NSAP 47th Annual Conference (JOS 2022) CONFERENCE PROCEEDINGS
THEME: SECURING ANIMAL AGRICULTURE AMIDST GLOBAL CHALLENGES

REPEATABILITY OF EGG QUALITY IN ISA BROWN LAYERS

*Adeoye, A.A, ** Udoh, J.E and ***Akinbowale, F. R
*Animal Production and Health, Olusegun Agagu University of Science and Technology, Okitipupa.
**Animal Science, University of Uyo, Uyo.
***Zoology programme, Olusegun Agagu University of Science and Technology, Okitipupa
Corresponding Email – adeomoh@yahoo.com

Abstract

Repeatability is the likelihood of an individual repeating its performance at any given time in subsequent measurement. It expresses the proportion of the total variance that is due to permanent or non-localized differences between individuals. A total of fifty (50) eggs were collected daily continuously for ten days from fifty (50) selected ISA brown layers in a base population at 31st week of age. The birds were kept at Poultry Unit, Teaching and Research Farm, Olusegun Agagu University of Science and Technology Okitipupa,. Data collected on the egg quality were subjected to one-way Analysis of Variance (ANOVA) with the Computer aided Software, Statistical Analysis System (SAS, version 8), to estimate the repeatability of egg quality traits. Low to high estimates (0.11 to 0.81) were reported for most of the traits while 0.23, 0.11 and 0.12 were reported for egg weight, yolk weight and albumen height, respectively. The low estimates are indicative of strong environmental influence on the traits while the traits with high repeatability estimates require few record to effect selection for genetic improvement.

Keywords: ISA brown layers, Repeatability, egg weight, yolk weight, albumen height

Introduction

In Nigeria, different poultry species contribute significantly to the annual animal protein supply to the populace (Ikeobi *et al.,* 1999). Poultry eggs are a good source of income and particularly significance in vaccine production (Adebambo, 2005). The egg is a complex structure distinguished by having four different parts; the egg shell, shell membrane, albumen and yolk. When eggs are for human consumption, it is important that they are suitable for this purpose (Kabir *et al.,* 2014). This will be determined by both the internal and external quality of the egg (Smith, 1990). External quality is focused on egg shell cleanliness and thickness, egg weight, height, width and shape whereas internal quality refers to albumen cleanliness and viscosity, yolk quality and absence of blood spots (Kabir *et al.,* 2014). Unlike external (shell) quality, internal quality of the egg begins to decline as soon as the egg is laid.

To fully characterize an avian and other animal species, reliable estimates of their genetic parameters are required. Apart from heritability and genetic correlations among traits, repeatability is another useful genetic parameter, providing a tool for quantifying the transmitting ability of a stock and its ability to maintain its performance and ranking within a test group on subsequent performance. (Udeh, 2010). This transmitting ability according to Ibe (1984) arises from inherent and other permanent influences causing observable differences among the individuals. Generally, the magnitude of a repeatability estimate gives indication of the extent to which selection practiced at any stage would affect subsequent flock performance (Buss,1982). A number of egg quality traits are known to be moderately to highly heritable and repeatable (Kotaiah *et al* 1976) and consequently, they tend to lend themselves to improvement through selection Ibe (1984). However, a number of investigators have reported low repeatability values for egg production and egg quality traits in different strains of chicken (Chineke 2001).The objective of this study is to determine the repeatability and phenotypic correlation of egg quality traits in ISA brown eggs.

Materials and methods

The experiment was carried out at Poultry Unit, Teaching and Research Farm and Analytical Laboratory of Olusegun Agagu University of Science and Technology, Okitipupa. Okitipupa lies between latitude $6^0$25 and $6^0$46 N and Longitude $4^0$35 and $4^0$50 E within the tropical rainforest zone of Nigeria. Eggs were collected from fifty (50) selected ISA brown breed of layer at 31stweeks of age continuously for ten (10) days. The birds were fed with commercial layers' mash and water supplied throughout the experimental period. Eggs collection was done early in the morning and internal and external quality of the eggs were analyzed within 24 hours of collection as reported by Adeoye, *et al* (2020).

The estimator of repeatability (R) was obtained as follows:

$$R = \frac{\sigma_i^2}{\sigma_i^2 + \sigma_e^2}$$

Where R = repeatability estimate

σ_i^2 = individual variance component

$\sigma_i^2 + \sigma_e^2$ = total phenotypic variance

The standard error of each estimate was calculated using the formula:

S. E (r)

$$= \frac{\sqrt{2(1-r)2[1+(k-1)r]2}}{K(k=1)(n-1)}$$

Where r = repeatability estimate
K = number of eggs per bird
n = number of birds involved.

Results

The summary statistics of the egg quality traits is shown in Table 1. The egg weight ranged between 50-72g while the average egg length was 5.59mm. The haugh unit ranged between 62 and 98, with average of 81.98%. The repeatability estimates for the egg quality is shown in Table 2. The estimates for egg weight, egg length, egg width and shell weight were 0.23 ± 0.065, 0.42 ± 0.18, 0.65 ± 0.071 and 0.59 ± 0.033, respectively while 0.86 ± 0.108, 0.11± 0.072, 0.54± 0.034, 0.43 ± 0.088, 0.12 ± 0.072 and 0.81 ± 0.117 were repeatability estimates for Shell thickness, Yolk weight, Yolk diameter, Yolk height, Albumen height and Haugh unit, respectively.

Table 1: The summery statistics

VARIABLES	MEAN	MINIMUM	MAXIMUM	CV
Egg weight	60. 09	50.00	72.000	7.605
Egg Length	5.59	5.140	6.050	3.827
Egg width	4.41	4.060	4.740	2.857
Shell weight	7.73	5.000	9.000	11.169

Shell thickness	0.732	0.210	0.990	23.930
Yolk height	15.50	15.020	15.980	1.742
Yolk weight	14.66	12.000	17.000	9.458
Albumen height	6.66	5.160	8.200	9.610
Haugh unit	81.98	61.820	98.050	10.739
Yolk diameter	40.12	37.000	43.00	3.838

Table 2: Repeatability estimates of egg quality traits

Traits	Repeatability
Egg weight	0.23 ± 0.065
Egg length	0.42 ± 0.18
Egg width	0.65 ± 0.071
Shell weight	0.59 ± 0.033
Shell thickness	0.86 ± 0.108
Yolk weight	0.11± 0.072
Yolk diameter	0.54± 0.034
Yolk height	0.43 ± 0.088
Albumen height	0.12 ± 0.072
Haugh unit	0.81 ± 0.117

Discussion

The egg weight observed in this study (60.09g) was higher than 56.82g 0bserved by Adeoye *et al.*, (2020) for the same breed meanwhile the values for egg length (5.59mm) and egg width (4.41mm) observed in the present study were lower than the report of Adeoye *et al* (2020). The reason for this discrepancies might be attributed to the age of the laying chicken. The average haugh unit, shell weight, shell thickness, albumen height, yolk height obtained in the present study were lower than those reported by Chatterjee *et al* (2007). However, the average yolk weight reported in this study was higher than those reported by Salahudin and Miah (2003). The differences in the result can be attributed to genetic differences and non-genetic factors.

The repeatability estimates for egg length (0.42), egg width (0.65), shell weight (0.59), yolk diameter (0.54), yolk height (0.43) were high and generally agreed with reports in literature. Goto *et al* (2015) recorded values at 0.42 for egg length, and 0.50 for yolk diameter, Blanco *et al* (2014) obtained 0.64 for egg width and Udeh, (2010) reported 0.59 and 0.54 for shell weight and yolk diameter respectively. However, low estimates of 0.23, 0.11 and 0.12 were recorded for egg weight, yolk weight and albumen height respectively. The low estimates could be attributed to environmental influence and age related factors, among other factors. Repeatability estimate for Haugh unit is similar to that reported by Godfrey et al. (1954). The low estimates are indicative of strong environmental influence on the traits while the traits with high repeatability estimates require few record to effect selection for genetic improvement.

Reference

Adebambo, O.A. (2005). Indigenous poultry breeds genetic improvement for meat and egg. *Proceedings 1st Nigerian International Poultry Summit: 1-8.*

Adeoye, A.A., Udoh,J.E., Oladepo,A.D.,and Ojajuni, J.B (2020). *Effect of duration of storage on egg quality*. *Proc. 45th Annual Conference of the Nigerian Society for Animal Production, March 16th – 19th 2020, BAUCHI* pp 311-314.

Blanco, A.E., Lekan, W, Ould-Ali, D., and Schmutz, M. (2014) genetic parameters of egg quality on different pedigree layers with special focus on dynamics stiffness. *Poult. Sci*, pp 2427-2463.

Chineke, C.A. (2001). Interrelationship existing between body weight and egg production trait in Olympia black layers. *Nig. J. Anim. Prod.* 28(1): 1-8.

Godfrey, G.F., Goodman, B,L. And Newell, (1954). Repeatability and heritability CSI innttcs of albumen qualily. Poultry Science 37: (Abstr.) B.L.. egg qualily Iraits in Coturnix quail Science 44: 1338-1339,

Goto, T., Shiraish, T. and Bungo, M. (2015) Characteristics of egg related traits in the onagoidori breed of chickens. *J poult sci*, 52(2015), pp. 81-87.

Ibe, S.N. (1984). Repeatability of egg quality traits in white Leghorn chicken. *Nig. J. Genet*. 5: 44-49.

Ikeobi, C.O.N., Hyginus C.M., Adenowo J.A. and Adedambo, O.A. (1999). Egg quality characteristics of four local poultry species in Nigeria. Trop. J. Anim. Sci., 1:37-42.

Kotaiah, T., Mohapatra, S.C, Aijanegulu, P.S and Ayjagi, R. B (1976). Heritability and repeatability estimates of some egg quality trait in chickens. *Indian poult. Gazette* 60(3): 65-71.

Udeh, I. (2010). Repeatability of egg number and egg weight in two strains of layer type chicken *Int. J. poult. Sci*. 9(7): 675-677