

## Physico - Chemical, Microbial Profile and Organoleptic Properties of Pickles from Turkey Meat

M. Anna Anandh<sup>1</sup>, R. Annal Villi and B. Puvarajan<sup>2</sup>

<sup>1</sup>Tamil Nadu Veterinary and Animal Sciences University,

Department of Livestock Products Technology,

Veterinary College and Research Institute, Orathanadu – 614 625, Thanjavur District

<sup>2</sup>Department of Veterinary Microbiology, Veterinary College and Research Institute,

Orathanadu – 614 625, Thanjavur District

---

Article Received on 08.06.2016

Article Published on 05.07.2016

---

### Abstract

Heavier size of turkey carcass make its effective utilization in value added meat product manufacture is a difficult task. In order to diversify the available product range, the cost effective recipe for turkey pickles were prepared and were studied for various physico-chemical, microbial and sensory qualities. Pickles prepared from broiler chicken meat used as control. Significantly ( $p < 0.01$ ) higher pH, product yield, TBA value and protein percentage were observed in turkey meat pickles as compared to control chicken meat pickles. Titrable acidity (% acetic acid), moisture and fat contents were significantly ( $p < 0.01$ ) higher in control chicken meat pickles as compared to turkey meat pickles. Total plate, coliform and yeast and mould counts of turkey meat pickles were significantly ( $p < 0.01$ ) higher as compared to control chicken meat pickles and values were within the standards specified for cooked meat products. All sensory scores were significantly ( $p < 0.01$ ) higher for turkey meat pickles expect tenderness, saltiness and sourness. Therefore, it can be concluded that turkey meat pickles prepared from meat had better physico-chemical, microbial qualities and sensory scores were rated to highly acceptable and were comparable to chicken meat pickles.

**Key words:** Turkey, Chicken, Meat, Pickles, Quality, Microbial profile, Acceptability

### Introduction

Commercial turkey (*Meleagris gallopavo*) farming is becoming popular in India and farmers started to show interest in rearing turkey birds. Recently, the consumption of turkey meat is increasing worldwide and a similar trend is also emerging in India. Turkey meat has tremendous commercial viability because of its low fat and cholesterol content in comparison to red meat and other poultry meat (Anna Anandh *et al.*, 2012). Popularization of turkey meat and meat products through efficient marketing is necessary to upgrade this back yard activity to a commercial business. Heavier size of turkey carcass make its effective utilization in value added meat product manufacture is a difficult task. Pickling of meat is an alternative method to develop a low cost shelf stable meat product in the market (Gadekar *et al.* 2010). Pickling help to improving desirable characteristics like taste flavour and texture along with preservative effect. Pickling also helps in improving desirable characteristics like

taste, flavour and texture along with preservative effect. Therefore, in order to diversify the available product range, the cost effective recipe for turkey pickles were standardized and their quality characteristics were evaluated.

## **Material and methods**

### ***Turkey meat***

Beltsville Small White turkey (*Meleagris gallopavo*) were procured from Instructional Livestock farm Complex and individually weighed after overnight fasting (except for water) and then slaughtered. The turkeys were killed by cutting the jugular vein and carotid artery on one side of the neck near atlanto occipital joint. After bleeding the carcasses were scalded at  $58\pm 2$  °C for 2min, handpicked and manually eviscerated. The meat separated from the turkey carcass and meat cut into small cubes (1 cm × 1 cm × 1 cm). The turkey meat cubes were used for preparation of turkey pickles.

### ***Chicken meat***

Boneless broiler meat was purchased from local broiler meat processor. The broiler meat cut in to small cubes (1 cm × 1 cm × 1 cm) and broiler meat cubes were used for preparation of chicken meat pickles.

### ***Spices and condiments mix***

Dry spices viz. aniseed (10%), black pepper (10%), capsicum (8%) caraway seed (10%), cardamoms (5%), cinnamum (4%), cloves (1%), coriander (20%), cumin seed (22%) and turmeric (10%) were cleaned to remove the extraneous materials and dried in oven at 50° C for 4 h. The ingredients were ground

in a grinder and sieved through a fine mesh. For preparation of condiments mix, fresh garlic and ginger were procured from the local market and were peeled of the external covering. The required quantities were cut in to small bits and mixed in a laboratory blender to a fine paste.

### ***Product formulation***

The formula for turkey meat pickles was developed after conducting a series of preliminary trials. The turkey meat pickle formulation consisted of turkey meat 100.0%, spice mixture–5.0%, red chilli powder – 4.5%, garlic paste – 5.0%, ginger paste – 5.0%, Jeera - 1.0%, mustard seeds – 1.0%, asafetida – 1.0%, fenugreek seeds – 1.0%, salt–3.0%, turmeric - 2.5%, Vinegar – 10.0% and gingili oil 50%. Pickles prepared from broiler meat used as control.

### ***Process schedule for preparation of tripe pickles***

The turkey meat/ chicken meat cubes were mixed with turmeric powder and marinated for 1 hr at  $5\pm 2$ °C for uniform dispersion. Then the turkey / chicken meat pieces were pressure cooked at 15 psi for 10 min and then used for preparation of pickles. The pressure cooked turkey / chicken meat pieces were deep fried in heated gingili oil till golden brown colour appeared and were kept separately. The mustard seeds, fenugreek seeds, condiments, red chilli powder and spice mix were shallow fried in the remaining gingili to get the “golden brown stage”. Salt and fried turkey / chicken meat pieces was added to it and allowed to boil for two min. Then, vinegar was added to make a broth and heated with high

constant stirring till boiling started. The turkey / chicken meat pickles were allowed to cool to room temperature. After cooling the turkey / chicken meat pickles were packed in the polyethylene terephthalate (PET) 100 g bottles and stored at  $32 \pm 2^\circ\text{C}$ . The products were evaluated the various physico-chemical parameters, microbial profile and sensory attributes on a 9 - point hedonic scale after 7 days maturation period.

#### ***Physico-chemical characteristics analysis***

The pH of turkey / chicken meat pickles were determined by using digital pH meter (Century Instruments Ltd, India). The weight of pickled products were recorded before and after pickling and the yield was calculated (product yield = weight of pickles / weight of raw products  $\times 100$ ) and expressed as percentage. Procedure of APHA (1984) was used for estimation of titrable acidity (% acetic acid). The procedure of Witte *et al.*, (1970) was followed to estimate thiobarbituric acid value (TBA). The moisture, protein and fat contents of turkey / chicken meat pickles were determined by standard methods using hot air oven, kjeldahl's assembly and soxhlet ether extraction apparatus, respectively (AOAC, 1995).

#### ***Microbial profile***

Total plate, coliform, yeast and mold of freshly prepared turkey / chicken meat pickle samples were determined by the methods described by APHA (1984). Readymade media (Hi-media Laboratory Pvt. Ltd., Mumbai, India) used for enumeration of microbes. Preparation of samples and serial dilutions were done

near the flame in a horizontal laminar flow apparatus which was presterilized by ultraviolet irradiation by observing all possible aseptic precautions. 10 fold dilutions of each sample were prepared aseptically by blending 10 g of sample with 10 ml of 0.1 % sterile peptone water with a presterilised blender. Plating medium was prepared by dissolving 23.5 g of plate count agar in 1 lit of distilled water and pH was adjusted to  $7.0 \pm 0.2$ . Media was autoclaved at 15 lb pressure for 15 min before plating. The plates were incubated at  $30 \pm 1^\circ\text{C}$  for 48 h for total plate count. Coliform count was detected using 41.5g of Violet Red Bile Agar and plates were incubated at  $37 \pm 1^\circ\text{C}$  for 48 h. 60.5 g of Potato Dextrose Agar was used for enumeration of yeast and mold count and the plates were incubated at  $25 \pm 1^\circ\text{C}$  for 5 days. The plates were incubated at  $37 \pm 1^\circ\text{C}$  for 48 hr. Following incubation, plates showing 30-300 colonies were counted. The average number of colonies for each species was expressed as  $\log_{10}\text{cfu} / \text{g sample}$ .

#### ***Sensory evaluation***

Sensory evaluation was conducted with semi-trained panelists. Turkey / chicken meat pickles were served to the panelists. The sensory attributes like appearance and colour, flavour, juiciness, tenderness, saltiness, sourness and overall palatability were evaluated on 9 - point descriptive scale (where in 1 - is extremely undesirable and 9- is extremely desirable).

#### ***Data analysis***

The experiment was repeated four times. The data generated from each

experiment were analyzed statistically by following standard procedures (Snedecor and Cochran, 1989) for comparing the means and to determine the effect of treatment.

## Results and Discussion

### Physico-chemical characteristics

Physico-chemical parameters of control and turkey meat pickles are presented in Table 1. Mean pH value was significantly ( $p < 0.01$ ) higher for turkey meat pickle as compared to chicken meat pickles. Overall mean for pH value was  $4.42 \pm 0.10$ . Higher pH values of turkey

meat pickles might be due to higher pH of fresh turkey meat as compared to broiler meat. The pH reduction in pickles could be attributed to the addition of acetic acid and its absorption into the meat muscle through capillary forces by pressure gradient exerted by internal deformation of the meat (Gault, 1985). Mean pickled product yield was significantly ( $p < 0.01$ ) higher for turkey meat pickles as compared to chicken meat pickles. Overall mean for pickled product yield was  $96.87 \pm 0.11$ . Low product yield of broiler meat pickle was due to higher cooking loss in broiler meat.

**Table 1: Physico-chemical characteristics of turkey meat pickles (Mean  $\pm$  S.E)**

Parameters	Chicken Meat Pickles (Control)	Turkey Meat Pickles	Overall mean
pH	$4.12 \pm 0.10^a$	$4.72 \pm 0.10^b$	$4.42 \pm 0.10$
Product yield (%)	$95.22 \pm 0.10^a$	$98.52 \pm 0.12^b$	$96.87 \pm 0.11$
Titration acidity (% acetic acid)	$0.93 \pm 0.17^a$	$0.91 \pm 0.14^b$	$0.92 \pm 0.16$
TBA value (mg malonaldehyde / kg)	$0.68 \pm 0.10^a$	$0.78 \pm 0.14^b$	$0.73 \pm 0.12$
Moisture (%)	$68.32 \pm 0.17^a$	$63.11 \pm 0.19^b$	$65.72 \pm 0.18$
Protein (%)	$18.12 \pm 0.14^a$	$19.68 \pm 0.17^b$	$18.90 \pm 0.16$
Fat (%)	$13.78 \pm 0.12^a$	$12.27 \pm 0.14^b$	$13.03 \pm 0.13$

Number of observations = 4

Means bearing different superscripts row-wise differ significantly ( $P < 0.05$ ).

The mean titration acidity value was significantly ( $p < 0.01$ ) higher for chicken meat pickle as compared to turkey meat pickle. This difference was due to critical absorption of acetic acid into the meat muscle. Similar observation was also made by Sahu *et al.* (2012). There was a significant ( $p < 0.01$ ) higher TBA values was observed in turkey meat pickles as compared to chicken meat pickles but the values remained well within the threshold limit of limit of 1-2 mg malonaldehyde / kg of cooked meat products (Watts, 1962). A positive correlation between microbial

load and TBA value was reported. Increase of microbial load in meat samples caused increased oxidative charges (Jay, 1996).

Moisture content was significantly ( $p < 0.01$ ) lower in turkey meat pickles as compared to broiler chicken meat pickles. This lower moisture content of the turkey meat pickles might be due to the more evaporation of water during cooking. Significantly ( $p < 0.01$ ) higher protein content value was observed in turkey meat pickles as compared to chicken meat pickles. Significantly ( $p < 0.01$ ) increased fat content value observed in chicken meat

pickles as compared to turkey meat pickle. The variation might be due to due to drastic reduction of moisture content (Wani and Majeed, 2014) and addition of oil during pickle processing and absorption of fat during frying in oil (Jindal and Bawa, 1998).

### **Microbial profile**

Microbial profiles of control and turkey meat pickles are presented in Table 2. The mean total plate count, coliform

count and yeast and mould count were  $1.22 \pm 0.12$  and  $1.32 \pm 0.16$ ,  $1.43 \pm 0.11$  and  $1.56 \pm 0.17$  and  $1.17 \pm 0.14$  and  $1.19 \pm 0.12$  for chicken and turkey meat pickles, respectively. Significantly ( $p < 0.01$ ) higher microbial counts were observed in turkey meat pickles as compared to chicken meat pickles and the microbial counts were within the standard stipulated for cooked meat products (Jay, 1996).

**Table 2: Microbial profile (log<sub>10</sub>cfu/g) of turkey meat pickles (Mean  $\pm$  S.E)**

Microbial profile (log <sub>10</sub> cfu/g)	Chicken Meat Pickles (Control)	Turkey Meat Pickles	Overall mean
Total plate count	$1.22 \pm 0.12^a$	$1.32 \pm 0.16^b$	$1.27 \pm 0.14$
Coliform count	$1.43 \pm 0.11^a$	$1.56 \pm 0.17^b$	$1.50 \pm 0.14$
Yeast and mould count	$1.17 \pm 0.14^a$	$1.19 \pm 0.12^b$	$1.18 \pm 0.13$

Number of observations = 4

Means bearing same superscripts row- wise do not differ significantly ( $P < 0.01$ ).

### **Sensory characteristics**

Sensory attributes of control and turkey meat pickles are presented in Table 3. The sensory attributes score for appearance and colour, flavor and juciness were significantly ( $p < 0.01$ ) higher for turkey meat pickles as compared to chicken meat pickles. However, tenderness, saltiness and sourness scores

significantly higher in chicken meat pickles as compared to turkey meat pickles. The overall acceptability scores between turkey meat pickles and chicken meat pickles were non-significant and turkey meat pickles was rated to very acceptable and were coparable to chicken meat pickles.

**Table 3: Sensory attributes turkey meat pickles (Mean  $\pm$  S.E)**

Parameters*	Chicken Meat Pickles (Control)	Turkey Meat Pickles	Overall mean
Appearance and colour	$7.50 \pm 0.11^a$	$7.60 \pm 0.10^b$	$7.55 \pm 0.16$
Flavour	$7.10 \pm 0.12^a$	$7.20 \pm 0.12^b$	$7.15 \pm 0.12$
Juciness	$7.30 \pm 0.10^a$	$7.40 \pm 0.14^b$	$7.35 \pm 0.12$
Tenderness	$7.20 \pm 0.13^a$	$7.10 \pm 0.11^b$	$7.15 \pm 0.12$
Saltiness	$7.60 \pm 0.14^a$	$7.50 \pm 0.12^b$	$7.55 \pm 0.13$
Sourness	$7.50 \pm 0.10^a$	$7.40 \pm 0.15^b$	$7.45 \pm 0.13$
Overall acceptability	$7.37 \pm 0.12^a$	$7.37 \pm 0.13^b$	$7.37 \pm 0.13$

Number of observations = 20

\*Sensory attributes of pickles were evaluated on a 9 – point descriptive scale (wherein 1 = extremely undesirable; 9 = extremely desirable).

Means bearing different superscripts row- wise differ significantly ( $P < 0.01$ ).

## Conclusions

Based on the results of physico-chemical parameters, microbial profile and sensory attributes, it can be concluded that turkey meat can be successfully used for value addition into preparation shelf stable pickles with acceptable physico-chemical, microbial and sensory characteristics.

## References

- Anna Anandh, M., Richard Jagatheesan, P.N., Senthil Kumar, P., Paramasivam, A. and Rajarajan, G. 2012. Effect of rearing systems on reproductive performance of turkey. *Vet. World*, 5: 226-229.
- AOAC. 1995. Official methods of Analysis. 16th edition. Washington DC, Association of Official Analytical Chemists, Arlington, VA.
- APHA. 1984. In: M.L. Speck (Ed.). Compendium of methods for the microbiological examination of foods. 2nd edition. American Public Health Association, Washington DC.
- Gadekar, Y.P., Kokane, R.D., Suradkar, U.S., Thomas, R., Das, A.K. and Anjaeyulu, A.S.R. 2010. Shelf stable meat pickles – a review. *Int. Food Res. J.*, 17: 221 – 227.
- Gault, N.F.S. 1985. The relationship between water holding capacity and cooked meat tenderness in some beef muscles as influenced by acidic conditions below the ultimate pH. *Meat Sci.*, 15: 15-30.
- Jay, J.M. (1996). Modern food microbiology. 4th edition. CBS publishers and distributors, Delhi, India.
- Jindal, V. and Bawa, A.S. 1988. Utilization of spent hens and soy flour in the preparation of poultry sausages. *Indian J of Meat Sci.*, 1: 23-27.
- Sahu, B.B., Kumar, K., Sahu, A.K., Kumar, R., Mohanthy, U.L., Maji, U.J., Noor Jahan, Sahoo, M., Samal, R. and Jayasankar, P. 2012. Quality and storage stability of low acid Murrel (*Channa striatus*) fish pickled at room temperature. *Int. Food Res. J.*, 19: 1629 – 1632.
- Snedecor, G.W. and Cochran, W.G. 1989. Statistical methods. 8th edition. Oxford and IBH publishing Co., Calcutta, India.
- Wani, S.A. and Majeed, D. 2014. Evaluation of quality attributes and storage stability of pickle prepared from chicken gizzard. *J. Meat Sci. & Technol.*, 2: 85 – 89.
- Watts, B.M. 1962. Meat products. In: Symposium on food lipids and their oxidation. AVI publishing Co. Inc., Westport CT.

Witte, V.C., Krouze, G.F. and Bailey, M.E. 1970. A new extraction method for determining 2-thiobarbituric acid values of pork and beef during storage. *J. Food Sci.*, 35: 582 – 585.