*Nig. J. Anim. Prod. 2017, 44(4): 264 - 269*
*Nigerian Journal of Animal Production*


# Effect of genotype on body weight and average feed intake of $f_1$ locally-adapted turkey of Nigeria

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**Abstract**

***A** total of 78 day-old Random-bred Nigerian local turkey poults were used as parent stock to generate 232, 1 day-old poults ($F_1$) used in the evaluation of the Nigerian local turkey phenotypes based on egg quality parameters. Three phenotypic classes (black, white and spotted) were obtained as base population and used to generate $F_1$ progeny for the study. Experimental design for the experiment was a Completely Randomized Design (CRD) with phenotypic class as major factor of interest. Results showed that Initial body weights were 62.39g, 62.56g and 62.43g in black, white and spotted respectively, whereas final body weights were 2761.25g, 2586g and 2697.58g in black, white and spotted respectively, and differed significantly ($p<0.05$) in weeks 13 and 17 with the heaviest weight in black phenotype. There was no significant difference ($p>0.05$) in body weights of the phenotypes in all other weeks. With the exception of weeks 3 and 13 in which there were significant differences ($p<0.05$), there was no significant difference ($p>0.05$) in average daily feed intake (ADFI) in all other weeks. It was therefore, concluded that for rapid improvement of these traits, the black variety could be used to enhance growth of Nigerian local turkeys in the study area. The present findings could assist in the design of long-term genetic improvement programmes for turkey production in Nigeria.*

**Keywords:** local turkey, genotype, average dailyfeed intake, body weight.

## Introduction

FMRD (2004) estimated animal protein intake in Nigeria in year 2000 at 18g/caput/day, which is below the recommended minimum level of 35g/caput/day. Currently, total poultry population in Nigeria is estimated to be about 172 million out of which chicken is estimated at 160 million, guinea fowl (8.3 million), ducks (1.7 million) and local turkeys (1.05 million) (FAOSTAT, 2011). The carcasses of turkey contain a high percentage of protein, low saturated fats, low in cholesterol, highest in methionine and essential amino acids required for complete protein usage than chicken. Turkey has an advantage over chickens and guinea fowls with high feed conversion ratio, hardiness and less susceptibility to common poultry diseases and parasites (Ibe, 1990). Apart from Ostrich and Emu, Turkey is the largest of poultry species.

In addition to the cash returns from sale of poultry products and their contribution to the diet of the family, poultry keeping in tropical areas has an important role in socio-cultural and religious life of African communities. Some people prefer the flavor of the meat that is usually associated with scavenging birds (Oluyemi and Roberts, 2000). Village

poultry production systems can be improved and transformed from subsistence to semi-commercial production systems to increase food security and family income especially among the rural populace and disadvantaged members of the community. Turkey (*Meleagris gallopavo*) is becoming popular in Nigeria due to its capacity to expand the poultry subsector and help to supply meat and eggs. In spite of all these attributes, local turkeys have poor growth performance, low egg production and low fertility (Zahrudden *et al.*, 2011). Local turkey is becoming few in Nigeria and are predominantly the bronze-black type raised extensively (Oluyemi and Roberts, 2000).

The main purpose of animal breeding practices is to improve traits of economic value (Mendes *et al.*, 2005) and body weight is one of those important economic traits in the selection of animals. Several qualitative and quantitative traits exist in farm animals which breeders desire to improve. The quantitative traits of major concern are the economic characters, such as growth rate and weight gain which are governed by polygenes (Ibe, 1998). The weights of domestic turkeys are twice that of wild turkeys and are raised on farms for profit. Most domestic turkeys are so heavy that they are unable to fly. Mendes *et al.* (2005) have reported that body weight is one of those important economic traits in the selection of animals. Body weight increased with increase in age of the birds in all turkey genotypes (Ilori *et al*., 2010).

However, Ibe (1998) has stated that quantitative genetic methods are useful in bringing about improvement in these economic characters, and that knowledge of genetic parameters enables the breeder to decide on the best method of selection to achieve rapid genetic progress. High cost of feed and high feed intake for turkey are also problems that hinder large scale commercial production (Ibe, 1990). Turkey is one of the poultry species that is declining in Nigeria due to the importation of frozen turkey from Europe and America despite its genetic resource base. Then it is imperative that the study of the native (local) turkey is an urgent necessity (SAGARPA, 2003) since the possibility of extinction of native turkey (Aquino *et al.*, 2003). There is therefore need to improve the productive performance of the Nigerian local turkey. This can be achieved by eliminating the genetic bottlenecks to increased productivity of local turkeys.

The objective of the study is to determine the effect of genotype on body weight and average feed intake of $F_1$ of Locally-adapted local turkey of Nigeria.

## Materials and methods

### *Experimental site*

The study was conducted at the Poultry Unit of the Teaching and Research Farm of the Michael Okpara University of Agriculture, Umudike, Abia State. Umudike is located on latitude $05^0$C 28′ North and $07^0$C 32′East and lies at an altitude of 122m above sea level. This area is situated within the Tropical Rainforest zone of West Africa which is characterized by long duration of rainfall (April - October) and short period of dry season (November-March). Average rainfall is 2169.8mm in 148 – 155 rain days. Average ambient temperature is $26^0$C with a range $22^0$C and $30^0$C. Its relative humidity ranges from 50 to 90%. These meteorological data were obtained from the meteorological station at the National Root Crops Research Institute, Umudike, Abia State.

### *Management of the base population and production of $F_1$ birds*

A total of 78 1, day-old local turkeys of three phenotypic classes based on plumage colour

(black, white and spotted) were obtained from a reputable hatchery as base population. The poults comprised of 26 black, 23 white and 29 white phenotypes. At the time of breeding, 2 Toms and 12 hens of black, 2 Toms and 12 hens of white and 3 Toms and 18 hens of spotted were used for mating. Random mating was used for the mating scheme within each identified group by selecting sexually active males for the females in the ratio of 1:6 for egg production. Eggs produced by the base population turkeys were collected on a daily basis, identified appropriately with indelible ink-marker and set in the incubator on weekly basis. Total number of eggs laid was 356 comprising 128, 114 and 114 for Black, White and Spotted phenotypes respectively and stored for less than 7 days in crates with large end up. The laying period was between 25 and 30 weeks of age. The incubator was Cabinet incubator type with relative humidity of 80%, temperature of $55^{0C}$, proper ventilation and turning suitable for hatchable eggs. The eggs were hatched weekly in batches. The numbers of progeny ($F_1$) poults produced were 86, 72 and 74 for black, white and spotted respectively. The poults were properly identified on hatching. Distribution and number of poults hatched per phenotypic class is shown in Table 1.

**Table 1: Distribution of local turkey Poults hatched per phenotypic class**

| | | Hatch | | | | | |
|---|---|---|---|---|---|---|---|
| **Mating** | **Phenotypic class** | **1** | **2** | **3** | **4** | **5** | **Class total** |
| Black x Black | Black | 3 | 11 | 10 | 36 | 26 | **86** |
| White x White | White | 2 | 6 | 6 | 28 | 30 | **72** |
| Spotted x Spotted | Spotted | 2 | 7 | 8 | 26 | 31 | **74** |
| **Total hatch** | | **7** | **24** | **24** | **90** | **87** | **232** |

**Brooding, rearing and laying of eggs by the $F_1$ Poults**

A total of 210, 1 day-old $F_1$ poults hatched in different batches were selected. The three phenotypic groups of local turkey contributed 70 straight-bred Poults each for the study.

They were brooded in three small metal cages for each hatch for a period of 2 weeks after which they were transferred to small compartments according to their phenotypic group for a period of 4 weeks and finally to deep litter pens at 6 weeks of age. Dry wood shavings were used as litter material. Fresh clean water was given *ad libitum* to the Poults during this period.

The birds were given routine vaccination. Prophylactic antibiotics and anticoccidial drugs were administered to the birds periodically. However, the birds were dewormed and acaricide sprayed to check worms and ectoparasites.

The respective hatches were brooded separately on floor pens. The brooding period was 6 weeks. From brooding through rearing, maximum comfort for the poults was ensured. Feed was provided in adequate quantity to the poults twice a day, namely at 8.30am and 2.30pm and drinking water was given *ad libitum.* Poults (0-6 weeks) were fed *ad libitum* with starter mash containing 28% crude protein and 2800kcal ME/kg. Growing turkeys (7-24 weeks) were fed growers mash (20% crude protein and 3000 kcal ME/kg). Laying hens (25-30 weeks) were on growers mash until 5% egg production was attained. During egg production hens were fed layers' mash containing 18% crude protein and 3200kcal ME/kg. All nutrient composition is as

labelled.

***Data collection***

***Brooding phase (0-6 weeks)***

Parameters measured were: Body weight (BWT), Average daily feed intake (ADFI)

**Body weight (BWT)**

The initial mean body weight of the poults was determined at day-old and subsequently body weight was measured weekly using a top loading Hana Power 5kg-scale with a sensitivity of 10g at week 1-6.

**Average daily feed intake (ADFI)**

$$\frac{\text{Quantity of feed consumed}}{\text{No. of turkeys per genetic group}} \times \text{total number of days}$$

Average daily feed intake (ADFI) (g) was recorded daily while body weight was measured weekly using a top loading 20kg-CAMRY scale with a sensitivity of 10g.

**Rearing phase (7-24 weeks)**

All surviving healthy birds in the various phenotypic groups were further identified using indelible markers which were re-enforced fortnightly for proper identification. The birds were housed, sexes combined, in batches according to their phenotypic groups.

***Experimental design***

The experiment was designed as a Completely Randomized Design (CRD) with phenotypic class as factor of interest.

The statistical model is given as;

$$\mathbf{Y_{ij} = \mu + P_j + e_{ij}} \quad \ldots (1)$$

Where

$Y_{ij}$ = $j^{th}$ observation in the $i^{th}$ phenotypic class

$\mu$ = Overall mean

$P_j$ = effect of $j^{th}$ phenotypic class (j=1,…,3)

$e_{ij}$ = Random error, assumed to be independently, identically and normally distributed with zero mean and constant variance [iind $(0,\sigma^2)$].

***Statistical analysis***

Data obtained were statistically analyzed with Statistical Procedure for Social Sciences (SPSS), 2011 version 16. All the parameters were determined in percentages which were subjected to arcsine transformation to satisfy the assumption of normal distribution. Duncan's Multiple Range Test (Duncan, 1955) was used to separate significant means.

## Results and discussion

***Effect of phenotype on quantitative traits***

Mean Body weight (g) of $F_1$ local turkeys are given in Table 2. There was significant difference ($p<0.05$) in the body weights of the phenotypic groups in weeks 13 and 17, with black phenotype having the highest values of 1350.58 ± 20.38g 1976.79 ± 61.64g, respectively.

**Table 2: Mean Body weight (g) (BWT) of $F_1$ local turkeys**

| | Phenotypic class | | |
|---|---|---|---|
| **Age (week)** | **Black** | **White** | **Spotted** |
| 1 | 62.39(0.74) | 62.56 (0.42) | 62.43 (0.70) |
| 3 | 133.42 (8.88) | 124.52(8.99) | 132.20(13.14) |
| 5 | 226.98 (12.65) | 233.12 (12.75) | 273.21 (28.95) |
| 7 | 417.42 (21.16) | 398.87 (19.41) | 430.52(49.80) |
| 9 | 702.10(27.84) | 570.51(52.54) | 666.49 (41.07) |
| 11 | 836.72 (39.59) | 836.42 (49.01) | 949.57 (43.70) |
| 13 | $1350.58^{a}$ (20.34) | $1102.43^{b}$ (71.44) | $1103.76^{b}$(60.76) |
| 15 | 1685.46 (52.28) | 1404.90 (46.48) | 1546.00 (44.48) |
| 17 | $1976.79^{a}$(61.64) | $1692.96^{b}$ (61.87) | $1862.11^{ab}$(61.60) |
| 19 | 2248.96 (56.20) | 1987.36 (76.71) | 2109.78 (61.94) |
| 21 | 2491.92 (47.40) | 2264.53(78.19) | 2410.49(67.87) |
| 23 | 2761.25(83.26) | 2585.96(79.43) | 2697.58 (83.62) |

*$^{a-c}$Means in the same row with different superscripts are significantly different ($p<0.05$). *S.E.M in parentheses.*

The difference is probably attributed to variation in genotype and management as opined by Oke and Iheanacho (2010). However black and spotted and white and spotted phenotypes, respectively did not differ significantly ($p>0.05$) at week 17. This significant difference in the average body weight suggests that black phenotype may have the potential for fast growth. This genetic potential for growth was evident as from week 13 when black turkeys showed significant difference in mean body weight than their counterparts. There were no significant differences in weeks 1, 3, 5, 7, 9 and 11. The delay in the manifestation of differences in average body weight until week 13 may be due to the fact that divergent significant growth among different breeds, strains or genotypes of chickens is mostly observed in their life time as they approach sexual maturity (Ibe, 1993; Peters *et al.*, 2007). There was no significant difference ($p>0.05$) in body weights of the phenotypes in all other weeks.

**Table 3: Average daily feed intake (ADFI) (g) of F1 Black, White and Spotted local turkeys**

| | Phenotypic class | | |
|---|---|---|---|
| **Age (week)** | **Black** | **White** | **Spotted** |
| 1 | 10.30(0.34) | 10.21(0.25) | 10.30(0.23) |
| 3 | 24.37 [a](0.27) | 23.87 [b](0.11) | 23.49[b](0.21) |
| 5 | 42.91(0.41) | 41.93(0.22) | 43.61(1.62) |
| 7 | 69.42 (0.76) | 67.44(0.32) | 71.02 (4.02) |
| 9 | 98.23 (0.71) | 96.53 (0.25) | 98.09 (1.95) |
| 11 | 124.49 (7.83) | 115.46 (0.23) | 114.48 (0.27) |
| 13 | 159.91 [a] (6.38) | 139.53 [b] (0.55) | 140.39 [b] (1.89) |
| 15 | 171.59 (0.65) | 169.25 (0.37) | 170.26 (1.84) |
| 17 | 191.53 (0.69) | 189.78 (0.38) | 192.14 (2.04) |
| 19 | 210.62 (0.55) | 208.44 (0.31) | 210.83 (2.05) |
| 21 | 227.67 (0.72) | 225.34 (0.30) | 227.14 (1.88) |
| 23 | 247.49 (0.62) | 246.88 (0.63) | 250.37 (2.63) |

*[a-c]Means in the same row with different superscripts are significantly different ($p<0.05$). *S.E.M in parentheses*

Average daily feed intake (g) of local turkeys is shown in Table 3. With the exception of weeks 3 and 13 in which there were significant differences ($p<0.05$), with the black phenotype having the highest values, there was no significant difference ($p>0.05$) in ADFI in all other weeks. The higher ADFI in black phenotype corresponded with higher body weight. This means that feed consumed was efficiently converted to body gain, especially in week 13, which was in agreement with previous findings that heavier birds consume more feed than lighter ones (Nwachukwu *et al*., 2006).

## Conclusion

This study has revealed the characterization of Nigerian local turkeys based on body weight and average daily feed intake. The black phenotype was the heaviest of the Nigerian local turkey. The characteristic performance of the Nigerian local turkey studied reveals certain qualities that can be tapped in strategic improvement programme of the poultry industry.

The attendant effect will be an increase in the number of quality birds, thereby assisting in bridging the animal protein gap in poor developing countries.

In view of the results obtained in this study, it is recommended that black locally-adapted turkey of Nigeria be selected for heavier body weight.

**References**

**Aquino, R. E., Arroyo, L. A., Torres, H. G., Riestra, D. D., Gallardo, L. F. and López, Y. B. A. 2003.** Guajolote criollo (*Meleagris gallipavo* L.). La ganadería familiar en la zona centro del estado de Veracruz. *Técnica Pecuaria en México*41(**2**):165 – 173.

**FAOSTAT 2011.** Food and Agricultural Organization of the United Nations http://faostat.fao.org/default. aspx. Accessed July 19, 2011.

**FDLPCS (Federal Department of Livestock and Pest Control Services), 1991**. Nigeria poultry Population. Federal Ministry of Agriculture and Rural Development, Abuja, Nigeria.

**Ibe, S. N. 1990.**Utilising local poultry gene resources in Nigeria. *Proceedings of the 4th World Congress on Genetics Applied to Livestock Production,***14**:51-53.

**Ibe, S. N. 1993**. Growth performance of normal, frizzle and naked-neck chicken in a tropical environment. *Nigerian Journal of Animal Production***20**:25-31.

**Ibe, S. N. 1998**. *An Introduction to Genetics and Animal Breeding*. Longman Nig. Plc. Lagos. Pp 92-93.

**Ilori, B. M., Peters, S. O., Ikeobi, C. O. N., Bamgbose, A. M., Isidahomen, C. E. and Ozoje, M. O. 2010.** Comparative assessment of growth in pure and **c**rossbred turkeys in a humid tropical environment. *International Journal of Poultry* Science 9: 368-375.

**Mendes, R. P., Karabayir, A. and Pala, A. 2005.** Path analysis of the relationship between various body measures and live weight of American bronze turkeys under three different lighting programs. *TarimBilmleriDergisi*. **11**: 184-188.

**Nwachukwu, E. N., Ibe, S. N. and Ejekwu, K. 2006.** Short term egg production and egg quality characteristic of main and reciprocal crossbred normal local, naked neck and frizzle x exotic broiler stock in a humid tropical environment. *J. Anim. and Vet. Adv*. 5(**7**): 547-551.

**Oke, U. K. and Iheanacho, V. C. 2010.** Effect of breed and breeding system on reproductive performance of Rabbits in a Humid Tropical Environment. *Tropical and Sub-tropical Agroecosystem* (**14**): 369-373.

**Oluyemi, J. A. and Roberts, F. A. 2000.***Poultry production in warm wet climate*, Rev. ed. Ibadan, Nigeria; Spectrum Book Ltd.

**Peters, S. O., Ikeobi, C. O. N., Ozoje, M. O., Famakinwa, O. A., Oshodi, Y. S. and Adebambo, O. A. 2007.** Egg quality of Nigeria Local Chicken as influenced by some major genes. *Nig. J. Anim. Prod.* 34(**1**): 25-35.

**SAGARPA, 2003.** (Secretaria de Agricultura, Ganaderia, Desrrollo Rural, Pesca y Alimentación). 2003 *InformeSobre la Situatión de los RecursosGeneticosPecuarios (RGP)* en Mexico.

**Zahrudden, O., Ahemen, T. and Aliyu, P. I. 2011**. Breeding characteristics of turkeys (*Meleagris gallapavo*) in parts of Jos Plateau. *Proc. 36th Confr. Nig. Soc. Anim. Prod.* 13-16th March, 2011. Univ. of Abuja, Nig. Pp 29-32.

***Received: 4th August, 2017***
***Accepted: 9th December, 2017***