INFLUENCE OF WATER RESTRICTION ON THE HAEMATOLOGICAL PARAMETERS OF WEST AFRICAN DWARF BUCKS

*** Sodipe, O. G.[1], Sowande, O. S.[2], Abioja, M. O.[3], Adeleye, O. O.[2] and Osho, K.O.[2],**

[1]Department of Animal and Environmental Biology, Federal University of Oye – Ekiti, PMB 336 Oye-Ekiti, [2]Department of Animal Production and Health, [3]Department of Animal Physiology, Federal University of Agriculture, PMB 2240 Abeokuta, Nigeria.

**Corresponding author: bunmigraphics@yahoo.com*

Abstract

This study shows the effect of water restriction on the haematological parameters of West African Dwarf (WAD) bucks. Treated groups (T1, T2, T3, and T4) with animals per treatment had 24 hours no withdrawal, 18 hours withdrawal, 15 hours withdrawal, 12 hours withdrawal respectively. Blood was obtained from the animals via the jugular vein for evaluation of haematological parameters at three different periods of the experiment. The effect of water restriction was significant ($P<0.05$) on the packed cell volume (PCV), haemoglobin concentration(Hb), Red blood cell, White blood cell, lymphocyte and neutrophil but not($P>0.05$) in eosinophil, basophil, monocyte, mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH) and mean corpuscular haemoglobin concentration (MCHC). The study concluded that water restriction had significant effect ($P<0.05$) on some of the haematological parameters of WAD bucks.

Key words: Water restriction, haematological parameters

Introduction

Water is essential nutrients required by livestock in larger quantities than other nutrients livestock for physiological functions; it is the most abundant molecule in all living cells (Wilson and Brigstocke, 1981; NRC, 2007). Both the intra and extracellular spaces are widely covered with water distributed in the body of the animals covering. According to Araujo, 2010, the major sources of water to livestock especially goats include drinking water, dietary water in feed ingested and metabolic water from catabolism of nutrients. Water restriction in animals reflects the provision water at less than the daily requirements of that species or at less than the required frequencies or duration. Water restriction has a negative effect on the feed intake in goats.

Reports on responses of ruminants to water deprivation in similar harsh environments have been published for West Africa (Aganga *et al.*, 1989) and (Abioja *et al.*, 2010) and East Africa (Schoen, 1968). However, there are limited information of the response of the West African Dwarf (WAD) bucks to water restriction. Hence, this study was designed to evaluate the influence of water restriction on feed intake and the haematological parameters of WAD bucks.

Materials and Methods

The experiment was carried out in the derived savannah vegetation zone of South-Western Nigeria at the Directorate of University Farms, Federal University of Agriculture, Abeokuta. The region lies between latitudes 7° 10'N and longitudes 3° 2'E (Google Earth, 2014). Twelve WAD yearling bucks were used. The WAD bucks were randomly allocated to watering treatments. There were four watering treatments with three replicates. Treatment 1 (Control, 24 hours no withdrawal), Treatment 2 (18 hours withdrawal), Treatment 3 (15 hours withdrawal), Treatment 4 (12 hours withdrawal). Evaporative water loss was determined by placing ten litres of water in empty pens to simulate prevailing conditions and to adjust the water intake for evaporative loss. The amounts of feed and water consumed were recorded every morning before fresh feed and water was offered. Animals were housed in individual pens and fed a diet consisting of 60% hay and 40% concentrate (Wheat offal, Maize, PKC, GNC, Bone meal, Rice bran Premix, Salt) at a level of 5% of body weight (dry matter basis). Animals were weighed every two weeks and monthly measurements were made for haematological parameters: packed cell volume (PCV), haemoglobin (Hb) and mean corpuscular haemoglobin concentration (MCHC). Urine was collected daily. The mean monthly ambient temperature ranges from 28°C in December to 36°C in February with a yearly average relative humidity of about 82%

The Relative Humidity, Atmospheric Temperature was checked using Hygrometer and Evaporative Rate was measured. The relative Humidity and Atmospheric Temperature was always checked by 8:00 am and 4: 00pm daily. The blood was

collected into the ethylene diamine tetra acetic acid (EDTA) tubes from the neck via the jugular vein. The blood was analysed for the haematological parameters using the Automated Haematology Analyzer (Vet 2800 Mindary).

. The experimental design was a completely randomised design and results were subjected to analysis of variance and regression analysis (SAS, 1990; Mead and Curnow, 1992).

Results and Discussion

The average minimum temperatures of the experimental site was 29.6 °C with an average maximum temperature of 36.8 29.6 °C. The relative humidity averaged 80.3 % during the experimental period. The result of haematological responses and serum biochemical indices in the goats is shown in Table 1. Water restriction had significant ($P<0.05$) effect on some the haematological (PCV, Hb, RBC, WBC, Neutrophil and lymphocytes). The result obtained in this study is not in accordance with the observation made by Abioja *et al.* (2014)but related to the reports of various previous studies in ruminant animals (Togashi and Tanaka, 1979; Abdelatif and Ahmed, 1994; Adogla-Bessa and Aganga, 2000). Water deprivation causes a shift in the dynamic water balance, which results in certain responses from the body systems. The initial response to a negative water balance is the withdrawal of fluid from tissues to maintain the normal blood volume (Radostits *et al.*, 2000). Water deprivation raised blood biochemical constituents significantly. Dehydration causes high values of haemoconcentration in water-deprived ewes. Prolonged watering intervals appeared to impose serious stress on the animals during the dry season. These animals appeared to drink in a compensatory fashion whenever they had access to drinking-water. Water deprivation also significantly lowered the respiratory rate in sheep. Jaw movements were drastically reduced with long watering intervals as well, indicating that rumination was seriously impaired by water deprivation (Aganga *et al.*, 1986). During dehydration, water is reabsorbed to accompany sodium absorption in the colon, which indicates the return of water to the blood (Abioja *et al.*, 2014).

Table 1: Effect of water restriction on the change in blood constituents and chemistry (final values minus initial values) in goats

	Treatment				SEM
Parameters	**0%**	**25%**	**50%**	**75%**	
Water intake (ml)	1836^{a}	1572^{b}	1281^{c}	894^{d}	112.80
Packed Cell Volume (%)	2.34^{c}	3.15^{a}	3.32^{a}	2.85^{b}	0.72
Haemoglobin (g/dl)	0.63^{d}	1.20^{b}	1.38^{a}	0.73^{c}	0.33
Red blood cell($x10^{12}$/L)	0.97^{c}	0.80^{c}	1.34^{a}	1.12^{b}	0.41
White blood cell ($x10^{9}$/L)	0.94^{b}	1.66^{a}	0.53^{c}	0.32^{c}	0.24
Neutrophil (%)	3.33^{a}	1.34^{c}	2.32^{b}	1.67^{c}	0.43
Lymphocyte (%)	1.34^{c}	1.67^{b}	1.30^{c}	2.00^{a}	0.32
Eosinophil (%)	0.67	0.00	0.00	0.00	0.00
Basophil (%)	0.00	0.00	0.00	0.00	0.00
Monocyte (%)	0.33	0.30	-0.32	0.52	0. 14
Mean corpuscular volume	1.50	1.03	0.50	0.13	0.25
MCH (pg)	0.40	0.33	0.13	0.30	0. 22
MCHC (%)	1.40	0.67	0.30	1.20	0.31

^{abcd}Means on the same row are significantly different ($P< 0.05$)

References

Abdelatif, A. M. and Ahmed, M. M. M. 1994. Water regime, thermoregulation, blood constituents and endocrine responses in Sudanese desert sheep. *Journal of Arid Environments* 26:171-180.

Abioja, M. O., Osinowo, O. A., Adebambo, O. A., Bello, N. J. and Abiona, J. A. 2010. Water restriction in goats during hot-dry season in the humid tropics: feed intake and weight gain. *Archivos de Zootecnia,* 59(2):195-203.

Abioja, M. O., Osinowo, O. A., Abiona, J. A. and Sodipe, O. G. 2014. Water balance and some blood parameters in water-restricted goats during hot-dry season. *Slovak J. Anim. Sci.* 47(3): 149-156

Adogla-Bessa, T. and Aganga, A. A. 2000. Responses of Tswana goats to various lengths of water deprivation.*South African Journal of Animal Science* 30(1): 87-91.

Aganga, A.A., Umunna, N.N., Okoh, P.N. and Oyedipe, E.O. 1986. Water metabolism of ruminants - a review. *J. Anim. Prod. Res.* 6: 171-181.

Aganga, A.A., Umunna, N.N., Oyedipe, E.O. and Okoh, P.N. 1989. Breed differences in water metabolism and body

composition of sheep and goats. *J. Agric. Sci. (Camb.)* 113: 255-258.

Araújo, G. G. L., Voltolini, T. V., Chizzotti, M. L., Turco, S. H. N. and De Carvalho, F. F. R. 2010. Water and small ruminant production. *Revista Brasileira de Zootecnia* 39: 326-336.

National Research Council (NRC) 2007. Nutrient requirements of small ruminants: sheep, goats, cervids and new world camelids. National Academy press, Washington, DC. *Radostits,*

Gay, O.M., C. C., Blood, D. C. and Hincliff, K. W. 2000. Veterinary Medicine: A textbook of the diseases of cattle, sheep, pigs, goats and horses. 9th ed. W. B. Saunders Co. Ltd., London.

Schoen, A. 1968.. Studies on the water balance of the East African goat. *East Afr. Agric. For. J.* 34:256-262.

Togashi, K and Tanaka, S. 1979. The effects of water regime on physiological responses in fattening beef cattle. Japanese *Journal of Zootechnical Science* 50: 320-327.

Wilson, P. N. and Brigstocke, T. D. A. 1981. Improved feeding of cattle and sheep.p 135-137.