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Azolla: A New Substitution for Livestock and Poultry Feed

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Abstract

India is well known for its biological diversity and largest livestock population in the world. The average production still needs to be improved, which is may be due to low plane of nutrition due to inadequate availability of good quality feed. For the fulfilment of the existing and future demands of the growing human population certain new approaches are to be adapted to meet the input requirements for production of livestock and they're by products. This has led to find alternate sources of good quality unconventional feed for efficient livestock production. For alternatives to feed to different species of animals, azolla is a great option, as a sustainable feed for livestock. It can be used as human food, animal feed, medicine, production of biogas, hydrogen fuel, water purifier, weed control, reduction of ammonia volatilization and because of

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the multifaceted uses, it has been aptly referred to as 'green gold mine'. It contains most of the nutrients which are required for all classes of livestock including poultry and fish, without any adverse effects. In dairy cows, feeding of azolla can increase milk production by 15 to 20 percent and in poultry, it improves the weight of broiler chicken and increases the egg production in layers. The birds that received normal feed with 5% extra supplementation of azolla showed a 10 to 12% increase in the total body weight. Dietary inclusion of sun-dried azolla up to about 5% levels had no adverse effect on the production performance of broiler chicken and reduces the feeding cost making the net profit per bird being higher. Pit is dung on ground for growing azolla which is covered with plastic gunnies to prevent the growth of roots of trees, soil temperature, and seepage water and later harvested with a scoop net with daily harvesting yield 10-12Kg/pit.

Keywords- Azolla, Alternate poultry supplement, Growing and Harvesting of azolla.

Introduction

India is well known for its biological diversity and largest livestock population in the world. The total livestock population is 535.78 million in India as per census 2019 (BAHS, 2019). For the fulfilment of the existing and future demands of the growing human population certain new approaches are to be adapted to meet the input requirements for production of livestock and their byproducts. India stands first in the world in terms of milk production which is about 198.44 million tonnes and bovine population, though its average production still needs to be improved, which is may be due to low plane of nutrition due to inadequate availability of good quality feed. This has led to find alternate sources of good quality unconventional feed for efficient livestock production. For alternatives to feed to different species of animals, azolla is a great option, as a sustainable feed for livestock. It is rich in various nutrients which are required for all classes of livestock including poultry and fish, without any adverse effects. In dairy cows, feeding of azolla can increase milk production by 15 to 20 percent and in poultry, it improves the weight of broiler chicken and increases the egg production in layers. The best performance diets of pullet chicks can be formulated with inclusion of azolla up to 5 per cent. Hence it can be used as an unconventional feed resource for non-ruminants also. Azolla can be used as an alternate source of feed for cattle, sheep, goats, pigs, rabbits and fish to improve the growth and production status of the animals (Shukla *et al*., 2018).

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The generic name of Azolla is a conjugate of two greek words, Azo (to dry) and ollyo (to kill), suggesting the fern is killed by drought, it is also known as water velvet, mosquito fern, feathered mosquito fern, duckweed fern, fairy mass and water fern (Van Hove and Lejeune, 2002). It is also known as aquatic fern consisting of a small, branched, floating stem, bearing roots which hang deep in the water. The leaves are alternately arranged and each consists of a thick aerial dorsal lobe containing green chlorophyll and a thin floating ventral lobe of slightly larger size which is colourless. Under certain condition an anthocyanin pigment gives the fern a reddish-brown colour. Plant diameter ranges from 1-2.5cm for small species, such as *Azolla pinnata*, to 15 or more cm like *Azolla nilotica* (Yadav, 2021). Azolla plants are triangular or polygonal in shape, and float on the water surface or individually or in mats. They give the appearance of a dark green to reddish carpet, except *Azolla nilotica* which does not produce the red anthocyanin pigment. The most remarkable characteristic of azolla is its symbiotic relationship with the nitrogen fixing blue green algae (cyanobacterium) *Anabaena azollae*. The fern provides nutrients and a protective cavity in each leaf to *Anabaena* colonies in exchange for fixed atmospheric nitrogen and possibly other growth promoting substances (Saini *et al*., 2021).

Azolla is eco-friendly water fern as it never leads to contamination of the environment. It also does not compete with the rice plants for photosynthesis or nutrition. Such biological systems are able to provide 1.5-2.0 million tonnes of nitrogen for crop production in India whereas at least 3.3-4.4 million tonnes of urea will be required to give similar amounts of nitrogen. It can be used as human food, animal feed, medicine, production of biogas, hydrogen fuel, water purifier, weed control, reduction of ammonia volatilization and because of the multifaceted uses, it has been referred to as 'green gold mine'.

Species of Azolla Found

A.filiculoides, A.caroliniana, A. mexicana, A.microphylla, A.nilotica, A.pinnata (Van Hove and Lejeune, 2002)

Proximate Composition of Azolla as Per (references)

Parameters	**Azolla**
Moisture content	15
Crude Protein	24.46
Ether Extract	2.25

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Crude Fiber	8.34
Total Ash	3.82

Azolla as Livestock Feed

Azolla can be fed to the livestock in fresh or dried form. It takes a few days for the animals to get acquainted with the taste of Azolla. Thus, it is better to feed it along with the concentrate's mixture in the initial stages so it should be mixed with commercial feed in a 1:1 ratio to feed livestock. Due to higher protein content, it fulfills the requirement of animal body and its requirement within minimum cost.

Azolla as Poultry Feed

Poultry and in particular chickens and ducks can be raised on a diet including fresh Azolla. The poultry industry has adopted profitable businesses in agriculture, providing nutritious meats and eggs for human consumption within the shortest possible time without compromising the health. Though, the industry is now threatened by higher prices and the non-availability of feed ingredients, reflecting feed costs comprising 60 to 65% of the total cost of poultry production. The nutrient digestibility of crude protein, crude fat, and crude fiber was not affected by the level of azolla in the ration. The broiler birds can readily digest the crude fiber in azolla, but not that in rice bran. Feeding azolla to poultry improves the weight of broiler chickens and increases the egg production of layers, with additional input of some manure and phosphate .Fresh azolla can partially replace whole soyabeans upto a level of about 20% of the total crude protein in diets of fattening ducks. The birds that received normal feed with 5% extra supplementation of azolla showed a 10 to 12% increase in the total body weight (Yadav et al., 2022). Dietary inclusion of sun-dried azolla upto about 5% levels had no adverse effect on the productive performance of broiler chicken and additionally the feed cost per kg gain was reduced making the net profit per kg bird being higher.

Types of Animals	Quantity of Azolla Required
Adult cow	1.5-3.0 kg
Buffalo	2.0-1.5kg
Bullock	1.5-2.0 kg
Goat	300-500 grams
Pig	1.5-2.0 kg

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Layer/broiler	40-70 grams
Rabbit	60-100 grams

Table 1: Requirement of Azolla to feed to your livestock

How To Grow Azolla

A pit size 2×1 m^2 length, width, and 20 cm depth should be dug on earth.

Then the pit is covered with plastic gunnies to prevent the growth of roots of trees, soil temperature, and seepage water.

Plastic gunnies should be covered by Silpuline plastic sheet / plastic sheets are spread without any fold.

Uniformly sieve soil (about 10 to 12 kg.) is spread over the plastic sheet.

5 kg of cow dung, 20 g of SSP made into slurry in 10 liters of water and is transfer in the pit, and then more water is discharged to make the water level at about 15 cm.

About 1-2 kg of fresh, azolla seed culture is inoculated into the pit.

7 to 10 days after azolla grows and fill the pit. About 12 kg of azolla can be harvested daily/pit.

About 2 kg of dung, is ready into a slurry in 2 liters of water should be given once in 15-20 days.

Harvesting

It is easily harvested with a scoop net, or grown in enclosed, floating rings which can be pulled to the edge for easy harvest and with the help of plastic tray having holes of 1 sq cm mesh size azolla should be harvested, daily harvesting yield 10-12Kg/pit.

Precaution

- Temperature should be maintained below 30 ^{0} C, in case the temperature goes up, it should be maintained by providing shade to the pond.

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- For the good growth of azolla, overcrowding by the biomass should be avoided by removing it every day or alternative days.
- Ph should be maintained at 5.5 to 7.
- Azolla should be well washed with water before feeding to livestock.

Conclusion

Azolla is a very nutritive and cheap organic useful feed supplement for dairy cattle, duck, poultry, pig, fish, sheep, goat, and rabbit, etc. Substitution of azolla by supplementing feedshowed an overall increase of milk by 15 to 20%. After initial collection/buying, we can get a lifetime supply and is cost effective for farmers.

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