

PHENOTYPIC CORRELATION COEFFICIENT FOR BODY WEIGHT AND CONFORMATION TRAITS OF SIRE AND DAM LINE SEXES OF NAPRI BROILER CHICKEN UNDER SELECTION AT EIGHT (8) WEEKS OF AGE

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ABSTRACT

This study was conducted at the National Animal Production Research Institute, Shika-Zaria, to evaluate the phenotypic relationship between body weight and conformation traits of Sire (male♂ and female♀) and Dam (male♂ and female♀) lines of chickens at eight weeks of age. A total of 410-day-old chickens from a single hatch were used, with 205 from each line. The birds were raised on a deep litter management system. Data on body weight was taken by weighing individual chicks using a digital weighing scale, and conformation traits were measured using a tape. Data were analyzed using Pearson's product-moment procedure of the SAS package. The results showed positive correlations between body weight and all conformation traits in both sexes and lines. Low to moderate relationships were observed between body weight and conformation traits. The strongest correlations were found between breast width and wing length, shank length and keel length, and breast width and wing length. The findings suggest that selection for improved body weight will have a positive correlated response on conformation traits, enabling simultaneous selection for multiple traits and enhancing the overall breeding program for improved productivity.

Keywords: Phenotypic correlation, Body weight, Conformation traits, Sire, Dam

INTRODUCTION

The poultry industry is a significant contributor to the global food supply, providing a protein source and a source of income to many people. Correlation refers to the statistical association between the phenotypic expressions of two traits (Mukaka, 2012). The phenotypic correlation is the sum total of genetic and environmental correlations (Isaac, 2021). Body weight is a vital trait in the selection of poultry and other husbandry. Body conformation traits are associated with broiler performance and can serve as a basis for selecting chicks for breeding (Azua *et al.*, 2022; Olayiwola *et al.*, 2023). Phenotypic correlation estimates between body weight and conformation traits can guide breeders in selecting desirable traits for successful breeding programs (Sam *et al.*, 2019). Conformation traits in poultry vary by genotype, sex, and data analysis methods (Assan, 2015). For a breeder to improve the breeding value of any animal it is paramount to know both the effect of the trait being selected and its effect on the other traits Yahaya *et al.* (2022).

MATERIALS AND METHODS

Experimental site

The research was conducted at the Research Unit of the Poultry Research Programme of the National Animal Production Research Institute, Shika-Zaria. Shika-Zaria is situated at latitude 11° 12' 42" N and longitude 7° 33' 14" E, with an altitude of 640m above sea level. The average maximum temperature reaches 38.89^oc, while the average minimum ambient temperature drops to 8.89^oc. Over the past 7 years, the yearly average temperature has been 25.55^oc. During dry and wet seasons, the mean relative humidity is 21% and 72%, respectively (IAR, 2018).

Experimental birds and Management

Four hundred and ten (410) birds of NAPRI broiler chicken from a single hatch were reared, with two hundred and five (205) each from the sire and dam line. The Chicks were wing-tagged according to the line at day old and raised on a deep litter management system. They were brooded with electric bulbs, coal pots, and kerosene stoves. The birds were fed *ad libitum* with a starter diet from day old to four weeks of age and subsequently with a grower ration. Recommended medication and vaccination according to NAPRI were adhered to strictly.

Data Collection

The individual body weight of the bird was measured in grams with a Camry digital weighing scale (model EK5055) using a procedure reported by (Yahaya *et al.*, 2012). Conformation traits (shank length, thigh length, keel length, body length, wing length, neck length, breast width, beak length, and height of chicken) were measured using tailor tape using a procedure reported by (Yahaya *et al.*, 2012; Sadick *et al.*, 2020).

Data analysis

Phenotypic correlation was analyzed using Pearson's product-moment procedure of the SAS package.

RESULTS AND DISCUSSION

The phenotypic correlation analysis of NAPRI broiler chickens revealed a complex network of relationships among various traits. Strong positive correlations were observed between shank length and keel length (0.71), keel length and body length (0.67), breast width and wing length (0.76), and keel length and beak length (0.82). Moderate positive correlations were found between body weight and neck length (0.42), and B and CH (0.46) in the male Sire population. Furthermore, the female sire of broiler chicken population (below the diagonal) showed strong positive correlations between keel length and shank length (0.50), wing length and breast width (0.88), body length and breast width (0.60), and wing length and neck length (0.54). Moderate correlations were observed between neck length and body weight (0.37), wing length and body weight (0.41) and breast width and shank length (0.34), while low correlations were found between thigh length and beak length (0.02) and keel length and beak length (0.04). Table 1: A comparison between male and female NAPRI broiler chickens revealed similarities and differences. Both sexes showed strong positive correlations between breast width and wing length. However, males had stronger correlations between shank length and keel length, and keel length and beak length, while females had a stronger correlation between chicken height and (neck length and wing length). The observed differences have important implications for breeding strategies. The positive correlation between body weight and conformation traits showed in Sire line such as the low to moderate correlation between body weight and some conformation is in accordance with the results of Adejoh-Ubani (2015), who observed low to moderate phenotypic correlation between body weight and morphometric traits at base generation of the NAPRI broiler line. The findings of body weight and shank length (0.50), and body weight and neck length (0.47), are inconsistent with Bello *et al.* (2021).

Table 1: Phenotypic Correlation Coefficient for Body Weight and conformation traits of male (upper diagonal) and female (below) of Sire line of NAPRI broiler chicken under selection at 8

Traits	BW	SL	TL	KL	BR W	BL	NL	WL	BKL	CH
BW	1	0.40	0.30	0.36	0.20	0.31	0.42	0.25	0.27	0.46
SL	0.18	1	0.52 ***	0.71 ***	0.46 ***	0.48	0.47	0.42 ***	0.21	0.39
TL	0.16	0.33 **	1	0.51 ***	0.13	0.19	0.17	0.05	0.08	0.11
KL	0.21	0.50 ***	0.57 ***	1	0.56 ***	0.67 ***	0.52 ***	0.35	0.82	0.47
BR W	0.40 ***	0.34 **	0.03	0.21	1	0.62 ***	0.64 ***	0.76 ***	0.25	0.39
BL	0.34 **	0.12	0.07	0.12	0.60 ***	1	0.44	0.40	0.30	0.45
NL	0.37 ***	0.30	0.10	0.21	0.60 ***	0.42 ***	1	0.60 ***	0.30	0.53***
WL	0.41 ***	0.29	0.07	0.19	0.88 ***	0.61 ***	0.54 ***	1	0.33	0.36
BKL	0.29	0.11	0.02	0.04	0.29	0.32	0.36 **	0.27	1	0.42
CH	0.45 ***	0.22	0.08	0.19	0.49 ***	0.41 ***	0.50 ***	0.50 ***	0.40	1

***Significant at (P<0.001), BW- Body Weight, SL- Shank Length, TL- Thigh Length, KL Keel Length, BRW- Breast Width, BL- Body Length, NL- Neck Length, WL- Wing Length, BKL- Beak Length, CH- Chicken Height

Table 2 present the phenotypic correlation of the dam line. In male Dam (above diagonal), body weight had moderate to low correlations with conformation traits, with values ranging from 0.47 to 0.20. Strong positive

correlations were observed between shank length and keel length (0.82), thigh length and keel length (0.71), body length and wing length (0.78), breast width and wing length (0.72), body length and keel length (0.62), body length and breast width (0.65), and body length and length (0.54). In contrast, low correlations were noted between body weight and breast width (0.27), body weight and beak length

(0.20), and chicken height and body weight (0.37). However, the female Dam line revealed strong positive to low correlations Moderate correlations existed between shank length and body weight (0.50), and neck length and body weight (0.50). Very strong correlation was found between keel length and shank length (0.73), wing length and breast width and (0.79), and moderate correlations between wing and neck length (0.41) and thigh length and shank length (0.57). However, low correlations were noted between beak length and body weight (0.06), chicken height and body weight (0.01), and beak length and shank length (0.24). Positive phenotypic correlations were also recorded for all the conformation traits in both the male and female of dam line this is line with findings of Oleforuh-Okoleh *et al.* (2017). The phenotypic correlations reported between thigh length and wing length is a positive but low correlation for the two sexes (0.05 and 0.07 in male and female respectively). Wing length were moderately correlated with body weight in female sire group this is in line with findings of Louis *et al.* (2021). The highly significant correlation within the conformation traits such as between shank length and thigh length is in agreement with results of Bekele and Chala (2021). Highly significant ($P < 0.01$) inter-correlations were found among conformation traits, such as shank length and keel length (0.82 in males) and keel length and shank length (0.73 in females) are in accordance with the findings and Bello *et al.* (2021).

Table 2: Phenotypic Correlation Coefficient for Body Weight and conformation traits of male (upper diagonal) and female (below) of Dam line of NAPRI broiler chicken under selection at 8

	BW	SL	TL	KL	BRW	BL	NL	WL	BKL	CH
BW	1	0.20	0.23	0.25	0.27	0.34	0.47	0.30	0.20	0.37
SL	0.50	1	0.61***	0.82***	0.39	0.48***	0.36	0.51	0.03	0.36
TL	0.48	0.57***	1	0.71***	0.46	0.54***	0.39	0.53	0.35	0.25
KL	0.38	0.73***	0.63***	1	0.59***	0.62***	0.47	0.64***	0.35	0.55***
BRW	0.10	0.37**	0.28	0.35**	1	0.65***	0.51	0.72***	0.14	0.45
BL	0.30	0.11	0.22	0.09	0.07	1	0.14	0.78***	0.31	0.38
NL	0.50	0.43***	0.28	0.40***	0.30	0.14	1	0.49	0.29	0.41
WL	0.12	0.42***	0.36**	0.40***	0.79***	0.05	0.41***	1	0.29	0.42
BKL	0.06	0.24	0.04	0.19	0.29	0.11	0.37***	0.36	1	0.29
CH	0.01	0.31	0.20	0.18	0.33**	0.01	0.42***	0.41***	0.37**	1

***Significant at ($P < 0.001$), BW- Body Weight, SL- Shank Length, TL- Thigh Length, KL Keel Length, BRW- Breast Width, BL- Body Length, NL- Neck Length, WL- Wing Length, BKL- Beak Length, CH- Chicken Height

CONCLUSION

The results revealed positive correlations between body weight and conformation traits, with strong correlations observed between BRW and WL, and SL and KL in both the sexes. These findings provide valuable insights for breeders, highlighting the importance of considering multiple traits and sex differences in selection programs to improve productivity.

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