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Study of genetic parameters in white leghorn

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Abstract

Data from 2277 progeny of 412 dams mated with 58 sires of two generations were analyzed for egg production up to 250 days of age, body weight (g) at 20 weeks, 24 weeks and 34 weeks, egg weight (g) and age at sexual maturity (days). The heritability of above traits was 0.169±0.34, 0.679±0.054, 0.630±0.053, 0.506±0.50, 0.365±0.045, and 0.157±0.33 respectively. Phenotypically and genetically egg number had negative correlation with all the traits except 20 and 24 weeks body weight while 20 weeks body weight was positively correlated with 24, 34 weeks body weight and egg weight but negatively correlated with age at sexual maturity. 24 weeks body weight was positively correlated with 34 weeks body weight and egg weight (at 40 weeks of age) and negatively correlated with age at sexual maturity. 34 weeks body weight was positively correlated with egg weight and had no relationship with age at sexual maturity. Egg weight (at 40 weeks of age) had also insignificant relationship with age at sexual maturity.

Key words: White leghorn, heritability, genetic correlation

Introduction

The economic benefits from the birds depend on the characters like egg production, egg weight, body weight and age at sexual maturity. The knowledge of phenotypic and genetic parameters for above traits is, therefore, essential to decide selection programme for overall improvement and hence the present study has been undertaken to estimate the genetic parameters.

Materials and methods

The data used in the present study were undertaken on the White Leghorn maintained at Poultry Farm, College of Veterinary and Animal Science, Bikaner. The data of 2277 pullets in two generations produced by mating of 412 dams with 58 sires were used. The experimental birds were kept in laying cages with standard feeding and managmental conditions throughout the experiment. The data were recorded for egg production, body weight at different ages, age at sexual maturity and egg weight traits. The heritability of different traits was computed using Sire component of variance (Falcorner, 1981), while the standard error and heritability was calculated as per Swiger et. al. (1964). The genetic and phenotypic correlation among the different traits was estimated from sire components of variance and co-variance as per Searly (1961).

Results and discussion

Average heritability along with their standard errors for different growth and production traits has been presented in Table 1.

Table 1: Heritability estimates with their standard error for different traits

S.No.	Traits	Heritability
1.	Egg production (up to 250 days of age)	0.169±0.034
2.	Body weight at 20 weeks (g)	0.679±0.054
3.	Body weight at 24 weeks (g)	0.630±0.053
4.	Body weight at 34 weeks (g)	0.506±0.50
5.	Egg weight (g)	0.365±0.045
6.	Age at sexual maturity (d)	0.157±0.033

Heritability: – Heritability estimates of all economic traits with their standard error (Table 1) indicated that 20, 24 and 34 weeks body weight are highly heritable traits and indicated that these traits could be improved by individual selection. These results are similar to the Prakash Babu et. al. (1978) in strain I genetic group (Nema and Johari, 1990). Estimates of heritability for egg weight are neither low nor high. Therefore, sufficient genetic variability exists in the population for further improvement. The low magnitude of heritability for egg production (up to 250 of days) and age at sexual maturity observed in the experiment could be due to several cycles of continued selection for higher egg production and age at sexual maturity. Our estimates for heritability values are similar to the reports of Lijedahl et. al. (1979), Singh (1986) and Bais

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et. al. (1997) for age at sexual maturity.

Correlation

The genetic and phenotypic correlations among the traits are presented in Table 2. Phenotypic and genetic correlation had negative association with all traits except 20 and 24 weeks body weight. Most of the workers have observed positive relationship between part egg production and body weight at 20 weeks (Johari et. al., 1988 and Kataria et. al., 1992). These corresponding estimates observed in the present investigation are consistent with these reports. Egg number had a very small non-significant positive correlation with body weight at 20 weeks. Similarly egg number had insignificant positive genetic association with body weight at 24 weeks. Egg number had a non significant negative association with body weight at 34 weeks. Singh (1981), Johari et. al. (1988) and Chaudhary (1983) observed similar findings and reported no relationship between these two traits. However, positive genetic relation does indicate increase in egg production at 20 and 24 weeks body weight with simultaneous decrease in body weight at 34 weeks. Phenotypic and genetic correlation between egg number and egg weight was found to be negative and insignificant. Almost similar results have been reported by Singh (1986) and Chaudhary (1983). This phenomenon is more pronounced as the production reaches optimum level. Phenotypic and genetic correlations between egg number and age at sexual maturity were found to be negative and highly significant. These results are similar with those of Das (1982), Johari et. al. (1985), Johari et. al. (1987), Chaudhary et. al. (1983) and Kataria et. al. (1992).

The phenotypic and genetic correlation of 20 weeks body weight with 24 and 34 weeks body weight was found to be positive and highly significant. These results also suggested that there are some common set of pleiotropic genes which govern these traits. The phenotypic and genetic correlation between 20 weeks body weight and egg weight were found to have a positive association but of low order. Mathur (1995) also arrived at similar conclusions. Phenotypic and genetic association between body weight at 20 weeks and age at sexual maturity were negative and not significant. Similar findings were reported by Thakur et. al. (1989) and Chaudhary (1983).

Phenotypic and genetic correlation between 24 weeks body weight and 34 weeks body weight was found positive and highly significant. This indicates that the pullets which are heavier around sexual maturity (24 weeks) tend to be of higher body weight at peak production (34 weeks) and vice-versa. Likewise, the phenotypic and genetic correlation of 24 weeks body weight and egg weight had positive relationship but non significant. It gives an indication that heavier birds at 24 weeks tend to lay heavier egg and vice-versa. These results are an agreement with the findings of Singh (1986). Phenotypic and genetic correlation of 24 weeks body weight and age at sexual maturity were statistically insignificant indicating no relations between these two traits. Similar findings were reported by Chaudhary et. al. (1983), Thakur et. al. (1989) and Mathur (1995).

Phenotypic and genetic correlation of 34 weeks body weight with egg weight were positive. Prakash Babu et. al. (1978), Singh (1986) and Chaudhary (1983) also quoted similar results. These results indicated that selection for body weight at 34 weeks could be effective

Table 2: Phenotypic (P) and genetic (G) correlation between various traits

S. No.	Traits	Co-relation	Body weight at 20 weeks	Body weight at 24 weeks	Body weight at 34 weeks	Egg weight	Age at sexual maturity
1.	Egg production up to 250 days	P	0.093	0.077	-0.038	-0.075	-0.459
		G	0.149	0.140	-0.086	-0.206	-0.877
			± 0.107	±0.108	± 0.114	±0.122	± 0.197
2.	Body weight at 20 weeks	P		0.729	0.524	0.102	-0.134
		G		0.918	0.676	0.172	-0.288
				±0.017	±0.048	±0.087	±0.111
3.	Body weight at 24 weeks	P			0.678	0.132	-0.061
		G			0.825	0.301	-0.144
					±0.031	±0.084	±0.112
4.	Body weight at 34 weeks	P				0.204	-0.065
		G				0.486	-0.167
						±0.077	±0.144
5.	Egg weight	P					-0.060
		G					-0.230
							±0.121

in increasing egg weight/size also. Phenotypic and genetic correlations between 34 weeks body weight and age at sexual maturity were low and non significant this indicated that the association in these traits disappeared by the time the birds reached 34 weeks of age. Johari et. al. (1987) reported low negative correlation between these two traits. Contrarily, low positive relationships between these two traits have been cited by Liljedahl et. al. (1979), Johari et. al. (1985) and Chaudhary (1983).

Correlation between egg weights and age at sexual maturity were negative, low and non significant. These results are akin to the findings of Prakash Babu et. al. (1978), Singh, R. P. (1986), Johari et. al. (1987) and Chaudhary (1983).

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