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Storage Quality and Shelf-life of Native *Desi* Chicken Meat Pickle at Room Temperature (32 ± 5 ºC)

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ABSTRACT

Pickle from native *desi* chicken meat was prepared and stored at room temperature (32±5ºC) in polyethylene teraphthalate (PET) bottles. The samples were evaluated for physico-chemical parameters, microbial quality and sensory attributes at regular intervals of 0, 5, 15, 30, 45,60, 75 and 90 days of storage. Non significantly increase in pH values were observed with increasing storage period and value remained below 5.0 up to 60 days of storage period. Non significantly increase in titrable acidity (% acetic acid) and free fatty acids (as % oleic acid) values were observed with increasing storage period. However, significantly decreased in moisture (%) values were observed with increasing storage period. A significant ($P<0.05$) and progressive increase in Thiobarbituric Acid (TBA) values (mg malonaldehyde / kg) were observed with increasing storage period and increase in TBA values between 0 and 60 days of storage did not turn out to be statistically significant. Microbiological counts were nonsignificantly increased between day 0 to 60, thereafter significantly ($P<0.05$) increased with the advancement of storage period and throughout the storage period, all microbial counts were within the acceptable limits. Sensory evaluation scores indicate that native *desi* chicken meat was very acceptable up to 60 days of storage and thereafter native *desi* chicken meat pickle was moderately acceptable between 60 to 90 days of storage at room temperature (32±5°C).

Keywords: Chicken, Native, Meat, Pickle, Storage, Shelf-life

Native *desi* chickens are reared under free range with access to grass pastures which gives a different flavor to their meat. Native chicken meat has a unique taste and texture particularly after cooking that attracts domestic consumers to a greater extent than the meat from commercial broiler chickens. 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). Further, utilization of native *desi* chicken meat in value added meat processing would increase the profitability to rural farmers. Presently more emphasis is given on developing shelf stable meat products, which can be stored at ambient temperature (Gadekar *et al.,* 2010).Preserving meat through value added technologies by different methods to extend the shelf-life and add value to the product. Application of suitable and acceptable processing technology leading to value addition of meat would be suitable remedy to its profitable disposal besides enhancing its acceptability as it will suit the taste buds of local consumers. Pickling in vinegar and edible oil with added salt, spices and condiments provide ready to eat highly acceptable convenience product with good self-stability at an ambient temperature (Khade *et al.,* 2019). Pickling of meat is also used as an alternative method to develop a low cost shelf-stable meat product and pickle is highly acceptable ready to eat and convenience meat product of Indian origin (Gadekar *et al.,* 2010). Preparation of different types of meat pickle has been developed and their qualities were assessed (Pal and Agnihotri. (1994); Sachdev *et al.* 1994; Khade *et al* . 2019; Anna Anandh *et*

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al. 2019). Native chicken meat also offers good scope for processing into palatable pickle.

The objective of the present study was to prepare and evaluate the storage quality and acceptability of native chicken meat pickle at room temperature (32±5ºC).

MATERIALS AND METHODS

Source of native *desi* chicken meat

Native *desi* chickens were procured from local farmers and were 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 ± 2°C for 1min, handpicked and manually eviscerated. The meat separated from the carcasses and meat was cut into small cubes (1 cm × 1 cm × 1 cm). The *desi* chicken meat cubes were used for preparation of pickle.

Native *desi* chicken meat pickle formulation

The formula for native *desi* chicken meat pickle was developed after conducting a series of preliminary trials. The ingredients used in the preparation of *desi* chicken meat pickle are presented in Table 1.

Table 1: Formulation for *desi* chicken meat pickle

Ingredients	Levels of ingredients (%)
Desi chicken meat	100
Spice mixture	2.5
Red chilli powder	2.5
Garlic paste	5.0
Ginger paste	5.0
Roasted cumin powder	2.5
Mustard seeds	2.5
Asafetida	1.0
Roasted fenugreek powder	1.0
Salt	4.0
Turmeric powder	2.0
Vinegar	20
Gingili oil	40

The spices and condiments mix were prepare by using 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 ºC 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 into small bits and mixed in a laboratory blender to a fine paste.

Preparation of native *desi* chicken meat pickle for storage study

The native *desi* chicken meat cubes were mixed with turmeric powder and marinated for 1 h at 5 ±2 °C for uniform dispersion. Then the native *desi* 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 pieces were deep fried in heated gingili oil till golden brown colour appeared and were kept separately. The mustard seeds, condiments mix, roasted fenugreek powder, roasted cumin 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 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 pickles were allowed to cool to room temperature. After cooling the native *desi* chicken meat pickle were packed in the polyethylene terephthalate (PET) 250 gm bottles and stored at 32 ± 5 °C. Likewise four batches of native *desi* chicken meat pickle were prepared. The pickle were evaluated the various physico-chemical parameters, microbial profile and sensory attributes on a 9 - point hedonic scale at an interval of 0, 15, 30, 45, 60, 75 and 90 days of storage at room temperature (32 ± 5 ºC).

Physico-chemical characteristics analysis

The pH native *desi* chicken meat pickle was determined by using digital pH meter. Moisture contents of the products were determined as per AOAC (1995). Procedure of APHA (1984) was used for estimation of titrable acidity (% acetic acid). Fee fatty acids (as % oleic acid) were determined as per procedures outlined by AOAC (1995).

The procedure of Witte *et al.* (1970) was followed to estimation thiobarbituric acid value (TBA).

Microbial profile determination

Total plate, coliform, yeast and mold and staphylococcal counts of stored native *desi* 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 pre-sterilized by ultraviolet irradiation by observing all possible aseptic precautions. 10 fold dilutions of each sample were prepared aseptically by blending 10 gm of sample with 10 ml of 0.1% 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 ± 0.2. Media was autoclaved at 15 1b pressure for 15 min before plating. The plates were incubated at 30±1 ºC for 48 hr for total plate count. Coliform count was detected using 41.5 g of Violet Red Bile Agar and plates were incubated at 37 ± 1º C for 48 hr. 60.5 gm of Potato Dextrose Agar was used for enumeration of yeast and mold count and the plates were incubated at 25 ± 1ºC for 5 days. Staphylococcal count was deducted by using 63.2 g Baird Parker Agar was dissolved in 950 ml of distilled water. The pH was adjusted to 7.0 ± 0.2 and sterilized before plating. The medium was tempered to 50 °C and egg yolk tellurite emulsion was added to the medium. 1 ml of suitable dilutions were placed in sterile petridish and overlaid with molten agar. After solidification, the plates were incubated at 37 °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 / gm sample.

Sensory evaluation

Sensory evaluation was conducted with experienced panelists. Native *desi* chicken meat pickle was served to the panelists. The sensory attributes like appearance and colour, flavour, juiciness, saltiness, sourness and overall palatability were evaluated on 9 - point descriptive scale (where in 1 - is extremely undesirable and 9- is extremely desirable) as suggested by Keeton (1983).

STATISTICAL ANALYSIS

The data generated from each storage period were analyzed statistically by following standard procedures (Snedecor and Cochran, 1989) for Analysis of Variance (ANOVA) comparing the means and to determine the effect of storage period by using SPSS-16 (SPSS Inc., Chicago, IL., USA). The level of significant effects, least significant differences were calculated at appropriate level of significance ($p<0.05$).

RESULTS AND DISCUSSION

Changes in physico-chemical characteristics

The mean values for changes in physico-chemical characteristics of native *desi* chicken meat pickle during storage are presented in table 2. The overall days mean showed a non significant increase in pH with increasing storage period up to 90 days. The pH values of native *desi* chicken meat pickle were below 5.0 up to 60 days of storage which is considered to be critical for storage stability of picked products (Dziezak, 1986). However, overall days mean for native *desi* chicken meat pickle pH non significantly increased above 5.0 on day 75 to 90 during storage. Similar increasing in pH with increasing storage period of various meat pickles were also reported earlier (Nayak *et al.,* 2011; Bhusal *et al.,* 2017; Khade *et al.,* 2019). It is believed that hydrolysis of the proteins molecules could have released amino group and could have increased the pH in the later period (Webster *et al.,* 1982). Moisture content of native *desi* chicken meat pickle values were significantly ($P<0.05$) decreased gradually during entire period of storage. However, no significant difference in overall day's means for moisture content was observed between days 0 to15 and 45 to 60 of storage. A significant and progressive decrease in moisture in native *desi* chicken meat pickle might be due to evaporation of water during sampling where the native *desi* chicken meat pickle samples drawn from the same PET bottle over the entire period of storage and could have resulted in more loss of moisture in native *desi* chicken meat pickle. A non significantly increased in titrable acidity values of native *desi* chicken meat pickle were observed with increasing storage period this might be due to more loss of moisture in native *desi* chicken meat pickle which in turn could have

increased concentration of undissociated molecules of acetic acid which increase the titrable acidity (Khade *et al.,* 2019). The present results are in conformity with Jayanthi *et al.* (2008) and Pal and Agnihotri (1994) who reported titrable acidity of pickle increased non significantly with advancement of storage period. Free fatty acids values of native *desi* chicken meat pickle increased non - significantly with increasing storage period. The increase in free fatty acid value in native *desi* chicken meat pickle might be due to bio chemical and microbial spoilage. The present results are similar with those of Jayanthi *et al.* (2008) who reported free fatty acids values were increased with increasing storage period in spent hen chicken meat pickle.A significant ($p<0.05$) and progressive increase in TBA value was observed with increase in storage period and the value did not statistically different between days 0 to 60 and 75 to 90 of storage. The TBA values in native *desi* chicken meat pickle was increased from 0.57 to 1.98 mg malonaldehyde / kg of meat pickle during the storage period but the values remained well within the threshold limit of 1-2mg malonaldehyde / kg of meat product during the entire storage. Increase in the TBA value might be due to the oxidation of fat during storage period (Pal and Agnihotri, 1994). Increase of microbial load in meat samples could have caused increased oxidative changes. These oxidative changes might also be attributed to increase in TBA value (Jay, 1996).

Changes in microbial quality

The mean values for changes in microbial profile of native *desi* chicken meat pickle during storage are presented in Table 2. Total plate and yeast and mold counts were increased with increasing storage period. However, no significant difference ($p<0.05$) in total plate and yeast and mold counts were observed between days 0 to 60 of storage. Coliform and staphylococcal counts did not deducted between 0 to 60 days of storage and the counts were increased nonsignificantly between 60 to 90 days of storage. In our present study, the native *desi* chicken meat pickle did not show any symptoms of spoilage or off odour on throughout storage period. Higher acidity, salt content, cooking, frying and low moisture reduces the microbial load of the product (Gadekar *et al.,* 2010). Similar observations also made by Pal and Agnihotri (1994) in chevon meat pickle and Khade *et al.* (2019) in spent hen meat pickle. During the storage period, the microbiological quality of native *desi* chicken meat pickle was satisfactory for throughout storage period and the microbial counts where within in the range of 0.82 to 2.90 $\log_{10}$ cfu / gm sample (Jay, 1996).

Changes in sensory attributes

The mean values for changes sensory attributes of native *desi* chicken meat pickle during storage are presented in Table 4. The sensory attributes scores for appearance and colour, flavour, juiciness, saltiness, sourness and overall acceptability were decreased with increasing storage period. All the sensory attributes of native chicken meat pickle were statistically un affected between 0 to 60 days of

Table 2: Changes in physico-chemical characteristics of native chicken meat pickle during storage at room temperature (32±5°C)

Parameters	Storage period in days						
	0	15	30	45	60	75	90
Physico – chemical characteristics*							
pH	4.28 ± 0.12	4.54 ± 0.10	4.58 ± 0.12	4.62 ± 0.11	4.65 ± 0.10	5.05 ± 0.12	5.12 ± 0.12
Moisture (%)	65.12 ± 0.10^{a}	64.72 ± 0.12 ^{a}	62.60±0.12 ^{b}	60.82±0.14 ^{c}	60.32±0.10 ^{c}	59.10±0.12 ^{d}	57.12±0.14 ^{e}
Titrable acidity (% acetic acid)	0.70 ± 0.14	0.72 ± 0.12	0.85 ± 0.17	0.92 ± 0.15	0.98 ± 0.12	1.12 ± 0.14	1.18 ± 0.16
Free fatty acids (% oleic acid)	0.42 ± 0.11	0.48 ± 0.12	0.56 ± 0.15	0.64 ± 0.13	0.67 ± 0.18	0.92 ± 0.15	0.96 ± 0.14
TBA value (mg malonaldehyde / kg)	0.52 ± 0.11^{a}	0.58 ± 0.12^{a}	0.62 ± 0.12^{a}	0.74 ± 0.10^{a}	0.79 ± 0.11 ^{a}	1.88 ± 0.13^{b}	1.98 ± 0.14 ^{b}

*Number of observations: 4

Means bearing same superscripts row-wise do not differ significantly ($p<0.05$).

Table 3: Changes in microbial profile of native chicken meat pickle during storage at room temperature (32±5 °C)

Parameters	Storage period in days						
	0	15	30	45	60	75	90
Microbial profile (log 10 cfu/gm) **							
Total plate count	1.20 ± 0.14 [a]	1.30±0.12 [a]	1.50±0.16 [a]	1.52±0.11 [a]	1.60±0.15 [a]	2.78±0.14 [b]	2.90±0.12 [c]
Coliform count	ND	ND	ND	ND	ND	0.82±0.12	0.87±0.12
Yeast and mould count	1.20 ± 0.16 [a]	1.24±0.12[a]	1.38±0.10 [a]	1.44±0.12 [a]	1.52±0.14 [a]	2.70±0.13[b]	3.18±0.10[b]
Staphylococcal count	ND	ND	ND	ND	ND	0.75±0.12	0.82..±0.014

**Number of observations: 4

Means bearing same superscripts row-wise do not differ significantly ($p<0.05$).

Table 4: Changes in sensory characteristics of native chicken meat pickle during storage at room temperature (32±5°C)

Parameters	Storage period in days						
	0	15	30	45	60	75	90
Sensory attributes***							
Appearance and colour	8.5 ± 0.10[a]	8.5±0.15[a]	8.2±0.11 [a]	8.0±0.10 [a]	7.8±0.13 [a]	6.5±0.10[b]	6.5±0.14[b]
Flavour	8.5 ±0.11 [a]	8.5 ± 0.10[a]	8.0 ± 0.10[a]	8.0 ±0.12 [a]	7.6 ± 0.15 [a]	6.5 ± 0.14[b]	6.0 ± 0.10[b]
Juiciness	8.0 ± 0.13[a]	8.0 ± 0.15[a]	8.0 ±0.14[a]	8.0 ± 0.10[a]	7.5± 0.15 [a]	6.5 ± 0.15[b]	6.5 ± 0.14[b]
Saltiness	8.0 ± 0.10[a]	7.9 ± 0.12[a]	7.8 ± 0.14 [a]	7.5± 0.11 [a]	7.0±0.12 [a]	6.0 ± 0.10[b]	6.0 ±0.12[b]
Sourness	8.0 ± 0.12[a]	8.0 ± 0.13[a]	7.5 ± 0.15 [a]	7.5± 0.10 [a]	7.0±0.12 [a]	6.0 ± 0.14[b]	6.0 ± 0.10[b]
Over all acceptability	8.2 ± 0.12[a]	8.1 ± 0.13[a]	7.9 ± 0.13[a]	7.8 ± 0.11[a]	7.3±0.14[a]	6.3±0.13[b]	6.2 ± 0.12[b]

***Number of observations = 32.

Sensory attributes were evaluated on a 9-point descriptive scale (wherein, 1 = extremely undesirable; 9 = extremely desirable).

Means bearing same superscripts (lowercase letters) row-wise do not differ significantly ($p< 0.05$).

storage and scores decreased significantly ($p<0.05$) on day 75 of the storage. Decrease in overall acceptability scores with increasing storage period might be due to decrease in appearance and colour, flavour, juiciness saltiness and sourness scores. The possible reason for decrease in appearance and colour scores during refrigerated storage might be due to lipid oxidation. Flavour reduction during storage might be due to microbial growth and lipid oxidation (Tarladgis *et al.,* 1960). Dehydration and moisture reduction of the product with advancement of storage could be the reason for lower juiciness scores. Similar observations of decrease in overall acceptability of various meat pickles with increasing storage periods were also reported (Khade *et al.,* (2019), Jayanthi *et al.* (2008) and Pal and Agnihotri, 1994). The native *desi* chicken meat pickle remained highly acceptable up to 60 days of storage and thereafter between 60 to 90 days of storage the native *desi* chicken meat pickle was only moderately acceptable.

CONCLUSION

Based on the above results, it can be concluded that native *desi* chicken meat pickle had higher sensory acceptability up to 60 days of storage at room temperature (32 ± 5 ºC) without significantly affecting physico-chemical and microbial quality as compared to 60 to 90 days of storage at room temperature (32 ± 5 ºC) where the native *desi* chicken meat pickle was only moderately acceptable.

REFERENCES

Anandh, A.M., Sutha, M. and Sobana, A.S. 2019. Quality and acceptability of pickle from chicken and turkey gizzards. *Asian J. Dairy Food Res.,* **38**: 155 -158.

Bhusal, S., Shrestha, R. and Upadhya, N. 2017. Preparation of chicken meat pickle and its storage stability studies at room temperature. *Golden Gate J. Food Sci. Technol.,* **3**: 59 - 62.

APHA. 1984. Compendium of methods for the microbiological examination of foods, (Ed. Speck, M.L), American Public Health Association, Washington DC.

AOAC. 1995. Official methods of Analysis, 16th Edition, Association of Official Analytical Chemists, Washington DC.

Dziezak, J.D. 1986. Antioxidants and antimicrobial agents. *Food Technol.*, **40**: 94-111.

Ilavarasan, R., Robinson J.J Abraham., Apparao,V., Pandiyan, V., Narendra Babu, R. and Wilfred Ruban, S. 2016. Effect of age on meat quality characteristics and proximate composition of *desi* chicken meat of Tamil Nadu. *Indian Vet. J.,* **93**: 44 - 46.

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.

Jay, J.M. 1996. Modern food microbiology, 4th Edition. CBS Publishers and Distributors, New Delhi, India.

Jayanthi, D., Karthik, P., Kulkarni, V.V., Arthanarieswaran, M., Kanagarajau, P. and Chandirasekaran, V. 2008. Development of traditional styled meat pickle from spent hen meat. *J. Meat Sci.,* **5**: 11- 14.

Khade, A., Raziuddin, M., Devangare, A. and Khan, M. 2019. Quality attributes and storage stability of spent hen meat pickle prepared from different Acidulants. *Int. J. Livest. Res.,* **9**: 160-167.

Keeton, J.T. 1983. Effect of fat and NaCl / Phosphate levels on the chemical and sensory properties of pork patties. *J. Food Sci.,* **48**: 878 - 881.

Nayak, N.K., Singh, P.K. and Nanavati, S. 2011. Quality characteristics of matured chicken pickle. *Indian Vet. J.,* **88**: 54-56.

Pal, U.K. and Agnihotri, M.K.. 1994. Storage stability of chevon pickle at room temperature. *J. Appl. Anim. Res.,* **5**: 89-93.

Sachdev, A., Ram Gopal., Verma, S.S., Kapoor, K.N. and Kulshreshtha, S.B. 1994. Quality of chicken gizzard pickle during processing and storage. *J. Food Sci. Technol.,* **31**: 32-35.

Shukla, P.K. and Shrivastava, R.K. 1999. Storage stability of poultry pickle stored at room temperature. Indian *J. Poult. Sci.,* **34**: 285-288.

Snedecor, G.W. and Cochran, W.G. 1989. Statistical Methods, 8th Edition, Oxford and IBH Publishing Co., Calcutta, India.

Tarladgis, B.G., Watts, B.M., Younathan, M.T. and Durgan, L.R. 1960. A distillation method for the quantitative determination of malonaldehyde in rancid foods. *J. Am. Oil Chem. Soci.,* **37**: 403- 406.

Webster, C.E.M., Ledward, D.A. and Lawrie, R.A. 1982. Effect of oxygen and storage temperature on intermediate moisture meat products. *Meat Sci.,* **6**: 111-121.

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.