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IMPACT OF WATER RESTRICTION ON PHYSIOLOGICAL INDICES OF SHEEP AND GOATS UNDER MIDDLE GUJARAT AGRO CLIMATIC CONDITION

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Abstract: Present study was conducted to assess the effect of water restriction and rehydration on physiological indices like rectal temperature (^{0}F), respiratory rate (per min) and pulse rate (per min) of Sheep and Goats under middle Gujarat agro climatic condition. Twenty four Sheep and Goats were randomly divided in to two water restriction treatment groups viz. T_1 (0% WR), T_2 (50% WR) on the basis of body weight (25-30 kg) after accessing individual water requirement during adaptation period and the experiment was conducted during two different seasons viz. hot dry (S_1) and hot humid (S_2). The rectal temperature, respiratory rate and pulse rate of 50% water restricted group during morning and afternoon hours was significantly ($P < 0.05$) higher than the animals of control group. The experimental Goats had significantly ($P < 0.05$) lowered rectal temperature (^{O}F) but, significantly ($P < 0.05$) elevated pulse rate and respiration rate as compared to Sheep in both morning and afternoon sessions. The rectal temperature, pulse rate and respiration rate was significantly ($P < 0.05$) higher in hot dry season than hot humid season in both morning and afternoon sessions. It is concluded from the present study that water restriction at 50% level in sheep and goat results in negative effect in terms of physiological indices and the effects were more stressful in hot dry season compared to hot humid season.
Keywords: Water restriction, rehydration, physiological indices, sheep and goat.

Introduction

Small ruminants have adaptability to wide range of environmental conditions. On exposure to harsh hot climate, these animals try to avoid the extra heat load activating their metabolic process in order to maintain homoeothermy. During heat stress, feed consumption decreases, while drinking of water increases [15] and weight gain slower down, which is parallel to feed consumption and nutrient balance. Additionally, the animals strive hard while attempting to balance body temperature, which in turn increases their energy need [13]. In the changing scenario of climate, thermal stress along with feed and water scarcity are the major predisposing factors for the low productivity of small ruminants under hot semiarid environment [14]. To assess the real problem faced by the animals in the field conditions and

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to understand water crisis management, the best experimental model is dehydration and rehydration [8]. Present study was conducted with the objective to assess the impact of water restriction and rehydration on physiological indices of sheep and goats under middle Gujarat agro climatic condition.

Materials and Methods

Twenty four sheep and Goats were randomly divided in to two water restriction treatment groups viz. T_1 (0% WR), T_2 (50% WR) on the basis of body weight (25-30 kg) after accessing individual water requirement during adaptation period and the experiment was conducted during two different seasons viz. hot dry (S_1) and hot humid (S_2). The experimental animals were fed on pelleted concentrate mixture (Amul Dana) and chaffed dry wheat straw as per ICAR feeding standard [7]. The water ingestion of all experimental animals were assessed by offering *ad lib* water after measuring in measuring cylinder during 15 days adaptation period to decide the quantum of water required by the animals. The animals of control group were offered the water in three installments 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 labeled 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 analyzed by four factorial completely randomized designs while the data of rehydration phase was analyzed by one way Anova by standard methods.

Results and Discussion

The rectal temperature (^{0}F) during morning hours in the animals of 50% water restricted group was significantly ($P < 0.05$) higher (101.2±0.14) in T_2 than the experimental animals of 0% water restricted groups (100.04±0.18) in T_1. The experimental Goats (100.91±0.16) showed significantly ($P < 0.05$) lower rectal temperature (^{O}F) as compared to Sheep (101.34±0.20). The rectal temperature (^{O}F) was significantly ($P < 0.05$) higher in hot dry season (101.26±0.14) than hot humid season (100.9±0.19). Whereas, the rectal temperature (^{0}F) during afternoon hours in experimental the animals of 50% water restricted group was significantly ($P < 0.05$) higher (101.79±0.16) in T_2 than the experimental animals of 0% water restricted groups (100.77±0.19) in T_1. The experimental Goats showed significantly ($P < 0.05$) lower (101.39±0.14) rectal temperature (^{O}F), as compared to Sheep (102.17±0.18). The rectal temperature (^{O}F) was significantly ($P < 0.05$) higher in hot dry season (101.96±0.12) than hot humid season (101.30±0.17). The water restriction caused a rise in

rectal temperature (^{O}F) when Awassi sheep were subjected to 50% WR for 4 days [16], 72 hrs water restriction [12] and 3 days of water dehydration [1] and there was an increase in the evening values of rectal temperature (^{O}F) from morning values [4,9] are in accordance with the present findings. Similarly, rectal temperature (^{O}F) rose by a mean value of 1.3 ^{0}F only in goats deprived of water in summer [6] well supported the present finding of 1.71 ^{0}F at 7.30 a.m. and 1.03^{0}F at 14.30 p.m. rise in rectal temperature (^{O}F) in summer season due to water restriction. The experimental animals under 40% water restrictions had a higher value of rectal temperature (^{O}F) than experimental animals under control and 20% water restriction group [10].

During morning hours the pulse rate (no./min) in experimental animals of 50% water restricted group (T_2) exhibited significantly ($P < 0.05$) higher (59.25 ±1.63) than the animals of 0% water restricted groups (T_1) (56.66 ±1.35). The Goats exhibited significantly ($P < 0.05$) higher (58.71±1.46) pulse rate than the Sheep (57.20±1.17). The experimental animals exposed to hot dry season exhibited significantly ($P < 0.05$) higher (59.98±1.89) pulse rate than experimental animals exposed to hot humid season (55.93±1.89). During afternoon hours the pulse rate in the experimental animals of T_2 group exhibited significantly ($P < 0.05$) higher (63.74±1.69) than the T_1 group (61.31±1.77). The Goats exhibited significantly ($P < 0.05$) higher (64.00±1.56) pulse rate than the Sheep (61.05± 1.70). The experimental animals exposed to hot dry season exhibited significantly ($P < 0.05$) higher (65.99 ± 1.90) pulse rate than experimental animals exposed to hot humid season (59.06±1.87). The pulse rate increased with 72 hrs water restriction has been observed by other worker [12] which supports the present findings. However, other scientist [11] reported that pulse rate (no./min) remain unaffected with level of water restriction. The experimental animals of 40% water restriction group exhibited significantly ($P < 0.05$) higher pulse rate (no./min) than the experimental animals of 0% water restriction group reported by other scientist [10] also supports the present findings.

During morning hours the respiratory rate (no./min) in the experimental animals of 50% water restricted group (T_2) exhibited significantly ($P < 0.05$) higher (52.38±1.02) than the 0% water restricted groups (T_1) (44.33± 3.89). The Goats exhibited significantly ($P < 0.05$) higher (51.06±4.05) respiratory rate than the Sheep (45.65±1.90). The experimental animals exposed to hot dry season exhibited significantly ($P < 0.05$) higher (50.78±2.73) respiratory rate than the experimental animals exposed to hot humid season (45.93±3.75). During afternoon hours the respiratory rate in the experimental animals of 50% water restricted

group (T_2) group exhibited significantly ($P < 0.05$) higher (63.36±5.66) than the 0% water restricted groups (T_1) (57.99±4.09). The Goats exhibited significantly ($P < 0.05$) higher (62.75 ± 2.45) respiratory rate than the Sheep (58.60±2.73). The experimental animals exposed to hot dry season exhibited significantly ($P < 0.05$) higher (50.78±2.73) respiratory rate than the experimental animals exposed to hot humid season (57.55±2.09). The respiration rate varied significantly ($P < 0.05$) among the experimental period has been observed by other scientists [2, 3, 5, 9, and 12] at 7.30 a.m. and 14.30 p.m. The experimental animals of 40% water restriction group showed significantly ($P < 0.05$) higher respiration rate (no./min) than the animals of 0% water restriction group [10] also supports the present findings.

Summary and Conclusion

In sheep and goats physiological responses like rectal temperature, pulse rate and respiration rate increased significantly ($P < 0.05$) when received 50% water requirements at 7:30 a.m. and 2:30 p.m. Similarly, experimental animals exhibited significantly ($P < 0.05$) lower physiological responses in hot humid as compared to hot dry season. It is concluded from the present study that water restriction at 50% level in sheep and goat results in negative effect in terms of physiological indices and the effects were more stressful in hot dry season compared to hot humid season.

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Table 1: Effect of water restriction on physiological parameters in Sheep and Goats

Particular	RT (^{0}F) (7:30A.M)	RT (^{0}F) (2:30P.M)	PR (no. per min.) (7:30A.M)	PR (no. per min.) (2:30P.M)	RR (no. per min.) (7:30A.M)	RR (no. per min.) (2:30P.M)
T1	100.04^{a} ± 0.18	100.77^{a} ± 0.19	56.66^{a} ± 1.35	61.31^{a} ± 1.77	44.33^{a} ± 3.89	57.99^{a} ± 4.09
T2	101.21^{b} ± 0.14	101.79^{b} ± 0.16	59.25^{b} ± 1.63	63.74^{b} ± 1.69	52.38^{b} ± 1.02	63.36^{b} ± 5.66
Sheep	101.34^{n} ± 0.20	102.17^{n} ± 0.18	57.20^{m} ± 1.17	61.05^{m} ± 1.70	45.65^{m} ± 1.90	58.60^{m} ± 2.73
Goat	100.91^{m} ±0.16	101.39^{m} ± 0.14	58.71^{n} ± 1.46	64.00^{n} ± 1.56	51.06^{n} ± 4.05	62.75^{n} ± 2.45
S1	101.26^{y} ± 0.14	101.96^{y} ± 0.12	59.98^{y} ± 1.89	65.99^{y} ± 1.90	50.78^{y} ± 2.73	63.80^{y} ± 2.66
S2	100.99^{x} ± 0.19	101.30^{x} ± 0.17	55.93^{x} ± 1.89	59.06^{x} ± 1.87	45.93^{x} ± 3.75	57.55^{x} ± 2.09

Superscripts (a and b) in column differed significantly ($P < 0.05$) showing Treatment effect
Superscripts (n and m) in column differed significantly ($P < 0.05$) showing Species effect
Superscripts (x and y) in column differed significantly ($P < 0.05$) showing Season effect