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Effect of Nutritional Stress on Physiological Responses of Non Descript Indian Buck (*Capra Hircus*)

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ABSTRACT

Goat farming, an integral part of agricultural production in India, mainly predominates in semi-arid tropical areas. Animal production and reproduction are severely hampered under such environmental conditions due to feed scarcity and energy deficiency. So the present study was conducted to evaluate the effect of nutritional stress on the physiological responses (rectal temperature, heart rate and respiration rate) in native bucks. The study comprised of eight native breeding bucks of 23-25 kg which were treated as control animals forthe first 10 weeks by providing full feeding as per ICAR requirement. The same animals were considered as treatment group for next 10 weeks in order to avoid the individual variations and fed with fifty percentage concentrate restriction. Rectal temperature, heart rate and respiration rate were taken daily on both morning and evening and calculated the mean weekly values. Physiological responses were significantly reduced (P<0.05) in treatment group than that in control.From the study, it can be concluded that even in 50% concentrate restriction, in order to maintain its homeostasis, animal can readjust physiologically.

KEYWORDS : Nutritional Stress, Physiological Responses,Non descriptBuck,Concentrate Restriction

INTRODUCTION

Goats are important browsing ruminants in India which face periodic shortages of feed availability in their natural habitat. Over-grazing is one of the major causes of feed shortage which is exacerbated by recurring drought periods (Dashtizadeh et al., 2008). The arid and semi-arid regions of India are drought prone due to low and uneven rainfall. During summer, the tropical feed resources are relatively poor in abundance and quality, thereby compromising the body condition score and production efficiency of animals (Maurya et al.,2004). This requires a clear understanding of both the nutrient requirement for reproduction and the mechanisms that partition nutrients between the various competing physiological systems.

The male breeding animal makes an important contribution to the performance and genetic improvement in a herd (Maurya et al.,2010). For successful management of bucks under these conditions, and to achieve the optimum level of reproduction, there should be efficient nutritional management. This requires a clear understanding of both the nutrient requirement for production and the mechanisms that partition nutrients between the various competing physiological systems (Sejian et al., 2010; Maurya et al., 2011). It is therefore important to pay attention to the factors which may influence male physiological efficiencies. But the effects of nutrition on animal physiology have been poorly studied in male animal compared to female animal.(Schwalbach et al., 2003). Hence the present study was planned to evaluate the effect of dietary energy restriction (nutritional stress) on the physiological responses ofnon descript Indian buck.

MATERIALS AND METHODS

1. Study site:

The present study was conducted at the Psychrometric chamber of Physiology and Climatology division, Indian Veterinary Research Institute, Izatnagar. During the trial period the mean temperature and relative humidity were set constant in the psychometric chamber in order to minimize and nullify the seasonal variation .

2. Animals:

Eight healthy native bucks of uniform age (2-3 years) and weighing 23-25 kg were selected from experimental shed and used in the present study. The animals were maintained under well ventilated and proper hygienic conditions. Prophylactic measures against goat diseases were carried out as prescribed by the health calendar of the institute to ensure that the animals were in a healthy condition throughout the study.

3. Experimental design:

The present study was designed for total 20 weeks of animal trial, involving two groups, one control and one treatment group. The eight animals selected were treated as control group for the first 10 weeks of the study and then as the treatment group for next 10 weeks. Control animals were fed with full feeding as per ICAR feeding standard(ICAR 1985).In treatment group 50% concentrate is restricted compared with control. Both the control and treatment groups consisted of same animals in order to avoid the error due to individual variation of animals. During the trial period the mean temperature and relative humidity were set at the thermoneutral condition inside psychometric chamber in order to minimize and nullify the seasonal effect on animals.

4. Physiological observations:

Rectal temperature (°F), respiration rate (breaths/min) and heart rate (beats/min) were recorded daily at morning (7.30 am) and evening (2.30 pm) in both treatment and control groups. Rectal temperature was recorded with digital thermometer that inserted about 1.5 cm deep into the rectum of animal so that it remained in contact until the reading stabilizes. The respiration rate (RR) was recorded by observing the flank movement for one minute in which each inward and outward movement of the flank was counted as one complete respiration. Heart rate was measured with stethoscope for one minute each and expressed as beats per minute.

Statistical Analysis

Data collected on various parameters were statistically analyzed by independent T test using SPSS software.

RESULTS

Fig. 1. Mean rectal temperature of animals at morning in °F

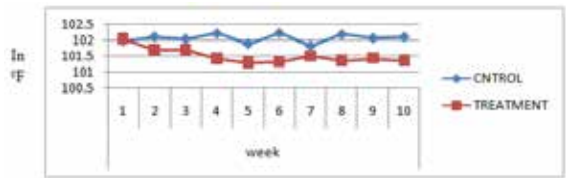


Fig.2. Mean rectal temperature of animals at evening in °F

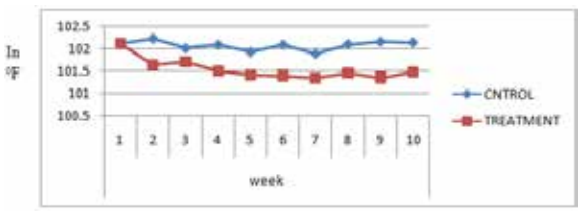


Fig.3. Mean heart rate of animals at morning in beats/ min

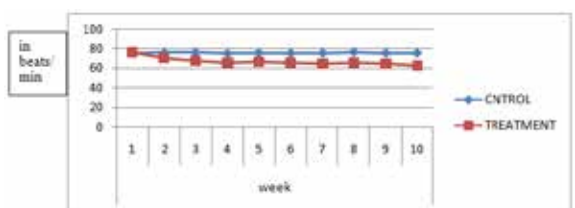


Fig.4. Mean heart rate of animals at evening in beats/min

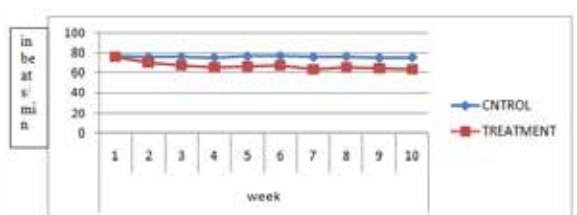


Fig.5. Mean respiration rate of animals at morning in breaths/min

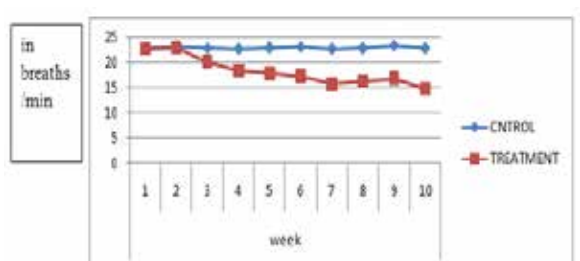
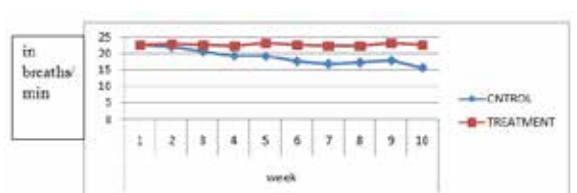


Fig.6. Mean respiration rate of animals at evening in breaths/min



Physiological Responses: Rectal temperature, heart rate and respiration rate of control and treatment groups at morning and evening are given in fig. 1 and 2, 3 and 4, and 5 and 6 respectively. Rectal temperature and heart rate at morning and evening reduced significantly in treatment group ($P < 0.05$) from 2nd week onwards. Respiration rate at morning and evening reduced significantly in treatment group ($P < 0.05$) from 3rd week onwards.

DISCUSSION

During the restricted feeding regimen, animal tries to decrease the body temperature in order to reduce the gradient for heat loss to the environment .This further reduces metabolic requirements as per the Newton's law of cooling. During feed restriction hypometabolic state involves reduction in body temperature. This decrease in body temperature further reduces metabolic rate as per Vant Hoff's rule (Hyder, 2012). The pulse rate is an indicator of general metabolic status and in the present study the reduction in pulse rate could be due to decrease in metabolic rate as a result of restricted feeding. Previous studies have shown that in desert goats there is decrease in energy expenditure with feed restriction (Choshniak et al., 1995) which is due to decreased oxygen consumption by peripheral skeletal muscles. Similarly the decrease in respiratory rate as observed in the present study might be due to reduced metabolic requirements and decreased oxygen consumption (Hyder, 2012).

CONCLUSION

The present study was conducted to evaluate the effect of nutritional stress on the vital physiological parameters,in nondescript Indian bucks. Physiological responses (rectal temperature, heart rate and respiration rate) were significantly reduced ($P<0.05$) in treatment group than that in control which is attributed to the low rate of metabolism. From the study, it can be concluded that even in 50% concentrate restriction, animal can readjust its physiological mechanisms to keep the metabolic rate at a lower level which can be considered as an adaptive strategy for homeostasis .This adaptive strategy paves way for the judicious partition of limited dietary energy for maintaining vital physiological functions and production factors.

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