

SHORT TERM EGG PRODUCTION PARAMETERS OF DIALLEL CROSSES BETWEEN NOILER AND HEAVY ECOTYPE CHICKENS REARED IN NSUKKA, SOUTH EAST NIGERIA

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ABSTRACT

The study investigated the short-term egg production parameters from diallel crosses between Noiler and Nigerian heavy ecotype chickens. It evaluated traits such as age at 1st egg, percentage egg production, weight of 1st egg, egg weight and egg mass, across various genotypes (NN, HN, NH and HH). A total of 84 birds comprising 6 Noiler cocks (NC) and 36 Noiler hens (NH), 6 heavy ecotype cocks (HC) and 36 heavy ecotype hens (HH) in the mating ratio of 1:6. The birds were arranged in four breeding groups or genotypes thus NC x NH (NN), HC X HH (HH), NC X HH (NH), and HC X NH (HN). Eggs laid were collected according to breeding groups and were set and hatched for growth traits studies. Data collected were subjected to analysis of variance (ANOVA). The results indicated significant difference ($P<0.05$) in egg production metrics. Noiler crosses exhibited superior egg weight, percentage egg production, age at 1st egg, weight of 1st egg and egg mass compared to local ecotypes. The current findings provide valuable insights into optimizing chicken breed for enhanced egg production in Nigeria's agricultural context.

Keywords: Short term, egg production, Noiler, Heavy Ecotype, Diallel crosses

INTRODUCTION

Short-term egg production parameters are critical for assessing the efficiency and productivity of poultry breeds particularly in hybrid crosses. This study focused on diallel crosses between Noiler and Nigerian heavy ecotype chickens, aiming to evaluate their reproductive traits. The Noiler breed is recognized for its rapid growth and disease resistance (Dogara *et al.*, 2021; Amo Farm, 2023; Okafor *et al.*, 2024), while the local heavy ecotype is valued for its adaptability to local conditions (Ndofor-Foleng *et al.*, 2015). By analyzing key metrics such as percentage egg production, egg weights, age at 1st Egg, weight of 1st Egg and Egg mass, this study sought to identify optimal genetic combinations that enhance egg production in Nigerian poultry farming, contributing to improved food security and economic viability (El-Tahary and Habashi, 2021).

MATERIALS AND METHODS

Location of the Study

This experiment was conducted at the Poultry Unit of the Department of Animal Science Teaching and Research Farm, University of Nigeria, Nsukka.

Base Population of the Study

The base population comprised 42 Noiler chickens (36 females and 6 males) and 42 local heavy ecotype chickens (36 females and 6 males). These birds were assigned into different breeding groups with a mating ratio of 1:6. The cocks were allowed some periods with the hens before commencement of artificial insemination. The semen of the cocks was collected from each group and inseminated with a gap of 3 days. After successful insemination, the birds were monitored till they started laying eggs. Eggs were collected once a day between the hours of 11.00 am and 12.00 noon each day. Fertile eggs for hatching were stored in a room before incubation. At the end of seven days of eggs collection, the total eggs collected for the week were set in the incubation. The chicks were vaccinated and all medication regimes were properly carried out as well as hygienic measures. The experimental layout was a completely randomized design (CRD). The data collected were subjected to analysis of variance (ANOVA) using SPSS version 25 (SPSS, 2022). The significant means were separated using the Duncan's New Multiple Range test.

Table 1: The mating arrangement

Noiler (NB)		Heavy Ecotype Bird (HEB)	
NB X NB	NB X HEB	HEB X HEB	HEB X NB
1:6	1:6	1:6	1:6
1:6	1:6	1:6	1:6
1:6	1:6	1:6	1:6
1:6	1:6	1:6	1:6
1:6	1:6	1:6	1:6
1:6	1:6	1:6	1:6
Offspring NB NB	Offspring NB HEB (Main Cross)	Offspring HEB HEB	Offspring HEB NB (Reciprocal Cross)

Key: NBNB (Noiler x Noiler), NBHEB (Noiler x Ecotype Bird), HEB (Heavy x Ecotype Bird), HENB (Heavy Ecotype x Noiler Bird)

RESULTS AND DISCUSSION

The results of the short-term egg production parameters are presented in Table 2. Breeding group represented by different cocks had significant effect ($P < 0.05$) on egg weight. The results showed that egg weight of heavy ecotype of the Nigerian local chicken was 51.72 ± 0.72 . Noiler birds had the highest egg weight of 54.44g, while egg percentage egg production for HH was 54.45 ± 2.02 . This is an indication that heavy ecotype could be developed further as a layer breed. In related study, Agu *et al.* (2012) reported 71.50 ± 3.77 g which is higher than the highest egg weight obtained in the current study.

Table 2: Short Term Egg production Parameters of Noiler and Heavy ecotype chicken genotypes

Genotype	Age at 1 st Egg	Percentage Egg production	Weight of 1 st Egg	Egg weights	Egg mass
N X N	167.83 ± 1.61^b	64.47 ± 0.02^a	44.40 ± 0.99^a	54.44 ± 0.71^a	3485.68 ± 78.21^a
H X N	179.20 ± 2.06^a	51.70 ± 0.97^b	34.33 ± 0.66^b	47.40 ± 1.20^b	2499.03 ± 98.24^b
N X H	178.20 ± 0.06^a	52.70 ± 0.30^b	36.63 ± 0.66^b	48.47 ± 1.20^b	2599.06 ± 98.24^b
H X H	178.49 ± 0.93^a	54.45 ± 2.02^b	36.72 ± 0.72^b	51.72 ± 0.89^a	2717.21 ± 65.07^b
Total	173.65 ± 0.85	57.93 ± 0.82	38.52 ± 0.55	51.48 ± 0.51	2904.48 ± 53.40

Key: a, b, c, means within the same column with different superscripts are significantly different ($P < 0.05$) BWT= Body Weight.

The significant differences between the breeding groups in egg weights and other parameters measured revealed that the Noiler and Heavy ecotype breeding groups and their crosses resulted in segregation by the cocks and hens paired randomly, and differed from one another. Egg mass mean of 3485.68 ± 78.21 for Noiler was significantly ($P < 0.05$) higher in the breeding groups. From the results obtained in this study on egg weight and percentage egg production of pure-bred heavy ecotype and Noiler chickens, it would appear that crossing Noiler birds with heavy ecotype chickens could positively enhance the performance of Nigerian poultry genetic resources. Noiler (NN) produced higher eggs weight than heavy ecotype chickens and their crosses because it converts feeds into eggs which contributed to increased egg yield. In addition, Noiler has resilience against some common diseases leading to overall health and productivity in egg laying. Noiler has been genetically enhanced over time leading to higher egg production and quality traits (Yahaya *et al.*, 2023). It is important to note that in heavy ecotype (HH), performance of main cross (NH) and reciprocal cross (HN) across all parameters may be attributed to their genetic compatibility and significant genetic correlation in egg production traits which enhanced hybrid vigor, resulting in similar outcomes (Yahaya *et al.*, 2023).

The percentage egg production which was expressed as Hen-day rate of production ranged from 51.70 to 64.47%. Noiler and Heavy ecotype hens reached their “peak” hen-day production at 64.47% at their second month of lay. Omeje (1983) and Adeodukun and Sonaiya (2001) reported peak production of the main cross between gold link and local chicken of Nigeria and Nigerian indigenous chicken, respectively to occur at the second month of lay. Agu *et al.* (2012) reported 60.80% as percentage egg

production at second month of lay. The average weight of first egg laid by hens ranged from 34.33 to 44.40 g in the current study. Agu *et al.* (2012) reported 34.29 g. The result was higher than 25.97g reported by Omeje and Nwosu (1984) but lower than that reported by Momoh (2005) for the local chicken. Weight of first egg lay of Noiler was significantly ($P<0.05$) different from the other genotypes in the breeding groups. This could be useful in the development of the Nigerian heavy ecotype chicken since the trait (egg weight) is highly heritable and therefore could be manipulated and improved easily through genetic selection.

CONCLUSION

The study evaluated the Age at 1st Egg percentage, Egg Production, egg and weight of 1st Egg weights and Egg mass of diallel crosses between Noiler and Nigerian Heavy ecotype chickens to enhance egg production traits. Four genotypes were analyzed: NN, HH, NH and HN. Results indicated significant differences in egg weights, Age at 1st egg percentage, egg production and with NN and NH showing superior performance. The NN genotype achieved an average egg weight of 54-44 and 64-47 percentage egg production while HH had a 51.72 egg weight and 54-45 percentage egg production. The findings suggest that crossing breeding can improve production traits in tropical environments, benefiting poultry farming in Nigeria.

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