

Heat stress in dairy cattle

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What is heat stress

Heat stress is a non-specific physiological response of an animal to the thermal environment when heat production is greater than dissipation. The normal body temperature ranges from 38.5°C to 39.5°C in calves, and from 38.0°C to 39.0°C in adult cows. An ambient temperature between 18°C and 25°C has been found to be beneficial for the good performance of cattle. Temperatures in excess of 25°C have been shown to cause an increased body temperature of dairy cows, thereby increasing heat stress. Significant metabolic heat is generated by the fermentation of the feed in the rumen and producing milk, which also results in an additional thermal load on the body.

Animals maintain their thermal balance either sensible or insensible heat loss. Sensible heat loss comprises the heat exchange mechanisms like conduction, convection and radiation. This type of heat exchange is typically operative at low ambient temperature. However, the insensible heat loss come into operation at relatively high ambient

temperature. This includes heat dissipation by increasing peripheral blood flow, panting, drooling etc. Short term response also includes limiting heat production by reducing activities and changing the feeding pattern. Therefore, the factors that influence the thermal exchange with environment include air temperature, radiant temperature, air velocity, and relative humidity.

Signs of heat stress

- Animal moves to the shade
- Water intake is enhanced, while feed intake is reduced.

- Animals become lethargic and inactive.
- Prefers standing with heads bowed to lying down.
- Increased respiration rate, body temperature
- Increased production of saliva
- Open-mouth breathing (panting)
- Animals move closer together and stand in tightly packed groups.

Effects of heat stress on animal health

Productive challenges

Heat stress can induce rumen dysfunction along with reduced feed consumption and increase the risk of metabolic disorders. It challenges milk production and affects the milk composition viz. milk fat% and SNF%. It may impair animals' immune responses, which leads to an increased susceptibility to the diseases like mastitis by increasing the survival and proliferation of pathogens. Ultimately, the body condition score gets lowered. Mortality incidences have also been reported during excessive heat stress.

Reproductive challenges

Heat stress can affect the synthesis of proteins and hormones associated with reproduction, which in turn leads to lowered fertility. It negatively affects follicular development and the oestrous cycle by impairing luteinizing hormone and oestradiol production. The signs of oestrus are poorly exhibited in heat stressed animals, which causes failure in detection of oestrus by animal keepers in 80% of the animals, even with the normal ovulation. Overall, it reduces the conception rate and also has a serious impact on pregnant animals including occasional abortions, teratogenicity and compromised growth of the foetuses.

Management of heat stress

Shade

Protecting animals from direct sunlight helps lower their body temperature and respiration rate. A shed with a north-south orientation prevents the wet areas from developing underneath. Placing pasture or a dry lot over the shed helps to significantly lower the temperature. Avoid overcrowding in a small shed. Ideally, 40–45 ft² (3.7–4.2 m²) area should be provided per cow in the shelter.

Ventilation

Ventilation, either by natural or mechanical means is of great help to overcome heat stress. The use of fans, exhaust, and cross ventilation helps to maintain cool air in the animal house.

Cooling with water

Fans in combination with a water sprinkling/fogging facility provide the best cooling option. Excessive sprinkling should be avoided, as it can result in wet bedding, making animals prone to mastitis and other diseases. It is necessary to remember that the water sprinkling should be avoided in hot-humid condition as it may add into heat stress by making evaporative cooling mechanism inoperative due to high humidity.

Drinking water

Adequate, cool drinking water should be provided all the time, as hydration has a marvellous role in regulating body temperature. Normally, an adult, healthy animal requires 75 to 80 litres of water daily. Add salt, jaggery and lemon to the drinking water to reduce heat stress.

Dietary management

Use high-quality forage and feed more concentrates to maintain energy requirements even with less dry matter consumption. High quality forages are digested faster, resulting in less heat being produced. However, care should be taken to balance diets properly in order to avoid digestive disorders.

Conclusion

Heat stress is a critical issue in dairy animals' management which challenge the production and reproductive potential of dairy animals leading to major economic losses. Implementing proper ventilation and cooling strategies at farms with better feeding programmes can help to minimise some of the negative impact of heat stress.

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