

Mystery of *Marsilea quadrifolia*- An Aquatic Fern

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Introduction

Among the aquatic plants, *Marsilea quadrifolia* L. is an important non-flowering plant. It is a leptosporangiate aquatic fern native to Europe and Asia which has played a key role in the evolutionary history of plants. In some parts of United States, it is considered as an aquatic weed. It is very common in aquatic or marshy habitat. Its life cycle is characterized by alternation of generations; reproduction occurs either sexually or by vegetative propagation. The species grows in wet habitats containing shallow water. It is very popular because of its nutritional and medicinal properties that include antibacterial, diuretic, depurative, cytotoxic and antioxidant effects. Mostly it grows in wild but due to its more popularization now it is cultivated by the farmers and sold in market as leafy vegetable (*Saag*) with price 40-60 rupees per Kg. This plant has been got place in Red data book of IUCN. As plant is red listed its conservation is very urgent.



Marsilea quadrifolia fern (Early age)



Marsilea quadrifolia (Late age)

Taxonomy

Division- Pteridophyta

Class- Polypodiopsida

Order- Salviniiales (Marsileales)

Family- Marsileaceae

Genus- *Marsilea*

Species- *Marsilea quadrifolia* L

Morphological Characters

Marsilea is characterized by heterospory, the ancestral progressive trait that led to the evolution of seeds. The main plant body is a diploid Sporophyte differentiated into root, stem (rhizome) and leaves. Rhizome is well branched and from the node adventitious roots are developed. Leaf is palmately compound and represented by four leaflets.

Species Dispersal

M. quadrifolia ferns are clearly dispersed by waterfowl. Wind dispersal is not possible because of both the size and weight of sporocarps, in addition to them being submerged. Conversely, hydrochory and zoochory play a key role, since reproduction exclusively occurs in the water. Sporocarps can be dispersed by aquatic birds as well as herbivorous mammals and fish, with dispersal occurring over several hundred kilometers

Uses

- **As Food Source:** - In most of the places the plant is used as food in different forms like fried and curry. The plant contains nutrients like Carbohydrate, Protein, Fat, Flavonoids, Aminoacids and Saponins.
- **Medicinal Value:** - It is an anti-oxidant and has anti-stress potential. The extracts also significantly reverse the behavioural and biochemical alterations in restraint stress. Moreover, it exhibit ant diabetic, antimicrobial and ant malarial properties. It is used to heal eye and skin diseases as well as to reduce body heat and thirst. It has a large impact on brain disorders and activity. Marsiline shows anti-epileptic efficacy and plant ethanolic extracts improve learning and memory due to facilitation of cholinergic transmission. The species has anti-cholinesterase potential and amnesia is reversed by *M. quadrifolia*.
- **Ethno-botanical uses:** - It used in the local Ayurvedic medicine by the Vaidyas for thousands of years. Leaf is used to cure headache, biliousness, to increase sperm formation. Root paste with black pepper is effective against boils.
- **Environmental Uses:-** *M. quadrifolia* has an economic value for wetland restoration due to its phytoremediation properties. It is used for nutrient uptake from freshwater lakes and for phytoremediation against heavy metals such as vanadium, arsenic, cadmium, chromium, mercury, and lead in the sediments and waters of mining areas. It exhibit high uptake capacity of heavy metals, especially in the roots. It is also able to treat sewage.

Conclusion

The *Marsilea* plantis slightly eutrophic-rooted aquatic species, able to tolerate different nutrient levels and has got a special place among aquatic plants due to its nutritional value, medicinal value and other uses. Besides its useful effects, it also has harmful effects and serves as a weed in the rice field. In some parts of the world, herbicides are used to manage this species. Therefore, it is a threatening species in the rice ecosystem. There is the requisite of developing different methods so that it should be cultivated in alternation with the rice. As the plant is gradually declining in wild its conservation is very urgent by taking different steps.