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Effect of Age and Sex on the Growth and Carcass Characteristics of Giriraja Birds and Selection of Ideal Slaughter Age

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ABSTRACT

An experiment was conducted with the aim to examine the effect of age and sex on growth and slaughter characteristics of Giriraja birds to find the ideal age of slaughter. A total of 100 day old Giriraja chicks were procured and divided into two groups viz., male (47 birds) and female (53 birds) after completion of 6 weeks of age. Growth and feed consumption was recorded till 12th week. Six birds each from male and female were slaughtered every week from 8 to 12 weeks as per the standard procedures and all the slaughter and carcass data were collected. In male and female Giriraja birds, the highest weekly body weight gain was recorded in 11th and 5th weeks, respectively, which were significantly ($P<0.01$) higher than other weeks. The cumulative FCR at 8 weeks of age was found to be economically better. In Giriraja birds, highly significant ($P<0.01$) differences were recorded in pre-slaughter weight (PSW) of the birds belonging to different weeks of age. There were no significant differences ($P>0.05$) in yield of blood, feather, head and shank, abdominal fat, giblets, and dressing percentage in male birds belonging to different weeks of age for both male. In case of female significant differences ($P<0.05$) were recorded in head and shank, giblets and dressing percentage at different weeks of age. In male birds age of slaughter had a significant ($P<0.05$) effect in the yield of back and neck percentage, whereas, in female age of slaughter had a significant ($P<0.05$) effect only in the yield of breast. The PSW and dressed weight of male birds were significantly ($P<0.01$) higher than female birds. From this study, it was concluded that age and sex of Giriraja bird has remarkable effect on the growth and carcass characteristics. Based on the growth, carcass characteristics, 8 weeks of age was found to be optimum for slaughter of Giriraja birds.
Keywords: Giriraja birds, pre-slaughter weight, feed conversion ratio, age of slaughter, carcass characteristics.

Introduction

Poultry industry in India is currently growing at the rate of 8-15% per annum (Prabakaran, 2014). Poultry production accounts for about 0.66 percent of India's GDP and 7.72 percent of the GDP from the livestock sector (Rajendran et al. 2014). Within the poultry industry, broiler sector is growing faster than the layer industry. About 66.7% of the total output from poultry industry is realized from the poultry meat sector. According to National Sample Survey Organisation (NSSO, 2014), the demand for chicken is growing at around 12 per cent a year, which is faster than any other type of meat. This increase is due to the increasing population, consumption of convenient foods, awareness about the animal protein in the

diet and increasing purchasing power of people.

Rearing of local chicken breeds in backyard is considered as one of the important sources of livelihood for small and marginal farmers. The growing demand for eggs and meat from indigenous birds and low investment in backyard poultry provides an opportunity of subsidiary income to the rural poor, particularly to the women (Kolte and Rani, 2008). Some of the constraints which need proper appraisal for the success of free range or semi-intensive poultry production are lack of improved germplasm suitable for village conditions, inadequate supplementation of balanced feed to the birds, besides natural resources and also lack of technical know-how (Johri et al. 2002 and Singh, 2005). The efforts were made to develop the dual purpose breeds and hybrids by genetic selection and cross breeding programmes. Hence, improved varieties, the cross between exotic breeds or native and exotic breeds would be the ideal replacement of native scavenging chicken for the improved backyard poultry keeping (Gueye, 2005).

The introduction of improved varieties like Giriraja, in small scale poultry operation have generated new opportunities for poultry production in rural areas (Pathak and Nath, 2013). Promoting improved strains of these crossbreds would make an impact on development programmes for small scale poultry keeping (Kumar, 2014). Giriraja, a synthetic cross bred strain developed by Department of Poultry Science, Karnataka Veterinary, Animal and Fisheries Sciences University, Bangalore, for backyard poultry production. They phenotypically resemble like indigenous birds in having variegated plumage pattern, but are superior to indigenous birds and possess desired genetic potentiality for rapid growth and higher egg production, survivability under adverse climatic conditions and immune competence (Devegowda, 1997). Giriraja is a dual purpose bird which can be used for meat as well as egg production and also suitable for backyard rearing and semi-intensive system of management (Patil et al., 2008). Because of its sturdy and disease resistant nature, it can easily acclimatize itself to any region and weather (Semmaran et al. 2008).

Most studies about the production 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 growth and carcass characteristics of Giriraja chicken. 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 growth and carcass characteristics of Giriraja birds up to 12 weeks of age with weekly interval to find the most suitable and economic age for slaughter.

Materials And Methods

A total of one hundred Giriraja birds were divided into male (47 birds) and female (53 birds) groups after completion of 6 weeks of age. A total of 6 birds from each group were slaughtered every week from 8th to 12th weeks of age. The carcass characteristics of these birds were evaluated from 8th-12thweek to find the effects of age and sex, if any. The experiments were conducted in the Department of Instructional Livestock Farm Complex (ILFC) and the Department of Livestock Products Technology (LPT), Rajiv Gandhi Institute of Veterinary Education and Research (RIVER), Puducherry.

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 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 2900kcal/kg of ME was provided up to 6 weeks of age. The grower feed with 16% CP and 2400kcal/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.

Growth Characteristics: The growth characteristics such as average weekly body weight gain, feed conversion ratio and survivability per cent of male and female Giriraja birds were recorded.

Average weekly body weight and weight gain: Individual body weights were recorded from day old chicks and subsequently for each bird, body weight was recorded at the end of each week. Based on the body weight recorded, the average body weight gains for male and female were calculated on weekly basis and also for the entire period of 12 weeks. Sex-wise average weights were obtained. The weighing of the birds was done in the early hours of the day before feeding by using electronic weighing balance (Essae Teraoka Ltd). Feed conversion ratio was calculated as total feed consumed divided by the total weight of live birds. For survivability (%), mortality was recorded as and when the birds died. Mortality percentage in each sex during the course of the study was recorded.

Slaughter and dressing of Giriraja birds: Six birds each from both male and female groups were randomly picked up at completion of 8, 9, 10, 11 and 12 weeks of age. The birds were fasted for 12 hours with provision of *ad-libitum* drinking water. The pre slaughter live weight of each bird was recorded and each bird was subjected to thorough ante-mortem inspection and slaughtered under hygienic condition in the

semi-automatic poultry-dressing unit as per the standard procedure in Dept of LPT, RIVER. After evisceration, a detailed post mortem inspection of the carcasses and visceral organs were carried out and then the carcasses were fabricated.

Carcass characteristics viz., blood, feather, head & shank, giblets, abdominal fat and dressing percentage were evaluated as follows. The dressing percentage was calculated as the weight of eviscerated carcass divided by the pre-slaughter weight of bird and the value was expressed in per cent of live body weight. Similarly the blood, feather, head and shank, giblets and abdominal fat percentage were calculated. For Shank length, the length of the tarso-metatarsus from the hock joint to the metatarsal pad is measured in millimetres using scale (Hindustan Pvt. Ltd). The angle of breast is measured using angle meter (Kristeel-Shinwa industries Ltd) and the value is expressed in degree. Cut-up-parts such as breast, back, neck, thigh, drumstick, wing and cutting loss per cent were calculated based on chilled carcass weight. The breast percentage was calculated as the weight of breast divided by the weight of chilled carcass and the value was expressed in per cent of chilled carcass weight. Similarly, back, neck, thigh, drumstick, wing and cutting loss percentage were calculated.

Statistical analysis: To investigate the effect of age and sex, 2x2 factorial experiment was carried out using univariate analysis in SPSS (version 16.0 upgraded, Inc, Chicago, IL.). Results were expressed as means±SE, considering mean difference is significant at the 0.05 level ($P<0.05$) and highly significant at 0.01 level ($P<0.01$).

Results And Discussion

Effect of age on growth characteristics of male and female Giriraja birds

The effect of age on growth characteristics viz., the average weekly body weight gain, feed conversion ratio and survivability per cent of male and female Giriraja birds have been summarized in Table 1.

Table 1: Effect of age on growth characteristics of male and female Giriraja birds (Mean±SE)

Week	Weekly body weight (g)		Weekly weight gain (g)		Daily weight gain (g)	
	Male	Female	Male	Female	Male	Female
Day1	39.30±0.43	38.92±0.55	-	-	-	-
1	103.10±1.40	103.20±1.23	63.81±1.30^{a}	64.28±1.13^{a}	9.11±0.18	9.18±0.16
2	214.90±3.29	209.80±3.57	111.70±2.67^{b}	106.60±3.03^{b}	15.96±0.38	15.22±0.43
3	361.70±5.13	338.20±5.86	146.90±3.65^{bc}	128.50±3.89^{bc}	20.98±0.52	18.35±0.55
4	560.40±7.49	512.40±8.56	198.60±4.39^{d}	174.20±4.00^{c}	28.38±0.62	24.88±0.57
5	877.30±9.21	755.60±10.55	316.90±6.37^{f}	243.20±7.13^{e}	45.28±0.91	34.74±1.01
6	1140±11.41	960.50±12.30	262.90±6.11^{e}	204.90±6.90^{d}	37.56±0.87	29.28±0.98
7	1409±13.92	1156±15.11	268.50±9.64^{e}	196±5.64^{d}	38.35±1.37	27.99±0.80
8	1593±19.06	1260±17.27	190±14.70^{d}	103.10±8.32^{b}	27.15±2.10	14.72±1.18
9	1857±24.30	1449±21.12	293.60±15.25^{e}	195.8±8.80^{d}	41.94±2.17	27.97±1.25
10	2030±27.89	1602±25.15	163.20±14.12^{cd}	144.90±6.69^{c}	23.32±2.01	20.70±0.95
11	2389±28.64	1804±35.18	362.30±16.03^{f}	223.40±9.34^{d}	51.75±2.29	31.91±1.33
12	2504±27.95	1882±32.94	105±12.67^{ab}	71.79±9.26^{a}	15.01±1.81	10.26±1.32

Means bearing different superscripts (within columns) differ significantly ($P<0.01$).

The result of the study showed that the effect of age had highly significant ($P<0.01$) effect on weekly body weight gain (WBWG) of male Giriraja birds. In case of male, the highest body weight gain was recorded in 11 weeks (362.30±16.03 g) followed by 5 weeks (316.90±6.37 g) which were significantly ($P<0.01$) higher than WBWG in other weeks. These results were lower than the findings of Reddy (2011) who reported the WBWG of Giriraja birds from 1 week to 4 week of age. Bhavya (2013) reported the WBWG of Giriraja birds up to 8 weeks of age which were higher than the values recorded in the present study. This might be due to the restricted feeding adopted in present study ration containing with 14 per cent crude protein and 2400 kcal ME after 6 weeks of age.

Similarly for the female Giriraja birds significant and progressive increase in live weight was observed with the advancement of age. The highest body weight gain was recorded at 5 weeks (243.20±7.13 g) followed by 11 weeks (223.40±9.34 g) of age. Perusal of table-1 further revealed that WBWG of the female birds at 5 weeks was significantly ($P<0.05$) higher than WBWG in any other week. Reddy (2011) reported the WBWG of Giriraja birds from 1 week to 4 weeks of age which was higher than the values found in the present study. Similarly Bhavya (2013) also reported higher WBWG of Giriraja birds up to 8 weeks of age. These differences are probably due to the restricted feeding practiced in the present study with 14 per cent CP and 2400 kcal ME after 6 weeks of age.

Feed conversion ratio and survivability of Giriraja birds: The

cumulative feed conversion ratio (CFCR) from 1 week to 12week was found to be 0.953 to 5.14 (Table-2). After 8 weeks the efficiency of feed utilisation was reduced and resulted in the increase of CFCR values. Therefore, FCR at 8 weeks (2.37) of age was found to be economically better and the efficiency of feed utilisation was not economical after 8 weeks of age. These CFCR values were similar to the values recorded by Reddy (2011) in Giriraja birds upto 4 week of age and Bhavya (2013) in Giriraja birds upto 8 week of age. The percentage of survivability was 100 % throughout the period of the study. This finding is in congruence with the observation made by Reddy (2011) and Bhavya (2013).

Table 2: Cumulative feed conversion ratio and Survivability (%) of Giriraja birds

Week	Cumulative feed conversion ratio	Survivability (%)
1	0.95	100
2	1.06	100
3	1.33	100
4	1.49	100
5	1.72	100
6	1.90	100
7	2.03	100
8	2.37	100
9	2.89	100
10	3.53	100
11	4.08	100
12	5.14	100

Effect of age on slaughter parameters of male Giriraja birds
Highly significant (P<0.01) differences were recorded in pre slaughter weight (PSW) among the male birds belonging to different weeks of age (table 3). The highest pre slaughter weight was recorded at 12 weeks while the lowest value for the same was at 8 weeks which were significantly (P<0.05) different from each other. The PSW recorded for Giriraja male chicken in the present study were much higher than the findings of (Ziauddin et al. (1996); Krishnamurthy, 2002 and Adebambo et al. 2010). A significant and progressive increase in PSW was observed with advancement of age which might be due to improvement in genetic make-up of the birds over the years besides better feeding and managemental practices compared to those reported by the above authors. No significant (P>0.05) differences were observed in the per cent yield of blood, feather, head and shank, abdominal fat and giblets among the male Giriraja birds belonging to different weeks of age. The blood per cent was slightly higher than the observations reported by Pal et al. (2003) in Vanaraja male birds of 38 weeks age. The feather per cent similar to the values reported by Padhi et al. (2012) in male line of Vanaraja birds of 8 weeks age. The yield of head and shank per cent was almost similar to the observations reported by Padhi *et al*. (2012) in male line of Vanaraja birds of 8 weeks age. The yield of abdominal fat at 8 weeks was very much lower than the findings of Bhavya (2013) in Giriraja birds of 8 weeks age. The yield of giblets (4.41±0.11 to 4.97±0.19 %) was closer to the findings of Bhavya (2013) who reported the giblets % in Giriraja birds of 8 weeks age.

No significant (P>0.05) differences were recorded in the dressing percentage among the different weeks of age in Giriraja male birds. In this study, the dressing percentage among birds belonging to different weeks of age was similar to those reported by Ziauddin et al. (1996) and Bhavya (2013). There exists a relationship between body weight and shank length, as shank length is used to predict the live weight in poultry. Significant (P<0.05) differences were recorded in shank length among the male birds belonging to different weeks of age. From 8 weeks (84.5±1.25 mm) to 12 (102.3±2.45 mm) weeks, shank length increased significantly (P<0.05) as the age advanced. The shank length values of 12 weeks Giriraja chicken were in agreement with the results of Adebambo et al. (2011) in Giriraja chicken at 8 and 12 weeks of age. Body weight and breast angle are correlated to predict the yield of breast meat. Highly significant (P<0.001) differences were recorded in breast angle among the male birds belonging to different weeks of age. From 8 weeks (94.77±0.98°) to 12 weeks (106.7±0.80°) breast angle increased significantly as age advanced. The result is in agreement with the findings of Siegel (1962) who reported the breast angle in male broiler chicken of 8 weeks age.

Table 3: Effect of age on slaughter parameters (%) of male and female Giriraja birds (Mean±SE)

Parameters	8th Week	9th Week	10th Week	11th Week	12th Week
			Male		
Pre-slaughter weight (g)	1621±26.56^{a}	1698±83.90^{a}	2033±78.80^{bc}	2349±61.31^{b}	2377±51.34^{b}
Blood %	4.79±0.48	4.64±0.07	4.81±0.32	4.74±0.49	4.69±0.25
Feather %	4.21±0.36	4.87±0.32	4.97±0.48	4.44±0.73	4.06±0.48
Head and shank %	8.81±0.10	8.83±0.20	8.83±0.09	8.25±0.21	8.43±0.23
Giblets %	4.41±0.11	4.95±0.14	4.51±0.08	4.95±0.23	4.97±0.19
Abdominal fat %	0.44±0.21	0.43±0.15	0.46±0.06	0.46±0.10	0.45±0.12
Dressing % (with giblets)	72.15±0.96	73.16±0.68	72.35±0.70	72.25±0.49	72.70±0.6

Shank length(mm)	84.50±1.25[a]	83.50±0.56[a]	89.67±1.38[bc]	100.80±1.01[b]	102.30±2.45[b]
Breast angle (°)	94.77±0.98[a]	95.67±2.98[a]	97.33±15.55[ab]	102.50±1.43[b]	106.70±0.80[b]
			Female		
Pre-slaughter weight (g)	1355±56.87a	1360±30.69a	1575±47.76a	1924±92.21b	1966±86.78b
Blood %	4.46±0.54	4.55±0.51	4.26±0.47	4.45±0.31	4.84±0.42
Feather %	5.15±0.46	4.47±0.43	4.09±0.34	4.04±0.56	5.62±0.53
Head and shank %	7.53±0.30a	7.71±0.15a	8.03±0.25b	8.16±0.19b	8.89±0.29b
Giblets %	4.45±0.10a	4.57±0.10ab	4.69±0.07ab	4.74±0.12ab	4.95±0.11b
Abdominal fat %	0.31±0.14	0.57±0.26	0.52±0.12	0.56±0.12	0.63±0.09
Dressing %	70.51±0.96a	73.94±0.69ab	73.77±0.63ab	74.35±1.12b	74.56±0.63b
Shank length (mm)	72.17±0.98a	74±1.46a	80.33±0.76b	88.33±3.00b	88.83±0.60b
Breast angle (o)	96.50±1.17a	98.67±1.17a	101.70±1.31b	103.50±2.20b	104.20±1.27b

Means bearing different superscripts (in a row) differ significantly (P<0.01).

Effect of age on slaughter parameters of female Giriraja birds
Highly significant (P<0.01) differences were recorded in pre-slaughter weight (PSW) among the female birds belonging to different weeks of age (table 3). The highest pre-slaughter weight was recorded at 12weeks (1966±86.78 g) while the lowest was at 8 weeks (1355±56.87 g) age. No significant differences in PSW were found between 8, 9 and 10 weeks of age and again among 11 and 12 weeks age. The PSW recorded for Giriraja female birds in the present study were much higher than the findings of (Krishnamurthy, 2002 and Adebambo et al. 2011). A significant and progressive increase in PSW might be due to improvement in genetic make-up of the birds with better feeding and managemental practices. No significant (P>0.05) difference in the per cent yield of blood, feather and abdominal fat among the Giriraja female birds belonging to different weeks of age were noticed. The blood per cent was slightly higher than the observations reported by (Pal et al. 2003) in Vanaraja chicken (4.27±0.20) of 38 weeks age. The feather per cent was almost similar to the values reported by Padhi et al. (2012) in Vanaraja birds of 8 weeks age. The yield of head and shank was similar to the observations reported by (Padhi et al. 2012) in Vanaraja birds of 8 weeks age. The yield of abdominal fat at 8th week was very much lower than the findings of
(Bhavya, 2013).
The yield of giblets (4.45±0.10 to 4.95±0.11 %) recorded in the present study was similar to the findings of (Bhavya, 2013) who reported the giblets per cent in Giriraja birds of 8 weeks age. Significant differences (P<0.05) were observed in the dressing percentage of female Giriraja birds of different weeks of age. In this study, the dressing percentage of birds belonging to different weeks of age was similar to those reported by (Ziauddin et al. 1996 and Bhavya, 2013). There exists a relationship between body weight and shank length, as shank length is used to predict the live weight in poultry. Highly significant (P<0.001) differences were recorded in shank length among the female birds belonging to different weeks of age. From 8weeks (72.17±0.98) to 12 weeks (88.83±0.60), shank length increased significantly as the age advanced. The shank length of Giriraja female chicken was in agreement with the results of (Adebambo et al. 2011) in Giriraja chicken at 8 and 12 weeks of age. Body weight and breast angle are correlated to predict the yield of breast meat. Significant (P<0.05) differences were observed in breast angle among the female birds belonging to different weeks of age. From 8 weeks (96.50±01.17°) to 12 weeks (104.20±1.27°) breast angle increased significantly (P<0.05) as age advanced. The results are similar to the findings of (Siegel, 1962) who reported the breast angle in female broiler chicken of 8 weeks age.

Effect of age on the cut-up-parts of Giriraja birds
Table 4 and 5 reveals the various cut-up-parts such as breast, back, neck, thigh, drumstick, wings and their yield per cent of male and female Giriraja birds. Significant (P<0.05) differences were recorded in the mean yield of back and neck among the male Giriraja birds belonging to different weeks of age. No significant (P>0.05) differences were found in the per cent yield of breast, thigh, drumstick and wings among the male Giriraja birds belonging to different weeks of age. However, numerically the weight of various cut-up-parts of Giriraja chicken increased from 8 weeks to 12 weeks. This could be due to the fact that weight of cut-up-parts increases up to a certain age. The values on the per cent yield of various cut-up-parts found in the present study were similar to the findings of (Pal et al. 2003) in Vanaraja birds of 38 weeks age.

Effect of age on cut-up-parts of male Giriraja birds: Significant (P<0.05) differences were recorded in the mean yield of back and neck among the male Giriraja birds belonging to different weeks of age (table 4). No significant (P>0.05) differences were found in the per cent yield of breast, thigh, drumstick and wings among the male Giriraja birds belonging to different weeks of age (table 5). However, numerically the

weight of various cut-up-parts of Giriraja chicken increased from 8 weeks to 12 weeks. This could be due to the fact that weight of cut-up-parts increases up to a certain age. The values on the per cent yield of various cut-up-parts found in the present study were similar to the findings of (Pal et al. 2003) in Vanaraja birds of 38 weeks age.

Table 4: Effect of age on the yield of cut-up-parts of male and female Giriraja bird (Mean±SE)

Cut-up-Parts	8th Week	9th Week	10th Week	11th Week	12th Week
			Male		
Chilled weight (g)	1071±29.41	1125±63.77	1327±106.80	1558±35.20	1597±68.11
Breast weight (g)	266.97±6.88	269±14.64	328.60±30.72	403.30±10.17	419.30±14.95
Back weight (g)	211.70±8.04	237±14.36	271.70±23.66	295.30±8.36	315± 15.53
Neck weight (g)	79.27±12.26	81.67±4.17	92±8.67	119±8.17	101.30±6.05
Thighs weight (g)	179.30±7.40	188±14.04	214.30±14.18	257.30±3.41	260±9.10
Drumstick weight (g)	178.30±7.03	190.70±12.55	232.70±19.08	269±7.60	269.70±11.63
Wings weight (g)	142.70±2.86	153.30±8.90	187.70±11.33	211.30±4.21	216.30±8.41
Cutting loss %	1.26±0.39	0.50±0.11	0.32±0.05	0.25±0.03	0.61±0.12
			Female		
Chilled weight (g)	858.80±35.22	906.70±23.73	1068±40.36	1326±95.82	1340±14.25
Breast weight (g)	217±9.01	245±10.18	292.40±13.70	340.38±25.95	386±15.95
Back weight (g)	167.30±8.14	165±3.21	216.30±9.33	259.63±9.71	259.55±17.6
Neck weight (g)	63.33±5.43	73.67±4.04	73±5.18	94.14±5.28	79.19±5.75
Thighs weight (g)	133.30±4.52	144.70±5.02	165±7.46	223.30±22.25	212.40±9.25
Drumstick weight (g)	141.70±8.47	149±4.15	172.30±8.96	224.50±30.81	212.52±9.21
Wings weight (g)	128.30±6.91	127.30±2.61	145.70±3.66	180±11.09	185±6.46
Cutting loss %	0.90±0.22	0.79±0.07	0.27±0.04	0.30±0.04	0.39±0.07

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

Effect of age on cut-up-parts of female Giriraja birds: Significant (P<0.05) difference was recorded in the per cent yield of breast among the female Giriraja birds belonging to different weeks of age (table 4). No significant (P>0.05) differences in the per cent yield of back, neck, thigh, drumstick and wings were observed among the female Giriraja birds belonging to different weeks of age (table 5). However, the weight of various cut-up-parts of female Giriraja birds increased numerically from 8 weeks to 12 weeks. This may be because of increase in the weight of cut-up-parts up to a certain age. The per cent yield of various cut-up-parts recorded in the present study were similar to the findings of Pal et al. (2003) who conducted the study on Vanaraja birds of 38 weeks age.

Table-5: Effect of age on the cut-up-parts (%) of male and female Giriraja birds (Mean±SE)

Cut-up-Parts	8th Week	9th Week	10th Week	11th Week	12th Week
			Male		
Breast %	24.92±0.53	23.96±0.62	24.54±0.63	25.88±0.38	26.40 ±0.71
Back %	19.76±0.59^{ab}	21.05±0.43^{b}	20.35±0.52^{ab}	18.94±0.22^{a}	19.77±0.53^{ab}
Neck %	7.40±0.30^{ab}	7.30±0.30^{ab}	6.86±0.23^{ab}	7.59±0.39^{b}	6.35±0.21^{a}
Thigh %	16.71±0.39	16.64±0.35	16.21±0.31	16.52±0.16	16.35±0.29
Drumstick%	16.62±0.22	16.91±0.26	17.47±0.30	17.26±0.35	16.93±0.26
Wings %	13.33±0.29	13.63±0.23	14.25±0.44	13.56±0.14	13.59±0.13
			Female		
Breast %	25.33±0.83^{a}	26.97±0.44^{ab}	27.36±0.69^{ab}	25.67±1.19^{ab}	28.81±0.76^{b}
Back %	19.48±0.43	18.24±0.43	20.19±0.57	19.58±0.58	19.37±0.72
Neck %	7.33±0.45	7.58±0.79	6.97±0.29	7.10±0.16	5.91±0.27
Thigh %	15.57±0.31	15.94±0.22	15.43±0.25	16.84±0.70	15.85±0.48
Drumstick%	16.44±0.32	16.43±0.20	16.11±0.45	16.93±1.19	15.86±0.28
Wings %	14.95±0.56	14.05±0.14	13.67±0.29	13.58±0.36	13.81±0.24

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

Comparison of important slaughter parameters and cut-up-parts of male and female Giriraja birds at different age

Table 6 reveals a comparison of slaughter parameters and cut-up-parts of male and female Giriraja birds at different age. The mean pre-slaughter weight (PSW) and dressed weight were significantly (P<0.01) higher in male than female on gross weight basis, which might be due to higher body weight recorded in male birds than female birds. This trend of higher PSW in male birds were similar to the results reported by (Debata et al. 2012) in Vanaraja birds of 20 weeks age. When expressed in terms of percentage sex had no significant (P>0.05) effect on the yield of the giblets and dressing %.

Table - 6: Effect of age and sex on important slaughter parameters and cut-up-parts of Giriraja birds (Mean ± SE).

Parameters	Sex	8th Week	9th Week	10th Week	11th Week	12th Week
Pre-slaughter weight (g)	Male	1621±26.56^{aB}	1698±83.90^{aB}	2033±78.80^{bcB}	2349±61.31^{bB}	2377±51.34^{bB}
	Female	1355±56.87^{aA}	1360±30.69^{aA}	1575±47.76^{aA}	1924±92.21^{bA}	1966±86.78^{bA}
Giblets %	Male	4.41±0.11	4.95±0.14	4.51±0.08	4.95±0.23	4.97±0.19
	Female	4.45±0.10^{a}	4.57±0.10^{ab}	4.69±0.07^{ab}	4.74±0.12^{ab}	4.95±0.11^{b}
Dressed weight (g)	Male	1099±32.14^{aB}	1161±68.11^{aB}	1381±46.43^{aB}	1580±36.36^{bB}	1610±56.61^{bB}
	Female	895±34.76^{aA}	944±25.48^{aA}	1088±41.56^{abA}	1340±64.44^{bA}	1369±59.95^{bA}
Dressing % (with giblets)	Male	72.15±0.96	73.16±0.68	72.35±0.70	72.25±0.49	72.70±0.60
	Female	70.51±0.96^{a}	73.94±0.69^{ab}	73.77±0.63^{ab}	74.35±1.12^{b}	74.56±0.63^{b}
Breast %	Male	24.92 ± 0.53^{A}	23.96 ±0.62^{A}	24.54 ± 0.63^{A}	25.88 ± 0.38^{B}	26.40 ± 0.71^{A}
	Female	25.33±0.83^{aB}	26.97±0.44^{abB}	27.36±0.69^{abB}	25.67±1.19^{abA}	28.81±0.76^{bB}
Thighs %	Male	16.71±0.39^{B}	16.64±0.35^{B}	16.21±0.31^{B}	16.52±0.16^{B}	16.35±0.29^{B}
	Female	15.57±0.31^{A}	15.94±0.22^{A}	15.43±0.25^{A}	16.84±0.70^{A}	15.85±0.48^{A}
Drumstick%	Male	16.62±0.22^{B}	16.91±0.26^{B}	17.47±0.30^{B}	17.26±0.35^{B}	16.93±0.26^{B}
	Female	16.44±0.32^{A}	16.43±0.20^{A}	16.11±0.45^{A}	16.93±1.19^{A}	15.86±0.28^{A}

Means with different superscripts (capital letters in the same column and small letters in the same row) differ significantly (P<0.05).

Male birds with higher body weights produced giblets and dressed weight in higher amounts (weight basis) compared to female birds with lower body weight. This trend of higher giblets and dressed carcass yield in male birds were in agreement with the findings of (Debata et al. 2012) in Vanaraja birds of 24 weeks age. Sex had significant (P<0.05) effect on the yield of important cut-up-parts viz. breast, thigh and drumstick. The yield of breast was higher in females than males, whereas, the yield of thigh and drumstick were higher in males than females.

Conclusion

In conclusion, to our knowledge, such studies on effect of age and sex on the growth and carcass characteristics of Giriraja birds have not yet been performed. An overall perusal of the results indicated that male and female Giriraja birds, the highest weekly body weight gain was recorded in 11th and 5th weeks, respectively, which were significantly (P<0.01) higher than other weeks. The cumulative feed conversion ratio at 8 weeks of age was found to be economically better. The percentage of survivability was 100 % throughout the study period. Based on the growth, carcass characteristics, 8 weeks of age was found to be optimum for slaughter of Giriraja birds (male and female). From this it was concluded that age and sex of Giriraja bird have remarkable effect on the growth and carcass characteristics.

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Competiting 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

Adebambo AO, Ikeobi CON, Ozoje MO, Oduguwa OO and Olufunmilayo AA (2011). Combining abilities of growth traits among pure and crossbred meat type chickens. Archivos de

Zootecnia, 60(232): 953–963.

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.

Devegowda G (1997). Giriraja – A disease resistant coloured breed for rural conditions. World Poultry Misset, 13(2): 15–16.

FAO (2014). Animal Production Year Book. Food and Agriculture Organization of the United Nations, Rome, Italy.

Gueye EF (2005). Gender aspects in family poultry management system in developing countries. World's Poultry Science Journal, 61(1): 39–46.

Johri TS, Singh UB and Singh D (2002). Supplementary feeding of birds reared under free-range and semi-intensive poultry production system. 2nd National Seminar on Rural Poultry for Adverse Environment, 11–12 December, Bangalore, pp. 49–52.

Kolte A and Rani S (2008). Financial support for women in livestock sector. IX National Technical Seminar and Annual Convention of IALV, 24–25 January, Bangalore, pp. 43–48.

Krishnamurthy D (2002). Growth performance, immunity responsiveness and carcass traits of naked neck and its crosses with parental lines of Giriraja and Girirani birds. M.V.Sc Thesis, University of Agricultural Sciences, Bangalore, India.

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.

NSSO (2014). National Sample Survey Organisation, Ministry of Statistics and Programme Implementation, Kolkata, India.

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.

Prabakaran R (2014). Indian poultry industry – Current status, practical challenges and opportunities. 31st Annual Conference and National Symposium of Indian Poultry Science Association, 18–20 December, Namakkal, pp. 1–14.

Rajendran K, Mani K, Shamsudeen P and Vasanthakumar T (2014). Broiler industry – Understanding the integration and role of private industries. 31st Annual Conference and National Symposium of Indian Poultry Science Association, 18–20 December, Namakkal, pp. 103–105.

Reddy BSV and Rajendiran AS (2002). Nutritional support for Giriraja under adverse environment. Seminar on "Giriraja Bird – A Boon for Rural Economy", 8 March, Bangalore.

Reddy J (2011). Studies on the optimum requirement of energy and protein for commercial Giriraja chicks. M.V.Sc Thesis, Karnataka Veterinary, Animal and Fisheries Sciences University, Bidar, India.

Semmaran M, Sasidhar PVK, Majumdar S, Chander M and Tripathi H (2008). Adoption behaviour of Giriraja backyard poultry by farmers in Karnataka. Indian Journal of Poultry Science, 43(3): 343–345.

Siegel PB (1962). A double selection experiment for body weight and breast angle at eight weeks of age in chickens. Genetics, 47: 1313–1319.

Singh DP (2005). Indigenous germplasm: Role in improving poultry production. XXIII Indian Poultry Science Association Conference, 2–4 February, Hyderabad, pp. 182–186.

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

Wakchaure RG, Babu P, Ganguly S, Para AP, Praveen KP, Kumar A and Sharma S (2016). Dairy, poultry and fisheries for overcoming food security: A review. World Journal of Biology and Medical Sciences, 3(1): 36–42.

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.