

Managing heat stress

in dairy animals

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Climate change has a major impact on animal production systems' sustainability. Heat stress occurs in hot, humid settings when there is an imbalance between the body's metabolic heat production and its dissipation to the environment. Increases in heart rate, rectal temperature and respiration rate are the primary responses of animals to hot weather. It has a direct impact on feed intake, which lowers growth rate, milk production, reproductive efficiency, and in severe situations, even death. Exotic and crossbred dairy breeds are often more prone to heat stress than native breeds, and higher producing animals are even more so because they produce more heat through metabolism. An animal's vulnerability to several diseases is increased when it experiences heat stress because it suppresses the immunological and endocrine systems. Hence, sustainable dairy farming remains a vast challenge in these changing climatic conditions globally.

Keywords: Dairy animals, Heat stress, Heat stroke, Management, Summer

Today, the effects of rising temperatures on agricultural crops as well as on the business of livestock and poultry farmers are being felt mainly due to increase in number of factories, digging of land, vehicle exhaust fumes, animal emissions (methane), etc. Due to these reasons, fluctuations in weather are being observed every year, which is having an adverse effect on the health of dairy animals. The coming summer months are also a matter of concern for the livestock breeders as due to extreme hot humid environment in June, July and August, the animals suffer from heat stress which leads to a sharp decline in milk production.

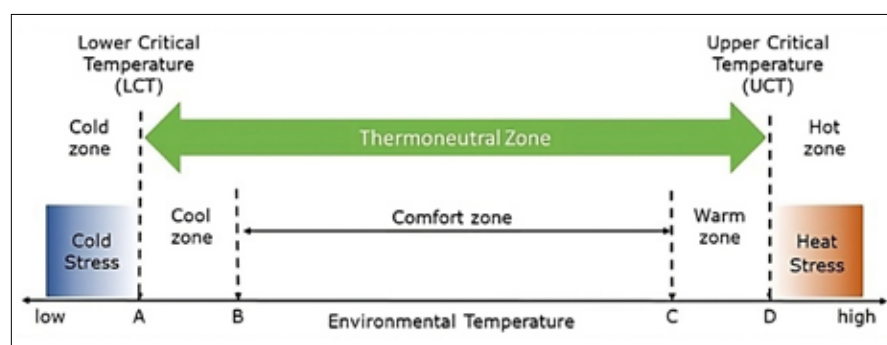
According to the Indian Meteorological Department, the earth's temperature is expected to rise by 3 to 5°Celsius by the end of this century due to continuous emissions of greenhouse gases and the worst effects of rising temperatures will be felt in the northern part of India. With respect to global scenario, India ranks first in milk production. This was made possible by large-

scale crossbreeding of exotic breeds of animals with indigenous (native) breeds. Nowadays crossbred and exotic breed cows are the most prevalent cows and almost all of the milch cattle are crossbred cows. But crossbred and exotic breeds cows are more susceptible to heat stress than native breeds.

Animals have a range of tolerance to the ambient temperatures. In summer, the noon temperature rises to 42-45°C or higher. When the ambient temperature is in the Thermoneutral Zone (TNZ) of the animal, the body needs less energy to keep the body cool or warm and

the animal performs well. This temperature range is very favourable for the health of animals and their overall development. The TNZ temperature (04-21°C) of exotic and crossbred cows is lower than that of native cows (10-27°C) which means that exotic and crossbred cows are more affected by heat stress. When the ambient temperature exceeds the TNZ limit, the animal begins to be affected by heat stress. Buffaloes are more affected by heat due to their black color and lesser sweat glands.

Many factors affect the intensity of summers stress such



Schematic representation of temperature and thermal zones

Changes in milch animals due to heat stress

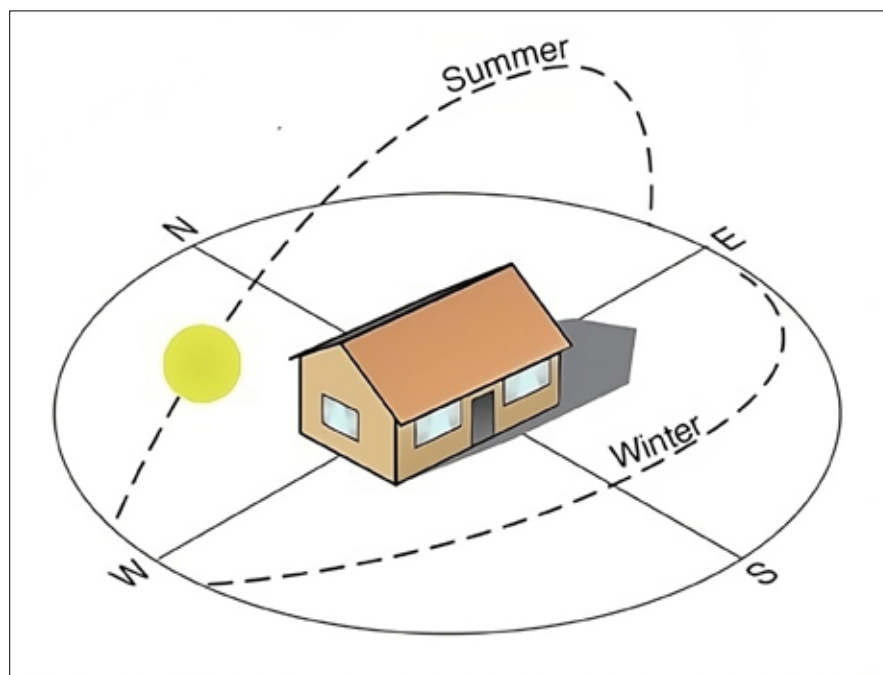
- Increase in body temperature and respiratory rate
- Open mouth, fast and long breathing
- Saliva and foam coming out of mouth of the animal
- Eating less fodder and grains
- Increased energy requirement
- Nutrient deficiency of the common elements like Sodium, Potassium and Bicarbonate
- Sharp decline in milk production
- Reproductive capacity of milch animals also reduces such as, decreased heat period (estrus) duration, decreased pregnancy rate, repeat breeding, decreased fetal size and development.

as environment, feed, breed, water status, etc. Humidity plays an important role in heat stress. This productivity deficit can be significantly reduced during the summers by adopting the following heat protection measures and good health arrangements.

Summer stress reduction tips

Provision of fresh, cold and clean water: In dairy animals, there is need to increase the amount of water during heat stress so that heat can be eliminated through breathing and sweating. Also, for digesting dry feed, more water is required during summers. Higher the ambient temperature, higher the water consumption by up to 50%. Therefore, the animal must be given fresh, cold and clean water, all time. One cow/buffalo needs 100-125 liters of water in summer. Due to dehydration in summer, the acid-base balance of the body deteriorates. That is why, we should give 50-60 g of baking soda and salt or electrolyte powder in water per day.

Animal housing: Under Indian conditions, animal sheds should be designed to reduce heat as heat stress causes more damage to animals than winter condition. Animals can tolerate winter conditions up to 15°C without any difficulty. But, when the temperature rises above 30°C, milk production begins to decline. That is why; dairy animals, especially



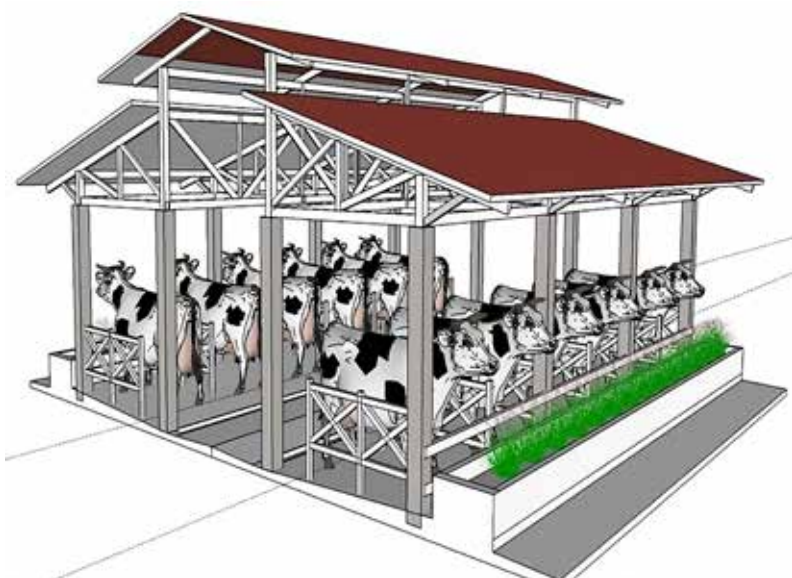
Direction of shed

the crossbred cows, should be given proper shelter.

- **Animal shed management:** India is a region with a hot climate. Therefore, the direction (length wise) of the shed should be from east to west which can protect the animals from direct sunlight (Fig. 2). The animal shed should be such that it does not get hot early in summers and the sun light does not stay in the shed for long. Shade trees should be provided around the animal shed to keep the temperature of the shed low. Open type sheds have more advantages than closed type sheds because the temperature and steam pressure in closed sheds are much higher than open type sheds. Closed sheds get hotter during hot and humid months, such as April to September. Also, wet gunny bags should be hanged on the front doors and windows to prevent direct exposure to hot air in the shed. This keeps the dairy animals' cool inside.
- **Width and size:** In hot, dry weather, an area of slightly more space than required for animals should be provided. With more space, the amount of radiation from the earth to the animal's body decreases to some extent.
- **Height:** In hot climates, the

height of the shed should be between 3.0-5.0 m. A height of less than 3.0 m interferes with proper ventilation resulting in increased heat inside the animals.

- **Roof type:** Roof shape should be either flat, or "A" in shape (Fig. 3). The "A" type roof is definitely better than a flat roof in hot climates. One side of the "A" shaped roof protects from direct sunlight. This helps to reduce the heat from the roof.
- **Roofing:** It can be hay or straw, galvanized steel, plywood and a variety of plastic roofs. Asbestos (cement) sheet is more effective as a top layer.
- **Mechanical cooling in the shed:** Animals do not need mechanical cooling unless the ambient temperature is below the animal's body temperature (38°C). But, only when the temperature of the surrounding air exceeds the body temperature of the animal then such cooling is required in which coolers, fans, fogger, mister, etc., should be used.
- **Roof and wall colour:** It should be white on the outside and colorful on the inside. Darker colors make the room warmer.
- **Provision of nutritious feed:** Decreased milk production can



"A" shaped roof type dairy shed

be prevented by increasing the amount of highly digestible fodder in animal rations, maintaining the ratio of minerals (sodium, potassium, chloride and sulphur), providing fodder/feed to the animals during cool time of the day. The density of protein and energy in the feed should be increased, so that even if the animal eats less due to heat, its deficiency will be countered.

Animal cooling system: At high ambient temperatures, by breathing and sweating, the nature has given the animal a way to reduce body heat which is created by its own feed during digestion. Increase in ambient temperature, activates the sweat glands that produce sweat. This process causes the skin to cool down. Sometimes, the animal breathes faster to cope with heat stress and rejects feed and fodder to reduce the burden of heat stress. In summer, the animals should be kept in the shade during the day. When the ambient temperature reaches 40-42°C, the temperature can be reduced by spraying water on the animal's body or on the shed. If an animal is affected with heat stroke,

immediately move it to a cool place and apply cold water on its body, if possible, use ice or cold-water bandages.

Breeds: Indigenous breeds are more resilient to climate change. These breeds have more resistance to bear high temperatures, lack of fodder, water scarcity and diseases than exotic and crossbred animals.

Shed cleanliness and management of external parasites: Care should be taken to keep the shed clean for the animal. Water should not stand in and around the shed. Animal excreta and cow dung should be disposed of away from the shed so that mosquitoes on cow dung cannot enter the shed. When the air is humid in summer, the effect of parasitic (lice, tick, etc.) attack on animals increases during this season, which is responsible for causing various diseases, such as theileriosis, babesiosis, etc. and the animals get high fever. Therefore, care must be taken to keep the shed and its surroundings clean. A solution of Malathion or Carbaryl 0.5-1.0%, Amitraz (250 ppm) or deltamethrin (25 ppm) is very useful for killing the ticks. There should be no wounds on the animal's body

and on the hands of the person administering the medicine. First, a mask should be put on its muzzle (mouth), and medicine should be applied around the animal's udder, on the inside of the legs, under the neck and tail where the ticks are more prevalent and on the rest of the body. This process is repeated next week, so that the ticks are managed effectively.

If animal has a fever for more than a day, medical advice should be sought immediately, as these diseases are fatal.

SUMMARY

It seems highly likely that milk production in the future in India will need to take account of changing climate and increasing ambient temperatures. To minimize potential problems with animal welfare, dairy managers need to recognize and monitor the symptoms of heat stress and actively manage their systems accordingly. Modern methods for keeping livestock and giving more preferences to indigenous breeds of cows and buffaloes can only deal with climate change. Heat needs to be dispelled from the cow else her performance and welfare will suffer. Cow performance begins to suffer above 25°C. During the summer, ambient temperatures are often above this, particularly in poorly designed accommodation. So, provision of shelter is advisable, with cows allowed easy access to water troughs that fill quickly. Also, implementing proper breeding programmes, cooling strategies at farm with better feeding programmes can help to minimize some of the negative effects of heat stress. Hence, by adopting these methods to a great extent the decline of milk, loss of fertility and other diseases can be prevented.

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