Quality and Acceptability of Pickle from Chicken and Turkey Gizzard

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Introduction

Poultry is slaughtered mainly for meat, the by-products that are emanated from slaughtered poultry are of also good value. The gizzard is one of the principal edible by-products of poultry processing, which is being marketed as variety meat along with dressed chicken or poultry. It accounts for 3% and 4.5% of slaughter weight of chicken and turkey, respectively (Charonpong and Chen, 1980 and Anna Anandh, 2017). The texture of chicken gizzard is tough and rubbery due to their characteristic muscular construction (Chen and Stinson, 1983), and they need proper technology for efficient utilization. Effective utilization of these by-products for the production of value-added meat products is one way to realize maximum returns from the poultry sector. 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 flavor and texture along with preservative effect. The pickling of gizzard could offer a new nutritious poultry product with a long shelf-life and a good market potential. Therefore, to diversify the available product range, the cost-effective recipe for chicken and turkey gizzard pickle were standardized, and their quality characteristics were evaluated.

Materials and Methods

Chicken and Turkey Gizzard

Fresh chicken and turkey 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 into small pieces.

Spices and Condiments Mix

Dry spices viz., aniseed (10%), black pepper (10%), capsicum (8%) caraway seed (10%), cardamom (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 50º C for 4 h. The ingredients were ground in a grinder and sieved through a fine mesh. For the preparation of condiments mix, fresh garlic and ginger were procured from the local market and were peeled off the external covering. The required quantities were cut into small bits and mixed in a laboratory blender to a fine paste.

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 gingelly oil—50%.

Abstract

Gizzard pickles prepared from chicken and turkey gizzard were studied for various physicochemical, microbial, and sensory qualities. Significantly \((p < 0.05)\) higher \(\text{pH}\) and titrable acidity (\% acetic acid) values were observed in chicken gizzard pickle as compared to turkey gizzard pickle. The product yield (\%), TBA value (mg malonaldehyde/kg), moisture (\%), protein (\%) and fat (\%) were significantly \((p < 0.05)\) higher in turkey gizzard pickle as compared to chicken gizzard pickles. Total plate counts of gizzard pickles did not differ significantly. No coliform and yeast and mold counts were observed in gizzard pickles. All sensory scores were significantly \((p < 0.05)\) higher for chicken gizzard pickle as compared to turkey gizzard pickle and were rated moderately to highly acceptable. Therefore, it can be concluded that highly acceptable pickle can be prepared from chicken and turkey gizzard had better physicochemical, microbial qualities, and sensory acceptability.

Keywords: Acceptability, Chicken, Gizzard, Pickle, Poultry, Quality, Turkey.
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Physicochemical Characteristics Analysis
The pH of gizzard pickles was determined by using digital pH meter. The weight of pickled products was recorded before and after pickling, and the yield was calculated (product yield = weight of pickles/weight of raw products × 100) and expressed as a percentage. The 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 gizzard 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 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. 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.

Results and Discussion
Physicochemical Characteristics of Gizzard Pickle
Physicochemical parameters of chicken and turkey gizzard pickles are presented in Table 1. Mean pH value was significantly (p <0.05) higher for chicken gizzard pickle as compared to turkey gizzard pickles. The pH reduction in pickle 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). The pH values of gizzard pickles were below 5.0, which is considered to be critical for the storage stability of pickled meat products (Dziezak, 1986). Mean pickled product yield was significantly (p <0.05) higher for turkey gizzard pickle as compared to chicken gizzard pickle. The low product yield of chicken gizzard pickle was due to a higher cooking loss in the chicken gizzard as compared to turkey gizzard. The mean titrable acidity (% acetic acid) value was significantly (p <0.05) higher for chicken gizzard pickle as compared to turkey gizzard pickle. This difference was due to the critical absorption of acetic acid into the gizzard tissue. The higher titrable acidity in chicken gizzard pickle could be due to more loss of moisture and the effect of condiments mix. A similar observation was also made by Maiti et al. (2009).

Sensory Evaluation
Sensory evaluation was conducted with semi-trained panelists. Chicken and turkey gizzard pickles were served to the panelists. The sensory attributes like appearance and color, flavor, juiciness, tenderness, saltiness, sourness and overall palatability were evaluated on 9-point descriptive scale (wherein 1 is extremely undesirable and 9 - is extremely desirable) as suggested by Keeton (1983).

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 Analysis of Variance (ANOVA) 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 the appropriate level of significance (p <0.05).

Table 1: Physicochemical characteristics of chicken and turkey gizzard pickle (Mean ± SE)

| Physicochemical characteristics* | Chicken gizzard pickle | Turkey gizzard pickle | Overall mean |
|---------------------------------|------------------------|-----------------------|-------------|
| pH                              | 4.10 ± 0.13^a          | 3.96 ± 0.12^b         | 4.03 ± 0.13 |
| Product yield (%)               | 108.16 ± 0.14^a        | 118.10 ± 0.10^b       | 113.13 ± 0.12 |
| Titrable acidity (% acetic acid) | 0.92 ± 0.10^a          | 0.73 ± 0.12^b         | 0.83 ± 0.11 |
| TBA value (mg malonaldehyde/kg) | 0.68 ± 0.15^a          | 0.82 ± 0.17^b         | 0.75 ± 0.16 |
| Moisture (%)                    | 54.46 ± 0.16^a         | 57.54 ± 0.18^b        | 56.00 ± 0.17 |
| Protein (%)                     | 24.92 ± 0.12^a         | 26.10 ± 0.10^b        | 25.52 ± 0.11 |
| Fat (%)                         | 15.26 ± 0.18^a         | 16.72 ± 0.13^b        | 15.99 ± 0.16 |

*Number of observations: = 4
Means bearing different superscripts row- wise differ significantly (p <0.05).

Process Schedule for Preparation of Gizzard Pickle
The washed chicken/turkey gizzard pieces cut into 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 the preparation of pickle. The pressure cooked gizzard pieces were deep fried in heated gingelly oil till golden brown color appeared and were kept separately. The mustard seeds, fenugreek seeds, condiments, red chilli powder, and spice mix were shallow fried in the remaining gingelly 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 the polyethylene terephthalate (PET) 100 g bottles and stored at 32 ± 2°C.

Sensory Evaluation
Sensory evaluation was conducted with semi-trained panelists. Chicken and turkey gizzard pickles were served to the panelists. The sensory attributes like appearance and color, flavor, juiciness, tenderness, saltiness, sourness and overall palatability were evaluated on 9-point descriptive scale (wherein 1 is extremely undesirable and 9 - is extremely desirable) as suggested by Keeton (1983).

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Significantly \( p < 0.05 \) higher TBA (mg malonaldehyde/kg) values were observed in turkey gizzard pickle as compared to chicken gizzard pickle, but the values remained well within the threshold limit of 1-2 mg malonaldehyde/kg of meat product (Watts, 1962). Moisture content was significantly \( p < 0.05 \) lower in chicken gizzard pickle as compared to turkey gizzard pickle. This might be due to the more evaporation of water during cooking. Significantly \( p < 0.05 \) higher protein content value observed in turkey gizzard pickle as compared to chicken gizzard pickle. Significantly \( p < 0.05 \) increased fat content value observed in turkey gizzard pickle as compared to chicken gizzard pickle. The variation might be due to a 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 Gizzard Pickle

Microbial profiles of chicken and turkey gizzard pickle are presented in Table 2. Non significantly higher total plate counts were observed in chicken gizzard pickle as compared to turkey gizzard pickle, and the total plate counts were within the standard stipulated for cooked meat products (Jay, 1996). Coliform and yeast and mold counts were not deducted in the chicken and turkey gizzard pickles. This could be due to the heat treatment during cooking and the addition of acetic acid used for pickling that leads 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 a well-known fact that acid and heat treatment are the major factors for increasing the safety against microorganisms of pickled products (Young-Lee, 2004).

Sensory characteristics of gizzard pickle: Sensory attributes of chicken and gizzard pickles were presented in Table 3. The sensory attributes score for appearance and color, flavor, tenderness, juiciness, saltiness, sourness and overall acceptability were significantly \( p < 0.05 \) higher for chicken gizzard pickle as compared to turkey gizzard pickle. Among gizzard pickles, a chicken gizzard pickle was rated to very acceptable and turkey gizzard pickle was rated moderately to very acceptable. Overall acceptability scores were significantly \( p < 0.05 \) higher for chicken gizzard pickle as compared to turkey gizzard pickle. The tough textural characteristics of turkey gizzard would be the reason for the decreased the overall acceptability scores in turkey gizzard pickle as compared to chicken gizzard pickle.

Conclusion

Based on the results of physicochemical parameters, microbial profile, and sensory attributes, it can be concluded that highly acceptable pickle can be prepared by using chicken and turkey gizzard with substantial value addition to the materials.

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