

## **A CRITICAL PHARMACOGNOSTIC EVALUATION AND PRELIMINARY PHYTOCHEMICAL INVESTIGATION OF *ALTERNANTHERA SESSILIS* (L.) R. BR. LEAVES**

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### **ABSTRACT**

*Alternanthera sessilis* (L.) R. BR. is an important medicinal plant and widely used in the treatment of variety of diseases and well explored scientifically for their pharmacological properties. The current study was therefore carried out to provide requisite pharmacognostical and physicochemical details of the leaves by means of standardization of the species. The morphological study reveals the leaves are simple, alternate; leaves lamina is oblong and the base is wedge-shaped. The microscopy reveals the dorsiventral type of leaves, with diacytic stomata, covering lower epidermis and presence of calcium-oxalate crystals and bunch of spiral vessel ground tissue. Physicochemical properties such as extractive values in different solvents were established. Qualitative phytochemical screenings revealed the presence of alkaloid, phenolic compounds, carbohydrates, saponins, steroids and triterpenoids in the leaves extract. The results of the study could be useful in setting some diagnostic indices for the identification and preparation of a monograph of the plant.

**Keywords:** *Alternanthera sessilis* (L.) R. BR., Leaves, Pharmacognostic study, Physicochemical, Phytochemical.

### **INTRODUCTION**

In recent years plant derived products are increasingly being sought out as medicinal products, nutraceuticals and cosmetics and were available in health food shops and pharmacies over the counter as self-medication or also as drugs prescribed in the non-allopathic systems [1,2]. According to an estimate of World Health Organization (WHO), about 80% of the World population still uses herbs and other traditional medicines for their primary health care needs [3]. Herbals are traditionally considered harmless and increasingly being consumed by people without prescription. However, some can cause health problems and some may interact with other drugs. Standardization of herbal formulations is essential in order to assess the quality of drugs, based on the concentration of their active principles [4]. Quality evaluation of herbal preparation is fundamental requirement of industry and other organizations dealing with ayurvedic and herbal products.

The present study was designed to standardize the

species *Alternanthera sessilis* (L.) R. BR. belongs to family Amaranthaceae. The standardization was being performed basing on preliminary physicochemical and pharmacognostical study of the leaves thoroughly. It is a herbaceous type of plant, much-branched from the root branches 15-50 cm long. Leaves are green simple, alternate in arrangement. Flowers were sessile, white, shining, in small axillary sessile heads. The plant is used as a galactagogue traditionally known to be good for eye. In Ayurveda it is prescribed for the vitiated conditions of kapha and pitta, burning sensation, leprosy, dyspepsia, splenomegaly and fever [5]. Folklore claims for its curative effect in eye complaints and night blindness in Madhya Pradesh, Maharashtra and Andhra Pradesh region [6]. The young leaves and stems were also used as edible vegetable in Sikkim, West Bengal, Bihar and Orissa region [7].

In the present study pharmacognostic profile and physicochemical parameters of the leaves of *A. sessilis*

have been studied, which can guarantee quality, purity and identification of the sample.

## MATERIALS AND METHODS

### Identification

*Alternanthera sessilis* (L.) R. BR. was taxonomically identified by The Central National Herbarium, Botanical Survey of India, Howrah, West Bengal, India and the specimen is preserved in our laboratory for further assistance.

### Collection

The mature leaves were collected from kalyani, Nadia, West Bengal, India. From the collected plants, few samples of leaves were separated for the study of macroscopical & microscopical characteristics. The rest of the leaves were washed and then subjected for shade drying and crushing to powder for the further physicochemical testing.

### Pharmacognostic study

#### A. Macroscopic Characters

Macroscopic characters of the leaves were studied systematically like size, shape, color, odour, taste and texture; the length, breadth etc. measurements were measured by standard scale [8].

#### B. Microscopic Characters

Free hand sections of fresh leaves were performed and observed under microscope. The microscopical features were noted down, for histochemical analysis of the sections of various stains like phloroglucinol and concentrated hydrochloric acid, Sudan red III indicators, starch solution etc. were used [8].

### Physicochemical analysis

The dried leaves powder material was used for the determination of extractive values in various solvents and preliminary phytochemical investigation. The chemomicroscopic examination and behavior of powder with chemical reagents were also studied. Chemical constituents of the samples were broadly determined by qualitative tests, using their extracts.

For qualitative tests petroleum-ether, chloroform and ethanol extracts were used and the phytochemical screenings were performed to seek the presence of various secondary metabolites within the respective extracts.

Tests were performed Like, for alkaloid- Mayer's test, steroid- Salkowski test, terpenoid- Libermann-Burchard test, glycoside- Brontegar's test, tannins -Ferric chloride test and carbohydrate- Molish's test etc [9].

## RESULTS AND DISCUSSION

### Pharmacognostic Study:

#### Macroscopy

plant with erect branches, the height of total plant is about 17 cm (Fig 1). Fresh leaves were green in colour, odourless with a slight acrid taste. The leaves were simple, alternate, leaves lamina is oblong and the base is wedge-shaped. The length of the leaves lamina is 1.6 cm and the breadth of the leaves lamina is 2.3 cm (Fig 2). The length of the petiole is 0.5 cm.

### Microscopy

In microscopy of leaves lamina, the 2-3 layers of palisade cells were observed below the single layered upper epidermis confirms the dorsiventral type of leaves (Fig 3). The leaves shown the presence of diacytic stomata, they were in abundance on the lower epidermis than the upper epidermis (Fig 4). Calcium oxalate crystals were abundantly seen in the lower epidermis section (Fig 5). Three to four strands of vascular bundles were seen in the transverse section of midrib.

Elongated chlorenchyma cells were found in the abaxial surface of the midrib (Fig 6). Lignified strands of spiral xylem vessel were abundantly found (Fig 7). Multi seriate trichomes with tiny outgrowth from their body were also found; they were more in number in case of lower epidermis than the upper epidermis (Fig 8).

Organoleptic studies of the powdered leaves drugs were performed. Deep green coloured powder with characteristic odour appears; astringent is taste and smooth texture. Results were represented concisely in table 1. Histochemical studies of the powdered drugs expressed the presence of lignin, starch in the leaves. Negative result for fixed oil was found. The results were represented in table 2.

### Physicochemical Study

The physicochemical analysis explored the extractive value for pet ether extract 3%, chloroform extract (5%) and methanol extract (15 %). Chemical constituents of the samples were broadly determined by qualitative tests, using their extracts. For qualitative tests ethanol, chloroform and pet ether extracts were used and the tests were performed as mentioned in previous chapter. The obtained results were described in Table-6:

From the above table pet ether and chloroform extract shows the presence of steroid and terpenoid and slightly fixed oil in very intense amount and ethanol extract shows the presence of steroid, terpenoid, saponin, alkaloid, carbohydrates. The chloroform extracts show a little higher pH than other two extracts, it may be for the solvent effect.

## CONCLUSION

The above study results may be concluded shortly as the leaves of *A. sessilis* (L.) R. BR. was green in colour, odourless with a slight acrid taste. The leaves were simple, alternate; leaf lamina was oblong and wedge-shaped base.

**Table 1. Organoleptic characters of *Alternanthera sessilis* (L.) R. BR. leaves powder**

Diagnostic feature	Leaves Powder
Colour	Dark green
Taste	Bitter, Astringent
Odour	characteristic
Touch	Smooth
Texture	Amorphous

**Table 2. Results of histochemical tests for the leaves of *Alternanthera sessilis* (L.) R. BR.**

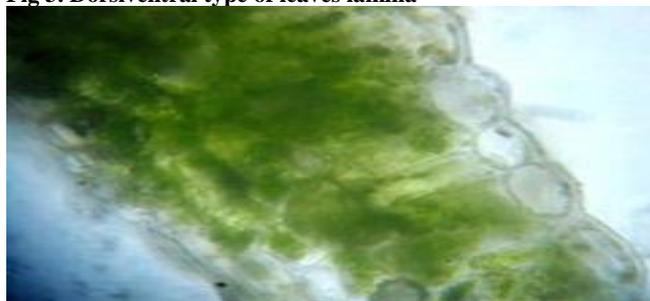
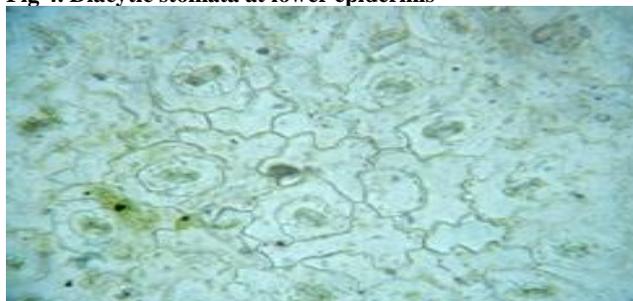
Sr. No.	Parameters	Tests	Results
1.	Test for Lignin	FeCl <sub>3</sub> test	+
2.	Test for Starch	Iodine solution test	+
3.	Test for fixed oil	Sudan Red III test	-

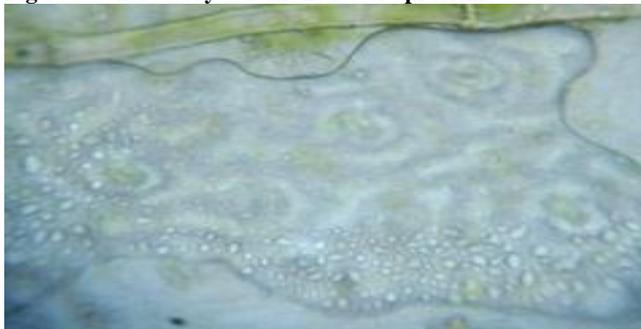
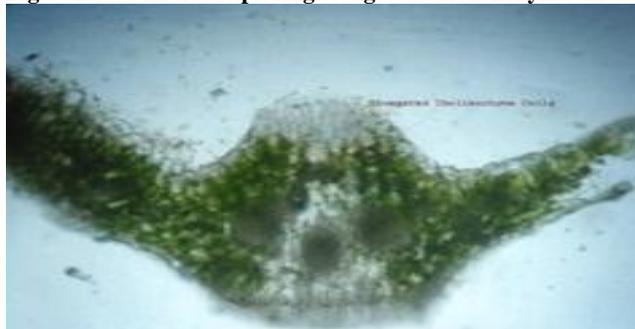
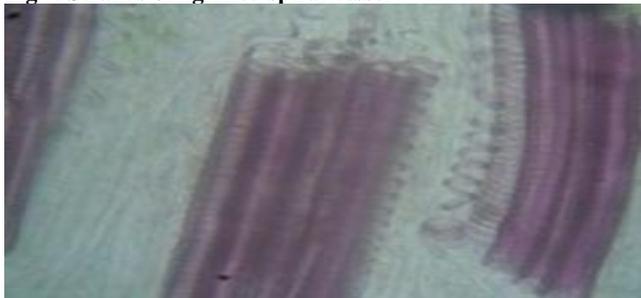
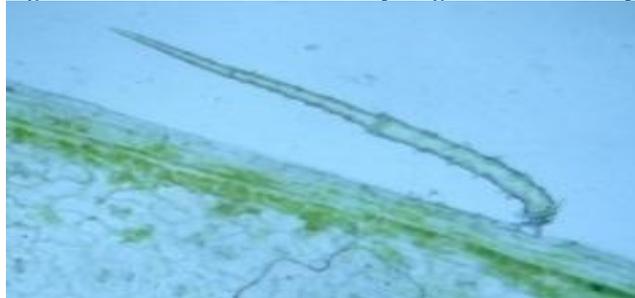
+ =Present, - =Absent

**Table 3. Result of phytochemical screenings for the different solvent extracts of the leaves of *Alternanthera sessilis* (L.) R. BR.**

Tests	Parameters	Pet ether extract	Chloroform extract	Ethanol extract
1.	Alkaloid	-	+	+
2.	Steroids	+	-	+
3.	Terpenoid	+	+	+
4.	Glycosides	-	-	+
5.	Tannins	-	-	-
6.	Proteins	-	-	-
7.	Phenolic compounds	-	-	+
8.	Carbohydrate	-	-	+
9.	Saponins	-	-	+
10.	Fixed Oil	+	-	-
11.	pH	5.5	7	6

(+) indicates presence and (-) indicates absence of that chemical constituent in the plant sample.

**Fig 1. Whole Plant****Fig 2. Leaves of *Alternanthera sessilis*****Fig 3. Dorsiventral type of leaves lamina****Fig 4. Diacytic stomata at lower epidermis**

**Fig 5. Ca-oxalate crystals in the lower epidermis****Fig 6. T.S. of midrib exploring elongated chlorenchyma cells****Fig 7. Strands of lignified spiral vessel****Fig 8. Multi seriate trichome with tiny outgrowth in their body**

Micro-morphological study explores the characteristic features like presence of diacytic stomata, calcium oxalate crystals in the lower epidermis section. Lignified strands of spiral xylem vessel, multi seriate trichomes with tiny outgrowth from their body in the midrib portion and the presence of oil globules within palisade cell layer were found under microscope. Preliminary phytochemical analysis indicated presence of alkaloid, phenolic compounds, carbohydrates, saponins, steroids and triterpenoids. The information obtained from the preliminary phytochemical screening will be helpful in finding out the authenticity of the drug. Extractive values

were preliminary useful for determination of exhausted or adulterated drug. Thus extractive values, phytochemical screenings etc. physicochemical analysis will be helpful in identification and authentication of plant material [9].

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