

Genetic Parameters of a Colored Broiler Female Parent Line

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Abstract

The present study was undertaken to evaluate the performance of a pedigreed closed flock of synthetic broiler breeder dam line (PB 2) maintained on poultry breeding for meat, for egg production and allied traits. The data pertaining to 804 female progenies of three consecutive hatches of a single generation were utilized for the study. The hatch corrected data was subjected to the estimation of genetic parameters. Body weights at 20 (BW20), 32 (BW32) and 40 weeks (BW40) of age, at sexual maturity (BWSM), and the egg weights at 32 (EW32) and 40 (EW40) weeks of age and egg number up to 40 weeks of age (EP40) were of low heritability ranging from 0.01 to 0.18. A positive genetic correlation was observed among body weights and egg weights at all ages. Positive genetic correlations were observed between the body weights (BW32 and BW40) and the egg weights at the same stages (EW32 and EW40). Negative genetic correlations were observed for EP40 with all the egg weights and all the body weights except the pullet body weight at 20 weeks of age.

Key words : Breeder, Dam line, Heritability, Egg production, Colored broiler female.

It has become a common practice to undertake selection for egg production up to 40 weeks of age in broiler dam lines following the primary selection at five/six weeks of age for juvenile body weight, to improve their total egg production and the number of chicks per dam. The present study was undertaken to evaluate the egg production and allied traits of a pedigreed closed flock of synthetic broiler breeder dam line (PB-2) maintained at AICRP on Poultry Breeding for meat located at Bangalore.

Methods

The data on 804 female progenies produced from 60 sires in three consecutive hatches of a single generation of the colored broiler dam line (PB2) were utilized for the study. The birds primarily selected on high body weight at six weeks of age were maintained as growers on restricted feeding from 7 to 20 weeks of age. The pullets were wing banded on the day of their first egg, trap nested and their daily egg production until the completion of 40 weeks of age (EP40) was recorded. Individual measurements were made on the body weights at 20 weeks (BW20), 32 weeks (BW32),

40 weeks (BW40) of age, at sexual maturity (BWSM) and the egg weights at 32 and 40 weeks of age (EW32, EW40). The data were corrected for significant hatch effects using the method of least squares (1) and the genetic parameters such as heritability, phenotypic and genetic correlations were estimated using the paternal half-sib correlation method (2).

Results and Discussion

Heritability Estimates

The heritability estimates for various growth and production traits in the synthetic colored broiler dam line (PB-2) are presented in Table 1. The heritability estimate for the body weights at 20 weeks (BW20), 32 weeks (BW32) and 40 weeks (BW40) of age and at sexual maturity (BWSM) were of low magnitude, ranging from 0.04 to 0.14. The results are lower than those reported by Kumar et al. (3) and Singh et al. (4) in different synthetic lines which could be attributed to the differences in the population structure and selection history.

Egg production up to 40 weeks of age (EP40)

Table 1. Heritability estimates (diagonal), genetic (above the diagonal) and phenotypic correlations (below the diagonal) among different traits in a broiler dam line (PB2). ψ — Not estimated.

Traits	BW20	BWSM	BW32	BW40	EW32	EW40	EP40
BW20	0.09±0.07	0.55±0.31	-0.78±0.25	-1.00±0.25	0.22±0.40	-0.97±0.05	0.37±0.58
BWSM	0.30±0.03	0.14±0.08	0.52±0.40	0.51±0.45	0.63±0.21	1.00±0.21	-1.00±0.45
BW32	0.26±0.03	0.37±0.03	0.05±0.06	ψ	0.91±0.08	0.20±0.08	-1.00±0.21
BW40	0.24±0.03	0.27±0.03	ψ	0.04±0.06	1.00±0.08	1.00±0.08	-1.00±0.08
EW32	-0.14±0.03	-0.01±0.03	-0.04±0.03	-0.03±0.03	0.18±0.08	ψ	\square -0.63±0.02
EW40	-0.12±0.03	-0.02±0.03	-0.03±0.03	-0.04±0.03	ψ	0.01±0.05	-0.78±0.02
EW40	0.18±0.03	0.01±0.03	0.03±0.03	0.04±0.03	-0.58±0.35	-0.54±0.13	0.05±0.06

was also found to be lowly heritable (0.05 ± 0.06) compared to the reports of Singh et al. (4) in different breeder lines and this could be due to the long term selection employed for this trait in the population leading to a reduction in the available genetic variance. Egg weights at 40 weeks of age (EW40) and 32 weeks of age (EW32) also showed a similar trend of lower magnitude, 0.01 ± 0.05 and 0.18 ± 0.08 respectively, in accordance with the reports of Kumar et al. (3) and Singh et al. (4).

Correlations

Among Body Weights at Different Stages. Body weight at 20 weeks of age (BW20) was positively correlated with that at first egg (BWSM) at genetic (0.55 ± 0.31) and phenotypic (0.30 ± 0.03) levels. The estimates obtained in this study were in conformity with those reported by Singh et al. (5) and Singh et al. (4). The high positive genetic correlation between the traits indicated that they are governed by the same set of genes and a faster growth up to 20 weeks of age allows the faster attainment of an optimum body weight at sexual maturity and thereby an early sexual maturity.

The phenotypic correlations of body weight at 20 weeks (BW20) with the subsequent body weights at 32 (0.26 ± 0.03) and 40 (0.24 ± 0.03) weeks of age were positive and moderate, comparable to those reported by Reddy et al. (6) and Singh et al. (4). Contrary to most of the earlier findings, the genetic correlations of this pullet body weight with the subsequent body weights at 32 and 40 weeks of age were negative (-0.78 ± 0.25 and -1.00 ± 0.25 respectively). These negative associations could be attributed to the smaller population size under study.

The pullet body weight at sexual maturity

(BWSM) also showed a similar trend of moderate to high positive phenotypic (0.27 ± 0.03) and genetic (0.51 ± 0.45) correlations with adult body weight at 40 weeks of age (BW40) in accordance with the reports of Singh et al. (5) and Singh et al. (4).

Between Body Weights at Different Stages and Egg Production. The association of body weight at 20 weeks of age (BW20) with total egg production upto 40 weeks of age (EP40) was low and position at phenotypic (0.18 ± 0.03) and genetic (0.37 ± 0.58) levels and tally with the estimates reported by Singh et al. (5). Pleiotropic gene action appeared to be responsible for this association.

Body weight at sexual maturity also showed a similar low and positive association with EP40 (0.01 ± 0.03) but the genetic correlation was negative and beyond unity. This negative genetic association indicated that those pullets with higher egg number upto 40 weeks of age weighed lesser or an optimum at their first egg. An optimization of body weight at sexual maturity was hence essential for an efficient production and so restricted feeding may strictly be followed in this dam line during the grower stage.

The genetic correlations of other body weights at 32 and 40 weeks of age with EP40 were also negative and exceeding unity. The negative genetic relationship suggested that mature body weight at 40 weeks of age was lower in pullets with higher egg production potential. The respective phenotypic correlations (0.03 ± 0.03 and 0.04 ± 0.03) were positive weak and imprecise and in agreement with Poonia and Kumar (7) and Singh et al. (4).

Between Body weights and Egg Weights at Different Stages. Egg weight at 32 weeks of age (EW32) had moderate to high positive genetic correlations with all the body weights viz., at 20 weeks (0.22 ± 0.40),

at sexual maturity (0.63 ± 0.21), at 32 weeks (0.91 ± 0.08) and at 40 weeks (1.00 ± 0.08) of age. The reliable positive genetic associations of EW32 with almost all the body weights suggested that birds giving optimum sized eggs at 32 weeks would remain with optimal body weight at all stages.

Similarly, egg weight at 40 weeks of age (EW40) also had moderate to high positive genetic correlations with all the body weights except with the pullet body weight at 20 weeks of age (-0.97 ± 0.05), though some estimates exceeded unity probably due to the low sample size involved. The unexpected high negative genetic association of EW40 with pullet body weight at 20 weeks suggested the likelihood of a possible deterioration in egg weight at 40 weeks when the pullets are heavier than their optimum at 20 weeks of age.

All the phenotypic correlations between these egg weights and the body weights at different stages were negative, weak and imprecise ranging from 0.01 to 0.14. The estimates are in agreement with those reported by Singh et al. (5), Reddy et al. (6) and Singh et al. (4, 8).

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