Role of Antioxidants in Poultry Diet

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ABSTRACT

Antioxidants plays a very important role in poultry feed formula on bird's ecophysiology. Oxidative stress cause biological deterioration, which can impede farm animals' ability of production. Oxidative stress in chicken production can be brought on by a number of things, including illnesses, high metabolic rates, stressful environments and inadequate nutrition. This oxidative stress results in formation of reactive oxygen species (free radicals). These free radicals have negative impact on growth, immune status, elevated lipid rancidity and poor quality of meat. Numerous substances, such as fat and water-soluble molecules, which the body may either naturally produce or augment with food, have antioxidant properties. These antioxidants additive usually utilized in order to increase the stability of feed. Supplementing poultry diets with antioxidants improves bird health by enhancing immune function, reducing inflammation, and protecting tissues from oxidative damage, making natural antioxidants more appealing due to consumer demand. This article delves into the biochemical roles of essential antioxidants in poultry nutrition, their impact on performance, and their potential to enhance the sustainability and welfare of modern poultry production systems.

INTRODUCTION

The gastrointestinal tract (GIT) physiology in chicken is highly capable of producing reactive oxygen species (ROS), which are produced by epithelial cells as a result of oxygen metabolism or by the microbiota to regulate gut health. As a result, there is a greater chance of oxidative stress due to the production of free radicals than antioxidant levels. Consequently, adding antioxidants to a meal can help reduce oxidative stress in the chicken gut and scavenge reactive oxygen species (ROS) (Mishra and Jha, 2019). The term "antioxidant system" refers to the special protective defence mechanism that living creatures have against reactive oxygen species that are continuously produced in their cells (Surai, 2002). There are many compounds having antioxidant features to counteract with free radicals, include fat-soluble vitamin and water-soluble vitamin, or synthesized endogenously such as ascorbic acid, glutathione, or maybe supplied via diet such as minerals, vitamin E, carotenoids. Additionally, the generation of mineral related antioxidant enzymes can deal with reactive oxygen.

Natural antioxidants

Natural antioxidants in poultry feed are an excellent alternative to synthetic ones since they are safer, less costly, and may stop oxidative reactions in the diet. They also don't induce metabolic abnormalities in the chicken body. The Enzymes with antioxidant activity are produced in the body and need co-factors for its stimulation; examples for these antioxidants include glutathione peroxidases (GSH-Px), selenium and thioredoxin reductase (TR). Many Co factors as copper, zinc and manganese are form a portion for superoxide dismutase (SOD); while Fe is a crucial element for catalase. Therefore, the supplement of natural antioxidants, especially vitamin E and selenium will help the nutritionists in the formulating of feed formula.

I. Natural antioxidants in poultry feed:

The list of following compounds is represented as popular antioxidants in poultry feed:

A. **Vitamin E:** Vitamin E had beneficial effects in poultry like improving the oxidative stability of body tissues, growth performance and meat quality in chickens. It blocks lipid peroxidation with scavenging and diminishes the action of free radicals.

B. **Vitamin C:** Its primary function is as an anti-stress agent. Vitamin C might incompletely impede with oxidative protein denaturation and would enhance the feed and nutrients digestibility. Furthermore, vitamin C plays a major role in the manufacture of corticosterone, which enhances the body's ability to cope with stressful situations (Ahmadu *et al.*, 2016).

C. Carotenoids: Carotenoids reduce oxidative stress in pre- and post-hatching birds in a variety of ways, such as by boosting the activity of antioxidant enzymes and reducing free radicals. Including carotenoids in the diet of chicken improves their health and yields high-quality poultry products (Nabi *et al.*, 2020).

D. **Selenium:** Selenium is mainly available in organic and inorganic forms. Inorganic form generally used as diet supplement. It forms an essential part of selenoproteins. Selenoproteins are having antioxidant effects and supporting the redox equilibrium of cells.

E. **Polyphenol:** These substances are mainly present in plants. Their mechanism of action involves shielding the cells from free

radicals in two ways: first, by impairing pro-oxidant enzymes like xanthine oxidase, membrane-associated β-NADPH oxidase, and protein kinase C (PKC); second, by activating antioxidant enzymes and quickly scavenging reactive oxygen species (ROS). Thirdly: inhibit hydroxyl radicals OH synthesis and finally: decrease of α-tocopherol radicals and improving the antioxidant action.

II. Synthetic antioxidants in poultry feed:

A lots of natural antioxidants such as vitamin E, C, flavonoids show their affect for a limited period of preserving time, hence synthetic antioxidants are vastly used. The most popular synthetic antioxidants are BHA (butylated hydroxy anisole), BHT (butylated hydroxytoluene), TBHQ (tertiary-butyl hydroquinone) and EQ (ethoxyquin) (6-ethoxy-1,2-dihydro-2,2,4-trimethylquinoline) (EQ) are the most frequent used especially in processed poultry feed.

A. **Ethoxyquin (EQ):** Ethoxyquin found in forms of liquid and lightly yellowish in color, but it changes to brown and polymerize when subjected to oxygen. EQ has a critical role to prevents lipids in food against rancidity. It elevates the level of vitamins A and E in the plasma higher than three-level as well as increase the levels of vit-A storage in the liver is high. EQ has the ability to react with alkyl peroxyl in the presence of oxygen which is also a strong antioxidant (Taimr, 1994).

B. **Butylated Hydroxy Anisole (BHA) and Butylated Hydroxytoluene (BHT):** Two mechanisms are involved in the efficacy of these antioxidants: first, BHA and BHT react with peroxyl radicals to stop their production, and second, a variety of other antioxidants, including carotenoids, switch off the reactivating singlet state of oxygen and modify it into a triplet state.

CONCLUSIONS

Oxidative stress has a negative impact on poultry performance. As a result, enhancing the antioxidant effects of poultry feed through the addition of natural and synthetic antioxidants in a balanced formula will help to reduce lipid peroxidation, lessen the impact of stressful conditions, and preserve the productivity trait.

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