Evaluation of Juvenile Growth, Feed Efficiency and Body Conformation Traits of Native × CSFL Crossbred Chicken under Intensive System of Rearing

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A B S T R A C T

A study was conducted to evaluate the performance of Native × CSFL F1 crossbred chicks up to 8 weeks of age under intensive management system. Ninety (90) chicks were used for this study. Body weight and feed intake were recorded weekly. The body conformation traits were measured at 6th and 8th weeks of age. The 8th week body weight of males and females were 1016.97±45.13g and 830.33±19.64g respectively. The weekly feed conversion ratio (FCR) increased progressively from 1.50±0.08 at 1st week to 4.38±0.89 at 8th week of age. The 8th week cumulative FCR was 3.23±0.15. At 6th week of age, all recorded linear body measurements were higher in male chicks than the female chicks except body girth. At 8th week of age, body girth, shank length, shank width and head width were significantly (P≤0.05) higher in male chicks than that of female chicks. From this study, it was concluded that the Native × CSFL F1 crossbred chickens could be reared profitably under intensive system of management because of its high 8th week body weight and low FCR. Further, the cross being developed using local native germplasm, the birds could thrive and perform better in local climatic conditions in rural small scale farming.

Introduction

Backyard poultry sector plays a significant role in improving the socio-economic status of rural people by generating employment opportunity and augmenting family income particularly among landless laborers, small and marginal farmers and women in rural areas. The native chickens are highly adapted to the local climatic conditions and are highly resistant to adverse climate and endemic diseases. However, the native chickens are poor performers in terms of growth when compared to improved commercial chicken varieties. In order to increase the productivity of backyard chicken, introducing improved "low technology inputs birds" is necessary. Crossbreeding could lead to production of birds that will be better in growth rate, efficiency of feed conversion and reproductive traits without sacrificing adaptability to the local environment (Adebambo *et al.,* 2011). Crossbred poultry have higher feed efficiency and lower mortality rate as compared to purebreds, which in turn play a very important role in increasing profits in poultry production (Dwivedi *et al.,* 1986). To utilize the good adaptive characteristics of the native chickens and possibly exploit the phenomenon of heterosis, crossbreeding programmes of native chickens with suitable exotic stocks would be more appreciable. Considering the necessity to develop potential poultry crossbreds, suitable for backyard farming as well as commercial farming, the present study was designed to evaluate the performance of the crosses of a native and coloured broiler parent line in respect to their juvenile growth, feed conversion efficiency and body conformation traits under intensive system management.

Materials and Methods

The study was carried out at PG Department of Poultry Science, College of Veterinary Science and Animal Husbandry, Orissa University of Agriculture and Technology, Bhubaneswar.

Experimental animals

Adult coloured synthetic female line (CSFL) females and males of a native population were used to develop the F1 cross. Five native males and 40 CSFL females were housed in breeding pens in the ratio of 8:1, to produce fertile eggs. The eggs were incubated to produce F1 progenies which were maintained up to 8 weeks of age under intensive system of management for evaluation.

Housing and management

Ninety (90) day-old Native × CSFL F1 crossbred chicks were randomly distributed into three replicate groups and housed separately. All the chicks were wing banded and day-old body weights were recorded. The chicks were brooded for 3 weeks and reared under intensive system on deep litter in conventional open-sided house and similar management practices were followed for all the chicks throughout the experimental period. Proper floor space, feeder space and waterer space was given according to their body weight and age. Routine medication and vaccination procedures were followed for all the experimental birds. A starter diet with 20% CP and 2600 kcal ME/kg was prepared and fed to the chicks ad libitum. Clean and fresh water was made available to the birds all the time.

Data collection

Body weight of birds was recorded individually at day-old followed by weekly intervals up to 8 weeks of age using a digital electronic balance nearest to 1.0 g accuracy. The body weight gain was calculated by subtracting the initial body weight from final body weight of the periods and cumulative

gains for successive weeks were calculated. The feed consumption of the experimental birds was recorded replicate-wise on weekly basis by subtracting the residual feed at the end of the week from total feed offered during the week. Cumulative feed intake (g/bird) was calculated by dividing total feed intake by the birds up to a particular week from number of birds. Weekly feed conversion ratio (FCR) was calculated from weekly body weight gain and weekly feed consumed. Similarly, cumulative FCR was calculated from cumulative body weight gain and cumulative feed consumed. Except breast angle which was measured by goniometer, all other body conformation traits such as beak length, head width, breast angle, shank length, shank width, body length, height, girth and keel length were recorded using measuring tapes (calibrated in centimetres) at 6th and 8th weeks of age as described elsewhere (Nandi *et al.,* 2017).

Statistical analysis

Data collected on various parameters were subjected to statistical analysis using Statistical Analysis System (SAS, 2009) version 9.2.1. The results were presented as least square means ± standard error and means separation was done by using t-test (Paired sample). The difference between means was declared significant at P≤0.05.

Results and Discussion

Body weight and weight gain

The mean day-old and weekly body weight of Native × CSFL F1 crossbred chicks up to 8 weeks of age have been presented in Table 1. The mean day-old body weight of Native × CSFL F1 crossbred chicks (40.64±0.37g) was found to be higher than BN cross (31.50g) and BND cross (33.52g) as reported by Guwahati Rural Poultry Centre as well as BN cross (30.37g) and DBN cross (32.36g) as reported

by Ranchi Rural Poultry Centre (AICRP Annual Report, 2013-2014). The day-old BW of Native × CSFL F1 crossbred was also higher than Hansli × CSML (36.60±2.23 g) as reported by Ekka *et al.,* (2016), Dahlem Red (33.24g), Dahlem red × Desi (32.67g) as reported by Jha *et al.,* (2013), PD1×PD4 (32.11 g) as reported by Padhi *et al.,* (2014) and PB2 X Indigenous (29.65g) as reported by Kalita *et al.,* (2011).

The 4th week body weight of the crossbred under study, on combined sex basis was 350.20±5.76 g. Kalita *et al.,* (2011) reported a lower value (210.58g) for 4th week body weight of PB2×Indigenous. The 4th week body weight of Native × CSFL F1 crossbred chicks was comparable with the 4th week body weight of Vanaraja (316.47±2.47g) as reported by Jha and Prasad (2013). The 6th week body weight of Native × CSFL F1 crossbred chicks on combined sex basis was 706.45±31.42g, which was higher than that of PD1×PD4 (380.63 g) as reported by Padhi *et al.,* (2014) and Vanaraja (625.0±10.90g and 629.23±4.02g) as reported by Jha *et al.,* (2013) and Kumaresan *et al.,* (2008) respectively but lower than that of Hansli × CSML (793.83 g) as reported by Ekka *et al.,* (2016).

The 8th week body weight of crossbred under study on combined sex basis was 923.64 ±47.18g which was much higher than that of Dahlem Red (495.46g), Dahlem Red × Desi (428.23g) and PD1 × PD4 (380.63g) as reported by Jha *et al.,* (2013) and Padhi *et al.,* (2014) but lower than that of Hansli × CSML (1159.45±49.09 g) as reported by Ekka *et al.,* (2016). The 8th week BW of Native × CSFL F1 crossbred chicks was also higher than that of Australop × Tswana (male-727.61g, female- 634.30g) as reported by Kgwatalala and Segokgo (2013) and RIR × Fayoumi (Khawaja *et al.,* 2012). As reported by Adedokun and Sonaiya (2002), Chatterjee *et*

al., (2002), Kalita *et al.,* (2011) and Padhi *et al.,* (2015), the 8th week body weight of various broiler native crosses were 468±33.1g, 413±8.12g, 670.83g and 721.73±15.20g respectively. It was found that the 8th week body weight of Native × CSFL F1 crossbred chicks was much higher than the above reported values for various broiler native crosses.

The 8th week body weight of the crossbred under present study was comparable with Vanaraja (832.5±4.53g) and PB2×Native cross (853.31g) as reported by Jha *et al.,* (2012). The body weight gain during different stages of growth exhibited a similar trend as that of body weight (Table 2).

Growth is a function of gene and environment. The difference in body weight of the crossbred in the present investigation as compared with other crosses could be attributed to the genetic potential of the lines/populations used to develop the cross which vary widely besides the difference in the nutritive values of the feed offered. The body weight of the crossbred in the present study indicates that the Native ×

CSFL F1 crossbred chicken has a good growth potential.

Feed conversion ratio

The weekly and cumulative FCR of Native × CSFL F1 crossbred chicks on combined sex basis have been presented in Table 3. The weekly FCR gradually increased with increase in age. The 5th week FCR of crossbred under study was recorded as 2.10±0.10. The 5th week FCR as reported by Ekka *et al.,* (2016) for Hansli × CSML cross was 2.05 which were similar to the FCR value obtained in the present investigation. The 5th week FCR value obtained in the present experiment was lower than that of PB2×Indigenous (2.72), Dahlem red × Native (2.75) and Kamrupa (2.81) which indicated better feed conversion efficiency of the crossbred under study. The 5th week FCR of BN crosses and BDN crosses of Guwahati centre were reported as 3.28 and 2.86 respectively and that of ND×D crosses was reported as 2.68 (AICRP Annual Report, 2013-2014) which were higher than the 5th week FCR of Native × CSFL F1 crossbred chicks.

Table.1 Weekly body weight (mean±SE) of native × CSFL crossbred chicks

Age	Body weight (g)			P value
	Male	**Female**	**Combined sex**	
Day-old	40.8±0.54	40.47±0.52	40.64±0.37	0.89
1st week	74.67±1.28	71.16±1.57	72.89±1.03	0.23
2nd week	140.12±2.71	131.40±2.94	135.71±2.04	0.10
3rd week	240.12[a]±4.58	205.47[b]±6.24	222.59±4.30	0.00
4th week	376.12[a]±7.70	324.88[b]±6.60	350.20±5.76	0.00
5th week	549.17[a]± 10.34	463.72[b]± 8.36	505.94±8.08	0.00
6th week	770.38±7.00	642.52±28.32	706.45±31.42	0.09
7th week	918.21±12.04	765.45±30.54	841.83±37.18	0.08
8th week	1016.97±45.13	830.33±19.64	923.64±47.18	0.10

Means with different superscripts in a row differ significantly (P≤0.05)

Table.2 Weekly body weight gain (mean±SE) of Native × CSFL crossbred chicks

Age (week)	Body weight gain (g)			P value
	Male	**Female**	**Combined sex**	
1st	33.85±1.14	30.69±1.44	32.25±0.93	0.24
2nd	65.45±2.05	60.23±1.82	62.81±1.39	0.17
3rd	100.00^a± 2.74	74.07^b±5.14	86.88±3.24	0.00
4th	136.00± 4.75	119.41± 6.79	127.61±4.23	0.14
5th	173.08^a±5.02	138.83^b±3.34	155.74±3.52	0.00
6th	221.21±7.56	167.76±9.57	194.48±13.14	0.09
7th	147.83±13.14	122.93±13.21	135.38±10.69	0.51
8th	98.74±33.14	64.88±18.50	81.81±18.58	0.67

Means with different superscripts in a row differ significantly (P≤0.05)

Table.3 Weekly and cumulative feed conversion ratio (mean±SE) of
Native × CSFL crossbred chicks

Age (week)	Weekly FCR	Cumulative FCR
1st	1.50±0.08	1.50±0.08
2nd	1.74±0.06	1.60±0.12
3rd	1.96±0.11	1.80±0.70
4th	2.04±0.09	1.90±0.05
5th	2.54±0.12	2.10±0.10
6th	2.69±0.05	2.69±0.05
7th	3.83±0.23	3.13±0.05
8th	4.38±0.89	3.23±0.15

Table.4 Linear body measurements (mean±SE) of Native × CSFL crossbred chicks

Traits	Age (week)	Male	Female	T value	P value
Breast angle (degree)	6th	61.57^a±1.60	59.00^b±1.09	1.59	0.00
	8th	62.53±1.34	62.30±1.22	0.13	0.89
Beak length (cm)	6th	3.12^a±0.02	2.80^b±0.07	3.73	0.00
	8th	3.46±0.04	3.30±0.06	1.56	0.14
Head width (cm)	6th	2.90^a±0.04	2.43^b±0.59	5.99	0.00
	8th	3.33^a±0.03	2.73^b±0.08	7.29	0.00
Body length (cm)	6th	31.57^a±0.40	29.35^b±0.48	3.39	0.00
	8th	35.40±0.39	34.95±0.46	0.61	0.55
Body girth (cm)	6th	25.42±1.32	24.03±2.30	1.71	0.10
	8th	27.96^a±0.49	26.66^b±0.45	2.27	0.04
Shank length (cm)	6th	8.80^a±0.10	7.79^b±0.09	8.56	0.00
	8th	10.34^a±0.10	9.89^b±0.13	2.53	0.02
Shank width (cm)	6th	1.56^a±0.04	1.40^b±0.03	3.30	0.00
	8th	1.62^a±0.03	1.50^b±0.05	2.08	0.05
Keel length (cm)	6th	8.68^a±0.11	8.02^b±0.09	5.60	0.00
	8th	9.75±0.17	9.37±0.17	1.44	0.17
Height (cm)	6th	31.64^a±0.40	27.32^b±0.80	4.51	0.00
	8th	30.61±0.48	30.55±0.34	0.09	0.92

Means with different superscripts in a row differ significantly (P≤0.05)

The 8th week cumulative FCR of Native × CSFL F1 crossbred chicks was found to be 3.23 ±0.15, which was higher than that of Vanaraja (2.16) and Hansli × CSML (2.26) as reported by Debata *et al.,* (2012) and Ekka *et al.,* (2016) respectively. Padhi *et al.,* (2015) reported 8th week FCR of PD1×PD4 as 2.79 which was also lower than the 8th week FCR of present crossbred chicks. The ability to convert feed in to body mass is dependent on the genotype and the nutrient content of the feed. Therefore, the variability in FCR values as obtained in the present investigation as compared to other crosses could be attributed to these factors.

Body conformation traits

The body conformation traits of Native × CSFL F1 crossbred chicks at 6th and 8th weeks of age were presented in Table 4. At 6th week, only the body girth was not significantly different in male and female chicks and all other linear body measurements were significantly (P≤0.05) higher in males compared to females. At the age of 8th week, head width, body girth, shank length and shank width expressed significant (P≤0.05) difference between male and female chicks and the remaining traits such as breast angle, beak length, keel length and height did not significantly differ in male and female chicks.

The 6th week shank length of both male and female chicks (8.80±0.09 cm and 7.79±0.09 cm) was higher than PD1×PD4 crosses (6.66±1.06 cm and 6.38±0.83 cm) as reported by Padhi *et al.,* (2015). However the values obtained were comparable with Hansli × CSML crosses as reported by Ekka *et al.,* (2016) and also comparable with PD1×PB2 crosses (8.58±0.62 cm and 8.08±0.68 cm) as reported by Padhi *et al.,* (2015). The 8th week conformation traits also revealed similar trend. The keel length of the cross under study at 6th and 8th weeks was also higher than the PD1 × PD4 crosses as reported by Padhi *et al.,* (2015). The breast angle was higher than Hansli × CSML crosses as reported by Ekka *et al.,* (2016). Ojedapo *et al.,* (2012) reported a

positive and significant correlation between body weight and linear body measurements. In the present study, though the 8th week body weight of males was numerically higher than that of females, the difference was not statistically significant. This could be the reason for not obtaining significant difference between most of the linear body measurement parameters of males and females.

Based on the findings of the present experiment, it may be concluded that the high 8th week body weight and low FCR of Native × CSFL crossbred chicken as well as preferential pricing due to their coloured plumage; the birds could be reared profitably under intensive management system. Further, the cross being developed using local native germplasm, the birds could thrive and perform better in local climatic conditions in rural small scale farming.

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