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EFFECTS OF GENOTYPE, AGE AND SEASON ON BODY WEIGHT AND SOME EGG QUALITY CHARACTERISTICS OF BROILER BREEDING STOCKS

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ABSTRACT

*The study was conducted on Marshall and Abor Acre broiler breeding stocks to determine the effect of genotype, age and season on body weight and some egg quality traits. The study was carried out at Gombe Poultry Production Unit, Ministry of Agriculture and Animal Husbandry, Gombe State, Nigeria. A total of 200 birds comprises of 100 Marshall and Abor Acre each were used to obtained the data during which they were all fed commercial diet at different age accordingly and water was provided ad-libitum. Data was collected on body weight, egg weight, egg length, egg width and egg shape index. The data were subjected to analysis of variance (ANOVA) and analyzed using general linear model of SAS computer package and Duncan Multiple Range was used to separate the means. The overall means for body weight (BW), egg weight (EW), egg length (EL), egg width (EWd) and egg shape index (E.S.I) were 41.30 g, 63.22 g, 4.55, 3.23 cm and 70.78 %, respectively. Effect of genotype was significant ($P < 0.05$) on BW and EW except EL, EWd and E.S.I. Age and season were significant ($P < 0.05$) on BW and EW while EL and EWd was significantly ($P < 0.01$) different between the age and season, respectively. The study concluded that there was variation on body weight and egg weight which indicated the differences between the Marshall and Abor Acre broiler breeder stocks. Age and season had significant effect on body weight and some egg quality traits which indicate differences in selection of genotypes between age and season within the genotypes. **Keywords:** Broiler Breeder Stock, Age, Season, Body Weight and Egg Quality Traits.*

8. INTRODUCTION

Body weight at the onset of egg production is a major factor influencing hen productivity, while egg weight increases significantly when the initial body weight of the hens is high (Perez-Bonilla *et al.*, 2012). Growth increases with age in laying birds and consistency in egg number and egg weight (Ojedapo *et al.*, 2008). Production of eggs and its quality may also be influenced by many other factors such as breed, mortality rate, culling age and season (North and Bell, 1990). The effect of season differed significantly for the traits; egg shell weight, shell thickness and egg shell membrane, but not differed for egg weight. However, egg weight and other quality traits are higher in wet season than the dry season (Islam *et al.*, 2001). During summer or hot season, laying birds are exposed to a number of stress like growth decrease, reduced production and imbalance nutrition (Ahmed *et al.*, 1993). However, management of heat stress during the dry season might requires a system of conductive cooling of the birds body either by sprinkling water and which have been reported useful and influences the quality of egg produce by layers during the hot season. Egg external and internal qualities are of major importance to egg industry worldwide. These qualities traits of the eggs are significant in the poultry breeding for their influence on the yield features of the future generation, breeding performance and quality of



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chicks (Altinel *et al.*, 1996). Therefore, the internal and external characteristics of egg changes significantly with age and egg quality are influenced by genetic and non-genetic factors such as season, environment and feed intake (Salahuddin and Howlider, 1991). The study of egg production and its related traits such as age and body weight at sexual maturity attracted the attention of several investigators who found that there were wide variations in these traits between different breeds or strains of chickens (Iraqi *et al.*, 2007). Peters *et al.*, (2007) and Kul and Seker (2004) reported that egg weight and egg index are determinant of egg resistance to cracking and are considered very important traits when eggs are packed in container. The aim of this study was to determine the effects of genotype, age and season on body weight and some egg quality characteristic in broiler breeder stocks.

MATERIALS AND METHODS

The experiment was carried out at the Gombe Poultry Production Unit, Ministry of Agriculture and Animal Husbandry, Gombe, Gombe State, Nigeria. The birds were purchased at CHI Ibadan, Oyo State, and were vaccinated according to the schedule of North- East, Nigeria. A total of 200 birds (100 Marshall and 100 Abo Acre) with a mating ratio of 10:1 (Females to Male). Birds were housed separately based on genotype. The birds were fed chick mash containing crude protein level of 19-20% and ME of 2650 Kcal from 0-8 weeks, grower mash from 8-18 weeks with crude protein level of 14-16% and ME of 2500 Kcal and breeder mash from 18 weeks upward with crude protein level of 17% and 2700kcal ME, together with fresh water *ad-libitum*. Birds were kept in deep liter system. Data were collected on body weight, egg weight, egg length, egg width and egg shape index. The data were subjected to analysis of variance (ANOVA) and Duncan Multiple Range was used to separate the means and analyzed using general linear model of SAS (2003) computer package.

RESULT AND DISCUSSION

Table1 showed the effect of genotype, age and season on body weight and some egg quality characteristics of Marshall and Abor Acre broiler breeder stock. The result indicated significant ($P<0.05$) differences of genotype on body weight and egg weight while insignificant ($P>0.05$) differences were observed on egg length, egg width and egg shape index. The BW, EW, EWd and E.S.I were significantly higher in Abor Acre (4.53 g, 63.85 g, 3.22 cm, and 71.00 % than in Marshall (3.35 g, 62.59 g, 3.21 cm and 70.59 %), respectively.

The result of this study are similar to those reported by Monina *et al.* (2003) who reported 58.38 g, 5.91, 4.21 cm and 74.10 % for EW, EL, EWd and E. S.I in white Leghorn and 55.95 g, 5.71, 4.13 cm and 72.14 % in Rhode Island Red. Similarly, Been *et al.* (2018) recorded 53.80 g, 5.40, 3.90 cm and 72.62 % and 58.69 g, 5.83, 4.34 cm and 74.44 % for EW, EL, EWd and E. S.I in white Leghorn and Hampshire. Ochai *et al.* (2019) also observed significant difference on egg quality characteristics in FUNAAB Alpha and ISA brown chickens as 60.66 g, 4.35, 5.71 cm and 76.28 % and 65.53 g, 4.53, 5.67 cm and 79.90 % for EW, EL, EWd, and E.S.I, respectively. This difference in body weight and egg quality traits may be due to differences in age and feed utilization.

There was significant ($P<0.05$) effect of age on BW, EW and E.S.I while EL and EWd were not significant ($P>0.01$) effect between ages. Age 3 (44-52 weeks) had the highest egg weight of 68.94g as compared to age 2 and 1 (65.87 and 56.42g). Age 1 and 2 recorded higher EL (4.67 and



4.54cm) than age 3 (4.51cm). As regards to EWD, age 3 and 2 had a higher value (3.26 and 3.29) while age one had the lowest 3.14 there was no significant difference among the age regards to SI, as 69.83, 70.45 and 72.21% was recorded for age 1,2 and 3 respectively. This shows that age 3 is most favorable for weight, egg length and egg width. This could be attributed to the positive effect of age of egg quality, as birds matures, egg quality also get better.

Table 1: Least Square Means and Standard Error of Body Weight and Some Egg Quality Characteristics as Affected by Genotype, Age and Season

Parameters	BW	EW(g)	EL (cm)	EWd (cm)	E.S.I (%)
Overall mean	41.30±0.33	63.22±0.99	4.55±0.22	3.23±0.02	70.78±0.53
Genotype	*	*	ns	ns	ns
Marshall	3.35±0.02 ^b	62.59±1.68 ^b	4.56±0.03	3.21±0.03	70.59±0.73
Abor Acre	4.53±0.02 ^a	63.85±1.07 ^a	4.54±0.03	3.22±0.04	71.00±0.77
Age (weeks)	*	*	***	**	*
26 – 34	3.80±0.04 ^c	56.42±0.79 ^c	4.54±0.04 ^b	3.14±0.03 ^b	69.83±0.88 ^c
35 – 43	4.08±0.04 ^b	65.87±0.52 ^b	4.67±0.03 ^a	3.29±0.05 ^a	70.43±1.02 ^b
44 – 52	4.50±0.06 ^a	68.94±1.65	4.51±0.03 ^b	3.26±0.03 ^a	72.21±0.79 ^a
Season	*	*	**	**	**
Dry cold	3.77±0.05 ^a	53.20 ±0.61 ^c	4.32±0.03 ^b	3.10±0.03 ^b	71.77±0.68 ^a
Dry hot	4.03±0.04 ^b	63.81±0.07 ^b	4.63±0.02 ^a	3.24±0.04 ^a	70.04±0.76 ^b
Rainy	4.51±0.06 ^a	70.00±2.39 ^a	4.54±0.04 ^a	3.27±0.04 ^a	71.98±1.02 ^a

BW = Body weight, EW = Egg Weight, EL = Egg Length, EWd = Egg width, E.S.I = Egg shape index. ^{a,b,c} Means within the same columns bearing different superscripts are significantly *(p<0.005), **: Significant (p<0.01); ***: significant (p<0.001) and ns: not significant.

Abdalla (2020) reported egg weight of 51.82, 58.03, 60.32 and 61.94g and shape index of 78.71, 77.99, 77.58 and 77.39% for week 22, 30, 34 and 38 of breeding stock. The values of egg weight were lower than the one recorded in this study at week 22 (56.42g as against 51.82g), week 34 (60.32 as against 65.87g), the shape index recorded by the author is higher than the values obtained in this study. Iyabode *et al* (2020) reported EW, EL, EWD and SI at week 26 as 60.18g, 5.68cm, 4.23cm and 76.13, the values are higher than the ones obtained in this study, the authors also recorded 67.52g, 5.98, 4.43cm and 74.79% for EW, EL, EWD and SI respectively at week 46 which is within the range of the one reported in this study. Rayan (2018) recorded SI of 80.26% and 77.44% at week 46 and 60 of breeding stocks, which is higher than the value obtained in this study. This shows a positive relationship between egg quality and age. As a bird ages, external egg quality also improves. For better external egg qualities, older birds produce them more than younger ones.

There was significant (P<0.05) effect of season on BW, EW, EL and EWd while E.S.I was significant (P<0.01) as observed. The rainy season had the highest mean values of BW, EW, EL and E.S.I followed by dry hot while the dry cold was recorded the least mean values. The differences observed in this study may be attributed to weather condition such as temperature and humidity since low and higher temperature and humidity affect feed intake and mating

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activities of birds which could lead to the decrease in body weight and consequently egg quality traits which are observed during dry cold and dry hot season in this study. The result of this study were contrary to the report of Abdullahi *et al.* (2021) who reported 53 g, 5.33, 4.36 cm and 81.00 % for EW, EL, EWd and E.S.I in dry cold season and similarly, Kulukyimaz *et al.* (2000) and Alsobayel *et al.* (2010) recorded significant different between season on body weight and egg quality traits in layers. This indicates that season had a significant effect on body weight and egg quality traits of layer chickens. The differences observed in this study and other study could be due to genotype or strains differences, environmental factors and nutrition.

CONCLUSION

There was genotypes variation on body weight and egg weight which indicated the differences between the Marshall and Abor Acre broiler breeder stocks. Age and season had significant effect on body weight and some egg quality traits which indicate differences in selection of genotypes between age and season within the genotypes.

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