JUST AGRICULTURE
multidisciplinary e-Newsletter

Significance of Azolla in Agriculture

Rupsikha Goswami

Assistant Project Scientist (Assam Agribusiness and Rural Transformation Project)

Krishi Vigyan Kendra, Sonitpur, Assam Agricultural University, Jorhat

ARTICLE ID: 016

Introduction

In the present day the demand for organically produced food items is creating new potential in organic farming. Due to high market price the farmers and the youths are also giving more importance towards organic farming. According to the World of Organic Agriculture report 2018, India has the largest numbers (30 per cent of the total organic producers) of organic farmers globally. But accounts for only 2.59 per cent (1.5 million hectares) of the total organic cultivation area of 57.8 million hectares. At the same time most of the farmers are struggling due to spiraling cost of inputs, low productivity and limited market. Animal husbandry along with crop production in an integrated manner can be an alternate income generating opportunity for those disappointed growers. India ranks first in cattle and buffalo population, second in goat, third in sheep and seventh in Poultry. Availability of quality feed and fodder is another issue which actually has put burden on natural vegetation.

Azolla, an aquatic fern, which has been used as a green manure in paddy has tremendous potential to meet the growing demand for fodder for the small and marginal farmers taking up animal husbandry.

Discussion

Azolla, a small free floating aquatic fern in found in rice fields, ponds and wetlands of warm temperature and tropical regions. It is a pteridophyte which has the ability to double its biomass in 3-5 days. It fixes atmospheric nitrogen by forming a symbiotic association with Blue Green Algae (*Anabaena azollae*) (Bhubaneswari and Kumar, 2013). Azolla has a characteristic bilobed leaf that consists of a dorsal and ventral lobe. The dorsal lobe is green or purple in colour and it has a central cavity which houses the symbiotic *Anabaena azollae*. The ventral lobe is relatively thin and always remains partially submerged in water and provides buoyancy (Raja *et al.*, 2012). The symbiont liberates a substantial amount of

JUST AGRICULTURE
multidisciplinary e-Newsletter

biologically fixed nitrogen as ammonia which is absorbed by the host through branched hairs present in the cavity and unbranched hairs transport fixed carbon from host to the cyanobiont.

Azolla has recognizable six species- *A. pinnata, A. filiculoides, A. rubra, A.microphylla, A. imbricate* and *A. carolineana* and all these contain the *Anabaena* association (Raja *et. al.*, 2012). Application of nitrogenous fertilizers to any crop is important to increase per unit yield. But the continuous use of chemical fertilizers has created harmful effects on soil organic matter further enhancing nitrogen deficiency (Hossain *et. al.*, 2001). Moreover, nitrogenous fertilizers also cause acidification of soils (Stumpe and Vlek, 1991) and thereby reduce the microbial activity of the soil in long run (Sutton *et al.*, 1991). In order to increase soil fertility and soil productivity and also keeping in mind environmental safety, use of biological fertilizers (Azolla) can be utilized in farmers' field. From previous studies, it has been found that Azolla used as a cover on flood water surface of rice can control volatilization losses of ammonia. Ammonia volatilization and the gaseous emission of ammonia to the atmosphere are the major causes of low nitrogen fertilizer use efficiency.

These gaseous losses also cause economic loss to the farmers and cause negative effect on the environment. As such, Azolla occurring on the flood water surface at the time of first urea application effectively prevents the rapid increase in flood water pH associated with urea hydrolysis (Reddy *et. al.*, 1990). Azolla has low C:N ratio, therefore it is mineralized faster than other species (Wang *et. al.*, 1987) and supply nitrogen to crop plant. Also, it has been found that application of Azolla enhances soil nutrients availability by their biological activity and helps build up microflora. The decomposed organic matter from Azolla biomass helps in development of microbial population. Continuous application of Azolla increases the organic nitrogen content of the soil significantly (Yadav *et. al.*, 2014). Species of Azolla such as *A. pinnata* and *Lamna minor* removes the heavy metals iron and copper from polluted water. Azolla can also be used as food supplement for variety of animals such as pigs, rabbits, chicken, ducks and fish (Hove, 1989). Seultrope (1967) also reported that Azolla is harvested in large quantities for utilizing as fodder for cattle and pigs. Studies showed that Azolla slurry remaining after biogas production is suitable as fish pond fertilizer.

Conclusion

Thus, it can be concluded that application of Azolla as biofertilizer helps in maintaining and improving global environment. It had been found that Azolla is more resistant to

JUST AGRICULTURE
multidisciplinary e-Newsletter

environmental fluctuation and less labour intensive. Thus, considering all the importances of this aquatic pteridophyte it has been referred to as 'green gold mine' by Wagner, 1997.

References

Bhuvaneshwari, K. and Kumar, A. (2013) Agronomic potential of the association Azolla-Anabaena. *Science Research Reporter* 3(1):78-82.

Seulthrope, C. D. (1967) The biology of aquatic vascular plants. Edward Arnold (Pub) Ltd. London, pp. 610-615.

Wagner G. M. (1997) A review of its biology and utilization. *The Botanical Review* 63: 1-26.

Hossain M. B., Mian M. H., Hashem M. A., Islam M. Z. and Shamsuddoha A. T. M. (2001). Use of Azolla as biofertilizer for cultivation of BR 26 Rice in Aus season. *Online Journal of Biological Sciences* 1(12): 1120-1123.

Raja W., Rathaur P., John S. A. and Ramteke P. W. (2012) Azolla-Anabaena association and its significance in supportable agriculture. *Journal Biology and Chemistry* 40 (1): 1–6.

Reddy K. R., Angelo D., Lindau C. and Patrick W. H. Jr. (1990) Urea losses in flooded with established oxidized and reduced soil layers. *Biology Fertilizers and Soils* 9:283-287.

Sutton S. D., Barrett G. W. and Taylor D. H. (1991) Microbial metabolic activities in soils of old field communities following eleven years of nutrient enrichment. *Environment Pollution* 73: 1-10.

Stumpe J. M. and Vlek P. L. G. (1991) Acidification induced by different nitrogen sources in columns of selected tropical soils. *Soil Science Society of America* 55(3): 145-151.

Wang D. X., Zhao M.Z. and Chen D.F. (1987) Studies on the of the mineralization rate and nutrient releasing dynamics, Azolla utilization, Proceedings of Workshop on Azolla Use, pp 275, Fuzhou, Fujian, China, International Rice Research Institute, LosBanos, Philippines.

Yadav R. K., Abraham G., Singh Y. V. and Singh P. K. (2014) Advancement in the utilization of Azolla-Anabaena system in relation to sustainable agricultural practices. In *Proceedings of Indian National Science Academy* 80(2):301-316.