



SOME BIOMETRIC AND ALLOMETRIC GROWTH TRAITS OF NIGERIAN LOCAL TURKEY PROGENIES

*, Ani, A.O., Ohagenyi, I.J., Uberu N.P., Osita C.O , Okuli, C.E.

Department of Animal Science, University of Nigeria Nsukka, Nigeria

*Corresponding author Email: augustine.ani@unn.edu.ng

Abstract

An eight-week study was conducted to estimate the genetic parameters of body weights and linear body measurements of the Nigerian local turkey progenies at different ages from 0 to 8 weeks of age. A total of 21 mature Nigerian local turkeys comprising seven males and fourteen females were used to generate 65 poults during the study. Bi-weekly linear body measurements in centimetres were taken using a measuring tape, while body weights measured in grams were taken from the poults every two weeks for 8 weeks using a digital scale. Body conformation traits measured included body weight, body length, breast girth, shank length, thigh length and keel length. Results showed that sire has significant ($p < 0.05$) effects on the body weight of progenies at 2, 4 and 8 weeks of age and body length of the turkey progenies at 0, 4 and 8 weeks. There were significant ($p < 0.05$) differences in the breast girth at weeks 0 and 4, and keel length of the turkey progenies at week 0. Also, significant differences were observed in the keel length measurements of the turkey progenies at 2 and 6 weeks of age. No significant ($p > 0.05$) differences were observed in the shank length and thigh length. It was concluded that body weight, body length and breast girth at 8 weeks could be used as traits for the selection of parents of the next generation, while thigh length and keel length at 4 weeks were the best predictors of genetic improvement through selection.

Keywords: Allometric, biometric, estimates, heritability, local turkeys.

Introduction

Nigeria's poultry population is estimated at 140 million (FAO, 2009), of which about 90% is made up of indigenous poultry (Gueye, 2003). Local turkeys, particularly at family level, still represent an appropriate system for supplying the fast-growing human population with high quality protein and also provide additional income (Gueye, 2003). A report by Alabi *et al.*, (2006) indicated that family poultry husbandry contributes 35% of the income of household women, and it is estimated at about 25% and 50% of Nigerian minimum wage and per capital income, respectively. The widespread use of poultry in third world countries demonstrates the importance of this small, easily managed household livestock. Small size, short gestation period, high fecundity, ability to forage for themselves and a natural desire to stay around the house put rural poultry among the most vital resources of rural Africa, Asia, and Latin America (National Research Council, 1991). Turkey production has not been fully exploited in the developing countries despite its greater potential than the chicken (Perez-Lara *et al.*, 2013). Turkey thrives better under arid conditions, tolerates heat better, ranges farther and has higher quality meat (Yakubu *et al.* 2013). It is common to see several harems of indigenous turkeys foraging extensively in backyards alongside chickens and ducks. Genetic improvement of the Nigerian local turkey can be achieved by obtaining information on genetic parameters such as heritability and genetic correlation of key growth and egg trait to enhance accuracy of predicting response to selection and ultimately improved growth and egg



laying performance of the Nigerian local turkey. This study therefore, aimed at estimating the genetic parameters (heritability and genetic correlation) of growth traits among the half sib progeny of Nigerian local turkeys.

Materials and Methods

The experiment was carried out at the Turkey Section of the Poultry Unit of the Department of Animal Science Teaching and Research Farm, University of Nigeria. The foundation stocks were 21 mature Nigerian local turkeys, comprising of seven males and fourteen females. The experimental birds consisted of 65 progenies produced from mating involving three different strains of local female turkey (white, black and bronze). The foundation stock were grouped into seven, each group containing one sire and two dams in separate pen and were allowed to breed randomly. Hatchable or fertile eggs were collected daily with egg crates and stored in a cool and airy room. Eggs from each hen were identified with a marker. Fertile eggs were taken to the hatchery every 10 days for hatching in batches of 30 eggs per set. Egg collection lasted for 2 months. Soon after hatching, coloured markers, rings and cloths were used to identify chicks from each hen. The markers were regularly checked and replaced as often as possible so as to prevent the chicks belonging to the various hens and sire from mixing up. Each batch was brooded for six weeks. Adequate brooding house and brooding condition were also provided to the chicks. Water and feed were given to them *ad libitum*. Also necessary vaccinations and medications were administered in addition to proper management practices. Parameters that were evaluated during the study were as follows: biometric traits (body weight and body weight gain) and allometric traits (body length (BL), shank length (SL), thigh length (THL), Keel length (KL) and breast girth (BG). Body weight records were measured in grams while conformation traits were measured in centimetres. The experiment which lasted eight weeks was carried out using Completely Randomize Design (CRD). Data collected were subjected to analysis of variance (ANOVA) in a nested of hierarchies statistic procedure using Animal Model (SAS, 2004). The nested design and the Animal Model (or SAS 2004) were used to derive variance and covariance components of all the traits under study.

Results and Discussion

Table 1 shows the effects of sire on average body weight of Nigerian local turkey at two weeks interval. The body weights of the Sire's progeny at weeks 0, 2, 4, 6 and 8 ranged from 38.89 ± 1.111 to 48.00 ± 3.742 , 108.33 ± 7.052 to 154.00 ± 4.00 , 248.33 ± 17.591 to 292.00 ± 14.967 , 368.89 ± 29.648 to 435.00 ± 54.609 and 612.00 ± 36.661 to 797.50 ± 54.568 , respectively. There were significant ($p < 0.05$) differences in the body weight of the progenies of the 7 turkey sire only at 2 weeks of age. The progenies from sire A, B, C, F and G were similar in their body weight and were significantly ($p < 0.05$) higher than the body weight of the progenies of sire D and E. There were no significant ($p > 0.05$) differences in body weight of progenies of the sires at zero (0) week, 4 weeks, 6 weeks and 8 weeks of age. Table 2 shows the effects of sire on the average body length of Nigerian local turkey at two weeks interval. The mean body lengths of the turkey sires progeny ranged from 12.420 ± 0.445 at week 0 to 38.625 ± 0.8491 at week 8. There were significant ($p < 0.05$) differences among body length traits of the Nigerian local turkey progeny at week 2, 4, 6, and 8. There were no significant differences observed at week 0, 4, 6, and 8 of age.



Table 3 shows the effect of sire on the average breast girth of sires' progeny of Nigerian indigenous local turkeys from week 1 to 8. The mean breast girth value of the sire progenies ranged from 2.380 ± 0.049 for week one to 11.250 ± 0.423 at week 8 of age. There were significant differences ($P < 0.05$) among the breast girth trait of the local turkey progeny at week 0 and 4. The mean breast girth value of sire A, B, C, E, F and G were similar and were significantly ($P < 0.05$) higher than those of sire D. The mean breast girth value of Nigerian local turkey progenies at week zero ranges from 2.380 ± 0.049 to 2.788 ± 0.083 . The effects of sire on average thigh length and shank length of the Nigerian indigenous local turkey progenies from weeks 1 to 8 are shown in tables 4 and 5. There were no significant ($p > 0.05$) differences among the thigh length and shank length of the turkey sire progeny. The mean values for thigh length ranged from 3.400 ± 0.100 at week one to 12.163 ± 0.365 at week 8 and 0.283 ± 0.040 at week 0 to 7.617 ± 0.283 at week 8 for the shank length. Table 6 shows the effect of sire on the average keel length of sires' progeny of Nigerian indigenous local turkeys from weeks 1 to 8. There were significant ($p < 0.05$) differences at 0, 4, and 8 weeks of age for the keel length. The keel length value of the local turkey progeny falls in the range of 2.120 ± 0.058 at week 0 to 8.125 ± 0.227 at week 8. In week 0, the mean keel length values of turkey poults from sire A, B, C, F and G were similar to those of sire E and were significantly ($p < 0.05$) higher than the progenies of sire D. In week 4, the keel length value of sire D, E and F were similar to those of sire A, C and G. The progenies of sire B has the highest mean value for keel length. In week 8, the mean keel length value of sire C and G progenies were similar to those of sire B, E and F. The progenies of sire A and D have the least mean value. The increasing trend from 0 to 8 weeks obtained in this study for body weight and other linear body measurement as the bird advanced in age is supportive of previous reports of Adeyinka (2006). This suggests that age is a major determinant of growth and physiological development. The mean body weight, shank length and thigh length reported in this study at week 8 are lower than the value reported by Heinrichs *et al.*, (1992). They reported mean value of 1630g for body weight, 11.6cm for shank length and 9.3cm for keel length. This could be attributed to differences in the strains of turkeys used or in part to differences in experimental techniques and management. The significant effect of sires obtained in some linear body measurement and body weight of the turkey poult at various ages implies that there are considerable genetic contributions of sires to these traits. Therefore, appropriate selection program that will ensure the use of proven sire in the poultry combined with good mating systems would yield good results.

Conclusion

It is evident from the results of the present study that the Nigerian indigenous local turkeys vary significantly in their allometric and biometric (growth) traits. The body weight, and breast girth at 4 and 8 weeks were the best predictors of genetic improvement through selection.

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Table 1: The effects of sire on average body weight (g) of Nigerian local turkey at two weeks interval

Parameters	SIRE A	SIRE B	SIRE C	SIRE D	SIRE E	SIRE F	SIRE G
BW0	38.89 ± 1.11	48.00 ± 3.74	44.44 ± 1.75	42.00 ± 3.39	44.17 ± 3.75	43.75 ± 1.83	45.63 ± 1.83
BW2	151.11 ± 0.76 ^a	154.00 ± 4.00 ^a	140.00 ± 9.86 ^a	98.00 ± 18.54 ^b	108.33 ± 7.03 ^b	138.75 ± 1.41 ^a	140.00 ± 7.32 ^a
BW4	280.00 ± 5.28	292.00 ± 14.97	251.11 ± 13.06	273.33 ± 6.67	248.33 ± 17.59	250.00 ± 11.34	265.00 ± 13.50
BW6	368.89 ± 9.65	410.00 ± 31.94	397.50 ± 30.10	386.67 ± 35.28	386.00 ± 34.87	374.29 ± 28.52	435.00 ± 54.63
BW8	704.44 ± 0.77	670.00 ± 75.50	797.50 ± 54.57	613.33 ± 96.15	612.00 ± 36.66	666.67 ± 83.69	792.50 ± 43.75

ab Means having different subscripts in the same rows are significantly different (p < 0.05).

Table 2: The effects of sire on the average body length(cm) of Nigerian local turkey at two weeks interval

Parameters	SIRE A	SIRE B	SIRE C	SIRE D	SIRE E	SIRE F	SIRE G
BL0	13.57 ± 0.38	12.74 ± 0.51	13.78 ± 0.26	12.42 ± 0.45	12.70 ± 0.33	12.99 ± 0.15	12.90 ± 0.15
BL2	21.06 ± 0.42 ^a	21.10 ± 0.43 ^a	20.49 ± 0.38 ^a	20.08 ± 0.57 ^{ab}	18.88 ± 0.33 ^b	20.44 ± 0.56 ^a	20.63 ± 0.56 ^a
BL4	23.06 ± 2.53	28.10 ± 0.71	25.94 ± 0.93	27.17 ± 0.44	25.12 ± 0.83	25.64 ± 0.60	26.50 ± 0.60
BL8	35.00 ± 0.33	37.60 ± 1.68	37.90 ± 0.82	35.00 ± 1.00	35.30 ± 0.70	36.83 ± 1.60	38.63 ± 1.60

ab Means having different subscripts in the same rows are significantly different (p < 0.05).

Table 3: The effects of sire on the breast girth(cm) of Nigerian local turkey at two weeks interval

Parameters	SIRE A	SIRE B	SIRE C	SIRE D	SIRE E	SIRE F	SIRE G
BG0	2.70 ± 0.07 ^a	2.68 ± 0.07 ^a	2.74 ± 0.06 ^a	2.38 ± 0.05 ^b	2.63 ± 0.08 ^a	2.63 ± 0.06 ^a	2.79 ± 0.06 ^a
BG2	5.19 ± 0.24	5.00 ± 0.22	5.11 ± 0.27	5.34 ± 0.45	4.40 ± 0.13	5.25 ± 0.25	5.06 ± 0.25
BG4	6.91 ± 0.31	7.20 ± 0.41	6.78 ± 0.39	5.17 ± 2.59	6.95 ± 0.47	6.69 ± 0.35	7.38 ± 0.35
BG6	7.94 ± 0.29	9.40 ± 0.40	8.40 ± 0.40	8.00 ± 0.29	7.64 ± 0.30	7.79 ± 0.34	8.25 ± 0.34
BG8	10.78 ± 0.49	10.50 ± 0.50	10.25 ± 0.46	10.17 ± 1.20	10.00 ± 0.35	11.17 ± 0.33	11.25 ± 0.33

ab Means having different subscripts in the same rows are significantly different (p < 0.05).



Table 4: The effects of sire on the shank length(cm) of Nigerian local turkey at two weeks interval

Parameters	SIRE A	SIRE B	SIRE C	SIRE D	SIRE E	SIRE F	SIRE
SHL0	2.37 ± 0.06	2.40 ± 0.05	4.84 ± 2.45	2.36 ± 0.06	2.28 ± 0.04	2.35 ± 0.03	2.44 ±
SHL2	3.49 ± 0.07	3.70 ± 0.09	3.36 ± 0.10	3.66 ± 0.16	3.45 ± 0.06	3.38 ± 0.08	3.64 ±
SH4	4.70 ± 0.15	4.90 ± 0.23	4.46 ± 0.15	4.73 ± 0.03	4.45 ± 0.12	4.55 ± 0.03	4.66 ±
SH6	5.87 ± 0.13	5.94 ± 0.18	5.53 ± 0.28	5.80 ± 0.23	5.64 ± 0.38	5.43 ± 0.28	5.64 ±
SH8	7.17 ± 0.19	7.00 ± 0.71	7.62 ± 0.28	7.17 ± 0.44	6.50 ± 0.16	7.43 ± 0.40	7.50 ±

ab Means having different subscripts in the same rows are significantly different (p < 0.05).

Table 5: The effects of sire on the thigh length(cm) of Nigerian local turkey at two weeks interval

Parameters	SIRE A	SIRE B	SIRE C	SIRE D	SIRE E	SIRE F	SIRE
THL0	3.78 ± 0.09	3.46 ± 0.05	3.68 ± 0.09	3.40 ± 0.10	3.53 ± 0.14	3.54 ± 0.09	3.50 ±
THL2	5.99 ± 0.14	5.72 ± 0.24	5.92 ± 0.20	5.92 ± 0.32	5.62 ± 0.10	6.09 ± 0.18	5.60 ±
THL4	7.99 ± 0.20	8.56 ± 0.31	7.51 ± 0.24	5.77 ± 2.63	7.90 ± 0.31	7.88 ± 0.16	8.00 ±
THL6	8.58 ± 0.33	9.30 ± 0.20	9.21 ± 0.34	9.67 ± 0.33	9.12 ± 0.38	9.06 ± 0.36	8.93 ±
THL8	11.00 ± 0.17	11.13 ± 0.66	11.67 ± 0.63	10.83 ± 0.60	10.74 ± 0.27	11.25 ± 0.7	12.16

ab Means having different subscripts in the same rows are significantly different (p < 0.05).

Table 6: The effects of sire on the keel length(cm) of Nigerian local turkey at two weeks interval

Parameters	SIRE A	SIRE B	SIRE C	SIRE D	SIRE E	SIRE F	SIRE
KL0	2.37 ± 0.04 ^a	2.38 ± 0.04 ^a	2.39 ± 0.04 ^a	2.12 ± 0.06 ^b	2.25 ± 0.99 ^{ab}	2.41 ± 0.05 ^a	2.34 ±
KL2	4.49 ± 0.18	5.12 ± 0.12	4.66 ± 0.13	4.58 ± 0.17	4.12 ± 0.08	4.50 ± 0.21	4.55 ±
KL4	5.77 ± 0.18 ^{ab}	6.26 ± 0.41 ^a	5.79 ± 0.25 ^{ab}	5.33 ± 0.17 ^b	5.12 ± 0.18 ^b	5.25 ± 0.10 ^b	5.54 ±
KL6	5.94 ± 0.29	6.80 ± 0.20	6.65 ± 0.23	6.10 ± 0.31	6.54 ± 0.20	6.14 ± 0.14	6.30 ±
KL8	6.76 ± 0.15 ^b	7.43 ± 0.42 ^{ab}	7.97 ± 0.41 ^a	6.50 ± 0.29 ^b	7.10 ± 0.25 ^{ab}	7.25 ± 0.56 ^{ab}	8.12 ±

ab Means having different subscripts in the same rows are significantly different (p < 0.05).