

NUTRITIONAL BLUEPRINT FOR BROILER PERFORMANCE UNDER HEAT STRESS

01

Heat stress is a significant concern for broiler production worldwide, and its impact on broilers can be severe. Broilers are highly susceptible to heat stress due to their genetics, high metabolic rate, and limited ability to dissipate heat. Here are various impacts of heat stress on broilers.

02

Reduced feed intake is a common symptom of heat stress in broilers. The heat can cause them to eat less, which can ultimately affect their growth rates and weight gain. This can lead to reduced profitability for broiler production. Along with reduced feed intake, broilers will drink more water during heat stress to restore thermoregulatory balance.

03

Respiratory distress is another common impact of heat stress on broilers. They may pant and breathe rapidly during heat stress, which can lead to respiratory distress and heat exhaustion.

04

Heat stress can also reduce immune function in broilers. Stress can suppress the immune system, making them more susceptible to diseases and infections. This can ultimately affect their health and welfare. Moreover, it can be a significant concern for broilers and can lead to increased mortality rates.

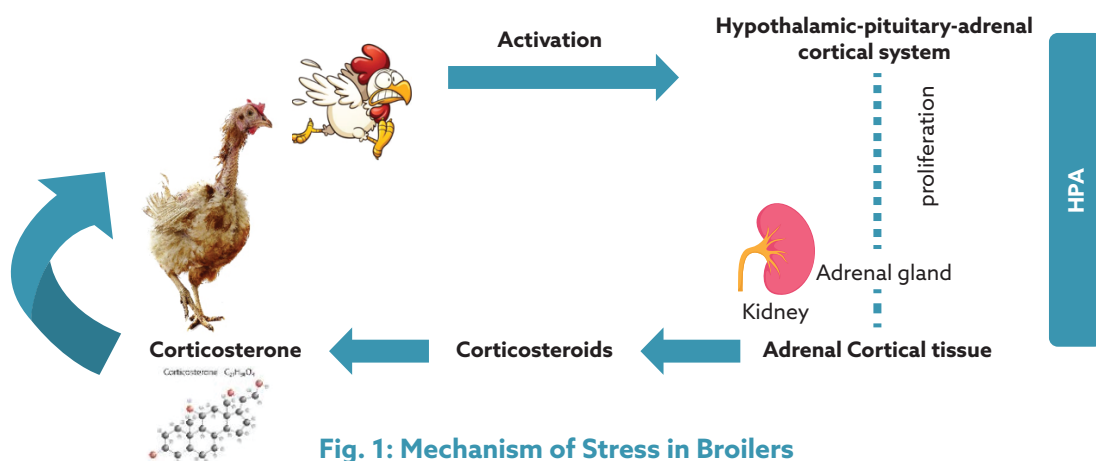


Fig. 1: Mechanism of Stress in Broilers

Corticosterone is a corticosteroid hormone that is produced by the adrenal gland in response to heat stress. However, chronic elevation of these hormones can have negative effects on the bird's health and performance. An increase in corticosteroids due to heat stress can lead to reduced growth rates, immune suppression, and other health issues.

Moreover, heat stress can increase oxidative stress in broiler tissues. Oxidative stress is an imbalance between the production of reactive oxygen species (ROS) and the ability of the bird's antioxidant defenses to neutralize them. Heat stress can increase the production of ROS, which can cause damage to lipids, proteins, and DNA in broiler tissues.



CHROMIUM, CORTICOSTERONE, AND HEAT STRESS

One of the mechanisms that chromium can benefit animals under heat stress is by improving glucose metabolism. Heat stress can impair glucose uptake and utilization in peripheral tissues, leading to hyperglycemia and other metabolic disturbances. Chromium has been shown to improve glucose tolerance and insulin sensitivity in animals under heat stress, which can help to maintain blood glucose levels and prevent the development of metabolic disorders.

Chromium supplementation can also help to modulate corticosteroid levels in broilers during heat stress, which can have beneficial effects on bird health and performance. High levels of corticosteroids can contribute to the negative effects of heat stress on animal health and performance. Hence, reducing corticosteroid levels can potentially help to mitigate the negative effects of heat stress in animals.

An experiment at Texas A&M University, U.S.A. involved Cobb 700 male broilers from day old to 52 days under summer season, and chicks were exposed to summer heat from day 10 until the end of the trial. The supplementation of Chromium Propionate resulted in **significantly reduced corticosterone levels** in plasma compared to broilers fed a control diet. (Figure 2)

The effect of Chromium Propionate on Broiler performance under heat stress

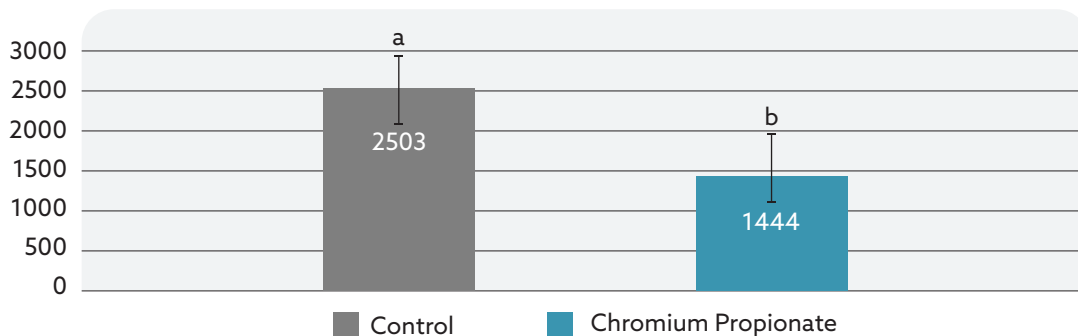


Fig. 2: Corticosterone level in plasma

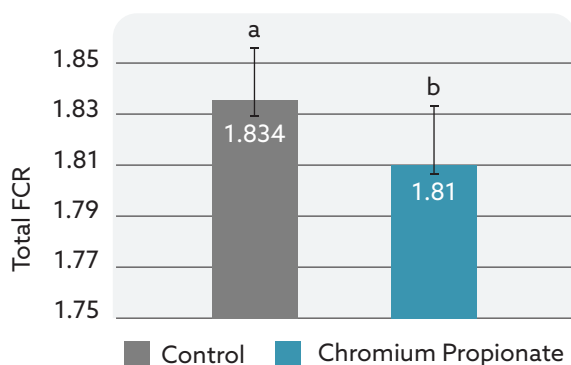


Fig. 3: Feed Conversion Ratio (FCR)

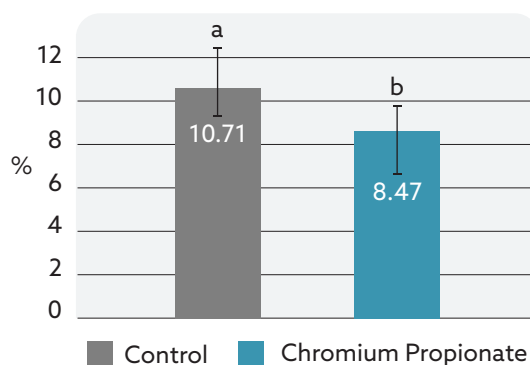


Fig. 4: Total mortality, %

From the same study, the results indicate that dietary Chromium Propionate supplementation, significantly improved the **feed conversion ratio by 2.4 points (Figure 3)**. Also, **total mortality was significantly reduced by 2.24% when chromium was added to the diet (Figure 4)**.

Similar observations have been demonstrated in previous studies examining the influence of chromium under heat stress conditions. Several studies in broilers showed improvement in weight gain and feed conversion with chromium supplementation under conditions of induced stress.



IMPROVING PROCESSING YIELD

In the world of broiler production, the quest for optimal meat yield has always been a top priority. Figure 5 shows that chromium propionate supplementation can also help **improve breast meat yield significantly by 0.4%** in broilers during the heat-stress period.

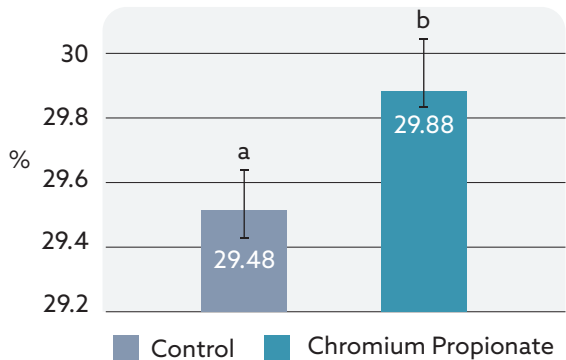


Figure 5: Breast Meat Yield in response to chromium propionate



CONCLUSION

Heat stress can cause a range of physiological and metabolic disturbances in animals. Chromium propionate supplementation can have beneficial effects on animals under heat stress by improving glucose metabolism, decreasing corticosteroid levels, and improving growth performance and carcass yield. However, the specific effects of chromium propionate may vary depending on the dose, timing, and duration of supplementation, as well as other factors such as the severity of the heat stress and the age of the animal.

References:

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- Brooks, M. A., Grimes, J. L., Lloyd, K. E., Krafka, K., Lamprey, A., & Spears, J. W. (2016). Chromium propionate in broilers: effect on insulin sensitivity. *Poultry Science*, 95(5), 1096-1104.
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