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PHENOTYPIC CORRELATIONS AMONG EGG QUALITY TRAITS OF SHIKA BROWN LAYERS FED DIETS SUPPLEMENTED WITH LYSINE IN THE TROPICS

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ABSTRACT

One hundred and sixty-five Shika brown birds at point of lay were used to evaluate the effect of lysine supplementation on egg production, external and internal egg quality characteristics of layers. The experiment, which was in a completely randomized design (CRD), had five treatments each replicated three times. There were 11 layers per replicate. The experimental diet contained 17% Cp and 2608.53 Kcal/Kg layer mash supplemented with 0.1 to 0.4% lysine. The control diet (C+1) had no lysine supplementation. The study lasted for 5 months. Results indicated that supplementation of the layer diet with lysine significantly altered some important components of external and internal egg quality characteristics of the layers but did not influence egg weight. The correlation between yolk height and albumen height and haugh unit and albumen height were significantly positive and high respectively (r=0.613; P < 0.05 and r=0.960; P < 0.01). Egg weight and egg diameter were positively and highly correlated with egg weight (r=0.609; P < 0.05 and r=0.842; P < 0.01). Therefore, it is concluded that it could be of economic important to supplement the diet of early layers with 0.3% lysine and that albumen height, egg height and egg diameter could be good predictor of egg weight and egg protein qualities.

Keywords – Lysine, Layers, Supplementation, Egg Production, Egg Quality

INTRODUCTION

The diet formulation for poultry birds is usually based on nutrient requirement and this is not ideal for the tropical climate conditions of some countries. No new reports on the requirement so far have been described (NRC, 1994) evidencing the need for new information. Feed supply is the basic resources for the animal industry. The levels and balance of amino acids in the diets are all important nutritional variables that affect the economic efficiency of an egg laying enterprise (Al-Saffar and Rose, 2002). Lysine, methionine, methionine plus cysteine and tryptophan are the major amino acids that can be limiting in practical feeds for laying hens (Olomu, 1995). It is observed that the supplementation of the diets with methionine, lysine and/or vitamin C, or combinations of these nutrients, did not affect any of the production parameters considered nor the external and internal egg quality characteristics. Although the egg shape index and shell weight values were within the range reported in literature (Olorede and Longe, 2000), they were numerically lower than that reported by Adeyemo (2000). This may be due to the fact that egg shell thickness and shell weight reduce with increase in egg size (Jackson *et al.*, 1989) and age of hens in lay (Jackson *et al.*, 1989). In addition, genetic and phenotypic correlations among egg quality which can provide information for breeders for genetic improvement of this group of birds are not available. So this study was carried out to evaluate the effect of lysine on egg quality traits and the relationship among the traits.

MATERIALS AND METHODS

Experimental Birds and Management

One hundred and sixty-five Shika brown birds (layers) used were obtained from the layers raised by the Department of Animal Science, Ahmadu University, Zaria from the day old chicks to point of lay. At the commencement of experiment, the birds were weighed in group of 11 and randomly transferred into their

various laying pen in complete randomization. The experiment, which was in a completely randomized design (CRD), had five treatments each replicated three times. There were 11 layers per replicate. The experimental diet contains 17% Cp and 2608.53 Kcal/Kg layer mash supplemented with 0.1 to 0.4% lysine. The control diet (C+1) had no lysine supplementation. The feeders were raised up to the shoulder of the birds to avoid wastage of feed.

Egg quality determination

Egg qualities (characteristics) were determined using different parameters. The parameters were classified into 2 namely external characteristics which include egg weight, egg length, egg diameter, egg shell weight and egg shell thickness and the internal characteristics which include albumen height, albumen width (diameter), albumen weight, yolk width, yolk length and yolk weight. The experiment was carried out within the period of 5 months. Eggs were weighed using an electronic (sensitivity 0.01g) top loading scale. Egg length and diameter were measured with vernier caliper and egg shape index were calculated as egg diameter divided by the length. Egg shell thickness was measured with a micrometer screw gauge. After cutting the eggs open to obtain yolk and albumen, the egg shells were carefully washed with water to remove adhering albumen, dried at room temperature and weighed to obtain egg shell weight. Yolk diameter was determined with a vernier caliper, while yolk and albumen heights were measured using Ames Tripod Thickness measure (Ames S-6428, 0.1mm). Yolk index was calculated as yolk diameter/yolk height while the Haugh unit (pronounced; "How") was calculated from the measured height of thick albumen and weight of egg using the following formula proposed by Raymond (1937). Yolk was separated from albumen with a separating spoon and each weighed with an electronic scale. Data on external and internal qualities of eggs were analyzed using General Linear Model procedure of SAS (2002). Phenotypic correlations were conducted using pearson correlation of SAS (2002) Significant differences among means were separated using Duncan's Multiple Range Test (Duncan, 1955).

RESULTS AND DISCUSSION

In table 1, there was no significant difference between the egg weight, egg height and egg shape index. The egg weight increased slightly at 0.3% level of inclusion of lysine but not significantly different from other (P<0.05). Likewise, the egg weight seems to increase from 0.1% level of inclusion but dropped as from 0.3% upward. Egg shape index was within the range reported by Amaefule *et al.* (2004). There are significant differences in egg diameter, egg shell weight and egg shell thickness although the responses were inconsistent at different levels.

Table 1: External Quality Characteristics of Eggs Laid by Birds Fed Lysine Supplemented Diets

Parameters	T_1 0%	$T_2$0.1%	$T_3$0.2%	T_4 0.3%	T_5 0.4%	SEM	LOS
Egg weight (g)	55.943	57.727	57.613	59.137	57.647	1.016	NS
Egg height (cm)	5.527	5.533	5.560	5.563	5.540	0.055	NS
Egg diameter (cm)	4.257^{b}	4.333^{ab}	4.307^{ab}	4.363^{a}	4.300^{ab}	0.027	*
Egg shape index	0.773	0.787	0.777	0.787	0.777	0.0076	NS
Egg shell weight (g)	5.625^{b}	6.007^{a}	6.010^{a}	5.900^{ab}	5.740^{ab}	0.01028	*
Egg shell thickness (mm)	0.407^{a}	0.413^{a}	0.410^{a}	0.410^{a}	0.397^{ab}	0.0163	*

LOS = Level of significant, NS = No significant,* = Significant

SEM standard error of means, NB – means with the same letter along the rows are not significantly different (P>0.05)

The effects of lysine on albumen height, yolk diameter and yolk weight were statistically significant (P < 0.05). This showed that lysing could be found in the pathways of these egg traits and hence its inclusion in the diet of layers could enrich the internal qualities of eggs. Similar reports could be found in literature

(Amaefule *et al.*, 2004). The no statistical differences were observed in albumen diameter, albumen weight, yolk weight and haugh unit (P > 0.05).

Table 2: Internal Quality Characteristics of Eggs Laid by Birds Fed Lysine Supplemented Diets

Parameters	T_1 0%	T_2 0.1%	T_3 0.2%	T_4 0.3%	T_5 0.4%	SEM	LOS
Albumen height (cm)	0.657^{b}	0.693^{ab}	0.737^{a}	0.690^{ab}	0.747^{a}	0.0199	*
Albumen diameter (cm)	7.443	7.807	7.477	7.800	7.473	0.132	NS
Albumen weight (g)	33.227	34.163	34.327	34.920	34.340	0.704	NS
Yolk height (cm)	1.713	1.713	1.747	1.760	1.7763	0.0147	NS
Yolk diameter (cm)	3.933^{b}	3.997^{ab}	3.987^{ab}	4.077^{a}	4.033^{ab}	0.033	*
Yolk weight (g)	13.963^{b}	14.387^{ab}	14.510^{ab}	14.883^{a}	14.447^{ab}	0.215	*
Yolk index	2.303	2.373	2.290	2.320	2.290	0.041	NS
Haugh unit	81.347^{b}	81.130^{ab}	85.557^{a}	82.480^{ab}	86.253^{a}	1.151*	

LOS = Level of significant, NS = No significant, * = Significant, SEM = Standard error means *=P>0.05, N.B – means with the same letter along the row are not significantly different

In Table 3, egg height and egg weight were positively correlated and correlation is significant (P < 0.05). There was significantly positive correlation (P < 0.01) between egg diameter and egg weight but correlation was not significant between egg diameter and egg height but positive. The correlation between egg shell thickness and shell weight was positive and significant (P < 0.01). This agreed with the report of Jackson *et al.* (1989) who observed that egg shell thickness and shell weight reduce with increase in egg size and also age of hens in lay. The discovery of positive correlation will mean selection for one traits will lead to genetic improvement in the other traits (Jaya *et al.*, 2002).

Table 3: Correlations within the External Characteristics

	EGG-WT	EGG-HT	EGG-DM	EGG-Shp Ind	SHEL-WT	SHEL-THK
EGG-WT						
EGG-HT	0.609*					
EGG-DM	0.842**	0.343				
EGG-Shp Ind	0.145	-0.620*	0.484			
SHELL-WT	0.489	0.054	0.428	0.332		
SHEL-THK	0.121	-0.238	0.093	0.356	0.676**	

Note: EGG-WT = Egg Weight; EGG-HT = Egg Height; EGG-DM = Egg Daimeter; EGG-Shape Ind =Egg shape Index; SHELL-WT = Shell weight; SHEL-THK = Shell Thickness

* Correlation is significant → P<0.05

** Correlation is significant → P<0.01

Table 4 shows the correlation within the internal characteristics. The albumen diameter and albumen height are negatively correlated i.e. when the albumen diameter increases the albumen height reduces. Yolk diameter is positively correlated with albumen height, albumen weight, and albumen height and non-significantly positive while the correlations between yolk weight and albumen weight were significantly positive at 5% (P < 0.05). The correlation between yolk weight and albumen diameter and yolk diameter are significantly positive 1% (P < 0.01). The correlation between the Haugh unit and

albumen height is significantly positive at 1% (P < 0.01). This shows that albumen height as a factor of haugh unit can be used to predict egg protein quality in place of haugh unit. This discoveries mean that selecting yolk weight, albumen diameter, yolk diameter and haugh unit will genetically improve egg proteins (Jaya *et al.*, 2002). It was negatively correlated with the albumen diameter, albumen weight, yolk weight and yolk index and not significant but positive and significantly correlated with yolk height.

Table 4: Correlations within the Internal Characteristics

	ALB-HT	ALB-DM	ALB-WT	YOK-HT	YOK-DM	YOK-WT	YOK-IND	Haugh unit
ALB-HT								
ALB-DM	-0.173							
ALB-WT	-0.151	0.193						
YOK-HT	0.613*	-0.179	-0.170					
YOK-DM	0.191	0.571*	0.219	0.269				
YOK-WT	0.061	0.671**	0.529*	0.193	0.840**			
YOK-IND	-0.316	0.496	0.224	-0.689**	0.440	0.409		
Haugh unit	0.960**	-0.374	-0.211	0.560*	0.067	-0.122	-0.353	

Note: ALB-HT = Albumen height; ALB-DM = Albumen diameter; YOK-HT = Yolk height; YOK-DM = Yolk diameter; YOK-WT = Yolk weight; YOK-IND = Yolk Index

* Correlation is significant → P<0.05

** Correlation is significant → P<0.01

CONCLUSION AND RECOMMENDATION

It is concluded in this study that lysine supplementation altered egg quality traits and there were correlations among egg quality traits. Therefore, it could be of economic important to supplement the diet of early layers with 0.3% lysine and that albumen height, egg height and egg diameter could be good predictor of egg weight and egg protein qualities. And this implies that selection for albumen height, egg height and egg diameter will lead to genetic improvement in egg weight even in the absence of lysine influence.

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