

Exploring the Potential of Seaweeds in Animal Nutrition

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Seaweeds, also known as marine macroalgae, have emerged as promising candidates for enhancing animal nutrition across various species. These aquatic plants, abundant in coastal waters around the world, offer a rich source of nutrients, bioactive compounds, and functional ingredients that can significantly impact the health, growth, and productivity of livestock and aquatic animals. In recent years, research into the nutritional benefits of seaweeds has expanded, revealing their potential to improve feed efficiency, enhance disease resistance, and promote sustainable farming practices.

Overview of Seaweeds

Seaweeds are classified into three main groups: green algae (Chlorophyta), brown algae (Phaeophyta), and red algae (Rhodophyta). Each group possesses distinct nutritional profiles and bioactive components that contribute to their efficacy in animal diets. These macroalgae are known for their high content of polysaccharides such as alginate, agar, and carrageenan, which have functional properties beneficial for animal health. Additionally, seaweeds are rich in essential vitamins (including B vitamins and vitamin K), minerals (such as iodine, calcium, and magnesium), essential amino acids, omega-3 fatty acids, antioxidants (like polyphenols and carotenoids), and other bioactive compounds.



Role of Seaweeds in Animal Gut Health

One of the primary benefits of incorporating seaweeds into animal diets lies in their ability to support gastrointestinal health. Components like alginates and other polysaccharides act as prebiotics, fostering the growth of beneficial gut microbiota such as lactobacilli and

bifidobacteria. This prebiotic effect enhances nutrient absorption, reduces the colonization of pathogenic bacteria, and improves overall digestive efficiency in animals. Studies have demonstrated that supplementation with seaweed extracts or meal can positively influence gut morphology, enzymatic activity, and immune function, thereby contributing to better animal health and performance.

Nutritional Benefits of Seaweeds

- ✚ **Iodine Content:** Seaweeds are renowned for their high iodine content, a crucial nutrient for thyroid hormone synthesis in animals. Adequate iodine levels are essential for regulating metabolic processes, growth, and reproductive health. Seaweeds provide a natural and bioavailable source of iodine, which helps prevent iodine deficiency-related disorders in livestock and aquaculture species. However, careful management is necessary to avoid excessive iodine intake, which can lead to adverse health effects.
- ✚ **Antioxidant Properties:** Seaweeds contain potent antioxidants such as polyphenols and carotenoids, which play a vital role in reducing oxidative stress and inflammation in animals. These compounds scavenge free radicals, protect cells from damage, and contribute to overall health and longevity. In poultry and livestock, supplementation with seaweed extracts has been shown to improve meat quality attributes, including reduced lipid oxidation and enhanced shelf-life.
- ✚ **Mineral and Vitamin Content:** Beyond iodine, seaweeds are rich sources of essential minerals like calcium, magnesium, and iron, which are critical for bone health, muscle function, and overall metabolic processes in animals. They also provide vitamins such as vitamin B12, which is particularly beneficial for animal growth and energy metabolism.

Applications in Livestock Farming

- ✚ **Poultry Nutrition:** Seaweeds are increasingly integrated into poultry diets to improve growth rates, feed efficiency, and immune responses. Research indicates that poultry supplemented with seaweed-derived additives exhibit enhanced meat quality characteristics, reduced susceptibility to stress, and improved resistance against common pathogens.
- ✚ **Swine Feeding:** In swine production, seaweed supplementation shows promise in enhancing reproductive performance, reducing the incidence of gastrointestinal



disorders, and promoting optimal growth rates. The inclusion of seaweed extracts in swine diets has been linked to improved nutrient utilization and overall gut health.

✚ **Aquaculture Applications:** Seaweeds play a crucial role in sustainable aquaculture practices by serving as dietary supplements for marine fish and shellfish. Aquaculture species benefit from the nutritional richness of seaweeds, which contributes to faster growth, disease resistance, and enhanced flesh quality. Seaweed-based feeds reduce reliance on traditional fishmeal and promote environmentally friendly aquaculture operations.

Sustainable Farming Practices

The integration of seaweeds into animal nutrition aligns with the growing demand for sustainable farming practices. By utilizing marine resources like seaweeds, farmers can reduce the environmental impact associated with intensive livestock production. Seaweed cultivation requires minimal freshwater and land resources compared to terrestrial crops, making it an environmentally friendly alternative for feed production. Furthermore, seaweeds contribute to coastal ecosystem health by serving as habitats and nurseries for marine organisms.

Current Research and Future Directions

Ongoing research continues to explore the full potential of seaweeds in animal nutrition. Scientists are investigating novel extraction techniques to maximize the bioavailability of seaweed-derived compounds in animal diets. Furthermore, studies focus on understanding the mechanisms through which seaweeds exert beneficial effects on gut microbiota, immune function, and overall animal health.

Conclusion

Seaweeds represent a valuable resource in modern animal nutrition, offering a myriad of nutritional benefits and functional properties that support optimal health and performance across diverse livestock and aquaculture species. As the global demand for sustainable and nutritious animal products grows, seaweeds are poised to play an increasingly significant role in shaping the future of agricultural practices. Continued research and innovation in seaweed utilization will further enhance their application in improving animal welfare, environmental sustainability, and farm profitability.