RAISING
AZOLLA
A Potential Biofertiliser
(Package of Practices)

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What is Azolla?

Azolla a dichotomously branched free floating aquatic fern is naturally available mostly on moist soils, ditches marshy ponds and is widely distributed in tropical belt of India. The shape of Indian species is typically triangular measuring about 1.5 to 3.0 cm in length 1 to 2 cm in breath. Roots emanating from growing branches remained suspended in water. The dorsal lobe which remain exposed to air is having a specific cavity containing its symbiotic partner, a Blue Green Algae (BGA)., the *Anabaena azollae*. The fern is capable of fixing atmospheric nitrogen in the soil in the form of NH_4 + and becomes available as a soluble nitrogen for the wet land rice crop, which is the major cereal for the people of the North East.

Owing to the poor economic conditions of the farmers of the North Eastern States, rice crop is mostly grown under natural soil fertility with minimum inputs and amelioratives. But for taking a good crop of rice, judicious application of nutrients is necessary. Besides, this, farmers of the state of Meghalaya and other north eastern states have apathy in using chemical fertilisers in crop production. For sustainable crop porduction, there is a practice to supply some quantity of nutrients through organic manure, viz; FYM and composted plant residues and biofertilisers.

In the context of depletion of soil fertility and high prices of chemical fertiliser, it has become imperative to use biofertiliser which is a cheaper and renewable source of low cost plant nutrient and playing a major role in Intergrated Plant Nutrient Supply System. Use of *Azolla* fern as a biofertiliser is advocated to minimise the dependency of chemical fertiliser. *Azolla* supplements nitrogen to rice crop by fixing atmospheric nitrogen in the soil for crop growth, crop production and maintain soil fertility.

Economic Value

On dry weight basis *Azolla* contains the following chemical composition :

Nitrogen	: 5.0%
Phosphorus	: 0.5%
Potassium	: 2.0 - 4.5%
Calcium	: 0.1 - 1.0%
Magnesium	: 0.65%
Manganese	: 0.16%
Iron	: 0.26%
Crude Fat	: 3.0 - 3.3%
Sugar	: 3.4 - 3.5%
Starch	: 6.5%
ChlorophyII	: 0.34 - 0.55%
Ash	: 10.0%

Classification (Taxonomy)

Class	*: Pteridophyta*
Order	*: Salvinales*
Family	*: Azollaceae / Salvinaceae*
Genus	*: Azolla*
Sub Genus	*: Eu - Azolla*

Adaptability

Azolla caroliniana, Wield is identified as a cold tolerant species and survives well even at very low winter temperature of 5°C during the months of December to February in mid hills of Meghalaya. *Azolla pinnata*, L is a local isolate found widely in the entire North Eastern Region, but does not survive under mid hills of Meghalaya. However, *Azolla caroliniana*, Wield has shown its adaptability in hills and other similar locations.

Azolla caroliniana, Wield can be preserved in shallow pound having -15cm of standing water and by providing shade 10-15cm above the pond water surface through weeds or paddy straw. For raising *Azolla* inoculum a pond size of 3 M x 2 M x 1 M is most desirable. Under such weed or straw mulch cover, the *Azolla* multiplies rapidly and inoculum will be ready within a period of 20-25 days for further releasing in the main multiplication ponds on the onset of monsoon in the month of April.

How to grow *Azolla*?

- In low land, field is ploughed, levelled and small bunds of 50 cm width are made to make small ponds of 3 x 2 x 1 M size.
- Only 10-15 cm standing water is allowed in the ponds.
- The green *Azolla* @ 50-200 g/sqm + P_2O_5 through SSP @ 20 kg/ha along with Furadan 1 g/kg of *Azolla* is mixed and released in the pond maintaining a 10-15 cm of water level, for further growth and multiplication of *Azolla*.
- *Azolla* multiplies rapidly and form a green mat like a carpet on water surface of ponds in just two weeks. This green *Azolla* is harvested in bamboo basket and transferred and released in the transplanted rice field for further multiplication, as dual cropping with rice for fixing nitrogen to rice crop.
- Harvested green *Azolla* could be converted in to compost by ponding in pits for a month which is then used like FYM for other crops grown under upland situation.
- During summer, green *Azolla* is harvested at an interval of 15-20 days but during winter growth of *Azolla* becomes slow due to moisture stress and low winter temperature, hence *Azolla* can be harvested at 25-30 days interval during winter.

How *Azolla* fixes atmospheric nitrogen?

The remarkable feature of *Azolla* is that its symbiotic relationship with Cyanobacterium *(Anabaena azollae)* which remained on the dorsal leaf cavity of *Azolla*. The fern provides protein substances to *Anabaena* (BGA). The BGA then absorbed the atmospheric nitrogen and decomposes it through enzymic activity and converted in to soluble ammonia (NH_4 +).

Favourable condition for higher efficacy of *Azolla*

Water : 10 to 15 cm fresh current water is necessary in multiplication pond.

Temperature: The day/night temperatures ranging between 32°C and 20°C have found to be most favourable. The optimum temperature for luxurious growth of *Azolla* is 25-30°C and can be raised successfully in the mid hills.

Light : *Azolla* prefers to grow well under partial shade. As dual cropping *Azolla* gets partial shade from rice plant and therefore as dual cropping with rice is most successful.

Soil pH : *Azolla* grows well in slightly acidic soil having 5.2 to 5.8 pH.

Nutrition

Being an N fixing fern *Azolla* does not require nitrogenous fertiliser for its growth. However application of N @ 4 kg/ha is useful as a strating dose in new multiplication area. Phosphorus @ 20 kg/ha is desirable for good bio-mass production.

Yield

Azolla produces around 300 tonnes of green bio-hectare per year under normal sub tropical climate which is comparable to 800 Kg of N (1800 kg of urea).

Contribution of *Azolla*

- Basal application on green *Azolla* manure @ 10-12 t/ha increases soil nitrogen by 50-60 kg/ha and reduces 30-35 kg of nitrogenous fertiliser requirement of rice crop.
- Release of green *Azolla* twice as dual cropping in rice crop @ 500 kg/ha enriches soil nitrogen by 50 kg/ha and reduces N requirement by 20-30 Kg/ha.
- Use of *Azolla* increases rice yield by 20 to 30%.
- Rice varieties like DR-92, RCPL-1-87-8, Mendri, H.-2850 and Manipuri produced more than 30 q/ha rice yield when grown with *Azolla* as dual cropping under natural soil fertility.
- Under low land condition a thick *Azolla* mat does not allow the weeds to grow in rice field thus, *Azolla* suppresses the weed growth and creates congenial condition for rice production.
- *Azolla* reduces evaporation from water surface and increases water use efficiency in rice.
- Dry *Azolla* flakes can be used as poultry feed and green *Azolla* is also a good feed for fishes.

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