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Comparative Evaluation of Production Performance in Improved Chicken Varieties for Backyard Farming

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Abstract: The growth and production performance of 4 chicken varieties developed for backyard farming were evaluated in the present study. The body weights were significantly ($p < 0.05$) varied in 4 chicken varieties. The body weights were significantly higher in C_1 and Vanaraja and lower in Gramapriya. The C_2 and C_4 crosses matured early at the age of 145.72 ± 1.11 and 154.67 ± 0.81 days, respectively. The egg weights were significantly ($p < 0.05$) higher in C_1 cross throughout the laying period. The egg weights ranged from 57.06 ± 0.27 g (Vanaraja) to 58.58 ± 0.29 g (C_1 cross) and 60.07 ± 0.28 g (Vanaraja) to 61.34 ± 0.35 g (C_1 cross) at 40 and 64 weeks of age, respectively. The egg production in C_1 cross was significantly ($p < 0.05$) better than Vanaraja and C_2 cross at all ages, however the egg production was on par with Gramapriya at 64 and 72 weeks of age. C_1 cross has substantial production capabilities as dual purpose bird suitable for rural and backyard farming in the country.

Key words: Backyard poultry, improved crosses, body weights, egg production

INTRODUCTION

Village chicken production under the free range and semi-intensive system is one of the viable alternative systems for improving the livelihood of rural households which provide additional income and supplement protein intake in rural and tribal folks. Wide gap exists in per capita consumption of egg and meat among the rural and urban people. The per capita availability of egg and meat is 45 and 2.00 kg against the recommended level of 180 eggs and 9.00 kg of meat by ICMR. To meet the growing demands of the population and to improve the per capita consumption among the rural/tribal people, backyard poultry farming in rural/tribal areas is the best alternative. Traditionally *desi* varieties are used for backyard poultry production whose production potential is very low around 60-80 eggs per year, thus making the backyard poultry less economical. Keeping this in mind Project Directorate on Poultry, Hyderabad, India, developed improved chicken varieties suitable for free range/ backyard farming for rural and tribal areas. The rural varieties Vanaraja (dual) and Gramapriya (layer) developed earlier are popular and well accepted by the small landless farmers and tribal folks of the country. These birds are popular among the rural/ tribal women as one of the income generating activity especially for rural women.

The exploitation of genetically diverse stocks for improving economic traits, such as body weights and annual egg production is one of the approaches in the breeding programmes of chickens. The improved performance of crosses and the parental breeds/ strains/lines, for economic traits is well known (Cole and Hutt, 1973). Variable amount of heterosis may be exhibited by various crosses depending upon the

specificity and divergence among the parental lines and the environment (Orzaco and Campo, 1975).

The knowledge of performance of economic traits in chicken is important for the formulation of breeding plans for further improvement in production traits. Growth and production traits of a bird indicate its genetic constitution and adaptation with respect to the specific environment (Ahmed and Singh, 2007). In the present study the improved varieties developed for backyard farming at Project Directorate on Poultry, Hyderabad, India, are evaluated. Though lot of work has been carried out on performance of economic traits of chicken (Sethi *et al.*, 2003; Fayeye *et al.*, 2005; Bharadwaj *et al.*, 2006; Jilani *et al.*, 2007; Hassen *et al.*, 2006; Mondal *et al.*, 2007) the information on crosses/varieties developed for rural/free range farming are scanty. The present study aimed at evaluating the comparative performances of 4 crosses developed for backyard farming in India.

MATERIALS AND METHODS

The growth and production data collected on 854 birds representing 4 crosses, C_1 cross, C_2 cross, Vanaraja (C_3) and Gramapriya (C_4) developed at Project Directorate on Poultry, Hyderabad, India, were utilized for the present study. The 4 varieties namely, Cross 1, a cross of broiler pure line 1 and a tinted egg layer; Cross 2, a cross between broiler pure line 2 and a tinted egg layer, Vanaraja, dual purpose backyard variety developed from broiler pure line and synthetic mediocre line and Gramapriya, rural layer variety developed from synthetic mediocre line and tinted egg layer. The crosses were produced by artificial insemination with pooled semen from male line. The data on body weights at 20, 40, 64 and 72 weeks of age, egg weights at 24, 28, 32, 36, 40,

64 and 72 weeks of age, egg production at 40, 64 and 72 weeks of age and Age at Sexual Maturity (ASM) were recorded. The 4 crosses were reared under similar environmental condition under deep litter for 18 weeks and thereafter housed in cages. The birds were fed *adlibitum* with starter ration up to 6 weeks of age; thereafter the birds were maintained on 10 per cent restricted feeding schedule. The restricted feeding schedule was practiced during the laying period also. The data were analyzed as per standard statistical methods (Snedecor and Cochran, 1994). The effect of genetic group on the different growth and production traits was studied. The individual means among genetic groups were tested by DMRT for their significance.

RESULTS

Body weights: The mean body weights in 4 crosses are presented in Table 1. The body weights at 20, 40, 64 and 72 weeks differed significantly ($p < 0.05$) in the 4 chicken varieties studied. The body weight at 20 week ranged from 1648.64±15.89 g in Gramapriya to 2106.51±21.77 g in C_2 cross (Table 1). The body weights in C_1 cross and Gramapriya differed significantly whereas C_2 and Vanaraja were non-significant. Body weight at 40 weeks differed significantly ($p < 0.05$) in all the crosses, with highest body weight of 264.16±25.51 g in C_1 cross, followed by Vanaraja, C_2 and Gramapriya (Table 1). The 64 week body weight between C_1 and Vanaraja were not significant but significantly ($p < 0.05$) higher from other 2 crosses. The body weights ranged from 2780.15±28.73 (Vanaraja) to 2445.18±33.55 g (Gramapriya).

The body weights at 72 weeks varied between 2866.31±22.31 (Vanaraja) and 2469.29±29.58 g (Gramapriya). The body weights between C_1 and Vanaraja were not significant but significantly higher ($p < 0.05$) from other 2 crosses. However the body weight of C_2 cross at 72 weeks of age was significantly higher than the Gramapriya (Table 1).

ASM: There was significant variation in attaining the sexual maturity in different chicken varieties. C_2 cross matured early at the age of 145.72±1.11 days (Table 2). Vanaraja and Gramapriya birds matured at a late age of 164.79±0.58 and 160.89±0.63 days, respectively. C_1 cross recorded better ASM (154.67±0.81) than the Vanaraja and Gramapriya birds, the 2 proven varieties under backyard farming.

Egg weights: Egg weight differed significantly ($p < 0.05$) in different varieties studied. The egg weights at 24 weeks were not significant among C_1 , C_2 and Gramapriya, whereas Vanaraja had significantly ($p < 0.05$) lower egg weights. The egg weights at 24 weeks ranged from 44.86±0.26 g in Vanaraja to 46.89±0.29 g in C_1 cross (Table 2).

The egg weights at 28 and 32 weeks, ranged from 49.63±0.29 (Vanaraja) to 52.08±0.29 g (C_1 cross) and 52.64±0.24 (Vanaraja) to 54.92±0.25 g (C_1 cross) respectively (Table 2). The egg weights at 28 and 32 weeks of age in C_1 cross and Gramapriya was significantly ($p < 0.05$) higher than the other 2 crosses. Egg weight of Vanaraja at 28 weeks of age was lower ($p < 0.05$) than C_1 and Gramapriya.

Table 1: Performance of growth traits in 4 crosses developed for backyard poultry

	C_1 cross 215	C_2 cross 193	Vanaraja 234	Gramapriya 212
Bwt 20	1967.40±19.52 ^b	2106.51±21.77 ^a	2086.67±16.53 ^a	1648.84±15.89 ^c
Bwt 40	2641.61±25.51 ^a	2456.64±29.84 ^c	2561.30±20.53 ^b	2304.25±20.41 ^d
Bwt 64	2780.12±29.27 ^a	2526.89±32.03 ^b	2780.15±28.73 ^a	2445.18±33.55 ^b
Bwt 72	2866.27±33.35 ^a	2624.45±29.61 ^b	2866.31±22.13 ^a	2469.29±29.58 ^c

Means with different superscripts within a row differ significantly ($p < 0.05$)

Table 2: Performance of production traits in 4 crosses developed for backyard poultry

	C_1 cross 215	C_2 cross 193	Vanaraja 234	Gramapriya 212
ASM	154.67±0.81 ^c	145.72±1.11 ^d	164.79±0.58 ^a	160.89±0.63 ^b
Ewt 24	46.89±0.29 ^a	46.43±0.30 ^a	44.86±0.26 ^b	47.19±0.29 ^a
Ewt 28	52.08±0.29 ^a	50.18±0.34 ^b	49.63±0.27 ^b	51.76±0.27 ^a
Ewt 32	54.92±0.25 ^a	53.22±0.32 ^b	52.64±0.24 ^b	54.37±0.29 ^a
Ewt 36	57.04±0.29 ^a	56.16±0.30 ^b	54.98±0.22 ^c	56.58±0.28 ^{a,b}
Ewt 40	58.58±0.29 ^a	57.35±0.33 ^b	57.06±0.27 ^b	57.43±0.27 ^b
Ewt 64	61.34±0.35 ^a	61.72±0.37 ^a	60.07±0.28 ^b	60.13±0.34 ^b
Ewt 72	63.15±0.36 ^{a,b}	63.47±0.43 ^a	62.35±0.31 ^b	61.14±0.37 ^c
EP 40	99.88±1.84 ^a	88.59±2.28 ^b	56.15±1.84 ^c	89.19±1.78 ^b
EP 64	200.98±3.99 ^a	183.46±4.24 ^b	131.84±3.84 ^c	204.85±3.15 ^a
EP 72	227.41±4.68 ^a	209.08±4.68 ^b	149.47±4.46 ^c	237.35±3.70 ^a

Means with different superscripts within a row differ significantly ($p < 0.05$)

Egg weight at 36 weeks ranged from 54.98±0.22 g in Vanaraja to 57.04±0.29 g in C₁ cross (Table 2). The 36 weeks egg weights varied significantly (p<0.05) in different genetic groups. At 40 weeks the egg weight in C₁ cross was significantly (p<0.05) higher (58.58±0.29 g) than the other 3 crosses which did not differ significantly. The egg weights at 64 and 72 weeks of age were significantly (p<0.05) better in C₁ and C₂ crosses than Vanaraja and Gramapriya varieties. At 64 and 72 weeks of age the egg weights ranged from 60.07±0.28 in Vanaraja to 61.72±0.37 g in C₂ cross and 61.14±0.37 in Gramapriya to 63.47±0.43 g in C₂ cross, respectively (Table 2).

Egg production: The egg production at 40, 64 and 72 weeks differed significantly (p<0.05) among the 4 varieties investigated in the present study. The egg production at 40, 64 and 72 weeks ranged from 56.15±1.84 (Vanaraja) to 99.88±1.84 (C₁ cross) 131.84±3.84 (Vanaraja) to 204.85±3.15 (Gramapriya) and 149.47±4.46 (Vanaraja) and 237.35±3.70 (Gramapriya) respectively (Table 2). The egg production of C₁ cross was significantly (p<0.05) higher than C₂ and Vanaraja at all ages but did not differ significantly with Gramapriya at 64 and 72 weeks of age (Table 2) which is a proven rural variety.

DISCUSSION

Body weight is the direct reflection of growth and it influences the production and reproduction traits of birds. The significant effect of genetic group on body weights of chicken was reported by many workers (Mohammed *et al.*, 2005; Devi and Reddy, 2005; Chatterjee *et al.*, 2007) similar to the present study. The body weights at different ages in C₁ and Vanaraja were significantly higher. The body weights in Gramapriya were lower at all the ages since it is developed as a rural layer. The higher body weights in C₁ may be because of the exotic broiler inheritance prevailing in the birds. The body weights of C₁ cross were higher than the Vanaraja the proven popular dual purpose bird for backyard farming. Lower body weights at 20 and 40 weeks were reported in 3-way and 2-way crosses of Dahlem Red, Rhode Island Red and White Leghorn (Devi and Reddy, 2005). Vasu *et al.* (2004) reported lower body weights of 1413.96±7.97 at 40 weeks and 1405.79±9.47 at 64 weeks in White Leghorn control populations which were lower than the present estimates. The C₁ cross, being developed as a dual purpose bird for backyard farming is excelling Vanaraja in body weights and egg production. Niranjan and Singh (2005) observed higher body weights, 1860 and 2773 g at 20 and 40 week of age in Gramapriya birds respectively. In general the ASM of rural varieties is higher than the improved exotic chicken varieties. The ASM in Vanaraja and Gramapriya were higher compared

to C₁ and C₂ crosses. The C₂ (145.72±1.11 days) and C₁ (154.67±0.81 days) crosses had significantly lower ASM than the other 2 crosses. The lower ASM in C₁ and C₂ may be because of the exotic pure line inheritance in the 2 crosses. The lower ASM in the dual purpose crosses is desirable which may lead to the increased laying period, thus improving the egg production. Sharma and Hazary (2002) reported, the ASM of 175.18 days for Vanaraja birds which was higher than the present findings. Chatterjee *et al.* (2007) observed higher ASM values in reciprocal crosses of ILI80 and Brown Nicobari birds under intense and backyard system of rearing. The higher ASM estimates of 169.67±1.45 (RIR X Hilly) and 171.35±1.08 (Hilly X Fay) observed in Bangladesh chicken crosses (Khan *et al.*, 2007). Ahlawat and Chatterjee (2002) also reported higher ASM estimates (172-184 days) than the present estimates in White, Black and Brown Nicobari chicken.

Egg production and egg weights determine the success of the poultry enterprise. In general the egg weights were significantly higher in C₁ and Gramapriya with better egg weights in C₁ cross during the entire laying period. In the later stages of laying period from 64 weeks onwards the C₁ and C₂ crosses had better egg weights compared to Gramapriya. However, the egg weights in Vanaraja are significantly lower than the other 3 crosses. The higher egg weights in C₁, C₂ and Gramapriya may be because of the same exotic female line utilized for developing them. The excelled performance of C₁ cross might be due to the paternal inheritance from male line. Sharma and Hazary (2002) reported 42-44 g (40 weeks) and 55-63 g (64 weeks) of egg weight in Vanaraja and an average egg weight of 53.55 g in Gramapriya, which were lower than the present estimates. Higher egg weight (59.25 g) than the present estimate at 40 weeks was recorded in Gramapriya (Anonymus, 2004). Khan *et al.* (2007) observed lower egg weights 44.37±0.49 (RIR×Hilly) and 42.35±0.29 (Hilly×Fay) at 180 days from Bangladesh. Lower average egg weights than the present study were reported by various workers; 49±0.56 in Yamuna cross (Mallik *et al.*, 2002); 49.6±0.89 and 47±0.7 in reciprocal crosses of White Leghorn and Black Nicobari (Ahlawat and Padhi, 2001) and 52.5±0.61 in reciprocal crosses of ILI 80× Brown Nicobari birds (Chatterjee *et al.*, 2007).

The egg production in C₁ and C₂ crosses was on par with Gramapriya the proven variety for backyard farming. Vanaraja, a dual purpose variety had significantly lower egg production compared to the other 3 varieties. The higher production in 3 crosses may be because of the parental lines utilized in developing the crosses. The egg production of 191±5.91 and 190±5.34 in ILI 80 and Brown Nicobari reciprocal crosses (Chatterjee *et al.*, 2007) was lower than the production of the present chicken varieties. The present estimates were comparable to the reports of Mallik *et al.* (2002) in

Yamuna cross and Ahlawat and Padhi (2001) in White Leghorn X Black Nicobari in which White Leghorn the popular egg producer was used as one of the parent. The performance of C₁ cross is better than the other 3 crosses in body weights and egg weights, it was better than the Vanaraja in all the traits studied. The C₁ cross also performed better than the Gramapriya in terms of ASM, body weights, egg weights and the egg production is almost comparable with Gramapriya. C₁ cross has substantial production capabilities as dual purpose bird suitable for rural and backyard farming in the country. Therefore, it is concluded that the C₁ cross is better than the proven rural varieties and can be a suitable alternative dual purpose variety for backyard farming.

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