J Res Educ Indian Med, 2017; 23(2) 84-89 doi:10.5455/JREIM.82-1454738309 **ISSN 0970-7700**

PHARMACOGNOSTICAL EVALUATION OF *ALTERNANTHERA PHILOXEROIDES* (MART.) GRISEB.

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Abstract: *Alternanthera philoxeroides* (Mart.) Griseb. is commonly known as alligator weed. In India especially in West Bengal, it is used as vegetable and useful in diabetes, influenza, diarrhea, dysentery etc. There is no as such report to be identified the plant microscopically, especially to determine the microscopical standard. Here the study was done with the shoot part of the plant with the aim to standardize the plant microscopically. Important diagnostic characters like sclerenchymatous fibre, inter fascicular cambium, spiral vessels, calcium oxalate crystals, multi and unicellular unbranched trichomes etc were observed. The preliminary phytochemical study revealed the presence of various functional groups like phenols, alkaloids, saponin etc. The findings of the current study can be useful for further scientific investigation of the plant.

Keyword : *Alternanthera philoxeroides,* inter fascicular cambium; calcium oxalate crystals; phenols; alkaloids.

1. INTRODUCTION

Traditional knowledges of plants are generated in the tribal people or community based on their necessity, experience, observation and with the accidental cases. These knowledges are carried generation to generation and renounces as alternative medicine[1,2].

Alternanthera philoxeroides (Mart.) Griseb. belonging to amaranthaceae family is a aquatic and semi-aquatic herbaceous plant[3]. It is the native plant of South Africa well-known as alligator weed[4] but it is taken as vegetable by Indian people as the name of '*jal-sanchi*'. Besides that, it considers as folk medicine of India and has been used by tribal people in different ailments[5].

This plant is useful in influenza, diarrhea, dysentery, stomach disorders etc[6,7]. Laboratory experiments give preventive measures against dengue virus[8], respiratory syncytial virus[9] and hemorrhagic fever virus[10].

Chemical compounds of these plants are alternanthin B and N-trans-feruloly-3, 5 - dimethoxytyramine[11]. Triterpene saponins like philoxeroideside A, philoxeroideside B, philoxeroideside C and philoxeroideside D[12] are also present. C-glycosylated flavonoid like alternanthin was isolated from the leave and stem of the plant[13].

Recently the microscopical study of medicinal plants are not a regular practicing method although it has a potential benefit among the other methods for identification. Before starting a scientific study on a specific plant, it is prior work to identify the exact genus and species of the particular plant. There are some scientific methods to categorize a plant in terms of chemically[14], pharmacologically[15] but all these processes are time consuming as well as expensive. The microscopical study of the plant is not only scientifically establishing a plant but

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also reduce the cost factor much more than the other regular practicing methods[16].

2. MATERIAL AND METHODS

Experimental Section

The plant was collected in full bloom in rainy season, from the campus of Jadavpur University, Kolkata, West Bengal and authenticated by experts of Botanical Survey of India, Office of the Scientist-D, Central National Herbarium, Howrah, West Bengal, ref no: CNH/28/2014/Tech.II, specimen no: SM-05[17]. Then the collected plant materials were washed thoroughly with running tap water to remove adherent dirt and were kept for 21 day under shade for drying. The shoot portions were separated out from the root portion and were cut into small pieces (1to 2cm). Few samples were preserved in FAA (Formalin: Acetic acid: Alcohol= 90:7:3)[18] for microscopic investigation. Free hand sections were taken from the preserved shoot portion. These sections were observed as such under the microscope for the presence of cell contents after mounting with glycerol [19]. The sections were cleared with chloral hydrate and stained with phloroglucinol, hydrochloric acid to observe the lignified cell contents if any[20]. The histochemical tests were performed to detect the location of various cell contents with the help of various reagents[20]. The presence of secondary metabolites were also performed by phytochemical screening[21,22].

3. RESULTS AND DISCUSSION

3.1. Morphology

It is a perennial herb growing in summer season in aquatic as well as semi aquatic place. The height of the shoot portion of a mature plant is varies from 30cm to 7 meters depending upon surrounded climate. Leaves are simple, shiny and spear shaped. Leaves come under the sessile type having entire margin without any stalk, present in opposite manner along with the stem. It is of 2.5-8 cm long and 1-3 cm width. Stems are simple sometime branched with hollow internodes bearing hairy roots at each node occasionally. The hollowness of the stem is much more in case of aquatic plant rather than the semi or non-aquatic plants. The width of the aquatic plant is generally upto 1cm. The surface of the stems are smooth and shiny like the leaves. The flowers grow at the internodes of the stem sometime on axils. The flowers are small 10-12mm wide, white in colour with papery nature **(Fig-a).**

3.2. MICROSCOPY

3.2.1. Leaf

Diagrammatic transverse section of the leaf passing through the midrib is convex broadly at the lower side, having a notch at its upper side with centrally located arc shaped meristele. The lateral dorsiventral lamina extends both sides of the midrib **(Fig- b, c)**.

Detailed transverse section of midrib shows single-layered epidermii covers with thinned layered cuticle on both surfaces. Very few numbers of epidermal cells are elongated outwards and form multiseriate hairs. Three to four layers of collenchymatous cells present towards the dorsal side followed by four to five layers of parenchymatous cells. At the ventral side, there are two to three layers of collenchymatous cells followed by one to two layers of parenchymatous cells. Centrally located open collateral vascular strands are usually three to five in number; each consists of xylem and phloem, divided by fascicular cambium.

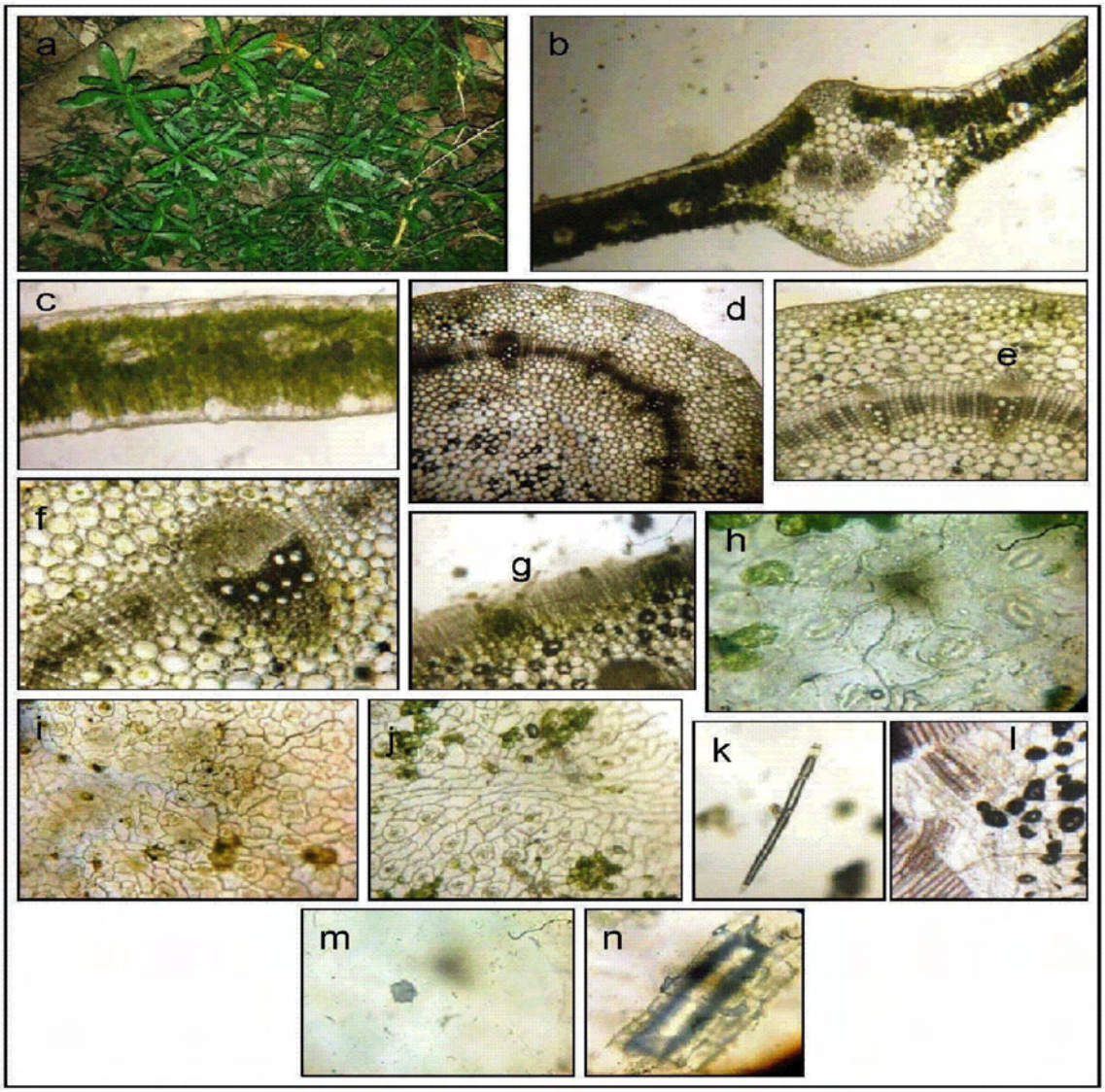
Mesophyll of lamina portions are differentiated into five to six layers of compactly packed spongy parenchyma with no intercellular space at the middle portion and four to five layers of palisade parenchyma at the both side of spongy parenchymatous cells. Diacytic or caryophyllaceous type of stomata are present on the both surfaces but most abundant in lower surface. Cluster crystals of calcium oxalate are present in midrib as well as both sides of lamina **(Fig-i, j).**

3.2.2.Stem

The diagrammatic transverse section of the stem shows a circular diagramme with irregular margin having single layered epidermis covered with cuticle, some time with sub stomatal chamber and stem hair followed by cortex region. Vascular bundles are located centrally beneath the cortex region and connected with each other by inter fascicular cambium followed by centrally located parenchymatous cells in pith or medulla **(Fig-d).**

The detailed transverse section shows three to four rows of hypodermis consisting of thin walled oval to round sclerenchymatous cells followed by eight to nine rows of thin walled chollenchymatous cortex. Open collateral vascular bundles arrange in a ring, with fascicular cambium between phloem and xylem with sclerenchymatous fibre. Inter fascicular cambium presents in-between two vascular bundles.

Histology of the leaf of *A. philoxeroides* (Mart.) Griseb.



a. Natural habitat ; b. Diagrammatic transverse section of midrib; c. Diagrammatic transverse section lamina; d. Diagrammatic transverse section stem; e. Gland; f. Vascular bundle; g. Stem hair; h. Oil globules; i. Upper epidermis; j. Lower epidermis; k. Multicellular trichome; l. Spiral Vessels; m. Cluster crystal ; n. Fiber

Pith is distinct with thin wall, and arranges with round to oval parenchymatous cells with intercellular space. Calcium oxalate cluster crystals are seen frequently throughout the pith as well as in the cortex region. Glands present rarely in the cortex region **(Fig- e, f, g).**

3.2.3. Powder microscopy

3.2.3.1.Organoleptic characters

The powder of the shoot portion of plant is coarse, gritty and brownish in colour with a characteristic odour.

3.2.3.2. Diagnostic characters

The powders of the plant shows epidermal cells in surface view, isolated or groups of xylem vessels, spiral vessels, fibers, calcium oxalate crystals, multi and unicellular unbranched trichomes, oil globules **(Fig-h, k, l, m, n)**.

Phytochemical analysis: Qualitative analysis for the presence of various functional groups was carried out on the methanolic and aqueous extract of the plant. The result gives positive response with carbohydrates, alkaloids, flavonoids, phenolic compounds, amino acid, steroids, terpenoids and saponins.

4. CONCLUSIONS

The presence of microscopical characteristics like epidermal characters, spiral vessel, calcium oxalate crystals, oil globules, diacytic or caryophyllaceous stomatas, multi and unicellular unbranched trichomes are the important diagnostic characters of *A. philoxeroides*. Pharmacognostical evaluation of the plant gives the scientific parameter that will be useful for the further scientific evaluation as well as identification of the plant.

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