Medicon Agriculture & Environmental Sciences
Volume 7 Issue 6 December 2024
Article Type: Editorial
ISSN: 2972-2691

Red Seaweed: A Promising Solution for Sustainable Ruminant Production

Gadzama IU*

School of Agriculture and Food Sustainability, University of Queensland, QLD, Australia

***Corresponding Author:** Gadzama IU, School of Agriculture and Food Sustainability, University of Queensland, QLD, Australia.

Received: November 29, 2024; **Published:** December 05, 2024

Red seaweed, scientifically classified as Rhodophyta, is a type of macroalgae that primarily inhabits the littoral zone of oceans (Kraft, 1981). It is characterized by its bright pink colour due to the presence of biloprotein pigments such as R-phycoerythrin and R-phycocyanin, and it plays a significant ecological role as a marine habitat. Red seaweeds are commercially harvested for various purposes, including human food, cosmetics, and livestock feed (Makkar et al., 2016).

Nutritional Value

Red seaweed boasts a rich nutritional profile, making it a valuable ingredient for both human and animal diets. It is particularly known for its high protein content, which can reach up to 50% of dry matter (Rocha et al., 2021). Additionally, red seaweed contains essential amino acids, minerals, and lipids rich in polyunsaturated Omega-3 (n-3) and Omega-6 (n-6) fatty acids (Van Ginneken et al., 2011). Commonly consumed red seaweeds include Pyropia, Porphyra, Chondrus, and Palmaria (Al-Amoudi et al., 2009).

Methane Mitigation Potential

Recent research has focused on the potential of certain species of red seaweed, specifically *Asparagopsis taxiformis* and *Asparagopsis armata*, to reduce methane emissions from ruminant livestock (Alvarez-Hess et al., 2023, 2024; Cowley et al., 2024). This potential is attributed to the presence of bromoform (CHBr3), a compound that inhibits the activity of methanogenic archaea in the rumen, the primary site of methane production in ruminants (Roque et al., 2019; Kinley et al., 2020). Studies have shown that incorporating *Asparagopsis* spp. into cattle diets can lead to significant reductions in enteric methane emissions, a major contributor to greenhouse gases (Cowley et al., 2024). Studies have reported methane reductions ranging from 22% to 67% in lactating dairy cows (Gadzama, 2024—unpublished review). In a 59-day study, beef cattle showed a 99% reduction in methane when *A. taxiformis* (51 mg bromoform/kg dry matter intake) was included in their diets (Cowley et al., 2024). This reduction is attributed to the seaweed's active compound, bromoform, which inhibits methanogenesis in the rumen (Roque et al., 2019; Kinley et al., 2020). Recently, Martins et al. (2024) conducted a comprehensive meta-analysis examining various methane mitigation strategies in dairy cows, revealing that dietary supplementation with feed additives including *Asparagopsis* spp., 3-NOP, nitrate, and lipids are highly effective in reducing daily CH4 emissions, yield, and intensity. This discovery has sparked interest in using red seaweed as a sustainable feed additive to reduce the environmental impact of livestock production.

Challenges and Future Directions

While the potential of red seaweed as a methane-mitigating feed additive is promising, several challenges need to be addressed. One notable concern is the potential for trace element accumulation, particularly iodine, with increased seaweed inclusion in animal diets (Roque et al., 2019). Additionally, some studies have reported a decline in dry matter intake (DMI) in animals fed red seaweed, raising concerns about potential negative effects on overall animal productivity (Roque et al., 2019; Stefenoni et al., 2021; Eikanger et al., 2024). The economic viability and scalability of producing and incorporating red seaweed into livestock diets also warrant further investigation. Developing sustainable cultivation methods and cost-effective delivery systems are crucial for widespread adoption. Continued research is necessary to optimize seaweed inclusion levels, understand the long-term impacts on animal health and productivity, and address the practical challenges associated with implementation (Romero et al., 2023; Martins et al., 2024).

References

1. Al-Amoudi OA., et al. "Chemical composition and antioxidant activities of Jeddah corniche algae, Saudi Arabia". Saudi Journal of Biological Sciences 16.1 (2009): 23-29.
2. Alvarez-Hess PS., et al. "Twice daily feeding of canola oil steeped with *Asparagopsis armata* reduced methane emissions of lactating dairy cows". Animal Feed Science and Technology 297 (2023): 115579.
3. Alvarez-Hess PS., et al. "Effects of a range of effective inclusion levels of *Asparagopsis armata* steeped in oil on enteric methane emissions of dairy cows". Animal Feed Science and Technology 310 (2024): 115932.
4. Cowley FC., et al. "Bioactive metabolites of Asparagopsis stabilized in canola oil completely suppress methane emissions in beef cattle fed a feedlot diet". Journal of Animal Science 102 (2024): skae109.
5. Eikanger KS., et al. "*Asparagopsis taxiformis* inclusion in grass silage-based diets fed to Norwegian red dairy cows: Effects on ruminal fermentation, milk yield, and enteric methane emission". Livestock Science 285 (2024): 105495.
6. Gadzama IU. "Asparagopsis Seaweed as a Feed Supplement for Dairy Cows". In press (2024).
7. Kinley RD., et al. "Mitigating the carbon footprint and improving productivity of ruminant livestock agriculture using a red seaweed". Journal of Cleaner Production 259 (2020): 120836.
8. Kraft GT. "Rhodophyta: morphology and classification". The Biology of Seaweeds 17 (1981): 6-51.
9. Makkar HP., et al. "Seaweeds for livestock diets: A review". Animal Feed Science and Technology 212 (2016): 1-17.
10. Martins LF., et al. "Effects of dose, dietary nutrient composition, and supplementation period on the efficacy of methane mitigation strategies in dairy cows: A meta-analysis". Journal of Dairy Science 107.11 (2024): 9289-9308.
11. Rocha CP., et al. "Seaweeds as valuable sources of essential fatty acids for human nutrition". International Journal of Environmental Research and Public Health 18.9 (2021): 4968.
12. Romero P., et al. "Rumen microbial degradation of bromoform from red seaweed (Asparagopsis taxiformis) and the impact on rumen fermentation and methanogenic archaea". Journal of Animal Science and Biotechnology 14.1 (2023): 133.
13. Roque BM., et al. "Inclusion of *Asparagopsis armata* in lactating dairy cows' diet reduces enteric methane emission by over 50 per cent". Journal of Cleaner Production 34 (2019): 132-138.
14. Stefenoni HA., et al. "Effects of the macroalga *Asparagopsis taxiformis* and oregano leaves on methane emission, rumen fermentation, and lactational performance of dairy cows". Journal of Dairy Science 104.4 (2021): 4157-4173.
15. Van Ginneken VJ., et al. "Polyunsaturated fatty acids in various macroalgal species from north Atlantic and tropical seas". Lipids in Health and Disease 10 (2011): 1-8.

Volume 7 Issue 6 December 2024