

## SHORT COMMUNICATION

# STRAIN DIFFERENCES IN THE GENETIC PARAMETER ESTIMATES FOR GROWTH TRAITS IN MEAT-TYPE CHICKEN

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### ABSTRACT

Data on live performance traits obtained from experiments involving two strains of meat-type chicken were analysed and used to estimate heritabilities of the traits and the inter-character correlations. There were strain differences ( $P < 0.05$ ) for body weight of birds to 56 days of age, average daily gain, and daily feed intake per bird. Strain differences were not significant ( $P > 0.05$ ) for feed conversion ratio. Genetic correlations obtained between pairs of characters were generally high ( $P < 0.01$ ). Coefficients of phenotypic correlation were slightly lower relative to those of the genetic correlation. Environmental correlation coefficients were moderate to high (0.36 to 0.99) and also significant ( $P < 0.01$ ) within strain. Correlation of feed conversion rate with other characters were negative for the two strains. Heritability estimates for the growth traits were very high, and no appreciable differences were observed between the strains.

**Key words:** Strain, Heritability, Correlation, Growth, Broiler.

### INTRODUCTION

Studies with commercial strains of meat-type chicken have shown that they have rapid rate of gain and high body fat content (Chambers *et al.*, 1981). Growth traits in broiler birds could be under some sort of genetic influence (Giodani *et al.*, 1992); Schmidt *et al.*, 1992). Chambers *et al.*, (1983) reported that broilers of different strains differed significantly in feed conversion to the same age of 47 days. Grunder and Chambers (1988) obtained significant strain differences in broiler bird weight at six weeks, feed intake, and feed efficiency. They also found heritability estimates for these traits to be

moderate to high. Working with meat-type chicken of three commercial strains, Garcia *et al.* (1991) observed significant difference among the strains in feed intake and in weight gain to 49 days of age, but differences were not significant for feed conversion efficiency.

In Nigeria, there are few reports on genetic parameter estimates for broiler growth traits. Report by Oluyemi and Roberts (1979) suggests the need to generate these estimates as baseline data for any future local improvement efforts. The objectives of the present study therefore were to estimate the heritabilities of live performance traits and evaluate the intercharacter genetic, phenotypic, and environmental correlations using broilers of two commercial strains in Nigeria.

### MATERIALS AND METHODS

Two strains of broiler birds were used in this study. 240 day-old chicks of those strains were raised in the Livestock Research Farm of the University of Agriculture, Abeokuta, Nigeria. They were brooded and reared in floor pens after randomly assigning each strain of birds to four replicates of 30 birds each. The birds were fed *ad libitum* on starter and finisher diets. The starter diet, containing 2950 Kcal M. E. and 22% CP was provided for the birds during their first four weeks of life. The finisher ration had 2972 Kcal M.E. and 20% CP. The birds had free access to drinking water, and routine veterinary and sanitary attention were provided.

Data were collected on weekly body weight and feed intake to 56 days of age and average daily weight gain and feed conversion ratio were derived from them. All the growth traits studied were subjected to analyses of variance of cross-products (Genstat Manual, 1977)

using a model which included the effects of strain, age, and sire within strain. Variance and covariance components for the growth traits were determined by equating the mean squares with their expectation (Falconer, 1989). The phenotypic ( $r_p$ ) and genetic ( $r_A$ ) correlations between pairs of traits were obtained using the method of Wang *et al.* (1977).

The coefficients of environmental correlation ( $r_E$ ) between traits were calculated from Falconer's (1989) relationship. Narrow-sense heritabilities were also calculated from the genetic and phenotypic components of variance (Falconer, 1989).

## RESULTS AND DISCUSSION

The analyses of variance revealed significant strain difference in body weight of broiler birds to 56 days, average daily gain, and feed consumption. Although strain differences in feed conversion ratio were not significant ( $P > 0.05$ ), birds in strain 1 had significantly higher values for body weight to 56 days, average daily gain, and daily feed consumption per bird relative to those in strain 2 (Table 1). Genetic correlations between growth traits for the strains were very high and positive, varying from 0.67 between average daily weight gain and body weight in strain 2 to 0.99 between body weight and feed consumption by bird from both strains (Tables 2 and 3). Similar but slightly lower values were obtained for the phenotypic correlation coefficients between pairs of growth traits for the two strains (Table 2 and 3). Moderate to high values (0.36 to - 0.99) were obtained for the coefficient of environmental correlation. A different pattern was observed as feed conversion ratio showed negative and significant environmental correlation with body weight, average daily gain and feed consumption in both strains (Table 4). Heritability estimates for growth traits were high and no appreciable differences were observed in the estimates obtained for the two strains (Tables 2 and 3).

The significant strain differences in the weight of broiler birds to 56 days of age and

their weight gains show that they were highly influenced by genetic factors and this tends to agree with the report of Hossain and Ahmed (1991). The high heritability estimates obtained for these growth traits in the present study showed that much of the variation in them was genetic in nature, and may also be indicative of the selection response shown by broiler weight and gain (Leenstra and Pit, 1988). Increases in feed consumption by broiler birds and in the feed conversion ratio (feed consumption/weight gain) tend to accompany increases in body weights of birds as broiler weight was positively and significantly genetically correlated with feed intake and feed conversion ratio. The heritability estimates obtained for feed conversion in this study compare with those reported by Leenstra and Pit (1988) who found feed conversion to be 58% heritable and Grunder and Chambers (1988) who reported heritability estimates of 0.42 and 0.44 for feed consumption and feed conversion respectively. These agree with the report of Oluyemi and Roberts (1979) on the additive nature of the gene action controlling the traits. However, increases in feed conversion ratio would not be desirable since that would entail the bird consuming more feed for a unit gain in body weight.

Both the genetic and the phenotypic correlation coefficients obtained in the present study showed that the association between broiler growth traits were high. It would appear then that repeatable increases in daily gain, feed consumption and feed conversion ratio would be obtained with improvements in the body weight of meat-type chicken. Marks (1979) and Chambers *et al.* (1981) found that the larger quantity of feed needed for body maintenance as a result of the improved body weight almost overrides any positive effect of rapid weight gain on feed efficiency. This may well be so, for, in the present study, both the genetic and the phenotypic correlations of body weight with feed intake and feed conversion were stronger (close to unity) than the corresponding correlation of body weight with average daily gain.

**GENETIC ESTIMATES FOR GROWTH IN BROILERS**

**TABLE 1: GROWTH TRAITS OF TWO STRAINS OF MEAT-TYPE CHICKEN**

Trait*	Strain 1		Strain 2	
Body weight, g	1037.19 <sup>a</sup>	(17.78)	935.10 <sup>b</sup>	(23.95)
Average daily gain, g	36.10 <sup>a</sup>	(2.09)	32.62 <sup>b</sup>	(2.08)
Average feed consumption,	101.68 <sup>a</sup>	(1.12)	90.80 <sup>b</sup>	(2.12)
Feed Conversion ratio	1.85	(0.03)	1.87	(0.02)

\*Means in the same row with different superscripts are significantly different ( $P < 0.05$ ). Standard error of the mean are in parantheses.

**TABLE 2: GENETIC CORRELATIONS (BELOW DIAGONAL), PHENOTYPIC CORRELATIONS (ABOVE DIAGONAL), AND HERITABILITIES (DIAGONAL) OF GROWTH TRAITS IN STRAIN 1**

Trait	BW	DG	FC	CR
Body Weight (BW)	0.89	0.73**	0.99***	0.95**
Daily Gain (DG)	0.76**	0.80	0.74**	0.69**
Feed Consumption (FC)	0.99***	0.77**	0.62	0.98***
Feed Conversion ratio (CR)	0.96***	0.74**	0.99***	0.58

\*\*  $P < 0.01$

\*\*\*  $P < 0.001$

**TABLE 3: GENETIC CORRELATIONS (BELOW DIAGONAL) PHENOTYPIC CORRELATION (ABOVE DIAGONAL); AND HERITABILITIES (DIAGONAL) OF GROWTH TRAITS IN STRAIN 2**

Trait	BW	DG	FC	CR
Body Weight (BW)	0.88	0.63**	0.99***	0.97***
Daily Gain (DG)	0.67**	0.76	0.70**	0.64**
Feed Consumption (FC)	0.99***	0.74**	0.62	0.97**
Feed Conversion ratio (CR)	0.98***	0.98***	0.98***	0.58

\*\*  $P < 0.01$

\*\*\*  $P < 0.001$

**TABLE 4: ENVIRONMENTAL CORRELATIONS BETWEEN GROWTH TRAITS IN TWO STRAINS OF MEAT-TYPE CHICKEN.**

Trait	Strain	BW	DG	FC
Body Weight (BW)	1			
	2			
Average Daily Gain (DG)	1	0.37*		
	2	0.36*		
Feed Consumption (FC)	1	0.98***	0.91***	
	2	0.84***	0.45*	
Feed Conversion Ratio (CR)	1	-0.99***	-0.52**	-0.99***
	2	-0.57**	-0.59**	-0.99***

\* $P < 0.05$ ;

\*\* $P < 0.01$ ;

\*\*\* $P < 0.001$

Strain differences in the genetic parameter estimates were more appreciable, in the environmental correlation coefficients for pairs of growth traits (Table 4). The lower coefficients obtained for broiler growth traits in strain 2 may be an indication of possible strain-by-environment interaction influences or differences in the non-additive genetic influences on the growth trait. It therefore supports the view that extrapolating genetic parameter estimates from one environment to another may not be advisable.

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