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Quality and acceptability evaluation of pickle from Japanese quail gizzards

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Abstract

Gizzard pickle developed from Japanese quail gizzards were studied for various physico-chemical, microbial and sensory qualities. Gizzard pickle was prepared from chicken gizzards were used as control. Significantly ($p < 0.05$) lower pH, product yield (%) and moisture (%) values were observed in Japanese quail gizzard pickle as compared to control chicken gizzard pickle. The titrable acidity (% acetic acid) and fat (%) values were significantly ($p < 0.05$) higher in Japanese quail gizzard pickle as compared to control chicken gizzard pickles. The mean TBA value (mg malonaldehyde/kg) and protein (%) value were non significantly higher in Japanese quail gizzard pickle as compared to control chicken gizzard pickle. Total plate counts of gizzard pickles did not differ significantly. No coliform and yeast and mould counts were observed in gizzard pickles. The overall sensory acceptability scores were significantly ($p < 0.05$) higher for Japanese quail gizzard pickle as compared to control chicken gizzard pickle and were rated moderately to highly acceptable. Therefore, it can be concluded that highly acceptable pickle can be prepared from Japanese quail gizzard with better physico-chemical, microbial qualities and sensory acceptability.

Keywords: Chicken, Japanese quail, gizzard, pickle, quality, acceptability

1. Introduction

Japanese quail (*Coturnix coturnix japonica*) is slaughtered mainly for meat, the by - products that are emanated from slaughtered Japanese quails is also of good value. Gizzard is one of the important edible offal and yielding about 2.5 to 3.0% per bird (Nasr *et al.* 2017)^[12]. Texture of poultry gizzard is tough and rubbery due to the characteristic muscular construction and has poor functional properties and shelf life (Chen and Stinson, 1983)^[2]. It is necessary to evolve appropriate technologies to convert the tough and perishable Japanese quail gizzards into convenience and more acceptable novel products. Effective utilization of these by-products for development of value added meat products is one way to realize maximum returns from poultry sector. Further, utilization of Japanese quail gizzards in value added meat product would increase the profitability to poultry processors and it can also provide a better avenue for entrepreneurship development. Pickling of meat is an alternative method to develop a low cost shelf stable food product. Meat pickles are highly acceptable ready to eat convenience meat product of Indian origin (Gadekar *et al.* 2010)^[5]. Preparation of different types of meat pickle have been reported (Pal and Agnihotri (1994)^[13], Puttarajappa *et al.* (1996)^[14], Das *et al.* (2013)^[3], Wani and Majeed (2014)^[17] and Anna Anandh *et al.* (2019)^[1]. Japanese quail gizzard also offers good scope for processing in to palatable pickle. Therefore, in order to diversify the available product range, the cost effective recipe for Japanese quail gizzard pickle were standardized and their quality characteristics were evaluated.

2. Materials and Methods

2.1 Chicken and Japanese quail gizzard

Fresh chicken and Japanese quail gizzards were purchased from a local retail poultry processing unit. The fat and adhering extraneous materials on the surface of gizzards were removed by hand and it was cut in to small pieces.

2.2 Spices and condiments mix

Dry spices *viz.* aniseed (10%), black peper (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° C for 4 h. The ingredients were grounded in a grinder and sieved through a fine mesh.

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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.

2.3 Gizzard pickle formulation

The formula for gizzard pickle was developed after conducting a series of preliminary trials. The gizzard pickle formulation consisted of pressure cooked gizzard pieces 100.0%, spice mixture - 2.0%, red chilli powder - 3.0%, garlic paste - 5.0%, ginger paste - 5.0%, Jeera- 1.0%, mustard seeds - 1.0%, asafoetida - 1.0%, fenugreek seeds - 1.0%, salt - 3.0%, turmeric - 2.5%, Vinegar - 20.0% and gingili oil 50%.

2.4 Process schedule for preparation of gizzard pickle

The washed chicken / Japanese quail gizzard pieces were cut in to small cubes. After dipping in vinegar: water mixture (1:1 v/v) for 1 hr, the gizzard pieces were pressure cooked at 15 psi for 10 min. The pressure cooked gizzard pieces were mixed with turmeric powder and marinated for 1 hr at 5 ± 2 °C for uniform dispersion and then the gizzard pieces were used for preparation of pickle. The pressure cooked gizzard pieces were deep fried in heated gingili oil until golden brown colour 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 gizzard pieces were 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 pickles were allowed to cool to room temperature. After cooling the gizzard pickle were packed in 100 g glass bottles and stored at 32 ± 2 °C. The products were evaluated for various physico-chemical parameters, microbial profile and sensory attributes after 7 days maturation period.

2.5 Physico-chemical characteristics analysis

The pH of gizzard pickles was determined by using digital pH

3 Results and Discussion

3.1 Physico-chemical characteristics

Table1: Physico-chemical characteristics of chicken and Japanese quail gizzard pickle (Mean \pm S.E)

Physico -chemical characteristics*	Chicken gizzard pickle	Japanese quail gizzard pickle	Overall mean
pH	4.04 \pm 0.16 ^a	3.58 \pm 0.18 ^b	3.81 \pm 0.17
Product yield (%)	110.48 \pm 0.10 ^a	105.64 \pm 0.12 ^b	108.06 \pm 0.11
Titration acidity (% acetic acid)	0.69 \pm 0.18 ^a	0.83 \pm 0.20 ^b	0.76 \pm 0.19
TBA value (mg malonaldehyde / kg)	0.53 \pm 0.24	0.54 \pm 0.20	0.54 \pm 0.22

*Number of observations: = 4

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

Physico- chemical parameters of chicken and Japanese quail gizzard pickles are presented in Table 1. Mean pH value was significantly ($p < 0.05$) lower for Japanese quail gizzard pickle as compared to chicken gizzard 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) [14] and Pal and Agnihotri (1994) [13]. 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) [6]. The pH values of Japanese quail gizzard pickle were below 5.0, which are considered to be critical for storage stability of pickled meat products (Dziezak, 1986) [4]. Mean pickled product yield was

meter. 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 titration acidity (% acetic acid). The procedure of Witte *et al.*, (1970) [19] was followed to estimate thiobarbituric acid value (TBA). The moisture, protein and fat contents of gizzard pickles were determined by standard methods using hot air oven, kjeldahl's assembly and soxhlet ether extraction apparatus, respectively (AOAC, 1995).

2.6 Microbial profile

Total plate count, coliform count, yeast and moldcount of freshly prepared gizzard 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. The average number of colonies for each species was expressed as log₁₀ CFU / g sample.

2.7 Sensory evaluation

Sensory evaluation was conducted with semi-trained panelists. Chicken and Japanese quail gizzard 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) as suggested by Keeton (1983) [10].

2.8 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) [16] comparing the means and to determine the effect of treatment by using SPSS-16 (SPSS Inc., Chicago, IL., USA). The level of significant effects, least significant differences were calculated at appropriate level of significance ($p < 0.05$).

significantly ($p < 0.05$) lower for Japanese quail gizzard pickle as compared to chicken gizzard pickle. Low product yield of Japanese quail gizzard pickle was due to higher cooking loss in Japanese quail gizzard as compared to chicken gizzard. The present findings are agreement with Anna Anandh *et al.* (2019) [1] and wherein they reported pickled turkey gizzard product yield between 108 to 118%. The mean titration acidity (% acetic acid) value was significantly ($p < 0.05$) higher for Japanese quail gizzard pickle as compared to chicken gizzard pickle. The higher titration acidity in quail gizzard pickle could be due to more loss of moisture and the effect of condiments mix. This difference was due to critical absorption of acetic acid into the meat muscle. Similar observation was made by Sahu *et al.* (2012) [15]. Pal and Agnihotri (1994) [13] reported

acid value 0.74 in chevon pickle whereas Jayanthi *et al.* (2005) [8] reported slightly higher acid value of 1.60 in spent hen meat pickle. Similar observation was also made by Maiti *et al.* (2009) [11]. Non significantly higher TBA (mg malonaldehyde / kg) values were observed in Japanese quail gizzard pickles as compared to chicken gizzard pickles but the values remained well within the threshold limit of 1-2 mg malonaldehyde / kg of meat product (Watts, 1962) [18]. These findings are in conformity with those of Puttarajappa *et al.* (1996) [14] who reported that TBA value of 0.57 in chicken pickle.

3.2 Proximate characteristics

Proximate characteristics of chicken and Japanese quail gizzard pickle are presented in Table 3. Moisture content was significantly ($p < 0.05$) lower in Japanese quail gizzard pickle as compared to chicken gizzard pickle. This might be due to the more evaporation of water in Japanese quail gizzard during cooking. Non significantly ($p < 0.05$) higher protein content was observed in chicken gizzard pickle as compared to Japanese quail gizzard pickle. Significantly ($p < 0.01$) increased fat content value observed in Japanese quail gizzard pickle as compared to chicken gizzard pickle. The variation might be due to drastic reduction of moisture content (Wani and Majeed, 2014) [17] and addition of oil during pickle processing and absorption of fat during frying in oil (Jindal and Bawa, 1998) [9].

Table 2: Proximate characteristics of chicken and Japanese quail gizzard pickle (Mean \pm S.E)

Physico-chemical characteristics*	Chicken gizzard pickle	Japanese quail gizzard pickle	Overall mean
Moisture (%)	67.30 \pm 0.18 ^a	55.72 \pm 0.20 ^b	61.51 \pm 0.19
Protein (%)	21.86 \pm 0.16	20.10 \pm 0.22	20.98 \pm 0.19
Fat (%)	14.64 \pm 0.12 ^a	17.30 \pm 0.16 ^b	15.97 \pm 0.14

*Number of observations: = 4

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

3.3 Microbial characteristics

Table 3: Microbial profile (\log_{10} cfu/g) of chicken and Japanese quail gizzard pickle (Mean \pm S.E)

Microbial profile (\log_{10} cfu/g)**	Chicken gizzard pickle	Japanese quail gizzard pickle	Overall mean
Total plate count	0.56 \pm 0.10	0.55 \pm 0.12	0.55 \pm 0.12
Coliform count	ND	ND	ND
Yeast and mould count	ND	ND	ND

**Number of observations: = 4

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

Microbial profiles of chicken and quail gizzard pickle are presented in Table 3. Non significantly higher total plate counts were observed in chicken gizzard pickle as compared to quail gizzard pickle and the total plate counts were within the standard stipulated for cooked meat products (Jay, 1996) [7]. Coliform and yeast and mould counts were not detected in the chicken and quail gizzard pickles. 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. Acidification of food to pH 4.6 is intended to prevent the growth of microorganisms and make the product shelf stable at room temperature. As it is well known fact that acid and heat treatment are the major factors for increasing the safety

against micro organisms of pickled products (Young-Lee, 2004) [20].

3.4. Sensory characteristics

Sensory attributes of chicken and Japanese quail gizzard pickles are presented in Table 4. The sensory attributes score for appearance and colour, flavour, juiciness, saltiness, sourness and overall acceptability were significantly ($p < 0.05$) higher for Japanese quail gizzard pickles as compared to chicken gizzard pickles. The sensory attribute scores for tenderness did not differ significantly between Japanese quail and chicken gizzard pickle. Based on the sensory evaluation scores, Japanese quail gizzard pickle was rated to very acceptable.

Table 4: Sensory attributes of chicken and Japanese quail gizzard pickle (Mean \pm S.E)

Sensory Attributes ***	Chicken gizzard pickle	Japanese quail gizzard pickle	Overall mean
Appearance and colour	8.0 \pm 0.10 ^a	8.5 \pm 0.12 ^b	8.3 \pm 0.11
Flavour	8.0 \pm 0.14 ^a	8.2 \pm 0.12 ^b	8.1 \pm 0.13
Juciness	7.5 \pm 0.12 ^a	8.0 \pm 0.10 ^b	7.8 \pm 0.11
Tenderness	8.5 \pm 0.10	8.5 \pm 0.12	8.5 \pm 0.11
Saltiness	7.5 \pm 0.12 ^a	8.0 \pm 0.12 ^b	7.8 \pm 0.11
Sourness	8.0 \pm 0.10 ^a	8.5 \pm 0.10 ^b	8.3 \pm 0.11
Overall acceptability	7.9 \pm 0.12 ^a	8.3 \pm 0.12 ^b	8.2 \pm 0.12

***Number of observations: = 32

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

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

4. Conclusion

Based on the results of physico-chemical parameters, microbial profile and sensory attributes, it can be concluded that highly acceptable pickle can be prepared by using Japanese quail gizzard with substantial value addition to the materials. Therefore, it can be concluded that highly acceptable pickle can be prepared from Japanese quail gizzard had better physico-chemical, microbial qualities and sensory acceptability.

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