like to wish you all success in your work.

KEYNOTE ADDRESS

NEW DIMENSIONS AND INNOVATION IN TEXTILES AND CLOTHING

Dr.S.Kauvery Bai
Professor & Head, Dept. of Textiles and Clothing,
V.H.D Central Institute of Home Science, Bangalore

"You can have anything you want in life if you dress for it." —**Edith Head**

When we think of clothing, we usually just think of it as something we wear to provide coverage, convey our sense of style and protect us from the environmental elements. But, the future of clothing as we know it is about to change in a big way, and smart textiles are paving the way for this change.

Smart textiles are fabrics that have been developed with new technologies that provide added value to the wearer. Rebeccah states that "What makes smart fabrics revolutionary is that they have the ability to do many things that traditional fabrics cannot, including communicate, transform, conduct energy and even grow."

Smart textiles can be broken into two different categories: Aesthetic and Performance Enhancing.Aesthetic examples include everything from fabrics that light up to fabrics that can change color. Some of these fabrics gather energy from the environment by harnessing vibrations, sound or heat, reacting to this input.

Performance enhancing smart textiles, which will have a huge impact on the athletic, medical, extreme sports and military industries. These are fabrics helps to regulate body temperature, to guard against extreme environmental hazards like radiation,fabric with moisturizer, perfume, and anti-aging properties, reduce wind resistance and control muscle vibration.

Smart textiles (wearable) and technology go hand-in-hand. The designers' approach the design application differently where the tech ends up being much more friendly to the end user.

Taking Textiles to A New Level

Whether you call it smart clothing, functional fabrics, or textile devices, these innovations are ground breaking. Technological advancements in wearable technology coupled with its rapid growth rate are majorly propelling the market growth of e-textiles. Wearable technology has witnessed a growth rate of around 126% during 2014-15 and is expected to continue this positive trend in the coming years.

Electrical engineers, material scientists, software developers, manufacturers, and fashion designers have all collaborated in an effort to merge the age-old industry of textile materials with nano-technology and the Internet of Things.

Today's smart fabrics are far more complex than a blend of wools, cottons, and polyesters. They incorporate a variety of metals, fiberglass, and ceramics. Rather than being superficially glued together, these make up the basic elements of the fiber, itself.The innovative fabrics are not yet made to wear as a fashion but serve much-needed and practical purposes of safety and protection.

Scientists have developed fabrics that react not only to the signals our body emits but to the elements it faces. The fabrics will be able to see, hear, communicate, and store energy. Ultimately, the fabrics will monitor the health of and heat or cool its wearer, accordingly. The camouflaged, weather-resistant, and temperature-controlled uniforms for military wear and making our soldiers being in ground combat and making their clothing invisible to the enemy.

Other novel properties, with wide-ranging applications, include fabrics that are incredibly lightweight and durable, as well as flame resistant. These technical textiles can forge protective gear for firefighters, rendering them impervious to flames, replicate the sensing capabilities of a smart watch, or detect when a wounded soldier needs to be treated with an antimicrobial compression bandage

Medical and healthcare, sports and fitness segments are anticipated to impact the market growth positively in the coming years due to increasing adoption of e-textile in these application areas. North America dominates the global market and held around 40% of revenue share in 2015 owing to the rising adoption of e-textile products in the regional healthcare and sports sector. In 2015, health and fitness trackers sales in North America were numbered 8.5 million units, up from 4.8 million units in 2014. Asia Pacific is growing with huge pace owing to availability of low cost fibres and cost-efficient manufacturing.

Recent Development in Technical Textiles

Wearable technology is the pioneer and a worldwide leading innovation, as well as a market development platform for the technologies worn close to the body. Constant technological advancements in this platform have boosted the market growth for e-textiles. The technological innovations showcased at the Wearable Technology Show in London in March 2016 included Babypod (music device), Spartan Boxer Shorts and Beddit Sleep Tracker (Beddit device tracking sleep time, heart rate, snoring, breathing and night-time events).A Spartan Boxer Shorts wearable technology is majorly designed with the aim to protect the males from the side effects of the Internet of Things (IOT) revolution. It has been witnessed that the electromagnetic radiations generated from the wireless devices possess the capability to decrease the fertility rate in men. This innovative product claims to restrict 99% of radiations from affecting the reproduction rate in men. Hence, it is estimated that the innovation of such technologies creates a wider scope for e-textile market.

Healthcare and Sports Applications

E-textile products are primarily deployed in the healthcare segment to fulfill the unique purposes such as to track heartbeat and to study and scrutinize numerous

disorders (cardiovascular, neurological or respiratory).In recent decades, a significant increase has been observed in the number of older people suffering from diseases. Due to this, automatic and smart health care services e-textiles can be foreseen as significant tools for achieving the goals of controlling the reducible costs and eliminating the inefficiencies in terms of reactive healthcare system. Currently, the need for preventive or predictive healthcare system has boosted the demand for e-textiles. Some of the most popular e-textile products in healthcare applications are *SmartShirt* and *LifeShirt*, with a capability of measuring the vital signals like blood pressure, heart beat, temperature etc. Furthermore, increasing sales volume of health and fitness trackers across the regions indicates a scope for e-textiles market in healthcare and sports segment.

Vision of Indian Textile Industry

Historically, the textile industry in India was the first sector that brought about the industrial revolution and many world economies depended on the evolution of this industrial sector for their political power for a very long time. The textile industry now comprises many different subsectors representing production of fibers, yarns and fabrics, dyeing and finishing, and other physical and chemical processes to achieve added value in the final products. The scientific and technological advances made in the textile and clothing sector during this period are unprecedented.

The Indian textile industry has strength across the entire value chain from natural to man-made fiber to apparel to home furnishings. Its share in the nation's GDP is 6% and in exports is 13%. The sector is the second largest employer after agriculture. After the phasing out of export quotas in 2005 India's export performance has been below expectations. Its share of global exports is around 5% whereas it was expected to rise quickly towards China's level. India has attempted a structural transformation whereby it became a net exporter of finished products. This resulted in increase of rapid growth rates in exports of fibre and yarn and growth rates of apparel, homes furnishing, technical textiles and other finished products. This in turn maximized employment generation and value creation within the country and moved towards fulfillment of the Prime Minister's Vision of "Make of India".

Effective Tools for Innovation

Following strategies are suggested for effective innovation in growth of textile sector in India.

- **Achieving Scale across the Value Chain:** In the Indian textile and apparel sector, the sub sectors of weaving, processing and garmenting are fragmented and lacking in the requisite scale for success in global markets. To bring them at par with global counterparts, there is a need to facilitate rapid growth and modernization of existing firms with potential for success. In addition, it would be necessary to attract large scale investment for manufacturing world class facilities for realizing the Prime Ministers vision of "Make in India"with "Zero Effect; Zero Defect" at each level of the value chain.

- **Attract Investment into the Sector:** The sector needs to be made attractive enough for investors. The key to getting investments on this scale is for returns on investments to appear attractive enough. Investments need to be adequately self-centered. The essential pre-requisites for getting investments on the scale requires well developed land with adequate infrastructure, skilled manpower andeasy connectivity to ports. Creating new mega textile parks would be the way forward. Lowering the cost of production as well as the cost of logistics would be of paramount importance and should be given highest priority.
- **Skill, Quality and Productivity:** For achieving the production capacities envisaged, additional skilled manpower of 35 million would be needed. The recent initiatives on skill development through the Textile Skill Sector Council in partnership with Industry need to be scaled up vigorously. Abundant availability of trained and certified manpower should become the norm in next three years.
- **Reforming Labour Laws:** The regulatory framework for labour with multiplicity of laws and reporting requirements exist for the labour intensive segments of the value chain. In order to attract large scale investments, to acquire global scale and bring the Indian sector at par with other competing countries, there is an immediate need to review the labour laws to make them investor and labour friendly.
- **Diversification of Exports in terms of Products and Markets:** Indian exports of textile and apparel products have been growing steadily; but they have been limited to only a few markets. The EU and the US remain the major export destinations with 50% share of the Indian export market. The higher share of global trade that is envisaged can be attained only if Indian exporters also start looking beyond traditional products and markets and begin succeeding soon. The product mix would need to be tailor made for each major market.
- **Promoting Innovation and R&D:** The Indian textile and apparel sector is known for its traditional products. India is yet to make its presence felt on the global stage with brands, chains, products and processes. Without innovation and R&D, this would not happen. India should try and position itself in the global frontier as an eco-friendly hub in the entire value chain of the textile and apparel sector.
- **New Approach towards Handloom and Handicrafts:** Handloom and Handicraft sectors employ 15 million people and provide livelihood to some of the weakest sections of the society. They embody the rich cultural heritage and traditions of India. With development, increasing per capita incomes and change in popular tastes, the scale and share of production in this sector is experiencing a decline. This would need imaginative and sustained promotional efforts.
- **Partnership with State Government:** There is a need to realize the employment and value addition potential of the textile and apparel manufacturing sector. The initiatives of the Central and State Governments need to complement each other for the attainment of the shared national objective.
- **Reengineering of Existing Schemes and Policies:** Ministry of Textiles has a large number of schemes and programs for textile and apparel sector. Some of the flagship

schemes are Technology Upgradation Fund Scheme (TUFS), Scheme for Integrated Textile Parks (SITP), Mega Cluster, Integrated Skill Development Scheme (ISDS), etc. These schemes need to be scaled up substantially. They also need re-engineering and re-calibration to suit the ambitious goals being adopted.

- **Smart Tailoring:** Smart Tailoring was created by an Indian designer which is a way to increase fabric efficiency (by 15 percent) and reduce lead-time (by 50 percent) to manufacture high-end garments.

Future Challenges Relating to Innovation

Future challenges relating to innovation in the global textile industry include the full realization of emerging technologies such as plasma technology, nanotechnology, micro-encapsulation technology and biotechnology, all of which provide strong tools for the textile industry to produce a wide range of added-value products in both commodity and more sophisticated product markets.

One of the most interesting development areas today, with very strong growth potential, is smart textiles and wearable systems. Further integration of micro- and nanotechnologies and flexible systems in textile material, aiming at the implementation of the e-textile paradigm result in sensing, actuating, communicating, processing and power sourcing seamlessly integrated into a textile. It's a key future development area with a large number of potential applications and business opportunities.

Innovations have been a steady process all over the world during last couple of decades. What we have been experiencing in the form of excellent quality fiber and fabrics with ultra-modern machines and equipment is the result of concerted and timely innovations. India ranks at 76th position among 143 countries in the global innovation index 2014. This certainly suggests that lot of efforts are required to be made in R&D and product development.

It is apt to conclude with the following:

'Product, Process and Systems Innovation' is the successful mantra.

SPECIAL PAPER

INVENTION IN FASHION INDUSTRY

Prof. Dr.S.Amsamani
Dept. of Textiles and Clothing,
Avinishlingam Institute of Home Science and Higher Education,
University for Women, Coimbatore

Introduction

Invention and fashion are most interesting terms which go vital across the globe; both have a great and long history from the inspection of earth till date. They are the foundations to man's civilization. The terms invention and a fashion have grown with the growth of mankind from the Old Stone Age to that of the present Digital Era. Invention is the ringing word which every ambitious man, company and country looks forward. What is Invention? The answer varies from person to person based upon ones education, age, sex, nationality and civilization. To a child it can be something which he sees for the first time; to an adolescent it is something different and new; to a common man it is something out of the box with unique features, a business man it is an idea to earn more money, a scientist it is a thing that has never existed before. The world has the best inventions as the discovery of wheel, nail, compass, the printing techniques, internal combustion engine, telephone, the light bulb, penicillin, contraceptives and finally now the internet.

When we focus on fashion, it can be described as something which is novel, a combination of textiles, clothing and accessories which is new and unique. *Fashion can be describes as something which is seen and used often* rather a popular style or practice, especially in clothing, footwear, accessories, makeup, or furniture. *Fashion* is an idiosyncratic and often constant trend in. In the recent years we are witnessing a rapid expansion in technology and its application in fashion industry. The major technologies influencing fashion are nano technology, bio technology electronic, coding systems and market management techniques.

History of Fashion invention

Fashion invention also has a history which started many years ago and developed along with civilization. The invention of using trees barks leaves and animal skin for protection and modest was the first phase to textile industry. Later this developed with the finer, yarns and weaves slowly. The fashion industry also developed from Stone Age when the cave men used tattooing for body decoration. The use of berries for coloration of body added credit to the fashion industry. The second phase of development was the use of electric power for processing of fibers, yarns and garments. Softening hard water was a breakthrough in the possessing industry. The third phase was the development of

the traditional system of craft-based production. This phase was enhanced by the introduction of sewing machine, artificial dyes and fashion accessories. The fourth phase of development was inventions in the digital era where in fabrics have become a part of information and data. These phases of developments are in link with the stages of industrials revolutions, dating back to the 18th, 19th and mid 20th centuries. Now Artificial intelligence plays a key role in the fourth industrial revolution, by automating functions currently performed by people. In a trend-driven industry like fashion, the ability to quickly make complex data-driven decisions has helped companies to predict whether a new product will become a bestseller, or how long a trend will last.

Invention in Fashion Processes

Bio-Filtering Wastewater: Modern technology know as Batch Biofilter Granular Reactor has been introduced in the field of treating waste water, where in waste water which has the pollutants is poured over the microorganisms. These microorganisms absorbers up to 80 percent of the pollutants which is more than that of the traditional method.

Air Dying Technology: This new technology developed by Colorep can save up to 283.906liters of water in the dying of 0.453592 kg of fabric. This in turn saves energy by 85 percent and end product being eco friendly. The dyes are transferred by heat and hot air resulting in reduction of water in dyeing.

Digital Printing: With digital printing, prints are directly applied to fabrics with printers, reducing water usage by 95 percent, energy reduction of 75 percent, and minimizing textile waste. This technique has been used by designers like Mary Katrantzou, Alexander McQueen and Basso & Brooke.

3D printing: With the advancement in printing technology 3D printing is spreading into all types of manufacturing processes especially in the fashion industry. 3D printing enables the designer to create his own design clothing and prototype accessories which is unique from others. MoMA's permanent design collection is a set of dresses which are made in such a manner where in the design is printed directly on the dress using 3 D printing technology in all parts or specific areas of the dress as the case may be. The machine is designed in such a way to move the fabric over 3,316 hinges that link its 2,279 interlocking triangular panels for printing to be complete. You can print a dress and wear it straight out of the machine. The concept is also used for printing accessories like hand bags, shoes and belts. Research has proved the production of 3D accessories also. Unique machines are available to produce products as per the designers wish, a mould is made as per the requirements and later they are used as dies to produce the accessories. The cost of 3D printing and production development is likely to reduce by 50 % by the end of 2018.The most recent research in 3D product development is the production of accessories using shrimp chitin by the researchers at the Massachusetts Institute of Technology. This is a biodegradable product with a shelf life of 3-4 months. The producers say that it can be used for one summer then throw it into the ocean to dissolve in salt water.

Invention in Fashion Products

Fabric Out of Milk, Tea, and Coffee Beans: Milk is used to produce Eco Milk fibers by German scholars. Theses fibers are more sustainable to fashion, soft in nature and are named as QMilch. Vegetable leather is another mile stone in the production of leather goods. Fermented tea is used to treat fiber to produce vegetable leather. These fibers are so close to leather to see and feel. Recycled coffee beans are used by High-tech sports clothing company, Virus to produce clothing for winter where in a coffee bean treated lining is introduced for performance apparel-Stay Warm.

Levi's Water-Free Stone washing – jeans: In order to reduce water pollution Livi's company has come with a new technology where in it used only 28 percent of water against the traditional 96 percent to make stone wash jeans pants.

Plastic Bags and Beer Bottles Fibers: Recycled synthetics, made with everything from plastic bags to beer bottles continue to make a splash. In much the same way that other materials and bamboo are transformed into thread, the up cycled synthetics are made by breaking down plastic bags, beer bottles into fine particulates and later melting them to form spinning solutions. This solution is passed through spinnerets to extruded fiber. These fibers are mixed with cotton in the ratio of 25:75 to produce material which is soft to the hand, yet durable and performs equal to denim. Manufactures have made jeans pants with is fabrics and named them as "I Am Not a Virgin jeans"

Swedish bicycle helmet: Wearing a helmet is a protective measure but still due its weight, sweat and discomfort created it has been avoided. This problem can be solves by the use of Swedish cycle helmet which is specially designed like a collar which can be worn around the neck. In order to create fashion it is available in many colors to match the dress. It is light weight and can be removed easily. In the event of an accident, the collar inflates into a protective airbag like helmet.

The Smoke Dress: The smoke dress is also known as invisible dress as the wearer can be made invisible like in the bedtime fairy tales. This is the work of a Dutch designer Anouk Wipprecht. The garment is designed to sense the approached unwittingly stranger. On identifying such strangers, smoke is emitted from the garment and the wear becomes invisible.

Color Changing Clothes: Change of color has been a need in the fashion industry. Light emitting devices are been used for this purpose. Organic light emitting devices are very thin and flexible. These devices can make electronic display on every material or screen enhancing glow materials. The effect of light can result in color changing fabrics. This is based on light reflection theory. The material is embossed with color palettes which are arranged in a sequence to create change of color continuously.

Invention in Fashion Tailoring: Computers have showed up as a boon to the fashion and garment industry. By using a computer garment designing, weaving to suit a style, patterning making all can be done together. This data can be attached to the loom with details about the colors, size related to the garment. Once this computer with data is attached to the loom a fabric with prober outlines to match the garment design and size is woven as a single piece ready to cut and weave. This process is called as Direct Panel on

Loom (DPOL) technology, or Smart Tailoring. It was created by Indian designer Siddhartha Upadhyaya. This technology also increases the fabric efficiency (by 15 percent) and reduces lead-time (by 50 percent) to manufacture high-end garments and saves wastage of fabric. This is also known as smart tailoring.

Wearable electronics: Wearable electronic is a mile stone in the field of apparel designing. Wearable electronic are developed like embroidered antennas and circuits with 0.1 mm precision, the perfect size to integrate electronic components such as sensors and computer memory devices into clothing. The devices gather, store, or transmit digital information. Garment made with this type of fabric serves antennas for your smart phone or tablet. These garments are called as High-tech clothing. Workout clothes like towels used by the athletes can monitor fitness level, sports bands used while playing can monitor the athletes' performance. Modern researches has gone step ahead to develop flexible fabric cap that can sense the activity of the brain

Clothing is also incorporated with automatically come with multiple USB outlets, just like our notebooks it notes the daily needs and worked as per the data feed. Example one set the alarm at five am, and request to send notification to the displayer of sound/ light display on the clothing indicating low leave of fuel in cars, purchase of vegetables and fruits and even play soft music once you lay on your bed.

Apart from comfort today garment are used as means to monitor health check sports activates, balance body temperature alone with the external weather (Body Temperature Balancing Clothes) and above all used for storage of data through electronics devices. Small chips are introduced into the fabric during weaving or knitting. These help in monitoring body temperature, heart beat and even blood pressure. These chips can be connected to your doctor's computer and he can guide with the requirements of drugs.

Invention in Fashion Care - Smart Cleaning

Self Cleaning fabrics: Laundry is one area where water consummation is the highest, alone with hard and time consuming process. This has been made an easy and enjoyable process by the art of nano finishing. This prevents the dirt entering into the core of the fiber resulting in waterless and minimum effort on the part of the cleaner. The most important aspect of smart cleaning is that reduction in ruining of fabrics even after multiple washes.

Stain Guard Fabrics: The market has also entered into the manufacturing stain repel-and-release treatment. Special chemicals are coated on the surface of the fabric which forms the effect of lotus leaf such the liquid rolls off the fabric. Nano technology has been used by many of the manufactures to give this finish.

Instantly Dry Clothes: Quick dry fabrics are need especially in rainy seasons. This process is used in the making of swim wear. This finish is given for swim wear resulting fast drying of as that of natural skin.

Odor Preventing Fabrics: Unpleasant smell resultant from sweat and dirt is one of the major reasons for frequent laundering. The presence of perspiration gives room for the

growth of bacteria and fungi which in turn causes bad odor and on a long run may lead to skin infection and foot corn on the wearer and deterioration of fabric. In order to prevent this bad smell and transform moisture created by sweat, Japanese company Teijin has develops wide range of solutions, including the anti-bacterial odor preventing functions. These solutions are enhanced with rose/jasmine essences and pure silver solutions for imparting fragrance and antimicrobial finishes. Sliver lined socks with rose fragrance is available in the markets at reasonable cost. They keep feet warm and smelling of roses.

Wrinkle Resistant Fabrics: Ironing is one of the major activities in care of textiles. This process removes the wrinkles and maintains the freshness of the fabric. A chemical treatment technique is followed such that the garment is treated with an anti-wrinkle finishing solution before dyeing which minimizes wrinkles and gives a smooth appearance to the fabrics.

Sustainable and Eco-friendly Fashion: Eco friendly being the buzzing word many manufactures are concentrating in the production of fabrics that Go Green. These fabrics are produced with minimum use of water, with natural sources and zero percent effluent discharge. Many efforts are taken by the manufactures, administers economics and social workers to up cycle the old fabrics and give them new life rather than throwing them into garbage or take them down to charity to recycle them. With modern developments these old clothing is up cycles to fashion products which on the other hand will dramatically lessen our carbon footprint over time, helping to preserve the environment for future generations. With low consumption of carbon, there will be greater emphasis on sustainable lifestyles with customers willing to pay extra for high-quality, sustainable clothing items. An example is modification old jeans pants into hand bags, shorts and other useful articles.

Streaming Fashion Shows: Fashion shows are the basis for future fashion forecast. It is mostly showcased in a big air conditioned auditorium which can be view by limited members. But with the advancement of streaming fashion shows the designers can showcase their products to a wider audience and gather data on where their potential customers live and shop.

Online Shopping: On line shopping is gaining popularity. There are number of apps which sell branded products at reasonable prices. The most popular fashion related apps are Apps That Provide Access to Fashion, Shopping Made Fun App, Shop Style App and Upper Street Shoe Designer App. These apps are specially designed to shop textiles, clothing and accessories. They also provide gift coupons and attractive offers. Some apps are really useful for budget-conscious shoppers, as it compiles items from over 100 online retailers to ensure you get the lowest price on your purchases. They provide view of unlimited items which can be mixed and matched. The major problem with on line shopping is the view of the clothing on the user and fit. But this is also solves today with the introduction of Digital Dressing Rooms. Manufactures have created tools which match shoppers to match clothing items to various body measurements and not just a size. As advancement some retailers have a virtual fitting room with a mannequin which

changes shape based on the measurements you put in. This allows one to see how clothing will look on your body. In a nut shell on line shopping has become smart shopping with great potential to dramatically reduce returns and minimize shipping energy and waste in the process.

Summary

Fashion has travelled a hard way from mere drapes around the body to the development of functional clothing. Clothes once used as protective material has now emerged into electronic goods to collect, store and analyze data. Civilization will not fold it hands and sit back enjoying the present inventions, the most unique creation of the almighty "The Human Brain" is and will look forward for more and more inventions. In the words of APJ Abdul Kalama "The Best yet To Come"

References

1. http://www.treehugger.com/sustainable-fashion/10-awesome-innovations-changing-future-fashion.html
2. https://www.sciencedaily.com/releases/2016/04/160419084501.htm
3. https://www.businessoffashion.com/articles/fashion-tech/fashions-fourth-industrial-revolution-2
4. http://www.thesnugg.com/The-Combination-of-Fashion-and-Technology-Past-Present-and-Future.aspx
5. http://yuliziv.com/?p=263
6. http://blog.inventhelp.com/7-ways-innovation-changed-fashion-industry/#sthash.gQ6wqqLz.dpuf
7. http://blog.inventhelp.com/7-ways-innovation-changed-fashion-industry/

SPECIAL PAPER

INNOVATION IN FUNCTIONAL TEXTILE FINISHING

Dr.G.Bagyalakshmi
Assistant Professor (SS), Department of Textiles and Clothing,
Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore

Introduction

Textile innovation is a key driver of textile and garment production. Technology offers much more possibilities to combine style and functionality. The consumers are demanding textile products with higher performances, even in the traditional clothing and home textiles areas. High performance properties in the area of textiles were developed mainly for "protective" clothing but in recent year's textiles with functionality is used for "normal" clothing too. Many fabric producers are devoting more and more attention to try to put into the market products with new effects that can represent an important added value. Functional properties can be defined as the real time effects that are beyond the pure aesthetic and decorative functions. Instantaneous effect due to external stimulation on the textiles exhibit "smart properties", to the purpose for which it is enhanced with.

Smart textile materials are designed with new technologies that provide more value to the wearer and possess an unimaginable ability to communicate, transform, conduct energy and even grow. Garment performance aspects determine the standards it meets and how the consumer benefits through it. Performance aspects include the garment aesthetic and functional performance. Aesthetic performance refers to attractiveness. Functional performance includes performance aspects other than appearance, namely the garments utility and durability. Performance enhancing textiles are enhanced with specific functionalities like body temperature control, reduce wind resistance and control muscle vibration for athletic, all of which help improve athletic performance. Some protective clothing guard against extreme environmental conditions too.

Innovation in textile sector is on the rise due to the end-user demands for specific applications. In many cases, the functional properties involve a surface modification, which can be obtained by means of chemical modification, by the application of a surface layer or by more environmental friendly treatments such as the use of enzymes or physical modification by plasma technology. New approaches to design products and to achieve high added value functionalities can be found by looking at nature with which nature protects itself in hazardous environments, based on extraordinary functionalities. Functional properties can be obtained either by the fibre itself (characteristics of the

polymer or additives before fibre spinning);yarn, fabric or material construction (for instance, with different fibres or different layers);

Functional textiles material for end specific application must possess combination of properties liste below;

Optimized moisture management
Improved thermal insulation
High performance in hazard protection
Increased abrasion resistance
Body control
High aesthetic appeal
High/low visibility
Better heat flow control
Breathability
Environmental friendly
Health control and healing aid
Easy care
Enhanced handle

Functionality of textile materials

Mimicking nature of textiles;

Bio mimicry or imitation of nature is a science that studies the nature's models and then imitates or takes inspiration from these designs and processes to impart functionality in textile materials. Self cleaning textiles is one such innovative functionality that can take advantage of the very sophisticated and highly efficient mechanisms with which nature protects itself in hazardous environments, based on extraordinary functionalities.

Eg: Lotus effect on textiles, Chameleon effect on textiles

High performance textile materials

Smart textiles are based on research, which has its foundation in different research disciplines; textile design and technology, chemistry, physics, material science and computer science and technology.

Technology behind smart textile production is as follows;

- Introduction of new type of textile fibres and structures
  Example: conductive materials.
- Miniaturization of electronics, which makes it possible to integrate electronics into textile structures and products.
- Various wireless technologies enabling the wear ability and enable communicating performance with other devices such as computers or mobile phones.

The expectations of the consumers concerning the performance of textile materials are always increasing. Through multifunctional properties, highly desirable characteristic which involves thermal insulation and active cooling effect on textile materials with controlled release properties are possible. The controlled release of chemicals can find many applications, not only in the cosmetic area, where several products are already commercially available, but also in medical applications for controlled release of drugs. Textile materials with bio sensing properties in general are also possible routes to bring highly desirable new products.

Functional finishing on textiles

Plasma technology is dry process which can improve or substitute a lot of finishing operations and new materials, not accessible by traditional process, can be produced and this is a very promising processing technique in terms of surface modification.UV protective textiles for swimmers, anti allergy, absorbent & antibacterial products used in medical applications, fabrics incorporating moisture management systems – used for speedy evaporation of sweat, reflective textiles for safety garment, insulation & buoyancy fabrics for activities in water are few examples for functional textiles. The dress mimics the body's circulation system, the senses and scent glands. The veins and arteries flow freely as the new interactive fabric emitting a selection of scents depending on wearers mood. A sleep suit has been developed to emit lavender for insomniacs when they wake to calm the wearer and send them back to sleep.

Micro-encapsulation Fragrances are captured in microscopic polymer bubbles which are added to natural or microfibres. When the fabric is rubbed or comes into contact with the skin, the bubbles slowly burst to release their content. Nano-particles are permanently attached to cotton or synthetic fibers. The change occurs at the molecular level, and the particles can be configured to imbue the fabric with various attributes.

Nano- technology combines the performance characteristics associated with synthetics with the hand and feel of cotton. Nano-fibers 1/1000 the size of a typical cotton fiber are attached to the individual fibers attached to cotton fibers and these Nano-fibers cause liquids to roll off.Smart-fabric with pine-cone model adapts to changing temperatures by opening when warm or shutting tight if cold.

Phase changing Materials in Textiles

Textiles containing phase change materials react immediately with changes in environmental temperatures, and the temperatures in different areas of the body. Rise in temperature causes the PCM microcapsules to react by absorbing heat and storing this energy in the liquefied phase change materials and the microcapsules release this stored heat energy and the phase change materials solidify when the temperature falls again.

Materials which are context aware and change their properties according to the environmental conditions could bring many benefits for the user. Such properties are for instance textiles which release substances in a controlled way, which could bring a high added value. Here materials with self-healing properties can also be included. Textiles with colour changing properties under different stimuli are already available but further developments and improvements can be made.

Also other approaches are today becoming interested for textiles. Materials are said to have shape memory properties if they can deform and fix into a temporary shape and recover their original, permanent shape only on exposure to an external stimulus. A thermally induced shape-memory effect can be activated by an increase in temperature. Recently certain polymers have been developed which show shape memory effects after exposure to light (UV-radiation). These materials could be of very large importance for textiles.

Conclusion

Innovation in functional textile area has risen and researches in this are now gaining importance.

Moreover use of natural materials for specific functional properties are exploited and administered in recent years. This is because of the eco consciousness of consumers. Textiles that are finished with functional value addition seemed to be the major thrust areas of research. Inspiration from nature paves way to carry out more researches and experiments.

References

1. Almeida, L.: Functional Finishes, Proceedings of 5th World Textile Conference AUTEX 2005, pp. 77-82, ISBN 86-435-0709-1, Portoro, Slovenia, June 2005, Published by AUTEX (2005).
2. Brown Rice, J. (1998). Ready to Wear Apparel Analysis. 2nd ed, New Jersey: Prentice Hall, 162-170,193-195.
3. EURATEX (with the support of TEXTRANET and AUTEX): Research Priorities Proposed by the 9 Thematic Expert Groups, EURATEX internal document, May 2006.
4. Das, S. (2008). Apparels for exports: Importance of quality characterization. Indian Textile Journal,Smart Textiles and Wearable Technology – A study of smart textiles in fashion and clothing
5. Dedhia E & Gupta M, (Sep - Oct 2009), Consumer preferences based on quality and appearance cues, Journal of Textile Association,Volume 70, No. 3.
6. Gupta.D (2011), Indian Journal of Fiber and Textile Research, Vol.36, December 2011, pp 321-326.

CONTENTS

S. No	Title of the Articles	Page. No
1.	Oektech in Trickling Filter Wastewater Treatment **Dr.M.Jayanthi**	1
2.	Sports Textiles **P.Thenmozhi**	3
3.	The Textile Form of Sound **A.Shakila**	7
4	Phillipinos Attire **C.Anitha &*Vasantha Esther Rani***	13
5.	Fabrication of Biosoftened Non - Conventional Fibers and Evaluation of its Properties **A.Lavanya & N.Vasugi Raaja**	18
6.	Acoustic Textiles in the Control of Noise Pollution **S.Ahalya**	22
7	Textiles in Food Production **T. Z. Ahamed**	25
8	Development and Evaluation of Eco-Friendly Wipes made by Upcycling Cotton Textile Processing Waste **Dr. S. Aishwariya & Dr. S. Amsamani**	27
9	Fabric Choices for Tactile Defensiveness in Children **Dr.M.V.Alli**	32
10	Extraction, Optimization and Finishing of Active Compounds Extracted From Tanners Cassia Flower and Azadirachta Indica Leaf for Antimicrobial Property on Spunlaced Nonwoven Fabrics **M.Amsaveni & Dr.S.Amsamani**	37
11	Dyeing of Cotton Fabric with Natural Dye Extract from Argemone Mexicana Leaves **K.Amutha**	47
12	Properties of Cyperus Pangorei-A Natural Fiber **P. Amutha & Dr.G.Bagyalakshmi**	53
13	Physical Benefits and Cultural Significance of Women's Apparel in India **K. Anuradha**	58
14	Quality Checker for Textile Industry **V. Anuradha & V.Aanandhi**	60
15	A Novel Antimicrobial Finish for Surgical Masks **S. Arathy sen & G. Bagyalakshmi**	66
16	Efficacy of Traditional Medicinal Plants Infunctional Finishing of Textiles **S.Archanaa Preetha & Dr.G.Bagyalakshmi**	71

17	Application of Eco-Friendly Natural Dye on Bamboo/Cotton Fabric Using Natural Mordant. **J.Banupriya & Dr.V.Maheshwari**	77
18	Surface Coating on Textile Material **R.Bhavani & Dr.S.Kavitha**	82
19	An Overview-Present and Future Scenario of Home-Tech Industry **K.Christie Jennifer & R.Kalpana**	86
20	Processing of Herbal Textiles **P. Dhana priya & Dr .U. Ratna**	91
21	A Study on Eco-Friendly Dyes with Selective Natural Components and its Effect on Woven Cotton Fabric **S. Divya & Dr. S.Grace Annapoorani**	94
22	Agro- Textiles **Dr.M.Hemalatha**	100
23	Ayurvasthra – A Novel Combination of Ayurveda and Textiles-A Review **Dr.M.Isai & J.Viji**	105
24	Living Conditions of Textile Migrant Workers Households in Tirupur **Dr. J. Indirani**	114
25	Significance of Natural Dyes in Health **L.Jayaprada**	120
26.	Sustainable Approach to Develop Innovative Textiles Using Plasma Treatment **Jayashree Venkatesh & K.N.Ninge Gowda**	125
27	Ayurvastra -Fabrics that Heal **Dr.S.Kala**	128
28	A Study on the Socio-Economic Status of Women Workers in Textile Industries at Tirupur District **Dr.M.Kalaiselvi& Ms.M.Radhika**	135
29	Eco-Friendly Dyes from Plants in Textile **P.Kamaladevi**	139
30	Herbal Finished Garment for Psoriasis Patients **Dr.M.Kanimozhi**	143
31	A Study on Measurement of Fabric-Skin Friction Characteristics **Dr.P.Kanthvadivu, R.Surjith & D.Gopalakrishnan**	147
32	FTIR and SEM Analysis Made on Nano Encapsulated Cotton Denim Fabric **V. S. Karpagavalli &Dr.M.Sumithra**	153
33	Characterisation of *Terminalia bellerica* and its Antibacterial Activity on Nonwoven Fabrics **P.Karpagam &Dr.G.Manonmani**	157

34	Recent Trends in Textiles **Dr.R.Kavitha**	160
35	A Study on Uses of Geo-Textiles in the Field of Engineering **R.Kavitha**	165
36	Disposable Textiles-Feminine Hygiene Product an Overview **S.Kokilavani & Dr.S.Karpagamchinnammal**	170
37	A Study of Textile Materials for External and Internal Healthcare Applications **Dr. Krishnaveni vasudevan**	173
38	A Hallmark of Heritage – Saree **Dr. C. Lalithambal**	180
39	Development of Value added Indoor Foot Wear Finished with Aloe Barbaderis Mill Extract **Dr.R.Latha**	182
40	Reuse of Decolourized Effluent Water for Dyeing **A.Lavanya& K.Kalaiarasi**	185
41	Impact of Feed Quality on Silk Fibre **S. Maheswari & P. Anitha**	189
42	Origin of Sarees and an Outlook of Silk Sarees Associated with Carnatic Music Singer **Dr.C. Malarvizhi**	192
43	Smart Coat with A Fully-Embedded Textile Antenna for (Iot) Applications **T.Malini**	194
44	Innovative Repellent Finish in Interior Decorative Fabrics **M.Malini Devi**	198
45	An Analysis of Growth and Development of Textile Industry in India **R.Mangaiyarkarasi & S.Vaishnavi**	207
46	A Review on Elements of Personnel Management and Employee Relations - Importance and Improving Ways in Apparel **C.Manimakala**	213
47	Nanotechnology in Textiles **Dr. P.K.Manimozhi**	217
48	Yarn Breakage Detector (Textronics) **M. Muthu Rubini & A.B. Bhargavi**	223
49	Aesthetic Textile Designs **Dr.S.Mythili**	228
50	Dress Culture of Chola Dancers **Dr. M. Nalini**	231
51	Application of Areca Husk in Textiles **N.Nithya & Dr.G.Bagyalakshmi**	233

52	A Study on Service Quality of Textile in Handicrafts **N.Padma Priya & V.Swasthika**	237
53	Role of Mulberry Silkworm *Bombyx mori* in Mulberry Silk Production **Dr.R.Prabhavathy**	244
54	Protagonist of Textiles In Interior Decoration **D.Priya**	247
55	Cotton Dyeing with Natural Dye Extracted from *Thespesia populnea* **S. Raadhai &Dr.R.Prabha**	251
56	Role of Textiles in Catering Industry **S. Ramesh Raj**	256
57	Make in India: Developing Textile Manufacturing Hub **P. Sailaja**	261
58	Cotton Mechanization in India **S.Saranya**	266
59	Agro Textiles **V.Saranya**	269
60	Solicitations of Coir in Agricultural Textiles **Saravana prakash &Dr. S.Kavitha**	275
61	Sartorial Elegance from Banana Fibre **P.Sasikala**	277
62	Methods and Applications of Automobile Textiles-A Review **K.Savitha & K.Saranya**	280
63	Reviving Tradition and Culture through Apparel Designs **Dr. J. Senthamarai**	287
64	Aesthetic Sense in the Apparels of Tamil People in Ancient Tamil Literature **Dr. K. Selvi**	292
65	A Study on Bamboo/Cotton and Bamboo/Polyester Blended Woven Fabric **C. Sheeba , P.Sasikala & Dr. K.Thangamani**	294
66	Interior Textiles **S.Sneha**	298
67	Agro Tech **R.Sowmiya**	304
68	A Study on the Trend and Growth of Secondary Sector in Tamilnadu **R.Sridevi karumari**	307
69	Sports Clothing Technology – The Future of Sports **T.Suthamathi**	312
70	Textile Dyes and Treatment of Wastes from the Dyeing Process **M.Tamilselvi**	315
71	Language of Clothes and Etymology of Fabric Names **R.Thenmozhi**	318

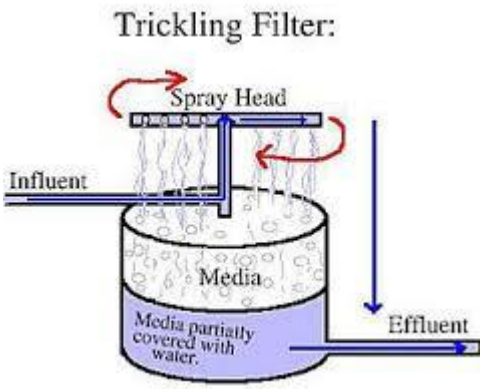
72	Natural Dyes and Dye Yielding **Dr.S.Thevasundari**	320
73	Medicinally Important Textile Plants **Dr.C.Thilagavathi**	324
74	Application of Hempcotton Fabric for Selected Home Furnishing **R. Umamaheswari**	327
75	Ayurvastra for Health and Elegance **Dr.S.Usha**	333
76	Adsorption Characteristics of Naphthol Blue Black – B on Activated Carbon Derived from Coconut Shell and Palmyra Fruit Nut Shell – A Comparative Study **Dr.M.Vasuki &M.Karthika**	336
77	The Role of Textiles in the Western European Civilization During Sixteenth Century-A Bird's Eye View **Dr. M. Venkateshwari**	339
78	Indian Textile Industry-Challenges and Oppurtunities **Dr.R.Vijayalakshmi**	342
79	Biosoftening of Hemp Yarn Using Pseudo Stem of Banana **A.Yamunadevi & Dr.R. Sunitha**	347
80	A Review on Unconventional Fiber and its Application in Technical Textiles **S.Yamuna devi & D. Sheeba mercy**	354

OEKOTECH IN TRICKLING FILTER WASTE WATER TREATMENT

Dr.M.Jayanthi
Principal, Seethalakshmi Ramaswami College, Tiruchirappalli

While addressing the Technotex-2017, Ms Irani, Minister of Textiles, Government of India commented that Agrotech, Geotextile and Oekotech must be represented as Technotex as these sectors have great untapped potential. Oekotech has the potential of globally implementing sustainable green in order to protect the environment. A technical textile is a textile product manufactured for non-aesthetic purposes, where function is the primary criterion. Technical textiles include textiles for automotive applications, medical textiles (implants), geotextiles (reinforcement of embankments), oekotech (erosion protection, waste treatment) agrotextiles (textiles for crop protection), and protective clothing (heat and radiation protection for fire fighter clothing, molten metal protection for welders, stab protection and bulletproof vests, and spacesuits). It is a large and growing sector and supports a vast array of other industries. The global growth rate of technical textiles is about 4% per year greater than the growth of home and apparel textiles, which are growing at a rate of 1% per year. This paper recommends for a modified trickling filter design to treat wastewater. The trickling filter is an aerobic treatment process utilizing microorganisms attached to a medium to remove organic matter from wastewater that passes through the medium. Trickling filters are the most common type of biological wastewater treatment systems because of the simplicity, ease of operation, and cost effective performance capabilities. Wastewater from the primary treatment device enters a basin for storage prior to discharge to the trickling filter. Dosing siphons or pumps in the basin dose the primary effluent to a rotary distributor or fixed spray nozzle system in the trickling filter. A rotary distributor may be hydraulically or electrically powered by the dosing siphon or pumps in the storage basin so as to rotate the distributor arms over the filter media, dispensing the primary effluent in an even manner across the entire filter bed. Wastewater flows by gravity through the filter bed and is treated by a combination of physical and biological processes. The filtered effluent passes through an underdrain system. Due to the nature of the rock, slag or plastic medium, a biological film or slime layer (approximately 0.1 to 0.2 mm thick) attaches to the medium. As the wastewater flows over the medium, microorganisms already in the water gradually attach themselves to the rock, slag or plastic surface in the form of a film. The organic material in the wastewater is then degraded by the aerobic microorganisms. As the layer thickens through microbial growth, oxygen cannot penetrate the medium face, and anaerobic microorganisms develop. As the biological film continues to grow, the microorganisms near the surface lose their ability to cling to the medium, and a portion of the slime layer falls off the filter. In spite of several advantages of trickling filters there are

some disadvantages also. Accumulation of excess biomass that cannot retain an aerobic condition and incidence of clogging are the worst that can impair trickling filter performance. Hence a need exists to modify the trickling filter design which could retain the advantages and minimizes the disadvantages.



Oekotech can bring a solution for this issue. The medium of the trickling filters could be modified by using a non-woven textile made from continuous or non-continuous synthetic fibers impervious to typical wastewater constituents. The synthetic fibers may be polyester, polypropylene, polyethylene, other synthetic materials, or a blend of materials. The fibers could be configured into a chip of approximately two inches square and one-quarter inch thickness. The chips have a plurality of layers of material arranged in a random fashion to provide a better filter medium. The chips are randomly placed to form a bed in the trickling filter, said bed typically being at least two feet in thickness. The textile material has several advantages over typical trickling filter medium. The open area within the textile chip is at least 85% compared to the 40% open area of rock media. The textile material has a water holding capacity of at least 15% by weight and also has a surface area of upto 5,000 square feet/cubic feet along with the large open area and water holding capacity, which is much greater than the rock, slag or plastic media.

The benefit of the textile material is that the media acts as both the attached growth medium for microorganism attachment and provides solids separation without the need for a separate clarifier as in conventional trickling filters. As the wastewater flows over the textile chips, microorganisms gradually attach themselves to the fibers of each chip. The organic material in the wastewater is then degraded by the aerobic microorganisms attached to the fibers. Due to the small diameter of the fibers, a thick slime layer cannot develop as occurs with rock, slag and plastic media and oxygen is present throughout the medium, preventing the growth of anaerobic microorganisms. The small diameter of the fibers allows the microorganisms to cling to the textile chips, and prevents sloughing of the biomass which is common in conventional trickling filters. Most of the biological activity takes place in the upper layers of the bed, and any excess biological material will be deposited in lower layers of the bed and biologically degraded in a similar fashion. The design of the textile media chips allows more aerobic microorganisms to populate the media bed, providing more biomass to reduce BOD and suspended solids than conventional trickling filters. The water retention capabilities of the textile chips also allow a higher biological retention time and a higher nitrification rate, thereby reducing ammonia- nitrogen in the effluent. Thus Oekotech, Ecotech - Ecological Protection Textiles could be used in biological waste water treatment systems to advance the existing ones.

SPORTS TEXTILES

P.Thenmozhi M.Sc; M.A; M.Phil
Associate professor and head, Department of homescience
Seethalakshmi Ramaswami College, Tiruchirappalli-2

Abstract

A textile is anything that is made up of fibers, yarns, or fabrics. The basic building blocks of textile products are fibers. A textile or cloth is a flexible material consisting of a network of natural or artificial fibers (yarn or thread). Yarn is produced by spinning raw fibers of wool, flax, cotton, or other material to produce long strands. Textiles are formed by weaving, knitting, crocheting, knotting, or felting. Textiles are often associated with the production of clothing. Sports textile is the one of the branch of technical textiles .Today's sports demand high performance equipment and apparel .These revolutionary new textiles, used in Sports & Leisure industry, are popularly known as Sports Textile or Sports tech.

Key Words: *Importance, Types, Properties and uses of Sports textiles.*

Introduction

Sports textile is one of the branch of technical textile. Now a days sophisticated technology are used in technical textile to produce sports wear. Textile has done it successfully. Hi-tech textiles in sport are nothing new. In recent years we have seen the design of fabrics that can take moisture away from the body, patches on all black jerseys so players can dry their hands for better grip, fabrics that can sense high impact stresses on players joints, and fabrics that can sense heart rate, temperature and other physiological data.

Cricket dress

Today's sports demand high performance equipment and apparel. The light weight and safety features of sport tech have become important in their substitution for other materials. These high-functional and smart textiles are increasingly adding value to the sports and leisure industry by combining utilitarian functions with wearing comfort that leads to achieving high level of performance.

Skiing dress

Technical textiles have enabled production of materials that are tougher than wood, which breathe like skin, are waterproof like rubber and at the same time are eco-friendly and highly economical. The augmentations in the sports and leisure industry have resulted in the use of technical textiles in different sports. These revolutionary new textiles, used in Sports & Leisure industry, are popularly known as Sports Textile or Sports tech

Properties of Sports Textile

- Sports textile must have comported ability, easy to wear, easy handling.
- It also provides superior strength and durability.
- Sports textiles fabrics have a very high electrical conductivity, so they can permit the effectual dissipation of electrical charge.
- It should be light as best as possible.
- Filaments fabrics are made highly effecting in moisture management & thus they can wick the moisture as known as sweat away from the body & keeps body dry.
- Sports textile should have good perspiration fastness.
- Sports textiles fabrics remove UVA and UVB rays that are dangerous to the skin, and guarantees an improved level of defense compared to the majority general natural and man-made fibers. Keeping a normal level of bacteria on the skin offers a high level of comfort and personal hygiene especially during athletic activities.
- These garments are also very less in weight& feature elasticity properties, which provides immense comfort and independence of movement.
- As this sports fabric has a special property of heat conductivity make possible to feel the user cooler in summer& warmer in winter.

Sports Textile has Versatile use. Some Uses of Sports Textile are

Shoes, sports equipment, flying and sailing sports, climbing, angling, cycling, winter and summer sports, indoor sports wear. Some of the sports where these textiles are being used are Golf, Tennis, Mountaineering, Skiing, Cricket and Paralympics Sports.

Textiles are being Increasingly used in the Following Areas

- Swimming costume
- Artificial turfs, sleeping bags, ballooning and parachute fabrics
- Material technology and design, of equipment
- Biomechanics and the Engineering aspects of sports machinery
- Surface treatment of equipment
- Sports Footwear

Some research centre as well as the manufacturer who are leading in the sports textiles are

1. DuPont
2. Kanebo ltd (trade name – killatN)
3. Teijin
4. Toyboo Co Ltd
5. Triangle research development corp.
6. Unitika limited
7. W.L.GORE

- Technology is developed in the manufacturing of fabric used in sports purpose to ensure incorporation of special characteristics demanded by the athletics & the leisure activities for their better performance in the sports.

- Garments manufactured from sports textiles fabrics, keeps the normal stability of body comfort, because these fabrics are
    1. Ultra-breathable,
    2. Fast drying and possess outstanding moisture managing properties, which rapidly wick moisture away from the body.
- These garments are also very less in weight & feature elasticity properties, which provides immense comfort and independence of movement.
- It also provides superior strength and durability.
- The technical textile products covered under Sports textiles are as give below:-
    1. Sports Composites
    2. Artificial turf
    3. Parachute Fabrics
    4. Ballooning fabrics
    5. Sail cloth
    6. Sleeping bags
    7. Sport nets
    8. Sportshoes components
    9. Tents
    10. Swimwear
- In sports, previously a traditional apparel textile was used. For that the player has to face so many problem like
    1. Sweating – which stick the fabric with body
    2. Feeling hot during run
    3. Improper stretch ability
    4. Extra weight of the fabric
    5. Give protection to body skin during fall on the ground
    6. Inadequate fabric for fluid resistance for swimmer
    7. Windproof, waterproof fabric for sailor
    8. Light weight shoe with proper strength & air circulation
    9. High tenacity & resistance to abrasion for the skiwear uniform
    10. Improper gripping of the shoes during run etc
- Therefore, technology has to develop for the above shortcomings. And for that the research activity took place & the country who were in the foremost are:
    1. Japan
    2. Spain
    3. Sweden
    4. U.S
- The strong growth in the consumption of other sporting goods is driven by a combination of demographic and sociological factors, including:
    1. Increased leisure time
    2. An ageing population showing interest in health-related activities
    3. Increased female participation in sports
    4. Increased accessibility and availability of sports such as skiing, golf and sailing
    5. The growth of sports facilities
    6. The advent of new sports such as snowboarding and roller-blading
- In many cases, the increased sports participation is also driven by higher performing, lighter, safer and ultimately cheaper, sports equipment and clothing.

Final consumption of sports goods is currently highest in developed economies such as the US where participation rates are high and mostly still growing. However, both the production and consumption of sports textiles is expected to grow most

quickly in the medium to long term in developing countries where living standards and lifestyles are changing fastest because of it's properties like**:** Keeping skin dry by moisture managing, Anti-static performances, Thermodynamic, Antimicrobial performances &Ultraviolet protection. Following are the New polymers for sports wear: **Phase change material (PCM):** Phase change stuff produce microcapsules full of paraffin. When the capsules are heated, the paraffin liquidities & heat energy is stored. When the environment cools, the paraffin crystallizes again, releasing heat. The paraffin, which is available in different recipes with various melting points, is referred to the phase change material or PCM. Because the paraffin can be formulated with different melting points, the microcapsules can be designed to keep the wearer either warm or cool. **Shape memory polymers:** This material can remember & retain its shape or return to a previous form. A garment made from these shape memory polymers is able to sense changes in the surroundings environment & can evaluate intelligently & control its response to ensure the highest level of comfort. This polymer is also unique as the temperature at which micro-Brownian motion begins can be freely specified. This means that the activation point can be set to match the environmental conditions in which a garment is likely to be worn.

Conclusion

Sports means Olympic (athletics), Football, Cricket, Indoor games, Outdoor games & Fashion clothes. In sports, previously a traditional apparel textile was used. For that the player has to face so many problem. Some research centre as well as the manufacturer who are leading in the sports textiles are manufacturing sports textiles and available commercially. For the comfort and better performance players or people involving in their regular sports activities can succeed in their goal by making use of these materials.

References

1. Dr V K Kothari: Technical Textiles – Growth Potential and Prospects in India.
2. Asian Textile Business, Date: Tuesday, July 1 2003, Sportswear changing aim from Exercise to Comfort Functions.
3. www.design-technology.org/sportsshoes1.htm.
4. Jump up to: Techtextil: Application areas. Techtextil, Frankfurt: Trade fair for Technical Textiles and Nonwovens] consulted 28 March 2015
5. Jump up Resisto Protection Textil GmbH visited 21 August 2008
6. Horrocks, A.R.; S.C. Anand. "Handbook of Technical Textiles." The Textile Institute. Woodhead Publishing Limited (2000)
7. http://www.technicaltextile.net
8. http://www.techfabs.com
9. http://www.textilesintelligence.com/tisttm/
10. http://www.materialsktn.net
11. http://www.technitex.org

THE TEXTILE FORM OF SOUND

A.Shakila
Associate Professor, Department of Home Science,
Seethalakshmi Ramaswami College, Tiruchirappalli

Abstract

Like the fabric, architecture has a long tradition of regulating sound. However, within the field of architecture exists a rich selection of both material and shape helps to regulate the sound, and over time a sophisticated acoustic idiom has developed. The acoustic properties of textiles are closely connected with sound physics. Sound is vibration in a medium. Sound makes the molecules in the media vibrate and spread from the sound source in all directions as a sphere of pressure waves. The sound is important part of our life, on the other hand if it is out of control it will create problem, so we need a sound but in control. Generally wood, textiles and synthetic material are used for this purpose. But the use of textiles for noise reduction is based on two major advantages of these materials, namely low production costs and small specific gravity. Non woven are preferred to use as acoustic due to its more porous structure, more surface area and low cost of production. Use of recyclable raw material further reduced down the cost and like recycled PET. Textile plays dual role aesthetic as well as functional. So it is added advantage to use Textile as an acoustic.

Keywords: *architecture, acoustic, textiles, nonwoven, porous*

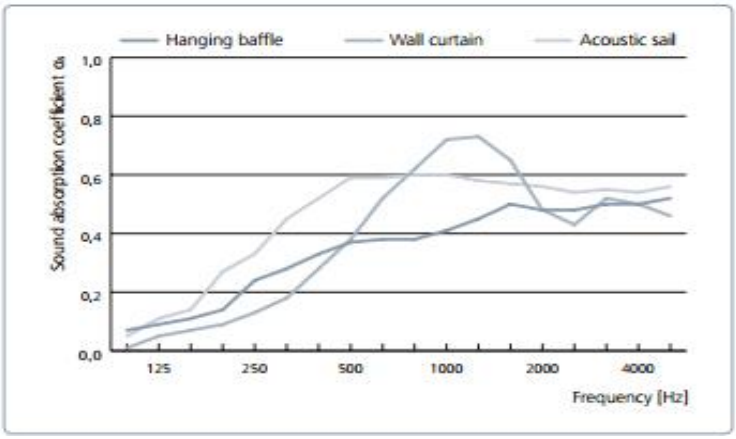
Introduction

Modern high-tech textiles are perfectly suited for interior design purposes. We create visually sophisticated concepts, taking architectural features into account. Seeming opposites merge into harmonic structures: Sun screens redirect the incidence of light and give rooms an own, unique character. Textile surfaces do not have a separating effect, but rather function as design elements, decorative compositions, or even as projection screens. Repeating, gently curved sail patterns create an impression of floating weightlessness, thus offering new perspectives in interior design.

Interior Design Meets Room Acoustics

Rooms with plain surfaces like glass, metal, concrete, or stone tend to cause bothersome acoustic reflections, resulting in a high reverberation period. The sound-absorbing materials Silent Protect and the acoustic foam Silent Cover, which were especially developed for this purpose, reduce the reverberation period considerably. The absorption effect can be clearly felt and measured. Visually appealing arrangements can be developed while taking into account the architectural standards. We are able to implement innovative ideas and at the same time accomplish complex room acoutics solutions. Predominantly humans are considered to perceive their environment through their visual sense. Acoustics is the science of sound and of its additional auditory events. The term acoustics originally comes from the Greek ακουστός, and means “to hear” or “to make oneself heard” (Blauert, J. & Xiang, N. 2009). An auditory event is something that becomes actual in the act of

hearing and sound is mechanic vibrations, mechanic waves, in elastic media. An auditory event don't happen without sound being present, except for when it comes to tinnitus. When the frequency of sound is not within the range of hearing, or for deaf people, there can be no auditory event even in the presence of sound (Blauert, J. & Xiang, N. 2009).



Acoustic Terms

Sound is a wave motion in an elastic media and the elastic media could be the air, water or a rock. The sound wave delivers energy to the media and the energy is carried away by the sound wave. A sound wave could also be described as a sound wave occur when a vibrating body sets the surrounding air in fluctuations and variation in air pressure appears. A sound source oscillates and brings the surrounding air into motion and in the presence of a recipient the sound can be perceived. These motions in air pressure perceives as sound and the sound can be affected by different objects.

When it comes to sound there are two attributes to take under consideration, tone and loudness. The physical amount for loudness is sound pressure, and for tone it is frequency (Möser, M. 2009). Frequency is the repeated events within a given time interval and it's measured in Hertz (Hz). 1 Hz means that one event repeats once per second (Gallagher, M. 2008). The range of frequency in a technical aspect covers more than the range that is audible by the human ear, the hearing level. For the human ear the hearing range starts about 16 Hz and goes up to about 20 000 Hz and the range in which the human hearing is most sensitive is within 1000 – 3000 Hz (Highfiled, D. 2000). The human ear is not equally sensitive to all frequencies, the perception of sound depends on sound pressure level, the objective strength and also on a complicated manner of the 6 spectral composition of sound signal, duration and other factors. Sounds can be divided into categories in terms of frequency, which are shown in table I.

Table I. Categories of frequency. Reference: Blauert, Jens. & Xiang, Ning (2009).

Sound	Frequency, Hertz (Hz)
Audible sound	16 Hz - 16 kHz
Ultrasound	> 16 kHz
Infrasound	< 16 Hz
Hypersound	> 1 GHz

Decibel

Different sounds have different intensity. To be able to measure the intensity relatively the scientific unit decibel (dB) is used, and the easiest way to describe it is the volume of sound, the sound pressure. The sound pressure is the difference between the instantaneous pressure and the static pressure.

Room Acoustics

Usually the purpose of room acoustic actions are to dampen unwanted sounds with absorbing materials or to create good conditions for wanted sounds with help of reflectors, diffusers and calculating reverberation time and considering the shape of the room. What is considered "good room acoustics" varies with a lot of different factors. It depends on what the room is used for, the size of the room, the expectations of the acoustic in the room in order to optimise the spread and absorption of the sound. According to the Swedish guidelines for how to build buildings, "Boverkets Byggregler" there are some requirements to be followed when it comes to sound levels. Sound level indoor from installations such as ventilation, should have a sound pressure level of maximum 30 dB in bedrooms and rooms used for education from sounds with long duration, and 35 dB for sounds with short duration. The sound pressure level indoor from traffic noise is 30 dB in classrooms and rooms used for resting, and also in rooms used for resting and sleeping shouldn't have a sound pressure level above 45 dB between 10 pm – 06 am more than maximum five times per night

Compared to a kitchen which doesn't have as high requirements for sound pressure level as bedrooms the maximum limit is set to 40 dB. Due to the fact that kitchens have a lot more hard reflective areas and usually kitchens have more of the hard unwanted sounds

Textiles

A textile is a material with components from natural or manufactured fibres or even a blend of those two. The fibres are spun into yarn and then formed into a textile fabric in several different ways as through either knitted, weaved or joined together by felt making or stitch bonding. "Textile, any filament, fibre, or yarn that can be made into fabric or cloth, and the resulting material itself. The term is derived from the Latin textiles and the French texere, meaning "to weave," and it originally referred only to woven fabrics. A textile material usually has low density which could be of disadvantage when it comes to sound diffusion. A textile is either acoustic absorbing or acoustic transparent. It's not air tight or satisfactorily stiff but by designing complex 3D structures stiffness can be attained at a level where it can acceptably diffuse medium to high frequencies. The same goes for absorption, it all depends on what region of frequency that is of interest. When it comes to diffusion, textile materials could be of advantage since it could be designed in an aesthetically pleasing way. The acoustic properties of textiles differ depending on how the textile is built up, through knitting or weaving or other techniques. In the structure of textiles

small air pockets are formed and could affect the acoustic properties. Textiles are also highly attractive when it comes to acoustics and sound absorption.

In a study of how down fibre assembly behave when it comes to sound absorption the authors conclude that in general the fractal dimensions for down fibre assembly, increases with fibre mass and decreases with the porosity (Yang, S. et al 2011) and this could be likened with textiles but depends on what frequency that is of interest. Textiles are porous materials such as nonwoven, woven and knitted fabrics. A textile is not a homogenous material; it doesn't have the same properties in every angle. Although textiles also have promising noise absorption properties, especially nonwoven, the challenge though, lies in producing it in an aesthetically pleasing appearance. The nonwoven are usually draped with a woven fabric. Plain weft knitted fabric has also been up for proposal when it comes to sound absorption, but the sound absorption performance isn't that good (Yanping, L. & Hong, H. 2010).

According to the author of "Sound Absorption Behavior of Knitted Spacer Fabrics" there are studies that focus on improving the noise absorption ability of knitted fabrics with producing spacer fabrics. The study showed that a spacer fabric composed of two weft-knitted surface layers with a uniform pattern of micro pores, with a spacer yarn of monofilaments could provide reasonable absorbability at mid-high frequencies. This could provide an appearance and structure that are designable and this characteristic can raise their value, even though the knitted fabrics are more expensive (Yanping, L. & Hong, H. 2010).

Cotton

Cotton is one of the most used fibres when it comes to interior design and fashion. In order to classify cotton it's based on its grade and staple length. The grade of cotton is determined by three factors; colour, leaf content and preparation during ginning. The staple length is determined by comparing the length of the fibre with the standard calibration cotton fibre (Yogeshwar, K. et al. 1999). There are many different types of cotton, but the one used for spinning into yarns is called mature cotton or lint (Humphries, M. 2009). Cotton still accounts for more than a third of all fibres used excluding jute. The properties of cotton is absorbent, comfortable, cool hand and with excellent static resistance. It has good strength when dry but also gets 25 percent stronger when wet. Cotton is not easy care without treatment, it's easily wrinkled, shrinks when washed and can also mildew.

Nonwoven

Textile material have been commonly used for sound absorption and particularly nonwoven fabrics because of their special structure. The usage of nonwovens has grown rapidly in the 21st century. Nonwovens have a varied usage for medical, construction, geotextile, transportation, agriculture, packaging and filtration and of course apparel and furnishings. A nonwoven fabric is a fabric made directly from fibres and there are many methods to achieving these fabrics including mechanical, thermal and chemical bonding. This has also given the rise to composites where two or more materials are combined in one fabric (Humphries, M. 2009).

The most common way to make nonwovens are by needled punched or by spun bonding. The needled punched means that the fibres are joined together with several needle sticks per cm 2 and as the fibres lay random crosswise or lengthwise and by that tangling some of the fibres as the needles goes in and out, gives a product that are flexible with good strength properties (Byggros.com). Spun bonding on the other hand means holding filaments together just after they are extruded from a spinneret. Nonwovens can also be spunbonded by melding, which is when the filaments are held together by heating. Thermally bonded nonwovens are manufactured by endless fibres that are melted together. This type of nonwoven gets stiffer than the needled ones due to the manufacturing process (Byggros.com).

Mineral Wool

Mineral wool is a is a generic name for building material made by mineral fibres which is used for insulation in first hand but also used for sound absorption. The fibres are long and thin and form a porous mass. Mineral wool can be divided in two main types, glass wool and rock wool, depending on base material. Mineral wool not only insulates from heat but also absorbs sound. This material is usually used for insulation but also in inner walls where heat insulation is not needed. Glass wool is usually made from raw material of recycled glass or sand, SiO2. The thin threads of glass are processed together with phenolic resin and 0,5% mineral oil to bind dust. Then the glass wool is formed into insulation boards or other products. The material is non-combustible. Glass wool could also have some health aspects since it can cause dust when insulating a building. Glassfibrewool can cause skin irritations for sensitive persons when contact with the skin. The material has good insulation properties and is also sound absorbing and is used for insulating floors and ceilings. Rock wool is also used as fire protection when building buildnings

Polyester

Polyester is a polymer, which is material that is cheap, simple and easy to manufacture. Polyester is a diverse and large family and can vary a lot. They have diverse ways to use it with widely different properties (Albertsson, A.C. et al. 2011). The properties of polyester are among others good strength and abrasion resistance, good resilience and high modulus, which mean that it is elastic and can recover well from strain. It conducts moisture away and dries fast. The wrinkle resistance is good and it is fairly rigid. It is also used as fibrefill, stuffing for pillows, insulation, batting etc (Humphries, M. 2009). Within the textile industry, the nonwovens are one of the fastest growing segments and make up to roughly one third of the fibre industry.

Conclusion

Textiles are highly competitive as a sound absorption material with the known sound proofing materials. The efficiency of sound absorption relate to the structure and thickness of the materials regardless of whether it's virgin or recycled. The results from this showed that using recycled nonwoven selvages to produce new composites for sound absorption can reduce the textile waste problem also shown in

"World production and consumption of polyester fibres and yarn. Effective sound absorption of a porous absorber is achieved when the thickness of the material is about one tenth of the wavelength of the incipient sound. A thin porous sheet or textile can be an alternative sound absorber. The thin textile has a high flow resistance in a very thin layer in contrast to a bulky fibrous material. If the flow resistance is right the thin textile can absorb almost as much sound as a bulky one. Therefore the textile could be an effective substitute for the bulky fibrous absorber.

Reference

1. Aizenshtein, E. M. (2012), Global chemical fibre production in 2011, Fibre Chemistry, vol. 44, no. 3, pp. 141-145.
2. Aizenshtein, E.M. (2007), World production and consumption of polyester fibres and yarn. Status and prospects for the Russian market, Fibre Chemistry, vol. 39, no. 5, pp. 355-362. Aizenshtein, EM (2003), Production and Use Of Polyester Fibres Today and Tomorrow, Fibre Chemistry, 35, 5, pp. 317-328, Textile Technology Complete.
3. Beranek, L. 2011, Concert hall acoustics, Architectural Science Review, vol. 54, no. 1, pp. 5. Blauert, Jens. & Xiang, Ning. (2009). Acoustics for Engineers: Troy Lectures. Berlin, Heidelberg: Springer Berlin Heidelberg pp 2-3.
4. Blauert, J. (2005). Communication Acoustics. Springer-Verlag, Berlin, Heidelberg.

PHILLIPINOS ATTIRE

C. Anitha
Assistant Professor, Department of Home Science, Seethalakshmi Ramaswami College, Tiruchirappalli
Vasantha Esther Rani
Associate Professor and Head, PG Department of Home Science with Food Biotechnology, Fatima College, Madurai

Abstract

The study on "Phillipinos Attire" focuses on the Philippino culture, customs and tradition especially prevalent among the selected adolescent girls between the age group of 17 to 19 in Philippines.The results were compared with the Indian subjects of similar demographic profile. The study was undertaken during the one month stay of the author at Philipines, funded by Rotary foundation group study exchange prograamme.Asia being a very large continent with diverse customs, traditions, cultures, regional habits including the community catering, we have a treasure of information on costumes. Before synthetic textiles came into use, M. textilis was a major source of high quality fiber: soft, silky and fine. Europeans first came into contact with Abaca fibre when Magellan made land in the Philippines in 1521, as the natives were cultivating it and utilizing it in bulk for textiles already. Banana plant or plantain plant not only gives the delicious fruit but it also provides textile fiber, the banana fiber. Banana fiber is natural fiber. Pineapple silk is considered the queen of Philippine fabrics and is considered the fabric of choice of the Philippine elite. The clothing style and fashion sense of the Filipinos in the modern-day era has been influenced by their native ancestors. A traditional garment for men is the barong tagalog (pronounced BAH-rong tah-GAH-lawg), an embroidered outer shirt, worn untucked. It has collars, long sleeves and mid-thigh horizontal hemline with side slits. It is made from pina (pineapple fibers), jusi (raw silk) or ramie (grass fibers). Women wear the heavily starched, butterfly-sleeved terno (pronounced tee-AIR-no) and a matching long skirt on formal occasions.

Introduction

The clothing style and fashion sense of the Philipinos in the modern-day era has been influenced by their native ancestors, the Spaniards (the Philippines was a colony of the Spanish Empire for around 300 years), the Americans (the Philippines was a territory of the United States for about 50 years), and even the Japanese (Japanese soldiers occupied the Philippines during World War II), as evidenced by the chronology of events that occurred in *Philippine history*. Apart from "colonial influences" and "media influence", the Filipino style of clothing had been dictated by the climate in the Philippines. With a tropical climate (dry and rainy seasons), early Filipinos - as well as the still extant tribal groups in the Philippines - wear colorful woven clothes, often with "intricate beadwork" and other ornaments. Other native clothing, during Pre-Spanish Philippines was the *canga* and the *bahag*. The canga is a type of a collarless shirt - which later became adorned with laces, trimmings, buttons, and a collar - was where from the Barong Tagalog evolved. On the other hand, the bahag was a type of *loin cloth* or *G-string*. Present-day Filipinos, due to climatic reasons, prefer to wear T-shirts combined with maong (jeans) trousers for men and skirts for women. The "jeans and T-shirts" combination was introduced to

the Filipinos by the Americans. A common attire while at home are ordinary *puruntongs* (singular: puruntong, a type of pair of shorts or Capri pants) combined with sleeveless shirts or T-shirts. During the rainy season and cold evenings in December and January, some Filipinos wear hooded jackets. At present, Filipinos conform their way of dressing, in addition to the above factors, as a result of the influence of what is shown by the *media* on television, cinema, and fashion shows, among others. Piña is a fiber made from the leaves of a *pineapple* plant and is commonly used in the *Philippines*. It is sometimes combined with *silk* or *polyester* to create a *textile* fabric. Pineapple silk is considered the queen of Philippine fabrics and is considered the fabric of choice of the Philippine elite. When the Americans came and became the second country to colonize the islands, the fashion remained the same for the first five years of the 20th century. But it started to change and become more modern in contrast to the conservative style of the previous centuries as the Americans started to influence the modern Filipino culture. The women now wore the 'Traje de Mestiza', the more modern version of the Maria Clara. It has now bigger sleeves and a narrower floor length skirt with a long train called saya de cola replaced the full wide skirt reflecting the Edwardian Fashion to the west. By the 1920s, the style of the skirt still remained however; the Butterfly sleeves now replaced the "Angel Wings" sleeves and the big panuelo reduced its size. Some Filipino women who had lived in United States and in Europe wore the western 1920s fashion with loose dresses and knee length skirt. Men wore the "Americana" the suit and coat worn in the West, mostly Americans (hence getting the name), replacing the traditional Barong Tagalog.

Methodology

This study was an attempt to study the food pattern of the selected adolescent group in two countries namely India and Philippines. In this study the retrospective analysis of the available research literature related to the present study were done. The reviews constitute a vital and a valuable source of information with vivid, comprehensive picture of the data, which provides a sound base for investigation. The relevant studies in this line along with their culture, customs and traditions were reviewed and have been presented. During the stay in Philippines the investigator happened to visit various schools, colleges, polytechnique and research institute like International Rice Research Institute Navotas Polytechnique College, Municipality of Navotas, Metropolitan Manila, Philippines, were selected as the sampling unit for the study in Philippines. Interview method and questionnaire method of data collection was considered as the best as the respondents possessed different languages. . In India, the investigator was able to do the survey as she is aware and fluent in the vernacular language Tamil and English. In Philippines few details were collected with the help of Mrs.Jeannette, a native of Philippines, who is aware and fluent in the local language, Tagalo and English. Barong Tagalog is the national costume of the Philippines. This type of clothing is thin and transparent; men would have to wear a white shirt under it. Men would usually wear this in special occasions such as weddings, parties, festivals, and government meetings. The Barong Tagalog was not made by the Filipinos but thought by the early

Spaniards, the Filipinos then developed it to which is now today's Barong Tagalog. The materials used to make a Barong Tagalog are Piña, Banana fabric, Jusi fabric, and Piña-Jusi fabric. Piña (pineapple fiber) and Banana fabric are used to make the thin and cheap type of Barong Tagalog. Jusi fabric and Piña-Jusi are used to make thicker and more expensive Barong Tagalog. These types of fabric would cost more because they are harder to make and they take time to make. Katipunero is not that common but still is considered traditional clothing. This type of clothing is very simple and is usually worn during the summer because it uses a very thin fabric. The design is very simple; this clothing has thin, red pants with white, plainshirt, and a red handkerchief that goes around the neck. They wore this type of clothing in the early 1800's during the time of war, the red symbolizes war and the white symbolizes peace. Today this type of clothing in now worn by farmers with a farming hat to protect them from the sun. Banana plant or plantain plant not only gives the delicious fruit but it also provides textile fiber, the banana fiber. Banana fiber is natural fiber. Natural fibers present important advantages such as low density, appropriate stiffness and mechanical properties and high disposability and renewability. Moreover, they are recyclable and biodegradable. There has been lot of research on use of natural fibers in reinforcements. Banana fiber, a ligno-cellulosic fiber, obtained from the pseudo-stem of banana plant (Musa sepientum), is a bast fiber with relatively good mechanical properties. Banana plant is available throughout Thailand and Southeast Asian, India, Bangladesh, Indonesia, Malaysia, Philippines, Hawaii, and some Pacific islands. Abacá (Filipino: *Abaka*), binomial name *Musa textilis*, is a species of banana native to the Philippines, grown as a commercial crop in the Philippines, Ecuador, and Costa Rica. The plant, also known as Manila hemp, has great economic importance, being harvested for its fiber, also called Manila hemp, extracted from the leaf-stems. The fiber was originally used for making twines and ropes; now most is pulped and used in a variety of specialized paper products including tea bags, filter paper and banknotes. It is classified as a hard fiber, along with coir, henequin and sisal. Piña is a fiber made from the leaves of a pineapple plant and is commonly used in the Philippines. It is sometimes combined with silk or polyester to create a textile fabric. Piña's name comes from the Spanish word *piña* which means pineapple. Since piña is from a leaf, the leaf has to be cut first from the plant. Then the fiber is pulled or split away from the leaf. Most leaf fibers are long and somewhat stiff. Each strand of the piña fiber is hand scraped and is knotted one by one to form a continuous filament to be hand-woven and then made into a piña cloth. Kalibo, Aklan, is the main and the oldest manufacturer/weaver of piña cloth in the Philippines which are being exported to various parts of the world most particularly North America, and Europe. Piña weaving is an age-old tradition which was recently revived in the past 20 years. Pineapple silk is considered the queen of Philippine fabrics and is considered the fabric of choice of the Philippine elite. During the 1996,APEC summit held in the Philippines, world leaders donned Barong Tagalog made of piña sourced from Kalibo..

Producers include La Herminia Piña Weaving Industry, Malabon Pina Producers and Weavers Association, Reycon's Piña Cloth and Industry, and Rurungan sa Tubod Foundation.

Results: Before synthetic textiles came into use, *M. textilis* was a major source of high quality fiber: soft, silky and fine. Ancestors of the modern abaca are thought to have originated from the Eastern Philippines where there is lot of rains (no pronounced dry season), in fact wild type of abaca can still be found in the interior forests of Catanduanes Island which is often not cultivated. Today, Catanduanes has many other modern kinds of abaca which are more competitive. For many years, breeders from various research institutions have made the cultivated varieties of Catanduanes Island even more competitive in local and international markets. This results in the optimum production of the island which had a consistent highest production throughout the archipelago. Europeans first came into contact with Abaca fibre when Magellan made land in the Philippines in 1521, as the natives were cultivating it and utilizing it in bulk for textiles already. By 1897, the Philippines were exporting almost 100,000 tons of abacá, and it was one of the three biggest cash crops, along with tobacco and sugar. In fact, from 1850 through the end of the 19th century, sugar or abacá alternated with each other as the biggest export crop of the Philippines. This 19th century trade was predominantly with the United States and the making of ropes was done mainly in New England, although in time the rope-making was moved back to the Philippines. Excluding the Philippines, abacá was first cultivated on a large scale in Sumatra in 1925 under the Dutch, who had observed its cultivation in the Philippines for cordage since the nineteenth century, followed up by plantings in Central America in 1929 sponsored by the U.S. Department of Agriculture.

It also was transplanted into India and Guam. Commercial planting began in 1930 in British North Borneo; with the commencement of World War II, the supply from the Philippines was eliminated by the Japanese. The inner fibers are used in the making of hats, including the "Manila hats," hammocks, matting, cordage, ropes, coarse twines, and types of canvas. It is called Manila hemp in the market although it is unlike true hemp, and is also known as Cebu hemp and Davao hemp. Abacá cloth is found in museum collections around the world, like the Boston Museum of Fine Arts and the Textile Museum of Canada. **Characteristics of Banana Fiber:** Banana fiber has its own physical and chemical characteristics and many other properties that make it a fine quality fiber. Appearance of banana fiber is similar to that of bamboo fiber and ramie fiber, but its fineness and spin-ability is better than the two. The chemical composition of banana fiber is cellulose, hemi-cellulose, and lignin. It is highly strong fiber. It has smaller elongation. It has somewhat shiny appearance depending upon the extraction & spinning process. It is light weight. It has strong moisture absorption quality. It absorbs as well as releases moisture very fast. It is bio- degradable and has no negative effect on environment and thus can be categorized as eco-friendly fiber. Its average fineness is 2400Nm. It can be spun through almost all the methods of spinning including ring spinning, open-end spinning, bast fiber spinning, and semi-worsted spinning among others.

Conclusion

The 1990s fashion remained popular during the early years of the first decade of the 21st century. 2000s fashion was considered a mash up of different styles. In the first part of the decade, the concept of *innerwear as an outer wear* was popularized resulting to having spaghetti strap clothes become popular in the mainstream. Men still followed the 1990s fashion with hip-hop inspired of clothing wearing cargo pants, oversized T-shirts. By the mid 2000s, colorful clothes began to rise again. Men started wearing flannel and checkered polos. At the end of the decade, people saw the mixture of clothing from uggboots worn with short shorts and t-shirts to dresses worn over with leggings. Natural fibers present important advantages such as low density, appropriate stiffness and mechanical properties and high disposability and renewability. Moreover, they are recyclable and biodegradable. There has been lot of research on use of natural fibers in reinforcements. Banana fiber, a ligno-cellulosic fiber, obtained from the pseudo-stem of banana plant (Musa sepientum), is a bast fiber with relatively good mechanical properties. In the early 1900s, a train running from Danao to Argao would transport Philippine abaca from the plantations to Cebu city for export. The train and tracks were destroyed during the Second World War; however the Abaca plantations continue and are now transported to Cebu by road. After the war, the U.S. Department of Agriculture started production in Panama, Costa Rica, Honduras, and Guatemala. Today, abacá is produced commercially in only three countries: Philippines, Ecuador, and Costa Rica. Baro't Saya (literally "Shirt and Skirt") is the Filipino style of Women's clothing. Traditionally, it is composed of a blouse and a long skirt with a "panuelo". The upper class women wore more elaborate baro't saya sewn with beads and has colorful designs. The skirt is also wider than what lower classes wore. These types of clothing that are "simple yet functional" that have both indigenous Filipino qualities and Spanish influence started to become prominent during the 16th-century in the Philippines. Such clothing, through the innovation of modern-day Filipino fashion designers, can be worn in the Philippines for formal occasions and office uniforms. These "national clothes" can be made from materials such as *piña*, *jusi*, abaca, and Mindanao silk. As the investigator had the opportunity to visit Philippines and stay with the Philipino families for a month, the study area was selected as India and Philippines for comparison of food pattern, customs, culture and tradition were studied. In order to know the background and socio economic aspects, the socio-personal characteristics of the adolescent respondents were analyzed. Few socio economic characteristics were studied along with their dressing style.

Reference

1. Vijanthimala, K. 2000. Women and health. The role of internal environment. Environment and people.
2. Kurz K and Johnson-Welch C. The nutrition and lives of adolescents in developing countries: Findings from the nutrition of adolescent girls research program. Washington, DC: International Center for Research on Women (1994).
3. Source - Food and Nutrition Research Institute. Developed by Clinical Nutrition Section and Medical Nutrition Division. 2000. Nutritional Guidelines for Filipinos. Revised Edition.
4. www.Adolescent Nutrition - Feeding your Teenager.
5. Growth and Development - Adolescent Nutrition.
6. http://textilelearner.blogspot.com/2014/01/properties-of-banana-fiber.html#ixzz4SJs2MxTO

FABRICATION OF BIOSOFTENED NON - CONVENTIONAL FIBERS AND EVALUATION OF ITS PROPERTIES

A.Lavanya
Assistant Professor, Department of Home Science Seethalakshmi Ramaswami College, Trichy,
N.Vasugi Raaja
Professor & Dean, Faculty of Home Science, Avinashilingam Institute for Homescience and Higher Education for Women, Coimbatore

Abstract

An attempt has been made to find new uses of natural fibres. The bio softened jute and hemp fibres were fabricated by needle punching process and physical and mechanical properties of the fabrics were evaluated. This study demonstrates the potential of natural fibres in technical textiles arena. The biosoftened fibre (jute, hemp) has Good strength, Absorbancy, Abrassion Resistance and Flame Resistant properties when compared with its control fabric.
Key words: *needle punching, flame resistant, biosoftening.*

Introduction

Natural fibers are lignocellulosic on nature that mainly composed of cellulose hemi cellulose and lignin. The peculiar forms, created naturally in the growing procedure of few natural fibers, cannot be created in manmade fibers, even by using latest scientific technologies which may be due to the excellence in the strength of these fibers. Natural fibers present important advantages such as low density, appropriate stiffness, mechanical properties and high disposability and renewability. More over they are recyclable and bio degradable. The fabrics made from non conventional fibers have distinct prickly sensation when in contact with the skin. This is due to rigid fibers protruding from the surface. Bio-softening aims to achieve a bio polishing effect with the use of specific micro organisms, with selected enzyme specificity towards surface cell wall components. Bio-softening brings about softening, thinning and bleaching of the fiber and avoids the use of caustic chemicals thereby minimizing pollution. The investigator considered all the above factors in mind and has selected the present work on "Fabrication of Biosoftened Non - Conventional Fibers and Evaluation of its Properties"

Objectives

The objectives of the study are to

- Biosoftening of non conventional fibres in optimized condition
- Preparation of Non woven fabrics- needle punching process (control and biosoftened fibres)
- Evaluation of control and treated fabric

Methodology : Bio-Softening Process

In order to obtain best results for the biosoftening of hemp and jute fibres, various parameters were optimized such as pH, temperature, enzyme proportion and incubation time. Based on the optimized conditions the fibres were treated.

Biosoftening Process

Needle Punching Process

Fabrication Process

The fabric was formed by a process called needle punching where the web structures are bonded mechanically by interlocking of fibres. DILO needle punching machine was used to make the needle punched fabrics. 1 lap consist of 6 webs, 4 webs were taken together and passed into the needle punching machine, for the preparation of fabric. The in feed draw off frequency was adjusted to 0.80m/min; stroke frequency to 222 strokes/ minute depth of penetration of the needles to 10mm for the study. The fabric width 20 inches and 400 GSM was produced.2 meters length and 20 inches width of the fabrics were prepared from each group (original untreated fibres, crude enzyme treated fibres, commercial enzyme treated fibres). The developed fabrics (untreated, crude enzyme treated) were evaluated for their essential characteristics such as fabric thickness, Fabric weight, fabric strength and elongation, fabric stiffness, flammability and absorbency test as per the ASTM testing method.

Result and Discussion

- The optimized parameters for biosoftening of hemp fibres are pH.6, temperature-40°C. Incubation time-60 minutes and enzyme: water proportion is 1:1. Thus the optimized parameters were carried out for further study. The optimized parameters for biosoftening of jute fibres are pH.7, temperature-30°C. Incubation time-60 minutes and enzyme: water proportion is 1:1. Thus the optimized parameters were carried out for further study.
- Needle punched fabrics were developed with the untreated, crude enzyme treated, fibres respectively, and evaluated

Fabric Weight

Table – I Fabric weight (GSM)

S.No	Samples	weight (GSM)	Loss/gain	Loss/gain percentage	F-Value
1.	O	5.960	-	-	
2.	CRS	7.966	-2.006	33.65	1924.79**

The maximum increase in weight was observed in the sample CRS

Table-II Fabric thickness (mm)

S.No	Samples	Thickness(mm)	Loss/gain	Loss/gain percentage	F-Value
1.	O	5.01	-	-	
2.	CRS	3.47	1.54	30.73	604.80**

** - Significant at 1% level

The thickness of the treated samples has decreased in treated samples. Maximum reduction in thickness was observed in sample CRS.

Fabric Strength

Table – III Fabric strength (kg)

S.No	Samples	Strength (kg)	Loss/gain	Loss/gain percentage	F-Value
1.	O	20.8	-	-	
2.	CRS	33	12.2	58.6	176.31**

** - Significant at 1% level

The fabric made by crude enzyme softened fibres has gained its strength by 59% when compared with original.

Fabric Elongation

Table – IV Fabric elongation (inches)

S.No	Samples	Elongation (inches)	Loss/gain	Loss/gain percentage	F-Value
1.	O	1.32	-	-	
2.	CRS	2.6	-1.28	96.96	65.92**

The elongation of the treated samples CRS, CCS has increased in elongation. The maximum increase in elongation was observed in the sample CRS.

Fabric Stiffness

Table – V Fabric stiffness (cm)

S.No	Samples	Stiffness (cm)	Loss/gain	Loss/gain percentage	F-Value
1.	O	8.54	-	-	
2.	CRS	4.88	3.66	42.85	301.178**

** - Significant at 1% level

The fabric stiffness of the treated samples has decreased. The maximum reduction in stiffness was observed in the sample CRS. Hence it could be concluded that the crude enzyme treated fabric suits best for home textiles.

Abrasion Resistance

Table-VI Abrasion Resistance (Percentage)

S.No	Samples	Abrasion resistance (%)	Loss/gain	Loss/gain percentage	F-Value
1.	O	17.03	-	-	
2.	CRS	12.94	4.09	24.01	56.94**

** - Significant at 1% level

- The abrasion resistance of the treated samples has decreased. Maximum reduction in abrasion resistance percentage was observed in the sample CCS.

Absorbancy Test

Table-VII Absorbency Test

S. No	Absorbency Test	Samples	Obtained Value	Loss/ Gain (%)	F value
1. 2.	Drop	O CRS	7.6 3.2	- 57.89	22.06**
3 4	Sinking	O CRS	20.4 9.2	- 54.9	144.64**
5 6	Capillary	O CRS	4.8 5.6	- 16.66	25.74**

** - Significant at 1% level

The absorbency of the treated samples has increased when compared with the original sample. Maximum absorbency percentage in drop, sinking and capillary raise was observed in the sample CRS.

Flammability Test

Table – VIII Flammability Test

S. No	Samples	Flammability test (seconds of flame spread)
1.	O	Did not ignite
2.	CRS	Class-I

In the case of flammability test, the developed fabrics are rated as not ignitable by the textile committee, Coimbatore. Hence the developed needle punched fabrics are suitable for home textiles

Conclusion

Natural plant fibers are lignocellulosic in nature, mainly composed of cellulose and hemi cellulose and lignin. The jute and hemp fibres possess moderately high specific strength, stiffness. The main inhibition of the usage of these fibres is harsh feel, brittleness. These can be overcome by blending and softening. The bio-softened fibres have good strength, low elongation and less stiffness which makes it suitable for home textile applications. Hence the fibers were blended and converted into needle punched fabrics. The developed fabrics have good strength, stiffness, thickness, water absorbency, highly inflammable. Hence the needle punched fabrics can be used effectively in home textiles.

References

1. Adanur, S. (2000), “Technology and Engineering”, CRC Press, P. 448.
2. Ajgaonkar (1995),”Application of cellulase enzymes on indigo dyed denim garmenrts pros and cons ”,Colourage , Vol. 13(1), P-35.
3. Majumdar, A., Das, A., Alagirusamy, R. and Kothari, V.K. (2012), “Business and Economics”, Elsevier, P. 512.
4. www.enzyme.chem.msee.ru
5. www.weibull.com

ACOUSTIC TEXTILES IN THE CONTROL OF NOISE POLLUTION

S. Ahalya
Assistant professor, PG & Research Department of Chemistry, Seethalakshmi Ramaswami College Tiruchirappalli

Abstract

Noise will produce serious health effects. It is very important to control the noise. Acoustic textiles are used to control noise due to its more porous structure. These are called sound absorptive materials. The sound absorption property of an acoustic textile can be measured by reverberant field method, impendence tube method and steady state method. Natural fibers such as cotton, silk, hemp and wool can be used as an acoustic material. These materials play dual role aesthetics as well as functional. The most important advantages of these materials are low cost of production and recyclability. Thus acoustic textiles have bright future in the control of noise pollution.

Keywords: *Acoustic, noise, sound absorption, natural fibers, low costs, aesthetics.*

Noise is a physical form of pollution. It is the unwanted sound that produces unpleasant effect and discomfort on the ears. Unfortunately most of the machines that have been developed for industrial purposes and for high-speed transportation are accompanied by noise. Noise can have serious health effects such as hearing loss, sleep disturbances, tiredness, cardiovascular and physcophysiological problems etc. Thus it is very important to control the noise from traffic, factories, offices and houses. Today noise pollution is one of the major environmental concerns in India. It is very doomed that we are all exposed to some form of loud noise for a considerable amount of time, during the day. A shocking survey of Maharastra pollution control board for four consecutive years- states that the noise pollution reached to over 125 dB. The continuing development of new technologies particularly the trend towards faster and more powerful machinery, environmental impact of noise is increasing. The problem of noise generated within the closed space can be particularly active. The main aim of this paper is controlling noise with the scope of using acoustic textiles. Generally wood, textiles and synthetic materials are used for the acoustic purpose. But the use of textiles for noise reduction is based on two major advantages of these materials, namely low production costs and small specific gravity. Out of textiles, nonwoven are prefered to use as acoustic due to its more porous structure and more surface area.

Acoustics

Acoustics is defined as the scientific study of sound that includes the effect of reflection, refraction, absorption, diffraction and interference. Materials that reduce the acoustic energy of a sound wave access through it by the phenomenon of absorption are called sound absorptive materials. Fibrous media usually consist of glass, rock wool or polyester fibers have acoustic absorption. Sometimes fire resistant fibers are also used in making acoustic products.

Mechanism of Sound Absorption in Fibrous Material

- Acoustic porous materialhave porosity greater than 90%. Common sound absorption materials are open cell foam and fiber.
- Sound absorption is an energy conversion process. The kinetic energy of the sound (air) is converted into heat energy when the sound strikes the cells of fibers.

The Acoustic Energy Loss is Due to

1. Frictional losses – because of sound pressure, air molecules oscillate in the interstices of the porous material with the frequencies of the exciting sound wave. This oscillation results in frictional losses.
2. Momentum losses – a change in the flow of direction of sound waves, together with expansion and contraction phenomenon of flow through irregular pores, results in a loss of momentum.
3. Temperature fluctuations – owing to excitation of sound, air molecules in the pores undergo periodic compression and relaxation. This results in change of temperature.

Acoustic Measurements

- The ability of the acoustic material to absorb the incident sound wave can be evaluated by comparing the sound power levels between the reflected sound wave and the incident sound wave. The following methods are used to characterize the sound absorptive properties of a material.
- **Reverberant field method** is concerned with the performance of a material exposed to a randomly incident sound wave which technically occurs when the material is in diffusive field.
- **Impendence tube method** uses plane sound waves that strike the material straight and so the sound absorption coefficient is called normal incidence sound absorption coefficient.
- **Steady state method** is mostly used when the others will not work. To measure the transmission coefficient of the materials, a third microphone or even a second pair of microphone can be placed behind the test sample in a second impendence tube.

Use of Natural Fiber as an Acoustic

- **Cotton–** The nonwoven composites with cotton as a surface layer had significantly higher sound absorption coefficients than the glass fiber-surfaced composites in the frequency range from 100 to 6400 Hz.
- **Silk** – light weight, translucent curtain materials in silk have been developed. They are excellent at absorbing sound with a gap of 15cm between curtain and wall, absorbs upto five times more sound than typical lightweight curtains.
- **Hemp** – Using hemp, we can produce ecologically green building material. Because hemp can be recycled easily and their production involves a low carbon footprint and no CFC emissions. It is naturally antimicrobial and resistant to ultraviolet.

- **Wool** – wool carpets are particularly effective as the millions of wool fibers in an area of carpet have a range of lengths, diameters, crimps and spirality which enables them to absorb sound over a wide range of frequencies.

Advantages

- As mentioned earlier the two major advantages of these materials are low production costs and specific gravity.
- Textile plays dual role aesthetic as well as functional.
- Use of recyclable raw materials further reduce down the cost.

Conclusion

There is already a high penetration of acoustic textiles in construction sector. With increase in awareness, the acoustic materials have bright future. For each application such as acoustic panels, ceilings, automotive insulation, upholstery in concert halls etc., there is still room for value added products and that will further consolidate acoustics position. When manufacturers have to choose between varieties of products, they consider following criteria: economics, durability, aesthetics, processibility, moldability, added benefits such as acoustics, flame retardant, recyclable etc..

References

1. https://www.slideshare.net/mobile/wasimchavhan/acoustic-textiles-sound-absorbing-textile
2. http://textination.de/en/document/1130003803282734/1.0/Acoustic%20Textiles%20sound%20absorption.pdf

TEXTILES IN FOOD PRODUCTION

T. Z. Ahamed
Associate Professor, Department of Hotel Management & Catering Science, Madurai Kamaraj University College, Madurai.

Abstract

Textiles and textile fibers may safely be used as articles or components of articles intended for use in producing, manufacturing, packing, processing, preparing, treating, packaging, transporting, or holding food, subject to the provisions of this section. The quantity of any adjuvant substance employed in the production of textiles or textile fibers does not exceed the amount reasonably required to accomplish the intended physical or technical effect or any limitation further provided. Substances employed in the production of or added to textiles and textile fibers may include: Substances generally recognized as safe in food. Substances subject to prior sanction or approval for use in textiles and textile fibers and used in accordance with such sanction or approval. Substances generally recognized as safe for use in cotton and cotton fabrics used in dry-food packaging. Substances that by regulation in this part may safely be used in the production of or as a component of textiles or textile fibers and subject to provisions of such regulation.

Introduction

Food contact materials are materials that are intended to be in contact with food. These can be things that are quite obvious like a glass, a can for soft drinks, but also machinery in a food factory or a coffee machine. Food contact materials can be constructed from a variety of materials like plastics, rubber, paper, coatings, metal etc. In many cases a combination is used; for example a carton box for juices can include (from the inside to the outside): plastic layer, aluminum, paper, printing and top coating. During the contact of the food contact materials with the food, molecules can migrate from the food contact material to the food. Because of this, in many countries regulations are made to ensure food safety. The international symbol for "food safe" material is a wine glass and a fork symbol. The symbol identifies that the material used in the product is safe for food contact. This includes food and water containers, packaging materials, cutlery etc. The regulation is applicable to any product intended for food contact whether it is made of metals, ceramics, paper and board, and plastics. Use of the symbol is more significant in products which should be explicitly identified whether food safe or not, i.e. wherever there is an ambiguity whether the container could be used to hold food stuff. The symbol is used in North America, Europe and parts of Asia. It is mandatory for products sold in Europe after the Framework Regulation EC 1935/2004.

Methodology

That the two most important factors for safe contact with food are the material or fiber of which the fabric is made - e.g. cotton, polyester etc., and the manufacturing process & adjuvants/additives used – e.g. oils used during knitting, dyes, softeners etc.

Both these factors have to be considered and both have to meet the following 5 basic requirements which can establish a fabric as safe for use with food:

1. The material must be listed in one of the sections as safe for contact with food.

2. It must be made using substances that are considered acceptable i.e. can only be made using certain adjuvant, additives etc. that are listed in the CFRs as acceptable for use and even then only in reasonable amounts.
3. For a coated or film-laminated fabric, the coating or film must be formulated from a material that is GRAS (Generally Accepted As Safe) or the use of which is permitted. The coating/lamination must be done using an approved process (several processes are listed in the CFRs)
4. If the fabric is waterproof it must pass test requirements for the type of food and the temperature of the storage conditions it is going to be used with. (These tests require use of solvents and, hence, cannot be used on fabrics that aren't waterproof.) The requirements to qualify the material vary based on

- different types of food products [i.e. for baked items, acid/non-acid, aqueous, oil/water emulsions, oils, dairy high-fat, dairy low-fat, beverages - alcoholic and non-alcoholic, etc.]
- the container cleaning and packaging process [e.g. heat sterilization] the temperature range for packing and storing [i.e. ambient room temperature, refrigerated, frozen, etc.], and whether the material is intended for single use or multiple uses.

For Use with Dry Food Items

Fabrics that meet points 1-4 but have not been (and cannot be) tested can be safely used for contact with and storage of dry food items. E.g. cotton fabric made in a manner that meets all other conditions can be used with dry food e.g. dry fruit, grains, flour etc.

For Use with Other Food Items (Non-Dry)

Waterproof laminated or coated fabrics (e.g. AKASoft PUL and AKASealPro) that meet the above requirements can be used for contact and storage of all types of food. But keep in mind that not all waterproof fabrics are safe. For instance, think twice about purchasing DWR-treated fabric for use with food because fabrics that have been given a Durable Water Repellant (DWR) finish (like some ripstop nylons) may not be safe! This is due to the fact that DWR treatments are performed by applying a chemical coating on the fabric and the chemicals used may not be safe.

The FDA regulations provide us with a basis to determine food-safe fabrics and by putting all the information relative to food preparation, processing, storage etc. all in one section of the Federal regulations FDA has made it easy and accessible to everyone.

DEVELOPMENT AND EVALUATION OF ECO-FRIENDLY WIPES MADE BY UPCYCLING COTTON TEXTILE PROCESSING WASTE

Dr. S. Aishwariya
INSPIRE fellow and Assistant Professor, Department of Costume Design and Fashion, Hindustan College of Arts and Science, Coimbatore
Dr. S. Amsamani
Professor and Head, Department of Textiles and Clothing, Avinashilingam University for Women, Coimbatore

Cotton spinning involves conversion of cotton kapas from field into yarn to aid formation of a textile material. During this process various types of cotton wastes are expelled. Coimbatore being one of the major textile hub focusing on spinning sector faces huge problem associated with the dusty cotton waste from the spinning industry. World-wide very few solutions are available for recycling this cotton waste which includes its application for paper production, mushroom cultivation and as natural mulching sheet in agriculture. This is a regional problem in which the spinning mills that store this last scrap waste from cotton processing suffer from the risk of fire hazard and lung related infections due to the dusty nature of the waste. Reports enumerate that approximately 2, 10, 000 tons of cotton dust (non-saleable waste) is produced during yarn manufacturing process. It is important to observe that most of it is discarded in the landfills without much end use or incinerated.

In the year 2010, huge amount of crude oil was dispersed in the sea. Huge skimmers and boomers were used in separating the oil from water but was relatively slow. Team of scientists from Teas Tech University, Lubbock, USA proved the efficacy of cotton based non woven with activated carbon to absorb and retain water or oil as designed [Singh et al., (2014), Singh and Ramkumar, (2014)]. The amazing water holding, water retention and hand of a cotton fiber is impeccable. When used along with formulas they can perform as wondrous cleansing materials. This organic waste being lignocellulosic in nature has qualities that will make it as an effective bio-degradable/ compostable organic wipe. Thus the research was planned with the objectives as below;

- To collect, analyse and characterise willow waste
- To grind and form willow waste wiping sheets
- To finish the wipes using Aloevera and lemon rind
- To test the willow waste wipes suitability for cleaning action and flushability capabilities

Material and Methods: Interview with Spinning Mill Owners

Cotton mill owners and members of the cotton waste merchant association were approached to collect information regarding the types and uses of cotton wastes using an open end questionnaire and interview method.

Collection of Willow Waste

Among the various wastes from cotton spinning industry, the last trash waste, namely willow waste was collected from Open end spinning mills in and around Ondipudur, Tamilnadu. This was further weighed and taken to handmade paper mill in Erode, Tamilnadu.

Testing of Willow Waste for its Characterisation

Meanwhile, using random sampling, the willow waste sample taken from each mill was taken and tested in Tamilnadu Agriculture University, Coimbatore for pH, moisture, macro and micro nutrients.

Production of Willow Waste Wiping Sheets

Preparation of the Slurry: The collected willow waste was taken to the handmade paper making industry. Initially, it was checked for the presence of any foreign materials and was then transferred into a huge tank along with water for soaking overnight. Unbleached cotton knit was added to this. After 12 hours, rosein and alum was added, to create and internal bonding, aid in printing and improve the porosity.

Formation and Drying of Sheets: The material binder ratio was 3:1 and the prepared content was grinded for 3 hours and run through a handmade paper making chamber. The resultant sheets were collected and dried. Calendaring was done to Further the sheets were cut to a defined shape suitable for its usage as wiping cloth.

Preparation of Aloe-Lemon Rind Gel : Aloe vera and lemon peel show strong cleansing (Abhijit, 2012), (Pagan, *et al.,* 2011), and antimicrobial properties, [Parashar,et al., (2014) and Dhanavade and Jalkute, (2011)], and hence selected for the study. Mature aloe vera was collected and washed with clean water. The colorless parenchymatous tissue, aloe gel was scrapped out carefully. The collected plant gel was weighed and mixed with 100ml of ethanol, then left for 24 hours in a shaker incubator. The extract was strained and stored in the refrigerator at 40°C, (Stanley, *et al*., 2014). In a similar way lemon peel was collected, ground into a paste, mixed with ethanol and stored in cool condition, (Nisha et al., 2014). The antimicrobial solution was prepared by mixing aloe vera and lemon peel extracts in the ratio 1:1 with 8% citric acid as binder (Chandrasekar, *et al.,* 2013). This was poured in the padding mangle and finished at pressure of 1kg/cm^2 (Pattanaik. and Ray. 2014).

Testing of Willow Waste Wipes: The prepared wiping sheet from willow waste was tested for weight, thickness, elongation, tearing index, burst, foldability, endurance number, water absorption and moisture content. The physical properties of paper like thickness, GSM, tearing strength, Cobb's value, water absorbency, folding endurance were measured in the standard temperature and humidity (Temp= 23± 10^{0}C, RH=50± 2%) for paper as per TAPPI standard test methods after conditioning for three days according to T402gm-93 procedure.

Test for Weight (GSM) and Thickness: Ten samples of 10cm × 10cm were taken from ten spots and measured using vernier caliper according to TAPPI T441om-97 method. The results were recorded in mm. Mass per unit area gives the weight of the sample. Using a GSM cutter, the sample was cut and weighed. Ten samples of 10cm

× 10cm were taken and weighed in an electronic balance and the values were multiplied by 100 to get the weight of the sample in grams per square meter (Hossain, et al., 2010).

Determination of Cobb Value (Water Absorbency Test): As per the methods discussed by Hossain, *et al.,* (2010), three samples of dimension 12.5cm×12.5cm for each experiment were cut. Water absorbency was tested according to TAPPI T 441om-98 method. The weight of water absorbed in g/sq meter was obtained from the following formula: Weight of water absorbed (Gm/m^2) = {Final wt. (g) - Conditioned wt (g)} × 100. Ten readings were taken and recorded systematically for further statistical analysis.

Test for Tensile Index and Elongation: Tensile index is the maximum force required to rupture a test strip of standard width and is reported as N/m. http://www.iso.org/iso. The samples were tested for tensile index and elongation as per ASTM D828-97. Test specimens of dimension 2.54 ±0.5cm width and 25.4±0.5cm length without any creases, holes, wrinkles were clamped between the jaws of the instrument. Ten test specimens in each principle direction were tested and tensile strength and elongation was recorded.

Testing the Tearing Index: Elemendorf tear tester was used for evaluating tear resistance following ISO 1974. The force needed to disseminate tear through a paper is known as tear index. Four test pieces superimposed with specified pre-cut slit was torn by moving the pendulum at a fixed distance. The tearing resistance of the paper was determined from the average tearing force and the number of sheets comprising the test piece. The average tearing force was indicated in a digital display.

Testing the Burst Index : This was tested in Mullen tester. Ten samples cut from different parts of the paper were clamped between two concentric plates with a circular opening in the centre. The open space is the testing area. The area of the test pieces was kept wide enough to be securely clamped (ASTM, 1963). Pressure was applied from the underside by a rubber diaphragm which expands due to hydraulic pressure. It is defined as the one burst made on each side of each four specimens. In this manner ten readings were noted.

Determination of the Folding Endurance Number : Folding endurance is very important in term of indication for durability and performance (Othman, et al, 2013). Folding endurance test is a measure of strength that a specimen holds under a constant tensile load. The folding endurance tester is a machine that tests the number of fold which a specimen can withstand before failure, under controlled condition. Ten specimens were subjected repeatedly to double fold through a wide angle kept under tension and the number of folds each sample could withstand was recorded.

Test for Water Absorption: The rate of absorption was tested using Byreck method. This is known as Klemm method for testing papers. The absorption was more when the rising was higher (Takahashi, et al., 2014). The test samples of dimension 1.5 cm were submerged perpendicularly in distilled water (20±2°C) and the rising height of water after ten minutes was noted on the graduated ruler mark. The

rising height of the distilled water in the paper starting from 2.5 minutes to thirty minutes was noted.

Test for Moisture Content: Moisture is an important property to asset the printability, shrinkage, dimensional stability, physical strength and run ability of paper. Therefore following the ISO 287: 2009 the moisture content of the prepared handmade paper was calculated. Ten test samples were cut as per the specifications and weighed before and after oven drying at 105^0C.The moisture content percent was calculated and recorded using the formula Moisture Content (%) =Initial dry weight - oven dry weight divided by oven dry weight into hundred.

Testing the Effectiveness of the Prepared Wipes: The sheets made from willow waste were subjected to finishing with aloe vera and lemon in 50/50. The wiping sheets were further subjected to testing of pH, flushability, moisture management and absorbency tests.

Test for pH Using Aqueous: The pH of the willow waste wipes was tested by soaking the sample in distilled water for two hours and testing according to ASTM D2165-1994, (2012). (Campbell, 2003)

Test for pH Using Water : It is important to test the pH of willow waste wipes to know the acidic or alkali contents on the wipe sample. For this, 250 ml of distilled water was boiled and 10gms of the test specimen was immersed into it and boiled for another ten minutes. The sample was squeezed for excess water and kept aside. The pH was calculated using a calibrated pH meter (https://www.aatcc.org/ Technical/ Test_Methods/ scopes/tm195.cfm). Ten readings were taken and recorded.

Sinking Time (Seconds): Four samples of size one centimetre by one centimetre was taken one by one and kept on the surface of water taken in a 500 ml glass beaker. Sinking time is the time taken by the piece to sink beneath the water surface. This was measured and reported, (Ul-Haq and Nasir, 2012).

Water Holding Capacity: Evaporation rate or the water holding capacity of willow waste wipes was calculated by weighing the samples after being soaked in water. The resultant values help in understanding aeration, water penetration and water retention properties.

Moisture Management Test : The overall (liquid) moisture management capability (OMMC) is an index of the overall capability of a fabric to transport liquid moisture as calculated by combining three measured attributes of performance: the liquid moisture absorption rate on the bottom surface (ARB), the one- way liquid transport capability (R), and the maximum liquid moisture spreading speed on the bottom surface (SSB). The moisture management test was conducted using AATCC test method 195-2011 in the instrument SDLATLAS.
(http://www.nfpa.org/Assets/files/AboutTheCodes/1975/1975_F2013_FAE-SCE_FirstDraft_ballot.pdf).

Flushability: Flushability is also called as column settling test. The test for flushability using willow waste wipes was done in FLUSH 100, Flushability tester, Lenzing Instruments. Four samples were taken, and put in each of the plastic tube containing a known amount of test liquid. After a specific number of rotations, the size of the residual fragments was analyzed by means of a sieve box. The values

including overall percentage of weight loss and the weight loss in sieve was measured for further interpretation.
(http://www.lenzing-instruments.com/produkt.infos/flush100-2.pdf)

Results: The wipes made using upcycled willow waste was tested for its physical and performance properties.

General Evaluation of Willow Waste Wipes

Parameter (units)	Values
GSM (g/m^2)	410
Thickness (microns)	1166
Cobb Value	530
Elongation (%)	5.4
Tearing index (mN. m^2/g)	8.8
Tensile Index (Nm/ g)	10.52
Burst (Kpa. m^2/g)	0.81
Folding endurance No.	77
Water absorption(mm/ min)	4
Moisture content (%)	6.9

The GSM of prepared sheets is 410 g/m^2 and thickness 1166 microns. The cobb's value is tested to be 530. The elongation of the paper is 5.4%, tearing index is 8.8 mN.m^{2}g, tensile index is 10.52 Nm/g and burst is 0.81 Kpa.m^2/g respectively. The folding endurance number or foldability is 77. The water absorption is 4 mm/min and moisture content is 6.9% respectively. The prepared wipes were tested for its performance during wetness. Further, absorbency, flushability, run-off time and porosity were tested and compared with the standards.

The pH of the aqueous extract is 4.22 and in water it is 6.87. The sinking time of the willow waste wipe is 3.4 seconds. The water holding capacity is 96%. The wetting time top (sec) is 5.831 seconds, wetting time for bottom is 7.3124, the top absorption rate 59.6601(%/sec), the bottom absorption rate 40.3677 (%/sec), the top max wetted radius 17 (mm), the bottom max wetted radius is 17 (mm), top spreading speed is 2.1567(mm/sec), the bottom spreading speed is 1.8946 (mm/sec), the accumulative one-way transport index 143.6603(%) and the overall moisture management capacity (OMMC) was calculated to be 0.1623. The flushability tests confirmed that the complete breakdown after 115 cycles. The overall weight loss during the test was found to be 8.5%, indicating low particle disintegration, which may be due to the absence of pre-processing in terms of size reduction to produce the wiping sheets. The maximum weight loss was in sieve of 4mm diameter and minimum in 12mm diameter.

Conclusion

The commercially available wipes are mostly made of synthetic and non degradable materials like polypropylene and high chlorine content. In contrast to this eco-friendly degradable wipes can be an excellent option. The prototype developed was tested and found to be fast absorbing and quick drying that makes it suitable for further exploration of this for domestic and industrial applications.

Acknowledgement

I would like to thank Jyothi Industries (a KVIC certified eco-friendly unit) for assistance rendered in the production of wiping sheets. I wish to thank SITRA, Coimbatore for providing the latest the testing facilities for my research. I also extend my gratitude for funding my doctoral work under AORC-INSPIRE Fellowship through the Department of Science and Technology.

FABRIC CHOICES FOR TACTILE DEFENSIVENESS IN CHILDREN

Dr. M. V. Alli
Associate Professor, Department of Nutrition and Dietetics,
Seethalakshmi Ramaswami College, Tiruchirapalli

Abstract

Tactile defensiveness is a problem that is least understood in the Indian context, wherein many of the children with special needs exhibit this hypersensitivity in different forms. Uncommon reactions, abnormal behavior characteristics and improper socialization are some of the problems confronted by the children who have tactile defensiveness. Several theories explain the cause of hypersensitivity arising due to various mechanisms involving the nervous system. Exposing the child to different tactile experiences and choosing the right fabric would drastically reduce the stress and inconvenience experienced by the child. Appropriate therapeutic interventions can help to improve the quality of life of the child.

Key words: *Hyper sensitivity, behaviours, occupational therapy, natural fabric.*

Introduction

Tactile sensitivity or hypersensitivity is an unusual or increased sensitivity to touch that makes the person feel peculiar, noxious, or even in pain. It is also called tactile defensiveness or tactile over-sensitivity. Like other sensory processing issues, tactile sensitivity can range from mild to severe. Children who have tactile defensiveness are sensitive to touch sensations and can be easily overwhelmed by, and fearful of, ordinary daily experiences and activities. Sensory defensiveness can prevent a child from play and interactions critical to learning and social interactions.

As with other sensory processing disorders, this may manifest through an individual's behavior, such as with breakdowns or tantrums. In particular, everyday activities can become challenges: such as getting dressed with the right clothes in the morning, being overwhelmed with the sensations of wind when outside or even being unable to tolerate certain food sensations during meals. Many children with tactile defensiveness will only use their fingertips when playing with sand, glue, paint, food, glitter etc. Consequently, their play is limited and so is their ability to engage in learning experiences. Children may become fearful, avoid activities, withdraw, or act out as their body responds with a "fight-or-flight" response.

Aetiology

The tactile system is our sense of touch through different sensory receptors in our skin. It is through the tactile system that we first receive information about the world when we come out from the womb environment. The ability to process tactile information effectively allows us to feel safe and form bonding with those who love us. It contributes to our social and emotional development. One important role of our tactile system is its protective function that alerts us when something is unpleasant or dangerous. For some children, this function of the tactile system is not working normally. It is due to the nervous system interpreting touch sensations and stimulation abnormally. It is absolutely the way in which their nervous system

interprets a tactile stimulus and it is not the fault of the child. Tactile defensiveness refers to a pattern of observable behavioural and emotional responses, which are aversive, negative and out of proportion, to certain types of tactile stimuli that most people would find to be non-painful. It is a type of Sensory Integrative Dysfunction, which is the brain's inability to process and use information through the senses. Children whose tactile systems give inaccurate information are frequently in the state of 'red alert'. Casual contracts within an ordinary daily environment could cause extreme reactions that may be interpreted as bad behaviours. They may react be whining and clinging (fright), or lashing out (fight) and running away (flight). The neural disorder that causes a child's tactile defensiveness does not necessarily affect the child's learning ability. However the discomfort and behavioural reactions caused by this disorder does interfere with the learning process. Very often the child is emotionally insecure. Although not well understood, Tactile defensiveness has been recognised for many years as a "Hypersensitivity" or "hyper-responsivity" to touch in a variety of populations. For example, it has been identified in children with specific learning difficulties, learning disability, autistic spectrum disorder, and other developmental disorders. It is important to note that tactile defensiveness and developmental Dyspraxia are two separate conditions. Occasionally a child could suffer from both conditions at the same time.

Behaviour Characteristics of a Child with Tactile Defensiveness

Behavioural indicators include hyperactivity and distractibility. They over-react to tactile stimulations so that most people do not particularly notice, or at least are not bothered by it. However, it is important to note that children with TD will get involved in certain tactile activities if they are in control. They will also actively seek out a large amount of muscle stimulation and firm touch stimulation as a means to reduce the level of hypersensitivity. They may frequently and consistently present some or most of the following behavioural features.

- Avoidance of certain styles or textures of clothing (e.g. scratchy or rough); or conversely an unusual preference for certain styles or textures of clothing (e.g. soft materials, long sleeved shirts)
- Avoidance Responses to Touch Stimulation
- Avoidance of contact with other children, e.g. preference for standing at the end of line during assembly, staying at the edge of a group during story time etc.
- Avoidance of anticipated touch or from interactions involving touch, e.g. tendency to pull away or avoidance of touch to the face
- Avoidance of play activities involving tactile materials (e.g. sand, finger paints) or body contact, with a tendency to prefer solitary play
- Avoidance of going barefoot, especially in sand and grass (could result in tip-toe walking)
- Avoidance of a crowded environment, likes to stay under the table, behind the settee or under the staircase
- Aversive Responses to Non-Painful Touch
- Aversion or struggle when picked up, hugged or cuddled

- Aversion to certain daily living tasks, e.g. having showers, cutting fingernails and hair and face washing
- Aversion to dental care and/or brushing teeth
- Aversion to being handled during daily activities, e.g. changing nappy or clothes, cleaning nose or face
- Aversion to being approached from behind. May rub skin or scratch area being touched
- Becomes anxious and distressed when being physically close to people, e.g. during assembly, inside the dining hall, etc.
- Refusal to participate in certain social activities, e.g. going to a party or supermarket
- Responding verbally or with physical aggression to light touch to arms, face or legs, e.g. lashing out
- Objection, withdrawal or negative responses to touch contact, including that encountered in the context of intimate relationship even in a friendly or affectionate manner.
- A tendency to prefer to touch rather than to be touched.
- It is important to note that children with TD quite often present hypersensitivity to other sensory stimulations, e.g. movements, sights, sounds. When a child presents hypersensitivity to more than one sensory stimulus, we call this Sensory Defensiveness.

Theory of Tactile Defensiveness

Different theories have been proposed to explain this specific Sensory Integrative Dysfunction over the years. The whole concept centres on the mechanism of inhibition at different levels of our brain function. Ayres, proposed a dual-system theory that TD resulted from an imbalance in two somatosensory systems – protective system and discriminative system. TD occurs when the protective system due to a lack of sufficient initiation predominates over the discriminative system. Larson suggested an imbalance in descending mechanisms from the higher part of the brain, which resulted in either too little or too much inhibition. Fisher and Dunn hypothesised that tactile input may be regulated at the level of the spinal cord by inhibitory influences from higher centres. In the case of TD, this modulation (i.e. inhibition) may be deficient, causing an over-reaction to tactile stimuli. A child with tactile defensiveness requires occupational therapy. They need to have the underlying sensory defensiveness addressed in order to achieve the proper developmental milestones and social interactions necessary. Tactile experiences should be introduced slowly and gradually. A child with tactile defensiveness should never be forced to touch anything they do not want to, as this will cause further apprehension and avoidance. Explain, understand and communicate with the child giving proper encouragement when attempting to introduce touch sensations to them in a safe and non-threatening way.

Beneficial Tactile Experiences: The child could be encouraged to handle different tactile sensations through play activities to overcome their hypersensitivity; however

they should never be forced to undertake such experiences if they are uncomfortable. They following activities can help a child with tactile sensitivity

- Feathers
- Finding objects buried in beans or rice (uncooked)
- Finger painting with pudding or finger paints
- Towel rub down after a warm bath (firm, quick strokes)
- Using various sponges, washcloths in the bath
- Messy play in the tub where they can immediately wash off if bothered by it
- Lotion massage to extremities
- Wearing spandex or lycra exercise-type clothes under regular clothes for calming, evenly distributed deep pressure input
- Wear moccasins instead of shoes
- Seamless socks
- Vibrating toys or massagers
- Sand and water tables
- Sandbox and beach sand toys

Choice of fabrics

Super-Soft Clothes: Soft, breathable fabrics should be chosen since the child can't tolerate stiff or scratchy fabrics. Clothes chosen should be tagless with covered elastic bands, no metal parts, no heavy embroidery or appliqué. Choose shirts without rough collars and tops without appliqués, as the reverse sides may be stiff, textured or itchy. Try loose pants with elastic waistbands if jeans or other pants that zip feel heavy or rough. Also consider clothes that have been pre-worn and washed many times, such as hand-me-downs or thrift store bargains. This may be especially helpful for outerwear, which can be stiff when new.

Natural Materials

Believe the child when he or she says that clothing is irritating. Allow the child to select clothing as often as possible. Garments made from synthetic materials can feel itchy or "weird" to kids with tactile issues. Instead of man-made blends, consider buying natural, breathable fabrics, such as 100 percent cotton, soft—not scratchy—wool, bamboo and linen.

Clothing without Tags and Seams

Children with sensory processing issues may find a scratchy shirt tag or a misaligned sock seam unbearable. If the tag cannot be snipped, try placing an adhesive bandage over the offending area. That might do the trick, unless the child finds the bandage even more annoying. Look for tagless, seamless clothes that are available in retail shops

Garments without Tricky Fasteners

Sensory processing issues can affect the child's motor skills that can make tasks like tying, snapping, buttoning or zipping clothing difficult—and frustrating. Opt for Velcro fasteners when possible. And if tying is challenging, consider pants with drawstrings. Drawstrings gather material from across a wider area rather than creating a single pressure point.

Clothes that do not Crumble

If boxer shorts irritate the child when they get hiked up on his thighs, opt for briefs instead. Likewise, choose bathing suits without a netting liner. For girls, find a bra that fits without slipping down her shoulders—a sports bra or a racer back style may be safe. For all kids with sensory processing issues, choose socks that won't slouch or slip down inside shoes.

Heavy Clothing

Sometimes as part of sensory integration therapy, children are covered with heavy blankets or wear weighted vests. These are sometimes called "compression" vests. If the child takes comfort in that "cocoon" feeling, try dressing him in layers. A T-shirt, hooded sweatshirt and vest might feel better to the child than, a button-down and light sweater.

Reinforce Social Norms

Make sure that the child understands the difference between socially appropriate and inappropriate dress. Point out how other people are dressed when running errands or at school. Explain the natural consequences of inappropriate dress such as, "You weren't wearing your rain boots, so your shoes got wet" or "We can't get ice cream, because the sign says you have to wear a shirt in the store."

Footwear

Sometimes the only way to get a child to wear any shoes at all is to allow sandals or flip-flops. But there's a downside. Many children refuse to give up their sandals till the end. Wearing sandals can prevent certain activities – indoor playgrounds require socks and outdoor playgrounds usually have wood chips, which can splinter inside the sandal. It's also unsafe to run or climb in sandals.

Conclusion

Tactile Defensiveness is not a disease but only a disorder that could be overcome by carefully observing the child and reacting to their emotions positively. The child should be given maximum comfort and reassurance in order to overcome his/her problem of oversensitivity. If the child suffers from Tactile Defensiveness seek professional input to confirm the diagnosis and advice on treatment strategies. The child should be referred to an Occupation Therapist specialized in Sensory Integrative Therapy. It is not always possible to outgrow tactile defensiveness but personal adaptation and family support could uplift the confidence of the child.

References

1. Fisher, E. Murray & Bundy, A (Eds). Sensory Integration: Theory and Practice. Philadelphia: F A Davis Trott, M.C. (1993).
2. Fisher, A.F & Dunn, W.D., Tactile Defensiveness in Children with Developmental Disabilities: responsiveness and habituation. Journal of Autism and Developmental Disorders 24 (4), pp 457-471 (1983).
3. Mailloux, Z ., The Sensory History of developmentally Delayed Children With and Without Tactile Defensiveness. American Journal of Occupational therapy 36, pp 590-596 (1992).
4. Carrero, K., A Touchy Subject – Tactile Defensiveness as a Child and Adult
5. www.dyspraxiafoundation.org.uk/downloads/Tactile_Defensiveness.pdf
6. http://www.friendshipcircle.org/blog/2012/03/28/10-tips-for-dressing-a-sensory-sensitive-child/

EXTRACTION, OPTIMIZATION AND FINISHING OF ACTIVE COMPOUNDS EXTRACTED FROM TANNERS CASSIA FLOWER AND AZADIRACHTA INDICA LEAF FOR ANTIMICROBIAL PROPERTY ON SPUNLACED NONWOVEN FABRICS

M.Amsaveni
Assistant Professor, department of Costume Design and Fashion, Kongunadu Arts and Science College, Coimbatore
Dr.S.Amsamani
Professor, Department of Textiles and Clothing, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore

Abstract

The usage of herbal plants for finishing textiles has recently become a great interest. Medicinal plants have been used from ancient times for human diseases and gives a new source of biological active chemical compounds as antimicrobial agent. Herbal / medicinal plants have advantage of no side effects, non toxic and eco friendly. The bioactive compounds from herbal plants with antimicrobial properties are gaining considerable attention as attractive alternative to synthetic chemical antimicrobial agents for medical textiles. With respect to the medicinal properties of the herbal plants the present study was focused on the extraction of bioactive compounds from the Tanners cassia and neem leaf extract for finishing on the 100% Bamboo, Viscose and Polypropylene spunlaced nonwoven fabrics, mordant optimization, optimization of time, temperature and concentration for finishing process condition and assessing its antimicrobial property. The study reveals that the bamboo and viscose fabrics treated with Tanners cassia and Neem extract showed maximum zone of inhibition when compared to polypropylene fabric.

Key words: *Antimicrobial property, mordanting, Azadirachta indica leaf extract, combination method, optimization parameters, Tanners cassia*

Introduction

Medicinal plants have been used more and more now-a-days in most of the areas especially in the field of medical textiles to provide antimicrobial finish to the textile fabrics. Cost effective, easy availability and fewer side effects are making the herbal medicine more popular both among the rural and city people. The use of medicinal plants for the treatment of diseases and disorders date back from older days (1). The medicinal properties of various plant material and extracts have been recognised since the beginning of the 5th century (2).

Materials and method

Collection of Source: Alum, myrobolan and pomegranate rind powder was selected for mordanting and got from the nearby herbal shop in Coimbatore. *Tanners cassia* flower and *Azadirachta indica* leaf was collected for the extraction of bioactive compounds and was collected from the nearby plants.

Test Organism: The bacterial and fungal strains were procured from NICM, Pune that included one gram positive (*Staphylococcus aureus* NICM 2079) and one gram negative (*Escherichia coli* NICM 2065) and two fungal organisms (*Aspergillus niger*

NICM 596 and *Candida albicans* NICM 3471). They were immediately sub cultured by inoculating a loopful in the respective broths for both bacteria and fungi. The bacterial sub cultures were incubated at 35°C-37°C for 18-24 hours and the fungal subcultures were kept at room temperature for 72 hours. Then they were streaked onto nutrient agar and potato dextrose agar plates and the plates were incubated and were stored at 4°C till use (7).

Extraction of Mordants: Three grams of each mordant of alum, myrobolan and pomegranate rind powders were taken in separate beakers and 100ml of distilled water was added to it and stirred well for few minutes and kept in water bath for one hour. The solution was filtered using whatman filter paper and finished on bamboo, viscose and polypropylene spunlaced non woven fabrics by pad dry cure method.

Selection of Mordant: Mordant helps to fix dye on the fabric. Myrobolan, alum and pomegranate rind acts as a natural tannin based mordants. The pomegranate rind powder of dyestuff is high in tannins and improves the light and washfastness of the dye with which it is mixed (8). As stated by Adivarekar et al., (2011), tulsi, neem and turmeric extract in combination with myrobalan imparts excellent antimicrobial property. Deepti Gupta and Ankur Laha (2007), reveals that, alum has high antimicrobial activity and posses no environmental hazards. Hence from the above facts alum, myrobolan and pomegranate rind were selected as mordants.

Mordant Optimization: Alum, myrobolan and pomegranate rind powders were collected from the nearby herbal shop. 3% of each mordant were taken in separate beaker. 100ml of water was added to each beaker, stirred well for one hour and then filtered. The fabric samples such as 100% bamboo, 100% viscose and 100% polypropylene spunlaced non woven fabrics of 5x5 inches were taken and dipped into the three mordants for one hour. The same mordanting procedure was carried out with the addition of 8% citric acid (3). Then the antimicrobial activity for the treated fabrics of mordant and mordant with citric acid samples were assessed and the mordant which shows good absorbency and antimicrobial activity was selected for further optimization process.

Extraction of Active Compounds: The active compounds from herbs were extracted by hot continuous Soxhlet extraction method (4). This method was selected because this requires only minimum amount of solvents and the solvents can be reused for the extraction of the same plant source. 30gms of the plant source was weighed and 300ml of ethanol solvent (5) was used for extraction of bioactive compounds. Six cycles were allowed for extraction and then the source was removed from the extractor, filtered and poured in the Petri plates for evaporation of the ethanol solvent. After evaporation the crude extracts were weighed.

Yield of the plant extract = A – B

% Yield of the plant extract = A – B / A x 100

Where A- Weight of the empty Petri plates,

B- Weight of the Petri plate with the evaporated extract

Yield of the plant extract- 41.6 - 45.9gms = 4.3gms

% Yield of the plant extracts - 10.3%

Optimization for the Finish Process Conditions

Required number of beakers were taken and the respective concentrations (0.5, 1.0, 1.5 and 2.0g) of the crude extracts (*Tanners cassia* flower extract and *Azadirachta indica* neem leaf extract separately) were weighed and poured in the beaker for optimization. A few drops of ethanol was added to dissolve the crude extract and stirred well. Then 8% of citric acid solution was prepared and 10ml of the solution was added to each beaker. Then the myrobolan bamboo treated fabric was cut to 5x5 inch size and was dipped into the beaker at, 40° C, 50° C and 60° C for 1, 3 and 5 hours respectively. The fabric was taken out, dried and its antimicrobial activity was assessed. The optimum parameter which shows maximum zone of inhibition was selected for further finishing on the fabric. Similarly the same procedure was carried out for optimizing the viscose and polypropylene fabrics with each of the extracted sources.

Table-I Optimization Parameters for Finish Process Conditions

Time	1,3 And 5 Hours
Temperature	40◦C, 50◦C and 60 ◦C
Concentration	0.5, 1.0, 1.5 and 2.0gm/10ml
Citric acid	8 %

Combination Method

In this method the *Tanners cassia* flower extract and *Azadirachta indica* leaf extract was combined together in the ratio of 50:50 for finishing on the bamboo, viscose and polypropylene spunlaced non woven fabrics for three hours at 50 °C. After three hours the fabric was taken out, dried and its antimicrobial activity was assessed.

Determination of Antimicrobial Activity by Using Agar Plate Method

Treated and untreated control fabric samples placed in contact with agar plates, which have been previously inoculated with inoculums of test organisms. After incubation, a clear area of uninterrupted growth underneath and along the sides of the test material indicates antimicrobial effectiveness of the fabric (6).

Results and Discussion

Table-II Optimization of mordants for mordanting on 100% Bamboo, Viscose and Polypropylene Fabrics

Type of fabric	Mordants	Zone of inhibition			
		Bacterial species		Fungal species	
		S. aureus	E. coli	A. niger	C. albicans
Bamboo fabric	Alum	***	***	6	3
	Alum with 8% citric acid	***	1	6	8
	Myrobolan	**4**	**4**	**2**	***
	Myrobolan with citric acid	**3**	**3**	**7**	**6**
	Pomegranate rind	2	3	***	---
	Pomegranate rind with citric acid	3	2	7	7
Viscose fabric	Alum	***	***	***	---
	Alum with 8% citric acid	***	***	5	6
	Myrobolan	**4**	**4**	***	***
	Myrobolan with citric acid	**3**	**3**	**2**	**6**
	Pomegranate rind	***	2	***	---
	Pomegranate rind with citric acid	3	2	2	***

Polypropylene fabric	Alum	***	***	2	6
	Alum with 8% citric acid	***	***	---	***
	Myrobolan	**2**	**3**	*******	**5**
	Myrobolan with citric acid	*******	*******	**2**	**---**
	Pomegranate rind	***	***	---	---
	Pomegranate rind with citric acid	***	***	***	***

***** = Weekly formed**

--- = nil (no zone formation)

It is clear from the Table II and Figure I, bamboo fabric treated with alum showed zone of inhibition of 6mm for *Aspergillus niger* and 3mm for *Candida albicans.* Bamboo fabric treated with alum with citric acid showed 6mm and 8mm of zone formation for *Aspergillus niger* and *Candida albicans* whereas for both fabrics treated with alum and alum with citric acid bacterial species showed week zone formation. The bamboo fabric treated with myrobolan shows zone of inhibition of 4mm for both *Staphylococcus aureus* and *E.coli* and 2mm for *Aspergillus niger* whereas with the addition citric acid zone formation of 3mm for bacterial species, 7mm for *Aspergillus niger* and 6mm for *Candida albicans* was observed.

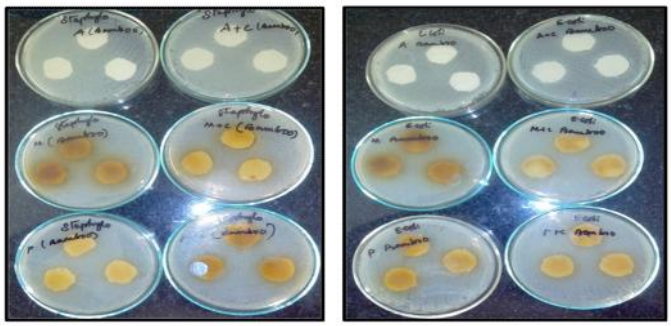
The pomegranate rind with citric acid treated bamboo fabric showed 3mm and 2mm for bacterial species and 7mm for both fungal species. Myrobolan with citric acid treated viscose fabric showed the antimicrobial activity for all bacterial and fungal species. 3mm for both *Staphylococcus aureus* and *E.coli* and 2mm for *Aspergillus niger* and 6mm for *Candida albicans* were observed.

The myrobolan treated polypropylene fabric showed zone of inhibition of 2mm for *Staphylococcus aureus,* 3mm for *E.coli* whereas for *Candida albicans* 5mm of inhibition was observed. It is clear from the above table that the myrobolan with citric acid treated bamboo, viscose and polypropylene spunlaced fabrics showed the maximum zone of inhibition for bacterial and fungal species. Hence the mordant myrobolan with citric was selected for the further processing.

Figure I: Zone of Inhibition formed for Bamboo, Viscose and Polypropylene fabrics mordanted with Alum, Myrobolan and Pomegranate rind powder with and without the addition of citric acid

Bamboo fabric treated with Alum (with and without citric acid), myrobalan (with and without citric acid), and Pomegranate rind (with and without citric acid)

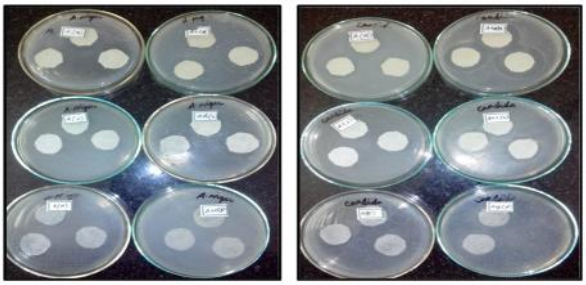
Bacterial species



Zone of inhibition formed for *Staphylococcus aureus* and *Escherichia coli*

Bamboo, viscose and polypropylene fabrics treated with Alum (with and without citric acid)

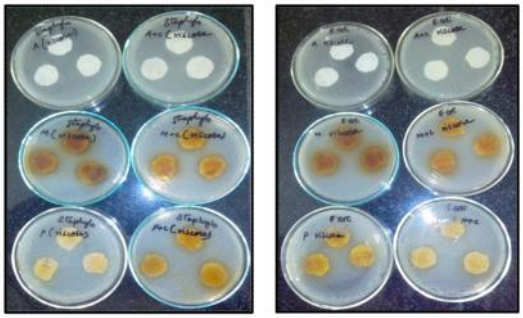
Fungal species



Zone of inhibition formed for *Aspergillus niger* and *Candida albicans*

Viscose fabric treated with Alum (with and without citric acid), myrobalan (with and without citric acid), and Pomegranate rind (with and without citric acid)

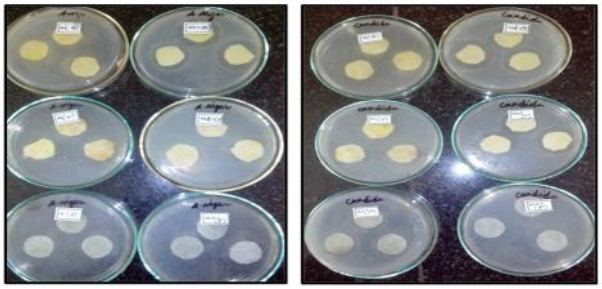
Bacterial species



Zone of inhibition formed for Staphylococcus aureus and Escherichia coli

Bamboo, viscose and polypropylene fabrics treated with Myrobalan (with and without citric acid)

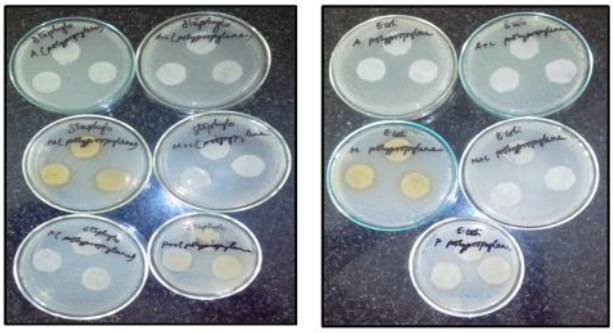
Fungal species



Zone of inhibition formed for *Aspergillus niger* and *Candida albicans*

Polypropylene fabric treated with Alum (with and without citric acid), myrobalan (with and without citric acid), and Pomegranate rind (with and without citric acid)

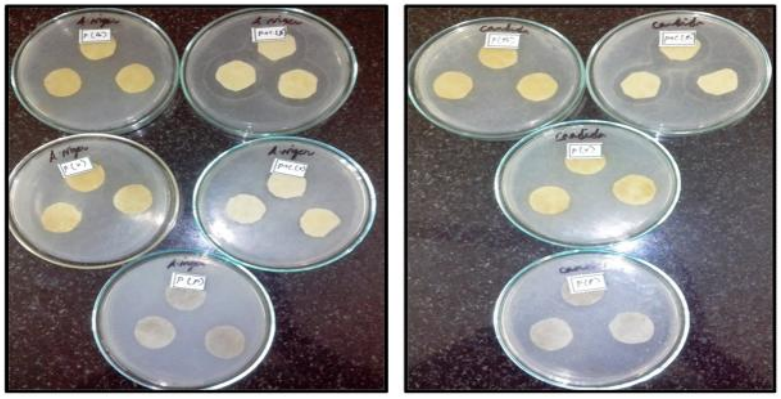
Bacterial species



Zone of inhibition formed for Staphylococcus aureus and Escherichia coli

Bamboo, viscose and polypropylene fabrics treated with Pomegranate rind (with and without citric acid)

Fungal species



Zone of inhibition formed for *Aspergillus niger* and *Candida albicans*

Antimicrobial Assessment of Tanners cassia flower and Azadirachta Indica Leaf Extract

Table III- Zone of inhibition formed for *Tanners cassia* flower extract treated on 100%Bamboo, Viscose and Polypropylene spunlaced nonwoven fabric

S.No	Conc.	Temp.	Time	Zone of inhibition for bacterial species						Zone of inhibition for fungal species					
				S. aureus			E.coli			A.niger			C.albicans		
				B	V	P	B	V	P	B	V	P	B	V	P
1	0.5 g/10ml	40°C	1	**12**	**3**	3	WF	2	-	10	4	-	22	2	-
2			3	4	WF	-	2	-	-	9	3	-	**27**	2	2
3			5	3	3	2	2	-	-	4	3	-	21	1	1
4		50°C	1	5	-	-	WF	3	1	5	3	-	18	3	1
5			3	WF	2	1	2	3	1	4	4	-	10	2	1
6			5	10	-	-	2	-	-	4	4	-	7	3	2
7		60°C	1	7	2	WF	1	-	-	7	7	-	9	5	1
8			3	4	1	WF	1	-	-	6	8	-	8	5	1
9			5	6	5	1	3	2	-	11	**10**	-	11	11	-
10	1.0 g/10ml	40°C	1	WF	-	-	WF	-	-	**17**	5	-	14	3	-
11			3	10	WF	-	1	-	-	4	4	-	15	4	-
12			5	10	1	1	5	-	-	4	3	-	15	2	2
13		50°C	1	9	WF	-	5	-	-	4	3	-	20	5	-
14			3	9	1	-	4	1	-	7	4	-	22	2	-
15			5	6	-	-	5	-	-	14	4	-	22	4	-
16		60°C	1	11	2	-	3	2	-	10	7	-	25	8	-
17			3	5	-	-	3	-	-	9	8	-	22	5	-
18			5	8	WF	-	2	-	-	12	8	-	19	6	4
19	1.5 g/10ml	40°C	1	6	WF	-	6	-	-	13	4	-	19	4	3
20			3	6	WF	WF	**7**	-	-	9	4	-	20	3	-
21			5	5	-	-	WF	-	-	8	4	-	18	5	3
22		50°C	1	3	-	-	WF	-	-	10	5	-	22	3	2
23			3	4	-	-	3	-	-	**17**	4	-	12	5	3
24			5	1	2	1	2	2	1	14	4	-	23	4	2
25		60°C	1	1	-	-	4	-	-	13	7	-	19	5	3
26			3	WF	-	-	WF	-	-	10	7	2	23	5	2
27			5	WF	-	-	2	-	-	9	7	2	12	5	2

28			**1**	5	-	-	2	-	-	9	4	-	16	3	2
29		**40°C**	**3**	6	1	-	1	-	-	12	4	-	22	4	-
30			**5**	9	-	-	WF	-	-	11	3	-	10	3	2
31			**1**	3	1	1	4	-	-	9	6	-	15	6	2
32	**2.0 g/10ml**	**50°C**	**3**	8	2	1	6	-	-	9	2	-	14	5	2
33			**5**	6	-	-	5	-	-	7	3	-	13	5	4
34			**1**	5	-	-	5	-	-	10	3	-	12	4	3
35		**60°C**	**3**	6	-	-	2	2	-	8	4	-	11	4	2
36			**5**	WF	2	1	2	1	WF	9	4	-	7	5	2

B- 100% Bamboo Spunlaced non woven fabric

V-100% Viscose Spunlaced non woven fabric

P-100% Polypropylene Spunlaced non woven fabric

From the above Table-III it is clear that the bamboo fabric treated with ethanolic extract of *Tanners cassia* (05g/10ml conc.) showed the maximum zone of inhibition of 12mm for *S.aureus*, 2mm for E.coli, 11mm for *A.niger* and 27mm for *C.albicans* when Compared with the viscose and polypropylene fabrics. The viscose fabric showed zone formation of 5mm for *S.aureus* in 0.5g/10ml 0f concentration at 60°C for 5 hours, 3mmfor E.coli in 0.5g/10ml conc. At 50°C for 1 and 3 hours. For fungal species viscose fabric showed zone of inhibition of 10mm for *A.niger* and 11mm for *C.albicans* at higher temperature kept for 5 hours respectively. Polypropylene fabric showed maximum zone formation of 3mm and minimum of 1mm. Also with increase in the concentration of the extract the zone formation also showed increase in bamboo fabric of 11mm for *S.aureus* (1.0g/10ml conc. Kept at 60% for 1 hour), 7mm for E.coli (1.5g/10ml conc. Kept at 40°C for 3 hours) which is higher when compared to the study done by Spriya et al., (2013), in which the root extract of saponin rich Cassia auriculata showed best antimicrobial activity against P.vesicularis and least against E.coli. At 2.0g/10ml of concentration the bamboo fabric showed zone formation of 5mm for *S.aureus,* 1mm for E.coli, 12mm for *A.niger* and 22mm for C.albicans which is maximum when compared to the viscose and polypropylene fabrics respectively. In the current study the ethanolic extract of Cassia auriculata showed maximum antibacterial activity of 12mm and least of 10mm against S.aureus at 0.5g/ml which was more or less equal to the research work of Jyoti Wadekar et a., (2011), reveals that, ethanolic extract of Cassia auriculata showed activity of 9mm, 12mm and 14mm against S.aureus at 200, 400 and 800µl/ml.

Figure II- Zone of Inhibition formed for 100% Bamboo fabric treated with *Tanners cassia* flower extarct

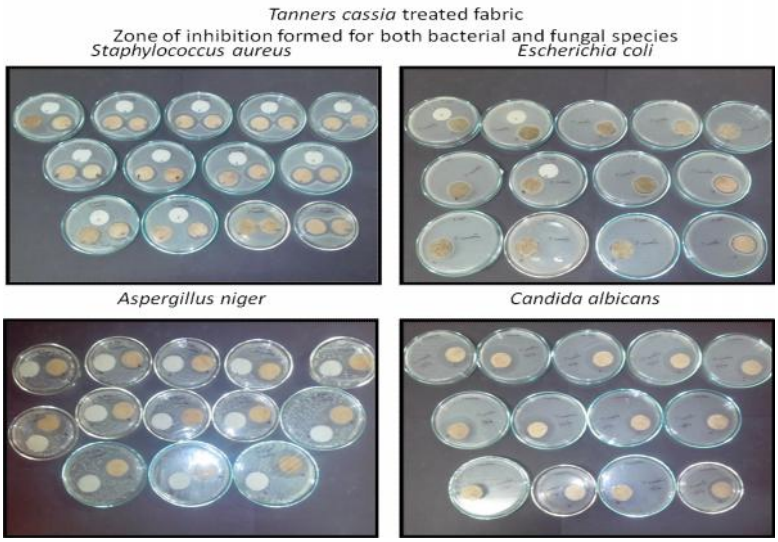


Figure II a- Zone of Inhibition of *Candida albicans* formed for 100% Viscose and Polypropylene Fabrics Treated with *Tanners cassia* Flower Extract

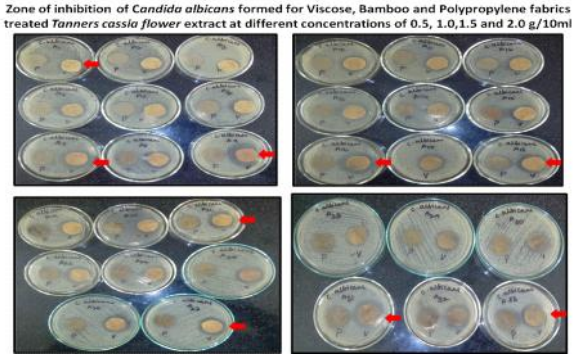


Table IV- Zone of inhibition formed for *Azadirachta indica* leaf extract treated on 100%Bamboo, Viscose and Polypropylene spunlaced nonwoven fabric

S.No	Conc.	Temp.	Time	Zone of inhibition for bacterial species						Zone of inhibition for fungal species					
				S. aureus			E.coli			A.niger			C.albicans		
				B	V	P	B	V	P	B	V	P	B	V	P
1.	0.5 g/10ml	40°C	**1**	2	-	-	2	2	-	3	8	5	7	5	2
2.			**3**	2	-	-	4	2	-	4	**11**	5	7	7	4
3.			**5**	1	2	-	4	3	-	7	5	-	7	7	5
4.		50°C	**1**	1	-	-	3	1	-	6	9	6	9	7	WF
5.			**3**	2	-	-	2	-	2	5	8	5	8	9	-
6.			**5**	4	3	-	4	-	-	4	-	-	8	7	3
7.		60°C	**1**	3	**4**	-	**5**	-	-	3	5	3	2	7	3
8.			**3**	3	-	1	1	-	-	7	**13**	-	3	8	5
9.			**5**	4	-	-	**5**	**3**	-	6	**11**	5	1	-	3
10	1.0 g/10ml	40°C	**1**	4	2	-	2	-	-	4	10	6	6	-	4
11			**3**	1	-	-	4	-	-	2	2	4	3	7	4
12			**5**	1	-	-	3	-	-	2	-	5	5	9	**6**
13		50°C	**1**	-	2	-	3	-	1	2	6	5	9	8	-
14			**3**	-	-	-	2	3	2	4	-	2	6	7	5
15			**5**	4	-	-	3	-	-	5	6	-	6	6	3
16		60°C	**1**	2	-	-	3	-	-	6	5	5	**11**	6	3
17			**3**	4	1	-	3	WF	-	7	2	**7**	8	**10**	4
18			**5**	-	2	-	1	1	2	7	7	6	8	6	4
19	1.5 g/10ml	40°C	**1**	-	-	-	3	-	1	7	7	3	3	9	-
20			**3**	-	3	WF	4	**5**	1	7	-	5	7	**10**	-
21			**5**	1	**4**	-	3	-	1	8	7	**7**	4	-	**6**
22		50°C	**1**	1	-	-	3	3	1	5	7	5	9	6	4
23			**3**	3	-	-	3	-	3	6	9	-	9	3	5
24			**5**	1	-	-	2	-	-	4	7	-	9	9	**6**
25		60°C	**1**	**5**	2	-	3	-	-	4	9	4	9	2	3
26			**3**	**5**	-	-	4	-	-	6	8	5	7	1	-
27			**5**	3	-	-	1	3	-	7	10	**7**	7	7	3
28	2.0 g/10ml	40°C	**1**	2	-	-	3	4	1	7	7	6	10	**10**	3
29			**3**	2	-	-	4	2	1	9	8	-	6	-	2
30			**5**	4	2	-	**5**	-	2	8	7	3	3	8	5
31		50°C	**1**	1	3	-	**5**	-	**3**	10	9	5	1	5	3
32			**3**	3	**4**	-	**5**	3	2	10	8	5	4	9	4
33			**5**	4	2	-	3	2	1	7	9	5	9	4	5
34		60°C	**1**	3	2	-	2	2	2	**11**	7	3	8	8	3
35			**3**	1	-	-	4	3	1	**13**	9	-	8	8	4
36			**5**	4	-	-	3	2	1	5	3	4	9	7	3

B- 100% Bamboo Spunlaced non woven fabric
V-100% Viscose Spunlaced non woven fabric
P-100% Polypropylene Spunlaced non woven fabric

It is clear from the above Table IV that, the bamboo fabric treated with *Azadirachta indica* leaf extract showed the maximum zone formation of 5mm and minimum of 1mm for both S.aureus (1.5g/10ml conc. at 60°C for 1 and 3 hours) and E.coli (0.5g/10ml of conc. at 60°C for 1 and 5 hours) respectively. For fungal species of *A. niger* the fabric showed zone of inhibition maximum of 13mm and 11mm for *C.albicans* respectively. In case of viscose fabric 4mm and 5mm of zone was formed for S.aureus and E.coli (0.5g/10ml conc. 60°C for 1 hour). The fabric showed antifungal activity of 11mm and 13mm at 0.5g/ml against A.niger and 10mm against C.albicans and the results were compared with the research work done by Devodas et al., (2013) states that, the chloroform extract of *Azadirachta indica* showed antifungal activity of 14mm against A.niger and C.albicans.

The polypropylene fabric showed week formation of zone of inhibition for both the bacterial species and showed 7mm and 6mm zone formation for A.niger and C.albicans.

Table V- Combination treatment of Tanners cassia flower and Azadirachta indica leaf extract 50: 50

Tanners cassia and Azadirachta indica leaf extract 50: 50 treated fabric	Zone of inhibition formed for bacterial species		Zone of inhibition formed for fungal species	
	S. aureus	E.coli	A.niger	C.albicans
Bamboo	5	6	**10**	**13**
Viscose	5	5	**9**	**11**
Polypropylene	2	1	**10**	**7**

A combination treatment of *Tanners cassia* and *Azadirachta indica* in the ratio of 50:50 was finished on the Bamboo, Viscose and Polypropylene fabrics. It was clear from the Table V that, the fungal species of *Aspergillus niger* showed the maximum zone formation of 10mm for both Bamboo and Polypropylene fabrics and for *Candida albicans* the Bamboo showed 13mm and Viscose showed 11mm zone formation. The bacterial species of *Staphylococcus aureus* showed zone of inhibition of 5mm for both the Bamboo and Viscose treated fabrics and 6mm and 5mm for *E.coli* respectively. In 50:50 ratio there is an increase in the zone formation of 10mm and 7mm for A.niger and C.albicans in polypropylene fabric when compared to the other two fabrics.

Conclusion

Assessment of antimicrobial property of Tanners cassia flower extract and Azadirachta indica leaf extract finished on Bamboo, Viscose and Polypropylene fabrics reveals the possibility of using these plants as antimicrobial agent was good on Bamboo and Viscose fabrics when compared to the Polypropylene fabric because the bamboo and viscose absorbs the extract well and showed the maximum zone of inhibition. Also it is concluded based on the findings of the present study that the Azadirachta indica shows higher antifungal activity on bamboo and viscose fabrics

than compared to antibacterial activity. The combination of Tanners cassia and Azadirachta indica extracts acts as a good antifungal agent on Polypropylene fabric when compared to the Bamboo and Viscose fabrics. Further health and hygiene products like antimicrobial treated bandages, shocks, sanitary pads etc can be developed to harvest the benefits of natural medication from these plants.

Acknowledgement

The authors thank the University Grants Commission (UGC), New Delhi, for providing us the financial support to conduct this research project.

References

1. K.Das, R.K.S. Tiwari and D.K.Shrivastava., "Techniques for evaluation of medicinal plant products as antimicrobial agent: current methods and future trends", Journal of medicinal plant research, Vol: 4 (2), 2010, Pp: 104-111.
2. O.Baris, M.Gulluce, F.Sahin, H.Ozer, H.Kilic, H.Ozhan, M.Sokmen and T.Ozbek., "Biological activities of the essential oil and methanol extract of Acillea Biebersteinii Afan (Asteraceae)", Turk.J.Biol, Vol: 30, 2006, Pp: 65-73.
3. G.Thilagavathi, S.Krishna Bala and T.Kannaian, " Microencapsulation of herbal extracts for microbial resistance in healthcare textiles", Indian Journal of Fibre and Textile Research, Vol:32, 2007, Pp: 351-354.
4. P.A.Egwaikhide and C.E.Gimba, " Analysis of the phytochemical content and antimicrobial activity of *Plectranthus glandulosis* whole plant', Middle-East Journal of Scientific Research, Vol: 2, 2007, Pp: 135-138.
5. R.J.Green, "Antioxidant activity of peanut plant tissues" Masters Thesis, North Carolina State University, USA, 2004.
6. D.Jothi, " Experimental study on antimicrobial activity of cotton fabric treated with aloe gel extract from aloe vera plant for controlling Staphylococcus aureus (bacterium)", African Journal of Microbiology Reearch, Vol: 3(5), 2009, Pp: 228-232.
7. Kruti Pandya, Bhavna Solanki, Bijal Shah, Diksha Parekh, Hardik Soni, Kunal Maniar, Nilesh Gurav and Prateek Patel, "Phyto-chemical screening and evaluation of antibacterial activity of polyherbal formation", Indo Global Journal of Pharmaceutical Sciences, 2011, Vol: 1(3), pp: 206-218.
8. Jyoti Wadekar, Ramesh Sawant and Bharat Honde, "Anthelmintic and antibacterial potential of cassia auricilata roots', International Journal of Pharmaceutical Frontier Research, (2011), V0l:1(2), pp: 93-98
9. Devados Kumarasamy Raja, Sundararaman Jeganathan and Rajappan Manavalan, " in vitro antimicrobial activity and phytochemical analysis of Cassia auriculata Linn", International Current Pharmaceutical Journal, (2013), V0l: 2(6), pp: 105-108.
10. Supriya Deshpande, Shailesh Kewatkar and Vivek Paithankar, " Antimcrobial activity of Saponins rich fraction of Cassia auriculata Linn against various microbial strains, (2013), International Current Pharmaceutical Journal, Vol: 2 (4), pp: 85-87.
11. Deepti Gupta and Ankur Laha, " Antimicrobial activity of cotton fabric treated with Quercus infectoria extract", (2007), Indian Journal of Fibre and Textile Research, Vol: 32, pp: 88-92.
12. R.V. Adivarekar, N.Kanoongo, M.Nerurkar and N. Khurana, " Application of Herbal Extracts for Antimicrobia Property", Journal of the Textile Association, (2011), pp: 324-330
13. Maiwa Handprints Ltd. www.maiwa.com

DYEING OF COTTON FABRIC WITH NATURAL DYE EXTRACT FROM ARGEMONE MEXICANA LEAVES

K.Amutha
Assistant Professor, Department of Textiles and Apparel Design, Bharathiar University, Coimbatore

Abstract

Dyeing is an ancient art and was prevalent in many parts of the world. Primitive dyeing techniques included sticking plants to fabric or rubbing crushed pigments into cloth. The methods became more sophisticated with time and techniques using natural dyes from berries and other plants, which were boiled into the fabric and gave light and water fastness, were developed. Natural dyes are more eco-friendly than the synthetic dyes. Most natural dyes have antioxidants. Clothes dyed with natural dyes could be free from carcinogenic components. Depending on the mordant used with a dye, variety of colours can be obtained which also depends on the sources of the dye. One dye may give 5 to 15 varying colour and shades. 100% cotton fabric was selected for the study. Bleaching and scouring process were done for cotton fabric as pre-treatment. The natural dye was extracted from Argemone mexicana leaf by using soxhlet extraction method. Two different mordants namely alum and myrobolan were used. Myrobolan was extracted by boiling method and used for dyeing. Three mordanting techniques were employed for dyeing process: 1.Pre-mordanting, 2. Meta-mordanting, 3. Post-mordanting. The natural dye and mordant were applied on 100% cotton fabric. The dyed samples were tested for colour fastness properties.

Keywords: *Alum, Argemone mexicana, mordant, myrobolan, plant dyes, spectrophotometer.*

Introduction

"Colours are the smiles of nature." – James Henry Leigh Hunt

The nature has blessed our planet Earth with numerous colours. Colour is perceived by human eye when light strikes an object and reflected back. Colour is an important attribute of clothing. The meaning that colour implies may differ according to the circumstances and culture. Colouring of textiles is a value addition and it is based on the consumer choice. Textiles could be dyed with natural or synthetic dyes. Both have their own merits and demerits. Natural dyes are bio-degradable, non-hazardous and environmentally safe. Hence natural dyes could be used in place of hazardous synthetic dyes. Natural dyes are derived from naturally occurring sources such as plants, insects, animals and minerals. Several synthetic colorants have been banned because they cause allergy-like symptoms or are carcinogens. Among the all natural dyes, plant-based pigments have wide range of medicinal values. The current research by the author explores the potential of natural dye extracted from *Argemone mexicana* leaves in dyeing of 100% cotton fabric.

Materials and Methods

100% cotton woven fabric has been selected for the study. Cotton is a versatile fabric and most suitable for people in country like India which lies in the tropic region. The natural dye source selected is the leaves of the plant *Argemone mexicana.* The plant is also called Mexican poppy, Mexican prickly poppy, flowering thistle cardo or cardosanto. It is a species of poppy found in Mexico and now widely naturalized in many parts of the world. An extremely hardy pioneer plant, it is tolerant of drought and poor soil. Its latex, leaf juice extracts and seed oil is applied externally to heal wounds faster, and in skin diseases.

Figure 1 Argemone mexicana plant

Figure 2 Soxhlet extraction of dye

When a compound of low solubility needs to be extracted from a solid mixture a Soxhlet extraction can be carried out. The technique places a specialized piece of glassware in-between a flask and a condenser. The refluxing solvent repeatedly washes the solid extracting the desired compound into the flask. Soxhlet extraction was carried out for colourant identification. In this work dried plant parts were put into thistle of soxhlet extractor and acetone was used as solvent. Temperature of the instrument was maintained well under boiling point of the used solvent. Several cycles of solvent were run so as to extract all the compounds from plant parts. Fresh leaves of the plant *Argemone mexicana* were collected from the Bharathiar University campus, washed with water to remove dust and impurities and then dried in shade. The dried leaves were pound to a fine powder and about 140 grams of it is packed in a cloth and stitched. The pack is placed in the thimble of the soxhlet extractor and 1 litre of methanol is used as solvent for extraction of dye. The mixture was refluxed for 32 hrs at 10°C to 50°C to extract the dye. Then the extract was filtered by using filtered paper. Then the dye solvent is used to dye the 100% cotton fabric. The non-soluble portion of the extracted solid remains in the thimble, and is discarded.

Mordanting

Since the dye is non-substantive in nature, a mordant is required to fix the dye molecule to the fibre. Two mordants namely alum and myrobolan were selected

for the study. Alum was bought from Precision Scientific Company and myrobolan was bought from an herbal store in Coimbatore.

Alum Extraction

Alum	-	200gms
Time taken	-	30 to 40 minutes
Water	-	3 litres
Temperature	-	80°C to 90°C

After the boiling process the solution is filtered by using Whatmann filter paper and then stored in air tight container at room temperature.

Myrobolan Extraction

Myrobolan	-	200 gms
Time taken	-	40 to 60 minutes
Temperature	-	80°C to 90°C
Water	-	3 litres

After the boiling process the solution is filtered by using Whatmann filter paper and then stored in air tight container at room temperature.

Dyeing

Pre-Mordanting with Alum: In this method of 100% cotton fabric was first treated with Mordant and then dyed under optimized conditions. 1/2 meter of cotton fabric was treated with Alum mordant at 60°C for 10 minutes. The m:l ratio used for mordanting was 1:5. Then the mordanted fabric was dyed at 60°C for 30 minutes with *Argemone mexicana* leaves dye. Then the fabric was washed with cold water and dried.

Meta-Mordanting with Alum: In this method cotton fabric was treated with mordant and dye simultaneously under optimized conditions. In meta-mordanting method (i.e. dyeing in the presence of mordant), the fabric was immersed in a bath containing Alum mordant and the *Argemone mexicana* leaves dye. The temperature was maintained at 60°C for 60 minutes. Then the fabric was washed with cold water and dried.

Post-Mordanting with Alum: In this method the cotton fabric was first treated with dye and then mordant under optimized conditions. First the fabric was dyed with *Argemone mexicana* leaves dye extract at 60°C for 60 minutes then the dyed fabric was treated with alum mordant at 60°C for 10 minutes.

Pre-Mordanting with Myrobolan: The fabric was first treated with Myrobolan mordant. 1/2 meter of cotton fabric was treated with Myrobolan mordant at 60°C for 10 minutes. The m:l ratio used for mordanting was 1:5. Then the mordant fabric was dyed at 60°C for 30 minutes with *Argemone mexicana* leaves dye. Then the fabric was washed with cooled water and dried.

Meta-Mordanting with Myrobolan: In meta-mordanting method (i.e. dyeing in the presence of mordants), the fabric was immersed in a bath containing Myrobolan mordant and the *Argemone mexicana* leaves dye. The temperature was maintained at 60°C for 60 minutes. Then the fabric was washed with cold water and dried.

Post-Mordanting with Myrobolan: First the fabric was dyed with *Argemone mexicana* leaves dye extract at 60°C for 60 minutes then the dyed fabric was treated with mordant at 90°C at Myrobolan mordant for 30 minutes.

Results and Discussion

The fabric samples dyed with natural dye extracted from *Argemone mexicana* leaves with two different mordants using three mordanting techniques were evaluated for colour fastness tests such as colour fastness to washing / laundering and rubbing. The colour coordinates L, a, b, c and the colour difference (ΔE) of the dyed samples were analyzed using spectrophotometer.

Colour Fastness to Washing

The colour fastness to washing of the 100% cotton fabric dyed with *Argemone mexicana* leaves dye with Alum and Myrobolan as mordant was tested according to ISO 1O5-C06. The change in colour and staining on multifibre adjacent fabric are tabulated below:

Table 1 Colour Fastness to Washing (Colour Change of Fabric)

S. No	Mordanting Technique	Mordant	
		Alum	Myrobolan
1	Pre-mordant	1	4
2	Meta-mordant	2	4
3	Post-mordant	1/2	3/4

Table 2 Colour Fastness to Washing (Colour staining on multifibre fabric)

S. No	Mordanting Technique	Colour staining on multifibre fabric	Mordant	
			Alum	Myrobolan
1	**Pre-mordant**	Acetate	4/5	4/5
		Cotton	4/5	4/5
		Nylon	4	4/5
		Polyester	4/5	4/5
		Acrylic	4/5	4/5
		Wool	4/5	4/5
2	**Meta-mordant**	Acetate	4/5	4/5
		Cotton	4/5	4/5
		Nylon	4/5	4/5
		Polyester	4/5	4/5
		Acrylic	4/5	4/5
		Wool	4/5	4/5
3	**Post-mordant**	Acetate	4/5	4/5
		Cotton	4/5	4/5
		Nylon	4/5	4/5
		Polyester	4/5	4/5
		Acrylic	4/5	4/5
		Wool	4/5	4/5

From Table 1, it could be inferred that the myrobolan mordant produced better fastness compared to alum. Among the three different mordanting techniques, the pre- and meta-mordanting gave better fastness than post-mordanting. Table 2

shows the staining on multifibre fabric which is insignificant and hence the results are good.

Colour Fastness to Rubbing

The colour fastness to rubbing (Dry & Wet) of the dyed samples was determined according to ISO 105-X12 by using crock meter and the results are tabulated below:

Table 3 Colour Fastness to Rubbing (Staining)

S. No	Mordanting Technique	Alum		Myrobolan	
		Dry	Wet	Dry	Wet
1	Pre-mordant	5	3	5	3
2	Meta-mordant	5	4/5	4/5	3
3	Post-mordant	4/5	3	5	2/3

Table 3 shows the ISO grey scale rating of dry and wet rubbing. The staining on cotton cloth by dry rubbing was found to be negligible while wet rubbing results are average. Alum mordant gave better results compared to myrobolan mordant.

Colour Measurement

The colour measurement of the dye and the dyed samples was done using spectrophotometer and the results are as follows:

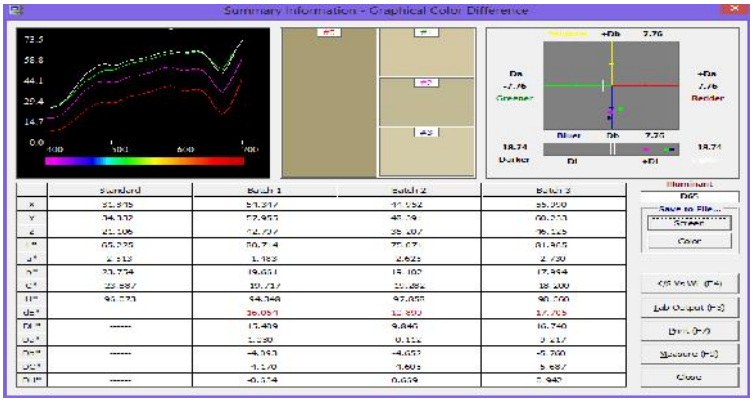


Figure 3 Colour Measurement of the Dye Extract

Figure 4 Colour Measurement of the samples Dyed with Alum Mordant

Figure 5 Colour Measurement of the Samples Dyed with Myrobolan Mordant

Conclusion

The Natural dye was prepared from *Argemone mexicana* leaf using soxhlet extraction method. The 100% cotton fabric was dyed using prepared Natural dye extract with Alum and Myrobolan as mordant. The dyed samples were tested for colour fastness properties. The Myrobolan mordant and Argemone mexicana leaf dye exhibit good colour strength and fastness properties. Natural dyes are better than the synthetic dyes owing to the fact that they are eco-friendly. Thus the above finding indicates that there is a good scope to dye 100% cotton fabrics using natural dye from *Argemone mexicana* leaves.

References

1. Andrew H.Paterson (2009), Genetics of cotton vellme 3 edited Pp.225,226
2. Akiko Fukai and Tamami South (2000). Fashion: The collection of the Kyoto Costume Institute. Taschen, Pp. 154,284
3. Bleaching of textile fibres (Rajash Kalra). Pp.1-24
4. Gulrajani. M.L., Sethil.B., Singhal.C., Giil.M and Hejib. T.,(2004),Applicatio of selected vegetable dyes on cotton, colour age, colour publication (p) lit., Mumbai, vol XLVIII, Pp19
5. Jermy M.Smith (2006), the ordinary to extraordinary world trade. Pp.34
6. Chavan, R.B. 2001. Environment-friendly dyeing processes for cotton. Ind. J. Fibre Textile Res. 4:239-242.
7. Cegarra, J., Puente, P., Valldeperas, J., 1992. The Dyeing of Textile Materials: the Scientific Bases and the Techniques of Application, Textile, Biella, Italy.
8. Sarkar RK, Purushottam DE and Chauhan PD (2003). Bacteria-resist finish on cotton fabrics using natural herbal extracts. Indian Journal of Fibre and Textile Research;28:
9. www.users. Globlnent.com
10. www.ecogreenunit.org/ Argemone mexcina.html.
11. www.journal.cotton.org
12. www.fibre2fashion.com
13. www.textilelearner.co

PROPERTIES OF CYPERUS PANGOREI – A NATURAL FIBER

P. Amutha
Assistant professor, Department of Fashion Technology and Costume Designing, Valluvar College of Science and Management, Karur
Dr.G.Bagyalakshmi
Assistant Professor (SS), Department of Textiles and Clothing, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore

Abstract

Bio fibres are available in abundance in and around the nature and are classified on the basis of source and chemical composition (Arora, 2010). Advantages of the bio fibres over traditional reinforcing materials are low cost, low density, high toughness, acceptable specific strength properties, reduced thermal and respiratory irritation, good thermal and mechanical properties and biodegradability. Natural fibre reinforced composites also possessed better acoustic absorption behaviour than synthetic fibre reinforced composite, especially at high frequencies which might be very beneficial for the aeronautical applications (Yang et al., 2012).The Bio fibres are derived from annually renewable resources. Therefore the use of renewable bio-based plant and agricultural products are the need of the hour. CYPERUS PANGOREI (KORAI GRASS) fiber is extracted from the natural resource of korai grass by using various extraction methods and the properties were studied. The cyperus pangorei (korai grass) showed an excellent tensile strength and elongation of the mechanically decorticated fibre was higher because of the absence of chemicals and microorganisms used. The fibre could withstand the temperature of about 300oC. Morphology of the cyperus pangorei fibre proved that it could be used for developing various technical textile products.

***Key words**: Natural Fiber (bio fiber), Cyperus Pangorei (korai grass) fiber, retting, mechanical decortication.*

Introduction

Fibres from natural resources have been used for thousands of years for producing textiles and related products (Rottan, 2007). Natural fibres are subdivided based on their origins such as plants, animals or minerals. All plant fibres are composed of cellulose while animal fibres consist of proteins (hair, silk, wool). Plant fibres include Bast fibres, leaf or hard fibres, seed, fruit, wood, cereal straw and other grass fibres. Grass is an annual plant with bundles of elementary fibre cells bound by pectin middle lamellae and parenchyma cells separate fibre bundles from each other. Cyperus is one of the largest genera in cyperaceae. It is cosmopolitan in distribution with 650-700 species spread all over the world. Of these 80 species occur in India. More specifically C.articulates, C,corymboses, C.iria, C.malacensis and C.pangorei are the major resources of mat sedges (Ravichandran *et al.,* 2005). ***C.pangorei*** provides raw material for mat making. It spreads all over the world. Korai grass is cut finely while it is still green. The grass is harvested in the months of September/ October and February/ March (http://www.industreecrafts.org). The outer part of the stem is used for weaving while the inside of the stem is removed with sharp edged knife (Misra, 2012).It is distributed all over India, Srilanka, Nepal and Burma. It was known since 2400 BC that the Egyptians used to make paper from the

pith of the C.pangorei (Benazir, 2009). It spreads all over the world and hence an attempt has been made to utilize "Cyperus pangorei with the following objectives:

Objectives

- To extract the natural fibre from cyperus pangorei
- To examine the properties of cyperus pangorei

Scientific Classification

Kingdom : Plantae
Phylum : Tracheophyta
Class : Liliopsida
Family : Cyperaceae (monocot family)
Genus : Cyperus L
Botanical name : *Cyperus pangorei*
Common name : Korai grass
Local name : Korai (Tamil), Jammu (Telungu), Chaape ullu (Kannada) (Benazir *et al., 2010)*

Chemical Composition of Fiber

Composition of Korai	In percent
Holocellulose	82.92
Alpha-cellulose	41.79
Hemi-cellulose	41.13
Lignin	13.28
Waxes	01.73
Moisture	09.20

Experimental Procedure

The fully grown (height up to 3 ½ feet to 4 feet) matured *Cyperus pangorei* was harvested and collected. It was harvested while it was still green.The full length of cyperus pangorei was cut down into the required length of 10 cm and soaked into the open water tanks for 4 weeks. The size of the water tank is 5 feet in length and 4 feet in width and 2 feet in depth. The fibers were bundled and weighted with stones for well soaking .After 4 weeks the bundles of stems were taken out and washed thoroughly with cleaned water. The fibers were separated from the stems and then it was dried under the shade.The stem was collected in early autumn at the latest to avoid difficulties in drying. After harvesting the c. pangorei stems were spread evenly in a grassy field reserved for the purpose. Once a week, the strands were turned to ensure even retting. The retting process was monitored carefully to ensure that the fibers separate from the inner core without much deterioration in quality, (Plate:1).This process was done for 15 days. Then the fibers were separated by hackling the stems. Proper vessel was taken and filled with the required amount of water to soak the stem. Alkali solution was added into the water. The stem tissues were softened by boiling with 1.0% sodium hydroxide for 6-8 hours. It was boiled to speed up the function of retting. After the treatment the fibers were washed with clean water. Then it was combed to remove the fibers. The fibers were dried under the shade. The pre-prepared samples of cleaned and matured cyperus pangorei stems were feed into the mechanical decorticator.

Plate.1 Cyperus Pangorei Stems Before and After Retting

The lower part of the stem is thick in diameter compared to the upper part. Therefore the lower part of the stem is feed into the machine. The extracted fiber was examined subjectively and objectively followed by TGA analysis. The samples were analyzed using a thermal analyzer. All the measurements were made under a nitrogen flow, keeping a constant heating rate of 10°C per minute and using an alumina crucible with a pinhole. The sample was tested up to the temperature of 650°C (Singa and Thakur, 2008). The mechanically decorticated fiber was also examined.

Results and Discussion: The visual evaluation result of the water retted, dew retted, chemical retted and mechanically decorticated samples are presented in the Table I.

Table-I Visual Evaluation

S. No	Samples	General appearance			Texture			Brilliancy of colour		
		E	G	F	S	M	C	H	M	L
1	WRF	85	15	-	75	20	5	70	20	10
2	DRF	-	-	100	-	-	100	-	-	100
3	CRF	80	20	-	80	15	5	85	15	-
4	MDF	90	5	5	85	10	10	80	10	10

E- Excellent, G-Good, F-Fair, S-Soft, M-Medium, C-Coarse, H-High, M-Medium, L-Low. From the above Table III, it is clear that the general appearance was rated to be excellent for the sample MDF by 90% of the respondents followed by the samples WRF and CRF by 85 and 80 % respectively. Regarding texture, MDF sample was observed to be soft as expressed by 85 percent of the respondents followed by CRF and WRF by 80 and 75 percent respectively. Minimum of 85 percent of judges has suggested sample CRF to be brilliant in colour with respect to its whiteness whereas, the minimum brilliancy in colour was observed in sample WRF by 70 percent. From among these criteria's, all the respondents have suggested sample DRF to be fair in appearance, coarse in texture and low in brilliancy of colour. The results of the properties of the water retted, dew retted, chemical retted and mechanically decorticated cyperus pangorei fibers are presented in the Table II.

Table II Fibre Properties

S. No	Testing of Fibre	WRF	CRF	MDF
1.	Tensile Strength	212.08	201.21	217.20
2.	Elongation %	0.719	0.716	1.045
3.	Tenacity	1.3260	1.2590	1.7100
4.	Work to Rupture	59.39	55.81	103.22

WRF- Water Retted Fiber; CRF- Chemical Retted Fiber; MDF- Mechanical Decorticated Fiber

The tensile strength of the mechanically decorticated fibre is higher because of the absence of chemicals and microorganisms used. The mechanically decorticated fibre sample recorded the highest increase in tensile strength by 277.20 MPa.

The elongation of fibre is higher in the mechanically decorticated fibre sample. The mechanical decorticated fibres elongation is higher by 1.0450 followed by the sample WRF and CRF with the values of 0.7190 and 0.7160 respectively. Compared to other natural fibers korai grass fibre sample has the almost similar elongation percentage. The mechanically decorticated fiber sample is increased in tenacity and work to rupture with the mean value of 1.71 and 103.22 respectively. And the water retted fibre and chemical retted fibre also exhibit the nearest value to mechanically decorticated fibre in both tenacity and work to rupture. From the TGA analysis, it is observed that the fibre could withstand the temperature of about 300oC (Figure.1). In the SEM analysis the morphology of the fibre was observed. The report shows that the size of the fibre ranged from 10 to 100 µm under 1000X, 500X, 150X magnification. The size of the fibre ranged from 10 µm to 100 µm under 1000X, 500X, 150X magnification. The fibre was viewed using a Scanning Electron Microscope with 3.0 kv electron beam.(Figure.2)

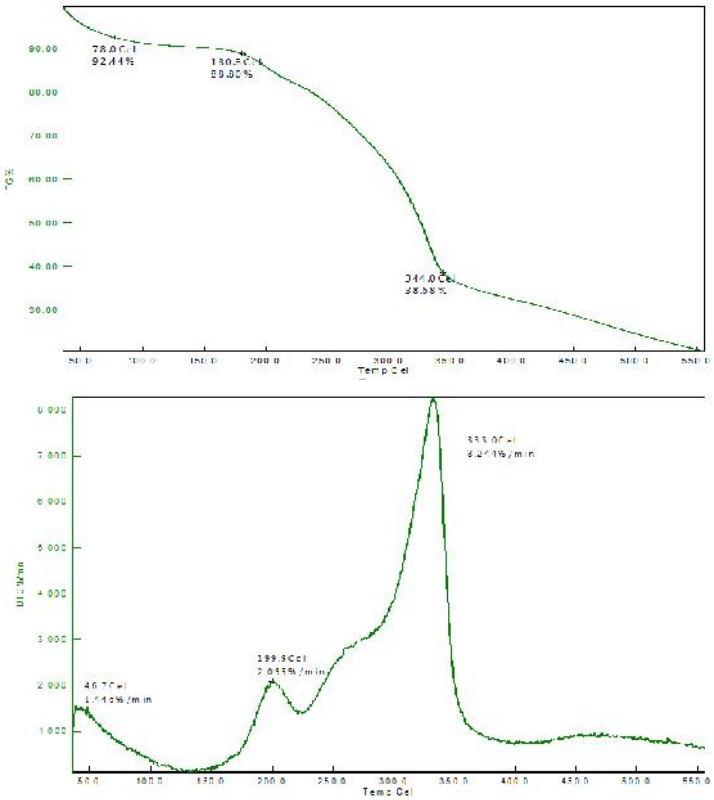


Figure 1 TGA Analysis and DTG Analysis

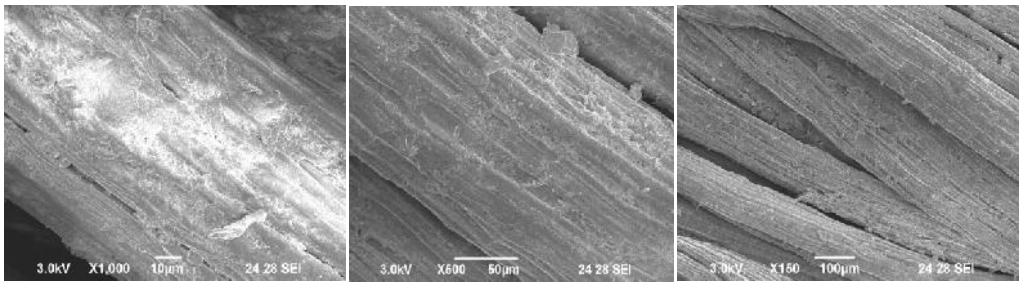


Figure 1 SEM Images

Conclusion

Cyperus pangorei was selected as a bio fiber for the study. The cyperus pangorei (korai grass) showed an excellent tensile strength and elongation of the mechanically decorticated fibre was higher because of the absence of chemicals and microorganisms used. The fibre could withstand the temperature of about 300°C. Morphology of the **cyperus pangorei** fibre proved that it could be used for developing various technical textile products.

References

1. Arora, V. (2010). *Textile Chemistry*. Abhishek Publications. Chandigarh, 1st Edition. 22
2. Benazir, J.F., Manimekalai, V., Ravichandran, P., Suganthi, R. and Dinesh, D.C. (2010). Properties of Fibers / Clum Strands from Mat Sedge (Cyperus Pangorei Rottb). *Bio Resources*. 5 (2), 952.
3. Benazir, J.F., Mathithumilan, B., Ravichandran, P., Vinodhini Jochebed, Suganthi, R. and Manimekalai, V. (2009). Invitro Regeneration of Mat Sedge (Cyperys Pangorei Rottb). *Journal of Plant Biochemistry and Biotechnology*.18 (2), 209.
4. Misra, Malaya K., Anima Panda and Deenabandhu Sahu (2012). Survey of Useful Wetland Plants of South Odisha, *Indian Journal of Traditional Knowledge*. 11 (4), 658-666.
5. Ravichandran, P., Mathithumilan, B., Benazir, J.F. and Manimekalai, V. (2005). Anatomy and Vascular Bundle Diversity in Mat Sedges. *Phytomorphology: An International Journal of Plant Morphology*. 55 (1 & 2), 75-83.
6. Rottan, J.B. (2007). *Modern Textile Management*. Abhishek Publications, 76.
7. Singha, A.S. and Thakur, V.K. (2008). Mechanical Properties of Natural Fibre Reinforced Polymer Composites, *Bull. Mater. Sci*. 31(5), 791-799.
8. Yang, W.D. and Li, Y. (2012). Sound Absorption Performance of Natural Fibres and their composites. *Science China Tech. Science*. 55 (8), 2278-2283.

PHYSICAL BENEFITS AND CULTURAL SIGNIFICANCE OF WOMEN'S APPAREL IN INDIA

K. Anuradha M.A. B.Ed. M. Phil. SET. Ph. D
Assistant Professor, Department of English
Seethalakshmi Ramaswami College, Tiruchirapalli

India is a land of diverse cultures. It is evident in the varied dresses that grace its people. Indian traditional way of dressing is marked by variations, both religious and regional with a wide choice of textures and styles. Sari is draped by the Indian girls of different region in different style. Traditional dress for Rajasthani and Gujarati girls are colorful Ghagra choli. South Indian girls wear half sari with duppatta. Churidar kurta is worn by the north Indian girls is quite popular with the young generation. Western dressing style is gaining its popularity amongst the urban youth. It demonstrates both elegance and simplicity. Many clothes, such as a lady's sari and a man's *dhoti*, are simply long pieces of cloth and do not require tailoring. For women there is an emphasis on modesty rather than gender allurement, and simple elegance rather than fashion. Sari come in a whole range of regional styles, and are made from cotton, silk or nylon. There are different regional ways of wearing a sari. In Britain, all Hindu men wear western clothes, except perhaps on important religious occasions. In India, Men wear Western or Indian clothes and often a mixture of both. Like other aspects of Indian culture, dress has religious as well as aesthetic significance. One's strength or potency is preserved by wearing a cloth, whose ends are pleated, or made into folds, and tucked in. (Hindu Dharma 611). In the past all south Indian women were interested to wear the sari and one of its types is Madisar (Nine-yard). It is not just a garment of style. The physical benefits of draping Madisar were great and it has both symbolic and practical meaning. If it is draped properly it looks modest and gives protection as well. The pant like style enables to move around comfortably to perform the daily duties. Like South India, the tradition of nine-yard was common in Maharashtra and Karnataka. Many Indian women soldiers draped in nine-yard sari and went to war in the past. The trouser style provided comfort and to move freely maintaining modesty

Indian women have a tradition of wearing five to nine yards of seamless woven fabric draped over the shoulder and wrapped around the body in various styles. The length of cloth is commonly known as sari or saree and is called a pudavai in Tamil. The Madisar is long wrapped around the body and legs in a Pant style. This style is worn as part of their culture by the women of the Gurukkal, Iyer, and Iyyengar Brahmin communities of Tamil Nadu. The three Brahmin communities in Tamil Nadu wear the traditional sari in slightly different styles. Gurukkals and Iyer women drape the pallu (the part of that comes over the shoulder) over the right shoulder, whereas the Iyyengar women drape the pallu on the left side. The folds and length of the sari protected women.

"Whenever I have read any part of the Vedas, I have felt that some unearthly and unknown light illuminated me. In the great teaching of the Vedas, there is no touch of sectarianism. It is all ages, climbs and nationalities and is the royal road for the attainment of the great knowledge. When I read it, I feel that I am under the spangled heavens of a summer night" - Thoreau, American Thinker. Critics and avid followers of religious tradition interpret Madisar as the unity of the male and female principles of the universe. Like six yard, nine yard also has pleats and pallu (folds in the upper decorative part of the sari) and the lower part looks like a dhoti. Madisar symbolizes Man and Woman in one form like *Siva and Shakthi or Vishnu and Lakshmi*. Though the procedures involved in it is not easy to wear the garment, the interpreters of the Indian culture say draping itself is a good exercise every morning. While draping one cannot avoid bending, turning around, moving and stretching arms and fingers. Some interprets that the full length of the sari and the folds that are tucked in the front part (abdomen) of the body protects women from the vibration of the powerful mantras they are exposed to regularly.

The Vedas are sounds emanating from the vibrations of this Great Intelligence, the Great Gnosis. That is why we believe that the mantras of the Vedas originate from the Paramatman himself. We must take special care of such sounds too ensure the good of the world. Yes, the Vedic mantras are sequences of sounds that are meant for the good of the world. (Hindu Dharma 83). The exact origin of the word is unknown. Sari is as old as civilization in India. Historians have found records of sari dating back thousands of years. The records show that both Indian men and women made a practice of wearing seamless lengths of cloth draped around their bodies. In former days, it was mandatory that all married Brahmin women always wore the Madisar. Today, the women of Tamil Nadu are likely to wear modern clothing to be stylish as well as for the sake of comfort. However, they are still worn for festivals and weddings. A Brahmin woman wears the Madisar Sari on important occasions such as her marriage, Seemandham (a function for pregnant women), poojas, and other ceremonies. Half sari is draped by the Indian girls of different region in different style. In the past and in the present, Hindu society has produced numerous women who were able Rulers, Warriors, Poetesses, scholars, mathematicians, freedom fighters, musicians, artists and so on. Hindu religion always regarded women in great esteem.

References

1. Shankaracharya, Chandrasekharendra Sarasvathi. "Hindu Dharma – Discourses". Trans.R.G.K. *Voice of the Guru*. Mumbai: Bharatiya Vidya Bhavan, 2008, Print.
2. Yuva Kendra, Chinmaya. *Awakening Indians to India*. Mumbai: Central Chinmaya Mission Trust 2003, Print.
3. http://hinduonline.co/HinduCulture/IndianTraditionalCostume. web
4. http://culturalindia.net/indian-clothing .web
5. http://goforindia.com/traditional-cultural-india.web

QUALITY CHECKER FOR TEXTILE INDUSTRY

Mrs. V. Anuradha
Department of Electronics, Seethalakshmi Ramaswami College, Trichy
V. Aanandhi
II B.Sc. Electronics Department of Electronics,
Seethalakshmi Ramaswami College, Trichy

Abstract

E-textiles, also known as smart garments, smart clothing, electronic textiles, smart textiles, or smart fabrics, are fabrics that enable digital components (including small computers), and electronics to be embedded in them. Smart textiles are fabrics that have been developed with new technologies that provide added value to the wearer. Here comes one of the important electronic system utilized in Textile Industry. Nowadays to check the Color of the fabric and the thickness of the fabric bundle. It is applicable to all textile Industries in Quality Check department. Today, the textile industries are one of the important factors for our country's growth. The part of Electronics- Sensors & circuits are the backbone for this kind of Industries. This system contributes a simple part , but vital part in Textile industry.

Objectives of this Study

- *To identify the mismatch of color and incomplete bundle*
- *To Monitor the details from control Room.*
- *To overcome the color blindness of Employee.*

Keywords: *Colour sensor, Ultrasonic sensor ARDUINO, WIFI, relay, valve, Pneumatic cylinder, lab view and driver circuit.*

Introduction

Objectives of this study

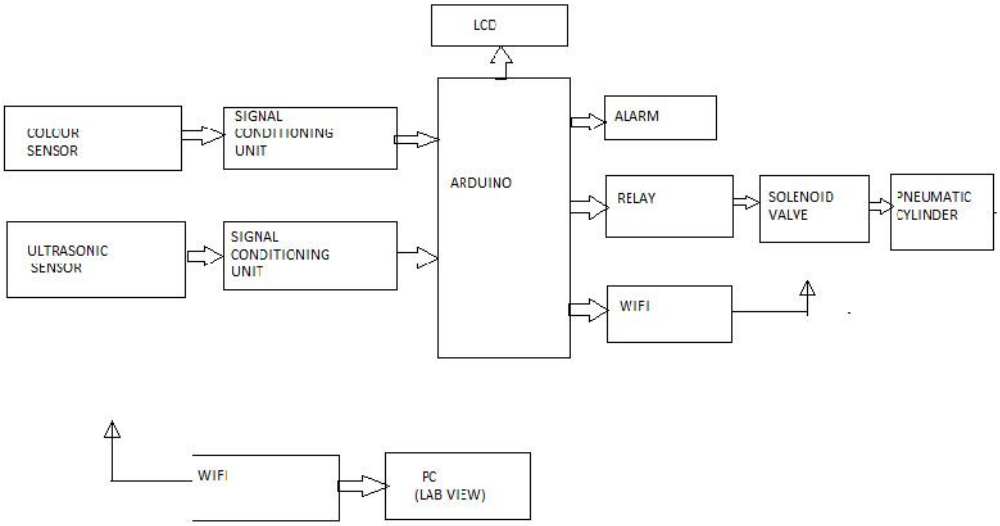
- To identify the mismatch of color and incomplete bundle
- To Monitor the details from control Room.
- To overcome the color blindness of Employee.

E-Textile means Electronic Textile. It is also known as smart textile. Electronic textiles are the textile fabrics with electronics and interconnections woven in their structure that enable the integration of electronic functions and attachments.

They possess the physical flexibility and size not known in conventional electronics. Components and interconnections are intrinsic to the fabric structure with reduced chance to be seen, tangled together or snagged by the surroundings. Thinking for electronics that can be draped over a vehicle or a tank is achievable using textile fabrics. Many smart clothing, wearable technology, and wearable computing projects involve the use of e-textiles. Electronic textiles are distinct from wearable computing because emphasis is placed on the seamless integration of textiles with electronic elements like ***microcontrollers, sensors, and actuators.*** Furthermore, e-textiles need not be wearable. For instance, e-textiles are also found in interior

design. The related field of fibretronics explores how electronic and computational functionality can be integrated into textile fibers. This system explains how the sensor, Microcontroller are utilized and helps to find the mismatch of color and Incomplete fiber bundle rejection in conveyor belt automatically. This has been monitored from the control room through *WIFI* technology.

Block Diagram



Working of the System

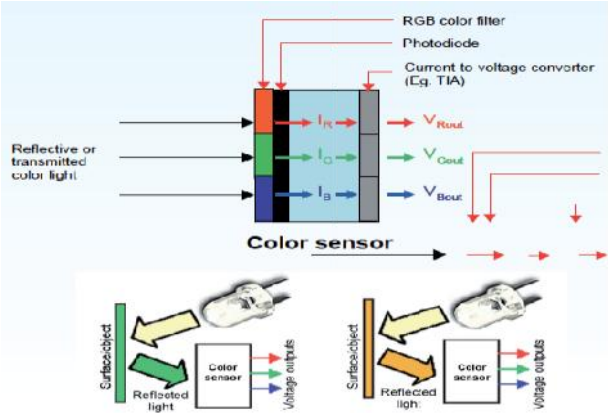
In textile industries the electronics circuits are plays a major role. These circuits are used to produce a reliable output. This circuit if fitted in the Conveyor Belt and control is from Control Room. In this application, two types of sensors are used to sense the fabric bundle. The first one is a color sensor which is used to check the color of the fabric. The second one is a Ultrasonic sensor. The purpose of this sensor is used to sense the fabric bundle role is completed or not.

Generally the ultrasonic sensors are used to sense the thickness of the material. The Supervisor can monitor all these details from the control room through WIFI. WIFI is one of the latest wireless technologies in the world which is used to transfer the data among various places. In this system, the fabric details are transferred from machine to control room. If the Supervisor wants to get only the red color fabric bundle means through WIFI they give a command the Machine receives that command and select that particular color only similarly the thickness can also monitor. If the thickness will be lower than the set value it automatically reject the bundle through Pneumatic Cylinder. The Pneumatic cylinder, Relay, Solenoid valve is controlled by the ARDUINO. Other components helps to make the system successful.

Color Sensor

Colour Sensors have the ability to recognize color by using white LED and integrated. RGB filters to give accurate colour readings. Quite simply, if the sensor were to be held over a blue piece of paper, it would recognize its exact RGB value and process this reading through to the arduino or computer program. Most color sensors contain a white light LED emitter and three separate receivers. The light is reflected off of the target such as a blue piece of paper and returns to the sensor.

The receivers are tuned to look for a specific wavelength of light working out its RGB or Red, Green and blue values. The light sensors are able to record the components of the reflected light and its intensity. The sensor then compares these values to the settings on the computer to determine the necessary action. Many of the color sensors today have the ability to recognize Red, Blue, Green (RGB) or primary colours as well as magenta, yellow and cyan (secondary colours) and black and white.

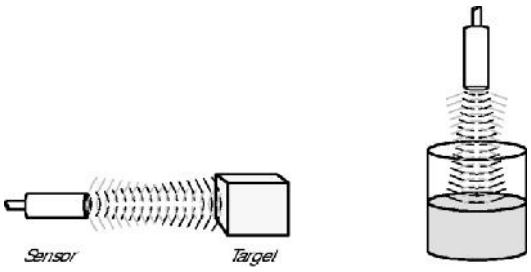


Operation of Colour sensor

For a colour sensor to work it needs to be correctly connected to the arduino to control and recognize all of the RGB as well as magenta, yellow and cyan. From a basic understanding of how the arduino and color sensors interact it requires and input, output and communication system.

Ultrasonic Sensor

Ultrasonic sensors emit a sound pulse that reflects off of objects entering the wave field. The reflected sound, or "echo" is then received by the sensor. Detection of the sound generates an output signal for use by an actuator, controller, or computer. The output signal can be analog or digital.

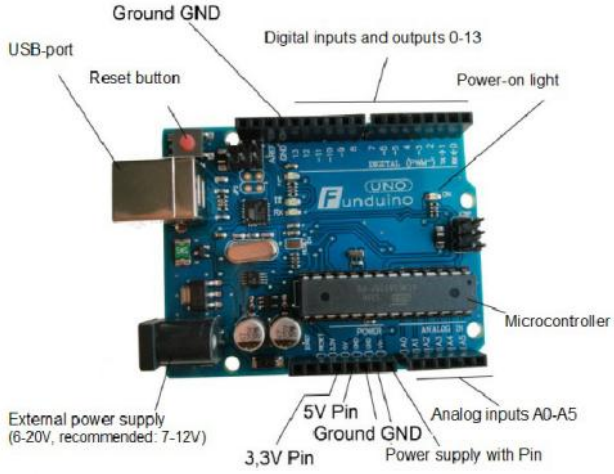


Sound waves echoing off of solid and liquid targets

Ultrasonic sensing technology is based on the principle that sound has a relatively constant velocity. The time for an ultrasonic sensor's beam to strike the target and return is directly proportional to the distance to the object. Consequently, ultrasonic sensors are used frequently for distance measurement applications such as level control. Ultrasonic sensors are capable of detecting most objects — metal or nonmetal, clear or opaque, liquid, solid, or granular — that have sufficient acoustic reflectivity. Another advantage of ultrasonic sensors is that they are less affected by condensing moisture than photoelectric sensors.

Arduino Micro Controller

Arduino is an Open-source-electronic-prototyping-base for simple used hardware and software in the field of micro controlling. It is suitable to realize fascinating projects in a short time. Many of them can be found on You tube under „Arduino“. It is mostly used by artists, designer or tinkers to realize creative ideas. But Arduino is also increasingly used by universities and schools to teach an interesting and simple beginning to the world of micro controlling. The term Arduino is mostly used for both components. The hardware (Arduino Boards) and the corresponding software (Arduino). This Microcontroller receives all the details about the fabric bundle as well as color details and monitor it and sends back the correct message –Alarm to find the error in color and incomplete bundle makes the relay to stop the conveyor belt and reject the bundle.



WIFI

Wi-Fi stands for **Wi**reless **Fi**delity. Wi-Fi It is based on the IEEE 802.11 family of standards and is primarily a local area networking (LAN) technology designed to provide in-building broadband coverage.

Current Wi-Fi systems support a peak physical-layer data rate of 54 Mbps and typically provide indoor coverage over a distance of 100 feet. Wi-Fi has become the *de facto* standard for *last mile* broadband connectivity in homes, offices, and public hotspot locations. Systems can typically provide a coverage range of only about 1,000 feet from the access point. Wi-Fi offers remarkably higher peak data rates than do 3G systems, primarily since it operates over a larger 20 MHz bandwidth, but Wi-Fi systems are not designed to support high-speed mobility.

One significant advantage of Wi-Fi over WiMAX and 3G is its wide availability of terminal devices. A vast majority of laptops shipped today have a built-in Wi-Fi interface. Wi-Fi interfaces are now also being built into a variety of devices, including personal data assistants (PDAs), cordless phones, cellular phones, cameras, and media players. The predominant role of this ***WIFI*** is- the system is successful unless and otherwise it uses this technology.

Lab View

Lab VIEW is a graphical programming language that uses icons instead of lines of text to create applications. In contrast to text-based programming languages, where instructions determine program execution, Lab VIEW uses dataflow programming, where the flow of data determines execution. In Lab VIEW, you build a user interface by using a set of tools and objects. The user interface is known as the front panel. You then add code using graphical representations of functions to control the front panel objects. The block diagram contains this code. In some ways, the block diagram resembles a flowchart. This is a software which is used in microcontroller for activation of Hardware parts.

Relay

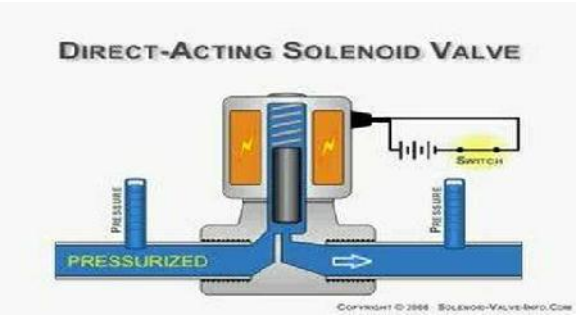
A **relay** is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a separate low-power signal, or where several circuits must be controlled by one signal.

Relay Diagram

The first relays were used in long distance telegraph circuits as amplifiers: they repeated the signal coming in from one circuit and re-transmitted it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations. Relay is a one which breaks and stop the conveyor belt.

Solenoid Valve

Solenoid valves are used in fluid power pneumatic and hydraulic systems, to control cylinders, fluid power motors or larger industrial valves. Automatic irrigation sprinkler systems also use solenoid valves with an automatic controller. Domestic washing machines and dishwashers use solenoid valves to control water entry into the machine. Solenoid valves are used in the paintball industry, solenoid valves are usually referred to simply as "solenoids." They are commonly used to control a larger valve used to control the propellant In addition to this, these valves are now being used in household water purifiers. Solenoid valves can be



used for a wide array of industrial applications, including general on-off control, calibration and test stands, pilot plant control loops, process control systems, and various original equipment manufacturer applications.

Pneumatic Cylinder

Pneumatic cylinders are mechanical devices which use the power of compressed gas to produce a force in a reciprocating linear motion. Like hydraulic cylinders, something forces a piston to move in the desired direction. The piston is a disc or cylinder, and the piston rod transfers the force it develops to the object to be moved. Engineers sometimes prefer to use pneumatics because they are quieter, cleaner, and do not require large amounts of space for fluid storage.

Conclusion

The use of this system in textile industries we can improve the quality of the product. The output of this project is given to the control room through Wi-Fi. Within a place we can monitor the operation of the machine. The sensor and Wi-Fi simplify the work and improve the speed of the process. Arduino is a one of the latest controller faster than other type. These are helps to improve the speed, reliability and accuracy.

References

1. www.ifm.com/colour-sensors
2. www.wenglor.com/Photoelectronic/Sensors
3. www.wenglor.com/Ultrasonic/Sensors
4. sensorwiki.org/doku.php/sensors/ultrasound
5. www.arduino.cc/en/Main/ArduinoBoardUno

A NOVEL ANTIMICROBIAL FINISH FOR SURGICAL MASKS

S. Arathy Sen & G. Bagyalakshmi
Department of Textiles and Clothing, Avinashilingam University for Women, Coimbatore

Abstract

Textile has been used by human since the prehistoric times due to its protective, functional as well as aesthetic requirements. It is not only acting as a protective layer for our body, but also as a good media for the growth of microbes. Medical textiles are the textile materials used in the medical field such as surgical apparels, bandages and orthopedic implants. Thus textiles used in this field are more susceptible to the attack of microbes due to its continuous exposure to the environment where microbes are present. Hence finishing textiles intended for medical use will be more useful in preventing the transfer of infectious microbes. Present paper is the outcome of the study conducted on finishing surgical masks with natural antimicrobial agents. The extract of Neem (Azadirachta indica) and Thulsi (Ocimum sanctum) were used to obtain 40% concentration of the extract and mixed with citric acid in the ratio 90:10 and antimicrobial finishing was done using exhaust method. After finishing samples were evaluated for their physical as well as mechanical properties. In addition the antimicrobial finished samples were subjected to quantitative and qualitative antimicrobial tests against Staphylococcus aureus organism which include shake flask method and parallel streak method respectively. The results obtained in shake flask method showed a reduction in the bacterial colonies after triplication of the sample and the parallel streak method showed a zone of inhibition of 7mm which proves the given efficiency of the given natural antimicrobial finish against microbial action.

***Key words**: Antimicrobial finishing, medical textiles, Surgical masks*

Introduction

Textiles are indispensable part of human life. It is considered to be the "artificial second skin" which is always being in intimate contact with us in our daily life. It protects the human body from the outside environment and thus enhances the protective function of our own skin especially from the areas where body's own protective mechanisms fails to satisfy its function. Textiles by virtue of their characteristics like higher surface area and presence of moisture content, textiles in close contact with human body offers an ideal environment for microbial growth, providing oxygen, water and warmth as well as nutrients needed for their propagation. These are present everywhere in the environment and our skin too acts as a home for a countless number of microbes. Thus textile material s worn next to skin acts as a carrier and media for pathogenic, odour generating bacteria, fungi and moulds Natural fibers like cotton, wool and silk retain water readily and provide nutrient to the micro organisms and hence they are more prone to attack, while synthetic fibers do not do so, explain Teli et al.(2007).Among the cellulosic fibers cotton is suspected to be attacked most easily by microbes because of their porous hydrophilic structure that retains water, oxygen and nutrients providing a perfect environment for bacterial growth. Now a days consumer are becoming increasingly aware about the hygienic life style and are looking solutions for microbial problems utilizing eco-friendly methods. There is an increased necessity and expectation of textile products finished with desirable

properties using natural products. Hence arrived the innovative functional finish called antimicrobial finish which satisfies the customers need to fit to their life style." Back to Nature " is now a coined phrase more frequently and hence the increased use of natural medicines and remedies over the past two decades have prompted one of the most exciting developments in health care in recent times. In order to satisfy the customer needs and also prevent pollution, the natural, eco-friendly finishing agents have been obtained from the medicinal plants having antibacterial, antifungal, non-toxic and non-allergic antimicrobial agents. Though the use of antimicrobial agents have been known for decades, use of eco-friendly finish applications in the field of medical, technical, industrial home furnishings, baby products and apparels has gained momentum and becoming popular now a days.

Medical textiles are generally recognized to be one of the most dynamic and promising areas of future of the textile industry. The textiles materials used in the medical field are more expected to be attacked by microbes due to its exposure to such adverse conditions such as in operating rooms, hospitals and patients of various conditions. The transfer of microorganisms can be reduced because of protective surgical apparel creates a physical barrier between the infection source and the healthy individual. So finishing medical textile products using antimicrobial agents will minimize the extent of infection. Based on the above facts and attempt has been made to finish the medical textile using natural antimicrobial agents with the following objectives

1. To extract natural antimicrobial agents from selected herbs.
2. To finish selected fabric with antimicrobial finish.
3. To evaluate the efficiency of antimicrobial finish given on selected fabric.
4. To convert the antimicrobial finished fabric into surgical masks.
5. To evaluate the effectiveness of the surgical masks.

Experimental Procedure

A fabric should perform mainly two important properties as, it should be able to evaporate the perspiration from the skin surface and to transfer the moisture to the atmosphere and make the wearer feel comfortable, says Ram (2007). Among the various textile fabrics, cotton is widely used in the medical applications due to its properties like high wet strength, biodegradability, non-toxicity and softness. Thus 100% plain weave cotton fabric was selected for the study. Desizing was carried out to remove the starch present in the fabric.

Antimicrobial Sources

The use of synthetic chemicals for the antimicrobial finishing process will possess hazardous effect during the disposal and create pollution problems. Herbs like Neem and Thulsi possess all these properties; they are also cheap, non irritant and non toxic. Therefore herbal plants like neem and thulsi were selected for the study as they inherit antimicrobial properties

Extraction of Source

For the extraction of antimicrobial agents from these sources, the leaves of Neem and Thulsi were collected, shade dried and ground into fine powder which is then

soaked in absolute ethanol in the ratio 1:5 and left closed for 3 days then it is allowed to evaporate and the extract is filtered off. According to Sreenivasa et a l(2007) alcoholic extraction using ethanol is more effective to extract the active ingredients of the antimicrobial so sources. The fixing agent used was citric acid

Optimization of Finishing Process

The optimization process was carried out to standardize where the material ti liquor ratio was taken as 1:20, the extracted sources were mixed in the ratio 20:20 where Neem, 20% and Thulsi 20% to obtain 40% concentration of the extract and citric acid was taken as 25% (25gm/100ml of water) and it was mixed with the extract in the ratio 90:10. The P^H value was maintained to neutral. Time and temperature opted were $1^{1/2}$ hours at 80^0 C for the water bath. Curing was carried out at 120^0 C for 2 minutes. After optimization, the antimicrobial finishing process was done using exhaust method.

Evaluation

The nomenclature of the samples given were O- original, DC- desized and FC-finished sample. The Samples were subjected to both subjective and objective evaluation. Physical tests used for the selected fabric were fabric Count, Thickness, Weight, Crease recovery, Strength and elongation, Drape, Stiffness, Tearing strength, Abrasion resistance, Colour fastness, Wettability and Absorbency, Air permeability, Antibacterial tests.

Antibacterial Tests

As suggested by Karolina and Mendapara (2007) The Shake Flask test method developed by AATCC, Test method 100-2004 was followed for quantitative evaluation. This provide the exact number of viable bacteria and the extend of bacterial reduction. In short the numbers of living organism were counted after stirring the microorganism suspension in an Erlenmeyer flask. The test solution was then allowed to shake over rotary shaker at 25^0 C for $4^{1/2}$ hours after the addition of 1gmof antimicrobial finished sample. The decrease in the number of living organism present in the medium containing sample has been noted after incubation and reduction percentage is calculated using equation

Reduction % = [(A-B)/A] x 100

Evaluation of Surgical Masks

The constructed surgical masks are then tested to evaluate its efficiency. According to Guruprasad (2008), parallel streak method (AATCC 147) can be used.

The parallel streak method (AATCC-140 147-2004) is a quick and easy method to determine the antibacterial activity. 15ml of prepared sterilized agar medium was taken in a petri dish and allowed to gel. Using a 1mm inoculating loop wire 1 loopful of diluted inoculums of test organism was transferred to the sterile agar plate by making long parallel streaks 1cm apart. A rectangular shaped 25x50mm test specimen was gently pressed transversely across the streaks to ensure the intimate contact with agar surface and incubated for18-24 hrs at 37^0 C. a clear area of interrupted growth underneath and along the sides of the test specimen indicates antibacterial activity.

Results and Discussion : Subjective Evaluation

The general appearance of the original, desized and antimicrobial finished samples were rated as good. Original sample was rough when compared to desized and antimicrobial finished samples. It was also rated as high lustrous fabric.

Objective Evaluation

The statistical analysis revealed that there is no significant difference in the fabric count of the original, desized and finished sample in the warp direction and a slight increase in the count was occurred in finished sample in the weft direction. Thickness was increased after finishing the sample. Weight of the fabric was reduced after finishing and desizing, crease recovery of the desized and finished samples increased in warp and weft directions. Tensile strength of the finished sample along the warp direction increased and decreased in weft direction. Regarding the elongation, the samples exhibited an increased elongation in the warp and weft direction. The drapability of the fabric increased after desizing and finishing. Stiffness and tearing strength of the samples increased after finishing along both warp and weft direction. The abrasion resistance of the samples also increased after antimicrobial finishing.

Figure I, Mean Air Permeability in cc/sec

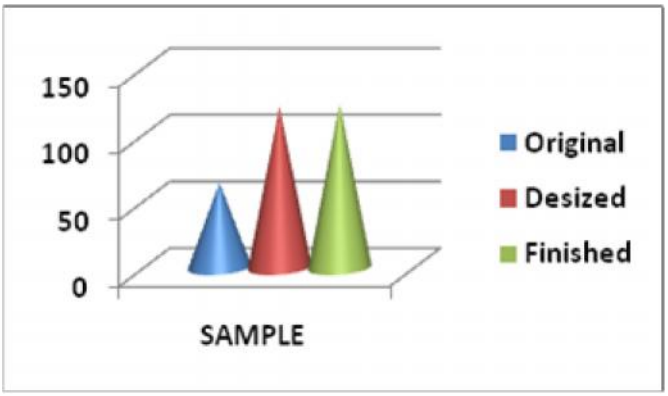


Figure I show the increased air permeability of the samples after desizing and finishing. Hence the antimicrobial finished samples can be used for medical purposes as it could breathe well.

Antimicrobial Test

The samples were subjected to qualitative and quantitative tests including shake flask method and parallel streak method which determines the efficiency of the antimicrobial finished fabric against bacteria by the presence of viable bacterial colonies.

Table I Shake Flask Test

Sl. No	Sample	Reduction in bacterial colonies/ml
1	Initial	1×5^{10}
2	FC	25×10^4
3	FC(i)	18×10^4
4	FC(ii)	12×10^4

The shake flask method is the quantitative test method used to determine antimicrobial activity. The test was carried out by serial dilution procedure in triplicates. The constructed surgical mask was artificially inoculated using the test organism *Staphylococcus aureus*. The initial inoculum used was 1×5^{10}. The antimicrobial treated swatches of size 3.5cm was used for carrying out the study and it is understood that during the first dilution, the bacterial population yielded was 25×10^4 colonies/ml and the second dilution showed a reduction of 18×10^4 colonies/ml. in the triplication a reduction of 12×10^4 colonies/ml were observed. The reduction in bacterial colonies shows the effectiveness of the antimicrobially treated sample against the activity of *Staphylococcus aureus*. Hence the surgical mask finished using neem and thulsi exhibits good antimicrobial activity.

This method is used to detect the antimicrobial activity quantitatively. This method consists of the visual observation of bacterial growth on the surface of the fabric after exposure to the microorganism. The antimicrobial treated sample was

exposed to the organism *Staphylococcus aureus* and it exhibited a zone of inhibition of 7mm. hence the treated sample shows activity against microbial action.

Conclusion

It may be concluded that the antimicrobial finishing given on the cotton fabric was effective against microbial attacks as per qualitative and quantitative tests. The antimicrobial finishing has made considerable amounts of increase in the physical properties of the fabric. The antimicrobial finished fabric which is converted to surgical mask is tested quantitatively for its effectiveness against microbial resistance and it seemed to be more effective against the air borne micros. Hence the surgical mask finished the using natural antimicrobial agents is very effective. Therefore this would be used by healthcare professionals, medical practitioners, patients and even the care givers to get protection from the infectious micros present in the adverse environment. It is recommended that future studies can be done in evaluating the bacterial filtration efficiency of the antimicrobial finish the surgical mask through wear study.

References

1. Guruprasad, (2008). "Surgical Gown and Drapes Products View and Performance Testing", Man Made Textiles, Vol.LI, No.10, October, P336-337
2. Karolina, A and Mendapara, (2007), imparting Antimicrobial and Fragrance Finish On Cotton using chitosan with silicone softener, Indian Journal Of Fibre and Textile Research, Mar, Vol.32, P.99
3. Teli, M.D, Prabhu, K.H And Sita, P (2007), Functional Dyes For Antimicrobial Property On Polyamide Fabrics, Proceedings Of National Conference On Advance In Chemicals For Textile Polymers-Application And Quality Assurance,P.65
4. Srinivasa, Krupanidhi, Rao, Shanmughappa, (2007), Diuretic Activity Of Ethanolic Extract Of Justicia Beddomei Leaves, Biomed, Jan, Vol.1, No 4, P.368
5. Ram, R.N (2007), Moisture Management on Cotton and Its Blends, Colourage, Vol.LIV, P.83

EFFICACY OF TRADITIONAL MEDICINAL PLANTS INFUNCTIONAL FINISHING OF TEXTILES

S.Archanaa Preetha
Ph.D Scholar, Department of Textiles and Clothing
Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore
Dr.G.Bagyalakshmi
Assistant Professor (Senior Scale) Department of Textiles and Clothing
Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore

Abstract

Textile materials are utilized for various applications and caught the attention of researchers in recent years. The studies are being carried out to explore the purpose of textile materials treated with functional finishes. Antimicrobial finishing on textiles with traditional plants is also gaining popularity now a days . In this research an attempt has been made to study the presence of phytochemical and MIC value of the Cassia Auriculata. The plant has been collected from the local area of the Theni district. Traditionally the plant has been used for treating cuts, wounds and bruises. The plant material was shadow dried at room temperature (20°c-25°c). Later the dried substance was powdered and subjected to Soxhlet extraction for 12 hours using various solvent such as hexane, ethyl acetate and methanol. Active solvent extraction method was screened for the presence of phytochemical components and the MIC value of the extract was also identified for various microbes such as Aeromonashydrophilla, Staphyococcussaprophyticus, pseudomonas aeruginosa, candia and Escheria coli. The antimicrobial activity against the selected microbes had been identified. Different application methods were tried to finish the textile material with the prepared extract. Antimicrobial efficacy of the traditional plant extract finished material was assessed. In addition the finished textile material was tested to study the physical, mechanical, comfort and functional properties.

Key words: *Cassia Auriculata, Soxhlet apparatus, antimicrobial, textile finishing*

Introduction

Medical textiles or Medtech is one of the most important, continuously expanding and growing field in technical textiles. Medical textiles represent structures designed and accomplished for a medical application. (Shilpi Akter et al.,2014) and functional properties can be defined as all the effects that are beyond the aesthetic and decorative functions. They includes a large range of properties that in some cases can also be classified as “smart properties” which means that they grant to the textiles the capacity of acting according to an external stimulation(Sumithra M et al 2014). The rapid growth in technical textiles and their end-use has generated many opportunities for the application of innovative finishes, novel finishes of high added value for apparelfabrics are also greatly appreciated by a more discerning and demanding consumer market. Antimicrobial textiles with improved functionality find a variety of applications such health and hygiene products, specially the garments worn close to the skin and several medical applications such as infection control and barrier material(R. Geethadevi et al, 2013). The consumers are now increasingly aware of the hygienic life style and there is a

necessity and expectation for a wide range of textile products finished with eco-friendly anti-microbial properties. Eco-textiles gain utmost importance as one of the most useful resources that help promote new innovations, in an eco-friendly manner (Sumithra M et al 2012). There are recent study and research have been carried out on functional finishing and antimicrobial finishing on the fabric is one of the functional finish carried out in this study to identify their efficiency of traditional medicinal plant *Cassia Auriculata* commonly used in treating rashes, skin infection, inflammation and for treating small cuts and burns

Materials and Methods

Selection of Herbs

Herbs are natural remedies for the disease with higher safety profile and efficiency. India is gifted with varieties of large number of medicinal herbs because of variety of climatic conditions and seasons favorable for growth of many species of plants. Amongst the large number of herbal drugs existing in India, a very few have been symmetrically studied so far (G.M. Nazeruddin et al., 2011). Among all the antimicrobial agents, the plants products comprise the major segment. Healing power of some of the plant materials has been used since ancient times. It is estimated that there are 250,000-500,000 species of plants on Earth (Borris R.P., 1996). A relatively small percentage (1-10%) of these is used as food by both humans and other animal's species. Possibly, even more than this has medicinal properties (Moerman D.E., 1996). Hippocrates (in the late fifth century B.C.) reported 300-400 medicinal plants (Schultes R.E., 1978). Most of them are secondary metabolites, of which at least 12,000 have been isolated(less than 10% of the total). In many cases, these substances serve as plants defense mechanisms against predation by microorganisms, insects, and herbivores (M. Joshi et al., 2008).

The anti-microbial activity of plants and plant derived products revealed that may significant contributions have been made on the bioactivities of medicinal plants. Herbal spices are important sources of anti-bacterial properties. Therefore based on the literature survey the following herb is selected. The selected herbs botanical name is mentioned as follows. Live and healthy herbal leaf parts of *Cassia auriculata* was collected from different regions in and around Theni district which were authenticated by the Botanical survey of India. Leaves of these plants were used for study. The plant parts were washed twice in freshwater to remove epiphytes and other extraneous matter from the plants. The above selected herb was used for the selected finishes such as antibacterial. *Cassia auriculata* Linn is an important medicinal plant belonging to the family Caesalpinaceae, commonly known as senna or cassia senna for its anthraquinone, glycosides and laxative action. The pods contain 5-7 seeds that are dark brown in colour. The leaves and pods contain sennosides used for their laxatives properties. The plant contain sennosides A ,B, C & also D, Beta sterol (0.33%) flavanols, koemferol, koempferin and isorhamnetin. Senna mainly used for habitual constipation, it increases the peristaltic movement of the colon which results in soft and bulky faces.

Extraction Process of Herbs

The leaves of the selected herbs were shadow dried and powdered by using dry grinding machine. The herbal powders were stored in a dry container for further studies. The above herbs were selected after thorough study from the related books. The extraction process was done in three stages, such as drying, grinding and extraction.

Drying of Herbs

The collected plants were dried at the room temperature for two weeks in the open air .Drying is a mandatory procedure without which the leaves cannot be stored. This is to avoid breakdown of important compounds and also contamination by microorganisms. The dried herbs were kept in a dark room so that the breakdown of important components by sunlight will be prevented.

Grinding Process

Dry Grinding of the selected herbal portion was done in grinder mixers. Once ground, the powder was sieved using a sieve to remove the dirt particles. The fine powder obtained was used for extraction.

Extraction

Properties of a good solvent in plant extractions includes, low toxicity, ease of evaporation at low heat, promotion of rapid physiologic absorption of the extract, preservative action, inability to cause the extract to complex or dissociate. Three solvent types such as Hexane, Ethyl acetate and methanol were followed for the herb. The extracts of the leaf samples were prepared in a sequential procedure by soaking 100 g of dried powder in 300 ml of different solvents (Hexane, Ethyl acetate and Methanol) for 48 h. Procedure was repeated. At the end of each respective extraction, the extracts were filtered using Whatma1 filter paper. The filtrate was concentrated under reduced pressure in vacuum at 40°C for 25 min using a rotary evaporator (Super fit-ROTAVAP, India). The percentage yield of extracts was calculated.

Phytochemical Screening

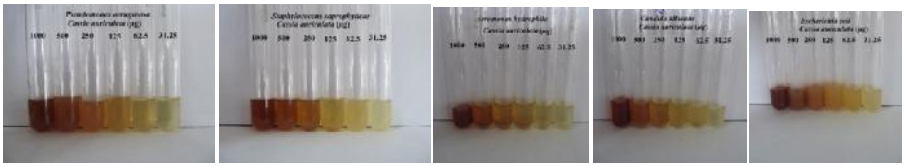
The phytochemical screening of leaf extracts were assessed by standard methods (Trease and Evans, 1987; Harborne, 1998). Phytochemical screening was carried out on the leaf extracts using different solvents [Hexane, Ethyl acetate and Methanol] to identify the major natural chemical groups such as carbohydrates, tannins, saponins, flavonoids, alkaloids, quinones, glycosides, phenols, terpenoids, cardiac glycosides, coumarins, steroids, phytosteroids, Phlobatannins and Anthraquinones.

Screening of the Solvent

The solvents had been screened for the further testing processes. Methanol shows better phytochemical screening result than the other two solvent. Hence, it had taken for antimicrobial testing processes. Minimum inhibitory concentration of the solvent had been identified for the preparation of the antimicrobial testing processes.

Determination of Minimum Inhibitory Concentration (Mic)

Minimum inhibitory concentration of the herbal extract was tested by the two-fold serial dilution method. The test extract was dissolved in 5% dimethyl sulfoxide (DMSO) to obtain 2000 µg/ml stock solutions. The samples were diluted to give the final concentrations of 1000, 500, 250, 125, 62.5, 31.25 µg/ml. About 100 µl of 10^5 CFU/ml of the test culture was inoculated in tubes with equal volume of nutrient broth and herbal extract samples. The control tube contained only organisms and not the plant extract. The tubes were incubated aerobically at 37°C for 24h. The lowest concentration that produced no visible turbidity after a total incubation period was regarded as final MIC.



MIC testing of the herbal extract-pic 1

Table 1: MIC values of herbal extract

S.No	Methanolic extraction	MIC values (µg /ml) of herbal extract				
		1	2	3	4	5
1	Cassia auriculata	62.5	125	250	250	62.5

1. Candida albicans 2. Pseudomonas aeruginosa 3. Escherichia coli 4. Staphylococcus saprophyticus 5. Aeromonas hydrophila

The MIC value for the methanol extract had been identified for five microbes and the result had been discussed in the table.

Preliminary Analysis Antibacterial Activity

Antibacterial Activity for the Extracts

Anti-microbial agents are undeniably one of the most important therapeutic discoveries of the 20th century. However, with the antibiotic era barely five decades old, mankind is now faced with the global problem of emerging resistance in virtually all pathogens (Peterson et al., 2004). The medicinal plants continue to play an important role for the management of different microbial diseases. In recent years there has been a resurgence of scientific interest in the use of medicinal plants for the development of new pharmacotherapeutic agents against different species of microorganisms including the resistance organisms (Hatano et al., 1999; Palombo et al., 2002). Antibacterial activity was carried out using well diffusion method. The individual extracts were screened for antibacterial activity against the following bacteria

1. Aeromonas hydrophila (MTCC 1739)
2. Staphylococcus saprophyticus (MTCC 6155)
3. E.coli (ATCC 25922)
4. Pseudomonas aeruginosa (ATCC27853).
5. Candida albicans

The following microorganisms were collected from Microbial type culture collection (MTCC) and *American Type Culture Collection* (ATCC).To identify antibacterial activity of herbal extract well diffusion method had been adopted.The

antibacterial activity of the plant extracts was evaluated by Agar well diffusion method. Sterile nutrient agar plates were prepared. The plates were allowed to solidify for 5 minutes and wells of 6 mm were punctured using a well borer. 0.1% inoculum suspension of test bacterium (*Staphylococcus saprophyticus, Escherichia coli, Aeromonas hydrophila, Candida albicans and Pseudomonas aeruginosa*) were swabbed uniformly over the surface of the agar. 100 µl of each herbal extract was loaded into the well and the plates were kept for incubation at 37ºC for 24 hours. The antibacterial activity was evaluated in terms of zone of inhibition, measured and recorded in millimeters.

Antibacterial activity of herbal extract by well diffusion method-pic 2

Table: 2-Antibacterial Activity of Herbal Extract by Well Diffusion Method

S.No	Sample	Zone of inhibition (mm)				
		1	2	3	4	5
1	Negative control	-	-	-	-	-
2	Positive control	22	25	30	28	31
3	Cassia auriculata (250µg/ml)	19	20	22	25	26

1. *Candida albicans* 2. *Pseudomonas aeruginosa* 3. *Escherichia coli* 4. *Staphylococcus saprophyticus* 5. *Aeromonas hydrophila*

Application of Herbal Extract on the Fabric

Antibacterial fibers and various antibacterial chemicals available in international market are mostly from synthetic base and is not environment friendly. Consumer preference has changed and higher demands are placed on the functional fabrics. This new requirement necessitates a production process that is an environment friendly. There are many natural plant products, show antibacterial properties extracts from roots, stem, leaves, flowers, fruits and seeds of diverse species of plants exhibit antibacterial properties. These antibacterial extracts can be used as textile agents in the crude form (G.Thilagavathi et al., 2007). The count 30's*10's yarn have been selected for the study. The fabric produced using the yarn will be of course and can be used in producing Self-adhesive band aids and First aid band aids. The fabric had under gone pretreatment such as Desizing, Scouring, and Bleaching for the further preparation of testing processes. Dip and Drying method had been adopted for the herbal application on the fabric

DIP Method

The method of dipping was done by immersing the fabric material (Cotton) in the treatment bath containing the herbal extracts for 20 minutes at room temperature and then pulled up from the bath followed by squeezing and the finished fabric was air-dried.Later the fabric had been under go antimicrobial assessment.

Antimicrobial Assessment of Finished Fabric: Antibacterial Activity By Aatcc 147

The AATCC plates were prepared by pouring 15ml of AATCC media into sterile Petri plates. The plates were allowed to solidify for 5min and the bacterial

culture was inoculated as single line followed by the four lines without refilling the inoculation loop. The fabric was cut into 5 X 2.5 size and immersed in treatment bath containing herbal and antimicrobial agents nanoparticles with the M:L ratio of 1:1:1 for 15 minutes and air dried in at room temperature. The finished fabric with the diameter of 2.5 cm was placed on over the inoculated bacterial species. And the plates were kept for incubation at 37ºC for 24 hours. At the end of incubation, zone of incubation formed around the fabric was measured in millimeter and recorded.

Antimicrobial assessment of finished fabric-pic 3

Table: 3- Antimicrobial Assessment of Finished Fabric

S.No	Type of Fabrics Used	Diameter of zone of inhibition (mm)				
		S. saprophyticus	P. aeruginosa	C. albicans	E. coli	A. hydrophila
1	Control	13	16	11	19	10
2	Normal finish	21	25	20	23	20

Result

The fabric treated with methanol extracted cassia angustifolia shows better effect against the microorganisms such as *S. saprophyticus, P. aeruginosa, C. albicans, E. coli, A. hydrophilla* which are commonly known for causing minor skin ailments in human-being

Reference

1. Shilpi Akter, Abu Yousuf Mohammad Anwarul Azim, Md. Abdullah al faruque; Medical Textiles: Significance and Future Prospect in Bangladesh; European Scientific Journal April 2014 edition vol.10, no.12 Issn: 1857 – 7881 (print) e - Issn 1857- 7431
2. Sumithra M, Vasugi Raaja N, Antimicrobial finish of denim fabric with herbal extracts, American journal of medical and biological research, 2014, vol-2, No-1, pp:26-30
3. Sumithra M, Vasugi Raaja N, Antimicrobial efficacy analysis of ricinus communis, senna auriculata and euphorbia hirta extract treated on the four various denim fabric against Escherichia coli and staphylococusaureus aureus, J Textile sci engg 2:1-4
4. R.Geethadevi, and V.Mageshwari, Imparting antimicrobial finish on selected regenerated cellulosic fabrics with herbal oil, textile science and engineering, 2013, vol-4, issue-1,4:1
5. Trease GE, Evans WC. A text book of pharmacognosy. Tindal, Oxford: ELSB/ Bailliere; 1987
6. Harbone, 1998: JB Harbone, phytochemical methods, Chapman hall, London 1998, pp-60-66
7. Peterson, R L., H.B. Massicotte and L.H. Melville,2004, Mycorrhizas: Anatomy and cell biology.NCR Research press, Ottawa, Canada.
8. Hatano T, Uebayashi H, Ito H, Shiota S, Tsuchiya T, Yoshuda T (1999) phenolic constitutions of cassia seeds and antibacterial effect of some naphthalenes and anthraquinones on methicillin-resistant staphylococcus aureus. Chem. Pharm bull 47(8): 1121-1127

APPLICATION OF ECO-FRIENDLY NATURAL DYE ON BAMBOO/COTTON FABRIC USING NATURAL MORDANT

J. Banupriya
M.Phil., (Ph.D Scholar), (Costume Design and Fashion, PSG College of Arts and Science/ Affiliation to Bharathiar University
Dr.V.Maheshwari
M.Phil., Ph.D (Guide and Associate Professor, Costume Design and Fashion, PSG College of Arts and Science/ Affiliation to Bharathiar University, Tamilnadu, India

Abstract

The natural dye are often neither safe nor more ecologically sound than synthetic dyes. Herbal textiles are dyed entirely with herbal extractions, without using any sort of chemicals. The herbs used are different from vegetable dyes as they are not only natural but also have medicinal value. These herbs are applied directly to the fabric with the help of natural ingredients, so that the medicinal value of the herbs can be kept intact. In the current study, simultaneous natural dyeing of Bamboo/cotton woven fabric was carried out using papaya leaf extract. This works reveals that most natural dyes are not particularly toxic in themselves. The dyed bamboo/cotton fabric was evaluated for color values, fastness properties as well as durability of the sample. The result clearly indicated the advantage of using such mordant in case of obtaining eco-friendliness.

Key words: *Eco-friendly dye, bamboo/cotton sample, papaya leaf extract, washes durability.*

Introduction

Bamboo has much to offer in its raw form. Its geographical range is wide spread and its uses are numerous. As a grass, it has a diverse network of growth patterns and can flourish in harsh climates. Nevertheless, many animal and plant species depend on bamboo. Bamboo textile products are having high demands in the market because of their anti bacterial nature, biodegradable properties, high moisture absorption capacity, softness and UV protective capability. Cotton is the most important apparel fiber. Its combination of properties like pleasing appearance, comfort, easy care and durability makes cotton ideal for warm weather clothing, active wear, work clothes, upholstery, draperies, area rugs, towels and bedding. Cotton is good for use in hot and humid weather. The fiber absorbs moisture and feels good against the skin in high humidity. Moisture passes freely through the fabric, thus aiding evaporation and cooling

Recently, there has been upsurge interest in apparel technology all over the world for much demanding functionality of the products like wrinkle resistance, water repelling, fade resistance and resistance to microbial invasion. Among these, development of antimicrobial textile finish is highly indispensable and relevant since garments are in direct contact with human body and cotton fabric provide ideal environment for microbial growth**.** Natural dyestuffs produce rare color ideas and are automatically harmonizing. Unlike non renewable basic raw materials for synthetic dyes, the natural dyes are usually renewable, being agro-renewable or vegetable

based and at the same time biodegradable. This is mainly because natural colorants are advantageous against synthetic dyes. The shades produced by natural dyes or colorants are usually soft, lustrous and soothing to the human eye. Natural dyestuff can produce a wide range of color. Herbal textile is dyed entirely with herbal extractions, without using any sort of chemicals. The herbs used are different from vegetable dyes as they are not natural but also have medicinal values. These herbs are applied directly to the fabric with the help of natural ingredients, so that the medicinal value of the herbs can be kept intact.

Materials and Methods

Selection of Fabric

Bamboo/cotton yarn with 30's count was taken for the study. Then the yarn is weaved in bit loom with plain weave structure. Then the fabric is pre treated using scouring, bleaching process.

Selection of Dye Source

Natural dyes are colorants extracted from vegetable matter, minerals or insects. These dyes are considered as eco-friendly dyes or mordant dyes as they require the inclusion of one or more metallic salts. Papaya leaf was selected for present study as natural dye source. It is non-carcinogenic in nature and so does not affect human body and environment. Hence, it was selected for the study.

Extraction of Dye from Papaya Leaf

Five grams of fresh papaya leaves were taken in a mortar and pestle and ground to paste. 100 ml of water was added to the paste and allowed to boil for one hour at 90℃. The resulting liquid was filtered and used as dye solution. The optical density of the dye solution was measured using a spectrophotometer at 365 nm.

Selection of Mordants

A mordant is a substance used to set dyes on fabric or tissue sections by forming a co-coordinating complex with the dye which then attaches to the fabric or tissue. Natural mordants such as Orange peel, pomegranate rind, Myrobolan and alum was selected. Pilot study was carried out to select the suitable mordant. Among the natural mordants, alum gave better color when compared with other mordants. Hence alum was selected for this study.

Selection of Mordanting Techniques

Mordanting is a process of impregnating textiles with a mordant usually salt or acid to faster the dye stuff, which is applied before or after the dye stuff. The three ways of mordanting are pre-mordanting, post-mordanting and simultaneous mordanting. In the pre-mordanting technique the sample is mordanted and then dyed. In post-mordanting technique the sample is first dyed and then mordanted. In Simultaneous mordanting, mordanting and dyeing are carried out at the same time.

Dyeing Parameters

Dyeing parameters namely dye concentration; dyeing time, mordant concentration and mordanting time were optimized. To determine the optimum dye concentration, different percentage of dye extract such as 20, 40, 60 80 and 100 % was used for dyeing. The optimum dye concentration was selected based on the shade produced on the fabric. To evaluate the optimum dyeing time, dyeing was carried out

at different time (30,45,60,75 min). Dyeing temperature was determined by dyeing the selected fabric at different temperature (60,90,).

Dyeing by Padding Mangle Method

200 ml of dye source was taken and poured into the steel plate which holds the solution. Rough cloth was stitched to one end of the fabric. The stitched cloth is placed on two rollers and machine was switched on. The fabric starts to pass through the roller and the fabric was dipped in the dye solution. The excess amount of dye was squeezed out. The same procedure was carried out 3-5 times to get even color. After dyeing the fabric was allowed to dry for 30 minutes. After drying, the fabric was weighed and evaluated.

Results and Discussion

Dye Source Concentration

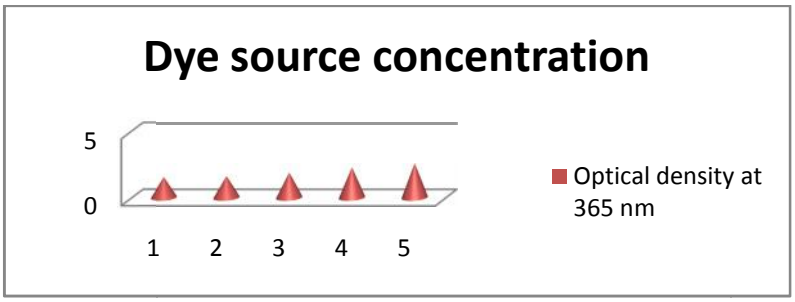
The effect of various concentration of papaya leaf was studied and the results are presented in Table 1.

Table 1 Dye Source Concentration

Concentration of papaya leaf (%)	Optical density at 365 nm
1	1.535
2	1.604
3	1.870
4	2.26
5	**2.56**

Figure-1 clearly indicates that the absorbance of the dye extract increased with increase in the concentration of papaya leaf. Maximum color intensity was noticed at 5% concentration. Hence papaya leaf at 5% concentration was used for dye extraction.

Figure-1



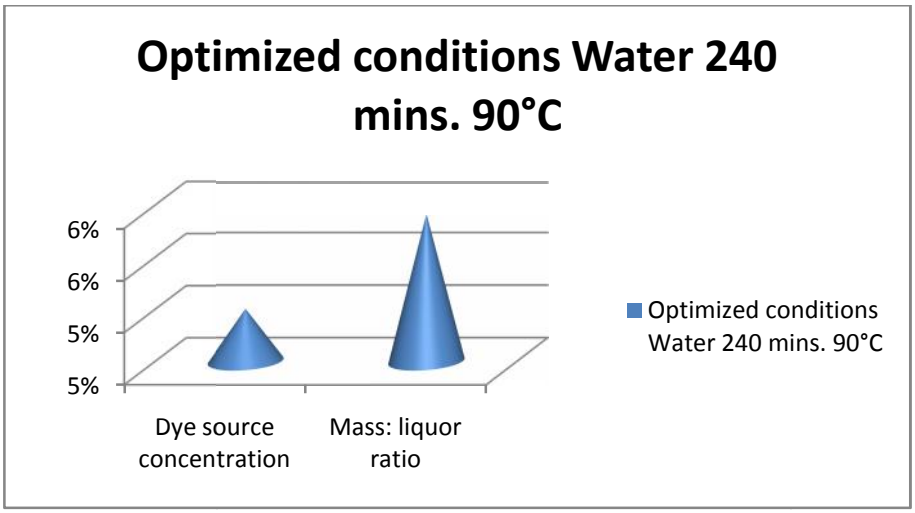
Optimized Conditions for Extraction of Dye From Papaya Leaf

Optimized conditions for the extraction of dye from papaya leaf are presented in Table 2.

Table 2 Optimized Conditions for the Extraction of Dye from Papaya Leaf

Parameters	Optimized conditions
Solvent	Water
Time	240 mins.
Temperature	90°C
Dye source concentration	5 %
Mass: liquor ratio	1:25

Figure-2



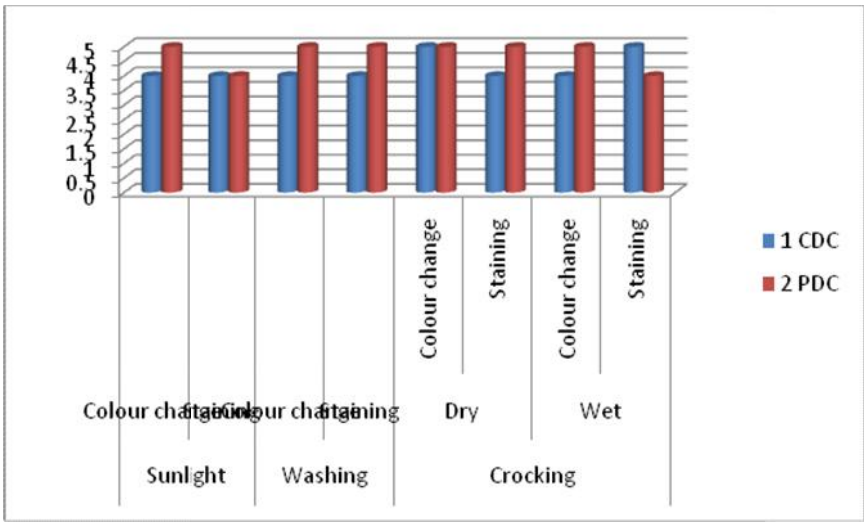
The above figure-2 shows, the dye was extracted under optimized conditions. The dye was extracted from papaya leaf using water as solvent at 90°C for 4 hours and filtered. The filtrate was used as dye source.

Color Fastness to Sunlight, Crocking and Washing

S.No	Sample	Sunlight		Washing		Crocking			
						Dry		Wet	
		Color change	Staining	Color change	Staining	Color change	Staining	Color change	Staining
1.	CDC	4	4	4	4	5	4	4	5
2.	PDC	5	4	5	5	5	5	5	4

5 – Excellent ; 4 – Very Good

Figure-3



From Table 3 & figure-3 , it is evident that all the dyed samples showed good fastness to sunlight. With regard to washing and crocking all the samples showed

good fastness. When compared between CDC and PDC samples, PDC showed excellent color fastness to all the color fastness tests. Here CDC indicates conventional dyes cotton & PDC is padding mangle dyed cotton.

Conclusion

There has been an increasing consumer demand for natural dye coated products like toys, because synthetic dyes coated material could be toxic to human. Natural dyes are not only having dyeing property but also have the wide range of medicinal properties. The present work reveals that, papaya leaf can be used as a dye for coloring textiles. These are grown through out India and so are easily available. The washing, light and rubbing fastness were quite good. The dyed fabric also showed antibacterial activity, the dye. Hence extraction from papaya leaf has good scope in the commercial dyeing of bamboo/cotton fabric.

Bibliography

1. Abhijit Majumdar, Samrat Mukhopadhayay, Ravindra Yadav & Achintya Kumar Mondal, " Properties of Ring Spun Yarns Made from Cotton and Regenerated Bamboo Fibre," Indian Journal of Fibre & Textile Research, Vol.36, pp.18-23,March 2011.
2. Allen R. L. M. (1971). "Color Chemistry", Nelson, London.
3. Anonymous. (2002). "100% Cotton Moisture Management", Journal of Textile and Apparel Technology and Management, Vol. 2.
4. Adeel., S. Ali., S. Bhatti., I. A. And Zsila., F. (2009). "Dyeing Of Cotton Fabric Using Pomegranate (punicaGranatum) AqueousExtract". Asian J. Chem., 21(5).pp.3493-3499.
5. Bhandari., K. (2011). "Natural compounds and its medical activity", Proceedings of the Vegetable Dye and its Application on Textiles National Workshop and Seminar, India.pp. 56-63.
6. Gulrajan.,i M.L. & Gupta., D.(1992). "Natural dyes and application to textiles", Depatment of textile technology, Indian Institute of Technology, New Delhi, India.
7. Kumar Samanta., A. and Konar., A. (2011). "Dyeing of textiles with natural dyes, Perrin Akcakoca Kumbasar E (ed.), In Tech".pp. 29-56.

SURFACE COATING ON TEXTILE MATERIAL

R.Bhavani
Assistant Professor, Department of Garment Designing, PSGR Krishnammal College for Women, Coimbatore
Dr.S.Kavitha
Associate Professor, Department of Home Science, Mother Teresa Women's University Kodaikanal

Abstract

Textiles with desired functional and aesthetic properties have an evergreen demand among the consumers globally. Unless any product is characterized by value addition, it is now impossible to survive in this highly competitive world market. Only innovative products will be sustainable to open up new markets and new horizons for textile industry. Coating techniques are used to impart properties to fabrics which are not necessarily those naturally assumed by textile fabrics. Cheaper fabric structures may be coated to provide higher added value to end-users and higher profit margins to manufacturers. The use of coated fabrics is common in industry, in transmission belts, conveyor belts or barrier materials gloves, cut resistant materials, clothing forclean rooms, fire, bad weather or NBC protection clothing, high visibility clothing, etc. The key to success in textile coating is depends upon the application of appropriate technology using modern machinery. A review is made on Coated textiles applications in Defence, transportation, healthcare, space, environmental pollution control, sports, architecture, and many other diverse end-product uses.

Key Words: *Textiles, Coating techniques, Health care, Applications, Technology, etc.*

Introduction

Surface Coating is important techniques for adding value to textiles. Coating is the process of covering a substrate (nylon, polypropylene, polyester, polyamide, cotton, wool, woven or non-woven fabrics or sheets), with a product (PVC, PU, silicone or other) to alter and enhance its physical properties and appearance. The formulation of a coating contains a wide range of chemicals depending upon the nature of the polymer, the necessary additives for the specific end use, whether the coating has to be foamed prior to application, and the type of coating machinery to be used. Coatings may be coloured, translucent or opaque. In the field of health care, coated fabrics are used as barrier materials, implants, incontinence products, hospital equipment and hygiene products. Textile coatings are common in gloves, cut resistant materials, clothing also have their applications in the sports like shoes, anoraks, etc. and leisure sectors like haversacks, camping tents, sleeping bags, etc. A wide range of properties like water resistance, fire retardance, UV resistance, flexibility, surface gloss, surface texture, etc. can be given to a coated fabric through proper application of specific chemical and additive mix and compounds on the fabric substrate.

Methods Coating on Textiles

Coating a layer of polymeric material on a textile imparts a new characteristic to the base material. There are various coating methods for applying polymers on textile materials. The choices of coatings are depending upon several factors mainly

nature of the substance, End use and economic of the process. The various methods are as follows:

1. Fluid Coating

Fluid Coated material in the form of paste or in the form of solution. The methods used for fluid coatings are

- Knife coaters
- Roll Coaters
- Impregnators
- Spray Coaters

2. Solid Coating

Solid coating is coating the material with dry compound like solid powder or film. The methods used for solid coatings are

- Melt Coating
- Calendering
- Lamination

Coated Fabrics and Their Uses

Coated fabrics are mainly used in technical textile industry.

- PVC coated fabrics: The PVC (Polyvinyl chloride) or polymer-coated fabrics are mainly used to make waterproof garments such as PVC rainwear. They are also used for making chemical protective clothing as well as industrial clothing that is oil and grease resistant. The PVC coating paste is directly applied to the fabric in four layers
- Teflon coated fabrics: These coated fabrics are very strong and are used to make gaskets and seals in the automotive industry as well as conveyor belts for use in various industries.
- Rubber coated fabric: They are used to make water resistant items such as bags andluggage bags. It is also used for heat curtains.
- Vinyl coated fabrics: They are used to make water and mildew proof fabrics required for outdoor applications, such as for tents and tarpaulins.
- TPO coated fabrics: Thermoplastic Polyolefin (TPO) is usually coated on polypropylene fabric (PP). These fabrics are used to make ground sheets, field covers, roofing membranes, sporting tents, light weight sport field covers, agriculture coverings, truck tarpaulins etc.

Techniques Used

Coating is the process of covering a substrate (nylon, polypropylene, polyester, polyamide, cotton, wool, woven or non-woven fabrics or sheets), with a product (PVC, PU, silicone or other) to alter and enhance its physical properties and appearance 5 main coating techniques are listed below.

- Direct coating
- Transfer coating
- Online coating
- Melt coating
- Calendering (rolling)

4.1 Direct coating: The PVC coating paste is directly applied to the fabric in four layers. Applications are side curtains, tilts and tarpaulins for trucks, railway wagons and containers, sports mats, swimming pool covers, textile architecture, publicity banners

4.2 Transfer coating: The coating paste (PU, silicone, etc.) is applied to the fabric via a paper carrier. Applications are: protective clothing, outdoor sports clothing, shoe protectors, mattress protectors, airbags, tents

4.3 Online coating: With online coating the open fabric is dipped in a coating bath once it comes off the loom. Applications are: geogrids, swimming pool covers, reinforcement nets, windbreak nets, filters,

4.4 Melt coating: Through melt coating we produce a film out of different polymers which is then laminated onto a carrier. This carrier can be a textile, a felt, knitted fabric, another film or paper. Applications include technical textiles for sewer renovation

4.5 Calendering (rolling): TPO (thermoplastic polyolefin) and PVC films which are embossed to give the film a textured aspect.

The application for coated and laminated textiles is widespread across a variety of technical textile sectors, these include;

Table: 1 Application for Coated and Laminated Textiles

Sector	Application/Role
Automotive and Aerospace	Vehicle interiors- textiles often laminated onto interior components such as door panels.
Medical and Hygiene	Anti Bacterial Coatings Waterproof breathable Hydrophilic membranes
Construction and Engineering	Tarpaulins Bulk bags
Interiors	Upholstery- Stain resistance UV resistance
Technical Apparel and PPE	Waterproof Breathable Membranes Phase Change Materials Fluorescence

Advantages and Disadvantage of Coating on Textiles

- Improving the hardness
- Improving the wear resistance
- Controlling friction, Reduction of adhesion, improving the lubrication, etc.
- Improving corrosion resistance
- Improving aesthetics

Along with many advantages, the coated fabric also have some disadvantages, the main being its threat to environmental cause. The problem lies with the disposal of waste, which is generated after the use of coated fabrics. They cannot be recycled even by applying high temperature or pressure. Dissolving them in solvents also doesn't seem to be working as these solvents too can't dissolve the whole of the coated

fabric for recycling purpose. The waste of coated fabrics can only be burnt safely with all the precautions taken from environmental point of view.

Conclusions

The coating gives a powerful tool for the advancement of textile technology and it enhance and extend the range of functional performance properties of textiles and the use of these techniques is growing rapidly as the applications for technical textiles become more diverse. Cheaper fabric structures may be coated to provide higher value added to the end-users and to the manufacturers. It provides the opportunities to produce the special fabrics like water-proof resistant tarpaulins, coverings, large tents and architectural uses, backcoating for upholstery including autoseats, Food, Medical applications, parachutes, Woven curtains, for heat sensitive fabrics, automotive fabrics, disposable hospital apparel etc. the recent developments also enhanced the lamination and coating technique into state-of-art process of the future in textile field.

References

1. Walter Fung , Coated and Laminated Textiles, By, Textile Institute (Manchester, England)
2. Kunal singha , a review on coating & lamination in textiles: processes and applications, american journal of polymer science 2012, 2(3): 39-49
3. Carme salgado tecnitex ingenieros s.l., textile coating, fiber2fashion.
4. http://www.highlandindustries.com/products/coated-and-laminated-fabrics
5. Http://www.sioen.com/technical-textiles/5-coating-techniques
6. http://www.amybutlerdesign.com/pdfs/Laminated_Tips.pdf

AN OVERVIEW -PRESENT AND FUTURE SCENARIO OF HOME-TECH INDUSTRY

K.Christie Jennifer
PhD - CDF Scholar, Department of Costume Design and Fashion, PSG College of Arts and Science, Coimbatore
R.Kalpana
Assistant Professor, Department of Textile and Fashion Designing, Vivekanandha College for Women, Namakkal

Abstract

Textile industries play a vital role in the world economy, providing employment to tens of millions, mostly, women workers in nearly two hundred countries. The industry is experiencing production and organizational changes globally, with deepening trade activity altering employer – employee relations. Among the various segments of technical textiles, the hometech industry is one of the largest segments which is growing due to the real estate boom and higher spending on the home interiors. The recent decades in terms of the development of the home textile industry at the global level have been marked by processes of intensive structural adjustment which has resulted in the transfer of production to developing countries. There have been a number of significant developments in home textiles over recent years. The global market offers consumers a broader range of fiber combinations, fabrics, designs, textures and colours than it did in the 1990s. Manufacturers have successfully adapted performance apparel technologies for use in home textile products. For example, bed sheets are being made from Coolmax and Thermolite fabrics. Coolmax fabric incorporates a moisture management technology and Thermolite is a light weight insulation material which was originally designed for outdoor performance apparel.

Keywords: *home-Tech textile, global market, trends and opportunities, future scenario.*

Introduction

Textiles are indispensable part of human life. They are mainly to cover the human for protection against all the adversities [1]. The textile industry occupies a unique place in India. it is a self reliant industry and accounts for 14% of the total industrial production, contributes to nearly 20% of the total exports of India. The textiles industry is moving towards the reorientation of non-clothing applications of textiles, known as technical textiles. There are over 150 products classified under Technical Textiles and its coverage in terms of application areas is expanding globally with each passing day on account of technological advancement in raw materials and processes. Though the Indian Technical Textiles industry consumes products under all twelve segments, the majority technical textiles products that are manufactured in India include– Clothtech, Packtech, Sporttech and Hometech.this sector is growing roughly at twice rate of textiles is now playing an important role in the construction of many household textiles, furnishing and floor coverings for domestic consumption and institutional end uses that are known as Hometech. The applications of technical textiles in home tech include fibrefill, carpet backing cloth, blinds etc.In the global textile market, home tech contributes about 7% of the share. The hometech market in India is estimated to be Rs 17,000 crore and is growing at over 9% annually. The hometech and furnishing market is expected to

reach Rs 26,600 crore by 2015. The recent decades in terms of the development of the home textile industry at the global level have been marked by processes of intensive structural adjustment which has resulted in the transfer of production to developing countries.

Objectives

- To learn about the present hometech industries scenario.
- To find out the domestic consumption and market size of hometech industry.
- To know about the technical textile development in home textile industry which is going to help hometech to grow stronger and have greater prominence in the global market.
- To prove that the demand for hometech textiles is big enough and is rising in the near future.

Hometech Textiles

Home Textiles are a flexible material consisting of a network of natural or artificial fibers often referred to as thread or yarn. Spinning raw wool fibers, linen, cotton, or other material on a spinning wheel to produce long strands produces yarn. Home textiles are formed by weaving, knitting, crocheting, knotting, or pressing fibers together. Home textiles have an assortment of uses, the most common of which are for clothing and containers such as bags and baskets. In the household, home textiles, they are used in carpeting, upholstered furnishings, window shades, towels, covering for tables, beds, and other flat surfaces in art, home textiles are all around. Home textiles such as net curtains, curtains, furnishing fabrics, textiles for upholstery and table linen all make a significant contribution to a feel-good atmosphere in the home. [3] The variety of these products is (almost) unlimited. Be it materials, colours or patterns are numerous different collections are always currently available.

Market Characteristics

The Textile Industry in India is one of the largest segments of the Indian economy accounting for over one fifth of the country's industrial production. It provides employment to around 15 million people who have helped produce one of the largest, most fascinating varieties of yarn, fabric, home textiles, home furnishings and other textile products in the world.[2] The Home Furnishings Industry in India falls under the purview of the textile industry. Indian home furnishings manufacturers and home furnishings exporters offers a spectacular range of bedspreads, furnishing fabrics, curtains, rugs, durries, carpets, placemats, cushion covers, table covers, linen, kitchen accessories, made-ups, bed spreads, bath linen, and other home furnishings accessories to the world. Manufacturers of Home Furnishings from India, whether floor coverings, kitchen linen, bath linen, cushion covers, bed spreads, curtains etc. create a rage in the international markets.

Changes in the World Textile Market

The development of the home textile industry in the world over the last 20 years is a typical example of production that has undergone major changes, which some would even call drastic, in terms of organisation, production structure, technology and sales methods. [4] While the process of structural adjustment was underway

in the developed countries regarding this industrial branch, followed by production reduction and labour force downsizing, specialisation and constant technological innovation, the promotion of new products and full product lines, at the same time the process of transferring production to other countries and the establishment of new centers of the global home textile industry. [6] The demand for textiles and garments in India comes from three major segments – household sector, non-household sector (institutional, industrial and technical) and export sector. The household sector consumes the largest share of textiles and garments in India (60% share), followed by the non-household sector (21% share), and then the exports sector (19% share). The textile industry in India is one of the flourishing sectors of Indian economy. It contributes more than 13% to industrial output, 16.63% to export revenues and 4% to the nation's GDP. In the year 2010, the industry is estimated to produce 12 million jobs with an investment of US$ 6 billion in the fields of textiles equipments and structure, and garment manufacturing by the end of 2015.

Assessment of Demand and Market Potential in India

There are no authentic statistics available on the production and the total market size of the home textile products. Not much data is compiled for these due to the large variety of products within the category. Further, majority of the market is still in the unorganized sector and highly dispersed. Therefore, the present estimates of the market are arrived at on the basis of primary survey conducted by Ace Global and discussions with the industry players. As per discussions with various industry players in different parts of country, the overall average growth rate of domestic urban market is about 15% - for bath linen it is 15%, for kitchen linen it is 10%, for curtains it is 12%, for upholstery it is 15% and for other remaining products it is about 10%.

Functionalities of the Products

Curtains and window decorations have particularly good light fastness and can maintain their brilliant colours for years, upholstery materials consist of particularly hard-wearing materials with a long life span and table linen features impressive designs with colours and patterns as well as functionality such as a washable coating. Many textile furnishing materials are usually put to use without prior washing and have a longer useful life. [5]

Stratergic Plan-Hometech

The implementation of the Strategic Plan requires resources to the tune of approximately Rs 58164/- crore during the next five years. Assuming an annual 25% increase in Annual Plan outlays from the base level (2010-11) of Rs 4725 crore, the required Annual Plan allocation are as follows:

Year	Amount in Rs Crore
2011-12	7000
2012-13	8750
2013-14	11125
2014-15	13906
2015-16	17383

The funds are to be provided as Budget Support to the Ministrys Plan. Planning Commission and the Ministry of Finance will be persuaded to allocate sufficient funds for the Ministry of Textiles under the Annual Plans.

Global Home Textiles Market: Trends and Opportunities

It was most interesting to see that the global home textiles market has recorded a relatively strong growth since 2009. In USD the retail value increased from just over USD 85 billion to just below USD 105 billion in 2013. The annual growth rate was well above 4% per annum. Growth was especially strong in China where the Combined Average Growth Rate (CAGR) from 2008-2013 was almost 14%. Also, other countries like India, Turkey and Russia recorded strong growth rates between 5 and 8%.

Fig-1 Retail Value and Annual Growth

With a share of approx. 25% bed textiles are still by far the most important category within home textiles followed by bath textiles (15%), rugs (10%), living room textiles (8%) and kitchen & dining textiles (7%). In advanced economies the main drivers of this growth are a tendency towards smaller households, stronger demand for more comfort, added value and convenience for use. In emerging countries the drivers are an increase in the number of new homes for a rising middle class who prefer affordable prices and convenient shopping opportunities.

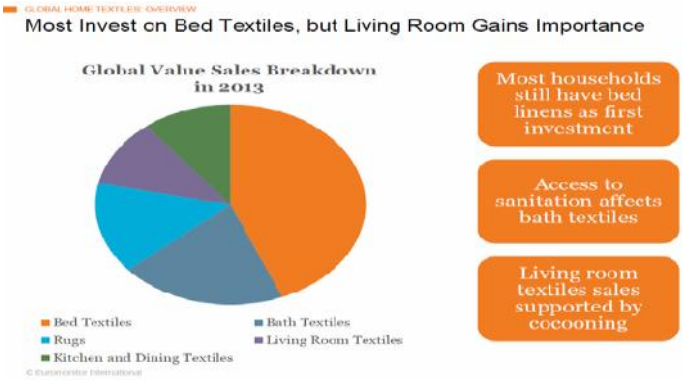


Fig-2: global value sales breakdown

Future Scenario

Looking at the period 2013-2018, estimates that bed textiles will remain the dominant segment (CAGR of 2.2%) but that also bath and living room textiles will also grow strongly by 2.3% and 2.2%, respectively. This growth will come from China's expanding middle class, higher online sales (convenience) and more added-value products (comfort).

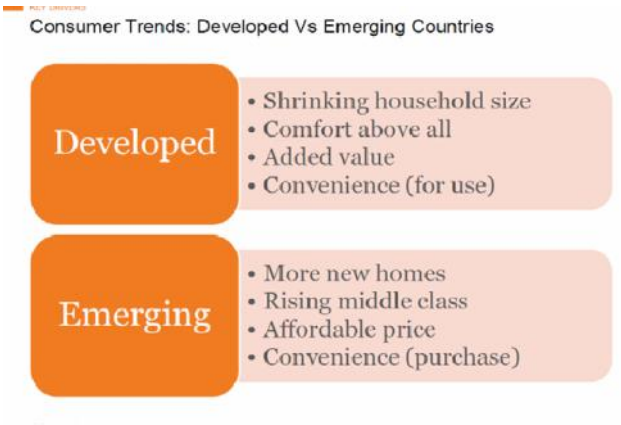
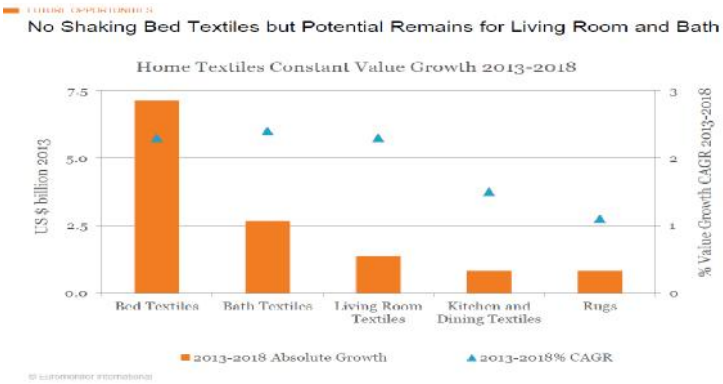


Figure 3

Consumer Trends: Developed Vs Emerging Countries

Fig-4: hometech constant value growth 2013-2018



Despite China's very strong growth rate and high absolute retail value it is important to note that China's per capita consumption of home textiles is still only one third of the US. The future potential in China and other emerging economies, especially India, is Enormous

Conclusion

The growth of domestic home textiles market, and the slower growth in customers' willingness to upgrade qualitatively, quantitatively, and pricewise is a conundrum that needs to be researched and analyzed more intensively. Other home categories showing very encouraging growth and so perhaps a tipping point for home textiles and furnishings may also be around the corner. Some product-usage based and channel-based segmentations could offer new opportunities to stimulate domestic demand.

Reference

1. Kaplan, N.S., (2001), Textile Fiber, Abishek Publication, Chandigarh, P.5
2. International Trade Centre, Trade statistics, 2012, avaliable at www.intracen.org/ (accessed: 25 June 2012).
3. "Hand book of home textiles," edited by A.R.Hrrocks and S.C.Annand, Textile Institute Publications-2000 edition.
4. Ratnakar A, Yumiko Y (2008) The textile and clothing Industry: Adjusting to the post-quota world. Indus Develop, UN, USA.
5. http://www.fibre2fashion.com/industry-article/2/134/indian-textile-industry-home-yarn-segment1.asp
6. http://www.artoflegendicccndia.com/html/home_textile_history.htm

PROCESSING OF HERBAL TEXTILES

P. Dhana Priya
Research Scholar Department of Textiles and Clothing,
Avinashilingam Institute for Home Science and Higher Eduation for Women
Dr .U. Ratna
Assistant Professor (SS), Department of Textiles and Clothing,
Avinashilingam Institute for Home Science and Higher Eduation for Women

Abstract

The herbal textile is completely free of synthetic chemicals, toxic irritants and thus avoids global warming. Textiles dyed from the extractions from various herbs are called herbal textiles. The concept of herbal textiles has been derived from Ayurveda, the ancient Indian method of Vedic healthcare. Herbs include crude plant materials such as leaves, flowers, fruits, seeds, stems, wood, bark, roots, rhizomes or other plant parts, which may be entirely fragmented or powdered. The Indian Ayurvedic system of medicine is known as the richest, and the foremost among the other branches of medicinal field. The study deals with the eco-friendly method of processing fabric to produce herbal textiles. The paper also highlights on the benefit of herbal sources in curing various diseases.

Key words: *Herbal Textiles, Ayurveda, Processing of herbs, Eco textiles.*

Introduction

Herbal textiles are completely organic and serve as green substitute to conventional chemical and natural dyeing. The herbs are selected according to Ayurveda, with the infused cloth known as ayurvastra. It is an ancient technique prevalent before textile industrialization to dye cloth with herbal dyes, which then acts as a barrier to the attack of various microorganisms. Ayurvastra is a branch of ancient Indian herbal medicinal repository.

Herbal Textiles

Herbal dyes are best with natural fibers such as cotton, linen, wool, silk, jute, ramie and sisal. The herbs are incorporated into the fabric release their medicinal properties onto and into the body thus providing medicinal immunity against different harmful toxins. These fabrics also have anti inflammatory properties and the best time of its usage is when the body is at rest like during sleep, meditation or relaxation as the functions of the body are mainly diverted towards healing activities.

Herbs and Their Medical Properties

S.No	Herb	Medical Properties	Diseases Cured
1.	Neem 	antibacterial and antifungal	Coomon Skin Diseases, Skin Allergy
2.	Aloe-Vera 	antibacterial and antifungal	Burns, Wounds, Common Skin Diseases, Psoriasis

3.	Eucalyptus 	Antiseptic	Relieve congestion Prevent Infection , Ease muscle soreness
4.	Tulasi 	Antibacterial, antiseptic, antispasmodic, diaphoretic, febrifuge, nervine	Respiratory Disorders
5.	Turmeric 	*Antihepatotoxi*, *Antioxidant*, *Antimicrobial*	Liver Disorders
6.	Ballon - vine 	Antiphlogistic, analgesic, blood refrigerant, anti-infectious.	Cold, fever, renal edema, urinary tract infections, · Furuncle, carbuncle, eczema, Sprains and external wounds.
7.	Sandalwood 	Alterative, antibacterial, antiseptic, astringent,carminative, disinfectant, diuretic, expectorant, hemostatic, refrigerant, sedative, stimulant.	acute dermatitis, bronchitis, cystitis, eye diseases, gonorrhea, herpes zoster, infection, palpitations, Sunstroke, urethritis

Processing of Herbal Textiles

Selection of Fabric

Most common type of fabric used is organic cotton, the cotton which is cultivated without chemical pesticides and fertilizers. Silk, wool, coir, linen, hemp banana, nettle, bamboo etc.

- **Desizing:** The gray cloth was boiled for 1 hour in solution of sea salt. Cloth was dipped in the sea salt solution for 12 hours. Then washed in running water and kept for drying in sunlight. Gray cloth was passed through this process for removing the sizing gums, oils and impurities on it, which makes the cloth more absorbent for the herbals. Detergent is not involved in this process. The detergent contains hazardous chemicals
- **Bleaching :** The fabric is bleached using a solution which contains cow urine, milk and honey. This preparation is used for cleansing or purifying rituals. Sunlight is the best source of natural bleaching. So, if possible, the fabric was spread on grass and also exposed to direct sunlight as the part of the process. Reaction between sun and grass makes the cloth bleach to a great extent Bleaching incorporating a mixture of natural bleaching agents and dipped in Ayurvedic concoctions using dung of animals like camel, buffalo, cow, sheep lasting for hours to several days under controlled temperatures for efficient

scouring & bleaching the gray cloth. The hand loomed cloth is also washed using natural mineral-rich water and sea salts to remove the sizing materials, gums and oils that were added to facilitate spinning process.

- **Mordanting:** The next processing step is mordanting to enhance the tinctorial value of the dyes that are later applied on to the fabric. The preferred natural mordants are the barks of Lodhra (Symplocos racemosa), Kenduka (Diospyroseebenum), fruit extracts of Haritaki (Terminalia chebula). Alum clays and iron clays are also used as mordant. But mordants like copper, chromium, zinc, tin are strictly avoided due to their creating environmental problems.
- **Preparation of Concoction:** Each herb was taken separately dried in shade and powdered. Then the medicated dye was extracted by soaking herbs in water in the ratio of 1:15 ml and boiled at 100 0c for 2 hours to get a thick viscous herbal solution. Then the solution was strained through cloth and kept overnight. The strained solution was used for dyeing
- **Dyeing Process:** The temperatures of the dyes, the duration and number of the dye soaks, the blend of herbs, and even the equipment used carefully controlled. The fabric was dyeing with the herb source with the help natural ingredients. The fabric is allow to dry for 3 days after dyeing in a shade and then kept in a room for 15 days a period of time that allows the fabric to dry completely and the Kashaya to settle in to the fabric. It is then washed and dried in the shade and kept for another 15 days.

Benefits of Herbal Textiles

- Natural fibres like cotton is good for the skin and when it is dyed with natural medicinal rich herbs, the comfort level and soft feel to the skin is further enhanced.
- The herbal properties of the clothing keep the user in safe zone by creating a barrier to the external environment toxins.
- A positive aura and earthy shades remains enveloped to the body thus boosting the confidence of wearer.
- Eco friendly and sustainable.

Conclusion

Thus Ayurvedic clothing is the new way to live a natural and healthy life. The Ayurvedic textile products are hand loomed. The Ayurvedic herbs have various medicinal properties and when they are dyed with the fabric, it gives a cooling and efficient effect. They are good for various skin disorders - asthma, rheumatic, body ache, diabetes, blood pressure, skin infections and allergies. In contact with clothing, the skin absorbs medicinal qualities of herbs. Herbal wear is advisable to all age of people, children, handicapped and pregnant woman. Herbal textiles is surely a revolutionary product that is infact the need of the present generation that is getting easily prone to many health issues owing to unfavorable lifestyles.

Reference

1. Gotipamul, R.L & Velapure, G.S. (2012). *Ayurvastra, recent advances*. Asian textile journal. Vol: 50. pp. 80-84.
2. Kolte, PP., Shivankar, VS and Ramachandran, M. (2015). Herbal Clothing - An Ayurveda Doctor. REST Journal on Emerging trends in Modelling and Manufacturing 1(1):26 –31.
3. Rangari NT, Kalyankar TM, Mahajan AA, Lendhe PR, Puranik PK; Review article: Ayurvastra: Herbal couture technology in textile. International Journal of Research in Ayurveda and Pharmacy, 2012; 3(5): 733-736.
4. Sabat, P.B & Magdum, P.K. (2012). Ayurvastra. Colourage. Vol: 7, Pp. 33-40.

A STUDY ON ECO-FRIENDLY DYES WITH SELECTIVE NATURAL COMPONENTS AND ITS EFFECT ON WOVEN COTTON FABRIC

S. Divya
Assistant Professor, Department of Garment Designing,
PSGR Krishnammal College for Women, Coimbatore
Dr. S.Grace Annapoorani
Associate Professor, Department of Textile and Apparel Design,
Bharathiar University, Coimbatore

Abstract

Natural dyes are becoming very important in industry for their less toxic tendencies as compared to synthetic dyes. Nature is full of fascinating Colour s and people had been exploiting them for dyeing garments, using them in food and many other items of the daily use. It has been reported by ancient writers that there were nearly thousand natural sources of dyes. There is a consideration demand for eco-friendly products in the global market and it is possible to master the technology of dyeing with natural dyes. In the search for newer natural source for dyes, and attempt has been made to extract dyes from selected plant components such as Pomegranate peel, Betel nut seed and prickly pear fruit. Cotton woven fabrics were dyed with natural dyes derived from the extracts of selected Pomegranate, Betel nut and prickly pear with different dye combination and mordant. Effect of dyeing, method of extraction and mordant has been visualized on the Colour strength and fastness properties of the dyed samples.

Key words: *Natural dyes, Eco-Friendly, Cotton woven fabric, Plant Components, Dye Combinations.*

Introduction

Colour is one of the elements of nature that made the human living more aesthetic and fascinating in the world. The word 'natural dye' covers all the dyes derived from the natural sources like plants, animal and minerals. The art of dyeing with natural dyes has gained momentum, not only for the safety of health and environment but also for the beauty and novelty, natural dyes are safer, No hazards, easy disposal, eco-friendliness and some dyes have medicinal properties that will improve value addition to the product and may be categorized under smart textiles. Transition metal ions usually have strong coordinating power and/or capable of forming week to medium attraction/interaction forces and thus can act as bridging material to create substantively of natural dyes/Colour ants when a textile material being impregnated with such metallic salt (i.e. mordanted) is subjected to dyeing with different natural dyes, usually having some mordant able groups facilitating fixation of such dye/Colour ant. These metallic mordants after combining with dye in the fibre, it forms an insoluble precipitate or lake and thus both the dye and mordant get fixed to become wash fast to a reasonable level. Betel nut contains tannin, gallic acid, catechin, alkaloids, fat, gum etc. The predominant pigment of Betel nut is gallotannic acid (P. Murugakoothan et al., 2014). Prickly pear juice is used as a natural dye. Betalain pigment was isolated from prickly pear (Fernandez-Lopez and Almela, 2001). it is found also in red beets (*Beta vulgaris*). The betalains are a group of

nitrogen containing pigments that are yellow, orange, pink, red and purple in Colour . Betalains have no toxic effects in the human body and are seen as a natural and safe alternative to synthetic red Colour ing (Pigi et al., 2003). Pomegranate (Punicagrantum) belongs to the family Punicacea is native of Persia (Goodarzian and Ekrami, 2010) It grows in all warm countries of the world and was originally a native of Persia (Goodarzian and Ekrami,2010). The rind of pomegranate contains a considerable amount of tannin, about 19% with pelletierine (Adeel et al., 2009; Tiwari et al.,2010). Dyeing textile using natural dyes was found to yield poor colour, have inadequate fastness properties. To overcome such hassle mordants are used. Metal ions of mordants act as electron acceptors for electron donors to form co-ordination bonds with the dye molecule, making them insoluble in water (Mongkholrattanasit et al., 2011). Common mordants used are alum, chrome, stannous chloride, copper sulphate, ferrous sulphate etc. (Kulkarni et al., 2011).The combinations for adding Colour to textile materials are either dyes or pigments. Two or more types of combination have very different properties are mixed together and dyed along with mordant.

Experimental Procedure

Selection of Fabric

Bleached 100 % cotton fabric procured from the market and removal of impurities by soaking the cotton fabric in distilled water before the application of dye. The specification of the fabric is as follows:

EPI: 60 count: 40S carded

PPI: 54 count: 40Scarded

Weave: plain GSM: 140

Natural Dye Materials

The Betel nut, Prickly pear and Pomegranate was collected from Mettupalayam area, Tamil Nadu, India.

Figure 1 : A. Betel nut B. Prickly Pear C. Pomegranate Peel

Selection of Mordents

A mordant is a substance used to set dyes on fabric. Mordants come from primarily 2groups plant based especially plants high in tannins and mineral based such as Alum, Iron, Tan and Chrome based. Alum and Iron are the most eco-friendly of mineral mordants while chrome tin and copper are considered more toxic so Alum(*KAl(SO4)2*·12(H2O)) and Ferrous-sulphate (FeSO4) mordant were selected for the study.

Method of Extraction of Natural Dye

The plant parts Pomegranate skin and Betel nut seed are dried and grained into powder form. 15 gram power each powder pasted with the little amount of water and mixed with 100 cc of water and the extractions were carried out at temperature 100^0C for 20-30 minutes. Filtered and dye extracted used for dyeing. The Prickly pear fruits of red prickly pear were homogenized with an equal amount of water. The mixture was heated for 5 min at 80 °C and quickly cooled on an ice bath until it reached a temperature of 8–10 °C then the extract was centrifuged for 20 min. Then it was used for dyeing the fabric.

Method of Dyeing

The fabric samples were cut as per the required dimension and it is weighed. Prior to dyeing, each of the samples was soaked in water, excess water was removed, and the sample was shaken well to remove creases. Then the sample immersed in the mordant for half an hour for pre mordanting. Then taken out and again immersed in to the dye extract with the Mixture of 2 dyes Betel nut with Prickly pear and boiling for half an hour. Later, it was taken out and washed and dried. For Post Cotton woven fabric were first dyed and then mordanted. After dyeing the cotton fabric was taken out and rinsed several times in fresh water and dried. The same procedure was followed for all the other samples i.e Prickly pear with Pomegranate peel and Pomegranate peel with Betel nut samples.

Laboratory Tests: The natural dyed samples were evaluated as follows:

Tearing Strength: The tearing strength of fabrics was done using ballistic tester.

Colour Fastness Test

The Colour fastness of a Colour ed textile is, therefore defined as it is resistance to these changes when subjected to a particulars set of conditions. It follows that Colour fastness must be specified in terms of these changes and expresses in terms of the magnitude. The importance of Colour fastness depends on the use of the fabric. The following Colour fastness tests were conducted to determined the Colour fastness of the dyed samples.

Colour fastness to washing **Colour fastness to rubbing**

Colour Fastness to Washing

The test samples of 2” x 4” size were cut from the material. Each sample was sandwiched between the undyed samples, which have been desized well. Soap solution of about 4 gms/litre was prepared. Each of the test samples was soaked in the soap solution, separately for about half an hour. After that, the test samples were removed, rinsed in cold water thoroughly squeezed well and dried. The Colour change and staining of the samples were assessed in compression with the grey scale.

Colour fastness to Rubbing

Crocking is the transferable of Colour by rubbing from one Colour ed textile material to another. A wet fabric will crock more easily than dry one because the moisture present assists in removing dye. crock meter was mounted into the rubbing finger with a ring. Each sample was given ten rubs based on the standardization. A damp white material was used for wet crocking. The procedure adopted was same as

that of dry crocking. The colour change and staining of the samples were assesses in comparison with the grey scale.

Results and Discussion

The results and discussion obtained for the study is as follows.

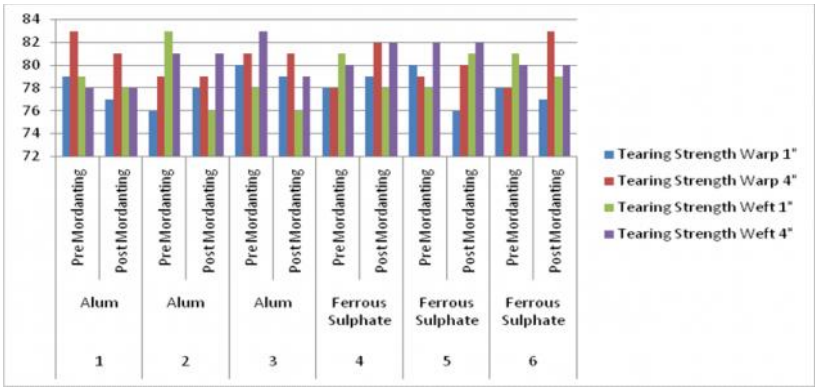
Tensile Strength (ASTM D 5034)

The Tensile strength, fastness properties of dyed cotton fabrics are shown in Table 1. It was observed that, combination dyeing with, Betel nut Prickly pear fruit and Pomegranate peel gave good washing, light and rubbing fastness properties. Overall, it could be used for commercial purposes and attain acceptable range.

Table 1: Tearing Strength

S.No	Dye	Mordant	Mordanting Methods	Tearing Strength			
				Warp		Weft	
				1″	4″	1″	4″
1	Betel nut + Prickly pear	Alum	Pre Mordanting	79	83	79	78
			Post Mordanting	77	81	78	78
2	Prickly pear + Pomegranate	Alum	Pre Mordanting	76	79	83	81
			Post Mordanting	78	79	76	81
3	Pomegranate + Betel nut	Alum	Pre Mordanting	80	81	78	83
			Post Mordanting	79	81	76	79
4	Betel nut + Prickly pear	Ferrous Sulphate	Pre Mordanting	78	78	81	80
			Post Mordanting	79	82	78	82
5	Prickly pear + Pomegranate	Ferrous Sulphate	Pre Mordanting	80	79	78	82
			Post Mordanting	76	80	81	82
6	Pomegranate + Betel nut	Ferrous Sulphate	Pre Mordanting	78	78	81	80
			Post Mordanting	77	83	79	80

Figure 1: Tearing Strength



From the above Table 1 and Figure 1 shows that tensile strength (kg/cm2) dyed samples. There is not much loss in tearing strength of dyed samples Betel nut with Prickly pear, Prickly pear with Pomegranate peel and Pomegranate peel with Betel nut samples.

Table 2: Colour Fastness to Laundering

S.No	Dye	Mordant	Mordanting Methods	Laundering
				Colour change
1	Pomegranate + Betel nut	Alum	Pre Mordanting	4
			Post Mordanting	3-4
2	Betel nut + Prickly pear	Alum	Pre Mordanting	4-5
			Post Mordanting	4
3	Prickly pear + Pomegranate	Alum	Pre Mordanting	4
			Post Mordanting	3-4

4	Pomegranate + Betel nut	Ferrous Sulphate	Pre Mordanting	4
			Post Mordanting	4
5	Betel nut + Prickly pear	Ferrous Sulphate	Pre Mordanting	4
			Post Mordanting	4
6	Prickly pear + Pomegranate	Ferrous Sulphate	Pre Mordanting	4
			Post Mordanting	4

Ratings: 5-Excellent, 4- Very good, 3- Good, 2- Fair, 1- Poor.

It is clear from the above table 2 that Betel nut with Prickly pear, Prickly pear with Pomegranate peel and Pomegranate peel with Betel nut samples shows good to excellent Colour fastness to laundering. Betel nut with Prickly pear Alum pre-mordanted sample shows 4-5 shows Very good to excellent Colour fastness to laundering.

Colour Fastness to RUBBING

The following table 3 shows the Colour fastness to Rubbing of cotton dyed fabrics.

Table 3: Colour fastness to Rubbing

S. No	Dye	Mordant	Mordanting Methods	Rubbing	
				Staining	
				Dry	Wet
1	Pomegranate + Betel nut	Alum	Pre Mordanting	4	3
			Post Mordanting	3-4	3
2	Betel nut + Prickly pear	Alum	Pre Mordanting	4-5	4
			Post Mordanting	3-4	3
3	Prickly pear + Pomegranate	Alum	Pre Mordanting	4	3-4
			Post Mordanting	3	3
4	Pomegranate + Betel nut	Ferrous Sulphate	Pre Mordanting	4	3
			Post Mordanting	3-4	2-3
5	Betel nut + Prickly pear	Ferrous Sulphate	Pre Mordanting	3-4	3
			Post Mordanting	4	3
6	Prickly pear + Pomegranate	Ferrous Sulphate	Pre Mordanting	4	2
			Post Mordanting	4	2-3

Above table 3 show that the Colour fastness to crocking of the dyed fabric. For Colour staining dry cotton sample Betel nut with Prickly pear Alum pre-mordanted sample is 4-5 and wet dyed cotton sample Betel nut with Prickly pear Alum pre-mordanted sample is 4 which shows good Colour fastness property compared to other dyed sample.

Conclusions

From the study, it may be concluded that the selected dye sources namely Betel nut, Prickly pear, and Pomegranate are highly suitable for cotton woven material with Alum and Ferrous mordant. The pre-mordant and Post Mordant techniques are mostly suitable for Cotton material. Different shades of colour can be obtained using different chemical and natural mordants. Fabrics dyed with mixing of natural dyes can be successfully used for dyeing cotton fabric to obtain a wide range of bright Colour s as well as to impart soft feel. Generally post mordanting method of dyeing gives best result. In post mordanting alum produced lighter shades. Pre-

mordanting Methods produced better result compared to post mordanting method. There is not much loss in tearing strength of combination shade dyeing. The washing fastness of combination shade is also good. The washing fastness rating is 4-5.The Rubbing fastness of combination shade is also good. For dry rubbing fastness rating is 4-5 and wet rubbing fastness rating is 4.

Fabrics dyed with Pomegranate with Betel nut dye have shown brighter Colour and better performance regarding Colour fastness to rubbing and washing than compared to other combination. These dyes are safe and eco-friendly. Therefore, their use will definitely minimize the health hazards caused by the use of synthetic dyes. These natural dyes give some medicinal properties also.

Acknowledgement

The authors express their sincere thanks to Mrs. R. Valarmathi GRG polytechnic college, Professor N.S. Geetha, Department of Textile Processing, GRG polytechnic college, Coimbatore Tamil Nadu for her useful suggestions and help in the preparation of this manuscript.

References

1. Adeel, S., Ali, S., Bhatti, I. A. And Zsila, F. (2009): Dyeing Of Cotton Fabric Using Pomegranate (Punica Granatum) Aqueous Extract. Asian J. Chem,. 21(5): 3493-3499.
2. Goodarzian, H. And E. Ekrami, 2010. Wool dyeing with extracted dye from pomegranate (Punica Granatum) peel. *World Applied Science Journal*, 8: 1387-1389
3. J.A. Fernandez-Lopez, L. Almela, Application of high performance liquid chromatography to the characterization of the betalain pigments in prickly pear fruits, J. Chromatogr., 913 (2001), pp. 415–420
4. N. A. Abdul Rahman, R. Tajuddin, and S. M. Tumin, Optimization of Natural Dyeing Using Ultrasonic Method and Biomordant, International Journal of Chemical Engineering and Applications, Vol. 4, No. 3, June 2013.
5. Rout gr, das s, samontoray p, das p (2001). Invitro micropropagation of lowsonia inermis (lythraceae) int. J. Trop. Bisl, conserv., 49: 1 – 7.
6. Tiwari H.C, Singh P., Mishra P.K. and Shrivastava P. (2010): Evaluation of Various Techniques for Extraction of Natural Colour ants from Pomegranate Rind Ultrasonic and Enzyme Assissted Extraction. IJFTR, 35: 272-276.

AGRO- TEXTILES

Dr.M.Hemalatha
Department of Botany Seethalakshmi Ramaswami College, Tiruchirapalli

Abstract

Agriculture is the backbone of our country. Now it is said that textile can be the backbone of agriculture. Textile fabrics have a long history of use in agro-tech sectors to protect, gather and store products. Between the 18th century and the end of the 19th century, agricultural development occurred, which saw a massive and rapid increase in agricultural productivity and vast improvements in farm technology. Agro textiles are the application of textile materials in Agro-tech sector . It is a very much important segment of Technical Textile. The word "Agro- Textiles" is used to classify the woven, non-woven and knitted fabrics, applied for Agro-tech sector including livestock protection, shading, weed and insect control and extension of the growing season. With the continuous increase in population worldwide, stress on agricultural crops has increased. So it is necessary to increase the yield and quality of agro-products. But it is not possible to meet fully with the traditionally adopted ways of using pesticides and herbicides. Today, agriculture and horticulture has realized the need of tomorrow and opting for various technologies to get higher overall yield, quality and tasty agro-products.

Key Words: *Technical Textile, Agro-Textile, Agro-products.*

Introduction

Agriculture, forestry, horticulture, floriculture, fishing segments, landscape gardening, animal husbandry, aquaculture & agro-engineering all these sectors combined together are popularly called as Agro-tech sector. Agro textiles are the application of textile materials in those sectors. It is a very much important segment of Technical Textile. The word "Agro- Textiles" is now used to classify the woven, non-woven and knitted fabrics, applied for Agro-tech sector including livestock protection, shading, weed and insect control and extension of the growing season. With the continuous increase in population worldwide, stress on agricultural crops has increased. So it is necessary to increase the yield and quality of agro-products. But it is not possible to meet fully with the traditionally adopted ways of using pesticides and herbicides. Today, agriculture and horticulture has realized the need of tomorrow and opting for various technologies to get higher overall yield, quality and tasty agro-products.

History of Agro Textile

Agriculture is the backbone of our country. Now it is saying that textile can be the backbone of agriculture. Textile fabrics have a long history of use in agro-tech sectors to protect, gather and store products. Between the 18th century and the end of the 19th century, agricultural development was occurred, which saw a massive and rapid increase in agricultural productivity and vast improvements in farm technology. From then, Textiles have always been used extensively in the course of food production, most notably by the fishing industry in the form of nets, ropes and lines but also by agriculture and horticulture for a variety of covering, protection and containment applications.

However, modern textile materials are also opening up new applications. Lightweight Spun bonded fleeces are now used for shading, thermal insulation and weed suppression. Heavier non-woven, knitted and woven constructions are employed for wind and hail protection. Fibrillated and extruded nets are replacing traditional baler twine for wrapping modern circular bales. Capillary non-woven matting is used in horticulture to distribute moisture to growing plants. Seeds themselves can be incorporated into such matting along with any necessary nutrients and pesticides.

The bulk storage and transport of fertilizers and agricultural products is increasingly Undertaken using woven polypropylene FIBCs (flexible intermediate bulk containers – big bags) in place of jute, paper or plastic sacks. Today, modern textile materials and constructions have helped to increase the strength, lightness and durability of traditional products, as well as open up completely new markets.

Fibers used for Agro Textiles

Man made (synthetic) fibers are preferred for agricultural product than the natural fibers due to their high strength, durability and other suitable properties of agricultural applications. On the other hand natural fiber based agro-textiles not only serve the specific purpose but also after some year degrade and act as natural fertilizers. Fibers used in agro-tech sectors are as follows:

Nylon	Polyester	
Polyethylene	Polyolefin	
Polypropylene	Jute	
Wool	Coir	
Sisal	Flax	Hemp

Though man made fibers (like poly-olefins) are preferred for agro-textiles than the natural fibers mainly due to their favourable price performance ratio, light weight with high strength and long service life, but natural fibers can be used in agro-textiles in some specific arena where characteristics like high moisture retention, wet strength, biodegradability are effectively exploited.

Properties Required for Agro-Textiles

Tensile Strength: The tensile strength of shade nets can be a deciding factor of its long term durability and service life. Hence good tensile strength is necessary parameter for shade nets. **Withstands Solar Radiation:** Agro textiles are laid over the cultivated areas immediately after sowing or planting. For such application Agro-textiles has to withstand solar radiation with varying surrounding temperature.

- **Withstands ultraviolet radiation:** The Non visible radiations include ultraviolet radiations (UV) radiation leads to degradation of molecular chains. No single material is resistant to all radiations .polypropylene and polyester are more resistant to UV radiations when used as an outdoor material, polyethylene is treated with the appropriate UV stabilizers. Potential to reduce the impact of UV radiation on plants by light absorbing or light-reflecting non-woven (light permeability: 80 to 90% to allow photosynthesis to take place).
- **Bio degradability:** Natural fibers like wool, jute, cotton are also used where the bio-degradability of product is essential. Natural polymer gives the advantage of bio-degradation but has low service life when compared to the synthetics.

- **Abrasion Resistance:** The abrasion to which a shade net is subjected may be of the material itself (material to material) or stray animals .abrasion of the shade net would result in holes though which animals and pests could enter the structure and harm the crops .good abrasion resistance is required of shade nets.
- **High potential to retain water:** This is achieved by means of fiber materials which allow taking in much water and by filling in super-absorbers. While non-wovens meant for the covering of plants show a mass per unit area of 15 to 60 gm/m2, values between 100 and 500 g/m2 are reached with materials for use on embankments and slopes.
- **Protection property:** It must have the properties of protection from wind and creation of a micro-climate between the ground and the non-woven, which results in temperature and humidity being balanced out. At the same time, temperatures in the root area rise. This is what causes earlier harvests, sufficient stiffness, flexibility, evenness, elasticity, biodegradability, dimensional stability and resistance to wetness. Fungicidal finish (up to 2% of the total mass), which avoids soil contamination.
- **Resistance to microorganisms:** It must resistant to microorganism to protect the living being.
- **Stable construction:** The construction must be such that it must be stable for any application.
- **Lightweight:** The weight of the fabric should be such that it will bear by the plant.

Applications of Agro-Textiles

1. **Agro-textiles for production of crops**

   The selection of Agro-textile product is depends on crop needs. Selection of the agro textiles is also greatly influenced by the geographical location. Some of the applications of agro textiles are as follows:

- **Sunscreen:** The Warp-knitted nets are used in order to protect fields and greenhouses from the intense solar radiation for healthy plant growth and good harvest. Sunscreen nets with open mesh construction are used to control sunshine and amount of shade required. These net fabrics allow the air to flow freely. So the excess heat does not built up under the screen. The percentage of shadow varies according to the density of threads. The current offer 45%, 65% & approximately 85% shadow.
- **Bird protection nets:** Knitted monofilament nets (Open knitted nets for crop protection) offer effective passive protection of seeds, crops and fruit against damage caused by birds and a variety of pests. Open-mesh net fabrics are used as a means of protecting fruit plantation. The special open structure repels birds, provides minimal shading and excellent air circulation - allowing plants to flourish, whilst avoiding the risk of dangerous mold developing on the fruit. These net are strong yet lightweight and protect the fruit without restricting plant growth. The use of polyethylene tape yarns or mono filament yarns makes the net extremely durable and hard-wearing.
- **Plant net:** Fruits, which grow close to the ground, can be kept away from the damp soil by allowing them to grow through vertical or tiered nets in order to keep the amount of decayed fruit to a minimum. These are made from polyolefin type of fiber.

- **Ground cover:** Ground cover is an extremely versatile landscaping and horticultural fabric for long-term weed control, moisture conservation and separation. It effectively suppresses competitive weed growth, conserves ground moisture, maintains a clean surface, protects from UV rays and creates a favorable environment for healthy plant growth. Ground covers can reduce the costs and minimizes undesirable herbicide use. It is mainly used in Borders & rockeries, nursery display areas, greenhouse floors, soft fruits beds & orchards, paved areas, horse bridleways & seed harvesting areas. 100% polypropylene is used.
- **Windshield /Wind protection nets/Wind-breaks:** Windshields are used in farming to protect fields of young plants, fruits, trees or the harvest from being damaged by the wind. Erecting wind-breaks at right angles protects the young seedlings and the mature plants from dying out and being broken. The nets used here reduce the effects of high winds and even help to keep out airborne sand and salt in areas close to the sea. Protecting plants from high winds also encourages plant growth and reduces the number of irrigation cycles required. It also prevents plants being cooled by wind too.
- **Root ball net:** It is extremely important for safe and speedy growing of young plants such that root system is not damaged when they are dug up, transported or replanted. Normally the root balls are wrapped in cloth. Elastic net tubes are alternative to this. When the plants are transplanted, the nets on the outside do not have to be removed since the roots can protrude through the nets.
- **Insect meshes:** Various pests like Whitefly, scale insects attack some ornamental plants and vegetables frequently. Clearly, woven and knitted polyethylene monofilament meshes to exclude harmful insects from greenhouses and tunnels, or to keep pollinating insects inside, The fine woven screens protect plants from insect attack (without the use of insecticides).
- **Mulch mat:** Mulch mats are used to suppress weed growth in horticulture applications, It covers the soil, blocking of light and preventing the competitive wheat growth around seed links, This also reduces the need for herbicides required for weed control Needle punched non-woven and black plastic sheet are used for this application, Bio degradable and non-biodegradable types of mulch mats are available.
- **Monofil nets:** Tough, knitted Monofil, nets for windbreak fences and shading/ privacy screens, A suitable windbreak, set at a right-angle to the prevailing wind, will protect plants against the harmful effects of blustery weather - which can break young branches, damage flowers and cause leaves to dry or tear. The nets also protect against frosts and help enhance the micro-climate. This not only safeguards the current harvest but also benefits future crops, since the woody part of the plant are protected too.
- **Cold and frost control fabrics:** Cold and frost fabric can be laid directly on the plants, unlike plastic covers that can attract frost, and burn any leaf that touches them. These fabrics protect the plant from frost kill during unexpected late cold snaps and unexpected early ones.
- **Nets for covering pallets:** For safe transportation of fruits and vegetables to the market the boxes are covered with large mesh nets and pallets to stop the boxes being turned upside down. This prevents damage of goods during transportation.

- **Anti-hailstone nets:** Anti-hailstone nets are used to cover plants and fruit orchards to protect them from being damaged by hailstones, but does not restrict their growth. The nets are primarily made from polyethylene monofilaments.
- **Harvesting net:** It is extremely helpful to those countries where labour charges are costlier. With the application of such nets for harvesting purpose, the labour cost could be reduced considerably. They are laid on ground or tied under the trees so that fruits fall directly on to them.
- **Packing materials for agricultural products:** Nets can be used for packaging of farm products for many end uses. It includes packing sacks for vegetables, tubular packing nets for fruits and wrappers for Christmas trees, Net structures are preferred because of their high strength, low weight, air permeability and cheapness.

2. Agro-Textiles for Horticulture & Floriculture

Application of textile materials in horticulture is growing fast. Nets, non-woven mats, movable screens for glass/poly houses, non-woven sheets, mixed bed for mushrooms, cordage and strings are used in horticulture. Nets are also used for protection against hailstorms, intense sunrays, etc. Light resistant woven and non-woven polyester fabrics are used in the inside of green house to protect the plants from extreme hot or cold conditions. They are also used on the outside of the green houses as screen to control sun light.

Some of the agro-textiles that are used frequently for horticultural & floriculture use are as follows:

- Hail protection fabrics
- Mulch net
- Rain protection fabrics
- Wind control fabrics
- Harvesting nets

Conclusion

Agro-textiles decrease the requirement of fertilizers, water, harmful pesticides and herbicides and render a healthy farming culture and are an eco-friendly technique. They prevent the soil from drying out increase crop yield. Thermal protection textiles are treated with ultraviolet ray stabilizers & it can save up to 40% on energy in heating greenhouses. Their use prevents staining and improves uniformity of color. They increase the early maturing of crops and non seasonal plants & protect from climatic changes and its effect. Agro textiles avoid branches from breaking, increase the cleanliness of the crop, make harvesting easy & give large space. Agro textiles for its excellent environmental resistance, mechanical properties, easy process ability and durability characteristics can improve quantity, quality and safety of agricultural products.

References

Books

1. Agro-textile Products & Their Usage By- Mrs. Manisha A. Hira Scientist C Sasmira, Mumbai

Links

1. http://www.textilemedia.com/technical-textiles/new-textile-materials/agrotextiles/
2. http://www.textileworld.com/Issues/2005/September/Nonwovens-Technical_Textiles/Agrotextiles-A_Growing_Field

AYURVASTRA: A NOVEL COMBINATION OF AYURVEDA AND TEXTILES - A REVIEW

M. Isai and J. Viji
Assistant Professor, Research Department of Zoology,
Seethalakshmi Ramaswami College (Autonomous), Tiruchirappalli

Abstract

Ayurvasthra is a branch of India's ancient form of medicine, Ayurveda. Clothes have fulfilled a variety of functions like awarding protection and warmth to being a symbol of fashion statement as of today. In the recent years, due to increase in health related issues, the collaboration between medical personnel and textile chemistry technologists has led to the evolution of innovative medical and functional applications for textiles. Now a day, the demand in enhancement of beauty through healthy and eco-friendly manner. Now people prefer apparels with additional functions like imparting fragrance, maintaining freshness, leading to a smart appearance, and also helping in maintaining a healthy life by using herbals. The herbal extracts have been found to be used for curing ailments. This is achieved by the addition of cosmetic and pharmaceutical herbal ingredients into the clothing, which then they enter into the body through the skin by the natural movements. Thus the skin is refreshed, revitalized and cured. Ayurvasthra cloth is used by Ayurveda health clinics in the treatment of various diseases like diabetes, skin diseases, eczema, psoriasis, hypertension, blood pressure, asthma and other health problems. The Ayurvasthra reinforces the importance of sustaining the earth for future generations and for the well-being of the current generation using age old practices, which do not add up to global warming but helps in minimizing it. It is expected that unique technology and thereby opening a novel area of entrepreneurship, job orientation and economic stability will be welcomed by the society as a whole.

Key Words: *Ayurvasthra, Textiles, Technology, Medicinal Plants and Cloths.*

Introduction

Humans are basically and intellectually different from other living beings, due to the exceptional development of their brain-cells. This difference in the primates led to different discoveries in all the spheres leading to their initial survival and later on to gaining control and supremacy on all other living beings. Hence even an eight ton elephant obeys all the commands of his keeper who is even less than one percent of his body weight and so nowhere near his physical strength (Farida and Bhumika, 2015). Adaptation of covering the bodies is evident even in ancient uncivilized humans by plant leaves and bark or shell. This may be due to defending their bodies from the attack by other organisms and animals. Improvement in civilization led to proper covering of the bodies, and out of various sources man found natural cotton to provide a good and durable covering. Work on this aspect of usage of cotton for the benefit of mankind has been refined in all these years to near perfection (Farida and Bhumika, 2015). Since all these years, modifications have been brought about in various processes to make the cotton fabric more comfortable to the wearer. Evolution of Ayurvasthra can be very safely considered to be one such modification (Farida and Bhumika, 2015). Ayurvasthra is a sanskrit word meaning "Life Cloth to develop as a branchof Ayurveda. Ayurvasthra is an ancient technique of dyeingtextiles using medicinal herbs. The concept of Ayurvasthra was practiced in India before the

industrialization of the textile industry. Even today, in some parts of the south India, ayurvedic herbal dyed clothes are used to carry a new born child, which will act as an antibacterial barrier for the new born. An evidence stated that these clothes were used as a medium for ayurvedic treatment, as the skin received the medicinal benefits of these herbs through the exposure clothing, bedding or coir mats. The Ayurvasthra concept was revived through a project submitted to the Government of Kerala, South India by a Weavers Society in Kerala and further developed and researched by the Ayurveda University of Kerala. Since 1992, the Weavers Society has been refining the Ayurvasthra Technique to make eco fabrics suitable for modern use and to create different colors depending on the plants or herbs used for various health benefits. Ayurvasthra fabrics are 100% organic completely free of synthetic chemicals, toxic irritants and are biodegradable. The colour of the fabric is derived from the medicinal plants and herbs that are wild-crafted and organic, having specific health or wellness benefits proven by both traditional knowledge as well as clinical research (Rangari *et al*., 2012 and Vastra Website).

How Ayurvasthra Works

As the body's largest organ, the skin functions as a protective barrier but also a conduit for outside substances to enter the body. In the same way that the skin may absorb environmental toxins and chemicals from conventional clothing, it has the ability to absorb herbs found in our natural dyes. These herbs provide their medicinal qualities into the body and strengthen the skin's ability to block and resist harmful substances (Jyothirmai and Sasmita Pandey, 2016 and Rangari *et al*., 2012).

Fabric used to prepare Ayurvasthra

Most common fabric used is organic cotton, the cotton which is cultivated without chemical pesticides and fertilizers.

Fibers used to prepare Ayurvasthra and its herbal applications:

1. Cotton and Silk: Bed sheets, nightwear for children and adults.
2. Wool: Woolen clothes, mats.
3. Coir and Jute: Carpets, rugs, mats and
4. Hand loom produce: Shawls, blankets, dhotis.

Hence it can be safely concluded that Ayurvasthra is the doctor of future, unlike allopathic doctors who prescribe medicines after infliction of a disease, act before hand to prevent the infliction of different diseases (Jyothirmai and Sasmita Panda, 2016 and Rockefeller, 2015).

Health advantages of using Ayurvasthra

Each fabric is infused with specific herbs which are known to cure allergies Ayurvasthra is extra smooth and good for transpiration that help in recovering various diseases. It may help to treat a broad range of diseases skin infections such as eczema and psoriasis the fabric also helps with conditions such as rheumatism, arthritis, blood pressure, diabetes and respiratory conditions, such as asthma, sleeping disorders. It also helps in boosting immunity. The Anti - bacterial and anti-inflammatory properties of Ayurvasthra extends its use as dressings and bandages. It can also relieve general body aches, stimulate weight loss, and strengthen the immune system. It can also be used as energy booster, mood enhancer, for overall

well -being, calming, and blood purification and cooling. (Rangari *et al*., 2012 and Jain, 2010). The most effective time to wear Ayurvasthra clothing is when the body is most at rest, such as during sleep, relaxation or ameditation because this is when the body is naturally healing and re-establishing balance. Hence most of products from Ayurvasthra are sleepwear, bed sheets, towels, meditation clothes and cotton mats (Jain, 2010).

Herbs used to achieve colours

Around 200 herbs are used to achieve various colors of Vastra clothing. Each color produced from a preparation that typically contains one or more pre-dominant plant/herb, like Turmeric in Turmeric clothing along with 40 or more others, which are specifically blended and carefully prepared from medicinal herbs, plants, flowers, roots and barks (jyothirmai and Sasmita Panda, 2016).

Table 1: Colors and plants

Source: Jyothirmai and Sasmita Panda (2016)

S. No	Color	Plant
1	Red	Sandalwood, Safflower, Madder Root
2	Blue	Indigo, lime, Jaggery
3	Yellow	Pomegranate Rind, Turmeric, Marigold, Saffron
4	Orange	Safflower, Madder Root, Marigold
5	Green	Pomegranate, Indigo, Neem, Amaltas, Turmeric
6	Brown	Cateccu, Lai Kashish, Henna
7	Black	Iron Scrap, Jaggery, Peanut Oil, Castor oil

By using the basic colors (blue, yellow, red) all the other colors will be achieved (Jain, 2010). Depending upon herbs mixed in dye bath, fabric obtains different medicinal qualities. Diabetes has been observed to have been controlled by a combination of the herbal dye with shoe flower, cumin seeds, champa flower and *Mimosa pudica*. Similarly curry leaves blended in the herbal dye are beneficial in curing arthritis; whereas sandalwood, turmeric and neem are beneficial in case of skin diseases (Farida and Bhumika, 2015).

Dyeing Procedure

Natural fibers and organic cotton will be used to prepare Ayurvasthra. Dyeing process includes Bleaching, Desizing / Gumming, Mordanting, Dyeing (Medication) and finishing (Kolte*et al*., 2015).

Bleaching

The fabric or yarn is first bleached using cow urine, milk, honey, along with biodegradable, naturally derived, organic cleaning agents and surfactants like Saptala (*Acacia sinuata*), Phenila (*Sapindusmukorossi*) *etc.,*(Jyothirmai and Sasmita Panda, 2016 and Deepak *et al*., 2102). The process ends with exposing the fabric or yarn directly to the sunlight.

Desizing / Gumming

The washing of fabric or yarn with natural mineral-rich water and sea salts to remove gums and oils (Kolte *et al*., 2015).

Mordanting

This is performed before dyeing the fabric or yarn to make the colors bright and fastby using natural mordants like Lodhra (*Symplocos racemosa*), Kenduka (*Diospyrose ebenum*), and fruit extracts of Haritaki (*Terminalia chebula*) etc., (Jyothirmai and Sasmita Panda, 2015 and Jain, 2010).

Dyeing (Medication)

The word medication is used instead of dyeing because the medicinal herbs are used to obtain required natural color to fabric or yarn (WWW.handloomswavers.com; WWW.vastra.us and Jyothirmai and Sasmita Panda, 2015).

The yarn or fabric is then medicated in a carefully controlled mixture of herbal medicine preparations called Kashayas (concoctions) depending upon the disease or ailment being treated. The temperatures of the dyes, the duration and number of the dye soaks, the blend of herbs, and even the equipment used carefully controlled. Required herbs are applied directly to the fabric with the help of natural ingredients, so as to keep the medicinal value of herbs intact (Jyothirmai and Sasmita Panda, 2016; Kolte *et al.,* 2015 and Jain, 2010). The fabric is left to dry for 3 days after dyeing in a shade and then kept ina room for 15 days for "seasoning," a period of time that allows the fabric to dry completely and the Kashaya to settle in to the fabric. It is then washed and dried in the shade and kept for seasoning for another 15 days. (Jyothirmai and Sasmita Panda, 2016 and Rangari *et al*., 2015).

Finishing

Finishing is done by sprinkling pure water on the cloth and then stretching under pressure, using hand rolls, aloe vera, castor oil etc., (Jyothirmai and Samita Panda, 2016 ; Kolte *et al*., 2015and Jain, 2010). After the dying, residue will be recycled. The entire process is organic. It does not pollute the environment like synthetic dyes. Solid and liquid waste is separated through the process of filtration and used for farming purposes - as manure and for watering the fields and the waste is used as bio-manure and also to generate bio gas (Jyothirmai and Sasmita Panda, 2016 and Kolte *et al*., 2015).

Antimicrobial finish

Cotton fabrics by their water absorbent capability, absorbs human perspiration, thus increasing the comfort feel of the wearer. The humid Indian climatic conditions lead to perspiration which is an excellent ground for the growth of microorganisms, which is not visible to the human eye, but shows its presence by the foul odor emitted from the fabric. This has to be curbed by the application of antimicrobial finishes on to the fabric during the final processing stage to impart better antimicrobial properties to it (Rangari *et al*., 2015). Antimicrobial finishes are generally prepared from inorganic/organic products, which are costly to manufacture as they require a large amount of energy sources, causing permanent depletion of these sources and also man power. Nowadays the trend is towards the use of plant based products to act as good antimicrobial agents (Rangari *et al*., 2015).

Research in this aspect has led to the manufacture of products from naturally available plants like M*icheliaalba*. The leaves of the plant were cleaned with water, dried in shade, and then ground to a fine powder. The powder was then soaked in methanol in a closed container overnight to let dissolve the natural ingredients in the solvent. The solution was then filtered, and the alcohol in the filtrate was allowed to evaporate in air, thus obtaining a condensed extract. This extract was then added to water in proper proportions, and it is applied on to the fabric by a bowl padding mangle, followed by drying at 80-100 °C, and later on curing in dry heat at 120-130 °C. This imparts wash durability to the fabric to certain washings like 50-100 which are quite sufficient to last to the service life of the fabric. The antibacterial/antifungal property was checked by taking a required amount of dry powder with methanol. The extract was finished on the fabric by dip dry method and tested for its Antimicrobial activity on *Staphylococcus*, *Escherichia coli* and *Aspergillus niger* against some conventionally available products. The tests have shown the plant extract based antimicrobial agent to have an upper hand compared to its conventional counterpart in curbing microbial growth of the above mentioned organisms (Rangari *et al*., 2015).

Table 2: Herbal Plants used in the production of Ayurvasthra and their medicinal properties

S. No.	Medicinal Products	Medicinal Properties
1	*Aloe vera/Ghritkumari (Aloe barbadensis)*	Highly effective in cure of infections, wounds and burns, HIV/AIDS
2	*Brajil wood / Pathan Bakkam (Caesalpinia braliensis)*	Acts as a blood purifier, thus improves complexion and also cures various skin diseases.
3	*Castor/Rendi (Ricinus communis)*	The oil contains strong insect repellent properties, maintains temperature of the skin, thus facilitating body transpiration.
4	*Cateccu / kattha (Unsaria gambir)*	Controlling the occurrence of pimples
5	*Harad (Terminalia chebula)*	Acts as antiseptic and due to its excellent blood purifying properties, curb dermatitis
6	*Chireta/ Chirayata (Swertia chiraata)*	Cures various skin diseases
7	*Cumin / Jeera (Cuminum cyminum)*	Oil from its seeds is effective against eczema.
8	*Golden Champa / Champa (Michelia champaca)*	Excellent in getting relief from burning sensations from skin diseases, allergices and sores. It imparts yellow colour to the fabric when its flowers release the same on boiling.
9	*Guar Gum / Guar (Cjamopsis tetragonaloba)*	It regulates body transpiration, curbs body infections
10	*Henna / Mehndi (Lawsonia inermis*	Henna is age-old blood purifier, with anti-irritant and deodorant properties. It is also a good antiseptic, hence is used for skin irritations, rashes and allergies caused by the extreme Indian heat, simultaneously cooling the body.
11	*Indian Basil / Tulsi (Ocimum sanctum)*	Controls viral and bacterial infections. Its essential oil is an antiseptic and insect repellent property, while paste of its root gives relief from bites and stings.
12	*Indian Gentian / Kalmegh (Andrographis paniculata)*	A good blood purifier and anti-viral substances

13	*Indian Gooseberry / Amla (Emblica officinalis)*	It is a rich source of Vitamin C. Due to its antioxidant properties, it stimulates healing due to fungal, bacterial and viral attacks and stimulate the body's immune system
14	*Indian Madder/Madder (Rubia cordifolia)*	It curbs blood impurities and gives relief from various skin diseases.
15	*Indian Mulberry, Noni / Al (Morinda dtrifolia)*	The dye obtained from root bark imparts a yellow, reddish purple and brown hue in making batik prints on cotton, wool and silk. It has good blood purifier properties and stimulates wound healing.
16	*Indian Podophullum / Bankakadi, Nirbash (Podophyllum emodi, Podophyllum hexandrum)*	Its rhizome is used in curing skin diseases, cuts and wounds.
17	*Indigo/Neel (Indigofera tinctoria)*	It has antiseptic, anti-allergic properties, so is effective in curing skin diseases
18	*Lime/Nimbu (Citrus medica)*	It is a powerful disinfectant and an astringent against sebaceous secretions. A mixture of lime juice and rose water is a popular body coolant and skin tonic.
19	*Long pepper / Pippali (Piper longum)*	Its fruit is used to cure leprosy.
20	*Mahua/Mahuva (Madhuca longifolia, Madhuca indica)*	The bark, leaves, flowers and seeds are used for varied medicinal purpose. Decoction of the bark is applied in curing itch; the seed oil is efficacious in treating skin ailments. It is administered internally in diabetes. Leaves being astringent, their ash mixed with butter is applied on burns and scalds.
21	*Marigold / Genda, Zergul (Calendula officinalis)*	Flowers promote skin health; used to cure skin disease
22	*Margosa (Azadirachta indica)*	It has good antiseptic and disinfectant properties; its stem bark, leaves and root bark act as blood purifier and is useful in many skin ailments like eczema, psoriasis, rashes, leprosy. Also soothes scabs with clearing away scars.
23	*Monkey Face Tree / Kamala, Kamela (Mallotus philippinensis)*	The red glandular and hairy substance separated from the fruits is used as anti Uergenic, and astringent to cure scabies, cutaneous infections and to destroy tapeworms and ringworms.
24	*Onion I pyaaj (Aluum cepa)*	Its helps to give relief from skin disease.
25	*Peanut oil / Mun^hali (Arachis hypogea)*	It promotes body freshness.
26	*Pomegranate / Anar (Púnica granatum)*	It is effective in providing relief from tapeworms by paralyzing them, thus they are easily expelled from the body. The plant is also rich in tannin, which makes it an effective astringent. The bark has prominent antibacterial, antiviral and astringent properties.
27	*Rose / Gulab (Rosa damascena, Rosa centifolia)*	Rose water and oil are good astringent to clean and tone up the skin.
28	*Safflower / Kusum (Carthamus tinctorius)*	Finds application in skin care; Florets and seeds release red and yellow dyes for application on cotton and wool fabrics.
29	*Saffron / Kesar (Crocus sativas)*	Cure pimples and gives relief from rashes
30	*Sandalwood / Chandan (Santalum album)*	It gives cooling sensation to skin, and maintains skin health. It has antiseptic, anti-inflammatory and Styptic properties, capable of stalling local bleeding in cuts wounds; helps in curing skin itching, prickly heat, burns and heat rashes.
31	*The Indian laburnum / Amaltas (Cassia fistula)*	Its leaves, stem bark, and fruit pulp have antibacterial properties. The root possesses antifungal activity and the essential oils extracted from various parts of the tree promote antiviral properties. The bark and leaves

		are ground into a paste to treat chronic skin infections.
32	*Tinospora / Gelqy (Tinospora cordifolia)*	Its root and bark are used to cure various skin disease
33	*Touch-me-not / Chhui-Mui, Lajwanti (Mimosa púdica)*	The roots, leaves and flower heads have medicinal properties, rendering it suitable in treatment of leprosy, inflammations,burning sensations
34	*Turmeric / Haldi (Curcuma longa)*	It contains curcumin having bactericidal, antiaUergenic, antiseptic and anti-inflammatory properties. Curcumin is also responsible for the bright yellow color of the turmeric. Acne, skin ulcers and wounds are rapidly healed by the application of turmeric paste due to its antiseptic properties. It cleans and disinfects the skin with a moisturizing effect by retaining its natural oils. Effective in the treatment of HIV / AIDS due to it creating anti-agents.
35	*Woad Vat / Palash (Butea monosperma)*	Its flowers have astringent properties, thus cure various skin diseases. The red colored gum called Bengal kino or butea gum and the seeds are used in treatment of roundworms and tapeworms.
36	*Indian Basil / Tulsi (Oscimum sanctum)*	Effective in the treatment of HIV /AIDS.
37	*Winter Cherry, Indian ginseng / Ashwagandha (Withania somnifera)*	Effective in monitoring health and prolonging longevity. It is also a most important components in HIV / AIDS treatment due to the presence of alkaloids: Withanin, Somniferine.

Sources :Deepak *et al*. (2011); Rangari *et al*. (2012); Kolte *et al*. (2015); Farida and Bhumika (2015) and Jyothirmai and Sasmita Panda (2016).

All these herbs give the magical healing quality to the dyed fabric or yarn (Jain, 2010; Deepak, 2011 and Kolte *et al*., 2015). There are many natural/ herbal products which show antimicrobial properties. The extracts from different parts of diverse species of plants like roots, flowers, leaves, seeds, etc. exhibit antibacterial properties (Joshi *et al*., 2009 and Naik *et al*., 2007). Herbal compounds like phenolics, terpenoids, flavonoids, alkaloids, polypeptide, poly-acetylenes, etc. which are antimicrobial. Some of these act as bactericides and some acts as bacteriostatic (Cowan, 1999). The use of herbal medicated products helps to reduce the opportunity for contamination by biological toxins and infectious pathogens and therefore reduce the spread of diseases to other patients (Massey*et al*., 2008). Fabric Performance Testing Research is also being done to check the changes in the performance properties and features of the fabric after herbal dye application. The warp and weft tensile strength, elongation and tearing strength are the main factors of concern, as any deterioration in these values will render the fabric unsuitable for clothing. The second aspect of concern is the air permeability of the fabric, with a soft handle/finish, which should remain as high as possible in order to satisfy the comfort feel of the wearer. Color change is also a factor that has to be kept in mind, as dulling or change of tone of the original color will also render the fabric to be unacceptable due to aesthetic reasons. The last main factor is the washing fastness of the herbal dyes. On repeated washings, it has been observed that the applied herbal dyes tend to bleed off the fabric, particularly at certain portions of the fabric where the fabric comes in constant direct and abrasive contact of the skin of the wearer. This leads to dark-light fading patches on the garment, making it unacceptable in terms of

aesthetic value, as well as simultaneous drop in the medicinal effect it is intended to impart to the wearer.

Hence, it can be safely concluded that this drawback of durability is the topic of main concern which requires to be addressed on priority basis (Jyothirmai and Sasmita Panda, 2016 and Nair, 2004).

Ayurvasthra Advantages:(Jyothirmai and Sasmita Panda, 2016; Rangari *et al.*, 2012 and Deepak *et al.,* 2011)

- Ayurvasthra has positive results on improving health condition.
- Use of herbal material in the process of dyeing , do not release any pollutants in the nature, thus the process is completely eco- friendly
- Use of herbal dyes improves the aesthetic quality of the cotton fabrics in eco-friendly way.
- Herbal fabrics are light and make for perfect breezy clothes. The best part of cotton herbal cloth is that it is super-cool in summer and warm in winter.
- The shades produced by naturally developed dyes are unique.
- The Unique flavor of the ayurvasthra enhances the mood.
- People with allergies and chemical sensitivity especially benefit from organic cotton clothing, as conventional cotton may retain harmful toxic residues. Even if an individual don't have sensitive skin, organic cotton will just feel better against the skin.
- Natural fibers and natural dyes used in preparation of ayurvasthra, allows its natural breakdown without damaging environment compared to the synthetic material which takes hundreds of years to breakdown and leaves pollutant material in soil.
- The production cost is low; hence the ayurvsthra price is less can be reached to many parts of the world.

Ayurvasthra Drawbacks:

- Natural Fabrics and dyes are poor substitutes for synthetic colors in terms of range and variations.
- Washing care is very crucial to retain its color and its herbal benefits, Need be washed separately, preferably hand wash or gentle machine wash, need to by dried only in shades. Need to use bleach free detergents. This makes very difficult for the consumer.
- The process is very complex, time taking and each stage of the dyeing process need to be done in controlled conditions.
- As the colors are achieved only by using medicinal herbs, all colors can't be given to all the diseases. Hence consumer needs to compromise on his/her color preference.
- Although Ayurvasthra showed positive results, they would not show quick results.
- Though there are no complaints on allergic reaction by the consumers, some people think that the ayurvasthra show side effects on children.

References

1. Farida, P. M. and Bhumika, S. 2015. Ayurvastra: An Innovative Alliance of Ayurveda and Textile: A Review. Sch. J. App. Med. Sci., 3(2): 925-931.
2. Rangari, N. T., Kalyankar, T. M., Mahajan, A. A., Lendhe, P. R. and Puranik, P. K. 2012.Ayurvastra: Herbal Couture technology in Textile. Int. J. Res. Ayur. Pharm. 3(5): 733-736.
3. www.vastra.us
4. Jothirmai, S. and Sasmitha, P. 2016. Ayurvastra- Herbal Clothing.A new Technology to heal naturally.IJARIIE. 2(4): 1166-1171.
5. Rockefeller. J .D (2015).An introduction to Ayurveda and its benefits. J. D Rockefeller.
6. Jain, M. 2010. Ayurvedic Textiles: A wonderful approach to handle health disorders. Colourage. 57(10): 45 -52.
7. Kolte, P.P., Shivankar, V.S. and Ramachandran, M. 2015. Herbal Clothing - An Ayurveda Doctor.REST Journal on Emerging trends in Modelling and Manufacturing. 1(1):26 –31.
8. Deepak, K., Abhishek, S., Raghav, V., Dharmendra, G. and Abhishek, K. 2011. Herbal textiles: Green business, green earth!!!.Colourage. 58 (4): 54 -60.
9. WWW.handloomswavers.com
10. Banupriya, J. and Maheshwari, V. 2014. Comparison between herbal and conventional methods in antimicrobial finishes. International Journal of Fiber and Textile Research. 4(2): 41-43. 3
11. Joshi, M., Wazed Ali, S. and R. Purwar, 2009. Ecofriendly antimicrobial finishing of textiles using bioactive agents based on natural products. Ind. J.Fibr.Text. Res., 34: 295-304.
12. Cowan, M.M., 1999. Plant products as antimicrobial agents.Clin.Microbiol. Rev., 12: 564-582.
13. Massey, D., Geol, P. and M. Swerev, 2008.Antimicrobial Finishes and Modification.Melli and Intl., 551-555.

LIVING CONDITIONS OF TEXTILE MIGRANT WORKERS HOUSEHOLDS IN TIRUPUR

Dr. J. Indirani

Assistant Professor, Post Graduate and Research Department of Economics, Seethalakshmi Ramaswami College, Tiruchirappalli

Abstract

At present, migration of people from rural to urban is not for improving their economic conditions or well-being like earlier. Instead of that, now people from rural areas are migrating towards urban due to the livelihood threats and vital issues like displacement risks, landlessness, homelessness, marginalization, food insecurity, community disarticulation, loss of access to common property resources. These livelihood threats and vulnerability directly or indirectly force them to migrate to urban areas for searching opportunities for their livelihood. This paper attempts to explore the living conditions of migrant textile worker's households in Tirupur with help of primary data collected from 200 migrant households in Tirupur by using systematic random sampling. The researcher carried out this study to collect the data to using interview schedules, observation and FGD techniques and collected data was analysed by using SPSS.

Key Words: *Migration, Livelihood, Textile, Amenities, Living Condition*

Introduction

The International Research Centre's study observes that migration is associated with a phase of person's life cycle (IDRC, 1973). The economic and family conditions force a rural youngster to migrate (Schultz, 1971; ISI, 1962; Singh, J.P 1980; Singh and Yadav, 1981; Singh and Sharma, 1998). Several research studies show that the rural outmigration concentrates extremely heavily on villagers aged 15-30 years. As such it could be expected that youngsters constitute a major proportion among migrants.

In India among migrants female are predominant. The phenomenon is more found in the case of migrants from rural areas. That is the percentage of female migrants to total migrants from rural areas is much higher. Tamil Nadu also follows the same pattern that two thirds of rural migrants are female (Census, 2001). Many of the studies on migration point to the high degree of educational selectivity in migration patterns. The tendency to migrate increases with the acquisition of educational qualifications, though (unlike the young or the male), the educated comprise a minority of total migrants from most areas. But in case of Tiruppur one would expect a large inflow of less educated. Because, many of the industrial units such as dyeing, printing and processing in Tiruppur garment industry require least skilled manpower (Neve, 2004).

The composition of migration means migrants migrate alone (male only, female only, child only) or a family (husband, wife and children) from native region to another region. Analyses based on the Census of India (2001), 29.0 per cent were youth, males (27.0 per cent) and females (30.0 per cent) and the same is true for both men and women as well as for rural and urban areas. The migrants among children (0-14 age group) may be due to the inclusion of children, who moved immediately

after birth or moved along with family members (Irudhaya Rajan, 2013). Children migrate with their parents namely whenever both men and women migrate as a family unit (Srivastava, 2011). At present, migration of people from rural to urban is not for improving their economic conditions or well-being like earlier. Instead of that, now people from rural areas are migrating towards urban due to the livelihood threats and vital issues like displacement risks, landlessness, homelessness, marginalization, food insecurity, community disarticulation, loss of access to common property resources. These livelihood threats and vulnerability directly or indirectly force them to migrate to urban areas for searching opportunities for their livelihood.

This paper attempts to explore the living conditions of migrant textile worker's households in Tirupur with help of primary data collected from 200 migrant households in Tirupur by using systematic random sampling. The researcher carried out this study to collect the data to using interview schedules, observation and FGD techniques and collected data was analysed by using SPSS.

Living Status of Textile Migrant Workers

The data on status of living of migrants at Tiruppur are shown in Table.1 and Table 2. Nature of house, type of house, number of rooms, kitchen, windows, fuel used for cooking, toilet, bathroom, facility for washing clothes, water supply, telephone and cable availability are considered under this. In Tiruppur, there are individual houses rented out. There are also cluster houses which are popular. It is a setting where small portions are made either by wall or sheets and around 10 houses are made in a house site which is constructed with compound wall. The so called houses are very smaller ranging from 80 square feet to 120 square feet. The type of house in which migrants dwell is ascertained here. As table.1 reveals most (91.0 per cent) of the respondents are living in cluster houses and only 9.0 per cent are living in independent houses. The houses are classified based on the nature of roof of house as shown in Table.1. A higher proportion of migrants are living in tiled house (67.0 per cent) followed by concrete roofed house (25.0 per cent), asbestos roofed house (6.5 per cent) and thatched house (1.5 per cent). Based on the data and further probing the following observations are made. As flow of migrants to Tiruppur started increasing, residents of Tiruppur city started constructing their houses in such a manner to rent out to the incoming migrants. Majority of these houses are tiled and concrete houses. Asbestos roofed and thatched houses are small in number. Migrants who can afford to pay a fixed amount of rent are staying in tiled house and migrants who can afford to pay a little more amount of rent are living in concrete house. Those who cannot afford to pay the fixed amount of rent are staying in asbestos and thatched houses. Nature of house of migrants reflects the poor living condition of migrant workers.

Number of Rooms in the House

Number of rooms in the houses where migrants are living also indicates their living condition. A higher proportion of houses (60.0 per cent) lives in a house of one room, 35.0 per cent in two rooms and only 5.0 per cent with more than '3 and above' rooms (Table 1). Houses with one or two rooms belong to cluster houses category and

houses with '3 and above' rooms belong to the category of independent houses. More migrants are living in houses with one room only, a compact living room cum kitchen.

Table 1 Status of Dwelling

Particulars	No. of Respondents		Percentage
Type of House			
Cluster of House	182		91.0
Independent House	18		9.0
Total	**200**		**100.0**
Nature of House			
Thatched House	3		1.5
Tiled House	134		67.0
Asbestos Roofed House	13		6.5
Concrete Roofed House	50		25.0
Total	**200**		**100.0**
Number of Rooms			
1	120		60.0
2	70		35.0
3	6		3.0
Above 3	4		2.0
Total	**200**		**100.0**
Basic Amenities	**Yes**	**No**	
Kitchen	79	121	39.5
Windows	136	64	68.0
Fuel used for Cooks	193	7	96.5
Gas	133		66.5
Fuel wood	5		2.5
Kerosene	47		23.5
Gas & Kerosene	8		4.0

Kitchen and Windows

The data on kitchen facility show that only around 40 per cent have kitchen. That is kitchen which is mostly one roomed house partitioned with wooden material. But majority do not have even kitchen partition and it is utilized for all purposes such as cooking, eating, sleeping and other common purposes (Table 1). Ventilation facility with windows is necessary for good health of people living in a house. But, little more than two-thirds (68.0 per cent) of houses of respondents under study do not have windows and the only 32.0 per cent are having windows. The data on dwelling condition in terms of kitchen and window show that the condition is worse which poses threat to many health problems to the migrants.

Box.1 Facilities in Cluster Houses

There are many "cluster houses" in Tiruppur city. Some of these houses have windows and it is not available in majority of houses. In the same way, cooking room is partitioned by a small wall or in the sheets in the one room house. Outside this house '*Thinnai*' (structure constructed at the either side of the entrance of the house at a particular height preparing 2 to 3 feet from the ground level) is constructed. Common path for walking is laid between two rows of cluster houses. Stone grinder and '*Ammi'* (traditional instrument used for crushing solid food materials into paste) are placed close to one wall common for the all the houses located in that side of wall. Those who want this facility can use them. Washing stone is placed close to the wall of one side of cluster houses in a planned way such that washed waste water can get into drainage. Members of cluster houses close to the wall can use this washing stone. Tap for drinking water and tap for salt water ('*sappa* water' in local language) for the use of washing vessels/cloths, bathing and toilet are available for all the cluster

houses located within one surrounding wall. Since there is water scarcity in Tiruppur people of Tiruppur city purchase both drinking water and (salt) water for other purposes. Under this situation migrants are compelled to spend sizeable part of their income for purchasing water required.

Fuel for Cooking

Regarding the use of fuel for cooking, two-thirds (66.5 per cent) of migrant households use gas and nearly one-fourth use Kerosene (23.5 per cent). Both Gas and Kerosene are used by 4.0 per cent of respondents and fuel wood by 2.5 per cent (Table 1). Majority (96.5 per cent) of migrants cook food in their houses only 3.5 per cent of migrants take food in hotels. Two-thirds of migrants who use gas reported that it was difficult to purchase fuel wood and kerosene in Tiruppur city. In the sending (rural) area most of these people use fuel wood as it is easily available. They can also get kerosene from public distribution system. Since these opportunities are not available in Tiruppur city more migrants are forced to using gas as fuel for cooking and spending for purchase of gas.

Basic Amenities

Toilet: All the migrants except one migrant have the toilet facility at their house premises (Table 2). Migrants staying in independent houses have separate toilet for their use (17.5 per cent of cases). Most migrants (82.0 per cent) who are residing in 'cluster house' share the toilet that is common. Two to four families sharing a toilet is found in most cases (69.5 per cent) followed by 4-6 families. There are a few cases where a toilet is shared by more than 6 families.

Bath Room: All households of migrants except one household have bath room facility (99.5 per cent). Higher proportions of migrants (82.0 per cent) share the bath room available with other families of the cluster houses. Separate bathroom is available for 18.0 per cent of migrants (Table 2). Migrants living in 'cluster household' mostly share the bathrooms. In that, 2-4 family members sharing the bathroom is found among 70.0 per cent of cases. Nearly 10.0 per cent of migrants share bathroom with 4-6 families. A few respondents share the bathroom with more than 6 families. It may be stated that as most migrants live in cluster houses, they have toilets and bathrooms to be shared with other families residing in the cluster houses. The number of families using ranges between 2 and 4 in most cases.

The reason for this situation is that residents of Tiruppur constructing certain number of 'cluster houses' with one common toilet and bathroom for the use of increasing number of migrants coming to Tiruppur. Both men and women migrants have to leave the house between 7 and 7.30 am for work. Hence, migrants living in "cluster houses" face difficulty in the use of toilet which is available as common to the residence and subsequently for leaving for work. Similar is the condition in case of washing place in the cluster house.

Electric Connection: All the houses of migrants (99.5 per cent) except one house have electricity connection (Table 2).

Water Supply

Except one household, all migrants have household water supply connection. In "cluster houses" the tap is common for the households of migrants just as applicable for bath room, toilet and structure built for washing. Nine per cent of migrants in independent houses have household water supply connection exclusively for them (Table 2). It is to be noted that Tiruppur city is facing acute water scarcity. Noyyal River is contaminated by chemical mixed water let out by dying units and level of ground water is also going down every year. Due to water scarcity, majority of migrants purchase drinking water as availability of water through household connection is limited.

Communication

Communication for mobile phone and cable TV connection for entertainment are the order of the day. To test this among migrants, they were enquired. Except nine migrants, all migrants (95.5 per cent) have mobile phones (Table 2). Most of migrants' (92.5 per cent) houses are connected the cable TV facility. The recent changes in society and economy promoted the availability of mobile phone and cable TV facility to people in almost every walk of life in India, so is the case of the sample migrants.

Table 2 Basic Amenities

Basic Amenities	No. of Respondents		Percentage
	Yes	No	
Toilet Facility	199	1	99.5
Separate Toilet	35	-	17.5
Shared Toilet	164	-	82.0
Both		1	0.5
If sharing Per Toilet shared by number of families			
2-4	139	-	69.5
4-6	22	-	11.0
6-8	2	-	1.0
8-10	1	-	0.5
Bathroom Facility	199	1	99.5
Separate	36	-	18.0
Shared	164	-	82.0
If sharing Per Bathroom shared by number of families			
2-4	140	-	70.0
4-6	19	-	9.5
6-8	2	-	1.0
8-10	2	-	1.0
Electric Connection	199	1	99.5
Water Supply	199	1	99.5
Public Street Tap / Hand Pump	1	-	0.5
Corporation Water Supply (Shared)	181	-	90.5
Corporation Water Supply (Individual)	18	-	9.0
Purchase Water	133	67	66.5
Communication		-	
Mobile Phone	191	9	95.5
Cable TV	185	15	92.5

Migrants working in garment industry in Tiruppur are facing the above problems. Amidst these odds they stay in the houses because, they want the house rent to be within the limit of their affordability. They consider other conveniences such as proximity to units and school for the education of children. Even if they change house they have to face the same problems since cluster type small roomed houses are only available option to migrants in terms of affordability. Most migrants' residences are cluster type of houses. The problems in current residence as revealed by respondents during pre test of the interview schedule are considered for analysis. These problems include small, narrow houses with inadequate space in between, purchasing water, not enough toilet facility, cooking and sleeping in one room, unclean environment around the houses, more people living in a narrow and small house resulting inadequate space. While comparing the living conditions of migrants' textile workers in Tirupur is more pathetic than their native.

References

1. Census of India. (2001). Registrar General and Census Commissioner, Ministry of Home Affairs Government of India, New Delhi.
2. Indian Statistical Institute. (1962). *The National Sample Survey*. No. 3, Tables with notes on Internal Migration, Delhi, 6.
3. International Development Research Centre. (1973). *Town Drift: Social and Policy Implications of Rural-Urban Migration in Eight Developing Countries*,5.
4. Rajan Irudaya, S. (2013). *Internal Migration and Youth in India: Main Features, Trends and Emerging Challenges* Discussion Paper, United Nations Educational, Scientific and Cultural Organization, UNESCO.
5. Ravi Srivastava. (2012). *Internal Migration in India: An Overview of its Features, Trends and Policy Challenges*. National Workshop on Internal Migration and Human Development in India. Workshop Compendium Vol. II, New Delhi: UNICEF & ICSSR.
6. Schultz, T. P. (1971). Rural-Urban Migration in Colombia. *Review of Economics and Statistics*, 53(2), 162.
7. Singh, J. P. (1980). Population Mobility in India: Studies and Prospects. *Sociological Bulletin*, 29(1), 33-62.
8. Singh, S. N., & Yadava, K. N. S. (1981). On Some Characteristics of Rural Out Migration in Eastern Uttar Pradesh", *Sociology and Culture*, 12(1), 33-46.
9. Singh, Sudhama & Sharma, Shyam Sundar Prasad. (1998). Some Aspects of Labour Migration in India. *The Indian Journal of Labour Economics*, 41(4), 792-793.

SIGNIFICANCE OF NATURAL DYES IN HEALTH

L.Jayaprada
Associate Professor, Department of Nutrition and Dietetics,
Seethalakshmi Ramaswami College, Tiruchirapalli-2

The worldwide demand for natural dyes is nowadays of great interest due to the increased awareness on therapeutic properties of natural dyes in public. Natural dyes are derived from naturally occurring sources such as plants, insects, animals and minerals. Several synthetic colorants have been banned because they cause allergy-like symptoms or are carcinogens. Among the all natural dyes, plant-based pigments have wide range of medicinal values. Although known for a long time for dyeing as well as medicinal properties, the structures and protective properties of natural dyes have been recognized only in the recent past. Many of the plants used for dye extraction are classified as medicinal and some of these have recently been shown to possess remarkable antimicrobial activity. The present review, describes the detail information about basic chemistry of the major pigments and their medicinal importance found in naturally occurring dye yielding plants, which are helpful to further development of pharmaceutical formulations.

Natural dyes are derived from naturally occurring sources such as plants (e.g., indigo and saffron); insects (e.g., cochineal beetles and lac scale insects); animals (e.g., some species of mollusks or shellfish); and minerals (e.g., ferrous sulfate, ochre, and clay) without any chemical treatment1. A spectrum of beautiful natural colours ranging from yellow to black exists in the above sources. These colours are exhibited by various organic and inorganic molecules (pigments) and their mixtures are due to the absorption of light in the visible region of 400-800 nm. This absorption of light depends on the structure or constituents of the colouring pigment/ molecules contain various chromophores present in the dye yielding plant to display the plethora of colours. The use of natural products together with their therapeutic properties is as ancient as human civilization and for a long time, mineral, plant and animal products were the main sources of drugs . The current preference for naturally derived colorants is due to their healthfulness and excellent performance. Several synthetic colorants have been banned because they cause allergy-like symptoms or are carcinogens. Nowadays, natural dyes are commonly used in the cosmetic industry due to no side effects, UV protection and anti-aging properties. I n India, there are more than 450 plants that can yield dyes. In addition to their dye-yielding characteristics, some of these plants also possess medicinal value. Natural dyes are environment friendly for example, turmeric, the brightest of naturally occurring yellow dyes is a powerful antiseptic which revitalizes the skin, while indigo gives a cooling sensation. Many of the plants used for dye extraction are classified as medicinal and some of these have recently been shown to possess antimicrobial activity**.** *Punica granatum* L. and many other common natural dyes are reported as potent antimicrobial agents

owing to the presence of a large amount of tannins. Several other sources of plant dyes rich in naphthoquinones such as lawsone from *Lawsonia inermis* L.(henna), juglone from walnut and lapachol from alkanet are reported to exhibit antibacterial and antifungal activity. Optimized natural dye powders of *Acacia catechu* (L.f.) Willd, *Kerria lacca*, *Rubia cordifolia* L. and *Rumex maritimus* were obtained from commercial industries and they showed antimicrobial activities. This is clear evidence that some natural dyes by themselves have medicinal properties.

Natural dyes are not only used to impart colour to an infinite variety of materials such as textiles, paper, wood etc. but also they are widely used in cosmetic, food and pharmaceutical industry. They have wide range of medicinal importance in pharmaceutical industry. Medicinal importances of some important natural dye yielding plants are discussed below along with their chemistry of pigments.

Turmeric: Turmeric is commonly known as Indian saffron. It consists of dried, as well as fresh rhizomes of the plant *Curcuma longa* Linn.

Chemistry of Pigments: Turmeric contains about 5% of volatile oil, resin and yellow colouring substances known as curcuminoids. The chief component of curcuminoids is known as "curcumin". Chemically curcuma species contain volatile oils, starch and curcumin (50 – 60 %).Curcumin and other related curcuminoids are reported to be responsible for yellow colour of the dye.

Medicinal Importance: Curcumin from *Curcuma longa* has antioxidant, anti-inflammatory, anti cancer and hepatoprotective. The pharmacological activities of cucrcumnoids are due to unique molecular structure. The phenolic yellow curry pigment curcumin used in the Alzheimer's disease, it involves amyloid (Abeta)accumulation, oxidative damage and inflammation potent. It has anti-inflammatory effects in arthritis, possibly inhibits prostaglandin synthesis pathway of Cox-2 without causing ulcers in the GI tract. Finally it has anti-platelet, anti viral, anti fungal, anti bacterial effects (inhibits Helicobacter Pylori) and powerful antiseptic agent.

Saffron : It is commonly known as crocus, it consists of dried stigmas and upper parts of styles of plant *Crocus sativus* Linn. It is a widely used as natural dye in food and cosmetic industry.

Chemistry of Pigments: The main constituents of saffron are crocin, crocetin, picrocrocin and safranal. α-crocin is a carotenoid pigment which is primarily responsible for saffron's golden yellow-orange colour. The bitter glycoside picrocrocin is responsible for saffron's flavour. It is a union of an aldehyde sub-element known as safranal, which is responsible for the aroma of the saffron.

Medicinal Importance

Saffron is used in folk medicine as an antispasmodic, eupeptic, gingival sedative, anti catarrhal, nerve sedative, carminative, diaphoretic, expectorant, stimulant, stomachic, aphrodisiac and emmenagogue. Its active constituents have ticonvulsant, antidepressant, anti-inflammatory and antitumor properties, radical scavenger as well as learning and memory improving properties and promote the diffusivity of oxygen in different tissues. *Crocus sativus* has been shown to have antidepressant effects; two active ingredients are crocin and safrana. Escribano *et al*

showed that saffron extract and its constituents; crocin, safranal and picrocrocin inhibit the growth of human cancer cells (Hella cells) *in vitro*. Crocin analogs isolated from saffron significantly increased the blood flow in the retina and choroid as well as facilitated retinal function recovery and it could be used to treat ischemic retinopathy and/or age-related macular degeneration. Picrocrocin and safranal in patients with coronary artery disease indicates the potential of saffron as an antioxidant. Antiparkinsonian effect of Crocetin, which is an important ingredient of saffron, may be helpful in preventing Perkinsonism.

Safflower

Safflower (*Carthamus tinctorius* L.)has a long history of cultivation as an oilseed crop and as a source of red dye (carthamin).

Chemistry of Pigments

The main constituents of the safflower are carthamin and carthamidin. And other constituents are safflor yellow, arctigenin, tacheloside, N-feruloyl tryptamine, N-feruloylserotonin, steroids, flavonoids, polyacetylenes19. Carthamin is responsible for to produce water-insoluble red dye and carthamidin for
water-soluble yellow colour dye.

Medicinal Importance

Carthamin is extracted from its flowers and it is used for treatment in the form of infusion for circulatory system related diseases. In addition to the colouring properties, safflower petals are used for curing several chronic diseases such as hypertension, coronary heart ailments, rheumatism, male and female fertility problems. The chief constituent Carthamin has uterine stimulating, coronary dilating and hypotensive. It also has the cytotoxic, antigenic and anti-platelet activities.

Pomegranate

It consists of fresh and dried fruits of the plant *Punica granatum*.

Medicinal Importance

Pomegranate fruit not only used as natural dye it also having traditional medicinal value is now supported by data obtained from modern science showing that the fruit contains anticarcinogenic, anti-microbial and anti-viral compounds. Recent Biological studies have proven that certain compounds contained in pomegranate juice, which has been shown to reduce blood pressure,are anti-atherosclerotic and significantly reduce LDL oxidation. These activities are attributed to the pomegranate's high level of antioxidant activity and high total phenolic content. It is also used as bactericide and stimulant. Because of their tannin content, extracts of the bark, leaves, immature fruit and fruit rind have been given as astringents to halt diarrhea, dysentery and hemorrhages. It has hypotensive, antispasmodic and anthelmintic activity in bioassay of leaves, seeds, roots and bark.

Tomato

It is widely used in worldwide food industry and it has potent anti cancer property. It consists of fresh ripen fruits of plant *Solanum lycopersicum*.

Chemistry of Pigments

The major constituents of the tomato are lycopene, α and ß-carotene, lutein, zeaxanthin and b-cryptoxanthin. Lycopene is a carotenoid that is present in tomatoes

is responsible red colour of the fruit. It constitutes about 80–90% of the total carotenoid content of redripe tomatoes. carotene, the yellow pigment of the carrot is the isomer of lycopene.

Medicinal Importance

In recent studies serum and tissue levels of lycopene were shown to be inversely associated with the risk of breast cancer and prostate cancer and also it is used to prevent all types of cancers in the body**.** Lycopene is the most efficient antioxidant among carotenoids through its quenching activity of singlet oxygen and scavenging of peroxyl radicals**.** Tomatoes are also used for the rich source of Vitamin-A.

Paprica

Paprika is obtained from the fruits of selectively bred varieties of 'sweet peppers', *Capsicum annuum* L. The fruits are large, fleshy with an intense red colour and it has many medicinal uses.

Chemistry of Pigments

The pigments present in paprika are a mixture of carotenoids, in which capsanthin and capsorubin are the main compounds responsible for the red colour of the dye. The pungent compounds of the Capsicum fruit are called capsaicinoids such as capsaicin and its analogs**.** It has a long history as a source of biologically active compounds, such as flavonoids, phenols, carotenoids, capsaicinoids and vitamins.

Capsicum fruits contain colouring pigments, pungent principles, resins, protein, cellulose, pentosans, mineral elements and very little volatile oil, while seeds contain fixed (non-volatile) oil.

Henna

Henna is widely used in the cosmetic industry as dyeing agent. It consists of fresh or dried leaves of the plant *Lawsonia inermis* Lam. It has medicinal importance along with dyeing property.

Chemistry of Pigments

The active constituents of the leaf is lawsone (0.5- 1.0%). Other constituents are 5-10% gallic acid, white resin, tannin and xanthones are the other contents of the leaves. The **'Lawsone'** is principally responsible for the colourant property of the henna leaves**.**

Medicinal Importance

Henna is worldwide known as cosmetic agent with anticarcinogenic, anti- flammatory, analagesic and antipyretic properties . Alcoholic extracts of henna leaves showed mild antibacterial activity against Micrococcus pyrogenes var Aureus and *Eschericia coli***.** The tannin and the gallic acid seem to have a complimentary beneficial effect.

Conclusion

Natural dyes are not only having dyeing property but also having the wide range of medicinal properties. Nowadays, fortunately, there is increasing awareness among people towards natural dyes and dye yielding plants. Due to their non-toxic properties, less side effects, more medicinal values, natural dyes are used in day-to-day food products and in pharmaceutical industry. Although worldwide possesses

large plant resources, only little has exploited so far. More detailed studies and scientific investigations are needed to assess the real potential and availability of natural dye yielding resources in great demand on the therapeutic formulations of natural drugs commercially. To conclude, there is need for proper methods, documentation and characterization of dye yielding plants for further development of pharmaceutical industry to formulate the natural plant pigments into therapeutically beneficial pharmaceutical formulations / dosage forms.

References

1. B.Chengaiah et al /Int.J. PharmTech Res., 150*auriculata* L. seed phthalate eye infection. Roots employed in skindisorders.,2010, 2
2. Satyanarayana, A., Rao, P.G.P., Rao, D.G.,Chemistry, Processing and toxicology of annatto (*Bixa orellana* L.). Journal of Food Science and Technology-Mysore 40,2003
3. Jondiko, I.J.O., Pattenden, G., Terpenoids and an apocarotenoid from seeds of Bixa orellana.Phytochemistry 28, 1989, 3159–3162,.
4. Burkill HM.The useful plants of West Tropical Africa, vol.1. Kew: Royal Botanic Gardens, 1985,269.
5. Yusuf, M., Chowdhury, J.U., Yahab, M.A.,Begum, J., Medicinal Plants of Bangladesh. BCSIR Laboratories, Bangladesh, ,1994,38.
6. T.C. Fleischera, E.P.K. Ameadea, M.L.K.Mensaha, I.K. Sawerb, Antimicrobial activity of the leaves and seeds of *Bixa orellana*,Fitoterapia 74, 2003,136–138.
7. Tzulker, R., Glazer, I., Bar-Ilan, I., Holland, D., Aviram, M., & Amir, R. Antioxidant activity, polyphenol content and related compounds in different fruit juices and homogenates prepared from 29 different pomegranate accessions. Journal Agriculture Food Chemistry, 55,2007, 9559–9570.
8. Adhami, V. M., & Mukhtar, H,. Polyphenols from green tea and pomegranate for prevention of prostate cancer. Free Radical Research, 40,2006, 1095–1104.
9. Shi J, Le Maguer M Lycopene in tomatoes: chemical and physical properties affected by food processing. Crit Rev Biotechnol20,2000,293–334.
10. B.Chengaiah et al /Int.J. PharmTech Res.2010,2(1) 154
11. Steven K. Clinton, Tomatoes or Lycopene: A Role in Prostate Carcinogenesis, J. Nutr. 135,2005,2057S–2059S.
12. Sies H, Stahl W., Lycopene antioxidant and biological effects and its bioavailability in the human. Proc Soc Exp Biol Med 218,1998,121–124.
13. http://en.wikipedia.org/wiki/*Capsicum_annuu m*
14. Philip, T. & Berry, James W. Process for the purification of lutein-fatty acid esters from marigold petals Journal of Food Science, 41,1,1976
15. Padma Vasudevan, Suman Kashyap & Satyawati Sharma Tagetes: A Multipurpose Plant, Bioresource Technology 62, ,1997,29.

SUSTAINABLE APPROACH TO DEVELOP INNOVATIVE TEXTILES USING PLASMA TREATMENT

Jayashree Venkatesh & K.N.Ninge Gowda
Department of Apparel Technology and Management,
Bangalore University, Bangalore

Abstract

Sustain able development remains an important global vision. Innovation in textiles refers to designing for aesthetics, comfort and sustainability. Inlightof environmental regulations and concerns the textile industry has become more interested in plasma applications as a novel finishing technology that significantly reduces toxic-chemical pollution.Plasma treatment is adry process since it does not require water or wet chemicals. In addition, plasma is able to change substrate surface properties such as micro-roughness and functionalization without affecting bulk properties. The objective of the paper is to establish an integrative conceptual frame work of sustainable development using plasma treatment on advanced cellulosic fabrics. The paper contributes to the sustainable design area by providing a deep explanation of the satisfaction process in the clothing field by identifying the attributes that enable long-term use of niche products in infant layettes. Wider approach is used to include design strategies and services in the discussion to provide innovative products for sustained consumer satisfaction in infant clothing category.

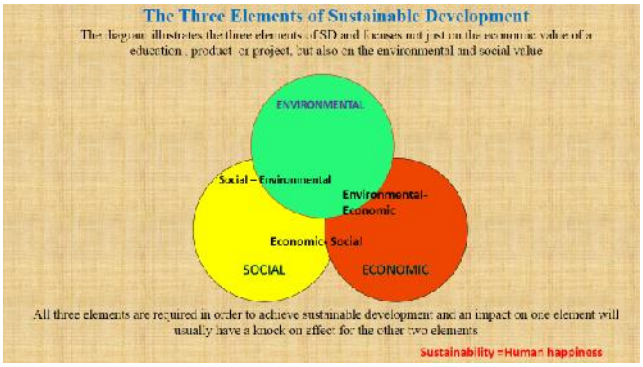
Key words: *Design, functionalization, Infant clothing, plasma treatment, sustainability.*

Introduction

Identity is an important resource for a country, since it is a critical precursor of an important strategic resource-legitimacy. However, identities of new industries in fashion are typically inchoate, since they cannot be classified within pre-existing cognitive categories and therefore do not benefit from a pre-existing understanding or identity of an industry. Given the importance of identity, it is critical to understand how the identity of a new industry is generated and thus bridge the gap. Although prior studies have attributed the specific identity, structure, and characteristic features of fashion industries in France, Italy, and the UK to the culture of Paris, Milan, and London. The identity of a new industry is in fact the result of an interaction between contexts and product innovation and entrepreneurial prospects. Sustainability has become a new paradigm in manufacturing these days.Innovation in textiles and apparel has to be looked from a three dimensional perspective of research and design that fosters better social, economic as well as environmental outlook. Knitted fabrics are commonly used because they are lightweight, flexible and possess excellent mechanical properties. The advantages of using knitted fabrics as opposed to conventional fabrics lie in their low cost, improved barrier properties, adequate strength, and comfort properties. Theypossesshigh extensibility underlowload allowing comfortablefit onanypartpulled. (1). The fabric texture and the movement of air, moisture and heat through the fabric is extremely important for designing of garments for imparting good comfort. Thus, by use of proper fabric structure it would be possible to design a product with reasonable functional and ergonomic properties. Poonam *et al*. (2) have reiterated in their research that textile

industry is considered as the most ecologically harmful industry in the world. The eco- problems in textile industry occur during some production processes and are carried forward right to the finished product. In the production process like bleaching and then dyeing, the subsequent fabric make toxic substances that swell into our ecosystem. Plasma treatments were found to have profound effects on the surface properties of bamboo fabric by research carried out by Prakash *et.al.,* (3).

Figure: 1: The three elements of sustainable development



The diagram illustrates the three elements of SD not just on the economic, technological innovation but also on social and environmental aspects.

Problem Definition

Science and technology is an integral part of our life and it provides support for our basic survival as well as for extravagance. It is important to make a conscious effort to realize our dependence on nature as well as advancement in science and technology .Further, accept the fact that natural resources are scarce and expensive. Water management, not compromising on comfort and convenience during textile processing is achievable task using plasma treatment.

Objectives of the Study

- Exploring the possibility of innovative and ecofriendly approaches using plasma treatment for enhancing comfort properties.
- Design development of infant layettes.

Research Methodology

In the present studyknitted and woven fabrics of pure bamboo were used. Single jersey knitted fabrics were developed. The woven fabrics had the plain woven construction. Based on the review of literature and standard procedures, the research methodology was formulated. The bamboo knitted fabrics were treated using low pressure glow discharge plasma. The glow discharge was generated using an apparatus made by an industry. The DC glow discharge was operated at 0.5 mbar.Infant layettes were designed using value addition in form of painting and crocheting.

Result and Discussion

Figure 2: Infant Jhabala designed using bamboo woven fabric

Figure 3: Value addition using painting and crocheting

Figure 4: Body suit designed using bamboo knittedfabric

Conclusion and Further Research

This study principally concerned with the possibility of development of innovative textiles and products to achieve desirable aesthetic, comfort and functional properties. Ecological concerns and emphasis on biodiversity has led to this research on bamboo fabrics. This can further be exploited and explored to produce functional textiles. There is a tremendous opportunity in upcoming fields for research and product development in nanotechnology and technical textiles. The period between 2010 and 2030 will be crucial for technical textile sector in India and will provide ample opportunities for both international and domestic players with a growth rate of 15% per annum. India can rise and move, with opportunities in every sector because of its population, diversity and multicultural creativity.

References

1. Mikučionienė Daiva, Milašiūtė Laima, Baltušnikaitė Julija, Milašius Rimvy, (2012), "Influence of Plain knits structure on Flammability and air permeability", *Fibres & Textiles in Eastern Europe,* ,20,5 (94),66-69.
2. Poonam Kumari, Saroj S., Jeet Singh Neelam M. Rose, (2015), "Eco – Textiles: For Sustainable Development", International Journal of Scientific and Engineering Research ,Volume 4,Issue 4.pp1379-1390.
3. Prakash .G, Ramakrishnan. S., Chinnadurai .S, Vignesh .M. Senthilkumar, (2013), "Effect of Plasma Treatment on Air and Water-Vapor Permeability of Bamboo Knitted Fabric", *Int J Thermophys* 34:2173–2182.

AYURVASTRA -FABRICS THAT HEAL

Dr.S.Kala
Associate Professor, Department of Botany,
Seethalakshmi Ramaswami College, Tiruchirappalli

"Natural Fabrics Allow Perspiration to Evaporate Properly,
Something that Can Be Difficult When Wearing Synthetic Clothing"

Abstract

Ayurvastra, a convenient and memorable combination of the Sanskrit words ayur—which means life, health, or longevity and vastra or vastram—which means clothing. Ayurvastra existed as a branch of Ayurveda, the 5000 year old system of medicine from India. It represents a modality of healing and achieving wellness, and also a complex system or technique of dyeing clothing using medicinal plants and herbs. Skin being the largest organ in the human body is used as a gateway in Ayurveda to infuse herbal medicines and our clothing is based on this concept. Our clothes are dyed fully naturally and manually using medicinal plants and herbs that are wild-crafted and organic having specific health benefits proven by both tradition as well as clinical research. We predominantly use cotton fabrics or yarn for dyeing. Ayurvastra fabrics are unique due to its healing properties, embodied through a complex manual dyeing with medicinal plants and herbs that are wild-crafted and organic; these are of great benefit to the wearer when in contact with the skin. The most effective time to wear Ayurvastra clothing is when the body is most at rest, such as during sleep, relaxation or meditation because this is when the body is naturally healing and re-establishing balance. This is why ayurvastra cloth is often used for sleepwear, bed sheets, towels, meditation clothes and cotton mats. New innovation in textiles and remedial requirements are opening new possibilities and avenues, for smarter fabrics and solutions. So, an effort is made in this paper to review the process and clinical research on ayurvastra.

Key words: *Ayurvastra, skin, herbal medicine, cotton fabrics, meditation.*

Introduction

Ayurveda is not only a system of medicine, but also a way of living. It is used both to prevent and cure diseases. In Ayurveda for healthy life three dosha (Vatha, Pitha, Kabha) should be balanced, if any dosha is imbalanced it will lead to diseases. To balance dosha and to have healthy living we need good food, shelter, clothing. Ayurvastra concept is to give good clothing in natural way without synthetic chemicals. 'Ayurvastra' existed as a branch of Ayurveda, the 5000 year old system of medicine from India. It represents a modality of healing and achieving wellness, and also a complex system or technique of dyeing clothing using medicinal plants and herbs. 'Ayur' in Sanskrit translates to 'life', 'health' and/or 'longevity' and Vastra translates to 'clothing'; thus Ayurvastra means 'clothing for 'life/health/longevity'. Many hundreds of years ago before the advent of industrialization, clothing was dyed using fully natural means in complete harmony with the environment in different parts of the world. In India, dyeing the yarn and weaving it into fabric was done by the same community, quite possibly with the knowledge of the same craftsman- the weaver. With the adoption of chemical dyeing and mechanization, these functions were separated and the art and tradition of dyeing fabrics fully naturally got buried in time.

Skin being the largest organ in the human body is used as a gateway in Ayurveda to infuse the wellness qualities of plants and herbs. Conventional Western medicine and traditional Eastern medicine also recognize the skin as being the body's largest organ. Skin is the only organ of the body that comes directly in contact with the garment one is wearing. Many environmental toxins and chemicals in conventional clothing are assimilated into the body through the skin. Ayurveda identifies seven unique layers of the skin where each layer has a distinct function. Starting from the outermost layer, the seven layers defined by Ayurveda are Avabhasini, Lohita, Shweta, Tamra, Vedini, Rohini and Mamsadhara.The fourth layer, Tamra, supports the immune system and performs the function of acting as a barrier. Skin infections reflect an imbalance in this layer. Anything which can improve the skin's natural ability to block and resist harmful chemicals and toxins from entering the body will be beneficial to health. Clothes are the whole and sole things that stay in contact with the skin for the longest time. Hence developing fabrics that can heal or protect the skin would add more value to our clothes. Therapeutic textiles provide new approaches and are gaining importance slowly because of its many benefits and positive results. These fabrics play an important role in relieving stress, rejuvenating, curing skin diseases and also help you sleep better.

The Ayurvastra cloth and clothing can improve the skin's ability to act as a barrier to external and environmental toxins, the wearer's health might be improved. Vastra clothing creates an encapsulation or micro-environment of medicinal herbs and sustains it around the skin as long as one is wearing it as apparel or using it as clothing or bedding, and just like the skin absorbs toxins that it comes in touch with, it also acts as a conduit for the beneficial effects of plants and herbs used in the dye. Natural, organic yarns are dyed by hand using plants that contain medicinal properties. The dye bath infuses the fibers with the lovely natural colours of these plants, along with their healing components. The yarns are then woven into fabric, and made into clothing or bedding. When worn or slept in, the fabrics "deliver the (medicinal) benefits of the herbs through the skin."

The ancient physician Charaka used this method whereby an environment is created around the patient with clothing, bedding, wall coverings etc all treated with medicinal ayurvedic herbs/plants specific to the health condition. Besides disease treatment, this concept of using clothing dyed with such plants was also used as for benefits. Thus clothing dyed with turmeric, for instance, was used to enhance skin beauty and radiance, detoxification and rejuvenation. Likewise Tulsi was used to offer stress-relief, enhance sleep and immunity. The core notion here is to excavate traditional organic natural dying method and implement it to the modern textile industry. Though the synthetic dye has always remained as a cheaper option, the adverse impact it deposits is compelling the world to rethink. Using synthetic dyes paves way for pollution and other environmental and health related issues. And as a result, it seems genuine why the traditional natural dying methods are back to the scene. Normal fabrics like organically grown cotton yarn, jute, fibre, silk, wool etc. are used to make Ayurvastra by dying them with the desired herbs in a controlled temperature and environment. Ayurvastra cloth is completely free of synthetic

chemicals and toxic irritants and is totally organic, sustainable and biodegradable. By coming in contact with Ayurvastra, the body loses toxins and its metabolism is enhanced. The most effective time to wear Ayurvastra clothing is when the body is most at rest such as during sleep or meditating because this is when the body is naturally healing and re-establishing its balance. This is why Ayurvastra cloth is often used as sleepwear, bed sheets, towels, meditation clothes and coir mats.

Process of making ayurvastra: There are two processes for making Ayurvastra. Firstly, the yarn is medicated before weaving and secondly, the fabric is dyed after weaving. The raw yarn is cleaned by a natural bleaching agent and dipped in Ayurvedic concoctions lasting from 4 hours to several days under controlled temperature. The encapsulation is assisted by a natural gum. It is allowed to dry and then is washed carefully to remove any loose particles. The process of making Vastra clothing starts with the 100% pure organic cloth and passes through several stages of treatment before becoming colourful and ready to wear. No machines are involved in the dyeing process. More importantly, no chemical additives are added to prepare the cotton fibers for spinning and weaving and no chemical finishes are applied to enhance its appearance. Every step in the preparation of Vastra clothing is carefully and precisely controlled. Most of the herbs are procured locally and some regionally and are wild-crafted or organically grown.

Stage I: De-sizing

The processing of Ayurvastra begins with the washing of hand loomed cloth in natural mineral-rich water and sea salts to remove its sizing, gums and oils used in the course of spinning.

Stage II: Bleaching

Fabrics are exposed to direct sunlight, then it is bleached with biodegradable, naturally derived, organic cleaning agents and surfactants like Saptala (*Acacia sinuata*), Phenila (*Sapindus mukorossi)* etc.

Stage III: Mordanting

To make the colours bright and fast a number of natural mordents such as bark of Lodhra (*Symplocos racemosa*), Kenduka (*Diospyrose ebenum*), fruit extracts of Haritaki (*Terminalia chebula*) etc are used. Alum clays, Iron clays are also used as mordent. But mordents like copper, chrome, zinc, tin etc are avoided due to the environmental reasons.

Stage IV: Medication (Dyeing)

The organic cotton yarn or fabric is then medicated in a carefully controlled mixture of herbal medicine preparations called Kashayas depending upon the disease or ailment being treated. The word medication is used instead of dyeing because here the medicines itself gives natural colour to fabrics. The temperature of the Kashayas, the duration and number of the medicinal soaks, the blend of herbs and the equipment are carefully used in a controlled manner. The medicated cloth is allowed to cool and repeatedly washed to remove any loose particles and is always dried in shades.

Stage. V. Finishing

In herbal dyeing, finishing is done by sprinkling pure water on the cloth and then stretching under pressure, using hand rolls, *Aloe vera*, castor oil etc.

Effluent Treatment

The entire process is organic. It does not pollute the environment like synthetic dye. And the waste is used as bio manure and also to generate bio gas. The technology for making Ayurvastra is being utilized for making coir mats, mattresses, door mats, carpets and fabrics out of bamboo, jute and silk.

Current Vastra products include shirts in 6 different colours: Yellow (main herb is turmeric [*Curcuma longa*, Zingiberaceae]); blue (main herb is indigo [*Indigofera tinctoria*, Fabaceae]); olive green (main herb is holy basil or tulsi [*Ocimum tenuiflorum*, Lamiaceae]); beige (main herb is neem [*Azadirachta indica*, Meliaceae]); gray (main herb is vetiver [*Chrysopogon zizanioides*, Poaceae]); and light peach (main herb is sandalwood [*Santalum album*, Santalaceae]).

Two studies have been completed on ayurvastra's effects in humans, both indicating positive results. As reported on the Vastra website and in a *TIME* magazine article, researchers in the Department of Pharmacology at the Government Ayurveda College (GAC) in Kerala found that patients who used bedding, rugs, and towels dyed with medicinal plants experienced relief in symptoms of eczema, psoriasis, and even rheumatism. Kerala's Ministry of Health conducted its own study on the effects that herbal-dyed clothing, bed sheets, and mattresses had on patients with a variety of ailments. They also hung ayurvastra cloth mats on their walls and ceilings. Researchers reported that patients' arthritis and rheumatism symptoms improved, suggesting possible effects that go beyond dermatological responses. A collection of herbs and the shades they give along with their binomials and herbal benefits are given in table -1 This gives an idea about the process and uses of ayurvastra.

Though we feel natural dyes are beneficial, there are differences between ayurvedic dyes and natural dyes at all the stages of preparation. The details are given in the table-2.Around 200 herbs are used for making various types/colours of Vastra clothing. Each Kashayas for Ayurvastra cloth typically contain between 40 and 60 specifically blended and carefully prepared medicinal herbs, plants, flowers, roots and barks. The examples for these medicines are Salaparni (Gmelina arborea), Dadima(Punica granatum), Amalaki (Emblica officinalis), Khair (Accacia catechu), Haldi (Curcuma longa), Kesar (Saffron/ Crocus sativus), Sappan (Caesalpinia sappan), Mahabharivacha (Alpinia galanga), Aranika (Premina latifolia Roxb), Adhapuspi (Trichodesma indicum),Yavani (Trachyspermum ammi), Agar (Aquilaria agallocha Roxb), Tirucalli (Euphorbia tirucalli), Irumullu (Xylia xylocarpa), Rui (Calatropis gigantea), Ashwagandha (Withania somnifera), Bodhi (Ficus religiosa), Gandha-unakuli (Aristolochia indica), Sugandhimoola(Vetiveria zizanioides), Amaltas (Cassia fistula), Kakamachi (Solanum nigrum), Ajagandhi(Ocimum basilicum), Chirabilva (Pongamia pinnata), Shalparni (Desmodium gangeticum),Chandana (Santalum album), Raktha Chandana (Sanicula marilandica), Pathimukham (Caesalpinia sapans), Dadhiphala (Feronia elephantum

), Tulsi (Ocimum sanctum), Karanja(Derris indica), Aksaphala (Drypetes roxburghi), Chakramarda (Cassia tora), Gammalu Aratu (Pterocarpus marsupium), Akschota (Jasminum grandiflorum), Harra (Embelica myrabolam), Gulgulu (Commiphora mukul), Neem (Azadirachta indica), Jatamansi (Nerium indicum), Chirtamutti (Pavonia zeylanica), Aratta (Alpinia calcarata), Patavalli (Cyclea peltata), Akil (Aquilaria agallocha), Chikha-mula (Solanum surattense), Shuddha Gairika (Strychnos nux-vomica), Brhatphala (Benincasa hispida), Kewda (Pandanus odoratissimus), Nirmali (Strychnos potatorum), Henna Leaf (Lawsonia inermis), Manjistha (Rubia cordifolia),Nagvalli (Piper betle) etc.

Ayurvastra project has been increasing global awareness of the practice. New innovation in textiles and remedial requirements are opening new possibilities and avenues, for smarter fabrics and solutions. Imagine wearing a garment that protects you from heat, keeps you relaxed and at the same time cures your ailments, the possibilities are endless. Medical textiles, according to www.technicaltextiles.net, are "manufactured goods which include textile stuff used in hygiene, healthiness and private care, as well as surgical end uses." In other words, the medical textiles marketplace is a large, rather complex and extremely diverse sector of the technical textiles and nonwovens industry.

Table-1 Herbs used in ayurvastra and their health benefits

Herb	Herbs and Shades Botanical Name	Herbal Benefits
	Turmeric *(yellow)* *Curcuma longa*	Turmeric is a natural wonder, proving beneficial in the treatment of many different health conditions from cancer to Alzheimer's disease.
	Tulasi *(green)* *Ocimum tenuiflorum*	Tulasi (Holy Basil/Ocimum sanctum) is a sacred plant in Hinduism. In Sanskrit, Tulasi means 'the incomparable one'. In the Ayurvedic tradition, Tulasi is used to support normal respiratory function, promote optimal health and longevity.
	Neem*(ivory)* *Azadirachta indica*	*Neem* Tree has been described in Ayurveda's prime text, the Charaka Samhita, as sarva roga nivarini (that which keeps all diseases at bay)
	Vettiver *(brown)* *Chrysopogon zizanioides*	Vetiver is used for the preparation of a decoction which used for the treatment of all kinds of poison in toxicology.

	Indigo *(blue)* *Indigofera tinctoria*	Indigo is one of the oldest dye plants , which have many health benefits Clothes
	Sappan Tree *(red+pink)* *Caesalpinia sappan*	Decoction of wood and bark used for tuberculosis, diarrhea, dysentery, postpartum tonic, skin infections and anemia. Seeds used for stomach aches and nervous disorders.
	Triphala*(kaki)* *Terminalia bellirica*	The magical ingredient in Terminalia bellirica gives the healing properties and also it gives some medicinal properties.
	Vembadam *(light grey)* *Ventilago madraspatana*	Anti-inflammatory and anticancer compounds.
	Pomegranate*(yellow+ivory)Punica granatum*	This nutrient dense, antioxidant rich fruit has been revered as a symbol of health, fertility and eternal life.
	Onion*(yellow+green)* *Allium cepa*	Onion is used for treating digestion problems including loss of appetite, upset stomach, and gallbladder disorders for treating heart and blood vessel problems.
	Bringaraj *(green)* *Eclipta alba*	Karisalankanni is the herb of choice in treating liver diseases. This herb grows in marshy areas throughout the year. It grows abundantly during the rainy season.
	Karungali*(black)* *Acacia*	The karungali is said to promote digestion. It is used by many people after meals.

Table-2 Differences between ayurvedic dye and natural dye

Process	Ayurvedic Dye	Natural Dye
Fabrics or Yarn	Only natural fabrics like Cotton, Silk, Linen, Jute, Bamboo, wool etc	Apart from natural fibers synthetic or petro chemical yarns and fabrics are also used.
Pre-processing of fabrics	Natural surfactants (soap net) and fibers are not harshly treated, the natural feeling is preserved. Bleaching is done naturally using sunlight & natural minerals.	Many natural dyers use chemicals for pre-processing because of cheap chemicals availability and easy work, there is no much different from synthetic dye.
Dyeing	The dye extracts are directly taken from medicinally rich herbs. The herbs will act as mordents and dye, the shades are earthly and there is no touch of any synthetic chemicals.	Even through dye extracts from natural sources but for fixing colors many toxic and heavy metals are used like tin, chrome etc., chemical mordents are used.
Finishing	Natural herbs and Surfactants are used for finishing.	Organic Chemicals are used for finishing the fabric. Organic chemicals are also synthetic chemicals.
Softening	Softener is made from naturally using, Castrol oil, Aloe vero and natural fixatives.	Eco-friendly chemical softener is used.

A STUDY ON THE STATUS OF WOMEN AT WORKPLACE WITH SPECIAL REFERENCE TO TEXTILE INDUSTRIES AT TIRUPUR DISTRICT

Dr. (Mrs.) M. Kalaiselvi
Associate Professor and Head, PG and Research Department of Economics, Seethalakshmi Ramaswami College, Tiruchirappalli

Ms.M.Radhika
Assistant Professor, PG and Research Department of Economics, Seethalakshmi Ramaswami College, Tiruchirappalli

Introduction

Extile industry is one of the main pillars holding the Indian economy. It constitutes about 14% of industrial production, 20% of the total export earnings, 4% of GDP and direct employment to an estimated 35million people. In spite of these, Indian's entire share in the world textiles trade is still maintained at around 3% mills, power looms and hand looms constitute three independent sectors of the Indian textiles industry. The mill sector is organized, mechanized and modernized concentrating in the production of yarn whereas the power loom and hand loom sectors have remained technologically background and stagnant. Almost all the spinning yarn made in India comes from the organized mill sector, reflecting the highly capital intensive nature of yarn spinning . Weaving in the mill sector has been gradually suffering due to the competition from the power looms and the trend may continue. Most of the India's competitors in textiles in the world market have a much larger number of shuttles-less looms. The hosiery sector caters mainly to the inner garment requirement. The textile and clothing sector is a highly important source of employment for women in developing countries, often being their largest employer after agriculture. It is also a sector where developing countries have a clear comparative advantage and potential to continuously benefit from growing trade. Therefore, the sector offers significant opportunity and prospect for women to improve their welfare but at the same time, what affects trade in textiles and clothing would have direct linkage to women's livelihood becomes necessary for one to ponder. So, an attempt was carried out to study on the status of women at work place with special reference to textile industries at Tirupur district.

Objectives

This study is mainly focused on the following objectives

- To find out the economic status of women workers in the textile unit.
- To analyse social status of women workers in the textile unit.
- To find out their level of satisfaction.
- To inquire into the discrimination based on sex at workplace.
- To examine their health status.

The present study is based on both primary data and secondary data. The primary data have been collected through direct personal interview with the help of structured questionnaire and the secondary data were collected from books, journals and websites. In order to study the status of women at workplace with special reference to textile industries, 102 samples were selected through random sampling method from five textile units namely Sivan exports, Veera creation, Laxmi Textile mills, M.K.Exports, and Rith Apparels.

Tirupur-Banian City

Tirupur popularly known as "Banian City" of the south India is located in the state Tamil Nadu. It has come a long way from a small cotton-marketing centre with a few ginning factories to become a prominent cluster of small and medium manufacturing enterprises gainfully engaged in the production and export of a range of knitted apparels. This township started with the production of low valued cotton hosiery items, mainly the under garments during the 1930's.Knitting to this city was brought by Mr.Gulam kadar in 1937. He established "Baby Knitting Industries" in Kaderpet area of Tirupur. It was followed by the establishment of second knitting by a woman, Mrs.Chellammal in the name of Chellammal knitting. Tirupur cluster comprises of around 5000 units which are involved in one or other activities of textile value chain. There are no precise data available as to the exact number of units in the different areas of value chain. However, the growth of the garment industry as a whole can be traced to the specialization of different activities up to the stage of garmenting in Tirupur. Such specialization has given in the international markets.

Women in the Indian Textile and Garment Industry

Textiles, one of the oldest industries in India accounts for around 20% of India's total industrial output and gives employment to nearly 15 million workers. Although textiles have a large domestic market, India has always had a share of world trade in textiles. In recent years, with a boom in exports and to foreign exchange earnings. The growth in textile exports has been phenomenal, with the garment industry emerging as the biggest contributor to its growth. Women have as good as disappeared from the mill sector. Several reasons have contributed to their declining employment. The upgrading of technology has not worked in favour of women. Successive attempts at rationalization and modernization by the mills have only depressed the number of women employed. Paradoxically ,protective legislation such as a ban on women's night shift, maternity and child care benefits have not worked in their favour. Mill owners have looked at these benefits as costly and bothersome and have resorted to ways of circumventing welfare measures such as provision of crèches and other benefits . An indirect consequence of protective legislation has been casualisation of women's work. While this may be true for industrial employment in general, even the few women who are employed work as temporary and casual workers. The production processes in power looms are not

substantially different. It is argued however, that the scope for women's employment is greater here as production takes place in the formal sector.

Status of Women Workers in the Textile Units of the Study Area

On the basis of the data collected an attempt is made to analyse the status of women workers in the textile unit under study with the help of some variables.It can be assumed that the status of women workers at the work place is a function of their economic well –being , Social factors, emotional satisfaction and health conditions. It is assumed that economic well –being is largely influenced by type and nature of job, years of service , training programmes and income.

As the educational qualification of most of the respondents is confined to schooling education. It is obvious that 83% is engaged in labour department, because there required qualification in this department is relatively less compared to the administrative department. Since a majority of workers are engaged in the labour department, their physical work is greater than the work done by those in the administrative department. So it can be presumed that 84% of the women workers' economic status is less compared to 16% working in the administrative department.

Again ,it can also be presumed that the status of the contractual workers in the unit have low economic status in terms of nature of job. It is assumed that a workers' status improves with experience. From the data collected 80% of the respondents have less than 9years of experience. So in terms of years of experience the economic status of 80% of the respondents is relatively low. In terms of training programmes all the workers have undergone training in their respective fields. Going by income as an important indicator to measure economic status, it can be concluded that the status of respondents working in the administrative department is 'better off" than the majority of workers in the labour department. This implies that the economic status of 84% of the women workers is low in terms of income . On an average the economic status of 64% of the respondents is low. It can be assumed that social status of the woman at the workplace is largely determined by social factors like Age, Educational qualification, Marital status, Native place, Work shift and Decision making status. As 73% of workers are found to be in the productive age group, it will not have a negative impact on their social status. This implies that 27% of these workers have a low social status in terms of age. As the educational qualification of 82% of the respondents is not beyond school, it can be inferred that their social status is poor. Although, married women workers can contribute to the family they also have their share of problems in terms of working hours ,shift work, maternity and child care. So it can be presumed that the social status of 72% of the workers may not be positive. The non-native respondents may have their share of problems-poverty , lack of job opportunities, agricultural failure, abandonments by husbands also. So, it can be assumed that 42% of respondents have low social status. Although night shift comes with additional wage, working on night shifts can have the negative impact on their social status. It is found that only 35% of the respondents work during night hours. Full freedom in decision making is seen to be enjoyed only by 18% of the respondents. On an average 57% of the women respondents have a low social status.

Emotional satisfaction/status of the respondents can be measured in terms of work facility, work benefit, work satisfaction, problems encountered and discrimination at workplace. About the work facilities extended to the respondents, only 21% of such facilities were found to be lacking . 64% of the respondents seem to enjoy work benefits as they are permanent. As a result the emotional satisfaction of 46% of respondents is low. In terms of satisfaction status, on an average only 29% of respondents have recorded low satisfaction relating to various areas.

On an average 53% of the respondents have identified problems and categorized as very severe and mildly severe. On an average 56% of workers have job, wage, training programmes, unionization and decision making related discriminations. On an average 41% of women respondents have low emotional status. The health status of the respondents at the workplace is determined by the job related ailments suffered by them. The magnitude of these ailments were classified into three- very severe, mildly severe and negligible. It was found that on an average the health status of 95% of the respondents is low. The overall status of the women respondents is determined by the percentage of respondents with a low/high status with respect to economic well-being, social factors, emotional satisfaction and health factors. It is found that on an average 63% of the women at the workplace enjoy low status.

Suggestions

- The units should arrange necessary steps for job security especially for contractual workers.
- A good relationship with superiors, peers, subordinates should be encouraged.
- It is also suggested that the Ministry of HRD (both centre and state) should pay regular visits to these units.
- Arrangements should also be made to sanctioned bonus and other incentives to the workers.

Conclusion

Based on the analysis and findings about the women textile workers, it could be concluded that the textile industry in the study area can meet the challenges and competition by according a more important place to women, minimize discrimination particularly relating to wage and work and extend job security,.Apart from providing other facilities, it can provide crèche facilities which will go a long way to help the women workforce with infants.

References

- http:// www.ijmrbs.com
- http://www.lowell-mill-girls.
- http:// www.women workers in textile industries.
- www.indianjournalof industrial relations.
- www.kisanworld.com
- www.epw.in

ECO-FRIENDLY DYES FROM PLANTS IN TEXTILE INDUSTRIES

P.Kamaladevi
Associate Professor, Department of Botany, SRC, Tiruchirappalli

Abstract

Man has always been interested with colours. The mother earth has rewarded us with natural vibrant hues called natural dyes. Natural dyes has their age old usage in textile industry and due to their non toxic and eco- friendly nature find their use in food, drugs and cosmetic industries. Though earth is bestowed with plants containing a wide range of attractive and eco- friendly pigments only 0.5 % has been exhaustively used and the remaining is left unexploited. Despite centuries of interest in natural pigments, our knowledge of their sources from plants, distribution, availability and properties is limited. But in recent times the environmental awareness about health hazards cause by synthetic dyes has regained importance of natural dyes. Therefore, novel plant pigments must be searched and proper collection, documentation, assessment and characterization has to be done. The present paper is an aid to a collective enquiry into the Indian dye yielding plants, their parts and chemical constituents.

Key words: *Natural dye, textiles, plant pigments, synthetic dyes*

Introduction

India has a rich plant biodiversity which is ranked 11th as biggest biodiversity in the world. It has approximately490,000 plant species and there is no doubt that the plant kingdom is a treasure-house of diverse natural products. One such product from nature is the dye. Pigment from leaves, fruits, seed, wood and roots were used as dye stuff for textiles and as paint in art and craft. Natural dyes are environmental friendly, hygienic, user friendly and permanent than other colorant. Nature has gifted us more than 500 colour yielding plants. The invention of Indigo, the most important Indian Natural dye is as old as textile making itself. History reveals that Chinese have recorded the use of dye stuff even before 2600BC. Herbal dyes were used to colour clothing or other textiles but by mid 1800, chemists began producing synthetic substitutes for them. By early 20th century only a small percentage of textile dyes were extracted from plants. Lately, there has been increasing interest in herbal dyes, as consumers have become aware of ecological and environmental problems related to the use of synthetic dyes. The most common herbal parts used for extracting dyes are seeds, flowers, leaves, berries, stems, barks and roots. Some parts may have more than one colour depending upon which part of the plant is used. The shade of colour**,** a plant produces will vary according to season at which the plant is picked, how it was grown, soil conditions, etc[4]. The dyeing process based on herbal resources includes three major steps, first being the extraction of colouring matter from the plant part, second is creating a bond between the colouring matter and the fibre to be dyed and the last is actual dyeing. The colour extraction is done usually by powdering the material then boiling it in water for10-20 minutes. The yarn or fabric to be dyed is first washed well then heated in the extract at different temperatures normally for about 30-40 minutes. The creation of a bond between the colouring matter and fibre is called mordanting i.e . a pre-dyeing process that makes the fibre

receptive to dye. Mordant is a chemical that when 'cooked' with fibres attaches itself to the fibre molecules. A dye molecule attaches itself to the mordant. Herbal dyes require mordant, which are metallic salts of aluminium, iron, chromium, copper and others, for ensuring the reasonable fastness of the colour to sunlight and also washing. The vessel that is used for dyeing itself is serving as a mordant. The dyers use copper tin vessels to brighten the colour and iron vat to dull the colour. To obtain basic original colour of the colouring materials, earthen or stainless steel pots are advisable. Herbal dyes are best with natural fibers such as cotton, linen, wool, silk, jute, ramie and sisal. Cotton dyeing needs a complex series of pre-treatment before it absorbs any dye other than indigo with which it bonds naturally. On the other hand wool or silk fibres

take the colouring matter quite easily. Herbal dyes are classified [5]on the basis of their chemical structure where grouping within each structure class is done according to Hue. The broad classes are: *Flavones* (Yellow and brown)-90% of all yellow dyes are flavonoids. The fastness of these yellow dyes is greatly affected by the mordant and the photosensitivity of the chromophores; *Iso-Quinoline* (Yellow)- the only basic dye stuff known from nature; *Chromene* (Orange yellow); *Napthoquines* (Brown and purple grey)-although an array of napthoquinones occur in nature, only a few are important as dyes; and *Anthraquinones* (Red)-over 95% of the known natural red dyes fall into this category. Anthraquinone dyes surpass all other classes of dyes in their fastness properties; *Benzophyrones* (Purple and black) ; *Indigoids* (Blue)-an unusually small molecule produces this stable blue colour in a vat process; *Vegetable tannins* (Neutrals)-gallotannins, ellagitannins, catecholtannins. All tannins have a large, heavy molecular structure which reacts readily with metallic salts. This article deals with commonly used dye yielding plants, parts used, colouring components, uses and colour with mordants.

1. Gum Arabic

Botanical name	:	Acacia **nilotica (Linn.) Delile** syn. A.arabica Willd. (Mimosaceae)
Common name	:	Gum Arabic, Babul, Sant tree, Karuvela maram
Habit	:	medium sized tree
Parts used	:	Bark and pods
Colouring Components	:	Catechin
Uses and colour with mordant	:	dyeing textiles, light yellow- Alum, yellowish brown- copper sulphate, dark grey - ferric sulphate
Therapeutic uses	:	Different parts of this plant such as the leaves, roots, seeds, bark, fruits, flowers, gum and immature pods act as anti-cancer,spasmogenic, anti-pyretic, anti-asthamatic, anti-diabetic, anti-platelet agregatory, anti-plasmodial and antimicrobial

2. Indigo

Otanical name : Indigofera tinctoria**,** Linn (Fabaceae)
Common name : True indigo, natural indigo, Neeli, Nil, Aviri
Habit : Perennial shrub
Parts used : Whole plant
Colouring Components : Indigotin

Uses and colour with mordant: Dyeing silk, wool, cotton with deep blue colour
Therapeutic uses: Indigofera tinctoria is used for the treatment of fever, liver and spleen disorders, rheumatoid arthritis, gout, grey hairs and leaves promote hair growth.

3. Kamala

Botanical name: Mallotus philippensis (Lam.) Müll. Arg. (Euphorbiaceae)
Common name:Kaamala tree, Kamala tree, Monkey face tree, Kapila poti
Habit : Medium sized tree
Parts used:Fruits
Colouring Components :Rottlerin, Isorottlerin

Uses and colour with mordant : Dyeing silk with red colour
Therapeutic uses :leaves are bitter, cooling and appetizer. Fruit is heating, Purgative, anthelmintic, vulnerary, detergent, maturant, carminative, alexiteric and useful in treatment of bronchitis, abdominal diseases, spleen enlargement etc.

4. Indian madder

Botanical name : *Rubia cordifolia,* Linn. (Rubiaceae).
Common name : Indian madder
Habit : Shrub

Parts used : Stem, Root
Colouring Components: Manjistin, Purpurin
Uses and colour with mordant : Dyeing coarse cotton fabrics- reddish brown, light pink- alum, light brown- copper sulphate, Reddish grey- Ferric sulphate
Therapeutic uses : Used for skin diseases, abscess, sinus, blood purification and kumkumadi oil for skin glow.

5. Red bull bresh

Botanical name : Woodfordia fruticosa, (Linn)Kurz, (Lythraceae), Syn. Woodfordia floribunda
Common name: Red bell bush,
Habit : Large shrub
Parts used: Leaves and flowers

ColouringComponents:Lawsone(2-hydroxy napthoquinone)

Uses and colour with mordant: Dyeing cotton with red or pink

Therapeutic uses : it is used to cure diarrhea, piles , dysentery , Leucorrhoea, tooth ache and skin diseases.

6. Marigold Botanical name*:* Tagetes erecta, Linn Syn. Diglossus cass, Enaicida cass (Asteraceae)

Common name: Mexican marigold, Aztec arigold

Habit : Annual herb

Parts used: Flowers

Colouring Components: Petulitrin (flavonoid glycoside)

Uses and colour with mordant: Yellow - chrome

Therapeutic uses: Anthelmintic, aromatic, digestive, diuretic, sedative, cough, ysentery, ulcer and ezema.

Conclusion

Natural dyes are now-a-days in demand not only in textile industry but in cosmetics, leather, food and pharmaceuticals. The rich biodiversity of our country has provided us plenty of raw materials yet sustainable linkages must be developed between the cultivation, collection and their use. This study have concluded that the natural dye extracted from the six different plant source extracts can be successfully applied to the textile industries to obtain a wide range of colour shadings along with the application of the mordant as a fixative agent. These dyes are environmental friendly and harmless when compared to synthetic dyes.

References

1. Neha Grover and Vidya Patni(2011), Extraction and application of natural dye preparations from the floral parts of Woodfordia fruticosa(Linn.)Kurz, Indian Journal of Natural Products and Resources Vol.2(4), pp 403-408.
2. Susan C Druding, A bi-annual gathering of weavers, dyes and spinners, Convergence, 1982, Seattle, Washington.
3. Pigments of some crude drugs and their utilization, Indian J Nat Prod, 1991, 7, 11-13.
4. Padma S Vankar, Chemistry of Natural Dyes, Resonanace, 2000, 5(10), 73-80.
5. Knags NS, Am Dyest Reptr, 1992, 81(11), 109-111.
6. Kokate CK , Purohit AP and Gokhale SB, Pharmacognosy, 12th Edition, Nirali Prakashan, 1999, pp.254.
7. Pullaiah T, Medicinal Plants in India, Vol. 1&2, Regency Publications, New Delhi, 2002.
8. Natural dyes and their applications to textiles, ML Gulrajani and Deepti Gupta (Editors), Indian Institute of Technology, New Delhi, 1992

HERBAL FINISHED GARMENT FOR PSORIASIS PATIENTS

Dr.M.Kanimozhi
Assistant Professor, Department of Home Science,
Sri Sarada College for Women

Abstract

In this study cotton fabrics were given eco-friendly finish to impart medicinal property for psoriasis patients. The textile product remains most essential for human being and now it is developed towards the value addition function. Medicines for psoriasis remains ineffective in controlling the symptoms. But still some herbs are used to treat psoriasis. Hence neem and Wrightia tinctoria leaves were used to finish thecotton fabrics. The finished fabrics were converted into garment for psoriasis patient. The fabrics were tested for its mechanical properties namely tensile strength, elongation and abrasion resistance. Antibacterial test was also performed for the finished fabrics.

Keywords: *Neem, Wrightia tinctoria, finish, cotton fabric, antibacterial.*

Introduction

Currently the textile industry is fronting a radicaltransformation which centers on the value addition of the product. Hence the textile materials were used for performance properties rather than aesthetic purpose which pays a major role for curative garment. Curative garment are supportive to the environment by avoiding the use of noneco-friendly substances thus results in zero effluent discharge. Psoriasis is an immune based mediated disease that affects the skin. There is no permanent cure existing for this disease Goldminzetal., (2013). But several treatments were done to control the symptoms. These curative garment protects the patients from allergies, septic condition, bad transpiration, etc., Chandrasekaran etal., (2012).

Methodology

Selection of Fabric: Cotton fabric causes no skin irritation, less overheating and also no heat retention when compared to synthetic fabrics (www.fibre2fashion.com). Hence 100% plain woven cotton fabrics were used for the development of curative fabrics.

Selection of Finishing Agent: Neem and Wrightia tinctoria are the most effective herbs to treat the psoriasis. These extract have good anti-fungal, anti-bacterial and anti-viral properties Ferlow (2013). Therefore the leaves of neem and Wrightia tinctoria were used as a finishing agent.

Preparation of Herbal Extract: The leaves of neem and Wrightia tinctoria were collected from the farms in palakad, Kerala. The collected leaves were shadow dried for 15days and grind into fine powder. The powdered herbs were boiled for one hour in three different combinations namely 100% neem, 100% Wrightia tinctoria and 50:50 neem: Wrightia tinctoria.

Pretreatment of the Fabrics: Desizing were done by boiling the fabric in plain water for 2hours. Following this bleaching is done in sun light for 5days.

Selection of Mordant: Alum is double sulfate salt, Which act as a good natural mordant using for dyeing. Hence alum is selected as the mordant for the herbal finishing.

Procedure for Fabric Finishing: The finishing of the fabric was done by pad-dry method. The mordanting technique adopted in this process was pre mordanting. The material liquor ratio for this study was 1:20.

End Product: The finished fabrics were converted into kurta using standard body measurement for women between the age group of 35 – 40.

Evaluation of Finished Fabric: The finished and unfinished fabrics were evaluated for its mechanical properties namely strength, elongation and abrasion. Antimicrobial activity of the finished fabric was tested using EN ISO 20645 against staphylococcus aureus and Escherichia coli.

Nomenclature: The nomenclature for the unfinished and finished samples were given in the table 1 below.

Table. 1 Nomenclature of the samples

S. No	Sample	Nomenclature
1.	Unfinished	UF
2.	Neem finished	NF
3.	Wrightia finished	WF
4.	Neem and wrightia finished	NWF

Result and Discussion

The result and discussion pertaining to this study were analyzed under the following headings.

Assessment of Mechanical Properties

The mechanical properties namely fabric strength, elongation and abrasion were assessed using ASTM standards.

Fabric Strength

The fabric strength of the finished and unfinished samples of cotton were discussed below.

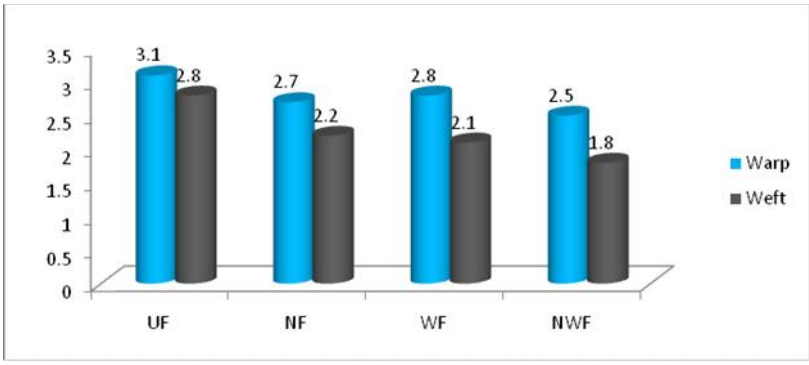
Table. 2 Fabric Strength

S. No	Sample	Mean (lb)	
		Warp	Weft
1.	UF	44	38
2.	NF	41	34
3.	WF	39	30
4.	NWF	42	36

From the table. 2 it was noted that the fabric strength have reduced in both warp and weft direction of the finished fabric when compared to the unfinished fabric. The neem finished fabric has reduced its warp and weft strength of about 6.81% and 10.52% when compared to original fabric. In the case of Wrightia tinctoria finished fabric the reduction of warp and weft strength was about 11.36% and 21.05% respectively. The Neem and Wrightia finished fabric has reduced its warp and weft strength of about 4.54% and 5.26% respectively. Over all among the finished fabrics Neem and wrightia finished samples has good strength.

Fabric Elongation: The fabric elongation of the finished and unfinished samples were given below.

Figure 1 Fabric Elongation



The figure. 1clearly depicts that the fabric elongation have reduced in both warp and weft direction of the finished fabrics when compared to unfinished fabric. The neem finished fabric has reduced its warp and weft elongation of about 12.9% and 21.4% respectively. The Wrightia tinctoria finished fabric has reduced its warp and weft elongation of about 9.6% and 25% respectively. The Neem andWrightia finished fabric has reduced its warp and weft elongation of about 19.35% and 35.71% respectively. Among all the samples Neem and Wrightia finished fabric has low elongation.

Abrasion Resistance

The abrasion resistance of the unfinished and finished samples were shown below.

Table 3 Abrasion Resistance

S. No	Sample	Mean (gm)	Grain / loss over original	% Grain / loss over original
1.	UF	0.02	-	-
2.	NF	0.025	0.004	20
3.	WF	0.025	0.004	20
4.	NWF	0.024	0.005	25

Table. 3 shows that all the finished fabricshas less weight loss due to the finish applied on the fabric when compared to unfinished fabric. The neem and Wrightia finished fabric has less weight loss of about 25 per cent. The neem finished and wrightia tinctoria finished fabric has the weight loss of 20 per cent.

Antibacterial Property

The antimicrobial properties of the finished fabrics were discussed below.

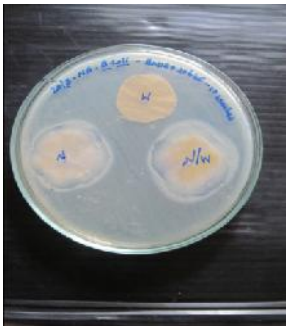
Table 4 Antibacterial Property

S. No.	Sample	Zone of Bacteriostasis (mm)			
		Staphylococcus aureus		Escherichia coli	
		Unwashed	After10 washes	Unwashed	After10 washes
1	NF	31	25	34	25
2	WF	26	21	32	28
3	NWF	34	29	37	30

Table. 4 shows the antibacterial activity of the finished fabric according to EN ISO 20645 against Staphylococcus aureus and Escherichia coli. The neem and Wrightia fabric shows good antibacterial property of about 34mm and 37mm against Staphylococcus aureus and Escherichia coli bacteria respectively. The neem finished

fabric has the antibacterial value of 31mm and 34mm against Staphylococcus and e-coli bacteria. The wrightia tinctoria finished fabric has comparatively less antibacterial property of about 26mm and 32mm against Staphylococcus and e-coli respectively. This finish has good stability on the fabric ever after 10 washes figure 2.

Figure 2Antibacterial Activity of Finished Fabric After 10 Washes



Staphylococcus aureus **Escherichia coli**

Conclusion

For this study neem and Wrightia tinctoria leaves were used as the natural finishing agent which was applied on the cotton fabric using pad- dry-cure method. These finishing agents were ecofriendly, non-toxic and non-irritant to the skin. Natural metallic mordant namely alum was used as a fixing agent following pre mordanting technique. The finished materials were converted in to kurta. The results showan increase in the value of abrasion resistance and decrease in fabric elongation and strength when compared to raw fabric. The antibacterial property was higher in neem and Wrightia tinctoria combinely finished fabric when compared to the individually finished fabric of neem and Wrightia tinctoria.

References

1. Goldminz, A.M., Au, S.C., Kim, N., Gottlieb, A.B. and Lizzul, P.F., 2013. NF-κB: an essential transcription factor in psoriasis. Journal of dermatological science, 69(2), pp.89-94.
2. Chandrasekaran, K., Ramachandran, T. and Vigneswaran, C., 2012. Effect of medicinal herb extracts treated garments on selected diseases. Indian Journal of Traditional Knowledge, 11(3), pp.493-498.
3. Ferlow K,2013. Psoriasis and Neem, positive health.com.
4. www.fibre2fashion.com

A STUDY ON MEASUREMENT OF FABRIC - SKIN FRICTION CHARACTERISTICS

Dr.P.Kanthvadivu
Professor & Head Department of Fashion Technology, PSG College of Technology, Coimbatore
R.Surjith
Assistant Professor Department of Fashion Technology, PSG College of Technology, Coimbatore
D.Gopalakrishnan
Project Fellow & Corresponding author Department of Fashion Technology, PSG College of Technology, Coimbatore

Abstract

The human skin is built from several layers, vessels, sensors and other structures. All together these form the integumentary system. The integumentary system is one of the organ systems in the human body. Friction is a system property, which indicates that it depends on multiple factors, such as the material properties, contact parameters and the environment. Friction is one of the themes in tribology, an engineering technology which is defined as "the science and technology of interacting surfaces in relative motion and of the practices related thereto". The term "skin friction" refers to the friction between in vivo human skin and an arbitrary contact material. Skin friction involves the interaction of the skin and the contact material, and consequently it depends on the properties of the skin, the contact material and its properties, the parameters of the contact between the materials and the environment surrounding the materials. The term skin friction actually can lead to confusion, it must be noted that skin friction is not a property of the human skin. Skin friction involves the interaction of the skin and the contact material, and consequently it depends on the properties of the skin, the contact material and its properties, the parameters of the contact between the materials and the environment surrounding the materials. Skin friction is important for everyone in practically every situation. In some situations it is just the skin and a product that are in interaction, like the hand and a cup, but in other situations multiple layers are involved, for example in shoes. Skin friction research is actually on the interface between tribology, materials science, dermatology, Product development and rehabilitation medicine.

Keywords: *Skin friction, Vivo/Vitro human skin, Contact material*

Introduction

Friction has been defined as "the resisting force tangential to the common boundary between two bodies when, under the action of an external force, one body moves or tends to move relative to the surface of the other". The frictional behaviour is usually expressed in the coefficient of friction, which is defined as "the ratio obtained by dividing the tangential force resisting motion between two bodies by the normal force pressing these bodies together". This can be described by the following equation:

$$\mu = F_{friction} / F_{normal}$$

In this equation, μ is the dimensionless coefficient of friction, $F_{friction}$ and F_{normal} refer to the friction force and the normal force respectively. In sliding contacts, two coefficients of friction are distinguished: the static coefficient of friction and the dynamic coefficient of friction. In tribology the definitions of these coefficients of

friction are based on two values of the friction force referred to as limiting static friction and dynamic friction:

Limiting Static Friction: It is the resistance to the force tangential to the interface which is just sufficient to initiate relative motion between two bodies under load.

Dynamic Friction: It is the friction between two surfaces in relative motion.

Surface Smoothness

Fabric friction during fabric/skin interaction due to body movements has a significant effect on the fabric tactile comfort. High frictional forces resisting body movement can be a source of discomfort. Fabric friction is defined as the resistance to motion when a fabric is rubbed tactually between the finger and thumb. Subjectively it is expressed as rough or scratchy by assessing the cloth surface by the thumb or finger. The frictional interaction depends on two factors as follow;

Fabric Surface Roughness

It is affected by the type of fibre, yarn structure and fabric weaves. For a fibre type and yarn structure increasing threads per inch, the fabric surface becomes smoother. Increasing yam linear density (diameter) fabric surface roughness increases due to increased crown height or crimp amplitude.

Why a Non-Human Test Material is Needed?

Disadvantages of in vivo testing:

- Poor reproducibility: Person-to-person variability
- Involuntary human movement during testing
- Last too long or they are destructive
- Necessary regulations: increase the effort and lead-time of experiments.

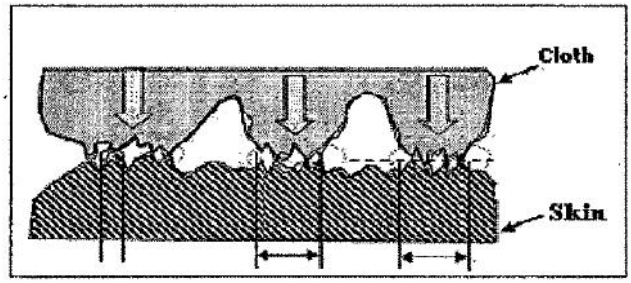
Skin and Their Properties

The human skin of an adult has a surface area of approximately two square metres. The thickness of the skin varies over the body: ranging from less than a millimetre on the eyelids to several centimetres in the abdominal region. The skin's characteristics (such as thickness, strength, elasticity and colour) depend on various subject related variables, for example age, gender, body composition, race, stress, season, nutrition and mechanical load. In humans, three types of skin are distinguished: mucocutaneous, glabrous and hairy skin. Mucocutaneous skin is found on the lining of body orifices, and can be seen on the lips. This type of skin originates from the mucous membrane (or mucosa) which lines cavities inside the body. Mucocutaneous skin does not belong to the integumentary system. Glabrous skin is hairless and found only on the palms of the hand and the soles of the feet (i.e. palmar and plantar skin respectively). All other skin is covered with hair and is thus called hairy skin. A force-displacement curve on the human forearm was measured for indentation of a steel ball and then compared with the various synthetic materials

Fabric/Skin Contact Area

Fabric surface exhibits many ridges and indentations by virtue of its structural composition. Human skin also has ridges and indentations as shown in Figures 1.

Fig.1. Fabric skin interaction



The true area of contact between skin surface and fabric is a complex parameter affected by yarn and fabric structural parameters. The pressure exerted by fabric on skin ranges from 0 to 0.12 KPa (i.e. 0 to 0.83 PSI). Techniques have been employed to assess the fabric static and dynamic friction quantitatively as well as determine the factors that may affect it. The difference between static and kinetic frictional forces (Fs-Fk) has been reported to be strongly correlated with fabric handle. For a scroopy handle a higher magnitude of Fg-Fk is required. Relationship between subjective assessment and objective measurement of the properties has a linear function on a logarithmic scale.

Skin Friction Measurement

Naylor was the first to report on the measurement of skin friction, measured with a reciprocating linear movement between the skin and contact material (Figure 2a). Comaish et al. were the first to use a rotating indenter to measure skin friction. The axis of rotation of the annular contact material was perpendicular to the surface of the skin (Figure 2b) Rotation allows for continuous movement with larger displacements than is possible with linear movements, without being affected by the anisotropic properties of the skin. Highly used a rotating contact material with the axis of rotation parallel to the surface of the skin (Figure 2c), allowing for continuous movements, while the anisotropic properties of the skin could be taken into account. In the early nineties, Dinc measured the friction between the skin on the tip of the finger sliding over a flat sample of material attached to a load cell (Figure 2d). The results reported in the literature for skin friction measurements were obtained using a large range of measurement conditions: besides the variation in the type of relative motion, large ranges for normal load and velocity have been used: 0.01 - 70N and 0.13mm/s - 3.5m/s respectively.

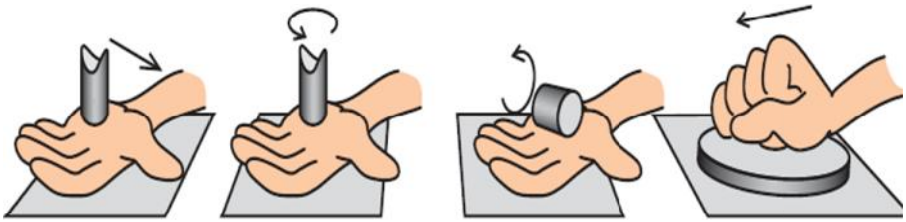


Fig.2. (a) Linear movement of contact material (b)Rotating Perpendicular movement (c)Rotating Parallel contact material (d) Skin making linear movement

Effect of the Contact Material

Tribology generally focuses on engineering materials for friction measurements, which can be applied, for example, in bearings or other moving parts. These can be described by characteristics such as the type of material and surface finish. The environmental conditions the materials were tested under are usually

expressed in terms of temperature, humidity, boundary layers and surface contaminants. However, this is different in skin friction research. Although the material interacting with the skin can be described in terms of type of material, geometry of the contact and surface finish, this information is not always described clearly and only a minority of studies gives a comprehensive description of the contact materials. Although the contact material can be described in the usual way for tribology, characterizing the skin is rather complex. In most skin friction research, the properties of the skin are expressed in the anatomical location: the site on the body where the friction is measured. Most often this is a rough description, such as the volar side of the forearm. The tribological system already indicated that the tribological properties measured at the skin are not only influenced by the skin, the contact material and the layer in between these materials, but also that the contact parameters, such as type of movement, normal load, relative velocity and the environment in which the measurements are executed play a role in the obtained coefficients of friction.

Fig.3. Contact materials in various shapes

Type of Motion

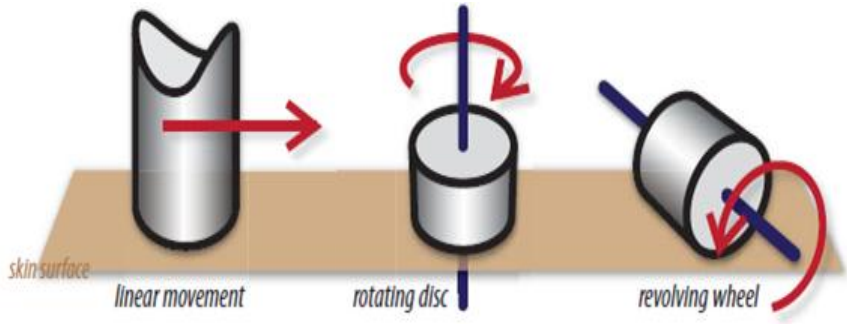
The tribological research on skin can be divided into two categories:

(1) the contact material moves relatively to the stationary skin

(2) the skin moves relatively to the stationary contact material.

In the latter category, the normal force and velocity are hardly controllable. In the former category, there are two common types of motion: linear motion and the rotating disc (Figure 4). In current tribology, a commonly used type of motion is the rotating ring against a stationary flat surface.

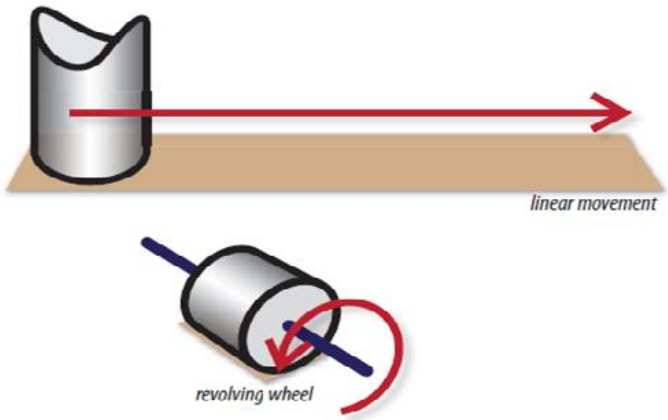
Fig.4. Types of movement with stationary skin and moving contact material.



In this type of movement the surface area of a cylinder (the wheel or ring) revolves over the stationary skin (the flat surface), which results in a relative sliding motion between the skin and contact material. The cylinder's axis of rotation lies parallel to the surface of the skin and is stationary, resulting in a sliding motion. The application of this contact situation has two major advantages. The first advantage is that only a small area of skin is required for executing a measurement. In Figure 5 the required area of skin for the revolving wheel is compared with the commonly used linear movements. With the revolving wheel, the size of the required area of skin is determined by the dimensions of the contact material. When using

linear movements, it is rather the length of the travelled path that determines the size of the required skin area, and because the skin is not perfectly flat, this will cause variations in the normal load between the sample and the skin.

Fig.5. Compared movements with required area of skin



The second advantage of using a revolving wheel over other types of movement is that the velocity is constant over the contact surface. In a contact situation with a rotating disc, with the axis of rotation perpendicular to the skin's surface, the velocity increases to the outside of the contact surface. Using the revolving wheel contact geometry, the travelled path or sliding distance between the sample and the skin are determined by the measurement duration and the dimensions of the wheel. Therefore, travelled paths much larger than the specified 10 mm at minimum are within the bounds of possibility. In short, all considerations result in contact geometry with a revolving wheel over the skin. The advantages of this type of contact geometry are:

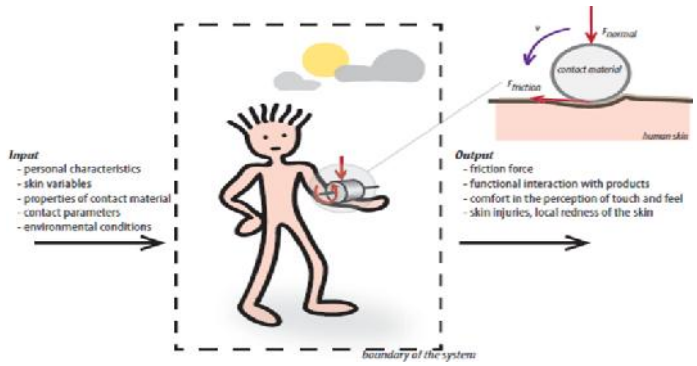
- only a small area of skin is required for a measurement;
- the velocity is constant over the contact surface;
- the effects of the anisotropic behavior of the skin can be measured.

A disadvantage of implementing this type of movement in skin friction research is that it makes it difficult to compare the obtained results with data reported in the literature. It is unclear which part of the (potential) variation in the measurement results obtained with different types of motion can be ascribed to the differences in the contact geometry. Further research will be needed to give a better understanding of this effect.

Tribological system of skin friction

In general, knowledge of skin friction can be used in the following ways: to improve the functionality of products, to prevent unwanted slipping of objects or, conversely, objects that unintentionally just stick to the fingers. Skin friction can also be used to gain the experience of high quality by simply improving the tactile perception of products, to create greater comfort in clothing, or to prevent slips in a bathroom or a swimming pool. And finally, this knowledge can be used to create skin care products that make the skin feel soft and supple, to make the use of products more comfortable, and to limit the adverse effects of skin friction, such as friction blisters and grazes. However, skin friction raises a lot of questions, is fraught with uncertainties, and a lot remains to be discovered.

Fig.6.Tribological system of skin friction



The human skin is built from several layers, vessels, sensors and other structures. All together these form the integumentary system. The integumentary system is one of the organ systems in the human body. Other examples of organ systems are the respiratory and circulatory systems.

Conclusion

The literature provides the foundation for the work described in further research. The literature review shows that there are some problems when trying to make comparisons of the available results. There is still limited knowledge on friction involving the human skin.

References

1. Pailler-Mattei C, Zahouani H. Analysis of adhesive behaviour of human skin in vivo by an indentation test. Tribol Int 2006;39(1):12-21.
2. Zhu YH, Song SP, Luo W, Elias PM, Man MQ. Characterization of skin friction coefficient, and relationship to stratum corneum hydration in a normal Chinese population. Skin Pharmacol Physiol 2011;24:81-86.
3. De Gee AWJ, Rowe GW. Friction, wear and lubrication. Paris: Organisation for economic co-operation and development; 1969.
4. Cua AB, Wilhelm KP, Maibach HI. Frictional properties of human skin: relation to age, sex and anatomical region, stratum corneum hydration and transepidermal water loss. Br J Dermatol 1990; 123:473-9.
5. Gitis N, Sivamani R. Tribometrology of skin. Tribol T 2004;47:461-9.
6. Koudine AA, Barquins M, Anthoine P, Aubert L, Leveque JL. Frictional properties of skin: proposal of a new approach. Int J Cosmet Sc 2000;22:11-20.
7. Ramalho A, Silva CL, Pais AACC, Sousa JJS. In vivo friction study of human skin: influence of moisturizers on different anatomical sites. Wear 2007;263:1044-9.
8. Chang WL, Seireg AA. Prediction of ulcer formation on the skin. Med Hypotheses 1999;53(2):141-4.

FTIR AND SEM ANALYSIS MADE ON NANO ENCAPSULATED COTTON DENIM FABRIC

Miss.V. S. Karpagavalli
M.Sc., M.Phil., (Ph.d) Assistant Professor, Departent of Garment Designing , PSGR Krishnammal College for Women
Dr.M.Sumithra
Assistant Professor, Departent of Textiles and Apparel Design, Bharathiar University, Coimbatore

Abstract

This paper elucidates about an eco friendly natural anti microbial finish has been prepared from the plant extracts for textile application. Herbal extracts from medicinal plants have been applied to cotton denim fabric by the method of Nanoencapsulation. All the treatments shown good antimicrobial properties and good washing durability up to 30 washes. The result of the antimicrobial activity is based on the standard test method AATCC 147 and AATCC 30 for evaluating antimicrobial efficiency. Finally FTIR and SEM analysis made on the treated cotton denim fabric and the results were discussed.

Key words: *Antimicrobial, Antifungal, Nano encapsulation, FTIR, SEM Analysis*

Introduction

Anti microbial finishes have increased its importance in the recent years for several reasons. They serve the consumer by offering protection from the harmful effects of certain microbes. Microbes are minute organisms, but can be most dangerous for creating harm to our lifestyle in different ways. Health and hygiene are the primary requirements for human beings to live comfortably and work with maximum efficiency. To protect the mankind from pathogens and to avoid cross infection a special finish like antimicrobial finish has become necessary**.** Denim has gained much popularity that if you look around, you will surely notice somebody wearing denim in your nearby. Consumers 'needs and wants are fine-tuned towards the latest developments and new styles; they are also aware of special finishes and process treatments given to the garment to make them eco-friendly and user friendly.

Experimental Procedure

Herbal Extraction: From the collected herbs the best three herbs were combined in the ratio 1:3:2 which are Jatropha (leaves and seeds), senna auriculata (leaves), and Euphorbia hirta (mixture of stem, leaf and flower). For these three plants the following extraction has been done.

Nanoencapsulation of Herbal Extracts: Nanoencapsulation is the coating of various substances within another material at sizes on the nano scale. This technique is already commonplace within a range of industries but it is accepted that only around 10% of potential applications are being exploited.

Selection of Wall and Core Material: The encapsulated material is commonly referred to as the internal phase, the core material, the filler or the fill. The encapsulation material is known as the external phase, the shell, coating or

membrane.The herbal extracts prepared were encapsulated using bovine albumin fraction as the wall material and the nanoparticles as the core material.

Fabric Treatment with Herbal Products

Direct Application Method: Methanol extracts of the herbs were directly applied on 100% cotton denim fabric by pad dry cure method. 2% of the herbal extract was applied on the fabric along with 8% citric acid as cross linking agent by pad dry cure method. Padding was carried out in a pneumatic padding mangle at 55 degree C.

Antimicrobial Test: The herbal treated cotton fabric were tested for the antimicrobial properties against gram positive as well as gram negative bacteria according to the AATCC method. Antimicrobial activities of the treated fabrics were evaluated by both quantitative (AATCC- 147) and quantitative (AATCC- 30) methods.

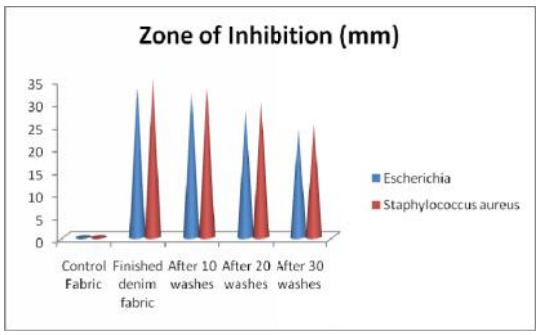
Wash Durability Test: The nanocapsules finished cotton fabric was analyzed for their wash durability by subjecting the sample to washing and testing its antibacterial efficiency. The denim fabric was subjected to washing by industrial machines and the antibacterial activity of the washed fabric was assessed by AATCC 147 test method.

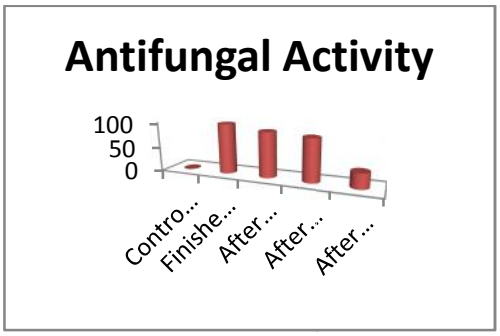
Results and Discussion: The results pertaining to the study are discussed under the following headings:

Antibacterial Activity (AATCC147): The cotton fabric with antimicrobial finish using Nanoencapsulation method showed maximum antibacterial activity. The result indicates the durability of fabric up to 30 industrial washes.

Antifungal Activity (AATCC 30)

The antifungal activity of treated cotton denim fabrics before and after 10, 20 and 30 industrial washes was evaluated. In the fabric before washing antifungal activity was observed by 100% mycelial reduction. The results analyzing antifungal activity of treated fabric before and after washes were shown good antifungal activity.



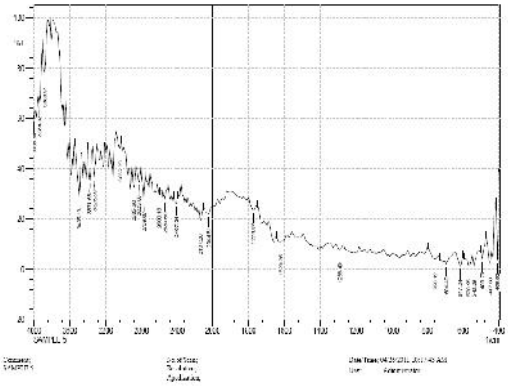


Ftir Analysis of the Fabric

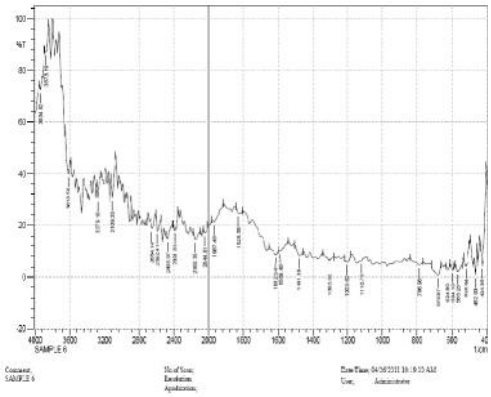
The FTIR analysis was done for nanoencapsulated finished fabric before wash and after 10, 20 and 30 washes of treated cotton denim fabric. When the FTIR spectrum of untreated and treated fabrics were compared, it was found that almost all the absorption peaks were modified upon treatment with nanoencapsulated finishes. FTIR is a technique that uses infrared light to observe properties of a fabric.

It is used in many different applications to measure the absorption, emission, and photo-conductivity of matter by shining a narrow beam of infrared light at the matter in various wavelengths and detecting how the matter responds to each wavelength. The following were the charts for FTIR analysis for the treated fabrics before wash and after washes.

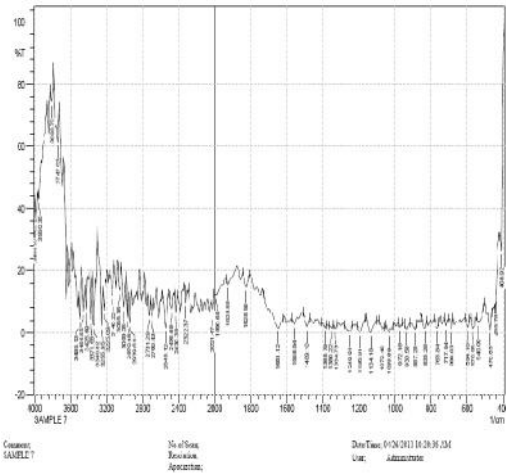
Finished Fabric Before Washing



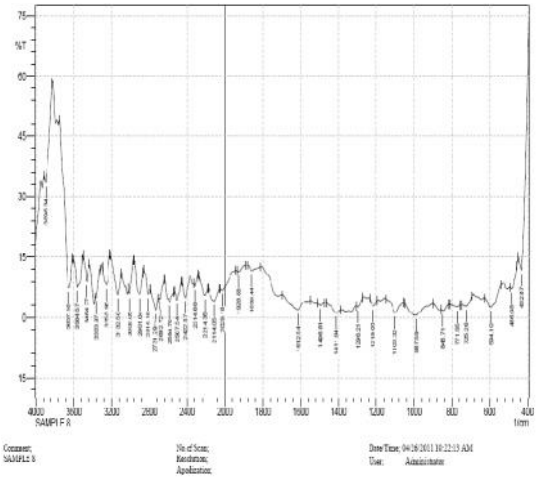
Finished Fabric After 10 Washes



Finished Fabric After 20 Washes



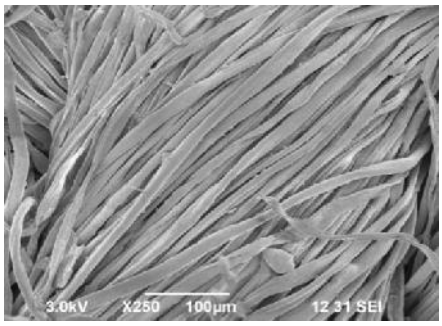
Finished Fabric After 30 Washes



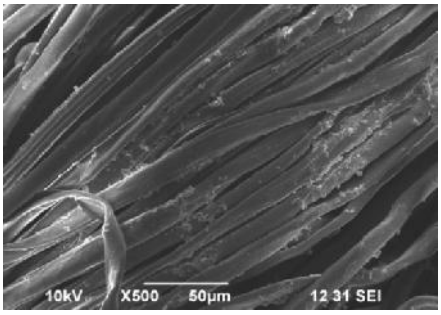
SEM Analysis

The surface of treated cotton denim fabric before and after washes was analyzed by scanning electron microscope to observe the size and shape of the Nanocapsules. The Nano encapsulated coatings were observed on surface of the cotton denim fabric. The Nanocapsules were well dispersed on the fabric surface. Scanning electron microscope analysis was done to measure the size of Nanocapsules. The particle size plays a primary role in determining their adhesion to the fabric. It is reasonable to expect that the largest particles will be easily remove from the fibre surface, while the small particles will penetrate deeper and adhere strongly into fabric. The SEM analysis of the treated fabrics showed Nano particles embedded on to the fabrics.

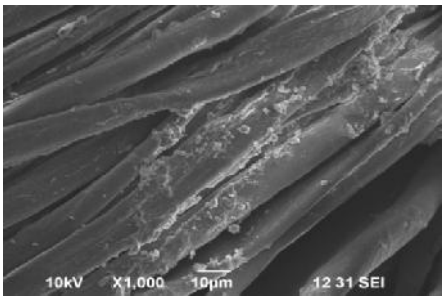
Finished Fabric Before Washing



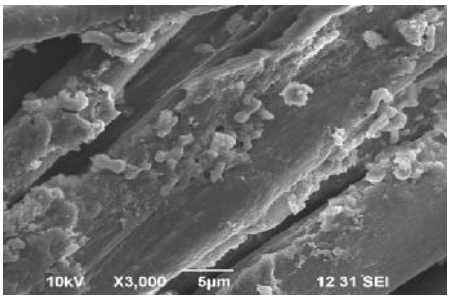
Finished Fabric After 10 Washes



Finished Fabric After 20 Washes



Finished Fabric After 30 Washes



Conclusion

The FTIR and SEM analysis were done for the sample A, B, C and D. the results were compared and concluded as almost all the absorption peaks were modified upon treatment with Nano encapsulated finishes. The surface of treated cotton denim fabric A, B, C and D was analyzed to observe the size and shape of the Nano capsules. The Nano encapsulated coatings were observed on surface of the cotton denim fabric. The Nano capsules were well dispersed on the fabric surface. From the SEM images it is assumed that Sample A have 100% efficiency of the finish applied on it. The other samples B, C and D have the efficiency of 90%, 75% and 50% respectively. The present investigation shows that the fabric is environment friendly without any harmful chemicals. Hence the finished antimicrobial fabric is considered to be an eco friendly fabric.

References

1. Past, present and future of jeans and denim fashion garments, Yasini Nensey, Clothes line July 2002, pp 78-80
2. Value Addition To Textiles By: Tanveer Malik and Shivendra Parmar
3. Functionalisation of textiles – Future perspectives By: Luis Almeida (2006)
4. Technical Textiles and Their ApplicationsAuthors: O.L.Shanmugasundaram Indian Textile Journal. 2009; 119(8):50-54. (published)
5. Application of Nanotechnology in Textile Finishing Authors: Shanmugasundaram, O. L Textile Review Journal. 2009; (published)
6. Trends and Patterns of Denim Jeans Demand in India By: Dr. P Nayak Source: Textiles Committee, Ministry of Textiles, Government of India, Mumbai
7. Self Cleaning Properties on Textiles: A Brilliant Application of Nanotechnology By: Chanchal Kumar Kundu December 24, 2010, technical textile
8. Come, Enter the World of Denim Jeans By: Funix sms
9. http://www.foresight.org/conferences/mnt9/abstracts/liu/index.html
10. http://www.agresearch.co.nz
11. http://www.nanoTsunami.com
12. http://www.thesmarttime.com/processing/textile-finishes.html

Characterisation of Terminalia bellerica and its antibacterial activity on Nonwoven Fabrics

P. Karpagam
Ph.D Research Scholar, Department of Costume Design and Fashion, PSG College of Arts and Science, Coimbatore, India
Dr.G.Manonmani
Assistant Professor, Mother Teresa University for Women, Madurai

Abstract
The investigation was done to promote antimicrobial finishing on nonwoven fabrics. The study investiges for the characterisation and antimicrobial activity of the plant extract Terminalia bellerica based on their antimicrobial property in nature. The various solvent extracts such as ethanol, petroleum ether, chloroform and aqueous was considered for the Invitro antimicrobial activity against Escherichia coli and Staphylococcus aureus. Ethanolic extract of Terminalia bellerica was selected it was then finished on nonwoven fabrics. The antimicrobial activity of coated fabric was assessed for AATCC 147. The results proved to have broad spectrum of antibacterial activity.
Keywords: *bio degradable, antimicrobial property, nonwoven fabrics and AATCC 147.*

Introduction

Medical textile is one of the fast and emerging field in technical textile market where the major products cover in health care and hygiene, non-implantable and clinical sectors. Terminalia bellerica is a common plant which are well known to their medicinal properties in traditional, ayurvedic and folk medicinal system. They are used to treat curative diseases. Ancient literatures prove the use of this plant for various treatments to cure health issues. They are major source of commercially marketed drug due to active substance such as phenols, alkaloids and tannin compounds. The bioactive nature and the constituents are effective against infective organisms. The current work was done to screen the active compounds that are responsible for the antimicrobial activity at different solvent extracts to establish new drug for the prevention and treatment of infection.

Materials and Methods: Tencel^R spunlace nonwoven fabric is the textile substrate used for the study having weight of 45gm/cm^2 was purchased from Shanghai Guizhi International Co Ltd, China. The medicinal herb Terminalia bellerica were procured from the local market, Coimbatore, India. Solvents of chloroform, petroleum ether, ethanol and aqueous was supplied by Precision Scientific Chemicals, Coimbatore, India. *Escherichia coli* and *Staphylococcus aureus* were obtained from KMCH, Coimbatore, India

Plant Extraction: Both aqueous and alcoholic extraction was done by maceration process. The extracts were filtered through Whatman No 1 filter paper and the solvent was made to evaporate and mixed with DMSO. This was then stored in screw capped bottle for further study.

Preliminary Assessment of Antibacterial Susceptibility Testing: The selected bacterial strains was inoculated for 1hr culture into nutrient broth and incubated for the growth at 37°C. After incubation a sterile cotton swab was immersed into the bacterial suspension and swabbed aseptically on the sterile Muller-Hinton agar plates. Wells of 6 mm diameter were punctured on the agar medium. About 150µl of the extracts was added to the wells. After which the plates were incubated at 37°C for 24 hrs in an incubator. Later on the zone of inhibition was measured and recorded.

Application of antibacterial finishing on nonwoven

Direct Application: The selected best activity herb in the solvent was finished on Tencel[R] nonwoven fabric by dip-dry method. The nonwoven fabric sample was made sterile by autoclave and with UV rays. Then the sterile fabric sample was finished with the selected plant extract by dip-dry method.

Assessment of Antibacterial Qualitative Test (AATCC147): The treated and untreated Tencel nonwoven fabric was cut into 2.5cm X 5 cm and were placed on the AATCC nutrient agar plates streaked with five parallel lines of bacterial inoculums. The plates were incubated at 37°C for 24 hrs. The sample was then observed for the zone of inhibition around and beneath the fabric.

Results and Discussions

Assessment of Antibacterial Qualitative Test (AATCC147)

The treated and untreated samples were subjected to Qualitative Assessment AATCC 147 (Parallel streak method) against the test organism *S.aureus* and *E.coli*. The result obtained is given in figure 1 stated that the untreated nonwoven fabric shows clear microbial growth proving that the control fabric sample do not inhibit microbial growth. Whereas the treated nonwoven fabric shows no microbial growth under the fabric.

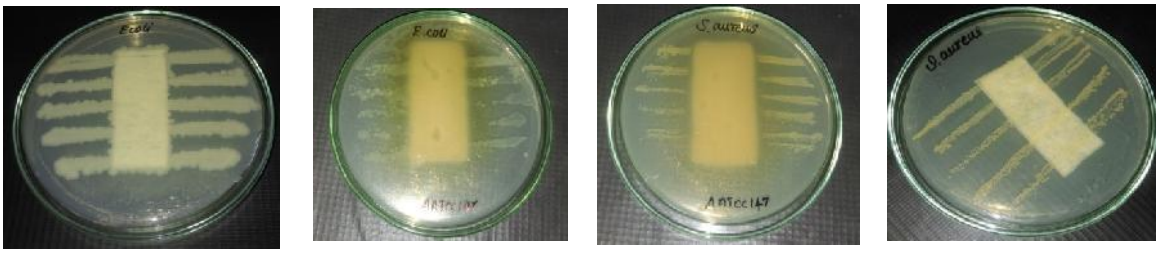


Fig 1:
A. Untreated nonwoven Fabric against *E.coli*
B. Untreated nonwoven Fabric against *S.aureus*
C. Treated nonwoven Fabric against *E.coli*
D. Treated nonwoven Fabric against *S.aureus*

Chemical characterization - FT-IR analysis

FTIR was adopted to characterize the potential interactions and to find the functional groups of the extract. FTIR spectra of herbal extract and bulk combinatorial herbal extract were analyzed and shown figure 2. In the spectra of herbal ethanolic extract, the broad band at 3649.32, 3572.17 and 3495.01 cm^{-1}

corresponded to the alcohols and phenols. The peaks at 2924.09, 2854.65 cm^{-1} was caused by C-H stretch which showed the presence of alkanes. The C= = = C stretch indicated the presence of alkynes (2299.15 and 2206.57 cm^{-1}).The peaks at 1743.65 and 1721.79 cm^{-1}corresponded to C=O stretch of carboxyl, esters and saturated aliphatic. The peak at 1527.62 represents the presence of nitro compounds with asymmetric stretch, C-C stretch at 1458.18 confirms the occurrence of aromatic compounds. The peak at 1242.16 , 1165 , 1049.28 cm^{-1} represented the C–N stretch which indicated the presence of aliphatic amines. =C–H bend states the presents of alkenes at 941 cm^{-1}. The peak at 802.39, 771.53 and 725.2 corresponds to c==H of aromatic compounds.

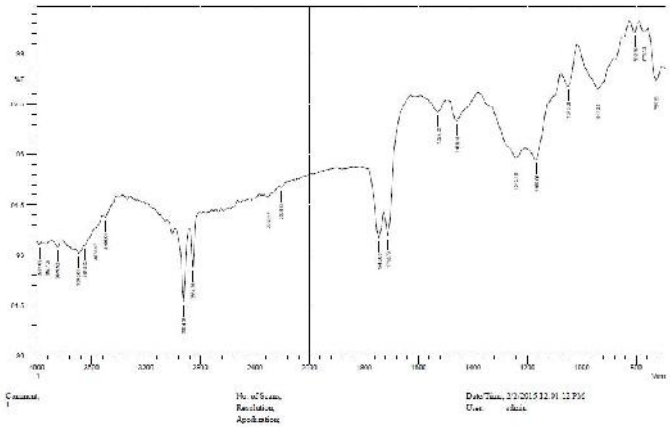


Fig 2: FT-IR analysis of Plant extract

References

1. F. Scazzocchio, M.F Cometa, L. Tomassini, and M. Palmery, "Antibacterial Activity Of *Hydrastis Canadensis* Extract And It's Major Isolated Alkaloids", Planta. Med, 2001, 67, pp.561-563.
2. G.Thilagavathi, R.Rathinamoorthy , "Optimisation Of Process Conditions Of Cotton Fabric Treatment With Terminalia Chebula Extract For Antibacterial Application", IJFTR , Vol 38, sep 2013, pp. 293-303
3. T. Essawi, M. Srour, "Screening of some Palestinian medicinal plants for antibacterial activity" J. Ethnopharmacol., 2000, 70, pp. 343-349
4. M.Yoh, E. K. Frimpong, S. P. Voravuthikunchai, & T. Honda, "Effect of sub inhibitory concentrations of antimicrobial agents (quinolones and macrolide) on the production and release of Vero toxin by enterohaemorrhagic Escherichia coli" 1999 o157:H7. Can. J. Microbial. 45, pp. 732-739.
5. K.M. Elizabeth, "Antimicrobial Activity Of *Terminalia Bellerica*, Indian Journal of Clinical Biochemistry, 2005, 20 (2) pp. 150-153
6. WHO Traditional medicine: Growing needs and potential, WHO Policy perspectives on medicines. p. 1, World Healh Organisation, Geneva 2002.
7. A. M Jansen, J. J. C. Cheffer, A. B. Svendsen, Planta Medica, 1987, 40, pp. 395–398.
8. Bruneton, Pharmacognosy, Phytochemistry, Medicinal plants 1995, pp. 265–380, France:Lavoisiler Publishing Co.
9. Voravuthikunchai, S.P Popaya, W.Supavita, "Antibacterial activity of crude extracts of medicinal plants used in Thailand against pathogenic bacteria", Ethnopharmacologia, 2004, 33, pp.60-65.
10. M.J. Balunas, A.D. Kinghorn, *Life Sciences*, 2005, 78, pp. 431-441.

RECENT TRENDS IN TEXTILES

Dr.R.Kavitha
Assistant Professor, Department of Physics,
Seethalakshmi Ramaswami College, Tiruchirapalli

Abstract

Textiles are an indispensable part of our everyday life. They are not limited to clothing made of fabric, knits and fleece, but also include technical textiles and composite materials. They withstand extreme stresses during washing and have many different functions while being light and highly flexible. By integrating electronic components, textiles can be enhanced with many different functions such as sensors and lighting. This enables completely new application areas for textiles. A main focus is innovative interconnection technologies for textile and stretchable substrates. Functionality and reliability requirements are always determined by the application in question. Our laboratory for electronics in textiles (Tex Lab) and diverse equipment for microelectronics assembly and analysis provide the best preconditions for research and development.

***Key words**: Microelectronics; Tex lab: Integrating: Electronic: Substrates*

Introduction

In the era of wearable computing, intelligent systems are breaking the bounds of traditional textiles and their design. The integration of the technologies with clothing, accessories, upholstery, or industrial technical textiles provides higher user-comfort and enables their seamless use in everyday activities. Investment in spinning and weaving equipment are increased very rapidly in Countries which is producing and exporting textiles. The Government will devise suitable measures to facilitate that the Textile Industry grows at the rate of 18% per annum. The Government will also take efforts to address the labour force will be generated by creating new infrastructure and also by strengthening the existing ones. Government of India is moving towards increasing productivity for increasing export growth of textiles. Purchasing new machinery or enhancing the quality of the existing machinery and introducing new technology can also be very useful in increasing the research and development (R and D) related activities that in the modern era are very important for increasing the industrial growth of a country. Some of the recent trends and developments of Textiles business will be discussed in this article.

Nanotechnology in Textile

Nanotechnology is a growing interdisciplinary technology often seen as a new industrial revolution. Nanotechnology (NT) deals with materials 1 to 100 nm in length. The fundamentals of nanotechnology lie in the fact that the properties of materials drastically change when their dimensions are reduced to nanometer scale. Nowadays also the textile industry has discovered the possibilities of nanotechnology. So, we can define nanotechnology in textile as the understanding, manipulation, and control of matter at the above-stated length, such that the physical, chemical, and biological properties of the materials (individual atoms, molecules, and bulk matter)

can be engineered, synthesized, and altered to develop the next generation of improved materials, devices, structures, and systems. It is used to develop desired textile characteristics, such as high tensile strength, unique surface structure, soft hand, durability, water repellency, fire retardancy, antimicrobial properties, and the like.

Modern Application of Nanotechnology in Textile Industry

Nanotechnology is increasingly attracting worldwide attention because it is widely perceived as offering huge potential in a wide range of end uses. The unique and new properties of nano materials have attracted not only scientists and researchers but also businesses, due to their huge economical potential. Nanotechnology also has real commercial potential for the textile industry. This is mainly due to the fact that conventional methods used to impart different properties to fabrics often do not lead to permanent effects, and will lose their functions after laundering or wearing. Nanotechnology can provide high durability for fabrics, because nano-particles have a large surface area-to-volume ratio and high surface energy, thus presenting better affinity for fabrics and leading to an increase in durability of the function. In addition, a coating of nano-particles on fabrics will not affect their breath ability or hand feel. Smart textiles are fabrics that have been developed with new technologies that provide added value to the wearer. Pailes-Friedman of the Pratt Institute states that "what makes smart fabrics revolutionary is that they have the ability to do many things that traditional fabrics cannot, including communicate, transform, conduct energy and even grow".

Smart textiles can be broken into two different categories: aesthetic and performance enhancing. Aesthetic examples include fabrics that light up and fabrics that can change color. Some of these fabrics gather energy from the environment by harnessing vibrations, sound or heat, reacting to these inputs. Performance enhancing smart textiles are intended for use in athletic, extreme sports and military applications. These include fabrics designed to regulate body temperature, reduce wind resistance, and control muscle vibration – all of which may improve athletic performance. Other fabrics have been developed for protective clothing, to guard against extreme environmental hazards, such as radiation and the effects of space travel. The health and beauty industry is also taking advantage of these innovations, which range from drug-releasing medical textiles, to fabric with moisturizer, perfume, and anti-aging properties

Color-Changing Fabrics

As part of a project "Karma Chameleon" scientists are investigating a way to electricity from the movement of the human body and use it to power a new kind of "electronic fabric". Using a very subtle current, the material would trigger super-fine wires woven into its makeup to change its color or illuminate according to the wearer's actions. Beyond that, the hope is to develop a fabric that can charge itself via the body and store energy independently, using it to completely change in appearance at the wearer's discretion. Making use of a small 12v arduino controller

the technology transforms soundwaves into low level heat, which in turn affects the properties of the dye in the fabrics to change their appearance almost instantaneously. Alongside this, the heat from a person's hands can also affect the dyes' color, providing a twofold means of interaction with the fabric. The fibres consist of multiple layers of polymers, which, when stretched and drawn out to a small diameter, begin to interact with each other". The possibilities brought by this incredible innovation would create attributes such as garments that change shapes and colours on their own, or clothes that use our energy to charge phones.

Optical Fibers

Plastic optical fibres may be easily integrated into a textile. They have the advantage of not generating heat and are insensitive to EM radiation. Optical fibres may serve a number of functions in a smart garment - transmit data signals, transmit light for optical sensing, detect deformations in fabrics due to stress and strain and perform chemical sensing. Plastic optical fibres can be woven into a textile, however bending of the fibers is an issue during the manufacturing process and also with the end product as mechanical damage causes signal loss. Commercially available Luminex ®fabric is a textile with woven optical fibers capable of emitting its own light. While this has aesthetic appeal for the fashion industry it is also used in safety vests and potential to be used for data transmission.

Applications of Smart and Interactive Textiles Health Care

The development of wearable monitoring systems is already having an effect on healthcare in the form of "Telemedicine". "The integration of high-technology into textiles, e.g. modern communication or monitoring systems or the development of new materials with new functions, has just started with timidity, but the branch already propagates an enormous boom for this sector Personalized Health care The concept of personalized healthcare empowers the individual with the management and assessment of their own healthcare needs. Wearable devices allow physiological signals to be continuously monitored during normal daily activities. This can overcome the problem of infrequent clinical visits that can only provide a brief window into the physiological status of the patient. Smart clothing serves an important role in remote monitoring of chronically ill patients or those undergoing rehabilitation. It also promotes the concept of preventative healthcare. Given the current world demographics there is a need to shift the focus of healthcare delivery from treatment to prevention and also to promote wellness monitoring rather than diagnosis of illness.

Wireless-enabled garment with embedded textile sensors for simultaneous acquisition and continuous Monitoring of ECG, respiration, EMG, and physical activity. The "smart cloth" embeds a strain fabric sensor based on piezo resistive yarns and fabric electrodes realized with metal based yarns.

- Sensitized vest including fully woven textile sensors for ECG and respiratory frequency detection and a Portable electronic board for motion assessment, signal pre-processing, and Bluetooth connection for data Transmission.

- Wearable sensitized garment that measures human heart rhythm and respiration using a three lead ECG shirt. The conductive fiber grid and sensors are fully integrated (knitted) in the garment (Smart Shirt).

Life Belt

Life belt is a trans-abdominal wearable device for long-term health monitoring that facilitates the parental monitoring procedures for both the mother and the fetus. Hospitals and obstetric clinics, on the other hand, might avoid the frequent visit of additional patients (most of them hypochondriacs), so the remote health monitoring provided by this. "Life belt" will contribute to a significant reduction of the hospitals' load. The hospitals' efficiency in that way can be increased as well as the quality of the provided services. "life belt" is also a valuable decision support tool for the obstetrician, who is enabled to monitor patients remotely, evaluate automated preliminary diagnosis of their condition based on collected and analyzed vital signs, access patients' medical data at any time and most importantly be alerted when potential pregnancy complications require physical examination of the patient. Furthermore, the obstetricians are able to use mobile units and portable devices to organize their work and increase their work efficiency and effectiveness. so this life belt is very useful in case of pregnant women .Pregnant women living in remote areas work during pregnancy and face certain health problems (e.g. high blood pressure, kinetic problems requiring immobilization, kidney or heart diseases, multiple pregnancy). Usually they feel uncomfortable with frequent visits for prenatal monitoring. The inaccessibility of the fetus, the sensitivity of fetal and maternal health status and susceptibility to psychological conditions pose significant difficulties in monitoring the progress of the pregnancy effectively. Furthermore, bulky or invasive equipment and long examinations in clinical settings affect both the mother and the fetus causing additional stress which influences their health. The use of a wearable platform able to monitor non-invasively fetal and maternal vital signs could improve significantly their living conditions.

Lifejacket

Life jacket is a medical device worn by the patient that consequently reads their blood pressure or monitors the heart rate; the information is transferred to a computer and read by medical staff. A specialized camera in the form of headwear has been developed to be worn by paramedics. Visual information captured by the camera can be transferred directly to medical staff at the hospital enabling them to advise instantly on appropriate treatment. Hypertension is another common disease found in the elderly population. Elevated BP increases the workload of the heart and scars the artery walls. Increases in either BP or BP variability (BPV)are partly responsible for various cardiovascular events. Nevertheless, most individuals with hypertension experience no symptoms, which often make them overlook their ailment. Thus, early detection of BP for health condition assessment by wearable devices before a severe event occurs is very important.

Military/Defense

In extreme environmental conditions and hazardous situations there is a need for real time information technology to increase the protection and survivability of the people working in those conditions. Improvements in performance and additional capabilities would be of immense assistance within professions such as the defense forces and emergency response services. The requirements for such situations are to monitor vital signs and ease injuries while also monitoring environment hazards such as toxic gases. Wireless communication to a central unit allows medics to conduct remote triage of casualties to help them respond more rapidly and safely.

Conclusion

Further developments in interactive and wearable electronics include garments and clothing that contain Luma live textiles that are able to transmit messages/advertisements. They have the ability to change colour, and contain LED's incorporated within the clothing. Phillips the electronics company behind these latest innovations is planning to develop fabrics with Luma live technology that will allow soft furnishings such as cushions, curtains etc. to transform/ alter colour and illuminate consecutively enhancing mood and atmosphere of their surroundings. To take the next step towards electronic clothing (made of electronic textiles) research has to be carried out in the following areas:

Clothing technology for manufacturing testing under wearing conditions and washing/cleaning treatments investigation of reliability We have seen that electronics can not only be attached to textiles but also realized in form of textile structures. Today, some performances cannot be compared with conventional computer technology. There are also some limitations concerning mass production and reliability. In the future it could become quite difficult to clearly separate electronic textiles from the aforementioned method of miniaturization plus attachment, because computers could be miniaturized until they are molecule-sized. In this case 'attachment' to fibres or fabrics would also lead to what we define as electronic textiles.

Plastic was a revolution, and nano-technology will probably be the next big change. There are a lot of thoughts about what could be done if we were able to manipulate, rearrange and build from molecules and atoms. Having a machine that changes a bicycle tire into meat, self-cleaning carpets, changing state from rigid to flexible and visa versa.

A STUDY ON USES OF GEO-TEXTILES IN THE FIELD OF ENGINEERING

R.Kavitha M. Sc, MBA, NET
Assistant Professor, Department of Textile and Fashion Designing, Vivekanandha College for Women, Tiruchengode

Abstract

Technical textiles are high performance, special textile materials and products that are manufactured primarily for their technical and performance properties rather than their aesthetic or decorative properties. Technical textiles are becoming very popular all over the world due to several functional requirement, user friendliness; eco friendliness; health & safety; cost effectiveness; durability; high strength; light weight; versatility; customization; logistical convenience etc. Technical textile is also known as industrial textiles, functional textiles, performance textiles, engineering textiles, invisible textiles and hi-tech textiles. Technical textiles represent a multi-disciplinary field with numerous enduse applications. The production of different items of technical textile industry has been slowly but steadily increasing in the country. An exceptional feature of technical textiles is the use of innumerable varieties of raw materials, processes, products and applications for their production. Some of the materials used for making technical textiles are Metals, like steel, Minerals, like asbestos and glass, Synthetic polymers, Regenerated fibers like rayon fiber and acetate fiber, Natural fibers like cotton fiber, jute fiber, wool fiber etc. Technical textiles areas are covering an important range of applications. These papers deal with research in Geotextiles, raw material used for its manufacturing ,its properties and its manufacturing. The future of textiles is very unpredictable due to day by day innovations in the various fields of textiles. The essential properties of geotextiles are high mechanical strength, filteration ability and permeability. India is a large producer of jute. Jute is a low cost, renewable, biodegradable and eco-friendly natural product. Jute-based geosynthetics is finding increasing acceptability among geotechnical engineers primarily because of its eco-concordance, facility of production of tailor-made fabrics and price competitiveness. However civil engineers are still apprehensive about its long- term effectiveness on account of its bio-degradability .Applications of Jute geotextiles in ground improvement, Improvement in Pavement Performance, etc.

Key Words: *Geo-Textiles, Geo-synthetics, Jute, Engineering and Fibers.*

Introduction

Geo-Textiles: The ASAE (Society for Engineering in Agricultural, Food, and Biological Systems) defines a geotextile as a "fabric or synthetic material placed between the soil and a pipe, gabion, or retaining wall: to enhance water movement and retard soil movement, and as a blanket to add reinforcement and separation." A geotextile should consist of a stable network that retains its relative structure during handling, placement, and long-term service. Other terms that are used by the industry for similar materials and applications are geotextile cloth, agricultural fabric, and geosynthetic. **Geotextiles** are permeable fabrics which, when used in association with soil, have the ability to separate, filter, reinforce, protect or drain. As the use of **geotextile fabrics** has expanded there has been the introduction of geotextile **composites** and the development of products such as **geogrids** and **meshes**. Overall these materials are referred to as geotextiles and related products.

Geomembranes are impermeable membranes used widely as cut-offs and liners. Until recent years, geomembranes were used mostly as canal and pond liners; however, one of the largest current applications is to the containment of hazardous or

municipal wastes and their leachates. In many of these applications geomembranes are employed with geotextile or mesh underliners which reinforce or protect the more flexible geomembrane whilst also acting as an escape route for gases and leachates generated in certain wastes.Geomembranes are made of various materials including low density polyethylene (LDPE), high density polyethylene (HDPE), and polypropylene (PP). They are manufactured from 100% continuous polyester filaments. Polyester is stable up to temperatures exceeding 250 degrees centigrade and is, therefore, unaffected by hot bitumen or asphalt. In addition, it is passed through hot ovens, raised to 200 degrees centigrade which 'pre shrinks' the fabric, enhancing its stability. The fabrics are used to provide a water resistant layer, virtually eliminating surface water infiltration.

Types of Geo textile

In general, the vast majority of geo textiles are made from polypropylene or polyester formed into fabrics as follows:

- Woven multifilament
- Woven slit-film monofilament
- Woven slit-film multifilament
- Nonwoven continuous filament heat bonded
- Nonwoven continuous filament needle-punched
- Nonwoven staple needle-punched
- Knitted

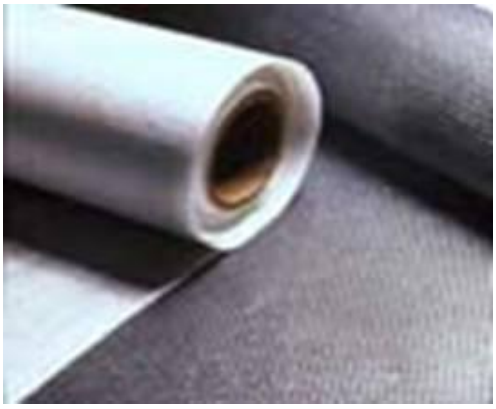


Fig.1 (a) Nonwoven Fabric

Fig.1(b) Woven Fabric

Properties of Geo-Textiles

There are three main properties which are required and specified for a geo textile are its mechanical responses, filtration ability and chemical resistance. These are the properties that produce the required working effect. They are all developed from the combination of the physical form of the polymer fibers, their textile construction and the polymer chemical characteristics. For example, the mechanical response of a geotextile will depend upon the orientation and regularity of the fibers as well as the type of polymer from which it is made. Also, the chemical resistance of a geotextile will depend upon the size of the individual component fibers in the fabric, as well as their chemical composition – fine fibers with a large specific surface area are subject to more rapid chemical attack than coarse fibers of the same polymer.

Geo textiles Used in Civil Engineering Applications

Geotextiles used in civil engineering applications are expected to carry out one or more functions over if given design life. There are five defined functions, these are; drainage, separation, filtration, protection and reinforcement. Geotextiles are normally manufactured by either woven or non-woven techniques. The functional requirements of the geotextile in a given application will determine the performance properties required, and any assessment of the products durability will be based on the degradation of these properties over a given time. Geotextiles particularly refers to permeable fabric or synthetic material, woven or non-woven, which can be used with geotechnical engineering material. They apply to a broad range of civil engineering construction, paving, drainage and other applications. Geotextiles are extensively used with soil, rock, earth or any other geotechnical engineering-related material.Modern geotextiles are usually made from synthetic polymers – polypropylenes, polyesters,polyethylenes, and polyamides – which do not decay under biological and chemical processes. This makes them useful in road construction and maintenance. Geotextiles made of materials are most commonly used. The makeup of these fabrics determines their best application, so it is important to understand their characteristics.

Application Areas

1. Seperation: Separation provides a media between the aggregate and the subsoil which absorbs the load in the form of tension and prevents change in alignment of the aggregate. Geo textile economically helps the separation concept of keeping two dissimilar materials apart to maximize the physical attributes of each of those materials. The object of separation by geo textiles is to prevent a well defined material or rich material from penetrating the sub-grade or the poor soil. For separation purposes, both woven / nonwoven geo textiles may be used. Geo textiles function to prevent mutual mixing between 2 layers of soil having different particle sizes or different properties.

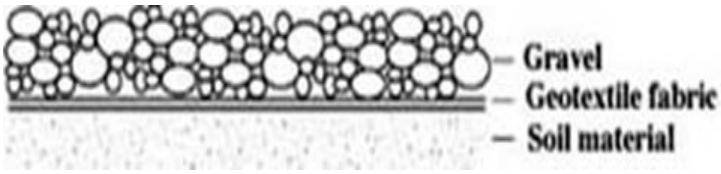


FIG 2: Illustration of a geo textile fabric separating a gravel layer from the underlying soil material

Table 1: The required properties for separation

	Mechanical	Hydraulic	Long-term Performance
During installation	Impact resistance Elongation at break	Apparent opening size Thickness	UV resistance
During construction	Puncture resistance Elongation at break	Apparent opening Size Thickness	Chemical stability UV resistance
After completion of construction	Puncture resistance	Apparent opening size Thickness	Chemical stability Resistance to decay

2.Drainage

The function of drainage is to gather water, which is not required functionally by the structure, such as rainwater or surplus water in the soil, and discharge it.

Table 2 The required properties for drainage

	Mechanical	Hydraulic
Permanent drainage function	Influence of normal overburden pressure	Permeability Thickness Apparent opening size (A.O.S.)
Temporary drainage function	Influence of normal overburden pressure	Permeability Thickness Apparent opening size (A.O.S.)

3. Filtration

Filtration involves the establishment of a stable interface between the drain and the surrounding soil. In all soils water flow will induce the movement of fine particles. Initially a portion of this fraction will be halted at the filter interface; some will be halted within the filter itself while the rest will pass into the drain. The geotextile provides an ideal interface for the creation of a reverse filter in the soil adjacent to the geotextile. The complex needle-punched structure of the geotextile provides for the retention of fine particles without reducing the permeability requirement of the drain.

Table 3. The required properties for Filtration

	Mechanical filter stability	Hydraulic filter stability	Long-term performance
Permanent filter function	A.O.S. Thickness	Geotextile permeability	Chemical properties of water and soil Chemical stability Decay resistance
Temporary filter function	A.O.S. Thickness	Geotextile permeability	Chemical properties of water and soil Chemical stability

4. Reinforcement

Due to their high soil fabric friction coefficient and high tensile strength, heavy grades of geotextiles are used to reinforce earth structures allowing the use of local fill material.

FIG 3: Reinforcement

Table 4: The required properties for reinforcement

	Mechanical	Hydraulic	Long-term performance
Base failure	Shear strength of bonding system	Hydraulic boundary conditions	Chemical and decay resistance
Top failure	Tensile strength of geotextile Geotextile/ soil friction	Hydraulic boundary conditions	Chemical and decay resistance
Slope failure	Tensile strength of geotextile Geotextile/ soil friction		Creep of the geotextile/ soil system Chemical and decay resistance

5. Protection

Erosion of earth embankments by wave action, currents and repeated drawdown is a constant problem requiring the use of non-erodable protection in the form of rock beaching or mattress structures. Beneath these is placed a layer of geotextile to prevent leaching of fine material. The geotextile is easily placed, even under water.

Table 6: The required properties for protection

	Mechanical	Long-term performance
Tunnel construction	Burst pressure resistance Puncture resistance Abrasion resistance	Chemically stable Decay resistance
Landfill and reservoir geomembrane construction	Puncture resistance Burst pressure resistance Friction coefficient	Chemically stable Decay resistance
Flat roof construction	Puncture resistance	Chemical compatibility

Conclusion

Geo Textiles as a branch of technical textiles is playing a very significant role in various application of civil engineering. The civil engineering vertical is already using about 100 million square metres of geo-synthetics and geotextiles, and it is projected to grow steadily at 10-12 per cent per annum. All have a wide range of applications and are currently used to advantage in many civil engineering applications including roads, airfields, railroads, embankments, retaining structures, reservoirs, canals, dams, bank protection and coastal engineering. So, from the above discussion it can be concluded that geotextile has a great potential and prospect to be used extensively in different civil engineering works as compared to conventional system.

References

1. Robert M. Koerner 'Designing with Geo synthetics', 1998.
2. Sreerama Rao –Jute Geo textile Application In Kakinada Port Area (National Seminar on Jute Geo textiles & Innovative Jute Products at New Delhi, India, 2003.
3. Ramaswami & Aziz –Jute Geotextile For Roads (Intl. Workshop on Geotextiles at Bangalore, India,1989).
4. ANON,WWW.dredge.com

DISPOSABLE TEXTILES- FEMININE HYGIENE PRODUCT AN OVERVIEW

Miss S.Kokilavani
Scholar, Research and Development Center, Bharathiar University, Coimbatore
Dr.S.Karpagamchinnammal
Head, Department of Costume Design and Fashion, Chikkanna Govt Arts College, Tirupur

Abstract

New generation medical textiles are important growing field with great expansion in disposable textiles, Disposable textiles are textile designed to dispose after use, and they are bound by "use and throw" concept. They can be tailor made functionally and economically for the end user. Disposable articles includes sanitary napkins, baby diapers, wipes etc., The main reasons for increased interest in this field include: an increased awareness towards personal hygiene, prevent skin infections and body odour, to improve physiological comfort value of garments. The key qualities of disposable products include they are bacteriostatic, anti-viral, fungi static, non-toxic, high absorbent, non-allergic, breathable, haemostatic, and biocompatible, also provide reasonable mechanical properties. The aim of this paper is to outline and review the latest developments in sanitary napkins.

Introduction

Sanitary napkins are feminine hygiene products falling under the umbrella of personal care products**,** designed to absorb and contain body exudates. They are absorbent disposable single use products designed to receive, absorb, retain menstrual fluid and isolate them from the rest of the body. The pads are both disposable and re-usable. It consists of an absorbent pad sandwiched between two sheets of nonwoven fabric. "Sanitary Napkins" also known as sanitary pads, sanitary towels or maxi pads form an important part of the gynaecological hygiene of every woman. Menstrual hygiene continues to be amongst the most challenging development issues today. Hence today some sanitary pad, come with health features to take care of the hygiene aspect of women such as sanitary pads with herb and negative ion.

Characteristics of Sanitary Napkins

- prevention of leakage
- Insignificant detectable odour formation
- Pleasant wearing with no skin Irritations
- Suitable size and volume
- Skin friendly

The main **components** of a sanitary napkin include

- Cover stock/ outer cover
- Absorbent filler (core)
- Barrier film
- Core tissue

Classification

- Sanitary napkins according to shape structure can be divided into wings, wings, sanitary pads, includes all kinds of extended widening special design.
- The surface of the material can be divided into dry net surface and cotton net surface; the sanitary microbiology characteristics can be divided into 3 classes namely, the common class, disinfection class and antimicrobial function class.

Importance of Sanitary Napkins

"Sanitary Protection: Every Woman's Health Right", a study by AC Nielsen concluded that out of India's female population (355 million), only 12 % use sanitary napkins, women depend on different alternatives like rugs, ashes and husk sand. Which causes serious women diseases such as Reproductive Tract Infection (RTI) is 70% more commonly visible among these women, Also menstrual hygiene plays a role in development of cervical cancer, researchers believe it will be beneficial to women's personal hygiene. The survey said 64 per cent of gynaecologists noted that sanitary napkins can act as a precautionary measure to reduce the risk of cervical cancer among women. Hence, the new line of products could revive in this area.

Latest Developments - Sanitary Napkins

Jute based sanitary napkins: The National Jute Board (NJB) in collaboration with the Indian Institute of Technology - Kharagpur is developing jute-based sanitary pads which could help prevent cervical cancer. Since menstrual hygiene plays a role in development of cervical cancer, researchers believe it will be beneficial to women's personal hygiene. Also, the new line of products could revive The dying jute industry. The product is fabricated from cellulose extracted from jute and its qualities are enhanced with addition of a super-absorbent polymer. Normally, the sanitary napkins are made of imported cotton or wood cellulose.

Nano Fibres Based Sanitary Napkins: Nanofibers Make Sanitary Pads Safer and Greener Nanofibers those are more absorbent and better for the environment. The new material, which is made of electro spun cellulose acetate nanofibers, the nanofibers are long and very thin fibres made using a technique called electro spinning – spinning using electricity. Because of their large surface area compared to their volume, they would be more absorbent than existing materials. The material used in commercially-available sanitary napkins is made up of flat, ribbon-like fibers that are about 30 micrometers thick. In contrast, the nanofibers are about 150 nanometers thick–about 200 times thinner. They compared the performance of the material to commercially-available sanitary napkins and found it to be even more absorbent. Notably, the material is more comfortable than those used in existing products and leaves behind less residue after use. The results show that electrospun nanofibers outperform commercially-available sanitary products in terms of absorbency and comfort, and to replace the potentially harmful materials currently used,"

Anion Sanitary Napkins : Anion Sanitary Napkins are designed to enhance physical health and mental well-being by emitting negative ions (anions) during use. The negative ion strip embedded in each sanitary pad is activated by the friction of wearing the pads. Benefits of anion pads as follows

- Reduce stress
- Alleviate depression
- Boost energy
- Enhance metabolism
- Reduce odour
- Strengthen immunity
- Enhance hormonal balance Support the respiratory, cardiovascular, and nervous systems. Contribute to eliminating or preventing bacterial infections

Conclusion

Menstrual hygiene is an often ignored problem in international development. This paper highlight the present research on sanitary napkins and its added values, In this modern world sanitary napkins are available in variety of designs, taking into consideration, the style, comfort and fashion, nowadays most women have their own standards.

References

1. http://www.technicaltextile.net/promotion/peixin-sanitary-napkins-report/Sanitary-napkin-project-feasibility-report.pdf
2. http://www.indiantextilejournal.com/articles/fadetails.asp?id=1567
3. www.sanitarynapkin.com
4. www. women's hygiene.com
5. http://www.oddnaari.in/archives/story/68percent-rural-women-cant-afford-sanitary-napkins-survey-89378-2011-02-28
6. https://thehoneypot.co/products/herbal-overnight?variant=1590771843
7. http://www.ndtv.com/india-news/indian-scientists-developing-sanitary-napkins-from-jute-1228255
8. http://www.asianscientist.com/2016/10/in-the-lab/nanofibers-environmentally-friendly-diapers-sanitary-pads/

A STUDY OF TEXTILE MATERIALS FOR EXTERNAL AND INTERNAL HEALTHCARE APPLICATIONS

Dr. Krishnaveni Vasudevan
Associate Professor, Department of Fashion Technology, Kumaraguru College of Technology, Coimbatore, Tamilnadu, India

Abstract

An important and growing part of the textile industry is the medical and related healthcare and hygiene sector. The extent of the growth is due to constant improvements and innovations in both textile technology and medical procedures. Medical textiles are manufactured a goods which includes textile stuff used in hygiene, healthiness and private care as well as surgical end use. The Medical textiles products are obtainable in woven, knitted and non-woven structure based on the area of application. The aim of this paper is to highlight the specific medical and surgical applications for which textile materials are currently used. A variety of textile products and their properties that make them suitable for these applications will be discussed.

Keywords: *Non-implantable materials, extracorporeal devices, Bandages, Gauzes*

Introduction

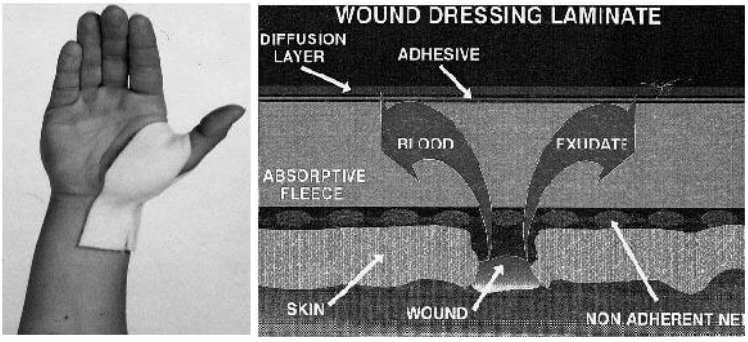
Now-a-days textiles are used in different sectors and various purposes beyond imagination. Medical sector is one of them. An important and emerging part of the textile industry is medical, hygiene and health sector .It is one of the major growth areas within technical textiles and the use of textile materials for medical and healthcare products ranges from simple gauze or bandage materials. Textile products are omnipresent in the field of human hygiene and medical practice. Their use is based on a number of typical basic textile properties like softness and lightness, flexibility, absorption, filtering etc. Advanced medical textiles are significantly developing area because of their major expansion in such fields like wound healing and controlled release, bandaging and pressure garments, implantable devices as well as medical devices, and development of new intelligent textile products. Present day society is undergoing changes like large population size, need of increasing his life span of every individual, various situations and hazards of human activity and civilization including transport accidents, chemical materials, fire, cold, diseases and sports. Such factors increase the demand of medical textiles. So there are several researching works are going on all over the world in medical textile materials and polymers. Materials used include monofilament and multifilament yarns, woven, knitted, and nonwoven fabrics, and composite structures.

Non-implantable materials

These materials are used for external applications on the body and may or may not make contact with skin. Table 1.illustratesthe range of textile materials employed within this category, the fibers used, and the principal method of manufacture (1).

Wound Care

These materials are used for external applications on the body and may or may not make contact with skin. A number of wound dressing types are available for a variety of medical and surgical applications. The functions of these materials are to provide protection against infection, absorb blood and exudate, promote healing and, in some instances, apply medication to the wound. Common wound dressings are composite materials consisting of an absorbent layer held between a wound contact layer and a flexible base material. The absorbent pad absorbs blood or liquids and provides a cushioning effect to protect the wound Figure.1 (a).



(a) (b)

Figure.1 (a) Wound dressing concept, (b) Wound dress

The wound contact layer should prevent adherence of the dressing to the wound and be easily removed without disturbing new tissue growth. The base materials are normally coated with an acrylic adhesive to provide the means by which the dressing is applied to the wound. Developments in coating technology have led to pressure sensitive adhesive coatings that contribute to wound dressing performance by becoming tacky at room temperature but remain dry and solvent free. The use of collagen, alginate, and chitin fibres has proved successful in many medical and surgical applications because they contribute significantly to the healing process. When alginate fibres are used for wound contact layers the interaction between the alginate and the exuding wound creates a sodium calcium alginate gel. (2) The gel is hydrophilic, permeable to oxygen, impermeable to bacteria, and contributes to the formation of new tissue Figure.1 (b).

Table.1 Non-Implantable Materials

Product application	Fibre type	Manufacture system
I. Wound care		
Absorbent pad	Cotton, viscose	Nonwoven
Wound contact layer	Silk, polyamide, viscose, Polyethylene	Knitted, woven, nonwoven
Base material	Viscose, plastic film	Nonwoven, woven
II. Bandages		
Simple inelastic/elastic	Cotton, viscose, polyamide, elastomeric yarns	Woven, knitted, nonwoven
Light support	Cotton, viscose, elastomeric yarns	Woven, knitted, nonwoven
Compression	Cotton, polyamide, elastomeric yarns	Woven, knitted

Orthopaedic	Cotton, viscose, polyester, polypropylene, polyurethane foam	Woven, nonwoven
III. Plasters	Viscose, plastic film, cotton, polyester, glass, polypropylene	Knitted, woven, nonwoven
IV. Gauzes	Cotton, viscose	Woven, nonwoven
V. Lint	Cotton	Woven
VI. Wadding	Viscose, cotton linters, wood pulp	Nonwoven

Bandages

Bandages are the final medical requirement. Bandages are designed to perform a whole variety of specific functions depending upon the final medical requirement. They can be woven, knitted, non – woven or composite in structure. They can be classified into various classes depending upon the function they serve as (3).

Simple Inelastic/Elastic: Bandages are designed to perform a whole variety of specific functions depending upon the final medical requirement. They can be woven, knitted, or nonwoven and are either elastic or non-elastic. The most common application for bandages is to hold dressings in place over wounds. Such bandages include lightweight knitted or simple open weave fabrics made from cotton or viscose that are cut into strips then scoured, bleached, and sterilized (4).

Light Support: Elasticated yarns are incorporated into the fabric structure to impart support and conforming characteristics. Knitted bandages can be produced in tubular form in varying diameters on either warp or weft knitting machines. Woven light support bandages are used in the management of sprains or strains and the elasticized properties are obtained by weaving cotton crepe yarns that have high twist content. Similar properties can also be achieved by weaving two warps together, one beam under a normal tension and the other under a high tension. When applied under sufficient tension, the stretch and recovery properties of the bandage provide support for the sprained limb.

Compression: Compression bandages are used for the treatment and prevention of deep vein thrombosis, leg ulceration, and varicose veins and are designed to exert a required amount of compression on the leg when applied at a constant tension. Figure.2.(a) - (d). Compression bandages are classified by the amount of compression they can exert at the ankle and include extra-high, high, moderate, and light compression and can be either woven and contain cotton and elastomeric yarns or warp and weft knitted in both tubular or fully fashioned forms (1,4).

Orthopaedic: Orthopaedic cushion bandages are used under plaster casts and compression bandages to provide padding and prevent discomfort. Figure.2: (e) & (f). Nonwoven orthopaedic cushion bandages may be produced from polyurethane foams, polyester, or polypropylene fibres and contain blends of natural or other synthetic fibers. Nonwoven bandages are lightly needle-punched to maintain bulk and loft. A development in cushion bandage materials includes a fully engineered needle punched structure which possesses superior cushion properties compared with existing materials (5).

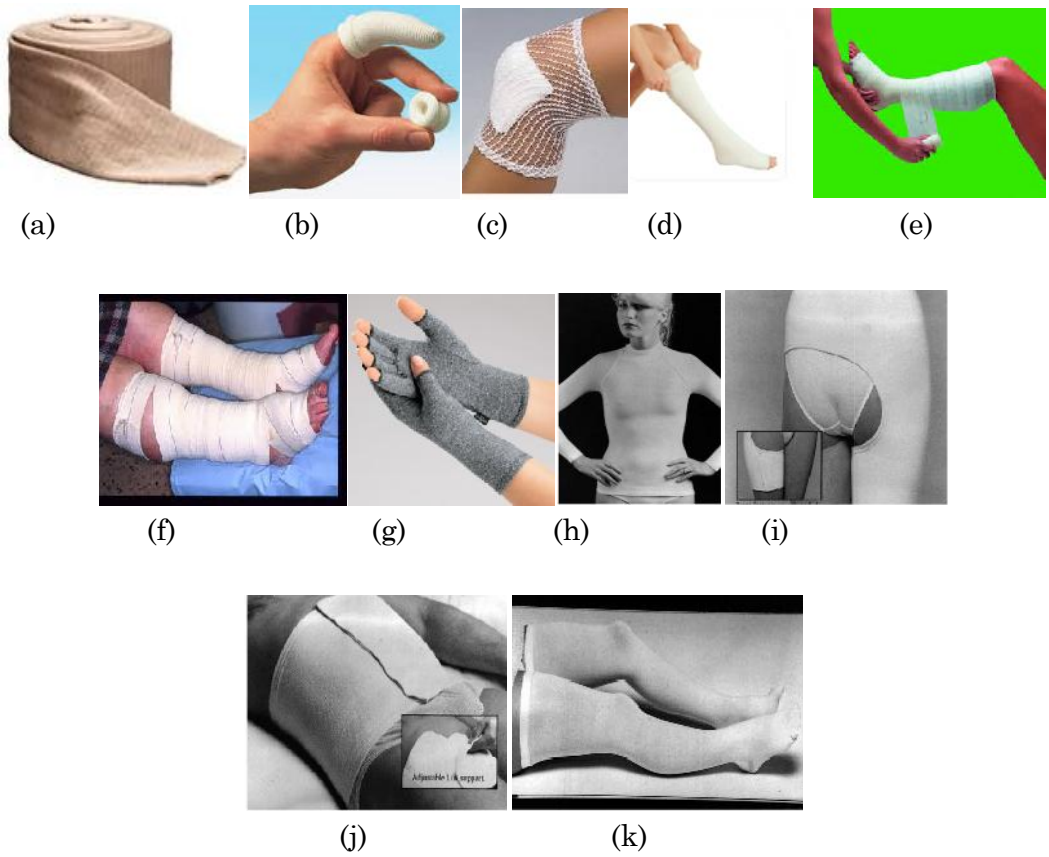


Figure.2: Different types of Bandages and their Application.

(a) Elasticated flat bandage, (b) tubular finger bandages, (c) tubular elasticated net garment, (d) tubular support bandages, (e) and (f) orthopaedic casting bandage, (g) pressure gloves, (h) pressure garment, (i) hip spica, (j) lumbar/abdominal support, (k) anti-embolism stockings.

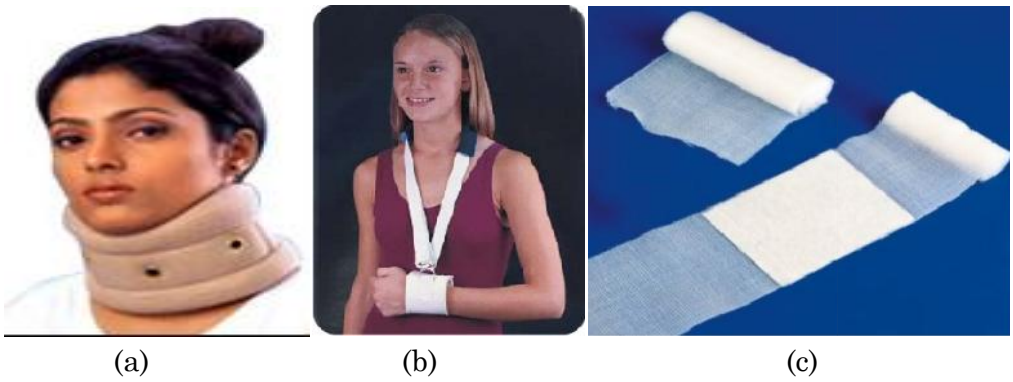


Figure.3: Miscellaneous Surgical Hosiery and other Products Made from Non-Implantable Materials

(a) Cervical collar, (b) foam padded arm sling, (c) adjustable wrist brace.

Plasters

Plaster is Medical adhesive sheets were developed for direct application to the human body, when emergency bonding, magnetic bonding, etc. is required figure 4 (a). Each backing consists of different materials, colors, and thicknesses. Various forms are offered as well, such as porous processed sheets, to meet a variety of

applications. Bandage, use dry cotton gauze (muslin) bandage is 500 cm long and 15 cm wide. Unroll a portion of the bandage on a dry table with a smooth top and apply plaster powder (anhydrous calcium sulfate or gypsum) evenly to the surface. Gently but firmly rub the powder into the mesh of the cotton and carefully roll up the powdered portion. Begin the same process with the next section until the entire roll has been powdered. The plaster bandage can be used immediately or stored in a dry place for future use (4).

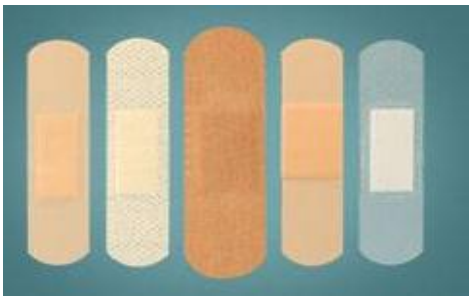


Figure.4: Plaster

Materials: Backing materials such as non-woven, Polyethylene film, PE, Elastic fabric, Foam, Cotton, etc. Unique Breathable Coating Technology is high permeability, comfortableness, hypo-allergenic and facilitates the healing of the wound. Hypoallergenic material makes it suitable for baby soft and sensitive skin types. Highly absorbent pad in the middle keeps the wound dry at all times yet wouldn't stick to it hence painless to remove (6).

Gauzes: Gauze is an open weave, absorbent fabric that when coated with paraffin wax is used for the treatment of burns and scalds. In surgical applications gauze serves as an absorbent material when used in pad form (swabs); yarns containing barium sulphate are incorporated so that the swab is X-ray detectable Figure.4. (b) Gauze.

Lint: Lint is a plain weave cotton fabric that is used as a protective dressing for first- aid and mild burn applications Figure.5. (a) Lint.

Wadding: Wadding is a highly absorbent material that is covered with a nonwoven fabric to prevent wound adhesion or fibre loss.

Figure 5: Lint

Extracorporeal Devices

Extracorporeal devices are mechanical organs that are used for blood purification and include the artificial kidney (dialyser), the artificial liver, and the mechanical lung. The function and performance of these devices benefit from fibre and textile technology (1). Table.2: illustrates the function of each device and the materials used in their manufacture. The function of the artificial kidney is achieved by circulating the blood through a membrane, which may be either a flat sheet or a bundle of hollow regenerated cellulose fibres in the form of cellophane that retain the unwanted waste materials. Multilayer filters composed of numerous layers of needle punched fabrics with varying densities may also be used and are designed rapidly and efficiently to remove the waste materials. The artificial liver utilizes hollow fibres or membranes similar to those used for the artificial kidney to perform their function. The microporous membranes of the mechanical lung possess high permeability to

gases but low permeability to liquids and functions in the same manner as the natural lung allowing oxygen to come into contact with the patient's blood (1).

Table.2: Extracorporeal Devices

Product Application	Fibre type	Function
Artificial kidney	Hollow viscose, hollow, polyester	Remove waste products from patients' blood
Artificial liver	Hollow viscose	Separate and dispose patients plasma and supply fresh plasma
Mechanical lung	Hollow polypropylene, hollow silicone, silicone membrane	Remove carbon dioxide from patients' blood and supply fresh blood

Artificial Kidney

Hollow fibres have replaced coil or laminate in dialyser devices. Pore sizes of membranes vary between 1 - 3 nm for conventional membranes and 4 - 8 nm for large pore membranes. This consists of 4,000 to 20,000 hollow filaments having an external diameter of 200 to 300 micrometer. Blood flows inside of the fibres and the dialysate flows outside of the fibres. Figure.6: Hemofiltration the term 'Artificial kidney' is often applied to the whole system including the pumps and control circuitry for the dialysate mixing and delivery, and for the blood preparation and monitoring, pumping, deaerating and return to the body (8).

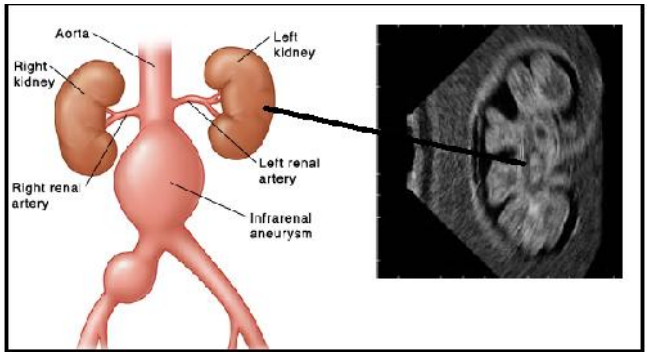
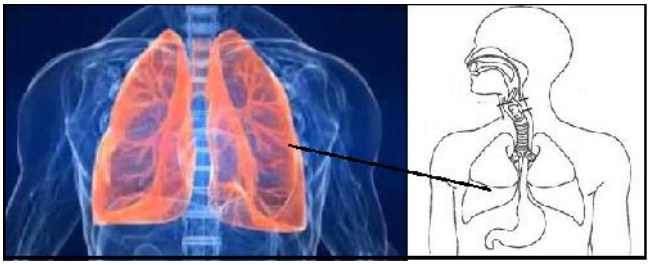


Figure 6: Artificial kidney

Mechanical lung

Mechanical lungs use micro porous membranes that provide high permeability for gases (both O2 and CO2) but low permeability for liquid flow and functions in the same manner as the natural lung allowing oxygen to come into contact with the patient's blood (Figure.7) during the flow, oxygen, which is maintained at a high partial pressure, displaces carbon dioxide, thus effecting purification. In this device, oxygen flows around hollow fibres at membranes of the mechanical lung possess high permeability to gases but low permeability to liquids and functions in the same manner as the natural lung allowing oxygen to come into contact with the patient's blood. If extremely low pressure then blood flow inside of the fibre. The oxygen permeates the microspores of the fibre and comes in contact with the blood. The pressure gradient between the blood and oxygen is kept near zero to prevent mixing of oxygen and blood. Red blood cells capture oxygen by diffusion process. It ideally should function for at least 1 to 3 weeks. But the present mechanical lung can function only for a week, because, its ability to remove carbon dioxide falls off (6, 8).

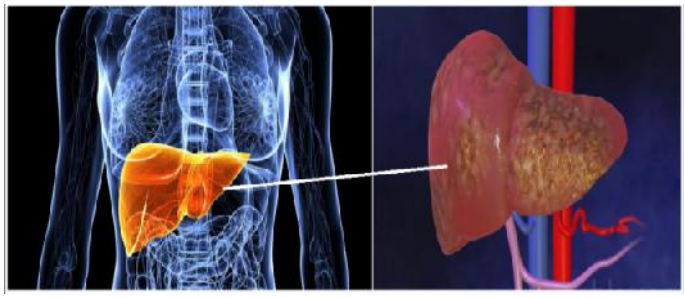
Figure 7: Mechanical lung



Artificial Liver

The artificial liver utilizes hollow fibres or membranes similar to those used for the artificial kidney to perform their function. Organ cells are placed around the fibres and blood flows inside the fibre (Figure 8 :) Blood nutrients pass through the fibre wall to the oxygen cells and enzymes pass from the cells to the blood. The metabolism of the liver is very complicated which poses problems for the artificial liver.

Figure 8: Artificial Liver



This can be solved by using a double lumen structure with a hollow fibre within a hollow fibre. Blood runs outside and in contact with liver cells and blood, and after purification it runs inside the fibre. The liver is a remarkable organ; like the skin, it can regenerate after severe trauma. In fact, a patient can recover with only 20% of his or her liver still functional as the liver grows back.(1,8).

Conclusion

Medical textiles are one of the most dynamically expanding sectors in the technical textile market. Growth rates are above average as a result of increases in day to day life. The prospects for medical textiles are rather better, especially for nonwoven materials and disposable medical textiles used in surgical rooms. Combination of textile and its application in medical sciences has been proof that the painful days of patients and surgeons converting into the comfortable days. The major requirements for biomedical polymers are Non toxic, Non-allergenic response, mechanical properties, strength, elasticity, durability and biocompatibility.

References

1. Alhayat Getu, Omprakash Sahu, *Technical Fabric as Health Care Material,* Biomedical Science and Engineering, 2014, Vol. 2, No. 2, 35-39.
2. Handbook of technical textiles "Edited by A R Horrocks and S C Anand" 'Published by Wood head Publishing Limited in association with The Textile Institute'. Abington Hall, Abington Cambridge CB1 6AH England.
3. D. Gopalakrishnan & R K Aswini, Nonwovens For Medical Textiles, Department of Textile Technology, PSG College of Technology, Coimbatore – 641 004.
4. http://www.worldwidewounds.com/1997/september/Thomas- bandaging/bandage-paper.html
5. V Bartels, Elsevier, *Handbook of Medical Textiles,* 19-Aug-2011, Woodhead publications.
6. http://www.hzpsa.com/product_medical%20Plaster-eng.html.
7. http://www.indiamart.com/nikshemultiproducts/surgical-products.html.

A HALLMARK OF HERITAGE – SAREE

Dr. C. Lalithambal
Asst. Professor, Music Department
Seethalakshmi Ramaswamy College, Tiruchirapalli

Prologue

India has been a country with variety of beautiful and esplendentdress cultures. It has been practised to wear specific dress for a specific rite. Analysts, opinion that every concept is scientific in the Hindu Religion. Thus, through this essay, it has been attempted to analyse the benefits of some specific communities in Hindu Religion, especially about the way the saree is worn at the time of *MaangalyaDhaaranam*, its colour, the hidden astrological facts, ordinary saree and 9 yards Saree.

Wedding Muhurtha [Koorai] Sarees Type: There are four types of *Koorai* Sarees. [1] The 9 yards Sarees worn by brides of Brahmin Community. [2] 6 yards Yellow worn by Telugu Communities [3] 6 yard sarees worn by other Tamil speaking sections and [4] 6 yard Red Sarees with golden border worn by certain other sections.

Colours and Planets: Though, there are different colours, there has been traditionally adopted that the bride wears a specific colour Saree for *MaangalyaDhaaranam*. It has been in vogue to wear Red, Yellow, White combined with Red, and Red bordered with golden jari. When we delve deep in to the background, it is known that each colour represents a planet. Thus, as we see, the colours related to the planets are viz. Red – Mars, Yellow- Jupiter, White-Venus.

In general, astrologically, Mars, Jupiter, Venus are concerning to matrimonial aspects. Mars is known as *Maanglik* and Tuesday is known as *Mangalvaar*. Mars is the Kalathrakarakan(7th place in the horoscope from the lagnam). Jupiter is the Lord of *Marriage*. As we know Jupiter is Guru who bestow boon in multiple when casts his blessed sight. The exalted position of Jupiter in a horoscope determines the solemn and peaceful married life. Venus is the Lord of enjoyment of all the temporal pleasures. The exalted position of Venus is essential for a prosperous married life. As such, it would be a commencement of married life with the blessing of the planets, if the bride is tied the knot wearing either Silk or Cotton Sarees of colour combination related to the planets. It makes in a nutshell as to how our ancestors adopted a heritage comprising multifarious coherent factors. But, now a days, depending on the whims and fancies, tastes and trends, different *Muhurtha* Sarees are being used defying the tradition which is mere expression of ignorance.

Characteristics of Colours: As it is the attributable characteristics of the aforesaid 3 colours, converts the atmosphere in to divine spell when wearing.

Red : Expressive of affection, Drawing Attention, Superiority, Respectful, Expressive of love, Stamina.

Yellow : Pleasing, Stamina, Drawing attention.

White : Purity, vigour, simplicity, judicious

Benefits of Wearing Sarees: Saree is the symbol of Indian culture. Our ancestors didn't do anything without any basis or reason as per Hindu dharma. Each and every action by them is an embodiment of science in it. Accordingly, the reason are

manifested for wearing 6 yards and 9 yards sarees. Wearing saree gives self-confidence to oneself. The tip of the Saree is the catch of a divine straw for infant children rendered with contentment and careless about anything in this world. They continue to derive strength with the tip of the saree while walking and the same saree helps in face and mouth cleansing. The Saree is also conveniently converted in to a cradle for small children. Sarees help absorb positive energy and thus leads to keep the immune systems in order and more vibrant. Saree extends power, happiness, and tranquillity that invites respect from others.

Benefits of Wearing 9 Yard Sarees: The 9 yard Sarees in our State is called '*MadisaarPudavai*'. Generally, Brahmin community people adopt this style of Sarees for the bride at the time of her *Kanyaadhaanam*. This Saree symbolically represents the philosophy of equality of men and women. The upper half represents the women and the lower half representing the men who wears *Panchakaccham*. Therefore, in each and every action, there appears to be the medium to remember continuously the ultimate spiritual representation to maintain equilibrium of mind for leading better and dignified life. Therefore, it represents Universal Truth of Arthanareeswara, the Lord Shiva an embodiment of male, and female.

My View: From time immemorial, all the Brahmin community women had been wearing *Madisarpudavai*. Presently, during the religious function, rituals and festivals only compel them to wear this Saree. In most of the cases, present day, a very few know to wear, independently without other's help, the 9 yard saree. Presently, it can be seen the women wearing 9 yards sarees in places like Triplicane, Mylapore in Chennai etc. and other rural places wherever there is an agrahara type colony. Also presently, readymade 9 yards sarees with stitched fleets are readily available in the open market which can be easily be worn. This saree is being worn during poojas and other rituals till completion of which, there will not be natural pressures. Besides, its special quality of supressing thirst, and hunger. The pleats strip taken from in between two legs to the back to the hip serves as a protection to the womb and is also considered that this acts as a shield protecting the reproductive organ from the effect of earth's gravitational force. It is also true that our ancestors who were wearing this saree did not face the problem of childlessness. Further the strip of pleats taken to the back to insert duly folded on the hip protecting the vertebral column. This 9 yards saree is the tool of representation for the three*Dhvaidh, Adhvaidh, and Vishishtaadhvaidh.* With blistering growth of the western culture and couture, it is equally vital to understand the benefits of the Silk and Cotton sarees, and adapt to our cultural hallmark of Saree and *MadisaarPudavai*. We can make the positive energy to regain only when we choose to opt for colour reflecting the positive vibrancy. During wedding, the three colours dealt in foregoing paras serve a better medium to convert the atmosphere to a divinity is understood.

Epilogue: Dress maketh the man perfect is an adage that has provoked the mankind to make choice. In order to establish prestige, respect and dignity, there is affectation of a fashionable wears to our choice. The chosen dress should not only be liked by us but that has the ability also to reflect our inner thoughts. It is better we protect and preserve our culture by opting for cotton sarees to maintain a healthy self.

Personal Interview

1. Dr. S. Usha, AssociateProfessor, Seethalakshmi Ramaswamy College, Trichy-27.12.2016
2. Shri. C. Narayanaswamy, Astro-analyst, Erode, 25.12.2016

DEVELOPMENT OF VALUE ADDED INDOOR FOOT WEAR FINISHED WITH ALOE BARBADERIS MILL EXTRACT

Dr.R.Latha
Associate Professor, Dept. of Home Science with Food Biotechnology, Fatima College, Madurai

Abstract

Medical Textiles also known as Healthcare Textiles is one of the most rapidly expanding sectors in the Technical Textile market. Textile products are omnipresent in the field of human hygiene and medical practice. Their use is based on a number of typical basic textile properties like softness and lightness, flexibility, absorption, filtering etc. To keep in line with the growing need for healthcare and hygiene products, an attempt has been made to develop value added indoor foot wear finished with Aloe Barbaderis Mill extract. Cotton fabric was chosen for the construction of indoor foot wear as cotton is known for its soft feel, comfort and durability. Herbs are eco-friendly and cost effective. Aloe Vera has antimicrobial, antifungal and anti parasitic properties in addition to its moisturizing and soothing qualities. Aloe Vera leaves were dried, powdered, dissolved in a suitable solvent and the extract was collected. This was applied to the selected cotton fabric and the herbal finished fabric was used in the construction of indoor foot wear. The value added indoor foot wear was then subjected to wear study and kept for visual inspection. The evaluation by the judges reveals that Aloe Vera finish has imparted excellent softness and comfort to the foot wear.

Key words: *Aloe Barbaderis Mill, eco-friendly, antimicrobial, antifungal, Indoor footwear.*

Introduction

Cotton termed as White Gold, is the 'King of Fibres'. Cotton fabrics are characterized by soft texture, excellent launderability, high absorbency, good colour fastness, easy dyeability and good pliability. Cotton finds specialty applications in medical and hygiene uses. Most notably cotton is used to manufacture hydrophile cotton (cotton wool), gauze bandages, tampons or sanitary pads, cotton swabs and cotton wipes. Many people who are concerned with the environment choose to use clothes and accessories that are made of cotton. Finishing is the final step of chemical processing that is carried out to improve the aesthetic appeal of the ready to use product. Some functional finishes are wrinkle resistant finish, fragrant finish and antimicrobial finish.(1) Nowadays multifunctional finishes are becoming increasingly important for high value fabrics.(2) The aim of textile finishing is to render textile goods fit for their end uses. The natural sources are bio-degradable, renewable and eco-friendly. The natural sources yield luster, pleasant fragrance and soft texture. They promote human health because they have antibacterial, insecticidal antifungal properties. Functional finishes represent the next generation of finishing industry. Functional finishing is the process of finishing operation endowing the fabric with a particular appearance, surface texture or behavior characteristics. (3) Herbs are the main source of finishing the fabrics. A finish adds minimally to the cost of the textile material and results in a much greater value addition. Natural herbs are harmless to man and environmental parts such as stems, barks, leaves, fruits, seeds and rinds can be extracted and used for processing textile materials. Aloe Vera is one of the

oldest known medicinal plants gifted by nature. Aloe Vera is a species of succulent plant that probably originated in northern Africa. Aloe Vera is widely used in the cosmetics and alternative medicine industries, being marked for its rejuvenating, healing or soothing properties.(4) This herb has many healing, soothing, moisturizing and cleansing properties. Aloe Vera has been recognized for centuries for its remarkable health enhancing properties and is effective in the treatment of wounds. Consumers are becoming more and more conscious of the comfort of the garments that they are wearing.

With the above backdrop, an attempt has been made to develop value added indoor foot wear finished with Aloe Vera extract with the following objectives:

(i) Preparation of Aloe Vera extract.
(ii) Application of Aloe Vera extract to the selected 100% cotton handloom fabric.
(iii) Construction of indoor footwear using the herbal finished cotton fabric.
(iv) Evaluation of the value added indoor footwear finished with Aloe Vera extract.

Materials and Methods

(i) Selection of Fabric: Among the various textile fabrics, cotton is clean, natural and eco-friendly and is characterized by its fine, soft feel, comfort and durability. Hence plain weave cotton fabric was selected for the construction of indoor footwear.

(ii) Selection of Herbal Finishing Agent: Herbs are available in nature abundantly. Herbal sources are eco-friendly and cost effective. It has been found that Aloe Vera is a mixture of antibiotic, astringent, coagulating agent and scar inhibitor. These properties make Aloe Vera play a dominant role in the primary health care.(5) The selected herb Aloe Vera has antimicrobial, antifungal and anti parasitic properties.

(iii) Collection of Herb: Aloe Vera leaves were collected from in and around Madurai. The collected leaves were dried under shade and ground into fine powder.

(iv) Extraction of Aloe Vera: 20 grams of Aloe Vera powder was dissolved in 100 ml of ethanol in a vessel and was left closed for 24 hours so that the ethanol takes the active components of the leaves. After 24 hours, the ethanol was allowed to evaporate and the residue gets settled at the bottom of the vessel.

(v) Selection of Binder: Citric acid is a good cross linking agent or binder and is well known for its low cost, widespread availability and ecological acceptability. (6) Hence citric acid was chosen as the binder.

(vi) Application of Herbal Extract to the Fabric: The selected cotton fabric was boiled in the 100% concentration of Aloe Vera extract at 80° C for 40 minutes. The fabric was then washed thoroughly and dried in shade.

(vii) Construction of Indoor Footwear: Indoor foot wears were constructed using selected cotton fabric with Aloe Vera finish and without Aloe Vera finish.

(viii) Subjective Evaluation: The constructed indoor foot wears using the selected cotton fabric without finish and with Aloe Vera finish were evaluated by a panel of 20 judges with textile knowledge.

Results and Discussion

The results of the subjective evaluation of the indoor foot wears without finish and with Aloe Vera finish are given in Table I.

Table- I Subjective Evaluation of Indoor Footwear

S.NO	Samples	Rating in Percentage														
		General Appearance			Texture			Colour			Comfort			Luster		
		E	G	F	S	M	C	B	M	D	E	G	F	H	M	L
1.	UFIFW	80	20	0	0	75	25	65	35	0	0	90	10	5	95	0
2.	AVIFW	60	40	0	30	70	0	0	90	10	80	20	0	0	75	25

UFIFW – Unfinished Indoor Foot Wear

AVIFW – Aloe Vera finished Indoor Foot Wear

E-Excellent G- Good F-Fair S- Soft M- Medium C- Coarse

B-Bright M-Medium D-Dull H-High M-Medium L-Low

General Appearance: Sample UFIFW was rated as Excellent by 80% of judges whereas AVIFW was rated as Excellent by 60% of judges. 20% felt that UFIFW was Good in general appearance and 40% felt that AVIFW was Good in general appearance.

Texture: Sample UFIFW was rated as Medium and Coarse by 75% and 25% of judges respectively whereas sample AVIFW was rated as Soft and Medium by 30% and 70% of judges.

Colour: 65% of judges opined that sample UFIFW had Bright colour whereas 90% of the judges were of the opinion that sample AVIFW had Medium colour tone. 10% felt that AVIFW was Dull.

Comfort: Aloe Vera finished indoor footwear was found to give Excellent comfort by 80% of judges while 90% of judges found the indoor footwear without finish to be Good in providing comfort.

Luster: Sample AVIFW was rated to have Medium luster by 75% of judges while 95% of judges rated UFIFW to have Medium luster.

Conclusion: From this study it is concluded that Aloe Vera finish has been found to impart soft texture and excellent comfort to the indoor footwear. The eco-friendly, biodegradable finish was also found to be non-irritant to the skin and enhanced the general appearance of the indoor footwear.

References

1. Goyal R & Deshpande R V (2006), “Reactive Softness”, Colourage, Vol.LII, No.8, Pg.115.
2. Adivarekar P V & kanoonga N (2008), “Textile wet processing scenario in India; Processing, Dyeing and Finishing – A special feature”, The Indian Textile Journal, Vol.118,No.4, Pg.54.
3. Parmer M S (2007), “Colouring, printing and finishing of fabrics”, Colourage, Vol. XLIII, No.7, Pg.23.
4. www.gorefabric.com
5. Usha S & Jawale S L K (2006), “Application of Herbs on fabrics”, Colourage, Vol. LIII, No.4, Pg.129.
6. Vikusiae S B, katerie D & Soljaerae J (2001), “Environment friendly durable press finishing with mixed polycarboxylic acid”, Vol. XLVII, No.3, Pg.35.

REUSE OF DECOLOURIZED EFFLUENT WATER FOR DYEING

A. Lavanya
Assistant Professor, Department of Home Science Seethalakshmi Ramaswami College, Trichy
K.Kalaiarasi
Assistant Professor Department of Textile&Clothing, Avinashilingam Institute for Homescience and Higher Education for Women, Coimbatore

Abstract

There is an increasing trend to require more efficient use of water resources, both in urban and rural environments. A major mechanism that can be used to achieve greater efficiencies is the reuse of water that once would have been discarded into the environment after use. Recycled water can have the advantage of being a constant, reliable water source and reduces the amount of water extracted from the environment. In addition, in some cases treatment requirements may be need to be less than for water used in an urban environment due to less potential human contact. Water quality issues that can create real or perceived problems in agriculture include nutrient and sodium concentrations, heavy metals, and the presence of contaminants such as human and animal pathogens, pharmaceuticals and endocrine disruptors. This paper will discuss the benefits from using decolorized effluent water for dyeing textiles and results the quality or properties of the fabric remains best when compared with its original fabric.

Key words: *treatments, pharmaceuticals, endocrine disruptors.*

Introduction

Textile sector is the second largest provider of employment after agriculture. The growth and all round development of this industry has a direct bearing on the improvement of the economy of the nation. It is well known, that textile processing mills consumes large volumes of water for various processes. Among the processing industries textile dyeing units produced large volumes of high strength wastes. As the cost of water supplied to industry keeps increasing, recycle schemes become more attractive with good payback periods. Increasing demand for water in industry and to control the pollution of environment, recycling or reuse of water is essential. In the present study the treated reactive dye effluent was utilized for dyeing.

Hence an attempt has been made for "reuse of bio-decolorized effluent water for dyeing" with the following objectives,

- To reuse the decolorized effluent water for dyeing
- To evaluate the dyed samples.

Materials and Methods: The water which is suitable for return to the environment is acceptable for reuse in preparation and dyeing. The treated effluent by both live and dead biomass of *Aspergillus fumigatus* was reused for dyeing the cotton fabric using reactive dye. Dyed fabrics were then evaluated by subjective and objective analysis.

Dyeing of cotton with reactive using treated and soft water: Dyeing as the application of colourant to the substrate in order to enhance the appearance by the attraction of hue. The selected cotton fabric was desized and then dyed with reactive dye by using treated and tap water.Dyeing using reactive dye on the cellulosic fibre material involves 3 steps as follows

- Exhaustion of the dye bath by the addition of the salt.
- Fixation of the exhausted dye bath by the addition of alkali.
- Washing off the unfixed dye reports Sekar (2004).

Table- I Dyeing parameters

Parameters	Amount
Fabric	1 meter
Shade	5%
Material : Liquor ratio	1:30
Caustic soda	2%
Sodium chloride	20%

Dyeing Procedure

The selected (desized) cotton fabric was dyed using soft water and effluent treated waters (TWD_1 and TWD_2). The fabric was soaked in soft water for 30 mins and squeezed. The dye stuff was made into paste with warm water, which is then added to the measured amount of water and stir well. The wet fabric was then immersed into the dye bath and kept for 10 minutes. After 10 minutes the fabric was taken out and NaCl was added to the dye bath and the content was mixed thoroughly. The removed fabric was immersed into the dye bath and kept for 20 minutes. The fabric was taken out and soda ash was added in the dye bath. The sample was reentered and again kept for 30 minutes. After dyeing was completed, the fabric was washed thoroughly by changing water thrice. Acetic acid (4 g/l) was added in the final rinse of water. Finally the sample was taken out and squeezed and dried in shade. Following the same procedure, dyeing was performed in treated waters for selected cotton fabrics. After dyeing the samples were evaluated for its physical, mechanical and comfort properties by ASTM standard methods.

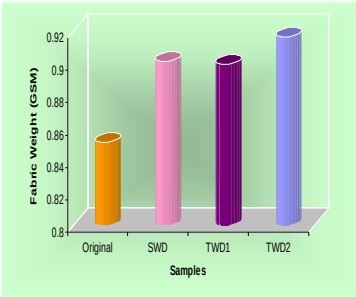
Nomenclature of Samples

Samples	Code
Original (desized) cotton fabric	O
Soft water dyed sample	SWD
Treated water Dyed Sample (Live Biomass)	TWD_1
Treated Water Dyed Sample (Dead Biomass)	TWD_2

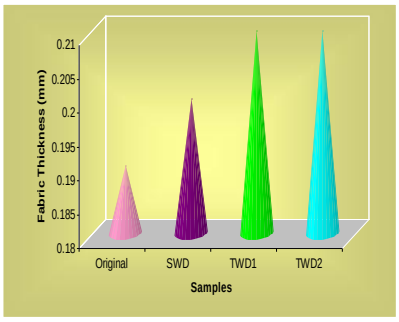
FINDINGS

Objective Evaluation

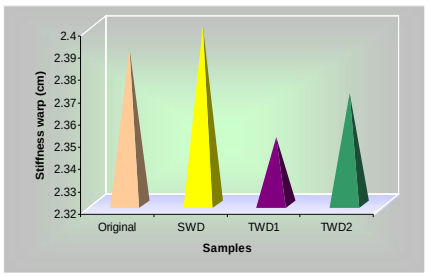
Samples dyed using effluent treated water were ranked as good, bright and evenly dyed in comparison with soft water dyed sample.



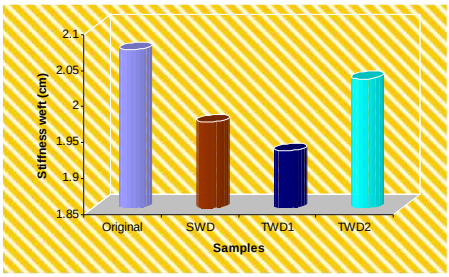
Fabric Weight



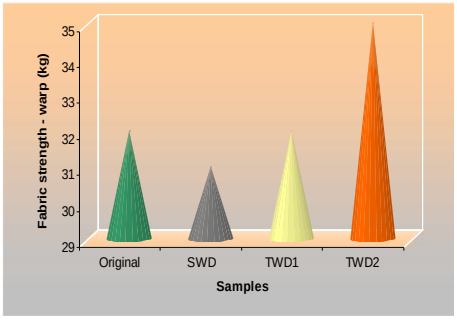
Fabric Thickness



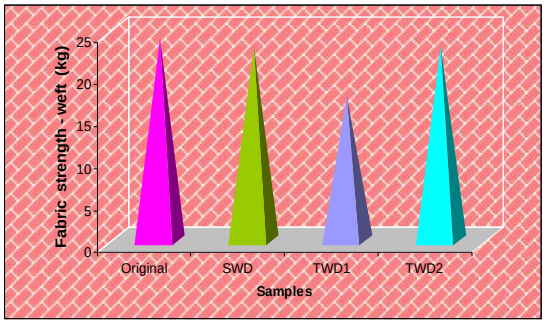
Fabric stiffness (Warp)



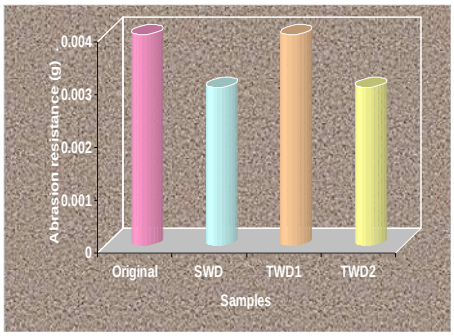
Fabric stiffness (Weft)



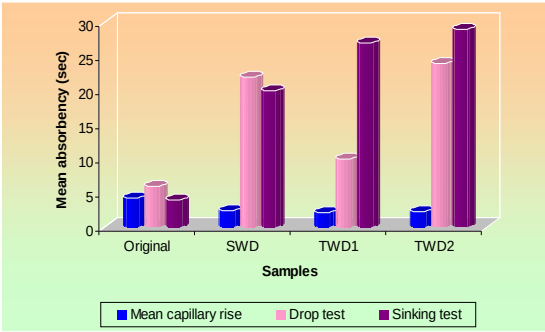
Fabric strength (Warp)



Fabric strength (Weft)



Abrasion resistance (g)



Absorbency tests(sec)

- Fabric weight of the samples dyed using soft water and treated effluent water has increased when compared over original. It may be due to the result of more dye uptake by the samples.
- Thickness of the samples TWD_1 and TWD_2 were increased when compared with SWD sample.
- Dyeing has decreased the stiffness when compared over original along both warp and weft direction in all the samples.

- The strength of the sample TWD_2 has increased by 9% after dyeing whereas SWD samples increase by 3%. There was no difference between original and TWD_1 sample along warp direction. with regard to weft direction the strength of all the dyed samples decreased over original.
- All dyed samples SWD, TWD_1, TWD_2 show increased elongation in weft direction by about 34%, 31% and 30% respectively.
- The abrasion resistances of all dyed samples were better when compared over original.
- Absorbance nature of the samples was found to be increased after dyeing the samples with treated effluent water.

Samples subjected to colour fastness tests exhibited excellent fastness properties. Fastness to light, pressing, crocking was ranked as 5 for SWD sample and 4/5 TWD_1 sample and 5 for TWD_2 with regard to pressing, TWD_1 sample has poor fastness to wet pressing. TWD_2 sample had excellent fastness to light, pressing and croching and ranked as 5 in dry pressing TWD_2 sample has ranked as 4.

Conclusion

It possessed high biosorption efficiency, reusability and stability. In addition, *Aspergillus fumigatus* is generally regarded as safe and its biomass production is simple and cheap. The results of this study will form the basis for the development of cost effective and robust indigenous technology for biosorption of reactive dye effluent. Hence it could be concluded that decolorized treated water can be effectively reused for dyeing and finishing of textile material.

References

1. Rye, Weon. (1992), Decolorization of Azo Dyes by *Aspergillus sojae*, Bio. J. Microbio. Biotechnol. Vol.2.pp:215 – 219.
2. Sekar (2004). Towards Safer Dyes in Textile Processing Part – I.Colourage, Vol. LI, No.3, pp : 47, 63.
3. Shenai, V.A. (2003). Effluent Treatment / Reuse of Spent Dye Bath. Colourage, Vol. L, No.2, p : 39.

IMPACT OF FEED QUALITY ON SILK FIBRE

S. Maheswari
Research Department of Zoology, Seethalakshmi Ramaswami College, Thiruchirappalli - 620 002

P. Anitha
Research Department of Zoology, Seethalakshmi Ramaswami College, Thiruchirappalli - 620 002

Abstract

Silk is one of the finest product from insect community which has a global, fabric demand for its luster and shine besides its ceremonial grace and values. It is chiefly the transformation of a novel liquid secreted by the insect Bombyxmori on a specific irritation during certain stages of its development. The quality of the silk thread depends upon the quality production of cocoon which is the raw material, which in turn is influenced by various parameters like the soil quality from where the mulberry feed plant raised, the feed quality, nature of feed, rearing methods, rearing appliances, handling, rearing and processing operations. Though all these are governing the quality of the silk thread produced, ultimately the one important factor which controls the shine and strength of the silk fibre is the quality feed which is used for feeding the silkworm. Accordingly, the shine and the strength is improved and the silk bale is graded. Silk worms which are fed with appropriate quantity and quality mulberry leaves on a regular, specified time intervals according to their stage of development,tend to show marvelous growth rate. Upon reaching the Vth larval stage, it stops feeding and undergo pupation. Spinning of the cocoon for its pupal growth is governed purely by the suitability and availability of fresh mulberry leaves which is the feed maintained under perfect environmental conditions. Synchronous cocoon formation is effected only when these parameters substantiate. Research in these aspects to improve the quantity and quality cocoon production through technology applications are on trials in sericulture industry.

Key words: *(Bombyxmori; Mulberry feed; Pupation; Synchronous; Cocoon formation; environmental parameters)*

Introduction

Silk is the liquid secretion of two glands passes through the spinnerets which transform them into a single thread. Sericin which causes the two fibres of fibroin to unite is secreted by a pair of accessory gland situated at the anterior region of silk-gland. Two streams of fibroin along with Sericin are expelled through the spinneret due to contraction and expansion of the body of Caterpillar. This sticky secretion after coming in contact with the air is converted into a fine, long and solid thread of silk.

Properties of Silk: Silk threads are very fine, soft and light in weight. They are very thin but strong having high elastic property. When a cross section of the Silk thread is observed under microscope, it is roughly in the figure of 8. Main inner portion (70 80%) is made up of fibroin (true fibre) which is surrounded by a thin covering of Sericin (gum covering) There is also little quantity of waxy and colouring material. Both fibroin and Sericin are proteinous in nature. Fibroin is insoluble in water and is made up of glycine, alanine and tyrosine. Sericin is easily soluble in water and is composed of Sericin, alanine and leucine.

Uses of Silk: Bulk of silk fibres produced is utilised in preparing silk clothes. Uses of pure silk are decreasing gradually due to its high cost value and costly maintenance.

Production of synthetic fibres has posed a serious threat to the silk industry. Clothes in which Silk fibres are combined with other natural and synthetic fibres are in great demand not only in India but also in foreign countries. Seeing this demand many textile industries are manufacturing clothes like Teri-silk, cotsilk etc. Besides silk being used as garments it is also used in other industries and for military purposes. It is used in the manufacture of fishing fibres, parachutes, cartridge bags, insulation coils for telephones and wireless receivers, tyres of racing cars, filter clothes for flour mills, and in medical dressings and suture materials. Insulation coils for telephones and wireless receivers, tyres of racing cars, filter clothes for flour mills, and in medical dressings and suture materials.

Physical Properties: Silk fibers from the Bombyxmori silkworm have a triangular cross section with rounded corners, 5–10 µm wide. The fibroin-heavy chain is composed mostly of beta-sheets, due to a 59-mer amino acid repeat sequence with some variations. The flat surfaces of the fibrils reflect light at many angles, giving silk a natural sheen. The cross-section from other silkworms can vary in shape and diameter: crescent-like for Anaphe and elongated wedge for tussah. Silkworm fibers are naturally extruded from two silkworm glands as a pair of primary filaments (brin), which are stuck together, with sericin proteins that act like glue, to form a bave. Bave diameters for tussah silk can reach 65 µm. See cited reference for cross-sectional SEM photographs. Silk has a smooth, soft texture that is not slippery, unlike many synthetic fibers. Silk is one of the strongest natural fibers, but it loses up to 20% of its strength when wet. It has a good moisture regain of 11%. Its elasticity is moderate to poor: if elongated even a small amount, it remains stretched. It can be weakened if exposed to too much sunlight. It may also be attacked by insects, especially if left dirty. One example of the durable nature of silk over other fabrics is demonstrated by the recovery in 1840 of silk garments from a wreck of 1782: 'The most durable article found has been silk; for besides pieces of cloaks and lace, a pair of black satin breeches, and a large satin waistcoat with flaps, were got up, of which the silk was perfect, but the lining entirely gone ... from the thread giving way ... No articles of dress of woolen cloth have yet been found. 'Silk is a poor conductor of electricity and thus susceptible to static cling. Unwashed silk chiffon may shrink up to 8% due to a relaxation of the fiber macrostructure, so silk should either be washed prior to garment construction, or dry cleaned. Dry cleaning may still shrink the chiffon up to 4%. Occasionally, this shrinkage can be reversed by a gentle steaming with a press cloth. There is almost no gradual shrinkage nor shrinkage due to molecular-level deformation. Natural and synthetic silk is known to manifest piezoelectric properties in proteins, probably due to its molecular structure.: Silkworm silk was used as the standard for the denier, a measurement of linear density in fibers. Silkworm silk therefore has a linear density of approximately 1 den, or 1.1 dtex. Comparison of silk fibers Linear density (dtex) Diameter (µm) Coeff. Variation Moth: Bombyx mori1.1712.924.8%Spider: Argiope aurentia 0.143.5714.8%

Chemical Properties: Silk emitted by the silkworm consists of two main proteins, sericin and fibroin, fibroin being the structural center of the silk, and serecin being the sticky material surrounding it. Fibroin is made up of the amino acids Gly-Ser-Gly-Ala-Gly-Ala and forms beta pleated sheets. Hydrogen bonds form between chains, and side chains form above and below the plane of the hydrogen bond network. The high proportion (50%) of glycine allows tight packing. This is because glycine's R

group is only a hydrogen and so is not as sterically constrained. The addition of alanine and serine makes the fibres strong and resistant to breaking. This tensile strength is due to the many interceded hydrogen bonds, and when stretched the force is applied to these numerous bonds and they do not break.: Silk is resistant to most mineral acids, except for sulfuric acid, which dissolves it. It is yellowed by perspiration. Chlorine bleach will also destroy silk fabrics. Silk's absorbency makes it comfortable to wear in warm weather and while active. Its low conductivity keeps warm air close to the skin during cold weather. It is often used for clothing such as shirts, ties, blouses, formal dresses, high fashion clothes, lining, lingerie, pajamas, robes, dress suits, sun dresses and Eastern folk costumes. For practical use, silk is excellent as clothing that protects from many biting insects that would ordinarily pierce clothing, such as mosquitoes and horseflies. Silk's attractive lustre and drape makes it suitable for many furnishing applications. It is used for upholstery, wall coverings, window treatments (if blended with another fiber), rugs, bedding and wall hangings.[citation needed] While on the decline now, due to artificial fibers, silk has had many industrial and commercial uses, such as in parachutes, bicycle tires, comforter filling and artillery gunpowder bags. [citation needed]. Fabrics that are often made from silk include charmeuse, habutai, chiffon, taffeta, crepe de chine, dupioni, noil, tussah, and shantung, among others. A special manufacturing process removes the outer irritant sericin coating of the silk, which makes it suitable as non-absorbable surgical sutures. This process has also recently led to the introduction of specialist silk underclothing for people with eczema where it can significantly reduce it. New uses and manufacturing techniques have been found for silk for making everything from disposable cups to drug delivery systems and holograms. To produce 1 kg of silk, 104 kg of mulberry leaves must be eaten by 3000 silkworms. It takes about 5000 silkworms to make a pure silk kimono.

Conclusion

Mulberry leaves which is the feed for these silkworms, when it is maintained and raised properly, taking into consideration of all these environmental factors, the quality of the silk fibre is increased. Thus silk gets its strength from the quality feed.

References

1. Vainker, Shelagh (2004). Chinese Silk: A Cultural History. Rutgers University Press. p. 20. ISBN 0813534461.
2. Barber, E. J. W. (1992). Prehistoric textiles: the development of cloth in the Neolithic and Bronze Ages with special reference to the Aegean (reprint, illustrated ed.). Princeton University Press. p. 31. ISBN 978-0-691-00224-8. Retrieved 6 November 2010.
3. Hill, John E. 2003. "Annotated Translation of the Chapter on the Western Regions according to the HouHanshu." 2nd Draft Edition. Appendix A.
4. "History of Sericulture" (PDF). Governmentof Andhra Pradesh (India) - Department of Sericulture. Archived from the original (PDF) on 21 July 2011. Retrieved 7 November 2010.
5. Muthesius, "Silk in the Medieval World", p. 331.
6. Bezzina, Neville. "Silk Production Process". Sense of Nature Research. Archived from the original on 29 June 2012.
7. "Silk Making: How to Make Silk". TexereSilk.com. Retrieved 25 May 2014.
8. "Mahatma Gandhi: 100 years", 1968, p. 349
9. Silk Moths Fly Free[dead link] KusumaRajaiah's Ahimsa project.

ORIGIN OF SAREES AND AN OUTLOOK OF SILK SAREES ASSOCIATED WITH CARNATIC MUSIC SINGER

Dr.C. Malarvizhi
Associate Prof. & Head Department of Music
Seethalakshmi Ramaswami College, Trichirappalli

Introduction

The Saree is one of the world's oldest and perhaps the only surviving unstitched garments from the past. Over the centuries it has not only become a sensuous, glamorous all time wear for but also the `Canvas' for weavers and printers to create artistic weaves, prints and jeweled embellishments. The Indus Valley civilization was the early precursor of the many splendoured sarees of India. Several assorted items of dress were described in the epics of India. Many women, featuring in the classical literature were described as beautiful in clothes made from silks encrusted with gold and gems. Though there were some elementary stitched garments, the neevi (the style of wearing a length of cloth worn around the waist) and the kanchuki (piece of cloth worn across the breasts of women) remained the mode of apparel for women. The art of dyeing these fabrics with vegetable dyes originated with the need of wealthier people in society to wear fancier clothes. By the time of epic era came to a close women were wearing extraordinarily beautiful clothes with ornate embroidery. The saree in its final form as is seen today came about only in the Moghul period when women's garments went through one more major revolution. In fact, historic records say that the silks and muslins were so highly prized all over the world. Several names were given to these fabrics depending upon their origin or texture.

Dyeing Process

In the golden age of Indian textiles, all the dyes were made from vegetables or other natural sources. It is reported that in the earliest age of dyeing during the moghul era, there were over five hundred kinds of natural dyes. These traditional dyes were made from turmeric, the indigo plant, barks of several trees, gums, nuts, flowers, fruits and berries. The silk cotton tree, for example was reputed to yield a gentle yellow – orange colour called kesari. The colours navy blue, khaki, mustard yellow, rust, rani pink and pista green seem to have originated during these years and have stayed on as names for identifying colours even now. With the advent of synthetic dyes, the number of natural dyes used by the industry began to dwindle considerably so that today there are hardly sixty varieties of natural dyes in use. Though these methods of traditional dyeing continue to credit ethnic fabrics for sarees the chemical dyes imported from other countries together with newer techniques of dyeing and printing have been given Indian women sarees of a vast variety in an unimaginable spectrum of shades.

Many new designs and techniques of weaving, dyeing and printing came to India with the repeated invasions of various clans. The all round development of textiles in India had a definite impact on the design of sarees. Even in the modern age women continue to buy sarees with great enthusiasam, especially during festivals and wedding seasons.

An Outlook of Silk Sarees Worn by the Classical Music Aritists

Generally wearing of silk sarees gives a rich, gorgeous and auspicious look to any woman, especially the renowned singers and artists of carnatic music like the carnatic music Trio Bharatratna Tmt. M.S.Subbulakshmi, M.L. Vasanthakumari, D.K.Pattammal, and the other singers who are amidst with us like Sudha Raghunathan, Nithyasri Mahadevan and so on are noted for their sarees in addition to that of their singing. During the music festival held in Chennai during December every year, not only the artists but also the Rasikas and observers almost used to wear silk sarees, which keep them warm.

M.S.Subbulakshmi and M.S.Blue

Among the weavers of silk in Tamilnadu, kancheepuram weavers occupy an unique place. Renowned carnatic singer M.S.Subbulakshmi is associated with one particular saree colour as it was specially made for her by a weaver Muthu chettiar. He was a staunch rasika of M.S. Subbulakshmi. He has, infact given up his family profession of weaving and became a disciple of Naina pillai who was a musician in Kanchipuram. His sarees were renowned at that time. It is said that in the 1960's, Muthu Chettiar wove a silk saree in a beautiful blue colour especially for MS Amma. This saree became a rage as all the society ladies wanted a similar saree and this is how this colour came to be known as 'MS Blue'.

Darbar Bhet Border Sarees

An incident shared by Nalli Sri. Kuppusami Chettiar during the centenary celebration of M.S.Subbulakshmi was that once when the king George V visited Delhi, he was honoured with a Shawl with Darbar Bhet border. (Coronation Border). After that this kind of border was not available for a long time. When he expressed this to MS Amma, she immediately went into the room and brought an old saree of her with Darbar Bhet border. On seeing this he was excited. He got the saree from her and started weaving the wedding sarees with Darbar Bhet border. Luckily the name Darbar coincides with the raga Darbar too. We can imagine the legendary singer MS Amma with this Darbar Bhet Border saree who ruled over the music Darbar.

Reference

1. The origin of the saree – Vima Patil . July 2012
2. Mangayar malar 2016

SMART COAT WITH A FULLY-EMBEDDED TEXTILE ANTENNA FOR (IOT) APPLICATIONS

T.Malini

Department of Physics, Seethalakshmi Ramaswami College, Trichy

Abstract

The Internet of Things (IoT) scenario is strongly related with the advance of the development of wireless sensor networks (WSN) and radio frequency identification (RFID) systems. Additionally, in the WSN context, for a continuous feed, the integration of textile antennas for energy harvesting into smart clothing is a particularly interesting solution when the replacement of batteries is not easy to practice, such as in wearable devices. This paper presents the E-Caption: Smart and Sustainable Coat. It has an embedded dual-band textile antenna for electromagnetic energy harvesting, operating at global system for mobile communication (GSM) 900 and digital cellular system (DCS) 1800 bands. This printed antenna is fully integrated, as its dielectric is the textile material composing the coat itself. The E-Caption illustrates the innovative concept of textile antennas that can be manipulated as simple emblems. Seven prototypes of these "emblem" antennas, manufactured by lamination and embroidering techniques are also presented. It is shown that the orientation of the conductive fabric does not influence the performance of the antenna. It is also shown that the direction and number of the stitches in the embroidery may influence the performance of the antenna. Moreover, the comparison of results obtained before and after the integration of the antenna into cloth shows the integration does not affect the behaviour of the antenna.

Keywords: *Textile antenna, energy harvesting, smart clothing, wearable devices,* E-Caption

Introduction

Nowadays, the socio-economic development and lifestyle trends indicate an increasing consumption of technological products and processes, powered by emergent concepts such as the Internet of Things (IoT), where everything is connected in a single network. The development of smart objects for IoT applications, include the capacity of this objects to be identifiable, to communicate and to interact . In this context, wearable technology has been addressed to make the person, mainly through his clothes, able to communicate with, and be part of, this technological network. Wireless communication systems are made up of several electronic components, which, over the years, have been miniaturized and made more flexible, such as batteries, sensors, actuators, data processing units, interconnectors, and antennas. In the systems for on-body applications, the antennas have been challenging, because they are conventionally built on rigid substrates, hindering their efficient and comfortable integration into the garment. However, embedding antennas into clothing allows expanding the interaction of the user with some electronic devices, making them less invasive and more discrete. Thus, textile antennas that are designed combining the traditional textile materials with new technologies emerge as a potential interface of the human-technology-environment relationship. Textile antennas, thus, become an active part in the wireless communication systems, aiming applications, such as tracking and navigation, mobile computing, and others.

Textile Antennas: For IoT applications, embedding antennas into clothing makes the garments become a smart interface for the interaction between the user and the network. The wearable antennas should be thin, lightweight, of easy or no maintenance, robust, and resistant to washing cycles and usage and, moreover, must be low cost for manufacturing and commercializing. In this way, textile planar antennas, the microstrip patch type, have been proposed for garment applications, because they present all of these characteristics, and also are adaptable to any surface . This type of antenna is usually formed by overlapping conductive (patch and ground plane) and dielectric (substrate) layers. Therefore, the knowledge of the properties of textile materials that are used is crucial, as well as the manufacturing techniques for connecting the layers, such as gluing, seaming, and laminating with adhesive sheets. Furthermore, the microstrip patch antenna radiates perpendicularly to a ground plane, which serves as a shield to the antenna radiation, assuring that the human body absorbs only a very small fraction of the radiation.

Electromagnetic Energy Harvesting: The integration of electronic devices on clothing puts the question about how to feed them. The batteries are an obvious choice, but they are bulky, require frequent replacement or recharging, and their short longevity is an ecological concern of current times. Additionally, the research of self-sustainable wireless devices is a growing challenge in IoT applications. In this context, energy harvesting is a promising solution to consider in the next generation of wireless sensor networks (WSN). Nowadays, radio frequency (RF) energy is currently broadcasted from billions of radio transmitters and, thus, can be collected from the ambient environment or from dedicated sources. Moreover, the advance of technology stimulates the growing number of wireless transmitters, especially in highly populated urban areas, increasing the power density of available RF in the environment.

Materials and Methods: This paper is based on the dual-band textile antenna for GSM900 and DCS1800 frequency bands. The next subsections will analyze the manufacturing process of making this antenna, presenting the prototypes, made using two different manufacturing techniques: thermal adhesive lamination and embroidering. Further, the integration of the antenna into a smart coat, by fully embedding it into the material constituting the coat, is described.

Materials: The selection of textile materials for the development of antennas is critical. For the dielectric substrate, a synthetic fabric with low regain was chosen, in order to minimize the effect of the moisture absorption on lowering the resonance frequency of the antenna.

Manufacturing Techniques: Beyond choosing the textile materials, the construction technique of the antenna is also crucial because the textile materials are highly deformable. The geometrical dimensions of the conductive patch and of the dielectric substrate should remain stable when connecting them, as the mechanical stabilization of both materials is essential to preserve the desired characteristics of the antenna. Moreover, the technique to connect the various layers should not affect the electrical properties of the patch, particularly its electrical resistivity. The antennas were glued by ironing without steam in a vacuum table. Steam was not used deliberately, especially on materials with copper, to avoid oxidation of the conductive material and the consequent increase of its electrical resistivity. However, an extra antenna was produced by an ironing process with steam in order to analyse the influence of the steam in the performance of the antenna. Additionally, in order to

ensure the geometrical accuracy, the patches were cut by an LC6090C CCD laser cutting machine.

Laminated Antennas: These antennas are made by superposing fabrics and attaching them with a thermal adhesive sheet. The cutting process of the conductive material is critical, as the antenna has very thin lines. In order to increase the geometrical accuracy, the patches were cut by an LC6090C CCD laser cutting machine. This procedure also reduces the common fraying effect that appears when cutting thin fabrics with scissors. Two antennas were fabricated with this lamination technique. In order to test the influence of the direction of the structure of the conductive fabric (Zelt) on the performance of the antenna, the patch of antenna A was cut parallel to the warp, and the patch of antenna B was cut at 45°.

Embroidered Antennas: Embroidering is a promising method in terms of repeatability and mass-manufacturing, as the embroidered antennas do not need a cutting or lamination process, thus reducing the production costs. For this reason, several embroidered antennas have been proposed; for instance, spiral antennas, RFID tags, and antennas without a ground plane. This paper explores the embroidering technique to produce antennas that can be easily applied in clothing as an emblem. This way the embroidering technique might enlarge the dissemination of the textile antennas into clothing. As the antenna considered in this paper is a printed monopole antenna which requires a ground plane, the manufacturing process has to be adapted in order to eliminate the short cuts caused by the embroidering technique in both sides of the dielectric material. Therefore, the construction technique of the embroidered antenna was: firstly, embroidering the patch in a thin textile; secondly, cut the embroidery; and, finally, attach the embroidery to the dielectric substrate using the thermal adhesive sheet. This process is the same one used to produce the traditional emblems for cloth customization.

Integration into Clothing: When developing smart textile products, bringing technologies to the consumer in an acceptable and desirable format is a challenge. Some authors have been integrating textile antennas in products in a pleasing way, for instance, as wearable antennas for commercial advertisement proposes, dissimulated in brand names and logotypes. However, until now, the microstrip patch textile antennas have been built ex situ and then posteriorly integrated in the lining of the garment or into pockets or simply glued to the cloth. This paper proposes an innovative solution that presents the first antenna prototype manufactured directly in the clothing as it is made with the same textile materials composing the cloth. This cloth is a smart coat for electromagnetic harvesting -the *E-Caption: Smart and Sustainable Coat*, in which the antenna has a substrate that is continuous and was cut according to the pattern-making of the coat, thus being part of it. The antenna is integrated into the clothing by manipulating it as a simple emblem. In the future, the antennas can be incorporated into patterns and drawings, mixing conductive and non-conductive embroideries, creating fashionable emblems that function as antennas. These "emblem" antennas may be accessible to the end user for customization of smart cloth, for several applications.

E-Caption: Smart and Sustainable Coat: The integration of textile antennas for energy harvesting into smart clothing emerges as a particularly interesting solution when the replacement of batteries is not easy to practice, such as in wearable devices. A fully-embedded antenna in clothing contributes for the integration of electronic devices in less obtrusive ways, improving the good aesthetic and the technical design,

making the garment more comfortable and desirable to the final consumer. This might enhance niche markets where form and function work together in order to create new attractive textile products that can assist the user in many aspects of their daily routine. The *Smart and Sustainable Coat* was developed combining these concepts, integrating antenna A produced by the lamination manufacturing technique presented in previous sections. It is the first prototype of a smart coat with a printed monopole antenna fully integrated, as its dielectric is the textile material composing the coat itself. The coat is made of Cordura and of a 3D fabric. *Smart and Sustainable Coat* is the first prototype of this concept, integrating an "emblem" antenna capable of completely covering GSM900 (880–960 MHz) and the DCS1800 (1710–1880 MHz) bands, for IoT applications. In this context, the integration of textile antennas for energy harvesting into smart clothing can be a solution for recharging wearable devices, such as low-power electronics and WBSN.

Discussion: In the future, garments will not only communicate social conditions or protect the human body against the extremes of nature, but will also provide information and communication tools. Clothes are becoming able to communicate wirelessly without the need of large and expensive equipment. This is possible because textile technologies can produce new types of sensors and antennas that are so small, flexible, and inexpensive that they can be applied in different types of clothing, shoes, and accessories. The effective integration of wearable systems contributes to the advance of the IoT. The innovative concept of producing textile antennas to integrate into clothing by simply manipulating it as an "emblem" may improve the usage of the wearable technologies. In the future, the wearable antennas can be incorporated into textile patterns and drawings, creating fashionable antennas. These "emblem" antennas may be easily acceded by the end user, for customization of smart cloth for several applications.

Conclusions: Embedding antennas in clothing contributes for the advance of the integration of electronic devices in less obtrusive way making the smart clothes more comfortable. In the *E-caption*, the antenna is manufactured directly on the clothing, having a continuous dielectric substrate made with the textile materials composing the coat. Therefore, a continuous substrate of the antenna does not influence its performance. Moreover, the masses of the coat and of the body influencing the radiation characteristic of the integrated antenna, it still shows a nearly omnidirectional pattern. When laminating, the ironing process without steam seems to be preferable as it better preserves the electromagnetic performance of the materials. Additionally, the orientation of the conductive fabric used for the patch is not influencing the performance of the laminated antenna. In addition, it shows the direction and number of the stitches in the embroidery may contribute to increasing the conductivity of some elements, thus improving the performance. Other techniques to produce "emblem" antennas may be considered in the future, for instance, transfer, screen printing, and inkjet methods. Finally, this innovative concept of textile antennas for energy harvesting might open new horizons in the clothing development and in sustainable communication.

INNOVATIVE REPELLENT FINISH IN INTERIOR DECORATIVE FABRICS

Mrs.M.Malini Devi M.Sc., M.Phil, Ph.D
Assistant Professor, Department of Garment Designing,
PSGR Krishnammal College for Women, Coimbatore-04

Abstract

Textiles have an important role to play in interior design and furnishing. They form an integral part of the aesthetic concept; they ensure comfort and safety a high repellent effect. These textiles give users the assurance that it is pos-sible to furnish spaces safely.In this paper Natural fabric plays an important role to manufactured products in the textiles field. In our country there are variety of natural fabrics are in use of many aspects. An attempt has been made to find new uses for natural fibres one renewable resource which is under-utilized the technical textiles have attracted considerable attention the use of fibres yarns and fabrics for application other than clothing and furnishing is not a new phenomenon. In this study Natural fibers were selected, such as jute and aloe vera and treated with mosquito repellent finishes. The structure and properties of the fibres, and the fabrication and physical and mechanical properties of their natural fibre-based composites are described and Eco-Friendly products were made. These days, consumers are becoming increasingly aware of the quality of the products that they use. Using the existing production process, a new design for a repellent curtain was required. A special component had been added to the product to kill the insects better. The paper wished to add a surprise element to both the design and the material.

Keywords: *Natural fibers, jute, aloe Vera, mosquito repellent Eco-Friendly etc.,*

Introduction

Indian textile industry is the one of the modules and most economic in energy consumption due to integrated and high ecologic system is followed. it is a big landmark to the entire field in the world. The global economy has had its effective on the textile industry across all of Asia by adopting into innovative eco-system to upgrade the products and features. In this fast moving world working people must be able to do their jobs with proper protection. Thus the safety wear that does not hinder and facilitates their tasks will contribute to integral safety to work. In this project choosing natural fibers, we boost the sectors contribution to economic growth and help fight hunger and rural poverty. The international year will raise awareness of their importance not only to producers and industry, because Natural fibers can this play key role in the Emerging Green Economy. India does not have a significant presence in other natural fibers though ramie, flax, linen as used by Indian textile industry. fibre such as Cotton, Banana, Pineapple, jute, Sisal fibers have huge potential. In this study, Design is mean by Three Natural fibers that can be blend into new type of fabric and the resulting material. It has some important fibers which is very popular and miracle fibers, that is aloe Vera, jute. It is the oldest, and medicinal, vegetable fibres. This fibers are commonly called Golden and white gold fibres. It has been claimed that thus herb in plants or fibers been incorporated in the blend, commonly natural fibers make the fabric cool and breathable ensure a great measures of comfort. The above mentioned fibers blending and weaving is made on hand weaving traditional methods. After finish the weaving the fabric is selected on

the suitable finishing processes. Finishing is maximum depends on the fiber properties. Basically this fibers having good insect repellents and breathable fibers. So I have done on mosquito repellent finish. This finishing also more interesting and useful finishes to our society and environment condition. But development of this project execute that the fabric is to give a wonderful finishing which is insect repellents mosquitoes. Today many people were affected with diseases such as malaria, dengue, and chicken gunia. The serious public health problems exist in Tropical regions, especially in Africa and Asia. These diseases are transmitted to human beings through mosquito only. Since there is no effective vaccine available to control the disease, but our garment industries produce prevented materials day-by-day and new type of materials is introduced in market. The Natural fabric plays an important role to manufactured products in the textiles field. In our country there are variety of natural fabrics are in use of many aspects. But these fabrics are Insect Repellents which are very useful to us and also to the society. So let we make use of the natural fabrics for Eco-Friendly products.

Methodology

The Method applied for this study.

Flow chart –Fabric producing

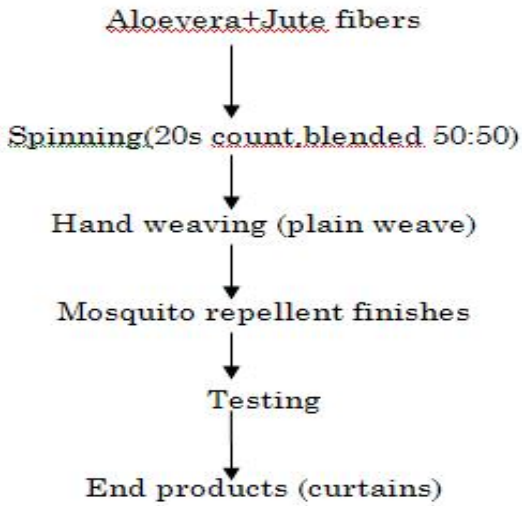


Fig: 1 Fabric producing

Selection of fibers

Fiber selections

In this project, Three Natural fibers like Aloe Vera and jute were taken from chennimalai Erode district.

Extraction Method

Aloe Vera and Jute fiber Extraction

Retting is the process of extracting fiber from the long lasting life stem or bast of the bast fiber plants. Aloe Vera fibre is traditionally extracted by retting. This process takes 15-21 days for a single cycle of extraction

Plate: 1 Aloe Vera Fiber Extraction

Plate: 2 Jute Fiber Extractions

Aloe Vera Leaf Fibre Extraction Method:

Leaf drying **(without gel)**

↓

Leaf separation

↓

Scrapping

↓

Softening (after 12 -25 days)

↓

Cutting

↓

Cording Drawing (2-5 days)

↓

Spinning

↓

Combing

Jute Stem Fibre Extraction Method

Retting (The extraction of the fibers from the non fibrous tissue in the bark of the plant is done)

↓

Dew Retting
(Stretching over green grass for 7-15 days)

↓

Stagnant water retting (7-15 days)

↓

Running water retting (10-20 days)

↓

Chemical retting (6-8 hrs)

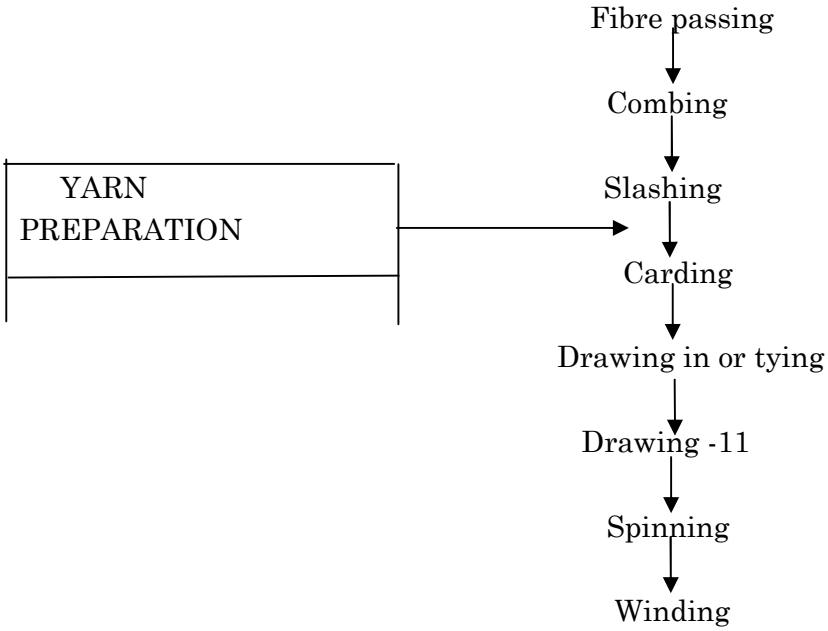
↓

Extraction ← Warm atmosphere
(Dried to make the fiber strong)

Yarn Spinning

Warp and weft filling yarns are subjected to different condition and requirements during weaving.

The yarn preparation of Aloe Vera, Jute and cotton which involves in similar method



The processes used to weave prepare yarns for weaving depends on yarn type as well winding is the major preparation process for filling yarn. The yarn quality characteristics that are most important for good weaving performance include short and long term weight and uniformity, imperfections, tensile properties and harness's yarn is winding on the corn on manually. After the yarn processes the yarn was converted into corn shape and beam to the weaving processes as shown in fig.a, b

Selection of Weave

The nature elasticity of the materials will produce a reasonable amount of give in warp and weft directions. In these weaving processes I have selected on plain weave methods. Weaving is interlacing of two sets of yarn which interlace at right angles to each other. The length wise threads are known as word. Individually they are called end cross wise threads as known as filling or weft. Before weaving to mainly know about yarn count. This yarn count is very useful to blending processes. This three fibers is blending together in 50:50 combinations.

Yarn Blending

The selected fibres are taken in equal proportions the warp yarn is made by aloevera jute, cotton yarn are used as yarn filling. The plain weave is selected for the study. In Plain weave method each thread of the warp is interlaced with filling

thread. In this type it's easy to make broad cloths. Plain weave fabric is tending to wrinkle rapidly and as less absorbent than other weaves. By using various fibres novelty or bulk special effect can be prepared to the plain weave fabrics .Blending with fibres in yarn stages, each fibres have same count.

WARP WEFT

- Aloe Vera ⟷ Jute

50:50%

Blending with suitable count

Tension Table

- Count of the yarns -20s.
- Weight in Grams -15 Grams.

Now yarns are blending with suitable count and percentage.

Hand weaving:

The loom is a device used to weave cloth the basic purpose of any loom to hold warp threads to under tension to inter weaving of the weft threads. The processes of weaving shown in fig.

Methods

Shedding
(Through the filling yarn carried by the shuttle)
↓
Picking
(To prevent the fabric from raveling) fig (c and d)
↓
Battening
(The reed presses or battens each filling yarn against.
The portion of the fabric that has been formed)fig shown on (e,f)

When weaving process was finished I have received 18 meters of fabrics from the weaver1 kilograms yarn= 6 meters of fabrics.3kilograms of yarn X 6 meters of fabric=18 meters of fabrics After finishing the weaving process the fabric will get a stable form. Some of the basic physical test is under gone with this fabric.

- TPI –Threads / inches. Ends per inch, picks per inch.
- Weight of fabric-weight/unit area, weight/unit length.
- Crimp-warp crimp, weft crimp.
- Count-warp count, weft count.

Before finishing Mechanical test is finished.

Because the testing of fabrics for quality is important and essential in the interest of the consumer. These figures show the clear form of weaving processes.

Selections of Finishes: After analyzing some of finishing process, it is suitable for antimicrobial and mosquito repellent finishes. The R&D Bio technology in

Coimbatore did this finishing process for this fabric .This finishing process will prevent the fabric mosquito's

Mosquito Repellent Finishes

Assessment of Mosquito repellency activity: The mosquito repellency efficiency of the finished fabric was tested using the modified excito chamber method.

Mosquito Collection: Anopheles mosquitoes were identified based on morphologic keys and they were collected during the evening hours. All mosquitoes were starved of blood and sugar of 4 hours before the tests.

Repellency Behavioral Tests: Specially designed two-excito repellency test chambers were used to evaluate the efficiency of repellency activity. The wooden outer chamber of excito-repellency testing device measures 34 cm × 32 cm × 32 cm and faces the front panel with the single escape portal. The box is composed of a rear door cover, an inner Plexiglas glass panel with a rubber latex-sealed door, a Plexiglas holding frame, a screened inner chamber, an outer chamber, a front door, and an exit portal slot. Mosquitoes were deprived of all nutrition and water for a minimum of 4 hours before exposure. Laboratory tests were performed during daylight hours only and each test was replicated four times. Observations were taken at one-minute interval for 30 minutes. After each test was completed, the number of Escaped specimens and those remaining inside the chamber was recorded separately for each exposure chamber, external holding cage, and paired control chamber. Escaped specimens and those remaining inside the chamber, for the treated samples, were held separately in small holding containers with food and water. For analyzing the finishing process I have spent 5 meters from the total length of the fabric Total fabric 18 meters - 5 meters of finishing process = so control fabrics-13 meters. Then the finished fabrics using the testing process.

End Products: Finishing product can be utilized for the hospital textile. In this project I have select the curtain size is 5"X 7" Inches windows. The product stitched manually on ordinary sewing machine. The curtain is very wonderful natural and Eco friendly product. The curtains from antimicrobial finishing was very use full in hospital setups' have applied this project in kongunadu hospitals at Coimbatore with the help of Mrs. christy, chief superintendent who belongs to Diabetology department. She had given a statement that, this mosquito repellent curtain is very helpful in preventing mosquitoes in our department. Earlier patients used to complaint regarding mosquitoes, now they are feeling that there is a prevention measure had been taken. Test is aply on the both daytime and night time. Mosquito levels measure on percentage methods.

Assessment of Mosquito Repellency Activity

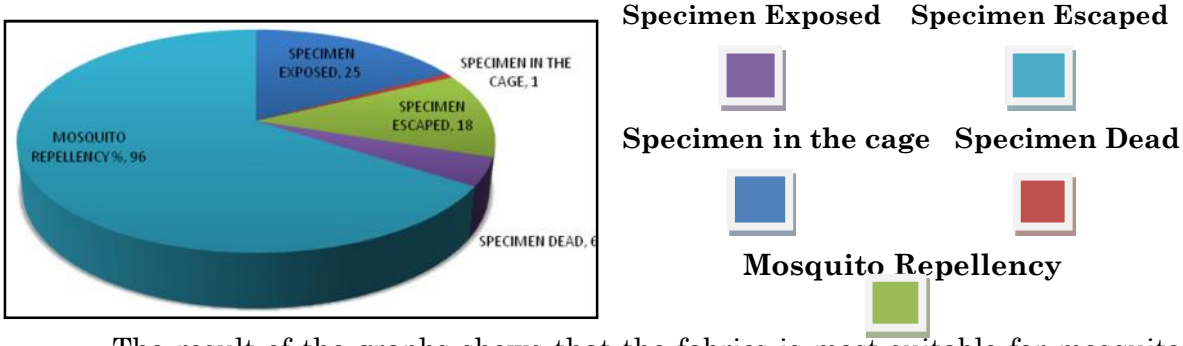
Table-I

S. No.	Fabric Samples	No. of specimen Exposed	No. of specimen in the cage	No. of specimen Escaped	No. of specimen Dead	Mosquito Repellency in %
1	Aleovera + Jute	25	1	18	6	96

Result

By using excito chamber method, mosquito repellency of the finished fabric was diagnosed. The overall mosquito repellency with this fabric is 96%.

Mosquito repellency activity



The result of the graphs shows that the fabrics is most suitable for mosquito repellency and we can implement this fabric in day today life.

Summary and Conclusion

In today's modernization in the textile industry, we are going through advancements of technology in every field of this industry. The world where this would lead us would be astonishingly hi-tech and materialistic. To ensure our security and safety from the future hazards, we need to equally development the technology for our protection. So in this Research, my goal is innovation in fabric Design on new type of natural yarns blend to identify the new type of fabrics. The fibres used in this project were taken from rural plant areas, there plant extraction method is directly done. After finished the Extraction the yarn was made. The selected fibres are Aloevera, Because each fibres has good fibre properties. These fibres were designed with three types of fabrics, which are Aloevera and Aloevera, Aloevera and jute. Though Aloevera's yarn strength is high, so blending with similar yarn will be suitable. The above mentioned fibers blending and weaving is made on hand weaving traditional methods. The selected fibres are taken in equal proportions the warp yarn is made by Aloe vera jute, yarn are used as yarn filling. The plain weave is selected for the study. In Plain weave method each thread of the warp is interlaced with filling thread. In this type it's easy to make broad cloths. After finished weaving process the fabric test will be taken count, fabric thickness, tensile strength then physical, mechanical test was done. After analyzing the properties, suitable finishes was given. Each fiber has good insect repellent properties also. So I have done mosquito repellent finish. Now a days there is a good deal of demand for the fabrics having functional or specialty finishes in general but antimicrobial, mosquito repellent finishes in particular protecting human being against microbes and mosquitoes. This finishing process was finished in RND BIO Solutions. Then I did antimicrobial and mosquito repellent test for the finished fabric. This finishing process prevents the fabric from mosquito's. The finishes are mosquito repellent finishes with Anopheles mosquitoes using Excito chamber method. Here specially designed two-excito repellency test chambers were used to evaluate the efficiency of

repellency activity. The overall mosquito repellency with this fabric is 96%. The finishing process was done. The finished fabric was converted in the form of curtain to analyze the mosquito repellent property and the curtain was stitched manually with ordinary sewing machine. The result of the curtain is very wonderful, natural and Eco friendly product. The finished curtains were very useful in hospital setups, which have applied in kongunadu hospitals at Coimbatore with the help of Mrs. christy, chief superintendent who belongs to Diabetology department. Her response towards this curtain was good. The extension of antimicrobial and mosquito repellent treatments into mainstream apparel and home textiles adds to consumers' overall comfort and well-being, in addition to enhancing the life cycle of textiles. The finished fabric should be beneficial in household and hospital windows curtains. Overall the test like abrasion stiffness and crease recovery testing resulting is better. The fabric durability and comfort also good. And Vice versa the finished fabric also seems to be better quality and result. This value added products made the users to feel happy and hygienic.

Future & Scope

Clothing made from natural fabrics are not only good for environment but the body as well. This study is just initiative by using multi finish on some fabrics. In fucture research has to be done to aply uses baby care products and night wears. Even though many products have come but still there is very good scope for the textile researchers in the field. Now the type of fabric is mainly used in manufacturing inner garments, as they are next to the skin. Apart from keeping the body warm; Aloe Vera enriched garments are in the initial stages of development.

goes without saying that using renewable materials in your interior design is good for the environment. Beyond that, it's also easy for your wallet and sense of style. There's really no downside. Take a look at our argument before you start your next home improvement project and we're sure you'll be a convert. Before you know it, these materials will have a prominent place in your interior design. Nature had a huge impact on our list of interior design trends and we're not the only ones. When it comes to creating a trendy interior, using green materials is definitely the way to go

Mosquito Repellent Finish: Fabric –Alovera with Jute Mosquito Repellent Curtains

Bibliography

Books

1. ANTHONY F., ACAR J (2009). Antimicrobial resistance: Responsible and prudent use of antimicrobial. *Rev. Sci. tech.Page No*, 829–839.
2. Angappan.P.,(1997) Textile testing. fabric Testing Page. No 219-320.
3. Chutler A. J (1998), Introduction to Clothing Production Management, Blackwell science, Page. No 408-418.
4. Chellamani .S (1993) Pineapple leaf fibre 1st edition Page .No 18-20
5. Eilers P. H. C (2006) Enhancing scatter plots with smooth densities, *Bioinformatics*, Page. No 623-628.
6. Gohl. E.P.G, (1998) Textile Science, A Text Book of Fibre Science and Technology, Page. No 321-332.
7. Harold Carr,(1994) The Technology of Clothing Manufacture., lTSA Page. No 413-415.
8. Lord P.R, (1973) Weaving, Conversion of Yarn to Fabric, Merrow Technical Library Page. No 919-922.

Websites

1. https://www.cabdirect.org/cabdirect/abstract/19940607820
2. http://www.jute.org.
3. www.biogents.com
4. www.indiafashionexpo.co.
5. http://www.express textile
6. textilej@benthamopen.org
7. http://www.discoverybangladesh.com/
8. www.textileinfo.com. http://www.jute.org/

AN ANALYSIS OF GROWTH AND DEVELOPMENT OF TEXTILE INDUSTRY IN INDIA

Ms.R.Mangaiyarkarasi
Lecturer, Department of Business Administration
Seethalakshmi Ramaswami College, Trichy
Ms.S.Vaishnavi
Lecturer, Department of Business Administration
Seethalakshmi Ramaswami College, Trichy

Abstract

The Textile Sector in India ranks next to Agriculture. Textile Industry is providing one of the most basic needs of people and the holds importance; maintaining sustained growth for improving quality of life. It has a unique position as a self-reliant industry, from the production of raw materials to the delivery of finished products, with substantial value-addition at each stage of processing; it is a major contribution to the country's economy. This paper deals with structure and growthof Textile Industry, size of the Indian textile industry, textile industry export, Role of Indian Textile Industry in the Economy, Government initiatives and strength, weakness, opportunities and threats of the Indian textile industry.

Key words: *Textile industry, Economy.*

Introduction

India has been in the midst of a great social, political and economic change ever since reforms were introduced in various spheres of activity. The country has greater confidence to take on the competition from developed countries and has attracted global investors in ever increasing measure. The Textile industry is one of the oldest industries in India. The sector has made significant contributions in terms of forex earnings and employment and is one of the mainstays of the economy. The Indian textile industry is one of the largest in the world with a massive raw material and textiles manufacturing base. India is the second largest producer of textiles and garments in the world. The textile and apparel industry can be broadly divided into two segments - yarn and fibre, and processed fabrics and apparel. India accounts for ~14 per cent of the world's production of textile fibres and yarns (largest producer of jute, second largest producer of silk and cotton, and third largest in cellulosic fibre). India has the highest loom capacity (including hand looms) with 63 per cent of the world's market share.

Objectives of the Study

- To know about the structure and growth of textile industry.
- To study about the Role of Indian Textile Industry in the Indian Economy
- To understand the initiative scheme taken by the Government for the development of textile industries.

Structure and Growth of Textile Industry

Growth of Textile Industry

The most significant change in the Indian textiles industry has been the advent of man-made fibres (MMF). India has successfully placed its innovative range of MMF textiles in almost all the countries across the globe. MMF production

recorded an increase of 10 per cent and filament yarn production grew by 6 per cent in the month of February 2014. MMF production increased by about 4 per cent during the period April 2013–February 2014. Cotton yarn production increased by about 10 per cent during February 2014 and by about 10 per cent during April 2013–February 2014. Blended and 100 per cent non-cotton yarn production increased by 6 per cent during February 2014 and by 8 per cent during the period April 2013–February 2014. Cloth production by mill sector registered a growth of 9 per cent in the month of February 2014 and of 6 per cent during April 2013–February 2014. Cloth production by power loom and hosiery increased by 2 per cent and 9 per cent, respectively, during February 2014. The total cloth production grew by 4 per cent during February 2014 and by 3 per cent during the period April 2013–February 2014. Textiles exports stood at US$ 28.53 billion during April 2013–January 2014 as compared to US$ 24.90 billion during the corresponding period of the previous year, registering a growth of 14.58 per cent. Garment exports from India is expected to touch US$ 60 billion over the next three years, with the help of government support, said Dr A Sakthivel, Chairman, Apparel Export Promotion Council (AEPC). The textiles sector has witnessed a spurt in investment during the last five years. The industry (including dyed and printed) attracted foreign direct investment (FDI) worth Rs 6,710.94crore (US$ 1.11 billion) during April 2000 to February 2014.

Market Size: The Indian textiles industry, currently estimated at around US$ 108 billion, is expected to reach US$ 223 billion by 2021. The industry is the second largest employer after agriculture, providing employment to over 45 million people directly and 60 million people indirectly. The Indian Textile Industry contributes approximately 5 per cent to India's Gross Domestic Product (GDP), and 14 per cent to overall Index of Industrial Production (IIP). The Indian textile industry has the potential to reach US$ 500 billion in size according to a study by Wazir Advisors and PCI Xylenes & Polyester. The growth implies domestic sales to rise to US$ 315 billion from currently US$ 68 billion. At the same time, exports are implied to increase to US$ 185 billion from approximately US$ 41 billion currently.

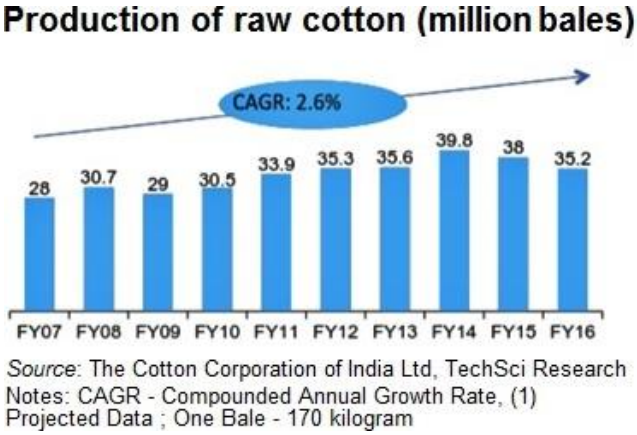
Textile Industry in India

- Production of raw cotton in India grew from 28 million bales in FY07 to 38 million bales in FY15 and further increased to 35.2 million bales in FY16
- During FY16(1), of the overall amount of raw cotton produced in the country, with domestic consumption totaling to 30 million bales

Export Market Share: Textiles has the Larger Share

- In 2014, textiles had a share of 60 percent of the export market; apparels contributed the remaining 40 percent.

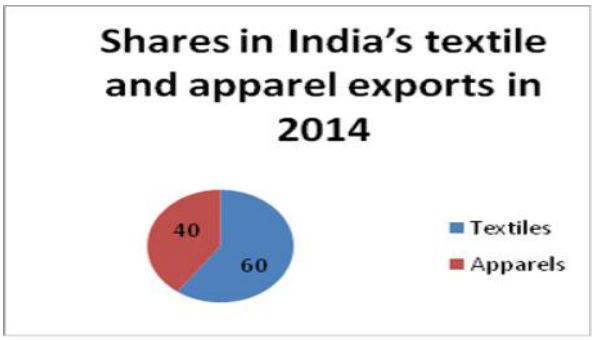
- To improve technical skills in apparel industry government established 75 apparel training and design centres across India.'



- National Institute of Fashion Technologies played pioneering role in growth of apparel industry and exports.
- To promote apparel exports 12 locations have been approved by the government to set up apparel parks for exports.

Role of Indian Textile Industry in the Economy

The textiles industry has made a major contribution to the national economy in terms of direct and indirect employment generation and net foreign exchange earnings. The sector contributes about 14 per cent to industrial production, 4 per cent to the gross domestic product (GDP), and 27 per cent to the country's foreign exchange inflows. It provides direct employment to over 45 million people. Thus, growth and all round development of this industry has a direct bearing on the improvement of the India's economy. Some of the important benefits offered by the Indian textile industry are as follows:



- India covers 61 percent of the international textile market.
- India covers 22 percent of the global market.
- India is known to be the third largest manufacturer of cotton across the globe.
- India claims to be the second largest manufacturer as well as provider of cotton yarn and textiles in the world.
- India holds around 25 percent share in the cotton yarn industry across the globe.
- India contributes to around 12 percent of the world's production of cotton yarn and textiles.

Government Initiatives

The Indian government has come up with a number of export promotion policies for the textiles sector. It has also allowed 100 per cent FDI in the Indian textiles sector under the automatic route. Some of initiatives taken by the government to further promote the industry are as under: India's first integrated textiles city, which will largely cater to the export market and build a brand for Indian textiles abroad, is likely to be set up in the state of Andhra Pradesh. The Clothing Manufacturers' Association of India (CMAI) has signed a memorandum of understanding (MOU) with China Chamber of Commerce for Import and Export of Textiles (CCCT) to explore potential areas of mutual co-operation for increasing

apparel exports from India. The Department of Handlooms and Textiles, Government of India, has tied up with nine e-commerce players and 70 retailers to increase the reach of handlooms products in the Indian market, which will generate better prices and continuous business, besides facilitating direct access to markets and consumers for weavers. The Government of India has started promotion of its 'India Handloom' initiative on social media like Facebook, Twitter and Instagram with a view to connect with customers, especially youth, in order to promote high quality handloom products. The Ministry of Textiles launched Technology Mission on Technical Textiles (TMTT), The objective of TMTT is to promote technical textiles by helping to develop world class testing facilities at eight Centres of Excellence across India, promoting indigenous development of prototypes, providing support for domestic and export market development and encouraging contract research.

Support to Textile Sector by the Government in Fy16 Budget

Custom Duty Reduction Basic Custom Duty Reduced to 2.5% for textile raw materials used in Technical textiles. The goods included under this facility are Nylon 66 filament yarn, Polyester anti-static filament yarn, Aramid flame retardant fibre, Para-aramid fibre, Nylon staple fibre, Nylon anti-static staple fibre, Mod acrylic fibre and Flame retardant viscose rayon yarn. This measure will help bring down the input cost for several technical textiles manufacturers in the country.

Budget Allocation to Ministry of Textiles Increased

The ministry has received Rs. 4594.82 crores for the upcoming financial year to support its various schemes covering the entire textile industry. In 2015-16, the budget allocation for the ministry was Rs. 4326.44 crores. The flagship ATUF scheme has been allocated Rs. 1480 crores for FY 2016-17 compared to Rs. 1510.79 crores in the FY 2015-16. Apart from ATUFS, all central funded schemes for textile sector have received required allocation of funds.

Consumption of Textiles and Apparel to Grow: The Government's focus on the farmer and rural sector is expected to boost the economic health of rural India which in return will improve consumption of textiles and apparels. Significantly large expenditure by the government in the rural and agricultural sector will stimulate demand. Domestic textile market size is anticipated to grow significantly, driven by increased consumption from rural and semi urban areas in the next 2-3 years.

Skill Development: Since its launch, the National Skill Development Mission has imparted training to 76 lakh youth, who found employment in various sectors, including textiles and clothing. The FM, in his budget speech announced, "We want to bring entrepreneurship to the doorsteps of youth through Pradhan Mantri Kaushal Vikas Yojana (PMKVY). We have decided to set up 1500 Multi Skill Training Institutes across the country. I am setting aside an amount of Rs 1,700 crore for these initiatives."

Tax Reforms: Presumptive taxation scheme under section 44AD of the Income Tax Act is available for small and medium enterprises i.e. non-corporate businesses with turnover or gross receipts not exceeding Rs 1 crore. This frees them from the burden of maintaining detailed books of account and getting audit done. The FM has

increased the turnover limit under this scheme to Rs 2 crore, allowing a large number of assesses in the MSME category.

Corporate Tax Reduction: Since the last budget, the government had mooted reduction of rate of Corporate Tax from 30% to 25% over a period of three years, accompanied by rationalization and removal of various tax exemptions and incentives like:

a) The accelerated depreciation provided under IT Act will be limited to maximum 40% from 1st April 2017.
b) The benefit of deductions for Research would be limited to 150% from 1st April 2017 and 100% from 1st April 2020.
c) The benefit of section 10AA to new SEZ units will be available to those units which commence activity before 31st March 2020.
d) The weighted deduction under section 35CCD for skill development will continue up to 1st April 2020.

Also, new manufacturing companies incorporated on or after 1st April 2016 will be given an option to be taxed at 25% + surcharge and cess, provided they do not claim profit linked or investment linked deductions and do not avail of investment allowance and accelerated depreciation. Further, companies with turnover not exceeding Rs 5 crore (in FY 2014-15), will attract a corporate tax of 29% plus surcharge and cess.

SWOT Analysis of Indian Apparel & Textile Industry

STRENGTH Raw material base Labour Flexibility Rich Heritage Domestic market	**WEAKNESS** More dependence on cotton Spinning Sector Weaving Sector Fabric Processing Poor Infrastructure Low Labour Productivity
OPPORTUNITIES Growing Industry Market access through bilateral negotiation Integration of Information technology Opportunity in High Value Items	**THREATS** Decreasing Fashion Cycle Formation of Trading Blocks Phasing out of Quotas

Key Players in the Industry

Company	Business Areas
Welspun India Ltd	Home textiles, bathrobes, terry towels
Vardhman Group	Yarn, fabric, sewing threads, acrylic fiber
Alok Industries Ltd	Home textiles, woven and knitted apparel fabric, garments and polyester yarn
Raymond Ltd	Worsted suiting, tailored clothing, denim, shirting, woollen outerwear
Arvind Mills Ltd	Spinning, weaving, processing and garment production (denims, shirting, khakis and knitwear)

Bombay Dyeing & Manufacturing Company Ltd	Bed linen, towels, furnishings, fabric for suits, shirts, dresses and saris in cotton and polyester blends
Garden Silk Mills Ltd	Dyed and printed fabric

Conclusion

The future for the Indian textile industry looks promising, buoyed by both strong domestic consumption as well as export demand. The Indian textiles and apparel industry is expected to grow to a size of US$ 223 billion by 2021, according to a report by Technopak Advisors. This industry accounts for almost 24% of the world's spindle capacity and 8% of global rotor capacity. Abundant availability of raw materials such as cotton, wool, silk and jute as well as skilled workforce have made the country a sourcing hub. The organized apparel segment is expected to grow at a Compound Annual Growth Rate (CAGR) of more than 13 per cent over a 10-year period. Finally, it is necessary that wholehearted joint efforts from manufacturers, buyers, suppliers, government, and other stockholders are highly expected to accomplish the development of potential and sustainable textile industries growth in India.

References

1. http://info.shine.com/industry/textiles/17.html
2. http://www.ibef.org/industry/textiles.aspx
3. http://www.india-opportunities.es/archivos/publicaciones/Textiles-and-Apparel-January-2016.pdf
4. http://www.textileexcellence.com/news/details/1005/textile-industry-to-benefit-from-union-budget-2016...
5. http://business.mapsofindia.com/india-gdp/industries/textile.html
6. http://blogs.siliconindia.com/rohitkantprasad/SWOT_analysis_of_Indian_Apparel_Textile_Industry-bid-nMHxN50t11848596.html

A REVIEW ON ELEMENTS OF PERSONNEL MANAGEMENT AND EMPLOYEE RELATIONS - IMPORTANCE AND IMPROVING WAYS IN APPAREL

C.Manimakala
Assistant professor, Department of B.voc in Garment Designing, PSGR Krishnammal College for Women, Coimbatore

Abstract

Personnel management can be defined as obtaining, using and maintaining a satisfied workforce. It is a significant part of management concerned with employees at work and with their relationship within the organization. Relationship between organization and job helps making a job effective and significant. Relationship between job and people makes the job itself important. Relationship between people and organization gives due importance to organizational structure and the role of people in it. Organization is said to be the framework of many activities taking place in view of goals available in a concern. An organization can be called as a physical framework of various interrelated activities. Right from manpower planning to employees' maintenance, all activities take place within this framework. Performance appraisal refers to the elaborate process of reviewing one's performance and output over a certain period of time and not only give correct feedbacks but also acknowledge and appreciate the hard work. Appraisal letters cause a lot of anxiety and sometimes disappointment among employees. An optimistic approach to strengthen disciplinary culture rooted on shared norms of employees should be adopted. An effective grievance redressal system should be there.

Keywords: *Personnel management, Employee relation, Job effective, Employee motivation*

Introduction

The textile industry is important in the business sector of India and it has to face cut throat competition in market due to decentralized sector and also has the opportunity in the world market. There is need to adopt new improvement technologies to not only manage supplies, but also control production and enhance productivity. More than 70% of EU imports of textile and clothing come from Asia. Many Asian workers have to work in sweatshop conditions, but the issue appears in global media only when major fatal accidents occur, like that at Rana Plaza in Bangladesh, in 2013.Long working hours, low wages, lack of regular contracts,and systemically hazardous conditions are often reported. Trade unions, when allowed, are unable to protect workers. International trade in textiles and clothing has played an important role in the development process of many countries and has also facilitated their integration in to the world economy. In the Developed Countries, the process of industrialization and subsequent prosperity in a way commenced with the mechanization of textile production in the early 19th Century. In the Developing Countries, on the other hand, the sector has co me to occupy an important place in terms of its contribution to national output, employment and exports. Developing countries as a group, account for more than one half of world exports of textiles and clothing.

Characterization of the Indian Textile Industry : India's textile industry is comprised mostly of small-scale, non integrated spinning, weaving, finishing, and apparel-making enterprises. This unique industry structure is primarily a legacy of

government policies that have promoted labor-intensive, small-scale operations and discriminated against larger scale firms.

- **Spinning** is the process of converting cotton or manmade fiber into yarn to be used for weaving and knitting. Largely due to deregulation beginning in the mid-1980s, spinning is the most consolidated and technically efficient sector in India's textile industry. Average plant size remains small, however, and technology outdated, relative to other major producers. In 2002/03, India's spinning sector consisted of about 1,146 small-scale independent firms and 1,599 larger scale independent units.
- **Weaving and knitting** converts cotton, manmade, or blended yarns into woven or knitted fabrics. India's weaving and knitting sector remains highly fragmented, small-scale, and labor-intensive. This sector consists of about 3.9 million handlooms, 380,000 "powerloom" enterprises that operate about 1.7 million looms, and just 137,000 looms in the various composite mills. "Powerlooms" are small firms, with an average loom capacity of four to five owned by independent entrepreneurs or weavers. Modern shuttleless looms account for less than 1 percent of loom capacity.
- **Fabric Finishing**. Fabric finishing (also referred to as processing), which includes dyeing, printing, and other cloth preparation prior to the manufacture of clothing, is also dominated by a large number of independent, small scale enterprises. Overall, about 2,300 processors are operating in India, including about 2,100 independent units and 200 units that are integrated with spinning, weaving, or knitting units.
- **Clothing. Apparel** is produced by about 77,000 small-scale units classified as domestic manufacturers, manufacturer exporters, and fabricators (subcontractors).

India has already completed more than 50 years of its independence. The analysis of the growth pattern of different segment of the industry during the last five decades of post independence era reveals that the growth of the industry during the first two decades after the independence had been gradual, though lower and growth had been considerably slower during the third decade. India is the third largest producer of cotton with the largest area under cotton cultivation in the world. It has an edge in low cost cotton sourcing compared to other countries. Average wage rates in India are 50-60 per cent lower than that in developed countries, thus enabling India to benefit from global outsourcing trends in labour intensive businesses such as garments and home textiles. Design and fashion capabilities are key strengths that will enable Indian players to strengthen their relationships with global retailers and score over their Chinese competitors. Production facilities are available across the textile value chain, from spinning to garments manufacturing. The industry is investing in technology and increasing its capacities which should prove a major asset in the years to come.

Employer-Employee Relationship in Textile Industry: Employee relations' is a common title for the industrial relations function within personnel management and is also sometimes used as an alternative label for the academic field of industrial relations. The term underlines the fact that industrial relations is not confined to the study of trade unions but embraces the broad pattern of employee management, including systems of direct communication and employee involvement that target the individual worker. The relationship between an employer and its employees is an important factor in the organization success. Employers will treat their employees with respect and vice versa if they all want to succeed and achieve goals. Some

organization forgets to focus on employee retention and appreciation, and then they lose productivity. The relationship between the employer and the employee is important, therefore business owners need to pay attention to this relationship if they want their businesses to grow and succeed. Good employer-employee relations are essential for different reasons. These reasons might include: Employees who are inspired to work produce better and more results. The level of competency of the staff increases because of their drive to become better. Customer service is improved because employees who have good relations with their employer are usually viewed as good Customer consultants.

Labor Welfare Records: Employers must maintain certain records relating to employees and former employees.The following list sets out the standard records whichan inspector will require access to during the course of an inspection:

1. Employer registration number with the Revenue Commissioners
2. Full name, address and PPS number for each employee
3. Terms of employment for each employee
4. Payroll details
5. Copies of payslips
6. Employees' job classification
7. Dates of commencement and where relevant,termination of employment
8. Hours of work for each employee (including starting andfinishing times, meal breaks and rest periods)
9. Register of employees under 18 years of age
10. Whether board and/or lodgings are provided and relevant details
11. Holidays and public holiday entitlements received by each employee
12. Any documentation necessary to demonstrate compliance with employment rights legislation.

Employers must establish certain policies and procedures, such as discipline and grievance, and dignity at work (including bullying and harassment). The establishment of others, such as data protection and absence policies, is considered best practice.

Major Environmental Impacts Are Related To Energy Use and Use of Toxic Chemicals Social implications for the clothing and textiles industry

The apparel industry has many negative environmental and social impacts that are complex and occur at different stages of the apparel life cycle. The development of fast fashion has amplified the impacts due to the in-creased volume of apparel produced and sold at lowprices. The apparel has a long and complicated production chain consisting of many phases including resource production and extraction, fiber and yarn manufacturing, textile manufacturing, apparel assembly, packaging, transportation and distribution, con- sumer use, recycling, and ultimate disposal. The environmental impacts of apparel are varied across the phases, difficult to assess for individualgarments, and are subject to the type of raw materialused, dyeing and laundering. The major environmentalimpacts associated with the production and use of apparel throughout its life cycle include wastewater emissions from dyeing, finishing, and washing processes, increase in pollution, solid waste production, and significant depletion of resources from consumption of water, fossil fuels, and raw materials Energy is used for laundering, transportation, operations of machines for various processes, the production of primary materials, especially man-made fibers such as polyester (a petroleum-based product), and yarn manufacturing of natural fibers such as cotton. Conventional cotton production has high water con-sumption and employs the use of toxic

chemicals that may harm human health and the environment Chemicals are also released in waste water from processes such as pre-treatments, dyeing, finishing, and laundry.

Working Environment in Textile Industry: A major concern among garment workers are long working hours and forced overtime. Employees normally have to work between 10 to 12 hours, sometimes 16 to 18 hours a day. When a factory faces order deadlines, working hours get longer. Chinese workers were frequently working a seven-day week in peak seasons and sometimes they sit working non-stop for 13 to 14 hours a day. They sew until their arms feel sore and stiff. In Thailand garment employees sometimes have to work a day shift and a night shift. Overtime is usually obligatory and if workers cannot work the additional hours they face penalties, verbal abuse and dismissals.

Absenteeism of Employees in Textile Industry: Absenteeism as commonly understood refers to the failure of an operative to report to work when work is available to him as used in the study overall absenteeism is made up of three component.

1) Leave sanctioned by management referred to in this report as authorized absence
2) Absence without any prior information to and permission from management referred to as unauthorized absence.
3) Certified sickness most widely knows as ESI leave. This does not include maternity leave absence of workers during strike due to lay off those o earned leave and women workers on maternity leave not have been considered as absentees

Internal Human Resources Audit in Textile Industry

Internal Audit is an independent function involving continuous and critical appraisal of the functioning of the entity with a view to suggest improvements in governance mechanism of the entity including entity's strategic risks and management checks and internal control systems. The aim of the internal control evaluation is to add value to organizational control systems with a systematic, disciplined approach to the risk mitigation effort. This evaluation includes accounting and reporting policies and compliance with the applicable legal framework and regulatory standards and standard operating procedures.

Eu Policy: Textiles and clothing is a diverse sector that plays an important role in the European manufacturing industry. It is also engaged in dialogues with non-EU countries on policy and regulatory issues that affect the textiles and clothing industry. The textile and clothing industry in the EU. The footwear industry.

Conclusions: This discussion paper has highlighted the scope and potential for departments to find ways within the existing system to become more effective in the management of human resources, assisted by a more flexible and focused approach at central level. In order to move from personnel management to HRM, there is a need for wider recognition that HRM itself is a valuable lever for change. This recognition must be translated into visible action if the civil service is to keep pace in the rapidly changing external environment in which it operates. n these circumstances countries in transition to a market economy are addressing a range of problems such as: the role of employers' and workers' organizations; national policy formulation through a tripartite process; a labour law system relevant to the new economic environment; methods and criteria in wage determination; dispute prevention and settlement procedures and mechanisms; and managing public sector enterprises in a competitive environment.

NANOTECHNOLOGY IN TEXTILES

Dr. P.K.Manimozhi
Department of Physics Seethlakhsmi Ramaswami College
Tiruchirapalli

Abstract

Nanotechnology is a growing interdisciplinary technology often seen as a new industrial revolution. Nanotechnology (NT) deals with materials whose size range between 1 to 100 nm in length. The properties of materials drastically change when their dimensions are reduced to nanometer scale and this is the property which is attracted by the researchers to make new innovations in all fields . Nanotechnology provides a wide window of study in textile industries. Nanotechnology in textile help in the understanding, manipulation, and control of matter at the above-stated length, such that the physical, chemical, and biological properties of the materials (individual atoms, molecules, and bulk matter) can be engineered, synthesized, and altered to develop the next generation of improved materials, devices, structures, and systems. It is used to develop desired textile characteristics, such as high tensile strength, unique surface structure, soft hand, durability, water repellency, fire retardancy, antimicrobial properties etc. This article will give a short insight into different types of smart textiles, their classifications, methods of incorporating manufacturing techniques and some of their applications.

Key words: *Microencapsulation, phoochromic textiles, integrated textiles, phase change materials.*

Introduction

Nanotechnology is increasingly attracting worldwide attention because it is widely perceived as offering huge potential in a wide range of end uses. Nanotechnology also has real commercial potential for the textile industry(1). This is mainly due to the fact that conventional methods used to impart different properties to fabrics often do not lead to permanent effects, and will lose their functions after laundering or wearing. Nanotechnology can provide high durability for fabrics, because nano-particles have a large surface area-to-volume ratio and high surface energy, thus presenting better affinity for fabrics and leading to an increase in durability of the function(2). In addition, a coating of nano-particles on fabrics will not affect their breath ability or hand feel.Technologically developed textiles are refereed as smart, interactive and intelligent textiles. They are used for a range of textiles products, andcan be divided into two categories: smart textiles and technical textiles.

Smart Textiles

Smart fibres and materials interact and adapt to you and the environment around them to create “Microenvironments”. They are often referred to as “sense and react” materials. Smart textiles can be developed by by microencapsulation, photochromic and thermochromic ink techniques. Tiny bubbles that contain scent or chemicals are incorporated into materials. The scent or chemicals are released or activated with heat or friction (3).Scented textiles,anti bacterial and anti allergenic textiles are produced using this technique. This technique is used in making aromatherapy pillows that release the scent of lavender when they are heated and

also in making of clothing that help mask bad odours such as scented socks, sportswear etc. They are used to make anti-allergy bedding such as pillows, duvets and mattresses and outdoor wear fabrics which contain anti mosquito repellent. Materials that contain antibacterial propertiessuch as clothing for babies and cleaning clothes bandages that release drugs to aid healing are the most wanted textile products in the market.

Technical Textiles

Technical textiles are fabrics and fibres that are developed for their unique properties. They function as electronic devices and sensors. Technical textiles can take the form of integerated circuits, wearable electronics and integerated wearable electronics. Clothing or textile items printed with thermochromic inks change colour according to wearer and environment(4). They react to changes in temperature such as body heat or boiling water. The inks are effectively colourless without the application of heat and turn into vibrant colour once activated. When the body or general temperature of the product reduces, the inks become clear again. Thermochromic inks have a number of end uses like kettle and mugs that change colour when in contact with high temperatures. They are used in making novelty t-shirts or nail varnish that change colour when the body temperature increases (5). Spoons change colour if the food is too hot, helping you keep baby safe and your own fingers. Bandages that respond to infections or change in temperature are available in the market.Photochromic dyes or inks change colour when exposed to ultra violet sunlight. They are able to alter from colourless to intense colour after 15 seconds in direct sunshine and return to clear after about 5 minutes indoors. They are used as an indication to how much UV rays the wearer/user is exposed to. Fabrics that contain photochromic dyes are useful to alert the wearer/user of the dangers of over exposure to harmful ultra violet sunlight. They act as a temperature warning in the form of garments or accessories. Photochromic dyes are mainly used for making children's sun suits that contain a label which changes colour as anindication of excessive contact to harmful sun rays. The sun suits alsoprotect the wearer/users skin by forming a barrier similar to suncream that aids protection from sunburn. Wristbands that can be worn which adapts in colour as an indicationwhen it comes into direct contact with sunlight.

Phase Change Materials

Phase Change is the process of going from one physical state to another i.e. from a solid to a liquid and vice versa. Fibre and textile which have automatic acclimatising properties have recently attracting more and more attention. This effect could be achieved by using phase change material (PCM) (6).The technology for incorporating PCM microcapsules (7) into textile structureto improve their thermal performance was developed in the early 1980s under NASA research programme. The original intent was to use these fabrics in the astronauts' space suits to provide improved thermal protection against theextreme temperature fluctuations in outer space. Phase-change materials (PCMs) have been used as thermal storage and control materials because of the heat absorption and release that occur upon a change of phase. In 1987, the microencapsulation technology of PCMs was developed and

incorporated with textile materials. Currently, for garments and home furnishing products, microencapsulated PCMs are incorporated into acrylic fibers or polyurethane foams or are embedded into a coating compound and topically applied to a fabric or foam. Some researchers have tried to apply PCM technology to protective garments worn in extreme environments, from cold water to hot deserts (8). Phase change materials (PCM) take the advantage of latent heat that can be stored or released from a material over a narrow temperature range. PCM possesses the ability to change their state with a certain temperature range. These materials absorb energy during the heating process as phase change takes place and release energy to the environment in the phase change range during a reverse cooling process. Insulation effect reached by the PCM depends on temperature and time. Recently, the incorporation of PCM in textiles by coating or encapsulation to make thermo-regulated smart textiles has grown interest to the researcher. Phase change materials absorb heat energy as they change from a solid to a liquid state and release heat as they return to a solid state. The PCMs change phases within a temperature range just above and below human skin temperature would be suitable for application in textiles. This interesting property of PCMs would be useful for making protective textiles in all-season. Fiber, fabric and foam with PCMs could store the heat body creates, then release it back to body, as it needs. Since the process of phase change is dynamic; therefore, the materials are constantly changing from a state to another depending upon level of physical activity of the body and outside temperature (9). The thermo-regulating characteristic is possible in manmade fiber by adding PCM microcapsules to a polymer solution prior to fiber extrusion. In the process, PCM microcapsules are integrated inside the fiber itself. Coating, lamination, finishing, melt spinning, bi-component synthetic fiber extrusion, injection molding, foam techniques are some of the convenient processes for PCMs' incorporation into the textile matrix.

Applications of Nano Enhanced Textiles

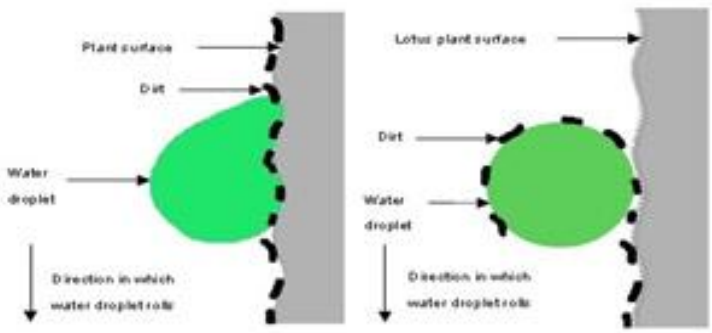
Apparel Industry: Examples of industries where nanotech-enhanced textiles are already seeing some application include the sporting industry, skincare, space technology and clothing and material technologies for better protection in extreme environments. Treating textiles with nanotechnology materials is a method to improve the properties of the textile, making it longer durable, have nicer colours etc. Nanotechnology can also be used to add new functionalities like energy storage and communications. Some interesting examples of nano improved textiles currently on the market are:Stain repellent and wrinkle-resistant threads woven in textiles , body warmers use Phase Change Materials (PCMs) responding to changing body temperatures, nano socks treated with silver nano particles. The silver acts against infection and odor(11).

Sporting Goods: Running shoes, tennis racquets, golf balls, skin creams, and a range other sporting goods have also been enhanced by nanotechnology. As well as developing textiles to withstand extreme environments, scientists have looked to naturally existing viral nano particles that live in some of the harshest environments on earth, for new building blocks for nanotechnology (12). A garment that senses

their surroundings and interacts with the wearer is an area of considerable interest. Such textile-based nano sensors could provide a personalized healthcare system, monitoring your vital signs as you run up a hill or responding to changes in the weather.

Flexible Electronic Circuits: Nano ribbons form the basis for the chips which are so flexible they can wrap around the edge of a microscope cover slip and so stretchable they can be twisted into a corkscrew (13). The researchers are focusing applications development in the healthcare industry and believe these tiny, flexible electronic sheets could one day be used to line the brain to monitor activity in patients at risk of epilepsy or be integrated into surgical gloves to monitor a patients vital signs during surgery.

Applications in Properties of Textile Material: The properties imparted to textiles using nanotechnology include water repellence, soil resistance, wrinkle resistance, anti-bacteria, anti-static and UV-protection, flame retardation, improvement of dye ability, Self-cleaning fabrics and so on. Among them important applications are described shortly.



Water Repellence: Nano-Tex improves the water-repellent property of fabric by creating nano-whiskers, which are hydrocarbons and 1/1000 of the size of a typical cotton fiber, that are added to the fabric to create a peach fuzz effect without lowering the strength of cotton. The spaces between the whiskers on the fabric are smaller than the typical drop of water, but still larger than water molecules; water thus remains on the top of the whiskers and above the surface of the fabric(14). However, liquid can still pass through the fabric, if pressure is applied. The performance is permanent while maintaining breath ability.

UV Protective Finish

The most important functions performed by the garment are to protect the wearer from the weather. However it is also to protect the wearer from harmful rays of the sun. The rays in the wavelength region of 150 to 400 nm are known as ultraviolet radiations. The UV-blocking property of a fabric is enhanced when a dye, pigment, delustrant, or ultraviolet absorber finish is present that absorbs ultraviolet radiation and blocks its transmission through a fabric to the skin. Metal oxides like ZnO as UV-blocker are more stable when compared to organic UV-blocking agents. Hence, nanoZnO will really enhance the UV-blocking property due to their increase surface area and intense absorption in the UV region. For antibacterial finishing, ZnOnano particles scores over nano-silver in cost-effectiveness, whiteness, and UV-blocking property. Fabric treated with UV absorbers ensures that the clothes deflect the Harmful ultraviolet rays of the sun, reducing a persons UVR exposure and

protecting the skin from potential damage. The extent of skin protection required by different types of human skin depends on UV radiation intensity & distribution in reference to geographical location, time of day, and season. This protection is expressed as SPF (Sun Protection Factor), higher the SPF Value better is the protection against UV radiation.

Self-Cleaning Fabrics

A self-cleaning cotton fabric known as nano-care was developed and is marketed by an American Company, Nanotex and stain-resistant jeans and khakis are available since 1990. Nanocare fabrics are created by modifying the cylindrical structure of the cotton fibres making up the fabric. At the nano scale, cotton fibres look like tree trunks. Using nano techniques, these tree trunks are covered in a fuzz of minute whiskers which creates a cushion of air around the fiber(15). When water hits the fabric, it beads on the points of the whiskers, the beads compress the air in the cavities between the whiskers creating extra buoyancy. In technical terms, the fabric has been rendered super-non wett able or super-hydrophobic. The whiskers also create fewer points of contact for dirt. When water is applied to soiled fabric, the dirt adheres to the water far better than it adheres to the textile surface and is carried off with the water as it beads up and rolls off the surface of the fabric. Thus the concept of Soil-cleaning is based on the leaves of the lotus plant.

Nano Technology for Wrinkle Free Treatment

Nano-Tex has launched a new nanotechnology-based wrinkle-free treatment that is said to offer an improved performance while preserving fabric strength and integrity providing an alternative to harsh traditional processes. Chemicals and processing methods reduce a fabrics tear and tensile strength. This means there are certain fabrics and garments that are Wrinkle-free textiles are popular and convenient for time-pressed consumers, but traditional not candidates for wrinkle-free technology, such as lightweight fabrics or slim fitting garments. Sometimes fabrics also need to be over-engineered or beefed up in order to withstand the fiber degradation caused by traditional wrinkle-free solutions. The nano-scale molecular structure in Nano-Texs new Fortify DP technology penetrates more deeply in the fiber to improve wrinkle-free performance. Additionally, it uses a longer and more flexible cross-linking chain which reduces fiber stress under tension, thus reducing the significant strength loss associated with traditional wrinkle-free chemistry

Conclusion

There are many challenges facing the use of these new innovative materials. The use of innovative new materials and integration of PCM into garments requires, for example, the development of new types of testing methods and standards. Furthermore, the development of materials, such as their mechanical properties, durability or functionality in various conditions, may take a longtime. The main challenge in developing textile-PCM structures is the method of their application. Encapsulation of PCMs in a polymeric shell is an obvious choice but it adds dead weight to the active material. The unique properties of non materials have attracted not only scientists and research workers but also businesses, because of their huge

economic potential. Using less resource without sacrificing performance, nanotechnology may save raw materials and also upgrade quality of life.

References

1. Mulligan, J. C.; Colvin, D. P.; Bryant, Y. G. J Space Rockets 1996,33, 278.
2. Colvin, D. P.; Mulligan, J. C. U.S. Pat. 4,911,232 (1990).
3. Bryant, Y. Q.; Colvin, D. P. Techtextil-Symposium 1992, 3, 1.
4. Pause, B. H. J Ind Fabrics 2003, 33, 93.
5. Colvin, D. P.; Bryant, Y. G. HTD (Am SocMechEng) 1998, 362,123.
6. Colvin, D. P.; Hayes, L. J.; Bryant, Y. G.; Myers, D. R. HeatTransfer Division (Am Soc MechEng) 1993, 268, 73.
7. Pause, B. J Coat Fabrics 1995, 25, 59.
8. Hittle, D. C.; Andre, T. L. ASHARE Trans: Res 2002, 107, 175.
9. P.O. Fanger, Thermal environment human requirements, Environmentalist6 (4) (1986) 275– 278.
10. P.O. Fanger, Human requirements in future10. J. Rupp, Interactive textiles regulate body temperature, InternationalTextile Bulletin 45 (1) (1999) 58–59.
11. B. Pause, Development of heat and cold insulating membranestructures with phase change material, Journal of Coated Fabrics25 (1995) 59–68.
12. M.M. Farid, A.M. Khudhair, S.A.K. Razack, S. Al-Hallaj, A reviewon phase change energy materials and applications, EnergyConversion and Management 45 (9–10) (2004) 1597–1615.
13. E. Jahns, J. Burger, A step forward in personal comfort: PCMnonwovens, Nonwovens World 14 (1) (2005) 51–54.
14. N. Sarier, E. Onder, The manufacture of microencapsulated phasechange materials suitable for the design of thermally enhancedfabrics, ThermochimicaActa 452 (2) (2007) 149–160.
15. P. Lamberg, Approximate analytical model for two-phase solidification problem in a finned phase-change material storage, AppliedEnergy 77 (2) (2004) 131–152.

YARN BREAKAGE DETECTOR (TEXTRONICS)

Mrs. M. Muthu Rubini
Department of Electronics, Seethalakshmi Ramaswami College, (Autonomous) (Affiliated to Bharathidasan University) Trichy

A.B. Bhargavi
II B.Sc. Electronics, Department of Electronics, Seethalakshmi Ramaswami College, (Autonomous) (Affiliated to Bharathidasan University) Trichy

Abstract

This system is entitled as "Yarn Breakage detector" plays an important role in textile industry. If this system, is implemented in real time manual error can be avoided and power wastage will be reduced. Electronic sensors circuits one of the important part of this study. If the Yarn will break in the roll during manufacturing it will automatically indicate the breakage at the same time , the speed of the spinning roll can be measured and stop the roll when the yarn will be break. The U-slot sensor and IR sensors are used for sensing purpose. When the breakage will be detected automatically the spinning machine was stopped through SMS and Zigbee technology the control room can automatically get the intimation. The main advantage of this study is the speed can be measured. U-slot sensor used to sense the speed and the IR sensor used to sense the yarn condition. ARM 9 processor plays a major role.

Objectives of this Study

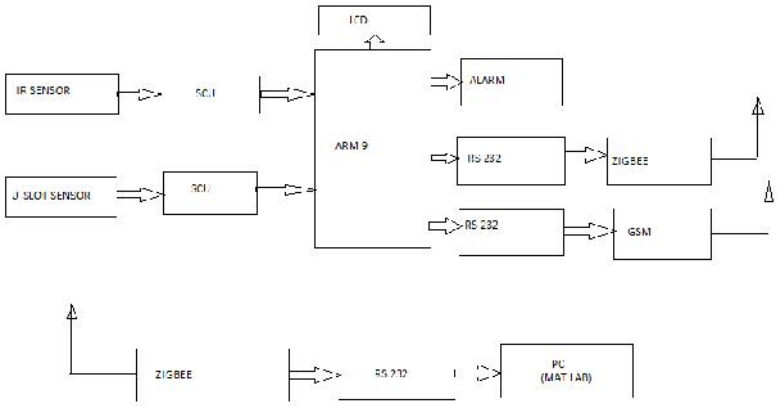
- To improve the quality of yarn and avoid manual error
- Save Electricity
- To expose remote machines.

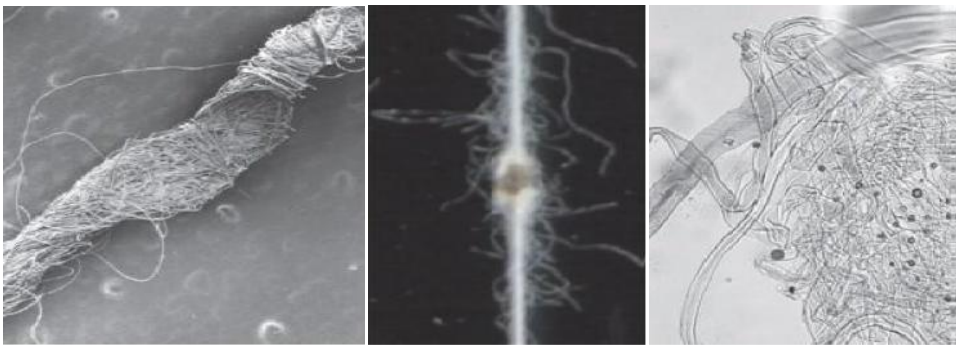
Keywords: *IR Sensor, U-Slot sensor, ARM 9, Zigbee, GSM , Mat Lab.s*

Introduction

Technical innovations are promote the textile industry evolving towards intelligent direction, including production capacity, production efficiency and products quality optimization. Textile intelligent trend has been unstoppable. Overall, import advantages in performance and quality dominate the emerging markets. But as the progress of technology, imported products without the price advantage in the market will lose its original technical support, and be squeezed. Product innovation keeps proceeding. Spinning process is inseparable from yarn break sensors, which plays an essential role in textile industries for saving raw materials, quality control. Selection of good yarn takes many factors into consideration, including the performance, quality and costs, which need the assistance View of yarn during spinning of automatic sensor facility and acknowledge of market. For choosing optical yarn break sensors applies in various textile machines like winders, twisting machines and texturing machines. Sensors are varied in technical parameters.

Block Diagram





View of damaged cotton

Working of the System

Yarn breakage detector used to check the condition of yarn. Initially the yarn will be rolled in the bundle automatically, in that stage the IR sensor (Ir transmitter and IR receiver) is in non sensing condition so there is no damage in the yarn. At the same time the speed of the roll can be measured using U-Slot sensor in terms of RPM(Revolutions Per Minute).If the yarn will be cut IR sensor goes to sensing condition and the processor get the signal through signal conditioning unit .So the processor will stop the motor which is attached to the spinning roll in this condition the speed goes to 0 rpm (i.e) the machine will be stopped and the power wastage can be avoided. The alarm will indicate the work will be stopped. Through Zigbee all these details can be monitored in the control room. The GSM modem can send the information to the authorized person through SMS.

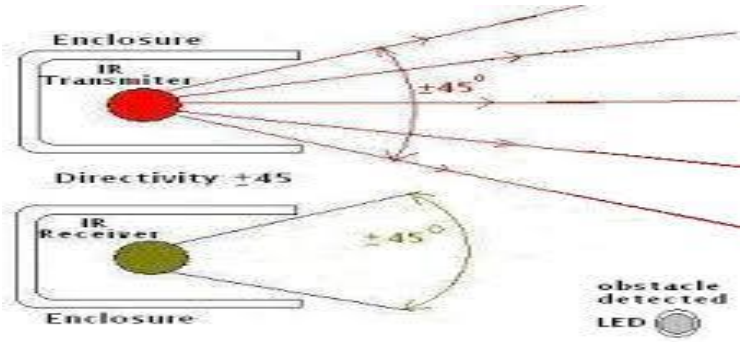
Yarn rolling in industry

In control room Through PC we can monitor the speed of the roll and the status of the yarn. Mat lab software is used to view the output.

IR Sensor

IR Sensors work by using a specific light sensor to detect a select light wavelength in the Infra-Red (IR) spectrum. By using an LED which produces light at the same wavelength as what the sensor is looking for, you can look at the intensity of the received light. When an object is close to the sensor, the light from the LED bounces off the object and into the light sensor.In this system IR sensors ate used to detect the yarn. If the sensor is in non sensing status there is no damage in yarn. If the Receiver directly receives the signal from the transmitter means the yarn gets damage.

Operation of IR sensor



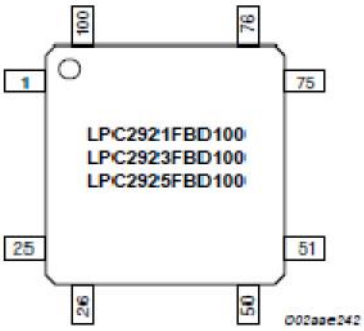
U-slot Sensor

Slot and slot grid sensors work according to the familiar principle of thru-beam sensors and are often used for detecting objects of all kinds on vibrating and oscillating conveyors. The special U-shaped design means the transmitter and receiver can be accommodated in one housing, which achieves high resistance to vibrations. There is no time-intensive adjustment of the transmitter and receiver lenses and only one device to be wired. Slot sensors are especially suited to detecting small parts over short distances. Small piece of slot is placed in the spinning roll. During every rotation of the spinning roll the slot will cut the U-slot sensor signal so the SCU with measure the speed with the help of ARM 9.

ARM 9:

The LPC2921/2923/2925 combine an ARM968E-S CPU core with two integrated TCM blocks operating at frequencies of up to 125 MHz, Full-speed USB 2.0 device controller, CAN and LIN, up to 40 kB SRAM, up to 512 kB flash memory, two 10-bit ADCs, and multiple serial and parallel interfaces in a single chip targeted at consumer, industrial, and communication markets. To optimize system power consumption, the LPC2921/2923/2925 has a very flexible Clock Generation Unit (CGU) that provides dynamic clock gating and scaling. The ARM968E-S is a general purpose 32-bit RISC processor, which offers high performance and very low power consumption. The ARM architecture is based on Reduced Instruction Set Computer (RISC) principles, and the instruction set and related decode mechanism are much simpler than those of

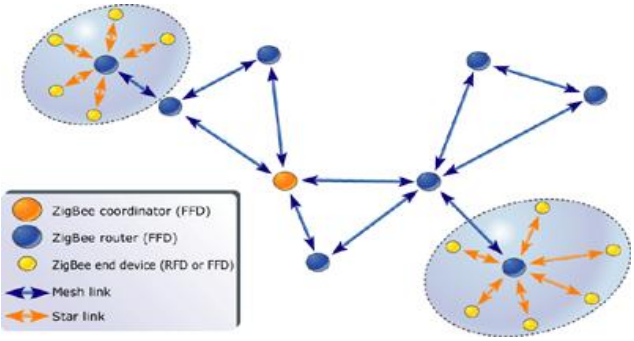
View of ARM-9 micro programmed Complex InstructionSet Computers (CISC). This simplicity results in a high instruction throughput and impressive real-time interrupt response from a small and cost-effective controller core. In this system it collects the information from the sensors and send the details to control room through zigbee with the help of RS232.



Zigbee

Technological Standard Created for Control and Sensor Networks. Based on the IEEE 802.15.4 Standard .Created by the ZigBee Alliance Operates in Unlicensed Bands. ISM 2.4 GHz Global Band at 250kbps 868 MHz European Band at 20kbps.915 MHz North American Band at 40kbps. Designed for wireless controls and sensors. Operates in Personal Area Networks (PAN's) and device-to-device networks Connectivity between small packet devices Control of lights, switches, thermostats, appliances, etc.The IEEE 802.15.4 standard was completed in May 2003.

Zigbee network configuration



The ZigBee specifications were ratified on 14 December 2004. The ZigBee Alliance announced public availability of Specification 1.0 on 13 June 2005. Much research is still going on with ZigBee. Named for erratic, zig-zagging patterns of bees between flowers Symbolizes communication between nodes in a mesh network Network components analogous to queen bee, drones, worker bees. It transfers the information from the machine to control unit.

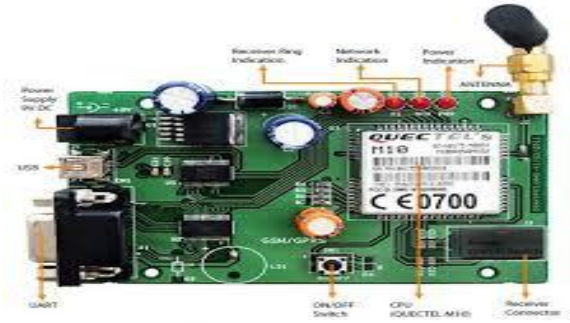
RS232: In addition to communications between computer equipment over telephone lines, RS232 is now widely used for direct connections between data acquisition devices and computer systems. As in the definition of RS232, the computer is data transmission equipment (DTE). However, many interface products are not data communications equipment (DCE). Null modem cables are designed for this situation; rather than having the pin- topin connections of modem cables, null modem cables have different internal wiring to allow DTE devices to communicate with one another.It acts as serial converter between zigbee and ARM 9.

Alarm: A piezoelectric element may be driven by an oscillating electronic circuit or other audio signal source, driven with a piezoelectric audio amplifier. Sounds commonly used to indicate that a button has been pressed are a click, a ring or a

beep. If the damage will be detected in the yarn the ARM 9 processor will automatically invoke the system to alert the workers

GSM Modem

A **GSM modem** is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. From the mobile operator perspective, a GSM modem looks just like a mobile phone. When a GSM modem is connected to a computer, this allows the computer to use the GSM modem to communicate over the mobile network. While these GSM modems are most frequently used to provide mobile internet connectivity, many of them can also be used for sending and receiving SMS and MMS messages. It automatically send the SMS to the unauthorized person during abnormal situation.



View of GSM modem

Mat Lab

MATLAB (matrix laboratory) is a multi-paradigm computing environment and fourth generation programming language. A proprietary programming language developed by Math Works, MATLAB allows matrix manipulations, plotting of functions and data, implementation of algorithms, creation of user interfaces, and interfacing with programs written in other languages, including C, C++, C#, Java, Fortran and Python. Although MATLAB is intended primarily for numerical computing, an optional toolbox uses the MuPAD symbolic engine, allowing access to symbolic computing abilities. An additional package, Simulink, adds graphical multi-domain simulation and model-based design for dynamic and embedded systems. This software is loaded in the control room we can view the motor speed and yarn status from our sitting place.

Conclusion

Implementation of this system in textile industries we can avoid the manual error. The output of this study is given to the control room through zigbee. Within a place we can monitor the operation of the machine. The sensors are simplify the human work and improve the speed of the process. ARM 9 is a one of the latest processor faster than other type. These are helps to improve our production.

References

1. O. Al-Araidah, A. Momani, M. Khasawneh, and M. Momani, —Lead-Time Reduction Utilizing Lean Tools Applied to Healthcare:
2. M. Ali, —Six-sigma Design through Process Optimization using Robust Design Method,‖ Master Thesis at Concordia University, Montreal, Canada, 2004.
3. S. Bisgaard, and R. Does, —Quality Quandaries: Health Care Quality – Reducing the Length of Stay at a Hospital, Quality Engineering‖, 2009, 21, pp. 117-131.
4. Y. H. Cheng, —The Improvement of Assembly Efficiency of Military Product by Six Sigma,‖ NCUT Thesis Archive, Taiwan, 2005.

AESTHETIC TEXTILE DESIGNS

Dr.S.Mythili
Associate Professor in Music,
Seethalakshmi Ramaswami College, Trichy

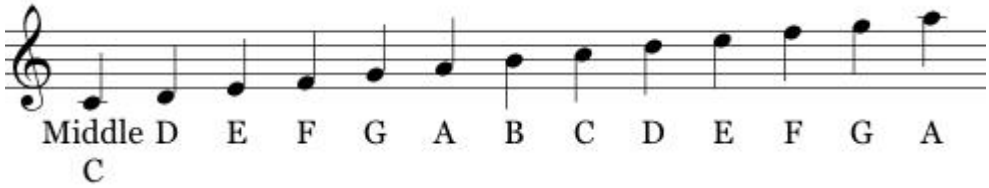
Fine Arts

In European academic traditions, fine art is art developed primarily for aesthetics or beauty, distinguishing it from applied art that also has to serve some practical function, such as pottery or most metalwork. Historically, the five main fine arts were painting, sculpture, architecture, music and poetry, with performing arts including theatre and dance. Today, the fine arts commonly include additional forms, such as film, photography, video production/ editing, design, sequential art, conceptual art, and printmaking. However, in some institutes of learning or in museums, *fine art* and frequently the term *fine arts* as well, are associated exclusively with visual art forms. One definition of *fine art* is "a visual art considered to have been created primarily for aesthetic and intellectual purposes and judged for its beauty and meaningfulness, specifically, painting, sculpture, drawing, watercolor, graphics, and architecture". In that sense, there are conceptual differences between the *fine arts* and the *applied arts*. As originally conceived, and as understood for much of the modern era, the perception of aesthetic qualities required a refined judgment usually referred to as having good taste, which differentiated fine art from popular art and entertainment.

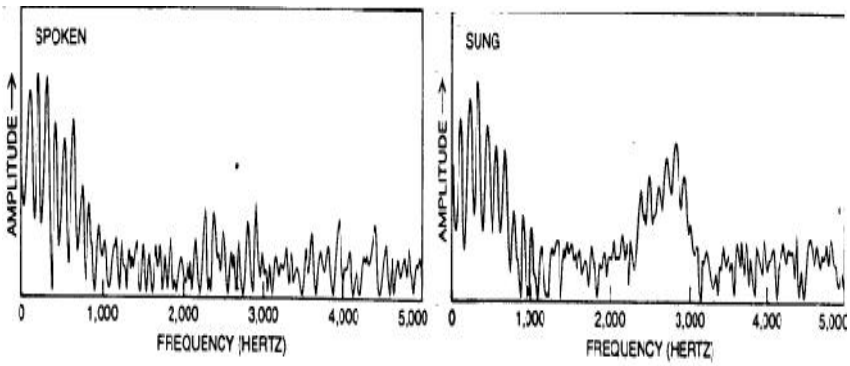
Textiles

Yarn, fabrics, and tools for spinning and weaving have been found among the earliest relics of human habitations. Linen fabrics dating from 5000 B.C. have been discovered in Egypt. Woolen textiles from the early Bronze Age in Scandinavia and Switzerland have also been found. Cotton has been spun and woven in India since 3000 B.C., and silk has been woven in China since at least 1000 B.C. About the 4th cent. A.D., Constantinople began to weave the raw silk imported from China. A century later silk culture spread to the Western countries, and textile making developed rapidly. By the 14th cent. splendid fabrics were being woven on the hand looms of the Mediterranean countries in practically all the basic structures known to modern artisans, and there has been no change in fundamental processes since that time, although methods and equipment have been radically altered. Textiles are classified according to their component fibers into silk, wool, linen, cotton, such synthetic fibers as rayon, nylon, and polyesters, and some inorganic fibers, such as cloth of gold, glass fiber, and asbestos cloth. They are also classified as to their structure or weave, according to the manner in which warp and weft cross each other in the loom . Value or quality in textiles depends on several factors, such as the quality of the raw material used and the character of the yarn spun from the fibers, whether clean, smooth, fine, or coarse and whether hard, soft, or medium twisted. Density of weave and finishing processes are also important elements in determining

the quality of fabrics. Textile art is the process of creating something using fibers gained from sources like plants, animals, insects (think silk worms!), or synthetic materials. Fashion design is the art of application of design and aesthetics or natural beauty to clothing and accessories. Fashion design is influenced by cultural and social attitudes, and has varied over time and place. Designs are done either with painting, or Printing or embroidery and so on. For that, attractive designs can be arrived at from the realm of Music. Let us discuss about the relationship between music and textiles which give abundant scope for creativity. Notation means Musicography i.e writing a song with svara and sahitya, The purpose is to remember the song for so many years. There are two methods of writing notation. One is solfa notation. Other one is Staff notation. Solfa notation is used in our system of Music which is written in a straight line. While writing notation various signs and symbols are used. Staff notation is written in five parallel lines and the notes (svaras) are written between the lines



The notes are represented in the form of symbols. These symbols are very artistic and used as designs in textiles. Likewise while speaking or singing ,the frequency of voice differ from one person to another. When they are monitored different types of wavy lines are shown .That gave an idea for an artistic designs for textiles.

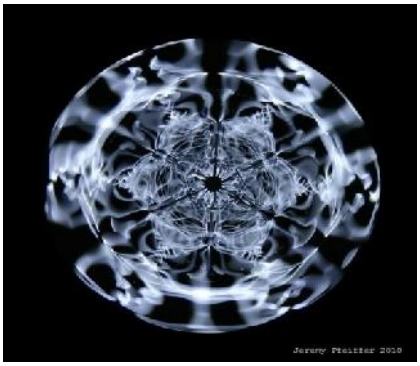


Role of Sound Waves in Textile Design

Why do sound-waves make cymatic patterns? Musical instruments are numerous in all types of music systems such as South Indian classical, Folk, North Indian Hindustani, Western ect., The instruments are classified into stringed, Wind and Percussion each having different frequencies..If the sound waves are monitored different shapes of wavy lines can be seen. For example, the frequency of stringed instrument and percussion instrument in fusion will give a new design which in turn developed the creativity for the textile designer.

Sound Waves

It's not the sound waves as such it is the way disks like cymbals vibrate in response the either a tap with a stick or high levels of sound, or by being attached to a mechanical vibrator. Flat panels of any shape have many resonance frequencies and if you stimulate only one of these you will see a simple pattern, stimulate more



than one and very complex patterns soon appear as the harmonics interact with each other.

Rhythmic Sound: Generally in afactories the machines will produce different kinds of sounds. When speaking about Textiles spinning and weaving are primary jobs done with machines the machines will produce a particular rhythm which the workers are accustomed to it. In some textile industries the rhythmic sound produced while the machines are operated without any defect is displayed in the monitor. If there is a problem with the machine the rhythmic sound will get disturbed and it will indicate the operators and thus the rhythmic sound is helpful in rectifying the problem.

Jalatharangam is an Indian melodic percussion instrument. It consists of a set of ceramic or metal Today only china bowls are preferred by artistes, numbering around sixteen in normal use. Cups for Mandra sthayi (notes of lower octave)are large while those for Tara sthayi (notes of higher octaves) are smaller in size. Water is poured into the cups and the pitch is changed by adjusting the volume of water in the cup. The number of cups depends on the melody being played. The bowls mostly are arranged in a half-circle in front of the player who can reach them all easily. The player softly hits the cups with a wooden stick on the border to get the sound. It's not easy to tune the instrument and needs some skill .The bowls are tuned with water. The bowls are played by striking the edge with beaters, one in each hand.While playing water in the cups vibrates. Experiment: In that water before starting to play add different colour dyes in drops. If you start playing now because of the vibration the colours will create new designs. It will produce different shapes anp shades which in turn will feed innovative ideas in colour shading designs for fabrics. Dance is lively art which gives feast to eyes and ears. Body movement is done with different gestures and poses .These are incorporated in the fabric designs. Images of musical instruments like Veena, Tabla, Flute, Mridangam, Violn, Guitar, are also used for fabric designs.

Colours and Music: Blue everywhere! Few colours fill our consciousness so, from the limitless sky to the rushing mud-blue of rivers and the ever changing tints of the ocean. Universally, blue evokes a sense of serenity and constancy. In more modern times, a colour that acquired celebrity status is 'MS Blue', named after the immensely talented and beloved Carnatic singer, M. S. Subbulakshmi. Renowned Carnatic singer MS Subbulakshmi, was known not just for her songs but also for her gorgeous Kanjeervaram sarees. Yarn, fabrics, and spinning and weaving are the important elements of textile industries. For that the texture of the material is more important. The most important aspect s is its colour and design which will enhance the beauty of the garment. Though there are so many designs and colours, the images of musical notes, musical Instruments, their frequencies, Dance poses, Mudras are very attractive and provide innovative ideas in creating artistic designs and thus the Music field is contributing for Textile Industries.

DRESS CULTURE OF CHOLA DANCERS

Dr. M. Nalini
Head of the Department of History,
Seethalakshmi Ramaswami College, Thiruchirappalli

It is imperative for any stage artist to make himself or herself presentable and attractive during the performance. Making oneself striking depends not only on the physical features of the individual but also on the suitable attire, jewellery and the makeup he or she uses during the act. It is understood from the ancient Tamil literature of the Sangam period that the stage artists of Tamilnadu were highly skilled in beautifying themselves as per the needs and the situations demanded. This trend continued with much improvisation in the art of makeup and the developments met with textile industry and jewel making in the early medieval period. Hundreds of inscriptions engraved in the temple walls of Tamilnadu and the sculptures that form part and parcel of the architectural marvels throw light on the exquisite ornaments and the variety of dress patterns used by the dancers of the Pallava and Chola period (C. E. 550 - 1250).

Study of Classical and Folk Forms: A detailed study of the dance sculptures and the paintings of Chola period made by Dr. R. Kalaikkovan, Director, Dr. M. Rajamanikkanar Centre for historical research and myself has revealed interesting data on the dress pattern followed by the dancers of both classical and folklore types of performance. In both forms the chest is not covered with any dress in the males as well as females. In females very rarely a breast-band or a loose cloth is noted that too only in the classical dance figures. Differences are noticed in the type of garments used as apparel from hip to ankle. In general classical artists are adorned with silk attire where as folklore performers used mostly cotton dress. The difference between the two is well represented in the sculptures by showing elaborate wavy lines through out in the silk dress. In case of cotton only the lower rim of the apparel is shown as a raised ridge. The thin and soft texture of the material is also expressed in early medieval sculptures by making them diaphanous so that one can enjoy the physical beauty of the artist as such.

Fleeted Skirts: Cotton and silk were used to prepare loose fleeted skirts which formed the usual attire of the lady dancers. These skirts in some cases split in to two and wound round the legs to make it more attractive and also to enhance the beauty of the physical form. A cloth belt stitched with pearls and gems worn around the hip added colourful grace to the artist and also helped to place the under garment in situ even during the vibrating sequences that occur in a performance. Covering the entire leg from the hip with suitable attire is met with both court and temple dancers.

Hip Belts: The different types of hip belts seen in the dance sculptures show the tactful taste exercised by the dancers in attracting their audience. This trend of wearing a belt to fix the under garment in place was in practice as early as the Sangam days. Early literature refers to it as 'araikkaccu' and names the clip as 'yappu'. Even a simple belt looks much ornamental in the sculptures and adds an extra credit to the under garment. Belts with central folds are fixed with suitable

clips. Some belts are studded with priceless gems and pearls. Some are embossed with animal heads or mythical figures on their clips. In some are noted series of silver or gold chains forming continuous arches along the lower edge of the belt. These belts seen in most of the representations of classical dancers are infrequently met in folk forms.

Idaikkattu: Idaikkattu, a long loose fleeted silk cloth worn around the hip over the skirt and the hip belt is to highlight the lower abdomen area more prominent. This added attire is tide with elaborate knots on both sides of the hip forming an attractive central arch with loose tassels to flow freely on the sides. Though it appears very simple in description, the study of sculptures show countless patterns followed in forming the arch and tying the knots. The free flow of tassels also differs in length and the number of folds shown in them also varies depending upon the social stature of the artists. Idaikkattu lavishly represented in sculptures depicting classical dancers is occasionally seen in folklore expressions.

Dress of Folklore Dancers: Most of the folklore artists are presented with simple dress. Males either used a loin cloth or a short dress that barely covered their thighs and tucked in the back. Female artists though shown with a short dress similar to their men counterparts are provided with a central fold that sprawls over their thighs. Men who performed pot dance (kudakkuttu) used along with the short dress, a triangular fold of cloth that was tied around their hip and hung in front. Dancers who performed tribal items used apparel made out of animal skin. The cuts and designs made in them and the way they were worn to exhibit the physical beauty simply enthralled the onlooker.

Dress Pattern in Paintings: Chola paintings of Rajarajisvaram built by Rajaraja the great at Thanjavur, reveal the designs and the colours preferred by the artists. Orange, yellow, green, blue, red and brown were the chosen colours of their attire. The fleeted skirts of some dancers have polka dots with borders made out of golden zari. In some other cases lines and checked patterns are also noted. The richness of their dress is obvious by the presence of embedded pearls and the golden chains and pendants stitched in them.

Dress in Epigraphs: Epigraphical records speak more on jewellery and provide very little information on dress. A brahmi record from Alagarmalai highlights a merchant of clothes as a donor and mentions him as aruvai vanikan. Presence of garment makers at Kanchipuram who stitched the royal clothes is found mentioned in the museum copper plates of Uttamachola. Thari irai, a form of tax levied on garment makers was collected in terms of cloth made per loom or in cash. Pudavai was the common term used to denote the modern word dress. Records mentioning various merchandise commodities use this word. Parichattam was the word used to identify the sacred clothes used to dress the deities in the temples.

Pot dancer

Dance troupe with knots and tassels

Dancer with Silk Dress

Siva with Idaikkattu

APPLICATION OF ARECA HUSK IN TEXTILES

Ms.N.Nithya
Assistant Professor, Department of Textiles and Clothing, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore

Dr.G.Bagyalakshmi
Assistant Professor(SS), Department of Textiles and Clothing, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore

Introduction

Nature in its abundance, offers us numerous fibrous materials, which grow in multiple geographical altitudes. Various parts of these lingnocellulosic plants such as the woody core, bast, leaf, cane, straw, grass and seed are sources o valuable lingnicellulosic fibres suitable for use not only in textiles, but also in building materials, human and animal food, agro fine chemicals, and environment friendly cosmetics and as sources of biopolymers and energy. Natural fibres have played an important role in human society since approximately 7000BC. They are completely biodegradable and their production does not generally damage the ecosystem. They can grow in different climates and recycle carbondioxide. India being a tropical country with abundant of renewable recourses obtained from plant and the second largest producer of fiber in the world, and is endowed with an abundant supply of natural fibres such as coir, jute, sisal, pineapple, ramie, bamboo and banana, which has focused more on the research and development. Fibers are fundamental units in fabrication of textile yarns and fabrics and the modern word calls it as eco-friendly fiber (Kandaswamy and Kumar, 2005). In recent year environmental awareness, new rules and legislations are forcing industries to seek new materials which are more environmentally friendly. Plant fibers from agricultural crops are renewable materials which have potential for creating green products and replacing synthetic materials (Srinivasa and Bharath, 2011). The utilization of organic wastes such as residues from the agricultural, forestry and Agro/alimentary industries as raw materials to produce value-added products has created a space for the researchers to develop newer products. The use of such wastes besides providing alternative substrates helps to solve environmental problems. Needle-punched nonwoven is an industrial fabric used in wide range of applications areas and extend into many niche product areas including, for example, medical wound dressings, composite leather felts, capillary mattings for horticulture, fire barriers, ballistic impact resistant fabrics and the advance application is geo synthetics, filter media, wadding and paddings, floor covering, automotive fabrics, insulation, blankets, wipes and roofing (Russell, 2007). Areca nut is an important cash crop in the Western Ghats, Eastern Ghats, East and North Eastern regions of India. Areca plant family is a tall-stemmed erect palm, reaching varied heights, depending upon the environmental conditions.

The arecanut separator helps to detach and segregate individual arecanuts from the bunch without damaging the nut and work faster. After areca nut was removed the husk is used as burner or left as waste. The study on **"Application of Areca Husk in Textiles"** has been under taken with the specific objectives as given below:

- To collect and process areca nut husk and viscose fiber
- To prepare needle punched fabric with the blend of areca nut husk and viscose fiber
- To test the performance of needle punched nonwoven fabric and find the suitable technical textile application.

Methodology

Collection and Extraction of Areca Husk Fiber

In Tamil Nadu and Kerala, it is found that areca nut shells are going waste and they either become a breeding ground for mosquitoes or ended up being burnt as firewood. As abundantly available, areca husk has been left rotting with no use. Considering this fact, the investigator decided to use the areca husk for the study. The areca nut shell was collected from various places like Thondamuthur, Pollachi and Kerala. There were different varieties available according to the place of cultivation and climate, so one variety was selected for the study. Retting process involves the removal and breaking down of the 'gummy' substances, particularly pectins, which bind the fibres together in bundles and to the plant core, (Ryszard, 2012). Water retting often produces the best separation in a short period of time. During retting bacteria break down the soft tissues around the fibre and separate fibres. Warm water retting (30°-35°C) is considered more efficient and normally requires 8-14 days, depending on temperature and softness of water, to complete the process, warm water requires 3-4 days, (Menachem Lewin, 2007). From the two methods of extraction followed for the study namely stagnant cold and hot water retting, the cold water retting process was opted, even though it took more time for fiber extraction, consumed maximum quantity of water. The fiber quantity was appreciable when compared with hot water retting. The extracted quantity of fiber is 2.75 kg from 5 kg of areca husk. The visual evaluation reveal that the fibers extracted through stagnant cold water retting was good in appearance; luster, bright in colour and texture. The length of the areca husk fibers was found to be 4-6cms.

Conversion of Fibers into Fabric

Selection of fiber for blending

Viscose fibre is cent percent biodegradable, produced from natural renewable pulp and its properties are similar to those of natural fibers like silk and cotton but can be modified to meet specific requirements (Roggenstein, 2011). As the areca nut husk was short fiber and does not have crimp, it is essential to blend with another fiber to form fabric. Blending is to assemble and combine together predetermined proportions of different fiber components so that the fiber exhibits a high level of uniformity, Grabbing fibers and mixing them until the blend looks right (Johnson, 2014). Therefore, areca husk fiber and viscose is blended in different thickness with the proportion of 60:40 ratios.

Fabric Formation

The fabric was formed by a process called needle punching where the mechanical interlocking is achieved with thousands of barbed felting needles repeatedly passing into and out of the web. Needlebonded fabrics are manufactured by a mechanical method, (Tracton, 2006), Needlepunched nonwovens are created by mechanically orienting and interlocking the fibers of a spunbonded or carded web. (Patel, 2010) The aim of needle punching is to compress and bind the fibers together. The web is passed over a feed table, throw the drawing in rollers and via feed rollers the web is fed to needling area. Here, the web is repeatedly punctured or perforated by a battery of needles and reoriented. This operation is carried out several times 1000 stokes per minute. In modern machines it is carried out around 2000 strokes per minute. Based on the principle of needle punching, lap was fed into the machine for the formation of needle punched fabric.

Evaluation of the needle Punched Fabric

The elongation of the needle punched fabrics of two different thickness show that the sample B has good elongation along machine direction (2.70 inches) and cross machine direction(2.92) when compared with sample A in machine direction and cross direction. The fabric weight of sample B (5.10) is higher than the sample A (3.53). The fabric thickness of sample B was higher (4.77mm) than sample A (2.47mm). The fabric strength of sample B is more than sample A along machine and cross machine direction. The fabric stiffness of the samples A is 4.48 cms and B has higher stiffness of 5.10 cms compared with sample A. On comparing the sample A and B in abrasion resistant test, it was found that sample B has high abrasion resistance, as it could withstand upto 300 revolutions. Thus it can be used as interlining for packaging process. The bursting strength process was compared for both the samples and found that sample B can with stand the pressure, as it has better thickness than Sample A.

Absorbency and Wetability of Needle Punched Fabric

Table I Absorbency and Wetability of Needle Punched Fabric

S. No	Needle Punched Fabric	Mean Drop Time (Seconds)	Mean Sinking Time (Seconds)	Mean Capillary Rise (Seconds)
1.	A	1.38	19.50	3.44
2.	B	2.66	18.18	4.68

Table I denotes the absorbency and wetability properties of the needle punched fabric. In water absorbency, the drop test was compared with sample A and B. The sample A took lesser time to absorb the water when compared with sample B. The sample B took lesser time to sink into the water when compared with sample A. In water absorbency, the capillary test was compared with sample A and B. The sample A absorbed water faster than sample B. Since the sample A has got good capillary rise, it could be prepared as a capillary mat used as a base for irrigation.

The sample A needle punched fabric has 98.4 % air permeable nature and the sample B needle punched fabric has 50.7% air permeability. In general, the air permeability decreases with the increase in fabric weight, while with the increase in fabric weight, the fabric becomes thicker as well as denser, resulting in consolidated

fabric structure, though the amount of pores increases with the increase in number of fibers, the pore size become smaller. This result reported that the air permeability is decreased with the increase in fabric weight of sample B when compared with sample A. This was an investigative study proposed for utilizing waste fiber for developing inexpensive disposable filtration media for air filtration. Thus the sample A has higher air permeability and pore diameter micron, so it can be used as filters according to the pore size microns, such as typical atmospheric dust (0.001 to 30 microns), mold spores (10 to 30 microns), oil smoke (0.03 to 1 micron) and tobacco smoke (0.01 to 1 micron) process in automobile industry. (Table II)

Uses of Needle Punched Fabric

Mulches can be made up of variety of different organic or inorganic substances, including plant material, paper, manure, plastic sheeting or rock, (Stephen 2001). Mulch is an effective and protective covering which when placed around plants can prevent the evaporation of moisture, the freezing of roots and the growth of weeds, (camden.nsw.gov.au/files/environment/mulchlr). As the mulch material decomposes, it increases the content of organic matter in the soil and it helps to create good soil with stable crumb structure, (2003). The sample A showed good air permeability, hence it was selected for the preparation of mulch mat. Soil was prepared by 1/1 feet land. The prepared mulch sheet was layered over it. 15 holes with the distance of one and half inches were made. Coriander seeds were placed in each of the holes. Similarly coriander seeds were placed in 15 holes without the mulch sheet. The growth of the plant was absorbed.

Conclusion

India being a tropical country with abundant of renewable recourses obtained from plant and the second largest producer of fiber in the world. It can be concluded that, the biomaterial based product areca husk fibre which could be utilized for needle punched fabric was selected for the study. Areca husk fibre is blending well with viscose fibre resulted in a usable non woven fabric. The areca husk and viscose fibre blended fabric possess appreciable physical properties besides having an excellent wettability and absorbency property. The fabric can be utilized as mulch mat. Utilization of non conventional fibre for technical textile applications proved to be worth experimenting.

References

1. Ajay Kr.Gupta for NIIR Board of Consultants & Engineers., (), Natural Fibres Handbook with Cultivation & Uses, published by National Institute of Industrial Research, Delhi. Pp:1
2. *Srinivasa Chikkol Venkateshappa, Basavaraju Bennehalli, Mownesh Gadde Kenchappa, Raghu Patel Gowda Ranganagowda, (2012)*Flexural Behaviour of Areca fibers Composites, Bio Resources Vol 5, No 3
3. Gert Venter. D. Eng. (2010), Successful Hydroponics: 21st Century technology for Commercial and Home Applications, USA. Pp.197, 198.
4. Technical Textiles & Nonwoven Association (TTNA) May, 2009.P. 2.
5. Subhash K. Batra and Behnam Pourdeyhimi, (2012). Introduction to Nonwoven Technology. DeStech Publications, Inc. Pennsylvania. P. 7,8.
6. Russell S.J. (2007) Handbook of Nonwovens, Wood Head Publishing New Delhi.
7. Ryszard M.Koztowski., (2012), Handbook of Natural fibres, Volume 1: Types, Properties and factors affecting breeding and cultivation, Woodhead Publishing Limited, USA. pp: 1 & 4.

A STUDY ON SERVICE QUALITY OF TEXTILE IN HANDICRAFTS

Mrs.N.Padma Priya, M.Com, M. Phil,(Ph. D)
Lecture and Head of the Department,
Seethalakshmi Ramaswami College, Trichy

V.Swasthika, III-B.Com-"B"(SF)
Department of Commerce (SF), Seethalakshmi Ramaswami College, Trichy

Abstract

Textile exports forms a significant role in Indian economy in terms pf generating employment and earning foreign exchange. Development economies like India have made transformational changes is industry in technological ways through various innovative measure from low technology level to a producer of high technology products. The Indian textile industry is also highly diversified and is gradually moving to branded segments. The role of government in the industry cannot be underestimated and has given impetus to the industry cannot be underestimated and has given impetus to industry especially after removal of quota system MFA in year 2004. The research paper intends to understand the significant role of textile industry. Its shares in total exports and future prospects.

Key Words: *Introduction, History, Types, Importance, Handicraft in trade, Handicraft in modern education, SWOT analysis, Advantages, Conclusion.*

Introduction

Handicrafts mean a work of art made by hands . Usually handicrafts are used as decorative pieces. They are made using very simple tools and hands. This is the traditional way of making goods. The handicrafts often have either cultural or religious significance. Handicrafts can not be mass produced.

There is a difference between a handicraft and a piece of arts and crafts. The things that come under the term art and craft are used only for decoration. The handicraft item on the other hand is made for personal use. It is more of a traditional work and it is created as a part necessary in the daily life.

History

In India the history of handicrafts go back to the beginning of civilization. It is aptly described as ' the craft of people'. Even in those times individuality was respected and the skill of the hands was appreciated.

Through the ages the handicrafts evolved by taking in different influences from different cultures and folk traditions. Handicrafts were a part of daily life. They served multiple purposes. It was a means of self expression with aesthetic approach to the life.

Types

There are different things included in the handicrafts. They can be classified as:

Toys	Accessories
Garden ware	Kitchenware
Furniture	Decorative items
Gifts and souvenir articles	Wall décor
House ware	Tableware

Import Ants

A handicraft, sometimes more precisely expressed as artisanal handicraft or handmade, is any of a wide variety of types of work where useful and decorative objects are made completely by hand or by using only simple tools. It is a traditional main sector of craft, and applies to a wide range of creative and design activities that are related to making things with one's hands and skill, including work with textiles, moldable and rigid materials, paper, plant fibers, etc. Usually the term is applied to traditional techniques of creating items (whether for personal use or as products) that are both practical and aesthetic. Handicraft industries are those that produces things with hands to meet the needs of the people in their locality. Machines are not used. Collective terms for handicrafts include artisanry, handcrafting, crafting, and handicrafts man ship. The term arts and crafts is also applied, especially in the United States and mostly to hobbyists' and children's output rather than items crafted for daily use, but this distinction is not formal, and the term is easily confused with the Arts and Crafts design movement, which is in fact as practical as it is aesthetic. Handicrafting has its roots in the rural crafts—the material-goods necessities—of ancient civilizations, and many specific crafts have been practiced for centuries, while others are modern inventions, or popularizations of crafts which were originally practiced in a limited geographic area.

Many handicrafters use natural, even entirely indigenous, materials while others may prefer modern, non-traditional materials, and even up cycle industrial materials.

The individual artisanship of a handicrafted item is the paramount criterion; those made by mass production or machines are not handicraft goods.

Handicraft in Trade

The Industrial Revolution and the increasing mechanisation of production processes gradually reduced or eliminated many of the roles professional craftspeople played,

and today many handicrafts are increasingly seen, especially when no longer the mainstay of a formal vocational trade, as a form of hobby, folk art and sometimes even fine art. The term *handicrafts* can also refer to the products themselves of such artisanal efforts, that require specialized knowledge, may be highly technical in their execution, require specialized equipment and/or facilities to produce, involve manual labor or a blue-collar work ethic, are accessible to the general public, and are constructed from materials with histories that exceed the boundaries of Western "fine art" tradition, such as ceramics, glass, textiles, metal and wood. These products are produced within a specific community of practice, and while they mostly differ from the products produced within the communities of art and design, the boundaries often overlap, resulting in hybrid objects. Additionally, as the interpretation and validation of art is frequently a matter of context, an audience may perceive handicrafted objects as art objects when these objects are viewed within an art context, such as in a museum or in a position of prominence in one's home.

Handicraft in Modern Education

At the Buell Children's Museum in Pueblo, Colorado, children and their guardians partake in "arts and crafts" (i.e. handicrafts). Simple "arts and crafts" projects are a common elementary and middle school activity in both mainstream and alternative education systems around the world.

In some of the Scandinavian countries, more advanced handicrafts form part of the formal, compulsory school curriculum, and are collectively referred to as *sloyd* in Swedish, and *käsityö* or *veisto* in Finnish. Students learn how to work with mainly metal, textile and wood, not for professional training purposes as in American vocational–technical schools, but with the aim to develop children's and teens' practical skills, such as everyday problem-solving ability, tool use, and understanding of the materials that surround us for economical, cultural and environmental purposes.

Secondary schools and college and university art departments increasingly provide elective options for more handicraft-based arts, in addition to formal "fine arts", a distinction that continues to fade throughout the years, especially with the rise of studio craft, i.e. the use of traditional handicrafting techniques by professional

fine artists. Many community centers and schools run evening or day classes and workshops, for adults and children, offering to teach basic craft skills in a short period of time. Handcrafted shoes from bamboo made by artists of West Bengal, India, at a fair in Kolkata. A hand made sofa set made from fibres extracted from bamboo at a fair in Kolkata. Made by artists of West Bengal, India.

SWOT ANALYSIS

STRENGTH

- Large, diversified and potential market.
- Strong, diversified and supportive retail infrastructure.
- Cheap labor rates that result to competitive price.
- Need low capital investment.
- There is flexible production flexibility.
- Easy creation and development of production centers.
- No need for macro-investment.
- Industry provides potential sources of employment.
- Products are high value added, and handicrafts have various applications.
- Potential source of foreign revenue because of higher export.

WEAKNESS

- Lack of infrastructure and communication facilities.
- Unawareness about international requirements and market.
- Lack of co-ordination between government bodies and private players.
- Inadequate information of new technology.
- Inadequate information of current market trends.
- Less interest of young people in craft industry.
- Lack of skilled labor.
- Still confined to rural areas and small cities and untapped market.
- Lack of promotion of products.

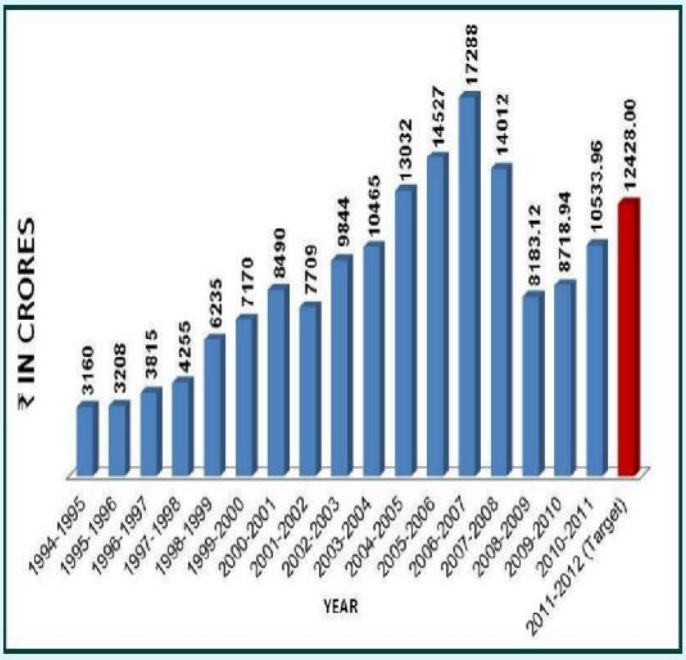
OPPORTUNITIES

- Rising demand for handicraft products in developed countries such as USA, Canada, Britain, France, Germany, Italy etc.
- Developing fashion industry requires handicrafts products.
- Development of sectors like Retail, Real Estate that offers great requirements of handicrafts products.
- Development of domestic and international tourism sector.
- E-Commerce and Internet are emerged as promissory distribution channels to market and sell the craft products.

THREATS

- Competition in domestic market.
- Balance between high demand and supply.
- Quality products produced by competing countries like China, South Africa.
- Better Trade terms offered by competing countries.
- Increased and better technological support and Rand D facility in competing countries.

Rashmi Verma IBR 5/06



KEY FACTS OF INDIAN HANDICRAFT INDUSTRY

- India's rich cultural diversity and heritage provides a unique and huge resource for developing craft products.
- Handicrafts industry is one of the important segment of decentralized sector in India.
- According to the national census of handicrafts, undertaken by the National Council for Applied Economic Research the value of handicrafts produced last year were of Rs.26,213 Crore.
- Provides huge employment opportunities to artisans that include women and people belonging to backward and weaker society (6 million artisans).
- The Indian Handicraft Industry is a $100 billion industry worldwide.
- India's contribution in world market is 1.2%
- The total exports of crafts items: - Rs. 13412.92 Crore.
- Industry's share in India's exports:- 1.51 %

Rashmi Verma IBR 5006

EXPORT OF INDIAN HANDICRAFT

- Indian Handicrafts and Gifts Industry : a rapid growing industry with a turnover from US $ 1.2 million to US$ 1.9 billion in the last decade.
- A consistent annual growth rate of more than 15 per cent over a 10-year period, from 3.6% to a respectable 10% share in global handicraft exports.
- In 2005-2006 the exports of Indian handicrafts has shown an increase of US$ 298.87 million, i.e. the exports increases by 10.02% over the similar period during 2004-2005.
- The industry is expected to triple its export turnover to Rs. 39,000 crore by 2009-10
- Create around 20 lakh new job opportunities.

Conclusion

Though in the field of textile handicrafts plays a major role . By doing this way textile field provides various job opportunities to the public sector as well as private sector.

References

1. "A Brief History Of Handicrafts". Boon toon. Retrieved 13 May 2016.
2. Barnard, Nicholas (1993). Arts and Crafts of India. London: Conran Octopus Limited. p. 14. ISBN 1-85029-504-2.
3. "Rajasthan is now on the world ramp". The Times of India. Jun 19, 2008.
4. Barnard, Nicholas (1993). Arts and Crafts of India. London: Conran Octopus Limited. p. 16. ISBN 1-85029-504-2

ROLE OF MULBERRY SILKWORM BOMBYX MORI IN MULBERRY SILK PRODUCTION

Dr.R.Prabhavathy
Assistant Professor, Department Of Zoology,
Seethalakshwmi Ramaswami College, Trichy

Abstract

Mulberry is a plant that is grown for silkworm rearing. Mulberry forms the basic food materials for silkworm. Production of mulberry on scientific lines is essential for organizing sericulture on sound economic lines. The findings show that the mulberry leaves produced high quality cocoons for the silk production in the textile industry. Bombyx mori, the mulberry silkworm is a well known silkworm which originated from China and has been introduced into many parts of the world for commercial purposes. In India, the scientist working in Central Sericulture and Training Institute, Mysore has developed good bivoltine races for the past ten years. South India accounts for 88% of total mulberry raw silk production of India in which Karnataka holds first. Mulberry silk is the highest quality silk made from mulberry silkworms and also the most expensive type of silk. India is the second largest producer of mulberry silk after China. The pupae of the mulberry silkworm are used to design the fabric in a textile industry so that no mineral is observed. Mulberry silk is a globally loved fabric which has given the world a vast taste of designs and apparels in the textile industry. It is evident that there is a great demand for this mulberry silkworm in spite of high cost compared to synthetic and cotton fabric.

Key Words: *Mulberry, Bombyx mori, Mulberry Silk Production, Textile Industry.*

Introduction

Sericulture is one of the highly viable and remunerative agro industry of the country. It provides employment to many, and is ideally suited to the economy of developing country like India. Historical evidence show that silk was discovered in China, and from there, it spread to other parts of the world. In India, silk worms were first domesticated in the foothills of the Himalayas. India, being the second largest producer of silk next to China at an annual turnover rate of 20,000 metric tons and accounting for 20% of world production. In India, Karnataka is the premier mulberry silk producing state. The silkworm is the larvae or caterpillar of *Bombyx mori*, domesticated silk moth is very economically important as the producer of silk. Mulberry silk is one of the most renowned and popular forms of silk, particularly when it comes to textiles. It was originated from the era of Indus valley civilization; it is one of the exquisite silk used in the textiles. The first country to apply scientific techniques to raising silkworms was Japan, which produces some of the world finest silk fabrics. Other countries that also produce quality silks are China, Italy, India, Spain, and France. The improvement in the quality of raw silk mainly depends on the quality of the mulberry leaves and favourable environmental factors. The quality of mulberry leaves predominantly influences the development of the larvae and the quality of the cocoon. Mulberry plays very important role in the economics of the industry and it has been estimated that 60% of the cost of the cocoons goes to the mulberry cultivation. About 97% of the raw silk comes from five Indian states namely Andhra Pradesh, Karnataka, Jammu and Kashmir, Tamil Nadu and West Bengal. In Tamil Nadu, mulberry cultivation is concentrated in the Coimbatore, Erode,

Tiruppur, Salem and Dharmapuri districts. Hyderabad, Andhra Pradesh and Gobichettipalayam, Tamil Nadu, were the first locations to have automated silk reeling units in India.

Mulberry Tree Propagation: Mulberry tree are cheap and easy to propagate. They are very easy to transplant and the trees grows rapidly. They are perennial and there pest immunity is more dependable than a tree that just comes from the forest. Mulberry varieties M_5 and S_{45} can yield the harvest of the cocoons more than the Japanese varieties K_2, S_1 and S_{36}. The mulberry bark can also be used as a treatment for worms. Mulberry grows well in the flat fertile lands and elevation up to 700m above mean sea level is considered suitable for the growth of mulberry. High altitude where frost is highly to occur is unsuitable for mulberry growth.

Physical Properties of the Mulberry Silk : Silk worm fibres are naturally extruded from two silkworm glands as a pair of primary filaments which were struck together with sericin proteins that acts like a glue. Silk has a smooth soft texture that is not slippery unlike many synthetic fibres. It is one of the strongest natural fibres which looses up to 20% of its strength when it is wet.

Reproductive Cycle of *Bombyx Mori*: The secret to silk production is the tiny creature known as the silkworm, which is the caterpillar of the silk moth *Bombyx mori*. It feeds solely on the mulberry leaves. The reproductive cycle of the *Bombyx mori* undergoes complete metamorphosis and has four stages in the life cycle which is egg, larvae, pupa and adult. The duration of the life cycle spend in the egg stage normally for 9-12 days for the embryonic development and for the larvae to hatch out. *Bombyx mori* has been domesticated to the point that is entirely dependent on humans for its reproduction and no longer occurs naturally in the wild. It comes under the member of the bombycidae family of *Lepidoptera*, feeds solely on the leaves of mulberry leaves. The silk worm spins around a protective cocoon around itself, so it can safely transform into chrysalis. In nature, the chrysalis breaks through the cocoon and it emerges as a moth. The moth's male and the female lays 300 to 400 eggs. A few days after emerging from the cocoon the moths die and the life cycle continues. The sericulture involves raising healthy eggs through the chrysalis stage when the worm is encased in his silky cocoon. The chrysalis inside is destroyed before it can break out of the cocoon so that the precious silk element remains intact. The healthiest moths are selected for breeding and they are allowed to reach maturity mate and produce more eggs.

Benefits of Mulberry Silk on the Textile Industry: Silk's absorbency makes it comfortable to wear in warm weather and while active. Its low conductivity keeps warm air close to the skin during cold weather. It is often used for clothing such as shirts, ties, blouses, formal dresses, high fashion clothes, lining, lingerie, pyjamas, robes, dress suits, sun dresses and Eastern folk costumes. For practical use, silk is excellent as clothing that protects from many biting insects that would ordinarily pierce clothing, such as mosquitoes and horseflies. Silk's attractive lustre and drape makes it suitable for many furnishing applications. It is used for upholstery, wall coverings, window treatments, rugs, bedding and wall hangings. Silk garments and sarees produced by the mulberry silk in Kanchipuram,

Pochampally, Dharmavaram, Mysore, Arani in South, Banaras in the North, and Murshidabad in the east are well recognized in the world. Mulberry silk has an exceptional material for bedding materials comprising sheets, pillow covers. It is an excellent source that offers the incredible relief to the body. The amino acids present in the material have been medically acclaimed as beneficial properties that improve health of the consumers. As compared to cotton or satin sheets, mulberry silk is fabricated from natural elements with innate resistance towards distinct surroundings. The mulberry silk calms the nervous system indirectly that allows a person to feel refreshed. The mulberry silk acts as a natural pest control solution and as a natural beg bug repellent. Its natural fabric structure has very smooth structure. As a result, bed bugs are not able to stick on it. Not all of the silk filament is usable for reeled silk. The leftover silk may include the brushed ends or broken cocoons. This shorter staple silk may be used for spinning silk in a manner of fabrics like cotton and linen. The quality of spun silk is slightly inferior to reeled silk. The waste materials from the spun silk can also be used for making "waste silk" or "silk noil". This coarse material is commonly used for draperies and upholstery.

Conclusion

Sericulture is an ancient science, and the modern age has not bought great changes to silk manufacture. The manmade fibers such as polyester, nylon, and acetate have replaced silk in many instances. But majority of qualities of the silk cannot be reproduced. For instance, silk is stronger than an equivalent strand of steel. Some recent research has focused on the molecular structure of silk as it emerges from the silkworm. In order to understand better how new, the stronger artificial fibers might be constructed. Silk spun by the silkworm starts out as a liquid secretion. The liquid passes through a brief interim state with a semi ordered molecular structure known as nematic liquid crystal, which solidifies before the fiber. The materials scientists have been able to manufacture durable fibers using liquid crystal source material, but only at high temperature or under extreme pressure. Researches from all over the world are still finding out to determine the study of silkworm on how the liquid crystal can be transformed into fiber at ordinary temperatures and pressures.

References

1. Bharathi, D. and Miao, Y. 2001. A review on the effect of insect hormone analogues on growth, development, silk yield and metabolic activities of silkworm, *Bombyx mori* L. J. Adv., **22:** 56-59.
2. Corbman, Bernard P. *Textiles: Fiber to Fabric.* 6th ed. McGraw-Hill, 1983.
3. Deshpande, Chris. Silk. Garrett Educational Corporation, 1995.
4. Krishnawami S, kumaraj K, Vijayaraghavan, Kasiviswanathan K (1971) silkworm feeding trials for evaluating the quality of mulberry leaves as influenced variety, spacing and nitrogen fertilisation. Ind J of sericulture: 79-89.
5. M. Lewin (ed.), *Handbook of Fiber Chemistry, 2nd ed.* (Marcel Dekker, 1998). ISBN 0824794710.
6. M. Lewin (ed.), *Handbook of Fiber Chemistry, 3rd ed.* (CRC press, 2006). ISBN 0824725654.
7. Veda K, Nagai I, Horikomi M *(1997) silkworm rearing (translated from Japanese), Science publishers. Inc USA.

"PROTAGONIST OF TEXTILES IN INTERIOR DECORATION"

D.Priya
Assistant Professor, Department of Costume Design and Fashion, Maharani Arts and Science College, Dharapuram

Abstract

Fabrics are wonderful option for home furnishing. In fact, it is an age-old concept to use fabrics for making interior decoration. The trade expert interior decorators often use fabrics for room decoration keeping symmetry with the arrangement of furniture and wall colors of the room. In other words the selection of fabric should be in tune with the furniture arrangement and other features of the room and the meticulous use of the fabrics can set the rue tone of the room deciding on its mood and radiating ambience. According to modern interior designing concept some fabrics are widely chosen by interior decorators for making interior decoration and these fabrics are silk, chiffon, organza, and stretch fabrics.

Key Words: *Interior design, Furnishings, Fabrics, Fiber.*

Introduction

Interior design therefore attempts to make indoor spaces as satisfactory, useful, pleasant and generally supportive as possible. In interior design, comfort, usefulness and beauty must work together for success to be realized. Elements like furniture, lighting, colourand art must be dealt with carefully.

Importance of Fabrics in Interior Designing

The common names of fabrics-for example, wool, satin, Dacron – are more confusing than helpful since they refer variously to fiber (wool), construction or weave, or even, in some cases, trade names. Various specialized forms of textiles also deserve note. These include embroidery, familiar as a handwork technique but now mechanically produced, and quilting, also best knows as a craft technique for layering together several fabrics, possibly with a filling between layers. The designer can usually tell quickly from a showroom visit if it is a source of strong interest. After making a selection of fabrics according to color and other qualities, the designer may request sample swatches, which can be put on file for reference when a scheme is being planned. Swatches, usually small, are attached to a card identifying the manufacture and pattern number and giving other data such as width, fiber content, and price

Characteristics Needed in Textile Furnishings

Home furnishings are not meant only for decoration. They have to be enough strong or light, resistant to some materials such as water or fire, and should have many other properties according the purpose they are intended to be used.

- Curtain fabrics should have light fastness.
- Upholstery fabrics and curtain fabrics again should have resistance to seam slippage.

- Bedding fabrics should have resistance to pilling and stains.
- Quilting fabrics and fabrics used for pillow covers, cushion covers, mattress cover etc. should have resistance to snagging.
- Fabrics for kitchen linen should be flame resistant fabric.
- Shower curtains should be made from water repellent fabrics.
- Other fabrics for bathroom furnishings like bath towels should have high water absorption ability.
- Upholstery and other fabrics like that for aprons should have shape retention capability.

It is this requirement of properties that some fabrics are preferred more for one home furnishing item and some others are liked for other home furnishings.

Interior Decor Styles Achieved Through Fabrics

A house furnished with exactly the right home furnishing fabrics at the right place truly gives a heavenly experience. And for this 'so-much-desired' experience, people spend money on everything from interior decorator's fee to furniture, flooring and many more things just to create magical environment with right match of color, theme, textures and fabrics. In fact, fabrics can give stylish, traditional as well as contemporary look to any decor.

- Chenille fabric and printed flocked fabric, used with a creamy white background color along with subtle shades of patterns will give a shabby chic style to a room.
- The rough strong corduroy fabric, used in various coverings, curtains and cushions give a contemporary stylish look.
- The same corduroy when combined with Damask- plain or with patterns- will give a traditional appearance.
- Jacquard fabric and brocade fabric-again available in plain or patterns- will give traditional looks.
- Stripes and chequered fabrics can make a room look bright and informal and when different sized stripes and checks are mixed and matched with complimentary colors, they will definitely provide a contemporary look.
- And here is the versatile knit fabric, that can give all kind of colors, forms, textures and dimensions to a room. They can be used for almost any home furnishings- cushion covers, bed coverings, sofa throws, rugs, curtains, sofa covers and what not! They are capable of giving traditional as well as contemporary look, that too with style.

The fabrics which are used in the hospitality area of interior decoration are called Hospitality Fabric. These fabrics are powered by better scale of durability; in most of the instances, these fabrics are extremely wash-friendly. Cushion cover, sofa cover, table cover, etc are meant for comfort and service for the users and thus the fabric used for these items are mainly made by hospitality fabrics. If we generally use fabrics for interior decoration, silk is basically used for curtain, wall papers, and some upholstery curtains, organza, and chiffon fabrics are basically used for internal curtains and for partition curtains because of its frilly texture and light weight. Chiffon fabric made curtains look equally good on arch windows and on connecting

doors. Stretch fabrics also widely used in making designer upholstery as netting are matched with this type of fabric for providing proper shape and flexibility for the shape of the said fabric furnishings. Organza is often used for making lampshades because of its crispy texture and availability in floral prints. Altogether it makes great romantic ambience for room lighting as well as for room dcor.

Fabrics in your Interior Decorating

Variety of fabrics to create the desired look. This could be a simple tablecloth on a large, impressive looking dining table or it could be a throw draped across the couch. Fabrics are generally used to provide a splash of color or texture to the room and you can use fabrics to pull out the decor you are going for or simply to accent it.

Rayon

Also known to many designers as "art silk," rayon is a semi-synthetic fabric that is a great alternative to silk. It has a bright shiny texture to it and is a great choice for many homes that is looking for something that is more durable than silk is. The one major drawback of rayon is that it will wrinkle so it is better to use it on a surface that won't have a lot of people lounging on it.

Silk

Well, we all know what silk is and it can provide a rich element to any room when you use it for window coverings, pillows or even as an upholstery covering. It has a soft lustre to it and the fibers themselves are actually prism like, which is why the material shines it reflects light at various angles. The main drawback of silk is that it is not very durable. It is prone to wrinkling and it will stain very easily. I would avoid using silk in high traffic areas such as family rooms where people may be munching on popcorn during a movie.

Olefin

If you want to find a material that is comfortable and functional, then you should choose this synthetic fabric. Olefin is a very common material that is used in furniture since the fabric is durable, holds color and stain resistant. This is the perfect fabric for those high traffic areas and for smaller fabric areas; you can find olefin combined with other fabrics to create beauty and function.

Polyester

Usually seen in drapes and bed sheets, most people do not use a straight polyester fabric to decorate with, or really at any time. What they do use instead is a polyester blend with a variety of other fabrics. Polyester is a synthetic fibre that is used in a variety of ways and can be found in a large number of textures. It, or a polyester blend, is a good choice for sitting areas since polyester is resistant to wrinkles.

Cotton

Cotton is a natural fiber that is found in a lot of different blends and fabrics. It is comfortable and breathable, which makes it an excellent fabric to work with. It also has the wonderful traits of being resistant to fading and other signs of wear and tear. The main problem with cotton is that it tends to stain and become soiled very easily. That is why, if you choose to use cotton in your home, you should use a cotton blend instead of a pure cotton.

Acrylic

Acrylic, also known as Acrylic fiber, is a synthetic fabric that was created as an alternative to wool and it has begun seeing use as an alternative to cashmere. The fabric is surprisingly soft and comfortable and its durability makes it an excellent choice for home decor. Generally, acrylic fabrics hold color extremely well and resist shrinkage, which is excellent when you have to clean some of your fabrics. Acrylic fabric also resists stains and wear and tear. It is also resistant to wrinkles.

Nylon

Another synthetic fabric, nylon is a resilient fabric that has a silky texture to it. It is usually resistant to stains and it holds color extremely well. Although it is a strong fabric it tends to only be used in blends and not on its own. Since it is a strong and resilient fabric, the uses for nylon, or nylon blends, is practically endless when it comes to your home decor.

Leather

The last fabric that I am going to look at is leather, which is a natural fabric that is produced by tanning various hides, usually cow but not always. Leather can add a rich element to a home and many people love it but this is not the easiest fabric to have in your home. Leather requires a lot of work and the color can fade if it is placed in direct sunlight. Another problem with leather is that it can become scratched and stained quite easily. Still, it does make a statement wherever you use it and can be an excellent choice for many rooms.

Conclusion

However, as every coin has its two sides, fabric based interior decor has its two sides. On the advantage side it is washable, replaceable, recyclable, and available in wide variants, the maintenance process of these fabrics needs special care and arrangement and in most of the case the care and wash requirement of different fabrics differs from each other. For example, the wash requirement and care may not match with chiffon or the care and maintenance schedule of stretchable fabric will vary from chiffon or organza.

References

1. “Quality Parameters For Home Textiles” published by BTRA, Sep. 2004.
2. “Techno Economics of Shuttless Looms” published by SITRA, Cbe.
3. “Express Textiles” - Weekly Edition, 2014.
4. Best of Office Architecture and Design Volume II,November 2015.
5. Best of Hospitality Volume II,April 2015.

COTTON DYEING WITH NATURAL DYE EXTRACTED FROM THESPESIA POPULNEA

Raadhai
PG Students, Avinasalingam Institute for Home Science and Higher Education for Women, Coimbatore

Dr.R.Prabha
Assistant Professor, Department of Textiles and Clothing, Avinasalingam Institute for Home Science and Higher Education for Women, Coimbatore

Abstract

Natural dyes can be defined as those colored substances that have the affinity to the substrate to which it is being applied and derived from natural sources such as plants, animals and minerals. Research into new natural dyes sources along with eco-friendly, and cost effective technologies for their processing and application have greatly aided in widening the scope of natural dyes in various traditional and advanced application disciplines. This paper reports the improving the colourfastness of the natural dye with dye fixing agents, extraction of the colourants from natural sources; effects of different mordant and mordanting methods; selection of fixing agents; dyeing variables; post-treatment process; development of newer shades with post treatment and analysis of colour improvement parameters with fixing agents for cotton dyed with natural dye;assessed colour improvement with colourfastness test using Thespesia populnea flower. Hence the flower was selected for the present study.

Key words: *Dye fixing agents, coloufastness, natural dye, Thespesia populnea*

Introduction

Dyeing is a method which imparts beauty to the textiles by applying various colours and their shades onto a fabric which can be done at any stage of manufacturing of textile (Jayalakshmi and Sondanyaa, 2014).Natural dyes are derived from naturally occurring sources such as plants, insects, animals and minerals without any chemical treatment (Chengaiah *et al.,* 2010).The environmental consequences are the reason for the importance of natural dyes around the globe. Research has shown that synthetic dyes are suspected to release harmful chemicals that the allergic, carcinogenic and detrimental to human health (Grover and Patni, 2011).Consumers have become more aware of environmental issues; as such they are increasingly seeking products with a green or organic label. This issue has prompted a resurgent interest in the application of colouring matters derived from natural sources (Ratnapandian *et al.,* 2012). Cotton textile dyeing was done since the medieval period using cheap natural dyes (Kulkarni *et al.,* 2011). It is the single most important natural fibre in the world and is used globally to manufacture a variety of textile products.It is generally recognized that most consumers prefer cotton personal care items to those containing synthetic fibers (Rahman *et al.,* 2014).*Thespesia populnea* is a large avenue tree found in the tropical regions and coastal forests in India and cultivated in the gardens (Parthasarathy *et al.,* 2009).

Materials and Methods

Materials: Selection of Natural Dye Source: Natural dyes can be defined as those colored substances that have the affinity to the substrate to which it is being applied and derived from natural sources such as plants, animals and minerals (Mishra *et al.*, 2009).Research into new natural dyes sources along with eco-friendly, robust and cost effective technologies for their processing and application have greatly aided in widening the scope of natural dyes in various traditional and advanced application disciplines (Satyanarayana and Chandra, 2013). *Thespesia populnea* flower along with its eco-friendly nature possess medicinal benefit and has antibacterial property. Hence the flower was selected for the present study.

Processing of Natural Dye

The flow chart for extraction of dye components from plant sources as follows:

Figure 1 Processing of Natural Dye

Optimization for Conventional Extraction

Solvent

To determine the suitable solvent for extraction 5 g crushed powder of *Thespesia populnea* flower was tested with different solvents such as water, ethanol, methanol and NaOH individually and placed in water bath for one hour at 90°C the resulting dye extract was filtered and the color intensity was measured at 376 nm using spectrophotometer. The solvent which showed higher absorbance was selected as the suitable solvent and used for further study.

Dye Concentration

To determine the optimum concentration of the dye source, *Thespesia populnea* flower at various concentration such as (1,2,3,4,5,6,7,8,9,10%), was taken individually and placed in water bath for one hour at 90°c. The optical density of the dye solution was analysed with spectrophotometer at 376 nm. The concentration at which the color intensity was higher was fixed as optimum dye concentration and used for the subsequent study.

Time: To determine the optimum extraction time, the dye extraction was carried out at different time intervals such as 40-140 min. The dye solution was analysed with spectrophotometer at 376 nm. The time at which the absorbance was maximum was selected as optimum time.

Temperature: To determine the optimum temperature, the dye extraction was carried out at different temperatures such as 40-100°C. The optical density of the dye solution was analysed with spectrophotometer at 376 nm. The temperature at which the absorbance was maximum was selected optimum temperature for dye extraction.

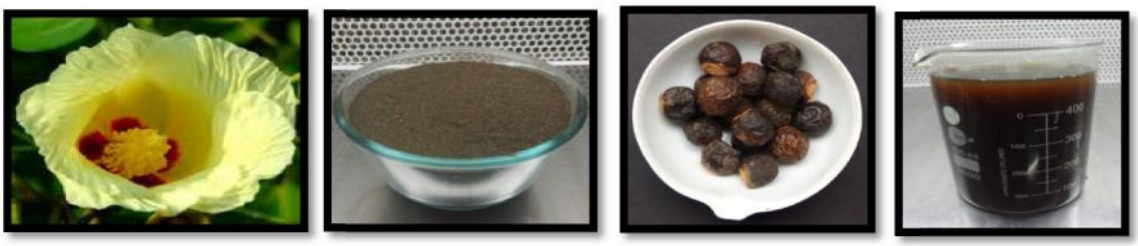
PH: To determine the optimum pH for extraction, the pH of the solvent was adjusted to 1, 3,5,7,8,9,10 using 1N HCL or 1 N NaOH. Optical density of the dye solution was determined.

Extraction of Dye under Optimized Conditions

Dye was extracted using suitable solvent under optimized conditions of pH, time, concentration and temperature in conventional and ultrasound extraction method. The dye extract was filtered and used as dye solution.

Selection of Mordants

Dye and mordant is the essential two dependant factors responsible for the development of natural colours applied to textiles (Wanyama *et al.,* 2010). A large number of natural dyes have low affinity and require the use of a mordant to fix the dye to textiles and hence are known as mordant or adjective dyes (Ratnapandian, 2013). Natural mordants such as alum, pomegranate rind and myrobolan were selected. Pilot study was carried out to select the suitable mordant. Among these natural mordants, myrobolan gave better colour when compared to other mordants. Hence myrobolan was selected for this study.



(i) (ii) (iii) (iv)

(i) Thespesia populnea Flower (ii) Thespesia populnea Flower Powder
(iii) Myrobolan (iv) Extracted Dye Solution

Techniques Used for Mordanting

The mordanting techniques selected are given below:

1. Without Mordanting
2. Mordanting
   - Pre Mordanting
   - Simultaneous Mordanting
   - Post Mordanting

The study was conducted among pre mordanting, post mordanting and simultaneous mordanting. Out of this pre mordanting technique was found to give better shade. Hence pre mordanting technique was followed for the present study.

Selection of Fabric: Cotton is still the king of fibres, and most of world's apparel is made of cotton. It has good strength and it is known to provide comfort, good moisture absorption and good strength and it is known to provide comfort, good moisture absorption and good wicking properties (Periyasamyn *et al.,* 2011). Hence bleached plain weave cotton fabric was selected for the present study.

Pre-treatment of the Fabric: It has been found that pretreatment of cotton before dyeing can offer a simple and effective method of improving dye-fibre affinity. Desizing is the process in which the size applied to the warp yarn before weaving is removed to facilitate the penetration of dyes and chemicals in the subsequent wet

processing operations (Karmakar, 1999). Hence, the cotton fabric was desized using a detergent.

Dyeing-Dyeing Parameters: Dyeing parameters namely dye concentration, dyeing time, temperature, mordant concentration, mordanting time and method of mordanting were optimized. To determine the optimum dye concentration, different percentage of dye extract such as 20, 40, 60, 80 and 100% was used for dyeing. The optimum dye concentration was selected based on the shade produced on the fabric. To evaluate the optimum dyeing time, dyeing was carried out at different time (40, 60, 80, 100, 120, 140 min). Dyeing temperature was determined by dyeing the selected fabric at different temperatures such as (20, 40, 60, 80°C). The optimized parameters for dyeing the selected cotton fabric are as follows.

Table I Optimized Dyeing Parameters

Dyeing parameters	Conventional Dyeing	Ultrasound Dyeing
Material : Liquor ratio	1: 20	1: 20
Dyeing Time (Min.)	60	60
Dyeing Temperature (°C)	90	80
Dye Concentration (%)	80	80
Mordant Soaking Time (Min.)	45	45
Mordanting Temperature (°C)	90	80

The selected cotton fabric was dyed under optimized conditions by conventional method.

Evaluation of the Dyed Fabrics

Colour Fastness Test

In natural dyeing color fastness of the natural dyes requires considerable attention and careful selection of materials and processes. The color fastness quantifies the color change on a dyed material under specific conditions and also the transfer of dyestuff to uncoloured adjacent material (bleeding) (Bechtold and Mussak, 2009). Colour fastness tests such as colorfastness to sunlight, crocking, pressing and fastness to washing were determined.

Fastness to Sunlight

This test measures the resistance to fading of dyed textiles when exposed to daylight and is very important.The dyed samples of 6 cm length and 1 cm width size were taken from each of the dyed materials. The entire samples were divided into eight parts by marking distance of two inches in the larger side marked up to eight. Each sample was covered to prevent the samples from direct sunlight. For the successive seven days the other portions were exposed accordingly along with the first portion. The first portion got seven days exposure to sunlight. The changes in color of dyed samples were compared with the original and the specimens were rated using grey scale.

Fastness to Crocking

Colour fastness to rubbing (crocking) is assisted by rubbing a standard white fabric against the dyed sample under a constant pressure for an agreed number of strokes. The test may be conducted under wet and dry conditions. Sasmira crock meter was used to determine the fastness of the dyed textile to wet and dry crocking. It has metal blocks. The base block was stationary, while the upper block had an arrangement to move to and from the base by means of a rotating handle. There was a finger knob attached to the upper block to hold the cotton material with ring. The samples were cut into pieces with the size of 20×10 cm, the sample was fixed on the base

block with longer side in the direction of rubbing the white desized original material (5×5cm) was fixed on the finger knob of upper movable block with a ring. The number of rubs given was standardized and fixed as ten rubs. Each sample was given ten strokes and the colour change and staining on the white cloth were graded.

Result and Discussion

Evaluation of Colour Fastness of Test Fabrics: Colour fastness of the dyed samples to sunlight, crocking, and washing were determined and their results are presented in Table

Colour Fastness to Sunlight, Crocking and Washing

5 – Excellent; 4 – Very Good

S.No.	Sample	Sunlight		Washing		Crocking			
						Dry		Wet	
		Colour change	Staining	Colour change	Staining	Colour change	Staining	Colour change	Staining
1.	CDC	4	4	4	4	5	4	4	5
2.	UDC	4	5	5	5	5	5	5	4

From the Table XXIII, it is evident that all the dyed samples showed good colourfastness to sunlight. With regard to washing and crocking all the samples showed good colourfastness. When compared between CDC and UDC samples, UDC showed excellent colour fastness compared to all the fastness tests. Colourfastness of any textile product is ofconsiderable importance to the consumer as it directly affects the serviceability of the fabric.Fastness tests establish the fitness for purpose of the fabric and help identify the appropriate care label instructions. Colour fastness is a measure of two different properties of a textile, the degree to which it changes colour when subjected to a particular treatment or environment, and the tendency for the textile to cause staining of other fabrics with which it comes into contact.

Conclusion: In the present study, colourant extracted from *Thespesia populnea* have been chosen for its dyeability. The coloured constituents of *Thespesia populnea* flower possess properties which find good application in textile industry. The properties of *Thespesia populnea* include non-toxicity and medicinal benefits. Traditionally *Thespesia populnea* flower have been used to cure skin diseases like pruritis and scabies.The cotton fabric dyed with *Thespesia populnea* flower imparts beautiful shades and fastness properties to cotton fabric. It also has good antibacterial activity.

References

1. Mishra, P.K., Mondal, M.K & Srivastava, P., (2009). *Separation Processes: Emerging Technologies for Sustainable Development*. Allied Publishers. pp: 208-209, 320.
2. Singh, B.P., (2010). *Industrial Crops and Uses*. CABI Publishers. pp: 269, 352.
3. Chengaiah, B., Rao, M.K., Kumark, M.K., Alagusundaram, M., Chetty, M.C., (2010). Medicinal Importance of Natural Dyes: A Review. *International Journal of Pharmtech Research*. 2(1). 144.
4. Grover, N & Patni, V., (2011).Extraction and Application of Natural Dye Preparations from the Floral Parts of Woodfordiafruticosa (Linn.)Kurz. *Indian Journal of Natural Products and Resources.* 2(4). 403.
5. Jayalakshmi, I & Soudanyaa, D., (2014).Eco-processing of bamboo woven material. *Asian Dyer.* 11(2). 43.

ROLE OF TEXTILES IN CATERING INDUSTRY

S. Ramesh Raj

Associate Professor & Head, Department of Hotel Management & Catering Science, Madurai Kamaraj University College, Madurai

Abstract

Table covers have the power to make or break the image you're trying to portray. From kid-friendly, disposable plastic table covers to upscale cloth linens for five-star hotels, the options out there are as endless as the establishments they will go in. Considering the aspects such as Colour, Design, Maintenance requirements, Price, Texture, Theme of the dining facility and Usage requirements regarding table linens will certainly help to narrow down your options while ensuring the perfect fit for the establishment. Making sure to check out linen table skirting to complete the look, Cloth table covers are perfect for venues and caterers alike, who are looking for an elegant appearance with a classic feel. They are available in a range of materials, from poly cotton to poly-spun to 100% polyester, and all are machine washable for easy laundering. Cloth table covers are specially designed for the heavy use that comes along with commercial applications, and can be reused time and time again, unlike one-time-use, disposable table linens. These table covers are often found in hotels, banquet halls, upscale restaurants, and at catered events.

Introduction

A restaurant tablecloth says a lot about the establishment, its desired clientele and the food that will be served. An essential addition to most dining rooms or outdoor eateries, table linens help to convey the theme and level of service in the establishment, while also offering a pop of colour and protection for tables. Consider selecting table linens by colour scheme or by size and style. Knowing the options and selecting the best catering linens for an event will dramatically help the aesthetic of the catering ensemble. From the extravagant to the basics, that one needs to know about choosing the catering linens. Caterers often need to bring a lot of equipment to an event, and this makes storage an issue that many caterers face. Storing equipment under the table is your best bet for hiding what may be unsightly industrial equipment. In order to mask the equipment, a tablecloth that drops all the way to the floor is a must. The tablecloths that feature a way to easily store and remove catering equipment from behind the table, like the vertical slit feature of Linen Tablecloth's fitted to tables. It may be tempting to use elaborate sequin linens or soft and delicate cotton linens for buffet tables, but as important as it is for a buffet table to look great, a *functional* buffet table is imperative. In a buffet scenario, a high frequency of guests will be serving themselves, and this means that spills and accidents are almost guaranteed. Sequin and other linens featuring a three-dimensional surface, as well as cotton and other delicate linens, will likely deteriorate throughout the event if there are enough guests at the event. It's generally recommended to stick with durable polyester tablecloths for buffet tables because poly is the easiest fabric type to clean. A great choice is to use poly-spun linens because they're made with durable polyester fabric, but are manufactured to feel as soft as cotton. Designing an elegant buffet table set up is vital for the overall look of

the event. Linen Table cloths are used on top to create a multi-tiered buffet setup. Ornamental tablecloths can be made of almost any material, including delicate fabrics like embroidered silk. Dining cloths are typically made of cotton, a poly-cotton blend, or a PVC-coated material that can be wiped clean, but they can range from functional coverings to fine textiles, as long as they can be laundered. There are several ranges of tablecloths to cater to the needs, taste and budget of different individuals.

Objectives

The virtues of a table cloth:

- The tablecloth is a decorative accessory that unifies the components of the table setting.
- A practical accoutrement that insulates the table and lowers the noise level in the room. To insulate against noise, a protective pad is laid under the tablecloth; this liner is known as a Baize/silence cloth.
- And, Tablecloths provide more elbow room than place/cover mats, and conserve space at a crowded table.

Methodology

The texture of the tablecloth should relate to the finish of the tableware and also to the dinning occasion. For Formal Dining - The textures should be smooth-porcelain, crystal, silver, finishes appropriate for a tablecloth woven with a satin sheen, such as damask. Informal Dining - The textures of informal dining range from smooth to coarse. Smooth weaves are compatible with fine surfaces, such as porcelain, bone china, ironstone, semi-porcelain, silver, silver plate, and stainless steel. Loosely woven heavy fabrics relate to coarse textures, such as pottery, stoneware, and pewter flatware. The patterns of tablecloths range from large to small, bold to subtle, each design appropriate for a particular occasion.

Damask is a reversible figured fabric of silk, wool, linen, cotton, or synthetic fibres, with a pattern formed by weaving. Damasks are woven with one warp yarn and one weft yarn, usually with the pattern in warp-faced satin weave and the ground in weft-faced or sateen weave. Twill damasks include a twill-woven ground or pattern. The production of damask was one of the five basic weaving techniques-the others being tabby, twill, lampas, and tapestry-of the Byzantine and Islamic weaving centres of the early Middle Ages. Damasks derive their name from the city of Damascus-in that period a large city active both in trading (as part of the silk road) and in manufacture. Damasks became scarce after the 9th century outside of Islamic Spain, but were revived in some places in the 13th century. The word "damask" first appeared in records in a Western European language in the mid-14th century in French. By the 14th century, damasks were being woven on draw looms in Italy. From the 14th to 16th century, most damasks were woven in one colour with a glossy warp-faced satin pattern against a duller ground. Two-colour damasks had contrasting colour warps and wefts, and polychrome damasks added gold and other metallic threads or additional colours as supplemental brocading wefts. Medieval damasks were usually woven in silk, but weavers also produced wool and linen damasks. A fine linen damask tablecloth provides a beautiful display of weavers' art.

Named after the ornamental fabrics from Damascus, these cloths have intricate patterns formed by weaving. These rich designs, ranging from the classic Irish Shamrock to the simple elegance of the Satin Band are brought out by different angles of light. This affect is achieved by long floats of warp and weft set at perpendicular angles. All of this careful craftsmanship comes together to create a splendid cloth; a stunningly beautiful dining experience.

Double Damask: The finest cloth is obtained when the double damask weaves are used. These cloths have more threads per square inch than the singe damask, resulting in an even richer cloth. Modern damasks are woven on computerized Jacquard looms. Damask weaves are commonly produced in monochromatic (single-colour) weaves in silk, linen, or synthetic fibres such as rayon and feature patterns of flowers, fruit, and other designs. The long floats of satin-woven warp and weft threads cause soft highlights on the fabric which reflect light differently according to the position of the observer. Damask weaves appear most commonly in table linens and furnishing fabrics, but they are also used for clothing. The Damask weave is used extensively throughout the fashion industry due to its versatility and high-quality finish. Damask is usually used for mid-to-high-quality garments, meaning the label tends to have a higher definition and a more "expensive" look.

Polyester: Tablecloths marketed as polyester tablecloths are just one of many table linen products made from polyester fibres. In fact, a large portion of the linens in the Linen Tablecloth catalogue are made from polyester. Poly is a synthetic fibre that's known for incredible durability and resistance to stain and wrinkles. These properties make poly an excellent choice for table linens used at high-volume banquet events like weddings, Bar Mitzvahs, Quinceaneras, and corporate events. If planning for an outdoor event and/or expecting accidents and spills, polyester tablecloths are best bet. Plain weave polyester is used to make not only standard polyester tablecloths but also stretch tablecloths and fitted tablecloths. These linens are designed to take on a spandex-like quality that conforms to the shape of a table. Spun polyester is also a great option, as the poly fibres are refined to be soft like cotton while also maintaining a high level of durability. Cotton-feel tablecloths are made from spun poly. Upscale dining establishments tend to use spun poly to present their guests with the maximum of comfort while also considering the durability–and therefore reusability–of the material.

Satin: Satin is both a weave and a fabric that's made by "floating" the warp (longitudinal yarns) over the weft (latitudinal yarns) to produce a high luster quality on one side of the fabric. Satin tablecloths can be made from either silk or synthetic materials like polyester, but most widely available satin fabrics are made with polyester as natural silk is quite costly. Satin made from polyester fibres is still durable, but we recommend that satin table linens are washed on a delicate cycle. Perfect for indoor banquet events, the glossy fabric beautifully radiates and reflects indoor lighting and creates a romantic and elegant vibe at any event. **Organza:** Known for its nearly semi-transparent appearance, organza linens are most commonly used as table runners and overlays because the linens underneath remain

mostly visible. These sheer linens are very elegant, complimenting most table-scapes while not overwhelming wedding tables design with colour. Organza is a plain weave fabric, typically made from polyester, and can be machine washed on a delicate cycle. Can be hand washed and air dry organza will maintain the fabric integrity. **Taffeta:** Traditionally made from silk, taffeta is a fabric known for it's stiffness, and the fabric can be found everywhere from wedding gowns to the lining in windbreakers. Taffeta tablecloths are made with a plain weave that features a faint weft (less latitudinal threads than longitudinal), and have a similar gossy appearance to satin. In today's world, most taffeta is made using polyester fibres.

Cotton: Cotton has become a trendy table linen fabric for weddings, probably because cotton tablecloths are made from natural cotton fibres. The unparalleled softness of genuine cotton makes cotton table linens an enticing buy for wedding planners and brides; however, despite being natural and soft, cotton is generally not recommended for high-volume banquet events. Cotton is prone to wrinkling and may even wrinkle during an event. Also, cotton is very absorbent and is sure to soak up any type of spill. It's a great fabric for kitchen and dining room tables, and it can even be a great option for events, depending on the guest count and event duration.

Burlap: Like cotton, burlap linens are made with an all natural material that bodes well with the eco-conscious, as the material 100% bio-degradable. Whereas cotton is made from cotton fibres, burlap is made from the skin of the jute plant. Jute is a vegetable found primarily in India and Bangladesh that is used to make a wide variety of consumer goods including twine, rope, and burlap sacks. Originally called "Hessian cloth," the fabric was once used to make uniforms for soldiers in the central region of Germany known as Hesse. The material is coarse, environmentally friendly, and generally regarded as the poster child of the "rustic chic" trend across the wedding community.

Results: There are so many things to consider when planning your big day: reception location, catering services, and the size of the wedding reception to name just a few major points. The last thing one thinks about is the linen fabrics for their tablecloths and other tabletop linens. However, the fabric of linens will greatly alter the look of table-scapes which will greatly alter the overall look of the event. There are a wide variety of fabric choices available–from organic to synthetic and from plain to satin weaves, the quality of a table linen fabric is governed by both the material fibres used and weave structure. To emphasize the beauty of an open-weave pattern, accent the design with a colourful under-liner in a shade that coordinates with the predominant hue of the dinnerware. The size of the tablecloth is determined by the length and width of the dining table and the overhang on all four sides. First of all, it's important to know the difference between all the various types of table linens available. Most people are familiar with the tablecloth, a table linen that is big enough to cover an entire table. Basic shapes like round tablecloths, square tablecloths, and rectangular tablecloths are available and fit most tables out there. A table skirt, a linen that is decorative and frilly, and hangs all the way to the ground. If wanted to top off your table-scapes with even more elegant fabric, table runners and table overlays are icing on the cake. A table runner is a long table linen that can

be used on top of a tablecloth, or alone on a bare table for a clean and classic look. Table overlays offer an extra layer to your table-scape which is great for broadening the event colour palette or adding depth with an interesting pattern like polka dot, animal print, or even a textured fabric like burlap. The quality of fabric material is a much understated part of shopping for table linens, yet it's very easy to feel the difference between high and low quality table linen products. Even when shopping for standard polyester tablecloths, quality varies greatly. Essentially, you can determine quality by a table linen's weight or GSM. Higher the GSM (grams per square meter), higher is the quality.

Conclusion

Table cloths are a great start, but definitely not the only thing one will need for a special event. Polyester or cotton-feel has both aesthetic and environmental reasons, and they also look a lot nicer. Choosing the perfect tablecloth for an event involves weighing a lot of important factors. This includes aspects like purpose, occasion, quality, and desired appearance. After all, while a cheap plastic tablecloth is good for one-time use at a family picnic, it would look rather out of place during a fancy dinner party or wedding reception. The basic foundation of a table settings, tablecloths do more than just cover and protect the tables. They have a big role in creating the right colour scheme, flair, and to theme the event. Tablecloths are extremely customizable and come in a wide array of colours, sizes, shapes, and materials. Standard tablecloths are decoratively draped while fitted or stretch tablecloths cling close to the table.

Reference

1. http://blog.razatrade.com/
2. www.webstaurantstore.com
3. blog.linentablecloth.com
4. https://en.wikipedia.org/wiki/Tablecloth
5. www.etiquettescholar.com

MAKE IN INDIA: DEVELOPING TEXTILE MANUFACTURING HUB

P. Sailaja
Assistant Professor, Post Graduate and Research
Department of Economics Seethalakshmi Ramaswami College, Tiruchirappalli

Abstract

This study examines the prospects of developing textile manufacturing hub under Make in India program. MAKE IN INDIA as an industrialization strategy facilitates foreign direct investment and builds best-in-class manufacturing infrastructure. India, being the second largest global textile producer, has the potential of seizing technological opportunities in textiles, especially technical textiles, for developing textile manufacturing hub. The analysis reveals that foreign direct investment into textile sector is somewhat sluggish and textile exports, mainly of knitted apparels, accounts a single digit share of global RMG exports. This study concludes that the prospect of developing textile manufacturing hub under Make in India Program is a million dollar challenge when juxtaposed to global players in textile exports, mainly RMG exports.

Key words: *Foreign Direct Investment, Technical Textiles, Apparel Made-Ups and Home Furnishing and RMG Exports*

MAKE IN INDIA is a strategic shift in development policy to build India as a global manufacturing hub. The Indian government has envisaged this 'MAKE IN INDIA' as an industrialization strategy in 2015 to facilitate investment, foster innovation, protect intellectual property, and build best-in-class manufacturing infrastructure. India is the second largest textile fibre producer in the world. It is the largest cotton and jute producer in the world. The fibre production in India accounts for about nine million tonnes during the year 2015-16. As far as the textile manufacturing capacity is concerned, India has globally the second largest textile manufacturing capacity. In fact, India accounts for about 18 per cent of world's spindles and 9 per cent of world's rotor. At the same time, India has the share of 5 per cent in global textiles and apparel trade. This paper examines the prospects of textiles under MAKE IN INDIA program. It is organised into five sections. The first section examines the prospects of developing textile manufacturing hub under MAKE IN INDIA strategy. Second section assesses the extent of FDI inflows into textile industry. Third section gives an account of export performance of textiles under Make in India Program. Final section brings out the prospects and challenges of textile industry under MAKE IN INDIA.

Developing Textile Manufacturing Hub

The Government of India has taken initiatives to start up the Make in India program. As a token of the first step, it has brought government department services into a single window online portal to facilitate the inflow of foreign direct investment. Promoting growth of manufacturing industry and facilitating foreign direct investment are primary objectives of the Make In India Program. Measures are being underway to upgrade industrial infrastructure, improving business

environment, developing manufacturing hub and opening up the critical sectors of the economy for foreign direct investment. Textiles is one of the prospective manufacturing industry in India under the umbrella of Make in India program. India has abundant availability of raw materials such as cotton, wool, silk, jute and manmade fibres. Given the population size and cultivable area, India continues to have comparative advantage in terms of skilled manpower and cost of production over major textile producers across globe. The Indian government has given a fillip to textiles manufacturing industry to transform itself through modernization and restructuring under Make in India. India has undoubtedly enormous potential of exploiting entire value chain for textile production beginning from production of natural fibre to the production of yarn, fabric and apparel within the country giving edge over countries like Vietnam, Bangladesh etc. India has the natural advantage of traditional skill sectors that is hand loom and handicraft enjoying an exclusive market niche in the globe. The Mode government has been taking concerted efforts in market access arrangements with Japan, South Korea, ASEAN, Chile while negotiations with EU, Australia, Regional Comprehensive Economic Partnership (RCEP) countries under process in addition to growing retail home market on account of demographic dividends and rising per capita income level.

Rationale for Textile Manufacturing Hub

Textile and apparel sector contributes 14 per cent to industrial production, 4 per cent to India's Gross Domestic Product (GDP) and constitutes 15 per cent of the country's export earnings. Textile and apparel sector is the second largest employment provider in the country employing nearly 51 million people directly and 68 million people indirectly in 2015-16. Textile exports of India stood at USD 40 billion in 2015-16. India's fibre production in 2015-16 is 9 million Tonnes in 2015-16 and is expected to reach 10 million Tonnes in 2017-18. The total fabric production in India is expected to grow to 69 billion sq.mts by 2017-18 from 66 billion sq.mts in 2015-16. India is the largest producer of Cotton in the world with 5,984 million kg production in 2015-16, the largest producer of Jute in the world with 1,710 million kg production in 2013-14, the second largest producer of Silk in the world with 29 million kg production in 2014-15, one of the major producer of Wool in the world with 48 million kg production in 2014-15 and the second largest producer of Manmade Fibre and Filament in the world with 2,511 million kg production in 2015-16. India's fibre consumption is cotton dominated contrary to the global trends. With change in consumer preferences and awareness about health and hygiene, consumption of manmade fibres is poised to grow in future. As far as the textile exports are concerned, apparel has contributed highest that is 42 per cent to the textile and apparel export basket of India during 2015-16. Also, it is one of the areas identified under Make in India program for generating 56-84 jobs per USD 0.15 million investment as compared to industry average of 6 jobs generated per USD 0.15 million investment.

Promotional Measures for Textiles under Make in India

As part of making textiles as one of the manufacturing hubs under Make in India Program, the Indian government has launched a number of initiatives to

strengthen textile production and encourage this industry to cater to the domestic and international market efficiently. They include modernization and upgradation of textiles through credit and capital subsidies under Technology Upgradation Fund Scheme (TUFS), providing infrastructural support of buildings for common facilities like design & training centre, warehouse, factories and plant & machinery under Scheme for Integrated Textile Parks (SITP), Integrated Processing Development Scheme (IPDS) for transforming Indian textiles to be more competitive and environment-friendly, Integrated Skill Development Scheme (ISDS), incentives to entrepreneurs and business owners for upgrading technologies under Amended Technology Upgradation Fund Scheme for textiles industry (ATUFS), export market access Initiatives (MAI), promotional measures under market development assistance (MDA). The Technology Mission for Technical Textiles (TMTT) is also underway to create a healthy ecosystem, common testing facilities and resource centres and to create domestic and export markets for technical textiles.

FDI Inflow in Textiles under Make in India

With the launch of Make in India Program, the Indian textiles industry is opened for 100 per cent Foreign Direct Investment (FDI) Inflow through automatic route. The recent data reveals that FDI equity inflows in the Textiles sector were USD 697.17 million between April 2014 and September 2016. The FDI equity inflow has grown by 16 per cent in the year 2015-16 over 2013-14. Table 1 shows major foreign direct investment inflows in textiles industry under Make in India Program. It is seen that eleven FDI inflows projects has come into textile sector. Most of the FDI inflows in textile sector are in the range of less than 50 million USD but three of the FDI inflows into Indian companies are more than 50 million USD. The nature of the companies that have received FDI inflows appears to be more of non-conventional textiles including technical textiles. The conventional textiles of cotton, silk and handlooms have not received FDI inflows. The Make in India Program is too early to get assessed. Given the two years of the launch of the Program, the FDI inflow into textile sector is appreciable and more promising in the years to come.

Table 1: FDI Equity Inflow in the Sector During April 2014 to September 2016

Foreign Collaborator	Indian Company	FDI Inflow (USD Mn)
KKR Jupiter Investors Pte Ltd	JBF Industries Ltd.	72.99
American & Efird Global Llc.	Vardhman Yarns and Threads Ltd.	61.88
Procter & Gamble Overseas India B.V	Procter & Gamble Home Products Ltd	41.89
E-Land Asia Holdings PTE Limited	Fashion India Private Limited	51.94
Procter & Gamble Overseas India B.V., Netherlands,	Procter & Gamble Home Products Ltd.	37.58
Ramunia Investments Limited, Mauritius	VAS Data Services Private Limited	29.28
Seiren Co. Limited	Seiren India Private Limited	19.57
General Atlanti Singapore Fund PTE Ltd	Designs India Limited	17.07
Celio International S.A., Brussels	Celio Future Fashion Limited	16.53
Ahlstorm, Finland	Ahlstrom Fiber Composites India Pvt Ltd	16.42
Toray Industries Inc., Japan	Toray Kusumgar Advanced Textile Private Ltd.	15.61

Export Performance of Textiles under Make in India Program

The exports of textiles and apparels are analysed to get some insights into the response of the textile sector to Make In India Program. Export basket of textiles are studied to know whether there is any perceptible change in the composition of the textile exports in recent years on account of Make in India Program. Fourteen types of textiles are being exported from India. It is seen from Table 2 that there has been an increase in textile exports from 36500 million USD in 2012-13 to 42192 million USD in 2014-15. In the first quarter of 2015-16, the textile exports are estimated to be around 13305 million USD. The contribution of textile exports to total exports of India is found to increase from 12.15 per cent in 2012-13 to 15.07 per cent in 2015-16 during the Make in India Program. Nearly 2 per cent increase in textile exports is a creditable achievement for the Make in India Program. The increase in contribution of textile exports to total exports from India can be attributed to a steady rise in the contribution of knitted apparel and accessories (HS 61) from 15.22 per cent in 2012-13 to 20.37 per cent in 2015-16 and woven apparel and accessories (HS 62) from 20.30 per cent in 2012-13 to 25.88 per cent in 2015-16. It is disquieting to note that cotton based textile exports has declined drastically to the order of 10 percentage points from 24.48 per cent in 2012-13 to 15.99 in 2015-16.

Table 2: Trends and pattern of textile exports from India

HS Code	Textiles and Apparels	2012-13	2013-14	2014-15	2015-16*	2013-14	2014-15
		Relative shares (%)				Annual growth (%)	
50	Silk based textiles	0.43	0.36	0.32	0.29	-5.23	-9.13
51	Wool & other animal hair based textiles	0.48	0.38	0.42	0.45	-9.65	11.36
52	Cotton based textiles	24.48	24.00	18.29	15.99	10.50	-25.16
53	Other Vegetable textile fibre based textiles	0.88	0.81	0.89	0.86	4.55	10.42
54	Manmade filament based textiles	6.10	6.21	5.67	5.73	14.33	-7.18
55	Manmade staple fibre based textiles	5.32	5.04	5.16	4.98	7.01	4.51
56	Wadding, nonwoven, yarn, twine etc.	0.86	0.78	0.80	0.80	3.14	4.23
57	Carpets and other textile floor coverings	3.90	3.82	4.31	4.47	10.33	14.20
58	Special woven/ tufted fabric, tapestry etc.	0.79	0.92	0.96	0.92	27.81	6.64
59	Impregnated, coated or laminated fabric	0.52	0.65	0.87	0.53	34.77	30.79
60	Knitted or crocheted fabric	0.60	0.59	0.61	0.57	10.44	6.01
61	Knitted apparel and accessories	15.22	16.10	18.14	20.37	18.13	13.95
62	Woven apparel and accessories	20.30	20.17	21.79	25.88	11.89	9.69
63	Other made-up articles, worn clothing etc.	11.07	10.78	11.01	11.54	9.85	4.15
	Handicrafts	9.05	9.39	10.75	6.63	16.17	15.51
	Total Textiles &Apparel Exports	100.00	100.00	100.00	100.00	12.50	1.99
	ia's Total Exports	300401	314405	310338	88302	4.56	-1.30
	Share of T&A exports (%)	12.15	13.15	13.60	15.07		

Note: * refers to the data pertaining only to the first quarter of 2015-16

Source: DGCI & S

The fall in cotton based textile exports with an increase in knitted apparels is indicative of changing composition of textile export basket. The demographic dividend, literacy level, economic improvements and hedonic lifestyle are stimulus to

home market innovation and expansion for domestic textile manufacturing sector. To seize the opportunities, the FDI inflows into textile sector are in the new emerging area of technical textiles which has wide applications across the industry board. Technological developments have brought about trajectory shifts in the composition of technical textiles giving a new flip to non-conventional technical textiles such as Agrotech, Meditech, Buildtech, Mobiltech, Clothtech, Oekotech, Geotech, Packtech, Hometech, Protech, Indutech and Sportech. Swati Sahu and Alka Goel (2016) have highlighted the 12th Five Year Plan estimate of expected growth of technical textiles in terms of market size at the rate of 20 per cent by 2016-17 in addition to growing carrier opportunities in the new field of technical textiles. It is reported that under the Integrated Skill Development Scheme (ISDS), the Ministry has trained 79245 persons in apparel made-ups and home furnishing and 29212 persons in textiles and handlooms of whom, 6.4 per cent was placed in apparel made-ups and home furnishing and 71 per cent in textiles and handlooms. The most promising area of textile manufacturing hub is to exploit the potential of ready-made garment exports. The UN commodity trade data (2013) shows that global ready-made garment (RMG) exports has registered a spectacular increase of 158 billion USD from 270 billion USD in 2005 to 428 billion USD in 2013. China has exploited the global RMG export growth potential by way of increasing its share in global exports from 24.4 per cent in 2005 to 38.6 per cent in 2013 followed by Bangladesh (6.1 per cent), Italy (5.1 per cent), Germany (4.3 per cent), Vietnam (4.3 per cent) and India (3.7 per cent). The prospect of textile manufacturing hub under Make in India Program becomes a million dollar question when juxtaposed to global players in textile exports, mainly RMG exports. Given the sixth rank in global RMG exports, India has to catch up of 34.9 percentage points lagging behind the share of global player China in RMG exports under Make in India Program.

Concluding Observations: Indian economy is a emerging market economy in terms of large human resources, huge home market, relatively less polluted environment and political stability. The pace with which the present government has initiated the processes, from awarding letter of intent to repatriation of profits, for grounding foreign capital through MAKE IN INDIA program, will certainly yield expected results of world class manufacturing infrastructure and access to quality products and services but with a time lag. However, the lack of dynamism in FDI inflows into textile manufacturing sector is somewhat disquieting. The promotional measures for technological upgradation and technical textiles are yet to yield results under Make in India Program. The prospect of textile manufacturing hub under Make in India Program becomes a million dollar question when juxtaposed to global players in textile exports, mainly RMG exports.

References

1. Make in India (2016), Ministry of Statistics and Program Implementation, Government of India, http://www.mospi.gov.in/
2. Make in India (2016), "*Textiles and Apparel Sectior: Achievement Report*", Department of Industrial Policy and Promotion, jointly with Ministry of Textiles, Government of India
3. United Nations (2014), *Commodity Trade data* on global exports, *Material on Technical Textiles*. http://texmin.nic.in/sector/note_technical_textiles_ammt.p df 8 October, 2015
4. Swati Sahu and Alka Goel (2016), "Changing Perspective of Clothing and Textiles in Home Science", *International Journal of Home Science*, vol.2 (2), pp.168-170.

COTTON MECHANIZATION IN INDIA

Ms.S.Saranya
Lecturer, Department of Business Administration,
Seethalakshmi Ramaswami College, Trichy

Abstract

Cotton is one of the most important crops throughout the history of India and it also plays an important role in social and economic aspects of the Indian society in the present age. Recent technological advances and trade liberalization have made India a major player in international cotton markets. India is the largest producer of cotton, second largest exporter and second largest consumer of cotton. Demand for cotton is expected to remain robust in India and in future there is a clear need to improve the productivity to meet this increasing demand. Indian cotton production is mired by low productivity driven by rain fed cultivation, small farm size, increasing pest & disease and labour intensive method of cultivation. Labour cost in India is rapidly increasing and therefore Mechanization in Cotton cultivation will play a key role in keeping the cost under control. Additionally, there will be productivity increase driven by high density planting. However to bring high density planting coupled with mechanization requires development of Symposia cotton hybrids with complete transformation in agronomy practices. . And demonstrate the mechanized method of cotton cultivation and its benefits to the farmer. The ultimate aim is to increase the productivity and overcome the challenge of labour cost increase through mechanization. The objective of this paper is to share the learning from cotton mechanization project.

Key Words: *Cotton, Technological advance, Labour Economics.*

Introduction

The Green Revolution succeeded in India in raising the farmer's income and yield of major crops because of introduction of high yielding varieties and wide use of synthetic fertilizers and pesticides. Though, this reflects the potential of our agriculture, it is not clear how long it will meet the growing needs of feed our ever growing population. The problem would be difficult to tackle if continue to depend only on traditional farming. In the post green revolution period, agriculture production once again has become stagnant and is not able to keep pace with the burgeoning population. The agricultural technology available in 1940's could not have met the demand of the food for today's world population in spite of the revolution. It is just difficult to assume that food requirement of the population by 2020 AD will be supplied by the technology of today. The transformation of India in the last century from a food deficient into a food surplus country shows our achievement that holds as much significance as its satellite launching and nuclear capabilities. As the country undertakes initiatives now to advance from the status of food security through newer and emerging technologies, the farmer in the field is poised to reap quantum agricultural grains through advanced farming. To meet the forthcoming our agricultural productivity like other countries of the world. 'Cotton' the white gold is one of the most important commercial; crops playing a key role in the economical, political and social affairs of the country. India today is the third largest producer of cotton in the world. About one third of total crop is irrigated and rest is rain fed. The yield of crop is 307 kg/ha as compared to 783 kg/ha in USA, 659 kg/ha in China and 988 kg/ha in Egypt. Our production levels of this crop satisfactory increased five folds since independence. The current yields tend to linger on lower averages, which has

been a matter of concern and a national challenge. Yields of cotton are attributed to inadequate inputs, untimely field operation, lack of irrigation (70 %).

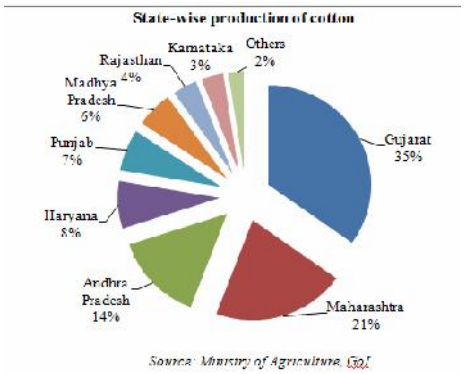
Cotton Production in India

Cotton is grown as a kharif crop in India. The planting period of cotton normally is from March to September, while the harvesting period is from October to February. The peak marketing season for the crop is during November to March. There are mainly three cotton-producing zones in India viz.

- Northern zone (Hirsutum and Arboreum Zones), comprising Punjab, Haryana and Rajasthan.
- Central zone (Hirsutum, Arboreum, Herbaceum and Hybrid Zones), comprising Maharashtra, Madhya Pradesh and Gujarat.
- Southern zone (Hirsutum, Arboreum, Herbaceum, Barbadense and Hybrid Zones) comprising Andhra Pradesh, Karnataka and Tamil Nadu.

  About 70% of total cotton is produced in Gujarat, Maharashtra and Andhra Pradesh.

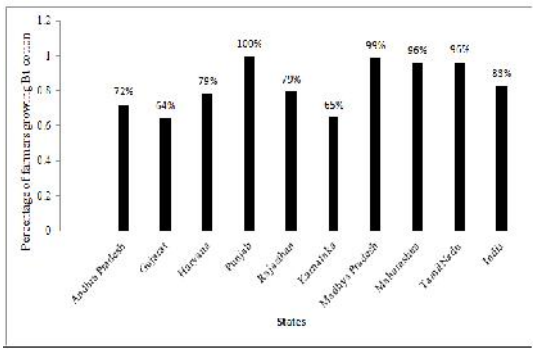
State –Wise Production of Cotton



Labour Economics in Cotton Cultivation

The entire cotton production in India is hand-picked by manlabour and picks 5 kg seed Cotton per hour and costing almost 10 times than irrigation and two times the weeding costs. It is reported that the labour availability has dropped from 70.3% of the population in 1961 to48.9% in 2010 and cost of picking cotton from the farm has increased to Rs 10-12 a kg now from Rs 4 a kg in2007. Therefore mechanization is clearly the need of the hour and will play important role to sustain the cotton production in future in India. Currently India is lagging behind many other large producers of cotton in mechanization of harvesting. In the USA, machines harvest the entire cotton crop, whereas in some regions of China, it is estimated that by 2020, about 20-30% of cotton will be mechanically picked. It is expected that India will soon have to mechanize its cotton harvesting operations as it is facing labour shortages and rising farm in states–wise percentage of farmers growing cotton.

Cultivation of Cotton in India: **Benefits of Cotton Mechanization and Farmer Practices**



High density planting system supported by cotton mechanization provides 25-40% yield increase compared to farmer practice. Yield increase is attributed to higher plant density per acre compared to conventional practice. This yield increase provides a strong basis for adoption of cotton mechanization. Farmers who adopt mechanized method of cultivation spend

additional costs of Rs. 75 Euro per acre towards increased seed rate and use of agrochemicals. There is no incremental cost of picking via machine because of as of today the cost of picking by machine is equal to average cost of picking by labour. In future, the labour cost is expected to increase at a fast pace compared to cost of picking by machine and more and more farmers will see this as a benefit and shift towards mechanical picking. This additional cost can be easily covered with incremental revenue of Rs. 137 Euro per acre on account of 25-40% yield increase. Therefore overall farmer tends to get benefited if he decides to adopt mechanical cotton cultivation.

Key Drivers of Cotton Mechanization & Adoption Trend

There are 3 major drivers of cotton mechanization in the world cost of labour, agronomy and Government policy. These 3 factors played a role in different cotton growing countries around the world. In USA it took 30 years to achieve 100% mechanization, Brazil took 45 years to achieve 100% mechanization, Turkey reached 75% of mechanization in 15 years and China took 20 years to reach 15% mechanization. India has started its journey with mechanization with collaborative cotton mechanization project from 2012 onwards but still in development phase. In future we expect many more companies will come forwards to promote the cotton mechanization and Indian farmers will eventually adopt mechanization in big way. Apart from increase in labour rate, support from government of India will play a key role for cotton mechanization. Most of the seed companies in India have realized that the mechanical cotton picking is the future requirement of the Indian farmers and have started to breed hybrids that are suitable for mechanical cotton picking. Therefore we assume that by 2020 these hybrids will get launched resulting in better picking efficiencies by machines. This will lead to large scale adoption by farmers. In next 10 years we can expect 2-3% of the planted area to get mechanized in India. First large scale adoption will start from the north cotton regions of the country followed by central and south India.

Conclusion : Mechanical cotton picking involved higher trash content compared to manual picking. The higher trash content is then removed using the Bajaj steel pre-cleaners. Since the cotton pass through the machines the fibre quality get marginally impacted compared to hand picked cotton. At present the cotton length is more or less remaining same but it observed increase of short fibre content and neps. With the improvement in machines and technology in India will come at par with the standards in USA and Brazil in terms of fibre quality. Labor is fast becoming a bottleneck and important cost factor, therefore manual picking will soon become unviable in Indian cotton production. Project farmers have experience 30 to 40% yield increase. Mechanization adoption rate will be yield increase. Mechanization adoption rate will be driven by development of machine suitable hybrids and continuous support from the government.

References

1. A Study of Mechanization of Cotton Harvesting in India: Implications for, International Markets, Final Report: Cotton Inc. Project #10-275, Srinivasa Konduru, Department of Agricultural Business; Fumiko Yamazaki & Mechel Paggi, Center for Agribusiness; Jordan College of Agricultural Sciences and Technology; California State University, Fresno, CA
2. A Study of Mechanization of Cotton Harvesting in India Mechel Paggi, Department of Agricultural Business, California State University, Fresno 93740, California

AGRO TEXTILES

V.Saranya
III B.Sc Home Science
Seethalakshmi Ramaswami College, Trichy

Abstract

Agriculture, forestry, horticulture, floriculture, fishing segments, landscape gardening, animal husbandry, aquaculture & agro-engineering all these sectors combined together are popularly called as Agro-tech sector. The word "Agro- Textiles" is now used to classify the woven, non-woven and knitted fabrics, applied for Agro-tech sector including livestock protection, shading, weed and insect control and extension of the growing season. With the continuous increase in population worldwide, stress on agricultural crops has increased. So it is necessary to increase the yield and quality of agro-products. Today, agriculture and horticulture has realized the need of tomorrow and opting for various technologies to get higher overall yield, quality and tasty agro-products.

Introduction

Agriculture, forestry, horticulture, floriculture, fishing segments, landscape gardening, animal husbandry, aquaculture & agro-engineering all these sectors combined together are popularly called as Agro-tech sector. The word "AGRO-TEXTILES" is now used to classify the woven, non-woven and knitted fabrics, applied for Agro-tech sector including livestock protection, shading, weed and insect control and extension of the growing season. With the continuous increase in population worldwide, stress on agricultural crops has increased. So it is necessary to increase the yield and quality of agro-products. Today, agriculture and horticulture has realized the need of tomorrow and opting for various technologies to get higher overall yield, quality and tasty agro-products.

History of Agro Textiles

Agriculture is the backbone of our country. Now it is saying that textile can be the backbone of agriculture. Between the 18th century and the end of the 19th century, agricultural development was occurred, which saw a massive and rapid increase in agricultural productivity and vast improvements in farm technology. From then, Textiles have always been used extensively in the course of food production, most notably by the fishing industry in the form of nets, ropes and lines but also by agriculture and horticulture for a variety of covering, protection and containment applications. Lightweight Spun bonded fleeces are now used for shading, thermal insulation and weed suppression. Heavier non-woven, knitted and woven constructions are employed for wind and hail protection. Capillary non-woven matting is used in horticulture to distribute moisture to growing plants. The bulk storage and transport of fertilizers and agricultural products is increasingly Undertaken using woven polypropylene FIBCs (flexible intermediate bulk containers – big bags) in place of jute, paper or plastic sacks. Today, modern textile materials and constructions have helped to increase the strength, lightness and durability of traditional products, as well as open up completely new markets.

Fiber used for Agro Textiles

Man made (synthetic) fibers are preferred for agricultural product than the **natural fibers** due to their high strength, durability and other suitable properties of agricultural applications. Fibers used in agro-tech sectors are as follows: Though man made fibers (like poly-olefins) are preferred for agro-textiles than the natural fibers mainly due to their favourable price performance ratio, light weight with high strength and long service life, but natural fibers can be used in agro-textiles in some specific arena where characteristics like high moisture retention, wet strength, biodegradability are effectively exploited.

Properties Required for Agro Textiles

Tensile Strength: The tensile strength of shade nets can be a deciding factor of its long term durability and service life. Hence good tensile strength is necessary parameter for shade nets.

Withstands solar radiation: Agro textiles are laid over the cultivated areas immediately after sowing or planting. For such application Agro-textiles has to withstand solar radiation with varying surrounding temperature

Withstands ultraviolet radiation: The Non visible radiations include ultraviolet radiations (UV) radiation leads to degradation of molecular chains. No single material is resistant to all radiations .polypropylene and polyester are more resistant to UV radiations when used as an outdoor material, polyethylene is treated with the appropriate UV stabilizers. Potential to reduce the impact of UV radiation on plants by light absorbing or light-reflecting non-woven (light permeability: 80 to 90% to allow photosynthesis to take place).

Bio degradability: Natural fibers like wool, jute, cotton are also used where the bio-degradability of product is essential. Natural polymer gives the advantage of bio-degradation but has low service life when compared to the synthetics

Abrasion Resistance: The abrasion to which a shade net is subjected may be of the material itself (material to material) or stray animals .abrasion of the shade net would result in holes though which animals and pests could enter the structure and harm the crops .good abrasion resistance is required of shade nets.

High potential to retain water: This is achieved by means of fiber materials which allow taking in much water and by filling in super-absorbers. While non-wovens meant for the covering of plants show a mass per unit area of 15 to 60 gm/m2, values between 100 and 500 g/m2 are reached with materials for use on embankments and slopes

Protection property: It must have the properties of protection from wind and creation of a micro-climate between the ground and the non-woven, which results in temperature and humidity being balanced out. At the same time, temperatures in the root area rise. This is what causes earlier harvests, sufficient stiffness, flexibility, evenness, elasticity, biodegradability, dimensional stability and resistance to wetness. Fungicidal finish (up to 2% of the total mass), which avoids soil contamination.

Resistance to microorganisms: It must resistant to microorganism to protect the living being.

Stable construction: The construction must be such that it must be stable for any application.

Lightweight: The weight of the fabric should be such that it will bare by the plant.

Manufacturing Process of Agro –Textiles

Several techniques of fabric production can be used to produce agro-textiles. Each method offers specific advantages for particular product. The techniques are:

Weaving and woven products

Woven products are manufactured by using weaving machines especially Sulzer projectile weaving machines. The machines with weaving width of 540 cm to 846 cm are available for the production of agro-textiles. The nets with a mesh width of 1.8 mm to 40 mm can be produced. Other methods of fabric manufacturing such as air-jet and rapier weaving machines are not preferred for the manufacture of such fabrics as they do not have required weaving width.

Knitting

Warp knitting technique is most widely used in comparison to weft knitting. Warp knitted protective nets are used in different sectors, which are produced on Raschel machines. Agro nets are produced in various constructions or lapping. Here, the construction or lapping is a way in which individual yarn systems are converted into fabrics.

Non-Woven

There are many techniques to produce non-woven fabrics. Spun bonding and needle punch techniques are mainly used for the production of non-woven agro-textiles. The spun bonded fabric has high and constant tensile strength in all directions. It has also good tearing strength. Needle punched fabric plant bags provide advantages over conventional fired clay pots. All natural fibers offer an added advantage of that the container decomposes after being planted in the ground. Thermal Bonding, Stitch-bonded, Hydro entangled & Wet non-wovens are also used.

Advantages

Agro-textiles decrease the requirement of fertilizers, water, harmful pesticides and herbicides and render a healthy farming culture and are an eco-friendly technique. Thermal protection textiles are treated with ultraviolet ray stabilizers & it can save up to 40% on energy in heating greenhouses. They increase the early maturing of crops and non seasonal plants & protect from climatic changes and its effect. Agro textiles avoid branches from breaking, increase the cleanliness of the crop, make harvesting easy & give large space. Agro textiles for its excellent environmental resistance, mechanical properties, easy process ability and durability characteristics can improve quantity, quality and safety of agricultural products.

Agro-Textiles for Production of Crops

The selection of Agro-textile product is depends on crop needs. Selection of the agro textiles is also greatly influenced by the geographical location. Some of the applications of agro textiles are as follows **Sunscreen:** The Warp-knitted nets are used in order to protect fields and greenhouses from the intense solar radiation for healthy plant growth and good harvest. Sunscreen nets with open mesh construction

are used to control sunshine and amount of shade required. These net fabrics allow the air to flow freely. So the excess heat does not built up under the screen. The percentage of shadow varies according to the density of threads. The current offer 45%, 65% & approximately 85% shadow. **Bird protection nets:** Knitted monofilament nets (Open knitted nets for crop protection) offer effective passive protection of seeds, crops and fruit against damage caused by birds and a variety of pests. Open-mesh net fabrics are used as a means of protecting fruit plantation. The special open structure repels birds, provides minimal shading and excellent air circulation - allowing plants to flourish, whilst avoiding the risk of dangerous mold developing on the fruit. These net are strong yet lightweight and protect the fruit without restricting plant growth. The use of polyethylene tape yarns or mono filament yarns makes the net extremely durable and hard-wearing. **Plant net:** Fruits, which grow close to the ground, can be kept away from the damp soil by allowing them to grow through vertical or tiered nets in order to keep the amount of decayed fruit to a minimum. These are made from polyolefin type of fiber. **Ground cover:** Ground cover is an extremely versatile landscaping and horticultural fabric for long-term weed control, moisture conservation and separation. It effectively suppresses competitive weed growth, conserves ground moisture, maintains a clean surface, protects from UV rays and creates a favorable environment for healthy plant growth. Ground covers can reduce the costs and minimizes undesirable herbicide use. It is mainly used in Borders & rockeries, nursery display areas, greenhouse floors, soft fruits beds & orchards, paved areas, horse bridleways & seed harvesting areas. 100% polypropylene is used.

Windshield /Wind protection nets/Wind-breaks:

Windshields are used in farming to protect fields of young plants, fruits, trees or the harvest from being damaged by the wind. Erecting wind-breaks at right angles protects the young seedlings and the mature plants from dying out and being broken. The nets used here reduce the effects of high winds and even help to keep out airborne sand and salt in areas close to the sea. Protecting plants from high winds also encourages plant growth and reduces the number of irrigation cycles required. It also prevents plants being cooled by wind too. **Root ball net:** It is extremely important for safe and speedy growing of young plants such that root system is not damaged when they are dug up, transported or replanted. Normally the root balls are wrapped in cloth. Elastic net tubes are alternative to this. When the plants are transplanted, the nets on the outside do not have to be removed since the roots can protrude through the nets. **Insect meshes:** Various pests like Whitefly, scale insects attack some ornamental plants and vegetables frequently. Clearly, woven and knitted polyethylene monofilament meshes to exclude harmful insects from greenhouses and tunnels, or to keep pollinating insects inside, The fine woven screens protect plants from insect attack (without the use of insecticides). **Mulch mat:** Mulch mats are used to suppress weed growth in horticulture applications, It covers the soil, blocking of light and preventing the competitive wheat growth around seed links, This also reduces the need for herbicides required for weed control Needle punched non-woven

and black plastic sheet are used for this application, Bio degradable and non-biodegradable types of mulch mats are available.

Monofil Nets : Tough, knitted Monofil, nets for windbreak fences and shading/ privacy screens, A suitable windbreak, set at a right-angle to the prevailing wind, will protect plants against the harmful effects of blustery weather - which can break young branches, damage flowers and cause leaves to dry or tear. The nets also protect against frosts and help enhance the micro-climate.This not only safeguards the current harvest but also benefits future crops, since the woody part of the plant are protected too. **Cold and frost control fabrics:** Cold and frost fabric can be laid directly on the plants, unlike plastic covers that can attract frost, and burn any leaf that touches them. These fabrics protect the plant from frost kill during unexpected late cold snaps and unexpected early ones. **Nets for covering pallets:** For safe transportation of fruits and vegetables to the market the boxes are covered with large mesh nets and pallets to stop the boxes being turned upside down. This prevents damage of goods during transportation. **Anti-hailstone nets:** Anti-hailstone nets are used to cover plants and fruit orchards to protect them from being damaged by hailstones, but does not restrict their growth. The nets are primarily made from polyethylene monofilaments. **Harvesting net:** It is extremely helpful to those countries where labour charges are costlier. With the application of such nets for harvesting purpose, the labour cost could be reduced considerably. They are laid on ground or tied under the trees so that fruits fall directly on to them. **Packing materials for agricultural products:** Nets can be used for packaging of farm products for many end uses. It includes packing sacks for vegetables, tubular packing nets for fruits and wrappers for Christmas trees, Net structures are preferred because of their high strength, low weight, air permeability and cheapness . Nets, non-woven mats, movable screens for glass/poly houses, non-woven sheets, mixed bed for mushrooms, cordage and strings are used in horticulture. They are also used on the outside of the green houses as screen to control sun light. Some of the agro-textiles that are used frequently for horticultural & floriculture use are as follows:

- Hail protection fabrics
- Mulch net
- Rain protection fabrics
- Wind control fabrics
- Harvesting nets

Agro-textile for Animal Husbandry : Nylon and polyester identification belts are used for cows. Textile nets are used to support the large udders. Non-woven fabrics are used to filter the milk in automatic milking systems and as an underlay to reduce mud on cattle paths and trails.

Fishing and aquaculture nets: Fishnets are used for fishing and in fish farming. Warp knitted knotleslow energy expenditure when the net is used for fishing. They are mainly produced from Nylon monofilament, multifilament or HDPE.

Markets of Agro Textiles

Agro-textiles is one of the smaller categories of technical textiles, with consumption accounting for around 8.2% by volume and 6.4% by value of the global technical textiles market in 2010 However, . Internationally, the agro-textile market is expected to grow from 1615000 tons (US$6.5 billion) in 2005 to 1958000 tons (US$8.1 billion) in 2010, at an average growth rate of 3.9% per annum. Developing countries like China, Brazil and India with CAGR of 7.8%, are expected to witness a surge in demand for agro textiles. The global end-use consumption of agro-textiles will increase from 3.3% in 2000 to 3.9% by 2010. In textiles, agricultural development, production and Applications will become an increasing concern.

Conclusion

Today agro textile plays a significant role to control environment for crop production, eliminate variations in climate, weather change and generate optimum condition for plant growth. Textile structures in various forms are used in shade house/ poly house, green house and also in open fields to control environmental factors like temperature, water and humidity. 'Agro textiles' gives multidimensional views and solutions to the problems being faced by agro industry. So now it is our turn, to carefully and beautifully shape this infant technology, to contribute to the nation's economy

"SOLICITATIONS OF COIR IN AGRICULTURALTEXTILES"

T.Saravana Prakash
Ph.D Research Scholar- Bharathiar University Coimbatore

Dr.S.Kavitha
Associate Professor in Textiles, Department of Home Science, Mother Teresa Women's University, Kodaikanal

Abstract

"Agriculture is the backbone of our country" went the saying so far. A textile fabric has a long history of application in agriculture. The word "agro textiles" now is used to classify the woven, nonwovens and knitted fabrics applied for agricultural & horticultural uses.The textile materials mostly produce by synthetics in various decompositions, utilized in the mode of either woven or nonwovens. Coir is a natural fibre that's extracted from the Coconut husk, it's popularly known as "The Golden Fibre".Coir is a biodegradable organic fibre and hardest among other natural fibres. It is much more advantageous in different application for agricultural textiles. The practice of textiles is also now widening to safeguard the agro products like plants, vegetables and fruits from weather, weed and birds. Here in this paper emphasis has been given on the properties of coir and some of the specific applications.

Properties Coir Fiber

Coir is a versatile hard fibre obtained from the husks of coconut. The Coir fibre is one of the hardest natural fibres because of its high content of lignin; Coir is much more advantageous in different application forerosion control, reinforcement and stabilization of soil and is preferred to any other natural fibres. The fibre ishygroscope, with moisture content of 10% to 12% at 65% humidity and 22% to 55% at 95% relative humidity, of all natural fibers coir processes the greatest tearing strength, retained as such even in very wet conditions. Morphologically, coir is a multicellular fibre with 12 to 24 microns in diameter and the ratio of length to thickness is observed to be 35. Cells of the fibre surface are occasionally covered with the silicide stigmata.The chemical constituents have found to be cellulose, lignin, hemi cellulose and pectin. The percentage of theingredients in the fibre is largely governed by the age of the nut from which it is derived. Cellulose and lignin arethe major constituents and higher lignin content makes the fibre stiffer and tougher. It is naturally resistant to rot, moulds and moisture. To suit the specific applications the coir fibrecan be used as thus or by making a suitable product, which adapts the specific needs. Coir can be converted tocoir yarn and then to woven mesh matting, which is used mainly controlling soil erosion and conditioning the soil. One more conversion of coir is to coir non-woven which is also used for controlling soil erosion and conditioningthe soil by more ground cover and soil retention Non woven coir used in the manufacture of basket liners,mulching mats, grow sticks, cultivation mats for plants, roof green applications, portable lawn or instant lawn andmany more applications.

Usage of Coir in Agricultural Textiles

Mulch Blankets: Coir due to its property can retain moisture for longer period. The coir non-woven or closely woven matting acts as a filter allowing the water to

flow across its plane as well as separator. The mulch mats will suppress the weeds and retain moisture in the soil, which will protect the roots from winter frost and summer scorching sun.

Basket Liners: Coir basket liners are used for hanging baskets. These coir pads facilitate better aeration of the growing media. As air can flow on more easily through the pores of coir pad, it will help the roots to grow faster and more vigorously. Coir non-woven felt cut in different shapes depending upon the size of the wire basket are used as basket liners. Coir non-woven felt due to its permeability will increase the growth and retain moisture for longer period and separate the pot soil by filtering the excess water.

Bio-Rolls: Coir non-woven felt mats made in the form of rolls filling it with peat moss/coir pith composite are used for bio-rolls. Rapid root growth is observed using these bio-rolls. The natural product combination will support the development of plant. The bio rolls are available according to customer requirements.

Roof Greening Mats: Roof greening mats are manufactured with coir non-woven felt spread with seeds or seeds in laid with stitch bonded coir pads. These roof greening mats will spread on the roof surface and the seeds on the coir pads will sprout out and grow evenly on the surface. Roof greening mats are available in standard sizes or according to customer requirements.

Grow Sticks: Grow sticks are used as natural supports for plants and creepers. They consist of wooden pole wrapped with the layer of coir-fibre or non-woven felt. The roots of the plant can easily penetrate on the pores of coir pad. Grow stick are available in standard sizes or according to customer requirements.

Coco Logs: Coco logs are used along stream, river, and lake banks to protect against scour. It consists of coir fiber or coir non -woven pads in the form of rolls and covered with coir nets. Coco logs are kept at the edge of the bank secured by wooden pegs may be used on alternate sides of logs. Coco logs work as a brake on waves and reduces the impact of erosion The natural product combination will support the development of plant by roots binding take over the protection. Coco logs are available in standard sizes or according to customer requirements.

Grow Media: Apart from coir fibre the other bi-product of the coir industry is the coir pith, which is mainly used as a growing media for the plants and also has replaced as a pot mixture by converting it to compost.

Conclusion: The journey so far through this paper has thus unraveled the macro views of this new venture of textiles interference into Agriculture. We have observed the reduced usage of harmful pesticides and herbicides to render a healthy farming culture. Unique manufacturing techniques and properties of this blend of agrotextile sector products whose cost is lesser than that of pesticides and chemical herbicides have been discussed.

Reference

1. Coir Board (2009) Annual Report 2008-09, Coir Board, Ministryof Small and Medium Enterprises, Government ofIndia.
2. " The Coconut Palm", Berne: InternationalPotash Institute, George Joseph, K.l (1994)
3. Coir Geo-Textiles For reinforcement Of Pavements"-Proceedings Geosynthetics Asia 2000-GA2000 (Kuala Lumpur, 29-31 May 2000)

SARTORIAL ELEGANCE FROM BANANA FIBRE

P.Sasikala

Abstract

Style is a way to say who you are without having to speak- Rachel Zoe

Textile fiber has some characteristics which differ between fiber to ***Textile fiber****. Textile fiber can be spun into a yarn or made into a fabric by various methods including weaving, knitting, and braiding, felting, and twisting. The essential requirements for fibers to be spun into yarn include a length of at least 5 millimeters, flexibility, cohesiveness, and sufficient strength. Other important properties include elasticity, fineness, uniformity, durability, and luster. Banana plant not only gives the delicious fruit but it also provides textile fiber, the banana fiber. It grows easily as it sets out young shoots and is most commonly found in hot tropical climates. All varieties of banana plants have fibers in abundance. These fibers are obtained after the fruit is harvested and fall in the group of bast fibers. This plant has long been a good source for high quality textiles in many parts of the world, especially in Japan and Nepal. According to the Australian Aid Global Education program, roughly 30 million tons of natural fibres are produced annually worldwide. Many small-scale farmers rely on this production process for their livelihoods and food security. Because synthetic fibres are taking over the textile industry, these farmers are suffering. Approximately 25 million tons of cotton is produced each year, but for the past 50 years the price of cotton has been driven down due to technological change and competition from artificial materials. Inexpensive synthetic materials drive small-scale farmers out of the textile market, because they cannot compete with the low prices. Synthetic materials, while inexpensive to produce, can cause more harm to the environment and economy than they do good. In order to improve food security, the livelihoods of impoverished people, and the health of the global community, the shift back to natural fibres must be made.*

I don't design clothes, I design dreams – Ralph Lauren

Proem:

Natural fibres originate from either plant fibres, such as coir, cotton and flax, or animal fibres such as camel hair, alpaca wool, and cashmere. As a completely renewable resource, natural fibres provide many benefits both to the environment and to those involved in the market that they create. The onset of synthetic materials has not only been destructive towards the environment, it has also had a negative economic impact on those whose livelihoods depend on the production and processing of natural fibres. In an effort to raise global awareness of the "importance of natural fibres not only to producers and industry, but also to consumers and the environment," the United Nations designated 2009 as the International Year of Natural Fibres. The year brought global attention to the important role that natural fibres play in alleviating food insecurity and poverty by allowing small-scale farmers a place in the international textile market. Banana fiber is a lingo-cellulosic natural fiber, with relatively good mechanical properties. Banana fiber is extracted from bark of banana tree, it belongs to bast fiber. The appearance of banana fiber is similar with natural original bamboo fiber and ramie fiber, but fineness and spinnability of banana fiber is better than natural original bamboo fiber and ramie fiber. The chemical composition of banana fiber is mainly cellulose, hemicellulose, and lignin. At present company make the limited application of banana fiber, for example,

in making ropes, mats, and some other fields such as the composite materials. In recent years, more and more plant fibers were considered to be "environmentally friendly" fiber sources, and many countries are emphasizing the utilizing of these fibers. Banana plant not only gives the delicious fruit but it also provides textile fiber, the banana fiber. It grows easily as it sets out young shoots and is most commonly found in hot tropical climates.

Characteristics of Banana Fibers

Banana fiber has its own physical and chemical characteristics and many other properties that make it a fine quality fiber.

- Appearance of banana fiber is similar to that of bamboo fiber and ramie fiber, but its fineness and spin ability is better than the two.
- The chemical composition of banana fiber is cellulose, hemicelluloses, and lignin.
- It is highly strong fiber.
- It has smaller elongation.
- It has somewhat shiny appearance depending upon the extraction & spinning process.
- It is light weight.
- It has strong moisture absorption quality. It absorbs as well as releases moisture very fast.
- It is bio- degradable and has no negative effect on environment and thus can be categorized as eco-friendly fiber.
- Its average fineness is 2400Nm.
- It can be spun through almost all the methods of spinning including ring spinning, open-end spinning, bast fiber spinning, and semi-worsted spinning among others.

Properties of Banana Fibers

Tenacity	29.98 g/denier
Fineness	17.15
Moisture Regain	13.00%
Elongation	6.54
Alco-ben Extractives	1.70%
Total Cellulose	81.80%
Alpha Cellulose	61.50%
Residual Gum	41.90%
Lignin	15.00%

Supremacy of Banana Fibre

1. The fineness of the fiber determines the thickness of the yarn, as finer yarn is used for clothing, medium grade yarn is used for table cloths, curtains and cushion covers, while thicker, coarser yarn is used for basket weaving, floor mats and bags.
2. The Processed banana fiber resembles bamboo and ramie fiber, but the high grade fiber is actually much finer and easier to spin. Despite its fineness, this high grade banana fiber is extremely durable, and has a natural luster that gives it a satin-like appearance. Spun banana yarn and woven banana textiles are very moisture-absorbent and since their processing does not involve chemicals, they are completely biodegradable.

3. The Banana Fibre can be used as fibre to manufacture fabrics. It is being used for making bags, table mats, ropes and twines. It can be blended with cotton or viscose fibre to produce blended fabric. Since Banana fibre is fully plant origin natural product, it has very good compatibility with other natural fibres like cotton, Coir, Pineapple fibres and Jute in blending.
4. The Banana fibre can also be dyed easily like other natural fibres and cloth made from it can also be dyed and printed like cotton cloth. It has good strength and has silk like luster. It can partly replace cotton fibre and hence we can estimate potential for it on the line of estimating demand for cotton fibre.
5. It may be noted that good quality Banana fibre is having strength and luster like silk and in the Philippines various garments are already manufactured from Banana fibres. Apart from it, Philippines is exporting huge quantity of ready-made garments like shirts, kimonos, gowns, nightwear's etc.
6. The banana fibres were reported to be elegant and highly versatile. As they do not crumple easily, these fibres have been used in the manufacture of dress materials. The fineness of texture depends on the quality of the fibre used. The material has a beautiful sheen and is used for making wedding gowns and barongs and napkins also.
7. The Hand-extracted fibres have been used to produce handbags, wall hangings, table mats and other fancy articles. The fibre can be powdered and different colours of fibre obtained using natural dyes, which can be made into beautiful pictures.
8. It protects us from atomic radiation.
9. It also prevents us from UV radiation caused by sun.
10. The rays emitted from the hospitals and research centres are also limited.
11. It is also used to reduce the heat from the people who are all always working in front of computers.
12. Generally it reduces the excess heat of the body temperature.
13. Especially, it controls the radiations emitted by the cell phones.

Upshot

Fibre to fashion is the latest concept supported by eco-friendly banana textile fibre. In the ultra modern world, we need and support the harmless with elegance fashion. The banana textile fibres have harmless, elegance and fashion too.

Reference

1. Kauffman, George B. (1993). "Rayon: the first semi-synthetic fiber product". Journal of Chemical Education. 70 (11): 887. *Bibcode*:*1993JChEd..70.887K*. *doi*:*10.1021/ed070p887*.
2. Encyclopædia Britannica. Encyclopædia Britannica, Inc. 2013.
3. Kauffman, George B. (1993). "Rayon: the first semi-synthetic fiber product". Journal of Chemical Education. 70 (11): 887.

Website References

1. www.bananatextile.com
2. www.mandaknitetextile.com
3. www.juteyarnbraid.com
4. www.startupfashion.com

METHODS AND APPLICATIONS OF AUTOMOBILE TEXTILES- A REVIEW

K.Savitha & K.Saranya
PhD Scholar, Department of Textile and Apparel Design, Bharathiar University, Coimbatore

Abstract

Mankind knows textiles by generations. On a broad outlook it appears that textiles have no application other than apparel purposes. It offer several advantages in their functional aspect for improving health and safety, cost effectiveness and durability and strength of textile material. They are defined as textile materials and products made principally for their functional properties and technical performance and rather than their aesthetic or decorative characteristics. On the basis of the functional, technical performance and end use, technical textiles are classified in to 12 categories namely Agrotech Buildtech, Clothtech , Geotech, Hometech, Indutech (Filtration, cleaning and industrial), Meditech, Mobiltech, Oekotech (Environmental protection), Packtech (Packing materials), Protech, Sportech. This clearly shows us that the technical industry is not a single industry, it caters to a wide gamut of industries right from agriculture to automobiles to construction activities, among others.Automobile is the lifeline of present society. Trade, Industry and Commercial activity extremely dependent on this sector. This automotive sector consumes a lot of textile materials that may be visible or concealed in automobile. The global consumption of textiles used in automobile industry is estimated to be over 4.5 lakh tonnes. The percentage of textile material used in motor car amounts to 2.2% of the overall weight of the car. Apart from traditional uses as interior fabrics, carpets, headliners, etc., textiles are also being used as tyre cord, fuel filters, safety belts, air bags and as a reinforcement material for composites.

Key words: *Technical Textiles, automobile industry, reinforcement material, aesthetic, decorative characteristics*

Introduction

The importance of interior design to the potential sales volume of passenger car has always been a major consideration to the automobile stylist. However, despite the fact that textiles had for a long time played a part in automobile manufacture it was not until the early to mid- 1970s that these same companies began to realize the role that well-designed textile fabrics could play in the design of attractive interiors.

Nowadays, car interiors are being influenced more than ever by consumers. They demand greater comfort- the seats should be comfortable and not cause excess fatigue, whilst noise from both inside and outside the car should be kept as low as possible. In addition, they want cars to be safe and environmentally friendly. They feel that the interior should be tasteful designed and that attempts should be made to reduce the car's weight.

It is estimated that approximately 45 sq meter of textile material is used in the average car for interior trim, which includes:

Seating area	Headliners
Side panels	Carpets
Trunks	Door trim,
Dashm	

The common expectancy of the car user is that the auto-interior should have:

Good appearance and aesthetics Good comfort
Easy to maintain Good durability
Wrinkle resistance Water and stain proof
Flame resistant for safety Low costs
Having antistatic and oil release property
Retention of good properties even after prolonged usage

Raw Material Used for Manufacture of Car Interiors

Various fibres used in automotive interiors and their properties

Application	Fibre used	Properties
Seat covers	Nylon, polyester, polypropylene, wool	Abrasion and UV resistance, attractive design and texture
Seat belts	Polyester	Tensile strength, extension (unto 25-30%), abrasion and UV resistance
Carpets	Nylon, polyester, polypropylene	Light fastness, mouldability
Airbags	Nylon 6,6 and nylon 4,6	Resistance to high temperature inflation gases, durability to storage over many years, tear strength
Seat fire barriers	Panox (UCF), Aramid(Nomex,Kevlar-DuPont),Inidex(Courtaulds)PBI(Hoechst)	Very high FR including restrictions of heat release, toxicity and opacity of fumes

Fabrics Used for Production of Auto-Interiors

Nonwovens

- Nonwovens have better adhesion property than woven and so binder application is more uniform.
- They also possess higher thickness for a given weight per unit length and so are more voluminous and comfortable.
- In addition they have a more uniform, smooth and random surface.

Nonwovens are used globally for the following applications:

- Floor panels
- Carpets
- Parcel shelves
- Linings for the side panels
- Roof linings
- Car seats
- Filters
- Acoustic insulation

Emergence of Nonwovens in Auto-Interiors is Helpful in Following Ways

- Improving cost-effectiveness
- Redefining carpet value
- Finding new filters

- Preventing fogging
- Working with contours
- Easily customized
- Attractive
- Durable
- Strength and weight
- Abrasion resistance
- Thermal protection
- Flame resistance
- Acoustic insulation
- Air filtration

Warp Knitted Spacer Fabrics

Spacer structures are knitted fabric constructions comprising two separate fabric webs which are joined together by spacer threads of varying rigidity. The spacer threads are generally made of PES or PA monofilament yarns. The degree of space or height between the two fabric faces is determined in the circular knitting machine by the setting of the dial height relative to the machine cylinder. Spacer fabric heights preset in this way can vary between 1.5 and 5.5mm.

Properties

- Soft handle
- Spring comfort(determined by yarn count, number of stitches, construction and threading-up arrangement)
- Air permeability
- Task-oriented comfort behavior
- Transport of moisture
- Thermal insulation
- Refraction of light
- Sorption of noise
- Filtration
- Requisite dimensional stability
- Longitudinal and/or transverse elasticity on one or both sides
- Plastic deformation
- Fabric can be folded easily
- Recyclable

Warp-Knitting Nonwovens

Because of their structure and functional properties, warp-knitting nonwovens should be introduced here as materials suitable for use in cars. Web bonding by warp-knitting the nonwoven has been effected by stitch-needles in fibre stitches or with binding yarns. All these facts lead to the following functional properties of warp-knitting nonwovens:

- Smooth surface protecting against abrasion
- Fibre pile with high fibre surface
- Pressure-elastic vertical fibre parts
- Large share of pores

Limited adjustability of strength and stability in machine and cross-direction.

Car Interior Components

Seat Covers: The most obvious area of application for the textiles in vehicles is in seating. At one time leather was used almost exclusively in these areas, exception cheaper cars where it was replaced by leather type materials. Leather is still the choice for the most luxurious cases, but the right grade of leather is now so expensive that it will clearly be limited to the market.

Evaluation Points for Auto-Seat Covers

- Physical properties like Extensibility, tear.
- Adhesion to backing (foam or nonwoven)
- Effect of heat, light, moisture and chemicals on physical properties
- Fastness properties of dyes used
- Performance criteria (abrasion, pilling, flex)
- Propensity to fog, odour, soil, static.
- Fibre or colour migration to other textiles, which come in contact with it.

Special demands like flame proofness, thermal insulation, water proofness, sound dampening.

Carpets

There are about 3.5 to 4.5 sq mt carpet in each car. Apart from ethical and sensual comfort, carpets also play significant role in acoustic and vibration control.

Road noise is considered as an environmental pollution in few countries. There are pressures on automobiles to reduce external noise by about 50%(up to 3dB). Carpets are contributing to solve this problem. Carpets by providing thermal and acoustic protection thus directly contribute to safety.

Types of Carpets

The carpets used in cars are mainly of three types:

1. Tufted cut-pile
2. Tufted loop-pile
3. Needle-felt

Manufacturing Process

- Carpets are manufactured either by tufting or needle felting. Carpets made by tufting are based upon a supportive backing, which is used as a base to accept the pile yarns, which becomes the uppermost surface.
- Carpet backing is usually spun bonded and is made by an integral process in which polymer chips are melted and filaments are extruded through a die. Mainly carpet is used in making thus carpet backing whereas a blend of nylon and polyester is used in some occasions and polypropylene in very few occasions. But during recent times polypropylene is assuming great importance considering the recyclability.
- The process of needling has got the advantage of more productivity at relatively low cost. But carpets produced by needling cannot be used to cover sharp contours especially foot areas and transmission tunnels. Superior needled material has a good filling which is determined by the amount of vertically oriented fibres at a given stitch density.

Molded Carpet Manufacturing can be Divided into Four Sections

- Needle punching
- Back coating of needle punched fleece with binder
- Lamination, blank cutting and moulding
- Trimming checking and packing

Noise Control

Sound is propagated through the air and by vibration of the car body and there are three basic methods of reducing it:

- By absorption
- By damping
- By isolation or insulation

In general a thick piece of material will absorb more sound than a thinner piece of the same material.

Sound absorbency is influenced by:

- Density of the material
- Air porosity of the material
- Thickness of the material

Hood Fabric

The textile content consists of:

- Inner hood
- Hood upholstery
- Cover fabric

The inner hood completely covers the hood frame and is produced from piece-dyed, profiled warp knit fabric which can be very efficiently processed, offering excellent crease reversibility. The hood upholstery is a multilayer fabric, the nonwoven polyester fabric supported by a woven net fabric which absorbs tensile loads. (The cover fabric, the hood fabric, consists of two-layer woven PES and/or PES/PAC fabrics which are bonded by an elastic intermediate layer. Spun-laid fabric layers on top and underneath largely eliminate running and activity noises. The upholstery wadding completely covers the frame to allow the hood arch to be laminated to the best effect.

Headliners

At one time the headliner was simply a covering for the metal roof inside the car and consisted of a piece of fabric, PVC or some other material simply 'slung' i.e. held in place only at a few points.

Some Important Requirements of Headliners are

- Lightweight
- Thin profile but rigid without any tendency to buckle
- Flex or vibrates directional stability
- Aesthetically pleasing
- Soft in touch

Attached to the side facing inwards is the decorative material, a nonwoven polyester scrim is usually attached to the other side. All layers are joined together by action of the hot-melt adhesives in a flatbed laminator, taking care neither to damage

the aesthetics of the decorative material nor to reduce the thickness of the center core.

Sunvisors

Injection moulding produces some sunvisors, others are composed of metal frames and rigid foam or cardboard are also used. The article is close to the windscreen and UV light and heat resistance must be of the highest standard. Passenger safety is also an important consideration. There are opportunities for textiles, especially nonwovens in this area to produce a recyclable product.

Safety Devices

Car seat Belts

The seat belt is an energy-absorbing device that is designed to keep the load imposed on a victim's body during a crash down to survivable limits. Primarily it is designed to deliver non- recoverable extension to reduce the deceleration forces, which the body encounters in a crash. This non-recoverable extension is very important as it prevents occupants from being pulled back into their seats and sustains whiplash injuries soon after an impact. There is a play of not more than 30cm so that while the belt is comfortable to the occupants, it avoids impacts with windshield and other fixed parts. In advanced car designs, seat belt works in coordination with the airbags. It holds the occupants in the correct position to strike the airbag when it is inflated. Recent design of seat belt envisages inflatable seat belt. Weak stitching which bursts holds this belt when the belt inflates, giving four and a half times more area.

Requirements of Seat Belt

- Should be able to carry a static load of around 1500kg with a maximum extension of 25-30%;
- Abrasion resistance
- Heat resistance
- Light resistance
- Flexibility for ease of use

Specifications for Manufacturing of Seat Belt

- Polyester (both doped dyed and yarn dyed) is the fibre mainly used in the seat belt manufacture
- The yarns for seat belt are made of 320 ends, each of 1100dtex.
- Warp direction is more critical since the force is applied in this direction during accidents.
- Shuttle less weaving machines and high-speed needle looms are employed for weaving seat belts.
- The woven fabric is shrunk by heat setting during finishing to improve energy absorption property. Shrinkage also increases weight from 50g/m to 60g/m.

Future Application of Automotive Fabrics

- **Listings**: Listings are strips of fabrics used to attach upholstery to the frame or moulded seat composite. These are interfaces that must be strong, have ample seam strength and low seam slippage, and must be able to hold a metal fastener or staple.

- **Insulator pads**: Insulator pads are composites that act as a buffer between the foundation and upholstery.
- **Map pocket liner**: Map pocket liner is a backing that supports the trim fabric.
- **Tie downs**: Tie downs are fabrics attached to an extended olefin polymer bead. These are similar to listings in that they are used to attach upholstery to the frame assembly. Tie downs are specially items that are sold for specific applications.

Conclusion

It is well known that change is the only permanent thing in nature. Textiles are now reinvigorating discoveries and innovations in almost every area of economy, which are revolutionary, not the evolutionary. Increasing global competition has forced automobile manufacturers to look for 'versatile' fabrics. Automotive textiles are constantly evolving to meet the latest demands of car manufacturers. So surely the road ahead for automotive textiles will conquer the demanding market of automobiles.

References

1. www.tx.ncsu.edu/ci/automotive/index.cfm
2. www.textilefiberspace.com
3. https://nileshtharval.wordpress.com/2010/05/19/application-of-textiles-in-car-interiors/
4. https://en.wikipedia.org/wiki/Technical_textile
5. http://www.fibre2fashion.com/industry-article/1807/application-of-textiles-in-automobile

REVIVING TRADITION AND CULTURE THROUGH APPAREL DESIGNS

Dr. J. Senthamarai
Associate professor Department of Hindi, SR College, Trichy

Abstract

India is a secular country with different cultures and traditions. Every state has its own customs and crafts. Similarly embroidery of each state is unique in itself. The characteristic of embroidery is in the basic techniques or stitches—chain stitch, buttonhole or blanket stitch, running stitch, satin stitch, crosses stitch. Embroidery is an art of decorating fabric or other materials with needle and thread or yarn. Other materials such as metal strips, pearls, beads, quills, and sequins can also be used in embroidery. The various traditional embroideries of India are discussed in detail in the paper.

Embroideries of India

Kashida – Jammu and Kashmir
Chamba rumalA – Himachal Pradesh
Mirror embroidery : Guajrat
Kantha: West Bengal
Applique work: Orissa and Rajasthan
Phulkari – Punjab
Chikankari – Uttar Pradesh
Kasuti: Karnataka
Zardozi: Lucknow, Bhopal and Tamilnadu

Kashida

Kashmiri embroidery commonly known with its traditional name Kashida Embroidery is famous for its sheer beauty. The source of inspiration of this embroidery is the beautiful nature of the state.

Materials: Kashmiri embroidery is known for the skilled execution of a single stitch, thus adding elegance to the fabric. It uses cotton or wool fabrics in crème, white (sufed), green (zingari), purple (uder), blue (ferozi), yellow (zard) and black (mushki). Embroidery thread employed earlier was fine quality woollen yarn. Gradually these woollen yarns were replaced by rich & lustrous silk threads. Nowadays bright, gorgeous inexpensive artificial silk (rayon) thread has entered the industry by replacing the expensive silk threads. Bright coloured cotton threads with good colour fastness are also used abundantly in the embroidery.

Techniques: The stitches used are simple the chief being satin stitch, stem stitch and chain stitch. Occasionally, the darning and herringbone stitches are also used. Sozni embroidery or dorukha is often done so skilfully that the motif appears on both sides of the shawl each side having a different color. There is no wrong side. The same design is produced in different colors on both sides. Zalakdozi is a general term used for the chain stitch done with a hook. Vata-chikan, the button-hole stitch, is only used for thick fillings. These are seen in landscapes, hunting scenes, etc. Rezkar form of needle embroidery is similar in technique to sozni; the difference lies in its longer stitches and in that these are not reinforced with additional stitches. Tilla and dori work-These embroidery techniques are executed with gold or silver zari (tilla) or silk

(dori). The decorative wire remains only on the surface while an additional thin cotton thread of yellow or white is stitched on top of it, thereby securing it by couching. Designs The motifs of kashida embroidery are mostly inspired from nature.

Motifs: The common motifs used are the cypress cones, the almond, the chinar-leaf and the lotus. The almond is a variation of the mango design and this is also called Paisley. Animal and human figures are usually not seen in the embroidered products. The bird motifs used are parrot, canary, magpie, woodpecker and kingfisher. A large variety of floral motifs in marvelous colours, shapes, size include iris, lotus, lily, tulip and saffron. The chinar leaf is an important motif. Many beautiful coloured butterflies which are found in the sanctuary and valley have occupied an important place in the Kashida. Geometrical motifs are also seen in Kashmir embroidery.

Products: Ari work- Stoles, shawls, pheran, kurta, capes Crewel work- upholstery, drapery, wall hangings, floor covering Rezkar– shawls, garments, table cover, bedspreads, household linen, capes Tilla and dori work– Pheran, sari, shawls also, namda and gabba are also some of the popular products.

Phulkari: An embroidery technique from the Punjab, literally meaning 'flower work', is mainly done by women in Punjab. Bagh is also a kind of phulkari which means 'garden'. Phulkaris and Baghs are worn by women all over Punjab during marriage festivals and other joyous occasions. Phulkari is folk art where the mother starts embroidering the cloth for her daughter and Phulkaris and Baghs are given to daughters at the time of their marriage.

Materials: Embroidery work is done on a plain cotton fabric (khaddar) handspun and hand woven with untwisted silk threads known as pat. The colours used for embroidery are vibrant colours like golden yellow, red, crimson, orange, green, blue and pink. Techniques Satin stitch is used in horizontal, vertical or diagonal direction.

Designs: Motifs of this embroidery are generally geometrical.

Types of Phulkari: 1) Chobe- is red colored cloth with embroidered borders usually presented to the bride by her grandmother during a ceremony before the wedding. 2) Vari-da-bagh (bagh of the trousseau) - is also on a red cloth with golden yellow embroidery symbolizing happiness and fertility. The entire cloth is covered patterns smaller ones within the border and intricately worked in different colors. 3) Ghunghat bagh - (covering for the head) has a small border on all four sides. In the center of each side, which covers the head, a large triangular motif is worked.4) Bawan bagh- (fifty-two in Punjabi) has as many geometrical patterns. 5) Darshan dwar- (the gate offering a view of the deity) is usually for presentation in temples or to adorn the walls of the home when the Granth Sahib (holy book of the Sikhs) is brought to a house.

Products: Shawls, odhanies and dupattas.

Chikankari: The state of Uttar Pradesh especially the city of Lucknow is considered to be the hub of Chikankari embroidery. Chikankari is derived from the word Chakeen that means elegant patterns on the fabric. Earlier it was done with white thread on muslin clothes. However now it is been done on various types of

fabrics like cotton, linen nylon, georgette, chiffon and synthetic fabrics. It is also called white embroidery.

Material: In chikankari traditionally white threads were used on transparent muslin cloth. But with changing fashion chikankari is now done on synthetic fabrics also. It is also available now in various colors. Sequin work is also done on the fabrics along with chikankari to give it an exquisite and glittering look.

Techniques: Various types of stitches are used on cotton or muslin fabric. Some of the stitches are: 1) Tepchi: Running Stitch. It is used to make outlines of designs. 2) Bukhia: Herringbone stitch done on the wrong side of fabric to give a shadow effect. 3) Pechani: It is a variation of running stitch. 4) Khatao: Flat style of chikankari. A very minute appliqué applied on fabric. 5) Murri: Knotted style of chikankari. It is a rice shaped stitch produced by satin stitch. 6) Phanda: Resembles millet and gives a raised effect on fabric. It is a French knot. 7) Jali work: Gives an effect of open mesh or net like appearance.

Motifs: The motifs are from the objects of daily life.

Products: Sari borders, blouses, kurtas, suits, hankerchiefs, white caps etc. Apart from wearable garments it is also done on various other things like curtains, bedsheets, table cloths, pillow covers and cushion covers.

Mirror Embroidery: This embroidery is done in the state of Gujarat. It is done with both large and small mirrors. It is also done in Rajasthan.

Materials: Embroidery is done using colourful threads like red, green, blue, yellow, black, maroon. The mirrors used are of different shapes and sizes like round, diamond, square shape. Round shape is the most common shape of mirror used.

Techniques: Combination of chain, herringbone, satin and buttonhole stitch are the stitches used. Products Garments cushion covers, purses, bedsheets, curtains, wall hangings, decorative items, laces etc.

Kasuti: Kasuti is famous embroidery of Karnataka. The word kasuti means hand work done on cotton as Kai means hand and suti means cotton. There is no right or wrong side. Both sides of fabric are identical.

Material: Embroidery is done on cotton fabrics with cotton threads. These threads are of variety of colours like maroon, yellow, red, green etc.

Techniques: There are four types of stitches that are used to make designs. These are: Gavanti : it is a double running stitch and is used in straight, diagonal, horizontal and vertical lines Muragi: it is a zig-zag stitch and looks like a ladder Negi: it is a darning stitch in which long and short lines are used Menthi: it is a cross stitch which resembles fenugreek seeds.

Motifs: This embroidery is rich in symbolic motifs. Symbols and designs come from temples, caves, shrines, the flora and fauna of region.

Products: Sarees, cholis, lehngas and bonnets for children.

Kantha: Kantha is the traditional form of embroidery of West Bengal. The word kantha literally means 'rags'. Originally it was done by women at their homes only but now it is commercialized and even men do it. There are 7 types of kanthas – Lep – thick quilted wrap for winters Soojni – large blanket for ceremonial occasion Bayton – wrapper for books and valuables Oaar – pillow cover Arsilata – cover for

comb and mirror Durjani or Thalia – quilted wallets made of rectangular kantha pieces Rumal – plate covers.

Material: The old cotton clothes are placed on the top of each other till the required thickness. The edges of all the fabrics are then folded and loosely tacked together. Most popular colours are blue, yellow, red and black. The outline of motifs is generally done in dark colours.

Techniques: The embroidery is done on many layers of cloths which are old and are not used. The cloths which are now a single unit are quilted in white thread. Different types of stitches are used but the most common one is the small running stitch, producing dotted effect.

Designs: Beautiful motifs of flowers, animals, birds, mythological figures and geometrical shapes, as well as themes from everyday activities are used as an inspiration for the designs. The center motif is generally lotus.

Products: Originally done on sarees nowadays it is also done on quilts, bedsheets, blankets, saris, salwar suits, stoles, napkins, shirts for men and women etc.

Zardozi: Zardozi work is an ancient form of embroidery basically done with gold or silver zari threads. It is also known as metal embroidery. Although now-a-days it is also done with colored metal threads. The word Zardozi is derived by combining two words Zar and Dozi which in Persian language means gold and embroidery respectively.

Techniques: The process of doing Zardozi on the fabric is time consuming and done by hand. A hooked needle called ari is used to do the embroidery on the fabric which is stretched on a wooden frame. The embroidery is done by picking up single thread in the needle and sewing it into the cloth. This art requires patience and is quite complicated. Expertise is required to do it properly.

Material: As zardozi is done with coiled metal wires studded with stones, beads, etc which is heavy in weight therefore is done on fabrics that are thick and heavy like silk, velvet, stain, crepe, etc.

Technique: The main stitches employed are chain, satin, stem and couching. Apart from zari, badla (thin metal strip), gijai (a thin stiff wire), sitara (a small piece appearing like star), salma, sea-pearls are also used.

Designs: The process of Zardozi revolves around six basic designs which have larger variation. These basic designs are jali (geometric design), bharat (filler design), Patti (leaf), phul (flower), pankhi (bird) and janwar (animal).

Products: Garments cushion covers, table cloths, wall hanging, fabric purses etc.

Applique Work: Applique is practiced in the state of Orissa and Rajasthan. In this decorative art one piece of cloth is sewn or fixed onto other.

Materials: The base material is prepared in the shape of square, rectangle, and circle or oval which forms the background for the pieces of art. The colour of base material is red, purple, yellow, green and white.

Techniques: Appliqué motifs in contrasting colours to the base fabric are cut in the shape of motifs. These motifs are then stitched onto the base cloth according to

the design. After applying these appliqué patches to the base cloth, the borders are then stitched.

Motifs: The appliqué motifs can be cut in the shape of animals, birds, flowers, leaves, celestial bodies and geometric shapes.

Conclusion

Today in our apparels we can see all the above designs in some form thus reviving tradition and culture of our country. The age old embroideries of India are living examples of the height Indians reached centuries ago. Not only in sculpture or architecture did Indians excel, but in embroidery too India has no match. The rich textiles of India and the wonderful creative abilities of the craftsmen favored such excellence. Over centuries the villages of India gave birth to generations of weavers and skilled craftsmen who with their nimble fingers, inimitable patience and awe inspiring sense of art have created yards of fine and flawless embroidery

AESTHETIC SENSE IN THE APPARELS OF TAMIL PEOPLE IN ANCIENT TAMIL LITERATURE

Dr. K. Selvi
Associate Professor& Head, Department of Tamil
Seethalakshmi Ramaswami College, Trichy

Abstract

The aim of the paper is to bring out the rich cultural heritage of the ancient Tamil people especially women and the variety of dress materials they had worn and the jewellery items that matched the clothes they had worn. The word 'culture' is an umbrella term which includes the way the women had adorned themselves and the things with which they weaved their clothes to suit their environment and climatic conditions. There are many evidences in Tamil literature to prove this and the books like Silapathigaram, Natrinai, Maduraikanchi and NedunalVaadai, Kalithogai and SeevagaChinthamani elaborately explain the apparels used by the women to beautify themselves. These textiles added pride to the aesthetic sense of the people and show how they preserve the pristine glory of Mother Nature.

Introduction

Tamil Literature abounds with references to the textiles and the dress materials used by the ancient Tamil people. They embellished themselves with myriad colours of clothes made of cotton and silk materials and expressed their sense of beauty and taste, based on their social and economic background. Both men and women had a very strong and sturdy personality and had woven their dress materials by themselves or used the leaves of some trees like neem which have medicinal properties, the flowers and the fibres of some particular trees for dressing up themselves in an exquisite and exuberant manner.They used the dresses made of the leaves and flowers of Asoka tree, Vilvam, Kuvalai, Pidavam, Sengazhuneer, Aambal, Vayalaikodi, Kanjankullai, Seyalaikodi and Nochchi. From the point of view of health, the dresses reduced their body heat and cooled down their temperament and regulated their swings of mood. They starched the cotton materials and worn them very neatly and decently. From the economic point of view, the queens and the rich people wore costly dresses studded with pearls and other precious stones bordered with myriad coloured silk laces and designed their dresses in an artistic manner. The poor people wore very simple dresses to suit their income. They used natural dyes like "red from many sources including lac, and the chay plant, blue from the indigo plant, yellow from turmeric and other plant sources and black from tannin bearing plants". These four colours were the dominant colours found in the clothes though they differed in texture and durability. The white coloured cloth was compared to foam, milk, fog and some clothes were compared to the skin of a snake – very different in pattern design and colour. They also used the fur of lambs and shiny hair of rats, in order to use them during winter season, to provide them warmth and heat. The word 'Culture' is an umbrella term which includes the dress sense of the

people, especially the ancient Tamil people which manifest their modesty and sense of beauty. The various books written in Tamil literature in the ancient period like Silapathigaram, Natrinai, Maduraikanchi,NedunalVaadai, Kalithogai and Seevaga Chinthamani elaborately describes the fabrics from which they had woven their own clothes. Attruppadai book provides evidence that the kings patronized the poets and the poor by giving them materials which were transparent and comfortable to wear. The people who lived in Mullai landscape used clothes with some paintings and drawings of zodiac signs. From various evidences we come to know that the aesthetic sense of the Tamil people is very remarkable and it deserves appreciation.The meticulous effort they took in protecting the natural resources and eco – friendly practices they adopted in making the dress materials to suit their environment are worth noticeable and they could be emulated by the present generation which spoils the natural resources by abusing and misusing them. The description of gods and goddesses in sangam literature is very gorgeous and extraordinarily beautiful. For example, in Kumaragurubarar's Muthukkumarasamy Pillai Tamizh, he describes the beauty of the Silambu (anklet) made of pure gold, the waist the waist band, the shining pearl ornaments on the foreheadpottu and a round dangling Netrichutti, a heavy and round ornaments attached with thin wire (Gundalam) hanging on their ears, the hairdo on top of the head with the original pearl ornaments fixed on it – wow! What a wonderful way the ornaments of Lord Muruga, in his young age were described. The ornaments, the precious stones and the jewellery items are nothing if the colourful dress of the child had worn is not mentioned, Likewise many gods and goddesess clothes and ornaments are exquisitely described in ancient Tamil Literature

Conclusion

Thus the ancient Tamil people disseminated the knowledge of the nature and the richness of their dress (textiles), ornaments and other accessories used by them through the works in ancient Tamil Literature to the whole world. Empowerment is the outcome of education of women their dress code is the expression of their culture.

References

1. Natrinai
2. Maduraikanjiand Nedunalvaadai
3. Silappathikaram
4. Kalithogai
5. Seevagachinthamani
6. Menon, Parvathi : The Hindu : The whole six yards -Date: 11.10.2015

A STUDY ON BAMBOO/COTTON AND BAMBOO/POLYESTER BLENDED WOVEN FABRIC

C. Sheeba
Assistant Professor, Department of Costume Design & Fashion, Kongunadu Arts and Science College, Coimbatore.
P.Sasikala
Associate Professor, Department of Costume Design & Fashion PSG College of Arts & Science, Coimbatore
Dr. K.Thangamani
Professor, Department of Textile Technology Kumaraguru College of Technology, Coimbatore

Abstract

The main objective of the study is to know the resemblances and differences between natural/regenerated and manmade/ regenerated blended fabrics. In this study the investigator selected two different fibres such as natural fibre (cotton) and manmade fibre (polyester) and blended it with the regenerated fibre (bamboo). The bamboo / cotton and bamboo / polyester blended yarns were made into a fabric, processed and fragrance finish was given to compare the properties between the two finished fabrics, before and after laundering. On comparison it was clear that the bamboo/cotton fabric showed, better geometrical, physical and mechanical properties; whereas bamboo/polyester fabric showed, better comfort and absorbency properties. Bamboo fabrics are now a day's filling the vacancy in the textile material development in our textile production nation and these will inevitably stimulate the new fabric development through blending and finishing, among the cotton, wool and silk and bring the textile corporations a new opportunity.

Introduction

Clothing is one among the most important three basic needs in every human life. It protects our body from various climates and gives us a good appearance says Vimala and Ramalakshmi (2008). Consumers are becoming increasingly very much conscious to environmental friendly consumer goods and much concerned about the green activities. This tendency for eco friendly come into contact with the skin for a prolonged period of the time says Dharani et al (2010). Cotton is an important textile fiber for human clothing and certain other needs ever since the fiber of the cotton plant was first observed and identified for its potential and the art of hand spinning and its numerous other uses were identified says Ravindranath and Srinivasan (2009). Bamboo is an important forest biomass resource. Bamboo textiles have many properties when used as textile materials such as high tenacity, excellent thermal conductivity, resistant to bacteria, and high water and perspiration adsorption. Yarns of bamboo fiber provide the desirable properties of high absorbency, antibacterial and soft feel in textiles and made ups. Bamboo textile products are having high demands in the market because of their antibacterial nature, biodegradable properties, high moisture absorption capacity, softness and UV protective capacity, breathability and fast drying behavior, bamboo fiber ensure comfort in various applications Currently, regenerated bamboo fibers are used in apparels including undergarments, sports

textile, t-shirts and socks.tey are also suitable for hygienic products and sanitary napkins, absorbing pads, masks, bandages and surgical gowns(Saravanan et al.,2007; Prakash et al., 2011). Bamboo can be spun purely or blended with other material such as cotton, hemp, silk, lyocel l, and modal. Cotton has been one of the most human friendly plants with its soft, luxury and hygienic touch to the skin. The purpose of blending is to produce yarn with such qualities that cannot be obtained by using one type of fiber alone. Blending is also practiced for reasons of economic production, shortage of natural fiber, better performance in spinning, to improve the yarn strength, yarn evenness, imperfection level etc the combination bamboo and cotton proved as a supreme blends components for modern and luxurious life. Polyester fibers are long chain polymers produced from elements derived from coal, air, water, and petroleum. As defined by the FTC, these fibers are chemically composed of "at least 85 percent by weight of an ester of a substituted aromatic carboxylic acid, but not restricted to substituted terephthalate units and para substituted hydroxybenzoate units." The work of (W.H Carothers 2004), on linear fiber forming polymers put his initials effort on polyester by polycondensation method. The polyester was aliphatic polyesters, made from dibasic acids like adipic acids and glycols. The melting points of the polymers were below 100° c having molecular weight in the range of 2500-5000. It is only a short step onwards from him to J.R Whinfield and J.T.Dickson, who prepared the first high molecular weight, high melting polyester in 1940. This polymer is poly (ethylene terephthalate) or poly (oxyethylene oxy terephthaloyl) or simply PET.

Materials & Methods

The investigator selected 100% regenerated bamboo fibre to blend it with 100% natural cotton and 100% man made polyester fibres. The fibres were blended in the ratio of 65:35 bamboo / cotton and 65:35 bamboo / polyester and made into yarns. Blended bamboo/cotton and bamboo/polyester fabrics were woven in twill weave structure. Then the woven fabrics were scoured, bleached and finished with fragrance finish. The fabrics were evaluated for its physical and mechanical properties and wear study was also carried out. The fabrics were evaluated for various properties like Geometrical which includes EPI & PPI, thickness, GSM, Physical which includes Tensile Strength, Tearing Strength, Mechanical which includes Abrasion resistance and Bursting strength, Comfort properties like Crease Recovery, stiffness, Absorbency properties like Wickability test and Drop test, and washing.

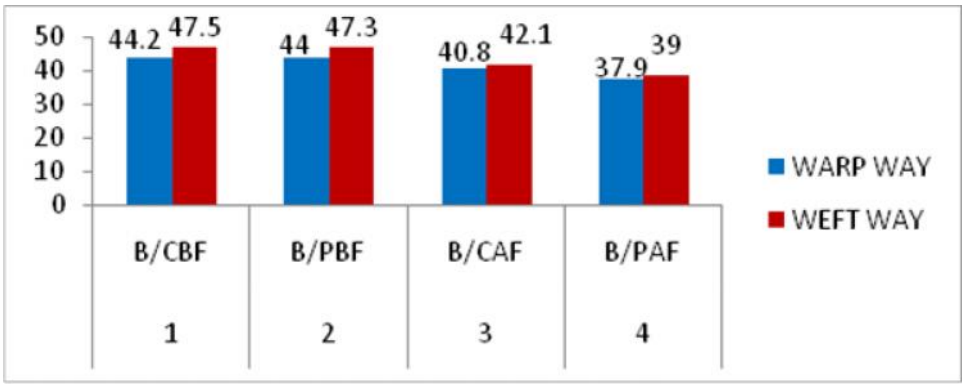
Results & Discussion

Geometrical Properties

EPI&PPI: Bamboo/Cotton and Bamboo/Polyester samples were found to have equal number of warp, whereas Bamboo/Cotton samples were found to have the higher number of weft than Bamboo/Polyester samples in before finishing. After finishing, there was no difference in the warp and weft value, for both the Bamboo/Cotton and Bamboo/Polyester samples. **Thickness and GSM:** Bamboo/Cotton and Bamboo/Polyester samples had higher thickness value before finishing, and there was

no difference between the two samples after finishing. The Finished Bamboo/Cotton samples were found to have more GSM than Bamboo/Polyester samples.

Physical Properties Tensile Strength Bamboo/Cotton and Bamboo/Polyester warp and weft way samples were found to have equal Tensile strength value in before finishing. After Finishing Bamboo/Cotton samples showed the higher Tensile Strength than Bamboo/Polyester samples.

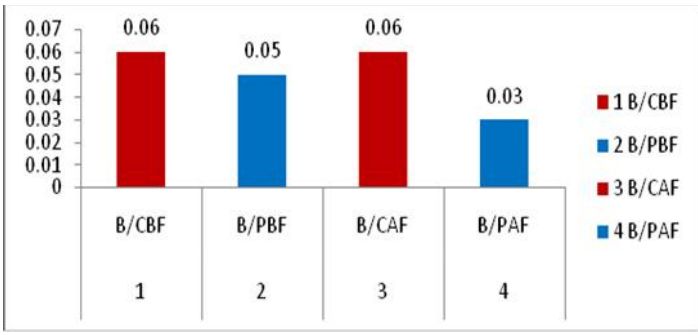


Tearing strength

Bamboo/Polyester warp and weft way samples were found highest Tearing strength value in before and after finishing than Bamboo/Cotton.

Mechanical Properties

Abrasion Resistance

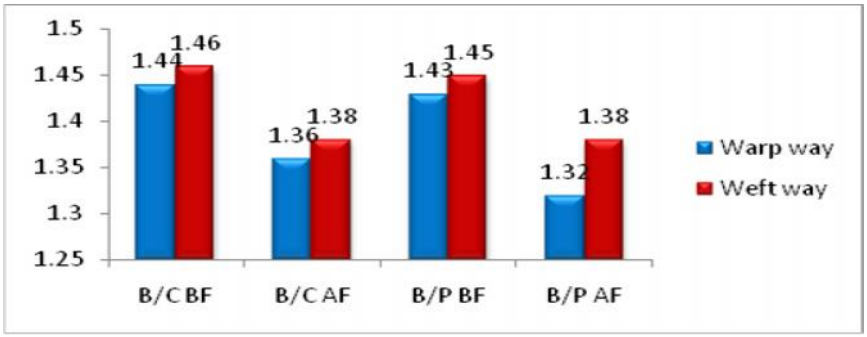


Bamboo/Cotton and Bamboo/Polyester samples had equal resistance against abrasion in Before Finishing. After Finishing Bamboo/Cotton samples showed the best resistance against abrasion than Bamboo/Polyester samples.

Bursting Strength: Bamboo/Polyester samples showed more strength against bursting than Bamboo/Cotton samples before and even after Finishing.

Comfort Properties

Crease Recovery: Bamboo/Polyester sample in warp and weft way had highest recovery than Bamboo/Cotton before after Finishing.



Stiffness: Both Bamboo/Cotton and Bamboo/Polyester samples showed highest Stiffness in warp and weft way in Before Finishing. After Finishing, in warp direction,

Bamboo/Cotton samples were found to have the best Stiffness value than Bamboo/Polyester samples. But in weft direction, both Bamboo/Cotton and Bamboo/Polyester samples had no differences in stiffness value.

Absorbency Property

Wickability: Bamboo/Cotton samples had more absorbency than Bamboo/Polyester samples, even after Finishing.

Performance Test: Both Finished Bamboo/Cotton and Polyester showed good Fragrance property even after many washing.

Conclusion

From the study it is concluded that, the bamboo/Cotton fabric showed good geometrical properties. Bamboo/Cotton fabrics had better Tensile Strength after finishing. Bamboo/Cotton fabrics had better resistance against abrasion in after finishing, whereas Bamboo/Polyester had good bursting strength. Bamboo/Polyester fabrics showed good recovery from crease. Bamboo/Cotton fabrics had good bending, and wicking properties. Both the Finished Bamboo/Cotton & Bamboo/Polyester fabrics showed good washing property. The search of natural, regenerated and manmade fabrics with many positive properties for the consumers who expect innovations in the Home textile and fashion industry has been achieved by this research.

References

1. AATCC Technical Manual (2008), American Association of Textile Chemists and Colorists, USA, Vol.83.
2. Alat, D.V., and Saraf.N.M, (2005), "Processing of Cotton-Solution Providers-Sarex", Colourage, Vol.LII, November, P.73.
3. Benoit Henault and Russ Elms (2001), "New Technologies for fabric care", 9e Giornate CID in Venezia
4. Booth, J.E., (1996), "Principles of Textile Testing", C.B.S. Publishers, Delhi.
5. BS Handbook II (1973), "Methods of test for Textiles" British Standards
6. David Gordan (2010), "Eco friendly Clothing from natural Products" Stitch Times, June, Vol 6, Iss 7, Pp.56.
7. Dharani, E, Janani, S, Mythili, P, Shampavibalu, Surya, S and Senthil Kumar, K, (2010), "Green/Eco-friendly textile manufacturing" Colourage, March, Vol LVII No: 3, P.36.
8. Gokerneshan, N, Durairaj, K, Naresh Kumar and Ihisha Gupta, (2009), "Innovation – the key to boost the textile business", The Textile Magazine, August, Pp. 18-26.
9. Gomathi, C., Manoharan, M., (2009), "Antimicrobial behavior of Socks from Bamboo Fibers" February, The Indian Textile Journal, Vol.CX1X, No.5, P.31.
10. Nayak, R.K., Chatterjee, K., Khandual, A., and Jaipura, L., (2008), "Evaluation of Functional finishes-An Overview", April, Man-Made Textiles, Vol.LI, No.3, P.130
11. www.bambooclothes.com
12. www.fiber2fashion.com

INTERIOR TEXTILES

S.Sneha
III Year B.Design, SRM University, Kattankulathur

Abstract

Fabrics ar wonderful option for interior furnishing. In fact, it is an age-old concept to use fabrics for making interior decoration. The trade expert interior decorators often use fabrics for room decoration keeping symmetry with the arrangement of furniture and wall colors of the room. In other words, the selection of fabric should be in tune with the furniture arrangement and other features of the room and the meticulous use of the fabrics can set the rue tone of the room deciding on its mood and radiating ambience. According to modern interior designing concept some fabrics are widely chosen by interior decorators for making interior decoration and these fabrics are namely silk, chiffon, organza, and stretch fabrics.This paper consist of various application of fabrics used in interior spaces and their additional properties obtained by various chemical processing.

Fibres

Units of matter characterized by flexibility, fineness and high ratio of length to thickness. Other necessary attribute for textiles are adequate strength and resistance to conditions encountered during wears, as well as absence of undesirable colour, and finally the property of dye ability.In generally, the steps in the manufacture of fabrics from raw material to finished goods are as follows:

- Fibre, which is either spun (or twisted) into yarn or else directly compressed into fabric.
- Yarn, which is woven, knitted, or otherwise made into fabric.
- Fabric, which by various dyeing and finishing process becomes consumer's goods.

Classification of Fibres

- **Natural Fibres**

  Natural fibres include those produced by plants, animals, and geological processes. They are biodegradable over time.They can be classified according to their origin:
  - **Vegetable fibres** are generally based on arrangements of cellulose, often with lignin. Examples include cotton, hemp, jute, flax, ramie, and sisal.
  - **Animal fibres** consist largely of particular proteins. Instances are spider silk, sinew, catgut, wool and hair such as cashmere, mohair and angora, fur such as sheepskin, rabbit, mink, fox, beaver, etc.
  - **Mineral fibres** comprise asbestos. Asbestos is the only naturally occurring long mineral fibre. Short, fibre-like minerals include wollastinite, attapulgite and halloysite
- **Manmade fibres:**

  Manmade fibres include those produced by reacting chemicals. They are non- biodegradable. They can be classified according to their origin there are two sorts of man-made fibres: **Organic and Inorganic.**Syntheticor

man-made fibres generally come from synthetic materials such as petrochemicals.

(a) Organic:

Polymer fibres are a subset of man-made fibres, which are based on synthetic chemicals (often from petrochemical sources) rather than arising from natural materials by apurely physical process. Such fibres are made from, **polyamide nylon**,**PET or PBT polyester, phenol-formaldehyde (PF), polyvinyl alcohol fibre (PVOH), polyvinyl chloride fibre, (PVC), polyolefins (PP and PE), acrylic polymers**, **pure polyacrylonitrile PANfibres.**

- **Aromatic polyamides (aramides)** such as Twaron, Kevlar and Nomex thermally degrade at high temperatures and do not melt. These fibres have strong bonding between polymer chains.
- Polyethylene (PE),Elastomers,Polyurethane fibres,Co-extruded fibres, Regenerated fibres

(b) Inorganic fibres

Mineral fibres,Glass fibres, Metallic fibres,Carbon fibres

Advantages of Using Fabrics in Interiors:-

- Fabric affords sun and light control.
- Fabric prevents interior colour from fading.
- Fabric prevents deterioration through sunlight.
- Protects eyes from glare.
- Protection from night blackness at evening and too-early sun in the morning.
- It can make summer room cooler and reduce air-conditioning load.
- Increase livability and workability of small space.
- It also reduces noise; make music even speech richer and more resonant.

Application of Textiles

Acoustics,Textiles for seating, Upholstery fabrics for contract use, Window textile, Sun filter, Semi sheer, Reflective textile, Curtain fabrics and drapes, Blinds, Bed textiles, Sheet and pillowcases, Quilted textiles, Blankets, Bed spreads, Mattress covers (Ticking), Fabrics for wall coverings, Bathroom textiles, Shower curtains, Terry towels, Table textile, Tablecloth, Tablemats, Textile art (wall hangings).

Selection of Fiber for Home Textiles

End use, cost factor, durability, comfort and aesthetic properties are some of key factors to be considered while selecting the fibres for making home textiles. In order to achieve the above, the following measurable properties of fibres are to be balanced.

- Tensile strength - Tenacity at break, Modulus and Elasticity.
- Moisture Absorption / Content properties.
- Optical behaviours like reflection / absorption of light and shape of fibre.
- Eco friendliness.
- Electrical and thermal characteristics such as fibre ability to dissipate static charge.

Advantages of Choosing A Fiber Type

Fibre Type	Advantages	
Cotton / Linen	Comfort	Moisture & Thermal Character.
	Aesthetic	Low Lusture& Surface Irregularity.
Wool	Comfort	Warmth.
Viscose / Polynosic/ Modal	Cost	Lower than Cotton.
	Comfort	High Moisture Absorption / Retention Capacity.
Polyester/Acrylic Polyamide/ Polypropylene	Cost	Longer Durability, High Strength & Tough.
	Comfort	Low Moisture Absorption Capacity, Low Thermo Plasticity.

Sometimes, modified fibres are also blended to achieve the desired end products and other factors like cost reduction and special colouring effects. The most common blends for home textiles are polyester /cellulosic, polyester/acrylic in the proportion 50:50 are 67:33 Blends with more than 50% fibre are termed ad richer fabric of that fibre; Cotton-rich, Polyester-rich, etc.

1.Bed Sheet:-

Raw Material: Cotton, Linen, P / C. It can be made up of the following cloths:

Cloth	Raw Material	Weave
Cambric	Cotton or Wool	Plain
Dimity	Cotton	Plain with Cross / Length wise and Cross Bar Effect
DottedSwiss	Cotton	Plain Ground With Swivel, Lappet)
Gingham	Cotton	Plain (Stripe, check Plaids)
Corduroy	Cotton, Rayon	Filling Pile with Plain or Twill Back.
Crettone	Cotton, Linen, Rayon	Plain or Twill.
Denim	Cotton	Twill, Right Handed L2/1, L3/1
Organza	Cotton	Plain, Swivel, lappet or Flocked Design
Plisse	Cotton, Rayon	Plain
Sateen	Cotton, Rayon	Sateen
Seersucker	Cotton, Rayon	Plain with Slack Tension

Finishing:

- Anti – Shrink Finish
- Softening
- Anti – Microbial Finish
- Crease Recovery Finish
- Anti – Pilling finish

2. Pillows

Raw Material:

- Feathers of Goose, Rabbit, Down, Duck, etc. (In Cold Countries)
- Polyester, Cotton (In Hot Countries)

Cloth	Raw Material	Weave
Crettone	Cotton, Linen,	Plain, Twill weaves
Tiking	Cotton, Rayon	Twill (L2, L3) Satin, Dobby & Jacquard

Consumer Requirements / Characteristics:

- Softer & Lighter
- Shape Retention
- Warmth / Coolness

Finishing:

- Softening
- Anti -Microbial Finish, Anti – Shrink Finish, Fire Retardant Finish

4. Blankets & Quilts

Raw material: Woolen, Cotton, P/C, Acrylic.

Cloth	Raw material	Weave
Calico	Cotton	Plain
Chinchilla	Cotton, Wool	Sateen, Twill with Extra Filling
Flannelette	Cotton	Plain ; Twill

Consumer Requirements / Characteristics:

- Warmth & Soft and Smooth
- Heavy dense
- Hard Wearing

Finishing

- Fire Retardant finishing
- Softening
- Anti – Microbial

5. Table Cloth:-

Raw Material: Cotton, Polyester, P/V, P/C.

Cloth	Raw Material	Weave
Brocade	Cotton (Ground), Viscose (Pattern)	Jacquard, Dobby
Monk's Cloth	Wool, Cotton, Linen, Silk, Rayon	4 * 4 Basket Weave
Chenille	Cotton	Plain

Consumer Requirements / Characteristics:

- Absorb Moisture
- Stain Repellent
- Easy wash care
- Hard wearing

Finishing:

- Fire – Retardant finish
- Stain – Repellent finish
- Anti – Shrinkage finish

6. Furnishing Fabrics :-

- **Raw Materials:** Cotton, Polyester, Silk, P/C.

Cloth	Raw Material	Weave
Brocade	Cotton (Ground)Viscose (Pattern)	Jacquard, Dobby
Chenille	Cotton	Plain
Organd	Cotton	Plain with swivel, lappet
Lawn	Cotton	Plain
Gingham	Cotton	Plain(Stripes, Checks, Plaids)
Point de sprit	Cotton, Silk	Leno, Gauze
Voile	Cotton,wool	Plain loosely woven

Consumer Requirements / Characteristics:

- Good Colour Combination, Fastness towards Light, Sufficient Weight.

Finishing:

- Fire – Retardant finishes
- Anti – shrink treatment

7. Upholstery Fabrics:-

Raw Materials: Cotton, Rayon, Polypropylene, Acrylic.

Cloth	Raw Material	Weave
Corduroy	Cotton, Rayon	Pile with Plain or Twill
Denim	Cotton	Twill RH or L2/1,L3/1
Tiking	Cotton	Twill L2/1,L3/1,Satin, Jacquard, Dobby
Monk's Cloth	Wool, Cotton, Linen, Silk, Rayon	4 * 4 Basket Weave
Chenille	Cotton	Plain

Consumer Requirements / Characteristics:

- Soft
- Comfort
- Hard Wearing
- Stain – Repellent finish

Finishing

- Fire – Retardant finish
- Stain – Repellent finish

8. Cushion Covers:-

Raw Material: Cotton, Polyester, P / C, other Synthetics.

Consumer Requirements / Characteristics:

- Soft
- Comfort
- Stain – Repellent

Finishing:

- Stain – Repellent finish
- Fire – Retardant finish

9. Window Textiles:-

Raw material used: Polyester, flax, viscose, cotton, silk, acetate, jute, hemp, glass, and modacrilics.

Requirements:

- Sun filters,Easy washing (similar washing reaction for all dyes used),Printed (natural designs),Solid colour dyeing,Reflective textiles (Reduce solar gain prevent sun glare).

10.Curtain Fabrics:-

Requirements:

- Drape flame retardancy, Excellent light fastness
- Opacity
- Waterproof
- Resistance to crease
- Good aesthetic property

11. Wall Covering:-

- They are taking over market from paints.

Raw material used:

Jute (original), flax, cotton, polyurethane foam liner, laminated non-woven's.

Requirements:

- Low flammability
- Good sound absorber
- Soil release
- Excellent **light fastness**
- Absorbing sound waves within the material is best achieve by material that are fibrous or cellular by nature such as mineral fibre and glass wool

12. Shower Curtains:

Requirements:

- Water proof

Special treatments: These are plastic coated (Interlined with HDPE, LDPE).

13. Table Textiles:

Raw material used: Cotton, linen, polyester blends, flax) PAN.

Requirements:

Soft handle, Stain proof, Drape properties, Excellent wash-n-wear, Durability, Good strength, Dimensional stability, Wrinkle resistant, Shape recovery, Heat insulation property.

14. Textile Art& Wall Hangings:

- Tapestry

Raw material used: Cotton, worsted wool.

Conclusion

Fabric is such a material that is used by most of the interior decorators to cure any flaw in the interior architecture. There are many other primary functions of fabrics in interior decoration apart from this secondary function of hiding defects in furniture and architecture. Fabrics provide good insulation, keeping cool in summers and warm in winters according to the choice of fabrics.They can be used almost everywhere and can take almost any shape and size. No other material can be used with so much of versatility. They can be reused, changed or replaced with great ease.

AGRO TECH

R.Sowmiya
III-B.Sc (Home science), Seethalakshmi Ramaswami College, Trichirapalli

Abstract

Textiles used in Agriculture are termed as agro textiles. They are used for crop protection, fertilisation, The essential properties required are strength, elongation, stiffness, and bio-degradation, resistance to sunlight and resistance to toxic environment. All these properties help with the growth and harvesting of crops and other foodstuffs. There is a growing interest in using materials which gradually degrade.

Some of the examples of agro textiles are:

- Preventing erosion and paving way for afforestation in greenhouse cover and fishing nets.
- For Layer separation in fields, nets for plants, rootless plants & protecting grassy areas.
- As sun screens (since they have adjustable screening) and wind shields.
- As packing material and in bags for storing grass (that has been mowed).
- Controlling stretch in knitted nets.
- Shade for basins.
- Anti-birds nets.
- Fabrics for sifting and separation, for the phases of enlargement of the larvae.
- Materials for ground and plant water management at the time of scarcity and abundance of water.

Introduction

Technical textiles are defined as 'textile materials and products manufactured primarily for their technical and performance properties rather than their aesthetic or decorative characteristics'. Technical textiles are reported to be the fastest growing sector of the textile industrial sector and account for almost 19% (10 million tonnes) of the total world fiber consumption for all textile uses. Agrotextiles is one of the growing areas of technical textiles. The volume of special textiles that are manufactured for agricultural applications is small compared to other areas of technical textiles. This does not mean that the use of textiles in agriculture is not significant.

Agrotech: Agriculture Aquaculture Horticulture and Forestry.

Agrotextiles is application of textile materials in the agriculture field. With the continuous increase in population worldwide, stress on agricultural crops has increased. So it is necessary to increase the yield and quality of agro-products. But it is not possible to meet fully with the traditionally adopted ways of using pesticides and herbicides. Today, agriculture and horticulture has realized the need of tomorrow

and opting for various technologies to get higher overall yield, quality and tasty agro-products

Properties Required for Agrotextiles Products Withstands Solar Radiation

Agro textiles are laid over the cultivated areas immediately after sowing or planting. For such application Agrotextiles has to withstand solar radiation with varying surrounding temperature.

Withstands Ultraviolet Radiation: Polyethylene is resistant to radiation in the visible range. But UV radiation leads to degradation of molecular chains. Hence when used as an outdoor material polyethylene is treated with the appropriate UV stabilizers. These are special types of carbon black which convert the UV radiation into thermal radiation. Good potential to reduce the impact of UV radiation on plants by light-absorbing or light-reflecting nonwovens (light permeability: 80 to 90% to allow photo synthesis to take place).

Bio Degradability: Natural fibers like wool, jute, cotton are also used where the bio-degradability of product is essential. Natural polymer gives the advantage of bio-degradation but has low service life when compared to the synthetics.

High Potential to Retain Water: This is achieved by means of fiber materials which allow taking in much water and by filling in super-absorbers. While nonwovens meant for the covering of plants show a mass per unit area of 15 to 60 gm/m2, values between 100 and 500 g/m2 are reached with materials for use on embankments and slopes.

Protection Property: Protection from wind and the creation of a micro-climate between the ground and the nonwovens, which results in temperature and humidity being balanced out. At the same time, temperature in the root area rise. This is what causes earlier harvests. Sufficient stiffness, flexibility, evenness, elasticity, bio-degradability, dimensional stability and resistance to wetness. Fungicidal finish (upto 2% of the total mass), which avoids soil contamination.

Techniques of Producing Agro Textile Products

Several techniques of fabric production can be used to produce Agro textiles; each method offers specific advantages for particular product. The techniques are,

Woven *Knitting* *Nonwoven*

Woven

Woven products are produced by using weaving machines especially Sulzer projectile weaving machines. The range of light to heavy and wide width fabric production is possible with Sulzer projectile weaving machine. The machines with weaving width of 540cm to 846cm are available for the production of agro textiles. The nets with a mesh width of 1.8mm to 40mm can be produced. Other systems of woven fabric production such as air jet and rapier weaving machines are not preferred for the manufacture of such fabrics, as they do not have required weaving width.

Knitting

Warp knitting technique is most widely used compare than the weft knitting. Warp knitted protective nets are used in different sectors, which are produced on raschel machines. Agro nets are produced in various constructions or lapping. Here,

the construction or lapping is a way in which individual yarn systems are converted into fabrics.

Nonwovens

There are many techniques to produce Nonwoven fabrics.

Needle-punched nonwovens	Stitch-bonded nonwovens
Thermally bonded nonwovens	Hydro entangled nonwovens
Spun bonded nonwovens	Wet nonwovens

Spun bonding and needle punch techniques are mainly used for the production of nonwoven Agrotextiles. The spun bonded fabric has high and constant tensile strength in all directions. It has also good tearing strength. Needle punched fabric plant bags provide advantages over conventional fired clay pots. All natural fibers offer an added advantage of that the container decomposes after being planted in the ground. Even with man made fibers the roots find their way through the fabric.

Applications of Agro Textiles

Wide varieties of agro textile products are available and the selection of suitable type of products depends on the protection that the crop. Selection of the agro textile is greatly influenced by the geographical location. At some location Agrotextiles are used to protect the plantation from excessive sunlight while at some places it is expected to protect plant from cold. Therefore selection of agro textile is done as per the location and the desired protection from the external agencies. With the use of high quality agro textiles quality and yield of agro products can be enhanced.

Some of the applications of agro textiles are as follows:

Sunscreens	Bird protection net	Plant net
Ground cover	Windshield	Root ball nets
Insect meshes	Turf protection net	Monofil nets
Tape nets	Cherry covers	

Packing materials for agricultural products

Nets for covering pallets

Conclusion

The journey so far through this paper has thus unraveled the macro views of this new venture of textiles interference into Agriculture. We have observed the reduced usage of harmful pesticides and herbicides to render a healthy farming culture. Unique manufacturing techniques and properties of this blend of agrotextile sector products whose cost is lesser than that of pesticides and chemical herbicides have been discussed. Textiles prove to be flexible in its suitability for specific geographical locations. So now it's our turn, to carefully and beautifully shape this infant technology, to contribute to a developed economy and thus a developed country. Coir is having a very high potentiality in agro textile application. Its moisture retention capability and high wet strength has been excellent and the characteristic has been made use extensively in agro textile applications.

"Textile is a global text which has the extra style of applications in all fields, - feel it and endure it"!!

A STUDY ON THE TREND AND GROWTH OF SECONDARY SECTOR IN TAMILNADU

R.Sridevi Karumari
Assistant Professor, Post Graduate and Research Department of Economics,
Seethalakshmi Ramswami College, Tiruchirappalli

Abstract

Industrialization is regarded as one of the greatest revolution of the world. It has a very significant role in economic development of all the country in the world. The industrialization has a major role to play in the economic development of any country in the world. There is positive relationship between per - capita income and share of manufacturing output in per-capita income between development and under developed countries which is reflected in the disparities of industrialization associated with the development of skills of industrial workers and industrial management which are beneficial to growth of productivity, production and employment. Tamil Nadu is the second largest economy in India with a current GSDP of Rs.13, 842 billion. Per capita GDP of Tamil Nadu was $3,000 in the year 2014-2015, the third highest in India. Over 50% of the state is urbanized, accounting for 9.6% of the urban population in the country while only comprising 6% of India's total population.

Tamil Nadu is one of the leading states in the textile sector and it houses the country's largest spinning industry accounting for almost 80 percent of the total installed capacity in India. According to official data, the textile in Tamil Nadu accounts for 17 percent of the total invested capital in all the industries. Coimbatore is often referred to as the "Manchester of South India" due to its cotton production and textile industries "Textile valley of India" is Tirupur with the exports from the Tirupur industries is Rs. 50,000 million and Karur garments generates around Rs. 35,000 million a year in foreign exchange. Out of 2049 large and medium textile mills in India, 893 mills are located in Tamil Nadu. Similarly out of 996 small units in India 792 are located in Tamil Nadu.

Key words: *Industrialization, Textile, Net state domestic product, Secondary sector.*

Introduction

Industrialization is regarded as one of the greatest revolutions of the world. The industrialization has a major role to play in the economic development of any country in the world. According to Karl Marx, industrialization process is the logical dialectical progression of feudal economic modes necessary for the full development of capitalization which he saw in itself as a necessary precursor to the development of socialism and eventually communism.

Need for Industrialization

Industrialization of an economy provides productive employment to the workforce which will otherwise be unemployed or under employed in the primary sector. It can stabilize the income through diversification of productive sectors of the economy. Industrialization alters the nature of the economy from a primary product exporting one to one that exports in industrial manufactures. It helps to shift the economy from a stage of producing import-substituting products to a stage of producing sophisticated industrial manufactures for export markets. Industrialization paves the way for development of the rural economy. The vertical

linkages with other manufacturing sectors of the economy bring all the sector of the economy on the path of development.

Tamil Nadu Economy

Tamil Nadu is the fourth largest state of India. Located in the southernmost part of the country, Gross state domestic product (GSDP) of Tamil Nadu grew at a compound annual growth rate (CAGR) of 12.31 per cent between 2004-05 and 2015-16, reaching US$ 175.33 billion in 2015-16. Per capita GSDP of the state was US$ 2,430.5 (at current prices) in 2015-16.Tamil Nadu has a diversified manufacturing sector and features among the leaders in several industries like automobiles and auto components, engineering, pharmaceuticals, garments, textile products, leather products, chemicals, plastics, etc. It ranks first among the states in terms of number of factories and industrial workers. Due to its achievements as an auto production hub, Chennai has been dubbed as the "Detroit of India". Tirupur and Coimbatore are the major textile centers in Tamil Nadu. Close proximity with East Asian countries is also enabling Chennai to become an international finance hub.

Importance of Textiles Industry in Tamil Nadu

Tamil Nadu is one of the leading states in the textile sector and it houses the country's largest spinning industry accounting for almost 80 percent of the total installed capacity in India. According to official data, the textile in Tamil Nadu accounts for 17 percent of the total invested capital in all the industries. Coimbatore is often referred to as the "Manchester of South India" due to its cotton production and textile industries "Textile valley of India" is Tirupur with the exports from the Tirupur industries is Rs. 50,000 million and Karur garments generates around Rs. 35,000 million a year in foreign exchange. Out of 2049 large and medium textile mills in India, 893 mills are located in Tamil Nadu. Similarly out of 996 small units in India 792 are located in Tamil Nadu.

Importance of the Study

Industrial development is inevitable for the economic development of the country. The structure of development in an economy follows a particular pattern. The move is normally from agriculture to industry to service sector but a view of industrial development shows a revenue pattern. An industrialized state, Tamil Nadu has shown consistent performance over the last decade. It has grown at an average annual growth rate of 10.8 percent between 2009-10 and 2014-15. When we come to the secondary sector, manufacturing sector is playing vital role in the development of industries in Tamil Nadu. Textile industry of Tamil Nadu is the forerunner in industrial development and in providing massive employment in the state. It is predominantly spinning oriented. In Tamil Nadu Economy, economic transformation is being noticed in the state economy. The relative share of agriculture in GSDP shrank while the relative share of service sector ratched up. The relative share of secondary sector remained stagnant. The state economy has become service-determine and the service sector had been the engine of overall economic growth. There is necessary to study the performance of secondary sector in Tamil Nadu and the sub-sectoral shares of secondary sector to the total Net State domestic product.

Objectives of the Study

- To assess the rate of growth of secondary sector in Tamil Nadu from 1999-2000 to 2014-2015.
- To study the contribution of secondary sector in Tamil Nadu economy from 1999-2000 to 2014-2015.

Data Source and Time Frame

Secondary sources are the basis for the study. The period taken for the analysis is from 1999-2000 to 2014-2015. The relevant data for Tamil Nadu's secondary sector is collected from Tamil Nadu Economic Appraisal various issues published by the government of Tamil Nadu.

- **Methodology -** To analyze the trend and growth of secondary sector in Tamil Nadu from 1999-2000 to 2014-2015 the following model has been used.
- **Trend model - Y**= $\beta_0 + \beta_1 + \mu$ Where Y = dependent variable, β_0= constant, β_1= slope coefficient, μ= stochastic variable.
- **Semi – log model -** Log Y= $\beta_0 + \beta_1 + \mu$ Where: compound growth rate = [(antilog b-1)] x100 β_0= constant, β_1= growth of the respective variable, μ= stochastic variable.'

Analysis of Share

In order to study the share of three sectors and particularly the share of secondary sector in total Net State domestic product of Tamil Nadu percentage share analysis has been used.

Table 1 Trend and overall growth of Tamil Nadu economy from 1999-2000 to 2014-2015

		Linear model			Semi – log model			
S.No	**Variables**	**Absolute growth rate B**	**T**	**R^2**	**B**	**T**	**R^2**	**Compound growth rate %**
1.	Net state domestic product	2044796.5	17.159*	95.8	0.079	26.654*	98.2	8.2
2.	Per-capita income	2854.8	15.497*	94.9	0.072	18.773*	96.4	7.4
3.	Primary sector	72224.2	4.296*	58.7	0.026	3.939*	54.4	2.6
4.	Secondary sector	518003.6	14.686*	94.3	0.072	16.986*	95.7	7.5
5.	Tertiary sector	1455510.2	17.545*	95.6	0.092	30.735	98.6	9.6

Note: * Indicates significant at 5% percent level

Tamil Nadu Economic Appraisal (various issues)

Table – 1 shows the result of the Trend equation and compound growth rate for the Tamil nadu in terms of Net state domestic product, per capita income, primary, secondary and tertiary sectors. The R^2 values are found to be highly satisfactory. The trend co-efficient for the variables in the study period are found to be statistically significant at 5% percent level. The Tamil Nadu economy has grown at an absolute rate of Rs.20,44,796 lakh for the whole period of study. The growth of Per-capita income has grown at an absolute rate of Rs. 2,856 lakh for the whole period of study. The sectoral analysis reveals that when the three sectors are compared the primary sector has grown at an absolute rate of Rs.72,224 lakh for the

whole periods of study. When we see the growth of secondary sector it clearly reveals that it has grown at absolute rate of Rs. 5, 18,004 lakh and the tertiary sector has grown at an absolute rate of Rs.14, 55,510 lakh. The compound growth rate of Tamil Nadu economy for the whole period is 8.2 percent per annum and the growth rate of per capita income is 7.4 percent per annum. Similarly the growth rates of primary, secondary and tertiary sectors are 2.6, 7.5 and 9.6 percent per annum for the whole period.

Table 2 Trend and overall growth of secondary sector in Tamil Nadu economy from 1999-2000 to 2014-2015

		Linear model			Semi – log model			
S.No	**Variables**	**Absolute growth rate B**	**T**	**R^2**	**b**	**T**	**R^2**	**Compound growth rate(%)**
1.	Manufacturing	341915.179	11.79*	91.7	0.077	13.167*	93.0	8.0
2.	Electricity, gas and water supply	-11851.125	-1.896*	20.9	-0.074	-1.855*	20.9	-7.6
3.	Construction	212254.329	18.408*	96.3	0.093	21.702	97.3	9.7

Note: * Indicates significant at 5% percent level

Source: Tamil Nadu Economic Appraisal (various issues)

Table-2 shows the result of the trend equation and compound growth rate for the secondary sector of Tamil Nadu in terms of manufacturing, Electricity, Gas and Water supply and Construction. The R^2 are values are found to be highly satisfactory. The trend co-efficient for the variables in the study period are found to be statistically significant at 5 percentage level except for the sub-sector Electricity, Gas and Water supply. The sub - sector Manufacturing has grown at an absolute rate Rs. 3,41,915 lakh, where as the growth of Electricity, Gas and Water supply is negative at the absolute rate of Rs. -11,851 lakh. Similarly the construction has grown at an absolute rate of Rs. 2,12,254 lakh for the whole period of study. Within the Secondary sector the annual compound growth rate of manufacturing is 8.0 percent and it is significant at 5 percentage level. The annual compound growth rate of Electricity, Gas and Water supply is -7.6 percent and it is not significant at 5 percentage level. The annual compound growth rate of construction is 9.7 percent per annum and it is significant at 5 percentage level. From the results it is revealed that the overall growth of secondary sector is due to the growth and income generated in the manufacturing and the construction sector.

Table – 2 Sectoral share of Secondary to the total Net state domestic product from 1999-2000 to 2014-2015

(In percentages/lakhs)

Year	Manufacturing	Electricity, Gas and Water supply	Construction
1999 – 2000	18.25	2.19	7.94
2000 – 2001	18.57	2.33	7.77
2001 -2002	16.48	1.07	8.03
2002 -2003	15.80	1.95	8.20

2003 -2004	16.71	1.26	8.24
2004 -2005	16.95	1.34	9.69
2005 – 2006	17.19	1.16	9.83
2006 – 2007	17.76	1.03	8.84
2007 – 2008	16.65	0.68	9.81
2008 – 2009	15.13	0.16	9.83
2009 – 2010	18.14	0.17	9.37
2010 – 2011	18.31	0.21	8.97
2011 – 2012	17.25	0.18	10.09
2012 – 2013	16.78	0.81	9.51
2013 – 2014	16.34	0.68	8.95
2014 – 2015	17.09	1.01	9.00

Source: computed by the researcher

The above Table- 3 shows the relative share of secondary sector to the total Net sate domestic product of Tamil Nadu. The secondary sector comprises of mainly the industrial sector which mainly occupies the manufacturing sector. From sub-sectoral analysis it is revealed that within the secondary sector it is the Manufacturing which has the highest share in total Net state domestic product of Tamil Nadu compared to the other two sectors. The results reveal that the share of manufacturing is more or less stagnant and the share of construction is constant whereas the share of Electricity, Gas and Water supply is negative.

Conclusion

According to the 2011 census, Tamil Nadu is the most urbanized state in India accounting for 9.6 percent of the urban population while only comprising 6 percent of India's total population and is the most urbanized state in India. Services contribute to 45 percent of the economic activity in the state followed by manufacturing at 34 percent and agriculture at 21 percent. Even though the economy is growing the real per-capita income should increase over the long period of time. The growth process should be like that it should benefit the weakest section of the society. The state should aim at a acceleration in the growth of secondary sector particularly the manufacturing sector which is accompanied by many industries particularly the textile industry which generate more employment and income in the state as well as in the country.

References

1. Damodar N.Gujarati, Basic Econometrics, Tata Mc Graw- Hill Publication, New Delhi, 2004.
2. Tamil Nadu Economic Appraisal- various issues, Evaluation and applied research development, Government of Tamil Nadu, Chennai- 600 008.
3. Leonard S.J. A.G., "Tamil Nadu Economy" Macmillan publication, Chennai, 2006.
4. Manickam S., Economic Development of Tamil Nadu in perspective, Uyirmmai Publications, Chennai, 2006.
5. Michael P. Todaro, "Economic development", Addison Wesley long main, Inc. New York, 2000.
6. Rajalakshmi N., "Tamil Nadu Economy", Kalyani Publications, New Delhi, 1987.

SPORTS CLOTHING TECHNOLOGY THE FUTURE OF SPORTS

T.Suthamathi
Directress of Physical Education / Associate Professor
Seethalakshmi Ramaswami College (Autonomous), Tiruchirappalli

Introduction

Technology has a long-standing and successful relationship with sports. Without technology, sports as we know it would be vastly different. We would have no instant replay for reviewing crucial game winning moments that relied on whether a foot was inches away from a line. There would be no shot clock to let players know how much time they have left to score. We wouldn't even be able to view a sports broadcast from the comfort of our own homes. Clothing technology is involves the manufacturing, materials, and design innovations that have been developed and used. The timeline of clothing and textiles technology includes major changes in the manufacture and distribution of clothing.

Clothing Technology in Sports

Technology in sports clothing is typically about the type of fabric used. Sports clothing needs to aid performance, and this is reflected in the fabrics used – fabrics that are both breathable and comfortable. The idea behind sports clothing technology is that the clothing should work in tandem with our bodies as we exercise, rather than merely sit on them. With that in mind, sportswear companies are turning to so-called smart textiles. Wearable computing devices are something that athletes have been using for some time now, but smart clothing that accesses similar functions is different because the technology is integrated into the clothing itself. The seamless integration of sensors and microprocessors into clothing is an exciting development, but work is still ongoing at a research level to develop materials that integrate technology yet can be safely washed. Laboratory research is also showing advances in such technologies as organic fiber transistors, which contain absolutely no metals, and the integration of organic solar cells into fibers.

Moisture-Wicking Fabrics

These terms are used for athletic clothing that "reacts" to athlete body temperature and perspiration. Moisture wicking fabrics reacts to sweat. Instead of absorbing sweat like normal fabrics, it moves it to the surface of the fabric and evaporates. This innovation helps keep an athlete dry and chaff-free. Thermal technology reacts to temperature. Essentially, thermal tech keeps the body warm while performing in colder conditions and climates. This kind of innovation is essential for any athlete whose performance is easily affected by the cold. More recently "compression" fabrics have been developed that are specially designed for

working out. As the name suggests, the fabric tightens around the muscles being used during a work out to help reach maximum muscular output.

There have also been great advances in protective materials that are being called "reactive materials." Reactive materials are flexible but have the ability to instantly harden on impact. An innovation like this allows athletes to have a wide, comfortable range of motion without fear of accidental injury. Though reactive materials and fabrics have made great strides in the world of sports clothing technology, they seem to fall flat when it comes to the fashionable side of things.

Cool Switch:

Athletes will be able to cool their bodies and fight heat. Technology that is applied directly to the fabrics and agents that promote faster moisture absorption making you feel the cool of a mint.

Streaker Technology

It contains low water absorption, fast dry and anti-shrink polyester that promotes cotton like comfort.

Flashdry Technology

It consists of a fiber that's incorporated into the fabric – that is, it doesn't wash out – which transfers the body moisture to an external layer, improving evaporation and keeping the athlete dry and comfortable during their performance.

FuseForm

It basically boils down to the fusion of Nylon and Polyester to ensure extra protection and comfort, respectively. This fabric is waterproof, breathable, as well as seamless, and it additionally features lightweight construction, design, comfort and protection. It's used in the making of waterproof jackets for outdoor activities, like mountaineering and climbing.

Fabric Technology

It has come a long way since the 1970s when polyester – perhaps the best known of the synthetic fibers developed – was associated with clingy, sweaty clothes, completely unsuitable for working out. Developments in polyester fiber technology have resulted in items of sportswear that allow moisture to pass through the material, drawing it away from the body. Another positive development, from an athletic point of view, has been the development of materials that are both breathable and waterproof at the same time – great for exercising outdoors in inclement weather. Innovations in sports clothing have also drawn on natural materials. Incredible as it might sound, bamboo can be turned into a rayon or viscose fiber that is durable, soft, and antimicrobial. That is far from the image of bamboo as something that pandas like to eat. Merino wool, which is less scratchy than other types of wool, can be used in items of clothing suitable for cold or warm weather training and exercise, and can be combined with spandex.

Smart Textiles

It can offer an athlete, then it makes sense to break them down into broad categories: performance enhancing and aesthetic. When it comes to the aesthetic in

smart textiles, the focus is on fabrics that change color during the performance, or fabrics that light up. In some cases, these fabrics are absorbing the environment around them – sound, heat, and vibrations – to change color. Performance enhancing fabrics have the ability to regulate the temperature of an athlete's body as they perform. They can also have the effect of cutting down on wind resistance – perfect for an athletic performance outdoors. An additional function of performance enhancing fabrics can be the control of muscle vibration, which helps to improve athletic performance.

Compression Clothing

Another category of sports clothing that is benefiting from breakthroughs in technology is compression clothing. The selection of compression clothes available ranges from back braces and tops to compression socks for men and women. These items offer support to athletes either recovering from or trying to prevent injury. Also, the type of material used provides additional comfort by keeping moisture away from the skin. Anything that helps to cool an athlete during exercise is of enormous benefit. Compression socks apply gentle pressure to the leg, and help blood to move upward. This has the effect of preventing our legs from swelling. An added and perhaps overlooked the benefit of compression socks is that, because they are long, they prevent scratches and cuts, making them ideal for those of us who like to run in the great outdoors, especially on cross-country trails. Compression clothing can be targeted to fight pain and aches wherever you feel them, with sleeves for wrists, arms, and elbows all available to purchase. Full and half-finger compression gloves help support injury recovery and injury prevention for hands.

So the next time you are exercising or working out, in the gym or outdoors, take a moment to think about what you are wearing and how the science of sports clothing is helping to facilitate and boost your performance, as well as aid recovery from and prevention of injuries.

Conclusion

When thinking about innovation, it is important to remember that it is not limited to the world of computers and smart phones, and sports clothing is one of those areas where breakthrough fin technology have proven to be of enormous benefit to athletes, amateur and professional alike.

It is a technical means by which athletes attempt to improve their training and competitive surroundings in order to enhance their overall athletic performance. It is the knowledge and application of using specialised equipment and the latest modern technologies to perform tasks more efficiently.

References

1. www.royalfashionist.com/new-sports- *clothing-technology*
2. https://en.wikibooks.org/.../Sport...Sportswear/Technology_ and_ innovation

https://www.routledgehandbooks.com/doi

TEXTILE DYES AND TREATMENT OF WASTES FROM THE DYEING PROCESS

M.Tamilselvi
Assistant professor, Department of Chemistry,
Seethalakshmi Ramaswami College, Trichy

Abstract

In textile industries, dyes are used as colouring substances. Dyes consist of chromophores, responsible for the colour. Textile materials can be dyed using batch, continuous or semi-continuous processes depending on the type of material such as fiber yarn, fabric etc. However the batch process is the most commonly used method. Most of the dyes are highly stable to light, temperature, water, chemicals etc. So they escape the waste water treatment process and persist in the environment. Dye waste water contains organic, coloured, toxicant, surfactant and chlorinated compounds and salts. Some dyes are toxic and mutagenic and also decrease light penetration and photosynthetic activity and limits uses such as recreation, drinking quality etc. Dyes are inevitable in this world today, so it is important to improve dye productivity and washing fastness and reduce both energy costs and water consumption. Since the textile industries pose a great threat to the environment, it is very important to find eco-friendly alternatives to the treatment of wastes from the dyeing process.

Introduction

Dyes used in textile industries are classified according to their application and chemical structure. The chromophore containing centers in dyes, are based on different functional groups, such as azo, nitro, carbonyl etc. In addition auxochromes (electron with drawing on donating substitutes) intensify the colour of the chromophores. Dyeing can be carried out as a continuous or batch process. However batch process is commonly used. In continuous processing, each time a fabric is passed through a solution, an amount of water equivalent to the weight of the fabric must be used. In batch processing (or exhaust dyeing) each time the fabric is exposed to a separate bath and it uses five ten times its own weight in water. Though environmental legislation obliges industries to remove colour from their dye-containing effluents, before discharging into water bodies, dyeing process is becoming one of the substantial source of severe pollution problem. During the dyeing process, the loss of colourants to the environment can be around 10-50% thus affecting the aesthetic quality and transparency of lakes, rivers etc.[3] In addition some dyes are toxic and mutagenic. Azo dyes are used for a variety of applications in textile industry due to its cost effectiveness and ease in its synthesis. However some azo dyes can show mutagenic and carcinogenic effects. Due to the design of dyes to resist biodegradation, they remain in the environment for long time. For instance the half life of the hydrolyzed dye reactive blue 19 is about 49 years at pH 7 and 25°C.

Textile Industries stand out with high polluting power. The environmental problem related to these industries is related not only due to the misuse of a large amount of water, but also due to the release of industrial and domestic effluents. Therefore it is obvious that there is a need to find alternative methods that are effective in the treatment of effluents resulting from textile industries.

Dyeing and Waste Water: Independent of the characteristics of the dyes chosen the final operation of all dyeing process involves washing in baths to remove excessof the original or hydrolyzed dyes not fixed to the fiber in the water bodies. Contamination

of natural waters can become an important sources of problem for human and environmental health. The textile industry also uses a large volume of water in its industrial park, consequently generating large volumes of effluent. About 200 liters of water are needed for each kilogram of cotton produced. The effluents that end up in water bodies are effluents containing a high organic load, colours lost during dyeing process, associated pesticides and heavy metals. In addition to visual pollution, the pollution of water bodies with the compounds causes changes in biological cycles of the aquatic biota, affecting the photosynthesis and oxygenation processes of the water body, for instance by hindering the passage of sunlight through water. The dyes are designed to resist biodegradation to provide durability of the colours in the fibers. This helps to meet the demands of the consumer market however this also makes the waste water treatment system and water treatment plants (WTP), ineffective in removing the colour and the mutagenic properties of dyes. There is no consensus amongst the different counties, with respect to the legislation related to effluent discharge.

Some countries like USA, Canada, Australia etc. have national environmental legislation. In some countries such as India, Pakistan etc., the emission limits are not mandatory though recommended.

Treatment of Waste Water: The processes currently used by the textile industries are based on methods which were designed for other waste, and so they have limitations when applied to textile effluents. Techniques used for the treatment of effluents, such as incineration, adsorption onto solid matrices, biological treatment etc. have drawbacks. During incineration, dioxins and furans are formed. Many scientists have attempted to find new forms of treatment to reduce the serious toxicological and environmental risks caused by many organic compounds. Flores et al (1997) examined the behavior of 25 N-substituted aromatic compounds such as azo dyes and nitro using the methanogenic bacteria and easily mineralized these compounds with a good yield. The use of microorganisms in the treatment of industrial and laboratory wastes containing aromatic amines deserves attention, due to the low investment and maintenance costs. However the results are far from ideal due to low biodegradation yields, long treatment times, and the generation of sludge deposited at the bottom of the treatment bonds. Fukushima et al.(2000) developed the Fenton system to promote the degradation of aniline. This method has shown promise for the mineralization of aromatic amines, obtaining a reduction of about 85%. However intermediate species such as aminophenol, hydroquinone etc., are formed during the degradation of aniline. Pramauro et. al., (1995) promoted the degradation of various aniline derivatives using TiO_2 particles suspended in a solution. Under optimal conditions, the method developed showed rapid mineralization of the aromatic amines. In recent years, much attention is focused on photoelectrochemical process. The results of this process is very promising because of the relatively short treatment time and the great efficiency, both in the removal of colour and in the reduction of the organic load. However the limitations of this technique are related mainly to the choice of the ideal catalyst. The synthesis of the best catalyst to take advantage of solar radiation, thus reducing the operating costs, and at the same time solving the other problems involved, is a major challenge. Thus some of the points to be considered for the development of an ideal process for textile waste treatment are

- A Process with less water consumption
- Better fixation of the dyes to the fibers

- Process using less hazardous dyes with respect to human health
- Methods capable of identifying the effluents with more efficiency and rapidity
- Assays to identify any potential carcinogenic and/or mutagenic properties in the dyes and their derivatives.
- Resistant biological treatments etc.

Towards Ecofriendly Textile Industry: The search and development of new methods to adopt more water friendly technologies to dye cotton and polyester (the two most mass marketed textiles) is constantly underway. Due to the dwindling supply and increasing demand of water in the textile industries, a better alternative is to attempt to further elevate the water quality of waste water effluent from a secondary waste water treatment plant to a higher standard for reuse.[10] Very little attention has been paid to this aspect thus far. More investment in the search for methodologies, to more effect treatment of the effluents can be much lower than that spent in tertiary treatment to remove these effluents. Various fabrics require different manufacturing processes, so one best technology does not exist for low-water or waterless dyeing. Adoption of waterless dyeing in the textile industry is years away[11].

Conclusion: Textile industries use a variety of synthetic dyes. These dyes are a large group of organic compounds, which poses a serious threat to the environment. They also cause serious damage to the health of humans and other living organisms, due to the toxicity and mutagenicity of its components. Many studies have been carried out for decades with the aim of developing new technologies capable of minimizing the volume and the toxicity of textile wastes. However the development of an ideal process that promotes colour removal is still a major challenge that exists. Hence there is an urgent need for the development of new methods that are effective and economical in the treatment of wastes from textile dyeing industries.

Reference

1. Bafana A, Devi SS, Chakrabarti T, Azo dyes:past, present and the future. Environmental Reviews; 2011(19) 350-370.
2. Zollinger, H. Synthesis, Properties of organic Dyes and pigments. In: color chemistry. Newyork, USA: VCH Publishers; 1987. P92-102.
3. Forgacs E, Cserhati T, Oros G. Removal of synthetic dyes form wastewater: a review. Environment International 2004; 30(7)953-971.
4. Guaratini CCI, Zanoni MVB. Textile dyes. Quimica Nova 2000; 23(1):71-78.
5. Carneiro PA, Osugi ME, Senl JJ, Anderson MA, Zanoni MVB. Evaluation of color removal and degradation of a reactive textile ago dye on nonporousTiOthin-film electrodes. ElectrochimicaActa 2004; 49 (22-23) 3807-3820.
6. Hessel C, Allegra C, Maisseu M, Charbit F, Moulin P. Guidelines and legislation for dye house effluents. Journal of Environmental Management 2007; 83 (2) 171-180.
7. Flores ER, Perey F, Torre M. Scale-up of Bacillus thuringilnsispermentation based on oxygen transfer. Journal of Fermentation and Bioengineering, 1997; 83 (6) 561-564.
8. Fukushima M, Tatsumi K, Morimoto K. The fate of amiline after a photo-fenton reaction in an aqueous system containing iron (III), humic acid, and hydrogen peroxide. Environmental Science and Technology. 2010; 34 (10) 2006-2013.
9. Pramauro E. et al. Photocatalytic treatment of laboratory wastes containing aromatic amines. Analyst. 1995; 120(2)237-242.

Language of clothes and Etymology of Fabric names

Ms. R. Thenmozhi
Associate Professor, Department of English
Seethalakshmi Ramaswami College, Trichy

Abstract

Home Science is a scientific course of study which moulds a student with a variety of life skills. Its unique feature is that it is a blend of science and art. It does not limit itself to the home related skills of cooking, laundry, decoration and stitching but fall under a wide spectrum of three main core subjects: Nutrition, Human Development and Family Resource Management. Its changing outlook has attracted many students enabling them to pursue a successful career. As it deals with the management of family resources, the maintenance of the clothes the people wear needs a special mention. Different methods are used to maintain the durability of any type of fabric. Silk, cotton, tussor and many other varieties are used by people for the purposes of their texture, grandeur, shiny look, shean, dignity, convenience and seasonal changes. The fact that the words like poplin and voile played an intrinsic part in the vocabulary of grandmothers in the past and that cannot be denied. As some people are interested in knowing the origin of many words that are used in our daily life, it is unavoidable that the people should know the origin of the words commonly used in the textile industry.

Introduction

"The Fabric of India, a first of its kind exhibition at London's Victoria and Albert Museum seeks to tell, drawing from its own a collection of nearly 10,000 samples of Indian textiles and museums elsewhere. As garment for both the humble and vain; as transmitter of symbolism, myth and religion; heralder of wealth and authority; and as canvas for creative and aesthetic exploration textiles indeed mirror the fabric of India". Many words attribute their origin to some foreign languages such as English, French, Portuguese – to name a few. Likewise many words about fabrics from India have made into English vocabulary.Calicut, located on the Malabar coast acted as an important trading centre between India and the Arab world. It was called 'Qualiqut' in Arabic, 'Collicuthia' in Portugese. Calicot, the pronunciation of the French form, influenced the term 'Calico' for the type of textile traded through Calicut. Cashmere, a very highly priced and costly material woven from the wool obtained from long – haired goats is the Anglicisation of the word Kashmir. Madras is a variety of bright – coloured muslin cloth first exported from the port now known as Chennai. Chintz, the name for a smooth, inexpensive cotton cloth, has its origin from the word 'Chheent', a Hindi word meaning spraying or sprinkling created a new wordChintz. In the history of British Literature,the first diarist Samuel Pepys (1633 – 1703) had maintained a diary of events for nearly a decade. From 1660 to 1669 Pepys had been writing a detailed diary of events and it was published in the 19th century. He published his personal revelation and eye witness accounts of great events in the British History like The Great Plague of London, the Second Dutch War and the Great Fire of London.He had also mentioned "Bought my wife a Chintz, that is, a painted Indian Calico, for her to line her new study". The word 'Chintzy' for 'something cheap and low quality' and 'somebody not willing to spend money' was first recorded in 1851 by a very famous woman novelist of British origin, Mary Ann Evans, who wrote under the pen name George Eliot, in order not to show her identity

as a woman writer, in a male dominated world of literature and also to ensure that her writing would be taken seriously when the other women writers published their works under their own names. Rudyard Kipling, a British short story writer, novelist, poet and a journalist mentioned about the trousers made from 'Dungari', in Hindi meaning 'fabric'. Dungari later came to denote work clothes made from a tough material. Many varieties of fabrics made from wool are available in Indian shops than any other material except cotton. The modern spelling for the word wool came from old English 'wull" which in influenced by 'wol' in Dutch, 'woll' in German and a few other North European languages. A movie released in 1956 called The Man in the GreyFlannel Suit discusses the suit as a sign of respectability and was worn by businessmen and executives. Advertisements for suit cloth in India often use the term ' worsted' named after the fabric made from twisted yarn first in 1926 in Worstead, a town in Norfolk, England.For decades, Indian stores have sold this fabric, the name which came from Welsh 'gwalanen' (woolen fabric). Another woolen fabric is 'Serge', originated from the Greek word ' Serica' meaning " cloth of wool mixed with silk or linen". An interesting etymological history of 'Garbardine' a closely woven cotton or wool twill commonly used for school uniforms because of its sturdy and long-lasting nature and durability is a direct French word 'gauvardine' meaning a long coarse cloak or frock worn especially by the Jews during the Middle Ages and also referred to as a 'pilgrim cloak'. The French term evolved out of Spanish garbadina used as an outer garment was originally lost, and by 1904, it came to mean simply 'fine worsted cloth'.Felt, another word commonly heard in India, has its root in Germanic 'Feltaz' meaning something beaten. The name is no surprise because 'felt' is a soft and thick material made of wool, hair or fur that has been'beaten' or 'processed' flat. Since 1862, shoddy has meant a cheap imitation of something of an inferior quality as in 'Shoddy workmanship'. But the word was first used in 1832 to mean 'wool made of woolen waste, old rags and cloth of reused wool'.

As far as English language is concerned many idioms and phrases are related to textiles. The figurative use of the term 'wool gathering' means indulging in wandering fancies and purposeless thinking. 'Pull the wool from over somebody's eyes' is 'to deceive someone by not telling the truth. 'A black sheep' means 'a disreputable or disfavoured member of a family or group' – the figurative usage of the word seem to mean a wool that cannot not be dyed and hence worthless.

Conclusion

Home Science and literature as an interdisciplinary subject will offer employment to many students because the etymology of anything and everything, each and everyword, is a beginning for the acquisition of the knowledge of technologically advanced, kaleidoscopic fabrics other than the existing textiles in the market which are very much consumer-oriented.

References

1. Anand: The Hindu: Language of Clothes (Wordspeak)
2. Menon Parvathi: The Hindu: The whole six yards. Dated: 11.10.2015

NATURAL DYES AND DYE YIELDING

S.Thevasundari
Assistant Professor, Department of Botany,
Seethalakshmi Ramaswami College, Tiruchirappalli

Abstract

Natural dyes are derived from naturally occurring sources such as plants, insects and minerals. They are more constructive, eco friendly, renewable and cost efficient. Worldwide demand for natural dyes from plants showed great interest which increased awareness on beneficial properties of natural dyes in public. Nearly 450 plants are known to yield dyes in India alone. Almost all parts of the plants like leaf, root, bark, wood, fruit, seed, flower, etc. produce dyes. The plants Curcuma longa L., Lawsonia inermis L., Carthamustinctorius L., Indigoferatinctoria L. etc are well known for its natural dyes. The present review, demonstrated the dye yielding plants in India which may prove to be useful for further development of textile dye industry.

Key words: *Natural dyes, plants, eco friendly, textile industry*

Introduction

Dyes are substances that can be used to impart color toot her materials, such as textiles, foodstuffs, and paper. Natural dyes refer to those colourants which are obtained from plant, animal and mineral resources. These are used for colouration of textile, food, drugs and cosmetics. Small quantities are also used for colouration of paper, leather, shoe-polish, wood, candle etc.(Gulrajani and Gupta, 1992; Vanker, 2000). The natural dyes used in India have been extracted from the roots, barks, flowers and fruits of various dye producing plants. Although plants exhibit a wide range of colours, not all of these pigments can be used as dyes. Some do not dissolve in water, some cannot be adsorbed onto fibres, whereas others fade when washed or exposed to air or sunlight (Gulrajani, 2001). The first report of natural dye extraction from plant sources dates back to around 2600 BC in China. The Indus valley civilization at Mahenjo - Daro and Harappa (3500 BC) traces of dyeing garments with natural madder (Siva, 2007). The use of natural dye stuff in by Phoenicians, Hebrews and Venetians was also started from the beginning of 13th century. Afterward the technology passed across regions and cultures like Greeks, Romans, old world Africans, Mexicans and was also evident in Peru (Dogan*et al*., 2008).

Indigenous traditional knowledge on dye yielding plants is very essential for rural based development, and future bioprospecting. Nature has gifted more than 500 dye yielding plants species (Mahantaand Tiwari, 2005). The actual nature of dye colour varies from plant to plant and their parts including method followed in the dye preparations. The use of natural dyes, particularly by women as a hobby, has continued in spite of the advent of synthetic dyes. Of late, this activity has increased considerably, particularly in India where many guilds have been formed to discuss about these dyes and organize workshops and training programmes on a regular basis. Natural dyes have demonstrated better biodegradability and are achieved from renewable sources. These are preferred mainly in developed countries like India, because of their non-allergic, non-carcinogenic, less-toxicity and better

biodegradability nature than the synthetic dyes (Purrohit*et al*., 2007). Synthetic dyes are valued for their abundance and bright colors. Nevertheless, synthetic dyes are also recognized for their toxicity, contribution to environmental pollution and for their carcinogenic properties and can cause allergic reactions in humans.Nowadays, there is increasing awareness among people towards natural dyes in textile industry.

Important Natural Dye Yielding Plants

Krishnamurthy and coworkers (2002) demonstrated the dye-yielding plants of Shervaroy Hills of Eastern Ghats. They found 22 dye yielding plant angiosperm species belonging to 14 different families. Fabaceae is prevailing family with four species followed by Mimosaceae with three species and Combrataceae, Rubiaceae and Euphorbiaceae with two species each. The remaining 9 families have one species each. Mahanta and Tiwari (2005) reported the natural dye yielding plants and indigenous knowledge on dye preparation in Arunachal Pradesh, Northeast India. They recorded thirty-seven species belonging to 26 families of dye yielding plants. Fabaceae is found to be dominant with six species followed by Euphorbiaceae and Moraceae with four each and Juglandaceae with two species. The remaining 21 families have one species each. Various plant parts, viz. leaves (*Aporusadiocia*), bark (*Bischofiajavanica*), flowers (*Clitoriamariana*), fruits (*Juglansregia*), seeds (*Bixaorellana*), etc. of the recorded species were found to be employed traditionally by the tribal communities of the districts for extracting dyes utilizing indigenous extraction techniques. Gaur (2008) studied the traditional dye yielding plants of Uttarakhand, India. Dye yielding plants numbered 106 species belonging to 63 families. Majority of dye resources belong to dicotyledones with the exception of 4 – monocots and 3 – gymnosperms.. Whole plants used in dyes commonly include herbaceous green plants. Generally chlorophyll, the source of green colour is easily extracted with the help of many solvents; therefore, large number of plants are preferred to extract green dye, i.e. from the leaves of *Adhatoda zeylanica, Amaranthus*sp., *Cinnamomumtamala, Cupressustorulosa*etc.

Lawsonia inermis Linn. (Mehendi) belonging to the family Lythraceae is a good herbal natural dye of all times of traditional art. The principle colouring matter 'lawsone' is present in leaves. In ancient times it is used to traditional art of weaving and design (Das and Mondal, 2012). Ten natural dyes yielding plants which have unique uses in the Meitei society of Manipur were analyzed for the biochemical substances responsible for dyeing by Saikhom *et al*. (2013).The dye yielding plant diversity of Eastern Uttar Pradesh has been documented by Srivastava*et al*. (2014). They reported 20 dye yielding plants belonging to 15 different families. These dye yielding plants have different medicinal and economic values. Recently Sindhu*et al*. (2015) reviewed the importance of natural dyes from *Solanum xanthocarpum*. *Solanum xanthocarpum*leaves have dark glossy greenish in colour having hair. *Solanum nigrum*plant fruits showed brown color dye was used to dye a cloth worn by the royals in early days known as 'Khamenchatpa'. All brown dyes are reported part of flavonoids and dyeing brown and black shades. Sutradhar*et al*. (2015) studied the traditional dye yielding plants of Tripura, Northeast India. They documented 39 species ofdye yielding plants belonging to 35 genera and 26 families. The plant

species belong to 3 families of monocotyledons (12% species) and 23 families of dicotyledons (88% species). Some important dye yielding plant names, family, parts used and pigments were illustrated in Table 1 – 3.

Table 1.Some important natural red dye yielding plants

S. No	Botanical name	Family	Parts used	Pigments
1	Aloe barbadensisL.	Lilliaceae	Whole plant	Barbaloin, aloe emodine
2	BixaorellenaL.	Bixaceae	Seeds	Bixin, norbixin
3	Capsicum annuum L.	Solanaceae	Fruits	Capsanthin, Capsorubin
4	CarthamustinctoriousL.	Asteraceae	Flowers	Carthamin
5	Elaeodendron glaucum Pers.	Celasteraceae	Bark	Elaeodendrol, elaeodendradiol
6	Eugenia jambolanaLam.	Myrtaceae	Bark, leaves	Elgicacid, jamboline
7	Hibiscus rosasinensisL.	Malvaceae	Flowers	Anthocyanidins, isoflavanol, flavone
8	Lawsonia inermis L.	Lythraceae	Leaves	Lawsone
9	Pterocarpussantalinus L.	Fabaceae	Wood	Santalin
10	RubiacordifoliaL	Rubiaceae	Root	Purpurin
11	Solanum lycopersicumL.	Solanaceae	Fruits	
12	TectonagrandisL.	Lamiaceae	Young leaves	Tectoleafquinone

Table 2 Some Important Natural Yellow Dye Yielding Plants

S. No	Botanical name	Family	Parts use	Pigments
1	Adhatoda vasica Nees	Acanthaceae	Leaves	Adhatodic acid, carotein, quercetin
2	ButeamonospermaLam.	Papilonaceae	Flowers	Butrin
3	CarthamustinctoriusL	Asteraceae	Flowers	Carthamin
4	Cassia auriculataL	Caesalpinaceae	Flowers, seeds	Di(2-ethyl) hexyl phthalate
5	Crocus sativusL.	Iridaceae	Flowers	α-crocin
6	Curcuma longa L.	Zingiberaceae	Rhizomes	Curcumin
7	CuscutareflexaRoxb.	Convolvulaceae	Whole plant	Cuscutin,quercetin, coumarin
8	Morindacitrifolia L	Rubiaceae	Roots	Morindone
9	PunicagranatumL.	Punicaceae	Fruits	Punicalgin, Isopelleterine
10	TageteserectaL.	Asteraceae	Flowers	Lutein, carotene
11	Toddalia asiatica (L.) Lam	Rutaceae	Roots	

Table 3 Some Important Natural Black and Blue dye Yielding Plants

S. No.	Botanical name	Family	Parts used	Pigments
1.	Acacia catechu L.	Mimosaceae	Wood	Catechin, atechutanic Acid (Black)
2	ClitoriaternateaL.	Fabaceae	Flowers	Anthocyanin, ternatin
3	IndigoferatinctoriaL.	Fabaceae	Leaves	Indirubin, Indican
4	MeliaazedarachL	Meliaceae	Leaves	Catechin, quercetin
5	Semecarpus anacardiumL.	Anacardiaceae	Seeds	Bhilawanol
6	Strobilanthescusia (Nees) O. Kuntze.	Acanthaceae	Leaves,	young buds Lupeol, betulin, lupenone, indigo, indirubin
7	WrightiatinctoriaR. Br.	Apocynaceae	Leaves	ß-amyrine

Advantageous of the Natural Dyes: Natural dyes have several important advantages than synthetic dyes. They are less toxic, less polluting, less health hazardous, non-carcinogenic and non-poisonous. Moreover, the waste formed while using these dyes becomes an ideal fertilizer. In addition, they are harmonizing colours, gentle, soft and subtle, and create a restful effect. Besides, they are environment friendly and can be recycled after use.

Limitations of the Natural Dyes: Extraction of colouring component from the raw material is tedious, low colour value and longer time make the cost of dyeing with natural dyes considerably higher than with synthetic dyes. Some natural dyes are fugitive and need a mordant for enhancement of fastness properties, which few are hazardous. In addition there are problems like difficulty in the collection of plants, lack of standardization, lack of availability of precise technical knowledge of extracting and dyeing technique and species availability.

Conclusion

Organized approaches with scientific attitude would help in conserving the economically important dye yielding plant resources. Commercialization of natural dyes can be successful in India with systematic and scientific approach for identification of resources, extraction, purification, chemical structure elucidation and promotion of use of natural dyes thereby enhancing the economy of the textile industry.

References

1. Das, P.K. and Mondal, A. M., 2012. Studies on traditional 'Mehendi' used as herbal colour with special references to its antimicrobial activity and pigment profiles by TLC. *Int. J. Sci. Nat.,* 3(1):799-804.
2. Dogan, Y., Baslar, S., Ozturk, M. and Mert, H. H., 2008. Plants used as dye sources (eds. Peter KV) Underutilized and Underexploited Horticultural Crops, 3:109-145.
3. Gaur, R. D., 2008.Traditional dye yielding plants of Uttarakhand, India.*Natural Product Radiance,* 7(2).:154-165.
4. Gulrajani, M. L. and Gupta, D. B., 1992. Natural Dyes and Their Application to Textiles.Indian Institute of Technology, New Delhi.
5. Gulrajani, M. L., 2001. Present status of natural dyes. *Indian J.Fibre.Text.Res.*, 26:191 – 201.
6. Krishnamurthy, K. V., Siva, R. and Senthil Kumar, T., 2002. Natural dye-yielding plants of Shervaroy Hills of Eastern Ghats. In Proceedings of National Seminar on the Conservation of the Eastern Ghats, Environment Protection Training and Research Institute, Hyderabad, 24–26 March 2002, 151–153.
7. Mahanta, D. and Tiwari, S. C., 2005.Natural dye-yielding plants and indigenous knowledge on dye preparation in Arunachal Pradesh, Northeast India, *Curr. Sci.*, 88: 1474–1480.
8. Purrohit, A., Mallick, S., Nayak, A., Das, N.B., Nanda, B. and Sahoo, S., 2007. Developing multiple natural dyes from flower parts of gulmohur.*Curr.Sci.*, 92:12
9. Saikhom, J. D., Salam, J. S., Potshangbam, K. S., Choudhury, M. D. and Maibam, H. D., 2013. Biochemical studies in several dye yielding plants. *Not. Sci. Biol.,* 5(3):303-308.
10. Sindhu V. T., Shobhnath, P. and Anita S. G. G., 2015. A Review: Importance of Natural Dyes from *Solanum xanthocarpum.Int. J. Sci. Engin. Res.*, 6(12): 33-37.

MEDICINALLY IMPORTANT TEXTILE PLANTS

Dr.C.Thilagavathi
Assistant professor, Department of Botany
Seethalakshmi Ramaswamy College, Tiruchirappalli

Abstract

Herbs are the major source of dyes that use only natural and minerals for all steps of the production process. Herbal Textile is dyed entirely with herbal extractions, without using any sort of chemicals. These herbs are applied directly to the fabric with the help of natural ingredients, so that the medicinal value of the herbs can be kept intact. The major source of the natural dyes and their parts, such as stems, wood, leaves, fruits and seeds etc, are used for extracting color components. Color has plays an important role in human life not only improves surface appearance of the substrate but also expresses emotion and ideas of the wearer. The application of herbal products on the textile substances is a very new concept. It gives a new direction towards the treatments of various diseases through textile industry.

Key words: *medicinal plants, textile dyes and natural color.*

Introduction

Ayur vastra clothing is made from organic cotton fabric that has been permeated with special herbs and oils that promote health and cure diseases. Synthetic fabric dyes used in textiles are also expensive and need to plant dyes for use as alternative color for textiles. The study based on qualitative research method employed observation and experimentation to study three different local plants. Dyes obtained from Turmeric (*Curcuma longa* L.), Indigo (*Indigofera tinctoria* L.) and Sandalwood (*Santalum album* L.) which are known spices yield color dyes that could be used. The dye extraction process involved the use of the bark, leaves, seeds, whole fruits, and roots of the three different plants, each of which was boiled for 30 minutes. Adu- Akwaboa (1994:129) shares the view that natural dyes of various colours can be obtained from any local plants in Ghana and that dyes can be extracted from barks of trees, leaves, roots, seeds, fruits, flowers, or the young shoots. A liberal use of dangerous chemicals in the textile industry leads to severe health problems that affect the nervous system. Alternatively, Herbs are applied directly to the fabric with the help of natural ingredients and organic cotton prohibits the use of such chemicals, with a gentle attitude towards environment Eco friendly.

Materials and Methods

Plant source	Cotton cloth	
Bowls	Beakers	
Conical flask	Mordants	
Knife	Vegetable grater	
Filter paper	Tripod stand	Mesh

Plants Used

- Turmeric (*Curcuma longa* L.)
- Indigo (*Indigofera tinctoria* L.)
- Sandalwood (*Santalum album* L.)

Extraction of Dyes From The Plants

The workstation was covered with the newspaper. The skin was peeled and grated using plant parts for better extraction. 5-10 gms of flowers, wood and rhizomes was added to 100ml of distilled water and was boiled well until the dye was released in water. This can be done for at least 15-20 mins for the complete extraction. After the dye is extracted it is stored in the refrigerator for further use

.

Blue Dyes

Indigo is the only important natural blue dye. Leaves of the plant *Indigofera tinctoria* are the best source of this dye. This very important dye popularly known as the "king of natural dyes" has been used from ancient times till now for producing blue color and is today most popular for denim fabrics. The coloring matter is present in indigo plant leaves as a light yellow substance called indicant (1H-indol-3yl b-D-glucoside). The leaf production from one acre of cultivated indigo plants is approximately 5,000 kg which can yield about 50 kg of pure natural indigo powder after processing. It is produced by fermenting the fresh plant leaves, and cakes thus prepared are used for dyeing purposes. Apart from indigofera species, there are several plants that can be used to produce indigo dye. Woad is a natural indigo-producing plant in Europe. Apart from this, dyers knotweed (Polygonum tinctorium) and Pala Indigo (Wrightia tinctoria) are some of the plants used to produce indigo traditionally. The use of natural indigo started declining after the manufacture of synthetic indigo by BASF in 1987.

Yellow Dyes

Turmeric

Turmeric is a well-known natural dye. The dye is extracted from the fresh or dried rhizomes of turmeric. The dye present is chemically curcumin belonging to the Diaroylmethane class. It is a substantive dye capable of directly dyeing silk, wool, and cotton. The shade produced is fast to washing but its fastness to light is poor. The natural mordants such as tannin obtained from myrobolan can be used to improve the fastness properties. Turmeric dyeings can be overdyed with indigo for production of fast greens.

Sandalwood

A yellow dye is obtained from the wood of *Santalum album* L. a small tree found in India, Malaysia, and the Philippines which is known as sand wood. Aqueous extraction can be used to extract the dye. Alkali extraction deepens the red color. Textile materials can be dyed to get the yellow color with or without the use of alum mordant. A combination of this dye with turmeric produces orange shades and a deep maroon color is produced with catechu.

Application of Natural Dyes on Textile

Color fastness is the resistance of a material to change any of its color characteristics or extent of transfer of its colorants to adjacent white materials in touch. _ Wool dyed with different natural dyes specimens was exposed to a xenon arc lamp for assessing its light fastness. _ Turmeric and sandal wood dyes faded

significantly more than any of the other yellow dyes. _ The light fastness and wash fastness under standard condition (50°c) and also at 20°c with a washing formulation used in conservation work for restoration old textiles.

Conclusion

Ayurvastra believes in restoring the balance within the body system and strengthen the immune system. The three herbs used have well proven antimicrobial and other medicinal properties. Various emerge natural extract impregnated wellness garments are hoping to tackle various diseases like hypertension, heart ailments, arthritis, asthma and diabetes with the herbal dyed bed linens, mattresses, healing herbal blankets, sun white towels, comforting apparels, aprons and night wears . As the waste generated during the process also can be efficiently used as fertilizers, wellness fabric is purely a green technology.

Reference

1. J. Lee, Characterization of Natural Dyes and Traditional Korean Silk Fabric by Surface Analytical Techniques, www.mdpi.com/journal/materials, 6, 2013, 1-19.
2. R. Kanchana, Dyeing Of Textiles with Natural Dyes, International Journal of Chem. Tech Research, 5, 2013, 2102-2109.
3. P. Mishra and V. Patni, Extraction and Application of Dye Extracted from Eriophyid Leaf Galls of *Quercus Leucotrichophora,* African J. Biochem Research, 5, 2011, 90-94.
4. R.D Gaur, Traditional dye yielding plants of Uttarakhand, India, *Nat Prod Rad*, 7(2), 2008,154-165.
5. S .B Gokhale, Tatiya, A U, Bakliwal, S R and Fursule, R A Natural dye yielding plants in India,*Nat Prod Rad*, 3(4), 2004: 228-234.

"APPLICATION OF HEMPCOTTON FABRIC FOR SELECTED HOME FURNISHING"

R.Umamaheswari
Assistant Professor & Head
Department of Costume Design and Fashion,
Kongu nadu Arts and Science College, Coimbatore

Abstract

Textiles have been used since earlier times by the people for protection against climatic changes. Now – a – days people use textiles for exhibiting their wealth in the way of using it for personal adornment and in the way of furnishing their Home furnishings and their arrangements express the personality of the family members . By arranging the furnishings in a harmonious way the home can be made satisfying and attractive. Hemp is a natural fibre known for its strength and durability. But Hemp has poor spinning property. So there was need for blending the fibres with other suitable natural fibre namely Cotton. Cotton is superior to other fibres in its comfort, strength and durability qualities. It has been and still is the most universally used single textile fibre. Due to increase in consumption and decrease in production of cotton there is more demand for alternative natural fibres that are biodegradable and friendly to the environment.

Introduction

Textile materials are of interest to everyone for they play a most important part in civilized life. From earlier times people have used textiles of various types for covering, warmth and personal adornment . By arranging the furnishings in a harmonious way the home can be made satisfying and attractive. Hemp is a natural fibre known for its strength and durability . But Hemp has poor spinning property. So there was need for blending the fibres with other suitable natural fibre namely Cotton. Cotton is superior to other fibres in its comfort, strength and durability qualities. It has been and still is the most universally used single textile fibre . Due to increase in consumption and decrease in production of cotton there is more demand for alternative natural fibres that are biodegradable and friendly to the environment. Hemp Cotton yarns were converted into fabric by suitable method. To know the performance of the fabrics, testing is must. Considering the above facts the investigator decided to do a study on

"Application of Hempcotton Fabric for Selected Home Furnishing"

Hence the Objectives of the Study are to :

- obtain suitable Hemp cotton Yarns
- Converting the Yarns into woven fabrics
- Finishing the woven fabric with suitable enzyme and softener.
- Subjecting the woven fabric to selected Home furnishing

Methodology pertaining to the study:

- **Blending of fibres:** Hemp fibres which are cellulosic in nature were selected, due to poor spinning property of Hemp was blended with cotton.

- **Yarn Preparation:** Blended yarns of 50 per cent Hemp and 50 per cent Cotton composition and 40 per cent Hemp and 60 per cent Cotton were used for the study.
- **Weaving**: As Hemp cotton yarns were thick it was difficult to knit and weaving was not possible in power loom Hence Handloom that too Pit loom was used to weave Plain and Twill weave samples.

Finishing the Woven Fabric

Finishing is done to fibre, yarn or fabric either before or after weaving or knitting to change the appearance, the handle and performance, says Gokum (2007). The woven fabrics were soaked in 100% wetting oil for an hour. This was done to immerse them fully in bleaching solution. The fabric was taken out and bleaching was carried out.

Bleaching

Objective of bleaching is to whiten the grey cloth which comes form the loom, say Gupta et-al (2005). Hydrogen peroxide bleaching is a universal bleaching agent and can be used for bleaching cotton, wool silk and Jute. The loss suffered by the fabric during peroxide bleaching is less compared to hypochlorite beaching. Superior fastness can be achieved in finished products bleached with hydrogen peroxide. There is less tendency of after yellowing of white goods bleached with hydrogen peroxide bleaching, says Shenai (1998). Hence Hydrogen peroxide bleach was selected for the study.

Bleaching Procedure

About 125 ml of hydrogen peroxide was mixed in approximately five liters of waters. At 80°C, pH of 11 to 12 the woven fabric was left for an hour as shown in Plate 6. During the process the fabric was turned frequently. After an hour the fabric was taken out of Peroxide bath and washed with hot water thoroughly for 20 minutes followed by cold washing . Acetic acid of 100 ml was added to bring pH to 4.0. This was followed by washing the fabric with cold water.

Enzyme Wash

Enzyme wash was given to the samples after bleaching .An enzyme is a type of protein present in all living things, wherever a substance needs to be transformed into another, nature uses enzymes to speed up the process says Jasuja (2005).Cellulase enzyme are used to improve the appearance of cellulosic fabrics by removing fuzz fibre and pills from the surface of the fabric, says Moses (2004) Treatment with cellulase under suitable conditions weakness the surface fibres in a cotton fabrics so they break off leaving a smooth, lustrous appearance. Fabrics processed in that way are described as biopolished or biofinished says, Rouette (2001). Hence celluslase enzyme was used for the study.

Enzymes can be obtained from different sources based on their availability commercial enzymes source were selected for the study.

Commercial Enzymes

Cellulase enzymes are commercially available for variety of application (http:// erwweb.co.doc.gov/biomass commercial – status.html.) So, commercial enzymes

Ezysoft super an acid cellulose enzyme was purchased from Resil Biotech, Bangalore and was used as source for the study. Ezysoft super can be used for biopolishing and biofading of all cellulosics and their blends - Resil Biotech.

Commercial Biopolishing Procedure : Bleached fabrics was washed well, taken out and put in a water bath containing five litres of soft water about 30ml of acetic acid was added to bring the pH to 4.5 and enzyme 75ml as per weight of the samples was added to the water bath and placed at a temperature 50°C for 45 minutes. After 45 minutes the temperature was raised to 70°C to inactive the enzyme. Then the sample was removed from the bath and rinsed in cold water.

Softeners

Fabric softeners are used to make fabric soft and prevent clinging.Fabrics are rendered smoother and softer on enzymes treatment and application of softeners enhances the performance properties of fabrics, express Raje et–al (2001). To get the required hand, fabrics are finished with cationic, silicones like Resil ultra or combination of both, says Mahato (2005) Resil ultra softener was purchased from Resil Biotech, Bangalore and used for the study.

Softening Procedure

`Enzyme washed woven fabric was put in a vessel containing five litres of soft water. About 80ml of softener was added and left for 15 minutes shown in Plate 7. The pH of the fabric was maintained to normal pH of 6, Then the fabric was taken out, wrung and dried

Nomenclature of the Samples

Nomenclature of the Samples

S.No	Details	Nomenclature
1	Original Sample (grey)	A
2	Hemp Cotton Composition 60:40	B
3	Hemp Cotton Composition 50:50	O
4	Finished Sample	F
5	Plain Weave of 50:50 Composition	P_1
6	Twill Weave of 50:50 Composition	T_1
7	Plain Weave of 40:60 Composition	P_2
8	Twill Weave of 40:60 Composition	T_2
9	Plain Weave 50:50 in Weft Direction	P_1WF
10	Twill Weave 50:50 in Weft Direction	T_1WF
11	Plain Weave 50:50 in Warp Direction	P_1WP
12	Twill Weave 50:50 in Warp Direction	T_1WP
13	Plain Weave 40:60 in Weft Direction	P_2WF
14	Twill Weave 40:60 in Weft Direction	T_2WF
15	Plain Weave 40:60 in Warp Direction	P_2WP
16	Twill Weve 40:60 in Warp Direction	T_2WP
17	Difference Between Compositions	C
18	Difference Between Weaves	W
19	Difference Between Composition and Weaves	CW
20	Difference Between Composition Along Weft	CWF
21	Difference Between Composition Along Warp	CWP
22	Difference Between Weaves Along Weft	WWF
23	Difference Between Weaves Along Warp	WWP
24	Difference Between Composition and Weave Along Weft	CWWF
25	Difference Between Composition and Weave Along Warp	CWWP

Selection of Item

Regarding the width of the fabric woven on pit loom the investigator selected Table mat as the end product for the study.

Table Mat

Table mat enhances the appearance of table, making the table appealing for dinning. Table mats add to the beauty, convenience and effectiveness of the table. Table mats can be used for both formal as well as for a slightly casual ambiance to place the serving dishes. Table mats are ideal for use in homes, offices, restaurants and cafeterias – http://www.textile.furnishings.com/table mats.html. Table mats are quick ways to change the mood for any table setting.. Table mat of size 45cm length and 25cm in breath was cut and used for the performance study.

Actual Performance

Table mat was put on the table during breakfast, meal and dinner as shown in Plate 8 and in the evening it was washed. This was repeated for 15 days and the finished washed samples were tested.

Washing Procedure: Mild detergent in soft water was used for the study. Table mats were soaked in a bucket containing 5 grams of detergent in soft water for 10 minutes. They were taken out rinsed thoroughly and dried under shade .This was repeated for 15 times. Finishing the woven fabric: Woven fabrics made of Hemp Cotton fibres had many short fibres protruding and was not good at handle. So the original grey fabric was bleached using hydrogen peroxide. Bleached fabric was given enzyme wash to remove the short fuzzy fibres and was finally soaked in softeners to improve the handle.

Performance Study

The finished woven fabric was cut and used as table mat for 15 days. At the end of each day the Table mats were washed.

Evaluation: Original (grey) Hemp Cotton fabric of 50 per cent Hemp and 50 per cent Cotton, and 40 per cent Hemp and 60 per cent Cotton, finished Hemp Cotton fabric of 50 per cent Hemp and 50 per cent Cotton, and 40 per cent Hemp and 60 per cent **Cotton were subjectively evaluated through visual evaluation and objectively evaluated through various physical testing's.**

Findings of the Study are

Subjective Evaluation - Visual Evaluation

Composition Blend	Samples	General Appearance			Texture			Colour			Lustre		
		G	F	P	S	M	C	B	M	D	B	M	D
A	P_1O	30	65	5	-	4	96	-	88	12	-	76	24
	P_1F	100	-	-	96	4	-	100	-	-	96	4	-
	T_1O	57	43	-	-	61	39	-	57	43	-	62	28
	T_1F	96	4	-	100	-	-	100	-	-	88	12	-
B	P_2O	-	96	4	-	19	81	-	57	43	-	43	57
	P_2F	100	-	-	100	-	-	100	-	-	100	-	-
	T_2O	-	43	57	-	-	100	-	24	76	-	38	62
	T_2F	100	-	-	100	-	-	100	-	-	100	-	-

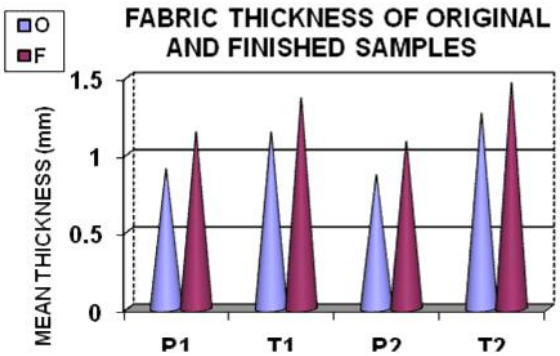
G – good , F – Fair , P - Poor , S – Soft , M - Medium , C – Coarse

B – Bright , M – Medium , D – Dull

The Visual Evaluation proved that samples P_1F (A), T_1 F(A) (Hemp 50 per cent and Cotton 50 per cent) and Samples P_2F (B) , T_2F (B) (Hemp 40 per cent and Cotton 60 per cent) were good in general appearance, texture, colour and lustre .

Objective Evaluation

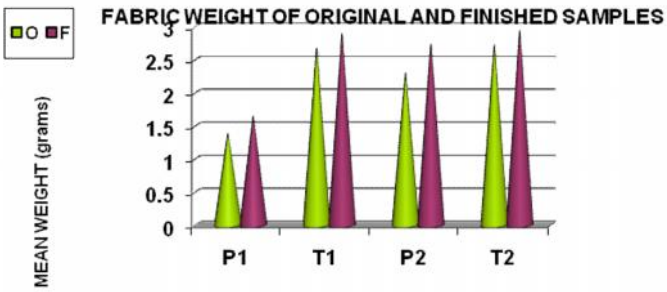
Fabric Thickness



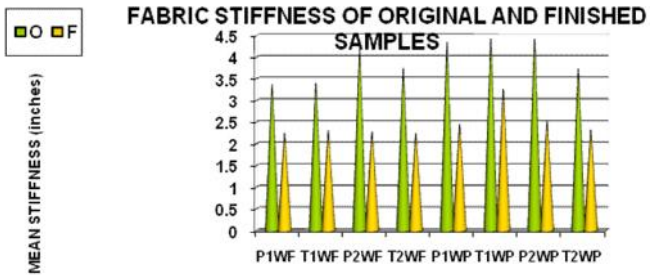
- All the finished samples have gained in fabric thickness compared to their originals
- Plain woven samples showed more gain in thickness than Twill woven samples
- Samples of 50 per cent Hemp and 50 per cent Cotton showed more gain in thickness than 40 per cent Hemp and 60 per cent Cotton samples.

Fabric Weight

- All the finished samples showed gain in fabric weight when compared to their originals
- Plain woven samples showed more gain in weight than Twill woven samples
- Samples of 50 per cent Hemp and 50 per cent Cotton showed more gain in thickness than 40 per cent Hemp and 60 per cent Cotton samples.



Stiffness of Fabric



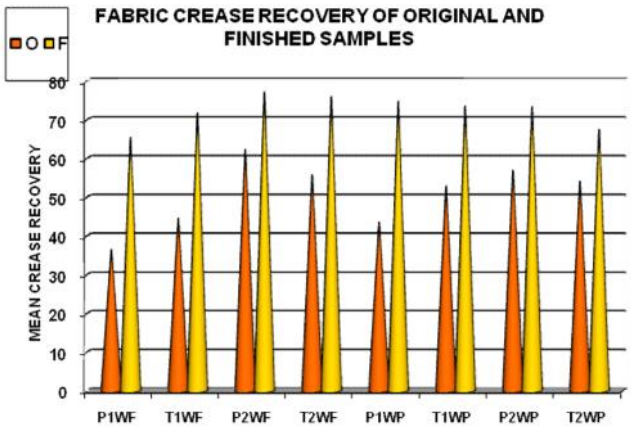
All the finished samples showed loss in stiffness when compared to their originals

- Loss of stiffness in finished samples were more along the weft direction.
- Plain woven samples showed more loss in stiffness than Twill woven samples
- Samples of 40 per cent Hemp and 60 per cent Cotton composition showed more loss in stiffness than samples 50 per cent Hemp and 50 per cent Cotton.

Crease Recovery of Fabric

Crease Recovery of Original and Finished Samples

- All the finished samples showed gain over originals in crease recovery.



- Samples along weft direction showed more gain than the samples along warp direction
- Plain woven samples showed more gain in crease recovery than Twill woven samples
- Samples of 50 per cent Hemp and 50 per cent Cotton showed more gain in crease recovery than the samples 40 per cent Hemp and 60 per cent Cotton.

Fabric Strength

Fabric Strength of Original and Finished Samples

Composition Blend	Weave	Mean Strength (kg)		Loss over Original	% Loss over Original
		O (grey)	F		
A	P_1 WF	34.6	31.8	-2.8	-8.1%
	T_1 WF	36.8	34.8	-2	-5.4%
B	P_2 WF	28.7	26.4	-2.3	-8.0%
	T_2 WF	31.6	28.8	-2.8	-8.9%
A	P_1WP	23.8	21.6	-2.2	-9.2%
	T_1 WP	32.7	30.2	-2.5	-7.6%
B	P_2 WP	20	16.88	-3.12	-15.6%
	T_2 WP	30.7	26	-4.7	-15.3%

- All the finished samples showed loss in fabric strength when compared to their originals
- Plain woven samples showed more loss in strength than Twill woven samples than samples along weft direction.
- Loss in strength was more in samples along warp direction than along weft direction of the samples.
- Samples of 40 per cent Hemp and 60 per cent Cotton showed more loss in strength than samples of 50 per cent Hemp and 50 per cent Cotton.

Hence it could be conclude that irrespective of weave and composition finishing increases the fabric weight, thickness, crease recovery, elongation and drape of fabric. Where as finishing reduces the strength and stiffness of the fabric.

Recommendation for Further Study

- Knitting and Evaluating Hemp cotton yarns for various end uses
- Dyeing the Hemp Cotton fabric with natural source
- Evaluating Antimicrobial property of Hemp Cotton fabric
- Evaluating Hemp Cotton fabric for its ultraviolet protection property.

Reference

1. Gupta .s,Garg.n,Saini.r(2005),Textbook of Clothing Textiles and Laundary,Kalyani publishers ,p:174
2. Shenai.v.a,Toxcity of Dyes and Intermadiates, Shevak publications, Mumbai. pp:113,114
3. Gokum(2007),Practical prospectives –Processing of Denium,Colourage vol LIV,,No.2,February,p:68

AYUR VASTRA FOR HEALTH AND ELEGANCE

Dr. S. Usha
Associate Professor in Sanskrit
Seethalakshmi Ramaswami College, Trichy

In the course of evolution of human race, clothing also got evolved from being a mere basic need to an aesthetically appealing comfort and a fashionably fulfilling luxury. Then, among several other dimensions of clothing, medical, be it preventive or healing got evolved and is fast picking up now. Ayur-vastra is one such medical clothing developed in Kerala patronised by Kerala government, based on ayurvedic concept of health. Ayur in Sanskrit means longeivity and vasta means cloth. So Ayur-vastra means dress for longeivity. Ayurveda, the ancient Indian medical science focuses on prevention, though healing is also elaborately dealt with. In this system, maintaining equalibrium of tridosas – vata, pitta and kapha is the key to good health. Illness is caused due to disturbance caused to the equalibrium of the tridosas. Treatment adopts various ways and means to maintain or to gain back the lost equalibrium. one among such ways is wearing suitable clothing. Cotton, jute, wool and silk are prescribed as ideal for clothes. Texure of the clothes and colours are identified for the three dosas. Following that helps to maintain perfect health and also a presentable elegant

Generally, people of vata constitution will - be small framed, get cold almost always, olive skinned and change their mind often. So to make them appear big, they need puffy, fleezy clothes. To keep warm they need sweatery hooded clothes. The warm colours that absorb heat like black, grey, brown, red, orange, purple, coral, deep pink are siutable for them. These colours also complement their skin colour. Vata problems are predominant in dry climates and old age. Suitable dress during these times is a good preventive measure. People with pitta constitution will be well built, pink skinned, sweat easily and get hot. So soft breathable natural fabric with correct fitting neither too loose nor tight is good for them. cool spectrum colours like teal, lighter shades of blue, cobalt, shades of green, white and white are suitable for them. Pitta problems get aggravated during teen age and adulthood. Hot climates excites pitta. Suitable costume and other preventive measures help to keep pitta under control. People with kapha constitution are broad chested and vibrant. Light weighted clothes that are not too tight in chest and stomach are preferable to them. orange, purple, red, pink, blue and green that suit their vibrant nature are good for them. Kapha problems crop up during childhood and wet winters and damp seasons aggravate kapha. Appropriate garments and preventive measures to keep kapha under control helps to maintain good health. Traditionally and culturally, clothes that covers the shoulders, knees, midriffs are always good. Cotton turbans are said to be good to prevent the ill-effects of noise pollution. Clean clothes and cotton thin mattress spread on the floor are prescribed for all at all times. Sharing of clothes is not advisable. Clothes with specific colours are also recommended for specific

diseases. Cotton dress in indigo is good for general well being. Fully covering brown cotton clothes are good for skin disorders. Silk or cotton in pink shade is good for arthritis. Based on further researches on these lines, the concept of ayurvastra got evolved. Clothes, beds, towels, rugs etc made of ayurvastra help in healing rheumatism, skin disorders, hyper tension, diabetes, blood pressure and so on. Many environmental toxins and chemicals get assimilated in the body through the skin, which is the largest organ of the body. Seven layers of skin with distinct functions are identified in ayurveda. The fourth layer of skin named Tamra supports the immune system imbalances in this layer. Ayurvastra helps a lot in setting right these imbalances. The concept of ayurvastra was conceived by the court physicians of Travacore several years back. While weaving sandalwood sarees the yarn and the cloth are dyed in sandalwood oil. Similarly the Ayurvedic herbs are boiled and the fabric is dipped in for several years. Based on all these practices of weaving for royal families, a five staged technology for Ayurvastra was developed.

100% pure organic hand loomed cotton fabric alone is used for ayurvastra. Yarn is dipped in medicated herbal extract and weaved and is again dyed in ayurvedic herbal extract. Natural bleaching agent is used to bleach the raw yarn and is treated in the ayurvedic herbal mixture for several hours under controlled temporature. then after treating it with natural gum, it is allowed to dry. Loose particles are carefully removed by washing it. Then the five stages of ayurvastra starts.

Stage I: De-sizing

The hand loomed cloth is washed in natural mineral rich water and sea salts to remove its sizing, gums and oils used during spinning.

Stage II: Bleaching

Fabics are kept in direct sunlight and bleached in natural bio-degradable organic cleaning agents.

Stage III: Mordanting

Natural mordents like Lodhra bark, kenduka, Haritaki extarcts are used make the colours bright and fast. Chemical mordents are avoided.

Stage IV: Medication/ Dyeing

For dyeing, extract of 200 ayurvedic herbs chosen according to the disease or ailment to be treated is used. Medicinces are used to give natural colours to the fabrics. Great care is taken in matters like the combinations of herbs, temperature of the extract, number of soaks, duration of soaks etc. Then the medicated cloth is allowed to cool and washed to remove loose particles. Clothes are dried only in shades. Roots, flowers, seeds and barks of 200 herbs are used for dyeing. Tribals in the region collect the herbs. Natural herbs have bright and appealing colours. This makes ayur vastra more popular and attractive. However, it is to be noted that the healing property of these fabrics lasts only till the colour remains.

Stage V: Finishing

Pure water is sprinkled on the cloth and is stretched under pressure using hand rolls, alovera, castor oil etc. This is finishing in herbal dyeing.

The entire process is fully organic and so is environmental friendly. The waste is used to generate bio-gas and also as manure. In this tecnology, fabrics are made out of bamboo, jute and silk. Mats, mattresses, door mats and carpets are also made.

Ayur vastra is healing, disinfecting and non-polluting. It also provides a beneficial natural aroma. Ayur vastra provides livelihood to 1200 weavers and many tribals who help to collect herbs. This is an appreciable step which takes human race close to nature.

1. Astangahrdaya of Vagbhata, with English Translation & Commentary by T. Sreekumar, Harisree Hospital, Kerala, June,2013
2. www.ayurvastra.in
3. www.vastra.cs/clinicalresearch.html

ADSORPTION CHARACTERISTICS OF NAPHTHOL BLUE BLACK – B ON ACTIVATED CARBON DERIVED FROM COCONUT SHELL AND PALMYRA FRUIT NUT SHELL – A COMPARATIVE STUDY

Dr.M.Vasuki & Ms.M.Karthika
PG and Research Department of Chemistry,
Seethalakshmi Ramaswami College, Tiruchirappalli

Abstract

Dyes are commonly used in textile, paint, paper, plastic, food and cosmetic industries for colouring purpose. Annually around 146000 tonnes of dyes are discharged from textile industry itself. These waste water contains lot of dye contents which are difficult to degrade. The waste water reaches the environment without treatment, it causes mainly water pollution. In the present work, adsorption of Naphthol Blue Black-B from aqueous solution over activated carbon obtained from cocunut shell (CSC) and palmyra fruit nut shell (PFSC) have been investigated at batch experiments. It has been observed that PFSC has greater adsorption capacity of Naphthol Blue Black-B dye than CSC.

Keywords: *Dyes, Adsorption, Activated Carbon, Naphthol Blue Black-B, Dye removal.*

Introduction

Dyes are synthetic aromatic water-soluble organic substances having complex molecular structure and they are widely used for colouration of different types of textile fibres and fabrics. The dyes can be classified into natural and synthetic dyes based on the source. Many natural dyes have been known for a long time. These were obtained from animal and vegetable sources. The availability of natural dye is less and they are not stable. Today, practically all dyes are synthetic and are prepared from aromatic compounds which are obtained from coal tar or petroleum. Water pollution is a major problem throughout the world. Water is being polluted by various means of sources like textile industry, dye house, factory, poultry etc. Nearly 10,000 dyes and pigments are used in dyeing and printing industries. Globally about 7 x 10^5 tonnes of dyes are produced. About 10 to 15% of the dye consumed in the dyeing process is disposed into the environment as effluent. Discharge of coloured effluent without proper treatment can degrade the environment such as water bodies, ground water, soil, etc.

Various methods are used for the treatment of textile waste water. These are broadly fall into three categories-physical, biological and chemical methods. The physio-chemical methods have many disadvantages such as high cost, low efficiency, limited versatility, toxic byproducts and handling of the waste generated. But the adsorption has been found to be an effective method. The adsorption was carried out using a low cost agricultural by products like rice husk, neam leaf powder, surgarcane bagasse, groundnut shell, coconut shell, palmyra fruitnut shell, etc. Activated carbon is most widely used adsorbent due to its high adsorption capacity, high surface area and microprous tight structure and provide good mechanical strength and hardness. Activated carbon plays a very critical role in drinking water

purification. The survey of literature reveals that there are only a few studies regarding the use of activated carbon from coconut shell and palmyra fruit nut shell, for the removal of dyes from water bodies. The aim of this study is to evaluate the adsorption process of diazo dye using activated carbons.

Materials and Method

Instruments: In the experimental studies, MAPADA V-1100D Spectrophotometer was used for determination of dye concentrations.

Materials: Naphthol Blue Black-B is used in the adsorption studies were obtained from SISCO Research Laboratories Pvt.. Ltd., Bombay. The coconut and palmyra fruit nut shells were collected.

Experimental Methods

Preparation of Activated Carbon: The coconut and palmyra fruit nut shells were impregnated with sulphuric acid and dried in an oven at 200°C for 10 hours. Then the carbonized material was washed with 1% sodium bicarbonate followed by distilled water, dried at105°C. The samples were ground and used in all adsorption experiments.

Preparation of stock dye Solution: Stock solution of Naphthol Blue Black-B was prepared by dissolving 0.5g of each dye in distilled water and making it upto 100 ml, in a standard flask.

Standardisation of Dye Solution: Solutions of Naphthol Blue Black-B was standardized by measuring the optical density of the various concentrations of the dye solutions at 605nm by using MAPADA spectrophotometer. 100ml of dye solution of required concentration was taken in each of the pyrex bottles which contains the required amount of activated carbons (CSC & PFSC). The solutions were shaken in orbital shaker. At appropriate time interval 10ml of aliquot was filtered in whatmann No.1 filter paper. The filtrate was collected separately in a clear dry test tube and then the optical density of the clear supernatant dye solution was measured till the equilibrium was attained. Effect of contact time were studied by taking 100ml of dye solution with appropriate concentrations in pyrex bottles containing 1g of activated carbon (CSC & PFSC). The influence of initial dye concentration was observed by varying the concentrations of Naphthol Blue Black-B dye (2.5-12.5mg/L) with 1g/L of activated carbon. To evaluate the percentage decolourisation dependence on the dosage of adsorbent, dosage of activated carbon was varied from 0.5 to 2.5g with suitable concentration of dye. The effect of decolourisation of Naphthol Blue Black-B dye by adsorption using CSC and PFSC were compared.

Results and Discussion

Adsorption of Naphthol Blue Black-B from aqueous solution over activated carbons obtained from Coconut Shell and Palmyra Fruit Nut shell have been investigated.

The rate of adsorption has been found to increase with

- increase in contact time(Fig.1)
- increase in dosage of adsorbent (Fig.2)
- decrease in initial dye concentration (Fig.3)

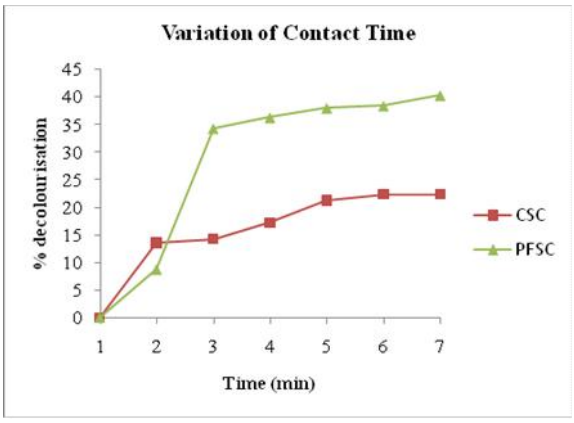


Fig.1: Variation of Contact Time

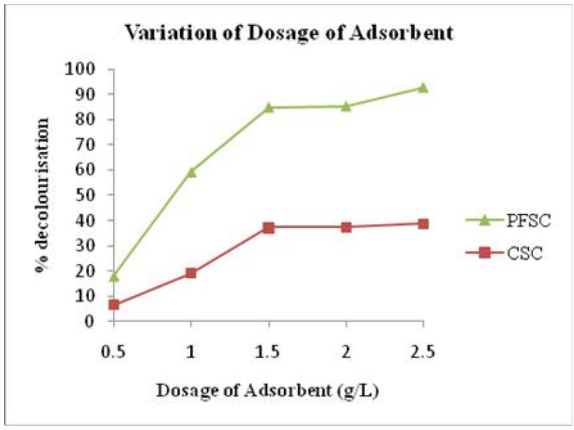


Fig.2: Variation of Dosage of Adsorbent

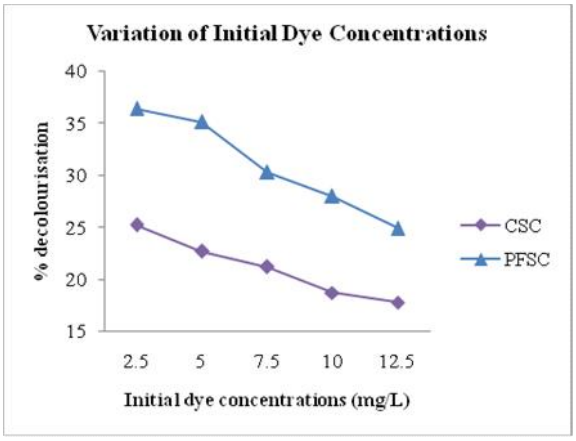


Fig.3: Variation of Initial dye concentrations

Conclusion

In this study, activated carbons (CSC and PFSC) were prepared by simple process and used for the adsorption of Naphthol Blue Black-B dye from aqueous solution. Adsorption efficiency of CSC and PFSC for Naphthol Blue Black-B at the equilibrium time of 60min was found to be 22.34% and 40.11% respectively. Thus, the efficiency of adsorption by palmyra carbon is twice that of coconut carbon.

References

1. Bahl, ArunBahl Advanced organic chemistry, S.S.Chand Publications, 2007.
2. Hem Lata, V.K.Garg, R.K.Gupta Removal of basic dye from aqueous solution of adsorption using Parthenium hysterophorus: An agricultural wastes. Dyes and Pigments, 74 (2007) 653-658.

Acknowledgement

We thank the Department of Chemistry, Seethalakshmi Ramaswami College, Trichy, for providing facilities.

THE ROLE OF TEXTILES IN THE WESTERN EUROPEAN CIVILIZATION DURING SIXTEENTH CENTURY -A BIRD'S EYE VIEW

Dr. M. Venkateshwari
Assistant professor, Dept. of English,
Seethalakshmi Ramaswami College, Tiruchirapalli

Abstract

The study on the history of textiles always traces the availability, the use of it and the development of technology for the making of clothing over human history. Clothing and textiles have always been important in the history of mankind and reflects the materials available to a civilization as well as the technologies that had been mastered. The social significance of the finished product reflects their culture. This paper focuses on the textiles used by the men and women of the Western European countries especially during the sixteenth century.

Introduction

The wearing of clothing is exclusively a human characteristic and is a feature of most human societies. The study on its history traces the availability, the use of textiles and the development of technology for the making of clothing over human history. It is not known when humans began wearing clothes but anthropologists believe that animal skins and vegetation were adapted into coverings as protection from cold, heat and rain, especially when humans migrated to new climates. Clothing and textiles have been important in human history and reflects the materials available to a civilization as well as the technologies that had been mastered. The social significance of the finished product reflects their culture.

Textiles can be felt or spun fibers made into yarn and subsequently netted, looped, knit or woven to make fabrics, which appeared in the Middle East during the late stone age. From the ancient times to the present day, methods of textile production have continually evolved, and the choices of textiles available have influenced how people carried their possessions, clothed themselves, and decorated their surroundings. Fashions to update the trendy things have always been a most wanted and demanding field throughout the ages and countries. Most of the wears of today's generations are the imitations from the western culture. To them, the western clothing gives a deep assortment of choices for different event and occasion. The style of dressing kept varying in different centuries. This paper focuses on the textiles used by the men and women of the Western European countries especially during the sixteenth century. Between 1550–1600, the Western European clothing was characterized by increased opulence. Contrasting fabrics, slashes, embroidery, applied trims, and other forms of surface ornamentation remained prominent. The wide silhouette, conical for women with breadth at the hips and broadly square for men with width at the shoulders had reached its peak in the 1530s, and by mid-century a tall, narrow line with a V-shaped waist was back in fashion. Sleeves and women's skirts then began to widen again, with emphasis at the shoulder that continued into the next century. The characteristic garment of the period was the

ruff, which began as a modest ruffle attached to the neckband of a shirt or smock and grew into a separate garment of fine linen, trimmed with lace, cutwork or embroidery, and shaped into crisp, precise folds with starch and heated irons. The severe, rigid fashions of the Spanish court were dominant everywhere except France and Italy. Black garments were worn for the most formal occasions. Black was difficult and expensive to dye, and seen as luxurious, if in an austere way. Regional styles were still distinct. The clothing was very intricate, elaborate and made with heavy fabrics such as velvet and raised silk,

Linen ruffs grew from a narrow frill at neck and wrists to a broad "cartwheel" style that required a wire support by the 1580s. Ruffs were worn throughout Europe, by men and women of all classes, and were made of rectangular lengths of linen as long as 19 yards. Later ruffs were made of delicate reticella, a cutwork lace that evolved into the needle laces of the 17th century. Women's fashion became one of the most important aspects during the period of Elizabeth I, the Queen of England. As the Queen was always required to have a pure image, and although women's fashion became increasingly seductive, the idea of the perfect Elizabethan women was never forgotten. With regard to the fabrics and materials for the clothes construction, only the royal people were permitted to wear ermine. Other nobles, the lesser ones were allowed only to wear foxes and otters. Clothes worn during this era were mostly inspired by geometric shapes, probably derived from the high interest in science and mathematics from that era. Padding and quilting together with the use of whalebone or buckram for stiffening purposes were used to gain geometric effect with emphasis on giving the illusion of a small waist. Not only fabrics were restricted on the Elizabethan era, but also colors, depending on social status. Purple was only allowed to be worn by the queen and her direct family members. Depending on social status, the color could be used in any clothing or would be limited to mantles, doublets, jerkins, or other specific items. Lower classes were only allowed to use brown, beige, yellow, orange, green, grey and blue in wool, linen and sheepskin, while usual fabrics for upper crusts were silk or velvet. By the end of the period, there was a sharp distinction between the sober fashions favored by Protestants in England and the Netherlands, which still showed heavy Spanish influence, and the light, revealing fashions of the French and Italian courts. This distinction was carried over well into the seventeenth century. The common upper garment was a gown, called in Spanish 'ropa' in French 'robe', and in English either 'gown or frock'. Gowns were made in a variety of styles- loose or fitted with short half sleeves or long sleeves; and floor length, a 'round gowns' or with a trailing train. The gown was worn over a kirtle or a petticoat for the sake of keeping themselves warm. Prior to 1545, the kirtle consisted of a fitted one-piece garment low neckline might be filled with an infill which is usually called in English a partlet. Partlets worn over the smock but under the kirtle and gown were typically made of lawn, a fine linen. Partlets were also worn over the kirtle and gown. The colours of "over-partlets" varied, but white and black were the most common. The partlet might be made of the same material as the kirtle and richly decorated with lace detailing to compliment it. Embroidered partlet and sleeve sets were frequently given to Elizabeth as New Year's gifts.

Fashion for men varied according to whether they were a member of the Nobility, upper class or one of the poor working class. The materials and fabrics used by them were extremely important. Their fashionable clothing consisted of a linen shirt with collar or ruff and matching wrist ruffs, which were laundered with starch to be kept stiff and bright. Over the shirt men wore a doublet with long sleeves sewn or laced in place. Doublets were stiff, heavy garments, and were often reinforced with boning. Optionally, a jerkin, usually sleeveless and often made of leather, was worn over the doublet. During this time the doublet and jerkin became increasingly more colorful and highly decorated. Waistlines dipped V-shape in front, and were padded to hold their shape. Around 1570, this padding was exaggerated into a 'peascod belly'.Hose, in variety of styles, were worn with a codpiece early in the period.' Trunk hose or round hose' were short padded hose. Very short trunk hose were worn over 'cannions', fitted hose that ended above the knee. Trunk hose could be 'paned' or 'pansied', with strips of fabric over a full inner layer or lining. 'Slops or galligaskins' were loose hose reaching just below the knee. Slops could also be 'pansied'. 'Pluderhosen' were a Northern European form of pansied slops with a very full inner layer pulled out between the panes and hanging below the knee. 'Venetians' were semi-fitted hose reaching just below the knee. Men wore stockings or 'netherstocks' and flat shoes with rounded toes, with slashes early in the period and ties over the instep later. Boots were worn for riding. Brocade, Buckram, Calico, Cypress, Damask, Flannel, Gauze, Linen, Russet, Sarcenet, Satin, Tiffany and Velvet were some of the common material and fabrics worn by the men during this era.

Textiles play a major role in social, economic, and religious lives of communities throughout the countries. It is a major component of material culture. They may be viewed as the products of technology, as cultural symbols, as works of art, or as items of trade. The textile arts are a fundamental human activity, expressing symbolically much of what is valuable in any culture. Out of textiles comes the clothing styles, an indispensable part of our life which requires a wise combination of fashion and comfort and one would be interested to read fascinating things about the choice and the clothing styles of men and women during sixteenth century.

Work Cited

1. Arnold, Janet. A Visual History of Costume: The 16th Century. New York: Pub Drama Book Publishers.1983. pp. 230–233.
2. Norris, Herbert. Daily Life in Ancient Modern London. Online Book. 1997 p. 127.
3. Arnold, Janet. Patterns of Fashion: the cut and construction of clothes for men and women 1560–1620, Macmillan 1985. Revised edition 1986. (ISBN 0-89676-083-9)
4. Ashelford, Jane. The Art of Dress Clothes and Society 1500-1915. Great Britain: National Trust Enterprises Limited. 1996. p. 20. ISBN 0-8109-6317-5.
5. Tammie L. Dupuis. Recreating 16th and 17th Century Clothing. The Renaissance Tailor. Retrieved 2012-06-09.
6. www.elizabethan-era.org.uk. Retrieved 2015-11-02.

INDIAN TEXTILE INDUSTRY-CHALLENGES AND OPPURTUNITIES

Dr.R.Vijayalakshmi
Associate Professor of Commerce
Seethalakshmi Ramaswami College, Trichy

Abstract

India is one of the world's largest producers of textile and garments.Abandunt availability of raw materials such as cotton, wool, silk and jute as well as skilled workforce have made the country a sourcing hub. It is the world's second largest producer of textiles and garments. The Indian textile industry accounts for about 24% of the world's spindle capacity and 8% of global rotor capacity. In this context this paper highlights the following aspects;

- *India's textile market share*
- *Policies and government incentives-FY 2016 Budget*
- *Major players in India and abroad*
- *Foreign investors in Indian textile Industry*
- *Technical textile industry-a new arena of growth*
- *Challenges and opportunities*

Keywords; *Textile Industry, Growth, Export, Market share*

Introduction

The Textile industry has made a major contribution to the national economy in terms of direct and indirect employment generation and net foreign earnings. The sector contributes about 14% to industrial production, 4% to the Gross Domestic product (GDP), and 27% to the country's foreign exchange inflows. It provides direct employment to over 45 million people. The textiles sector is the second largest provider of employment after agriculture. Thus, the growth and all round development of this industry has a direct hearing on the improvement of India's economy.

Figure: 1 Evolution of the Indian Textile Sector

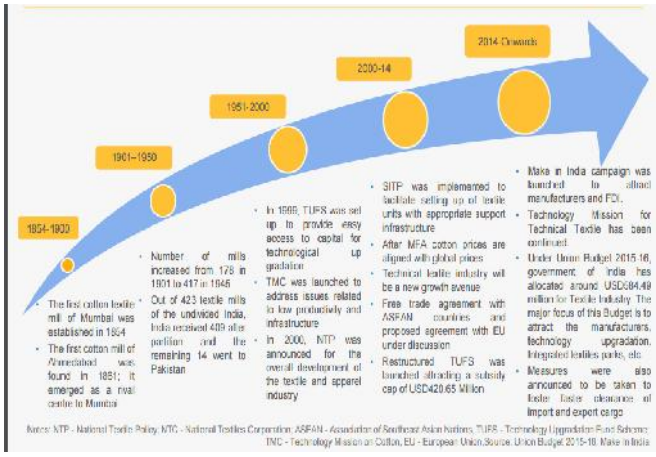


Table: 1
India's Textile Market Share

Categories	Market Share
Textile	31
Apparel	69
Total	100

Source: Secondary Data

India has overtaken Italy, Germany and Bangladesh to emerge as the world's second largest textile exporter. India's share in Global Textiles increased by 17.5% in 2013 compared to 2012. Textiles exports from India will touch US $ 300 billion by the year 2024-25. In 2012, apparel had a share of 69% of the overall market, textiles contributed the remaining 31%.

India's Textile Market Size

The Indian Textile Industry has the potential to grow five-fold over the next ten years to touch US $ 500 billion mark on the back of growing demand for polyester fabric. The US $ 500 billion market figure consists of domestic sales of US $ 315 billion and exports of US $185 billion. The current industry size comprises domestic market of US $ 68 billion and exports of US $ 40 billion. Apparel exports from India have registered a growth of 17.6% in the period April- September 2014 over the same period in the previous financial year.

Global Vs Domestic Scenario

The global trade of textile and garments was approximately $ 781 billion in 2013. This is almost 4.6 percent of the trade of all commodities, which is estimated at approximately $ 17 trillion. From 2008 to 2013, the global textile and garment trade has grown at a CAGR of 4 percent. The current global garment is estimated at approximately $ 1.15 trillion which form nearly 1.8 percent of the world GDP. Almost 75% of this market is concentrated in Europe, USA, China and Japan. An Analysis of per capita spend on garment in various countries shows a significant difference between numbers in developed and developing economies. Within the major markets, India has the lowest per capita spend on garment ($37) which is only 3 percent of the highest one viz. Australia ($1,131). The Indian Textile and Government industry has an important presence in the country's economy through its contribution to industrial output, employment generation, and the export earnings. It contributes almost 5% to the dollar $ 1.8 trillion Indian economy whereas its share in Indian exports stands at a significant 13%. India is the second largest exporter of Textile and Garment goods with a global trade share of approximately 5%.

Policies and Government Incentives

Figure: 2 Continued support to Textile sector by the Government in FY 16 Budget

Source: Union Budget FY15-16, Ministry of Textile Notes: SITP -Scheme for Integrated Textile Parks, TUFS - Technology Up gradation Fund Scheme, NER –North East Region

USD252 million has been allocated for TUFS scheme

• USD24.8 million has been allocated for National Handloom Development Program

• USD33.34 million has been allocated for Human Resource Development

Some of the key tax reliefs in Budget FY16:
• Zero excise duty for the cotton products

• Structure of the excise duty on Man-Made Fiber has been same

Allocation of USD39.8 million for apparel parks under SITP

• USD26.05 million have been allocated for NER Textile Promotion Scheme

• USD1.33 million has been allocated to Trade Facilitation Centre and Craft

Figure: 3

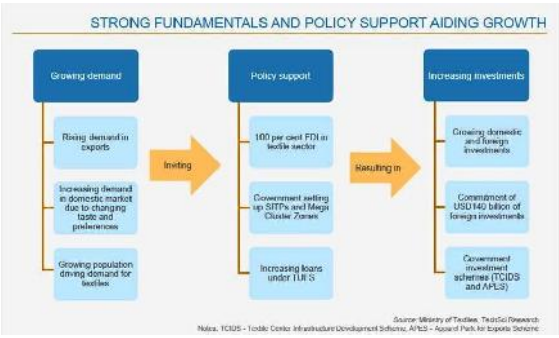
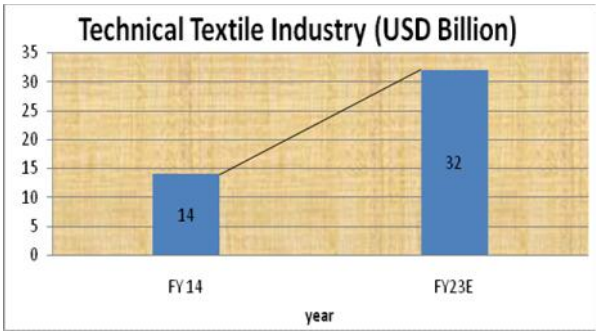


Figure: 4 Technical Textile Industry



Source: Chamber of Commerce, Indian Technical Textile Association, Tech Sci Research Notes: SME -Small and Medium Enterprises, E –Estimates

- The major service offerings of the technical textile industry include thermal protection and blood-absorbing materials, seat belts and adhesive tapes
- The technical textile industry is expected to expand at a CAGR of 9.6 percent during FY14–23 to USD 32 billion in FY23.
- The targeted market size would be achieved by targeting non-woven technical textiles
- Healthcareandinfrastructuresectorsaremajordriversofthetechnicaltextileindustry
- India is expected to be a key growth market for the technical textile sector due to cost-effectiveness, durability and versatility of technical textiles
- The government has supported the technical textile industry with an allotment of USD 1 billion for SMEs and an exemption in custom duty for raw material used by the sector
- USD70.83million has been allocated to promote the use of Geo technical textiles in the North East states in FY14

Major Indian and Foreign Players

- Chiri pal Group - Spinning and denim weaving
- The Victoria Mills Ltd - Fabrics for local and International markets.
- Digjam- SUITING fabrics - Light wool, Polyester wool and woolen fabrics.

- The Ruby mills Ltd - Composite textiles mainly on Cottons. Collaboration with Gygli Textile AG, Switzerland.
- Bombay Dyeing - Spin cotton yarn dip dyed by hand. NGSSS Technology from Invista polyester Technologies and chemtex International Inc, USA.
- Arvind Mills -Manmade made ups for export High and superfine fabrics.
- Welspun India Ltd - Home textiles for bed and bath category.
- Alok Industries Ltd - cotton yarn, Apparel fabric, Home textiles, Garments and Polyster yarn.
- Raymond Ltd - Wool and wool blended Fabrics exporting products to over 55 Countries.

Foreign Investors in Indian Textile Industry

Rieter (Switzerland)	Trutzschler (Germany)	Soktas (Turkey)
Zambiati (Italy)	Bilsar (Turkey)	Monti (Italy)
CMT (Mauritius)	E-land (S. korea)	Nissinbo (Japan)
Marubeni (Japan)	Skaps (USA)	Ahlstorm (USA)
Terram (UK)	Strata Geosystems (USA)	Zara (Spain)
Marks & Spencer (UK)	Mango (Spain)	Promod (France)
Benetton (Italy)	Esprit (USA)	Levi's (USA)
Forever21 (USA)		

Challenges and Future Prospects

Challenges Faced by the Indian Textile Industry

In spite of immense factors fuelling the growth of the Indian textile Industry, there are certain challenges faced by the country in terms of scarcity of trained manpower, escalating energy costs, high transportation costs, obsolete labor laws, low level of technology, and lack of economies of scale.

Future Prospects

The Indian textiles industry is set for strong growth, buoyed by both strong domestic consumption as well as export demand. The industry is expected to reach US$220 billion by 2020. With consumerism and disposable income on the rise, the retail sector has experienced a rapid growth in the past decade with several international players like Marks & Spencer, Guess and next having entered the Indian market. The organized apparel segment is expected to grow at a compound annual growth rate (CAGR) of more than 13 percent over a 10-year period

Growth Drivers

- Rising per capita income, favourable demographics and a shift in preference for branded products is expected to boost demand.
- Favourable trade policies and superior quality will drive textile exports.
- Increase in domestic demand is set to boost cloth production.
- Pointed and favourable policies instituted by the government will give the industry fillip.
- With consumerism and disposable income on the rise, the retail sector has experienced rapid growth in the past decade, with many global players entering the Indian market.

- The centers of excellence focused on testing and evaluation as well as resource centres and training facilities have been set up.
- As per plan for 2012-17, the Integrated Skill development Scheme aims to train over 2,675,000 people up to 2017, covering all sub-sectors of the textile sector – textiles and apparel, handicrafts, handlooms, jute and sericulture.
- Changing lifestyles and increasing demand for quality products are set to fuel the need for apparel.

Investment Opportunities

- Entire value chain of synthetics
- Value added and specialty fabrics
- Fabric processing set-ups for all kind of natural and synthetic textiles
- Technical textiles
- Garments
- Retail brands

Conclusion

To conclude the Indian Textile industry plays a very vital role in the economic development of our country. It is the major role player in earning precious foreign exchange earnings of our country. The government has to take some more important steps to develop this industry to face the global competition.

Reference

1. A brief report on textile industry in India, January 2010.
2. Gary Bridge; Sophie Watson (8 March 2010). The Blackwell City Reader. John Wiley & Sons. pp. 75–76. ISBN 978-1-4051-8983-5.
3. Government of India, Ministry of Textiles. "National Jute Policy, 2005
4. www.ibef.org

BIOSOFTENING OF HEMP YARN USING PSEUDO STEM OF BANANA

A.Yamunadevi
Assistant Professor, Department of Garment Designing, PSGR Krishnammal College for Women, Coimbatore, Tamil Nadu

Dr.R. Sunitha
Assistant Professor, Department of Textiles and Clothing, Avinashilingam University for women, Coimbatore, Tamil Nadu

Abstract

In this study, the leaf fibres are hard, coarse and stiff in texture whereas the bast fibres are soft. The natural cellulose fibres come under the criteria of biodegradable textiles because of the presence of natural macromolecules like protein and cellulase. Hemp is the common name for plants of the entire genus Cannabis. Hemp is one of the fastest growing biomasses known, producing upto 25 tonnes of dry matter per hectare per year and one of the earliest domesticated plants known. Hemp is used for a wide variety of purposes, including the manufacture of cordage of varying tensile strength and clothing. Enzymes are protein substance preferred due to the reasons that these replace house chemicals, create no pollution, act as a catalyst and are degradable. The selected natural sources namely banana stem waste and cauliflower leaf stalk were chopped into small pieces of 2-3"size. These cut pieces were ground individually and juice from the same was extracted for identification of the presence of enzyme. The cellulase enzyme extraction method on fresh mouldy substrates obtained after incubation were soaked in distilled water and allowed to stand at room temperatures 30îC for one hour and extracted the enzyme from banana stem waste and cauliflower leaf stalk. The tests were conducts at Avinashilingam University. The treated yarns were visually and objective evaluations were carried out in the laboratory. The obtained results are compared with the banana stem waste and cauliflower leaf stalk.

Keywords: *Hemp fibres, banana stem waste, cauliflower leaf stalk, cellulase enzyme, spinning*

Introduction

Natural fibres include vegetable, animal and mineral fibres. The source of each vegetable fibre is cotton-cotton ball, linen-flax stalk, jute-jute stalk, hemp-hemp stalk, sisal-agave leaf, kapok-kapok tree, pine-pineapple leaf, Ramie-Rhea or China grass and coin-coconut tree.Industrial Hemp has been tried for many uses including paper, textiles, biodegradable plastics, constructions, health food and fuel with modest commercial success. The use of hemp fibre in the production of nonwovens and felt is a proven application for many different products, such as goetextiles, automatic substrates, sound absorbing material, insulation, furniture, mattress, horticulture, carpet backing and composite material. The hemp plant, cannabi sativa, is a member of the mulberry family and a type of marijuana plant. The fibre bundles come from the bast layer of the stem. The properties of hemp fibres as antiseptic absorbent, physiologically friendly due to their thermal and electrostatic properties and are also able to protect against ultra violet radiation.The tensile properties of hemp are not uniform throughout the length of the fibre but the fibers are stronger and stiffer at the mid-span and moderate at the tip. Hence, the researcher selected the natural vegetable fibres namely Hemp for the study. The enzyme also was

extracted from natural vegetable wastes obtained from banana stem waste and cauliflower leaf stalk for treating the yarns. The objectives of the study were to:

- Spin and evaluate selected natural vegetable fibres
- Identify the presence of cellulase enzyme in natural source.
- Extract and optimize the enzyme
- Process the spun yarns
- Evaluate the treated yarns.

Methodology

Procurement of Hemp Fibre: The fibres are usually obtained by machine decortication method in which the leaf is crushed and the resulted pulp is scrapped, washed and dried by natural means. Decortication method was found to be the best as it does not involve chemicals for fibre separation. More quantity of fibres were extracted with minimum consumption of water and time giving good luster and softness to the fibres.

Spinning of Hemp Fibres: The method of spinning of Sisal fibres was carried out commonly used spinning system was utilized for the spinning of Sisal fibres. It consists of two stages of carding, followed by three stages of drawing and finally a spinning stage. After spinning of sisal fiber, the yarn is treated with scouring and bleaching (Plate –1).

Collection of Natural Sources for Enzyme Treatment: Enzymatic softening is carried out cinder mild physical and chemical conditions due to which the process is non-corrosive, consumes very little energy, absolute safe to handling personnel and are biodegradable. Hence the investigator selected the natural sources namely banana stem waste and cauliflower leaf stalk for enzyme extraction to treat the yarn samples. An aerobic cellulase recovery from banana stems waste. Banana stem wastes thrown away by farmers after harvesting of fruits were collected from the wastes. The banana stems wastes were chopped into small pieces of 2-3”size. Similarly cauliflower leaf stalk were collected from kitchen waste and were also chopped to 2-3" size. These cut pieces were ground individually and juice of the same was extracted for identification of the presence of enzyme.

Plate 1 Original, Scoured and Bleached Yarns

Hemp Original

Hemp Scoured

Hemp Bleached

Identification of Cellulase Enzymes from Selected Natural Sources

The cellulase enzyme extraction method on fresh mouldy substrates obtained after incubation were soaked in distilled water and allowed to stand at room temperatures 30°C for one hour and extracts were obtained by filtering the mixture through nylon cloth. He also explained the enzyme activity was expressed in international units (IU), as micromoles of glucose produced per minute. The filter paper activity measured by the release of reducing sugar produced in 60 minutes,

from mixture of 0.5ml diluted enzyme, one ml of acetate buffer and 50mg of Whatman No. 1 filter paper incubated at 55°C. Accordingly the investigator extracted the enzyme from banana stem waste and cauliflower leaf stalk and found the optical density level of cellulase enzyme presence in both the sources. Both the sources were compared and better source was selected for further study.

Enzyme Treatment of Yarn Samples

The efficiency of cellulase bio polishing depends on various process parameter like pH, temperature, duration of the treatment, MLR and conditions of the fabrics. After optimization of pH and temperature, the enzymes were extracted from the selected natural source. Then the weighed quantity of bleached Hemp yarn was treated with enzyme at the optimized pH range of 8.0 and temperature at 40°C for 24 hours. After the enzyme treatment the yarn sample was taken out and given a hot wash followed by cold water wash to neutralize the enzymatic effect. This was dried in shade for 24 hours.

Nomenclature of Samples

The nomenclature of the samples used are clearly given in Table I.

Table I - Nomenclature of Samples

S. No.	Details of yarns	Sample
1	Hemp Original	HO
2	Hemp Scoured	HS
3	Hemp Bleached	HB
4	Hemp enzyme treated	HE

Results and Discussion

Identification of Cellulase Enzymes from Selected Natural Sources

The identification of cellulase enzymes from selected natural sources is given in Table II.

Table Ii Identification of Cellulase Enzymes From Selected Natural Sources

Particulars	Cauliflower leaf stalk	Banana stem waste
Absorbency at 540nm	0.86	1.10

From the Table II, it is clear that the maximum absorbency value in banana stem waste and the minimum absorbency value in cauliflower leaf stalk. Hence, it could be concluded that there was the maximum absorbency in banana stem waste.

Optimization of Ph for Effective Reaction of Cellulase Enzyme from Banana Stem Waste

The optimization of pH for effective reaction of cellulase enzyme from banana stem waste is given in the following Table III.

Table Iii Optimization of Ph and Temperature for Effective Reaction of Cellulase Enzyme from Banana Stem Waste

Particulars	pH						Temperature				
	4	5	6	7	8	9	20 C	30 C	40 C	50 C	60 C
Absorbency at 540 nm	0.3	0.2	0.36	1.21	**1.36**	0.59	0.21	0.22	**0.26**	0.22	0.23

From the Table III, it is clear that the optimization of pH is most effective at the pH value of 1.36 at 8. The maximum optimization of temperature at 40°C with the value of 0.26

Visual Analysis of Original and Treated Hemp Yarn Samples

The visual analysis of original and treated Hemp yarn samples is shown in Table IV.

Table IV Visual Analysis of Original and Treated Hemp Yarn Samples

S.No.	Sample	General Appearance			Colour			Lustre			Texture		
		G	F	P	B	M	D	G	F	P	S	C	VC
1	HO	44	56	0	20	80	0	12	84	4	20	80	0
2	HS	68	32	0	28	72	0	56	40	4	20	80	0
3	HB	76	24	0	88	12	0	48	52	0	52	48	0
4	HE	88	12	0	96	4	0	92	8	0	92	8	0

G-Good; F-Fair; P-Poor; B-Bright; M-Medium; D-Dull; S-Soft; C-Coarse; VC-Very Coarse

Form the Table IV, it is clear that the samples HB and HE as good in general appearance by 88 per cent of judges respectively. The samples HO and HS were rated as medium in color by 80 per cent and 72 per cent of judges and 88 per cent and 96 per cent of judges rated the samples HB and HE as bright respectively. The majority of judges 92 per cent of rated sample HE as good in lustre. The majority of judges 92 per cent rated HE sample as soft in texture.

Findings reveal that the samples HB and HE were rated as good in general appearance, bright in colour and soft in texture by maximum number of judges. Lustre was also rated to be good in sample HE by maximum judges.

Objective Evaluation

The original and treated hemp yarns were objectively evaluated for the strength, elongation per cent, RKM, single TPI, Mean U %, diameter and yarn count.

Strength of original and treated Hemp yarn

The strength of original and treated Hemp yarn is given in Table V.

Strength of Original and Treated Hemp Yarn

Sample	Actual strength	Loss/Gain over original	Loss / Gain in per cent over original
HO	5779.0	-	-
HS	5196.9	582.1	10.07
HB	6110.1	331.1	5.72
HE	4599.4*	-1179.6	**20.41**

*** - 5 % significant**

From the Table V, it is clear that there is loss in strength of sample HS of 10.07 per cent followed by sample HE of 20.41 per cent. In the sample HB there is an increase in strength of 5.72 per cent over the sample HO. Hence it could be concluded that though there was an increase in strength in sample HB there was a loss in

strength of sample HE. Significant difference of five per cent was found between samples HO and HE.

Elongation per cent of original and treated Hemp yarn

The elongation per cent of original and treated hemp yarn is given in the following Table VI.

Elongation Per Cent of Original and Treated Hemp Yarn

Sample	Elongation	Loss/Gain over original	Loss / Gain in per cent over original
HO	2.16	-	-
HS	2.84	068	31.48
HB	3.45	1.29	**59.72**
HE	2.98	0.82	37.96

From the above Table, it is clear that there is gain in elongation per cent in all samples when compared to original. Sample HB showed an elongation by 59.72 per cent followed by samples HE and HS of 37.96 per cent and 31.48 per cent respectively. Hence, it could be concluded that there was an increase in elongation per cent in the sample HE over HO and HS.

Breaking tenacity of original and treated Hemp yarn

The breaking tenacity of original and treated hemp yarn is given in Table VII.

Breaking Tenacity of Original and Treated Hemp Yarn

Sample	Breaking tenacity	Loss/Gain over original	Loss / Gain in per cent over original
HO	9.79	-	-
HS	10.30	0.51	5.20
HB	9.22	-0.57	5.82
HE	6.86	-2.93	**29.92**

From the above table, it is vivid that the breaking tenacity got increased in sample HS of 5.20 per cent over the sample HO. It had got decreased in sample HB of 5.82 per cent followed by sample HE of 29.92 per cent. Hence, it could be concluded there was a decrease in breaking tenacity in sample HE.

Single TPI of original and treated Hemp yarn

The single TPI of original and treated hemp yarn is given in the following Table VIII.

Single TPI of Original and Treated Hemp Yarn

Sample	Single TPI	Loss/Gain over original	Loss / Gain in per cent over original
HO	3.26	-	-
HS	3.30	0.04	1.22
HB	3.31	0.05	1.53
HE	3.37	0.11	**3.37**

From the Table, it is vivid that there is drastic increase in twist per inch in sample HE of 3.37 per cent followed by sample HB and HS of 1.53 per cent and 1.22 per cent respectively. The direction of the twist in hemp yarn was analyzed to be 'Z' twist. It could be concluded that there was a gain in twist in samples HE, HB and HS over sample HO.

Imperfection in treated and untreated Hemp yarn: The imperfection of original and treated hemp yarns is given in the following Table IX.

Imperfection in Hemp Treated and Untreated Yarn

Sample	Thick place (+50%)	Thing places (-50%)	Nep (+200%)	U% Imperfection		
				Mean	Loss / Gain over original	Loss / Gain in per cent over original
HO	1013	800	7	22.31	-	-
HS	1000	980	0	23.70	1.39	6.23
HB	240	180	40	15.50**	-6.81	30.52
HE	1000	120	180	17.10	-5.21	23.35

**** - 1 % Significant**

From Table, it is clear that all the treated samples showed less in imperfection in the thick place in the yarn are reduced in the sample HS and HE of 1000 over the sample HO followed by sample HB which is 240 over the sample HO which is 1013. Thin places are increased in sample HS of 980 over the sample HO (800). It is reduced in sample HB (180) and sample HE (120) over the sample HO.

Neps are found to be increased in sample HE of 180 followed by sample HB over sample HO (7). No nep is found in sample HS. Mean U% imperfection increased in sample HS of 23.70 over sample HO which is 22.31 whereas it has got decreased in sample HE of 17.10 followed by HB of 15.50. Hence, it could be concluded that U% imperfection is reduced drastically in samples HB and HE.

In statistical analysis it is evident that there is a significant difference of one per cent between HO and HB. Hence, it could be concluded that U% imperfection was reduced drastically in samples HB and HE.

Diameter of Original and Treated Hemp Yarns

The diameter of treated and untreated Hemp yarn is given in Table X.

Diameter of Treated and Untreated Hemp Yarn

Sample	Yarn diameter (mm)	Loss/Gain over original	Loss / Gain in per cent over original
HO	0.96	-	-
HS	1.18	0.22	22.91
HB	1.263	0.303	**31.25**
HE	1.207	0.247	25

The Table reveals that the diameter got increased, sample HB of 31.25 per cent followed by sample HE of 25 per cent and sample HS of 22.91 per cent. This concludes that the diameter got increased in all the three treated samples namely HB, HE and HS.

Yarn count of original and treated Hemp yarn

The yarn count of original and treated Hemp is given in Table XI.

Yarn Count of Original and Treated Hemp Yarn

Sample	Yarn count	Loss/Gain over original	Loss / Gain in per cent over original
HO	1.0	-	-
HS	1.17	0.17	**17**
HB	0.88	-0.12	12
HE	0.88	-0.12	12

From Table it is clear that the actual count of yarn decreased in both samples HB and HE of 12 per cent and it got increased in sample HS of 17 per cent over the sample HO. Hence it could be concluded that count of yarn got reduced in both samples HB and HE.

Conclusion

From the above findings, it could be concluded that the enzyme extracted from banana stem waste is the most suitable for Hemp yarn, as it had improved the strength and elongation per cent and further had reduced the yarn U% imperfection. As the enzyme is extracted from the natural nonedible portion it could be utilized in softening similar coarse fibres and yarns.

Reference

1. Bhatnagar, P. (2002) Elementary Textile, Abhishek Publications, India, I Edition, P 16.
2. http://en.wikipedia.og/wiki/hemp
3. Fakiror, S. and Bhattacharyya, D. (2007) Handbook of Engineering Biopolymers, Homopolymers, Blends and Composites, Hanser Verlag, USA, P. 44.
4. Collier, B.J., Tortora, P.G. (2005) Understanding Textiles, 6th Edition, Prentice Hall, Upper Saddle River, New Jersey.
5. Sudha, Giri, S., Dev, V.R., Neela Kandan, R. (2006) Natural Fibre Composites, Asian Textile Journal, Vol 15, No. 4, April, P. 53.
6. Britannica Micropedia (2000). Britannica, M. (2000) Natural Fibers – Handbook with cultivation and Uses, P. 449.
7. Sunitha, R. and Krishnabai (2005) Extracting and processing of Agava Americana fibres, producing needle punched jute blench and creating innovative products, Master of Philosophy in Textiles and Clothing, Avinashilingam University for Women, Coimbatore. Pp. 40-41.
8. Franck, R.D. (2005) Bast and Other Plant Fibres, Woodhead Publishing Limited, England, Pp. 38-39.
9. Shyamsundar, P. and Sivakumar, K. (2008) Value Addition of Garments by Specialty Finishes, Colourage, March, Vol. LV, No. 3, P. 95.
10. www.indianexpress.com/tnbanana_stem_waste
11. Shukla, S.R., Ananthanarayanan, L. and Damle, A.J. (2005) Production and Application of Cellulase Enzyme, Colourage, Vol. LII, No. 7, July, P. 41.
12. Saravanan, D., Rajendran, R., Rajesh, F.M. and Ramachandran, T. (2010) Influence of Biopolishing on Certain Physical Properties of Cotton Fabrics, Colourage, Vol. LVII, No. 2, February

A REVIEW ON UNCONVENTIONAL FIBER AND ITS APPLICATION IN TECHNICAL TEXTILES

S.Yamuna Devi & D. Sheeba Mercy
Research Scholars Department of Textiles and Apparel Design, Bharathiar University, Coimbatore, India

Abstract

The materials chosen for structural up gradationmust, in addition to functional efficiency and increasing or improving the various properties of the structures, should fulfil some criterion, for the cause of sustainability and a better quality. For example, these materials should not pollute the environment and endanger bio reserves, should be such that they are self-sustaining and promote self-reliance, should help in recycling of polluting waste into usable materials, should make use of locally available materials, utilize local skills, manpower and management systems, should benefit local economy by being income generating. We have enough natural resources and we must keep on researching on these natural resources. Development of plant fibre composites has only begun. Among the various natural fibres such as, sisal fibers, bamboo fibres, coir fibres and jute fibres are of particular interest as these composites have high impact strength besides having moderate tensile and flexural properties compared to other lignocellulose fibres. Economic and other related factors in many developing countries where natural fibres are abundant demand thatscientists and engineers apply appropriate technology to utilize these natural fibres as effectively and economically as possible for structural up gradation and also other purposes for housing and other needs and also for various other applications .

Key words: *Self-sustaining, fibre composites, economic, natural fibres.*

Introduction

A judicious combination of two or more materials thatproduces a synergistic effect. A material system composed of two or more physically distinct phases whose combination produces aggregate properties that are different from those ofits constituents. Composites are hybrid materials made of a polymer resin reinforced by fibres, combining the high mechanical and physical performance of the fibres and the appearance, bonding and physical properties of polymers, the short and discontinuous fibre composites are responsible for the biggest share of successful applications, whether measured by number of parts or quantity of material used.

Sisal

The plants look like giant pineapples, and during harvestthe leaves are cut as close to the ground as possible. The soft tissue is scraped from the fibres by hand or

Fig 1: Sisal Fiber

machine. The fibres are dried and brushes remove the remaining dirt, resulting in a clean fibre. Sisal produces sturdy and strong fibres. Sisal fibre is one of the prospective reinforcing materials that its use has been more experiential than technical until now. The Sisal plant is a monocotyledonous, whose roots are fibrous, emerging from the base of pseudo stem. The leaves of Sisal are an example of natural composite with lingo cellulosic material presenting in 75 to 80 % of the total weight of the leaves, reinforced by helical micro fibres of cellulose, which represent about 9 to 12 % the total weight. The composition of Sisal fibre is basically of cellulose, lignin and hemicelluloses. The failure strength and the modulus of elasticity, besides the lengthening of rupture, depend on the amount of cellulose and the orientation of the micro-fibres. As a natural product these characteristics have a wide variation from one plant to another. The Sisal fibres are found commercially in several formats: fabric, cords, strips, wire, rolls, etc.

Properties of this fibre are as follows:

- Specific gravity [Kg/m3] 1370
- Water absorption [%] 110
- Tensile strength [M Pa] 347-378
- Modulus of elasticity [G Pa] 15

Advantages

a) They are very well resistant against moist.
b) These fibres have a good tension resistance or tensile strength.
c) They are very well resistant against heat.
d) Sisal short fibres delay restrained plastic shrinkage controlling crack development at early ages.
e) Sisal fibres conditioned in a sodium hydroxide solution retained respectively 72.7% and 60.9% of their initial strength.

Disadvantages

a) Decomposition in alkaline environments or in biological attack

Applications

a) It is mainly used for ropes, mats, carpets and cement reinforcement.
b) It is also used cement reinforcement.
c) In developing countries, sisal fibres are used as reinforcement in houses.

Bamboo

Bamboo has been one of the common materials inpre-industrial architecture in Asia and South American countries, employed as structural elements.

Fig:2 Bamboo Fiber

The utilization of bamboo as construction component is motivated by its widespread availability in the tropical and subtropical climatic regions, its rapid growth and the combination of elevated mechanical strength and low specific weight. However, at the present time, even the most modern construction where bamboo is used rely on a craft approach, with the know-how of construction techniques restricted to a small group of researchers, engineers and architects. There is on-going research concerned with the structural analysis of bamboo frame structures commonly used by local people, improvement of the concrete permanent bamboo shutter slabs and reinforced concrete beams and columns, having in mind its improvement according to available knowledge. Fabrication of corrugated composite slabs based on cement paste reinforced with cellulose pulp of bamboo**.** The cement composites reinforced by bamboo pulps are produced by the vacuum pressure process, seeking to establish the characteristics of a material which can be easily fabricated, utilizing the machinery of asbestos cement industry. The bamboo pulp is used in the paper industry on a large scale. There are studies underway to produce durable furniture and new geometrical structural forms, as well as bicycles, tricycles and car bodies using bamboo. The first aero plane which succeeded to fly was made with bamboo by the Brazilian Santos Dumont.

Properties of this fibre are as follows

- Specific gravity [Kg/m3] 1158
- Water absorption [%] 145
- Tensile strength [MPa] 73-505
- Modulus of elasticity [GPa] 10-40

Advantages

a) It has elevated mechanical strength.
b) It has low specific weight too.
c) It has high tensile strength.
d) It has better modulus of elasticity than any other natural material.
e) Easily and locally available material.

Disadvantages

a) It is very much bad in torsion when it became mature.
b) Probability of decomposition in biological attack.

Applications

a) Bamboo segments are used as reinforcement of concrete beams, circular columns and pillars in quadratic form of concrete, double–layer spatial and

plane truss bamboo structure and special joints between the bamboo elements, which can be easily used for plane and double-layer spatial structures.

b) Bamboo frame structures commonly used by local people for improvement of the concrete permanent bamboo shutter slabs and reinforced concrete beams and columns.

Coir (Coconut Fibre)

Coconut fibre is obtained from the husk of the fruit of thecoconut palm; the trees can grow up to 20 m, making harvesting a difficult job. People climb the tree to pick thenuts, or a pole with attached knife is used. The fruits are dehusked with on a spike and after retting, the fibres are subtracted from the husk with beating and washing. The fibres are strong, light and easily withstand heat and salt water. Coir is an abundant, versatile, renewable, cheap, and biodegradable lignocellulose fibre used for making a wide variety of products. Coir has also been tested as a filler or a reinforcement in different composite materials. Coir fibre–polyester composites were tested as helmets, as roofing and postboxes.

Fig: 3 Coir Fiber

Moreover, even with high coir fibre loading fractions, there is no improvement in the flexural strength. From these results, it is apparent that the usual fibre treatments reported so far did not significantly change the mechanical performance of coir–polyester composites. Although there are several reports in theliterature which discuss the mechanical behavior of natural fibres reinforced polymer composites. However, very limited work has been done on effect of fibre length on mechanical behavior of coir fibre reinforced epoxy composites. The present work thus aims to develop this new class of natural fibre based polymer composites with different fibre lengths and to analyses their mechanicalbehavior by experimentation.

Properties of this fibre are as follows:

- Specific gravity [Kg/m3] 1177
- Water absorption [%] 93
- Tensile strength [MPa] 95-118
- Modulus of elasticity [GPa] 8

Advantages

a) The fibres are strong, light.
b) The fibres can easily withstand heat.
c) The fibres can withstand salt water.

d) The use of coconut fibres seem to delayed restrainedplastic shrinkage controlling crack development at early ages.
e) Coir is an abundant, versatile, renewable, cheap, and lignocellulose fibre.
f) The addition of coconut coir reduced the thermal conductivity of the composite specimens.

Disadvantages

a) The fibres are biodegradable.

Applications

a) It is used for the production of yarn.
b) It is used for manufacture of rope and fishing nets.
c) It can be used for the production of brushes and mattresses.
d) Coir has also been tested as a filler or a reinforcement in different composite materials.

Jute

Fig: 4 Jute Fiber

The fibres are extracted from the ribbon of the stem. When harvested the plants are cut near the ground with a sickle shaped knife. The small fibres, 5 mm, are obtained by successively retting in water, beating, stripping the fibre from the core and drying. A single jute fibre is a three dimensional composite composed mainly of cellulose, hemicelluloses, and lignin with minor amounts of protein, extractives and inorganics. These fibres were designed, after millions of years of evolution, to perform, in nature, in a wet environment. Nature is programmed to recycle jute, in a timely way, back to basic building blocks of carbon dioxide, and water through biological, thermal, aqueous, photochemica1, chemical, and mechanical degradations.

Properties of the fibre are as follows

- Specific gravity [kg/m3] 1460
- Water absorption [%] 13
- Tensile strength [MPa] 400-800
- Stiffness [KN/mm2] 10-30

Advantages

a) It can withstand rotting very easily.
b) Lignocellulose fibres are favorably bonded with phenolic resin to have better water resistance.
c) The fibres can easily withstand heat.

d) It has high tensile strength.

Disadvantages

a) Due to its short fibre length, Jute is the weakest stem fibre than other fibres.
b) Jute fibre based composites involve reactions with acetic anhydride (acetylation).
c) The fibres are biodegradable.

Applications

a) It is used as packaging material (bags).
b) It is used as carpet backing, ropes, and yarns.
c) It is used for wall decoration.

Hemp

fig: 5 Hemp Fiber

Hemp is a member of the *Cannabaceae*family and is aplant which produces bast fibres. Bast fibres are soft woodyfibres obtained from the stems of dicotyledonous plants.Hemp originated in Central Asia and was grown for its fibressince 2800 BC. It was cultivated in the Mediterraneancountries during the middle Ages. Hemp (also known as*Cannabis*) was one of the first plants to be cultivated by thehuman race and was previously considered to be one of themost important agricultural crops. Fibres are very strong with a tensile strength of 550 – 900MPa and were valued hugely before the development ofplastic fibres from petrochemicals. A Hemp yarn isstrong and has of all natural fibres the highest resistanceagainst water, but it shouldn't be creased excessively to avoidbreakage. The fibre is used for the production of rope, fishing nets, paper, sacks, fire hoses and textile. Fibre stemsdrying on the field separating the fibres from the stem. Firstly, hemp hurdswere mixed with a hydraulic lime binder as an aggregate; secondly, fibres were added as a tensile reinforcement in alime/hemphurd mix. This investigation was designed toexamine the strength of a typical lime/hemp hurd mix and todetermine if hemp fibres can strengthen it.Hemp howeverhas certain distinct advantages. It is stronger than sisal andramie, and it is much cheaper to grow and process than flax.Hemp also grows with a much higher yield per acre than flax.

Properties of this fibre are as follows

- Density [kg/m3] 1480
- Tensile strength [N/mm2] 550-900
- Stiffness [kN/mm2] 70
- Moist absorption [%] 8

Advantages

a) Its fibres are very strong with a tensile strength of 550 –900 MPa
b) A Hemp yarn is strong and has of all natural fibres thehighest resistance against water.
c) Hemp is a plant which does not require pesticides andrequires little fertilizing.
d) Its growth is faster than any other any other naturalfibre.
e) Hemp requires less moisture to grow than kenaf.

Disadvantages

a) The production is very labour intensive, especially theseparation of the fibres from the bast.
b) It shouldn't be creased excessively to avoid breakage.
c) Restrictions of its growth and cultivation in NorthAmerica, especially in the United States.
d) Lower fibre yields than kenaf and other tropical speciesin the warmer portions of the United States and moresoutherly regions.

Applications

a) Hemp is used to produce rope, cloth, food, lighting oiland medicine.
b) Currently hemp fibres are used to manufacture banknotes.
c) These are valued hugely before the development ofplastic fibres from petrochemicals.
d) Hemp hurds can be mixed with hydraulic lime binder asan aggregate

Kenaf

Fig: 6 Bast Fiber

Kenaf [Etymology: Persian] *Hibiscus cannabinus*, is aplant in the Malvaceae family. *Hibiscus cannabinus*is in thegenus *Hibiscus* and is probably native to southern Asia,though its exact natural origin is unknown. The name alsoapplies to the fibre obtained from this plant. Kenaf is one ofthe allied fibres of jute and shows similar characteristics.

Beyond cordage, bast fibres are expanding intonew markets of mouldable, nonwoven fabrics, and reinforcedcomposite materials in automotive, aerospace, packaging andother industrial applications. This trend is in part due to thefibre's physical properties of light weight, competitive tensilestrength and stiffness, and vibration damping properties, andalso due to the fibre being a renewable and biodegradableresource. Nonwoven materials made of kenaf or other naturalfibres blended with polyester or polypropylenes are efficientsound absorbers and can meet

industry specifications offlammability, and odour and mildew resistance. It is anannual or biennial herbaceous plant (rarely a short-livedperennial) growing to 1.5-3.5 m tall with a woody base. Thestems are 1–2 cm diameter, often but not always branched. Kenaf was grown under two differentconditions, at an average temperature of 22 °C (condition A)and at an average temperature of 30 °C (condition B).

Properties of this fibre are as follows

- Density [kg/m3] 1320
- Tensile strength [N/mm2] 260
- Moist absorption [%] 10-12

Advantage

a) Rapid growth: Kenaf reaches 12-18 feet in 150 days,while southern pine (A species commonly grown on treeplantations) must grow 14 to 17 years before it can beharvested.
b) High yield: Kenaf also yields more fibre per acre thansouthern pine producing 5-10 tons of dry fibre per acre,or approximately 3 to 5 times as much as southern pine.
c) It is a bast fibre with good length.
d) This fibres are very good in tension.
e) Easily available and low cost fibres.
f) Bast plants have a relatively low specific gravity of 0.28– 0.62, yielding an especially high specific strength, i.e.strength to weight ratio.

Disadvantage

a) Rotations at least every other year generally required.
b) Lack of related agricultural infrastructure.
c) Relatively high absorption of moisture in core portion.
d) Diminished board properties when using core forparticleboard.

Applications

a) The kenaf leaves are consumed in human andanimal diets.
b) The bast fibre was used for bags, cordage, and thesails for Egyptian boats.
c) The uses of kenaf fibre have been rope, twine, coarsecloth.
d) Uses of kenaf fibre include engineered wood, insulation,clothing-grade cloth, soil-less potting mixes, animalbedding, packing material, and material that absorbs oiland liquids.

Flax

Flax (also known as common flax or linseed) (binomialname: Linumusitatissimum) is a member of the genus Linumin the family Linaceae. It is native to the region extendingfrom the eastern Mediterranean to India and was probablyfirst domesticated in the Fertile Crescent.

Fig: 7 Flax Fiber

Flax is an erect annual plantgrowing to 1.2 m (3 ft 11 in) tall, with slender stems. Theleaves are glucose green, slender lanceolate, 20–40 mm longand 3 mm broad. It is stronger thancotton fibre but less elastic. Flax is harvested for fibreproduction after approximately 100 days, or a month after theplant flowers and two weeks after the seed capsules form.The base of the plant will begin to turn yellow. The fibre degrades once the plant is brown.There are two ways to harvest flax, one involvingmechanized equipment (combines), and a second method,more manual and targeted towards maximizing the fibrelength. The mature plant is cut with mowing equipment,similar to hay harvesting, and raked into windrows.

The amount of weeds in the strawaffects its marketability, and this coupled with market pricesdetermined whether the farmer chose to harvest the flax straw.

Advantage

a) Flax fibre is soft, lustrous and flexible.
b) Flax is easy to grow.
c) It is a bast fibre with good length.
d) These fibres are very good in tension.
e) Easily available and low cost fibres.

Disadvantage

a) Flax is susceptible to a wide variety of fungal diseases,blights and rusts.
b) Both Pond and Stream retting were traditionally usedless because they pollute the waters used for the process.
c) Difficulty in handling long fibre bundle lengths forprocessing.

Applications

a) The best grades are used for linen fabrics such asdamasks, lace and sheeting.
b) Coarser grades are used for the manufacturing of twineand rope.
c) Various parts of the plant have been used to make fabric,dye, paper, fishing nets, hair gels, and soap.
d) The use of flax fibre for manufacturing fabrics forgarments dates back to Neolithic times.

Ramie

Ramie (pronounced Ray-me) is one of the oldest vegetablefibres and has been used for thousands of years. It was used inmummy cloths in Egypt during the period 5000 - 3000 BC,and has been grown in China for many centuries. Ramie(Boehmerianivea), commonly known as China grass, whiteramie, green ramie and rhea, is one of the group referred to asthe bast fibre crops. It possesses highest strength andlength, good durability and absorbency with excellent lustre.

Fig: 8 Ramie Fiber

These remarkable characters make it rather more suitable foruse in the manufacture of wide variety of textiles and cordageproducts. These stalks grow upto the length ofabout 150 to 200 cm with a diameter of 12 to 20 mm depending upon the growing conditions. The textile value of ramie fibre isremarkable because of its silky, lustre, durability and its suitability as blend with all natural andmanmade fibres. Ramie has exceptionally long ultimate fibrecells which range from 120 to 150 mm approximately. It can absorb moisture and also give it up quicklywith no shrinking and stressing effects on it. Ramie fibre alsoresists the action of chemicals better than other fibres and hashigh resistance to the effects of bacteria and fungus includingmildew. The fibre also takes the dye readily. The specificgravity of fibre ranges from 1.50 to 1.55.

Advantage

a) Resistant to bacteria, mildew, alkalis, rotting, light andinsect attack.
b) Extremely absorbent (this makes it comfortable to wear)
c) Dyes fairly easy.
d) Natural stain resistance.

Disadvantage

a. Low in elasticity.
b. Lacks resiliency.
c. Low abrasion resistance.
d. Wrinkles easily.
e. Stiff and brittle.
f. Necessary de-gumming process.
g. High cost (due to high labour requirement in production,harvesting and decortications.)

Applications

a. Despite its strength, ramie has had limited acceptance fortextile use. Ramie is used to make such products asindustrial sewing thread, packing materials, fishing nets,and filter cloths Sewing threads, Handkerchiefs,Parachute fabrics, Woven fire hoses, Narrow weavingCanvas, and Filter cloth etc
b. It is also made into fabrics for household furnishings(upholstery, canvas) and clothing, frequently in blendswith other textile fibres (for instance when used inadmixture with wool, shrinkage is reported to be greatlyreduced when compared with pure wool.)

c. Shorter fibres and waste are used in paper manufacture.

Conclusion

A Polymer matrix composite contains thevarious natural fibres as the reinforcement phase was successfully fabricated .The material properties of fabricated natural fibre reinforced composites were observed. It is found that polymer banana reinforced natural composites is the best natural composites among the various combination. It can be used formanufacturing of automotive seat shells among the other natural fibre combinations.

Reference

1. Sapuan SM, Harimi M, Maleque MA. Mechanical properties of epoxy/coconut shell filler particle composites. Arab J SciEng 2003;28(2B):171–81.
2. Luo S, Netravali AN. Mechanical and thermal properties of environmentally friendly green composites made from pineapple leaf fibres and poly(hydroxybutyrate-co-valerate) resin. PolymCompos 1999;20(3):367–78.
3. Belmares H, Barrera A, Monjaras M. New composite materials from natural hard fibres. Part 2: Fatigue studies and a novel fatigue degradation model. IndEngChem Prod Res Dev 1983;22:643–
4. Suschland, O., and Woodson, G. E., "Fibre Board Manufacturing Practices in the United States," *United States Dept. of Agriculture, Forest Service, Agriculture Handbook*, No. 640, 1986, 263 pp.