

Original Research Article

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Storage Quality and Acceptability of Turkey Meat Pickle at Room Temperature ($32 \pm 5^\circ\text{C}$)

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ABSTRACT

Meat pickle prepared from turkey meat was stored at room temperature ($32 \pm 5^\circ\text{C}$) and was subjected to assess the quality changes and shelf stability at 0, 15, 30, 45, 60, 75 and 90 day of storage. pH and titrable acidity values were non significantly increased with increasing storage period. Moisture values decreased significantly ($p < 0.05$) on day 60 of storage whereas free fatty acids and TBA values were significantly ($p < 0.05$) increased on day 75 of storage. Throughout storage period, there is no pathogenic microorganisms were deducted except total plate counts and yeast mould counts and were within the acceptable limits. Sensory scores were decreased progressively with increasing storage period. However, no adverse effects were noticed on sensory scores for appearance, flavour, juiciness, saltiness, sourness and overall acceptability up to 90 days of storage. Throughout storage period the turkey meat pickle had rated very to moderately acceptable. Therefore, turkey meat pickle was found to be very acceptable up to 60 days thereafter moderately acceptable up to 90 days for consumption at room temperature ($32 \pm 5^\circ\text{C}$).

Keywords

Turkey, Meat,
Pickle, Storage,
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Introduction

Commercial turkey (*Meleagris gallopavo*) farming is becoming popular in India and farmers started to show interest in rearing of different turkey varieties. Turkey farming in India has now shifted from backyard farming to scientific intensive farming due to change in market priorities and consumer preference.

Turkey meat resembles red meat but is low in flavour, tender and has higher meat and bone ratio. Turkey meat is consumption increasing in India. However, heavier size of turkey carcass make its retail sale is a difficult task. Therefore, it is necessary to develop value added meat products from turkey meat. Turkey meat has enormous potential for processing in to valuable and highly palatable

processed meat products. The development and processing of turkey meat in to various value added products provides variety to the consumers and further the value added turkey meat products offer increasing convenience to the consumer. Meat pickling in vinegar and edible oil with added salt, spices and condiments provide ready to eat highly acceptable convenience product with good shelf stability at an ambient temperature (Gadekar *et al.*, 2010). Pickling also helps in improving the desirable characteristics like taste and flavor along with the preservative effect (Khade *et al.*, 2019). Several meat pickles have reported a long shelf life without refrigeration. Hence, the objective of the present study was to prepare and evaluate the quality and acceptability of turkey meat pickle at room temperature storage (32 ± 5°C).

Materials and Methods

Turkey meat source

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 following standard protocol. After dressing, the meat separated from the turkey carcass and then meat cut into small cubes (1 cm × 1 cm × 1 cm). The turkey meat cubes were used for preparation of turkey meat pickle.

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 turkey meat pickle formulation consisted of turkey meat 100.0%, spice mixture–5.0%, red chilli powder – 3.0%, garlic paste – 5.0%, ginger paste – 5.0%, roasted jeera powder - 1.0%, mustard seeds – 1.0%, asafetida powder – 1.0%, roasted fenugreek seeds powder – 1.0%, salt –4.0%, turmeric - 2.5%, vinegar – 20.0% and gingili oil 50%

Processing of turkey meat pickle for storage studies

The turkey meat pieces were mixed with turmeric powder and marinated for 1 hr at 5 ±2 °C for uniform dispersion. Then the turkey meat pieces were pressure cooked at 15 psi for 10 min and then used for preparation of pickle. The pressure cooked turkey meat pieces were deep fried in heated gingili oil till golden brown colour appeared and were kept separately. The mustard seeds, roasted jeera powder, roasted asafetida powder, roasted fenugreek seeds powder, condiments (ginger and garlic paste), red chilli powder and spice mix were shallow fried in the remaining gingili oil to get the “golden brown stage”. Salt and fried turkey 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 meat pickle was allowed to cool to room temperature. After cooling the turkey pickle were packed in the polyethylene terephthalate (PET) 250 gm bottles. Likewise four batches of turkey meat pickle were prepared. The turkey meat pickle were evaluated the various physico-chemical

parameters, microbial profile and sensory attributes at an interval of 0, 15, 30, 45, 60, 75 and 90 days of storage at room temperature ($32 \pm 5^\circ\text{C}$).

Physico-chemical analysis

The pH turkey 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). Free 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 turkey 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 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 gm of plate count agar in 1 lit of distilled water and pH was adjusted to 7.0 ± 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 hr 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 hr. 60.5 gm 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. Staphylococcal count was deduced 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 $37 \pm 1^\circ\text{C}$ 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 / gm sample.

Sensory evaluation

Sensory evaluation was conducted with semi-trained panelists. Turkey 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).

Statistical analysis

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

Changes in physico-chemical characteristics

The mean values for changes in physico-chemical characteristics of turkey meat pickle during room temperature storage are presented in Table 1. Overall day mean for pH of turkey meat pickle ranged from 4.52 ± 0.11 to 4.68 ± 0.12 . The pH values of turkey meat pickle increased non significantly

($p < 0.05$) with increasing storage period and was below 5.0, which is considered to be critical for storage stability of pickled meat products (Dziezak, 1986). A similar increase in pH during storage of pickle was also reported by Bhusal *et al.*, (2017) in chicken meat pickle, Maiti *et al.*, (2009) in gizzard pickle and Pal and Agnihotri (1994) in chevon meat pickle. Overall days mean for moisture of turkey meat pickle ranged from 65.82 ± 0.12 to 61.17 ± 0.10 .

The moisture values of turkey meat pickle were decreased significantly ($p < 0.05$) with increasing storage period. However, overall days mean for moisture significantly ($P < 0.05$) decreased on day 60 of storage and the decrease in moisture values between on day 0 to 60 and between on day 75 to 90 of storage did not turn out to be statistically significant. Pal and Agnihotri (1994) had also reported decrease in moisture contents in chevon meat pickle at room temperature. Overall day mean for titrable acidity of turkey meat pickle ranged from 0.88 ± 0.12 to 1.54 ± 0.14 . Titrable acidity values of turkey meat pickle were increased non significantly with increasing storage period.

The increased titrable acidity could be due to loss of moisture and the effect of condiments mix used in the turkey meat pickle formulation. There was constant increase in titrable acidity of chevon meat pickle also reported by Pal and Agnihotri (1994) in chevon meat pickle and Jayanthi *et al.*, (2008) in spent hen meat pickle. Overall day mean for free fatty acids and TBA values of turkey meat pickle ranged from 0.46 ± 0.12 to 1.75 ± 0.14 and 0.60 ± 0.12 to 1.92 ± 0.14 , respectively. Free fatty acids and TBA values of turkey meat pickle were increased significantly ($p < 0.05$) with increasing storage period. However, increase in free fatty acids and TBA values between on day 0 to 60 and between on day 75 and 90 of storage did not turn out to be statistically significant.

Increase in free fatty acids with increasing storage period might be due to bio chemical and microbial changes that cause the hydrolytic rancidity. The present finding are in conformity with Jayanthi *et al.*, (2008) who also reported constant increase in free fatty acid values in spent hen meat pickle during storage at room temperature. Even though there was a increase in TBA values during storage, they were well within the threshold limit of 1-2 mg malonaldehyde / kg meat (Wastt, 1962). Increase in TBA values might be due to increase in lipid oxidation and production of volatile metabolites in aerobic packaging (Jay, 1995). Increases in TBA during storage of different meat pickle were also recorded earlier by Das *et al.*, (2012), Maiti *et al.*, (2009) and Pal and Agnihotri (1994).

Changes in microbial characteristics

The mean values for changes in microbial characteristics of turkey meat pickle during room temperature storage are presented in Table 2. Overall day mean for total plate counts of turkey meat pickle ranged from 1.34 ± 0.15 to 2.20 ± 0.14 . Total plate counts were increased non significantly with increasing storage period and total plate counts were within the standards stipulated for cooked meat products, even though total plate counts were increased with increasing storage period (Jay, 1996). Coliform counts and staphylococcal counts were not deducted throughout storage period. Yeast and mould counts were not deducted between day 0 to 60 of storage thereafter yeast and mould counts were deducted on day 75 of storage and the value ranged from 0.70 ± 0.13 to 1.18 ± 0.10 . Throughout storage period, pathogenic microorganisms were not deducted. This could be due to the heat treatment during cooking and addition of acetic acid used for pickling that lead to retardation of microbial growth (Wani and Majeed, 2014).

Table.1 Changes in physico-chemical characteristics of turkey 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	4.52 ± 0.11	4.54 ± 0.12	4.58 ± 0.12	4.62 ± 0.11	4.64 ± 0.11	4.68 ± 0.13	4.68 ± 0.12
Moisture (%)	65.82 ± 0.12 ^a	65.66 ± 0.18 ^a	65.54 ± 0.14 ^a	65.44 ± 0.12 ^a	64.32 ± 0.10 ^b	62.22 ± 0.15 ^b	61.17 ± 0.10 ^c
Titration acidity (% acetic acid)	0.88 ± 0.12	0.92 ± 0.14	0.98 ± 0.15	1.02 ± 0.14	1.28 ± 0.12	1.42 ± 0.15	1.54 ± 0.14
Free fatty acids (% oleic acid)	0.46 ± 0.12 ^a	0.45 ± 0.12 ^a	0.47 ± 0.14 ^a	0.52 ± 0.12 ^a	0.58 ± 0.12 ^a	1.68 ± 0.15 ^b	1.75 ± 0.14 ^b
TBA value (mg malonaldehyde / kg)	0.60 ± 0.12 ^a	0.62 ± 0.11 ^a	0.75 ± 0.12 ^a	0.78 ± 0.11 ^a	0.80 ± 0.12 ^a	1.85 ± 0.13 ^b	1.92 ± 0.14 ^b

*Number of observations: 4; Means bearing same superscripts row-wise do not differ significantly (p<0.05)

Table.2 Changes in microbial profile of turkey 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	1.34 ± 0.15	1.38 ± 0.12	1.52 ± 0.18	1.58 ± 0.17	1.65 ± 0.21	1.85 ± 0.15	2.20 ± 0.14
Coliform count	ND	ND	ND	ND	ND	ND	ND
Yeast and mould count	ND	ND	ND	ND	ND	0.70 ± 0.13	1.18 ± 0.10
Staphylococcal count	ND	ND	ND	ND	ND	ND	ND

**Number of observations: 4; Means bearing same superscripts row-wise do not differ significantly (p<0.05)

Table.3 Changes in sensory characteristics of turkey 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	8.0 ± 0.14 ^a	8.0 ± 0.12 ^a	7.5 ± 0.14 ^a	7.5 ± 0.12 ^a	7.0 ± 0.11 ^b	6.5 ± 0.14 ^b	6.5 ± 0.12 ^b
Flavour	8.0 ± 0.14 ^a	8.0 ± 0.12 ^a	7.5 ± 0.12 ^a	7.5 ± 0.14 ^a	7.0 ± 0.12 ^b	6.0 ± 0.12 ^b	6.0 ± 0.14 ^b
Juiciness	8.0 ± 0.12 ^a	8.0 ± 0.10 ^a	7.5 ± 0.12 ^a	7.5 ± 0.14 ^a	7.0 ± 0.14 ^b	6.0 ± 0.13 ^b	6.0 ± 0.12 ^b
Saltiness	8.0 ± 0.10 ^a	8.0 ± 0.12 ^a	7.5 ± 0.12 ^a	7.0 ± 0.12 ^a	7.0 ± 0.10 ^b	6.5 ± 0.10 ^b	6.5 ± 0.14 ^b
Sourness	8.0 ± 0.12 ^a	8.0 ± 0.14 ^a	8.0 ± 0.14 ^a	8.0 ± 0.14 ^a	8.0 ± 0.14 ^a	7.5 ± 0.12 ^a	6.5 ± 0.12 ^b
Over all acceptability	8.0 ± 0.13 ^a	8.0 ± 0.12 ^a	7.6 ± 0.12 ^a	7.5 ± 0.14 ^a	7.2 ± 0.13 ^a	6.5 ± 0.12 ^b	6.3 ± 0.13 ^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 ($p < 0.05$)

The microbial count were reported in the present study were remained satisfactory even after 90 days of storage at room temperature as the count remained in the range of 3 log₁₀ cfu / gm sample. Similar observations were also reported Kumar and Bachil (1993) in pork pickle, Pal and Agnihotri (1994) in chevon meat pickle and Jayanthi *et al.*, (2008) in spent hen meat pickle.

Changes in sensory characteristics

The mean values for changes in sensory characteristics of turkey meat pickle during room temperature storage are presented in Table 3. Appearance and colour, flavour, juiciness, saltiness, sourness and overall acceptability scores were decreased progressively with increasing storage period. Appearance and colour, flavour, juiciness, saltiness scores of turkey meat pickle were decreased significantly ($p < 0.05$) on day 60 of storage except sourness and overall acceptability scores. However, appearance and colour, flavour, juiciness, saltiness scores of the turkey meat pickle between day 0 to 45 and day 60 to 90 of storage did not turn out to be statistically significant. Sourness and

overall acceptability scores of turkey meat pickle were significantly ($p < 0.05$) decreased on day 75 of storage. Sourness and overall acceptability scores of the turkey meat pickle between day 0 to 60 and day 75 to 90 of storage did not turn out to be statistically significant. Decrease in overall acceptability scores with increasing storage period might be due to progressive decrease in the colour, flavour, texture and juiciness scores (Khade *et al.*, 2019). Similar observations of decrease in overall acceptability of pickle with increasing storage period in various meat pickles were also reported (Pal and Agnihotri (1994), Janathi *et al.*, (2008), Even though there were a decrease in sensory acceptability scores of turkey meat pickle during advancement of storage, the turkey meat pickle rated very to moderately acceptable throughout the storage period.

From these results, it can be concluded that turkey meat pickle had very acceptable up to 60 days and moderately acceptable from day 75 to 90 of storage at room temperature (32 ± 5°C) without significantly affecting physico – chemical and microbial quality.

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