RESPONSE OF NIGERIAN FAIRLY BRED CHICKENS TO INBREEDING AND MASS SELECTION

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ABSTRACT
The study was conducted to investigate the response of Nigerian local chicken to different breeding methods (Inbreeding and Mass selection). A total of 80 birds was used in this study, which lasted for 8 weeks. 4 sires and 12 hens were used to generate the progenies used for the experiments. Traits measured included weekly body weights and fitness traits comprising leg deformation, lethal gene, disease resistance, starvation rate and survival of starvation. Data collected were subjected to one-way analysis of variances in a Paternal half sib analysis using Animal model of SAS. The mean result of the study on body weight of sire families 23, 24, 25 and 27 for eight weeks ranged from to 0.035+_19.20 in C27 to 0.039±0.610 in C23; 0.235±8.48 in C23 to 0.327±29.65 in C27; 0.327±29.65 in C27 to 0.391±18.75 in C23; 0.420±43.24 in C27 to 0.709±22.50 in C23 and 1.500±0.3 in C27 to 1.700±3.01 in C23 respectively. Progenies of C23 weighed significantly (P<0.05) higher than other genetic groups at week 1, 4, 6 and 8, However progenies of C25 were significantly higher than C24 and C27 at week 1 and 6. The result on fitness traits further revealed that Leg deformation and,lethal gene, survival rate, and disease resistance were significantly(p<0.05) higher in the inbred progenies than mass selected progenies, however the inbred and mass selected were statistically similar in rate of survival of starvation. The study recommends the combined use of inbreeding and mass selection for enhanced breeding program among the fairly bred chickens
Keywords: Nigerian local chicken, Progenies, Traits, Lethal gene, Mass selection

INTRODUCTION

The purpose of modern breeding program lays emphasis on balanced breeding. Balanced breeding means to find a compromise between the health and welfare of animals, their environmental impacts and the quality and the quantity of the production (milk, meat and eggs). This can be achieved by selection and inbreeding and cross breeding. Examples could be, milk and meat production and quality, as well as disease resistance, robustness, fertility, longevity and the reduction of the impact in the environment e.g. methane use and better use of feed resources (Chapatte, 2021). Mass selection is a breeding method where the genetic values of individual animals are estimated, and then based on these estimates animals are selected to be the parents of the following generation based on their appearance, preferred characteristics, colour, and body weight for as many generations as desired. Inbreeding is useful in the retention of desirable characteristics or the elimination of undesirable ones, but it often results in decreased vigour, size, and fertility of the off springs because of the combined effect of harmful genes that were recessive in both parents (Adeleke *et al*., 2011).

Today genetic progress has exponentially grown the world poultry Chicken meat (100,931,000 metric tons export for 2022), which constitutes 30% of the world livestock. Brazil, China and European Union exports of chicken were 14,400,000 metric tons 14,300,000 metric tons and 10,920,000 metric ton, respectively out of world chicken export (USDA (2022) .

The genetic improvement of the Nigerian chicken research at the University of Nigeria research and experimental farm in the past decade has recorded substantial progress. Both the growth and reproductive traits of the inbred population (Ohagenyi *et. al.*, 2023), (Ohagenyi and Idenyi, 2024), (Ohagenyi *et al.* 2023b) and the mass selected population of the Heavy local chicken ecotype (Momoh (2005), Ogbu *et al*. (2012) , Agbo *et al,* (2018,) and Udeh *et al* (2024)) have been consistently evaluated and improved over the past decade. Ohagenyi *et. al*., (2024) reported 60.70g, 89.44, g, 382.08g, weights of inbred chickens at weeks 1,2 and 4 weeks of age. Udeh *et al* (2004) and Ohagenyi *et. al.*, (2023a) reported 55.36g, 88.,00g and 299g at1, 3 and 4weeks of age for body weight, of mass selected Nigerian

chickens. This yield of meat is not adequate, in relation to the exoric broiler chicken, consequently Nigeria poultry meat has very little contribution to the world poultry trade.

Enhanced genetic progress among the fairly improved inbred and Mass selectef chicken will facilitate Nigerian chicken predicted goal of providing solution to the global animal protein malnutrition and food security can be achieved through enhanced breeding methods and predictive accuracy (FAO, 2021). Taking a comparative look at the genetic progress obtained through mass selection and inbreeding to decifer the method with highest genetic gain are both strategic and pragmatic for maximal meat and egg yield of the population, which is dominantly (80%) local. The present study aimed at investigating the response of Nigerian local chicken to inbreeding and mass selection.

MATERIALS AND METHODS

Management of experimental population

The parent stock used for the study comprised four strains of heavy local ecotype (White strain, Black strain, Barred strain and Brown strain) and four groups of inbred local chickens (Cock 41, Cock 42, Cock 43 and Cock 44). The experimental birds comprise of 2 genetic groups. Group one were 80 individuals generated from 4 males mated to 12 females subjected mass selection. Group 2 were 80 inbred offspring of G2 local chickens generated from mating 4 cocks and 12 hens comprising of four strains which are black, barred, brown and white. The pens were swept and cleaned and disinfected thoroughly with formalin, as well as the drinking and feeding troughs. The experimental birds were fed *ad-libitum* with broiler starter from day 1 to 4 weeks and broiler finisher from 5-8 weeks of age.

Statistical analysis and experimental design

Data obtained from body weight, body length, shank length, breast girth and wing length were subjected to analysis of variance (ANOVA) in an Animal Model Paternal half sib analysis of all data generated were analyzed using SAS (2004) statistical procedure. Paternal half sib model and SAS 2004 statistical procedure were used to derive the variance and covariance components of all traits under study.

Model:

$Yij = \mu + Ti + e_{ij}$

Where;

Yij = the record of body weight, body Length, shank length, wing length and breast girth of individual progeny of the jth dam mated to the ith sire

μ = overall mean

Ti = the random effect of the ith sire

e_{ij} = the uncontrolled environment and genetic deviations attributable to individual progeny within each sire group.

RESULTS AND DISCUSSION

Table 1 below compares some growth and fitness traits of the Nigeria inbred chicken and mass selected Nigeria heavy local chicken ecotype. Sire progenies of white, black, barred and golden of body weight of week 6, 8 and 40 showed significance differences.

Table 1: Comparing the effects of Inbreeding and Mass selection on the Growth and Fitness traits of Nigerian Inbred chicken and the Nigerian Heavy local chicken ecotype

	Inbred				Mass selection			
Sire	C23	C24	C25	C27	Black	Barred	White	Golden
BW1	0.479±0.610^{a}	0.505±0.98^{a}	0.626±1.40^{b}	0.815±19.20^{a}	0.038± 0.002^{b}	0.036± 0.002^{b}	0.038± 0.002$^{N.S}$	0.036 ±0.002$^{N.S}$
BW4	0.235±8.48^{NS}	0.221±10.86^{NS}	0.229±5.94^{NS}	0.216±24.85^{NS}	0.1960±0.009$^{N.S}$	0.196±0.002$^{N.S}$	0.1960±0.009$^{N.S}$	0.188 ±0.008$^{N.S}$
BW6	0.391±18.75^{a}	0.251±8.30^{c}	0.349±7.88^{ab}	0.327±29.65^{b}	0.312±0.0143^{b}	0.360±0.0157^{ab}	0.312±0.0143	0.346± 0.016^{ab}
BW8	0.709±22.50^{a}	0.579±31.80^{b}	0.576±32.16^{b}	0.429±43.24^{c}	0.564± 0.226^{ab}	0.516± 0.256^{b}	0.564± 0.226	0.584 ±0.010^{a}
BW 40	1.700±3.01^{b}	2.050±0.04^{a}	1.450±0.05^{c}	1.500±0.03^{c}	1.430± 0.09^{c}	1.540±0.07^{c}	1.430± 0.09$^{a b}$	1.430±0.08^{a}
Leg deformation	5.00±0.01^{a}	0.00±0.01^{b}	0.00±0.01^{b}	0.00±0.01^{b}	0.00±0.01^{b}	0.00±0.01^{b}	0.00±0.01^{b}	0.00±0.01^{b}
Disease resistance	1.00^{b}	2.10 ±0.11^{a}	2.00±0.01^{b}	2.00±0.01^{b}	2.00±0.01^{b}	2.00±0.01^{b}	5.00±0.01^{a}	5.00±0.01^{a}
Lethal gene	5.00±0.01^{a}	0.00±0.01^{b}	0.00±0.01^{b}	0.00±0.01^{b}	0.10±0.01^{b}	0.11±0.01^{b}	0.00±0.01^{b}	0.00±0.01^{b}
Survival of starvation	10.00±0.01^{a}	10.00±0.01^{a}	10.00±0.02^{a}	10.00±0.01^{a}	10.00±0.01^{a}	10.00±0.01^{a}	11.00±0.01^{a}	10.00±0.01^{a}

Lethal gene - caused Death of chicks within 7 days of age: survival of starvation – survival of birds after 2 weeks of shortage of feed

Body weight of inbred chicken at weeks 1, 4, 6, 8 and 40 ranged from 0.47kg to 0.50kg, 0.221to 0.023, 0.25kg to 0.3, 0.57 to 0.70, 1.7 to 2.05kg, respectively, while for mass selected group ranges body weight at week 1, 4, 6, 8 and 40 ranged from 0.036kg to 0.038, 0.188kg to 0.19kg, 0.312kg to 0.36kg,

0.51 to 0.56, 1.43 to 1.54 respectively. Leg deformation ranged from 0.00+_0.01 in mass selected groups to 5.00+_0.01 among inbred. Disease resistance ranged from 1.00 among inbred to 5.00 among mass selected population. Lethal gene ranged from 0.00+_0.00 among mass to 5.00+_0.01 among inbred. Survival of starvation ranged from 0.00 among inbred to 2.00 among mass selected.

Body weights of inbred showed significant differences ($p>0.050$) at weeks 1,8 and 40, However, Nigeria inbred and mass selected chickens were statistically the same ($p<0.05$) at week 4. Again body weights of inbred progenies weighed significantly more than mass selected chickens at week 1, 6, 8 and 40. At weeks 1, 6 and 8 sire family of C23 (inbred progenies) weighed significantly ($P<0.05$) higher than the progenies of mass selected (white and golden) while at week 8 the progenies of C24 weighed significantly ($P<0.05$) higher than the mass selected progenies. Leg deformation and, lethal gene, survival rate Disease resistance and were significantly ($p<0.05$) higher in the inbred progenies than mass selected progenies, however the inbred and mass selected were statistically ($P>0.05$) similar in rate of survival of starvation.

The higher records of the inbred progenies indicate that inbreeding could accelerate the rate of homogeneity, when compared to mass selection, since mating of sibling increase the concentration of superiority of the parents that are retained in the offspring. The observed variation in the body weights and fitness traits could be die to diverse degree of homogeneity resulting from the 2 breeding strategies and some environmental factors such as time difference in feeding as the number of weeks increases as seen in week four and six when compared to week one. The values recorded in this study for body weights of the superior inbred chickens were higher than the reports of 0hagenyi et al. (2023) a and 2023b), Udeh et al. 2024) while the less superior inbred chickens were in agreement with the work of Agbo *et al*. (2018), Udeh *et al*. (2024) and Ohagenyi *et al*. (2023).

CONCLUSION

The sire family of inbred progenies (C23) weighed significantly ($P<0.05$) higher than the progenies of mass selected (white and golden) at weeks 1, 6 and 8, while at week 8 the progenies of C24 weighed significantly ($P<0.05$) higher than the mass selected progenies. Body weight of inbred chicken varied significantly ($p<0.05$) at weeks 1, 6, 8 and 40, except at week 4. Body weight of mass selected progenies showed significant ($p<0.05$) differences at weeks 1, 6, 8 and 40, but statistically ($p>0.05$) the same at week 4. Leg deformation and, lethal gene, survival rate, disease resistance and were significantly ($p<0.05$) higher in the inbred progenies than mass selected progenies, however the inbred and mass selected were statistically ($P>0.05$) similar in rate of survival of starvation. This study therefore recommends inbreeding as a veritable tool for enhanced improvement of Nigeria local chicken.

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