

# Review on Fern *Marsilea Minuta* Linn (*Marsileaceae*)

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**Abstract-** *Marsilea minuta* Linn. is a fern belongs to the family Marsileaceae. The plant is distributed throughout India. According to Acharya Charak and Susruth it possess tridosaghan property and grahi in nature. The synonyms of the plant are Sitivara and Svastika. The chemical constituent marsilene, a macrocyclic ketone has been isolated from the plant which possesses sedative and anti-convulsant properties. The plant has been studied for their various pharmacological activities like adaptogenic-antistress, anti-depressant, anti-diabetic, anti-aggressive, anti-fertility, anti-tussive, hepatoprotective, analgesic and hypocholesterolemic activity. Ethno botanically the plant is important as it is used in the treatment of diabetes by local people in Javadhu Hills Tamil Nadu, India. Though, systemic information on various aspects of this species is unavailable. In present review, an attempt has been made to present the information regarding plant profile, pharmacological properties and ethno botany.

**Keywords-** *Marsilea minuta* Linn., tridosaghna, marsilene, antidepressant, ethnobotanically.

## I. INTRODUCTION

*Marsilea minuta* Linn. is a fern and grows in less moist areas commonly in rice and wheat fields of tropical India. The rhizome is aerial, slender, creeping below the surface of the soil. Roots are borne at the nodes. The young leaves are circinate, four leaflets terminate the petiole, and the leaflets are folded together, till maturity. Leaflets—entire or crenate. Pedicels 2-6, are basal, slightly connate or free. It is cooling, light to digest, appetizer and promotes sleep. <sup>[1]</sup>

## II. GENUS DESCRIPTION

*Marsilea* is represented by 53 living and 10 fossil species. The genus *Marsilea* with about 60-65 species is cosmopolitan distribution mainly in warmer parts of the world such as tropical Africa and Australia. About 9 living species have been recorded from India, of them four from Rajasthan. Of these *Marsilea minuta* Linn. is the commonest and *M. brachypus*, *M. quadrifolia*, *M. rajasthanensis* and *M. aegyptiaca* are the other important Indian species. <sup>[2, 3, 4]</sup>

## III. FAMILY FEATURE

Aquatic or marsh plants with slender creeping rhizomes, growing in mud, the leaf with blades (when present) often floating on surface of water and petioles arising from rootstocks, the blades simple or with 2 or 4 pinnae, fan-shaped, the veins dichotomous and anastomosing at margin; plants monoecious, producing megasporangia and microsporangia; the sporocarps hard and bean-shaped, borne on the petioles laterally or at their bases, stalked, solitary or numerous. Morphologically, the sporocarps are a modified leaf segment, folded together, containing 2 rows of indusiated sori within. Megasporangia produce megaspores which on germination give rise to egg cells, while the microsporangia produce microspores that give rise to sperm-producing antheridia.

## IV. SCIENTIFIC CLASSIFICATION

The Taxonomical Classification of *M. minuta* Linn. is as follows:

*Marsilea minuta* L., Mant.pl.Aitera 308.1771[Oct 1771]

Kingdom : Plantae

Phylum : Polypodiophyta

Division : Pteridophyta

Class : Equisetopsida C. Agardh

Subclass : Polypodiidae Cronquist, Takht. & W. Zimm.

Order : Marsileales

Family : Marsileaceae Mirb.

Genus : *Marsilea*

Species : *minuta* L. <sup>[5, 6, 7, 8]</sup>

## V. BOTANICAL DESCRIPTION

The plant *Marsilea minuta* L. belonging to the family Marsileaceae is a creeping herb with long, slender rhizomes; leaves alternate, in two rows on the rhizome. Petiole long, slender, with the four obovate–retuse, glabrous leaflets at the tip, arranged in a whorl. Flowers absent. Fructification (sporocarps) produced during summer, dark brown, hard and bean-shaped with two unequal horns.<sup>[9]</sup>

Plant is an aquatic leptosporangiate fern (pteridophyte) which is considered to be highly advanced among pteridophytes for as heterospory and specialization of ganteophytes. Small herbaceous plant with trailing habit shows profuse vegetative growth producing largest nodes in the rhizome.<sup>[10]</sup> (Figure 1).



Fig. 5.1 *M. minuta* Linn. in rice field

## VI. MEDICINAL USES

The ethanolic extract of *M. minuta* Linn. (Whole plant) produced CNS depressant effects and hypothermia in mice. The aqueous and alcoholic extracts of defatted and fresh leaves of *M. minuta* Linn. was proved effective for anti convulsant and sedative activities.

The microbiological studies on *Marsilea* (*Sunisannaka*) have been carried out. *Marsilea* leaves extract showed a mild degree of antifungal activity against *Alternaria alpandi*, *Fusarium nivale*, *Gleocladium*, *Phomopsis* and *Gibberella spp.* Optimum antibacterial activity was reported against *Bacillus anthracis*, *B. pumilus*, *B. subtilis*, *Salmonella paratyphi*, *Vibrio cholera*, *Xanth. Campestris* and *Xanth. Malvacearum*.<sup>[10]</sup>

## VII. HISTORICAL REVIEW

1. In *Charak Samhita*, *Sunisannak* (*Chaupatiya*) i.e. *Marsilea minuta* Linn. is *grahi* in nature and has *tridosaghan* property.<sup>[11]</sup>

2. In *Susruth Samhita*, *Susruta* has described *Sunisannak* in *Sak Varga*. *Sunisannak* has *tridosanasak* property and helpful in burning sensation and dysentery.<sup>[12]</sup>

3. In *Raj Nighantu*, *Sunisannak* has been described in *Satahadi Varga*.<sup>[13]</sup>

4. Classical texts describe this plant as a vegetable (*Saka*) and as having four leaflets (*Catuspatri*, *Caturdalah*), which resemble those of *Cangeri*, i.e. *Oxalis corniculata* (Vaidya Bapalal, 1982: 212). This has been universally accepted as belonging to the genus *Marsilea* (Marsileaceae) and the ancient descriptions compare well this plant.<sup>[14]</sup>

5. However, most of the authors have described it under the name *M. quadrifolia*, the taxonomy of which is in some confusion.<sup>[15]</sup>

6. In a recent paper, *Bharadwaja* (1980) has concluded that the Indian specimens have wrongly been identified as *M. quadrifolia*. The Indian specimens belong to *M. minuta* with which some authors have equated this drug (Singh & Chuneekar, 1972:436; Chuneekar, 1982:674; Sharma, 1983: 535).<sup>[16]</sup>

7. In *Shankar Nighantu* (1935 AD), *Sunisannak* is harmful for kidney and intestine. The antidote for this is the gum of babul.<sup>[17]</sup>

8. In *Nighantu Adarsh* (1928 AD) the leaves paste of *Sunisannak* is helpful in curing wounds.<sup>[18]</sup>

9. In *Dravyaguna Vijanan* (1997 AD), it is found throughout India, mainly near canals and marshy places.<sup>[19]</sup>

10. *Dalhana* has quoted *Brahmadeva* while describing the plant as follows:

*Sunisanna* plant has leaves like *Changeri* plant, leaves are 4 in number, it is growing in water or watery places. It is known as ‘*Catuspatri*’ (plant with 4 leaves).

*Dalhana*, here, has identified the plant thus:

A plant with 4 leaves. Others say *Sunisanna* is *Siravalika* plant.<sup>[20]</sup>

### VIII. PHARMACOGNOSTICAL REVIEW

1. Distribution: This plant is an emergent aquatic fern commonly found in marshy and shady places by the side of canals and rivers and also in the low flooded rice fields of West Bengal. The Genus *Marsilea* species are of wide and almost cosmopolitan distribution except for limited occurrence in some areas. [31, 32]

2. Synonyms: *Sitivara*, *Svastika*, *Sunisannaka*, *Srivaraka*, *Sucipatra*, *Parnaka*, *Kukkuta* and *Sikhi*. [33]

3. Vernacular names :

- Sanskrit- *Sunnisannaka*, *Catuspatri*
- Hindi- Choupatiya, Sunasuniya
- Bengali- Susani Shak
- Tamil- Arai-kirai
- Telegu- Mudugo-tamara
- Malayalam- Chitigina Soppu
- Kannar- Papalu
- English- Water clover, pepperwort. [34]

4. Rasa Pancak (Pharmacodynamics)

- ✓ *Rasa- Kasaya* (Astringent), *Madhura* (Sweet)
- ✓ *Guna- Laghu* (Light), *Snigdha* (Unctuous)
- ✓ *Virya- Sita* (Cold)
- ✓ *Vipaka- Katu* (Pungent)
- ✓ *Dosakarma- Tridosaghna* (that which alleviates all three dosas). [35]

5. Properties and actions:

- Karma- *Arsoghan* (alleviates piles), *Dipana-grahi* (Appetiser- Antilaxative), *Raktosodhana* (Blood Purifier), *Kasahara* (Destroys cough), *Vrsya* (Aphrodisiac), *Visaghna* (Removes poison), *Medhya- nidrajanana- vedanahara* (Promotes retentive intelligence- Induces sleep- Alleviates pain), *Caksusya* (Beneficial for the vision). [36]
- Roga- *Arsa* (Piles), *Vatarakta- urustambha* (Gout- Stiffness in the thigh muscles), *Agnimandya-grahani* (Digestive impairment- Malabsorption syndrome), *Raktavikara* (Disorders of blood), *Vataja kasa-svasa* (Cough due to vata dosa- Dyspnoea), *Sukraksaya* (Deficiency of semen), *Visa* (Poison), *Timiraroga* (Cataract), *Manasaroga-nidranasa* (Mental diseases-Insomnia). [37]

6. Therapeutic uses

The plant drug is used as nervine tonic in treatment of epilepsy and insomnia. The leaves are used as a remedy in carbuncle in thigh. Leaves roasted in ghee are used in bilious affections. The mature spores with butter milk recover urinary troubles. The plant acts as anti venom drug.

The whole plant of drug *Sunisannaka* is ground and pasted over wounds. Drug is suggested to be wholesome to protect and promote eye-sight. The vegetable of herb (*Sunisannaka Saka*) is fried in ghee (butter) and given in intrinsic haemorrhage (*raktapitta*) as *Sunisannaka* belongs to a group of vegetables wholesome (*pathyasaka*) in *Raktapitta* diseases. In condition of *Urustambha*, the vegetable of drug plant *Sunisannaka* is cooked in water and oil, without salt, and same is prescribed in diet. The drug plant is a major ingredient drug in *Sunisannaka cangeri ghrta* prescribed in management of piles or haemorrhoids (*arsa*). Stalks of leaves eaten as a pot-herb especially in times of scarcity. *Sunisannaka* does not cause heartburn, checks flow through channels. Settles three dosas. [38, 39, 40]

### IX. PHYTOCHEMICAL REVIEW

1. Chemical constituents: Marsilene, a macrocyclic Ketone with sedative and anti convulsant properties. [41] (Table 1).

2. Phytochemical studies on *Marsilea minuta* L. [42] The crude extract of *M. minuta* illustrated diverse phyto-profile with reference to solvents of the plant extracts. The phenol is present in all the tested extracts i.e., petroleum ether, chloroform, acetone, benzene and aqueous extracts of *M. minuta*. The flavonoid is present in petroleum ether, acetone and benzene. The tannin showed its present in all the extracts of *M. minuta* except ethanol. The coumarin and carbohydrates are present in the chloroform, acetone, benzene and aqueous extracts of *M. minuta*. The steroid is present in chloroform, petroleum ether, aqueous and ethanol and saponin in petroleum ether, benzene and chloroform extracts of *M. minuta*. Xanthoproteins is present in petroleum ether, acetone and aqueous extracts of *M. minuta*. The chloroform and petroleum ether extracts of *M. minuta* showed the presence of proteins.

### X. PHARMACOLOGICAL REVIEW

1. *M. minuta* Linn. has a wide range of Pharmacological activities. It is traditional used to promote appetite overcome the three dosas – *vata*, *pitta* and *kapha*-excess fat, fever, diabetes, leprosy and other skin diseases. The drug induces sleep and is used in mental and nervous disorders. It is an aphrodisiac; it purifies blood and cures cough,

haematological diseases, dyspepsia, piles and poisons. (Chunekar, 1982:674; Sharma, 1983:535).<sup>[43]</sup>

The various reported Pharmacological activities of the plant highlight the therapeutic potential of *M. minuta* Linn.

2. Adaptogenic Anti-stress Activity<sup>[44]</sup> *M. minuta* adaptogenic anti stress activity as shown by its mitigating effects on several chronic stress induced physiological and behaviour perturbations, comparable to that induced by the well accepted adaptogenic agent, *Panax ginseng*.

3. Antidepressant Activity<sup>[45]</sup> The anti-depressant effect exhibited by *Marsilea minuta* extract may be due to its effect on 5-HT<sub>2A</sub> density in rat frontal cortex. Anti-depressant activity was studied using forced swimming test (FST), tail suspension test (TST), learned helplessness test (LHT) and 5-hydroxytryptophan (5-HTP) induced head twitches response in rodents. Immobility time in FST and TST significantly P (<0.05) reduced by ethanol extract of *Marsilea minuta* treated animals. A decrease in number of escape failures in LHT was also observed in *Marsilea minuta* treated rats. Head twitch response induced by 5HTP was significantly attenuated by *Marsilea minuta* (400 mg/kg, p.o.) and imipramine showing the involvement of serotonergic system.

4. Antidiabetic Activity<sup>[46]</sup> *Marsilea minuta* has significant Antidiabetic activity when compared with standard drug Glibenclamide. The study was performed on ethanolic extract of MM leaf in oral glucose tolerance test (OGTT) and alloxan-induced diabetes models in albino rats. Three weeks treatment of diabetic animals with EEMM (250 and 500 mg/kg) showed significant check in rise of blood glucose compared to undertreated diabetic rats along with improved complete lipid profile. The fasting blood glucose, cholesterol, HDL cholesterol and serum triglyceride content were found to be significantly reduced (P<0.05) in EEMM treated rats and the extract also showed the potent elevation in the level of serum HDL cholesterol. On the basis of analysis of data obtained during the study, it may be concluded that EEMM leaf is having significant anti-hyperglycemic potential and can be further fractionated in order to get a responsible constituent for this very action.

5. Anti-aggressive Activity<sup>[47]</sup> The standardized extract of *M. minuta* was evaluated for its potential effects against defensive and offensive aggression behaviour models of rodents. *M. minuta* extract was orally administered at three dose levels (100, 200 and 400 mg/kg BW) once daily for 14 consecutive days as a suspension in Polyethylene Glycol (PEG), diazepam (2.5 mg/kg, p.o.) was used as a standard

anti-aggressive agent. Control groups animals were given an equal volume of vehicle (10% v/v PEG Suspension). Anti-aggressive activity was evaluated using the following validated models of aggression, viz: foot shock-induced aggression, isolation-induced aggression and resident intruder aggression, in rodents. The results show that the extract from *M. minuta* has a promising anti-aggressive activity qualitatively comparable to that of diazepam.

6. Anti-fertility Activity<sup>[48]</sup> The methanol extract of *M. minuta* was found to produce significant elevation of the level of total cholesterol and ascorbic acid content of the ovaries of the treated female swiss albino mice. It was showed that a significant reduction produces in the activities of glucose 6 phosphate dehydrogenase enzymes and  $\Delta^5$ -3- $\beta$ -hydroxysteroid dehydrogenase enzymes in mice. The results show that the methanol extract produced anti-fertility activity in mice, which may be due to inhibition of gonadal steroidogenesis.

7. Anti-tussive, expectorant activity<sup>[49]</sup> The anti-tussive activity of *M. minuta* methanol, ethyl acetate, and petroleum ether extracts was evaluated using ammonia and sulphur dioxide induced mice coughing. The expectorant activity was evaluated by the volume of phenol red in mice's tracheas. Extracts significantly increased mice's cough latent period and inhibited the frequency of cough induced by ammonia and sulphur dioxide, and improved tracheal phenol red output in expectorant evaluation. Methanol extract produced the highest activity in all tested models. Methanol extract at 500 mg/kg showed 59.5% and 55.8% inhibition in the number of coughing induced by ammonium liquor and SO<sub>2</sub>, respectively, while it showed 89.3% increase in phenol red secretion at the same dose, which showed superior activity compared to other extracts. The present study provided evidence for *M. minuta* to be used as an anti-tussive and expectorant in Indian folk medicine.

8. Biological Activity<sup>[50]</sup> The anti-bacterial activity of ethanolic extract of *M. minuta* by disc diffusion method and the concentration of cadmium and chromium was determined by using the atomic absorption spectroscopy. The metal contents were extracted from the plants and crude extract by using wet digestion process.

9. Hepatoprotective Activity<sup>[51]</sup> The methanolic extract of *M. minuta* has hepatoprotective and anti-hepatotoxic effects in CCl<sub>4</sub> induced hepatotoxicity in rats by its ability to stabilized cell membrane, which may be due to its antioxidant property by in vitro DPPH assay. MMME at 100, 200, 400 mg/kg

b.w.p.o showed a significant decrease in serum bilirubin levels suggesting the possibility of the extract's ability to repair the damage of the hepatocytes caused by CCl<sub>4</sub> in prophylactic and curative studies.

10. Hypocholesterolemic Activity<sup>[52]</sup> Feeding of a *Marsilea minuta* leaf extract (Fr.L) reduced serum cholesterol and triglycerides by 31 and 63% respectively, in athero diet fed gerbils. Liver cholesterol and triglycerides were also lowered by 71 and 27% respectively, in comparison to athero fed controls. Moreover, treatment with Fr.I prevented the accumulation of cholesterol and triglycerides in liver and aorta and was able to dissolve atheromatous plaques of thoracic and abdominal aorta. Faecal excretions of cholesterol and triglycerides were significantly increased in Fr.I fed gerbils.

11. Locomotor and Analgesic activity<sup>[53]</sup> *M. minuta* was used in ancient days as valiya varahydighrtam to produce sedative action and to control the vatadosha's induced pain. In the study locomotor and analgesic activity of different extracts of aerial parts of *Marsilea minuta* were evaluated in albino mice. The extracts produce significant locomotor and analgesic activity when compared with standard drugs- diazepam and pentazocine respectively.

#### XI. MISCELLANEOUS

1. Structure of Marsileagenin A: A new hexahydroxy triterpene from *Marsilea minuta* Linn.<sup>[54]</sup> The crude saponin obtainable from *Marsilea minuta* Linn. on acid hydrolysis yielded a mixture of Sapogenols. The major sapogenol named Marsileagenin A was found to be a hexahydroxy triterpene of oleanene series. From a study of various Spectrometric data together with chemical reactions the structure of this sapogenol has been assigned as olean-12-ene-2 $\alpha$ , 3 $\beta$ , 16 $\beta$ , 21 $\beta$ , 22 $\alpha$ , 28-hexol (1 $\alpha$ ).

2. Ultrastructural and biochemical effects of cadmium on the aquatic fern *Marsilea minuta* Linn.<sup>[55]</sup> The uptake of cadmium by cultured vegetative clones of the aquatic fern *Marsilea minuta* Linn. was studied in a static experimental bioassay system as functions of dose and period of exposure. The pathomorphological manifestations of Cd toxicity, as studied by transmission electron microscope, indicated damage to chloroplasts and tonoplasts as well as electron opaque granular deposits. Preliminary evidence based on molecular sieving Chromatography showed the formation of two cadmium binding proteins of 78 and 33kDa in the leaf tissue under cadmium stress.

#### XII. ETHNOBOTANICAL REVIEW

Description of Ethno botanical Uses of *M. minuta* Linn. in different localities are enlisted. (Table 2).

#### XIII. CONCLUSION

The plant has long being investigated for its pharmacological activities supporting its vast ethno botanical and alternative medicinal use. The plant has been reported extensively as anti-depressant, anti-stress, anxiolytic, anti-fertility and anti-tussive agent. Though diseases treated indigenously using the plant has not been confirmed in the laboratory so this leaves an opportunity to explore the species both phytochemically and pharmacologically. Ethno pharmacology can bridge between the folklore use and actual pharmacological efficacy of medicinal plant. Therefore it may be used in novel drug discovery in near future.

#### XIV. ACKNOWLEDGEMENTS

The author wish to thank Prof. Monica Gulati (Dean, School of Pharmaceutical Sciences, Lovely Professional University) for her encouragement and moral support and Mr. Saurabh Singh Baghel for his constant support and guidance.

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Parts	Active Constituents
Alcoholic extract of <i>M. minuta</i> Linn.	A saponin (a mixture of sapogenols on hydrolysis). Marsileagenin A, the major sapogenol was found to be olean-12-ente-2a, 2B, 16B, 21a, 22a, 28-hexol whereas the other two sapogenols viz. Marsileagenins B and C were present in small quantities. <sup>[10]</sup>
Chloroform extract of leaves of <i>M. minuta</i> Linn.	Marsilin <sup>[10]</sup>
Chloroform extract of whole plant	$\beta$ - sitosterol <sup>[10]</sup>
Roots and Stems of <i>M. minuta</i> Linn.	Marsilin <sup>[10]</sup>
Petroleum ether extract of leaves of <i>M. minuta</i> Linn.	An asymmetrical hydroxyketone substance (3-hydroxy-triacontan-11-one and a mixture of secondary alcohol with kentriacontane-16-01. <sup>[10]</sup>
<i>M. minuta</i> Linn.	Calcium and Phosphorous <sup>[10]</sup>

Table 1: Chemical Constituents

S. No.	Location	Ailment treated/Properties and action
1.	Bannu District, Pakistan <sup>[56]</sup>	Methanol extract from the leaves is used to prevent accumulation of cholesterol and triglyceride in the liver
2.	Javadhu Hills, Tamil Nadu, India <sup>[57]</sup>	Leaf juice is used for diabetes. Local name is Aarakkerai.
3.	Kumaun Himalaya, Uttarakhand, India <sup>[58]</sup>	Plant used in cough, spastic conditions of leg muscles, in sedation and insomnia. A macro cyclic ketone of sedative and convulsant properties has been isolated.
4.	Mirzapur village of Dinajpur district, Bangladesh <sup>[59]</sup>	Juice obtained from crushed whole plant is used in gastrointestinal disorder.
5.	Moarea, French Polynesia <sup>[60]</sup>	Respiratory (Cough) India [Dhiman 1998, Vasudeva 1999] Eye diseases India (Dhiman 1998) Reduce cholesterol in gerbils (Gupta et al 2000).
6.	Pachmarhi, Central India (Pagara, Bariam Amkhedi, Neemghan, Singanama, Tekapar, Chaka and Pisua) <sup>[61]</sup>	The whole part of plant is used to treat cough, spastic conditions of leg muscles, in sedation and insomnia. A macrocyclic ketone of sedative and convulsant properties has been isolated.
7.	Pudu kottai district, Tamil Nadu, India <sup>[62]</sup>	The dried and powdered leaves, mixed with hot water, are taken in cases of diabetes.
8.	Ranchi & Latehar District of Jharkhand, India <sup>[63]</sup>	Plant is used in cough, spastic conditions of leg muscles, in sedation & insomnia. A macrocyclic ketone of sedative and convulsant properties has been isolated.
9.	Sal forests of Jharkhand, India <sup>[64]</sup>	The whole plant is used in body ache.
10.	Simlipal Biosphere Reserve, Orissa, India <sup>[65]</sup>	Plants are used in cough, spastic condition of leg & muscle. About 10g whole fresh plant paste is mixed with 100g of crud prepared from cow's milk. The dosage is given orally once a day in empty stomach for one month against epilepsy. Younger leaves are crushed to extract the juice and 2 drops of juice are dropped in the nostrils of nose twice a day effective in migraine.
11.	Vindhyan Region, (M.P), India <sup>[66]</sup>	Plants are used in cough, spastic condition of leg muscles. Plant is sweet, diuretic and ophthalmic. It is used in Psychopathy, Ophthalmia,

		Diarrhoea, Leprosy, Skin diseases, Hemorrhoids and Fever.
12.	Flora of Nasik district, India <sup>[67]</sup>	Occasional in stagnated waters Karanjul (Surgana range ). Sporocarps: October – April. Leaves are cooked and eaten as vegetable.
13.	Southeast Alabama, USA <sup>[68]</sup>	It is known dwarf water clover. It is found in Shoreline and shallow water along margin of beaver pond.
14.	Flora of Eastern India <sup>[69]</sup>	<i>a) Marsilea minuta</i> (Leaves entire or slightly crenate) It is found in Eastern India and other parts of India. Grows in marshy places along ponds, ditches, lake. Uses: Leaves are eaten as vegetables. <i>b) Marsilea minuta</i> var. <i>Indica</i> (Leaves always crenulate) It is found in Rajasthan, Punjab, West Bengal (India). Grows on marshy places near ponds, lakes, jhils. Uses: Leaves are edible.
15.	Fern Flora of Punjab, Pakistan <sup>[70]</sup>	This species is just like <i>M. quadrifolia</i> , but smaller in size, its length is about 7.5 cm and margins are crenate.
16.	Flora of Chandgad forest of Kolhapur distric (Maharashtra), India <sup>[71]</sup>	It is a semi aquatic fern used by the native people from the hilly region of Chandgad.
17.	Surguja and Korea region in Chattisgarh, India <sup>[72]</sup>	Sleeping disorders, tranquilizer.
18.	Kalahandi district of Odisha, India <sup>[73]</sup>	Equal amount of spores of the plant, roots of <i>Smilax Zeylanica</i> , root of <i>Lawsonia inermis</i> and white coloured onion bulb is ground and the extracted juice is taken orally twice a day upto 7 days to cure jaundice. Leaves are cooked and taken to cure insomnia.
19.	Pteridophytes of Rajasthan <sup>[74]</sup>	Garasia and Bheels cook the leaves as vegetable. The decoction of leaves along with ginger is used to cure cough and bronchitis in many villages of Rajasthan.

Table 2: Ethno botanical uses of *M. minuta* Linn. around the world