Blood profile of prevalent sheep breeds in Nigeria: A case study of Ikorodu Local Government Area of Lagos State, Nigeria

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Abstract

The role of the environment in the survivability of an animal is paramount and blood profiles are part of the indices for measuring the health status. Therefore, a study was carried out to determine the blood profile of prominent indigenous breed of sheep (Ram) viz: West African Dwarf, Yankasa, Balami and Ouda breeds reared in Ikorodu Local Government. A total of 20 rams were used comprising of five rams per breed, with average age of 2½ years weighing 31.13±4.8 kg. Blood samples were carefully collected from the rams into labeled sterile bottles containing EDTA for haematological examination and another set of bottles containing Lithium Heparin was used to collect blood for the serum biochemical analysis. Haematological parameter assessed were Packed Cell Volume (PCV), White Blood Cell (WBC), Red Blood Cell (RBC), while the biochemical parameters investigated were Total protein (Tp), Albumin, Glucose, Creatine Cholesterol, and Alkaline phosphatase (ALP). PCV was significantly ($p<0.05$) highest (32.25%) in Yankassa and lowest (26.25%) in Ouda. Yankasa had statistically ($p<0.05$) the higher 11.66g/dL Hb, followed by WAD (10.00), Ouda (9.60) and lower (9.20) in Balami. RBC ($\times 10^6/\text{ml}$) was significantly ($p<0.05$) higher in WAD (3.72) than other breeds and lowest in Ouda (3.11). MCV (fl) value was significantly lower in Yankasa (75.83) than other breeds and higher in Ouda (83.60). MCH (pg) was statistically ($p<0.05$) highest (30.89) in Yankasa and lower (26.93) in Balami. Yankasa had significantly ($p<0.05$) the higher (8673.00) Total WBC (mm^3), followed by WAD (8453.25), Balami (6814.25) and least in Ouda (6718.75). Total protein was significantly ($p<0.05$) the higher (53.76) in WAD ram and lower (43.76) in Ouda. Yankasa ram recorded significantly ($p<0.05$) the higher Albumin content (5.45), glucose level (48.87), ALP (129.71) and significantly the least creatine (0.63) while significantly ($p<0.05$) the least values for Glucose were in Ouda (44.83), Albumin content and Alkaline phosphatase in Balami (4.33, 104.87 respectively). Cholesterol value was significantly the higher (93.22) in WAD and lower (79.70) in Balami. Results revealed significant differences in haematological and serological indices tested though all values obtained were within the normal range for sheep.

Keywords: Blood Profile, Sheep Breed, Ikorodu local government area

Profil sanguin des races de moutons prévalentes au Nigeria: étude de cas de la collectivité locale d'Ikorodu dans l'État de Lagos, Nigeria

Résumé

Le rôle de l'environnement dans la survie d'un animal est primordial et les profils sanguins font partie des indices de mesure de l'état de santé. Par conséquent, une étude a été menée pour déterminer le profil sanguin de la race indigène de moutons (bélier), à savoir: les moutons nains d'Afrique de l'Ouest (WAD), Yankasa, Balami et Ouda élevés dans la collectivité locale d'Ikorodu. Au total, 20 béliers ont été utilisés comprenant cinq béliers par race, avec un âge moyen de 2 ans et demi pesant 31,13 ± 4,8 kg. Des échantillons de sang ont

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été soigneusement prélevés sur les béliers dans des flacons stériles étiquetés contenant de l'EDTA pour un examen hématologique et un autre ensemble de flacons contenant de l'héparine de lithium a été utilisé pour collecter du sang pour l'analyse biochimique du sérum. Les paramètres hématologiques évalués étaient le volume de cellules emballées (PCV), les globules blancs (WBC), les globules rouges (RBC), tandis que les paramètres biochimiques étudiés étaient la protéine totale (Tp), l'albumine, le glucose, la créatine cholestérol et la phosphatase alcaline (ALP). Le PCV était significativement ($p < 0,05$) le plus élevé (32,25%) à Yankassa et le plus bas (26,25%) à Ouda. Yankassa avait statistiquement ($p < 0,05$) le taux d'Hb le plus élevé de 11,66 g / dL, suivi de WAD (10,00), Ouda (9,60) et moins (9,20) à Balami. Les globules rouges ($\times 10^6$ / ml) étaient significativement ($p < 0,05$) plus élevés chez WAD (3,72) que chez les autres races et plus faibles chez Ouda (3,11). La valeur MCV (fl) était significativement plus faible à Yankassa (75,83) que dans les autres races et plus élevée à Ouda (83,60). MCH (pg) était statistiquement ($p < 0,05$) la plus élevée (30,89) à Yankassa et inférieure (26,93) à Balami. Yankassa avait significativement ($p < 0,05$) le plus élevé (8673,00) WBC total (mm³), suivi des moutons nains d'Afrique de l'Ouest, (8453,25), Balami (6814,25) et inférieur à Ouda (6718,75). La protéine totale était significativement ($p < 0,05$) la plus élevée (53,76) chez les moutons nains d'Afrique de l'Ouest, et la plus faible (43,76) chez Ouda. Le bélier Yankassa a enregistré de manière significative ($p < 0,05$) la plus haute teneur en albumine (5,45), le niveau de glucose (48,87), l'ALP (129,71) et significativement le moins de créatine (0,63) tandis que de manière significative ($p < 0,05$) les valeurs les plus faibles pour le glucose étaient à Ouda (44,83), teneur en albumine et phosphatase alcaline chez Balami (4,33, 104,87 respectivement). La valeur du cholestérol était significativement la plus élevée (93,22) chez les moutons nains d'Afrique de l'Ouest et la plus basse (79,70) chez Balami. Les résultats ont révélé des différences significatives dans les indices hématologiques et sérologiques testés bien que toutes les valeurs obtenues se situent dans la plage normale pour les moutons.

Mots clés: Profil sanguin, race de mouton, collectivité locale d'Ikorodu

Introduction

In Nigeria small ruminant is about 63.7% of total grazing domestic livestock. They are widely distributed in rural, urban and periurban area. There are estimated 42.1million indigenous sheep in Nigeria (NASS, 2011). The indigenous breeds of sheep in order of importance are Yankassa West African Dwarf Ouda and Balami. The vast majority of these small ruminants are found in the northern savannah zone. Sheep are estimated to contribute 11% of the meat supply from the slaughter houses in the Nigeria. Sheep rearing is taken a leading role in the sustainable rural development programmes in developing countries (Rastogi, *et al.*, 2006). Physiological and

pathological changes in an organism can be detected through the blood indices (Mitruka and Rawnsley, 1977). The primary function of the blood is to transport oxygen from the respiratory organ to the body cells (Duke, 2000) and distribution of nutrient enzymes to the cells and carrying away waste products (Slaker and Suverton, 2005), thereby maintaining homeostasis of the internal environment (Bentrick, 2009) the various functions of the blood are carried out by the individual and collective action of its constituent the haematology and biochemistry components (Akinmutimi, 2004). Haematological test is widely used for the diagnosis of various diseases and nutritional status of animals. The haematological and serum biochemical

profile provide reliable information on the health status of animals (Cetin, *et al.*, 2009). Also, it helps in determine the extent of tissue and organ damage, the response of defense mechanism of the animal and diagnosing the type of possible anaemia (Weaver, 2005). Significant variation could occur in blood parameter due to altitude, management, feeding level, age, sex, breeds, health status, method of blood collection, haematological techniques used, seasonal variation, ambient temperature and physiological status such as excrement, muscular, water balance and transportation (Ewuola, *et al.*, 2008). Physiological and pathological changes can be best evaluated when normal blood values are available for comparison. Even though considerable information is available on the normal blood parameters of domestic animals the values are that of exotic breeds kept under different environment and management conditions (Tibbo, *et al.*, 2004). Therefore, this study is aimed at comparing the haematological and biochemical indices of the indigenous breeds of sheep in Nigeria.

Materials and methods

Experimental site

The experiment was carried out at the small ruminant unit of the Animal Production Technology Department of Lagos State Polytechnic, Ikorodu, Lagos state.

Experimental animals and management

Twenty matured rams comprising of five rams per breed from the four prominent breeds with average age of 2½ years weighing between 31.13±4.8 kg viz: Yankassa, Ouda, West African Dwarf (WAD) and Balami were purchased and managed in the small ruminant unit of the Polytechnic Teaching and Research Farm and were managed for a period of four weeks to acclimatize and for necessary prophylactic medication before the commencement of the experiment. The rams were allowed to graze within the

paddock around the small ruminant housing unit and water was given ad-libitum. Salt leak and supplementary feeds (wheat offal) were given once a day.

Data collection and analysis

Blood samples were collected from the jugular vein of each ram using 10mL needle and syringe per week for a period of six weeks. 5mL of the blood collected were discharged into sample bottle containing EDTA for haematological studies and another 5ml into Lithium Heparin bottle for serum biochemistry. The samples were analyzed for the following haematological parameters: Packed cell volume (PCV) and Haemoglobin (Hb) was determined according to procedure described by Dacie and Lewis (2001), RBC and WBC were evaluated by method outlined by Jain (1986) Mean Corpuscular Haemoglobin Concentration (MCHC) Mean Corpuscular Haemoglobin (MCH) Mean Corpuscular Volume (MCV) values were calculated according to formulae of Patterson *et al.*, (1960). The total protein (Tp) was determined based on Biuret reaction (Dioumas, *et al.*, 1981) and Albumin was determined as described Dioumas and Biggs (1972). Creatinine determination was done according to method of Ambrose, *et al.*, (1983). Cholesterol levels were estimated using the principles of Huang *et al.*, (1961) and modified by Ness, *et al.*, (1962). All data collected were subjected to analysis of variance (ANOVA) for a (CRD) according to the standard procedure as describe by Steel and Torries (2002). Duncan multiple range test was used to compare the means

Result and discussion

Result in Table 1 shows the summary of haematological values for the experimental animals. The packed cell value (PCV) differed significantly ($P>0.05$) between breeds with Yankassa ram having the higher PCV (32.25%), Hb (11.66g/dL) and WBC

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(11.66g/dL) values. The higher value of RBC ($3.72 \times 10^6/\text{mL}$) was observed in Balami ram while Ouda ram had the least (3.11g/dL) value of MCH ranges from (26.93-30.89pg) with Ouda ram having the highest value while Balami ram had the least (26.93pg). The highest value of (36.95g/dL) was observed in Ouda ram for MCHC. Ouda ram was observed to have the higher MCV. Yankassa ram had the highest value for WBC (11.66g/dL). The lymphocytes value ranged from 48.50% in WAD to 55.00% in Yankassa and Balami ram, respectively. The higher value for Neutrophils was observed in Ouda and WAD ram (51.00%) while Yankassa ram had the least (44.00%). PCV (26.25-32.25%) values were within the normal range (28.90 to 30.25%) reported by various authors (Rusuff, *et al.*, 1954, Bianca, 1955 and Baneejee, 2007). An increase in PCV might be attributed to high environmental temperature. This is similar to the report of Patterson, *et al.* (1960) which report that increase in environmental temperature cause an increase in PCV. The result of the Hb content showed that the value ranged

from (9.20-11.66 g/dl) with Yankassa having the higher value. The normal Hb range was 8-16 g/dL reported for sheep (RAR, 2009). The increase in Hb concentration is associated with greater ability to resist infection and low level is an indication of infection and poor nutrition (Cheesbrough, 2004; Tambuwal *et al.*, 2002). The RBC value was observed to be higher in WAD. But the value (3.11-3.72) obtain in this study were within the normal value recommended (Campbell *et al.*, 2003). The value of MCV (75.83-83.60), MCHC and MCH significantly increased and are very important in the diagnosis of anaemia and also serve a useful index of the capacity of the bone marrow to produce RBC (Awodi, *et al.*, 2005). The WBC count was observed to be higher in Yankassa (8673.00). The higher WBC in this study is an indicator of immune response to infections or toxic substances in the animal and a low count is an indication of pathogenic infection or presence of antigen in the organism (Bradbury, *et al.*, 1999). There was no significant difference in the Lymphocyte and Neutrophils of the entire breed.

Table 1: Haematological values of four breeds of ram

Parameter	Breeds of ram				SEM
	Balami	Yankassa	Ouda	WAD	
PCV (%)	28.00 ^b	32.25 ^a	26.25 ^b	30.25 ^a	1.30
Hb (g/dl)	9.20 ^c	11.66 ^a	9.60 ^b	10.00 ^b	0.54
RBC ($\times 10^6/\text{ml}$)	3.40 ^b	3.41 ^b	3.11 ^b	3.72 ^a	0.12
MCH (pg)	26.93 ^b	27.70 ^b	30.89 ^a	27.53 ^b	0.89
MCV (fl)	82.11 ^a	75.83 ^b	83.60 ^a	80.95 ^a	1.68
MCHC (g/dl)	32.78 ^c	36.48 ^a	36.95 ^a	33.90 ^b	1.00
WBC (mm^3)	6814.25 ^c	8673.00 ^a	6718.75 ^d	8453.25 ^b	520
Lymphocytes %	55.00	55.00	49.00	48.50	1.80
Neutrophils %	45.00	44.00	51.00	51.00	1.96

^{a,b,c,d} mean having different superscript letters in the same row differ significantly ($p < 0.05$)

Table 2 shows serum biochemistry of the rams. All the parameters showed significant difference ($P < 0.05$) between breeds. The value for total protein concentration, albumin, glucose, alkaline obtained were higher in Yankassa the creatinine and

globulin were significantly higher ($P < 0.05$) in WAD ram than any of the breed. Serum biochemical indices is used to determine the level of heart defects, liver damage, evaluate protein quality and amino acid requirement in animals as reported by

(Harper, *et al.*,1979). The values of total protein concentration obtained were higher in Yankassa and Ouda ram than other breeds. This agrees with the report of Kamalu, *et al.*, (1988). Plasma protein helps to transport calcium and phosphorus and other substances in the blood by attaching to the albumin. The Albumin values obtained in the present study was higher (5.45) in Yankassa ram than other breeds. Value of albumin less than the normal value usually indicates hypo albumineamia (Altman, 1979). The Glucose levels show that Yankassa had the higher glucose level. When glucose is lower than the normal range is an indication of hypoglycemia Olorunnisomo, *et al.*, (2012). The creatinine

value of the present study was within normal range and were different significantly ($p<0.05$) among the breeds. High creatinine is indication of poor protein and amino acid metabolism that can lead to impaired renal function and cardiac infraction (Gray and Howarra, 1980). The cholesterol value shows inconsistency for breed. If the blood cholesterol is high it may result in its deposition on the walls of the blood vessels and these deposits may eventually result to atherosclerotic plaque, this may block important blood vessels and result in a myocardial infraction. The alkaline phosphatase showed a significant difference ($p<0.05$) among the breed, Yankassa ram having the highest.

Table 2: serum biochemical result of different breed of ram

Parameter	Breeds of ram				SEM
	Balami	Yankassa	Ouda	WAD	
Total protein (g/l)	52.37 ^b	53.19 ^a	43.76 ^c	53.76 ^a	2.35
Albumin(g/dl)	4.33 ^c	5.45 ^a	4.84 ^c	5.15 ^b	0.23
Glucose(mg/dl)	45.44 ^c	48.87 ^a	44.83 ^d	47.64 ^b	0.94
Creatinine(mg/dl)	0.75 ^b	0.63 ^d	0.65 ^c	0.77 ^a	0.03
Cholesterol(mg/dl)	79.70 ^d	85.72 ^b	84.21 ^c	93.22 ^a	2.81
Alkaline phosphates (i.u/l)	104.87 ^d	129.71 ^a	118.68 ^c	120.05 ^b	5.11

^{a,b,c,d} mean having different superscript letters in the same row differ significantly ($p<0.05$)

Conclusion

From the present study, it can be concluded that the haematological and biochemical parameters differs from one breed to another. Nutrition, age and other environmental factors pose great influence on the blood profile of sheep in the tropics

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