

EFFECT OF FLOCK AGE ON FERTILITY AND HATCHABILITY TRAITS OF SHIKABROWN[®] CHICKENS

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ABSTRACT

The research was conducted to determine the effect of flock age on fertility and hatchability traits of ShikaBrown[®] chickens in Aliero. A total of 1177 hatchable eggs were collected from birds of African Chicken Genetic Gains (ACGG) project in Kebbi State and incubated at different flock age (48, 49, 50 and 51 weeks). The experimental design used was the Nested type (Henderson, 1963). The Parameters considered include mean egg weight, fertility, hatchability, hatch weight and embryonic mortality. The data was analyzed using GLM of SPSS (2013). Significant interaction ($P \leq 0.05$) was observed between flock age and egg weight, fertility, hatchability, embryonic mortality and hatched weight. Highest egg weight (58.40 ± 0.32 g) and hatchability ($68.57 \pm 1.91\%$) were recorded at age 51, fertility was highest ($94.65 \pm 1.75\%$) at age 50 weeks and lowest (89.52 ± 2.21) at 48 weeks. Egg weight, hatchability and hatched chicks' weight were amplified ($P \leq 0.05$) with increase in age (48-51 weeks). Embryonic mortality improves with advancing age ($P \leq 0.05$) and was highest at the early stage and lowest at mid-stage of incubation.

Key words: Flock age; fertility; hatchability traits; chick weight; ShikaBrown[®]

INTRODUCTION

Fertility and hatchability are interrelated heritable traits that vary among breeds, and individuals in a breed (King'or, 2011). According to Brillard (2003), fertility of individual egg is a function of the genotype of the embryo to which both parent (sire and dam) contribute. Thus if the fertility in a flock is low many infertile eggs will be incubated. Hatchability on the other hand is the rate at which incubated or fertile eggs are turned into viable chick after 21 days of incubation. Hatchability is determined based on the number of eggs set or fertile eggs set after candling on the seven and eighteen days of incubation (Orunmuyi *et al.*, 2011). Failure of an egg to hatch is caused by infertility or by death of embryo after fertilization.

Several genetic and non-genetic factors have been reported to influence fertility and hatchability of chicken eggs. These factors include: breed, egg age, storage condition, nutrition, system of husbandry and rearing technology, mating system, mating ratio, incubation relative humidity, temperature and eggs turning angle (Wilson, 1997; King óri, 2011; Bobbo *et al.*, 2013).

The ShikaBrown[®] chicken breed is the preferred layer breed in Nigeria having remarkable characteristics that include excellent shell quality, high production rate, persistency, egg weight, livability, and feed conversion and is well adapted to the harsh tropical environment with resistance to many diseases of economic importance (Ayorinde *et al.*, 2016). However, there is paucity of information on fertility and hatchability traits of the breed. The present work was carried out to determine effect of flock age on the fertility and hatchability traits of ShikaBrown[®] chickens.

MATERIALS AND METHOD

Location of experiment

The research was conducted at the Animal Science Laboratory, University campus at Aliero (Lat. 12° 18' 18" N, Long. 4° 29' 52" E and Alt. 266.2m above sea level) in the dry sub-humid zone of Nigeria.

Management of breeding stock

During the onset of lay, the birds were fed diet containing 2,600 ME Kcal/kg and 16-18% crude protein. Egg production of the parent stock was observed before selection and setting up of mating pens. A total of 96 ShikaBrown[®] chickens of age 48 weeks were used as parents for the study. The birds which consisted of 84 pullets and 12 cocks were selected and allowed to mate in separate pens labelled according to the cocks (sire).

Mating and incubation of fertilized eggs

The pullets with brown plumage were mated to white- brown cocks at a ratio of 1:7. Fertile eggs were collected three times daily (7:00am, 2:00pm, and 5:00pm). The eggs were sorted to remove cracked eggs, soiled eggs, small sized or oversized eggs.

Selected eggs were labeled, fumigated and stored in cool room at a temperature of 19°C for a period of 24 hours before setting them in an automated incubator. The incubation process was conducted according to flock age, taken into account the number of fertile eggs and number of eggs hatched in each breeding pen. Candling was done at the 7th and 14th day to remove infertile eggs and eggs with dead embryos. At the 20th -23rd day of each batch of incubation hatched chicks were removed and eggs that failed to hatch were removed, examined and counted as late stage of embryonic mortality.

Experimental design

The experimental design used was the Nested type (Henderson, 1963), in which a sire is mated to several dams with each mating producing several offspring. The model is given below:

$$Y_{ijk} = \mu + A_i + B_j + W_k + \epsilon_{ijk}$$

Where Y_{ijk} = any observation; μ = overall mean; A_i = effect of sire; B_j = effect of flock age;

W_k = effect of interaction between sire and flock age and ϵ_{ijk} = random error

RESULTS AND DISCUSSION

Effect of age on egg weight of ShikaBrown[®] pullets

Expectedly, age has significant effect on egg weight ($P \leq 0.05$). Eggs of age 51 weeks were heaviest (58.40 ± 0.32 g) and were statistically similar in weight with those of 48 and 50 weeks (57.82 ± 0.29 and 57.90 ± 0.28). However, eggs of 49th week (57.41 ± 0.24) were the lightest ($P \leq 0.05$). The mean egg weight in this study concurred with the findings of Abudabos *et al.* (2010) who reported that egg weight was affected by collection week or hen's age ($p \leq 0.05$), heavier eggs were produced in weeks 3 and 4 (45.42 and 45.48 g, respectively) compared with weeks 1, 2, 6, 7, 8, and 11 (44.72, 44.54, 44.59, 44.65 and 44.28 g respectively).

Effect of age on fertility of ShikaBrown[®] chickens

The fertility of 94.65 ± 1.75 and 93.69 ± 1.87 percent observed at the age 50 and 49 weeks, were similar and higher ($P \leq 0.05$) than 92.07 ± 1.96 and 89.52 ± 2.21 of age 51 and 48 weeks respectively. Percent fertility at week 51 and 48 were similar ($P \leq 0.05$). The flock fertility observed increases with age reached maximum and tends to decline at 51 weeks of age. The results agreed with the findings of Abudabos *et al.* (2017) who reported that fertility (F) was influenced by collection week or hens' age ($p \leq 0.05$), with eggs collected in week 3 presenting the lowest fertility percentage (60.45%), which, however, was similar to those collected in weeks 2, 6, 8, and 9 (73.68, 71.53, 71.79, and 71.14%, respectively). Similarly, Elibol and Brake (2006) reported 97.1% and 81.1 % fertility for young (34 and 37 weeks) and old (59 and 61 weeks) broiler breeder flocks respectively and suggested that fertility of total eggs differed with flock age ($P \leq 0.01$) and was more for young than for old flocks.

Effect of age on hatchability of ShikaBrown[®] eggs

Hatchability of eggs was influenced significantly by the flock age ($P \leq 0.05$). The highest hatchability recorded at 51st week ($68.57 \pm 1.91\%$) and the lowest was at 48th week ($47.00 \pm 1.66\%$). Hatchability at 49th week (61.66 ± 1.78) was similar ($P \leq 0.05$) with that of 50th week (59.51 ± 3.02). Expectedly, the results showed a trend of relatively increasing hatchability rates with the flock age since the flocks studied were within their first year in lay and under normal conditions, hatchability is expected to drop during second year in lay (Oluyemi and Roberts, 2000).

Effect of age on hatch weight of ShikaBrown[®] chicks

Hatch weight was significantly influenced by flock age ($P \leq 0.05$). The hatch weight at age 50 (43.12 ± 0.25 g) and age 51 weeks (43.08 ± 0.22 g) were not different statistically, but were higher ($P \leq 0.05$) than the hatch weight of 42.42 ± 0.20 g and 42.69 ± 0.19 g for age 48 and 49 weeks respectively. Expectedly, the results show a linear relationship between age and hatch weight which proves that as the pullets ages hatch weight increases. The hatch weights obtained in this report agreed with the findings of Abudabos *et al.* (2017) who studied hatch weights of free-range Hassawi indigenous chickens and

reported that lightest hatchlings were obtained from eggs collected in week 1 (28.96 g), while eggs collected in week 2 produced intermediate weight hatchlings (29.77 g) ($P \leq 0.01$) and the heaviest chicks hatched were from eggs collected in weeks 3, 4, 6, 7, and 8 (30.65, 30.99, 30.70 and 30.56, respectively).

Effect of age on embryonic mortality

Age had significant effect on early, mid and late stage embryonic mortality ($P \leq 0.05$). Early embryonic mortality was higher at age 48 weeks ($27.24\% \pm 2.23$) than $17.96\% \pm 1.84$, $20.34\% \pm 1.78$ and $16.17\% \pm 1.58$ (at age 49, 50 and 51 weeks respectively). Similarly, midterm embryonic mortality was highest ($9.56\% \pm 1.58$) at 50 weeks of age and the lowest ($4.56\% \pm 1.04$) was at 49 weeks. Late embryonic mortality was higher ($P \leq 0.05$) at age 48 ($18.54\% \pm 1.61$) and 49 weeks ($15.81\% \pm 2.12$) than at 50 ($10.59\% \pm 1.20$) and 51 weeks ($8.98\% \pm 1.68$). Late embryonic mortality decreases with flock age (48-51 weeks). Generally, highest embryonic mortality was observed at the early stage of incubation followed by the late stage while the least was observed at mid-stage of incubation. The results partially disagree with the findings of Iqbal *et al.* (2016) who reported that age of hen had no influence ($P \geq 0.05$) on embryonic mortality during incubation but observed highest embryonic mortality at early stage of incubation and the least at mid-stage of incubation. The results however, partially agreed with the findings of Elibol and Brake (2006) who observed highest embryonic mortality in the early phase followed by the late phase and mid phase had the least embryonic mortality in both young and old broiler breeder flocks. They however reported higher early and late embryonic mortality in old than in young flocks ($P \leq 0.01$).

Similarly, total embryonic mortality varied significantly ($P \leq 0.05$) with flock age. The highest ($52.9\% \pm 1.66$) was at 48 weeks of age and the lowest ($31.4\% \pm 1.83$) was at 51 weeks.

Table 1: Age effects on hatchability traits of ShikaBrown[®] eggs

Parameter	Age of birds (week)			
	48	49	50	51
Egg weight (g)	57.82 ± 0.29^{ab}	57.41 ± 0.24^b	57.90 ± 0.28^{ab}	58.40 ± 0.32^a
Egg fertility (%)	89.52 ± 2.21^b	93.69 ± 1.87^a	94.65 ± 1.75^a	92.07 ± 1.96^{ab}
Hatchability (%)	47.00 ± 1.66^c	61.66 ± 1.78^b	59.51 ± 3.02^b	68.57 ± 1.91^a
Chick weight (g)	42.42 ± 0.20^b	42.69 ± 0.19^{ab}	43.12 ± 0.25^a	43.08 ± 0.22^a
Early E.M (%)	27.24 ± 2.23^a	17.96 ± 1.84^b	20.34 ± 1.78^b	16.17 ± 1.58^b
Mid E.M (%)	7.22 ± 1.19^{ab}	4.56 ± 1.04^b	9.56 ± 1.58^a	6.27 ± 1.11^{ab}
Late E.M (%)	18.54 ± 1.61^a	15.81 ± 2.12^a	10.59 ± 1.20^b	8.98 ± 1.68^b
Total E.M (%)	53.00 ± 1.66^a	38.34 ± 1.78^b	40.49 ± 3.01^b	31.43 ± 1.91^c

Means along the same row bearing different superscripts are significantly different ($P \leq 0.05$).

E.M = Embryonic mortality

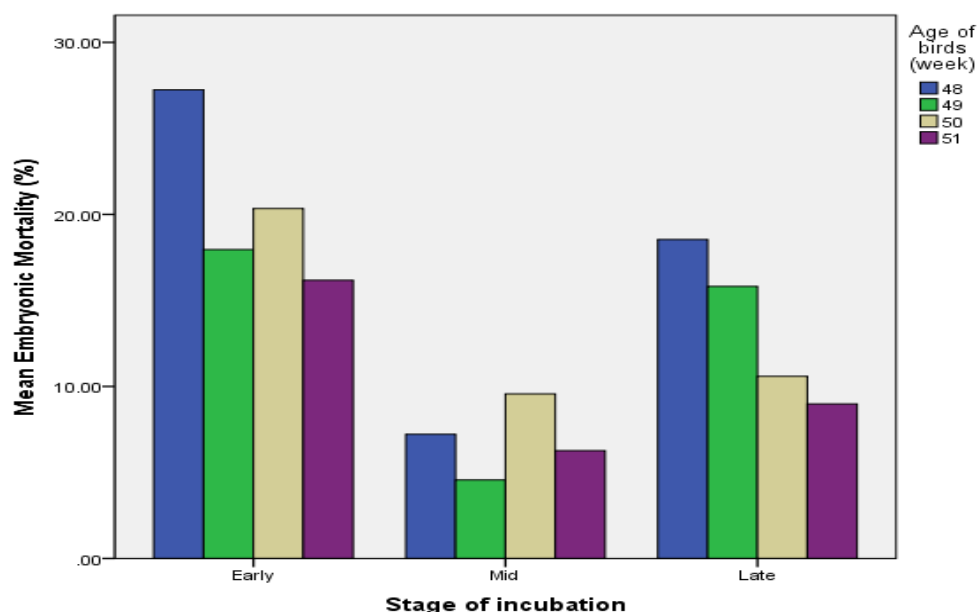


Figure 1: Stages of embryonic mortality based on flock age

CONCLUSION AND RECOMMENDATION

From the results of this work, it can be deduced that age has great influence on egg weight, fertility, hatchability, embryonic mortality and hatched chicks' weight of ShikaBrown® chickens. At the age (48-51 weeks) investigated, the birds proved to have high fertility, increasing hatchability rates and hatched chicks' weight. Further research should be conducted beyond the period covered in this study to determine the period of maximum reproductive efficiency of the breed.

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