

Full Length Research Paper

Influence of management systems and sex on haematology of West African dwarf goat

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Accepted 13 January, 2019

This study was conducted to know the effect of management practices and sex on the hematological parameters of the West African Dwarf (WAD) goat. Hematological values of this breed of goat were evaluated under the intensive and extensive systems of management. The intensively managed animals had significantly higher ($p < 0.01$) erythrocyte, total white blood cell, lymphocyte and eosinophil counts than goats managed extensively. Similarly the mean corpuscular volume (MVC) and mean corpuscular haemoglobin (MCH) were significantly higher ($p < 0.01$) in the intensively managed goats. Both groups of animals however had similar monocyte counts, basophil counts, haemoglobin concentrations, packed cell volume and mean corpuscular haemoglobin concentration. There was no sexual dimorphism in the erythrocyte and leucocyte values. This study revealed that although management systems influenced the haematological values in the WAD goats, the effect of sex on the blood profiles was minimal.

Key word: Goat, haematology, management, sex.

INTRODUCTION

The population of the West African Dwarf (WAD) goat is estimated to be 9.3 million, which is about 27.16% of the total goat population in Nigeria (RIM, 1992). The WAD goat is the most predominant breed of goat in southern Nigeria and it is resistant to the excessive humidity and typanosomosis, which are prevalent in the forest zone (Upton, 1985). A very high percentage of this breed of goat is raised extensively in Nigeria. There have been studies on the normal haematological values of this breed of goat in Nigeria (Oduye, 1976; Oyewale, 1991 and Daramola et al., 2005). However, there has not been any report on the effect of management systems on the haematology of the WAD goat. In our previous studies, we observed that the intensively managed West African dwarf sheep (Olayemi et al., 2000) and White Fulani cattle (Olayemi and Oyewale, 2002) had significantly higher haematological values than their counterpart that were managed extensively. This paper is a follow up to these previous studies. These studies assume significance because many reported cases of anemia earlier thought to be due to diseases may have been caused by poor management practices (Olayemi and Oyewale, 2000).

Therefore in this study, we present the effect of management on the haematology of West African Dwarf goat.

MATERIALS AND METHODS

In the first group, twenty intensively managed West African Dwarf (WAD) goats (ten male and ten female) were used for the present study. They were bought from the goat market and were managed intensively at the Teaching and Research Farm, University of Ibadan, Ibadan, Nigeria. The animals were clinically healthy and housed in pens at night and released into fenced paddock to graze on improved grass and legumes during the day. Regular feed was supplemented with concentrates. The animals were treated against nematode parasites with Ivermectin (Keprome[®], Kepro B.V., Deventra, Holland).

The second group of twenty WAD goats used for this study was reared under the traditional extensive management system. They grazed on free-range pasture that was not supplemented with any concentrate. They were also apparently healthy. They were not given any veterinary care.

Blood was obtained from the jugular vein of all the animals into sample bottles containing ethylene diamine tetraacetic acid (EDTA) (2 mg/ml of blood) as anticoagulant. Red blood cell (RBC) and white blood cell (WBC) counts were determined using a haemocytometer. The packed cell volume (PCV) was estimated by the microhaematocrit method and the haemoglobin (Hb) concentration by the cyanmethaemoglobin method. The mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH) and mean corpuscular haemoglobin concentration (MCHC) were calculated as

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Table 1. Erythrocyte values (mean \pm sd) of WAD goat under intensive and extensive management.

Parameters	Extensive (n = 20)	Intensive(n = 20)
RBC ($\times 10^{12}/L$)	14.60 \pm 3.05	19.53 \pm 2.38 ^a
PCV (%)	31.65 \pm 7.92	33.30 \pm 4.94
Hb (g/dl)	9.84 \pm 1.68	10.71 \pm 1.66
MCH (pg)	5.49 \pm 0.60	6.92 \pm 0.98 ^a
MCHC (g/dl)	31.17 \pm 2.26	32.43 \pm 1.57
MCV (fl)	17.10 \pm 1.88	22.17 \pm 2.53 ^a

Values significantly different from intensively managed goats at ^a $p < 0.01$.

Table 2. Leucocyte values (mean \pm sd) of WAD goat under intensive and extensive management.

Parameter	Extensive (n = 20)	Intensive (n = 20)
TOTAL WBC ($\times 10^9/L$)	10.97 \pm 1.36	9.28 \pm 1.75 ^a
LYMPHOCYTE ($\times 10^9/L$)	5.36 \pm 1.16	4.11 \pm 1.44 ^a
NEUTROPHIL ($\times 10^9/L$)	6.55 \pm 1.02	4.87 \pm 1.42
EOSINOPHIL ($\times 10^9/L$)	1.26 \pm 0.09	0.23 \pm 0.03 ^a
MONOCYTE ($\times 10^3/l$)	0.15 \pm 0.23	0.10 \pm 0.01

Values significantly different from intensively managed goats at ^a $p < 0.01$.

Table 3. Erythrocyte values (mean \pm sd) of male and female WAD goat.

Parameters	Male (n = 7)	Female (n = 7)
RBC ($\times 10^{12}/L$)	20.82 \pm 1.91	19.82 \pm 2.21
PCV (%)	36.57 \pm 3.26	30.71 \pm 4.57
Hb (g/dl)	11.73 \pm 1.12	9.96 \pm 1.59
MCH (pg)	5.64 \pm 0.33	5.04 \pm 0.66
MCHC (g/dl)	32.06 \pm 0.76	33.24 \pm 2.07
MCV (fl)	17.59 \pm 1.16	15.56 \pm 1.99

described earlier (Jain, 1986). Blood smear were stained with Giemsa stain for differential WBC counts.

Statistical comparisons were carried out using Student's t-test, with $p < 0.01$ taken as significant.

RESULTS

Table 1 shows the erythrocyte values of the intensively and extensively managed WAD goats. The RBC, MCV and MCH values were significantly higher ($p < 0.01$) in the intensively than extensively managed WAD goats. However, the values of PCV, Hb and MCHC were similar in the two groups of animals.

The leucocyte values of intensively and extensively managed WAD goats were presented in Table 2. The total WBC, eosinophil and lymphocyte counts were significantly higher ($p < 0.01$) in the extensively than in the intensively managed goats. The monocyte and basophil counts were similar in the two management groups.

As shown in Table 3, the values of RBC, PCV, Hb, MCV, MCH and MCHC were similar in both the male and female WAD goat.

Also Table 4 revealed that there was no sexual dimorphism in the total WBC, neutrophil, lymphocyte, eosinophil and monocyte counts.

DISCUSSION

Although the RBC counts for the intensively managed WAD goat in the present study was higher than those previously reported for the same species of goat by Oyewale (1991), the other erythrocyte values of the WAD goats of the present study were however similar. The erythrocyte values of both the intensively and extensively managed WAD goats of the present study were significantly higher than those reported for the Red Sokoto goats that are found in the northern part of Nigeria (Elsa

Table 4. Leucocyte values (mean \pm sd) of the male and female WAD goat.

Parameter	Male (n = 7)	Female (n = 7)
TOTAL WBC ($\times 10^9/L$)	9.21 \pm 1.95	9.09.08 \pm 2.06
LYMPHOCYTE ($\times 10^9/L$)	3.87 \pm 1.22	4.19 \pm 1.89
NEUTROPHIL ($\times 10^9/L$)	5.30 \pm 1.13	4.14 \pm 1.65
EOSINOPHIL ($\times 10^9/L$)	0.41 \pm 0.32	0.26 \pm 0.06
MONOCYTE ($\times 10^3/l$)	0.21 \pm 0.18	0.08 \pm 0.03

and Onyeyili, 2002). The higher RBC values observed in the WAD goats which are predominant in southern Nigeria may be due to the richer pastures found in the southern part of Nigeria which is a result of the heavier rainfall pattern in this region.

In the present study (Table 1), the RBC, MCH and MCV values were significantly higher ($p < 0.01$) in the intensively than extensively managed WAD goats. The Hb, PCV and MCHC values were also higher (though not significantly) in the intensively managed goats. This observation of higher erythrocyte values in the intensively than the extensively managed WAD goats is similar to our previous observations in the West African Dwarf sheep (Olayemi et al., 2000) and the White Fulani cattle (Olayemi and Oyewale, 2002). It was observed that the erythrocyte values were higher in these species of ruminant that were intensively managed than those managed extensively.

This higher RBC values that were observed in the intensively managed goats in the present study may be due to higher plane of diet and veterinary care given to them. Rekwot et al. (1987) observed that White Fulani that were feed with high protein diet (14.45% crude protein) had higher erythrocyte values than those on low protein diet (8.51%). In the present study, the protein content in the different feed given to the goats in the two different groups were not determined, however the diet of the intensively managed goats which included improved pasture that was supplemented would also have a higher protein content than the feed of the extensively managed goats.

The leucocyte values were higher in the extensively than intensively managed WAD goats in the present study (Table 2). It seems the higher leucocyte values in the extensively managed WAD goats may be due to the higher challenge from microbes when on the free range. Sub-acute infection may have caused the higher leucocyte values in the extensively managed WAD goats. Similarly, Saror and Coles (1973) observed that White Fulani cattle that were managed extensively had higher WBC values than those managed intensively.

In the present study the erythrocyte and leucocyte values were similar in the male and female WAD goats (Tables 3 and 4). It has also been reported that there were no sex differences in the erythrocyte values of the White Fulani cattle (Olayemi, 2004), African giant rat (Oyewale et al., 1998) and the Nigerian cat (Nottidge et

al., 1999). Also, the observation of similar WBC values in the male and female WAD goat is in agreement to that made in the mongrel dogs (Oduye, 1978) and the pangolin (Oyewale et al., 1997) in which the male and the female were reported to have similar leucocyte values. The observation by Oyewale et al. (1998) that the total white blood cell counts was higher in the male than the female African giant rat is different from our finding.

It can be concluded from the present study that the erythrocyte values were higher while the leucocytes values were lower in the intensively than the extensively managed WAD goats. The higher plane of diet and veterinary care received by the intensively managed WAD goat may be responsible for the observed differences.

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