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308 Lasani Town, Sargodha Road, Faisalabad - Pakistan
Mob: +92 300 3008585, Fax: +92 41 8815544
E-mail: editorijps@gmail.com

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Evaluation of Growth Traits and Short-Term Laying Performance of Three Different Strains of Chicken in the Derived Savannah Zone of Nigeria

L.O. Ojedapo*, O. Akinokun, T.A. Adedeji, T.B. Olayeni, S.A. Ameen, A.O. Ige and S.R. Amao
Department of Animal Production and Health, Ladoke Akintola University of Technology,
P.M.B. 4000, Ogbomoso, Oyo State, Nigeria

Abstract: Growth evaluation and short-term egg laying performance of 360 commercial layers of three different strains, Brown shaver (BRS), Nera black (NB) and Black shaver (BLS) were studied at day old, 4, 8, 12, 16 and 20 weeks. Parameters measured were bodyweight, body length, breast girth and keel length. Body weight and other body dimensions were significantly ($P<0.05$) influenced by strain of chickens. Nera black layers consistently had the highest body parameters at all ages. Generally, body parameters increased with increasing age of the birds. The correlation coefficients amongst the body parameters revealed positively high and significant ($P<0.05$) relationship. Traits considered for egg laying performance were egg number and egg weight. Strains significantly ($P<0.05$) affected mean egg number and egg weight at weeks 4, 7 and 8; and 12, 13 and 15 respectively. BRS laid more eggs per bird than other genotypes, followed by NB and BLS, the least. Egg weight was highest in BRS, NB and BLS in that order. Estimates of correlation coefficient showed that the traits being considered are mostly positive but with low correlation of egg number to egg weight for BRS and BLS. Phenotypic correlations of egg traits were found to be negative between egg number and egg weights in NB.

Key words: Strains, shaver, derived savannah, short-term, Nera

Introduction

The need to produce more animal protein in the country has become increasingly urgent in view of the ever rising population. The human population in Nigeria is projected to grow at an annual rate of 2-5% to the year 2025 (Adebambo, 1999). Population growth has surpassed food production and at the moment it is estimated that about one quarter of the population are already facing chronic food insecurity. Poultry meat and eggs have been recommended among the livestock to bridge this protein gap, because of short generation interval, high rate of productivity, quick turnover rate, higher feed efficiency and low labour and land requirement.

Adequate information on growth potentials of existing commercial layers in the country is essential to poultry farmers so as to guide or assist in the choice of stock. However, because these commercial layers vary in production indices, it is therefore imperative to assess them as a measure of their performance in the environment (Piper and Latter, 1974). Wiener (1994) also reported that most production traits tend to differ among animals of the same breed or strain. One of the measures being employed is the growth rate. Siegel and Duninngton (1987) reported differences in the pattern of growth among various strains of chicken studied.

Most commercial laying birds are bred in developed countries of Europe and America by International breeding companies and supplied to enfranchised companies locally from whom many farmers purchase their chicks (Oluyemi, 1978). However, genotype X environment interaction continues to lower performance of these birds as against what obtained abroad. Egg number and egg weight are important performance indices in the economies of poultry production and play a significant role in determining the net final income of egg producers (Kolstad, 1979). These two traits are heritable and vary with strain of birds (Akinokun and Dettmers, 1977). The aim of this research was therefore to evaluate the growth traits and short-term laying performance of three different strains of chicken in the derived savannah environment.

Materials and Methods

The research was carried out at the poultry unit, Teaching and Research farm of the Ladoke Akintola University of Technology, Ogbomoso. Oyo state, Nigeria. Ogbomoso lies on longitude $4^{o}15^{1}$ East of the Greenwich Meridian and latitude $8^{o}15^{1}$ North-East of the equator. It is about 145 kilometers North- Eastwards from Ibadan the capital of Oyo state. The altitude is between 300 and 600 meters above sea level. The mean annual temperature is about $27^{o}C$ (Oguntoyinbo, 1978) while that of rainfall is 1247mm. The vegetation of the study area is derived savannah. A total of 360 day-old chick birds comprising 120 birds per strain of Brown shaver (BRS), Nera black (NB) and Black shaver (BLS). They were brooded using the procedure as described by (Oluyemi and Robert, 2000). Commercial chick starter

Table 1: Least Square Means and Standard Error for Body Weights and Body Linear Measurements at Different Ages as Affected by Strains

Age	Strain	No Obs	Body weight (g)	Body length (cm)	Breast girth (cm)	Keel length (cm)
Day-old	Nera Black	120	30.31±0.88[a]	5.02±0.07	4.62± 0.03	1.29±0.02
	Brown shaver	120	27.80±0.03[b]	4.83±0.03	4.52±0.02	1.23±0.02
	Black shaver	120	29.63±0.32[b]	4.98±0.03	4.57±1.01	1.26±0.01
4 weeks	Nera Black	120	156.82±6.85[a]	8.85±0.15[a]	7.78±0.00[a]	3.47±0.11[a]
old	Brown shaver	120	133.61±3.04[b]	8.08±0.08[c]	7.00±0.05[c]	3.04±0.66[c]
	Black shaver	120	147.79±30.6[b]	8.42±0.20[b]	7.49±0.28[a]	3.25±0.10[b]
8 weeks	Nera Black	120	376.21±24.7[a]	12.53±0.23[a]	11.07±0.28[a]	5.28±0.26[a]
old	Brown shaver	120	310.80±16.35[c]	11.19±0.10[b]	10.05±0.04[b]	4.80±0.20[c]
	Black shaver	120	356.16±27.10[b]	11.37±0.06[b]	10.44±0.11[b]	5.03±0.11[b]
12 weeks	Nera Black	120	5954.32±20.41[a]	15.55±0.25[a]	14.25±0.26[a]	7.24±0.29
old	Brown shaver	120	518.98± 4.17[c]	14.11±0.12[c]	12.80±0.08[c]	6.72±0.22
	Black shaver	120	586.74±17.65[b]	14.74±0.07[b]	13.22±0.85[b]	7.09±0.16
16 weeks	Nera Black	120	808.10±13.89[b]	17.83±0.27[b]	16.68±0.14[b]	8.93±0.11[b]
old	Brown shaver	120	752.61±27.90[c]	17.20±0.23[c]	16.05±0.18[c]	8.69±0.12[c]
	Black shaver	120	1245.00±27.59[a]	20.32±0.18[a]	18.49±0.14[a]	11.31±0.12[a]
20 weeks	Nera Black	120	1237.74±2.71[a]	22.04±0.23[a]	20.43±0.14[a]	11.12±0.12
old	Brown shaver	120	978.30±2.57[b]	20.92±0.29[c]	19.38±0.18[c]	10.69±0.13
	Black shaver	120	983.49±4.27[b]	21.33±0.18[b]	20.02±0.26[b]	11.09±0.12

Means in the same column with different superscripts are significantly (P<0.05)

Table 2: Estimates of correlation for body weight and body dimension at day old and 4 weeks of age

	BDW	BDL	BG	KL
BDW		0.87**	0.85**	0.88**
BDL	0.91**		0.98**	0.99**
BG	0.31**	0.75**		0.98**
KL	0.99**	0.84**	0.16**	

Upper diagonal represent correlation estimates at 4 weeks
Lower diagonal represent correlation estimates at day old

Table 3: Estimates of correlation for body weight and body dimension at 8 and 12 weeks of age

	BDW	BDL	BG	KL
BDW		0.95**	0.97**	0.99**
BDL	0.91**		0.97**	0.94**
BG	0.95**	0.99**		0.96**
KL	0.98**	0.96**	0.99**	

Upper diagonal represent correlation estimates at 12 weeks
Lower diagonal represent correlation estimates at 8 weeks

Table 4: Estimates of correlation between for body weight and body dimension at 16 and 20 weeks of age

	BDW	BDL	BG	KL
BDW		0.96**	0.98**	0.97**
BDL	0.98**		0.98**	0.95**
BG	0.99**	0.99**		0.95**
KL	0.97**	0.99**	0.98**	

Upper diagonal represent correlation estimates at 20 weeks
Lower diagonal represent correlation estimates at 16 weeks
BDW = body weight, BDL = body length, BG = breast girth and KL = keel length.

containing 23% crude protein and 3000 kcalME/kg and grower mash containing 16% crude protein and 3000 kcalME/kg were fed and water was supplied *ad-libitum*. Data on body weight, body length, keel length and breast girths were collected at day old, 4, 8, 12, 16 and 20 weeks of age. Body weight was measured using a weighing scale: body length, keel length and breast girth were measured with the use of Tailor's tape rule in cm. These birds were later transferred to battery cages at 21st week of age and egg laying performance were studied. Commercial layers mash of 16% crude protein and 2700kcalME/kg fed. Feed and water were supplied *ad-libitum*. Birds were also vaccinated as at when due. Records of egg number and egg weight were taken and recorded on weekly basis when the birds were between 9 and 23 weeks in lay. Data were subjected to analysis using the following models

$Y_{ij} = \mu + \beta_i + A + e_{ij}$ ---------- Model 1
$Y_{ij} = \mu + \beta_i + e_{ij}$ ---------- Model 2
Where;
Y_{ij} is the observation of the individual bird.
μ is the overall mean
β_i is the fixed effect of strain (i=1, --------3)
e_{ij} is the uncontrolled environmental and genetic deviation attributable to individuals within each strain, assumed to be normally and independently distributed (-NID) with zero mean and variance δ^2_e
A is the age in weeks as a covariate.
Model I was used for growth traits evaluation and subjected to one-way analysis of variance while Model 2 was used for egg number and egg weight and was also subjected to one-way analysis of variance using the general linear model of SAS (1990).
Correlation analysis for the growth traits, egg number and egg weight was done with pearson moment correlation of SAS (1990) and means were separated using Duncan Multiple Range Test Procedure (Gomez and Gomez, 1984)

Results and Discussion

The result revealed that strain differed significantly ($p < 0.05$) in body weight and other body dimensions at all ages (Table 1) Nera black had the highest body weight,

Table 5: Weekly means of egg weight (g) of three different laying chickens

Age	No of	Overall	Genotype	---------- Egg wt /bird ----------	
(week)	Birds	Mean	BRS	N B	BLS
1	120	16.89±1.00	17.80 ± 0.78	17.40± 1.21	15.48± 1.01
2	120	17.11±1.13	17.44 ± 1.25	17.48 ± 1.19	16.40 ± 0.94
3	120	19.11±1.53	20.44 ± 2.05	18.92 ± 1.58	17.96 ± 0.95
4	120	18.68±1.39	19.64 ± 1.96	18.56 ± 1.24	17.84 ± 0.97
5	120	18.81±1.34	20.04 ± 1.89	18.12 ± 1.19	18.28 ± 0.95
6	120	17.43±1.35	19.52 ± 1.80	17.16 ± 1.15	15.60 ± 1.11
7	120	16.79±1.21	18.44 ± 1.79	15.40 ± 0.91	16.52 ± 1.03
8	120	18.24±0.81	15.84 ± 1.30	13.16 ± 0.80	15.72 ± 0.82
9	120	15.32±1.04	16.28 ± 1.32	15.16 ± 0.99	15.12 ± 0.80
10	120	14.92±0.95	14.84 ± 1.04	15.60 ± 0.97	14.32 ± 0.84
11	120	15.08±0.90	15.52 ± 1.06	15.20± 0.83	14.52 ± 0.82
12	120	16.13±0.91	16.36 ± 0.84^{ab}	16.48 ± 1.01^{a}	15.56 ± 0.89^{c}
13	120	17.40±1.29	18.04 ± 1.68^{a}	17.24 ± 1.07^{b}	16.92 ± 1.13^{c}
14	120	18.08±1.32	18.08 ± 1.67	19.04 ± 1.17	17.12 ± 1.13
15	120	18.95±1.27	20.20 ± 1.59^{a}	19.72 ± 1.21^{ab}	16.92 ± 1.01^{b}

Means along the same row having different superscripts are significantly (P<0.05) different

Table 6: Weekly Means of egg number of three different laying chickens

Age	No of	Overall	Genotype	---------- Egg No/bird ----------	
(week)	Birds	Mean	BRS	N B	BLS
1	120	51.64 ± 1.18	56.90 ± 1.82	54.35 ± 0.91	53.68 ± 0.82
2	120	55.36 ± 0.79	54.38 ± 0.79	56.47 ± 0.84	55.22 ± 0.74
3	120	56.24 ± 0.94	56.39 ± 0.74	55.94 ± 1.20	56.38 ± 0.88
4	120	56.52 ± 0.92	53.83 ± 0.87^{c}	56.52 ± 1.03^{b}	59.21 ± 0.87^{a}
5	120	57.17 ± 0.70	57.74 ± 0.68	56.38 ± 0.81	57.39 ± 0.62
6	120	56.78 ± 0.89	56.97 ± 0.82	57.73 ± 0.96	55.58 ± 0.89
7	120	57.34 ± 0.72	57.58 ± 0.66^{ab}	55.60 ± 0.70^{b}	58.85 ± 0.80^{a}
8	120	57.70 ± 0.85	59.26 ± 0.77^{a}	55.93 ± 1.01^{b}	57.91 ± 0.76^{ab}
9	120	56.89 ± 1.03	57.53 ± 0.98	57.52 ± 1.26	55.62 ± 0.84
10	120	56.56 ± 0.94	57.03 ± 0.95	56.68 ± 0.95	55.98 ± 0.91
11	120	56.03 ± 0.72	56.90 ± 0.55	55.29 ± 0.88	55.91 ± 0.73
12	120	56.98 ± 0.80	57.07 ± 0.84	56.46 ± 0.79	57.40 ± 0.78
13	120	59.45 ± 0.69	59.72 ± 0. 41	59.58 ± 0.95	59.06 ± 0.70
14	120	57.35 ± 0.86	57.28 ± 1.00	58.51 ± 0.77	56.26 ± 0.82
15	120	57.69 ± 0.86	57.15 ± 0.78	58.50 ± 1.12	57.42 ± 0.68

Means along the same row having different superscripts are significantly (P<0.05) different

body length, breast girth and keel length amongst the strains values of 1237.74 gm, 22.04 cm, 20.47 cm and 11.12 cm. However, Brown and Black shavers did not differ significantly (P>0.05) in body weight and keel length. Generally, all the body parameters increased with age of the birds in each strain. This result compares with the findings of Crawford (1990), Hossain and Ahmed (1993). Ebangi and Ibe (1994) and Giordani *et al.* (1992). They all reported differences in growth rate of chickens as a result of genotype and age. The relationship that exists between Black and Brown shavers suggest that they are having common ancestors. Similarly, increase in all body measurements of each strain as growth advances in this study is in line with report of Pingel *et al.* (1990) that age is a major determinant of growth and physiological development. Omeje and Nwosu (1986) opined that these relationships could be utilized in the genetic improvement of growth through selection.

The correlation estimates (Table 2, 3 and 4) between body weight and other body measurement was high, positive and significant (P<0.05) at all ages. This agrees with the findings of Ezzeldin *et al.* (1994). They reported medium to high phenotypic correlation coefficients in body weight and other body measurements in pure breed.

The means of egg number and egg weight of three commercial layer strains at different laying phases are presented in Table 5 and 6 respectively. There were significant (P<0.05) differences in the egg number at weeks 12, 13 and 15 and egg weight at weeks 4, 7 and 8. Egg weight was highest in BRS (59.26g) intermediate in BLS (59.21g) and lowest in NB (55.60g). BRS (20.20) laid more eggs per bird than other genotypes followed by NB (19.72) and the BLS (16.92), the least. This is consistent with previous reports (Bateman *et al.*, 2002a, 2002b and 2003). Also, as observed in this study, the consistent increase in egg weights at different laying phase agreed with the observations of Ketelaere *et al.* (2002) that egg weight in chicken increases with increase in age of laying birds.

The estimate of correlation coefficient as shown in Table

Table 7: Pearson Correlation Coefficient of egg number and Egg weight of three commercial laying strains

	Genotype/Egg Number		
	BRS	NB	BLS
Egg weight	0.031	- 0.011	0.059

7 revealed that positively low correlations existed between egg number and egg weight for BRS and BLS. These positive correlations agreed with results reported by literature by other workers (Akinokun and Dettmers, 1977a,b; El-Hossari, 1978; Oluyemi, 1978; Omeje, 1983; Omeje and Nwosu, 1986; Oni *et al.*, 1991). Meanwhile, phenotypic correlations of egg traits were found to be negative between egg number and egg weights in NB. These agreed with those of other workers (Muir and Patterson, 1990; Abdallah *et al.*, 1993).

Conclusion: It could be concluded that growth increase with age in all strains for all the parameters measured and there were consistency in egg number and egg weight in all the strains. Selection for strains of birds for the traits studied is difficult at the tender age of this laying period.

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