

Pharmacognostic Evaluation of *Alternanthera Sessilis* (L.) R.Br.ex.DC

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ABSTRACT

Alternanthera sessilis L. is a leafy vegetable used widely for its medicinal properties. The lack of documentation of medicinal plants have lead to the loss of quality in many important plants. The objective of the work was to study the pharmacognostic features of this plant. The study revealed the presence of calcium oxalate crystals in both stem and leaves. Extensively longer uniseriate trichome measuring 1227.4-1431.9 μm was observed in powder analysis. Macrosclerids and scalariform thickening were characteristic observation in the stem maceration. The vascular bundle showed inter fascicular cambial ring which is an anomalous secondary growth. The phytochemical studies on aqueous extracts of leaf showed positive result for Phenols, flavonoids, tannins and saponins. This study will help in standardizing and detection of adulterants.

Key words: *Alternanthera sessilis* , Pharmacognostic evaluation

INTRODUCTION

Alternanthera sessilis (L.) DC. (Sessile joy weed). It is a popular leafy vegetable. Its leaves and young shoots are eaten as vegetable^[1] or cooked in soup in Sri Lanka and also used as traditional medicine in China, Taiwan and India. *Alternanthera sessilis* (Amaranthaceae) is widespread throughout the tropics and subtropics and is an annual or perennial prostrate herb with several spreading branches, bearing short petioled simple leaves and small white flowers, found through out the hotter part of India, ascending to an altitude of 1200m^[2] in the Himalayas and even cultivated as a potherb.

A. sessilis is known as Matyakshika in Ayurvedic medicine^[3]. It has been used in Indian traditional system of medicine since a long time in diseases due to vitiated blood, skin diseases and ulcers^[4]. Its active principles, extracted in oil, were used to treat infected wounds and the herb also proved styptic in colitis; its nutritive values make the herb a potent tonic with a wide range of applications. Poultice of pounded fresh material is used in sprains, burns and eczema, carbuncle, erysipelas and acute conjunctivitis. A decoction is recommended as a herbal remedy to treat wounds, flatulence, nausea, vomiting, cough, bronchitis, diarrhea, dysentery and diabetes. Its roots can relieve inflamed

wounds^[5]. The leaves and shoots are boiled and drunk as an antihypertensive remedy^[6].

It is also used as a cholagogue, galactagogue, abortifacient, febrifuge and to treat snakebites, dysentery, diarrhea, skin problems inflamed wounds and boils, and applied externally on acne and pimples^[7-11]. In some parts of Bihar (India) the plant is used for hazy vision, night blindness, and post-natal complaints. *A. sessilis* has been reported to possess anti-microbial, molluscicidal, a moderate antimutagenic, antidiarrhoeal, hepatoprotective, cytotoxic and antiviral activities.^[12-13] The wound healing property of *Alternanthera sessilis* was reported by^[14]. Degenerative and necrotic changes in the liver and kidney in Swiss mice, caused by oral administration of water extract of *A. sessilis* in high doses was revealed through histopathological test^[15]. Previous phytochemical studies have reported the isolation of flavonols, triterpenoids, steroids and tannins; β -sitosterol, stigmasterol, campesterol, lupeol being few of its important constituents^[16]. The petroleum ether and benzene extracts inhibit the growth of some human and plant pathogenic bacteria^[17]. Previous study on this plant showed that it has hepatoprotective activity^[18] and potent nootropic activity^[19].

Ancient Indian literature incorporates a remarkably broad definition of medicinal plants and considers all plants parts to be potential source of medicinal substances. However a key obstacles which has hindered the acceptance of the alternative medicines in the developing countries, is the lack of documentation and stringent quality control. There

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is a need for documentation of research work carried out on traditional medicines with this back drop, it becomes extremely important to make an effort towards standardization of the plant material to be used as medicine. Hence pharmacognostic and phytochemical evaluation of *Alternanthera sessilis* is reported .

Materials and Methods

Fresh material was collected from the field and a voucher specimen was deposited in the Department herbarium collection.

Macroscopic and microscopic study

The macroscopic characters such as description of the plant, colour, odour, taste, nature, texture were studied for morphological investigation. For anatomical studies Free hand section of stem and leaves were taken, stained with safranin and mounted in glycerol and observed under light microscope and photographed. The quantitative microscopy was studied as per the procedure of^[20-21]

Maceration

The stems of *Alternanthera sessilis* were cut into small piece, boiled in water and cooled material was repeatedly boiled to expel air and cooled for 3-5 times till the pieces settled down. Treated pieces of the plant were soaked in Jeffery's fluid (equal volume of 10% of nitric acid and 10% of chromic acid) for 24 hours at 30-40 °C, decanted, washed and then stored in 50% alcohol. Pieces of macerated stem treated with aqueous safranin overnight , dehydrated through alcohol series (50%, 60%, 70%, 80%, 90%, 100%) for five minutes and passed through alcohol: xylol (1:1 ratio) series for five minutes and then the material was macerated and observed.

Histochemical test

The plant section was treated with various reagent such as wagners reagent (potassium iodide and iodine) for detection of alkaloid, orcinol in sulphuric acid for gums, Toluidine blue O for lignin, copper acetate test for Terpenoids, ferric chloride in 1N Hydrochloric acid for tannin, Sulphuric acid for crystals , methylene blue test for phenols.

Phytochemical Screening

The dried leaves were extracted with sterile distilled water. The behavior of powder with various chemical reagent and preliminary chemical tests was carried out according to the standard procedures described by Kokate^[22] and Horborne^[23].

Powder Analysis

The fine powder of *Alternanthera sessilis* was obtained by air drying the leaves. The dried leaves were powdered and sieved to obtain fine powder. The fluorescence analysis was done according to^[24].

RESULTS AND DISCUSSION

Macroscopy

Alternanthera sessilis is a prostrate or procumbent, annual or perennial herb. The branches are raised from the root and are up to 50 cm long. They are often purplish in colour and glabrous. The leaves are fleshy, generally 1.3-3 centimetres long and 0.5-1 centimetres wide though the leaves are larger in wet habitats, linear-elliptic, oblong or obovate, apex rounded and base cuneate. The flowers are inconspicuous, white, borne in small, axillary heads; bracts are ovate or obovate and are 1 mm long. The bracteoles are shorter, persistent; subequal, ovate and acute. Utricle are cordiform and are strongly compressed. The seeds are orbicular. The plant bears flowers and fruits throughout the year.

Microscopy

Microscopical studies are useful to establish the botanical identity for the valuable herbal drugs, which forms the basis for the identification and determination of adulterants. The anatomical study of the stem revealed a single layered epidermis. There were 2-3 layers of collenchyma cells .The cortex was made up of 7-8 layers parenchymatous cells. The material under investigation was a tender stem and hence does not exhibit secondary growth. However anomalous growth of the cambium was evident. The interfascicular cambium forms a cambial ring. Intrafascicular cambium was also evident. Vascular bundle consisted of xylem and phloem. Characteristic rosette crystals were present scattered in the cortex and in the pith. These were calcium oxalate crystals.

The leaf was differentiated into upper epidermis and lower epidermis. Mesophyll was differentiated into palisade and spongy parenchyma. spongy parenchyma cell were compactly arranged with no intercellular spaces. In upper epidermis the palisade cell were arranged in three layers. Vascular bundles contain xylem and phloem. Xylem is surrounded by phloem. It contains no distinct bundle sheath and dense starch accumulation in mesophyll cells. Mesophyll cell also harbored calcium oxalate crystals in a scattered manner (Plate-1).

Quantitative Microscopy

Quantitative microscopic data are found to be constant for a species. These values are especially useful for identifying the different species of genus and also helpful in the determination of the authenticity of the plant. The study of the leaf constants showed that the average stomatal number is 82 and the stomatal index was 113.8%. The vein islets number and vein termination numbers were 33.5-37 and 28-31/sqmm respectively. The microscopic linear measurement of the trichomes showed that the length of the trichome was 1227.4-1431.9 µm and the width was around 122.7-204.6 µm (Table-1).

Maceration

The macerated stem of the plant showed various structure. *Alternanthera sessilis* showed scalariform thickening in the tracheids with macrosclerids (Plate-1) .

Powder Analysis

The powder characters of a drug are mainly used in the identification of the drug in the powder form. The leaf powder was pale green in colour , fragrant , tasteless and papery in texture. The microscopical examination the powder showed anomocytic stomata, unicellular trichome , epidermal cells and calcium oxalate crystals.(Plate-1)

Histochemical test

The Histochemical studies showed the blue, bluish green or brown pigmentation for the presence of tannin and

lignin in *Alternanthera sessilis*. Absence of Brisk effervescence with sulphuric acid revealed the existence of calcium oxalate crystals.

Phytochemical tests

The aqueous extract revealed the presence of Phenols, flavonoids, tannins, saponins were present and remaining phytochemicals were absent (Table-2).

Fluorescence analysis

The fluorescence analysis of powdered leaves was studied in both UV and day light. The powder showed fluorescent green colour with UV light at 365 nm, which indicates the presence of chormophore in the drug (Table-3).

CONCLUSIONS

Establishing standards is an integral part of establishing the correct identity and quality of a crude drug. Before any drug can be included in the pharmacopia, these standards must be established. The majority of the information on the identity, purity and quality of the plant material can be obtained from its macroscopy and microscopy parameters. As there is no record on pharmacognostical work on

Table 1: Quantitative microscopy of *Alternanthera sessilis*

S.No	Quantitative characters	Numbers
1	Stomatal number	82
2	Stomatal Index	113.8%
3	Vein-islet number	33.5-37/Sq.mm
4	Vein termination number	28-31/Sq.mm
5	Trichome length	1227.4-1431.9 μ m
6	Trichome breadth	122.7-204.6 μ m

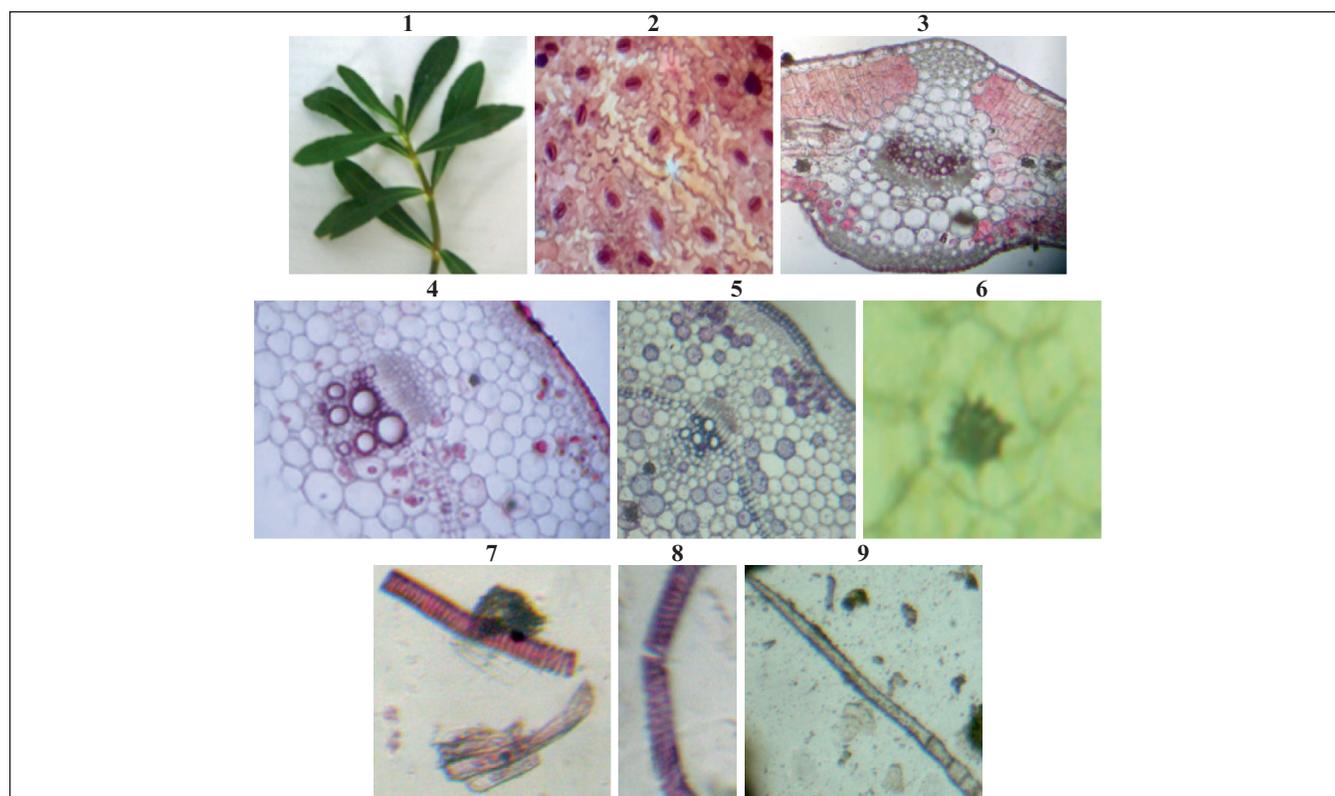


Plate 1: Pharmacognostic features of *Alternanthera Sessilis*

1-Habit of *Alternanthera sessilis* 2-Epidermal peeling - Anomocytic Stomata 3-C.S of leaf showing calcium oxalate crystals 4-T.S of stem stained with safranin 5-Histochemical test of for Phenols with Toluidene blue O 6-Rosette calcium oxalate crystal 7-macrosclerids 8-Scalariform thickening in xylem tracheids 9-Uniseriate trichome. Magnification -10 X

Alternanthera sessilis Linn. The present work is undertaken to produce some pharmacognostical standards. The above studies provide information with respect to their identification and chemical constituent characters which may be useful for pharmacognostical study and standardization of herbal drugs of folk medicinal practice of present era and enrichment of ayurvedic pharmacopoeia. It will also determine therapeutic diagnostic tools for the scientists who are keen and sincere to evaluate the herbal medicine of indigenous resources. The present pharmacognostic studies on *Alternanthera sessilis* will be of great importance in detecting adulterant in these herbal drugs.

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Table 2: Phytochemical test of aqueous extract of *Alternanthera sessilis*

S.No	Aqueous Extract	Phytochemical test
1	Alkaloids	-
2	Phenols	+
3	Flavonoids	+
4	Tannins	+
5	Terpenoids	-
6	Gums	-
7	Resins	-
8	Steroids	-
9	Saponins	+
10	Glycosides	-
11	Anthroquinone	-
12	Phlobatanmin	-

Table 3: Powder analysis under white and UV light

Dry powder	Ordinary	Hydrochloric acid	Sodium hydroxide & methanol	Sodium hydroxide & water	Nitric acid	Sulphuric acid
White light	Dull green	Green	Dark green	Yellowish green	Brown orange	Yellow green
UV Light 365nm	Fluorescent green	Green	Dark brown	Brown	Brown	Green
UV Light 265nm	Fluorescent yellow	Fluorescent yellow	Fluorescent yellow	Fluorescent yellow	Fluorescent yellow	Brown