COMPARATIVE EVALUATION OF EGG QUALITY TRAITS FROM CHICKENS AND GUINEA FOWLS

I. O. SULEIMAN, O. M. AKINSOLA, AND M. A. ABUBAKAR
[1,3] *Department of Animal Science, Bayero University, Kano,*
[2] *Department of Animal Science, Ahmadu Bello University, Zaria*
Correspondence: ibro172000@yahoo.com, 08030520867

ABSTRACT
The study was carried out to determine the magnitude of the differences in egg quality traits from chickens and guinea fowls. For this purpose, a total of twenty egg laying birds, consisting of ten Guinea fowls and Rhode Island Red were used at the poultry section of the Teaching and Research farm of the Animal Science Department, Faculty of Agriculture, Bayero University, Kano. Formulated layers diets were fed to the birds for six weeks and egg samples were collected weekly to study the internal and external egg quality traits. The external quality traits were egg weight, shape index, egg circumference, egg diameter, egg length and shell surface area while the internal quality traits were the albumen weight, yolk weight, shell weight and shell thickness. Results showed that there was no significant difference ($P>0.05$) in shape index of the two bird species. On the contrary, there were highly significant difference ($P<0.01$) in egg weight, egg circumference, egg diameter, egg length, shell surface area, shell thickness, yolk weight, albumen eight and shell weight. Relationships between measured traits had positive and negative distribution within traits for both bird species. Hopefully, the result obtained from this study would serve as baseline information for more studies, most especially in Guinea fowl, for selection procedures and genetic improvement.
Keywords: Egg Quality Traits, Chicken and Guinea Fowl.

INTRODUCTION
The importance of poultry as a subsector of agriculture cannot be over emphasized. Poultry production play vital roles in maintaining the protein balance of human population, in addition, it serves as source of income and employment to many people and there is no religious or social taboo associated to poultry than there with other livestock (Smith, 2000).Guinea fowl is a promising genetic resource for evolving a low input grain saving poultry alternative for production in the developing world. The rearing of guinea fowl is a potential alternative poultry system. Commercial guinea fowl production is at its infant stage in Nigeria. Numerous visits by individuals to animals health and production offices across the country seeking information on guinea fowl farming indicates that this type of birds has generated interest in the minds of many people (Poultry Annual Reports, 1999). Eggs are highly versatile food containing many essential nutrients. Eggs of most species of birds may have similarities in nutritional composition and potential food usage, however, information on egg quality characteristics and utilization of egg for food and other purposes have been limited mostly to chicken eggs. Egg quality is composed of those characteristics of an egg that affects its acceptability to consumers such as; cleanliness, freshness, egg weight, shell quality, yolk index, albumen index and chemical composition (Song *et al.,* 2000).Therefore, the objectives of this study were to examine the variation and the association in the internal and external egg quality traits from chicken and guinea fowl.

MATERIALS AND METHODS
The experiment was conducted at the Teaching and Research Farm of the Animal Science Department, Bayero University, Kano. The geographical location of Kano is 12^0 00' North and 8^0 31' East (Ahmad, 1998). It is located at 481 meters above the sea level. The climatically defined vegetation type in the state is the Northern Guinea Savannah and Sudan Savannah (Ahmad, 1998). Annual rainfall and temperature range between 787mm and 960mm and 21^0C and 39^0C respectively. A total of 20 birds for both

Rhode Island Red and Guinea Fowl approximately 52 weeks of age were used. They were housed in standard battery cages with automatic nipple drinkers throughout the duration of the experiment. Two birds were house in each cell. Feed and water were given ad libitum.Ten (10) eggs were collected from the cells of each species of birds making a total of 20 eggs every week for quality assessment. Measurements of internal and external egg qualities were carried out within 24hours of collection from the farm.

Data Analysis

Data was subjected to general linear model procedure of analysis of variance (S.A.S, 9.0, 1993). Significant differences in means were compared using Duncan's Multiple Range Test (Duncan, 1955). Correlation analysis was done using PROC CORR algorithms of S.A.S, 9.0(1993).

RESULTS AND DISCUSSION

Generally eggs of birds have oval shape with small differences among species. In this study, the eggs from guinea fowl and Rhode Island Red showed conical shape with blunt and pointed ends.

The shape of an egg is expressed in terms of the shape index and in this study, those of guinea fowl and Rhode Island Red eggs were 78.52 and 78.63 respectively with no statistical difference ($P>0.05$).The shape indices in this study were higher than those reported by some authors for chicken; 76.14 (Atabey), 75.02 (Supernick), 76.48 (Atak), 78.08 (Super brown) and 75.59 (Atak-S) reported in Turkey by Sarica *et al.* (2012). 74.68 (Free range naked neck) and 72.60 (free range normal feathered) reported in Nigeria by Yakubu *et al.* (2008). 75.29 (Isa brown) in Cage, 74.91 (Isa brown) on floor and 74.90 (Isa brown) on free range reported in Serbia by Dukic-stojcic *et al.* (2009). 74.90 (Japanese Quail) reported in Turkey by Salim and Ibrahim, (2009). 74. 92 (Guinea fowl) reported in Botswana by Tebesi *et al.* (2012). 76.18 (Exotic Isa brown) reported in Nigeria by Olawumi and Ogunlade (2008). The is an indication that birds used for various studies have different genetic structure, health condition, age, use of different content diets in feed and management of the birds. The magnitude of the differences showed in the remaining quality traits measured in both species of birds. The mean egg weight (36.52g) for guinea fowl was much lower than 42.03g reported by Tebesi *et al* (2012), while that of Rhode island red (59.88g) falls within the results of some authors. Dukic –stojcic *et al* (2009), reported 66.74g for Isa brown on cage, 64.75g for floor birds and 65.25g for those on free range. Olawumi and Ogunlade (2008), reported 55.90g for exotic Isa brown layers. Sarica *et al.(*2012*)* reported 61.5g (Atabey), 64.98g (Supernick) 63.98g (Atak), 67.60g (Super brown) and 65.22g (Atak-S) genotypes in Turkey. Zhang *et al.(2005)* reported 53.85g for Brown- egg Dwarf layers in China. On other quality traits, Yakubu *et al.* (2008) reported 20.53g and 17.61g for albumen weight, 16.95g and 16.05g for yolk weight, and 4.48g and 4.65g for shell weight in local naked neck and normal feathered birds respectively. He also reported 5.15cm for egg length and 4.87cm for egg width in local naked and normal feathered birds. Olawumi and Ogunlade (2008), reported 5.57cm for egg length and 4.24cm for egg with of exotic Isa Brown. Zhang *et al.,* (2005) reported 5.51cm and 4.08cm for egg length and egg width respectively. Likewise, Olawumi and Ogunlade (2008), reported 35.94g, 14.35g and 5.62g for albumen weight, yolk weight and shell weight in exotic Isah Brown layers. Zhang *et al.*, (2005) reported 32.02g, 14.77g and 7.07g as well. On egg shell thickness, the value obtained for Rhode Island Red was higher than the range given earlier and compared to other authors; Dukic – Tsojcic reported 0.37mm, 0.36mm and 0.37mm for Isa Brown breed on cage, floor and range respectively. Sarica *et al.* (2012) reported 0.38mm, 0.36mm, 0.35mm, 0.37mm and 0.33mm for Atabey, Supernick, Atak, super brown and Atak –S genotype layers respectively. Zhang *et al.* (2005) reported 0.34mm in brown egg dwarf layers. Yakubu *et al.* (2008) reported 0.38mm and 0.54mm for naked neck and normal feathered local birds respectively, while Olawumi and Ogunlade (2008) reported 0.27mm in exotic Isa brown layers. The difference in the results was the amount of calcium and phosphorus deposited by the birds during egg shell formation. Studies conducted on guinea fowl by Tebesi *et al.*, (2012), showed that shell thickness from the

birds was 0.32mm.On correlation analysis, the negative and statistically significant correlation between egg shape index and weight in both species indicate an inverse relationship. These results were consistent with the findings of Begli *et al.* (2010), on Iranian native fowl (-0.25), Tebesi *et al.* (2012), on guinea fowl in Botswana (-0.49), Kul and Seker (2004) on Japanese quails in Turkey (-0.22), Iscan and Akcan (1995) on hen layers (-0.26) and Ozcelic (2002), on quails (-0.10). Likewise, the shape index had a negative and significant relationship with egg circumference, egg width and shell weight. These result showed that, these traits are component of the expression used in determining the shape index. These agrees with Tebesi *et al* (2012), (-0.28 and -0.32 respectively).However, the shape index had a significant ($P<0.05$) and positive relationship with which egg length, which indicated that the index will increase at increasing egg length. This was consistent with the value of 0.79 reported by Oluwumi and Ogundele (2008). The weight of the eggs was found to have a positive and significant correlation with all the external and internal quality traits of egg. According to Nordstrom and Ousterhout (1982), shell weight is significantly influenced by egg weight, they found that 47% of variation in shell weight was due to egg weight. This result implies that all the traits increased with egg weight of both species which means that egg weight has a direct relationship with other traits. Ozcelic (2002) reported that the egg weight values are more appropriate in determining the shell quality. These strong associations indicate that improvement on any of these traits through natural or artificial breeding could result in concomitant improvement of the other traits.

The albumen weight had a significant ($P<0.05$) and positive association with yolk weight (0.41), shell weight (0.27) and shell thickness (0.24). Also, yolk weight with shell weight (0.43) and shell weight shell thickness (0.40). The result showed that improvement of any of these will cause a corresponding influence on other traits. These were in consistent with the values obtained by Begli *et al.* (2010), Tebesi *et al.* (2012), Kul and Seker (2004), Zhang *et al.* (2005) and Yakubu *et al.* (2008).This study showed that there was a significant difference ($P<0.05$) in the egg quality traits of Guinea fowl and Rhode Island Red bird species except for the shape index. It was considered that the difference between the results of this study and other authors was as a result of the breed difference, genetic structure, health condition, flock age, and the differences in the care and management condition of the birds in question. The study also revealed the possibility of using egg weight to determine most of the other quality traits of egg in birds. Hopefully, the result obtained from this study would serve as baseline information for breeding programmes, most especially in guinea fowl, for selection procedures and genetic improvement.

REFERENCES

Ahmad, K.(1998). The Kano Physical Environment. Retrieved from *http://www.kanostate.net/physical.html on 20/05/2007.*

Begli, H.E, Zerehdaran, S, Hassani, S, Abbasi, M.A and Ahmadi, A.R.K. (2010). Heritability, genetic and phenotypic correlations of egg quality traits in Iranian native fowl. *British. Poultry Science. 5(6): 740 – 744.*

Duncan, D.B. (1955). Multiple Range and Multiple F Tests Biometrics, 11:1- 42.

Iscan, K.M. andAkcan, A. (1995). Broiler parent YUMURTALARINDA yumurtaagirligi, yumurtaOzgulagirgivebaziyumurtakisimilariarasindak iilliskiler. *Journal of CentralAnimal ResourcesInstitute. 5:49-52.*

Kul, S. and Seker, I. (2004). Phonotypic Correlations between Some External and Internal Quality in the Japanese quail (*Coturnix cotunix japonica*).*International Journalof Poultry Science 3(6):400-405.*

Nordstrom, J.O and Ousterhout, L.E. (1982). Estimating of shell weight and shell thickness from egg specific gravity and egg weight. *Poultry Science*. 61:1991 – 1995.

Olawumi, S.O.,Ogunlade, J.T., Oseni, S.O and Akinokun, J.O. (2008). Egg quality characteristics of two breeds of layer breeders in south – west Nigeria, proc. 11th Ann. Conf. Animal Science Association of Nigeria Spet. 18 – 21, 2006. I. A.R 8T, Ibadan, Nigeria, pp: 249-250.

Ozcelik, M., (2002). The phenotypic correlations among some external and internal quality characteristics in Japanese quail eggs. *Veterinary Journal of Ankara University. 49:67 – 72.*

Ogazie, P.O., Hassan, U.A. and Ogunwusi. (1997). Boosting the supply of Agricultural Raw Material

for industry use. Published by Raw material Research council. Plot 427, Aguiyi Ironsistreet, Maitama district Abuja Nigeria. Pp 231.

Oluyemi, J.A and Robert, F.A.(2000). Poultry Production in Warm Wet Climate.Published by spectrum book Ltd. Pp 277.

Salim, K. and Ibrahim S. (2009). The Phenotypic Correlation between Some External and Internal Quality in the Japanese Quails (*Coturnix coturnix japonica*). *International Journal of Poultry. Science* 4(7):500-505.

Smith, T.S (2000). Poultry problem and prospect to the tropical agriculturist. Macmillan publishers. 2nd 2000.pp 14-20.

SAS, (2000).The Statistical Analysis System for Windows. SAS^R Software, Version 9.0. Cary, Nc. U.S.A

Song, K.T., Choil, S.C., and Oh,H.r. (2000).A comparison of Egg Quality of Pheasant, Chukar, Quail and Guinea Fowl. *Asian- AustralianJournal Animal Science. 13(7):986-990).*

Tebesi, T., Madibela, O.R. and Moreki, J.C. (2012).Effect of Storage Time on Internal and External Characteristics of Guinea Fowl (*Numida meleagris*) Eggs. *Journal of Aminal Science.*2(6): 534 – 542.

Yakubu, A., Ogah, D.M. and. Barde, R.E. (2008). Productivity and egg quality characteristics of Free Range. Naked Neck and Normal feathered Nigeria indigenous chickens. *International Journal of Poultry Science. 7:579 – 585.*

Zhang., L.C, Ning., Z.H, Xu., G.Y, Hou., Z.c and Yang., N. (2005). Heritabilities and genetic and phenotypic correlations of egg quality traits in brown – egg dwarf layers. *Poultry Science. 84:1209 – 1213.*

Table 1: Internal and External Quality Traits in Guinea Fowl and Rhode Island Red

Parameters	GF	RIR	Ttest value
SI	78. 52	78.63	0. 27
EW(g)	36. 53^b	59.88^a	0.89
EC(cm)	11. 63^b	13.68^a	0. 14
ED(cm)	3. 70^b	4.35^a	0.04
EL(mm)	46. 04^b	54.88^a	0.72
SSA(cm^2)	13. 61^b	14.50^a	0.31
AW(g)	18. 33^b	36.25^a	0.65
YW(g)	12. 27^b	15.97^a	0. 30
SW(g)	5. 73^b	7.97^a	0.18
ST(mm)	0.22^b	0.59^a	0.04

^{ab}means with different superscript differ significantly(P<0.05)

Table 2: Correlation Analysis between Egg Quality Traits in Guinea Fowl

	EW	EC	ED	EL	SSA	AW	YW	SW	ST
ST	-0.01	-0.58**	-0.59**	0.77**	-0.15	-0.05	0.16	-0.15	-0.06
EW		0.64**	0.64**	0.37**	0.62**	0.88**	0.72**	0.63**	0.33**
EC			0.99**	0.34**	0.40**	0.62**	0.36**	0.40**	-0.08
ED					0.34**	0.39**	0.62**	0.36**	0.40**
EL						0.08	0.30**	0.40**	0.09
SSA							0.36**	0.42**	0.99**
AW								0.44**	0.36**
YW									0.42**
SW									

**P<0.01

Table 3:Correlation Analysis between Egg Quality Traits in Rhode Island Red

	EW	EC	ED	EL	SSA	AW	YW	SW	ST
ST	0.18	-0.55**	-0.55**	0.96**	-0.15	0.11	0.24	-0.16	-0.07
EW		0.84**	0.85**	0.38**	0.32**	0.90**	0.39**	0.33**	0.31**
EC			0.99**	0.38**	0.38**	0.79**	0.31**	0.40**	0.14
ED					0.38**	0.38**	0.80**	0.30**	0.40**
EL						-0.11	0.31**	0.30**	0.11
SSA							0.27**	0.43**	0.99**
AW								0.41**	0.27**
YW									0.43**
SW									