

Utility of *Azolla* as a Superfood for Animals and Fish

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Abstract: *A small aquatic fern, Azolla (Salvinaceae), has been widely researched as a possible low-cost feed source due to its high growth rate and relatively high protein levels. It is capable of accumulating protein without external sources of nitrogen, in part because of its symbiotic relationship with the nitrogen-fixing cyanobacterium Anabaena azollae, which has led to its being investigated as an alternative to traditional feed components like soybean meal and fishmeal. Crude protein is reported as ranging between 19 to 30 percent of dry matter with some variance depending on conditions of growth and species. The present review is a compilation of the existing literature on the application of Azolla in livestock and aquaculture systems, including cattle, poultry, pigs, and a variety of fish. Instead of discussing Azolla as a universal solution, the discussion is dedicated to the areas where it can be effective and where the limitations can be revealed. Feeding trials indicate that it is most effective as a partial supplement, rather than a total replacement and results vary greatly depending on processing, inclusion levels and target species. Azolla has a hard time being ignored by its economic and environmental appeal. It is relatively easy to manufacture, it does not have to compete with arable land, and can be incorporated into wastewater-based systems. Simultaneously, these benefits are accompanied by practical limitations, such as low dry matter content, difficulties in handling, and the existence of anti-nutritional factors which need processing. All in all, Azolla seems to be a valuable yet context-related feed resource. It will continue to play a minor role especially in smallholder and integrated farming systems. More research is required to understand the best levels of inclusion, standardization of processing procedures, and economic feasibility over the long term under the field conditions.*

Keywords: *Azolla*, Superfood, Fish, environment, livestock, aquasystems etc.