

FERTILITY AND EGG HATCHABILITY OF FOUR STRAINS OF NIGERIA HEAVY ECOTYPE LOCAL CHICKENS (NHELC)

C. C. Nwoga, M. O. Onodugo and C.C. Olijio

Department of Animal Science, Faculty of Agriculture, University of Nigeria, Nsukka.

Corresponding author: C.C. Nwoga; E-mail: cornelius.nwoga@unn.edu.ng; Tel: +2348039307202

ABSTRACT

A study was conducted to investigate the fertility and egg hatchability of four strains of Nigerian Heavy Ecotype Local Chickens (NHELC). The four strains, designated into treatments, comprised T1(white), T2(barred), T3(golden) and T4(black) plumage colours. Forty matured NHELC birds made up of 8 cocks and 32 hens were assigned to the corresponding treatments of 8 hens and 2 cocks/treatment. They were housed separately according to treatments and sexes. 115 g of commercial layer's mash was given per bird and water were given *ad libitum*. Breeder cocks previously evaluated for fertility were employed and artificial insemination (AI) was used. The trial was done in a completely randomized design (CRD). The results of the study showed that there were no significant ($P>0.05$) differences in egg length and shape index of eggs among the hens in the four treatments. Significant ($P<0.05$) differences however occurred in egg width and egg weight. There were no significant ($P>0.05$) differences in fertility, hatchability, embryonic mortality and chick hatch weights. It was concluded that strain differences did not affect fertility and hatchability of the four strains of NHELC studied.

Key words: Fertility, hatchability, egg qualities and artificial insemination

INTRODUCTION

The Nigerian local chicken is a dual purpose bird that is used both for meat and egg production in rural and peri-urban areas of the country (Adeleke *et al.*, 2011). They are spread through the rural areas of Nigeria and many occur as two distinct ecotype namely the Light ecotype and found mostly in the Swamp, Rainforest and Derived savannah areas of Southern Nigeria, and the heavy ecotype found in the mountain areas of southeastern and western Nigeria, middle belt and North (Ogbu, 2010). Strains of birds may be seen in terms of their genetic make-up, place of origin and their production purpose as meat or egg production (Pilecco *et al.*, 2011, Islam *et al.*, 2015). It may also be classified based on the colour of their feathers, locality or size to enable studies properly carried on them.

Nigerian heavy ecotype local chicken have been selected over and over again for body weight and egg production potentials, evaluation of other reproductive traits such as the fertility and hatchability should also come to the front burner to achieve a high productivity. High fertility and hatchability of eggs of breeder stock and survivability of the chicks is necessary to produce large numbers of birds (Ndofor-Folenge *et al.*, 2015).

Kumar *et al.* (2002) opined that among egg quality characteristics egg shell has a direct effect on shell breakage, hatchability and contamination of hatcheries in commercial poultry operations whereas optimum egg weight is necessary for obtaining required levels of fertility, hatchability and chick quality which determine the profitability of the poultry enterprises. Therefore, every attempt should be made to improve egg quality and other production traits.

Abu *et al.* (2013) noted that Evaluation of semen quality is very important before selection of breeding cocks used for artificial insemination. The authors observed that for genetic improvement, artificial insemination (AI) is regarded as an important breeding tool throughout the world and like other livestock species, assessment of semen quality before being used for AI in poultry is essential. As a matter of fact, quality of semen after processing may significantly affect the success of AI in poultry as well as other animals.

MATERIALS AND METHODS

Location of study

The study was conducted at the Poultry Unit of the Department of Animal Science Teaching and Research Farm, University of Nigeria, Nsukka. Nsukka lies within Latitude 6°51'28"N and Longitude 7°23'44"E and is 423m above the sea level (Date and Time info, 2017). The climate is humid tropical

with relative humidity of 55-85% with mean daily temperature of 20°C-23.9°C and maximum range from 29.5°C-34.9°C.

Management of experimental birds

Four strains of Nigerian Heavy Ecotype Local Chicken birds totaling 40 and made up of 8 cocks and 32 hens were used for the study. The four strains, designated into treatments, comprised T1 (white), T2 (barred), T3 (golden) and T4 (black) plumage colours. Forty matured NHELC birds made up of 8 cocks and 32 hens were assigned to the corresponding treatments of 8 hens and 2 cocks/treatment. They were housed separately according to treatments and sexes. Water was given *ad libitum* and 115 g of commercial layer's mash was given to each bird per day. Breeder cocks previously evaluated for fertility were employed and artificial insemination (AI) was used.

Egg collection, incubation and hatching

50 eggs were collected from each treatment, labeled and sent to the incubator. Candling was done on the 14th day of incubation and the infertile eggs were removed and counted. After 21 days, the fertile eggs that failed to hatch were broken out in order to determine the embryonic mortalities.

Parameters measured/calculated

- ✓ **Egg weight (g):** This was done using a sensitive scale and the weights were recorded immediately.
- ✓ **Egg length and egg width (cm):** These were measured using Vernier caliper.
- ✓ **Fertile eggs:** This was calculated as total egg incubated- the number of eggs that were infertile after candling.
- ✓ **Percentage fertility (%)** = $\frac{\text{Total number of fertile eggs}}{\text{Total number of eggs set}} \times \frac{100}{1}$ (Ojedapo, 2013).
- ✓ **Embryonic mortality (%)** = $\frac{\text{Number of dead-in-shelled embryo}}{\text{Number of fertile eggs}} \times \frac{100}{1}$
- ✓ **Chick hatch weight (g):** This was determined using a sensitive scale.

Statistical analysis

The design adopted was completely randomized design (CRD) with the model below;

$$Y_{ij} = \mu + T_i + e_{ij}$$

Where;

Y_{ij} = Individual observation;

μ = Population mean;

T_i = Treatment effect, and;

e_{ij} = Experimental error associated with observation.

The data collected on body weights, ages at puberty and semen quality traits were subjected to Analysis of Variance (ANOVA) using the Statistical Package for Social Sciences (SPSS, 2010). Significantly different means were separated using Duncan's New Multiple Range Test (DNMRT) (Duncan, 1955).

RESULTS AND DISCUSSION

The results on egg characteristics of our strains of NHELC hens are shown in Table 1.

Table 1: Egg characteristics of four strains of NHELC hens

Parameters/Treatment	T1 (White)	T2 (Barred)	T3 (Golden)	T4 (Black)
Egg length (cm)	5.71±0.25	6.97±51	5.89±0.32	5.76±0.33
Egg width (cm)	4.05±0.16 ^c	4.21±0.17 ^a	4.16±0.21 ^{ab}	4.12±0.19 ^b
Egg weight (g)	50.92±4.58 ^b	57.84±5.06 ^{ab}	53.48±5.71 ^a	51.32±5.03 ^b
Shape index (%)	70.98±4.21	71.36±4.12	71.08±3.85	71.76±4.35

^{a,b,c} means with different superscripts are significant.

The mean egg width values of hens in the four strains ranged from 4.05±0.16 cm – 4.21±0.17 cm with the highest value recorded in T2 (Barred) hens and the lowest value recorded in T1 (White) hens. These results on egg width fall in the range of 40.9 mm (4.09 cm) given by Momohet *et al.* (2010) but differed from the works of Bobo *et al.* (2015) and Yonaset *et al.* (2019) that observed 3.95 cm, 3.78 cm, 3.76 cm, 3.9 cm and 3.78 cm respectively, while studying NHELC and other local hens. The results on egg weight also agree with the works of Momohet *et al.* (2010) that recorded 53.6 g egg

weight in NHELC hens. However, the results disagree with the findings of Yonaset *et al.* (2019) who recorded 45.28 g and 39.30 g while working with other local chicken. There were no significant ($P>0.05$) differences in egg length (cm) and shape index (%) among hens in the four strains studied. This shows that strains do not affect shape index of eggs in the local chicken. This agrees with Momoh *et al.* (2010) who observed average egg length 53.6mm (5.36cm) while working with NHELC. This is also similar to the works of Yonaset *et al.* (2019) that recorded 52.39 ± 2.43 mm and 50.39 ± 3.83 mm (5.40cm and 5.04cm) in local chicken. The results on shape index were also similar to the works of Bobo *et al.* (2013) who reported shape index of their local eggs as 77.61%, 76.25% and 76.09%.

Table 2: Fertility and hatchability of four strains of NHELC hens

Parameters/Treatment	T1 (White)	T2 Barred)	T3 (Golden)	T4 (Black)
Fertility (%)	53.00 $\pm$ 1.41	59.00 $\pm$ 15.56	77.00 $\pm$ 1.41	62.00 $\pm$ 12.02
Hatchability (%)	51.00 $\pm$ 1.41	62.50 $\pm$ 23.33	51.50 $\pm$ 2.12	62.50 $\pm$ 27.58
Embryonic mortality (%)	47.00 $\pm$ 1.41	38.00 $\pm$ 24.04	51.50 $\pm$ 2.12	37.50 $\pm$ 27.58
Chick hatch weight (g)	37.14 $\pm$ 7.26	3.500 $\pm$ 8.89	33.68 $\pm$ 91.23	33.00 $\pm$ 9.79

The results above show that there were no significant ($P>0.05$) differences among treatments studied in terms of fertility, hatchability, embryonic mortality and chick hatch weight. This showed that strains do not affect fertility and hatchability NHELC. This is similar to the findings of Fayeye and Ogundere (2017) who recorded 74.44% and 61.50% in fertility and hatchability for the Nigerian Yoruba ecotype local chicken.

CONCLUSION AND RECOMMENDATION

It could be concluded from this work that strain differences did not affect fertility and hatchability. However, for laying stock for farmers, T2 (Barred) and T3 (Golden) hens of the NHELC are recommended as they gave better egg weight and egg width.

REFERENCES

- Abu M.d, M.T, Mohamed, M.U.B, Raihana, N.F, Nasrin, S.J and M.D, Bazlur, R. Mouah, (2013). Evaluation of semen quality among four chicken lines. *Journal of Agriculture and Veterinary Sciences*. Vol 6, (5) pp 07-13.
- Adeleke, M.A., Peters, S.O., Ozoje, M.O Ikeobi, C.O., Adebambo, A.O., Olowofeso, O., and Bamgbose, A. M. (2011). A preliminary screening of genetic lineage of Nigerian local chickens based on blood protein polymorphisms: *Animal Genetic Resources*. 48, 23-28.
- Bobo, A.G, Bab, S.S and Yahaya, M.S. (2013). Egg quality characteristics of three phenotype of local chickens in Adamawa state, *Journal of Agriculture and Veterinary science*. 4(2) pp 13-21.
- Dateandtime.info (2017). www.dateandtime.info. Geographical coordinates of Nsukka, Nigeria. Accessed 16/5/2017.
- Duncan DB (1955). New Multiple Range Test. *Biometrics*, 11: p. 1-43.
- Fayeye, T.R and Ogundene, A.A. (2017). Fertility, hatchability and growth performance of native and crossbred chickens in a tropical climate. *African Journal online* vol 65 no 2. Retrieved July 2nd from www.ajol.info/index.php/bahpa/article/view/167671.
- Islam, S, Bari, M.S, Moni, S.P, Siddique, M.Z.F, Uddin. M.H and Miazi, O.F. (2015) Phenotypic Characteristics of Commercial Layer Strains, ISA Brown and Hisex Brown. *International Journal of Natural Sciences*, 5(2): 41- 45.
- Momoh, O.M, Ani, A.O, Ugwuowo, L.C. (2010). Part-period Egg Production and Egg Quality Characteristics of Two Ecotypes of Nigerian Local Chickens and Their F1 Crosses. *Int. J. Poult. Sci*. 9(8): 744-748, 2010 ISSN 1682-8356.
- Ndofor-foleng, H.M, Vivian Oleforuh-Okoleh, Musongong, G.A., Ohagenyi, J and Duru U.E. (2015) Evaluation of growth and reproductive traits of Nigerian Local Chicken and exotic chicken. *Indian Journal of Animal Research* 49(2) pp 155-160.
- Ogbu, C.C. (2010). Genetic changes in the Nigerian Heavy local chicken ecotype (TIV chicken) Through selection for body weight and egg production traits. Unpublished Ph.D thesis submitted to the Department of Animal Science, UNN, March, 2010 Pp 7.

- Ojedapo, L.O. (2013). Phenotypic correlation between the external and internal egg quality traits of pharaoh quail reared in Derived savanna Zone of Nigerian. *Journal of Biology, Agriculture and Healthcare*, 3(10).
- Pilecco, M, Almeida, Paz, Tabaldi, L.A, Nääs, de. A, Garcia, R.G, Caldara, F.R, Alves, M.C.F, and Felix, G.A. (2011). Influence of Genetic Strain and Season on Back Scratch Lesions in Broilers. *Brazilian Journal of Poultry Science*. ISSN 1516-635X Oct - Dec / v.13 / n.4 / 241-245.
- SPSS (2010). Statistical Package for Social Sciences. SPSS Inc. Chicago, USA.
- Yonas, K., Sandip, B and Mestawet, T (2019). Some internal and external egg quality characteristics of local and exotic chickens reared in Yirgalem and Hawassa Towns, Ethiopia. *International Journal of Livestock production*. Vol, 10(5), pp 135-142 Doi:10,5897/ijlp2018.0547.