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Research Article

PHARMACOGNOSTIC AND PHYTOCHEMICAL INVESTIGATION OF SIDA CORDIFOLIA L.-A THREATENED MEDICINAL HERB

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ABSTRACT

Sida cordifolia L. is threatened medicinal herb, belongs to the family Malvaceae. The plant is used in traditional system of medicine for healing various diseases. However, the present study was aimed to evaluate the parameters to determine the quality of the plant. This study comprises of morphological, microscopical and preliminary phytochemical investigations of the herb.

Keywords: Malvaceae, Pharmacognosy, Phytochemical screening, Sida cordifolia L.

INTRODUCTION

Sida cordifolia L. is commonly known as "Indian Ephedra", Bala (Sanskrit), Hetthuti-gida (Kannada) and Country Mallow (English) is an important medicinal herb belongs to the family Malvaceae. The whole plant of *Sida cordifolia* is used as medicinal herb, because leaves contain small quantities of both ephedrine and pseudoephidrine[1], roots and seeds contain alkaloid ephedrine, vasicinol, vasicinone, and N-methyl tryptophan[2,3,4] and is extensively used as a common herbal drug[5, 6]. Because of ephedrine, various ayurvadic preparation of this plant used in asthma, fat lose, increase energy[7], chronic dysentery and gonorrhea in the Indian subcontinent[8,9]. Recently, cardiovascular effects[10], analgesic, antiinflammatory[11] and hypoglycemic activities[12] were reported from its leaves. Because of these important medicinal properties *Sida cordifolia* L. is under threat due to extensive collection and continuous deforestation. This requires conservation of traditional medicinal plant for the future generation.

The qualitative chemical tests of the Petroleum ether extracts of plant material revealed the presence of Steroids, Fatty acids, Alkaloids and Tannins. Chloroform extract revealed that presence of Alkaloids and Methanol extract revealed that presence of Flavonoids, Saponins and Triterpenoids. The study scientifically validates the use of plant in traditional medicine and it contributes to the development of standardized parameters of herbal drugs used in Indian system of medicine. Hence, in the present study morphological, microscopical and preliminary phytochemical investigations were undertaken.

MATERIALS AND METHODS

Macroscopic studies of *Sida cordifolia* L.

Sida cordifolia L. is an erect, perennial undershrub, grows upto 1mt. in height. Stem ascending, terete or sulcate, softly villious and densely stellate-pubescent all over. The simple cordate leaves with serrate margin are 2.5-7 cm long and 2.5-5 cm broad, with 7-9 veins. Flowers yellow, peduncles, axillary, upper flowers nearly sessile and fasciculate towards the tip of the branches forming subspicate inflorescence. Fruits subdiscoid, 6-8 mm across, mericarps 10, 3 sided. Seeds trigonous, glabours, tufted-pubescent near the hilum.The plant flowers from August to December and fruiting from October to January.

Collection of plant material and authentication

Fresh whole plants of *Sida cordifolia* L. were collected from Karnatak University campus Dharwad and were authenticated and voucher specimen has been deposited in the P. G. Department of Botany, Karnatak University, Dharwad for future reference.

Drying of plant material

The whole plant material of *Sida cordifolia* L. was subjected to shade drying for about 10 weeks. The shade dried plant material was further crushed to powder and the powder was passed through the mesh 22 and stored in air tight container for further analysis.

Macroscopic and microscopic analysis

The macroscopic and microscopic examinations of plant studied were based on the method of the plant studied were according to the method[13,14,15]. Transverse sections of Leaf, Stem, and Roots were prepared and stained with saffranin and Fast green as per the procedure[16]. Powder microscopy was performed according to the prescribed procedure[17,18] and stomatal index by following standard method.

The microphotographs were taken by Bright field microscope with digital camera Canon Photo shot G2.

Determination of behaviour of plant powder

Behaviour of plant powder with different chemical reagents was determined under natural light and fluorescent-UV light.

Extraction of powdered plant material

The plant material collected from their natural habitat was cleaned, shade dried at room temperature, coarsely powdered and stored in an air tight glass container. 100 gms of each coarse powder was successively extracted with different solvents *viz.* Petroleum ether, Chloroform and Methanol (40-60) in Soxhlet extractor for 16-18 hours. Then, the extracts were filtered and concentrated using rotary flash evaporator and residues were dried in desiccators over sodium sulfite below 60°C. Freshly prepared extracts were subjected to phytochemical evaluation for the detection of various constituents using conventional protocol[19].

RESULTS AND DISCUSSION

Pharmacognostic investigations

The detailed and systematic pharmacognostical evaluation would give valuable information for the future studies. The detailed morphology of *Sida cordifolia* L. was carried out to support proper identification of drug.

Stomata and Stomatal index

Sida cordifolia L. has two types of stomata, namely anisocytic and paracytic. The epidermal cells are larger than subsidiary cells. Stomatal index, the percentage of stomata found in unit area of leaf exhibited

marked variation in the adaxial and abaxial surface of the leaf. Abaxial surface has an increased stomatal frequency than adaxial surface (Fig. 1. D). The values are represented in the Table 1.

Microscopy

Microscopy of Root (T.S)

T.S of root (Fig.1.A.) shows single layered epidermis covered by cuticle, cortex is made up of group of parenchymatous cells. Some cells contain calcium oxalate crystals and few sparsely distributed with starch grains. Endodermis is distinct, single layered made up of polygonal thick walled cells. Secondary phloem occurs next to the cortex. This region consists of 6-8 tangential bands of thick walled phloem fibre groups alternating with thin walled phloem elements. Vascular cambium is distinct. Secondary xylem contains vessels, xylem parenchyma, xylem fibres and medullary rays. Vessels many, occur in scattered groups of 2 to 4. Xylem parenchyma cells are thick walled, surround the vessels but do not form concentric rings and contain starch grains. Xylem fibres are thick walled and more in number than xylem parenchyma. Medullary rays are uni or biseriate in the secondary xylem region while multiseriate in the secondary phloem region extending and reaching up to the cortex in a straight course.

Microscopy of Stem (T.S)

T.S of stem (Fig.1.B) shows outer epidermis is made up of single layer of rectangular thin walled cells. The cortex consists of outer two layered chlorenchyma and middle 2 to 3 layered collenchyma cells and inner 3 to 4 cells deep rotund to oval parenchyma cells, some of the parenchyma cells contain druses of calcium oxalate crystals, Pericyclic fibres in groups occur as a ring, external to the phloem. Vascular bundles are closely arranged forming a continuous ring. Pith is made up of thin walled parenchyma cells, most of the cells are filled with starch grains. Mucilage cells are present in the cortex and pith. Most of the cells are filled with starch grains. During its early secondary growth cork cells are 3 to 4 layered and are made up of rectangular tangentially elongated cells arranged in a row. Secondary cortex contains 2 to 3 rows of fibre groups. Secondary phloem is narrow. The secondary xylem arranged as a ring and the vessels are rotund in outline and occur solitary or in radial rows of 2 to 3.

Microscopy of Leaf (T.S)

T.S of leaf (Fig.1.C) shows the leaf across the midrib showed an upper epidermis consisting of long elongated palisade cells with calcium oxalate crystals and lower epidermis consists of spongy parenchyma. Upper and lower epidermis having uniseriate and multiseriate trichomes. Stomata were anisocytic and paracytic type, whereas in *Sida acuta* Burm.f. anisocytic[20] and *Abutilon indicum* L. anomocytic stomata[21] were present. The midrib bundle was surrounded by a zone of closely packed collenchyma cells with 2 to 3 layered in the upper and 3 to 4 layered in the lower part. Just below and above the collenchyma and parenchyma cells are arranged loosely with much of large intracellular space. The lignified pericyclic fibre was present below vascular bundle.

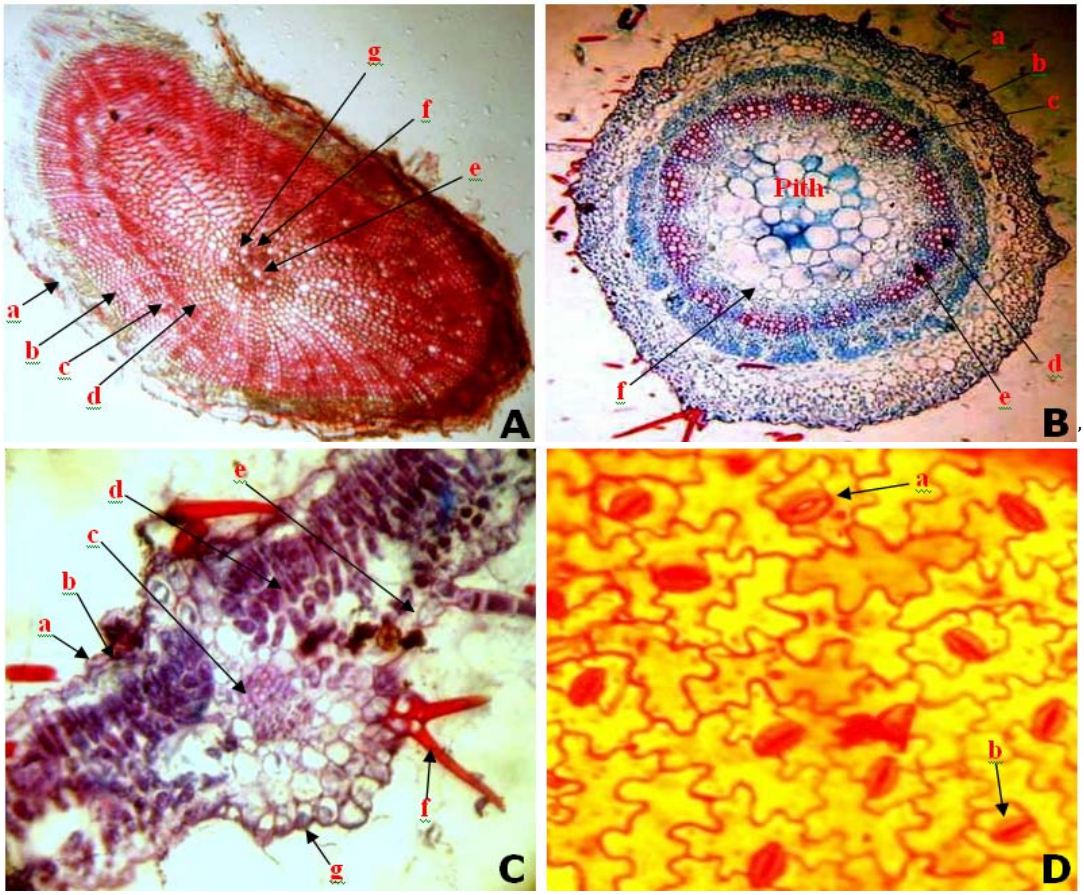

Fig. 1: A-T.S. of young root, a-epidermis, b-cortex, c-endodermis, d-pericycle, e-medulla, f-phloem, g-xylem. B-T.S.of stem, a-epidermis, b-hypodermis, c-conjuctive tissue, d-meta xylem, e- proto xylem, f-phloem. C-T.S.of leaf, a-upper epidermis, b-cuticle, c-vascular bundles, d-palisade parenchyma, e-spongy parenchyma, f- trichome, g- lower epidermis. D-Surface view of leaf epidermis showing a-anisocytic and b-paracytic stomata.

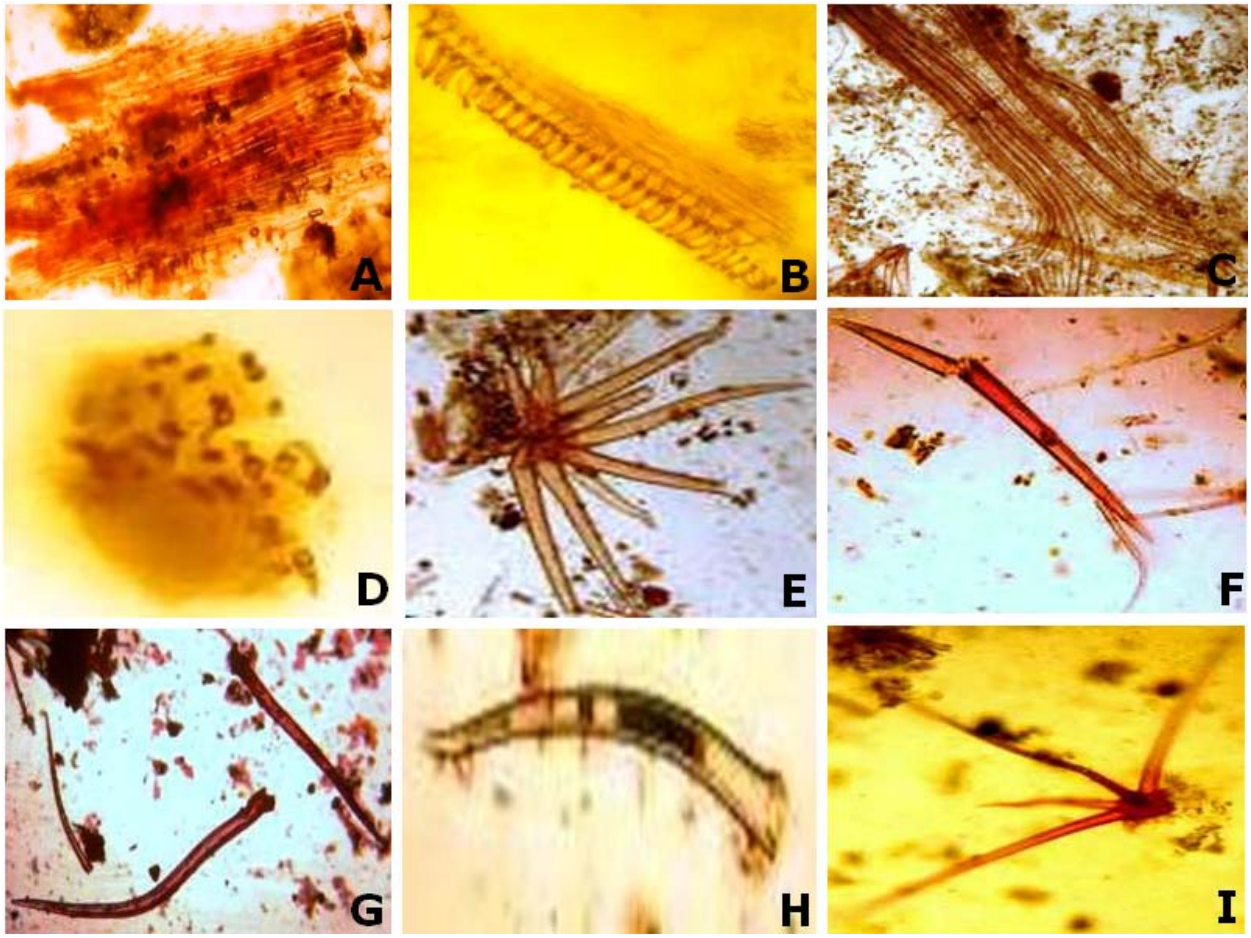

Fig. 2: A- Epidermal cells, B-Annular to spiral Vascular Bundle, C-Vessels, D- starch grains, E- Multiseriate trichome, F-Unicellular conical trichomes, G-Warty trichome, H- Uniseriate trichome, I- Stellate trichome.

Table 1: Stomatal index on adaxial and abaxial leaf surfaces of *Sida cordifolia* L.

Trials	Adaxial surface of leaf		Abaxial surface of leaf	
	Margin	Middle	Margin	Middle
1.	134	128	148	198
2.	162	145	155	210
3.	148	122	156	223
4.	155	148	168	238
5.	160	156	174	240
Average	151.80	139.80	160.19	221.80
	145.80		190.99	

Table 2: Phytochemical analysis of whole plant extract of *Sida cordifolia* L.

Sl. No.	Phytochemicals	Petroleum ether extracts	Chloroform Extracts	Methanol Extracts
1.	Steroids	+	-	-
2.	Glycosides	-	-	-
3.	Fatty acids	+	-	-
4.	Aanthraquinone glycoside	-	-	-
5.	Alkaloids	+	+	-
6.	Flavanoids	-	-	+
7.	Saponins	-	-	+
8.	Tannins	+	-	-
9.	Triterpenoids	-	-	+
10.	Cardiac glycoside	-	-	-

+ = Present, - = Absent.

Table 3: Behaviour analysis of whole plant powder of *Sida cordifolia* L. with different chemical reagents

Sl. No.	Treatment	Colour of powder	
		Day Light	UV Light (254 nm)
1	Powder as such	Light green	Light green
2	Powder + Picric acid	Yellowish green	Light green
3	Powder + HNO_3	Faint brown	Yellowish green
4	Powder + HCL	Dark green	Dark green
5	Powder + H_2SO_4	Light green	Light yellow
6	Powder + $FeCl_3$	Dark brown	Dark brown
7	Powder + NaOH	Light green	Dark green
8	Powder + Glacial acetic acid	Light green	Light green
9	Powder + Iodine solution	Faint black	Black
10	Powder + Aqueous solution	Light green	Dark green
11	Powder + Aq. Mercuric chloride	Light green	Dark green
12	Powder + HNO_3 + Ammonium solution	Light brown	Light brown

Table 4: Organoleptic evaluation of various parts of *Sida cordifolia* L.

	Flower	Fruit	Seed	Leaves	Stem	Root
Colour	Yellow	Dark green	Brown	Dark green	Light green	Light brown
Odour	Odourless	Odourless	Odourless	Odourless	Odourless	Odourless
Taste	Bitter	Bitter	Pungent	Bitter	Slight bitter	Slight bitter

Preliminary Phytochemical Analysis

Preliminary phytochemical screening of the *Sida cordifolia* L. plant powder is done following standard methods[19] and results are presented in the Table 2.

Behaviour of whole plant powder with different chemical reagents

Behaviour of powder of *Sida cordifolia* L. with different chemical reagents is detected. The colour changes, when observed under day light and fluorescence UV-light by method[22] and results are presented in the Table 3.

CONCLUSION

In present investigation, various standardized parameters such as macroscopic, microscopic, pharmacognostic and phytochemical screening was carried out and which could be helpful in authentification of ***Sida cordifolia* L.** The results of present study will also serve as reference material in the preparation of monograph. It is present need to conserve the plant for medicinal usage. Tissue culture techniques may be more useful in the conservation point of view and to make the drug available throughout the year.

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