EXTERNAL EGG QUALITY CHARACTERISTICS OF SEVEN-CHICKEN STRAINS FROM SOUTH-WESTERN NIGERIA

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Abstract
The study was conducted to determine the effect of strain on external egg quality characteristics of seven-chicken in South-Western Nigeria using a total of 195 point of lay hens. Each of the seven strains used was replicated three times at 10 birds per replicate, making a total of 30 hens per strain except for the frizzle feather that were 15 in number. Completely randomized design was used for the trial that lasted for 22 weeks. A total of 936 eggs were collected between weeks 30–37 from the hens for external quality studies. The birds were fed experimental diets during the period of the study. Results of this study showed that egg weights, shell thickness and colour were significantly different ($p<0.05$) among the seven strains. Hubbard strain eggs had the highest egg weight (50.53g). Also, eggs of indigenous chickens are generally small/peewee in size (37.11g–43.23g) and the eggs of Fulani ecotype chickens weighed heaviest (43.23g) with thinnest shell (0.31mm) among the indigenous chickens. Brownish colour eggs are more pronounced in exotic chickens than the indigenous population. It can be concluded that normal feather chickens possessed good shell thickness and Fulani ecotype chickens possessed the greatest potential for laying large size eggs. Shell colour which could appeal to consumers in indigenous chickens should be improved upon. Fulani ecotype chicken is recommended for improvement and incorporation as indigenous layer bird while normal feather chickens are recommended because of their egg shell strength. Researches on Nigeria Indigenous Chickens for improvement in egg shell colouration to attract consumers are highly advocated.

Keywords: Egg measurements, egg shell, improvement, indigenous and exotic chickens

Introduction
Indigenous chickens, such as naked neck, frizzle feather, Fulani ecotype and normal feather, constitute about 80% of the 120 million poultry birds found in Nigeria (RIM, 2002). Among these species, naked neck possesses good egg laying characteristics (Udoh *et al.*, 2012). This breed of chicken contains genes and alleles pertinent to their adaptation to a particular environment and breeding goals (Romanov *et al*., 1996). Indigenous chickens are self-reliant and hardy birds with the capacity to withstand harsh weather conditions and adapt to adverse environment (Chin, 2003). They are known to possess qualities such as the ability to hatch their own eggs, brood, scavenge for major parts of their food and possess appreciated immunity from endemic diseases (Duguma, 2006). Their products are preferred by the majority of Nigerians because of the pigmentation, taste, leanness and suitability for special dishes (Horst, 1989). These products (egg and meat) are readily available to villagers and people in the urban and semi-urban areas at relatively cheaper rates, thus, serves as a good source of income and protein in their diets (Ibe, 1992).
Therefore, the objectives of the study are to determine the external quality characteristics of eggs from seven-chicken strains in South-western Nigeria. This will also help to generate

baseline data on the egg quality characteristics of some Nigerian indigenous chickens and make appropriate recommendations necessary for theirimprovement to increase the protein intake of Nigerians.

Materials and Methods

The study was carried out between September – December, 2016 at the Teaching and Research Farm, Livestock Section (Poultry Unit) of the Federal University of Technology, Akure, Ondo State, Nigeria with Latitude 07° 16¹ and 07° 18¹N and Longitude 05° 09¹ and 05° 11¹ E. There is a unimodal rainfall pattern which starts from April to October with an average of 1556mm per annum. The average ambient temperature was about 30 - 32°C and relative humidity was 80%.A total of 195 laying hens of different strains were obtained from FUNAAB hatchery, Ogun state and Foresight Farm hatchery, Oyo State, Nigeria. The seven chickenstrains used for the experiment were: Normal feather, Fulani ecotype, Frizzle feather, and Transylvania and Naked neck indigenous strains while Hubbard and Marshall were meat-type exotic chickens. Each strain was replicated three times at 10 birds per replicate making a total of 30 hens per strain except for the Frizzle feather that were 15 in number. The study which lasted 22 weeks had the birds distributed into seven treatments according to their genotypes in a completely randomized design (CRD) arrangement. The diet used for the experiment was formulated at the Federal University of Technology, Akure Teaching and Research Farm Feed mill. The diet was fed to the birds at 125g/bird/day for the period of the experiment. The calculated analysis of the diets' crude protein (CP) and metabolizable energy (ME) used were grower's mash (16.66% CP and 2798.56Kcal/kg ME) and layer's mash(18.17% CP and 2995.95Kcal/kg ME).A total of nine hundred and thirty-six (936) eggs at18 eggs per strain and 9 eggs for Frizzled feather were collected every Friday for 8 weeks from 30 – 37 weeks of age from the experimental hens for external egg qualities. The external egg quality characteristics determined as described below were egg weight, width and height, shell thickness, colour and weight.

a. Egg and egg shell weights

The eggsand egg shells were weighed (g) using the sensitive scale (5kg max) while the vernier caliper was used to determine the egg length and egg width and the micrometer screw gauge which was used to determine the egg shell thickness after 72hours. The egg shell colour was determined by visual observation of its colour and comparison was done using the Roche colour fan.

b. Shell thickness

The internal egg membranes of freshly collected eggs were pulled off the shells immediately after being broken. The shell thickness was determined by taking the thickness of the egg shell at three different places (the narrow end, the broad end and the side) by using a micrometer screw gauge calibrated in millimeters. The average of the three values was then recorded.

c.Egg height

This was determined by using the vernieer caliper. The caliper was place at the narrow and broad end of the egg and held firmly but not too tight to prevent cracking of the egg. The readings on the two scales were recorded.

d.Egg width

This was determined by the use of the venire caliper. The instrument was placed at the equatorial plane of the egg and held firmly round the egg. The dimension was read off in centimeters.

Data Analysis

All data generated were subjected to one way analysis of variance (ANOVA) using SAS, 2008 Version 13 statistical software. Duncan Multiple Range Test (DMRT) was used to separate the means where significant differences existed using the same statistical package.

Results and Discussion

This study revealed that egg weights were significantly different ($p<0.05$) among the seven strains with Hubbard strain eggs being heaviest (50.53g) and the lightest in naked neck (37.11g). This result disagreed with the report of Udoh *et al.* (2012) who reported that naked neck had heaviest egg weight among the exotic and indigenous strains. The differences observed could be attributed to variations in their genotypes. Egg weight variations in different genetic groups have been reported by many authors (Padhi *et al.*, 1998 and Chatterjee *et al.*, 2007).The study showed that eggs of indigenous chickens are generally small or peewee in size as their weights ranged between 37.11g – 43.23g and chicks from the chicks are presumed to be small as such. Among the indigenous chickens, the eggs of Fulani Ecotype chickens weighed heaviest (43.23g) with thinnest shell (0.31mm).Birds with big body ate more feed to maintain their body size and therefore, the size of their eggs is greater (Alex, 2001). This confirmed the findings of this study in which the exotic birds ate more, weigh heavier and had bigger/heavier egg weights than their indigenous counterparts.

The variation in height of the eggs among the strains, in which Hubbard (HB) and Transylvanian (TB) had higher egg height, could be due to their genetic makeup. Environmental factors such as diet, water intake, temperature, humidity and management practices may also contribute to the variability observed in external egg quality parameters (Isihahomen *et al.*, 2014). The differences observed in the shell thickness and weight among all the strains is a reflection of high genetic value for shell strength and weight which could make it withstand environmental stress. The low value (<0.33mm) observed in Fulani ecotype, frizzled feather, Hubbard, naked neck and Transylvanian strains for shell thickness showed that eggs of these strains are more prone to breakage and microbial spoilage compared to normal feather and Marshall broiler and could largely determine the fertility and hatchability of indigenous chicken eggs. Chineke (2001) observed that egg shell thickness below 0.33 mm is considered too thin with the attendant risk of breakage and ease of entry by micro-organisms. The consumer's acceptability of an egg is a function of its colour which invariably affects saleability and profitability. The shell colour were significantly different ($p<0.05$).The characteristics brown colour eggs is more pronounced in exotic chickens. This could be probably due to their genetic composition for melanocortin synthesis and deposition on their egg shells than in the indigenous species. Variation observed in shell colour among the strains could be as a result of strain difference. Shell colour is a strain characteristic, although there are often variations among individual hens in a particular flock even when all are of the same breed or strain. Jacob *et al.* (2000) further explained that, shell colour comes from pigments in the outer layer of the shell. The shell colour of the indigenous chickens was clearly different from that of broiler chickens except for naked neck and Transylvanian chickens. This shows the characteristic brown and white shell colours of exotic and indigenous chickens respectively. However, few brown eggs were found in NN and TB chickens.

Table 1: Effect of strains on external egg quality characteristics of experimental birds

Parameters	NF	NN	FF	FE	TB	MB	HB	±SEM
BWT (g)	1391.11^{d}	1451.76^{d}	1404.95^{d}	1840.99^{c}	1966.80^{b}	3559.73^{a}	3569.73^{a}	184.70
EWT (g)	40.39^{f}	37.11^{g}	41.98^{e}	43.23^{d}	47.36^{c}	48.92^{b}	50.53^{a}	0.42
EHT (cm)	4.99^{d}	5.00^{d}	5.14^{c}	5.14^{c}	5.40^{a}	5.27^{b}	5.46^{a}	0.03
EWH (cm)	4.37	3.73	3.84	3.95	4.16	4.04	4.13	0.03
STK (mm)	0.34^{a}	0.31^{c}	0.28^{d}	0.31^{c}	0.29^{d}	0.33^{b}	0.31^{c}	0.01
SWT (g)	4.16^{c}	3.81^{d}	3.95^{d}	4.41^{b}	4.48^{b}	4.83^{a}	4.95^{a}	0.06
Shell colour	1.97^{a}	1.61^{b}	1.97^{a}	1.85^{a}	1.55^{b}	1.08^{c}	1.00^{c}	0.04

$^{a, b,, c, d, e, f, g}$ =means on the same row but with different superscripts are statistically ($p<0.05$) significant,BWT = Body weight, EWT = Egg weight, EHT = Egg height, EWH = Egg width, STK = Shell thickness, SWT = Shell weight,cm = Centimeter; g = Gram; FE = Fulani Ecotype; FF = Frizzled Feather; HB = Hubbard Broiler; MB = Marshal broiler; NF = Normal Feather; TB = Transylvanian Breed; NN= Naked Neck; ±SEM = Standard Error of Mean.

Conclusion and Recommendations

The findings of this study indicated that strain had significant effect on egg weight and height, shell thickness, weight and colour. Most of the external egg quality investigated revealed that exotic strains were superior to indigenous species on egg weight as their eggs were heavier in weights with good heights and shell thicknesses. The study also showed that eggs of indigenous chickens are generally small/peewee in size and chicks from them would probably be small as such. Among the indigenous chickens, the eggs of Fulani Ecotype chickens weighed heaviest with thinnest shell. The low shell thickness observed in some strains showed that eggs of these strains are more prone to breakage and microbial spoilage. The characteristics brown colour eggs is more pronounced in exotic chickens in this study than the indigenous population. It can be concluded that normal feather chicken eggs had good shell thickness that favour its handling and reduction in microbial spoilage. Fulani ecotype chickens possessed the greatest potential for improvement as egg producing indigenous chickens in Nigeria. Brown eggs shell colour formation of indigenous chickens is poor. Fulani ecotype chicken is recommended for improvement and incorporation as indigenous layer bird because of its potential in laying heavy weight eggs. Normal feather chickens are also recommended because of their egg shell strength. Researches on NICs for improvement in egg shell colouration to attract consumers and increase saleability and profitability of produces is highly advocated.

References

Alex, O. (2001). Factors affecting the control egg size. Department of Agriculture and Marketing. *Poultry Specialist Bulletin*, Nova Scotia, Webmaster.

Chatterjee, R.N., Rai, R.B., Kundu, A., Senani, S. and Sundar, J. (2007).Egg quality traits in indigenous breeds of chicken of Andaman.*Indian Veterinary Journal*, 84: 206- 208.

Chin, V. (2003). Pattern of chicken consumption to increase body weight gain in chickens. *Endocriminology*, 118: 1961-1965.

Chineke, C.A. (2001). Interaction existing between body weight and egg production traits in Olympia Black Layers.*Nigerian Journal of Animal Production*, 28: 1-8.

Duguma, R, (2006). Phenotypic characterization of some indigenious chicken ecotypes of Ethopia. *Livestock Research for Rural Development*, 18: 25-28.

Horst, P. (1989): Native fowl as reservoir for genomes and major geneswith direct and indirect effects on adaptability and their potential for tropically oriented breeding plans, *Archives Guflugelk*, 5313: 93–101.

Ibe, S.N. (1992).Incorporating adaptability genes in poultry breeding programmes in Nigeria. *Proceedings of the XIX Worlds Poultry Congress*, Sept. 20-24 Amsterdam, 693-696.

Isihahomen, C. E., Njidda, A. A. and Adeniji, A. A. (2014). The effects of genotype on internal and external egg quality traits, egg proximate composition and lipid profile characteristics of three strains of layer turkeys. *International Journal of Agricultural Bioscience*, 3(2): 65-69.

Jacob, J.E., Miles, R.D. and Mather, F.B. (2000). Chicken egg quality. US Department of Agriculture, *Cooperative extension services*, University of Florida, IFAS.http://edis.ifas.ufl.edu/pdffiles.

Padhi, M. K., Rai, R. B., Senani, S. and Saha, S. K. (1998). Assessment of egg quality characteristics in White leghorn Layers: *India Journal of Poultry Science*, 33: 113-115.

RIM (1992). Resources Inventory and Management Ltd, Nigeria. National Livestock Survey. *Federal Department of Livestock and Pest Control Services*, Abuja, NigeriaPp:287.

Romanov, M.N., Wezyk, S. Cywa-Benko, K. and Sakhatsky, N.I. (1996). Poultry genetic resources in the countries of Eastern Europe: History and current state. *Poultry and Avian Biological Revolution*, 7: 1-29.

SAS, (2008): Statistical Analysis System User's Guide, Version 13 for Windows. Statistical Analysis Institute, Inc., SAS Camp Drive Cary, North Carolina U.S.A.

Udoh, U.H., Okon, B. and Udoh, A.P. (2012). Egg Quality Characteristics, Phenotypic Correlations and Prediction of Egg Weight in Three (Naked Neck, Frizzled Feather and Normal Feathered) Nigerian Local Chickens. *International Journal of Poultry Science*, 11 (11): 696-699.