FERTILITY AND HATCHABILITY OF DIALLEL CROSSES BETWEEN NOILER AND NIGERIAN HEAVY ECOTYPE CHICKENS

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ABSTRACT
Nsukka Region is an agrigarian community, noted for livestock production especially poultry business, there is no current work on Noiler breed combinations crossing with local chickens (Heavy Ecotypes) to identify the best combiners apart from the other studies on the performance of the individual cross breeds. Therefore this experiment was carried out to evaluate the fertility and hatchability of diallel crosses and reproduction traits of Noilers and Nigerian heavy ecotype chickens for possible genetic improvements of production traits. A total of 70 birds comprising of 5 noiler cocks (nc) and 30 noiler hens (nh), five heavy ecotype cocks (hc) and 30 heavy ecotype hens (hh) in the mating ratio of 1:5. 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). The cocks were trained for semen collection and artificial insemination was used for breeding. 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 ($P \leq 0.05$) effect of genotype on fertility and hatchability of eggs in which the Percentage fertility across the genotypes were 57%, 29%, 61% and 37%, while hatchability was 74, 47, 72 and 49%, for the genotypes NN, HH, NH and HH respectively. The genotypes NH had higher egg weight of 47.33 and 46.03 than HH and HN with egg weights of 43.70 and 44.43 respectively. The findings showed that breeding local pullets with local cocks of noiler improved fertility and hatchability.
Key words: Egg Weights, Fertility, Hatchability, Noiler bird, Heavy Ecotype chicken.

INTRODUCTION

The need to produce more animal protein in the country has been a burden to any successive governments in Nigeria as a result of the ever-rising population. Poultry eggs constitute one of the most valuable sources of animal protein recommended for human consumption (Dogara *et al*., 2021). The fertility and hatchability, characteristics of egg type chickens in Nigeria are two man traits of assessing the potentials of hens (Allanah *et al*., 2014). Fertility refers to the percentage of incubated eggs that are fertile while hatchability is the percentage of fertile eggs that hatch. Cross breeding is widely used in poultry breeding programmes because it increases the number of heterozygous loci and results in heterosis for traits such as growth and egg production (EL-Tahawy and Habash, 2021). Positive heterosis or hybrid vigour is a phenomenon according to which cross bred offspring exhibit better performance that the average of the parental breed because the interaction of alleles from the sire and dam results in effects of dominance and epistasis (Soltan et al, 2018). Indigenous chickens have desirable traits such as disease resistance, pleasantly flavoured meat and egg, and ability to withstand adverse environmental conditions (EL-Tahawy and Habash, 2021).

Crossing Nigeria local chickens with noiler strains which are for commercial purpose one could take advantage of high egg production, early maturity and better meat type development. Cross breds that results for the best performing parental breeds should lead to the production of birds that will be superior in growth and eggs production in a tropical environment. Also hybrid could be used to develop new hybrid strains of chickens (EL-Tahawy and Habash, 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

Experimental Animals, Design and Management

A total of 70 birds comprising of 35 Noilers (30 laying hens and 5 cocks) and 35 heavy ecotype chickens (30 hens and 5 cocks) in a mating ratio of 1:3 were used for this experiment. While noilers were procured from a reputable farm, heavy ecotype birds were selected from the University of Nigeria Animal Science departmental farm. A diallel breeding procedure was set to generate four genotypes and artificial insemination was employed to fertilize the hens. The experiment lasted for 7sevenweeks in which first week was used to stabilize the birds; the second week was used to train the cockerel for semen collection and the third week was used for artificial insemination, while the remaining four weeks were used for hatchery and computing results. The birds were housed in battery cages. Laying birds were fed with hybrid layers while the cocks were fed with hybrid growers. The experimental birds were vaccinated against Newcastle diseases (NDV). Prophylactic drugs were given to the birds to check or inhibit the incidence of some diseases like coccidiosis. Proper hygiene was maintained adequate.

Table1: Mating Ratio

Breeding grps/Genotypes	No of cocks	No of hens	Genetic group
Noiler x Noiler (NN)	1	5	Noiler
Heavyeco x heavyeco (HH)	1	5	Heavy ecotype
Noiler x heavyeco (NH)	1	5	Main cross
Heav eco x Noiler (HN)	1	5	Reciprocal cross

The cocks were trained for semen collection at the interval of two days in a week by abdominal massage technique as according to Burrows and Quinn (1937).The semen was diluted with saline water and inseminated with 1ml syringe through hen's left vent of its genital organ when the abdominal region is gently pressurized until the vent pulls up. Eggs were collected for one week from each breeding group, labeled and stored accordingly before taking them for hatchery. The hatched chicks were gotten after 21 days from which fertility and hatchability were calculated. Fertility = number of eggs fertile after candling/ egg set x 100 and Hatchability =(number of eggs hatched)/(number of eggs set) x 100. Experimental design was 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 (Duncan, 1955).

RESULTS AND DISCUSSION

Table 2: Mean ± Standard Error of production traits of the breeding groups.

	Genotypes			
Parameters	**NN**	**HH**	**NH**	**HN**
Egg weight (g)	47.33 ± 0.77^{a}	43.70 ± 0.66^{c}	46.03 ± 0.60^{ab}	44.43 ± 0.37^{bc}
Egg set	130^{a}	135^{a}	101^{b}	113^{b}
Ferile eggs (%)	84.62^{a}	85.93^{a}	66.10^{b}	63.72^{b}
Hatched eggs (%)	73.85^{a}	71.84^{a}	50.50^{b}	54.87^{b}

Means±SEM with different superscript a, b, c within the row show significance (P< 0.05) among the means while those with the same superscript show no significance.

Table 2 presents the means of the egg weight, egg set, percentage of fertility and hatchability of diallel crosses of Noiler and heavy ecotype chickens. There were significant ($p<0.05$) differences in all the parameters studied with NN genotypes being the best in egg weight (47.33± 0.77) followed by NH, HN, and HH genotypes respectively. There were also significant ($p<0.05$) differences in egg set, percentage fertility and percentage hatchability where NN and HH genotypes were the best and significantly ($p<0.05$) different from genotype NH and HN.

The mean egg weight of NN (47.33± 0.77) and NH (46.03 ± 0.60) genotypes were within the range reported by Dogara etal.(2021) while evaluating the mean egg weight of different strains of noiler chicken as black (47.91±1.21), brown (45.45±1.08) and sported (46.35±2.26). It also shows that siring

a heavy ecotype hen with noiler cock has improved on egg weight of NH genotype and that heavy ecotype local chicken has over time been genetically improved as a result of many years of index selection in University of Nigeria Nsukka.

There were also significant ($p<0.05$) difference in percentage fertility and hatchability among the genotypes where NN and HH genotypes were higher than NH and HN genotypes. The percentage fertility and hatchability in NN genotype (84.62% and 73.85%) and HH genotype (85.93 and 71.84) respectively is an indication that noiler as improved dual-purpose birds and heavy ecotype local birds are potentials for protein increase in the country. This high productivity agrees with Ojedapo *et al.,* (2008) who noted that

poultry products could be employed to bridge protein gap because of short generation interval, high rate of productivity, quick turnover rate, higher feed efficiency of poultry. This also agrees with Amo-farm(2023) who noted that noiler dual purpose birds could serve high production rate in Nigeria animal industry.

The result of high hatchability of HH genotype (71.84%) was not in line with the percentage hatchability obtained by Malago and Baitilwake (2009) who obtained 52.20% for local chickens when compared to their exotic and cross-breed counterparts. Perhaps, this could be attributed to the relationship between egg weight and hatchability. Ndofor-Foleng *et al*. (2015) reported that it was preferable to have egg of average weight to achieve good hatchability. This is probably because breed has little effect on hatchability of poultry eggs.

Sola-Ojo and Ayorinde (2011) reported that many factors results to the failure of fertile eggs to hatch, they are insufficient nutrients in the egg, egg storage duration and conditions also other factors include health nutrition and age of the flock and egg size.

CONCLUSION AND RECOMMENDATION

It could be concluded that noiler chickens eggs weighs higher than other genotypes studied and a main cross of noiler and heavy ecotype local chicken (NH) genotype could increase egg weight and other production traits in heavy ecotype chickens.

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