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Evaluating the performance of Vanaraja female line (PD-2) chicken for fertility, hatchability, body weight, shank length and keel length

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ABSTRACT

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The present study was aimed at evaluating the performance of Vanaraja female line (PD-2) chicken. Data collected on 3737 chicks, progeny of 50 sires and 250 dams produced in a pedigreed full sib mating at the Directorate of Poultry Research, Hyderabad in four hatches during 15th generation were utilized for the present investigation for estimating various parameters. The results indicated that the mean fertility was 83.57 percent. The overall mean hatchability percentage was 72.66 on total eggs set (TES) and 86.95 on Fertile Eggs Set (FES). The mean fertility (83.57%) and hatchability (86.95 %) indicating the good reproduction and mothering of the PD-2 population. Highly significant (P<0.01) difference among the four hatches were observed for body weights at day old, 2, 4, 6, 12, 16, 20 and 40 weeks of age and hatch effect was observed for shank length at 4, 6 weeks of age and keel length at 6 weeks of age. Carcass traits such as live weight, dressing, and blood percent were significantly higher in male than female. Percent live weight of liver, gizzard, heart and feathers were significantly (P<0.01) higher in females than males.

Keywords: Body weight, Shank length, Fertility, Hatchability, Carcass parameters, Vanaraja

INTRODUCTION

Backyard poultry farming offers a bright scope for increasing the availability of poultry produce in remote areas of the country. The waste food materials can be ploughed back into the human food chain, by converting them into highly balanced chicken meat by practicing backyard poultry farming (Rajkumar *et al.,* 2018). The major drawback of native chicken has been their low production potential. Therefore, there is a need to develop new varieties which resembles the native birds having the attributes such as medium body size, long shanks, and better flight, able to withstand adverse climatic conditions. Vanaraja is one of the most widely recognized dual-use chickens in the country and it was developed at ICAR- Directorate of Poultry Research, Hyderabad. Vanaraja terminal cross has been improved to be more productive with continuous selection on the parent line. In the present study, the female line of Vanaraja (PD-2) which was under selection to evaluate growth, reproductive and slaughter traits.

MATERIALS AND METHODS

The experiment was conducted at experimental farm of ICAR-Directorate of Poultry Research, Hyderabad Telangana India. The experiment was approved by the Institutional Animal Ethics Committee.

Experimental population

Vanaraja female line (PD-2) is a pure line variety suitable for backyard rearing. Vanaraja female line (PD-2) is a pure line chicken evolved from a synthetic population which is used as a female line for production of Vanaraja. A total of 3737 chicks produced from 50 sires and 250 dams in pedigreed full sib mating in four hatches during 15th generation were utilized for the present study.

Rearing and management

Chicks were fed *ad lib* with starter (ME 2900 and CP 22) and finisher (ME 3000 and CP 20) diets based on maize-soya bean meal from 0-4 and 5-6 weeks of age, respectively. Hens (196) selected at 6 weeks of age were reared up to 40 weeks of age in individual cages with one and half square feet floor space with automated drinkers. The birds were kept on restriction feeding schedule from seventh weeks onwards to maintain the target body weight during the laying cycle for better egg production. The birds were maintained on a grower ration (2600, ME and 18, CP) up to 20 weeks of age and broiler breeder ration (2700, ME; 17, CP and calcium; 3.5%) till the end of the production cycle. The birds were vaccinated against Marek's disease (day 1), Newcastle disease, Lasota (day 7 and 30), infectious bursal disease (day 14 and 26), fowl pox (week 6), ND R2b (week 9) and IB and ND inactivated (week 18). The ambient temperature ranged from 34 to 42°C during the rearing period.

Traits studied

The reproductive parameters, fertility and hatchability; growth traits such as day old, 2, 4, 6, 12 and 16 weeks body weight; shank length at 4 and 6 weeks

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of age were measured. Keel length at 6 weeks of age and slaughter parameters at 12 weeks of age were measured. The production parameters like age at sexual maturity and body weight (20 and 40 weeks) were recorded from 620 birds reared up to 40 weeks of age.

Statistical analysis

The pedigreed data were analyzed using least squares technique (Harvey, 1990; Fixed effect model) to find out effect of hatch on the traits studied. Significant differences between means were tested by using Duncan's Multiple Range Test (Duncan, 1955).

RESULTS AND DISCUSSION

Reproduction traits

Percentage fertility in Vanaraja female line population varied from 80.72 to 86.02 with an overall mean of 83.57 (Table 1). These results are similar to the reports of (Kalita *et al*., 2012 and Hussain *et al*., 2017), but are slightly higher than those observed by (Sankhyan and Thakur 2016) in Vanaraja female line chicken. However, slightly lower values were also reported among native breeds, by Singh *et al*. (2000). The variations in fertility may be attributed to the breed varieties as fertility depends on the type of chicken breed.

The mean hatchability on TES recorded in the present investigation ranged from 68.23 to 76.72 percent with an overall percentage of 72.66. Similarly, the mean hatchability percentage on FES ranged from 83.13 to 90.47 per cent with an overall hatchability percentage of 86.95 (Table 1). Similar hatchability (TES) estimates were reported by Sankhyan and Thakur (2016) in Vanaraja, Hussain *et al.* (2017) in Rajasri chicken. Higher hatchability was reported by Rajkumar *et al.* (2012b) in Gramapriya male line birds, whereas lower hatchability (TES) estimates were reported by Kalita *et al.* (2012)

Body weight

The body weights at day old, 2, 4, 6, 12, 16, 20 and 40 weeks of age were found to be significantly ($P<0.01$) different among the four hatches (Table 2). The overall least squares means for body weight were found to be 37.07 and 147.13 g at day old and two weeks of age. The present findings are in agreement with the reports of (Haunshi *et al*., 2009: Kundu *et al*., 2015) at day old age and (Barwa *et al*., 2017: Ghosh and Sahu 2017) at 2 weeks of age in Vanaraja population. Over all least squares means for body weights at 4 and 6 weeks of age obtained in the present study were 334.67 and 662.38 grams. Similar results to those obtained in the present study were reported by Haunshi *et al.* (2007) in Vanaraja. Similarly higher values reported by Padhi *et al.* (2012) in Vanaraja at 4 weeks of age. Lower values were reported by Haunshi *et al*. (2009) at 4 weeks of age and Padhi *et al*. (2012) at 6 weeks of age in Vanaraja. Least squares mean for body weights at 12 weeks of age obtained in the present study was 1271.75 g. Similar results were also reported by Barwa *et al.* (2017) in Vanaraja at 12 weeks of age. Higher body weights were reported by Kundu *et al*. (2015) in Vanaraja, while lower body weights were reported by Ghosh and Sahu (2017) in Vanaraja at 12 weeks of age. Least squares means for body weights at 16 weeks of age obtained in the present study was 1770.04 g. Similar results were also reported by Debata *et al*. (2012) in Vanaraja. The differences in body weights reported by different authors may be due

Table 1: Percent fertility and hatchability in Vanaraja female line (PD-2) chicken

Effect	Eggs set	Eggs transferred	Chicks hatched	Fertility %	Hatchability %	
					TES	FES
Hatch I	1011	829	750	82.00	74.18	90.47
Hatch II	1426	1151	973	80.72	68.23	84.54
Hatch III	1323	1138	946	86.02	71.50	83.13
Hatch IV	1392	1191	1068	85.56	76.72	89.67
Over all	5152	4309	3737	83.57±1.31	72.66±1.82	86.95±1.83

Table 2: Means of body weights (g) of (PD-2) line chicken at first 6 weeks of age

Genotype/ Age (wks)	Body weight (BW) (g) day old	BW2	BW4	BW6	N
Hatch I	37.53^{a}	111.31^{d}	329.48^{c}	585.96^{d}	664
Hatch II	36.69^{b}	158.58^{b}	378.62^{a}	718.76^{a}	578
Hatch III	37.27^{a}	168.49^{a}	273.37^{d}	697.47^{b}	771
Hatch IV	36.80^{b}	150.14^{c}	357.17^{b}	647.37^{c}	903
Mean	37.07	147.13	334.67	662.38	–
SEM	0.07	0.61	1.44	2.54	–
P	0.01	0.01	0.01	0.01	–

Means with the same superscripts in a column did not differ significantly ($P<0.01$)

to differences in genetic makeup, agro climatic conditions, feeding and management practices. In general, genotypes having broiler inheritance have higher body weights (Padhi *et al*., 2012).

Conformation traits (Shank length and keel length)

Chicks of IV hatch recorded significantly (P<0.01) longer shank length at 4 weeks of age than other hatches (Table 3). Chicks of II and III hatch recorded significantly longer shanks and keels at 6 week of age when compared to chicks of other hatches. The overall mean shank length was 54.18 and 71.48 mm at 4 and 6 weeks of age respectively. These values are in accordance with the findings of Rajkumar *et al*. (2012a) in Gramapriya male line, Padhi *et al*. (2015c) in Vanaraja. Longer and stronger shanks make the birds more fit for the forage conditions. The shank length is directly positively correlated with body weights, which is a desirable feature in meat and dual purpose birds. Longer shanks in parents lead to improvement in shank length in terminal cross, Vanaraja which help the birds to move faster to escape from the predator in backyard conditions. The overall mean keel length was 76.15 mm recorded at 6 weeks of age (Table 3) and are in accordance with the findings of Padhi *et al*. (2015c) in Vanaraja, whereas, the values are higher than that of the recordings of Behera *et al*. (2017) in Hansli x coloured synthetic male line.

Slaughter traits

The slaughter parameters were recorded at 12 weeks of age randomly from 20 males and 20 females from one hatch (I). Mean values of various slaughter parameters in Vanaraja female line (PD-2) chicken at 12 weeks of age were expressed in percentage of live weight

Table 3: Means of shank length at 4 and 6 weeks and keel length at 6 weeks of age in (PD-2) line chicken.

Genotype/ Age (wks)	Shank length (mm) at 4th week	Shank length (mm) at 6th week	Keel length (mm) at 6th week	N
Hatch I	53.28^{c}	69.18^{c}	73.98^{b}	664
Hatch II	56.45^{b}	73.46^{a}	77.66^{a}	578
Hatch III	49.28^{d}	73.14^{a}	78.26^{a}	771
Hatch IV	57.70^{a}	70.13^{b}	74.72^{b}	903
Mean	54.18	71.48	76.15	–
SEM	0.11	0.12	0.14	–
P	0.01	0.01	0.01	–

Means with the same superscripts in a row did not differ significantly (P<0.01).

Table 4: Mean values of slaughter parameters in Vanaraja female line (PD-2) chicken at 12 week age as expressed in percentage of live weight

TRAITS	Male	Female	Mean	SEM	P
N	20	20	–	–	–
Dressing Percentage	73.56	73.22	73.39	0.34	0.62
Breast	16.13	16.75	16.44	0.24	0.22
Thigh	22.31^{a}	20.39^{b}	21.35	0.24	0.01
Wing	10.39^{a}	9.69^{b}	10.04	0.12	0.03
Back	14.42	14.57	14.49	0.24	0.05
Neck	5.40	5.23	5.32	0.13	0.49
Heart	0.37	0.43	0.40	0.02	3.47
Liver	2.07^{b}	2.45^{a}	2.26	0.06	0.01
Gizzard	2.15^{b}	2.45^{a}	2.30	0.05	0.02
Fat	0.05^{b}	0.82^{a}	0.43	0.12	0.01
Bursa	0.06^{b}	0.13^{a}	0.09	0.01	0.01
Spleen	0.14^{b}	0.22^{a}	0.18	0.01	0.02
Live weight (g)	1497.15^{a}	1271.75^{b}	1384.5	31.73	0.01
Carcass weight (g)	1101.82	931.61	1016.72	34.93	-
Feather	9.84	11.12	10.48	0.60	-
Blood	3.82	3.46	3.64	0.30	-

Means with the same superscripts in a row did not differ significantly (P<0.01).

(Table 4). Least square mean values of thigh, wing, liver, gizzard, fat, bursa, spleen, live weight were found to be significantly ($p<0.05$) different among male and female birds. Thigh, wing and live weight were significantly higher in males than female birds, while liver, gizzard, fat, bursa and spleen were significantly higher in females than male birds. Giblet percentage was similar with findings of Rajkumar *et al*. (2012a) in Vanaraja birds and Padhi *et al*. (2015) in PD-1 and Vanaraja birds. Higher live weights recorded for PD-2 male birds than female birds were similar to reports by Reddy *et al*. (2017) in Rajasri. The main factor on sex differences in body weight and muscularity might be predetermined during embryonic development when the number of myofibers is established (Henry and Burke, 1999). It may also be attributed to the sexual dimorphism in favor of males, as the growth rate is faster in males and have much higher rate of cell multiplication than females, apart from favorable influence of androgenic hormones on growth rate of males (Ramappa, 1986).

CONCLUSION

The study concluded that, the mean fertility (83.57 %) and hatchability (72.66% -TES and FES - 86.95%) indicating the good reproduction and mothering of the PD-2 population. The increased shank length is directly positively correlated with body weights, which is a desirable feature in meat and dual-purpose birds. Longer shanks in parents lead to improvement in shank length in terminal cross, Vanaraja which help the birds to move faster to escape from the predator in backyard conditions.

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