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Research Article

AN IN-DEPTH PHARMACOGNOSTICAL VIEW OF *SUNISHANNAKA* (*MARSILEA QUADRIFOLIA* LINN) – A VALUABLE PTERIDOPHYTE

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ABSTRACT

Sunishannaka (*Marsilea quadrifolia* Linn) is a known pteridophytic creeping aquatic fern, commonly known as European Water Clover belonging to the family Marsileaceae which is being used extensively since *Samhita* period. According to Acharya Vagbhata, it is included among *Pathyaahara* or *Nityasevaniyaahara* which itself shows its nutritional importance. Pteridophytes have considerable importance in traditional pharmacopoeias, whereas scientific studies on pharmacognosy of this group are scanty. Records of indigenous medicinal knowledge about pteridophytes need to be given top priority to aid the protection of such knowledge before they vanish from present day traditional healers. This work aims at understanding the organoleptic features and microscopic details of leaf, petiole and rhizome(stem) and root of *Marsilea quadrifolia* Linn. Even though the drug *Sunishannaka (Marsilea quadrifolia* Linn) is being used by traditional *Vaidyas*, but the detailed study regarding the microscopical aspects of the plant has not been documented in detail. So the present paper will definitely throw a light towards the microscopical characters of the plant which is much essential to provide a key towards identification of the plant source and to prevent any adulterations.

KEYWORDS: Pharmacognosy, *Sunishannaka, Marsilea quadrifolia* Linn, Microscopy.

INTRODUCTION

Sunishannaka (Marsilea quadrifolia Linn.) is a pteridophytic perennial, creeping herb, belonging to the family Marsileaceae is being used extensively since *Samhita* period. It is being considered as a wholesome leafy vegetable rich in protein and starch. The pteridophytes constitute the primitive vascular plant group which is found scattered all over the world.

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, very commonly seen in wet, marshy places, flooded low lands and along the banks of canals and rivers. Roots are adventitious, arising from the underside of the node of rhizome, either singly or in groups. It has long, slender, dichotomously branched rhizome with rooting at nodes. Petiole is long, slender and flexible. Leaves are quadrifoliate, alternate, in two rows on the rhizome, circinate when young, lamina divided into four leaflets, obovate-retuse, glabrous at tips and arranged in a whorl.[1] Flower is absent. Sporocarpis bean shaped with two unequal horns, greenish when young and dark brown while becoming old, hard, borne on short distance above the base of the petiole.[2]

MATERIALS AND METHODS

Macroscopic study of roots

Preparation of sample: The whole plant of *Sunishannaka* (*Marsilea quadrifolia* Linn) was collected freshly from the nearby canals of paddy fields and washed thoroughly to remove soil and debris.

Method of study: The macroscopic characters of leaf, petiole, rhizome (stem) and root of fresh sample of the drug was studied under organoleptic methods.

Microscopic characters

Preparation of sample: The whole plant of *Sunishannaka* (*Marsilea quadrifolia* Linn) was collected freshly from the nearby canals of paddy fields and washed thoroughly to remove soil and debris.

Method of study: Fresh leaf, petiole, rhizome and root were selected and uniform fine sections of each part were taken using new blades. Thin sections were selected, stained using Safranin stain, then placed over clean glass slide and covered with clean cover slips. The slides were observed under the microscope under different magnifications and the cells were identified.

RESULTS AND DISCUSSION

The macroscopic characters of leaf, petiole, rhizome (stem) and root of *Sunishannaka* (*Marsilea quadrifolia* Linn) were analysed by organoleptic method.

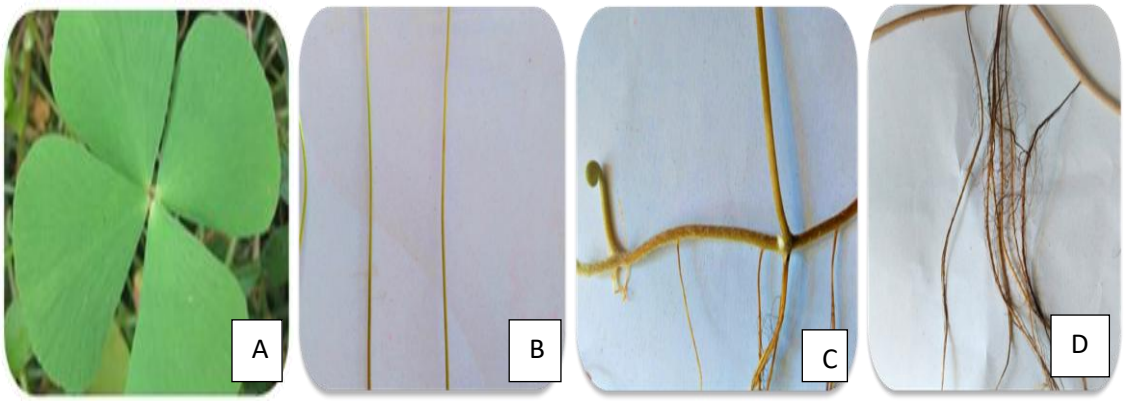

Fig 1 A: Leaf; Fig B: Petiole; Fig C: Stem (Rhizome); Fig D: Root of *Sunishannaka (Marsilea quadrifolia* Linn).

(a) The macroscopic features of leaf are summarized in table 1.

Table 1: Organoleptic characters of leaf of *Sunishannaka* (*Marsilea quadrifolia* Linn)

Kind: compound, quadrifoliate	Shape: obdeltoid
Size: Length- 2cm, Width- 1.5cm	Base: connate
Apex: retuse	Margin: entire
Fracture : easy	Surface: smooth and glabrous
Venation: dichotomous	Taste: mild astringent
Colour: pale yellowish green	Odour : nil

(b) The macroscopic features of petiole are summarized in table 2.

Table 2: Organoleptic characters of fresh petiole of *Sunishannaka* (*Marsileaquadrifolia* Linn)

Shape	Cylindrical
Size	5.5-17 cm long, slender
Colour	Greenish
External characters	densely covered with dull white hairs
Taste	Astringent – mild sweetish
Fracture	Fibrous

(c) The macroscopic features of rhizome (stem) are summarized in table 3.

Table 3: Organoleptic characters of fresh stem (rhizome) of *Sunishannaka* (*Marsilea quadrifolia* Linn)

Shape	Cylindrical
Colour	Greenish- brown
External characters	Densely covered with dull white hairs
Fracture	Fibrous
Taste	Mild Astringent

(d) Themacroscopic features of root are summarized in table 4:

Table 4: Organoleptic characters of fresh root of *Sunishannaka* (*Marsilea quadrifolia* Linn)

Type	Adventitious roots , roots both at nodes and internodes of rhizome
Size	10-20 cm length, 0.5-1mm breadth
Shape	Cylindrical tapering
External characters	With many lateral rootlets
Colour	Brownish
Odour	Characteristic
Fracture	Fibrous
Taste	Astringent

Microscopic analysis

i) Microscopic analysis of leaf of *Sunishannaka* (*Marsileaquadrifolia* Linn)[3]

Epidermis- one layer of wavy epidermal cells with anisocytic stomata.

Mesophyll- is differentiated into an upper palisade tissue which is elongated cells with chloroplast. Lower layer contains spongy tissue with loosely arranged parenchymatous cells and large air spaces.

Vascular bundles: In between the mesophyll tissue are present several vascular bundles. Each vascular bundle is concentric and amphicribal type i.e., made up of a centrally situated xylem, surrounded on all sides by phloem. The phloem is enclosed by a single layered thick endodermis.

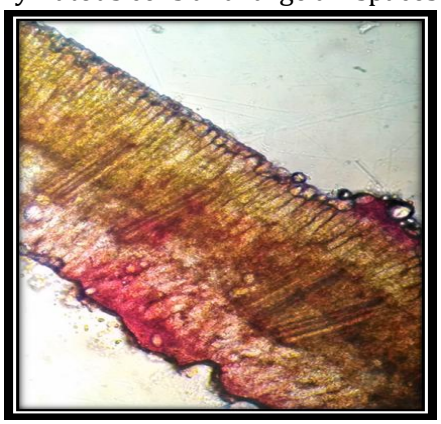

Fig 2: T.S of leafshowing epidermis, palisade tissue, vascular bundle, air space and spongy tissue of *Sunishannaka* (*Marsileaquadrifolia* Linn)

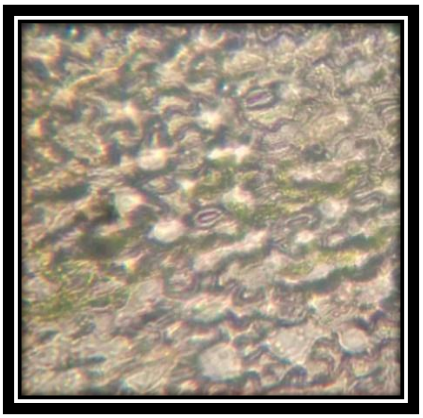

Fig 3: Stomata and wavy epidermal cells of leaf of *Marsilea quadrifolia* Linn(40X)

ii) Microscopic analysis of petiole of *Sunishannaka* (*Marsilea quadrifolia* Linn)

Epidermis:- Outermost layer of single cell thickness. The cells are parenchymatous and slightly elongated. Trichomes are present.

Cortex: Outer cortex is present just below the epidermis, (also called hypodermis) which is made of thin walled cells (parenchymatous). Middle cortex lies below the hypodermis and called aerenchyma consisting of air chambers. The air chambers are separated by single layered partitions of thin-walled parenchymatous cells. Inner cortex is a solid tissue of several cells thickness. The cell layers are parenchymatous and contain starch and tannin filled cells.

Stele: It is somewhat triangular in outline and is of protostelic type i.e. pith is absent. Xylem is "V" shaped with 2 distinct arms. Each arm is provided with metaxylem elements in the centre and protoxylem is situated at both the margins i.e., protoxylem is exarch. The xylem is surrounded on all sides by phloem. Phloem is externally surrounded by a single layer of parenchymatous pericycle which, in turn, is bounded by a single layered endodermis.

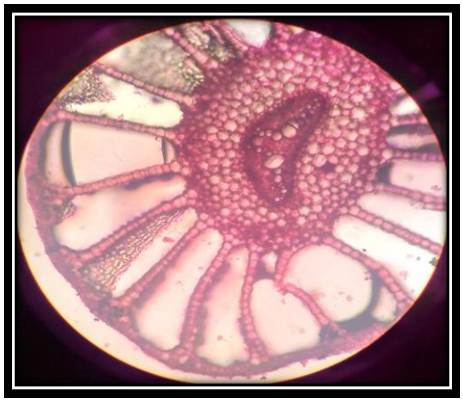

Fig 4: T.S of petiole of *Sunishannaka (Marsilea quadrifolia* Linn) showing Protoxylem, Phloem, Metaxylem, Endodermis, Pericycle, Inner cortex, Septum, Middle cortex, Outer cortex [hypodermis], Epidermis.

Fig 5: Trichome of petiole of *Sunishannaka* (*Marsilea quadrifolia* Linn) 40X

iii) Microscopic analysis of stem (rhizome) of *Sunishannaka* (*Marsilea quadrifolia* Linn)

Epidermis is the outermost limiting layer of single celled thick parenchymatous cells. Stomata are absent.

Cortex: Outer cortex is present just below the epidermis (also called hypodermis). It is parenchymatous and may be one to several cells thick. Some of its cells contain tannin. Middle cortex is also called aerenchyma which lies below the hypodermis. It consists of large air spaces (chambers) separated by one cell thick parenchymatous septa. Inner cortex is a solid tissue of several cells thickness. Some of these cells are filled with starch or tannin.

Stele: In the centre there is a pith. Xylem is present in the form of a complete ring which is surrounded on both sides by a complete ring of inner and outer phloem, pericycle and endodermis.

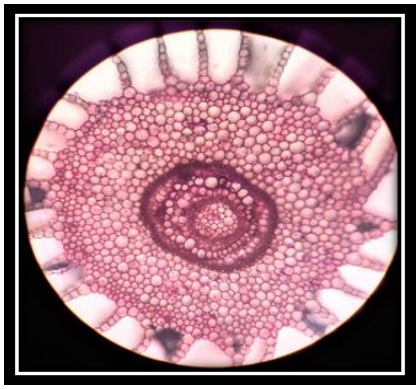

Fig 6: T.S of stem (rhizome) of *Sunishannaka* (*Marsilea quadrifolia* Linn) showing Air space, Cortical sclerenchyma, Outer endodermis, Inner endodermis, Xylem, Pith, Cortex, Phloem.

Fig 7: T.S of stem (rhizome) of *Sunishannaka* (*Marsilea quadrifolia* Linn) showing Epidermis, Outer cortex, Middle cortex, Parenchymatous septa, Tannin containing cells.

iv) Microscopic analysis of root of *Sunishannaka* (*Marsilea quadrifolia* Linn)

Epidermis: It is the outermost, parenchymatous, single layered covering.

Cortex: The outer cortex consists of large air chambers arranged in the form of a ring (parenchymatous). These chambers are separated from each other by longitudinal septa. The inner cortex is differentiated into outer parenchymatous and inner sclerenchymatous regions. The inner cortex is delimited by single layered thick endodermis.

Stele: Is devoid of pith. Xylem is situated in the centre which is diarch and exarch. It is surrounded by phloem. The phloem is bounded externally by a single layer of pericycle.

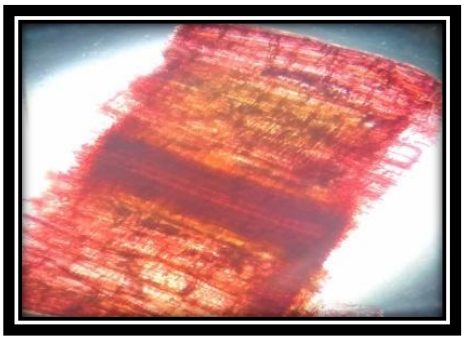

Fig 8: T.S of root of *Sunishannaka* (*Marsilea quadrifolia* Linn) showing epidermis, cortex and stele

The macroscopical and microscopical analysis of the different parts of *Marsilea quadrifolia* Linn coincides with the available details in various articles and textbooks of pharmacognosy.

CONCLUSION

The findings drawn from the study substantiates the genuineness of the drug *Sunishannaka (Marsilea quadrifolia* Linn.), which is in par with the authentic descriptions available in the authentic books. The data obtained add on to the existing details available so far. The pharmacognostic analysis of various parts of this plant, and the diagnostic microscopic features reported in this paper could be useful for the compilation of a suitable monograph for its proper identification.

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