

Popular Article

Nutritional Guide During Heat Stress in Poultry

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Abstract

Growth in the human population in recent past years has diverted the poultry industry to enormously increase poultry production to fulfill the demand. Poultry is widely known for its high-quality protein, vitamins, and minerals in form of eggs and meat production. Eggs are also rich in antioxidants such as lutein and zeaxanthin, which possess major benefits for eye health. The substantial economic loss has been recorded in the poultry section is due to environmental heat stress. To mitigate the stress different nutritional planning in form of water and feed management such as regular availability of water, restricted and dual feeding can be done. Besides that, the addition of essential vitamins, minerals, and phytochemicals (lycopene, resveratrol, etc.) to the diet along with the maintenance of electrolyte balance are some crucial points to be considered.

Introduction

Heat stress in poultry birds due to their greater metabolic activities leads to greater body heat in combination with less heat dissipation capacity due to a lack of sweat glands. Imbalance in the environmental factors (sunlight, thermal irradiation, and humidity) and characteristics of animals (species, metabolism rate thermoregulatory mechanism) leads to heat stress resulting in several physiological changes, such as oxidative stress(excessive production of reactive oxygen species), acid-base imbalance, and suppressed immunocompetence (due to penetration of microbes in challenged gut health and loosening of enterocytes) which directly influences mortality, feed efficiency, body weight, feed intake, and ultimately leads to poor egg and meat production.

Several strategies have been adopted to mitigate heat stress in poultry but nutritional strategy played a vital role in the context to animal nutrition besides environmental and housing management.

Nutritional aspect to mitigate heat stress

The important nutritional strategies to alleviate heat stress in poultry production includes: -

- 1. Water:** Bird tends to increase their water intake by 2-4 times more than usual during heat stress. About 70-80% of heat production in poultry during heat stress is dissipated via panting. Hence adequate water provision, reduction of after temperature, and addition of salts help improve water intake in poultry and reduce the heat stress.
- 2. Feeding methods:** During summer, the livability of birds is the most important factor which is concerning poultry farmers so the way of restricted feeding was found to be beneficial to reduce the metabolic rate, rectal temperature, mortality, and decreasing abdominal fat in heat-stressed broilers. Other strategies like the dual feeding method maintain the nutritional balance by feeding a carbohydrate and fat-rich diet in comparison to protein-rich diet during warmer days as they provide energy, minimize metabolic heat production, and combat heat stress. Wet mash and pelleted feed are also considered to be better for performance in broilers and layers under high temperatures.

- 3. Supplementation of vitamins and minerals:**

Supplementation of vitamins like Vitamin E, A, and C which are rich in antioxidants, neutralizes the free radicals, increases immunity, egg weight, and live weight gain during summers.

Zinc is essential for enzymatic activity and antioxidant defense system as a free radical scavenger reduces the level of the lipid peroxide, and increases the activity of superoxide dismutase enzyme during summer resulting in body mass growth and egg mineralization.

The organic form of chromium as chromium methionine improves the cellular and humoral immune responses in broilers during heat stress, moreover, improved immune response, egg quality, Haugh unit, and reduced serum glucose, cholesterol, and triglyceride concentration.

The organic form of selenium (selenized yeast) which gets easily absorbed in the diet of laying hens enhances the egg weight, egg production, Haugh units, and eggshell strength during heat stress.

- 4. Electrolytic:** The key elements involved in the maintenance of dietary electrolyte balance (DEB) in body fluids are sodium (Na), potassium (K), and chloride (Cl). The addition of various compounds to water such as ammonium chloride (NH₄Cl), sodium bicarbonate (NaHCO₃), sodium chloride (NaCl), potassium chloride (KCl), and potassium sulfate (K₂SO₄) will fulfill the requirement of these elements and alter the bird's osmotic balance, resulting in increased water consumption, influencing water balance during heat stress in broiler chickens.

5. **Supplementation of Phytochemicals:**

Various types of phytochemicals such as lycopene, resveratrol, EGCG (Epigallocatechin gallate), and Curcumin supplemented in the diet also help to mitigate the heat stress in poultry birds.

Lycopene is found in tomatoes known to enhance the production of antioxidant enzymes and improved the cumulative feed intake, body weight, and FCR in heat-stressed broilers and enhanced vitamin levels in the egg, and also improved oxidative stability and yolk color of the egg in laying hens.

Resveratrol is a natural bioactive polyphenol mainly found in grapes, peanuts, berries, and turmeric. It enhanced the antioxidant capacity, improved the average daily gain, and decreased the rectal temperature improving different gut health parameters such as microbial profile, villus-crypt structure, and expression of the tight junction in the broilers during heat stress. resveratrol also improved meat quality in the heat-stressed broilers by increasing the muscle total antioxidant capacity (T-AOC) and activity of antioxidant enzymes (catalase, GSH-Px).

Epigallocatechin gallate (EGCG) is the polyphenols present in green tea extract that possess high antioxidant and anti-inflammatory properties for heat-stressed broiler birds.

Curcumin, extracted from turmeric and possesses antioxidant and anti-inflammatory properties its use as a potential compound to mitigate heat stress.

6. **Supplementation of Osmolytes:** Betaine, an osmolyte, and methyl donor acts as an anti-heat stress agent by promoting favorable gut microbiota, protecting internal organs, and increasing fatty acids catabolism in chickens leading to improved broiler performance.

Conclusion:

Heat stress is considered as a major obstacle for poultry farming in hot climate areas, triggering major economic loss in poultry production. A combination of the nutritional strategies and proper feed formulation with a specific dietary regimen is more helpful and economically viable when compared to non-nutritional strategies, for reducing the deleterious effects of summer stress. These strategies will help the producers to keep their flock healthy, comfortable, and productive throughout the summer season.

References

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