FUDMA Journal of Sciences (FJS)
ISSN Online: 2616-1370
ISSN Print: 2645-2944
Vol. 2 No.3, September, 2018, pp 256 - 259

COMPARISON OF EGG QUALITY TRAITS OF PEARL AND BELGY STRAINS OF GUINEA FOWLS IN NORTHERN GUINEA SAVANNA ZONE OF NIGERIA.

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ABSTRACT
Total of 60 (30 each) of two distinct strains of adult guinea fowls (Pearl and Belgy) comprising of 6 males and 24 females for each strain were used to compare and assess the egg quality of two guinea fowl strains. The external egg quality traits measured were egg weight, egg length, egg width, shell weight, shell thickness and egg shape index while the internal egg quality traits measured were yolk weight, yolk height, yolk diameter, yolk index albumen weight, albumen height, albumen diameter and albumen index. Data obtained were analyzed using General Linear Model Procedure of SAS. Means within the traits were compared using Duncan's Multiple Range Test. Belgy strain had higher values for external egg quality traits for egg weight, egg length, egg width, shell weight and egg shape index were found respectively as 57.38±0.71g, 52.20±0.04mm, 40.10±0.04mm, 6.41±0.09g and 76.14±0.39% and internal egg quality traits for yolk weight, yolk height, yolk diameter, yolk index albumen weight, albumen height, albumen diameter and albumen index were found as 14.83±0.36g, 1.58±0.03mm, 43.35±1.92%, 35.75±0.61g, 6.50±0.01mm, 6.48±0.07mm and 9.95±0.19% than Pearl strain for all the egg quality traits. The significant difference observed for these traits between Belgy and Pearl suggests at least some degree of genetic variability. Belgy strain should be used in place of Pearl strain for improvement of egg quality of guinea fowl strains.

Keywords: *Guinea fowl, Northern guinea savanna, Egg quality traits, Nigeria*

INTRODUCTION

Egg quality is an important economic index in commercial egg production (Jibir *et al.,* 2010). Egg quality reflects characteristics of egg that determines it acceptability to the consumers (Ojedapo *et al.,* 2013). The external and internal quality traits of eggs had significant effects on the fertility and hatchability of incubated eggs (Kabir and Muhammad, 2011), as well as development of the embryo (Kabir *et al.,* 2007). Several factors that affect egg quality include egg size, age of the bird, genetics, diseases, stress, environmental temperature, nutrition and water quality (Kabir *et al.,* 2014). Apart from environmental factors which have been reported to greatly affect egg quality traits, evidence of genetic influence including breed effect have also been noted (Obike and Azu, 2012).

In poultry, efficiency of production and profitability depends largely on characters like fertility, egg number, hatchability and egg quality traits among others (Balvir *et al*., 2000; Yahaya *et al*., 2009). Wolc and Olori (2009) reported that the dam was the main source of genetic variation in hatchability of fertile eggs, suggesting a huge impact of egg quality traits. These corroborated the report that many characteristics of egg quality have a genetic basis (Stadelman, 1977). This implies that egg quality traits can be improved genetically through knowledge of their genetic variability. Kosum *et al*. (2004) reported that the potential for genetic improvement of traits is largely dependent on the genetic and its correlation among traits of economic importance. This study was therefore aimed at comparing egg quality traits of Pearl and Belgy strains of guinea fowl in Northern Guinea Savanna zone of Nigeria.

MATERIALS AND METHODS

Study area

The experiment was carried out at the Teaching and Research Farm, Department of Animal Science, Ahmadu Bello University, Zaria. The site is geographically situated between latitude 11°12'N and longitudes 7° and 33'E at an attitude of 640m above sea level (Ovimaps, 2016). Annual rainfall in this area ranges from 1102mm to 1904mm per annum which last from late April or early May to October. The mean temperature fluctuates from 31°C maximum during the dry season to 18°C minimum during the wet season. It is located 22km Northeast of Zaria city and in the Northern Guinea Savannah zone of Nigeria (Kabir, 2010).

Management of experimental birds

A total of 60 (30 each) of two distinct strains of Guinea fowl birds (Pearl and Belgy) comprising of 6 males and 24 females each of Pearl and Belgy strains were obtained from Zaria in Kaduna State and Maradi, Niger Republic, respectively for the study that lasted for 16 weeks. Six pens were used for each strain. Each pen housed 1 guinea cock and 4 guinea hens. Twelve cocks were selected, six from each strain and mated to a total of forty eight (48) females. Egg collection started two weeks after adaption period. Each egg collected was labeled according to the pen number.

Data collection

Forty fresh eggs (20 each) from the two strains were collected to evaluate external and internal egg quality traits. The external egg quality traits measured were egg weight, egg length, egg width, shell weight, shell thickness and egg shape index while the internal egg quality traits measured were yolk weight, yolk height, yolk diameter, yolk index, albumen weight, albumen height, albumen diameter and albumen index.

Weight measurements were determined using Mettler top loading digital scale while length and width were measured using a vernier caliper and the shell thickness was measured to the nearest 0.01 mm. Yolk and albumen measurements were determined using standard methods as described by Olawumi and Ogunlade (2009).

Statistical analysis

The effects of external and internal egg quality traits and strain on body linear measurements were estimated using the GLM procedure of SAS (SAS, 2004) as shown in the model below. Means within the traits were compared using Duncan's Multiple Range Test (Duncan, 1955).

$Y_{ij} = \mu + S_i + e_{ii}$

Where,

Y_{ijk} = The record of observation

μ = Population mean

S_j = Effect of the j^{th} strains (Pearl and Belgy)

e_{ijk} = Random error particular to the ijk^{th} observation assumed to be independently randomly distributed with mean zero and variance NIID (0, e).

RESULTS AND DISCUSSION

External and Internal Egg Quality Traits in Pearl and Belgy Strains of Guinea fowl

Mean values for external and internal egg quality traits studied showed significantly ($P<0.01$) different in all the traits examined. The mean value of egg weight and external egg quality traits for Belgy was higher than that for Pearl strain of guinea fowl. The differences observed might be due to variations in strain and environment. This agrees with report of Nowaczewski *et al*. (2008) who reported similar result of egg weight and external egg quality traits for French and for domestic Polish guinea fowls. Table 2, mean value of internal egg quality traits for Belgy strain was higher than that for Pearl strain. Patrick *et al*. (2013) reported mean values for internal egg traits of Pearl grey, lavender, royal purple and white strains of guinea fowl which agrees with the present report for Belgy and Pearl strain. Differences observed for these traits between Belgy and Pearl indicated some degree of genetic variability owing to the fact that the Belgy had a better performance in terms of external and internal egg quality traits. Table 3 and 4 revealed low and high significant ($P<0.01$) correlation between egg weight and egg quality traits in both guinea fowl strains. This results indicated that the heavier the weight of the albumen and the yolk, the higher the egg weight. Selection for egg weight will invariably leads to improvement of yolk weight to improve embryo development (Sezai *et al.* 2013). The findings observed in this study were in agreement with the reports of Obike and Azu (2012) who reported high significant ($P<0.05$) correlations between egg weight and egg quality traits for Pearl and Black strains guinea fowl.

Table 1: Means (±SE) for External Egg Quality Traits in Pearl and Belgy Strains of Guinea fowl

Trait	Belgy	Pearl
EWT (g)	57.38±0.71[a]	44.49±0.71[b]
ELT (mm)	52.20±0.04 [a]	48.50±0.04[b]
EWD (mm)	40.10±0.04 [a]	37.90±0.04[b]
SWT (g)	6.41±0.09 [a]	5.78±0.09[b]
STK (mm)	0.45±0.00	0.46±0.00
ESI (%)	76.14±0.39 [b]	77.40±0.39[a]

EWT = egg weight, ELT = egg length, EWT = egg width, SWT = shell weight, STK = shell thickness, ESI = egg shape index, a,b = figures with different superscripts across the rows are significant different at $P<0.01$.

Table 2: Means (±SE) for Internal Egg Quality Traits in Pearl and Belgy Strains of Guinea fowl

Traits	Belgy	Pearl
YWT (g)	14.83±0.36 [a]	9.68±0.36 [b]
YHT (mm)	1.58±0.03 [a]	1.33±0.03 [b]
YD (mm)	3.66±0.06 [a]	2.89±0.06 [b]
YI (%)	43.35±1.92 [b]	47.61±1.92 [a]
AWT (g)	35.75±0.61 [a]	28.41±0.61 [b]
AHT (mm)	6.50±0.01 [a]	4.70±0.01 [b]
AD (mm)	6.48±0.07 [a]	5.45±0.07 [b]
AI (%)	9.95±0.19 [a]	8.62±0.19 [b]

YWT = yolk weight, YHT = yolk height, YD = yolk diameter, YI = yolk index, AWT = albumen weight, AHT = albumen height, AD = albumen diameter, AI = albumen index, a,b = figures with different superscripts across the rows are significant different at P<0.01.

Table 3: Correlation among Egg Weight and Egg linear Traits for Belgy (below diagonal) and Pearl (above diagonal) Guinea fowl strains

TRAITS	EWT	ELT	EWD	SWT	ESI
EWT		0.23[ns]	0.46*	0.10[ns]	0.30[ns]
ELT	0.68**		0.30[ns]	0.37[ns]	0.04[ns]
EWD	0.63**	0.46*		-0.17[ns]	0.11[ns]
SWT	0.76**	0.48*	0.44[ns]		0.08[ns]
ESI	0.52**	0.05[ns]	0.51*	0.36*	

EWT = egg weight, ELT = egg length, EWD = egg width, SWT = shell weight, ESI = egg shape index, *(P<0.05); **(P<0.01), ns = non-significant.

Table 4: Correlation among Egg Weight and Internal Egg Traits for Belgy (below diagonal) and Pearl (above diagonal) Guinea fowl strains

TRAITS	EWT	YWT	YHT	YD	YI	AWT	AHT	AD	AI
EWT		0.43*	0.43 [ns]	0.15 [ns]	0.34 [ns]	0.49*	0.45*	0.55*	0.26 [ns]
YWT	0.49*		0.42 [ns]	0.66**	0.12[ns]	-0.50*	0.34 [ns]	0.51*	0.16 [ns]
YHT	0.40 [ns]	0.52*		0.29 [ns]	0.69**	0.09 [ns]	0.36 [ns]	0.23 [ns]	0.32 [ns]
YD	0.08 [ns]	0.46*	0.07 [ns]		-0.27[ns]	-0.48*	0.22 [ns]	0.52*	0.03 [ns]
YI	0.31 [ns]	0.08 [ns]	0.62**	-0.69**		0.49*	0.19 [ns]	0.01 [ns]	0.22 [ns]
AWT	0.69**	0.21 [ns]	0.44 [ns]	0.11[ns]	0.17[ns]		0.01 [ns]	-0.04 [ns]	0.04 [ns]
AHT	0.39 [ns]	0.81**	0.39 [ns]	0.45*	0.03[ns]	0.08 [ns]		0.58**	0.92**
AD	0.40 [ns]	0.48*	0.39 [ns]	0.39[ns]	-0.01[ns]	0.51*	0.52*		0.22 [ns]
AI	0.17[ns]	0.60**	0.16 [ns]	0.27[ns]	0.03[ns]	-0.27*	0.77**	-0.13 [ns]	

******P < 0.01, *P < 0.05, ns = non-significant; EWT =egg weight, YWT = yolk weight, YHT = yolk height, YD = yolk diameter, YI = yolk index, AWT = albumen weight, AHT = albumen height, AD = albumen diameter, AI = albumen index.

CONCLUSION AND RECOMMENDATION

Belgy strain had higher values than Pearl strain for all the egg quality traits, except ESI (%) and YI (%). Belgy strain should be used in place of Pearl strain for improvement of egg quality of guinea fowl in Nigeria.

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