

Maximizing The Potential of Azolla: Exploring the Role of Azolla in Animal Feed

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Structured Abstract

Background: Heavy reliance on imported feed ingredients such as soybean and corn affects the sustainability of the livestock and aquaculture industry. The increasing cost of feed led to higher product prices and potentially affected consumer affordability and market demand. Therefore, there is a need to explore sustainable and cost-effective alternatives for animal feed such as azolla. This review aims investigate the impact of addition different levels of azolla on the growth performance of livestock and aquaculture, the challenges hindering the widespread utilization of azolla as animal feed and a possible way to overcome the challenge.

Main body: For livestock, *Azolla pinnata* can be included up to 45% in broiler chicken diets, 40% for rabbits, 20% for both goats and lambs and 6% for sheep. As for aquaculture *Azolla pinnata* can be used for Thai Silver Barb up to 25% and Nile tilapia 20%, meanwhile *Azolla cristata* can be used for Carp species up to 10%. Its adoption is limited due to high crude fiber, anti-nutritional factors, and amino acid imbalances that affecting nutrient absorption and digestibility. However, solid-state fermentation of azolla with *Lentinus edodes*, *Bacillus subtilis*, *Lactobacillus plantarum*, and *Leuconostoc* sp. improves its nutritional value by increasing protein, fat, amino acids, and reducing crude fiber, resulting in improved growth performance in animals and enabling higher inclusion rates in feed.

Research gap: There is lack of latest comprehensive research on azolla's effects across a wider range of animals. Also, there is limited research regarding solid state fermentation of azolla, especially with co-culture fermentation. This leaves a significant knowledge gap in understanding which fermentation approach (single or co-culture) is more effective in optimizing the nutritional value of azolla for animal feed.

Conclusion: In conclusion, azolla has demonstrated significant potential as a valuable and cost-effective feed for livestock and aquaculture. However, optimal inclusion levels of azolla vary among species due to diverse nutritional requirements and digestive capabilities. The presence of high crude fiber, anti-nutritional factors, and amino acid imbalances have limited its widespread adoption as it negatively impacts animal growth. Utilizing solid-state fermentation (SSF) for azolla presents a strategic approach to enhance digestibility, palatability, and nutrient content, making it a more effective feed ingredient.

Keywords: Azolla, Animal feed, Nutritive value, Growth performance, Challenges, Solid-state fermentation.

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