



Research Article

PHARMACOGNOSTIC AND PRELIMINARY PHYSICO-CHEMICAL EVALUATION OF *MATSYAKSHI* [*ALTERNANTHERA SESSILIS* (LINN.) R.Br]

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ABSTRACT

Alternanthera sessilis (Linn) R.Br. is a plant that belongs to the family Amaranthaceae. This species has a huge global range, including both native and introduced distribution. The plant has been widely used by the ethnic population for food and medicine. The plant has been mentioned in Ayurvedic classics by the name *Matsyakshi*. The plant is also observed to be an ingredient in the some of the formulations indicated for urinary system pathologies, in *Chikitsamanjari*, *Yogamruta* and some other traditional Ayurvedic texts in Kerala. The quality control of herbal crude drugs and their bioconstituents is of paramount importance in justifying their acceptability. The crude drugs can be identified systematically on the basis of their morphological, histological, chemical, physical and biological studies. The aim of the study is to evaluate the preliminary pharmacognostical and phytochemical evaluation of *Alternanthera sessilis* (Linn) R.Br. Pharmacognostical evaluation of the plant *Alternanthera sessilis* (Linn.) R.Br. was done by studying the macroscopic and microscopic features of leaf, stem and root of the plant. The preliminary phytochemical analysis including quantitative data, qualitative chemical analysis, Thin Layer Chromatography, High Performance Thin Layer Chromatography and Atomic Absorption Spectroscopy were determined. Various pharmacognostic and preliminary phytochemical characters observed in this may help in standardization, identification and carrying out further research in *Alternanthera sessilis* (linn.)R.Br.

KEYWORDS: *Alternanthera sessilis* (Linn) R.Br, *Matsyakshi*, Pharmacognosy, Phytochemistry.

INTRODUCTION

Alternanthera sessilis (Linn)R.Br. [Amaranthaceae] is commonly known as Sessile joy weed. The species occurs throughout tropical and subtropical regions of the world. This is a pioneer species typically growing on wetland habitats, often in species-rich associations with a range of other aquatic and wetland plants. Its leaves and young shoots are eaten as vegetable and also used as traditional medicine. Eminent academicians like Bapalal vaidya, Dr. K. C Chuneekar identify *Alternanthera sessilis* (Linn.) R. Br as the drug *Matsyakshi*, which is mentioned in Ayurvedic texts. Also, Ayurvedic pharmacopoeia of India point out the botanical identity of *Matsyakshi* as *Alternanthera sessilis* (Linn.) R. Br. The drug is found to be an ingredient of *Rasayana* (Rejuvenation) preparations in *Brihat trayis* (Classical treatise in Ayurveda). It is indicated for the treatment of skin diseases (*Kushtaghna*) and has antimicrobial property (*Krimighna*). Traditional Ayurvedic books in Kerala, refers this plant in the management of many diseases like *Muthrakrichra* (dysuria), *Ashmari* (urinary calculus), *Kamala* (jaundice) and *Vrana* (ulcers). The researches have proven the anti inflammatory^[1], anti diabetic^[2], hematinic^[3], diuretic^[4], central stimulating and analgesic activities^[5] of the plant. The objective of the present study is to evaluate the pharmacognostic and phytochemical parameters of the plant which will help in the authentication of the plant.

MATERIALS AND METHODS

Plant material

The whole plant of *Matsyakshi* [*Alternanthera sessilis* (Linn.) R.Br] was collected from the natural habitat near Station Kadavu, in Thiruvananthapuram District, Kerala. The genuinity of the drug was confirmed and a herbarium was prepared and kept for future reference.

A. Pharmacognostic study

1. Macroscopic evaluation

Fresh stem, root and leaf of the plant were taken for morphological and histological studies. The organoleptic characters of fresh plant of *Alternanthera sessilis* (Linn.) R.Br, viz. colour, feature, shape, taste, odour were analyzed.

2. Microscopic evaluation

Materials: Sharp blades, Safranin stain, glass slides, cover slips, glycerin, Petri dishes, brushes and digital microscope.

For microscopical studies transverse sections of stem, root and leaf were prepared and stained as per standard procedure^[6].

Physico-chemical evaluation

Physico-chemical analysis including the analyzing parameters such as the foreign matter, moisture content, ash values, fiber content, volatile oil content, sugar content, different extractive values, qualitative analysis, heavy metal analysis by Atomic Absorption Spectroscopy and

chromatographic techniques like TLC, HPTLC were done. The procedures were done as per mentioned in Ayurvedic Pharmacopoeia of India.

Preparation of sample drug

The whole plant of *Alternanthera sessilis* (Linn.) R.Br (sufficient quantity) was collected, cleaned and dried in shade. After drying, the coarsely powdered drug was kept in air tight containers.

Reagents used

Xylene, dilute Hydrochloric acid, Petroleum ether, Cyclohexane, Acetone, Acetic anhydride, concentrated Hydrochloric acid, concentrated Sulphuric acid, Magnesium ribbon, neutral Ferric chloride, Benzene, Chloroform, Ethyl acetate, Potassium permanganate, Acetic acid, Fehling's solution, Sodium bicarbonate, Dragendroff's reagent, Ferric alum, Ethanol, Lead acetate, Sodium oxalate, Ethanol, and distilled water.

Apparatus

Dean and Stark's apparatus, Clevenger apparatus, Soxhlet apparatus, silica crucible, Bunsen burner, round bottomed flask, measuring jars, beakers, conical flask, funnel, glass rods, watch glass, electronic balance etc.

RESULTS AND DISCUSSION

I. Results of macroscopic evaluation

Macroscopic evaluation is the quickest and simplest method and serve as an important standardization parameter. Macroscopically, *Alternanthera sessilis* (Linn.) R.Br. is a small herbaceous plant with soft texture (Figure 1). The organoleptic characters of stem, root and leaf of fresh plant of *Alternanthera sessilis* (Linn.) R.Br were summarized in Table No: 1.

II. Results of microscopic evaluation

1. Transverse section of leaf of *Alternanthera sessilis* (Linn.) R.Br

Midrib portion (Figure:2) was prominent and projecting both on dorsal and ventral sides. The midrib had a single layer of epidermis on both surfaces; consisting of polygonal parenchymatous cells; covered by striated cuticle. Multi-seriate trichomes were seen, which were more in number in lower epidermis than upper epidermis. Beneath the epidermis collenchymatous cells were seen. In dorsal side, 1-2 layered collenchymatous cells were seen, while 2-4 layered in ventral side. In the ground tissue, consist of 4-5 layers of parenchymatous cells. Calcium oxalate crystals were found in few of them. On the ventral side, the parenchyma cells were filled with chloroplast. Three set of vascular bundled were present at the centre, consisting of xylem and phloem.

Lamina (Figure:3) consisted of a single layer of epidermis on both surfaces; covered by cuticle. Stomata were abundant on the lower epidermis than on the upper epidermis. Between the epidermal layers, mesophyll tissues were present; which include the palisade parenchyma and the spongy parenchyma. Beneath the upper epidermis, 2-3 layered palisade cells were seen. The palisade tissue consisted of regular long columnar cells, which were filled with chloroplast. Next to palisade tissue, spongy parenchyma was present; consisted of 3-4 layered irregular loosely arranged cells. Few of them consisted of rosette crystals of calcium oxalate.

2. Transverse section of stem of *Alternanthera sessilis* (Linn.) R.Br.

The stem in transverse section (Figure:4) showed circular in outline. Epidermis was composed of single layer of round or oval thin walled cells. It was covered with a thin layer of cuticle. Cortex was 6-10 layered. Alternate strands of chlorenchyma and angular collenchyma was seen beneath the epidermis. There were 2-3 layers of collenchyma cells. Beneath this layer, 3-4 layers of thin walled oval to round parenchymatous cells were seen. Few of them contained rosette crystals of calcium oxalate. Vascular bundle consisted of xylem and phloem, which were arranged in the form of a ring; with anomalous secondary growth. Vascular bundles were conjoint, bicollateral and open type. Pith was distinct and large. The pith portion was composed of large thin walled parenchymatous cells. Rosette shaped crystals of calcium oxalate(Figure:5) were present in few of them.

3. Transverse section of root of *Alternanthera sessilis* (Linn.) R.Br.

The transverse section of root of *Alternanthera sessilis* (Figure:6) showed circular in outline. Cork composed of 5-7 layered thin walled tangentially elongated rectangular radially arranged cells. Cortex consisted of 4-5 layers of thin walled round or oval parenchymatous cells. Pericycle and endodermis were indistinct. Anomalous secondary growth occurred in the form of succession of rings of vascular bundles which were collateral, open and exarch. It was composed of xylem and phloem, which were arranged radially. Phloem was narrow. Xylem was exarch and was lignified. In the center, two large vascular bundles composed of xylem and phloem was present.

An important feature of leaf, stem and root of the plant *Alternanthera sessilis* (Linn.)R.Br. is the presence of abundant calcium oxalate crystals. Anomalous secondary growth was seen in the transverse sections of stem and root of the plant.

III. Results of physico-chemical evaluation

Preliminary physical and physico-chemical analysis such as foreign matter, moisture content, ash values, fiber content, volatile oil content, different extractive values were done and the results are summarized in Table No: 2. The moisture content should be minimum to prevent the bacterial and fungal contamination. Total ash represents the inorganic salts present in the drug. Acid insoluble ash represent the contamination of earthy material. The extractive values assist in the evaluation the constituents soluble in a particular solvent. Also, fiber and sugar is present in the drug; and the volatile oil content was found to be nil.

IV. Results of preliminary phytochemical analysis

The ethanolic extractive obtained was subjected to qualitative analysis for identification of various plant constituents like steroids, phenols, alkaloids, flavonoids, tannins and results were depicted in Table No:3.The presence of different plant constituents determines the pharmacological action and therapeutic potential of that plant. Testing for these phyto constituents helps in determining the quality of the drug.

V. Results of TLC and HPTLC

The spots obtained in TLC gives a rough idea about the study plant constituents. The best separation was achieved using Toluene: Ethyl acetate: Formic acid in the ratio 9: 1: 0.1. The plates were first viewed through UV-fluorescence viewing cabinet (365 nm) and the Rf values of the spots were noted (Table No:4). HPTLC was done and the data of the analysis were tabulated (Table No: 5). The TLC and HPTLC profiles were shown in figure 7 and figure 8 respectively.

LIST OF FIGURES AND TABLES**Table 1: Table showing the organoleptic characters of fresh plant of *Alternanthera sessilis* (Linn.) R.Br**

Organoleptic characters	Leaf	Stem	Root
Colour	Greenish or greenish purple	Purplish	Yellowish brown to brown
Feature	Simple, sessile or short petiolate, opposite; 1.3-3.5 cm long	Herbaceous; with distinct nodes and internodes	Numerous rootlets arising from main taproot as lateral rootlets
Shape	Obtuse or sub-acute, tapering towards the base	Cylindrical; occasionally sub quadrangular	Cylindrical
Taste	Bitter- astringent	No characteristic taste	No characteristic taste
Odour	Indistinct	No distinct odour	No distinct odour

Table 2: Preliminary phytochemical analysis of *Alternanthera sessilis* (Linn.). R.Br

Sl. No	Name of Experiment	<i>Alternanthera sessilis</i> (Linn) R.Br	
1.	Foreign matter	1.3%	
2.	Moisture content	9%	
3.	Volatile oil content	Nil	
4.	Total ash	4.8%	
5.	Acid insoluble ash	0.69%	
6.	Fibre content	18.46%	
7.	Hot water soluble extractive	60%	
8.	Alcohol soluble extractive	21%	
9.	Sugar content	Reducing sugar	3.3
		Total sugar	6.4

Table 3: The results of Qualitative chemical analysis of alcoholic extract

Sl.No	Chemical Constituent	Status
1	Alkaloid	Present
2	Steroid	Present
3	Phenols	Present
4	Flavonoids	Present
5	Tannin	Absent

Table 4: Rf values of spots obtained in Chromatography

Solvent system	Extract	Spot detection	No: of spots	Rf value
Toluene: Ethyl acetate: Formic acid (9: 1: 0.1)	Ethanol	UV	2	0.858
				0.38

Table 5: Rf values of different spots obtained in HPTLC

Solvent system	Extractive	No:of spots	Rf values
Toluene: Ethyl acetate : Formic acid(9: 1: 0.1)	Ethanol	3	0.12
			0.17
			0.76

Table 6: Results of AAS

Metals	Sample (ppm)
Cadmium	0.0026
Iron	4.6487
Lead	0.0751
Zinc	0.5362

Figures:



Fig: 1 *Alternanthera sessilis* (Linn.) R. Br

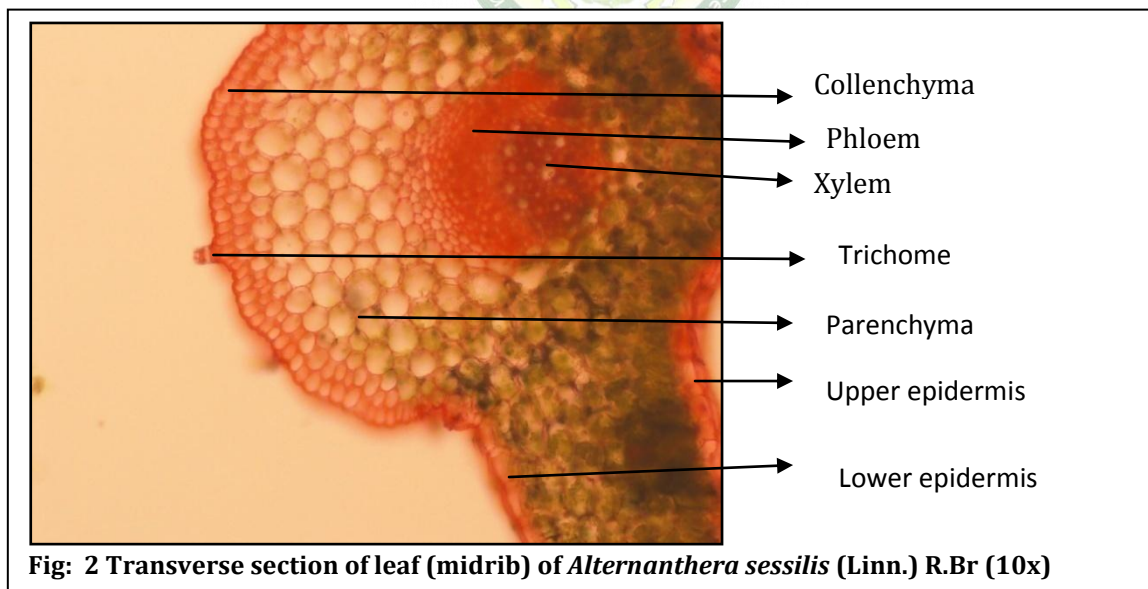
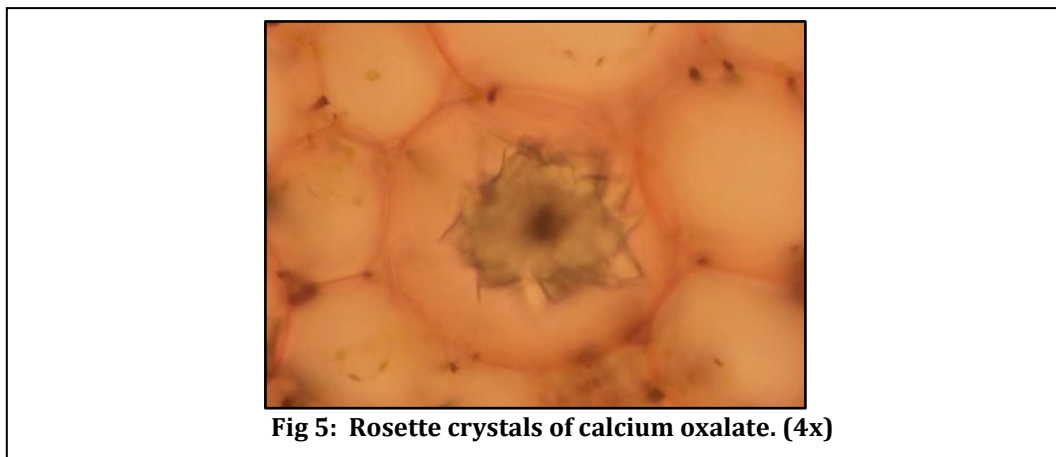
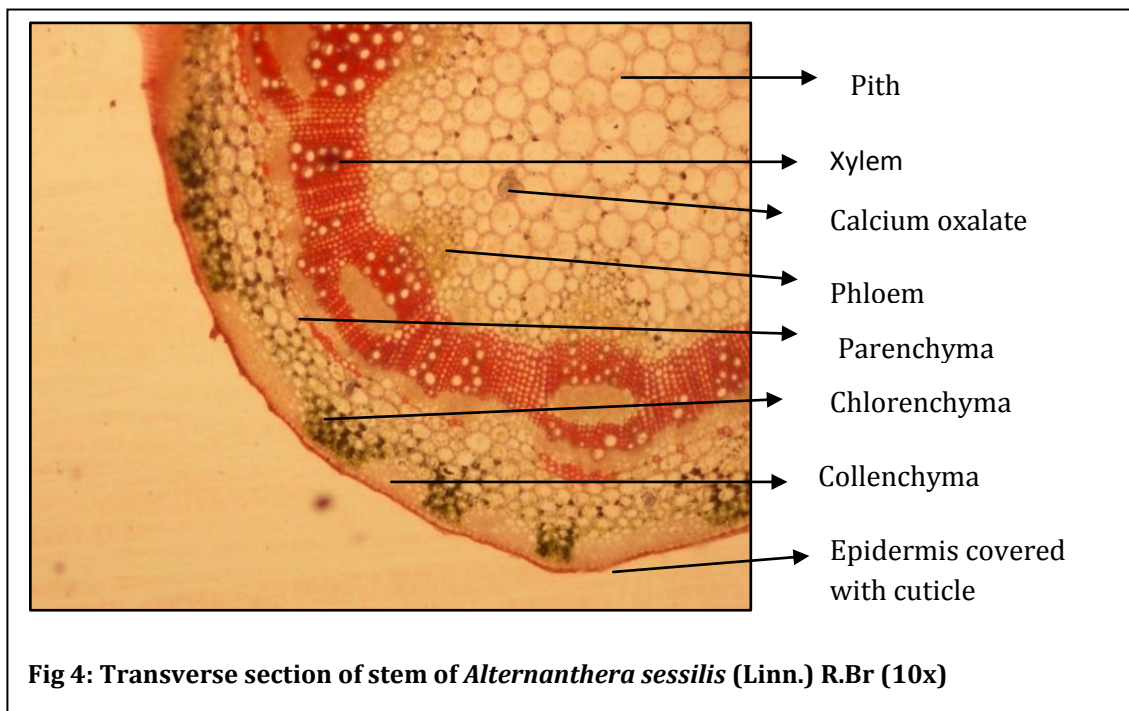
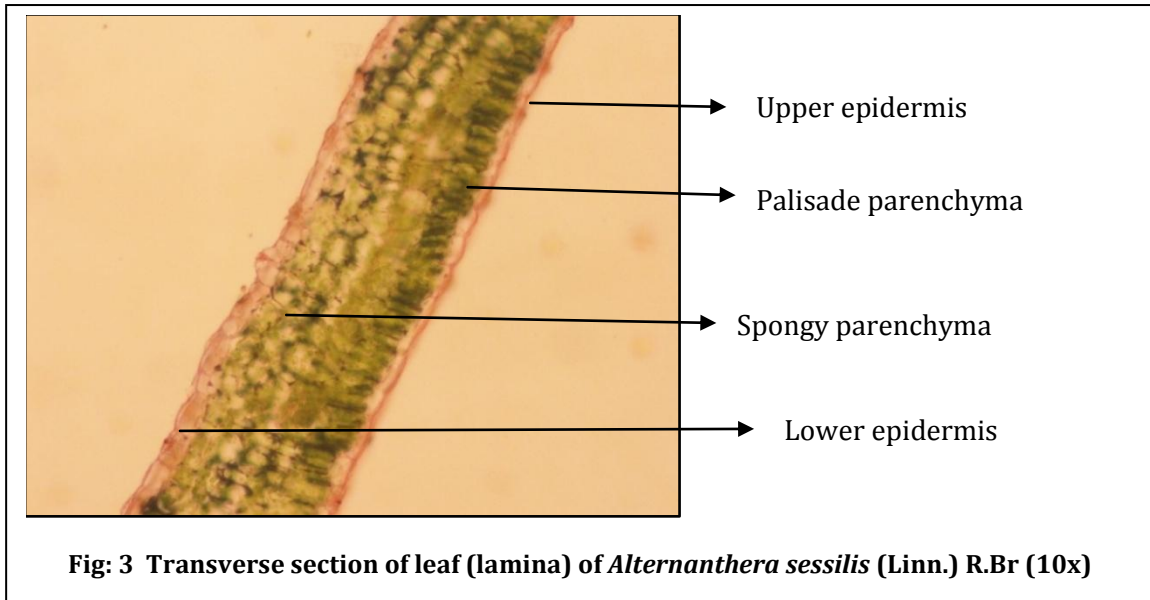


Fig: 2 Transverse section of leaf (midrib) of *Alternanthera sessilis* (Linn.) R.Br (10x)



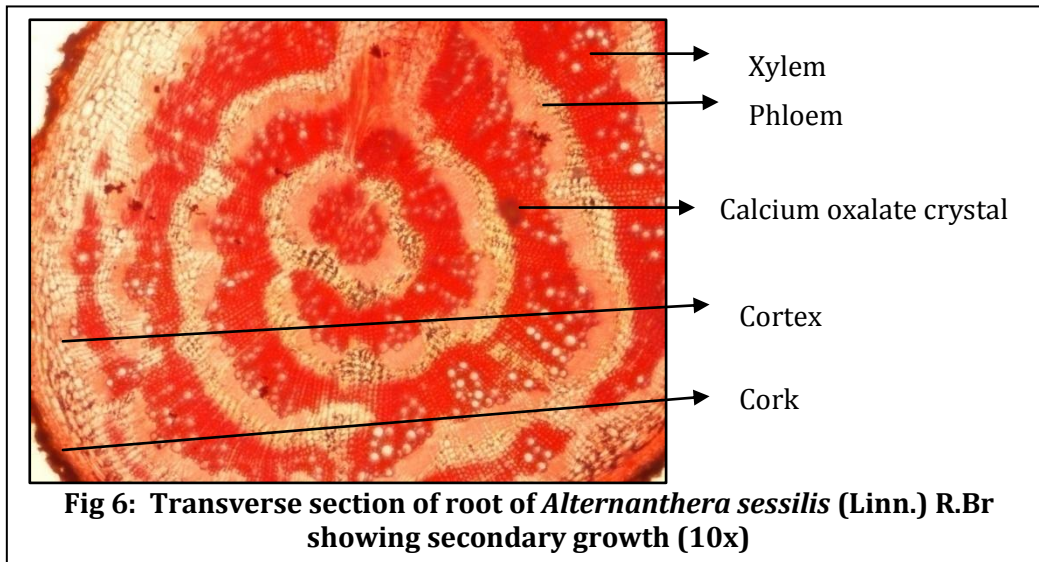


Fig 7 : TLC Plate with solvent system Toluene: Ethyl acetate: Formic acid (9: 1: 0.1)

CONCLUSION

In the present study, various standardized pharmacognostic and phytochemical screening were carried out as per pharmacopoeia and WHO guidelines. The morphological and microscopical evaluations were done to ascertain the standard reference value for the standardization of plant material. The study revealed the phytochemical constituents may be responsible for various pharmacological activities of this medicinal plant. These results may help in standardization, identification and in



Fig 8: HPTLC Plate with solvent system Toluene: Ethyl acetate: Formic acid (9:1: 0.1)

carrying out further research in *Alternanthera sessilis* (Linn)R. Br based drugs which are used in Ayurveda.

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