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Influence of simulated body condition score on growth, physiological responses and blood metabolites of native Malpura ram

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ABSTRACT

The effect of simulated body condition score (BCS) on body weight, wool yield, respiration rate, pulse rate and rectal temperature was evaluated in native Malpura ram. The rams were randomly divided into group 1 (2.5 BCS; n= 7), group 2 (BCS 3.0–3.5; n=7) and group 3 (BCS 4.0; n=7). Apart from grazing for 8 h a day, the rams were provided with concentrate mixture @ of 100 g, 300 g and 500 g to group 1, 2, and 3, respectively, to attain their respective BCS. The body weight (kg), heart girth (cm) physiological responses i.e. respiration rate (RR, breath/min), pulse rate (PR, beat/min) and rectal temperature (RT °C) were recorded at fortnightly interval. The wool yield was recorded at 6 monthly interval clipping. The blood samples were also collected at fortnightly interval and analyzed for packed cell volume (PCV, %), hemoglobin (Hb, g/dl) and glucose (mg/dl). The animals of G1 had significantly lower (P<0.05) RR and RT than the other 2 groups of rams. A significant decrease in the body weight, HG and wool yield was observed in G1 rams as compared to G2 and G3 rams. The PCV, Hb and glucose values were significantly higher in G2, G3 animals than that of G1 animals.

Key words: Body condition score, Body weight, Physiological responses, Ram, Wool yield

The body condition score is a simple, non-invasive, time saving and affective managemental tool to rank rams according to their body reserve by sight and touch. The body condition scoring in sheep can be a useful and beneficial means for assessing the flock production (Gordon 1997, Sejian *et al.* 2010a). Nutrition has an important impact on the reproductive performance in sheep, but the magnitude of the effect may vary with the season (White *et al.* 1983). Body condition change (BC), is a good prediction technique of body energy reserves (Sanson *et al.* 1993), and is associated with food seasonal variations, which are more marked in tropical regions. The responses of ram to nutritional manipulations can be divided into short-term effects that act mainly on the neuroendocrine system (Blanc *et al.* 2001) and long-term effects that act on growth and sperm production (Oldham *et al.* 1978,-Maurya *et al.* 2010). Under extensive management system, level of nutrition may have a greater influence on reproduction and production rams (Perez *et al.* 1997). The sheep with appropriate BCS and that maintain it throughout productive phase of sheep; have greater performance than sheep of poor BCS (Russel *et al.* 1969). To optimize the productivity of sheep it is therefore essential to have a simple and reliable indicator at hand, which allows to assess sheep nutrition level and to decide when and how to supplement the flocks (Atti *et al.* 2001). The ram contribute significantly to the overall performance of a flock. It is therefore important to pay attention to the factors which may influence productive potential of native Malpura rams. Hence the present study was undertaken to assess the influence of BCS on growth, physiological responses and blood metabolites of Malpura rams in semi-arid region of India.

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MATERIALS AND METHODS

The rams were condition scored in the scale of 1–5, where, 1 indicates completely emaciated while 5 indicates very fat rams. BCS of the rams was assessed by careful palpation of the spinous and transverse process in the loin area, immediately behind the last rib (Russel *et al.* 1969). During the study period the mean environmental temperature and relative humidity ranged between 22.8–38.2 °C and 35–52%, respectively.

Malpura rams (21), 4–6 year-old, with mean body weight of 45.5 kg were used in the study. The animals were randomly divided into 3 groups based on body condition as group 1 (2.5 BCS; n= 7), group 2 (BCS 3.0–3.5; n=7) and group 3 (BCS 4.0; n=7) respectively. The animals of different groups

were simulated to different BCS by subjecting them to different nutritional regimen. All animals grazed 8–10 h daily on natural vegetation interspersed with seasonal shrubs and forbs. In addition to grazing, concentrates (barley, 650 g/kg, groundnut cake, 320 g/kg, minerals 30 g/kg including 10 g/kg NaCl, with crude protein, 180 g/kg and total digestible nutrients, 650 g/kg) were fed in 3 different levels among the group. Group 1 rams were provided with concentrate @100g/day/ram (1.51 MJ of ME/day/ram). The rams in group 2 were provided with concentrate at an amount of 300 g/day/ram (4.52 MJ ME/day/ram). The group 3 rams were provided with 500 g/day/ram (7.53 MJ of ME/day/ram). After the desired BCS was attained in each group, the study was conducted for 45 days. The same feeding regimen was followed for the rest of the study period to maintain their respective BCS. Their BCS was assessed at fortnightly interval to ensure that they were in respective BCS as per the experiment. Under these 3 different feeding regimes, body weight, HG, physiological responses and blood metabolites were studied.

Physiological responses, viz. respiration rate (RR), pulse rate (PR) and rectal temperature (RT) were recorded twice daily at 7:00 h and 14:00 h. The RR was recorded by counting flank movements/min from a distance of 4–5 m without disturbing the lambs while for recording the PR and RT the lambs were restrained gently. The PR was measured by palpating the femoral artery and for recording RT clinical thermometer was inserted (6–7 cm) inside the rectum inclined towards wall of the rectum. Hb and PCV were estimated using whole blood samples as per Balasubramaniam and Malathi (1992), Jain (1986), while plasma glucose was estimated according to Tietz (1976).

The data generated from the study were analyzed using GLM procedure by analysis of variance for repeated measurements which included the effects of BCS. *Post hoc* analyses were performed using Duncan's multiple range tests for pair-wise comparisons. Data were presented as mean±SEM and statistical analysis were carried out using SPSS software program, version 10.0. Level of statistical significance was set at $P < 0.05$.

RESULTS AND DISCUSSION

The effect of body condition score on body weight, HG, and wool yield are given in Table 1. The body weight showed a significant ($P < 0.05$) difference between the groups with lower value being in G1 rams and highest in G3 rams. The body weight of G2 rams was in-between. HG and wool yield showed similar trend i.e the HG and wool yield was significantly ($P < 0.05$) lower in G1 rams. The above result depicted a positive correlation among the body weight and heart girth. In agreement with our finding Nsoso *et al.* (2003) also reported a positive correlation of BCS with HG and body weight of sheep. In accordance to our finding Raaof (2009) reported a positive correlation between wool yield and body weight of sheep. The significant changes in the body weight of the different BCS groups indicated the precision of the condition scoring methodology by which one can provide strategic supplementation of feed and fodder to the sheep.

Table 1.Effect of BCS on growth of adult Malpura rams

Attributes	B.wt (kg)	HG (cm)	Wool yield (g)
2.5	35.4^{C}	76.4^{C}	245.7^{C}
3.0	50.2^{B}	84.9^{B}	594.3^{B}
4.0	60.1^{A}	89.4^{A}	814.3^{A}
SEM	1.66	1.40	73.64

^{ABC} means with different superscript in same column differs significantly ($P<0.05$).

The mean values of physiological responses (RR, PR and RT) of ram in G1, G2 and G3 are presented in Table 2. The data indicated a significant increase ($P<0.05$) in RR from morning to afternoon in all the groups of animals but the rate of increase was greater for G1 as compared to G2 and G3 rams. Among all the 3 group of rams, the morning RR was significantly ($P < 0.05$) lower in G1 rams as compared to G2 and G3 rams. Moreover the afternoon RR was significantly ($P < 0.05$) higher in G1 rams as compared to G2 and G3 rams. The morning and evening PR among the group did not differ significantly. A significant difference among the group of animals were obtained for morning and evening RT. The morning RT of G1 rams was significantly ($P < 0.05$) lower than the G2 and G3 rams. While in afternoon G3 rams had significantly higher ($P < 0.05$) RT as compared to other 2 groups of rams. Among the physiological response, RR showed significant changes with respect to the different BCS than the PR and RT. The reason for this could be that the homoeothermic animals initially react to stress by enhancing the thermoregulation mechanism, such as RR, to avoid an increase in RT. These findings are in agreement to the previous study conducted in our laboratory and elsewhere (Sleiman and Abi Saab 1995). The physiological response varied enormously during forenoon and afternoon. This is because the animals maintained under semi-arid condition

Table 2. Effect of BCS on physiological responses of adult Malpura rams

BCS	Respiration rate (breath/min)		Pulse rate (beat/min)		Rectal temperature (°C)	
	M	E	M	E	M	E
2.5	11.9^{A}	60.6^{A}	57.4^{A}	64.0^{A}	100.8^{B}	102.1^{A}
3.0	16.9^{B}	46.7^{B}	60.9^{A}	67.1^{A}	101.5^{A}	102.1^{A}
4.0	16.6^{B}	48.0^{B}	61.7^{A}	66.9^{A}	101.5^{A}	101.6^{B}
SEM	0.61	3.95	1.85	1.59	0.18	0.14

^{AB}means with different superscript in same column differ significantly ($P<0.05$).

Table 3. Effect of BCS on blood metabolites of adult Malpura rams

Attributes	BCS 2.5	BCS 3.0	BCS 4.0	SEM
PCV %	22.8^{B}	28.9^{A}	31.1^{A}	0.78
Hb (g/dl)	7.65^{B}	11.12^{A}	11.30^{A}	0.22
Glucose (mg/dl)	43.69^{B}	54.81^{A}	56.74^{A}	0.81

^{AB}means with different superscript in same row differ significantly (P<0.05).

are usually exposed to high ambient temperatures during hot summer (Naqvi 1987). The increase in ambient temperature through the morning and towards the afternoon may explain the reason for rise in the physiological responses in the afternoon when compared to morning values (Maurya *et al.* 2007). Sejian *et al.* (2010b) reported a greater increase in body temperature of ewes with low BCS sheep as compared to sheep with high BCS. The lower values for respiration rate, pulse rate and rectal temperature in lower BCS animals may be attributed to their low metabolic rate during the energy deficiency (Maurya *et al.* 2004).

The effect of body condition score on the changes in blood profile is presented in Table 3. The PCV and Hb concentration were significantly (P<0.05) lower in the G1 rams as compared to G2 and G3 rams. However, the values of PCV and Hb among the G2 and G3 rams did not differ significantly. The reason for the greatest reduction in PCV and Hb in the lower BCS group of rams may be due to reduction in the synthesis of RBC and Hb. In the present study, a significant decrease in the PCV and Hb of rams with lower body condition was also confirmed by the report of Sejian *et al.* (2010c). In the present study, the glucose level was significantly low in the rams of low body condition score. The reason for the decrease in glucose concentration was due to less availability of substrate for glucose formation in the body of energy depleted rams. In agreement to our results, Caldeira *et al.* (2007) also reported the same finding.

It may be concluded from the above finding that low body condition scores of rams affects the growth, physiological and blood profile of rams. So the rams' body condition score should be optimized by proper feeding to have normal physiological and biochemical values/functions in the body, which inturn will help to increase the productivity of animals. Further more, animals with a very good body condition (3.5) which suffer a loss of up to a point of body condition in a scale of 1 to 5 are not able to maintain their proper growth, physiological responses, and blood metabolites.

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