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Egg Quality Traits of Indigenous and Exotic Chickens As Influenced By Specific Genes

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Abstract
This experiment was conducted using five chicken genotypes, comprising three Nigerian local (The normal feather, frizzle feather and the naked neck) and two exotic (Dominant black and Dominant blue) genotype. A total of one hundred eggs comprising of twenty eggs from each genotype were collected to evaluate the egg quality traits. Egg weight (EW), Egg length (EL), Egg width (EWD), Shell colour (SC) ,Albuminweight(AW),Yolkweight(YW),Yolkthickness(YT),yolklength(YL),yolkcolour(YC),shellweight(SW),shellthickness(ST), Moisture (M), Crude Protein (CP), Fat (F) and Ash (A) were evaluated and were significantly (P<0.01) affected by genotype. It therefore indicates that genetic differences in egg quality traits exist among the five genotypes studied. Egg quality trait in term of crude protein highly favoured Naked neck compared to others. From this result, this paper therefore underscores the potentials of the Naked neck chicken in terms of egg quality just like their exotic counterpart in ensuring food security, improved income and sustainable life.
Keywords: Normal feather, Frizzle feather, Naked neck, Dominant black/blue, genotype

1. Introduction

A wide range of physical and chemical properties make up a total egg quality (Shanawany *et al*, 1988). The avian egg is an excellent source of nutrient which is widely accepted for human consumption.

Egg production is one of, if not the major performance parameter of a laying bird. Egg production is believed to be a complex qualitative trait which is influenced by several factors e.g. breed, nutrition, age, weight of birds, level of production, management practices and environ mental factors. (Oluyemi and Roberts, 1982; Williamson and Payne, 1982).

Under normal condition of intensive management, a maximum of about 300 eggs per year is considered satisfactory (Oluyemi and Roberts, 1982). In the tropics egg production has remained at 180 – 200 per year. The egg production of local chickens can raised up to 99 eggs per hen per year with improved feeding, housing and health care (Tadelle *et al* 2000). The assessment of proximate composition of different strains of local and exotic chicken has been given less attention. This study, therefore, was conducted to evaluate the proximate composition, egg quality of different strains of local and exotic chicken eggs.

2. Materials and Methods

2.1 Description of site and samples

This study was conducted at the poultry unit in the teaching and research farm Ambrose Alli University, Ekpoma ,Edo State. Twenty fresh eggs each from five strains namely: normal feather, frizzle feather, Naked neck, Dominant black and Dominant blue chickens were used to obtained the eggs quality traits of these chickens. The eggs collected were sorted and pedigreed along each sire line. All hens were wing tagged for proper identification and subjected to the same management practices throughout the experimental period. The birds were fed *ad libitum* with layer mash containing 16% Crude Protein, 2800kcal/kg Metabolisable Energy.

2.2. Data Collection

Data was collected on:

Egg Weight: This was taken on individual eggs from each layer with the aid of an electronic balance having sensitively of 0.01g

Egg Length: A Venire caliper with an accuracy of 0.1mm was used to determine the egg length. It was taken as the longitudinal distance between the narrow and the broad ends.
Egg Width: It was measured to the nearest 0.1mm with venire caliper. The egg width was taken as the diameter of the widest cross-sectioned region.
Egg shell colour: This was done with the aid of a colour chart.
Proximate composition of eggs was determined according to the method of AOAC (1980).
2.3. Data Analysis

All data collected were subjected to Analysis of Variance in a generalize linear model (GLM) of the Statistical Analysis System Institute (SAS, 1999), Significant differences were computed using New Duncan multiple range test (Gomez and Gomez , 1984) to determine the significance of specific classes.
The model is stated thus:
$Y_{ijk} = \mu + G_i + \Sigma_{ij}$
Where,
Y_{ijk} = Dependent Variable
μ = Overall mean
G_i = Effect of the i^{th} genotype on egg traits
Σ_{ij} = Random Residual error

3. Result

The least square means and the significant test of the effect of genetic group on external egg traits revealed significant differences between all the parameters measured among the genetic groups. Least square means and standard error of egg weight as affected by genotype are as presented in Table 1. Egg weight were found to have significant ($P<0.01$) effect in this study. Dominant blue had the highest mean value (59.70) while the Normal feather had the least (52.90). Egg length followed the same trend with egg weight, while Frizzle feather chicken had the least mean value of egg width (4.16).
Least square means and standard error of proximate composition as affected by genotype are presented in Table 2. Genotype significantly affected ($P< 0.01$) proximate composition. The crude protein value was highest in naked neck (52.38) while the least value was recorded in normal feather chickens (45.24) the ash content was highest in the frizzle feather chickens (4.14%) and lowest in the naked neck feathers(3.56%)
Least square Means and standard errors for internal egg quality in relation to genes are presented in Table 3. The mean value for albumin weight, yolk weight and yolk length favours the exotic chicken when compared with their local counterparts.
4. Discussion
Egg weight were found to have significant ($P<0.01$) effect in this study. Dominant blue had the highest mean value while the Normal feather had the least. Observation by Kushwaha and Krishna (1993) in their study on comparison of some multi-traits selection indices in layer chickens concluded that, egg production and body weight were the most important traits for gain in aggregate genetic value. Alex (2001) further reported that an egg weight is proportional to body weight. Big body birds eat more feed to maintain their body size. Therefore, the size of their eggs is greater. Saleh *et al* (1991) also reported that egg weight is higher for heavy birds than light birds, the ranges and coefficient or variations indicated that selections for higher pullet weight would yield positive result in egg weight.

The variation in length and width of the eggs among the genetic group studied could as well be due to their genetic makeup. Environmental factors in terms of diet, water intake, temperature, humidity and management practices may also contribute to the variability observed. Many reasons could have been attributed to the variation in egg shape index of the chicken genotypes. Since in a sophistical market egg weight and shell weight to a large extent positively correlated. Good egg shape index enhance marketing and profitability, in that, short round eggs do not make the best appearance and long eggs are much likely to be broken during packaging and transportation, since they do not fit squarely in convenient containers The difference observed in Dominant blue and Dominant black is a reflection of high genetic value for shell strength which could make it withstand environmental stress. The low value observed in other genotypes showed that eggs of those genotypes are more prone to breakage compared to Dominant blue. This is in agreement with the findings of Belyavin and Boorman (1981) who observed that elongated (low index) and heavier eggs were more prone to cracking.

The egg shell colour obtained in this study confirms the work of Oluyemi and Robert's (2000).They reported that hybrid between brown-egg and white eggs birds would produced tinted eggs rather than white. This is an indication that brown egg shell colour is dominant over white egg shell colour. Jacob *et al*, (2000) further explained that, shell colour comes from pigments in the outer layer of the shell. Shell colour is a breed characteristic, although there are often variations among individual hens in a particular flock even when all are of the same breed or strain.

The reason could be their genetic make up. However the value recorded were lower compared to the report of Olomu, (2003). The crude protein was equally affected where the Naked neck local had the highest value. This is in agreement with finding of Faga *et al* (1989) who observed that the gene for feather structure in the dam is also deposited in chicken egg during egg formation irrespective of the size. They further reported that egg shell quality of naked neck could be related to a higher Cholecaicipherol synthesis from 7-dehydrocholesterol deposit on these birds of an area of the body without feather, thus being the receptor of the indirect solar radiation. Also the values fall within range according to Babangida *et al*, (2006) and Olomu (2003). The values for fat was highest in exotic genotype and the lowest was observed in Frizzle feather which may also due to their genetic makeup and which is contrast with the report of Babangida *et al*, (2006). It could probably be due to the analytical procedure. In the value for ash, the reverse was the case in that the local had the highest value while the exotic had the lowest. However, the value did not agree with the work of Babangida *el al*, (2006) .This could be attributed to environmental and the analytical procedure involved.

This is in agreement with (Harms and Hussein, 1993) that albumin weight had been reported to be more closely associated with egg weight than yoke weight. The mean value for yolk thickness was higher in the naked neck genes when compared to their counterparts. Egg Yolk has been reported to be affected by environmental factors than genetic (Oluyemi and Roberts 2000) .Effect of genes were not evident in the value obtained for yolk colour and shell weight. This might be attributed to the number used in this study. Also according to Oluyemi and Roberts (1979) factors like nutrition and environment may affect shell thickness, the mean value for shell thickness were higher in the local than the exotic. The gene may influence the amount of egg shell being deposited during egg formation.

5. Conclusion

It can be concluded from the results obtained in this study that genetic differences significantly (P<0.01) affected both external and internal egg qualities. The influence is as result of genetic variability. It is therefore recommended that Nigeria local chickens can be improved upon and especially Naked neck gene can be incorporated in poultry production program so as to harness and utilize their potential.

References

AOAC (1980). Official Methods of Analysis. 13th edition. Association of official Analytical Chemist. Washington D.C USA.

Alex, O. (2001). Factors affecting controlling egg size. Poultry specialist, Department of Agriculture and Marketing P.O. Box 550, Truro, Nora Scotia, Web master. Pp 1 – 4

Babangida, S., Isidahomen, E.C and Igebuike J.U (2006). A comparison of egg quality parameter of some poultry species in Maiduguri, Nigeria, *Journal of Research in Agriculture* Vol.3 (2) Pp 37 – 39

Belyavin, C.G, and Boorman, K.N (1981). Physical Characteristic of intact and so cracked eggs. *British poultry Sci*. 22: 9 – 15

Fraga, L.M, M. Valdivie, I Berrio, and P. Pertez, P.C, (1989). Naked neck genes are useful in the tropics. Misset International Poultry. An international Magazine on poultry Vol. 5 94) Pp 26 – 27

Gomez, A.K and Gomez, A.A (1984). Statistical procedure for Agricultural research. 2nd edition. John Willey and

Sons New York USA. pp. 680.

Jacob, J.P.,. Milles, R.D and F.B. Mather (2000). Egg quality .Florida cooperative Extension Service, University of Florida, Gainesville . 32611.

Kushwaha, B.P and Krishna, S.T. (1993). Comparison of some multi-trait selection indices in layer chickens. Indian journal of Animal Science 63 (5) pp 577 – 579

Oluyemi, J.A and Roberts, F.A (2000).Poultry production in warm wet climate 3rd edition MacMillan publisher ltdd London.

Olomu, J.M (2003). Poultry production. A practice Approach. Jachem publication, Benin city Nigeria pp. 94 – 97.

SAS (1999). SAS User's Guide. Statistical Analysis Inc. Cary North Carolina.

Saleh, K.EL habbak, M.M. Negin, H.M and Abdou, E.E (1991). Magnitude of interaction between breed, seasons and body weight determining the development and performance of chickens. *Egyptian Journal of Animal Production* 128 (1) 95-112

Shanawany, M.M Mehrez, A.Z. and mahmoud, J.T. (1988). Chemical composition of hen's egg in relation to certain quality parameter. World Rev. Animal production 24 (3) 55-58)

Tadelle, D., Alemu, Y. and Peters, K.J (2000). Indigenous chickens in Ethiopia; genetic potentials and attempts at improvement. *World Poultry Sciences Journal*, 56:45 – 54

Williamson, G. and Payne, W.J.A (1982). An introduction to Animal Husbandry in the tropics. ELBS/Longman.

Table 1: Least Squares Means ± SE of effect of Genotype on External Egg Traits

Traits	N	Normal feather	Fizzle feather	Naked Neck	Dominant black feather	Dominant blue
Egg weight (g)	20	52.33±0.67^{b}	52.90±090^{b}	52.70±1.23^{b}	54.60±1.29^{b}	59.60±1.15^{a}
Egg length (L)	20	5.50±0.05^{C}	5.57±0.05^{bc}	5.58±0.66^{bc}	5.67±0.04^{b}	5.88±0.07^{a}
Egg width (cm)	20	4.21±0.02^{cd}	4.16±0.03^{d}	4.27±0.03^{C}	4.37±6.02^{b}	4.43±0.03^{a}
Shell colour	20	1±6.00^{b}	1±0.00^{b}	1±0.00^{b}	1±0.00^{a}	1±0.00^{a}

^{a,b,c,d} means in the same row with different superscripts are significantly different ($P < 0.05$)

Table 2: Least Squares Means ± SE of effect of Genotype on proximate composition

Traits	N	Normal feather	Fizzle feather	Naked Neck	Dominant black	Dominant blue
Moisture	20	4.05±0.67^{e}	4.12±0.00^{d}	4.35±1.12^{b}	4.46±0.05^{a}	4.22±0.00^{c}
Crude protein	20	45.25±0.04^{d}	45.54±0.01^{bc}	52.38±0.01^{a}	45.17±0.12^{d}	47.76±0.08^{b}
FAT	20	32.78±0.06^{cd}	31.28±0.50^{b}	33.62±1.01^{b}	36.17±0.90^{a}	31.40±0.08^{b}
ASH	20	4.01±0.05^{b}	4.14±0.01^{a}	3.56±0.00^{c}	3.66±0.00^{d}	3.88±0.02^{c}

^{a,b,c,d} means in the same row with different superscripts are significantly different ($P < 0.05$)

Table 3: Least Squares Means and SE for internal egg quality traits as affected by genotype

Traits	N	Albumin weight	Yolk weight	Yolk thickness	Yolk length	Yolk colour	Shell weight	Shell thickness
NORMAL	20	32.1 ±1.26^{ab}	17.55±0.33^{b}	1.47±0.03^{bc}	3.93±0.04^{c}	1±0.00^{a}	4.9±0.20^{a}	0.36±0.1^{c}
FRIZZLE	20	26.63±0.64^{c}	17.45±0.32^{b}	1.38±0.05^{c}	4.07±0.02^{b}	1±0.00^{a}	5.3±0.16^{a}	0.49±0.23^{a}
NAKED NECK	20	30.05±0.39^{b}	18.2±0.24^{b}	1.68±0.02^{a}	4.04±0.02^{b}	1±0.00^{a}	4.95±0.14^{a}	0.42±0.00^{b}
DOMINAN T BLACK	20	33.8±0.52^{a}	18.1±0.39^{b}	1.52±0.02^{b}	4.16±0.03^{a}	1±0.00^{a}	5.15±082^{a}	0.50±0.01^{a}
DOMINAN T BLUE	20	31.35±1.60^{ab}	19.5±0.33^{a}	1.42±0.05^{bc}	4.06±0.02^{b}	1±0.00^{a}	4.85±0.20^{a}	0.42±0.00^{b}

^{a,b,c,d} means in the same column with different superscripts are significantly different ($P < 0.05$)