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Whole blood coagulation time, haematocrit, haemoglobin and total protein of turkeys reared in Zaria, Nigeria

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Abstract

The study was carried out to determine the values of whole blood coagulation time (WBCT), haematocrit (HM), haemaglobin (HB) and total protein (TP) of one hundred and eighteen apparently healthy turkeys reared under an extensive management system in Zaria. The mean values for WBCT, HM, HB and TP were 1.12 ± 0.02 min, 31.31 ± 0.52%, 10.43 ± 0.17g% and 7.89 ± 0.14g/dl, respectively. The mean value of 1.14 ± 0.41 min for WBCT of the male turkey was not significantly different (P>0.05) from the mean value of 1.11 ± 0.04 min obtained from the female. Similarly, there was no significant difference (P>0.05) between the mean HM value of 32.12 ± 0.89 recorded for the male and the mean value of 30.60 ± 0.59 recorded for the female turkey. The correlation coefficient between age and WBCT was negative and significant (r = -0.235, P<0.05), while the correlation coefficient between WBCT and TP was negative and insignificant (r = -0.016, P>0.05). The relationship between WBCT and HM was also negative and insignificant (r = -0.073, P>0.05). On the other hand, the correlation coefficient between the HM and HB was positive and highly significant (r = 0.999, P<0.001). The results obtained in the present study provide baseline values for WBCT, HM, HB and TP in turkeys reared under an extensive management system in Zaria.

Keywords: Haematocrit, Haemoglobin, Total protein, Turkey, Zaria.

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Introduction

Turkey is an American bird of the pheasant super family Meleagrididae. Some researchers trace back turkey's name not to the Republic of Turkey, but to the bird's call of "turc-turc-turc" (Ehrlich *et al.*, 1988; Peterson, 1990). Turkeys are magnificent birds with metallic lustre feathers, reflecting brown, reddish, and green colours among other beautiful colours. They are particularly impressive looking when they make fan wise display of their wide tail feathers at courting time (Kightley *et al.*, 1998). Turkeys are good foragers, as such they can be kept on free range as commonly practiced by backyard poultry farmers in Zaria. They strive well in dry, chalky soil, particularly where trees can provide natural shade, as opposed to damp and poorly drained soil (Peterson, 1990; Kightley *et al.*, 1998).

At the moment in Nigeria, large scale turkey production is not as popular as domestic chicken. Infact, huge amount of money is invested in the development and industrialization of domestic chickens, but only little attention is paid on other avian species like turkeys, ducks and guinea fowls. The production of turkeys is being neglected apparently, due to lack of adequate attention by research scientists, developmental agencies and private sectors (Ikpi & Akinwumi, 1981). Yet turkeys are good meat producers. It is believed that a matured male turkey can reach an average weight of 14.5kg (Erhlich *et al.*, 1988, Kightley *et al.*, 1998). Their commercial production, therefore, is more profitable than the little income generated by those who keep them on free range, where they are constantly exposed to so many diseases, theft and severe environmental stresses (Oladele & Ayo, 1999; Oladele, 2009).

The significance of blood in humans and domestic creatures has long been appreciated. However, despite historical interest, the physical features of blood have not been overlooked or exhausted (Oladele, 2009). The knowledge of the haematology

of turkey is important in understanding its nutritional and pathological status under various conditions. For many years, criteria such as colour and clotting time were used to assess the health status of animals (Hawkey & Dennett, 1989). This is because one of the most important properties of blood is its ability to coagulate or clot outside the blood vessels. Clotting is essential for healing of wound, as it is one of the most important blood defence mechanisms in animals. Failure of blood clotting is found in haemorrhagic diseases (Sullivan *et al.*, 1994). The determination of the values of blood parameters, such as HM, HB, TP and WBCT in different poultry species is of clinical significance in the management of haemacoagulatory disorders, trauma, wound; and for better understanding of their haematological and physiological indices.

Lack of attention on turkeys has invariably led to paucity of information on the baseline data of this species of bird. Very little is known about the data of turkeys reared in Zaria. For example, bulk of reference haematological parameters of turkeys are those obtained from the temperate countries. It, therefore, becomes necessary to determine the baseline values of HM, HB, TP, and WBCT of turkeys reared under the traditional extensive management system in Zaria. These reference values would be useful for the evaluation of patho-physiologic alterations, and aid in diagnosis and therapy of avian diseases.

Materials and methods

Study area

The study was carried out in Zaria (11^{o} 10'N 07^{o} 38'E) located in the Northern Guinea Savannah zone of Nigeria. There are three seasons in this zone, namely the harmattan, hot and rainy seasons. Trees and grasses characterize the vegetation of this zone with average temperature of 17^{o}C to 33^{o}C (Sa'idu *et al.*, 1994; Oladele *et al.*, 2003).

Experimental birds

A total of one hundred and eighteen apparently healthy turkeys, comprising fifty-five males and sixty-three females served as the subjects of the experiment. The turkeys were aged between eight and twelve months old. They were reared under the traditional extensive management system.

Laboratory procedures

About four ml of blood was aseptically collected using 23 gauge sterile hypodermic needles and syringes from the wing vein of each bird, into two sets of Bijou bottles. One set of the bottles contained ethylene diamine tetra acetic acid (EDTA), as anticoagulant, while the other set of the bottles had no EDTA. Blood containing EDTA was used to determine the values of HM, HB and TP, according to the methods of Benjamin (1985), while blood that did not contain EDTA was used to determine the values of WBCT, according to the procedures of Hall (1972).

Statistical analysis

All the data obtained were subjected to statistical analysis, using Student's t-test and correlation analyses. Values of $P<0.05$ were considered significant.

Results

Table 1 shows the sex variation in the values of HM, HB, TP and WBCT of turkeys. Although the mean values obtained for HM, HB, TP and WBCT in the male turkeys were higher than the corresponding values in the females, there were no significant differences between the values ($P>0.05$).

The correlation coefficient between WBCT and age ($r = -0.235$, $P<0.05$) was negative but significant, while the correlation coefficients between WBCT and HM ($r = -0.073$, $P>0.05$), and between WBCT and HB ($r = -0.076$, $P>0.05$), and between WBCT and TP ($r = -0.016$, $P>0.05$) were all negative and insignificant (Table 2).

Table 1: Sex variation in haematocrit, haemoglobin, total protein and whole blood coagulation time of the turkey (Mean ± SEM)

Sex	Haematocrit (%)	Haemoglobin (g%)	Total protein (g/dl)	Whole blood coagulation time (min)
Male	32.12 ± 0.89[a] (n = 55)	10.71 ± 0.29[a] (n = 55)	7.93 ± 0.21[a] (n = 55)	1.14 ± 0.41[a] (n = 55)
Female	30.60 ± 0.59[a] (n = 63)	10.19 ± 0.19[a] (n = 63)	7.86 ± 0.19[a] (n = 63)	1.11 ± 0.04[a] (n = 63)
Mean ±SEM	31.31 ± 0.52 (n = 118)	10.43 ±0.17 (n = 118)	7.89 ±0.14 (n = 118)	1.12 ± 0.02 (n = 118)

a, b = For each blood parameter, data along the same column with the same superscript alphabets are not significantly different (P>0.05)

Table 2: Correlation coefficient (r) of age, whole blood coagulation time, haematocrit, haemaglobin and total protein of the turkey

Parameters	Age (months)	WBCT (min)	HM (%)	TP (g/dl)	HB (g%)
Age (months)	-	-0.235^{NS}	-0.286^{*}	-0.249^{*}	0.286^{*}
WBCT (min)	-0.235^{NS}	-	-0.073^{NS}	-0.016^{NS}	-0.076^{NS}
HM (%)	0.286^{*}	-0.073^{NS}	-	-0.567^{**}	0.999^{***}
TP (g/dl)	-0.249^{*}	0.016^{NS} -	0.567^{**}	-	0.564^{**}
HB (g%)	0.286^{*}	-0.076^{NS}	$0.999^{** *}$	-0.564^{*}	-

NS = Non-significant Correlation (P>0.05)
* = Significant Correlation at P<0.05
** = Significant Correlation at P<0.01
*** = Significant Correlation at P<0.001

Discussion

The mean value of 31.31 ± 0.52% recorded for HM in this study is lower than the mean HM values of 39.45 ± 2.34% (Makinde & Fatunmbi, 1985) and 37.55 ± 2.92% (Oyewale & Ajibade, 1990) obtained from turkeys reared in Ibadan, Southern Nigeria. Similarly, the mean HB value of 10.43 ± 0.17g% obtained in this study is lower than the values of 12.95 ± 1.03g% (Makinde & Fatunmbi, 1985) and 11.49 ± 1.21g% (Oyewale & Ajibade, 1990) obtained from turkeys reared in Ibadan Southern Nigeria. Also, the mean HM values of 31.31 ± 0.52% obtained for turkeys in this study is lower than the mean HM value of 40.30 ± 4.1% obtained from turkeys in the temperate countries; and the mean HB value of 10.43 ± 0.17g% obtained in this study is lower than the mean HB value of 13.70 ± 2.30g% obtained from turkeys reared in the temperate countries (Lisano & Kennamer, 1977).

The difference in values of haemotological parameters obtained in this study and those obtained from turkeys in Ibadan may be due to nutrition in which fresh grasses and vegetable; in addition to the feed supplements available for the turkeys almost all the year round in Southern part of Nigeria when compared to the scanty herbages present in the Northern part of Nigeria, especially during the dry season, for the free ranging domestic turkeys. The higher values of HM and HB in turkeys reared in the temperate regions of the world may be due to proper management and availability of various kinds of feed for turkeys. Also, since those turkeys were kept under intensive management system, they were not frequently exposed to diseases and infections, when compared to our free ranging turkeys which are frequently challenged by infectious agents common in the environment (Oladele & Ayo, 1999).

Furthermore, in the temperate countries, where turkeys are kept predominantly indoor, the adverse effects of heat stress are minimal because ambient temperature is monitored and regulated constantly. However, in Nigeria, turkeys are predominantly subjected to heat stress because they are reared mainly under the free range management system,

involving their free ranging in search of feeds; and lack of minimum veterinary care. Also, it has been established that birds reared in the region of high temperatures tend to have lower HM and HB values than those reared in areas of lower temperatures (Bannor & Ogunsan, 1987).

The present study shows that the mean values for HM and HB in the male turkeys were higher than the corresponding values obtained from the females. This result is in line with the findings of Hunsaker *et al.* (1964) & Wolf *et al.* (1985) who found that the increase in the value of haematological parameters of adult male birds than their female counterparts was due to the hormone androgen known to stimulate erythropoiesis, and consequently, increase in the values of HM and HB.

The Mean WBCT value of 1.12 ± 0.02 min obtained in the turkey in this study is lower than the mean WBCT values of 2.90 ± 1.90 min, 6.60 ± 1.50 min and 3.60 ± 0.13 min obtained from chickens, ducks and mallards, respectively (Ayo *et al*., 2002; Oladele *et al.*, 2007). This result is in line with the findings of Byars *et al.* (1976) who found that there were variations in WBCT of different animal species. There was no significant difference (P>0.05) between the mean WBCT values for the male and female turkeys in this study. This result is also in agreement with the findings of Haymenko *et al.* (1990); Ayo *et al.* (2002) & Oladele *et al.* (2010) who found no sex difference in values of WBCT of some domestic birds. The correlation coefficient between age and WBCT was negative and significant in this study. This result contradicts the findings of Ayo *et al.* (2002) who found positive and significant relationship between age and WBCT of chickens and ducks.

The negative relationship between the WBCT and TP obtained in this study may be attributed to increase in the level of fibrinogen in the blood of the turkey. Although the concentration of fibrinogen was not determined in this study, it is established that fibrinogen, a precursor of fibrin, is a principal serum component essential for blood coagulation (Amad, 1986). Therefore, high fibrinogen in circulating blood may result in reduced WBCT of poultry (Bakhiet *et al.*, 2006).

This study has established the baseline values for WBCT, HM, HB and TP in turkeys reared under the extensive management system in Zaria. These parameters would be of significance in understanding the pathogenesis of haematological disorders of poultry, especially those associated with haemacoagulatory and cardiovascular disorders.

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