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Quality evaluation of frozen chicken meat obtained from Rajasri and Commercial broiler chicken

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Abstract:

The present study was undertaken to determine the quality traits of frozen meat of Rajasri and Commercial broiler chicken. About 100 birds were used for quality evaluation, 50 birds from each group i.e. Rajasri (17 weeks old) and Commercial Broiler (38 days old). The Meat samples from both the groups were frozen stored (-18^0C to -20^0C) and evaluated at regular intervals (on 30 and 60 days of frozen storage for various meat quality parameters. Results from the study revealed that meat from Commercial broilers showed significantly ($P<0.05$) higher water holding capacity (%) and pH values when compared with Rajasri group, however a decreasing trend of pH, water holding capacity (%) values and sensory scores for meat of both the group of birds were observed as the storage period advanced. Contrary to this, meat from Rajasri group showed significantly ($P<0.05$) higher values for TBARS and shear force than meat of Commercial broiler chicken. An increasing trend in TBARS and decreasing trend in shear force values (SFV) were observed as the storage period advanced. Meat from the Rajasri group showed higher scores for all the sensory attributes i.e. Appearance, Flavour, Juiciness, Texture and overall acceptibility compared to Commercial broiler meat. Results indicated that though few meat quality parameters were higher for Commercial broilers but the sensory attributes were higher for meat of Rajasri, an important parameter to increase the market demand now a days. Also freezing is a best method which increase the shelf life of meat with only minute changes in nutritional quality of meat.

Keywords — **Freezing, Commercial Broiler, Rajasri.**

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I. INTRODUCTION

In the present days there is a huge demand for local chicken meat as well as for eggs when compared to the fast growing Commercial broilers because of more taste and flavour of meat which is sensed by consumers [10]. Now a day's development

of poultry breeds in the backyard system giving economical support for the rural population mostly in Telangana. Different breeds of chicken showing variations in the meat quality traits, however some problems like eggs with less number, high mortality of chicks observed in indigenous birds, so, to overcome all these problems improved varieties of backyard poultry breeds were developed, Rajasri is one of such improved variety developed by Poultry Research Station (PRS) under P.V.N.R.T.V.U. These improved varieties of birds perform better than other backyard poultry.

In present days freezing of meat is a common practice to increase shelf life. It plays an important role in providing safety of meat & meat products. Frozen storage decrease the microbial load & prevents the meat from spoiling. The practice of freezing the meat has originated thousands of years ago, however in present days different new technologies for freezing came into force. So, the present study was undertaken to compare the quality traits of frozen meat obtained from Rajasri and Commercial broilers.

II. MATERIALS AND METHODS

A. Source of raw material

Improved chicken variety i.e. Rajasri (17 weeks old) and Commercial broilers (38 days old) were procured from Poultry Research Station (PRS), Rajendranagar, Hyderabad and local markets of Hyderabad, respectively. By following hygienic conditions during slaughter, all the birds were slaughtered only after giving adequate rest immediately after transportation. Before slaughter Ante mortem examination was conducted at Department of Livestock Products Technology, College of Veterinary Science, P.V.N.R.T.V.U, Rajendranagar, Hyderabad. After slaughter and bleeding, the birds were scalded at 58^0C for 90 seconds, defeathered, cleaned thoroughly and dressed in a hygienic manner. After dressing the dressed meat which is required to be frozen is collected.

B. Storage of meat sample

Chicken meat samples both the breasts and thighs from each bird were collected and packed in separate trays and sealed aseptically. The meat samples which are packed were preserved at frozen storage conditions (-18^0C to -20^0C) for analysis of different quality traits at regular intervals i.e. on 30th day and 60th day of frozen storage.

C. Physico-chemical parameters
p^H

The p^H for the meat sample estimated by following the method given by [12]. Five grams of meat sample was blended with 45 ml of distilled water using Ultra Turrax Tissue Homogenizer for one minute. The p^H recorded by digital p^H meter by immersing the glass electrode into the homogenate of sample. The p^H of the sample was measured with the p^H meter, p^H 4, 7 and 14 as per user manual instructions.

Thiobarbituric Acid Reactive Substances (TBARS)

Thiobarbituric acid reactive substances (TBARS) value will measure the lipid oxidation in the chicken meat sample which is estimated as per the procedure given by [11]. Meat sample about 4g along with 20 ml of 20% trichloroacetic acid was blended for 3min. The blended sample kept for centrifugation at 5000 rpm for 15 minutes. Filtering of supernatant through Whatman No.1 filter paper. The filtrate i.e. TCA extract was used in the estimation of thiobarbituric acid number (TBA).The test solution was prepared by mixing 3 ml of 0.1% thiobarbituric acid to the 3 ml of TCA filtrate. After mixing the contents, tubes were kept in boiling water bath (100^0C) for 30 minutes along with blank. Blank was prepared by mixing 5 ml of 20% trichloroacetic acid with a 5ml of 0.1% thiobarbituric acid reagent mixed properly and was run simultaneously to check the

experimental error. After cooling, the optical density (O.D) was measured in a UV- VIS spectrophotometer at 532 nm. TBARS expressed in terms of mg malonaldehyde per kg of meat sample.

Water Holding Capacity (WHC)

The WHC of meat estimated by the process given by [15]. Thoroughly minced meat sample weighing about 10g was stirred with 0.6M sodium chloride (NaCl) about 15ml in a so called centrifuge tube. The tubes were then kept for 15 minutes at a temperature of 4 ± 1^0C, the meat sample stirred again and centrifuged for 25 minutes at a speed of 5000 rpm. The supernatant obtained after centrifugation was measured and the difference between volumes i.e. initial (15ml NaCl) and the supernatant left over, used for calculation of WHC and is expressed in percentage of meat sample (i.e.10g) weight to calculate WHC.

Shear force value (SFV)

For estimating the warner Bratzler shear force value the meat sample packed in low density polyethylene bags and sealed properly to avoid entry of water then the packed sample cooked in water bath for 10 to 20 minutes at 80^0C. After cooking, the cooked meat samples were made into cores and the cores from each sample were sheared across the length of the meat sample. These sample cores so prepared were placed under the V- notched shear blade of the Texture analyser. Cores were sheared perpendicular to the fiber orientation to measure the shear force. The peak shear force was recorded in newtons (N) and the average value from the three cores was recorded.

Sensory Evaluation

The sensory evaluation includes such as appearance, overall acceptability flavor, texture and juiciness of the meat samples evaluated using a descriptive scale (8 point) [4]. In the 8 point scale, highest quality of components characteristic given as 8 whereas scores were considered acceptable from 5 to 8 and scores from 1 to 5 were considered unacceptable. Minimum of 6 trained and experienced members of the institute were there in the panel, who were well familiar with all the characteristics of the meat. The meat samples were cooked in water bath for 20 minutes at 80^0C by adding salt (0.5% by weight of sample). After cooking, the cooked samples were cut into small equal sized pieces (square shape). At room temperature these coded samples are served in plates in separate sensory evaluation cabins, in between to avoid mixing of sensory attributes of different meat samples water served for cleansing the mouth.

III. STATISTICAL ANALYSIS

The data which is obtained in the study for different meat quality traits were compiled and analyzed by SPSS (version 13 for Windows, SPSS, USA). The entire data was subjected to analysis of variance, (one-way ANOVA) for both groups, and (Two-way ANOVA) for both groups and storage days during super chilling. The least significant difference (LSD) and Duncan's multiple range tests are so applied to compare the means to find difference between both the groups and storage days. The smallest difference of about (5%) for two means was reported as different significantly.

IV. RESULTS AND DISCUSSION

P^H

The Table 1 represents the mean $\pm$ SE values of p^H , WHC, TBARS, Shear force & sensory evaluation scores for meat of Rajasri chicken variety and Commercial broilers preserved at frozen storage conditions (on 30 and 60 days). Higher significant (P<0.05) p^H values were observed for Commercial broilers during the entire frozen storage period. Also noticed that, as the storage period advanced there is a decreasing trend in p^H values was observed for the meat of both the group of birds. Significant (P>0.05) difference in mean $\pm$ SE values were noticed between meat of Rajasri chicken and Commercial

broilers on 30 and 60 days of freezing storage conditions. In the present study, the p^H values decreased with the increased duration of frozen storage. Findings of present study were coinciding with the [6], who also stated that the p^H of broiler chicken breast meat decreased with increasing freezing storage duration, if the conditions of storage were proper. This p^H decrease might be because of loss of water along with its associated soluble substances, and the progressing process of glycogenolysis resulting in accumulation of acidic products.

Thiobarbituric Acid Reactive Substances (TBARS)

Significant ($P<0.05$) increase in mean ± SE TBARS values were observed for the meat of both group of birds as storage period advanced. Higher significant ($P<0.05$) TBARS values for meat of Rajasri bird were noticed compared with Commercial broilers both on 30 and 60 days frozen storage. Lipid oxidation of muscle tissues will be accelerated due to freezing and thawing [3, 16]. In Findings of [14] the TBARS values increased from 30 days of frozen storage in rustic crossbred beef, and the TBARS values were more pronounced from 90 days. According to [1] the ice crystals which are formed during freezing will injure cells and increase lipid oxidation by subsequent release of pro-oxidants particularly of non-heme iron.

Water Holding Capacity (WHC)

Among the bird groups significantly ($P<0.05$) higher mean ± SE values for WHC were observed for Commercial broiler meat when compared with meat of Rajasri bird on day 30 and day 60 of freezing storage conditions. The WHC values for meat of both groups of birds decreased with storage time. The results of [9] showed similarities with present study where the WHC values of breast fillets were much lower when compared with fresh breast fillets. [5] stated that the decrease in WHC could be because of the rate of p^H decline after post mortem, protein

denaturation and enhanced movement of water into extracellular space.

Shear Force Value (SFV)

The mean ± SE Shear force values decreased significantly ($P<0.05$) with increasing storage time for the meat of both group of birds. Whereas in between the groups, meat of Rajasri chicken showed significantly ($P>0.05$) higher SF values when compared with Commercial broiler chicken. [14] reported that the ice crystals formation disrupts the physical structure of pork tissue, resulting in tenderization by breaking myofibrils apart, whereas in the findings of [7] the force needed to shear the frozen meat was reduced because of loss in membrane strength due to ice crystal formation. Present study findings correlated with [8] who also observed higher SFV in larger Aseel followed by smaller Aseel than Commercial broilers.

Sensory Evaluation

The mean ± SE scores for Sensory attributes like appearance, flavour, juiciness, texture and overall acceptibility showed a decreasing trend as the storage period advanced. All mean ± SE sensory attributes scores for meat of Rajasri group were significantly ($p<0.05$) higher compared to Commercial broiler chicken meat both on 30 and 60 days of freezing storage condition. These results were correlated with the studies of [8], who stated that meat from the Aseel chicken showed significantly ($P≤ 0.05$) higher sensory scores compared to Commercial broilers meat. Whereas, in the findings given by [13] no significant differences in sensory scores observed among Aseel crosses. Sensory attributes for breast meat of Indbro bird were higher when compared to Commercial broiler breast meat [2].

Table: 1 Mean ± SE values of P^H, TBARS, WHC, SFV and, Sensory evaluation scores for meat of Rajasri and Commercial broiler chicken preserved at frozen storage conditions

Parameter	Storage period (days)	Rajasri (R)	Commercial broilers (C.B)
P^H	30	5.77±0.00 [aB]	5.83±0.00 [bB]
	60	5.73±0.01 [aA]	5.78±0.01 [bA]
TBARS (mgMDA/Kg)	30	0.15±0.001 [bA]	0.14±0.000 [aA]
	60	0.18±0.001 [bB]	0.17±0.001 [aB]
WHC (%)	30	19.00±0.28 [aB]	27.83±0.24 [bB]
	60	15.66±0.16 [aA]	24.33±0.33 [bA]
Shear force (N)	30	9.31±0.04 [bB]	5.28±0.07 [aB]
	60	8.82±0.04 [bA]	4.85±0.04 [aA]
Appearance	30	6.85±0.17 [bB]	6.58±0.20 [aB]
	60	6.81±0.02 [bA]	6.53±0.02 [aA]
Flavour	30	7.01±0.03 [bB]	6.66±0.21 [aB]
	60	6.81±0.07 [bA]	6.56±0.06 [aA]
Juiciness	30	7.26±0.15 [bB]	6.73±0.16 [aB]
	60	6.84±0.08 [bA]	6.61±0.04 [aA]
Texture	30	6.91±0.03 [bB]	6.79±0.00 [aB]
	60	6.69±0.04 [aA]	6.66±0.02 [aA]
Overall Acceptibility	30	6.91±0.04 [bB]	6.75±0.02 [aB]
	60	6.64±0.03 [bA]	6.33±0.10 [aA]

Different superscripts i.e. Lowercase (rows) and uppercase alphabets (columns) for the Mean ± SE values are different significantly (P≤0.05).

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