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MARSILEA QUADRIFOLIA LINN. - A VALUABLE CULINARY AND REMEDIAL FERN IN JADUGUDA, JHARKHAND, INDIA

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ABSTRACT

An investigation has been made on the relevance of one such lesser known species *Marsilea quadrifolia* Linn. (Vernacular name - sushni saag) commonly used by 'Ho' tribes in the mining belt of Jaduguda, Jharkhand (India) for its culinary and medicinal properties. Besides exploring indigenous knowledge of local tribals, the study also incorporates the survey of local markets in and around Jaduguda. Information was collected from the local tribal people (Ho) as well as local drug sellers in the Haat (local market) pertaining to use of *Marsilea quadrifolia* Linn. It is a pteridophytic plant that is marketed and used by tribals of that area for its nerve relaxant nature and curative properties for various other ailments of nervous system and its nutritional value. The present paper compiles botanical description *of M. quadrifolia* Linn., its traditional folk medicinal uses and marketing and monetary benefit to the villagers.

Keywords: *Marsilea quadrifolia* linn., botanical description, folk medicinal uses

INTRODUCTION

European Water clover is native to Europe and Asia, and is an aggressive and invasive non-indigenous aquatic species (Service and Peck,2008) . *M. quadrifolia* was found in shallow water on bottom rich in clay and silt. It forms more or less monospecies communities (Hulina, 1998). It is also rooted in the bottom of clayey soil in submerged water (Maewat et al , 2007). *M quadrifolia* is enlisted in the Red Data Book of the International Union for Conservation of Nature (IUCN) (Tuba, 1995). In Europe M. quadrifolia represents a rare species, included in Red list floras (Wraber and Scoberne, 1989). *M. quadrifolia* is also eaten by various tribal communities such as Kadars, Pulaiyars, Malasars, Malaimalasars, Mudhuvars of Anamailais hills, Western Ghats, Coimbatore district Tamil Nadu, India as per seasonal availability (Ramachandran,2007) . *M. quadrifolia* Linn. have got profound antibacterial, cytotoxic and antioxidant effect and may have potential use in medicine (Ripa et al, 2009) . A medicinal plant can be viewed as a synthetic laboratory as it produces and contains a number of chemical compounds. These compounds, responsible for medical activity of the plant, are secondary metabolites. For example, alkaloids which are nitrogenous principles of organic compounds combine with acids to form crystalline salts (Dubey and Tripathi, 2004). *M. quadrifolia* is loving plant for *Rana sp*. (frogs) (Bortamuli and Bordoloi, 2008) .Aquatic and semi aquatic macrophytes play an important role in maintaining the riverine ecosystem (Gopal and Zutshi,1998). According to Pradhan et al 2005, *M. quadrifolia* Linn. was found common and recorded from the riverine beds of six major rivers of South West Bengal (Dwarkeswar, Kansai, Keleghai, Rupnarayan, Shilabati and Subarnarekha). *M. quadrifolia* is beneficial for nutrient mitigation from the fresh water lake and significant progress has been made for wetland restoration (Khan and Manzoor,2010).

Marsilea quadrifolia Linn. is a pteridophyte belonging to Family Marsileaceae commonly known as European water clover. In eastern parts of India it is known as Sushni .The plant is widely distributed throughout India. It is an aquatic and amphibious plant

with roots embedded in the soil, mud or in shallow pools. The plant prefers light (sandy) and medium (loamy) soils. It can grow in semi-shade (light woodland) or no shade and requires moist or wet soil and can also grow in water.

Plant body of this fern is a sporophytic, resembles a four leaved clover plant shows differentiation into stem, leaves and roots. Rhizome is freely branched and is capable of indefinite growth. The rhizome is well branched and the branches arise at the base of the leaves. The primary roots are short –lived and are soon replaced by one or two adventitious roots that usually develop at the nodes on the underside of the rhizome. The leaves arise alternately in two rows from the upper surface of the creeping rhizome. Leaves, when young, show circinate venation.The petioles of submerged species are long, weak, cylindrical and flexible, with leaf-lets floating on the surface of water. However, the petiole of species growing on mud or ground, are short, cylindrical and upright. At the tip of each petiole, there are four leaflets of equal size, and hence commonly known as four leaf clover.

Propagation is through spores. The plant produces sporocarps that need to be lightly abraded and then immersed in water. The sporocarps then swell and burst to release the spores which germinate immediately. The highly developed prothallus remains inside the large seed-like spores. The gametophyte generation is completed in 24 hours and the first roots and shoots appear in 2- 3 days. Mature plants bearing sporocarps can develop in as little as 3 months. Spore germination (gametophyte growth) and fertilization occur immediately (Huxley, 1992).

This fern is commonly known in Jharkhand, West Bengal and Bangladesh as "Sushni".It is available in vegetable markets as a leafy green with medicinal properties. The name Sushni in colloquial Bengali that means 'don't sleep' as it is eaten cooked, for its soporific (sleep-inducing) effect. Tribal and other local people use it for relaxing in the night after day long work due to its abundant availability and relatively low cost than prescription drugs.

The present study is a part of exhaustive ethnobotanical survey conducted in and around the villages and local markets of mining belt of Jaduguda. The major ethnic community of this mineral rich belt is Ho tribe. Tribal belt of Jaduguda in Jharkhand is very rich in ethnobotanical information because to a large extent the tribal population depends on the native species for their food, fiber and medicinal use .An appropriate dosage of ethnopharmacognostic preparation from different parts of plant body such as roots, rhizome, bulb, leaves, bark, wood, flower, fruit, seed etc. are prescribed as a remedy for different disorders (Hains, 1921-25).

MATERIALS AND METHODS

This paper is based on extensive survey in the tribal dominated villages of Jaduguda that lie between latitude 22° 30' North and longitude 85° 40' East. The area is mountaneous with an average altitude of 172 m above msl. The average annual rainfall varies from 750 mm - 1300mm and minimum and maximum annual temperature vary between 20°C-45°C.April and May are the hottest months with an average temperature reaching 45°C.The survey has been undertaken using standard ethnobotanical methods like interviews of local tribals.The local family heads accompanied in field trips to forest areas from where they usually collect their edible/medicinal plants and confirmed. Local name, ailments for which they were prescribed, part of plant used, formulations and dosages etc. were recorded. Information was also obtained from local markets in the vicinity and details of marketed produce collected through personal interviews of old market traders and buyers for their medicinal and edible uses. These markets (Haats) are held twice a week in different localities. Detailed uses of specific plant parts are recorded. Information was also obtained on the specific time or month when the plant was collected, and marketed. Old and well-informed villagers collect *M. quadrifolia* Linn. (Sushni Saag) from the low lying moist areas and from near seasonal water bodies. After collection they sell it in local market that is visited by employees of UCIL (Uranium Corporation of India Limited) Jaduguda, HCL (Hindustan Copper Limited) also besides villagers.

The information collected for *Marsilea quadrifolia* Linn. commonly marketed as sushni Saag has been documented with botanical name, family name, common tribal name, taxonomic description, plant form, mode of use and price in the local market.

RESULTS AND DISCUSSION

Leaves and petioles are sold in local markets for its culinary uses commonly known as sushni saag (Table 1).Availability of this Saag in the market depends on the rains. If rain start in the first weak of June this Saag is available in the market by last weak of July till last weak of November that is till the soils remain saturated. Majority of local tribal population is employed for heavy physical work in the uranium mines and other industries in the vicinity and are exhausted by evening.

The specific knowledge of plants as a source of medicine dates back to the time of 'Rig Veda'. Much of this knowledge remained secret and often passed on from one generation to another through words of mouth instead of records. This knowledge is vanishing on account of rapid industrialization and modernization. Documenting the indigenous knowledge through ethnobotanical studies is important for the conservation and utilization of biological resources. The ethnomedicinal aspects of various tribes have been studied by different ethno-botanists and florists in the states of Orissa, Madhya Pradesh and Bihar[14-27]. The present study is a part of intensive ethnobotanical survey conducted in and around the villages and local markets of mining belt of Jaduguda. Specimens have been collected from the riverine belt of Gara river, Swarnrekha river and low lying areas of Jaduguda where rain water gets collected during rainy season for botanical identification and study of morphological features. Prevalent uses of *M. quadrifolia* Linn. for traditional and ethno medicinal interest have been recorded on the basis of primary data collection as well as secondary information based in available literature (Table1).

Marsilea quadrifolia Linn. in natural condition (A)

Leaves ,stems, rhizome and roots (B)

Sporocarps of the plants (C)

Venders collecting saag from low lying areas (D)

Vender selling sushni saag in the Jaduguda haat (E)

Each heap 250gm of sushni saag (F)

Plate1. *Marsilea quadrifolia* Linn. (Sushni saag) an overview

However, most of the primary ethno-medicinal information collected as part of this study has not been reported earlier (Table 1).

Table 1.*Ethomedicinal uses of Marsilea quadrifolia (sushni saag)*

S.No.	Plant part used	Preparation	Uses
1	Petiole and leaves (Matigora and Jaduguda village)	Cooked in oil with salt and masalas	Regular consumption relieves of hypertension, sleep disorders and headache (present investigation)
2	Petiole and leaves (Jaduguda village)	50 ml. warm mustard oil with garlic (2-5 gram) poured over Washed and chopped 250 gms. Petiole and leaves cooked covered with bamboo basket followed by seasoning with 4-5 gram desi masala (mixture of red chilies, turmeric, coriander and zeera) and salt	Consume only in the evening for sound tension free night sleep (minimum 12- 14 hours)and relaxes them both physically and mentally, Hypertension and other nervous disorders all type of body aches, insomnia (present investigation).
3	Entire fresh plant (Matigora)	Juice+ Garlic	Cure cough as well as convulsive condition of leg and muscles(present investigation)
4	Fresh shoots (Roam village)	Juice	Remedy for cough, respiratory troubles, especially for their babies (present investigation).
5	whole plant(Matua village)	Juice or paste	Applied externally on the head relieves from sleep disorder and hypertension (present investigation).
6	Entire fresh plant (Matua and Kalkapur Galudih village)	10 gm of entire fresh plant paste is mixed with 100 g of curd prepared from black cow's milk. The dosage is given orally once a day in empty stomach for one month	Epilepsy (present investigation).
7	Young leaves (Rakha mines)	Two drops juice of crushed leaves in the nostrils twice a day	Migraine (present investigation)
8	Whole plant	Crushed plant with sugar candy or honey	To cure infantile diarrhea(Sen and Behera,2008)
9	Whole plant	Whole plant including roots is made into a paste with whole plant of *Centella asiatica* applied twice daily for 7 days around the nipple	Improving lactation after childbirth (Shahidullah et al 2009)
10	Leaves	with one breath several leaves are to be plucked and the squeezed juice from the leaves massaged to all ten tendons of the body twice daily for 2-3 days	Tribe of Bangladesh lesions on tongue or in the mouth and rheumatism (Shahidullah et al, 2009)
11	Young stems and leaves	Cooked leaves and petioles	A famine food, only used in times of scarcity (Tanaka,1976)
12	Spores	Spores ground and mixed with flour	Used in making bread etc. It is rich in starch (Cribb,1976)

Table 2. ***Anonymous (1996-2008) has rated the three species of Marsilea for edibility but the medicinal value of only Marsilea quadrifolia has been mentioned.***

S.NO.	Latin Name	Common Name	Family	Edibility Rating	Medicinal Rating
1.	*Marsilea drummondii*	Common Nardoo	Marsileaceae	1	0
2.	*Marsilea mutica*	Nardoo	Marsileaceae	1	0
3.	*Marsilea quadrifolia*	Water Clover	Marsileaceae	1	2

Total Monetary return to villagers

As per market survey (haat) during June to October, 2010, five haats were surveyed in and around Jaduguda. These hatts are held once or twice every week and 20 local sellers sold the sushni saag. All local sellers collect the sushni saag from the adjacent areas and they sell at an average price of Rs.73.75/kg ranging from 40 to 120/kg (table 3). Maximum sellers come at Jaduguda haat because demand was very high. Most of the sushni saag is purchased by local UCIL employees. In other haats relatively lesser quantity was sold. Rakha mines haat also held two times in a weak time but price is lower. Villagers of Matigora, Roam and Rakha mines visit the Rakha mine haat. Narwapahar haat is held once in a weak but market price was very high. Galudih and Kalkapur villagers purchased from this haat. Among the five local markets studied, total 36 local sellers sell the on an average 83 kg. sagg for a total value of Rs.7215 that means an average weakly income of `200 from the *M. quadrifolia* sushni saag alone(table 3).

Table 3. Marketing of *M. quadrifolia* (sushni saag) in the local market (Haat) in and around Jaduguda

S. No.	Location of Haat	Days of Local market	Local seller	Total Average produce sold(kg)	Price(Rs/kg) in local haat	Average Price(Rs/kg)
1.	Jaduguda	Thursday	8 (2 male,6 female)	17.50	80-120	100
		Sunday	12(2male,10 female)	24.50	80-120	100
2.	Rakha mines	Tuesday	4 (male)	7.50	60-80	70
		Saturday	4 (male)	9.50	60-80	70
3.	Narwapahar	Wednesday	3 (female)	12.50	80-120	100
4.	Galudih	Monday	2 (female)	4.50	40-60	50
		Friday	2 (female)	2.50	40-60	50
5.	Kalkapur	Wednesday	1 (female)	4.50	40-60	50

Moreover, collection and marketing of this Saag is also a source of income for village women, as out of total 36 vendors, 24 are women. Promotion of e*x-situ* propagation of this species will generate a regular source of income for the villagers of the area.

CONCLUSION

M. quadrifolia Linn., (Plate 1) is an important marketable species that has a significant role in the lives of tribals. Inventorisation of this plant species that is being used since time immemorial in the area has been undertaken with the aim to promote it for *Ex- situ* conservation outside its natural habitats for wide use by other communities. *M. quadrifolia* Linn., pteridophyta is recommended for further phytochemical/ pharmacological investigation and nutritional analysis, which might result in a breakthrough of new drug molecules for human welfare. Since this plant species is being exploited from the aquatic, semi aquatic and riverine ecosystem. Aquatic and semi aquatic macrophytes play an important role in maintaining the riverine ecosystem. It is further suggested that nutritional analysis of some such prospective but under exploited species for food supplements and also help to protect the intellectual property of these tribal people by way of benefit sharing and sustainable utilization of the wild bioresources. Moreover, promotion of e*x-situ*

propagation of this species will generate a regular source of income for the villagers of the area.

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