CARCASS AND SERUM BIOCHEMICAL CHARACTERISTICS OF F_2 PROGENY OF ABIA ECOTYPE BIRDS AND THEIR EXOTIC MALE LINE CROSSES IN THE HUMID TROPICS

Olagbegi, A. D.,Oke,U.K.,Nzeaghara J. M.,Obike,O. M.,Urum,S.M.,Nosike, R. J. Obi C. O., Anieke,Eunice and Ohiaegbe, J.P.
Department of Animal Breeding and Physiology College of Animal Science and Production, Michael Okpara University of Agriculture, Umudike. Abia State Nigeria
Corresponding author's mail: ayoglow81@gmail.com

ABSTRACT
The study was conducted to evaluate the meat production potentials and serum attributes of Nigerian locally adapted chickens crossed with an exotic male line. Abia Ecotype chickens from three senatorial districts of the state were used to study the growth performance and genetic traits of f_2 progenies of the birds. The birds consisted of a base population of two Abia ecotype chicken, Brown (B_1) and Black (B_2) plumage colours were used as female – lines and crossed with two exotic meat type chicken, Cobb (A_1) and Ross 308 (A_2), as male – line. The mating for the formation of F_2 was set up using a 4x4 diallelic crossing technique and the Selection of the most three productive progenies of the F_2 evaluated for further selection as improved Abia ecotype Chicken. Data were used to determine the growth performance traits, carcass and serum biochemical profile. Y1A1 (438.00) was significantly higher in week 7 while in week 8, Y1A1 (550.33) and Y2A2 (550.66) had significant ($P<0.05$) higher in body weight while the least was recorded in Y3A3 (440.00). Y1A1 and Y2A2 had larger breast expansion and was significant ($P<0.05$) higher at weeks 7 and 8. Y1A1 has longer ($P<0.05$) in weeks 4, 5, 6, 7 and 8, while in week 5, Y1A1 and Y1A2 was higher in the mean value of keel length but was not different ($P>0.05$) from Y2A2. Live weight, dress weight and drumstick were significantly ($P<0.05$) higher in Y1A3. Y2A3 had the higher significant ($P<0.05$) value for dress percentage. Head and breast were higher in Y1A3. Neck and wings showed the highest ($P<0.05$) values in Y1A2. Y1A3 was significantly higher ($P<0.05$) in the value of shank. Y2A1 showed higher significance ($P<0.05$) thigh value, while Y3A3 had the highest significant ($P<0.05$) value in breast percentage. Y3A3 having the highest h^2 estimate of 0.78 for BWT. Significant differences ($P<0.05$) were observed in albumin, urea and phosphate. Albumin concentration of Y_2A_3 is significantly ($P<0.05$) different when compared with other progenies but not significantly ($P>0.05$) different from Y_2A_1 and Y_1A_2. Urea and phosphate concentration of Y_2A_3 and Y_3A_1 were significantly higher ($P<0.05$) when compared to other genotypic groups. Correlation coefficient was consistently high between body weight and linear body measurements in all the progenies. From the study, Y1A1 and Y1A3 genetic groups weighed heaviest and showed distinct phenotypic characteristics among the indigenous chicken strains. Efforts are needed to conserve the genetic resources of these chickens.
Keywords: Abia-ecotype birds, exotic birds, body weights, heritability.

INTRODUCTION

Genetic improvement of local chicken is one of the ways to enhance its commercial value thus contributing to the much needed animal protein in Nigeria. These genetic blueprints could be exploited by crossing our local hen with selected exotic male breeders in other to develop better strains, and improved quality for locally based meat type or egg type chickens suitable for use in the tropics. The increasing population have surged the demand for poultry products as animal protein sources. Our indigenous chickens are hardy, resistant to disease and have superior genetic merit for reproductive traits, while exotic birds are known for their superior genetic merit for productive traits (Adeleke *et al*, 2011). The population is increasing and so is the demand for poultry products. Local chickens are predominant in Nigeria especially in the rural areas than cross or exotic breeds, their productivity in terms of meat and egg productions remained very poor with a slow growth rate which make them economically unproductive and unsuitable for commercialization. This has brought about increased clamor for upgrading these local dam strains with exotic sire lines which have high reproductive and growth potentials.

According to Oke *et al.* (2001), haematology is the study of blood, the blood-forming organs and blood diseases. Serum biochemical and haematological references constitute an important aspect in management of farm animals. The parameters are good indicators of the physiological status of animals. The basic parts of a chicken for meat consumption include the head, neck, shank, thigh, wings, drumstick, breast, and back cut. This study is therefore aimed at estimating the genetic growth characteristics of F_2 progeny of crosses between the local birds and exotic sires using their carcass and serum biochemical characteristics. The purpose of this study is to improve the performance of the indigenous or local chicken, to determine the carcass characteristics of F_2 progeny crosses between the local birds and the exotic male and to determine the serum biochemical profiles of F_2 progeny crosses between the local birds and the exotic male.

MATERIALS AND METHODS

Experimental site

The experiment was carried out at the Poultry unit of the Teaching and Research farm of Michael Okpara University of Agriculture Umudike, Abia State, Nigeria. Umudike is located within latitude 05□ 29' North of the equator and longitude 07□ 33' East of the Greenwich meridian. It has an altitude of 122m above sea level. The area falls within the tropical rainforest zone. Annual rainfall average 2,177mm evenly distributed over 8 months (March- November). The area has warm humid climate and experiences a monthly ambient temperature range between 22□-32□ and relative humidity between 50 and 95% depending on the season.

Experimental animal and management

A base population of two indigenous Abia ecotype chicken, Brown and Black plumage colour obtained from the three senatorial districts of Abia State, Nigeria was used as female – lines and crossed with two exotic meat type chicken, Cobb (A_1) and Ross 308 (A_2), as male – line, with the objective of producing F_1 crossbred that became the grandparent stock. The mating for the formation of F_2 was set up using a 4x4 diallelic crossing technique and the Selection of the three F_1 progenies with Black(Y_1), Brown(Y_2) and White(Y_3) plumage colour for further evaluation as improved Abia Ecotype Chicken.

	Hen		
Cock	A1	A2	A3
Y1	Y1A1 - (**1**)	Y1A2 - **(2)**	Y1A3 – (**3**)
Y2	Y2A1- (4**)**	Y2A2 - **(5)**	Y2A3- (**6**)
Y3	Y3A1- (**7**)	Y3A2 - (**8**)	Y3A3- (**9**)

Fig 1 Mating design between cocks and hens of three different plumage colours.

Y1A1 = Black plumage sire x Black plumage dam ; Y2A1 = Black plumage sire x Brown plumage dam; Y3A1 = Black plumage sire x White plumage dam
Y1A2 = Brown Plumage sire x Black Plumage dam ; Y2A2 = Brown Plumage sire x Brown Plumage dam; Y3A2 = Brown Plumage sire x White Plumage dam
Y1A3 = White plumage sire x Black Plumage dam; Y2A3 = White Plumage sire x Brown Plumage dam ; Y3A3 = White Plumage sire x White Plumage dam

Statistical analysis

Data were analyzed using analysis of variance (ANOVA). Significant means were separated using Duncan's multiple range test (Duncan 1955). The design was a randomized compete block design (RCBD) and all data generated were analyzed using SAS (2004) statistical procedure.

RESULTS AND DISCUSSION

The Carcass Characteristics of the *F_2* progeny of Abia ecotype chickens x exotic male line is shown in Table 1

Table 1.0: Carcass Characteristics of F_2 Progenies of Abia Eco-Type Birds and their Exotic Male line Crosses

Parameters	Y_1A_1	Y_1A_2	Y_1A_3	Y_2A_1	Y_2A_2	Y_2A_3	Y_3A_1	Y_3A_2	Y_3A_3	SEM
LW (g)	1533.333^{d}	1666.667^{c}	2466.667^{a}	1660.667^{c}	1322.667^{e}	1916.667^{b}	1566.667^{c}	1416.667^{c}	1900.00^{b}	78.879
DW (g)	776.667^{f}	765.333^{f}	1276.000^{a}	896.667^{d}	544.667^{g}	1063.333^{b}	834.667^{e}	763.333^{f}	1040.000^{c}	39.709
Dress %	60.867^{b}	54.160^{e}	50.3000^{f}	60.793^{b}	56.103^{d}	98.843^{a}	59.163^{c}	56.100^{d}	60.407^{b}	2.647
Head (% of DW)	6.407^{c}	6.107^{d}	7.497^{a}	5.777^{g}	5.627^{h}	5.537^{i}	6.567^{b}	5.877^{e}	5.847^{f}	0.113
Neck	8.207^{c}	8.847^{a}	7.347^{h}	8.107^{d}	8.037^{e}	7.977^{f}	7.047^{i}	8.627^{b}	7.547^{g}	0.107
Shank	7.947^{e}	9.107^{b}	9.147^{a}	8.327^{d}	7.497^{g}	6.567^{h}	8.837^{c}	7.817^{f}	6.423^{i}	0.187
Thigh	18.457^{b}	18.227^{bc}	19.327^{a}	18.297^{bc}	16.667^{e}	18.497^{b}	19.293^{a}	17.647^{d}	17.917^{cd}	0.157
Wings	15.507^{c}	15.757^{a}	14.703^{f}	14.887^{e}	15.357^{d}	13.897^{h}	13.857^{i}	15.687^{b}	14.147^{g}	0.141
Drumstick	18.207^{g}	19.397^{d}	19.857^{a}	19.667^{c}	18.237^{f}	17.457^{i}	19.707^{b}	18.947^{e}	17.827^{h}	0.167
Breast	25.507^{d}	23.827^{fg}	28.297^{a}	23.667^{g}	25.777^{cd}	27.887^{b}	25.927^{c}	24.047^{f}	24.993^{e}	0.310
Back cut	21.277^{b}	20.567^{e}	20.087^{g}	20.967^{c}	22.267^{a}	20.937^{c}	19.467^{h}	20.257^{f}	20.847^{d}	0.147

^{abc} means for each trait in a column with different superscripts are significantly different (P<0.05)

From the result of the study, Y_1A_3 had higher significant (P<0.05) live weight and dressed weight with the least value in dress percentage. These are in keeping with Adebambo (2005) who stated that crossbreeding indigenous chicken with exotic also improved body weight greatly at 12 weeks. Mustafa (2014) reported that the breast percentage of Hubbard broiler strain was 42.29% and its drumstick percentage of 27.69%, which was higher than the breast cut percentage of 23.67 – 28.29% and drumstick Percentage 17.45 – 19.85% obtained in this work. Y_1A_3 showed a significant difference (P<0.05) in the thigh length while Y_1A_2 had the highest significant (P<0.05) in the neck and wings which may be due to genetic variation within the flock. (Ayorinde and Oke,1995)

Serum biochemical profile of the F_2 progeny of abia ecotype chickens x exotic male line.

The response of serum biochemical profile of the different genotypic groups is shown in Table 2.

Table 2: Serum Characteristics of F_2 progenies of Abia eco-type birds and their exotic Male line Crosses

Parameters	Y_1A_1	Y_1A_2	Y_1A_3	Y_2A_1	Y_2A_2	Y_2A_3	Y_3A_1	Y_3A_2	Y_3A_3	SEM
Glucose	175.111	173.778	185.111	191.667	176.667	178.556	188.444	176.544	181.667	2.894
Albumin (g/dL)	2.699^{c}	2.923^{abc}	3.179^{a}	3.123^{ab}	2.766^{c}	2.863^{bc}	2.787^{c}	3.012b	2.877^{b}	0.039
Urea (mg/dL)	3.634^{ab}	3.233^{b}	4.081^{a}	3.580^{ab}	3.740^{ab}	3.178^{b}	4.259^{a}	3.224^{b}	3.164^{b}	0.183
Creatinine (mg/dL)	0.658	0.650	0.662	0.674	0.596	0.692	0.722	0.667	0.598	0.015
Phosphate (mg/dL)	6.028^{cd}	6.478^{b}	7.009^{a}	5.843^{d}	6.257^{bc}	6.324^{bc}	7.164^{a}	6.333^{b}	5.897^{d}	0.072

^{abc} means for each trait in a column with different superscripts are significantly different (P<0.05)

Significant (P<0.05) differences were observed in albumin, urea and phosphate. Albumin concentration of Y_1A_3 is significantly (P<0.05) different when compared with other progenies but not significantly (P>0.05) different from Y_2A_1 and Y_3A_2. The increase in albumin levels recorded in this research suggests the proper maintenance of the integrity of the liver and extrahepatic tissues involved in the synthesis of protein from the test feedstuff. As a carrier protein, this shows that the increased level of albumin facilitated the transport of large number of compounds including vitamins, minerals and administered drugs in the animal system. It could also be an indication that the birds were not prone to haemorrhage, increased serum albumin which increases the clotting ability (Robert *et al.,* 2003). The

results of the serum biochemical profile showed the normal physiological process in the broiler chicken.

CONCLUSION AND RECOMMENDATION

The crossbreds Y_1A_3 than other breeds is thus recommended for further improvement as it proved to be superior in serum profile, body weight and most linear body traits coupled with high heritability and repeatability obtained in the study.

REFERENCES

Adebambo O.A.(2005): Indigenous poultry breeds genetic improvement for meat and eggs. Proceedings of the 1st International Poultry Summit, Feb 20 – 25, Ota , Ogun State, pp: 1-8

Adeleke M. A., Peters S. O., Ozoje M. O., Ikeobi C. O. N., Bamgbose A. M., Adebambo, O. A. (2011): Genetic parameter estimates for bodyweight and linear body measurements in pure and crossbred progenies of Nigerian indigenous chickens. Livestock Research for Rural Development 23 (1), 189-191

Ayorinde, K. L and Oke, U. K (1995): The influence of juvenile bodyweight and two feeding regimes during the growing phase on growth performance and early lay characteristics of pullets. Nigerian Journal of Animal Production 22(2): 101 -107

Duncan, D.C 1995 Multiple range and multiple F TEST. BIOMETRICS,11:1-42.

Oke, U.K., Joseph, K, Udo H. 2001. Haematological values of the indigenous female guinea fowl (*Numida meleagris galeata* Pallas) as influenced by photoinduction: Proceeding of the 6th Annual conference of Animal Science Association of Nigeria Sept. 17 – 19, 2001 University of Maidugiri Convocation square Nigeria Pg. 36 – 38.

Robert, K. M., Daryl, K. G., Peter, A. M and Victor, W. R. (2003). Harpers' Biochemistry. 25th edition. McGraw- Hill New York.25:763-766.