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ABSTRACT

Chromium as a Supplement for Large Ruminants to Reduce Heat Stress

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ABSTRACT

Global warming and the rise in Earth's surface temperature pose significant global threat. As environmental temperature continues to rise, livestock are increasingly experiencing severe heat stress, particularly those livestock are raised under poor management conditions, exotic and cross breeds. Inadequate housing, poor ventilation and overcrowding, limited access to water further aggravates the heat stress effects, leading to reduced production, poor health and even mortality. Providing good ventilation and shade for livestock helps them cool their body temperature to some extent. However, to effectively alleviate heat stress, supplementation plays a key role.

Chromium (Cr), known as an anti-stress mineral, has the ability to reduce heat stress in animals (aids in coping with high temperature).

Key points: Global warming, Heat stress, Production loss, Insulin, Chromium propionate.

Chromium alleviates the stress by altering insulin sensitivity and increasing glucose uptake, glucose oxidation to CO2, and glucose absorption into triglycerides (Brooks *et al*., 2016). It also minimizes lipid peroxidation caused by heat stress. By inhibiting the release of heat shock proteins like HSP – 72 and protecting nucleic acids (especially RNA from denaturation), chromium reduces cell injury.

Its anti-oxidant activity and immune- boosting properties helps in countering infections. The use of other anti-oxidants such as selenium and vitamin E, along with the chromium can enhance its effect. However, the use in livestock remains limited due to non-availability, insufficient research, lack of scientific knowledge regarding its use, potential toxicity and carcinogenic activity of various preparations. Chromium propionate is the most common preparation used supplement for livestock.

There is limited data available on inclusion levels, and various authors reported have different levels, Chromium to diets with concentrations of 0.05 mg Cr/kg of Cr-methionine and for heat-stressed buffaloes at 0.5 to 1.5 mg/kg of dry matter to improve heat tolerance, immune function, and insulin effectiveness (May Bin-Jumah et al., 2020) and Q. Shan *et al*., 2020, by their study concluded that 0.36 mg Cr/kg DM is the optimal amount to alleviate heat stress in mid-lactation dairy cows in hot weather.

A study by Raghunandan T *et al.*, 2022, shown that 0.5 mg/kg DM of chromium propionate, 500 IU/animal/day of vitamin E and 0.3 mg/kg DM of selenium decreased the cortisol level and glutathione peroxidase activity, combination of Chromium and anti-oxidants showed alleviation of thermal stress. There is scope for research on chromium as a supplement for heat stress, and future studies may support and increase its use as a supplement.

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