

MANAGEMENT OF HEAT STRESS IN SHEEP

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Sheep form a crucial component of rural economy, particularly in the arid, semi-arid and mountainous areas of the country because of its multiple utilities for wool, meat, milk, skins and manure. It provides a dependable source of income to the shepherds through sale of wool and animals (NAPS, 2018). They contribute greatly to the agrarian economy, especially in areas where crop and agriculture doesn't seem to be economical. Further, they play a crucial role in the livelihood of an outsized proportion of small and marginal farmers and landless labourers (Acharya, 1982). 4.55 million farmers within the country holds about 65 million sheep. Our country has 43 registered breeds of sheep. Tamil Nadu stands fourth in the country with 4.78 million sheep holding about 7.36% of country's sheep population.

Due impacts animals' production and health, climate change is perceived as the most serious long-term challenge faced by small ruminants' farmers all over the world (Silanikove and Koluman, 2015). Environmental factors like temperature, radiation and humidity have direct and indirect effects on animals (Collier *et al.*, 1982). The high ambient temperature that challenges health and performance of animals also described as the magnitude of forces external to the body that tend to displace its systems from their ground state. Animals undergo various sorts of stressors, i.e. physical, nutritional, chemical, psychological and heat. Among all, heat stress is the utmost concerning issue nowadays in the ever-changing climatic scenario (Silanikove and Koluman, 2015), and it is one of the most important stressors in the tropical, subtropical (Marai *et al.*, 2007; Nardone *et al.*, 2010), arid (Silanikove, 1992), and semi-arid (Silanikove, 2000; Al-Dawood, 2015) regions of the world. Heat stress is defined as the perceived discomfort and physiological strain associated with exposure to an extreme and hot environment (Gupta *et al.*, 2013).

Identifying heat stress

Heat stress can be identified through many signs exhibited by animals. Some general signs include: huddling in the shade (if it's available), increased water intake, loss of appetite, listless/lethargy, slobbering, high respiratory rates (panting), high body temperature, open mouth breathing. In severe cases of heat stress, lack of coordination, trembling and down animals is also seen (Burton, 2014, Agriculture Victoria, 2017).

Animals in danger (Agriculture victoria, 2017)

Animals at high risk of heat stress are:

- young animals
- dark coloured animals
- animals that are sick or have a previous history of respiratory disease
- animals with other stresses like heavy lactation

Measures to alleviate heat stress

1. Grazing

- Provision of shade and clean water within the grazing area.
- Grazing during the evening or during cool hours.

2. Supplementation

- Strategic supplementation of pregnant, lactating and breeding ewes as mentioned below.
- Feeding of crop residues and high-moisture agro-industrial by-products (ABP), tree fodders, oil cakes etc.,
- Supplementation of buffers to supply the higher dietary Na and K levels needed for lactating ruminants during hot climate.
- Supplementation of fat-enriched rations to raise the energy density of the diet, and to decrease metabolic heat production as metabolizable energy derived from fats are efficiently utilized by ruminants.
- Supplementation of vitamins which are part of the non-enzymatic antioxidant system especially vitamins A, E, and C to fight oxidative stress. Dietary supplementation with 50 mg/ kg of vitamin E and 0.3 mg/kg of selenium during summer improved sheep reproductive performance and lamb growth. It also had a

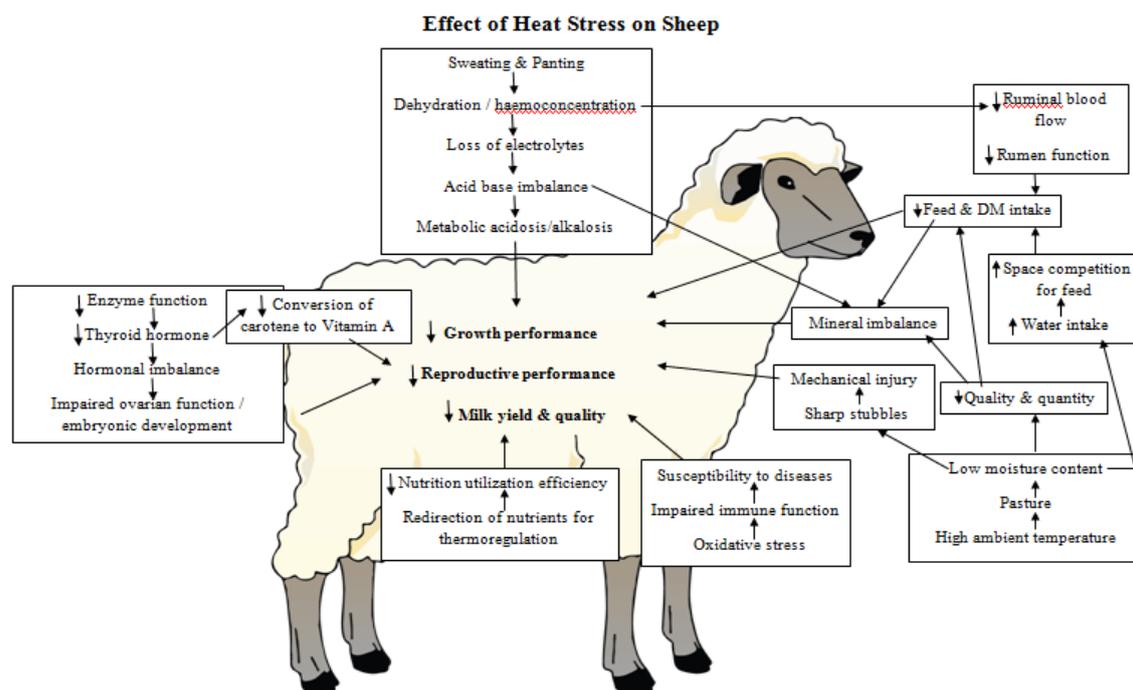
beneficial effect on blood metabolites, protein metabolism and thyroxin concentration.

3. Watering(Agriculture victoria, 2017)

- Provide ad libitum clean drinking water.
- Design the water troughs or containers large enough so that all the animals have easy access.
- If large number of animals is kept together increase the number of watering points and/or water flow.
- Fix the troughs or containers firmly so they cannot overturn.
- Troughs should be kept clean and should be designed and maintained to prevent injuries.
- The location of water should be familiar to animals' days before extreme heat arrives.
- Animals should not be made to walk long distances for water.

4. Handling (Agriculture victoria, 2017)

- Don't handle animals in extreme heat unless necessary.
- If necessary, confirm that it is done as early or late in the day as possible when temperatures are lower.



5. Transportation (Agriculture victoria, 2017)

- Transport of animals should be planned in such a way to avoid climatic extremes likely to compromise the animals' welfare.
- If transport is absolutely necessary, plan the journey in such a way to minimize the effects of hot weather on the animals by pre-determining the route, marking out places of shade for a rest stop and perhaps water availability along the route.
- Animals should be transported only during the cooler hours of the day. While resting, park the vehicle in the shade and at right angles to the wind direction to improve wind flow between animals during hot weather. Duration of stops should be kept to a minimum to avoid the build-up of heat within the vehicle while it is stationary.
- Stocking densities should be reduced to 85 per cent of capacity to ensure good airflow between animals, and drivers should have contingency plans in place for the occurrence of adverse weather events.

6. Culling

- Animal stocking density should be reduced based on the availability of feed/fodder resources and to reduce excessive maintenance cost during summer.
- Surplus animals aside from breeding stock such as unproductive animals, animals with chronic ailments, poor milkers, repeat breeders, aged, animals with poor growth rate, animals with vices and leg deformities shall be culled.

7. Health

- Animals should be dewormed using suitable anthelmintics to reduce worm load (especially for flukes).
- Animals should be vaccinated against sheep pox, PPR, anthrax and FMD.
- Footbath with disinfectants may be done routinely to prevent foot rot.
- Potassium permanganate mouth wash can be given to sheep having oral wounds due to browsing of dry stubbles.

Conclusion

Heat stress exerts negative effects on productivity and well-being in sheep. Heat stress negatively affects biological functions, changes antioxidant levels and various hormones which are reflected in the impairment of their health, production and reproduction.

Management strategies mentioned above may be applied to counter hot/humid environmental conditions. For optimal results, the people who care for animals should be educated regarding the effect of heat stress and on animal production and the managemental strategies to alleviate the problems. It is to be noted that awareness of heat stress is the first step towards its management.

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