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RESEARCH ARTICLE

IMPACT OF WATER RESTRICTION AND REHYDRATION ON HAEMATOLOGICAL PROFILES OF SHEEP AND GOATS UNDER MIDDLE GUJARAT AGROCLIMATIC CONDITION

Khanvilkar, A. V., Neelam Gupta, Modi, R. J., Islam, M. M. and Wadhwani, K. N.

Department of Livestock Production and Management, College of Veterinary Science and Animal Husbandry, Anand Agriculture University, Anand, Gujarat, India

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ABSTRACT

The experimental animals ingested 50% water of its requirement showed significantly lower Hb (g %) concentration than the animals of control group. The PCV (%) increased to the tune of 9.9% when experimental animals consumed 50% less water than the requirement. This may be due to haemo concentration induced by water restriction. However, seasons did not play any significant role on Hb (g %). The experimental Goats showed significantly ($P < 0.05$) lower value of Hb (g %) and PCV (%) to the tune of 9.30 and 21.7% as compared to Sheep. The PCV (%) reduced significantly ($P < 0.05$) due to rehydration after 2nd (9.38 and 9.32%) and 4th day (5.60 and 8.21%) in hot dry and hot humid season, respectively. The RBC count (X106/µl) did not show significant effect due to treatment and seasons but, the WBC count (X103/µl) differed significantly ($P < 0.05$). The Goats exhibited lower RBC (X106/µl) count than Sheep. Similarly, Goats exhibited significantly ($P < 0.05$) lower WBC (X103/µl) count (11.51%) as compared to Sheep. The rehydration of experimental animals did not show any significant change in WBC ($X10^3$/µl) count. Similarly, WBC (X103/µl) count did not differ between two species due to rehydration.

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INTRODUCTION

Dehydration in warm weather conditions reduces plasma volume as water is taken up by the tissue (Schaefer *et al.*, 1990), and reported that increased (PCV %) and Hb (g %) concentration are good indicators of dehydration. Similarly, contradictory results were reported regarding haemoglobin whilst an elevation of haemoglobin level was attributed to a decrease in plasma volume due to water loss (Christopherson *et al.*, 2000).

MATERIALS AND METHODS

Twenty four sheep and Goats were randomly divided in to two water restriction treatment groups on the basis of body weight (25-30 kg) after accessing individual water requirement during adaptation period viz. T_1 (0% WR), T_2 (50% WR) during two different seasons viz hot dry (S_1) and hot humid (S_2). The water restriction phase was of 28 days which divided in to four periods (P_1, P_2, P_3 and P_4) followed by 4 days of rehydration. The experimental animals were fed on pelleted concentrate mixture (Amul Dan) and chaffed dry wheat straw as per (ICAR, 1998) feeding standard. The water ingestion of all experimental animals was assessed by offering *ad lib* water after measuring in measuring cylinder during period of 15 days adaptation to decide the quantum of water required by the animals. The animals of control group were offered the water in three instalments i.e. 9.00 am, 2.00 and 4.00 pm. after measuring every time while in water restriction groups, the whole day water requirement was measured once in morning and kept in respective labelled bucket. During rehydration phase all experimental animals offered *ad lib* measured water in three installments i.e. 9.00 am, 2.00 and 4.00 pm. The data of body weight during dehydration phase was analysed by four factorial completely randomized design while the data of rehydration phase was analysed by one way Anova by standard methods. The blood collections of experimental animals were collected weekly (04weeks), 2nd and 4th day of rehydration by the vacutainer tubes. The haematological profiling of blood samples were done by using Automatic blood analyser.

Corresponding author: **Khanvilkar, A.V.**
Department of Livestock Production and Management, College of Veterinary Science and Animal Husbandry, Anand Agriculture University, Anand, Gujarat, India.

RESULTS AND DISCUSSION

The experimental animals ingested 50% water of its requirement, showed significantly ($P < 0.05$) lower Hb (g %) concentration than the experimental animals of control group. Similarly, Goats showed significantly ($P < 0.05$) lower values of Hb (8.08) than sheep (9.31).

Table 1. Effect of water restriction on Haematological Profiles in Sheep and Goats

Particular	Hb (g%)	PCV (%)	RBC($X10^6$/µl	WBC($X10^3$/µl)
T1	$8.82^{b} \pm 0.22$	23.97 ± 0.54	10.88 ± 0.19	$10.41^{b} \pm 0.46$
T2	$8.57^{a} \pm 0.19$	23.34 ± 0.33	11.12 ± 0.14	$9.79^{a} \pm 0.44$
S1	8.81 ± 0.25	23.43 ± 0.57	10.98 ± 0.22	$9.56^{x} \pm 0.35$
S2	8.58 ± 0.23	23.86 ± 0.29	11.01 ± 0.19	$10.63^{y} \pm 0.30$
P0	$8.54^{A} \pm 0.23$	$23.47^{A} \pm 0.50$	$11.34^{B} \pm 0.30$	$11.26^{B} \pm 0.51$
P1	$9.09^{C} \pm 0.26$	$23.28^{A} \pm 0.48$	$10.98^{B} \pm 0.32$	$10.85^{B} \pm 0.65$
P2	$8.69^{B} \pm 0.24$	$24.74^{B} \pm 0.69$	$11.14^{B} \pm 0.21$	$9.76^{A} \pm 0.55$
P3	$8.57^{B} \pm 0.23$	$23.27^{A} \pm 0.70$	$10.38^{A} \pm 0.25$	$9.26^{A} \pm 0.40$
P4	$8.59^{B} \pm 0.21$	$23.50^{A} \pm 0.55$	$11.14^{B} \pm 0.26$	$9.36^{A} \pm 0.51$

Superscripts (a and b) in column differed significantly differ ($P < 0.05$) showing treatment effect.
Superscripts (x and y) in column differed significantly ($P < 0.05$) showing season effect.
Superscripts (A and B) in column differed significantly ($P < 0.05$) showing period effect.

Table 2. Effect of water rehydration on Haematological Profiles in Sheep and Goats

Particular		Particular	Hb (g %)	PCV (%)	RBC($X10^6$/µl	WBC($X10^3$/µl)
Final weight (DH)	S1	T1	8.80 ± 0.39	24.32 ± 1.00	10.28 ± 0.29	8.93 ± 0.57
		T2	8.61 ± 0.33	$26.66^{b} \pm 0.78$	10.83 ± 0.45	8.34 ± 0.21
	S2	T1	8.47 ± 0.21	22.71 ± 0.63	11.02 ± 0.26	10.34 ± 0.28
		T2	8.49 ± 0.12	$26.29^{B} \pm 0.38$	11.81 ± 0.21	9.80 ± 0.25
2^{nd}day (RH)	S1	T1	8.48 ± 0.23	23.78 ± 0.86	10.67 ± 0.37	8.83 ± 0.42
		T2	8.53 ± 0.11	$24.16^{a} \pm 0.73$	11.30 ± 0.25	8.52 ± 0.19
	S2	T1	9.07 ± 0.22	24.56 ± 0.73	10.88 ± 0.12	10.51 ± 0.21
		T2	8.54 ± 0.26	$23.84^{A} \pm 0.69$	10.57 ± 0.18	9.95 ± 0.23
4^{th}day (RH)	S1	T1	8.25 ± 0.24	22.56 ± 0.49	10.61 ± 0.32	8.71 ± 0.26
		T2	8.66 ± 0.22	$24.82^{a} \pm 0.39$	11.08 ± 0.35	8.46 ± 0.37
	S2	T1	8.90 ± 0.18	23.40 ± 0.74	11.02 ± 0.16	10.10 ± 0.25
		T2	8.80 ± 0.20	$24.13^{A} \pm 0.66$	10.79 ± 0.16	10.00 ± 0.16

However, seasons did not play any significant role on Hb (g %). Hb in Sheep and Goats neither influenced by treatment nor by seasons. The water restriction of 72hrs (Adogla-Bessa and Aganga, 2000) in Goats, 30 to 50% (Ajibola, 2006) in male Goats and once in three days (Hamadeh *et al*., 2006) in Awassi ewes elevated the Hb concentration significantly ($P < 0.05$). However, Hb (g %) concentration was observed to be lower in warm climate than that in cold climate (Christopherson *et al.*, 2000). Similarly, Hb (g %) concentration was significantly ($P < 0.05$) influenced by period and seasons of experiment (Neelam, 2013; Schaefer *et al.*, 1990) contraindicated with our findings. The Hb and PCV not affected by feed and water restriction. The Hb concentration was significantly ($P < 0.05$) influenced by SP x SE and T x SP x SE x P interaction effects. There was no significant effect of rehydration and species wise rehydration on Hb. The PCV (%) increased to the tune of 9.9% when animal consumed 50% less water than the requirement. This may be due to haemoconcentration induced by water restriction. The PCV was found significantly ($P < 0.05$) higher in the experimental animals which kept on 40 % water restriction (Hamed *et al.*, 2007; Neelam, 2013). The experimental Goats showed significantly ($P < 0.05$) lower (21.77 %) of PCV as compared to sheep (25.40 %). However, seasons did not influence PCV which was contradicted with the findings of (Neelam, 2013). The PCV did not change much during various periods of experiment whereas, (Alamer, 2006) reported that effect of water deprivation on PCV was lower during the first day, but it showed a steady and significant ($P < 0.05$) increase as the water deprivation period advanced. PCV in Sheep and Goats neither influenced by treatment nor by seasons. The PCV did not influence by P x S, P x T, T x S and P x T x S interaction effects (Neelam, 2013). The present findings are in accordance with the findings of (Aganga, *et al.*, 1989; El-Nouty *et al.*, 1990; Ghanem *et al.*, 2008). The PCV reduced significantly ($P < 0.05$) due to rehydration after 2^{nd} (9.38 and 9.32%) 4^{th} (5.60 and 8.21 %) day in S_1 and S_2, respectively.

The present findings are contradicted with (Neelam, 2013). The PCV did not differ in sheep and Goats due to rehydration. The RBC count ($X10^6$/µl) did not show significant effect due to treatment and season but, Goats exhibited significantly ($P < 0.05$) lower RBC count than sheep. The RBC count in Sheep and Goats neither influenced by treatment nor by seasons. The RBC count significantly ($P < 0.05$) affected by T x SE, SP x P, SE x P and SP x SE x P interaction effects. The present finding was contradicted with (Ayoub *et al.*, 1998). The RBC count was less affected by dehydration in Goats (Ayoub *et al.*, 1998). The effect of rehydration on RBC count of experimental animals did not produce any significant change. Similarly, species difference was also at par due to rehydration. The WBC count ($X10^3$/µl) influenced significantly ($P < 0.05$) by level of water restriction on species, seasons and periods of experiments. The WBC count reduced significantly ($P < 0.05$) to the tune of 5.6% when experimental animals exposed to 50% water restriction. The Goats exhibited significantly ($P < 0.05$) lower WBC count (11.51%) as compared to sheep. Whereas, experimental animals during hot humid season exhibited (11.91%) significantly ($P < 0.05$) higher WBC count than hot dry season. Surprisingly, WBC count maintained up to P_1 but afterwards started declining significantly ($P < 0.05$) till the end of experiment. The present findings are very well supported by (Ayoub *et al.*, 1998) whereas; it contradicted with the findings of (Neelam, 2013). The rehydration of experimental animals did not show any significant change in WBC count. Similarly, WBC count did not differ between two species due to rehydration. The WBC count in Sheep and Goats neither influenced by treatment nor by seasons. The WBC count was significantly ($P < 0.05$) affected by T x P and SE x P interaction effects.

Conclusion

The Hb (g %) and PCV (%) level significantly ($P < 0.05$) decreased, increased and at par, respectively, when

experimental animals received 50% less water than the requirement. The PCV (%) declined significantly ($P < 0.05$) due to rehydration. The Hb (g %), PCV (%) and RBC ($X10^6/\mu l$) count was Significantly ($P < 0.05$) lower in Goats as compared to Sheep.

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