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Research Article

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Genotype influence on Production, Fertility and Hatchability of Eggs of Guinea fowl (*Numida meleagris*) in a Tropical Rain Forest Zone of Nigeria

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Abstract This study was carried out to assess the egg production, fertility and hatchability of three genotypes of guinea fowl. The genotypes were: Pearl X Pearl (PXP), Black X Black (BXB) and Black X Pearl (BXP). One hundred and twenty (120) female guinea fowls at point of lay (26 -28 weeks of age), which were first filial generation (F1) progeny of an unselected parent population were used for the experiment. Parameters measured studied were: egg number (EN), Hen-day percentage (HDP), fertility and hatchability. The BXB genotype exhibited significant ($P<0.05$) superiority in average EN production (3.84) and HDP (54.87%), followed by the BXP genotype with 3.09 EN and 44.16% HDP. Genotype groups did not differ significantly ($P>0.05$) in their fertility and hatchability rates. Fertility ranged from 67.00 -74.57 %, and hatchability 68.57-75.57% among the genotypes. It was concluded that the BXB genotype be selected for improvement as egg-laying birds and suggested that commercial expansion of guinea fowl production be considered in the rain forest zone of Nigeria, given the high fertility and hatchability percentages.

Keywords Guinea fowl, genotype, fertility, hatchability, egg production

Introduction

The potential of the guinea fowl to increase egg production in Nigeria is a fact that deserves a better recognition. Under the free range system of management, guinea hens can lay up to 60 eggs per season, while intensively reared stock can lay up to 200 eggs per annum. According to Farrel (2017), average annual egg production in guinea fowl is between 55 and 100 [1]. A clutch size of 15 – 20 eggs is common, with egg laying season being from April to September [2]. Laying could continue for between 5 to 7 years [3]. Egg production can be increased by removing eggs from the laying nest to discourage broodiness by the hen.

Fertility and hatchability of poultry eggs vary among breed, variety and individuals in a breed. Egg size, age of hen, season of breeding and weight of hen have been implicated to affect fertility and hatchability of poultry eggs [4-6]. Fertility percentage range of 70 to 85 have been reported in guinea fowl [7-8], while hatchability percentage range of 72 to 80 had been reported by different authors [1, 9-10]. The success of the guinea fowl enterprise is wholly hinged on egg productivity, as well as its fertility and hatchability. This study therefore aimed to assess the egg production, as well as fertility and hatchability of guinea fowls, as affected by their genotype in Calabar, tropical rain forest zone of Nigeria.

Materials and Methods

The research was carried out in the Poultry Unit of the University of Calabar Teaching and Research Farm. The study lasted between July and September, 2013. The guinea hens were F1 progeny of an unselected parent population consisting of 15 pearl males, 56 pearl females, 14 black males and 30 black females. The progeny birds were mated at a ratio of 1:4 in the following mating scheme:

- Pearl male X Pearl female (P XP) – homozygous pearl thorough bred line

- Black male X Black female (B X B) – homozygous black thorough bred line
- Black male X Pearl female (B X P) – heterozygous cross bred line

The birds were housed in a deep litter house, fed *ad libitum* on a layers ration containing 18.54% crude protein with 2700 Kcal/Kg metabolizable energy. Adequate hygiene was maintained and necessary medications administered. Eggs were collected daily from 3 to 13 weeks in lay and set in an artificial incubator at a temperature of 37.5º C and 60% relative humidity. Fertility was determined by candling on the 12th day of incubation. The parameters studied were:

- Egg number = total number of eggs / bird
- Hen day percent = $\frac{\text{total number of eggs laid}}{\text{Average number of hen X number of hen days}} \times \frac{100}{1}$
- Percentage fertility = $\frac{\text{number of fertile eggs}}{\text{number of eggs set}} \times \frac{100}{1}$
- Percentage hatchability = $\frac{\text{number of hatched eggs}}{\text{number of fertile eggs}} \times \frac{100}{1}$

Descriptive statistics was used to analyze data collected from this experiment.

Results and Discussion

Results of the comparative egg number production of the three genotypes of guinea fowls are presented in Table 1. There were significant (P<0.05) differences among the genotypes for mean egg production, the BXB having the highest number. Mean weekly EN recorded in this study were 3.84, 3.09 and 2.80 in the BXB, BXP and PXP genotypes respectively. Average weekly EN of 12.84 and 22.71 were reported by Obike *et al.* (2011) [11] in the black and pearl varieties respectively. Odukwe (2009) [12] and Onunkwo & Okoro (2015) [13], reported higher EN productivity in the pearl than the black variety. The disparity between the reports of the authors and the present research findings could be attributed to the young age of the hens used in this study and the bias posed by the unequal number of layers used by the authors in their experiment.

Table 2 shows the result of the hen-day (HDP) performance of the three genotypes. The BXB group significantly (P<0.05) excelled in this trait (54.87%). The HDP recorded in this research were much higher than the range (21.34 – 25. 81%) reported by Onunkwo and Okoro (2015) [13], as well as 11.92% given by Odukwe (2009) [12]. The HDP fluctuated through the weeks across the genotypes. This fluctuating trend in egg production is in line with the observations of Oke *et al.* (2004) [6] and Onunkwo & Okoro (2015) [13]. Progesterone levels in guinea fowl is positively correlated egg production (r = 0.89) and is highest during the months of June to August in the tropics [14]. This period correspond with the periods of peak production in this experiment.

Fertility and hatchability traits of the genotypes are presented in Table 3. Fertility percentage was highest in the BXP group, followed by BXB and lastly, PXP. The values obtained in this experiment are line with the reports of Moreki (2007) [7] and Agbolosu *et al.* (2012) [8]. The BXB genotype exhibited the highest numerical hatchability percentage (75.57). Hatchability percentages recorded in this research are similar to 72.80 – 73.60% reported by Naandam and Issah (2012) [9] and 81 – 87% given by Ayorinde (1987) [4] in guinea fowls. Similarly, Ajayi *et al.* (2008) [15] obtained 80.50% hatchability for Nigerian indigenous chickens. Odukwe (2009) [12] however had lower values (53.84 and 53.41%) in guinea fowls.

Conclusion

Based on the EN and HDP production, the homozygous black genotype can be selected and improved for egg production in the rain forest zone of Nigeria. Genotype did not significantly (p>0.05) affect fertility and hatchability of guinea fowl eggs. Fertility and hatchability of intensively reared guinea fowl is high from result of this research. Consequently, commercial expansion of the species can be given a shot at in this zone of the country.

Table 1: Comparative performance of mean weekly egg number of guinea fowl genotypes

Week s in Lay	Genotypes			SEM
	P × P	B × B	B × P	
3	1.17[c]	3.00[a]	2.50[b]	0.28
4	1.83[c]	2.67[b]	4.00[a]	0.32
5	1.83[c]	2.67[b]	4.00[a]	0.32
6	3.66[c]	4.83[b]	5.67[a]	0.30
7	2.33[b]	4.17[a]	4.17[a]	0.31
8	2.33[b]	2.50[b]	3.83[a]	0.24
9	2.00[c]	3.83[a]	3.17[b]	0.27
10	3.67[b]	4.33[a]	1.67[c]	0.40
11	4.25[b]	5.00[a]	2.33[c]	0.40
12	3.58[b]	4.42[a]	1.58[c]	0.42
13	2.92[b]	4.17[a]	2.08[c]	0.31
Total				
Mean	2.80[b]	3.84[a]	3.09[ab]	0.19

[a, b]Means with different superscripts across the rows differ significantly at P<0.05; SEM= Standard error of the mean

Table 2: Comparative performance of hen-day percent of three genotypes of guinea fowl

Weeks in Lay	Genotypes			SEM
	P × P	B × B	B × P	
3	16.67[c]	42.86[a]	35.71[b]	3.91
4	26.19[c]	38.10[b]	57.14[a]	4.51
5	42.86[b]	47.62[a]	42.86[b]	0.81
6	52.38[c]	69.05[b]	80.95[a]	4.15
7	33.33[b]	59.52[a]	59.52[a]	4.37
8	33.33[c]	35.71[b]	54.76[a]	3.39
9	28.57[c]	54.76[a]	45.24[b]	3.83
10	52.21[b]	61.74[a]	23.64[c]	5.72
11	60.55[b]	71.26[a]	33.17[c]	5.67
12	51.02[b]	62.93[a]	22.45[c]	6.01
13	41.50[b]	59.36[a]	29.60[c]	4.33
Mean	39.94[b]	54.87[a]	44.16[ab]	2.71

[a, b]Means with different superscripts across the rows differ significantly at P < 0.05; SEM= Standard error of the mean

Table 3: Fertility and Hatchability Traits of three genotypes of guinea fowl

Parameter	Genotype			SEM
	P×P	B×B	B×P	
Mean number of set eggs	53.43[a]	53.14[a]	33.57[b]	4.35
Mean number of fertile eggs	36.29[a]	40.57[a]	25.14[b]	3.80
Fertility percent	67.00	73.71	74.57	3.08
Hatchability Percent	68.57	75.57	73.29	3.76

[a,b]Means with different superscripts across the rows differ significantly at P>0.05; SEM= Standard error of the mean

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