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Effect of Age and Sex on the Physico-Chemical and Sensory Quality of Meat from Giriraja Birds

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ABSTRACT

The present study was envisaged to assess the effect of age and sex on the physico-chemical and sensory quality of meat from Giriraja birds reared up to 12 weeks of age at weekly interval. A total of 100-day-old Giriraja chicks were reared in the institution poultry farm up to 12 weeks of age as per standard management practices. Birds were divided in to two groups viz., male (47 birds) and female (53 birds) after completion of 6 weeks of age. Six birds each from male and female groups were slaughtered every week from 8 to 12 weeks as per the standard procedures and meat samples were collected from breast and thighs for meat quality and sensory analysis. In male Giriraja birds highly significant ($P<0.01$) difference in the moisture content, significant ($P<0.05$) difference in pH, water holding capacity and fat content of meat were observed. Whereas, in female Giriraja birds significant difference ($P<0.05$) was noticed in the pH and fat content, no such significant ($P>0.05$) difference was found in the water holding capacity and protein content of meat at different weeks of age. Meat from Giriraja birds (male & female) of 8 weeks of age had higher moisture and less fat but no difference in protein content and the meat had comparatively higher level of acceptability. No significant ($P>0.05$) differences were noticed among the sensory attributes of meat from Giriraja (male& female) birds belonging to different weeks of age. However, meat from 9 weeks in male and 8 weeks in female had slightly higher acceptability scores for all sensory attributes when compared to that of other age groups. From this it was concluded that age of Giriraja bird has remarkable effect on the physico-chemical and sensory quality of meat.

Keywords: Giriraja birds, Meat quality, Physcio-chemical quality, Sensory quality, Water holding capacity.

Introduction

Poultry meat is an important source of high quality protein, MUFA, vitamins and minerals. Presently, poultry population of India stands at 851.81 million as per 20th livestock census, with growth rate of 16.81%. India's poultry meat production was approximately 5 million metric tonnes in 2022-23, contributing about 51% of the total national meat production and growing by 4.52% over the previous year (DAHD, 2022-2023). India have recently developed few improved backyard poultry varieties like Vanaraja, Gramapriya, Srinidhi, Giriraja etc. mostly by public sector and a few by private sector (Anonymous, 2015). They have given good results under traditional backyard and semi-intensive system of poultry production with an improved productivity, adaptability and disease resistance.

Giriraja is a first improved poultry breed of India and it was developed by Karnataka Veterinary, Animal and Fishery

Sciences University in 1989 through cross between White Plymouth Rock × Red Cornish × New Hampshire. Giriraja is dual purpose poultry breed and achieved average weight gain of about 3 kg in hens and 4 kg in cocks at 6 months of age and eggs production is 180-190 per year with average egg weight 52-55 g. Eggshell are brown in colour and thicker than other commercial egg (Ayyagiri, 2001).

Most studies about the production and carcass characteristics of Giriraja birds have been done (Patil et al.2008; Neupane et al.2014 and Yogeshpriya, 2015), but no systematic attempt has been made to study the meat quality characteristics of Giriraja. Data on the effects of age and sex on different carcass parameters of Giriraja birds are scanty. Therefore, in this study, an attempt has been made to evaluate the effect of age and sex on meat quality of Giriraja birds from 8 to 12 weeks of age with weekly interval.

Materials And Methods

The experiment was conducted to evaluate the effects of age and sex on meat quality of Giriraja birds from 8 to 12 weeks of age. A total of 100-day-old Giriraja chicks were reared in the institution poultry farm. The birds were divided in to male (47 birds) and female (53 birds) groups after completion of 6 weeks of age.

Procurement, Rearing and Management of Chicks

One hundred, day old Giriraja chicks were procured from the hatchery, wing banded and individual body weight were recorded. Chicks were housed in brood-grow house at Instructional Livestock Farm Complex (ILFC), RIVER. Brooding was done using electrical brooder under the deep litter system of management for up to 4 weeks of age. Feed was provided *ad libitum* up to 6 weeks of age. Giriraja birds were grouped into male (47 birds) and female (53 birds) groups and separately housed from seventh week onwards. The broiler starter feed with 21% CP and 2900 kcal/kg of ME was provided up to 6 weeks of age. The grower feed with 16% CP and 2400 kcal/kg of ME was provided from 7 to 12 weeks of age. Birds were managed as per standard management practices with proper vaccination schedule followed at ILFC, RIVER.

Slaughter of Birds

A total of 6 birds from each group were slaughtered every week from 8^{th} to 12^{th} weeks of age. Breast meat from each bird was packed in LDPE bags and stored in freezer (Blue star) at -18±1° C to assess the physicochemical and sensory qualities of meat. The physicochemical and sensory quality of meat of these birds were evaluated from 8^{th}-12^{th}week to find the effects of age and sex, if any. The experiments were conducted in the Department of Livestock Products Technology (LPT), RIVER, Puducherry.

Physico-chemical Analysis

The physico-chemical analyses included pH, water holding capacity and proximate composition (moisture, crude protein and fat contents) of the meat from male and female Giriraja birds. The pH of Giriraja breast meat was determined by adopting the procedure laid down by AOAC (1995). The water holding capacity (WHC) of meat was estimated by the method of (Whiting and Jenkins, 1981). Proximate compostion viz, moisture, crude protein (by using micro-Kjeldahl) and fat content (by using automatic Kelplus – Classic DX VATS (P) (Pelican Equipments, Chennai) of Giriraja breast meat was determined as per AOAC (1995) and expressed as percent.

Sensory Evaluation

The sensory quality of meat obtained from Giriraja birds of different weeks of age was evaluated and it was repeated four times each for male and female, separately. For sensory analysis, breast meat was cut into 1cm cube and subjected to pressure cooking after marination with 10% water, 1.5% salt and 0.1% turmeric powder for 10 minutes and organoleptic evaluation was carried out using semi trained panelists adopting 8 point hedonic scale (Keeton, 1983).

Statistical Analysis

The data generated in the study on various parameters were statistically analyzed using SPSS version 16.0 MSI (SPSS, Chicago, U.S.A). Oneway analysis of variance (ANOVA) was used to analyse the effect of age on physico-chemical analysis, proximate composition and sensory attributes separately for male and female Giriraja birds. The data were tabulated and significant effects were tested using the least significant difference (LSD) test (Snedecor and Cochran, 1994).

Results And Discussion

Physico-chemical Quality of Meat from Male Giriraja Birds

Significant ($P<0.05$) effects of age were observed on the pH of meat at different weeks of age (Table 1). The pH values ranged from 5.57 to 5.67. These pH values were lower than the values reported by (Pal et al. 2003) in Vanaraja birds of 38 weeks age. However, the pH values of male Giriraja meat is well within the normal range of ultimate pH of poultry meat (Sharma, 1999).

Significant ($P<0.05$) effect of age was observed on the water holding capacity (WHC) of meat at different weeks of age and ranged from 38.40 to 40.80 per cent (Table 1). The WHC decreased as age advanced. These findings were in congruence with the observations reported by (Pal et al. 2003) in Vanaraja birds of 38 weeks age. Highly significant ($P<0.01$) effect of age on the moisture content of meat of male Giriraja birds belonging to different weeks of age was observed.

Table 1: Effect of age on physico-chemical quality of meat from male Giriraja birds (Mean ± SE)

Parameters	8th Week	9th Week	10th Week	11th Week	12th Week
pH	5.65±0.02^{ab}	5.62±0.01^{ab}	5.67±0.02^{b}	5.57±0.01^{a}	5.62±0.01^{ab}
WHC %	40.14±0.84^{ab}	40.80±0.49^{b}	38.95±0.52^{ab}	39.93±0.30^{ab}	38.40±0.33^{a}
Moisture %	75.45±0.2^{b}	75.20±0.26^{ab}	75.77±0.09^{b}	74.73±0.09^{a}	74.64±0.09^{a}
Protein %	22.10±0.12	22.14±0.11	22.26±0.10	22.23±0.07	22.29±0.10
Fat %	0.96±0.04^{a}	1.08±0.08^{ab}	1.14±0.03^{ab}	1.15±0.03^{ab}	1.24±0.04^{b}

Means with different superscripts in the same row differ significantly (P<0.05).

The moisture, fat and protein content of meat from male Giriraja is presented in table 1. The moisture content ranged from 74.64 to 75.77 per cent. These values are similar to the observations reported by (Ziauddin et al. 1996) in Giriraja birds of 8 weeks age and (Debata et al. 2012) in Vanaraja birds of 24 weeks of age. Significant (P<0.05) effects of age on fat content of meat from male Giriraja birds belonging to different weeks of age were recorded. The fat content at 8 weeks age was significantly (P<0.05) lower than 12 weeks of age. Lower fat and higher moisture levels in younger groups were observed in the study. The fat content was slightly higher than the observations reported by (Ziauddin et al. 1996) in Giriraja birds of 8 weeks age and (Pal et al. 2003) in Vanaraja birds of 38 weeks age. No significant (P>0.05) difference was recorded in the protein content of meat from male Giriraja birds belonging to different weeks of age. The protein content was similar to the observations reported by (Ziauddin et al. 1996 and Bhavya, 2013) in Giriraja birds of 8 weeks age.

Physico-Chemical qualityof Meat from Female Giriraja Birds

Age had a significant (P<0.05) effect on the pH of meat from female Giriraja belonging to different weeks of age (Table 2). The highest pH was recorded at 9 weeks (5.70±0.02) while the lowest pH was recorded at 11 weeks (5.59±0.01) and these values differed significantly (P<0.05). These pH values were lower than the values reported by (Pal et al. 2003) in Vanaraja birds of 38 weeks age. However, the pH values of female Giriraja meat was well within the normal range of ultimate pH of poultry meat (Sharma, 1999).

No significant (P<0.05) effect of age was observed on the water holding capacity (WHC) of meat from female Giriraja birds belonging to different weeks of age (table 2). The highest water holding capacity was recorded at 10 weeks (39.77±0.37) while the lowest was recorded at 12 weeks (39.18±0.54). The findings were in congruence with the observations made by (Pal et al. 2003) in Vanaraja birds of 38 weeks age.

Table 2: Effect of age on physico-chemical quality of meat from female Giriraja birds (Mean±SE)

Parameters	8th Week	9th Week	10th Week	11th Week	12th Week
pH	5.63±0.01^{ab}	5.70±0.02^{b}	5.64±0.01^{ab}	5.59±0.01^{a}	5.62±0.02^{a}
WHC %	38.72±0.46	39.30±0.55	39.77±0.37	39.62±0.32	39.18±0.54
Moisture %	75.16±0.24^{b}	75.30±0.20^{b}	75.68±0.18^{b}	74.55±0.09^{a}	74.46±0.09^{a}
Protein %	22.07±0.10	22.00±0.11	22.21±0.15	22.13±0.12	22.28±0.08
Fat %	0.98±0.05^{a}	1.03±0.06^{ab}	1.11±0.04^{ab}	1.11±0.03^{ab}	1.20±0.05^{b}

Means with different superscripts in the same row differ significantly (P<0.05).

The moisture, fat and protein content of meat from male Giriraja is presented in table 2. Highly significant (P<0.01) effect of age on the moisture content of meat from female Giriraja birds belonging to different weeks of age was observed. The highest moisture (%) were recorded at 10 weeks (75.68±0.18), while the lowest moisture (%) was recorded at 12 weeks (74.64±0.09) and these values showed highly significant (P<0.001) difference. The values were similar to the observations reported by (Ziauddin *et al*. 1996) in Giriraja birds of 8 weeks age and (Debata et al. 2012) in Vanaraja birds of 24 weeks age. There was a significant (P<0.05) effect of age on fat content of meat from female Giriraja birds belonging to different weeks of age. Fat percentage was found to be significantly (P<0.05) lower in 8 week (0.98±0.05) and higher at 12 weeks (1.20±0.05). Lower fat and higher moisture levels in younger groups were observed also in meat from female birds in this study. The fat content was slightly higher than the observations reported by (Ziauddin et al. 1996) in Giriraja birds of 8 weeks age and (Pal et al. 2003) in Vanaraja birds of 38 weeks age. However, no significant (P>0.05) difference was recorded in the protein content of meat from female Giriraja birds belonging to different weeks of age. The protein content ranged from 22.07 to 22.28 %. These values were almost similar to the observations reported by (Ziauddin et al. 1996) and (Bhavya, 2013) in Giriraja birds of 8 weeks age and (Pathak et al. 2009) in Vanaraja birds of 80 weeks age.

Effect of age on Sensory Quality of Meat from Male Giriraja Birds

The mean with standard error for sensory attributes of meat from male Giriraja birds are presented in the table 3. No significant (P>0.05) differences were noticed among the sensory attributes of meat from male Giriraja birds

belonging to different weeks of age. However, the meat from birds at 9 weeks age had slightly higher scores for all sensory attributes. These results were in agreement with (Ziauddin et al. 1996) who had reported that the product prepared with Giriraja meat scored high level of acceptability in respect to appearance, flavour, texture and juiciness. These results were also similar to (Padhi et al. 2012) who had reported the non significant difference in sensory quality between meat from PD1 and Vanaraja commercial birds.

Table 3: Effect of age on sensory quality of meat from male Giriraja birds (Mean ± SE)

Attributes	8th week	9th week	10th week	11th week	12th week
Appearance	7.07±0.09	7.22±0.09	7.07±0.08	7.12±0.09	7.15±0.08
Flavour	7.10±0.11	7.15±0.09	7.17±0.09	7.07±0.09	7.05±0.07
Texture	7.22±0.13	7.20±0.10	7.20±0.11	6.85±0.11	7.10±0.08
Juiciness	6.92±0.10	7.15±0.10	7.10±0.10	6.77±0.10	6.97±0.09
Overall palatability	7.17±0.10	7.25±0.08	7.22±0.09	6.97±0.09	7.15±0.08

Effect of Age on Sensory Quality of Meat from Female Giriraja Birds

The mean with standard error for sensory attributes of meat from female Giriraja birds are presented in the table 4. No significant (P>0.05) differences were observed among the sensory attributes of meat from female Giriraja birds belonging to different weeks of age. However, the meat from birds at 8 weeks of age had slightly higher scores for all sensory attributes such as appearance, flavour, texture, juiciness and overall palatability when compared to the sensory attributes of meat from Giriraja female chicken of different age groups. These results were similar to Padhi et al. (2012) who had reported the non significant differences in the scores of different sensory attributes between the meat from PD1 and Vanaraja commercial birds. Similarly, Ziauddin et al. (1996) reported that the product prepared with Giriraja meat scored high level of acceptability in respect to appearance, flavour, texture and juiciness.

Table 4: Effect of age on sensory quality of meat from female Giriraja birds (Mean ± SE)

Attributes	8th week	9th week	10th week	11th week	12th week
Appearance	7.27±0.101	7.25±0.08	7.25±0.09	7.25±0.09	7.22±0.09
Flavour	7.57±0.07	7.32±0.11	7.30±0.07	7.25±0.10	7.20±0.10
Texture	7.15±0.13	7.10±0.11	7.15±0.09	7.10±0.10	6.97±0.12
Juiciness	7.10±0.10	7.10±0.10	7.00±0.10	7.05±0.10	7.00±0.12
Overall palatability	7.52±0.09	7.35±0.09	7.22±0.09	7.40±0.09	7.20±0.10

Conclusion

In conclusion, to our knowledge, such studies on effect of age and sex on meat quality of Giriraja birds have not yet been performed. Meat from Giriraja birds (male & female) of 8 weeks of age had higher moisture and less fat but no difference in protein content and the meat had comparatively higher level of acceptability. From the results, it was found that age and sex of Giriraja bird have remarkable effect on the meat quality. An overall perusal of the results on effect of age on meat quality indicates that 8 weeks of age is optimum for slaughter of Giriraja birds (male & female).

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Competing Interests

The authors have no competing interests technical, financial or personal between themselves or others that might bias the work

Ethics Statement

Not applicable

References

Anonymous (2016). Annual report of Project Directorate on Poultry, Hyderabad, Telangana State.

AOAC (1995). Official methods of analysis, 16th edition. Association of Official Analytical Chemists, Washington DC, USA.

Ayyagiri V (2001). Genetic development and propagation of Giriraja germplasm. In: Proceedings of the Seminar on Appropri-

ate Poultry for Adverse Environment, Hyderabad, pp. 7–14.

Bhavya TR (2013). Effect of varying levels of metabolizable energy on the performance of Giriraja birds. M.V.Sc Thesis, Karnataka Veterinary, Animal and Fisheries Sciences University, Bidar, India.

Debata D, Panigrahi B, Panda N, Pradhan CR, Kanungo S and Pati PK (2012). Growth performance and carcass traits of Black Rock, Red Cornish and Vanaraja chicken. Indian Journal of Poultry Science, 47(2): 214–217.

Department of Animal Husbandry and Dairying (DAHD) (2023). Annual Report 2022–2023. Government of India, New Delhi, India.

Keeton JT (1983). Effect of fat, NaCl and phosphate levels on the sensory properties of pork patties. Journal of Food Science and Technology, 48: 591–597.

Neupane D, Karki M and Shrestha SB (2014). Intensive management of New Hampshire and Giriraja chickens for generating premium cash income. Nepal Journal of Science and Technology, 15(2): 23–28.

Padhi MK, Rajkumar U, Haunshi S, Niranjan M, Panda AK, Bhattacharya TK, Reddy MR, Bhanja SK and Reddy BLN (2012). Comparative evaluation of male line of Vanaraja, control broiler, Vanaraja commercial in respect to juvenile and carcass quality traits. Indian Journal of Poultry Science, 47(2): 136–139.

Pal UK, Mandal PK, Kesava Rao V and Venugopal S (2003). Carcass characteristics, meat and sausage quality of Vanaraja birds. Journal of Meat Science, 1(1): 34–36.

Pathak PK and Nath BG (2013). Rural poultry farming with improved breed of backyard chicken. Journal of World's Poultry Research, 3(1): 24–27.

Patil SD, Patil HD, Mote PU and Jagtap JB (2008). A study on rearing of Giriraja poultry birds. Agriculture Update, 3(1–2): 208–210.

Sharma BD (1999). Meat and meat products technology. 1st edition. Jaypee Brothers Medical Publishers (P) Ltd, New Delhi, India.

Snedecor GW and Cochran WG (1994). Statistical methods. 6th edition. Oxford and IBH Publishing Co., New Delhi, India.

Whiting RC and Jenkins RK (1981). Comparison of rabbit, beef and chicken meat for functional properties and frankfurter processing. Journal of Food Science, 46: 1693–1696.

Yogeshpriya S (2015). Comparative study of Giriraja and Desi birds under backyard systems of rearing in farmers' field. Veterinary Science Research Journal, 6(2): 100–102.

Ziauddin SK, Singh KC, Rao S and Fairoz N (1996). Comparative study of meat quality of Giriraja and broiler birds. Journal of Food Science and Technology, 33(2): 229–230.