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A Review of the Advantageous Impacts and Health Benefits of Carotenoids Molecules on Farm Animals

Honey Gupta*

Department of Animal Science, Kabul University, Kabul, Afghanistan

Introduction

Astaxanthin (AST) is a carotenoid red pigment that is regarded as a high-quality keto-carotenoid pigment with food, livestock, cosmetic, therapeutic, and nutraceutical applications. Astaxanthin occurs naturally in fish, crustaceans, algae, and birds, primarily as fatty acid esters. Many studies have shown that astaxanthin has beneficial effects when used as a pharmaceutical agent in animal nutrition. Astaxanthin has a number of important biological actions, including antihypertensive, antioxidant, anti-obesity, and anti-carcinogenic properties. Astaxanthin has recently gained popularity as a potent immunomodulator for maintaining animal and human health and well-being. Astaxanthin is widely used in medical sciences and aquatic species nutrition; however, it currently has limited applications in broader animal nutrition [1].

Carotenoids, a diverse group of fat-soluble pigments discovered in fish, vegetables, fruits, and animal products such as egg yolks, have already been identified as important nutrients with valuable health benefits. Xanthophylls and carotenes are the two major dietary carotenoid groups. Carotenes, including beta and alpha carotenes, are an important source of vitamin A in the diet and lack oxygen atoms.Whereas xanthophylls, such as astaxanthin, lutein, and zeaxanthin, contain one or more oxygen atoms. Because animals and humans lack the ability to synthesise carotenoids, they must be obtained through diet. In humans, approximately 10-20% of carotenoids consumed are absorbed in the gastrointestinal tract with daily meals [2].

Researchers have spent decades studying the extraction of astaxanthin from various biological sources. Simple microorganisms, specifically algae, yeast, fungi, and bacteria, are the primary natural sources of astaxanthin. Animals cannot biochemically synthesise ASX, but it accumulates in their tissues after eating astaxanthin-containing organisms. Natural astaxanthin extracts may contain other carotenoids (beta-carotene, canthaxanthin, and lutein) associated with other biological activities, depending on the source. Microorganisms and marine animals such as microalgae, yeast, wild and farmed salmonid muscles, trout, and shrimp are all present [3].

Most carotenes have free radical scavenging, anti-cancer, anti-aging, and antioxidant properties and are widely used in medicine, food, feed, and cosmetics. Astaxanthin is a powerful natural antioxidant with numerous biological applications in biology. The only carotenoid that can cross the blood-brain and retinal barriers is astaxanthin. As an antioxidant, it is also used to treat brain injury and cardiovascular disorders. Furthermore, astaxanthin has anti-cancer properties in a variety of cancers, including oral cancer, colon cancer, liver cancer, bladder cancer, and leukaemia. Furthermore, animal studies have shown that astaxanthin plays an important role in controlling sugar metabolism, boosting immunity, and improving motor function. As the largest organ in the body, the liver is essential for nutrient digestion and transformation [4].

***Address for Correspondence:** Honey Gupta, Department of Animal Science, Kabul University, Kabul, Afghanistan, E-mail: honeygupta@gmail.com*

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Discussion

ASX has advantages in a wide range of animal health and production processes. ASX is a safe, pleiotropic medication with no known side effects. Orally/parent rally in many types of diseases in cell lines or various animal models. It can thus play an important preventive role in the onset and progression of diabetes. Nonetheless, due to the heterogeneity of the DM models, ASX source, dosage, administration mode, and results studied, it is nearly impossible to compare the results obtained. While the effects of ASX have already been studied in several clinical trials, more research on the biological mechanisms associated with diabetic context is needed. To achieve positive results with diabetic complications, appropriate human studies should be conducted to assess efficacy and protection in terms of bioavailability, individual reaction, metabolism, tissue delivery, and potential toxicity.

Obesity and metabolic diseases like diabetes are major public health concerns. The cause of metabolic disorders associated with obesity is multifactorial and can be attributed to nutritional, genetic, and environmental factors. Obesity is a major public health problem that can lead to type 2 diabetes, hyperlipidaemias, hypertension, and cardiovascular disease. Animal studies have shown that including astaxanthin in the diet helps to prevent weight gain, lowers plasma cholesterol, and lowers plasma and liver triacylglycerol. Astaxanthin has also been used to improve lipid metabolism during exercise, resulting in lower body lipids and increased muscle activity. Fourteen human RCTs were systematically reviewed and found that astaxanthin supplementation was not significantly associated with a reduction in body weight or BMI [5].

Conclusion

Stress is defined as physical or chemical factors that cause physical reactions that result in illness or death. Biological stress refers to the body's non-specific response to any challenge. Heat stress was mitigated in laying hens by adding another antioxidant, vitamin E, as a feed additive before, during, and after heat stress. The potential of astaxanthin to alleviate stress-induced gastric ulcers in rats has been investigated; the results showed that ulcer indices were reduced in the rat group fed astaxanthin extract compared to the control.

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Conflict of Interest

There is no conflict of interest by author.

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