



INFLUENCE OF MANAGEMENT SYSTEMS ON SEVERITY OF HEAT STRESS AND REPRODUCTIVE PERFORMANCE OF RAMS IN THE TROPICS – A REVIEW*

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Abstract

Sheep are an important source of protein for humans, and recent decades have seen a significant increase in the production of sheep-based products, thus indicating an increase in demand for this commodity. At a time when this sector is growing, sheep are exposed to various challenges. These include climate change, which can cause heat stress in sheep, including rams, which later negatively affects their growth and reproductive performance. Exposure to heat stress results in physiological and reproductive behaviour responses in rams, which could also be used to visually identify the effect of heat stress as it will affect the productivity of livestock. In addition, the year-round hot and humid climate of the tropics is expected to contribute to a higher probability of heat stress occurrences in rams reared in developing countries around the equator. Nevertheless, the adaptability of rams to heat stress varies according to their origin, whereby native breeds tend to adapt better. Despite that, native breeds still can be affected by adverse environmental conditions and rely on thermoregulation mechanisms to mitigate heat stress. This results in numerous negative physiological changes, such as sweating and increased heart rate. This review highlights the effects of heat stress on the physiology, reproductive behaviour and reproductive performance of male sheep. The review also discusses the impact of management systems on heat stress in rams, which affects sheep productivity.

Key words: rams, management systems, heat stress, reproductive, physiology

Mutton and lamb are some of the main types of animal protein sources consumed worldwide. Over centuries, sheep were domesticated to obtain various products. The last two decades have seen an increase in the sheep population, which has risen to 1.17 billion heads worldwide. Asia is the second largest contributor to the increase, recording 24% of the world's sheep population and making the continent as the host for the largest sheep population in the world in 2018 (FAO, 2018; Corazzin et al., 2019). In tropical countries such as Malaysia the per capita consumption of mutton in 2020 was reported to have increased to 1.3 kg/per year with a high import dependency ratio (IDR) at 90.4% (Mahidin, 2021).

The large population of farmed sheep in Asia is a factor in the application of various types of livestock management systems. The selection of appropriate livestock management systems is important to ensure that livestock productivity continues to be guaranteed. The livestock management system impacts physiology of the livestock in various ways, with concomitant changes in

the productivity and wellbeing of the animals, such as influencing their mature weight (Corazzin et al., 2019). Over time, management systems have been developed to increase farm productivity and profitability for farmers. The space provided usually depends on the management systems provided by farmers. Three types of management systems are usually used in sheep farming, namely intensive, semi-intensive and extensive (free-range) systems (Escareño et al., 2013). Basically, an intensive management system keeps animals indoors in supervised facilities and with set routines. Meanwhile, semi-intensive systems allow animals to graze during the day and provide confinement during the night. Extensive or free-range systems keep animals outdoors and reliant on wild foraging and pasture (Escareño et al., 2013). The effects of heat stress on livestock caused by climatic factors such as temperature, humidity and solar radiation can affect animals in all types of management systems, whether extensive, semi-intensive or intensive and climate change is expected to exacerbate these effects (Karthik et al., 2021 b; Thornton et al., 2021).

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