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Research Article

REPRODUCTIVE, JUVENILE TRAITS AND CARCASS PERFORMANCE EVALUATION IN SYNTHETIC COLORED BROILER MALE LINE (PB-1) UNDER INTENSIVE SYSTEM OF MANAGEMENT

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ABSTRACT

The synthetic colored broiler male line (PB-1) was used in the production of commercial hybrids, Krishibro which is an attractive, coloured and hardy meat type chicken and this PB-1 line has on continuous mass selection for about 28 generations with a target to increase the body weight of Krishibro. The PB-1 line of S-29 generation recorded the overall fertility, hatchability on total egg set and hatchability on fertile egg set as 89.27, 83.40 and 93.43%, respectively. The overall mean (±SE) for the juvenile body weights recorded at day-old (BW0), second week (BW2), fourth week (BW4), fifth week (BW5) and sixth week (BW6) were 41.65±0.14, 185.12±1.38, 608.68±4.33, 874.82±5.33 and 1105.70±6.42 g, respectively in pooled sexes. Linear body measurements, keel length and shank length at five weeks of age was 75.57±0.21 and 77.43±0.18 mm, respectively for pooled sex, which has improved compared to the previous generation. Significant difference between sexes were noticed for dressing weight (P≤0.05), eviscerated weight (P≤0.05), leg weight (P≤0.01) and giblets weight (P≤0.01), whereas, no significant differences were noticed for neck & back, breast and wings weight. The performances of PB-1 line in the current generation (S-29) were better compared to the previous generation which might be due to the long-term intensive for the fifth week body weight. The birds with higher shank length can run faster, thus protecting themselves from the predator and therefore, the shank length can be included as a primary trait in the selection programmes aimed at backyard rearing.

Keywords: Coloured broiler-reproductive parameters, Juvenile traits-body weights

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In India, about 80 percent of poultry sector was organised and the meat production from poultry contributes about 50.06% of total meat production (BAHS, 2019). The rapidly growing chicken meat industry has been based on only few fast-growing broiler strains produced by commercial breeding companies in intensive fattening systems (Jaturasitha *et al.*, 2008). Birds having multi-coloured feather pattern is fetching premium prices compared to the white plumaged birds in the market.The acceptability of the birds with multi-colour feather pattern is better in rural areas due to aesthetic aspect, native look, cultural and religious reasons. Growth and production traits of a bird indicateits genetic constitution and adaptation with respect to the specific environment (Tomar *et al.*, 2014). The synthetic meat type line *viz*., synthetic colored broiler meat line (PB-1) was developed at Punjab Agricultural University, Ludhiana under AICRP on poultry breeding as coloured synthetic male lines for the production of commercial coloured broilers. This PB-1 line is used in the production of commercial hybrids, Krishibro which is an attractive coloured and hardy meat type chicken. This coloured synthetic male broiler line has been on continuous mass selection for about 28 generations with a target to increase the body weight of Krishibro. Considering the necessity to develop potential poultry crossbreds, suitable for backyard farming as well as commercial farming, the present study is undertaken on synthetic colouredbroiler male line on S-29 generation.

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MATERIALS AND METHODS

The current study was conducted at Directorate of Poultry Research, Hyderabad, Telengana, which is located in Deccan plateau in the southern part of India positioned between 17° 23' N and 78° 28' E at the altitude of 500 m above mean sea level. The state has relative humidity ranges between 15 to 95.

Protocol design: The work was approved by the Institutional Animal Ethics Committee (IAEC/PDP/B-01). The experimental birds were intermingled by sex and were raised in more than one pen under intensive system of management. Data on juvenile traits were obtained from the record book which was maintained on daily basis.

Data collection: The pedigreed population under present study descended from 40 sires and 200 dams which were raised under uniform farm conditions. The birds were weighed in the morning before supplying the feed. Fasting live weight of mixed sexes was recorded at day-old followed by bi-weekly intervals up to six weeks of age, in-addition during fifth weeks of age using a digital electronic balance nearest to 1.0 g accuracy and were presented in grams. Body linear measurements such as shank length

(SL5) and keel length (KL5) were measured with electronic digital Vernier calipers (calibrated in milli meters) with an accuracy of 0.01 mm at the age of five weeks of age. Keel length was measured from the chest bone to the end towards the abdomen region. Shank lengths was the length of the tarso-meta-tarsus from the hock joint to the meta-tarsal pad (toe) of the bird. The birds survived up to sixth weeks of age were taken for the analysis of juvenile data.

Carcass traits: Thirty birds (fifteen from each sex) were selected randomly and sacrificed by cervical dislocation for evaluating the carcass traits on the 43rd day. The randomly selected birds were off fed overnight and submitted to water dietary regimen for 12 hours prior to evaluation. The carcass traits such as dressed weight, primal cuts weight (legs, wings, breast, neck and back) and giblets weight (gizzard, liver, and heart) were recorded using a digital electronic balance nearest to 1.0 g accuracy and were presented in grams. Weight of the carcass along with the edible viscera like liver, heart, gizzard and abdominal fat was recorded as dressed weight.The combined weight of the liver, heart, and gizzard was recorded as the giblet weight. The least square means and standard error for carcass traits were analyzed statistically (SPSS, 2004) and significance were noted. Significant mean differences between the fixed effects were determined at a 5 percent probability level ($P<0.05$) using Duncan's Multiple Range Test (DMRT) as modified by Kramer (1957). For the carcass traits, the statistical model included the fixed effect of sex (two levels).

RESULTS AND DISCUSSION

Reproductive parameters: The reproduction parameters *viz*., fertility and hatchability on total egg set and on fertile egg set were depicted in the Table 1. The overall fertility of PB-1 line in S-29 generation has been improved compared to the previous generation (S-28) which has the fertility rate of 88.04% (ICAR-DPR, 2019). The fertility rate observed during the current study was superior to the commercial broiler strains reported by Hristakieva *et al.* (2014) in Ross 308 (84.17±0.84%) and Cobb 500 (86.36±3.76%) strains. The current study has superior hatchability performances as compared to the same line evaluated at the AICRP centre, Bengaluru (ICAR-AICRP, 2019), whose hatchability on TES and FES were 79.72 and 89.36%, respectively. Further, hatchability on FES in the current study was better compared to the male lines *viz.*, PD-1 and PD-6 whose performances were 88.30 and 90.00%, respectively (ICAR-DPR, 2019).

Juvenile body weights: The juvenile body weights and conformational traits recorded at different ages was analyzed and the mean (±SE) values for both the sexes and pooled sex were shown in Table 2. Sex-wise mean (±SE) of juvenile body weightsand conformational traits in two different hatches were depicted in Table 3.

Table 1. Reproduction parameters of two different hatches in PB-1 line

Parameters (%)	Hatch1	Hatch2	Total hatch
Hatchability on total egg set	82.89	83.96	83.40
Hatchability on fertile egg set	94.40	92.40	93.43
Fertility	87.81	90.87	89.27

Table 2. Mean(±SE) of juvenile body weights and conformational traits

Traits	Male	Female	Pooled
N	326	512	838
BW0	41.95±0.22	41.45±0.17	41.65±0.14
BW2	191.51±2.35	181.06±1.67	185.12±1.38
BW4	641.06±7.29	588.07±5.16	608.68±4.33
BW5	931.28±9.28	838.87±5.89	874.82±5.33
BW6	1180.77±10.71	1057.89±7.25	1105.70±6.42
KL5	77.54±0.36	74.31±0.24	75.57±0.21
SL5	79.54±0.30	76.09±0.21	77.43±0.18

(N- number of birds, BW0 - Hatch weight, BW2 - body weight at second week, BW4 - body weight at fourth week, BW5 - body weight at fifth week, BW6 - body weight at sixth week, KL5 - keel length at fifth weeks of age and SL5 - shank length at fifth week of age)

The mean day-old body weight of PB-1 line (pooled sex) in S-29 generation had been analogous to the performance of same line (42.82 g) and PB-2 line (43.01 g) in AICRP centre, Bengaluru (ICAR-AICRP, 2019). Moreover, the day-old body weight of pooled sex in the current study was also similar to the PD-1 line (38.74 g) reported by Padhi *et al.* (2012) and also comparable to the broiler strains *viz.*, Ross 308 (42.86±0.39 g) and Cobb 500 (44.96±0.38 g) studied by Hristakieva *et al.* (2014). Being a maternal trait, the day-old body weight was highly dependent on egg weight as supported by Singh *et al.* (2018), which in turn associated with the dam's body weight. The mean second week body weight in the present study was better compared to the PD-1 line (136.38±0.01 g) on pooled sex as reported by Padhi *et al.* (2012) and lower when compared to Ross 308 (381.66±3.83) and Cobb 500 (334.52±3.89) as studied by Hristakieva *et al.* (2014) and the same trend was noticed on sex wise also in both the cases. The average body weight of the line in the current study at fifth week of age was 874.82±5.33 g, which had been improved, as compared to the previous generation of 841.60±0.85 g (ICAR-DPR, 2019). The performances of PB-1 line in the current generation (S-29) was better compared to the previous generation which might be due to the long-term intensive selection (Rajkumar *et al.*, 2010) for the fifth week body weight.

Table 3. Mean (±SE) of juvenile traits in two different hatches

Traits	Hatch 1		Hatch 2		Overall mean of hatches	
	Males	Females	Males	Females	Hatch 1	Hatch 2
N	228	256	98	256	484	354
BW0 (g)	42.18±0.28	41.73±0.26	41.41±0.38	41.18±0.23	41.94±0.18	41.242±0.20
BW2 (g)	193.77±2.76	184.95±2.48	186.26±4.44	177.17±2.30	189.10±1.83	179.68±2.07
BW4 (g)	654.55±8.50	609.32±7.41	609.66±13.57	566.82±6.95	630.63±5.69	578.88±6.35
BW5 (g)	952.98±11.44	876.43±8.55	880.79±14.50	801.30±7.42	912.49±7.24	823.31±6.95
BW6 (g)	1178.76±12.99	1039.14±9.93	1185.46±18.91	1076.64±10.45	1104.91±8.66	1106.76±9.54
KL5 (mm)	78.55±0.43	75.72±0.34	75.20±0.61	72.91±0.31	77.05±0.28	73.5414±0.28
SL5 (mm)	79.92±0.38	76.98±0.31	78.65±0.46	75.20±0.28	78.63±0.25	76.1557±0.25

(BW0 - Hatch weight, BW2 - body weight at second week, BW4 - body weight at fourth week, BW5 - body weight at fifth week, BW6- body weight at sixth week, KL5 - keel length at fifth weeks of age, SL5 - shank length at fifth week of age, N – number of birds)

Table 4. Mean (±SE) of various carcass traits of PB-1 line

Traits (g)	Males	Females	Pooled sex	Sig.
Pre-slaughter live wt.	1507.20±25.40	1228.33±25.40	1367.77±17.96	**
Dressed wt.	949.66±18.71	748.70±18.71	849.18±13.23	**
Eviscerated wt.	820.66±15.35	649.45±15.35	735.05±10.85	**
Breast wt.	228.59±6.57	184.63±6.57	206.61±4.64	**
Neck & back wt.	226.47±4.42	185.05±4.42	205.76±3.12	**
Leg wt.	277.87±6.33	209.74±6.33	243.80±4.47	**
Wings wt.	87.73±2.27	70.02±2.27	78.88±1.61	**
Liver wt.	38.03±1.27	35.90±1.27	36.97±0.89	NS
Gizzard wt.	35.47±1.39	32.95±1.39	34.20±0.98	NS
Heart wt.	7.47±0.38	6.58±0.38	7.023±0.27	NS
Giblets wt.	80.97±2.46	75.43±2.46	78.20±1.74	NS
Spleen wt.	3.42±0.22	3.17±0.22	3.30±0.16	NS
Bursa wt.	2.37±0.23	1.63±0.23	2.00±0.16	*

(NS - Non-Significant, * - significant and ** - highly significant)

Conformational traits: Linear body measurements, keel length at five weeks of age was 75.57±0.21 mm for pooled sex, with males (77.54±0.36) have higher values than the females (74.31±0.24) was similar with reports of Nandi *et al.* (2017) in Hansli breed of Odisha. The mean shank length measured at five weeks of age has been improved since the previous generation whose value was 74.10±0.08 mm (ICAR-DPR, 2019). Males had higher shank length values than the female counterparts and the similar difference was reported by Nandi *et al.* (2017) in Hansli breed of Odisha. Padhi (2016) reported that the birds with higher shank length can run faster, thus protecting themselves from the predator. Linear body measurement traits were scanty, which was influenced by hatch and sex effects in the present study and might also be influenced by breed, strain, system of rearing and climatic conditions reported by Ekka *et al.* (2016).

Carcass traits: The carcass performance of colored synthetic male broiler line (PB-1 line) were tabulated in Table 4. The dressing weight obtained in the present study were comparable to the Vanaraja chicken reported by Kalita *et al.* (2011). Significant difference between sexes were noticed for dressing weight ($P \leq 0.05$), eviscerated weight ($P \leq 0.05$), leg weight ($P \leq 0.01$) and giblets weight ($P \leq 0.01$), whereas, no such differences were noticed for neck & back, breast and wings weight. Males have relatively high thigh yield as compared with female counterparts and similar findings was reported by Hristakieva *et al.* (2014). No significant difference in breast weights were observed between sexes which was in contrary with Hristakieva *et al.* (2014). Gonmei (2012) reported significant differencebetween sexes for giblet weights in Vanaraja chicken and reported that females had higher yield than the male counterparts and it was analogous with the present study ($P \leq 0.01$).

CONCLUSION

The performances of PB-1 line in the current generation (S-29) were better compared to the previous generation which might be due to the long-term intensive

selection for the fifth week body weight. The birds with higher shank length can run faster, thus protecting themselves from the predator and therefore, the shank length can be included as a primary trait in the selection programmes aimed at backyard rearing.

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