THE SCIENCE WORLD
A Monthly e Magazine
ISSN:2583-2212
Jan 2024 Vol.4(1), 475-480

Popular Article

Seaweeds: A Sustainable Revolution in Livestock Feed

Adis Mirel Ahmed
M.V.Sc. Scholar, Division of Animal Nutrition, Indian Veterinary Research Institute (IVRI), Bareilly, UP.
https://doi.org/10.5281/zenodo.10612465

Abstract

As the global population is approaching the 9 billion mark by 2050, there is an urgent need to enhance food production by 70%, with a particular focus on sustainable practices in the livestock industry. This article explores the potential of seaweeds as innovative and eco-friendly feed additives for livestock. Drawing on historical practices dating back thousands of years and recent research findings, this article provides an in-depth understanding of seaweeds, categorizing them into green, red, and brown algae. The nutritional attributes of seaweeds including macronutrients and micronutrients are highlighted presenting a diverse and comprehensive profile. Studies revealed their positive impact on animal nutrition, performance, and health, showcasing antibacterial and antioxidant properties. Seaweeds emerge as a game-changer for sustainable and nutritious livestock feed, signalling a crucial shift toward resilience and eco-conscious practices in animal production. Ongoing research should optimise inclusion levels and processing methods for maximal benefit.

Keywords: Seaweeds, eco-friendly, sustainable

Introduction

As the global population is expected to surpass 9 billion by 2050, a significant 34% increase from current levels, and with an escalating demand for animal products driven by improved living standards, there is an urgent requirement to boost food production by 70%. This surge in production must not solely rely on conventional sources but should also explore novel alternatives. To achieve sustainable growth in the livestock industry, it is imperative to broaden the range of available livestock feed resources. This involves discovering new feeds or creating innovative additives that enhance resource utilisation efficiency. Livestock farmers actively seek solutions to improve animal growth, performance, and the quality of animal products. Among these solutions,

the exploration of feed additives, including antibiotics, antioxidants, acidifiers, vitamins, minerals, amino acids, binders, and enzymes is a key focus.

An innovative and environmentally friendly approach being considered by livestock farmers is the incorporation of seaweeds as novel and safe feed additives. The incorporation of seaweeds in the feed of livestock is not a new concept. Dating back thousands of years, historical mentions in Ancient Greece and Icelandic sagas indicate their early use. Traditionally dried and stored in barns, seaweeds were preserved as silage for winter feed in the 1900s. Records from the 19th and early 20th centuries underscore the organised utilization of seaweeds in livestock nutrition across areas such as Brittany, the Scottish islands, and Scandinavia, especially in ruminants and pigs.

Understanding Seaweeds

Seaweeds refer to a diverse group of marine algae that grow in various aquatic environments, primarily in the ocean. Marine algae can be broadly categorised into macroalgae (seaweeds) and microalgae. Macroalgae are larger and found in the shore area, while microalgae are smaller and can be found in the ocean floor and shore as well as throughout the ocean waters as phytoplankton. Although there are approximately 10000 seaweed species, only a selected few are suitable for animal feeding e.g *Ascophyllum nodosum*, *Laminaria* species, *Lithothamnion* species, *Macrocystis pyrifera*, *Sargassum* species, *Palmaria palmata* and *Ulva* species. Seaweeds come in a variety of shapes, sizes, and colours, and they can be broadly categorized into three main groups: Green algae (Chlorophyceae), Red algae (Rhodophyceae), and Brown algae (Phaeophyceae).

- **Green Algae (Chlorophyceae):** These seaweeds typically exhibit a green colour due to the presence of chlorophyll, the same pigment found in terrestrial plants. They can be located in diverse marine environments, including rocky shores and coral reefs. Key genera of green algae encompass *Ulva*, *Codium*, *Enteromorpha, Chaetomorpha,* and *Cladophora*.
- **Red Algae (Rhodophyceae):** The colouration of red seaweeds is attributed to pigments known as phycoerythrins. Often inhabiting deeper waters, they flourish across various temperature ranges and light conditions. Prominent genera of red algae include *Pyropia, Porphyra, Chondrus, Palmaria, and Lithothamnion.*
- **Brown Algae (Phaeophyceae):** Characterized by a distinct brown colour derived from pigments like fucoxanthin, brown seaweeds are frequently larger than their green and red

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Published 28.01.2024

counterparts. Common genera of brown algae encompass *Ascophyllum, Laminaria, Saccharina, Macrocystis, Nereocystis, and Sargassum.*

Nutritional Attributes

Seaweeds serve as valuable and sustainable sources of macronutrients and micronutrients. Their composition varies based on species, habitat, and collection time. Rich in biologically active compounds such as polysaccharides, proteins, essential amino acids, lipids, antioxidants, vitamins, and minerals, seaweeds provide a comprehensive nutritional profile. Over 54 essential trace elements crucial for physiological functions are present in seaweeds.

Nutritional Composition

The nutritional composition of brown, red and green seaweeds are:

Nutrients	**Brown seaweeds**	**Red seaweeds**	**Green seaweeds**
Water (g)	81.6	79–88	90.7
Carbohydrates (g)	48.0	46–50	48
Protein (g)	8–14	12–21	10–18
Fat (g)	1.0	0.7–3.0	0.5–1.7
Total fibre (g)	6.2	5.4	4.9
Ash (g)	6.61	15–30	0.60

These nutritional values are representative of *L. digitata* (brown), *P. palmata* (red), and *Enteromorpha* sp. (green) seaweeds, and the data is calculated per 100g of fresh weight.

Application Of Seaweeds as Animal Feed

Numerous research studies emphasize the positive impact of seaweed inclusion in the diets of pigs, cows, sheep, and poultry. Even in small amounts, seaweeds enhance overall nutritional value, leading to improved animal performance. Seaweed additives offer antibacterial, antifungal, antiviral, antioxidative, anti-inflammatory, anti-cancer, and anti-methanogenic properties, contributing to the well-being of livestock. Research highlights the effectiveness of seaweeds in monogastric animals like swine and poultry, as well as in ruminants.

Advantages Of Seaweeds in Animal Feed

Some of the documented advantages of seaweed supplementation in animal feed are

1. **Enhanced Nutritional Value**: Seaweeds are rich in essential nutrients, vitamins, and minerals, enhancing the nutritional profile of animal diets. Valuable for pigs, cows, sheep, and poultry, contributing to overall better nutrition.

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2. **Improved Animal Performance**: The inclusion of seaweeds or its components leads to better growth rates, increased feed intake, and overall improved health in animals. Studies consistently support the positive impact on animal performance.
3. **Alternative to Antibiotics:** Seaweeds serve as a natural and effective alternative to prophylactic antibiotics in feed. Seaweeds constituents exhibit antimicrobial properties, improving gut microbiota.
4. **Gut Health Promotion:** Seaweeds positively influence gut health by modulating microbial populations. Reduction in harmful bacteria like *E. coli* and an increase in beneficial bacteria like *Lactobacilli* contribute to a healthier digestive system.
5. **Immune System Enhancement:** Brown seaweed polysaccharides, such as fucoidan and laminarin, enhance animal immune responses. Increased concentrations of Immunoglobulin G (IgG) and improved lymphocyte phagocytosis.
6. **Mucin Stimulation:** Seaweeds components stimulate mucin secretion in the intestinal tract, promoting better gut health. This inhibits the adhesion of pathogenic microorganisms and positively influences intestinal metabolism.
7. **Muscle Tissue Benefits and Meat Quality Improvement:** Bioactive compounds deposited in muscle tissue enhance meat quality and productivity. Seaweed-supplemented meals increase superoxide dismutase activity and antioxidant capacity aiding in oxidative stress resistance.
8. **Milk Yield and Composition Improvement:** Lower concentrations (below 5%) of *A. nodosum* in diets enhance milk yield, constituents and overall cattle performance. Increased lactation efficiency and high protein content were observed with specific seaweeds supplementation.
9. **Nutrient Digestibility and Rumen Fermentation Benefits:** Seaweeds supplementation improves nutrient digestibility, milk yield, composition, feed conversion, and rumen fermentation activity. Commercial seaweeds supplements positively impact blood serum proteins in lactating cows.
10. **Cholesterol Level and Fatty Acid Profile Modulation:** Seaweeds supplementation alters cholesterol levels and fatty acid profiles in cattle. Improved growth, immunity, and fatty acid profiles contribute to healthier meat.

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11. **Environmental Impact Reduction:** Seaweeds supplementation shows potential in reducing greenhouse gas production in ruminants. Specific seaweed species demonstrate a significant reduction in total gas and methane production.

12. **Impact on Carotenoid Content:** Seaweeds inclusion in diets leads to significant increase in lutein, zeaxanthin, and total carotene content in eggs.

13. **Enhanced Fatty Acid Levels:** Seaweeds supplementation increases omega-3 fatty acid levels in eggs. It promotes nutritional richness without compromising taste or quality.

14. **Improved Eggshell Strength and Bone Health:** Calcified seaweeds, even at low concentrations, effectively replace inorganic lime calcium in broilers' feed. It positively impacts eggshell strength and bone health as well.

15. **Reduced Fat Thickness:** The inclusion of *E. prolifera* at different levels decreases abdominal and subcutaneous fat thickness in broilers. This improvement contributes to enhanced meat quality.

16. **Sustainability and Cost-Effectiveness:** Seaweeds offer a sustainable and cost-effective solution, replacing certain antibiotics, organic acids, and growth promoters in animal feed. Environmental benefits accompany economic advantages, maintaining and enhancing livestock production more economically.

Conclusion

Seaweeds emerge as a game-changer in the hunt for sustainable and nutritious livestock feed. With an increasing global population and a growing demand for animal products, seaweeds present a proven, eco-friendly solution that has been used for centuries of practice. Their adaptability is shown by their vast range of advantages, which include improved growth, health, and reduced environmental impact. Seaweeds, renowned for their nutrient richness, emerge as a trusted companion for the livestock industry. Integrating seaweeds into animal feed is a revolutionary way to make animal farming more resilient and sustainable. Ongoing research and industry practices should continue to find the best amounts and methods for adding seaweeds to animal feed, unlocking their full potential and creating a more durable and eco-friendly livestock sector for the future.

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Published 28.01.2024

References

Makkar, H.P., Tran, G., Heuzé, V., Giger-Reverdin, S., Lessire, M., Lebas, F. and Ankers, P., 2016. Seaweeds for livestock diets: A review. *Animal Feed Science and Technology*, *212*, pp.1-17.

Morais, T., Inácio, A., Coutinho, T., Ministro, M., Cotas, J., Pereira, L. and Bahcevandziev, K., 2020. Seaweed potential in the animal feed: A review. *Journal of Marine Science and Engineering*, *8*(8), p.559.

Rajauria, G., 2015. Seaweeds: a sustainable feed source for livestock and aquaculture. In *Seaweed sustainability* (pp. 389-420). Academic Press.

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Published 28.01.2024