CONTRIBUTORY EFFECT OF POST BROODING AGE ON GROWTH PARAMETERS OF ABOR ACRE BROILER CHICKEN

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ABSTRACT
Growths in broiler are mostly in two phases of starter and finisher. The most profound developmental changes, both qualitative and quantitative, occur at starter phase which are sometimes relatively short when compared with the finisher phase. Knowing the contributory effect of the finisher phase on growth will guide farmers to optimized profitability. The study analyzed the growth performance and the correlation between weight and age of abor acre commercial broiler strains, post brooding. A total of one hundred and fifty day old chicks were used for the study. The chicks were fed commercial starter mash between day one and 28 days and then changed to finisher crumble for the period of the study. The initial weight of the birds were taken individually at day 28 and were subsequently weighed at 5 days interval for the duration of the study. All data collected were analyzed using the general linear model procedure of SAS (1999) to estimate the heritability, repeatability and the correlation coefficient. The result of the study showed that percentage weight gain increased at a reducing rate as age increases. The standard deviation (SD) for the mean weight ranged between 25.17 and 35.54, showing little genetic by environmental variations between the individual body weight records and the overall mean. The coefficient of variation (CV) were low and ranged between 1.34 and 3.07. The values were relatively similar, suggesting a more precise estimate of the body weight. The study also recorded an average total weight gain of 1115.51g in body weight for the duration of the study which translated to 55.78g average body weight on daily basis and 5.00% in growth and development. The repeatability and heritability estimates obtained in this study were between 0.62 and 0.77, and 0.27 and 0.50 respectively. This was suggestive of reduced impact of environment as the bird increases in age. The correlations between the ages were positive, high and shows significance ($P<0.05$) as the bird increases in age with phenotypic correlation coefficient ranging between 0.63 and 0.92, the genetic correlation coefficient ranged between 0.51 and 0.89 while the environmental correlation ranged between 0.88 and 0.99. The study therefore concludes that environmental variation fades off as the bird advances in age and as age increases the weight was increasing at a reducing manner.

Keywords
Arbor Acre, Broiler Chicken, Post Brooding Age, Growth Parameters

INTRODUCTION

Growth involves increase in size and changes in functional capabilities of the various tissues and organs of animals (Ojedapo et al.,2012) and has consistently been the prime selection trait since the 1950s, with more recent emphasis placed on meat yield, liveability and feed use efficiency (Muir and Aggrey, 2003; Laughlin, 2007; Renema et al., 2007). Growth in farm animals is however, very complex and not a straight forward affair as it entails different phenomenal of increase in increasing rate or increase at a decreasing rate. The performance of broiler birds is determined by its genotype and environmental factors (Boukwamp et al.1973; Edward and Denman, 1975). This is because there are combinations of factors which may favour or disfavour it.

One of such factors is age and its interrelationship between genotype and the environment. Leeson and Summer (1980) reported that the slaughter value of birds changes depending on their age. Age and weight are two factors that are directly proportional to one another, all things being equal. Age, together with species and environmental conditions, belongs to the key factors affecting the growth rate of birds. Furthermore, age has a significant effect also on developmental processes, while the most profound changes, both qualitative and quantitative, occur at early life stages which are relatively short (compared with the lifespan) and characterized by rapid growth (Daria, 2017).

Heritability estimate for body weight at different ages can be used for evaluation of genetic variability and also to examine if there exist a considerable direct additive genetic effects in the expression of body composition traits (Gaya et al., 2006). Repeatability estimate on the other hand is a good static value showing level of assurance and a measure of the tendency for an animal to repeat the present performance in future (Fayeye, 2014). It is the average proportion of differences in the present records that is likely to be repeated in later records. It is important in prediction of breeding values from multiple records on the same animals as well as being very important in making culling decisions: The magnitude of a repeatability estimate gives an indication of the extent to which selection applied at any stage will affect subsequent flock performance (Ibe, 1995). The correlation between body weights at different ages can be used as a direct selection for body weight which could produce indirect genetic gain for some body weight parameters. The study aimed to analyze the growth performance and the correlations between weights at different ages using commercial strains of broiler chicken.

MATERIALS AND METHODS

Experimental site

The research was carried out at the poultry unit of Agricultural Technology Department Farm of Akanu Ibiam Federal Polytechnic Unwana, Ebonyi Nigeria. The farm lies on the latitude within the equatorial climate belt of Nigeria. Unwana has one vegetation belt which is the freshwater swamp. It has a high temperature of between 27^{o} and 38^{o}c. Rainfall is high and maximum during june/july and September/October with a short august break. Humidity, due to its nearness to the river is moderate. It is located at latitude 5.7833^{o} and longitude 7.9333^{o}.

Animal Management and Housing

A total of one hundred and fifty day old commercial broiler chicks (abor acres) were purchased from a reputable hatchery in Ibadan Nigeria and transported to Akanu Ibiam Federal Polytechnic Unwana Demonstration and Research Farm where the study was carried out. The brooder house and its environment including the feeders and drinkers were cleaned with detergent and disinfectant, a week prior to the arrival of the birds. Electric bulb (100 watts) and charcoal stove were used as a source of heat for the brooding period which lasted for 14 days. The chicks were fed *ad-libitum*with commercial starter mash for 27 days and later changed to commercial finisher crumble for the period during which the study lasted. Clean drinking water was given freely. Other routine health and management protocol were carried out.

Data Collection and Analysis

The data collection started when the birds were 4 weeks old. Individual weights of the birds were taken at 5 days interval for 20 days. The repeatability was estimated according to Becker (1984) while the heritability was estimated in a broad sense. Pearson's correlation method was used

for the coefficient of correlation among body weight. All data collected were subjected to Analysis of variance (ANOVA) of completely randomized design of SAS package (2002). The means separation was carried out using Duncan Multiple Range Test (Duncan, 1955). All statement of significance were based on 5% significance level. The following model was used for the effect of age on body weight;

$Y_{ik} = \mu + A_i + e_{ij}$

Where Y_{ik} = i^{th} observation at j^{th} age

μ= overall mean

A_i = fixed effect of i^{th} age (j=4, 28, 38, 43, 48)

e_{ij} = random error

RESULTS AND DISCUSSION

The descriptive statistics for body weight of broiler chickens at different ages are as presented in Table 1. The result showed that the birds increased in body weight as they advance in age with D28, D33, D38, D43 and D48 having a mean weight of 850.33 1145.27g, 1234.77g, 1553.48g and 1965.84g respectively. The percentage weight increase was highest in D33 (25%), similar for both D43 and D48 while it was lowest in D38 (7%). The lowest weight increase of 7% recorded in D38 may be attributed to the effect of environmental adjustment as a result of post brooding effect.. The growth rates of the bird in this study vary with age as also reported by Daria (2017).

The standard deviation (SD) was low for the body weight, however, highest value of 35.54 was obtained in D33 while D43 recorded the lowest value of 25.17 giving a variation of 10.37. The relatively low SD obtained in this study showed that little genetic by environmental variation exists between individual body weight records of the birds with respect to the overall mean. In the same vein, the coefficient of variation (CV) was low with D33 recording the highest CV of 3.07, followed by D28 (2.21) while the lowest value was recorded in D48 (1.34). The similarity in CV value obtained for all ages suggest a more precise estimate of the body weight. The highest variation between the minimum and maximum body weight recorded during the study was obtained in D48 (136) while the lowest variation was obtained in D43 (29.5).

Table 1. Descriptive statistics for body weight of broiler chickens at different ages

Days	Mean ±SE	SD	CV	Min wt (g)	Max wt (g)
D28	850.33 ±0.99	19.22	2.21	710.5	870.88
D33	1145.27 ±1.01	35.54	3.07	1115.0	1179.0
D38	1234.77 ±1.23	26.78	2.19	1217.5	1268.0
D43	1553.48 ±0.96	25.17	1.67	1634.5	1664.0
D48	1965.84 ±1.11	26.00	1.34	1942.0	2078.0

±SE = Standard error; SD = Standard deviation; CV = Coefficient of variation; wt = weight

Table 2 presented the body weight performance of broiler chickens over a period of 20 days. The birds started with an average initial weight of 850.33g at 28 day and achieve an average 48 day final weight of 1965.84g. For the period of the study, the chickens were able to gain a total average of 1115.51g in body weight which translated to 55.78g of average body weight on daily basis representing 5.00% in growth and development.

Table 2. Mean weight performance of broiler chickens

Parameters	Average values
Average Initial weight (g/bird)	850.33
Average Final weight (g/bird)	1965.84
Average Weight gain (g/bird)	1115.51
Average Daily weight gain (ADWG) (g/bird)	55.7
Percentage DWG (%)	5.00

Table 3 showed the repeatability of body weight for broiler chickens at different ages. The result of the study showed an increase in the repeatability and heritability value as the age of the bird increases. The repeatability estimates obtained suggests the likelihood of the birds repeating their performance. The heritability estimates increased as the birds advance in age, which revealed the reducing effect of the environment on the phenotypic expression. Laughlin (2007) and Groeneveld et al. (2010) also reported that body weight is highly heritable and easy to measure.

Table 3. Repeatability and heritability of body weight for broiler chickens at different ages

Age (day)	Repeatability	Heritability
D28	0.62 ±0.17	0.27 ±0.08
D33	0.65 ±0.22	0.27 ±0.09
D38	0.70 ±0.27	0.38 ±0.07
D43	0.69 ±0.15	0.44 ±0.12
D48	0.77 ±0.44	0.50 ±0.11

The phenotypic, genotypic and environmental correlation coefficient for body weights of broiler chickens at different ages are presented in Table 4. The correlations were significantly positive and high as the bird increases in age. The highest phenotypic correlation coefficient of 0.92 was obtained between D43 and D48 while the lowest phenotypic correlation was obtained between D33 and D38 (0.63) and relatively close the value of 0.64 obtained in D38 and D43. The genotypic correlation on the other hand ranged between 0.51 and 0.89. The correlation between D43 and D48 (0.89) was the highest. The lowest genetic correlation of 0.51 was obtained between D38 and D33. The environmental correlations were significantly different from one another and ranged between 0.88 and 0.99.

Table 4. Phenotypic, genotypic and environmental correlation coefficient for body weights at different ages

Day	D28	D33	D38	D43	D48
D28					
D33	0.55		0.51*(0.89*)	0.69*(0.91*)	0.72*(0.99*)
D38	0.59	0.63*		0.78*(0.89*)	0.62*(0.95*)
D43	0.69	0.77*	0.64*		0.89*(0.97*)
D48	0.71	0.89*	0.81*	0.92*	

Phenotypic correlation is lower diagonal to the right,
Genotypic correlation is above diagonal to the left,
Environmental correlation is in bracket above diagonal to the left.
**Significantly different at $p<0.05$*

CONCLUSION

The result of the study concludes that arbor acre chickens were not significantly affected by the environment judging from the values obtained for heritability and repeatability estimates. The result further showed that the age of the birds is key to growth performance as they are significantly correlated and if birds are well managed there would not be so much weight difference between the birds.

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