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Studies on Growth Performance of Improved Varieties of Chicken

Dhirendra Bhonsle[1], Saroj Kumar Chourasia[2], Sanjay Punjabrao Ingole[3], Rupal Pathak[1*] and Sambhuti Shankar Sahu[1]

[1]Department of Livestock Production Management, College of Veterinary Science and A.H., Bilaspur, C.G.K.V. Durg (C.G), INDIA
[2]Department of Livestock Production Management, College of Veterinary Science and A.H., Durg, C.G.K.V. Durg (C.G), INDIA
[3]Department of Veterinary Anatomy, College of Veterinary Science and A.H., Bilaspur, C.G.K.V. Durg (C.G), INDIA

**Corresponding author: R Pathak; Email: rupal.pathak3@gmail.com*

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ABSTRACT

The present investigation was carried out to study growth traits in improved varieties of chicken. Six different varieties namely CARI Shyama, Vanaraja, Kalinga Brown, Black Rock, Caribro Dhanraja and Kuroiler used in Chhattisgarh for backyard poultry were studied. The growth parameters studied were body weight, average daily gain, and average weekly gain up to 10 weeks of age. Significantly (P<0.01)) higher growth rates in males compared to females were recorded. The highest rate of growth was recorded for Caribro Dhanraja. The overall mean values for 10 weeks body weight were observed to be 1259.48±30.00, 1393.27±35.52, 871.98±25.24, 1366.91±30.96, 1823.47±33.74 and 1219.62±29.50g for CARI Shyama, Vanaraja, Kalinga Brown, Black Rock, Caribro Dhanraja and Kuroiler, respectively. Variety and age significantly affected the feed conversion ratio. The feed conversion ratios were observed to be 2.77, 2.55, 2.76, 2.50, 1.96 and 2.45 for CARI Shyama, Vanaraja, Kalinga Brown, Black Rock, Caribro Dhanraja and Kuroiler, respectively. Significant (P<0.01) effect of variety on shank length and keel bone length was observed. Sex also significantly (p<0.05) affected the shank length in present study. There was significant effect of variety on the growth performance of chicken.

Keywords: Growth Performance, improved varieties of chicken, Chhattisgarh

Backyard poultry farming is done basically by women and it plays a vital role in livelihood generation. In tribal areas of Chhattisgarh it is not only a livelihood activity but forms a part of their social structure. In this state Animal Husbandry Department is running Backyard Poultry Scheme under Centrally Sponsored Scheme in a assistance to the State Poultry Farms. Under the backyard scheme low input technology birds of coloured strain are supplied to the farmers of the state on subsidized rates in order to improve livelihood of rural household's by generation of additional income of rural and tribal folks. Backyard poultry production thought to be less economical in traditional method where the low producing non descript varieties of chicken is used. The benefit of the hybrid vigour can be achieved in the crosses based on specificity and variation among the parental line and the environment (Sahu *et al*., 2016). In order to improve the production trait, an in-depth understanding of performance of economic traits of chicken is imperative for the designing of breeding plans. In birds, traits like growth and production specify its genetic make-up and adaptability to its environment (Ahmed and Singh, 2007). Though a lot of work has been carried out on performance of economic traits of chicken (Sethi *et al*., 2003; Bharadwaj *et al*., 2006; Jilani *et al*., 2007; Hassen *et al*., 2006; Mondal *et al*., 2007) the information on improved varieties developed for rural free range farming are scanty and very few systematic work has been carried out to test the performance of different improved varieties used for backyard poultry farming in Chhattisgarh state. Several high yielding germplasm suitable for backyard production have been developed by different agencies in India. These birds have different combination of native and exotic germplasm. Phenotypically these birds look like original native breed from which they developed with

2 to 3 times increased rate of growth and production. Out of all these varieties the commonly used in Chhattisgarh state for backyard poultry farming are namely CARI Shyama, Vanaraja, Kalinga brown, Black Rock, Caribro Dhanraja and Kuroiler.

MATERIALS AND METHODS

The experiment was conducted in the College of Veterinary Science and A.H., Anjora, Durg. The experimental birds (chicken) of six varieties i.e. CARI Shyama, Caribro Dhanraja, Vanaraja, Black Rock, Kuroiler, Kalinga Brown were brought from Government Poultry Farm Bilaspur (C.G.). Total 600 chicks *i.e.* 100 chicks of each variety were reared under the study. All chicks under the experiment were provided standard management, feeding conditions and similar treatment vaccinations etc. as per the standards. All standard practices were maintained in experimental poultry unit. The effect of variety, sex and age (8, 9 and 10 weeks) were studied in the growth traits in different varieties of backyard chicken. The body weights of the birds were taken using balance at day old stage then at weekly intervals from 0 to 10 weeks of age. The pre weighted feed were offered every day and the balance was weighed at every week. Thus the feed consumed per week was estimated. The mortality was recorded every day. The Physical traits studied during the research were live weight, growth rate, feed consumption, feed conversion ratio and mortality per cent. The body conformation traits studied were shank length, keel bone length and breast angle.

RESULTS AND DISCUSSION

Weekly body weights

There was a significant (P<0.01) effect of variety and sex on the body weight from 8 to 10 weeks of age. In general the mean values were higher for males as compared to females of all varieties studied. The mean comparison of overall body weight showed significant effect (P<0.05) of genetic group (Table 1). Amongst all varieties studied Caribro dhanraja variety had the highest mean value of body weight from 8-10 weeks of age, whereas Kalinga Brown variety had lowest mean values for weekly body weight from 8-10 weeks of age. The differences in mean body weight may be attributable to the effect of environment on genotype. Studies on the performance of backyard varieties are very scanty, therefore direct comparison for all varieties from other studies could not be made. However, these mean values are lower than the finding (Singh, 2008) for Vanraja variety whereas these values are higher than the findings of Singh *et al*. (2018) in Vanraja and Grampriya. The superiority of males could be as a result of ability to dominate like feeding and hormonal differences resulting in fastest deposition of muscles in males than in females. In many previous studies, it has been documented that male birds had a significantly higher body weight than that of female birds which is in support of our present study (Ghosh *et al*., 2005).

Weight gains

The growth rates showed significant (P <0.01) difference amongst varieties and both sexes for average daily gains for 0-10 weeks of age (Table 2). The highest average weekly gains were recorded for Caribro Dhanraja followed by Vanaraja, Black Rock, CARI Shyama, Kuroiler and Kalinga Brown. The same trend was followed for average daily gains for 0-10 weeks. Amongst the six varieties studied Caribro Dhanraja variety had the highest rate of growth. The males had the higher growth rates as compared to females in all varieties. In the present investigation, the highest average daily gains for 0-10 weeks were recorded for Caribro Dhanraja followed by Vanaraja, Black Rock, CARI Shyama, Kuroiler and Kalinga Brown. The mean values of weight gain of Caribro Dhanraja was significantly (P<0.05) higher as compared to all other varieties studied. Caribro Dhanraja being broiler type had the highest gains and Kalinga Brown lowest being egg type backyard variety. All other varieties were midway being dual purpose.

Feed conversion ratio

The feed conversion ratio values were observed to be 2.77, 2.55, 2.76, 2.50, 1.96 and 2.45 for 0-10 weeks of age for CARI Shyama, Vanaraja, Kalinga Brown, Black Rock, Caribro Dhanraja and Kuroiler, respectively. Therefore as expected Caribro Dhanraja was found to have lowest feed conversion ratio which was significantly (P<0.05) lower than all other varieties but un expectedly CARI Shyama was observed to have highest feed conversion ratio as compared to all other varieties though the difference

Table 1: Body weight (g) of improved varieties of chicken

Age	Sex	Variety					
		CARI Shyama	Caribro Dhanraja	Vanaraja	Black Rock	Kuroiler	Kalinga Brown
AWG (0-10)	Male	133.89 ± 4.63	185.89 ± 4.91	150.41 ± 5.17	148.85 ± 3.36	129.82 ± 4.42	94.70 ± 2.39
ADG (0-10)		19.12 ± 0.66	26.55 ± 0.70	21.48 ± 0.73	21.26 ± 0.48	18.54 ± 0.63	13.52 ± 0.34
AWG (0-10)	Female	116.53 ± 3.65	169.36 ± 3.64	124.22 ± 4.17	122.15 ± 4.02	110.20 ± 3.53	73.52 ± 3.30
ADG (0-10)		16.64 ± 0.52	24.19 ± 0.52	17.74 ± 0.59	17.45 ± 0.57	15.74 ± 0.50	11.29 ± 0.47
AWG (0-10)	Overall	122.06^{b} ± 3.00	179.02^{d} ± 3.38	134.75^{c} ± 3.50	132.83^{c} ± 3.08	118.40^{b} ± 2.93	84.11^{a} ± 2.52
ADG (0-10)		17.43^{b} ± 0.42	25.57^{d} ± 0.48	19.25^{c} ± 0.80	18.97^{c} ± 0.44	16.91^{b} ± 0.41	12.01^{a} ± 0.36

Mean superscripted by different letters differed significantly ($p< 0.05$) from each other in a row.

AWG- Average weekly gain; ADG- Average Daily Gain.

Table 2: Growth rates (g) of improved varieties of chicken

Age (week)	Sex	Variety					
		CARI Shyama	Caribro Dhanraja	Vanaraja	Black Rock	Kuroiler	Kalinga Brown
8^{th}	Male	978.93 ±31.24	1296.13 ±36.59	1145.78 ±38.96	1107.38 ±26.36	972.55 ±34.97	658.13 ±17.07
9^{th}		1194.20 ±35.86	1611.39 ±54.99	1373.81 ±48.76	1326.44 ±29.84	1172.39 ±40.44	819.90 ±20.80
10^{th}		1371.62 ±45.49	1892.10 ±49.00	1555.51 ±52.80	1528.94 ±33.78	1334.68 ±44.49	975.09 ±24.77
8^{th}	Female	877.12 ±27.59	1195.40 ±19.96	940.94 ±28.77	911.90 ±27.45	851.58 ±23.63	565.23 ±23.67
9^{th}		1040.80 ±32.53	1460.81 ±29.78	1122.98 ±35.86	1091.48 ±33.54	994.86 ±28.13	696.71 ±28.24
10^{th}		1207.03 ±36.90	1726.88 ±36.40	1284.12 ±41.94	1258.88 ±40.37	1137.13 ±35.54	822.67 ±33.14
8^{th}	Overall	909.57^{b} ±21.75	1254.29^{d} ±23.62	1023.32^{c} ±25.41	990.10^{c} ±21.94	902.09^{b} ±20.91	595.29^{a} ±17.67
9^{th}		1089.69^{b} ±25.94	1548.84^{d} ±35.46	1223.85^{c} ±31.63	1185.46^{c} ±26.28	1069.00^{b} ±25.14	736.57^{a} ±21.35
10^{th}		1259.48^{b} ±30.00	1823.47^{d} ±33.74	1393.27^{c} ±35.523	1366.91^{c} ±30.96	1219.62^{b} ±29.50	871.98^{a} ±25.24

Mean superscripted by different letters differed significantly ($p< 0.05$) from each other in a row.

with Kalinga Brown was statistically insignificant but the difference with other four varieties was found statistically significant ($P<0.05$). In the present investigation same feeding and management conditions were made available to all groups therefore the mean feed conversion ratio differences must be attributed to genetic variation amongst the varieties studied which was similar with other findings (Panda *et al*., 2008; Ramarao *et al*., 2005). In general, the rapid rate of growth is concerned with lower feed conversion ratio. This might be due to the fact that both these varieties are basically egg type varieties. The FCR also depends upon the activity of the birds and their basal metabolic rate. CARI Shyama is having blood of indigenous variety Kadaknath in its inheritance therefore, they were more active which might be the probable cause for higher feed conversion ratio of CARI Shyama. Higher feed conversion ratio for indigenous varieties and their crosses have been also reported by Gupta *et al*. (2000).

Body conformation traits

Shank length, keel bone length had significant ($P<0.01$) influence of variety but the breast angle was not significantly affected by the variety. The effect of sex on shank length was found to be significant ($P<0.05$). Significant difference in conformation traits due to genetic groups was also reported by Bharadwaj *et al*. 2006. The conformation traits like shank and keel length are indicator of skeletal growth. The sex differences may be attributed to different pattern of growth in males and females. Some researchers reported significant effect of

sex on conformation traits including keel length and shank length in Anak broiler genotype (Folasade *et al*., 2009).

Shank length

The effect of sex on shank length was found to be significant (P<0.05). It was also evident that the mean values showed increasing trend as the age advanced from 8 to 10 weeks of age. The mean values were higher in males as compared to females in all varieties studied except in Vanaraja. Vanaraja recorded the longest shank which was significantly (P<0.05) higher than all other varieties. Kuroiler and Kalinga Brown were having smallest shank. The mean comparison showed that there was significant difference in mean values of different varieties. By perusal of the table it is also evident that the mean values showed increasing trend as the age advanced from 8 to 10 weeks of age. Amongst the varieties studied Caribro Dhanraja was the heaviest but in present investigation Vanaraja recorded the longest shank which was significantly (P<0.05) higher than all other varieties. Some researchers reported significant effect of sex on conformation traits including keel length and shank length in Anak broiler genotype (Folasade *et al*., 2009). As it is already stated that body conformation traits are indicator of growth therefore, the shank length must be in proportion to their body weights. Amongst the varieties studied Caribro Dhanraja was the heaviest but in present investigation Vanaraja recorded the longest shank which was significantly (P<0.05) higher than all other varieties which may be attributed to different pattern of growth in different varieties. It is interesting to note that both of these varieties are claimed to have better self defence against predators in extensive system of rearing by the agencies developed these varieties. In the present study Vanaraja had the longest shank followed by Black Rock, Caribro Dhanraja, CARI Shyama, Kuroiler and Kalinga Brown being smallest variety having smallest shank is obvious but Vanaraja and Black Rock having lower body weights but having longer shank than Caribro Dhanraja needs discussion. Their longer shank may be the reason for their superiority in self-defence. The values for shank and keel bone length are in close agreement with those reported by Singh *et al*. (2018) but higher than those reported by Bharadwaj *et al*. (2006) and Khurana *et al*. (2006).

Keel bone length

The mean differences for keel bone length between the varieties were found to be significant (P< 0.05). The mean values showed increasing trend as the age advanced due to increase in body size. No significant differences were observed in between the means of males and females. The mean keel bone length measurement was lowest in Kalinga Brown whereas all other varieties had no significant differences. The mean differences for keel

Table 3: Body conformation traits of improved varieties of chicken in different age groups (overall)

Traits	Age (week)	Variety					
		CARI Shyama	**Vanaraja**	**Kalinga Brown**	**Black Rock**	**Caribro Dhanraja**	**Kuroiler**
Shank length (cm)	8	6.62 ± 0.17	8.03 ± 0.29	6.28 ± 0.18	7.6 ± 0.48	7.78 ± 0.19	7.63 ± 0.22
	9	8.07 ± 0.28	8.38 ± 0.14	6.68 ± 0.24	8.03 ± 0.10	8.15 ± 0.20	7.92 ± 0.15
	10	8.73 ± 0.30	9.22 ± 0.21	8.38 ± 0.36	8.72 ± 0.33	8.27 ± 0.21	8.42 ± 0.40
	Total	**7.80^{b} ± 0.25**	**8.54^{c} ± 0.17**	**7.12^{a} ± 0.26**	**8.12^{bc} ± 0.22**	**8.07^{bc} ± 0.12**	**7.99^{b} ± 0.17**
Keel bone length (cm)	8	8.67 ± 0.78	9.58 ± 0.25	7.38 ± 0.21	9.23 ± 0.52	9.25 ± 0.30	9.58 ± 0.28
	9	10.1 ± 0.16	10.57 ± 0.31	8.38 ± 0.30	10.03 ± 0.15	10.12 ± 0.40	9.93 ± 0.21
	10	10.5 ± 0.31	10.62 ± 0.18	8.87 ± 0.29	11.35 ± 0.43	10.38 ± 0.46	10.58 ± 0.42
	Total	**9.75^{b} ± 0.33**	**10.25^{b} ± 0.18**	**8.21^{a} ± 0.21**	**10.20^{b} ± 0.30**	**9.92^{b} ± 0.24**	**10.03^{b} ± 0.20**
Breast angle (Degrees)	8	60.83 ± 0.83	60.83 ± 2.01	59.17 ± 2.01	58.33 ± 2.79	59.17 ± 0.83	57.5 ± 4.03
	9	61.67 ± 3.07	61.67 ± 1.05	60.00 ± 2.58	61.67 ± 2.11	59.17 ± 3.00	59.15 ± 2.71
	10	64.17 ± 2.01	63.33 ± 2.10	64.17 ± 2.71	64.17 ± 2.01	61.67 ± 3.07	60 ± 1.29
	Total	**62.22 ± 1.23**	**61.94 ± 1.00**	**61.11 ± 1.43**	**61.39 ± 1.39**	**60.00 ± 1.40**	**58.89 ± 1.59**

Mean superscripted by different letters differed significantly (p< 0.05) from each other in a row.

Table 4: Least square analysis of variance for body conformation traits

Traits	Source of variation	DF	SS	MSS	F
Shank length (cm)	Variety	5	19.997	3.999	8.353**
	Sex	1	2.521	2.521	5.265*
	Error	99	47.403	0.479	
Keel bone length (cm)	Variety	5	52.864	10.573	13.600**
	Sex	1	1.815	1.815	0.023
	Error	99	76.967	0.777	
Breast angle (Degree)	Variety	5	143.519	28.704	0.870
	Sex	1	33.333	33.333	1.010
	Error	99	3266.204	32.992	

*Significant at $p < 0.05$ and ** Significant at $p < 0.01$.

bone length between the varieties were found to be significant (P<0.05). The mean values showed increasing trend as the age advanced due to increase in body size. The overall mean values were measured as 9.75 ±0.33, 10.25 ±0.18,8.21 ±0.21, 10.20 ±0.03, 9.92 ±0.24 and 10.03 ±0.02 cm for CARI Shyama, Vanaraja, Kalinga Brown, Black Rock, Caribro Dhanraja and Kuroiler respectively. No significant difference could be observed in the length of keel bone between all other varieties studied. Vanaraja had the longest followed by Black Rock, Kuroiler, Caribro Dhanraja and Kalinga Brown. Keel bone length also indicates the body size and growth. Therefore as expected Kalinga Brown being smallest had significantly (P<0.05) smallest keel bone length. However, the values observed in present investigation are lower than those recorded by others (Bharadwaj *et al*., 2006; Khurana *et al*., 2006; Singh *et al*., 2018) might be attributed to some different varieties strains and breeds studied by them.

Breast angle

The mean differences between the breast angles were found to be insignificant. The overall mean values recorded were 62.22 ±1.23, 61.94 ±1.00, 61.11 ±1.43, 61.39 ±1.39, 60.00 ±1.40, 58.89 ±1.59 degrees for CARI Shyama, Vanaraja, Kalinga Brown, Black Rock, Caribro Dhanraja and Kuroiler respectively. Breast angle was the least variable trait amongst the body conformation traits in the present investigation. No significant difference in between the varieties or sexes could be observed to form any opinion. The differences between the mean values for breast angle were found to be insignificant. The breast angle indicates the body capacity. However, all of these varieties except Kalinga Brown could achieve market weight within 8 to 10 weeks of age, if reared for meat purpose.

CONFLICT OF INTEREST

We certify that there is no conflict of interest with any financial organization regarding the material discussed in the manuscript.

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