ORIGINAL ARTICLE

Evaluation of quality attributes and storage stability of pickle prepared from chicken gizzard

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Abstract

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Received: 13/11/2014

Revised: 27/11/2014

Accepted: 01/12/2014

In the present study, quality attributes and storage stability of pickle prepared from chicken gizzard was evaluated. Aim of the study was to economic and efficient utilization of chicken gizzard in highly acceptable way and increase the shelf life by converting it into pickle. It is observed that storage time did not markedly affect the pH and tritrable acidity value of the chicken gizzard pickle. Storage of chicken gizzard pickle has little effect on proximate compounds. Storage period have minor effect on acceptability of pickle i.e. it was more acceptable within 30 days compared to 60 days. Microbial count did not show substantial change and remained satisfactory throughout the storage period, after a period of two months no clostridia growth was observed in chicken gizzard pickle.

Keywords: Chicken gizzard, pickling, storage, microbial, sensory evaluation.

Introduction

Broiler production in India is about 3450 MT per 1000 MT in the year 2013 with the production rate of about 9.18% (US Department of Agriculture, 2013). With the present growth rate of over 15%, broiler production is expected to reach 4 billion by the year 2020 (Fakhruddin et al., 2001). With the growing poultry production and processing activities, there would be an increased availability of the edible byproducts (Mountney and Parkhurst, 2001). Animal byproducts include everything of economic value other than the carcass obtained from an animal during slaughter and processing (Selvan et al., 2007). Efficient and economic utilization of these edible byproducts is essential. Unprocessed edible byproducts like chicken gizzard are comparatively harder, fetch considerably low price and not preferred by consumer. However, proximate composition and amino acid profile of gizzard is nearly the same as that of chicken meat (Arafa, 1977). Gizzard is one of the principal edible byproducts of poultry processing which is being marketed as variety meats along with dressed chicken. It forms nearly 3% of dressed chicken (Charoenpong and Chen, 1980) and as such it is less preferred by the consumer due to its peculiar flavor and texture. Gizzard contains approximately 20% proteins (Kondaiah and Panda, 1987).

Chicken gizzard need proper utilization to avert possible fiscal losses to processors with availability of moderate cost convenient food product to the consumers. Texture of chicken gizzard is tough and rubbery due to their characteristic muscular construction (Chen and Stinson, 1983) and they need proper tenderization for efficient utilization. Pickling is one of the alternatives to develop such kind of products (Gadekar et al., 2010). Studies on development of chicken gizzard pickle were carried out in order to preserve it and made it acceptable. Further, utilization of this byproduct would increase the profitability of broiler industry. The present study involves the utilization of chicken gizzard for the preparation of its pickle with consumer acceptance and increased shelf life. Chicken gizzard pickle was investigated for its proximate, sensory and storage quality.

Materials and Methods

The study was conducted in the department of Food Technology, Food Analytical Laboratory of the Islamic University of Science and Technology, Awantipora, Kashmir, India. Chicken gizzard obtained from local market were transported to laboratory in polythene bags under chilled conditions, fat were removed from each gizzard and all gizzards were washed with clean water followed by proximate and microbial analysis. Other materials of reputed brands

required for pickle preparations such as fenugreek, cumin, turmeric, whole chillies, mustard seeds, fennel, kalong, ginger paste, garlic paste, onions, tomato puree, mustard oil, red chilli and salt are procured from local market. Gizzards were cooked in little amount of water for 15 minutes in pressure cooker. Each gizzard was cut into pieces of approximately 1 cm length and made small pricks on each pieces. The smaller pieces of gizzards were fried in oil. Separately onion was fried with spices. Acetic acid was mixed to the whole mixture. The whole mixture was filled in sterilized glass bottles. Pickled bottles were kept at room temperature.

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pH and titrable acidity

The pH is a measure of the acidity or alkalinity in solutions or water containing substances. The pH values of chicken gizzard pickles with the liquid portion were determined by homogenizing 10 g of each sample with 100 ml distilled water. The pH was recorded with a digital pH meter. The pH value in meat and meat products can be measured by direct contact between the sensitive diaphragm of the electrode and the meat tissue. Through the diaphragm differences in electrical load between the meat and electrolyte solution (e.g. Potassium chloride) inside the glass electrode are measured and directly indicated as the pH-reading. In raw fresh meat, it is recommended to spray small amounts of distilled water onto the tissue at the point of measurement (prior to inserting the electrode), because the operation requires some fluidity in the sample and the glass electrode should be thoroughly wet. The amount of water necessary will not appreciably alter the pH. For accurate pH readings

the pH-meter should be calibrated before use and adjusted to the temperature of the tissues to be measured. The electrode must be rinsed with distilled water after each measurement (Pippen, 1965).

Titratable Acidity of product is the acidity in terms of the predominant acid present in the juice i.e. acetic acid. Titratable acidity was measured according to the method described by Ranganna (2001). The % titratable acidity was determined by taking 5 ml of sample, adding 4 to 5 drops of 1 % phenolphthalein indicator and titrating with 0.1 N NaOH. The following formula was used to calculate the total acid, %.

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\label{eq:without} \begin{split} & \mbox{\%itrable acidity} \\ & = \frac{\mbox{titre} \times \mbox{normality of alkali} \times \mbox{volume made up} \times \mbox{eq. wt of acid} \times 100 \\ & \mbox{volume of sample taken for estimation} \times \mbox{wt or volume of sample taken} \times 1000 \end{split}
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Proximate composition

The moisture, fat, ash and protein contents of the chicken pickles were analysed in triplicates using the standard AOAC (2000) method.

Microbial analysis

Microbial analysis was performed for detection of total plate count, acetic acid bacteria and lactic acid bacteria and *Clostridium botilinum*. Three types of media were used for the determination of *Clostridium botilinum* including Robertson's cooked meat media (RCMM), Brain heart infusion (BHI) and Triptase, Arginine, Serine and Hoof (TASH) agar. The analysis was conducted according to the method of APHA (2001).

Sensory evaluation

The product was evaluated organoleptically using semi-trained panelists consists of faculty and post graduate students using hedonic scale of four point (Keetan, 1983). The panelists were explained about the nature of experiment without disclosing the identity of the samples. They were requested to record their preferences for appearances, color, flavor, texture and overall acceptability as given in the score sheet. Taste panel was conducted between 2 to 4 pm.

Statistical analysis

Data are expressed as means. The data across treatment groups were analyzed by (Duncan's test) by using one-way analysis of variance (ANOVA). A confidence interval of 95% (P \leq 0.05) was considered significant in all cases.

Results and Discussion

Fresh values of raw chicken gizzard are presented in Table 1. The pickled gizzard was found to meet the criterion of acceptability for quality. The average panel scores for appearance, juiciness, texture

and overall acceptability indicated that the recipe was more acceptable when compared with raw gizzard.

pH and Titrable acididty

The pH of chicken gizzard declines from 6.6 to 3.1. This decline of pH of raw samples could be attributed to postmortem glycolysis and resultant accumulation of lactic acid. The pH of raw chicken gizzard was 6.6, pH reduces down significantly (P \leq 0.05) to 3.1. This reduction 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). Or it could be due to penetration of acetic acid into the musculature part might be responsible for such decrease as stated by Singh and Panda (1984). The result is shown below in Table 2. The results of storage shows that time did not markedly affect the any pH value of the pickled product.

In case of titrable acidity, an increase in acidity of pickle was observed as compared to raw gizzard, which could be due to addition of acetic acid during pickling and absorption of acetic acid into the gizzard muscle through capillary forces by pressure gradient exerted by internal deformation of the meat. Nonsignificant increase in acidity was also observed during storage period.

Table 1: Fresh value of raw chicken gizzard

Parameters	Values
Moisture content	76.6
Ash content	0.64
Protein	19.69
Fat content	2.15
рН	6.6
Acidity	0.2

Proximate analysis

Moisture content: There was significant ($P \le 0.05$) reduction in miosture content of pickle as compared to raw gizzard. This reduction in moisture may be due to the evaporation of water during cooking. There was a significant ($P \le 0.05$) increase in moisture during storage period from 0 days to 60 days in chicken gizzard pickle (Table 2). The increase in moisture content may be due to faulty packaging system or some moisture picked up by package during filling. The moisture content of raw chicken gizzard was higher than that of gizzard pickle as shown below in Table 1. It happened due to loss of moisture during cooking (Posati, 1979; Keetan, 1983) or may be due to evaporation.

Ash content: The ash content of raw gizzard (Table 1) was found to be less as compared to gizzard pickle because cooking significantly ($P \le 0.05$) increased the ash content of gizzard pickle as compared to raw due to the loss in moisture content during cooking. There was a non-significant decrease of ash content (Table 2) during storage period in case of chicken gizzard pickle was observed.

Fat content: The fat content of chicken gizzard pickle was significantly ($P \le 0.05$) higher than that of raw gizzard (Table 1). This can be due to drastic reduction of moisture content and addition of oil during pickle processing. There was a non-significant change in the fat content of pickle during storage (Table 2). This decrease although non-significant may be due to fat oxidation and lipolysis.

Protein content: The crude protein content of raw chicken gizzard (Table 1) was significantly (P \leq 0.05) lower than cooked gizzard. Cooking significantly increased the protein content of chicken gizzard irrespective of the treatment used during cooking. The quantitative significant (P \leq 0.05) increase in protein content was the result of loss of moisture during cooking (Posati, 1979; Keetan, 1983). There was a non significant change in protein during storage. The results of analysis of protein are presented in Table 2.

Microbial analysis

Results of the total plate count, acetic acid bacteria, lactic acid bacteria and *Clostridium botolinum* are shown in Table 3. There wasn't any microbial growth detected for chicken gizzard pickle stored for 60 days. On comparing the result with the previous findings same observations were made by Das *et al.* (2013) on meat pickle which was made from spent chicken. They investigated that up to 3 months the pickle could be shelf-stable at atmospheric temperature. 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. 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).

For the determination of *Clostridium botulinum*, after three days of incubation under anaerobic conditions no growth was observed on TASH media and BHI agar. RCM media also shows no turbidity and upon staining no spore forming was observed under microscope at 100x. The same results were found after the storage period of 30 days and 60 days. Low pH value could be free from the growth of *Clostridium botulinum* according to the Field *et al.* (1977) that pH

of 4.6 or less is considered safe to inhibit the growth of *Clostridium botulinum*.

Sensory evaluation

The average results of sensory analysis presented on Table 4. The average result for sensory evaluation was "good". Non-significant decline in sensory characteristics of fried gizzard pickles up to 30 days at atmospheric storage period was observed, and the scores for colour, juiciness, texture and overall acceptability at 60^{th} day were reported to be significantly (P ≤ 0.05) lower as compared to freshly prepared pickle samples. This could be due to faulty packaging and other environmental factors.

Conclusion

It can be concluded that pickling of chicken gizzard offers highly nutritious and delicious ready to eat shelf stable product with high consumer acceptability. It will also helpful for economic and efficient utilization of poultry offal meat by converting into gizzard pickle.

Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

Table 2. Effect	t of storage on	chemical co	mposition of	processed	chicken	oizzard	nickle
Table 2. Life	t of storage on	chemical co	mposition of	processeu	CHICKCH	gizzaiu	pickie

Number of	Moisture		Acidity	Ash content	Protein	Fat content
days	content %	рн	(%)	(%)	Content (%)	(%)
0 days	64.6 ^b	3.5 ^a	1.4 ^a	1.26 ^a	25.75 ^a	3.40 ^a
30 days	65.4 ^{ab}	3.3 ^a	1.5 ^a	$1.22^{\rm a}$	25.89 ^a	3.20 ^a
60 days	65.6 ^a	3.1 ^a	1.7 ^a	1.22 ^a	25.99 ^a	3.26 ^a

Values are means of 3 replications. Means figures in a column followed by different superscripts indicate that they are significant (p < 0.05) different with each other determined by Duncan's tests.

Table 3: Microbial analysis of chicken gizzard pickle for 0, 30 and 60 storage days

Sample	Storage days	Total plate count (cfu/g)	Lactic/acetic acid bacteria (cfu/g)	Clostridial count (cfu/g)
1	0 days	<1×10	<1×10	<1×10
1	30 days	<1×10	<1×10	<1×10
1	60 days	<1×10	<1×10	<1×10

Days after	Appearance.	Inicinasa Taxtura		Overall	
storage	and color	Juiciness	Texture	acceptability	
O days	3.55 ^a	3.57 ^a	3.5 ^a	3.6 ^a	
30 days	3.32 ^a	3.77 ^a	3.84 ^a	3.71 ^a	
60 days	2.60^{b}	2.20^{b}	2.95 ^b	2.75 ^b	

Table 4: Organoleptic evaluation of Chicken Gizzard Pickle

Values are means of 3 replications. Means figures in a column followed by different superscripts indicate that they are significant (p < 0.05) different with each other determined by Duncan's tests.

References

- AOAC (2000). Official method of analysis, 17th Edn. *Association of Official Analytical Chemists.*
- APHA (2001). Compendium of methods for the microbiological examination of foods. (Frances, P.D. and Keith, I., eds.), Washington DC: APHA.
- Arafa AS (1977). Pickled chicken gizzards: 1. Acceptability and proximate analysis. *Poultry Science*, 56: 1014-1017.
- Charoenpong C and Chen TC (1980). Qualities of pickled chicken gizzards as affected by salt and vinegar. *Poultry Science*, 59: 537-542.
- Chen TC and Stinson RS (1983). Scanning electron microscope studies on chicken gizzard structure as affected by cooking. *Poultry Science*, 62: 2011-2016.
- Das A, Nath DR, Hazarika M and Laskar SK (2013). Studies on certain quality attributes of meat pickle

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prepared from spent chicken. *Veterinary World*, 6(3): 156-158.

- Fakhruddin, Gahlot AK, Tanwar RK and Singh AP (2001). Poultry resource management for food security and export promotion, *In: Proceeding, South Asian Regional Poultry Conference, Pune, 24-26th September.*
- Field MA, Zamora AF and Bradsher M (1977). Microbiological analysis of home canned tomatoes and green beans. *Journal of Food Science*, 42: 931-934.
- Gadekar YP, Anjaneyulu ASR, Kandeepan G, Mendiratta SK and Kondaiah N (2008). Safe pickle with improved sensory traits: Effect of sodium ascorbate on quality of shelf stable pickled cooked chicken. *Fleischwirtschaft International*, 4: 56-62.
- Gault NFS (1985). The relationship between waterholding capacity and cooked meat tenderness in some beef muscles as influenced by acidic conditions below the ultimate pH. *Meat Science*, 15(1): 15-30.
- http://www.indexmundi.com/agriculture/?country=inandc ommodity=broiler-meatandgraph=production
- Keetan JT (1983). Effect of fat NaCl and phosphate on the chemical and sensory properties of pork patties. *Journal of Food Science*, 48: 878-881.
- Kondaiah N and Panda B (1987). Physicochemical and functional properties of spent hen components.

Journal of Food Science and Technology, 24: 267-269.

- Mountney GJ and Parkhurst CR (2001). Poultry products Technology. 1st edn., Viva Books Pvt. Ltd., New Delhi.
- Pippen EL, Fremery DD, Lineweaver H, Hanson HL (1965). Chicken broth flavor and pH. *Poultry Science*, 44(3): 816-823.
- Posati LR (1979). Poultry products raw processed and prepared. USDA, Washington, D.C., pp. 230.
- Ranganna S (2001). Handbook of analysis and quality control for fruit and vegetable products," Ranganna, S. (Ed.). *Tata McGraw-Hill Publications, New Delhi*, 719-724.
- Selvan P, Mendiratta SK, Porteen K and Bhilegaonkar KN (2007). Studies on effect of sodium hypochlorite on microbial, sensory and physiochemical characteristics of buffalo offal. *American Journal of Food Technology*, 2: 366-376.
- Singh RP and Panda B (1984). Preparation and storage stability of quail pickle. *Indian Journal of Poultry Science*, 19: 203-206.
- US Department of Agriculture (2013). Indian broiler meat (poultry) production by year 2013.
- Young-Lee S (2004). Microbial safety of pickled fruits and vegetables and hurdle technology. *Internet Journal of Food Safety*, 4: 21-32.