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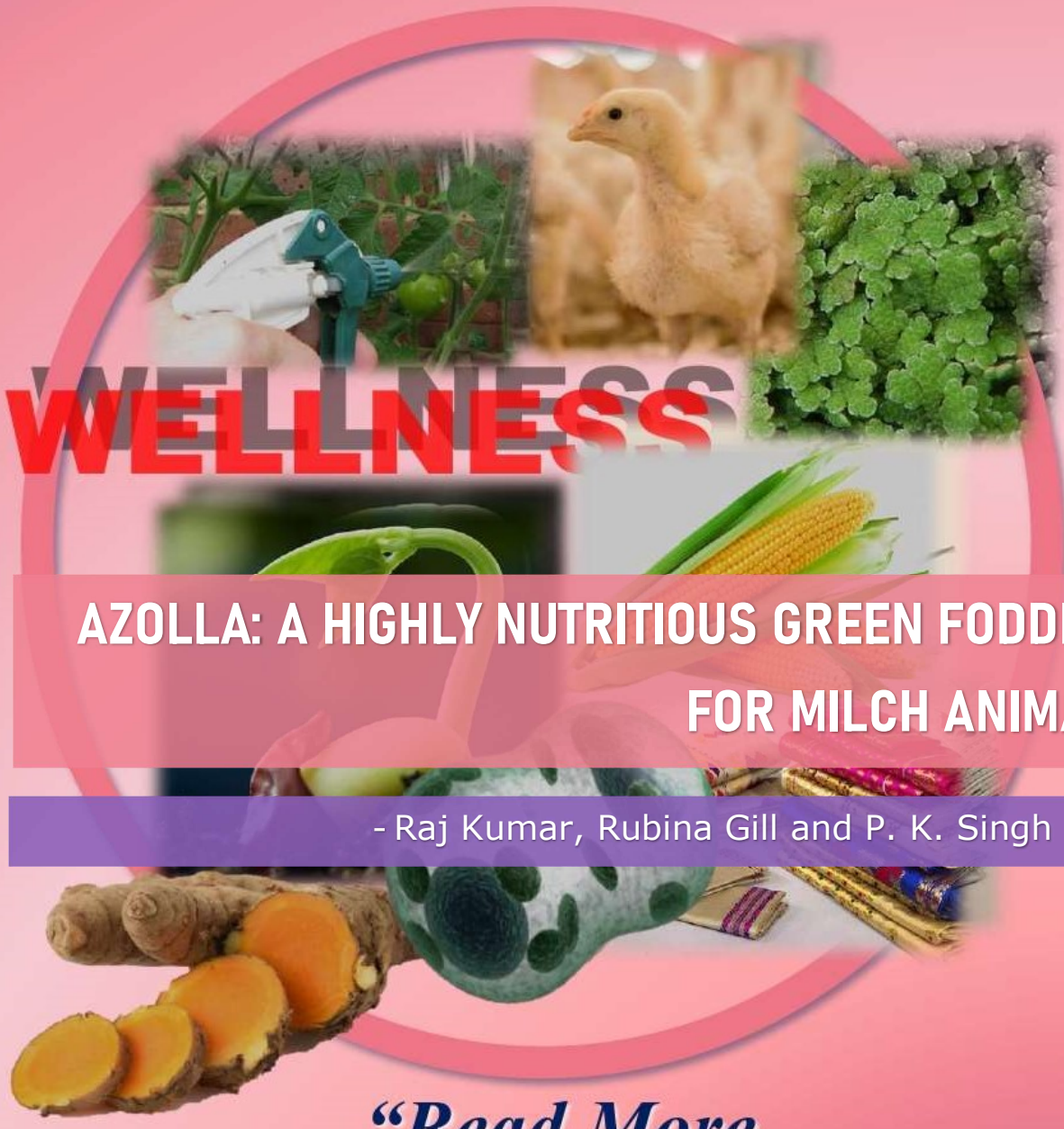

WELLNESS

AZOLLA: A HIGHLY NUTRITIOUS GREEN FODDER FOR MILCH ANIMAL

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AZOLLA: A HIGHLY NUTRITIOUS GREEN FODDER FOR MILCH ANIMAL

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AZOLLA

Azolla ***(Azolla pinnata X Anabaena azollae)*** is a branched free floating aquatic fern & naturally available mostly on moist soils, ditches marshy ponds and is widely distributed in tropical belts of India. There are at least eight species of Azolla worldwide; *Azolla caroliniana, Azolla circinata, Azolla japonica, Azolla mexicana, Azolla microphylla, Azolla nilotica, Azolla pinnata and Azolla rubra*. The common species of Azolla in India is Azolla pinnata. It produces more than 4 to 5 times of protein of excellent quality in comparison to lucern and hybrid napier. Azolla was found to be a very nutritive and cheap organic feed substitute for dairy cattle.

It is generally found floating on stagnant water. There is a small cavity on the upper most part of the leaf which houses as many as 80,000 blue green algae have the capacity to fix atmospheric nitrogen and make it available to azolla. In return the blue green algae gets shelter and food from azolla fern and blue green algae. When the plant dies and decays in the soil nitrogen becomes available to plants.

"Azolla cultivation is an excellent option for farmers who want to fix the Nitrogen in paddy fields and to save supplemental feed cost in livestock"

Classification of Azolla

Kingdom -Plantae – Plants
Subkingdom -Tracheobionta – Vascular plants
Division -Pteridophyta – Ferns
Class -Filicopsida
Order -Hydropteridales
Family -Azollaceae – Azolla family
Genus-*Azolla* Lam. – mosquitofern

NUTRITIVE VALUE OF AZOLLA

Nutritive value of Azolla is well documented which shows that it is a good source of protein 20-25% on dry weight basis with almost all essential amino acid required for animal nutrition (notably lysine). Furthermore, it also provides macronutrients like calcium, magnesium, potassium and vitamins like vitamin A (precursor beta-carotene) and B12.

Table 1: Comparison of biomass and protein content of azolla with other fodder

S.No.	Items	Annual production of biomass (MT/ha)	Dry matter content (MT/ha)	Protein content (%)
1.	Hybrid Napier	250	50	4
2.	Kolakattao grass	40	8	0.8
3.	Lucerne	80	16	3.2
4.	Cowpea	35	7	1.4
5.	Subabool	80	16	3.2
6.	Sorghum	40	3.2	0.6
7.	**Azolla**	**1,000**	**80**	**24**

Source : Dr P Kamalasanan et al. 2004 "Azolla -A sustainable feed substitute for livestock", Spice India.

Table 2 Chemical composition of azolla.

Nutrients	*Azolla*
Dry matter	4.70
Organic matter	82.66
Crude Protein	22.48
Ether extract	4.50
Crude fibre	14.70
Total ash	17.34

REQUIREMENTS FOR GROWTH

Azolla grows well in partial shade and requires light for photosynthesis. Generally, Azolla needs 25 to 50 per cent of full sunlight for its normal growth. Water is the basic requirement for the growth and multiplication of Azolla and is extremely sensitive to lack of water. The optimum temperature is 20 C to 30 C and the optimum relative humidity is 85 to 90 per cent. The optimum pH is 5 to 7. Azolla absorbs the nutrients from water. Though all elements are essential, phosphorus is the most common limiting element for its growth. About 20 ppm of phosphorus in the water is optimum.

CULTIVATION OF AZOLLA

Selection of Location for the Pond

- The location of Azolla pit/pond should be near water source.
- It should have access to road/path which helps for better maintainanace.
- The pit base and side should be free from plant roots, pointed stones etc. can puncture the sheet and cause leakage of water.
- The site under partial shade is ideal or else, shade has to be created to reduce the evaporation of water and also, for better growth of Azolla.

Pond size and construction

The size of pond/pit depends on number of animals, quantity of supplemental feed required and availability of resources.

- Mix clean fertile soil with cow dung and water needs to be spread uniformly in the pond. About 1-1.5 kg of fresh Azolla culture is needed for a pond of 6 × 4 feet size. It has to be applied uniformly in the pond. Biogas slurry can also be used instead of dung. For fast growth of azolla, the farmer can tap rain water during monsoon season. The depth of water should be four to six inches. If the total salt content of the water used for growing Azolla is high, it will adversely affect the growth.
- .All corners of the selected area should be cleaned and levelled so that a uniform water level can be maintained.

- The side walls of the pond can be of either bricks or raised embankment with the excavated soil.
- The pit floor is covered with plastic gunnies to prevent the roots of the nearby trees piercing the silpauline sheet, which is spread over the plastic gunnies without any fold.
- After spreading the durable plastic sheet, all the sides have to be secured properly by placing bricks over the side walls.
- After 10-15 days, Azolla fills the pit/pond because it grows rapidly after that we can remove one kg every day for animal feeding.
- Once in every 15 days, application of 2-5 kg buffalo dung, 100 g super phosphate should be added to obtain better growth of Azolla

MAINTENANCE OF THE POND

Application of about one kg of cow dung and about 100 grams of superphosphate once in two weeks will ensure better growth of Azolla. Any litter or aquatic weeds are seen in the pond should be removed regularly. The pond needs to be emptied once in six months and cultivation has to be restarted with fresh Azolla culture and soil.

PRECAUTIONS FOR AZOLLA CULTIVATION

- A shady place, preferably under a tree, with sufficient sunlight should be chosen for the Azolla production unit. A place of direct sunlight should be avoided.
- All corners of the pit should be of the same level so that the water level can be maintained uniformly.
- Azolla biomass @ 300 gms – 350 gms/sq.meter should be removed daily to avoid overcrowding and for keeping the fern at the rapid multiplication phase.
- Suitable nutrients should be supplied, as and when the nutrient deficiency is noticed.
- Plant protection measures against pests and diseases should be taken as and when required,
- About 5 kg of bed soil should be replaced with fresh soil, once in 30 days, to avoid nitrogen build-up and prevent micro-nutrient deficiency.
- 25 to 30% water is also needed to be replaced with freshwater, once in 10 days, to prevent nitrogen build up in the bed.
- Replacement of water and soil should be followed by fresh inoculation of Azolla, at least once in six months.
- A fresh bed has to be prepared and inoculated with a pure culture of Azolla when contaminated by pests and diseases.

Harvesting and Preparing

- Harvest the floating Azolla plants using a plastic tray having holes of 1 cm2 mesh size to drain the water.
- Wash the Azolla to get rid of the cow dung smell. Washing also helps in separating the small plants which drain out of the tray. The plants along with water in the bucket can be poured back into the original bed.

AZOLLA AS LIVESTOCK FEED

Azolla has vast potential as a livestock feed due to:

- Azolla an ideal organic feed substitute for livestock
- Livestock can easily digest azolla due to its high protein content and low lignin content
- Fresh azolla can be mixed with commercial feed in the ratio 1:1 or given directly to livestock
- It was found that the milk production in cattle increased by 10-12% when they were fed with azolla.
- It is also found that azolla feeding improve the quality of milk.
- Its ability to proliferate without inorganic nitrogen fertilization.
- Its high rate of growth in water without the need to displace existing crops or natural ecological systems.

AMOUNT PER DAY

Adult cow, buffaloes, bullock and pig-1.5- 2 kg/ day
Goat – 300-500 gram/ day
Layer/ broiler- 20-30 gram/ day
Rabbit-100 gram/day

SPECIFIC IMPORTANCE OF AZOLLA

- Azolla covering water surface reduce light penetration of soil surface, resulting in the depreciation in the germination of weeds (70% of the weed). Thus growth of azolla reduces aquatic weeds in flooded rice fields.
- The integrated use of azolla with rice and fish farming has been developed. The integrated approach can enhance a farmer's income while reduce the use of pesticide and fertilizers and consequently environmental pollution.
- It can fix atomospheric nitrogen; carry out photosynthesis and uptake nutrients from its surrounding environment through its root system.
- It has wide range of use including fodder for dairy cattle, pigs, chicken, ducks and fish.
- Azolla can be used for all type of vegetables and plantation crops.
- In some village communities it has even increased the overall milk yield.
- The application of azolla as biofertilizer on agriculture crops, in order to provide a natural source of crucial nutrients nitrogen, can be very beneficial for the future.
- Due to fact that rice paddy field from an ideal environment for azolla.
- Improve the nutritional status of the soil.
- Azolla has been used as green manure.
- Improve yields by 15-20 per cent.
- Azolla can be used as an animal feed a human food, a medicine and water purifier.
- It may also be used for the production of hydrogen fuel the production of biogas the control of mosquitoes and the reduction of ammonia volatilization which accompanies the application of chemical nitrogen fertilizer.

MOSQUITO CONTROL:

Azollas are extensively utilized for controlling the growth of mosquitoes in the crop fields. These plants grow on a thick layer of water that does not allow the larvae of mosquitoes to come up to the surface and they are choked to death. They help in protecting the crops from damage that can be caused by larvae and help in their proper growth.