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Pharmacognostical evaluation and preliminary phytochemical analysis of *Alternanthera philoxeroides*

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Abstract: *Alternanthera philoxeroides* commonly called panimati kaduri (Assamese) use as vegetable basically the young stem and leaf, and also used against to treat various disease like dysentery, asthma etc. in various regions of Assam. The present study attempts to evaluate the pharmacognostical and physicochemical parameters of *Alternanthera philoxeroides*. The physicochemical parameters were evaluated- loss on drying (4.9%), total ash content (8.9%), extractive value of plant powder with ethyl acetate, water, alcohol and methanol (8.67%, 11.87%, 21.72%, 13.98% respectively). Phytochemical screening of the ethyl acetate, methanol, alcohol and water extract of the plant powder drug indicated the presence of flavonoids, Saponins, glycoside, saponin, tannin, free reducing sugar and amino acid. However alkaloid were absence in this species. The physicochemical, morphological, histological parameters and chemical analysis presented in this paper may be proposed as parameters to identify and establish the authenticity of *Alternanthera philoxeroides* and also may help in carrying out further research in *A. philoxeroides* leaf and stem based drugs.

Keywords : Pharmacognosy , *Alternanthera Philoxeroides* , Phytochemicals , natural drugs .

1. Introduction

Pharmacognosy is the study of medicines derived from natural sources. The American Society of Pharmacognosy defines Pharmacognosy as “the study of the physical, chemical, biochemical and biological properties of drugs, drug substances or potential drugs or drug substances of natural origin as well as the search for new drugs from natural source”[1]. World health organization has estimated that perhaps about 80% of more than 4000 million people on earth rely chiefly on traditional medicine for their primary health care needs and also can safely be presumed that a major part of traditional therapy involve the use of plant extract or their active principles. Plant-derived substances have recently become of great interest owing to their versatile applications. Medicinal plants are the richest bio-resource of drugs of traditional systems of medicine, modern medicines, food supplements, folk medicines, pharmaceutical intermediates and chemical entities for synthetic drugs [2]. It is estimated that 265,000 flowering species inhabits earth, of these less than half of one percentage have been studied exhaustively for their chemical compositions and medicinal values. The search of natural sources for novel bioactive molecules as potential drugs can be conducted through three major disciplines or activities : 1) Ethnobotany and the associated traditional knowledge: this one of the most useful approach to investigate plant species, 2) Chemotaxonomy (phylogenetic approaches): this process may be employed to target a specific taxonomic group containing classes of compound that are similar to these present in species genera or families that have previously exhibited high rates for a particular type of bioactivity ,3) High throughput based bio prospecting programs[3]. Ethnomedical information can be acquired from

various sources such as books on medical botany and herbals, review articles usually involving surveys of medicinal plants by geographic region or ethnic culture, field work. The use of Ethnomedical information has contributed to health care worldwide, even though effort to use it has been sporadic [4].

Alternanthera philoxeroides belonging to the family *Amaranthaceae* popularly known as alligator weed is a non woody summer perennial aquatic plant. *Alternanthera philoxeroides* is reportedly native to South America and it is invasive to India. The plant has a great importance in Ethnobotany among different community in Assam as well as in India. The local name of the plant is “Pani Mati kaduri” (Assamese) and it also use as vegetable basically the young stem and leaf and used against to treat dysentery, asthma in various regions of Assam. Young shoot and leaf juice (50-100ml) with equal amount of water is given before bedtime for stomach pain regularly for a week by Bodo, Santhal, and Goreswar tribes of North east [5]. The people of north east blessed with rich biological diversity of plants and a high degree of traditional knowledge about medicinal plants. North east is been located in a floristically diverse area, tropical rain forest and such diversity dramatically increase the number of plants available, it therefore enhances the likelihood that plants with pharmacologically active molecule will be pressed into service. Also the societies of North east have remained in the region for many generations so they have had ample opportunity to explore and experiment with the local vegetation. There is a need for documentation of research work carried out on traditional medicine, and its become important to make an effort towards the standardization of the plant material to be used as medicine. The process of standardization can be achieve by step wish Pharmacognosy studies. These studies help to identification and authentication of plant material.



Fig : *Alternanthera philoxeroides*

2. Materials and Methods

2.1 Collection of plant material and identification:

The fully matured plant of *Alternanthera philoxeroides* were collected during the month of January 2014 from Diphu, Assam. The species was identified by Dr. Robindra Teron, taxonomist from Assam University Diphu Campus.

2.2 Drying and processing :

The freshly leaves and young stems were washed thoroughly with distill water to remove dust and dirt. Washed leaves and young stems were shade dried at room temperature (20-25 °C) for about 10 days , and then grounded into coarse powder with the help of mortar and pistil. The grounded powder was sieve in a mesh of size 150 micron and the powder was used for studying physico chemical properties and phytochemical screening.

2.3 Reagent and Chemicals :

All reagents and chemicals used for testing were analytical grade obtained from Himedia Company.

2.4 Organoleptic Evaluation :

Freshly obtained leaves and young stems were spreaded on a clean dry plastic sheet and investigated different organoleptic characters by repeated observation using magnifying glass.

2.5 Microscopical studies :

Leaf and stem were taken from mature plant and cut T.S with the help of sharp razor blade and the specimens were passed through 30% and 50% alcohol for 50 minute and then the specimens was stained by safranin for 3-5 minute. Good specimens were taken in microscopic slide and examined and photographed with Trinocular Olympus research microscope camera.

2.6 Macroscopical studies :

Macroscopical study carried out by naked eye and whenever needed used simple microscope. Macroscopical study allow us to make a description of the plant.

2.7 Physio- chemical studies:

2.7.1 Moisture content:

Moisture content determined by loss of weight on drying method. For this 3 sample of 5 gm of fresh leaves and stem were taken and kept in a oven at 105 °C till a constant weight was obtained. The masses obtained were used to calculate the mass loss and calculate the water content of the plant as percentage.

2.7.2 Total ash values:

Ash value is used to determine quality and purity of crude drugs. 1gm of powder of leaves was taken in a silica crucible and ignited in a Furnace at 600 °C until it was white. After cooling in a desiccator, the ash was weighted. The masses obtained were used to calculate the total ash content and expressed as a percentage.

2.7.3 Extractives values:

Considering the drug , four different solvent Methanol , water , Ethyl acetate , and alcohol were used for determining extractive values. About one gram of powder drug taken into 100 ml of above solution and subjected to maceration. After 24 hours, extraction was filtered and filtered solution kept in a oven at 100 °C until the solution is completely dry and get a constant weight.

2.8 Preliminary phytochemical analysis:

Shaded dried and powdered samples were successively extracted with Etyl-acetate, methanol, alcohol and water by maceration technique [6]. The extracts were filtered and the differen extracts were subjected to qualitative test for identification of various phytochemical constituents as per standard procedures [7].

3. Result and Discussion

3.1 Organoleptic Evaluation : The characters recorded are described below:

Color : green.
Odour : fish smell .
Taste : bitter .
Texture : smooth.

3.2 Macroscopical study :

3.2.1 Morphological Evaluation :

Habit: Annual, branched herb.

Habitate: Marsh and aquatic.

Stem: Cylindrical, soft, hollow, hairy; hairs simple, non glandular, multicellular, green, with node and internode; internode 2-7 cm. long.

Leaves: Opposite decussate, simple, lanceolate, 8-9 cm. in length and 1.5 cm. in breath, acurninate, entire, cuneate base herbaceous; venation reticulate, hairy; hairs simple multicellular, green, sessile, exstipulate.

3.3 Microscopical evaluation:

3.3.1 Anatomical Observation :

3.3.1.1 stem anatomy : T.s through stems shows the following arrangement of tissues (fig 1 and 2) :

Epidermis: It is uniseriate, parenchymatous, and cuticularised. Rectangular parenchymatous cells are joined end to end. Intercellular spaces are absent .

Cortex : It is differentiated into collenchymatous hypodermis and parenchymatous cells arranged tangentially .

Vascular bundle: Vascular bundles are presence in ring and 8 in number. Each bundle is collateral, conjoint and open type. Phloem's in towards the endodermal side.

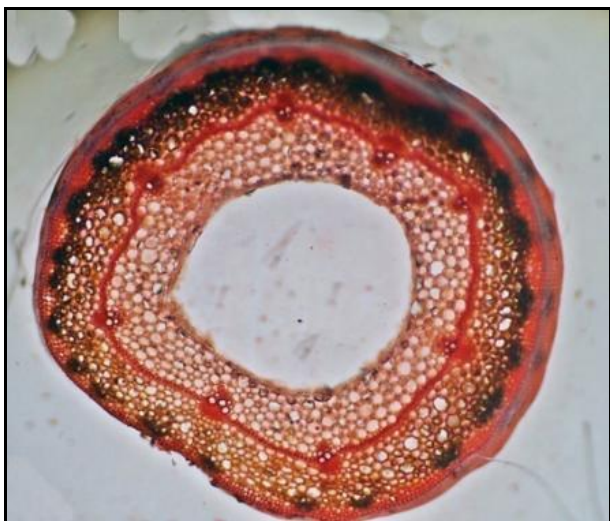


Fig 1: T.S of stem *Alternanthera philoxeroides*

3.3.1.2 Leaf anatomy :

The leaf is dorsi ventral and has reticulate venation. Thin section of leaf shows the following arrangement of leaves (fig 3)-

Epidermis : These are two epidermal layer upper and lower epidermis. Each layer is uniseriate, being composed of row of compactly set rectangular cells and cuticularised externally.

Mesophyll tissue: Mesophyll tissue is differentiated into palisade and spongy layers. The palisade layers occurs towards the upper epidermis and composed of columnar cells . The spongy layers occurs in the lower epidermis and composed of loosely arranged rounded cells. The both types of cells are containing abundant chloroplast .

Vascular bundles: Vascular bundle is collateral and closed, located in mesohyll tissues. The bundle is composed of xylem and phloem. The bundle is bounded by bundle sheath.

3.3.1.3 stomata study :

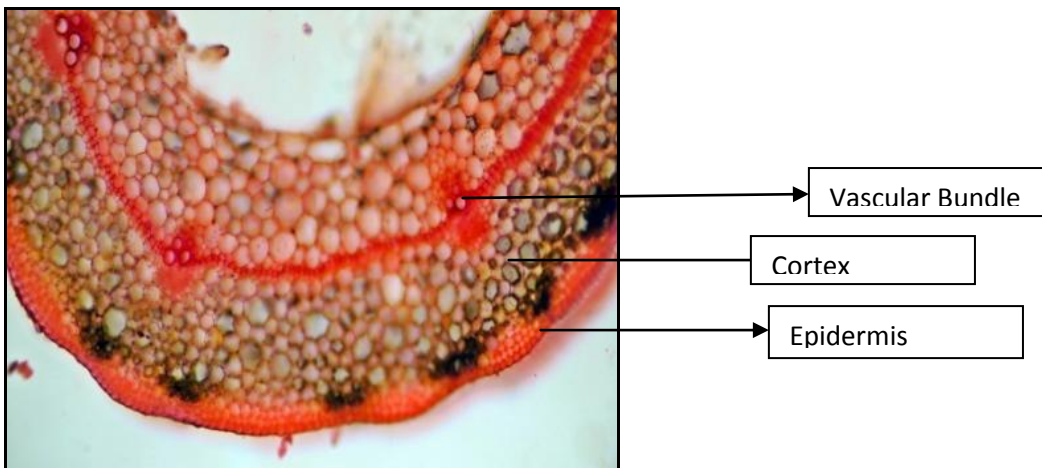


Fig 2 : T.S of stem *Alternanthera philoxeroides*(enlarge)

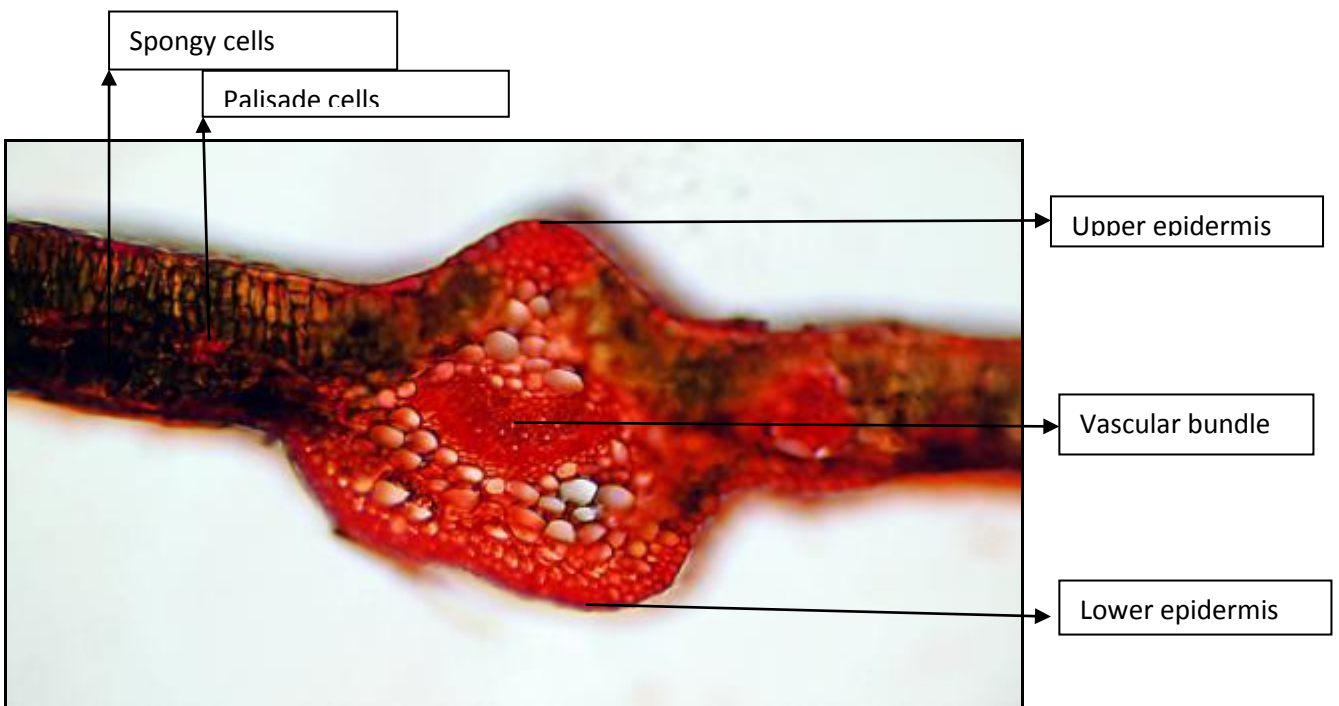


Fig 3 : T.S of leaf *Alternanthera philoxeroides*.

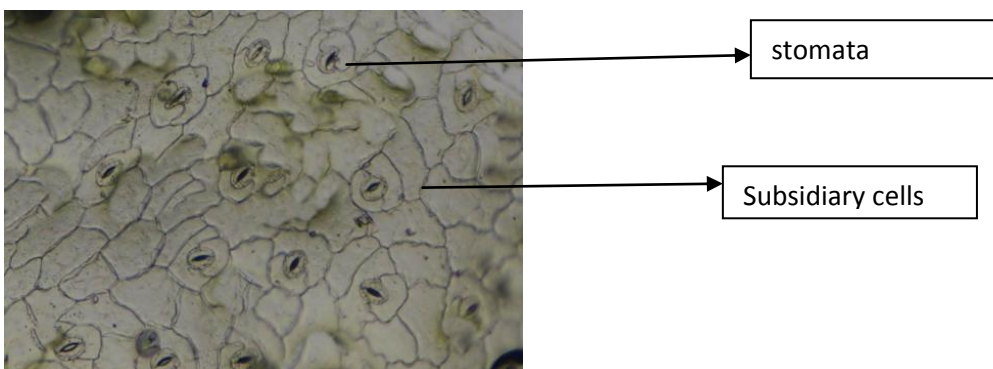


Fig 4 : Diacytic stomata of *Alternanthera philoxeroides* .

Stomata is diacytic type i.e. stomata is surrounded by two subsidiary guard cells which exists at the right angle to guard cells.(Fig 4)

3.4 Physico chemical evaluation :

The values of all determinations are summarized in table 1. The physico-chemical parameter helps in judging the purity and quality of the drugs [8]. The percentages of active chemical constituents in crude drugs are mentioned in air dried basis and hence moisture content of a drug should be determined [9]. Here moisture content was found 4.9%, which is quite low and it favors to not decomposition of the drugs due to chemical change or microbial contamination. The result showed greater extractive value in Alcohol then ethyl acetate, methanol and water .

Table 1 : Physio chemical Results of *Alternanthera philoxeroides*

Parameters	Values %
Total ash content %	8.9
Moisture content %	4.9
Alcohol soluble extractive %	21.12
Methanol soluble extractive %	13.98
Ethyl-acetate soluble extractive %	8.67
Water soluble extractive %	11.87

3.5 Preliminary Phytochemical screening :

The plant material was subjected to preliminary phytochemical screening involving successive solvent extraction by different solvents in order of increasing polarity to obtain diverse polar and non polar phytoconstituents possessing different solubility pattern, followed by various chemical tests for qualitative detection of various chemical constituents [10]. The result of preliminary Phytochemical screening of Water, Alcohol, Ethyl acetate and Methanol extracts of air shaded powdered drug of the plant are presented in the table 2. The water extract shows the presence of saponin and reducing sugar, and Ethyl acetate extracts shows the presence of glycoside, tannins, and flavonoids. Also alcohol shows the presence of reducing sugar and tannins. Presence of reducing sugar and amino acid indicates that it's a good food source. Therapeutically terpenoids have wide spectrum of activities such as antiseptic, stimulant, diuretic, anthelmintic, analgesic and counter-irritant [11]. Saponins have great pharmaceutical importance because of their relationship to compounds such as the sex hormones, cortisones, diuretic steroids, vitamin [12]. Flavonoids are important group of polyphenols widely distributed among the plant flora. Structurally, they are made of more than one benzene ring in its structure (a range of C15 aromatic compounds) and numerous reports support their use as antioxidants or free radical scavengers [13].

Table 2: Result of Preliminary Phytochemical analysis of *Alternanthera philoxeroides*.

Constituents	Water	Alcohol	Ethyl acetate	Methanol
Alkaloids	-	-	-	-
Glycosides	-	-	+	-
Terpenoid	-	-	-	-
Steroid	-	-	-	-
Flavonoid	-	+	+	-
Tannins	-	+	+	-
Saponin	+	-	-	-
Amino acids	+	+	+	-
Reducing sugar	+	+	+	+

4. Conclusion

After present investigation it can be concluded that the pharmacognostical study of *Alternanthera philoxeroides* leaves and young stem yielded a set of qualitative and quantitative parameters or standards that can serve as an important source of information to ascertain the identity and to determine the quality and

purity of the plant material in future studies. As *Alternanthera philoxeroides* being a morphologically variable species, these information will also be helpful to differentiate *Alternanthera philoxeroides* from the closely related other species and varieties of Amaranthaceae family like *Alternanthera sessilis* (L.) R.Br. ex DC. The pharmacognostic constant for the various parts of above said plant, the diagnostic microscopic features and the numerical standards reported in this work could be useful for the compilation of a suitable monograph for its proper identification. Also in the present investigation, a set of pharmacognostical standardization parameter studies were conducted on *A. philoxeroides* leaves and young stem as per pharmacopoeia and WHO guidelines. These studies revealed the presence of various important bioactive compounds and proved that the plant leaves are also medicinally important. These results may help in standardization, identification and in carrying out further research in *A. philoxeroides* leaf and stem based drugs.

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