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Original Article

Effect of Flock Age on Reproductive Traits of Shika Brown® Chicken

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ABSTRACT

The research was conducted to determine the effect of flock age on the reproductive traits of Shika Brown® chicken in Aliero, Nigeria. A total of 1177 eggs were collected from the birds of the African Chicken Genetic Gains (ACGG) project in Kebbi State and incubated at different flock ages (48, 49, 50, and 51 weeks). The experimental design used was the Nested type. The Parameters considered include mean egg weight, fertility, hatchability, hatch weight, and embryonic mortality. The data were analyzed using the Generalized Linear Model of SPSS. Significant interaction ($P \leq 0.05$) was observed between flock age and egg weight, fertility, hatchability, embryonic mortality, and hatched weight. The highest egg weight (58.40±0.32g) and hatchability (68.57±1.91%) were recorded at age 51, fertility was highest (94.65±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 the increase in age (48-51 weeks). Embryonic mortality differs with age ($P \leq 0.05$) and was highest at the 48th week and lowest at 51 weeks of age. From the results obtained, it can be deduced that flock age has a great influence on egg weight, fertility, hatchability, embryonic mortality, and hatch weight of Shika Brown® chicken.

Keywords: flock age, reproductive traits, Shika Brown®, chicken

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INTRODUCTION

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

Several genetic and non-genetic factors have been reported to influence the 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 egg turning angle (Wilson, 1997; King óri, 2011; Bobbo *et al.*, 2013). Hatchability, in particular, is attributed to be a complex age-dependent trait. Egg production and hatchability of broiler eggs have been reported to be influenced considerably by flock age (Elibol and Brake*,* 2006). Abudabos *et al.,* (2010) reported that egg weight was affected by collection week or hen's age ($p \leq 0.05$).

The Shika Brown® chicken is the preferred layer breed in Nigeria with remarkable production performance, little information is reported on fertility, hatchability, and other reproductive traits of the breed. The present work was carried out to determine the effect of flock age on the key reproductive traits of the breed.

MATERIALS AND METHODS

Location of Experiment

The research was conducted at the Animal Science Laboratory, Kebbi State University of Science and Technology, Aliero (Lat. 12º 18'18" N, Long. 4º 29'52"E and Alt. 266.2m above sea level) in the dry sub-humid zone of Nigeria (KSUSTAM, 2015).

Management of Breeding Stock

During the onset of lay, the birds were fed a diet containing 2,600 ME Kcal/kg and 16-18% crude protein. Egg production of the parent stock was observed before the selection and setting up of mating pens. A total of 96 Shika Brown® chickens of age 47 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 12 separate pens.

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 (7:00 am, 2:00 pm, and 5:00 pm). The eggs were sorted to remove cracked eggs, boiled eggs, and small-sized or oversized eggs.

Selected eggs were labeled, fumigated, and stored in a cool room at a temperature of 19^{o}C for 24 hours before setting them in an automated incubator. The incubation process was conducted according to flock age, taking into account the number of fertile eggs and the number of eggs hatched in each breeding pen. Candling was done on the 7th and 14th day to remove infertile eggs and eggs with dead embryos. On 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:

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

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 Flock Age on Egg Weight of Shika Brown® Pullets

Expectedly, age has a significant effect on egg weight ($P \leq 0.05$). Eggs of age 51 weeks were heaviest (58.40±0.32g) 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 ($p \leq 0.05$).

Effect of Flock Age on Fertility of Shika Brown® 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 at age 51 and 48 weeks respectively. Fertility at weeks 51 and 48 was similar ($P \leq 0.05$). The flock fertility observed increases with age reached a 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 ($p \leq 0.05$). The results further agreed with the findings of Elibol and Brake (2006).

Effect of Flock Age on Hatchability of ShikaBrown® Eggs

The hatchability of eggs was influenced significantly by the flock's age (P≤0.05). The highest hatchability was recorded in 51st week (68.57±1.91%) and the lowest was in 48th week (47.00±1.66%). Hatchability in 49th week (61.66±1.78) was similar (P≤0.05) to 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 the second year in lay (Oluyemi and Roberts, 2000).

Effect of Flock Age on Hatch Weight of Shika Brown® Chicks

Hatch weight was significantly influenced by flock age (P ≤ 0.05). The hatch weights at age 50 (43.12±0.25g) and age 51 weeks (43.08±0.22g) were not different statistically but were higher (P ≤ 0.05) than the hatching weight of 42.42±0.20g and 42.69±0.19g for age 48 and 49 weeks respectively. Expectedly, the results show a linear relationship between age and hatch weight which proves that as the age of the pullets increases, hatch weight increases. The hatch weights obtained in this report agreed with the findings of Abudabos *et al.,* (2017) who reported that the lightest hatchlings were obtained from eggs collected in week 1, while eggs collected in week 2 produced intermediate-weight hatchlings (P ≤ 0.01) and the heaviest chicks hatched were from eggs collected in weeks 3, 4, 6, 7, and 8 respectively.

Effect of Flock Age on Embryonic Mortality

Age had a significant effect on early, mid, and late-stage embryonic mortality (P ≤ 0.05). Early embryonic mortality was higher at age 48 weeks (27.24%±2.23) than at 17.96%±1.84, 20.34%±1.78 and 16.17%±1.58 (at age 49, 50, and 51 weeks respectively). Similarly, midterm embryonic mortality was highest (9.56%±1.58) at 50 weeks of age and the lowest (4.56%±1.04) was at 49 weeks. Late embryonic mortality was higher (P ≤ 0.05) at age 48 (18.54±1.61%) and 49 weeks (15.81±2.12%) than at 50 (10.59±1.20%) and 51 weeks (8.98±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 the age of hen had no influence (P ≥ 0.05) on embryonic mortality during incubation but observed the highest embryonic mortality at an 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 the 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 ≤ 0.01).

Similarly, total embryonic mortality varied significantly (P≤0.05) with flock age. The highest (52.9±1.66%) was at 48 weeks of age and the lowest (31.4±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≤0.05).
E.M = Embryonic mortality

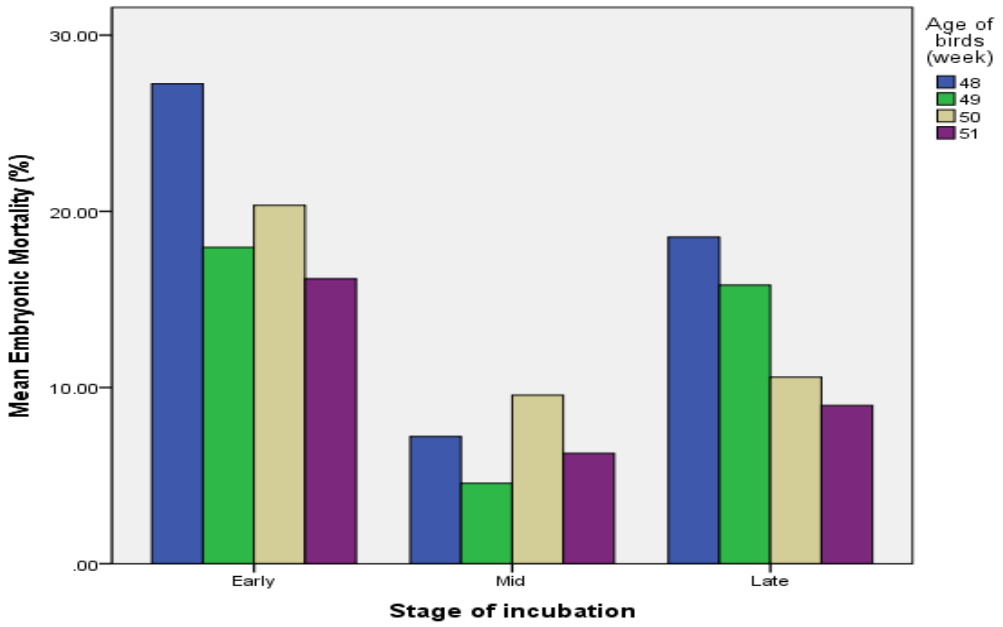

Figure 1: Stages of embryonic mortality based on flock age

CONCLUSION

From the results of this work, it can be deduced that flock age has a great influence on egg weight, fertility, hatchability, embryonic mortality, and hatched chicks' weight of Shika Brown® chickens. At the age (48-51 weeks) investigated, the birds proved to have high fertility, increasing hatchability rates, and hatched chicks' weight.

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CONFLICT OF INTERESTS

The authors declare that they have no conflicting interests.

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