



ISSN 0972-1665

Journal of Agrometeorology

Volume 15

Special Issue - II

December 2013

Editors
V.U.M. Rao
B. Bapuji Rao

Association of Agrometeorologists
Anand - 388 110, India

Thermotolerance of sheep in relation to coat colour

P. K. PANKAJ*, D. B. V. RAMANA, RITA RANI, M. NIKHILA, D. SUDHEER and K. P. CHOWDARY

Central Research Institute for Dryland Agriculture, Santoshnagar, Hyderabad-500 059, Andhra Pradesh

*E-mail: dr.prabhatkumarpankaj@gmail.com

ABSTRACT

The present investigation was conducted to study the influence of the coat colour on thermal susceptibility of sheep in terms of performance and blood protein level under three different Temperature Humidity Index (THI) conditions between May to July 2012. Plasma total protein, albumin, globulin and creatinine were determined under these conditions at Hayathnagar Research Farm of Central Research Institute for Dryland Agriculture. THI varied at 87.6 ± 0.57 in May, 84.7 ± 0.41 in June and 81.4 ± 0.32 in July. Eighteen male and female sheep of three different breeds in the age group of 9-10 months with average body weight 16.6-17.0 kg, six animals each from Deccani (black color with long coarse carpet wool), Nellore (dark brown color with little wool) and Deccani x Nellore Crossbred (light brown color with long coarse carpet wool) were selected for the study. Immediate indicators of stress (respiratory rate and rectal temperature) varied significantly ($p < 0.05$) in three breeds under different THIs. There was significant variation ($p < 0.05$) in the feed intake of three groups and Deccani sheep was the worst affected. However, body weight change under these extreme circumstances was not significantly differed in three groups. The level of total plasma protein was significantly decreased ($p < 0.05$) with increase in the THI in all the three breeds. However, the plasma protein (g/l) levels declined more in Deccani (8.70 vs. 5.73) followed by crossbred (8.20 vs. 6.02) and Nellore (7.48 vs 6.35). Similarly significant decrease ($p < 0.05$) was observed in plasma albumin and globulin levels in all the three breeds. Serum cortisol and creatinine level was high under hot climatic condition in all the three breeds but no significant difference was observed between the breeds. The results obtained in this study clearly indicated that all three breeds of sheep are thermally stressed during the month of May as compared to July, while dark colored sheep (Deccani) were under more stress compared to the rest. This study suggests a relationship between the coat color and thermotolerance of sheep.

Key words: Temperature-humidity index, stress hormones, small ruminants, plasma protein, heat stress

Ruminants are least tolerant to the heat stress because the ruminal fermentation produces excessive heat in addition to the environmental factors (ambient temperatures, relative humidity, solar radiation and air movement). This excess heat needs to be efficiently dissipated in order to maintain the constant body temperature especially in grazing animals. Increase in solar radiation considerably increases the thermal load on the grazing animals like sheep and goat during the day, particularly in summer. Susceptibility of sheep to heat stress is associated with several factors like species, colour, condition score or finish, temperament, sex, coat thickness and previous exposure to heat stress (Brown Brandl, 2009). Among these coat colour is very important as it determines (partly) the amount of radiant heat absorbed by the animal's coat, along with length and condition of its hair. Studies have shown that animals with dark coat colour absorb more solar radiation and therefore are more susceptible to thermal radiation, compared to those with light coat colour (Silva, 1998).

The physiological responses of livestock to heat stress have been well described (Ominski *et al.*, 2002), and include increased body temperature (Bernabucci *et al.*, 1999),

increased respiratory rate (Collier *et al.*, 2006), decreased feed intake (West, 1999) and increased water intake (Mader *et al.*, 2006). These responses have detrimental effect on production, reproduction and health in ruminants. Likewise, sheep productivity is also affected adversely by the extreme climatic conditions. Excessive heat stress causes hyperthermia and potentially has several physiological side effects. Thus, present investigation has been carried out to suggest thermotolerant breed of sheep with respect to coat colour.

MATERIALS AND METHODS

Six animals (three male and three female) each from Deccani (Black colour with long coarse carpet wool), Nellore (dark brown colour with little wool) and crossbred (Light brown colour with long coarse carpet wool) of Deccani and Nellore were selected from the herd maintained at Hayathnagar Research Farm, Central Research Institute for Dryland Agriculture (17°27'N latitude and 78°35'E longitude and altitude 515m), Hyderabad. The animals were in the age group of 9-10 months and average body weight was 16.6-17.0 Kg. The experimental animals were maintained as per standard managerial and feeding practices.