

PHARMACOGNOSTIC STUDIES ON *Sida acuta* Burm.f.

S.MOHIDEEN*, E.SASIKALA** AND V.GOPAL***

*Lecturer, Department of Pharmacognosy, Adhiparasakthi College of Pharmacy, Melmaruvathur-603 319, Tamilnadu.

**Research Officer (Pharmacognosy), Central Research Institute for Siddha, Arumbakkam, Chennai-600 1001.

***Head of Department, Mother Terasa Institute of Pharmacy, Pondicherry.

Received: 12.3.2002

Accepted: 14.6.2002

ABSTRACT: *Sida acuta* Burm.f. (Fam. Malvaceae) is used in Siddha system of medicine and in folk medical practice in Tamil Nadu under the names Arivalmooku pachilai or vattatiruppi. The leaves of this plant are used for their diuretic, demulcent, anthelmintic and wound healing properties. The present paper discusses the anatomy of petiole leaf and stem, microscopic constants, physico-chemical standards and fluorescence analysis of the drug.

INTRODUCTION

Species of the genus *sida* (Fam. Malvaceae) are used in Ayurveda, Siddha and Unani systems of medicine. In the Ayurvedic system, these species are designated as varieties of Bala, such as Bala, Nagabala etc. In Ayurveda, the drug Bala is derived from *Sida Cordifolia*. However, according to Kerala tradition, *Sida retusa* is taken.

Sida acuta Burm.f. is used in Siddha system of medicine and in folk medical practice in Tamil Nadu, under the names Arivalmanaippundu or Arvalmooku pachilai¹ of Vattatiruppi².

The plant is an erect, perennial under shrub or shrub, 1.5m height with linear to lanceolate leaves and flower yellow solitary or in pairs. It is distributed through out the hotter parts of India and Nepal .

Plant is credited with abortifacient, anthelmintic and antiemetic³ Properties. Leaves are considered to possess demulcent, diuretic, anthelmintic and wound healing

properties and are used I rheumatic affections.^{1,4}

Root is said to possess aphrodisiac, antirheumatic, stomachic, diaphoretic, diuretic, antipyretic and wound healing properties.

MATERIALS AND METHODS

Leaves were collected from Villupuram and Trichy Districts of Tamil Nadu. Standard methods of processing and microscopy were applied⁹. Quantitative microscopy was determined by methods prescribed by Wallis¹⁰. Physico-chemical constants¹¹⁻¹³ were carried out and fluorescence character¹⁴ were also observed under day light and ultra violet light at 254 nm.

OBSERVATION

TRANSVERSE SECTION OF PETIOLE

The transverse section of petiole is nearly circular at the proximal end. Outer Cortex is

made up of 2-3 layers of collenchyma cells and inner region consists of 5-7 rows of round parenchyma cells with small intercellular spaces. The epidermis beset with sporadic stellate trichomes and occasional glandular trichomes. Some of the cortical parenchyma cells possess large solitary cluster crystals.

The vasculature is represented by a dorsiventrally flattened, siphonostele where in the vessels are arranged in radial series (Fig.A). The phloem is devoid of lignified cells. Some cells contain druses of calcium oxalate crystals. Vasculature is ensheathed by heavily lignified fibres. The medullary parenchyma is transformed into lignified tissue almost entirely in mature petioles.

The transverse section of petiole at the distal end is adaxially compressed and the vasculature is represented by 4 distinct collateral strands of which one is abaxial, two are lateral and the smaller one is adaxial. They are ensheathed by heavily lignified fibres, thus presenting a dictyostelic pattern.

TRANSVERSE SECTION OF LAMINA

The lamina in transverse section reveals the dorsiventral structure. The adaxial epidermis is single layered. The palisade mesophyll is three layered. The spongy mesophyll is four to five layered, made up of rotund cells of various sizes. Some cells contain druses of calcium oxalate crystals (Fig E). Mucilage cells are present among the palisade and in between palisade and spongy tissue. The lower epidermal cells measure equal anticlinally and periclinally excepting where they happen to be subjacent to glandular trichomes which are borne in depression.

TRANSVERSE SECTION OF MIDRIB

The midrib shows a small projection on the adaxial face and a convexity on the abaxial face (Fig B). The adaxial and abaxial sub-epidermal cell layers along the rib are composed of collenchyma. A large crescentic collateral vascular bundle traverses the rib. The rest of the area is occupied by parenchyma cells. Some of these cells and phloem cells contain druses of calcium oxalate. Mucilage cells are also seen. The palisade tissue is almost continuous over the midrib region excepting a few collenchyma and parenchyma cells breaking the continuity.

EPIDERMIS IN SURFACE VIEW

The adaxial foliar epidermis is composed of large penta to heptagonal cells with slightly curved walls. Anisocytic cruciferous stomata are present (Fig.C). The abaxial foliar epidermis is composed of slightly smaller cells with strongly wavy margins. It is profusely perforated by anisocytic stomata (Fig.D).

TRICHOMES

Glandular and stellate trichomes occur. These characteristic stellate trichomes with eight arms are numerous (Fig.G). The presence of stellate trichomes is said to characterize a few families, particularly the Malvaceae to which *Sida acuta* belongs. Glandular trichomes have multicellular basal cell, 3-5 celled uniseriate stalk and 4-8 celled head (Fig. F).

TRANSVERSE SECTION OF STEM

Transverse section of stem is oval in outline. Epidermis is made up of single layer of rectangular thin walled cells. The cortex consists of outer two layered chlorenchyma and middle 3-4 layered collenchyma cells

and inner 3-4 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, Mucilage cells are present in the cortex and pith. Most of the cells are filled with starch grains (Fig.H&I).

During its early secondary growth cork cells are three to four layered and are made up of rectangular tangentially elongated cells arranged in a row. Secondary cortex contain two to four 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 two to three. Pith is made up of thin walled rotund cells. Most of the cells are filled with starch grains.

QUANTITATIVE MICROSCOPY

In quantitative microscopical studies, the following data were determined and the results are given below:

a. Stomatal Number

i. For upper epidermis – $44.75-7/mm^2$

ii. For lower epidermis- $12-14.5-16/mm^2$

b. Stomatal index

i. For upper epidermis – $7-8-11/mm^2$

ii. For lower epidermis- $15-16-19/mm^2$

c. Vein-islet number – $11.5-13-15/mm^2$

d. Veinlet-termination number - $13-14-16/mm^2$

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e. Palisade ratio – 5-6.5-7.5

PHYSICO CHEMICAL CONSTANTS

Physico-Chemical constants were determined and recorded in Table -1.

FLUORESCENCE ANALYSIS

Fluorescence analysis of drug powder and extracts were carried out and recorded in Table -2 and 3.

DISCUSSION

The present study deals with the pharmacognostical studies of the petiole, leaf and stem of *Sida acuta* Burm.f.

The presence of characteristic stellate and glandular trichomes, druses of calcium oxalate crystals and siphonostelic vasculature in the petiole and the presence of three layered palisade and mucilage cells, druses in the spongy tissue, anisocytic (Cruciferous) type of stomata in the leaf are the salient features of diagnostic value in the pharmacognostic determination of the drug.

The relevant quantitative microscopy, physico-chemical constants, fluorescence analysis are very much helpful in laying down the standards.

ACKNOWLEDGEMENT

Authors are thankful to Vaidya. S. Usman Ali, Retired Research officer, Central Research Institute for Siddha, Chennai- 106, for his support and creative criticism.

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TABLE -1
PHYSICO-CHEMICAL CONSTANTS

I ASH VALUE	
a. Total ash	8.34%
b. Water soluble ash	3.95%
c. Alkalinity of water soluble ash	0.01ccof0.1 NHC1/gm
d. Acid insoluble ash	0.94%
II SOLUBILITY	

a. Alcohol	8.23%
b. Water	18.83%
III EXTRACTIVE VALUES	
a. Hexane	4.94%
b. Benzene	0.70%
c. Chloroform	0.81%
IV. QUALITATIVE INORGANIC TESTS	
a. Acid radicals	Sodium, Potassium Iron, Calcium
b. Basic radicals	Carbonate, Sulphate, Chloride, phosphate

**TABLE -2
FLUORESCENCE ANALYSIS OF DRUG POWDER**

Material	Day Light	UV Light
Drug Powder	Brownish green	Green
Drug Powder + 1NNaOH (aqu)	Pale Brown	Dark green
Drug Powder + 1NNaOH (alc)	Pale green	Parrot green
Drug Powder + 1NHCI	Light Brown	Pale green
Drug Powder +50% H2SO4	Green	Brownish green

**TABLE -3
FLUORESCENCE ANALYSIS OF EXTRACTS**

Extracts	Day Light	UV Light
Hexane	Pale green	Parrot green
Benezene	Green	Olive green
Chloroform	Yellowish green	Dark green
Alcohol (Methanol)	Bluish green	Dark green
Water	Pale green	Pale green
Acetone	Bluish green	Green

ILLUSTRATION OF THE FIGURES

- A. T.S. of petiole
- B. T.S. of leaf

- C. Adaxial foliar epidermis
- D. Adaxial foliar epidermis
- E. Palisade cells showing druses of calcium oxalate crystal
- F. Glandula trichome
- G. Stellate trichome
- H. T.S of Young stem-ground plan
- I. T.S. of Young stem-A portion enlarged

ABBREVIATIONS

Ch	- Chlorenchyma
Co	- Collenchyma
Dr	- Druses of calcium oxalate crystal
Ep	- Epidermis
F	- Fibers
Mc	- Mucilage cell
P	- Parenchyma
Pa	- Palisade tissue
Ph	- Phloem
Pi	- Pith
Sg	- Starch grains
Si	- Siphonostele
Str	- Stellate trichome
Sp	- Spongy tissue
St	- Stoma
Vb	- Vascular bundle
Xy	- Xylem

FIGURE

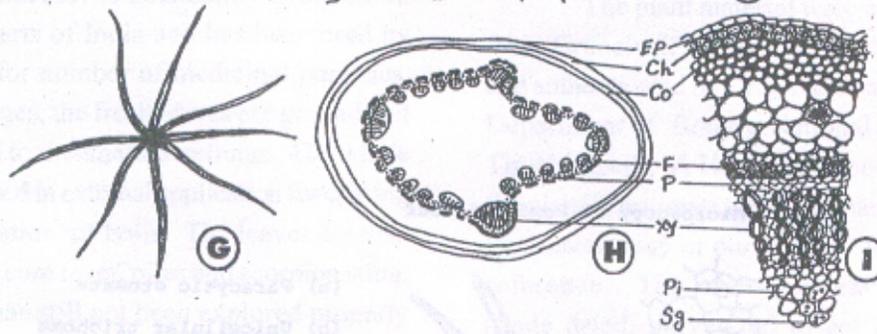
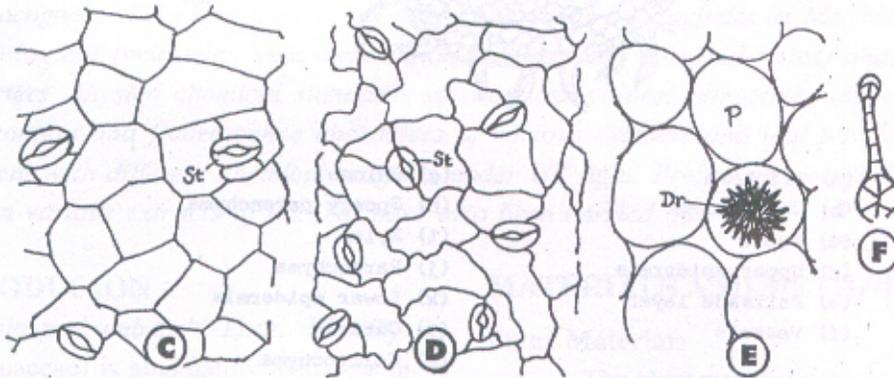
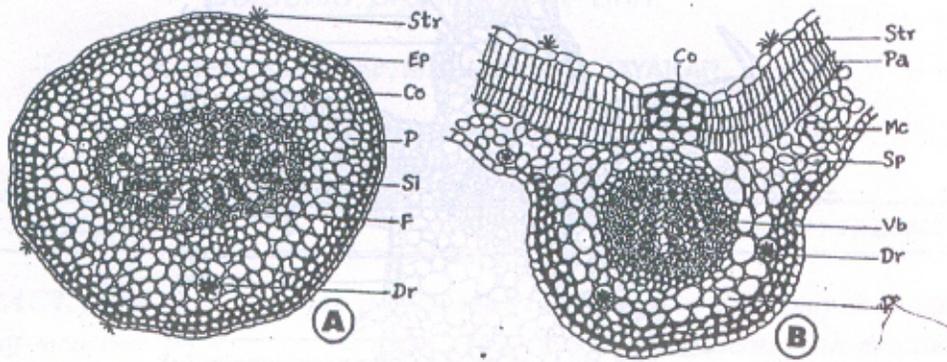
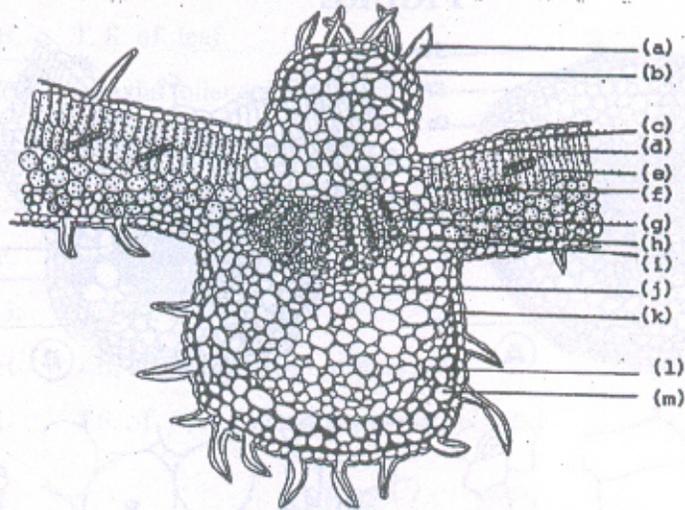


Fig.1.T.S. of the leaf through midrib



- | | |
|---------------------|-----------------------|
| (a) Trichome | (g) Phloem |
| (b) Collenchyma | (h) Spongy parenchyma |
| (c) Stoma | (i) Xylem |
| (d) Upper epidermis | (j) Parenchyma |
| (e) Palisade layer | (k) Lower epidermis |
| (f) Vessels | (l) Cuticle |
| | (m) Collenchyma |

Fig.2. Microscopy of Powdered Leaf

