FERTILITY AND HATCHABILITY OF F1 CROSSES OF EXOTIC AND NIGERIAN HEAVY ECOTYPE LOCAL CHICKEN BIRDS REARED IN UNIVERSITY OF NIGERIA NSUKKA

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Abstract
This research was conducted to determine the fertility and hatchability of FI crosses of Exotic and Nigerian Heavy Ecotype Local Chicken reared in University of Nigeria Nsukka. A total of 72 mature birds (8 cocks and 64 hens) were randomly selected from the four sire families: Ammo cocks and Isa brown hens (AC x IBH), Ammo Cocks and Heavy Ecotype Local Hens (AC x HEH), Heavy Ecotype Cocks and Isa Brown Hens (HEC x IBH) and Heavy Ecotype Cocks and Heavy Ecotype Hens (HEC x HEH). The experiment lasted for 6 weeks during which the cocks were trained for semen collection, artificial insemination, egg collection, egg setting and hatchery. The Percentage fertility, hatchability and the production performance were estimated and subjected to analysis of variance in a completely randomized design. The result obtained showed that there were significant ($p<0.05$) differences in both percentage fertility (85.7867 ±1.17553) and hatchability (71.9467 ±1.04566) in which (AC x HEH) performed best among all the sire families. The result also revealed that there were significant ($p<0.05$) differences in egg number, average egg weight and the number of pauses. The (HECx HEH) was the best in egg number (88.33 ±0.333) and number of pauses (8.00 ±0.577) while (AC xIBH) was the best in average egg weight (54.00 ±0.577) followed by the (AC x HEH) which has 52.67 ±0.333. It could be concluded hence that crossbreeding local birds with a proven exotic breed increases the percentage fertility, hatchability and average egg weight.

Keywords: Fertility, hatchability, egg weight, local chicken and exotic chicken

Introduction

Poultry eggs constitute one of the most valuable sources of animal protein recommended for human consumption, and offer means of solving the problems of animal protein shortage(Olawoyin, 2006). Fertility, hatchability, egg production and growth are economically important traits in local poultry production systems. Breeders usually aim at conserving and increasing the productive efficiency of native chickens genetically for economic traits (R.Sh., 2014). High fertility and hatchability of eggs of breeder stock and survivability of the chicks is necessary to produce large numbers of birds. Fertility and hatchability are two major parameters that highly influence the demand for day-old chicks. Fertility refers to the percentage of incubated eggs that become fertile while hatchability is the percentage of fertile eggs that hatch (Kingori, 2007). Fertility and hatchability are the two important traits and are the major determinants of profitability in poultry enterprise (Peters *et al*., 2008). The Nigerian indigenous chickens have high reproductive potentials as was evident in their early and middle reproductive ages (Fayeye *et al*., 2005). The adoption of Artificial Insemination (A.1.) technology in this research, which is the technical introduction of cocks' semen into the vagina of hens, has helped in the production performance of those hens. Exploring the potentials of the Nigerian indigenous heavy chicken ecotype through cross breeding will not only lead to improvement of the local chicken but also reduction of the cost of importation of day-old chicks and breeder stock which are costly to manage, especially in Nigeria.

Materials and Methods

Study location

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

The experimental birds were acquired from the population of F1 crosses of exotic and local birds of four sire families (AC x IBH, AC x HEH, HEC x IBH, HEC x HEH) from on-going research in the Animal Science Department. A total of 72 birds comprising of 8 mature cocks (2 per sire family) and 64 laying hens (16 per sire family) were randomly selected for this research. The experiment lasted for 6 weeks 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 three weeks were used for hatchery. 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. The mating ratio adopted was one cock to 8 hens using artificial insemination.

Table1: Mating Ratio

Breeding groups	Number of sires	Number of dams	Mating ratio
AC x IBH	1	8	1:8
AC x HEH	1	8	1:8
HEC x IBH	1	8	1:8
HEC x HEH	1	8	1:8

The cocks were trained for semen collection at the interval of two days in a week using abdominal massage technique as described by Burrows and Quinn (1937).The collected semen was diluted with saline water and inseminated with 1ml syringe through hen's left vent of its genital organ. Eggs were collected for one week from each sire family, labeled and stored accordingly before taking them for hatchery. The hatched chicks were collected after 21 days from which fertility and hatchability were estimated. 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 discussions

Table 2: Mean ± Standard Error of mean of percentage (%) fertility and hatchability of F1 crosses of Exotic and Local chicken

Breeds of Animal	**Percentage fertility**	**Percentage hatchability**
AC x IBH	55.6600 ±0.49095^{c}	55.5600 ±0.45611^{b}
AC x HEH	85.7867 ±1.17553^{a}	71.9467 ±1.04566^{a}
HEC x IBH	62.6967 ±1.59525^{b}	52.0267 ±0.93852^{c}
HEC x HEH	46.6467 ±0.35825^{d}	38.4800 ±1.22049^{d}

Means±SEM with superscript a, b, c, d, shows significance (P< 0.05) among the means

Table 2 shows the percentage fertility and hatchability of f1 crosses of local and exotic chicken reared in University of Nigeria Nsukka. There were significant ($p<0.05$) differences in all the four groups of the experimental animals used. The percentage of fertility was highest in AC x HEH (85.7867 ±1.17553) followed by HEC x IBH (62.6967 ±1.59525), then AC x IBH (55.6600 ±0.49095) and HEC x HEH (46.6467 ±0.35825) respectively. This result followed the line of past studies on fertility in Exotic chicken where optimum fertility 83.50 ± 11.88 % was observed using sperm of indigenous cocks for breeding (Ojedapo *et a*l., 2022). This might have also resulted from successful Artificial insemination (AI) in birds as it expresses better fertility than natural mating and has the ability to spread up the rate of genetic improvements by increasing differentials, wherein, one highly selected sire can be mated with thousands of females (Chaudhury, 1996; Gee *et al*, 2004).This result also agrees with Padhi (2016) who opined that when local ecotypes are crossed with exotic chicken, there will be tendencies to develop appropriate native-type birds with higher production potentials as we have seen in Exotic x Local crossbred

improvement in the traits studied above. In percentage hatchability, also, AC x HEH performed best (71.9467 ±1.04566) in all the group of crossbred animals tested followed by AC x IBH (55.5600 ±0.45611), HEC x IBH (52.0267 ±0.93852[c]) and HEC x HEH (38.4800 ±1.22049[d]) in that order. This result is in accordance with Yeigba (2021) who reported 31.14 ± 22.39% - 62.91 ± 20.38% on both local and exotic breeds. This also agrees with Oluyemi and Roberts (2000) who noted that fertility and hatchability are heritability characteristics that are reduced by inbreeding and increased by crossbreeding. This shows that our crossbreeding exercise yielded positive results. However, the results failed to agree with the findings of Peters *et al.,* (2007) who reported that there was no significance different in both percentage fertility and percentage hatchability of eggs of both exotic and local chicken.

Table 3: Mean±Standard Error of mean of Production Performance of the F1 crosses of Exotic and Local chicken.

Breeds of Animal	**Egg number**	**Average weight**	**Number of pauses**
AC x IBH	42.67 ±0.333[d]	54.00 ±0.577[a]	50.00 ±0.577[a]
AC x HEH	70.00 ±0.577[c]	52.67 ±0.333[ab]	26.33 ±0.882[b]
HEC x IBH	82.00 ±0.577[b]	51.00 ±0.577[b]	14.00 ±0.577[c]
HEC x HEH	88.33 ±0.333[a]	52.00 ±0.577[b]	8.00 ±0.577[d]

Means±SEM with superscript a, b, c, and d shows significant ($p<0.05$) differences.

The Production Performance Mean± Standard Error of Mean Values of the F1 crossbred of Exotic and Local chicken are presented in table 3 above. The result showed significant difference ($p<0.05$) in egg number in the entire group tested. The result shows that in terms of egg number, HEC x HEH performed best (88.33 ±0.333) in all the groups followed by HEC x IBH(82.00 ±0.577), AC x HEH(70.00 ±0.577), and AC x IBH(42.67 ±0.333) in that order. This failed to agree with Alemneh and Getabalew (2019) who recorded 38.5 on Exotic × Exotic, and 30 on Local × Local. However, in average weight, AC x IBH(54.00 ±0.577) performed highest followed by AC x HEH(52.67 ±0.333), HEC x HEH(52.00 ±0.577), and HEC x IBH(51.00 ±0.577) respectively. This is almost in line with what Alemneh and Getabalew (2019) recorded, noting that Exotic x Exotic was 60.00g, Exotic × Local 49 – 56g and Local × Local with 38g. But for the number of pauses, the highest is the AC x IBH showing that farmers cannot be advised to cross Isa brown hens with Ammo cocks for increased number of egg pauses.

Conclusion and Recommendation

From the results of the study, it was evident that the crosses of AC x HEH and HEC x IBH performed favorably better than the AC x IBH and HEC x HEH in most of the parameters being evaluated. It shows also that crossbreeding exercise embarked on this project was not a wasted exercise since the crossbreed performed better than the parents (hybrid vigour). Therefore, for a commercial egg and chick production, we strongly recommend a crossbreeding exercise of local x exotic and exotic and local birds for a better result.

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