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PHYSICO-CHEMICAL AND ORGANOLEPTIC EVALUATION OF DAHI PREPARED WITH BETEL LEAF EXTRACT

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Abstract

A study was undertaken to assess the effect of betel leaves (Piper betel Linn) extract on the physico-chemical, sensory and textural properties of dahi made from cow's milk and stored under refrigerated temperature. The parameters studied include pH, titratable acidity, textural properties (firmness and consistency) and sensory analysis. The result revealed that pH of control decreased from 4.40 to 4.03 whereas treatment was 4.23 up to the 7th day of storage. Titratable acidity for control increased from the beginning to 7th day of storage whereas for the treatment showed controlled increase at the end of the storage period. Dahi prepared with 0.5% betel leaves extract had showed reduced firmness and consistency compared to the control. Sensory evaluation (overall acceptability) scored similar value for control and treatment. From this study, it was concluded that 0.5% aqueous betel leaf extract added dahi was superior to control on the 7th day of storage at refrigerated temperature.

Key words*: Dahi, betel extract, physico-chemical, sensory and texture*

Introduction

Milk is very nutritious and perhaps an indispensable food for human being. But in this era of industrialization, food habit of common people is changing. It is preferable as it is healthy, delicious food to fresh raw foods. Hence, milk is converted to various milk products including dahi or yoghurt. About 9% of the total milk produced in India is converted to fermented milk products (Singh, 2007). Consumption of fermented milk products is associated with several types of human health benefits partly because of their content of lactic acid bacteria. Several experimental observations have indicated a potential effect of lactic acid bacteria against the development of colon tumours (Wollowski *et al*., 2001). Dahi is the most popular fermented dairy product in the Indian sub-continent and consumed by most of the people with everyday meal and it is also used to prepare several culinary dishes (Shekhar *et al*., 2013). Dahi is highly nutritious, delicious and contain lots of gut health promoting factor in it (Hosono *et al.,* 1986) thereby increasing the longevity of human life. There was marked difference between the curd made from cow's milk to that of buffaloes' milk in terms of body and texture, mainly due to the inherent variations in the protein make up of both the milks (Ganguli, 1974). Being moisture rich food substance, the shelf life of curd stored under room as well as refrigerated temperature is very low. In order to improve the shelf life, several packaging methods and addition of preservatives are followed. Nowadays, natural way of preservation with the help of herbal extract is gaining popularity. One such item is betel leaves, because

it exhibit preservative effect due to its antimicrobial and antioxidant substance in it (Chakraborty and Shah, 2011). Moreover, these substances are easily available at all seasons, very cheap and utilized by people for different purposes. The present study was aimed to produce dahi of good flavor, texture, appearance, palatable and acceptability added with betel leaf extract.

Materials and Methods

Pasteurized milk procured from the Model Dairy Plant, Department of Livestock Products Technology (Dairy science), MVC, Chennai and Kumbakonam betel leaves (*Piper betel*) purchased from the local market in Chennai were used for this purpose. Dahi was prepared as per the procedure outlined by De (1980) and betel leaves extract was prepared as per the procedure outlined by Preethi *et al.,* 2010. Shade dried betel leaves were powdered and used for this purpose. Ten gram of betel leaf powder was soaked in 100ml of sterile distilled water for 24 hours and then filtered through Whatman No.4 filter paper. The extract was diluted to a concentration of 100 mg/ml and used for this purpose. Dahi was prepared without betel leaf extract (control) and with betel leaf extract (treatment) at a concentration of 0.5%.

The dahi samples were stored at refrigerated temperature and analysed for pH using a digital pH meter and titratable acidity as per the procedure described in BIS,SP: 18(part - XI) 1981 for a period of 7 days at regular intervals. Texture profile analysis of dahi (firmness and consistency) was carried out using the Stable Micro Systems texture analyzer as per Seckin and Baladura (2012). Sensory evaluation of dahi viz., appearance, flavor, body and texture, sourness and overall acceptability was carried out by using 9-point hedonic scale as per the method prescribed by Larmond (1977). Statistical analysis was carried out as per Snedecor and Cochran (1994).

Results and Discussion

Table 1 shows the change in physico-chemical properties of dahi with 0.5% aqueous extract betel leaves stored at refrigerated temperature. The pH of the control (dahi) decreased from 4.40±0.11 to 4.03±0.07 on 7^{th} day of storage, whereas, those with 0.5 per cent aqueous extract of betel leaves showed a pH of 4.24±0.02 at the end of 7^{th} day of storage. Statistically highly significant difference ($P \leq 0.01$) was observed between the control and treatment during 5^{th} and 7^{th} day of storage. The titratable acidity (per cent lactic acid) of control dahi samples increased to 0.96±0.006 on 7^{th} day of storage whereas, the acidity increased to 0.82±0.01 at the end of 7^{th} day of storage in treatment. Statistical analysis showed no significant difference ($P > 0.05$) between treatments during 0 and 3^{rd} day of storage, whereas, a highly significant difference ($P \leq 0.01$) was observed between treatments during 5^{th} and 7^{th} day of storage. The results were in accordance with the study of Kamruzaman *et al.* (2002) who analyzed physico - chemical properties of dahi stored at

room and refrigerated temperature and found that pH decreased with an increase in acidity. He also reported that at refrigerated temperature, plain dahi was acceptable for consumption up to 12 days of storage. Slower rate of increase in acidity in treated sample might be due to inhibitory effect of phenolic compunds on the starter cultures and was this correlated with the findings of Kriangkrai and Penkhae (2009) who reported that gram positive bacteria are more sensitive to the antimicrobial activity of *Piper betel*.

Texture analysis of dahi prepared with added 0.5 per cent aqueous extract of betel leaves compared with control is shown in the Table 2. Texture analysis of dahi prepared with added 0.5 per cent aqueous extracts of betel leaves exhibited reduced firmness and consistency (110.52±3.57g and 789.14±7.35g/sec), compared to that of the control (132.67±6.05g and 859.27±9.03g/sec). Statistical analysis showed that there was a significant difference ($P \leq 0.05$) in firmness and a highly significant difference ($P \leq 0.01$) in consistency between control and treatment. The addition of betel leaf extract might have decreased the firmness and consistency of dahi. This might be due to the inhibitory activity of aqueous betel leaves extract on the starter culture in delaying the formation of curd influencing the textural qualities of dahi (Chakraborty and Shah, 2011).

Table 3 shows the sensory evaluation of dahi with 0.5% aqueous extract of betel leaves stored in refrigerator condition. The sample treated with 0.5 per cent aqueous extract of betel leaves remained acceptable up to 7^{th} day of storage period with scores of 7.00±0.25, 7.67±0.21, 7.25±0.31, 7.67±0.49 and 7.40±0.22 for appearance, flavor, body and texture, sourness and overall acceptability. There was no significance difference ($P>0.05$) between treatments during 0, 3, 5 and 7 days of storage. The overall acceptability scores for dahi decreased on storage due to increased acidity and reduced pH. These observations coincides with the findings of Kamruzzaman *et al.* (2002) who analysed the organoleptic qualities of different varieties of dahi stored at room and refrigerated temperatures and concluded that overall acceptability of dahi decreased gradually on storage. Loliger and Schmied (1971) found that addition of aqueous extract of betel leaves did not have any appreciable effect on overall acceptability of dahi samples though phenolic compound was present in betel leaves. Statistically no significance difference ($P>0.05$) was observed between control and treatment during 0, 3, 5 and 7^{th} day of storage.

Summary

The current study was designed to determine the physic-chemical, organoleptic and textural qualities of dahi prepared with betel leaves extract. Standard method was followed to prepare dahi with betel leaves extract at a concentration of 0.5%. Prepared dahi was stored under refrigerated condition and subjected to various physico-chemical and sensory analysis at periodic interval. The parameters studied include pH, titratable acidity, textural properties (firmness and consistency) and sensory analysis. The result revealed that pH of control decreased from 4.40 to 4.03 whereas treatment was 4.23 up to the 7^{th}

day of storage. Titratable acidity for control increased from the beginning to 7th day of storage whereas for the treatment showed controlled increase at the end of the storage period. Dahi prepared with 0.5% betel leaves extract had showed reduced firmness and consistency compared to the control. Sensory evaluation (overall acceptability) scored similar value for control and treatment. From this study, it was concluded that 0.5% aqueous betel leaf extract added dahi was superior to control on the 7th day of storage at refrigerated temperature.

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Table 1: Changes in Physico-chemical properties of dahi with 0.5 per cent aqueous extract of betel leaves at refrigerated storage (Mean±SE) @

Storage (Days)	pH			Titratable acidity#		
	C	TAB_2-D	t value	C	TAB_2-D	t value
0	4.40±0.113	4.42±0.075	0.12^{NS}	0.72±0.007	0.70±0.005	1.81^{NS}
3	4.38±0.079	4.40±0.113	0.12^{NS}	0.75±0.005	0.73±0.007	2.10^{NS}
5	4.19±0.038	4.34±0.020	3.45^{**}	0.84±0.007	0.78±0.006	5.46^{**}
7	4.03±0.072	4.24±0.023	3.76^{**}	0.96±0.006	0.82±0.012	10.23^{**}

@Average of six trials, NS - Non significant (P>0.05), ** Highly significant (P≤0.01)
Titratable acidity as percentage of lactic acid
C - Control (Dahi), TAB_2-D - Dahi with 0.5 per cent aqueous extract of betel leaves

Table 2: Texture analysis of dahi with 0.5 per cent aqueous extract of betel leaves (Mean±SE)@

Type of Sample	Firmness (g)	Consistency (g/sec)
C	132.67±6.05	859.27±9.03
TAB_2-D	110.52±3.57	789.14±7.35
't' value	3.15^{*}	6.02^{**}

@Average of six trials, * - Significant (P≤0.05), ** highly significant (P≤0.01)
C - Control (Dahi), TAB_2-D- Dahi with 0.5 per cent aqueous extract of betel leaves

Table 3: Sensory evaluation of dahi with 0.5 per cent aqueous extract of betel leaves at refrigerated storage (Mean±SE) @

Sensory Parameters	Storage period (Days)											
	0			3			5			7		
	C	TAB_2-D	t value	C	TAB_2-D	t value	C	TAB_2-D	t value	C	TAB_2-D	t value
Appearance	8.17±0.31	8.50±0.22	0.40 NS	8.17±0.31	8.42±0.201	0.51 NS	7.92±0.27	8.08±0.27	0.67 NS	7.17±0.30	7.00±0.25	0.68 NS
Flavour	8.33±0.33	8.25±0.03	0.68 NS	8.00±0.36	8.33±0.33	0.52 NS	7.83±0.47	8.00±0.26	0.76 NS	7.50±0.42	7.67±0.21	0.73 NS
Body and Texture	8.50±0.34	8.25±0.17	0.53 NS	8.25±0.36	8.17±0.31	0.86 NS	8.08±0.33	7.92±0.24	0.84 NS	7.58±0.33	7.25±0.31	0.47 NS
Sourness	8.33±0.21	8.50±0.34	0.68 NS	8.00±0.26	8.33±0.33	0.45 NS	7.67±0.42	8.17±0.31	0.36 NS	7.00±0.36	7.67±0.49	0.30 NS
Overall acceptability	8.30±0.03	8.36±0.042	0.72 NS	8.10±0.47	8.30±0.31	0.77 NS	7.88±0.49	8.00±0.26	0.88 NS	7.31±0.48	7.40±0.22	0.54 NS

@Average of six trials, NS - Non significant (P>0.05)

C - Control (dahi), TAB_2-D - Dahi with 0.5 per cent aqueous extract of betel leaves