

# Quality evaluation of traditional styled meat pickle prepared from native desi chicken meat

M. Anna Anandh and R. Annal Villi

A study was conducted for the preparation traditional styled pickle from native desi chicken meat and were studied for various physico-chemical, microbial and sensory qualities. Pickle prepared from broiler chicken meat was used as control. Significantly ( $p < 0.05$ ) higher pH, product yield and moisture percentage were observed in native desi chicken meat pickle as compared to broiler chicken meat pickle. Titrable acidity (% acetic acid), TBA value (mg malonaldehyde / kg meat) and fat percentage were significantly ( $p < 0.05$ ) higher in broiler chicken meat pickle as compared to native desi chicken meat pickle. Total plate and yeast and mould counts of native desi chicken meat pickle and broiler chicken meat pickle were did not differ significantly between them. Coliform counts were not detected in both native desi chicken meat pickle and broiler chicken meat pickle. All sensory scores were significantly ( $p < 0.05$ ) higher for native desi chicken meat pickles expect tenderness, saltiness and sourness. Therefore, it can be concluded that pickle prepared from native deis chicken meat had better physico-chemical and microbial qualities and were comparable to broiler chicken meat pickles. Finding of this study have shown that native chicken meat can be successfully used for preparation of shelf stable pickle of acceptable quality with substantial value addition to the materials.

**Key Words :** Native, Desi, Chicken, Broiler, Meat, Pickle, Quality, Acceptability

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## INTRODUCTION

Native desi chicken birds are raised under free range with access to grass pastures, which gives a different flavor to their meat. There is an increasing demand for desi chicken meat and meat products in the market. It is reported that traditionally raised native chickens have a

more characteristic “chicken” flavour than those produced from broiler. The meat from desi chicken is preferred because of their pigmentation, taste, leanness and suitability for special dishes and often fetches higher prices (Ilavarasan *et al.*, 2016). In this perspective, it is necessary to evolve appropriate technologies to convert the tough, flavour full and perishable desi chicken meat into convenience, attractive and more acceptable novel products. Further, utilization of native desi chicken meat in value added meat processing would increase the profitability to rural farmers and it can also provide a better avenue for rural entrepreneurship development. Pickling of meat is an alternative method to develop a low cost shelf stable meat product. Meat pickles, highly

### MEMBERS OF RESEARCH FORUM

Author for correspondence :

**M. Anna Anandh**, Department of Livestock Products Technology, Veterinary College and Research Institute (TANUVAS), Orathanadu, **Thanjavur (T.N.) India**  
(Email : [drannaanandh@gmail.com](mailto:drannaanandh@gmail.com))

Associate Authors' :

**R. Annal Villi**, College of Poultry Production and Management, **Hosur (T.N.) India**

acceptable ready to eat and convenience meat product of Indian origin (Gadekar *et al.*, 2010). Preparation of different types of meat pickle has been reported Pal and Agnihotri (1994); Sachdev *et al.* (1994); Puttarajappa *et al.* (1996); Das *et al.* (2013); Wani and Majeed (2014) and Anna Anandh (2017). Native chicken meat also offers good scope for processing in to palatable pickle. Therefore, in order to diversify the available product range, the cost effective recipe for native desi chicken meat pickle were standardized and their quality characteristics were evaluated.

## METHODOLOGY

### Native desi chicken meat:

Native desi chicken were procured from local farmers and individually weighed after overnight fasting (except for water) and then slaughtered. The native desi chickens 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  $55 \pm 2^\circ\text{C}$  for 1 min, handpicked and manually eviscerated. The meat separated from the carcasses and meat cut into small cubes (1 cm  $\times$  1 cm  $\times$  1 cm). The desi chicken meat cubes were used for preparation of pickle.

### Chicken meat:

Boneless broiler meat was purchased from local broiler meat processor. The broiler meat cut in to small cubes (1 cm  $\times$  1 cm  $\times$  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%), cinnamon (4%), cloves (1%), coriander (20%), cumin seed (22%) and turmeric (10%) were cleaned to remove the extraneous materials and dried in oven at  $50^\circ\text{C}$  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 native desi chicken meat pickle was

developed after conducting a series of preliminary trials. The native desi chicken meat pickle formulation consisted of native chicken meat 100.0 per cent, spice mixture – 2.5 per cent, red chili powder – 2.5 per cent, garlic paste – 5.0 per cent, ginger paste – 5.0 per cent, roasted jeera powder – 2.5 per cent, mustard seeds – 2.5 per cent, asafetida – 1.0 per cent, roasted fenugreek seeds powder – 1.0 per cent, salt – 4.0 per cent, turmeric powder – 2.0 per cent, vinegar – 10.0 per cent and gingili oil 40 per cent. Pickle prepared from broiler chicken meat was used as control.

### Process schedule for preparation of native desi chicken meat pickles:

The native desi chicken meat / broiler chicken meat cubes were mixed with turmeric powder and marinated for 1 hr at  $5 \pm 2^\circ\text{C}$  for uniform dispersion. Then the native desi chicken meat / broiler chicken meat pieces were pressure cooked at 15 psi for 10 min and then used for preparation of pickle. The pressure cooked native desi chicken meat / broiler chicken meat pieces were deep fried in heated gingili oil till golden brown colour appeared and were kept separately. The mustard seeds, condiments mix, roasted fenugreek seeds powder, roasted jeera powder, asafetida powder, red chilli powder and spice mix were shallow fried in the remaining gingili oil to get the “golden brown stage”. Salt and fried native desi chicken meat / broiler 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 native desi chicken meat / broiler chicken meat pickles were allowed to cool to room temperature. After cooling the native desi chicken meat / broiler 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 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 native desi chicken meat / broiler 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 native desi chicken meat / broiler 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 per cent sterile peptone water with a pre sterilized 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  $\log_{10}$  cfu / g sample.

#### Sensory evaluation:

Sensory evaluation was conducted with semi-trained panelists. Native desi chicken meat / broiler chicken meat pickles were served to the panelists after 7 days of maturation period. 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.

### OBSERVATIONS AND ASSESSMENT

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

#### Physico-chemical characteristics of native desi chicken meat and broiler chicken meat pickles:

Physico-chemical parameters of broiler chicken meat and desi chicken meat pickles prepared by traditional style are presented in Table 1. Overall mean for pH value was  $4.47 \pm 0.11$ . The mean pH values were  $4.37 \pm 0.12$  and  $4.56 \pm 0.10$  for broiler chicken and desi chicken meat pickles. Mean pH value was significantly ( $p < 0.05$ ) lower for broiler chicken meat pickle as compared to desi chicken meat pickles. The pickling of various meat were also studied and reported that the pH of the meat pickles ranged from 4.4 to 4.7 (Puttarajappa *et al.* (1996) and Pal and Agnihotri (1994). The pH reduction in pickles could be attributed to the addition of acetic acid and its

Table 1: Physico-chemical characteristics of broiler chicken meat and native desi chicken meat pickle			(Mean $\pm$ S.E)
Parameters	Chicken meat pickle (Control)	Native desi chicken meat pickle	Overall mean (Mean $\pm$ S.E)
pH	$4.37 \pm 0.12^a$	$4.56 \pm 0.10^b$	$4.47 \pm 0.11$
Product yield (%)	$107.18 \pm 0.14^a$	$110.25 \pm 0.17^b$	$108.72 \pm 0.11$
Titrable acidity (% acetic acid)	$0.73 \pm 0.08^a$	$0.68 \pm 0.06^b$	$0.71 \pm 0.07$
TBA value (mg malonaldehyde / kg)	$0.51 \pm 0.11^a$	$0.48 \pm 0.15^b$	$0.50 \pm 0.12$
Moisture (%)	$65.27 \pm 0.10^a$	$67.03 \pm 0.14^b$	$66.15 \pm 0.07$
Protein (%)	$21.08 \pm 0.10$	$20.96 \pm 0.12$	$21.02 \pm 0.11$
Fat (%)	$12.43 \pm 0.12^a$	$11.17 \pm 0.14^b$	$11.80 \pm 0.13$
Number of observations: = 4		Means bearing different superscripts row- wise differ significantly ( $P < 0.05$ )	

absorption into the meat muscle through capillary forces by pressure gradient exerted by internal deformation of the meat (Gault, 1985). Overall mean for pickled product yield was  $108.72 \pm 0.11$  per cent. The mean pickled product yield values were  $107.18 \pm 0.14$  per cent and  $110.25 \pm 0.17$  per cent for broiler chicken meat and desi chicken meat pickles. Mean pickled product yield was significantly ( $P < 0.05$ ) higher for native desi chicken meat pickles as compared to broiler chicken meat pickles. Low product yield of broiler chicken meat pickle was due to higher cooking loss of broiler chicken meat during preparation of pickle. The present findings are agreement with Maiti *et al.* (2009) and wherein they reported pickled product yield between 110 to 115 per cent. Overall mean for titrable acidity value was  $0.71 \pm 0.07$ . The mean titrable acidity (% acetic acid) values were  $0.73 \pm 0.08$  and  $0.68 \pm 0.06$  for broiler chicken meat and desi chicken meat pickles. The mean titrable acidity value was significantly ( $p < 0.05$ ) higher for broiler chicken meat pickle as compared to native desi chicken meat pickle. This difference was due to critical absorption of acetic acid into the meat muscle. Similar observation was made by Sahu *et al.* (2012). Pal and Agnihotri (1994) reported acid value 0.74 in chevon pickle whereas Jayanthi *et al.* (2005) reported slightly higher acid value of 1.60 in spent hen meat pickle.

Overall mean for TBA value was  $0.50 \pm 0.13$ . TBA values for broiler chicken meat and desi chicken meat

pickles were  $0.51 \pm 0.11$  and  $0.48 \pm 0.15$  mg malonaldehyde / kg meat. There was a significantly ( $p < 0.05$ ) higher TBA values was observed in broiler chicken meat pickles as compared to native desi chicken meat pickles. Higher fat content could be responsible for enhanced TBA value of broiler chicken meat pickles (Maiti *et al.*, 2009). However, the values remained well within the threshold limit of limit of 1-2 mg malonaldehyde / kg of meat product (Watts, 1962). These finding are in conformity with those of Puttarajappa *et al.* (1996) who reported that TBA value of 0.57 in chicken pickle. However, our findings had lower TBA value as compared to the findings of Pal and Agnihotri (1994) and Jayanthi *et al.* (2005) in chevon pickle and spent hen meat pickle, respectively. A positive correlation between microbial load and TBA value was reported. Increase of microbial load in meat samples caused increased oxidative charges. Increased oxidative changes might be attributed to increase in TBA value (Jay, 1996).

Overall mean for moisture, protein and fat value were  $65.15 \pm 0.07$ ,  $21.02 \pm 0.11$  and  $11.08 \pm 0.13$ , respectively. The mean moisture, protein and fat content values were  $65.27 \pm 0.10$  and  $67.03 \pm 0.14$ ,  $21.08 \pm 0.10$  and  $20.96 \pm 0.12$  and  $12.43 \pm 0.12$  and  $11.17 \pm 0.14$  for broiler chicken meat and desi chicken meat pickles, respectively. Moisture content was significantly ( $p < 0.05$ ) higher in native desi chicken meat pickle as compared to broiler chicken meat pickles. Higher protein content value

**Table 2: Microbial profile ( $\log_{10}$ cfu/g) of of broiler chicken meat and native desi chicken meat pickle (Mean  $\pm$  S.E)**

Microbial profile ( $\log_{10}$ cfu/g)	Chicken meat pickle (Control)	Native desi chicken meat pickle	Overall mean (Mean $\pm$ S.E)
Total plate count	$1.14 \pm 0.02$	$1.15 \pm 0.06$	$1.15 \pm 0.04$
Coliform count	ND	ND	
Yeast and mould count	$1.18 \pm 0.04$	$1.19 \pm 0.02$	$1.19 \pm 0.03$

Number of observations: = 4  
Means bearing same superscripts row- wise do not differ significantly ( $P < 0.05$ )

**Table 3: Sensory attributes of broiler chicken meat and native desi chicken meat pickle (Mean  $\pm$  S.E)**

Parameters**	Chicken meat pickle (Control)	Native desi chicken meat pickle	Overall mean (Mean $\pm$ S.E)
Appearance and colour	$7.60 \pm 0.14^a$	$8.40 \pm 0.18^b$	$8.00 \pm 0.16$
Flavour	$7.20 \pm 0.10^a$	$8.40 \pm 0.10^b$	$7.80 \pm 0.10$
Juciness	$7.30 \pm 0.14^a$	$8.10 \pm 0.12^b$	$7.70 \pm 0.14$
Tenderness	$8.10 \pm 0.10^a$	$7.60 \pm 0.14^b$	$7.85 \pm 0.12$
Saltiness	$7.50 \pm 0.14^a$	$7.20 \pm 0.12^b$	$7.35 \pm 0.14$
Sourness	$7.50 \pm 0.12^a$	$7.10 \pm 0.14^b$	$7.30 \pm 0.14$
Overall acceptability	$7.54 \pm 0.12$	$7.80 \pm 0.14$	$7.67 \pm 0.14$

Number of observations: = 28

\*\*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 ( $P < 0.05$ )

was observed in broiler chicken meat pickles as compared to native desi chicken meat pickles. However, the protein content of broiler chicken meat and desi chicken meat pickles did not differ significantly between them. Significantly ( $p < 0.05$ ) increased fat content value observed in broiler chicken meat pickles as compared to native desi chicken meat pickle. The variation might be due to 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, 1988).

### Microbial profile of native desi chicken meat and broiler chicken meat pickles:

Microbial profiles of broiler chicken meat and desi chicken meat pickles prepared by traditional style are presented in Table 2. Overall mean for total plate count and yeast and mould count were  $1.15 \pm 0.04$ , and  $1.19 \pm 0.03$ , respectively. Coliform counts were not detected both in broiler chicken meat and desi chicken meat pickles. The mean total plate count and yeast and mould count were  $1.14 \pm 0.02$  and  $1.15 \pm 0.06$  and  $1.18 \pm 0.04$  and  $1.19 \pm 0.2$  for broiler chicken meat and desi chicken meat pickles, respectively. There was no significant difference between broiler chicken meat and desi chicken meat pickles and the microbial counts were within the standard stipulated for cooked meat products (Jay, 1996). This may be due to the heat treatment and acetic acid used for pickling which retards the microbial growth (Wani and Majeed, 2014). Acetic acid and heat are considered as major factors for increasing microbial safety of pickled products. Low pH, low moisture, salt and spices in the pickle were able to keep the microbial level very low (Grover *et al.*, 2004).

### Sensory characteristics of native desi chicken meat and broiler chicken meat pickles:

Sensory attributes of broiler chicken meat and desi chicken meat pickles prepared by traditional style are presented in Table 3. The sensory attributes score for appearance and colour, flavour and juiciness were significantly ( $p < 0.05$ ) higher for native desi chicken meat pickle as compared to broiler chicken meat pickles. However, tenderness, saltiness and sourness scores were significantly ( $p < 0.05$ ) higher for broiler chicken meat pickle as compared to native desi chicken meat pickle. Overall acceptability scores were significantly ( $p < 0.05$ )

higher for native desi chicken meat pickle. The tough textural characteristics of native chicken meat prevented it from fragmentation by vinegar and cooking. This would be the reason for the increased the overall acceptability scores of native desi chicken meat pickle and it indicated that native desi chicken meat would be a highly suitable meat for preparation of pickle.

### Conclusion:

Based on the results of physico-chemical parameters, microbial profile and sensory attributes, it can be concluded that meat pickle prepared from native desi chicken meat were rated better in organoleptic acceptability with comparable microbial profile and physico-chemical characteristics of pickle prepared from broiler chicken meat. Therefore, native desi chicken meat can be successfully used for preparation of meat pickle of acceptable quality with substantial value addition to the native desi chicken meat.

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