BODY MASS INDEX (BMI) AND PRODUCTION PERFORMANCE OF TWO STRAINS OF UNSELECTED BREEDER TURKEY (*Meleagris gallopavo*) IN ZARIA, NIGERIA

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ABSTRACT

This study was conducted to assess body mass index (BMI) and some production performance of two strains of unselected breeder Turkey. The data was generated from (n=64) Turkeys comprising (n=32 each) of Norfolk black and Mammoth bronze strains. The growth and body linear measurements studied included body weight (BW), body length (BL), body height (BH), chest girth (CG) and shank length (SL). Haematological parameters included pack cell volume (PCV), haemoglobin (Hb), white blood cell (WBC), red blood cell (RBC) and total protein (TP). Data was collected when over 70% of the females were into lay (38 weeks of age). Result indicated that the BMI (g/cm^2) for Mammoth male and female are 160.03±6.66 and 115.08±6.55, respectively. While for Norfolk male and female was 161.96±7.02 and 105.41±2.37, respectively. BW (g) in the Mammoth male and female was 7100.00±351.18 and 4110.00±193.90, respectively. While for Norfolk male and female it was 7183.33±358.62 and 3710.00±79.68, respectively. This showed that the males of the two strains have significantly higher BMI and BW than the females. Lower BMI is an indication of reduced fat deposition, which is required for breeder females. Result for body linear measurements showed no sexual dimorphism and/or strain effect in both Mammoth and Norfolk strains. The result of haematological parameters shows that there was significant difference between strains but no significant sex effect. It was concluded that females of the two strains performed better in their laying period by having low BMI. The males however, showed good performance for their age.

Keywords: Body mass index, Haematology, Mammoth, Norfolk, Turkey.

INTRODUCTION:

Turkey *(Meleagris gallopavo)* is a good source of protein and one the world most valued poultry especially in the USA where it is highly priced during the 'Thanksgiving' periods (FGN and UNICEF, 1990). Turkey production is not common among poultry farmers in Nigeria, although a number of farms are now beginning to rear Turkey at sub-commercial level owing to increasing interest. They are mostly located in urban areas and are gradually spreading out to village farms. According to Ojewola *et al.*, (2002) turkey has no consumption problems as 116 million Nigerians are active consumers. Despite the increase in demand of turkey consumption, there are no large scale commercial turkey farms in Nigeria to meet with the ever increasing demand (Kabir *et al.*, (2014a). According to Peter (2006), turkey has a very strong aversion to any change in their feeding routine. Poults up to 10 weeks of age require ration containing approximately 23% crude protein (CP). The CP content should be reduced to 15% for mature turkeys. For the breeder stock, diets low in protein (9-14%) and low in energy (2600Kcal/Kg ME) is required.

According to Kabir *et al.*, (2014a), light and heavy breeds of turkey require an average daily feed intake of about 115 to 285g, respectively. In the tropics, approximately 24kg of feed is required to produce a 6.4kg turkey at 24 weeks of age provided they are properly managed (Payne and Williamson, 1990). Heavy hens at 14 weeks of age, weighing 7.7kg would consume 17.4kg of feed for feed conversion of 2.35kg of feed for 1kg of weight gain. Heavy toms at 16 weeks of age, weighing 12.30kg would consume 28.85kg of feed for a feed conversion of 2.29kg of feed for 1kg weight gain (Anon, 2005). The implication is that turkeys have specific nutritional needs (ARC, 1975; Maynard *et al.*, 1979; Aduku, 1993), which are somewhat different from that of broilers and growers on which most farmers base their turkey feeding. Body mass index (BMI) or Quetelet index, is a measure of relative weight based on an individual's mass and height. Devised between 1830 and 1850 by the Belgian polymath Adolphe Quetelet during the course of developing "social physics", it is defined as the individual's body mass divided by the square of their height–with the value universally being given in units of kg/m^2 or g/cm^2 (Gray and Fujioka, 1991). There are also researches that used the BMI for the determination

of body composition in broiler (Miller *et al.*, 2007, Ferguson *et al.*, 2007). Most studies on Body Mass Index (BMI) were conducted in humans to measure obesity (Must *et al.*, 1991; Engeland *et al.*, 2007). Obese studies are scanty in livestock and poultry, however commercial broiler chickens have increased growth rate, which is associated with negative effects including increase in fat deposition (Griffin, 1996; Zerehdaran *et al.*, 2004; Fergusion *et al.*, 2007). Decreased fat content may be desired in meat products and this can be provided by decreased BMI. Excessive fattening is undesirable for bird health and meat quality (Shahin and Elazeem, 2005, 2006).

MATERIALS AND METHODS:

The experiment was conducted at the poultry unit, teaching and research farm of the Department of Animal Science, Ahmadu Bello University, Samaru, Zaria, Kaduna state. Description of the study area was earlier given by Kabir *et al.* (2014b). Total of 64 Turkeys which comprised of (n=32) Norfolk black strain (16 males and 16 females) and (n=32) Mammoth bronze strain (16 males and 16females). BMI was calculated as a ratio of body weight to body height (g/m^2) while production parameters include body weight (BW) in grams, body length (BL), body height (BH), chest girth (CG) and shank length (SL) all in centimeters. Haematological parameters considered are pack cell volume (PCV), haemoglobin (Hb), white blood cell (WBC), red blood cell (RBC) and total protein (TP). The study commenced when over 70% of the female birds of the two strains were into lay (38 weeks of age). They were housed on strain basis according to sex and fed *ad libitum* on a compounded breeder/layer mash of 15.50% Crude protein (CP) and 2650kcal/ Kg Metabolizable energy (ME). Clean drinking water was also provided *ad libitum*. Data collected was subjected to analysis of variance using the general linear model procedure of SAS (2003). Significant means were separated using Duncan Multiple Range Test, (Duncan, 1955). The following statistical model was employed:

$$Y_{ijk} = \mu + B_i + S_j + e_{ijk}$$

Where: Y_{ijk} = Individual observation, μ = Overall mean, B_i = Effect of the i^{th} strain (i = 2) and S_j = effect of j^{th} sex (j = 2) e_{ijk} = Random error.

RESULTS AND DISCUSSION:

BMI and growth parameters:

Table 1 shows sex and strain effect on BMI, BW and some linear body measurement of unselected breeder turkey. The result indicated that BMI (g/cm^2) and BW (g) in the males of the two strains are similar but significantly ($p<0.05$) higher than in the females of the two strains. This result agree with the report of Tanko and Ojewola (2003) who reported that body weight and feed intake of the indigenous turkey were significantly different because the sexual dimorphism was in favour of the males. No significant ($p>0.05$) sexual dimorphism or strain effect was observed for body linear measurements obtained.

Haematological parameters:

Result of haematological parameters is shown in Table 2 and it revealed that all the tested parameters were not significantly ($p>0.05$) different in the males of the two strains. However, PCV (34.00±2.64%) and Hb (10.90±0.88g/dl) are significantly ($p<0.05$) higher in the Norfolk females than in the Mammoth females (PCV=26.66±4.80% and Hb=7.87±1.61g/dl). Females of the Mammoth strain had on the other hand significantly ($p<0.05$) higher WBC ($9.06\pm2.65\times10^9$/l) and RBC ($5.70\pm0.43\times10^6$/l) than females of the Norfolk strain (WBC=$7.66\pm0.95\times10^9$/l and RBC=$3.22\pm0.23\times10^6$/l). This finding agreed with the report of Mushi *et al.* (1999), Iheukwumere and Herbert (2003) that blood profiles varied among different breeds. Uko and Ataja (1996) as well as Ikhimioya *et al.* (2000) compared the blood parameters of different breeds of poultry and similarly concluded that there were significant variations in the haematological parameters of different breeds of poultry. Total protein remained unaffected by sex or strain difference.

CONCLUSION

It was concluded that the breeder females belonging to Mammoth black and Norfolk bronze had no excessive fat deposition as to interfere with their reproductive system. This was evident by the reduced BMI obtained. The males however, showed good performance for their age in terms of BW, BMI and stable haematological picture recorded.

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Table 1: Means (±SE) for BMI and growth traits in male and female of two strains of unselected breeder Turkey

		Strain (mean±SE)	
Variables	Sex	Mammoth black	Norfolk bronze
BMI (g/cm^2)	M	160.03±6.66^a	161.96±7.02^a
	F	115.08±6.55$_a$	105.41±2.37^b
BW (g)	M	7100.00±351.18^a	7183.33±358.62^a
	F	4110.00±193.90^a	3710.00±79.68^b
BL (cm)	M	34.33±0.33	34.66±0.33
	F	30.00±0.00	29.80±0.20
BH (cm)	M	44.33±0.33	44.44±0.66
	F	35.80±0.37	29.80±0.20
CG (cm)	M	60.00±0.00	60.66±0.33
	F	44.00±0.83	42.80±0.37
SL (cm)	M	13.00±0.00	13.00±0.00
	F	10.00±0.00	10.00±0.00

^{ab}= Means with different superscripts for a given variable differ significantly ($p<0.05$), BMI=body mass index, BW=body weight, BL=back length, BH=body height, CG=chest girth, SL=shank length, M=male, F=female, SE=standard error.

Table 2: Means (±SE) for haematological parameters in male and female of two strains of unselected breeder Turkey

		Strain (mean±SE)	
Variables	Sex	Mammoth black	Norfolk bronze
PCV (%)	M	32.66±2.18	33.00±1.73
	F	26.66±4.80^b	34.00±2.64^a
Hb (g/dl)	M	10.86±0.72	11.00±0.57
	F	7.87±1.61^b	10.90±0.88^a
WBC ($\times10^9$/l)	M	7.43±2.01	7.30±1.55
	F	9.06±2.65^a	7.66±0.95^b
RBC$\times10^6$/l)	M	5.40±0.36	5.50±0.28
	F	5.70±0.43^a	3.22±0.23^b
TP (g/dl)	M	6.53±1.27	7.46±1.23
	F	7.73±1.37	6.73±0.17

^{ab}=Means with different superscripts for a given variable differ significantly ($p<0.05$), PCV=packed cell volume, Hb=haemoglobin, WBC=white blood cells, RBC=red blood cells, TP=total protein, M=male, F=female, SE=standard error