

COMPARATIVE EVALUATION OF HAEMATOLOGICAL PROFILE OF West African Dwarf and Red Sokoto GOATS REARED IN HUMID SOUTHEASTERN NIGERIA

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ABSTRACT

A comparative evaluation of the haematological values of two Nigerian goat breeds reared in humid Southeastern Nigeria was determined in thirty (30) goats, made up of fifteen (15) West African dwarf (WAD) and fifteen (15) Red Sokoto goats. Each breed comprised four (4) adult male, four (4) adult female, four (4) young female and three (3) young male goats. The age of the goats ranged from 6 months to 4 years. Blood samples (5 ml) were drawn from each goat through the jugular vein and placed in labeled sterile bijoux bottles containing 1 mg ml⁻¹ of an anti-coagulant, ethylene diamine tetracetate (EDTA) for haematological analysis. The mean values for Haemoglobin (Hb), Packed cell volume (PCV), white blood cell, red blood count, mean corpuscular volume (MCV), mean corpuscular haemoglobin concentration (MCHC) and mean corpuscular haemoglobin (MCH) were 7.92 and 7.23 g/dl, 23.60 and 21.67%, 17.8 (x 10³ml) and 15.7 (x 10³ml), 5.39 and 5.29 (x10⁶ ml), 45.93 and 43.55 µm³, 33.24 and 33.31%, 15.32 pg and 14.52 pg for Red Sokoto and WAD goats, respectively. The WBC counts differentials in Red Sokoto and WAD goats, male and female and young and adult goats were similar (p>0.05). The result of the present study revealed that the haematological values of WAD and Red Sokoto goats did not differ significantly (p>0.05). Similarly, haematological values showed non-significant (p>0.05) age and sex differences and were therefore, similar in both adult and young and male and female goats, respectively. This is an indication that the goats were averagely healthy and may have adapted to the study area.

Keywords: Haematology, Red Sokoto, West African Dwarf goats, humid environment

INTRODUCTION

The West African Dwarf (WAD) goat is a trypanotolerant breed kept mainly for meat production and found within the rainforest and derived savanna ecological zone of Nigeria. The WAD goats are indigenous to Southeastern (SE)

Nigeria and with a population of about 14.6 million in 1992 (Okoli *et al.*, 1995) and 28 million in Nigeria (FAO STAT, 2006). The breed constitutes a major contributor to the animal protein intake of over 19 million people of the area. The Red Sokoto goat is the predominant and most important breed of goat found mainly in the Sudan and Sahel savanna zone or in the Sokoto province, North-Western zone of Nigeria. It is well adapted to the arid zones. It accounts for 17.3 million of the goat population in Nigeria or about 70% of the estimated 34.50 million goats in Nigeria (Osuhor *et al.*, 1998).

These two breeds of goat are better adapted to ecological zones where they are indigenous but, they seem to adapt to areas outside their ecological zone. In Nigeria, there is a flourishing trade in both breeds into areas where they are not indigenous. This has resulted to a high population of Red Sokoto goats in the southern humid zone of SE Nigeria and WAD goats in the sahel/sudan zones. Recently, Ahamefule *et al.* (2011) stated that these small ruminant breeds can do well outside their natural habitat baring acclimatization difficulties if well managed. The need therefore arises to document haematological values of both goat breeds raised in SE Nigeria with a view of determining the health status and extent of adaptability of Red Sokoto and WAD goats raised in the area.

The significance of determining haematological indices of domestic farm animals has been well documented (Oduye and Adadevoh, 1976; Anosa and Isound, 1979; Opara *et al.*, 2010). Similarly, various reports (Oduye, 1976; Egbe-Nwiyi *et al.*, 2000; Tambuwal *et al.*, 2002; Daramola *et al.*, 2005; Adass *et al.*, 2010) have documented haematological indices of indigenous Nigerian goats. There is great variation in the haematological values as observed between breeds of goats (Azab and Abdel-Maksoud, 1999; Tambuwal *et al.*, 2002). Nutrition, age, sex, genetics, stress, disease, management system, location and transportation are all known to affect haematological and biochemical parameters observed in domestic animals (Schalm *et al.* 1975; Coles, 1986; Anosa and Isound, 1979;

Adejinmi *et al.*, 2000; Egbe-Nwiyi *et al.*, 2000; Daramola *et al.*, 2005; Addass *et al.*, 2010).

Several researchers have underlined the emerging observation that it may be difficult to formulate a universal metabolic profile test for indigenous goats (Daramola *et al.*, 2005; Addass *et al.*, 2010). These differences had further stressed the need to establish an appropriate physiological baseline values for various breeds of goats in Nigeria, which will help in a realistic evaluation of the husbandry practices, nutritional and health status of goats.

Blood is an important and reliable medium for assessing the health status of individual animals (Oduye, 1976). Haematological values could serve as baseline information for comparison in conditions of nutrient deficiency, physiological and health status of WAD goats in SE Nigeria (Opara *et al.*, 2010). Haematological values of Red Sokoto goats raised in northern guinea savanna and arid zones of Nigeria (Tambuwal *et al.*, 2002; Addass *et al.*, 2010) and WAD goat raised in the sahelian zone of Nigeria and humid forest zone of SE Nigeria (Addass *et al.*, 2010; Opara *et al.*, 2010) have been reported.

However, there is dearth of literature on the comparative evaluation of haematological values of WAD and Red Sokoto goats raised in humid forest zone of SE Nigeria. This study will therefore examine and document the haematological values of WAD and Red Sokoto goats raised on composite forage based diet in the humid forest zone of South eastern Nigeria.

MATERIALS AND METHODS

The experiment was conducted during the rainy season (July/August) at the Sheep and Goat Unit of the Teaching and Research Farm, Michael Okpara University of Agriculture, Umudike, Abia state, Nigeria (latitude 05° 29' North, longitude 07° 31' East at an altitude of 122 meters (400 feet) above sea level). It falls within the 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 2169.8 mm in 148-155 days. Average temperature is 26 °C with maximum of 32 °C and minimum of 22 °C. Relative humidity ranges from 50-95%.

Experimental animals

A total of thirty (30) goats made up of fifteen (15) West African Dwarf (WAD) goats and fifteen (15) Red Sokoto goats were used for this experiment. Each breed comprised of four (4) adult male, four (4) adult female, four (4) young female and three (3) young male goats. The age of the goats ranged from 6 months to 4 years. Dentition method as described by McNitt (1983) was adopted for age determination in this study. Prior to the trial, the animals were quarantined for 60 days during which they were

dewormed, given acaricide bath and vaccinated against *Peste des petits ruminants* (PPR). The animals were subsequently housed in groups in well ventilated cement floored pens equipped with feeders and waterers and fed on composite forage based diet.

Haematological studies

Bleeding of the goats was done between 9.00 am and 11.30 am on the day of blood sampling. The point of collection was first cleaned with surgical spirit to remove excess microbes, debris, and also, to note the vein. The surgical spirit was allowed to dry before puncturing the vein. Blood samples (5 ml) were drawn from each goat through the jugular vein and placed in labeled sterile bijour bottles containing 1 mg ml⁻¹ of an anti-coagulant, ethylene diamine tetracetate (EDTA) for haematological analysis.

The following indices were determined using routine laboratory methods. Packed cell volume (PCV) and Haemoglobin (Hb) were determined by the microhaematocrit and haemetin method as described by Dacie and Lewis (1991); Schalm *et al.* (1975) and Baker and Silverton (1982). Erythrocytes (red blood cells) were counted using the improved Neubauer haemocytometer (Dacie and Lewis, 1991). Leucocytes counts (WBC) were determined by method described by Jain (1986) while differential count, Mean corpuscular volume (MCV), Mean corpuscular haemoglobin (MCH) and Mean corpuscular haemoglobin concentration (MCHC) were determined as described by Schalm *et al.* (1975).

Statistical analysis

Mean values and standard errors were calculated from the haematological data and the results were compared statistically using students' t-test assessing the mutual statistical differences between WAD and Red Sokoto goats and one-way analysis of variance was used to assess the statistical differences between male and female and young and adult goats (SPSS, 1989).

RESULTS AND DISCUSSION

Haematological values of WAD and Red Sokoto goats are as shown in table 1. The result of the present study revealed that the haematological values of the WAD and Red Sokoto goats did not differ significantly ($p>0.05$). Similarly, haematological values showed non-significant ($p>0.05$) age and sex differences (Tables 2 and 3). In other words, the haematological values were similar in both adult and young and male and female goats respectively. Haemoglobin (Hb), packed cell volume (PCV), Red blood cell (RBC), White blood cell (WBC), Mean corpuscular volume (MCV), Mean corpuscular haemoglobin concentration (MCHC) and Mean corpuscular haemoglobin (MCH) of the goats did not differ significantly ($p>0.05$) among the two breeds of

the goats. Although, Hb, PCV, RBC, WBC, MCV and MCH values were higher in Red Sokoto goats (Table 1) but they were not statistically different

($p>0.05$) from the values obtained for the WAD goats.

Table 1: Haematological values of Red Sokoto and West African Dwarf goats reared in Southeastern Nigeria

Parameters	Breeds Red Sokoto	of Goats West African Dwarf	Mean \pm SEM Both breeds
Haemoglobin (Hb) g/dl	7.92 \pm 0.26	7.23 \pm 0.28	7.57 \pm 0.20
Packed cell volume (%)	23.60 \pm 0.75	21.67 \pm 0.82	22.63 \pm 0.57
White blood cell ($\times 10^3$ μ l)	17.8 \pm 0.17	15.7 \pm 0.10	16.70 \pm 0.10
Red blood cell ($\times 10^6$ ml)	5.39 \pm 0.27	5.29 \pm 0.32	5.34 \pm 0.21
MCV (μ m ³)	45.93 \pm 3.01	43.55 \pm 3.52	44.74 \pm 2.29
MCHC (%)	33.24 \pm 0.060	33.31 \pm 0.05	33.27 \pm 0.04
MCH (pg)	15.32 \pm 1.00	14.52 \pm 1.18	14.92 \pm 0.76

MCHC= Mean corpuscular haemoglobin concentration; MCH = Mean corpuscular haemoglobin; MCV = Mean corpuscular volume. Means with no superscript in a row are not significantly different ($p>0.05$). SEM = Standard error of mean

In the present study, PCV for both the WAD and Red Sokoto goats ranged between 18.0-27.0 % and 15.0-27.0 % respectively. The mean PCV value of 23.60 % was obtained for Red Sokoto goats in the present study. This value was lower than the values of 25.7 % and 31.31 % reported by Tambuwal *et al.* (2002) and Addass *et al.* (2010) respectively for the Red Sokoto goat. The mean PCV value of 21.67 % which was obtained for WAD goats in the present study, was within the range of 21.0-35.0 % reported by Daramola *et al.* (2005) and 15-30.0 % (Orheruata *et al.*, 2004) but lower than the values of 25.7 % and 57.4 % reported by Opara *et al.* (2010) and Addass *et al.* (2010), respectively for WAD goats. The PCV value reported for WAD goat was within the PCV values of 20.5-24.8 % for WAD goats fed leaf meal based diets (Belewu and Ojo-Alokomaro, 2007). The lower PCV values obtained in the present study for the two breeds of goats might be associated with location, environmental and nutritional stress.

However, the similar PCV values of the Red Sokoto and WAD goats might be an indication of the healthy physiological status and extent of adaptability of the two breeds in the study area. PCV is used as an index of toxicity but its composition varies among breeds (Azab and Abdel-Maksoud, 1999; Opara *et al.*, 2010; Addass *et al.*, 2010). As a normal rule in animals, the PCV

is directly related to the RBC and Hb contents (Swenson, 1977) and is reflected in this study. PCV values are good indicators of the haemogramme and especially the number of circulating erythrocytes as well as the Hb (Hawkey *et al.*, 1984). A decrease in its percentage shows a poor transportation of oxygen and absorbed nutrient. Such differences in PCV may also be attributable to the physiological and nutritional status of the animals (Esonu *et al.*, 2001). In the present study, the goats were fed forage based diets and this may have contributed to the PCV values obtained.

Haemoglobin (Hb) values for both the WAD and Red Sokoto goats ranged between 5.0-9.0 g/dl and 6.0-9.0 g/dl, respectively. Average Hb value of 7.92 g/dl was obtained for Red Sokoto goats in the present study. This value was lower than the values of 11.40 g/dl reported by Tambuwal *et al.* (2002) for the same breed reared in Bauchi, northern guinea savanna zone of Northern Nigeria but higher than the value of 5.72 g/dl or 57.25% reported by Addass *et al.* (2010) for the breed reared in Mubi, Adamawa state, Nigeria. A mean Hb value of 7.23 g/dl was obtained for WAD goats in the present study. The Hb value was higher than the value of 31.45 % or 3.14 g/dl reported by Addass *et al.* (2010)

Table 2: Effect of sex on the haematological values of two Nigerian goat breeds reared in Southeastern Nigeria

Parameters	Sex of Goats		(Mean±SEM)
	Female	Male	
Haemoglobin (Hb) g/dl	7.32	7.84	0.20
Packed cell volume (%)	22.00	23.57	0.59
White blood cell (x 10 ³ µl)	17.7	16.1	0.98
Red blood cell (x 10 ⁶ ml)	5.44	5.22	0.21
MCV (µm ³)	43.98	47.89	2.24
MCHC (%)	33.29	33.29	0.24
MCH (pg)	13.97	18.00	0.76

MCHC= Mean corpuscular haemoglobin concentration; MCH = Mean corpuscular haemoglobin; MCV = Mean corpuscular volume. Means with no superscript in a row are not significantly different ($p>0.05$). SEM = Standard error of mean

but lower than the values of 9.5 g/dl reported by Opara *et al.* (2010) for WAD goats in Owerri, humid forest zone of SE Nigeria. The Hb values of the WAD goats in the present study were in agreement with reports of Belewu and Ojo-Alokomaro (2007) who obtained Hb values of 5.17 to 8.3 g/dl for WAD goats fed leaf meal based diets. The Hb values were within the normal range of 7-15 g/dl reported for WAD goats (Daramola *et al.*, 2005).

Table 3: Haematological values of young and adult goats of two Nigerian goat breeds reared in Southeastern Nigeria

Parameters	Age of Goats		(Mean±SEM)
	Young	Adult	
Haemoglobin (Hb) g/dl	7.59	7.56	0.20
Packed cell volume (%)	22.71	22.75	0.59
White blood cell (x 10 ³ µl)	17.8	16.3	0.98
Red blood cell (x 10 ⁶ ml)	5.21	5.46	0.21
MCV (fl)	45.36	44.20	2.29
MCHC (%)	33.36	33.20	0.04
MCH (pg)	15.13	14.73	0.76

MCHC= Mean corpuscular haemoglobin concentration; MCH = Mean corpuscular haemoglobin; MCV = Mean corpuscular volume. Means with no superscript in a row are not significantly different ($p>0.05$). SE = Standard error of mean

The reduction in RBC and Hb values observed in the two goat breeds could be due to the inherent anti-nutritional factors especially tannin in the composite forage diets they were fed during the study. The goats may have consumed a high level of tannin in the diets. Eniolorunda and Fasina (2006) had made similar observations in goats fed *Cynodon nlemfuensis* and *Spondias mombin* based diets. Reduction in the values of PCV and Hb may indicate a low protein intake, liver damage or anaemia. Haemoglobin falls gradually in animals on a low protein intake, parasitological infestation or liver damage (Lindsay, 1977).

Haemoglobin (Hb), PCV, MCV, MCH, MCHC, RBC and WBC values in male goats were similar ($p>0.05$) to the values obtained for female goats. These haematological indices were also similar ($p>0.05$) in young and adult goats. The result of the

present study is consistent with the report of Opara *et al.* (2010), who reported non-significant differences between male and female and young and adult WAD goats for most haematological values. Addass *et al.* (2010) had also reported non-significant differences in Hb, WBC, MCH and MCHC values between male and female goats. However, it is contrary to reports of Addass *et al.* (2010) who reported significant age differences in RBC, MCV, MCH and MCHC of WAD, Red Sokoto, Kano Brown and Bornu White goats raised in Northern Nigeria. Similarly, significant age differences have been reported in Red Sokoto goats, where male and adult goats had higher values than female and young Red Sokoto goats in all haematological values investigated (Tambuwal *et al.*, 2002). Such similarities in the effect of age of goats on the haematological parameters could be

attributed to the ages of the goats, which ranged from 6 months to four years in the present study. The goats that were classed as young have attained puberty and are therefore physiologically mature as the older adult goats.

The WBC, RBC, MCH, MCHC and MCV were not significantly affected ($p>0.05$) by breed, age and sex of the goats in the present study (Tables 1, 2, 3). The non-significant breed, age and sex variations observed on WBC, might be an indication that breed, age and sex had little or no effect on the health status of the two goat breeds. Addass *et al.* (2010) had made similar observations in four indigenous Nigerian goat breeds. The WBC values ranged from 12.0-35.0 ($\times 10^3$ ml) and 9.5-24.0 ($\times 10^3$ ml) with mean values of 17.8 ($\times 10^3$ ml) and 15.7 ($\times 10^3$ ml) for Red Sokoto and WAD goats, respectively. Aikhuomobhogbe and Orheruata (2006) reported that had no significant influence on WBC values in WAD goats.

The total WBC values in this study are within the range of 6.8-20.1 ($\times 10^3$ ml) obtained for WAD goats (Daramola *et al.*, 2005). The WBC values were higher than the values of 10.60 ($\times 10^3$ ml) (Tambuwal *et al.*, 2002) and 12.52 ($\times 10^3$ μ l) (Addass *et al.*, 2010) reported for Red Sokoto goats but outside the normal range of 4.0 to 13.0 ($\times 10^3$ ml) reported for goats in general (Radostits *et al.*, 1997). The mean WBC value obtained for WAD goats in the present study was similar to value of 17.3 ($\times 10^9$ l) reported for WAD goats in SE Nigeria (Opara *et al.*, 2010). The moderate WBC counts observed in the goats could indicate the absence or low incidence of microbial infection (foreign body or antigen) (Swenson, 1977) or parasites (Adejinmi *et al.*, 2000) in the circulating blood. High WBC counts or leucocytosis have been attributed to the presence of microbial infection, antigen (Swenson, 1977) or parasites (Adejinmi *et al.*, 2000) and increased level of anti-nutritional factors (ANFs) in the diets consumed by the goats (Ahamefule *et al.*, 2005). Nevertheless,

the WBC values obtained in the present study is still higher than the values of 4.16 to 5.49 ($\times 10^{11}$ c) reported for WAD goats fed leaf meal based diets obtained from Akee apple, *Etanda africana*, *Gliricidia* and Baobab leaf meals (Belewu and Ojo-Alokomaro, 2007). The values of leukocytes in this study are similar to values reported by Oduye (1976) and Ajala *et al.* (2000) for normal healthy goats. This probably shows that the goats maintained an active immune system that defends the body against infection, allergic reactions, parasites and antigens (Belewu and Ojo-Alokomaro, 2007).

In the present study, total WBC counts differentials in young and male goats compared well with values obtained for adult and female goats. The values obtained fell within the broad range recorded for Red Sokoto (Tambuwal *et al.*, 2002; Addass *et al.*, 2010) and WAD goats (Daramola *et al.*, 2005; Opara *et al.*, 2010), thus suggestive of a well developed immune system in the WAD goats with such number of immune cells to proffer good health (Daramola *et al.*, 2005).

The percentage distribution of leukocytes which included lymphocytes, neutrophils, eosinophils, basophils and monocytes in Red Sokoto and WAD goats, male and female and young and adult goats were similar ($p>0.05$) (Tables 4, 5 and 6). In the present study, sex and age were observed to have a non-significant effect ($p<0.05$) on the WBC counts differentials (Tables 5 and 6). This finding is contrary to results obtained by Opara *et al.* (2010), Daramola *et al.* (2005) and Tambuwal *et al.* (2002) for WAD goats and Red Sokoto goats respectively. These researchers observed that sex and age have significant effect on WBC counts differentials. The lymphocytes constituted the majority of the WBC counts. The lymphocytes were higher than the neutrophils as generally reported for goats and other ruminants (Olusanya *et al.*, 1976; Tambuwal *et al.*, 2002).

Table 4: Differential leukocyte values of Red Sokoto and West African Dwarf goats reared in Southeastern Nigeria

Parameters	Breeds of Goats		Mean \pm SEM Both breeds
	Red Sokoto	West African Dwarf	
White blood cell ($\times 10^3$ μ l)	17.8 \pm 0.61	15.7 \pm 0.10	16.7 \pm 0.30
Lymphocytes (%)	50.46 \pm 3.30	52.46 \pm 1.82	51.46 \pm 1.82
Neutrophils (%)	45.08 \pm 3.51	39.38 \pm 2.27	42.23 \pm 2.12
Eosinophils (%)	3.15 \pm 0.61	8.15 \pm 1.88	5.56 \pm 1.09
Monocytes (%)	0.46 \pm 0.18	0.00 \pm 0.0	0.23 \pm 0.10
Basophils (%)	0.07 \pm 0.07	0.00 \pm 0.0	0.03 \pm 0.03

MCHC= Mean corpuscular haemoglobin concentration; MCH = Mean corpuscular haemoglobin; MCV = Mean corpuscular volume. Means with no superscript in a row are not significantly different ($p>0.05$). SEM = Standard error of mean

The RBC counts observed in the present study did not differ significantly ($p>0.05$) between the two breeds, sex and age. Mean values were 5.39 and 5.29 ($\times 10^6$ ml), 5.44 and 5.22 ($\times 10^6$ ml) and 5.26 and 5.46 ($\times 10^6$ ml) for Red Sokoto and WAD goats, female and male goats and young and adult goats, respectively. The RBC counts were much lower than the 9.2-13.5 ($\times 10^6$ ml) range reported

for Red Sokoto goats (Tambuwal *et al.*, 2002) and 9.9 and 18.7 ($\times 10^6$ ml) (Taiwo and Ogunsanmi, 2003) for WAD goats and sheep, respectively. Red blood cell indices aid in the characterization of anaemia (Merck, 1979). Thus, the low RBC counts recorded for the two goat breeds present a likely high susceptibility to anaemia-related disease conditions by the goats.

Table 5: Differential leukocyte values of young and adult goats reared in South eastern Nigeria

Parameters	Age		Mean \pm SEM Both breeds
	Young	of Goats Adult	
Lymphocytes (%)	46.64 \pm 10.73	55.00 \pm 6.28	51.46 \pm 9.27
Neutrophils (%)	48.90 \pm 12.28	38.00 \pm 5.84	42.62 \pm 10.42
Eosinophils (%)	4.18 \pm 5.42	6.73 \pm 5.60	5.65 \pm 5.56
Monocytes (%)	0.27 \pm 0.65	0.13 \pm 0.35	0.19 \pm 0.49
Basophils (%)	0.00 \pm 0.00	0.06 \pm 0.26	0.03 \pm 0.20

Means with no superscript in a row are not significantly different ($p>0.05$). SEM = Standard error of mean

This is corroborated by the fact that the two breeds of goat in the present study recorded MCV values that were relatively high, 45.93 and 43.55 μm^3 for Red Sokoto and WAD goats and ranged from 26.60-84.0 μm^3 , compared to the normal range of 18.0-34.0 μm^3 for goats, which could have resulted from release of immature red blood cells into the blood system (Merck, 1979). Reduction in concentrations of erythrocyte parameters such as PCV, red blood cell counts and haemoglobin concentration and elevation in MCV are indications of macrocytic (regenerative) anaemia emanating from increased destruction and subsequently enhanced erythropoiesis at liver, spleen and kidneys (Tripathi *et al.*, 2008).

The mean MCV value (45.93 μm^3) reported for Red Sokoto goats in this study was higher than the value of 25.40 μm^3 and 3.58 μm^3 obtained by

Tambuwal *et al.* (2002) and Addass *et al.* (2010) respectively. The MCV value of WAD goats is 43.55 μm^3 is higher than 3.57 μm^3 reported by Addass *et al.* (2010) but lower than the value of 114.5 μm^3 reported by Opara *et al.* (2010). In the present study, MCV values were relatively high, 45.36 μm^3 and 44.20 μm^3 for young and adult goats. The mean corpuscular haemoglobin concentration (MCHC) values of both Red Sokoto and WAD goats ranged between 33.24 and 33.31 %, respectively. The MCHC values reported for Red Sokoto and WAD goats were within the normal range of 30.0-36.0 % for goats (Swenson, 1977; Radostits *et al.*, 1997; Banerjee, 2007) or specifically 32.0-34.6 % reported for WAD goats (Daramola *et al.*, 2005) or 44.70 g/dl reported for Red Sokoto goats (Tambuwal *et al.*, 2002). The MCHC values for the young and adult goats were 33.36 and 33.20 %, respectively.

Table 6: Differential leukocyte values of male and female goats reared in South eastern Nigeria

Parameters	Sex		Mean \pm SEM Both breeds
	Female	of Goats Male	
Lymphocytes (%)	51.64 \pm 3.30	51.25 \pm 3.01	51.46 \pm 1.82
Neutrophils (%)	41.93 \pm 2.68	42.58 \pm 3.50	42.23 \pm 2.12
Eosinophils (%)	6.07 \pm 1.63	5.17 \pm 1.47	5.65 \pm 1.09
Monocytes (%)	0.29 \pm 0.16	0.17 \pm 0.11	0.23 \pm 0.10
Basophils (%)	0.07 \pm 0.07	0.00 \pm 0.0	0.03 \pm 0.03

Means with no superscript in a row are not significantly different ($p>0.05$). SEM = Standard error of mean

The mean corpuscular haemoglobin (MCH) values of both Red Sokoto and WAD goats ranged between 10.90-23.20 pg and 10.0-28.0 pg, with mean MCH values of 15.32 pg and 14.52 pg for Red Sokoto and WAD goats respectively. The MCH value of Red Sokoto goats in the present study was higher than the 10.13 pg and 11.30 g/dl reported by Addass *et al.* (2010) and Tambuwal *et al.* (2002) respectively. The MCH value of WAD goats obtained in the present study was lower than 37.8 pg reported by Opara *et al.* (2010) and higher than 6.49 pg reported by Addass *et al.* (2010) for the same breed. In the present study, MCH values obtained for the young and adult goats were 15.13 and 14.73 pg respectively.

CONCLUSION

The haematological values of WAD and Red Sokoto goats in this study were similar and fall within the range reported for goats. This is an indication of the good health status and extent of adaptability of both breeds of goats to the area.

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