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Pharmacognostic and phytochemical investigation of *sida acuta* leaves

Shikha Sharma[1]*, Biswal Shashi Bhusan[2], Shailendra Lariya[3], Sunil Mistry[4]
[1]Faculty of Pharmacy, Pacific Academy of Higher Education and Research University, Udaipur, India.
[2]Dept of Pharmacology, VIMSAR, Burla, Odisha, India
[3]Radha Raman Institute of Pharmaceutical Science, Bhopal, Madhya Pradesh, India.
[4]Malhotra College of Pharmacy, Bhopal, Madhya Pradesh, India.
***Corresponding author: E-Mail: shkha.22bhopal@gmail.com**

ABSTRACT

Sida acuta (Malvaceae) found throughout the hotter region of India and Nepal, is an erect perennial shrub. It is used for treatment of various diseases such as liver disorders diuretic, female disorders & abortifacient in ayurvedic preparations, cough, cold, asthma, fever, headache (migrane), ulcer. Antifertility agent, anthelmintic, snake bite and urinary diseases. The present study was carried out to evaluate the Pharmacognostic and qualitative analysis of various phytochemicals parameters of *Sida acuta* leaves.

KEY WORDS: *Sida acuta,* Pharmacognostic, Phytochemicals, Microscopy.

1. INTRODUCTION

For the treatment and prevention of a range of disorders, Herbal drugs have been used since ancient times as medicines. Medicinal plants and their formulations have played a important role in world health. In spite of the great advancements in modern medical science in recent years, contribution of medicinal plants still important to health care (Calixto, 2000). Due to commercialization of the herbal medicine and product, assurance of quality, safety and efficacy has become a challenging issue. Due to several factors the raw material from herbs is prone to a lot of variation; the important issue is to identification and selection of desired plants due to seasonal variation and climatic conditions, Variation due to chemotypic, genotypic and the ecotypic variations, Variations due to drying procedure and conditions of storage and the presence of xenobiotic (Dixit, 2008). *Sida acuta* belongs to family Malvaceae, an erect perennial shrub found throughout the hotter regions of Nepal and India. It is useful in treatment of various medical disorders such as liver disorders diuretic, female disorders & abortifacient in ayurvedic preparations, asthma, fever, headache (migrane), antifertility drugs and sedative (Pattar, 2012; Kirtikar, 1993). The aerial part of *Sida acuta* is mostly used for greater medicinal properties. The leaves of this plant are useful for its wound healing, demulcent, diuretic and anthelmintic properties (Anonymous, 1985). *Sida acuta* Burm .f. is used in Siddha system medicine. There are 1096 species of *Sida* out of which 100 species are medicinally important. From more than over 2000 years, the plants belong to *Sida* genus are used in India for their medicinal properties. The plants are also described in various Ayurvedic reference books like Bhav Prakash Niganthu, Niganthu Ratnakar, Charak Sanhita etc. Various species like *Sida cordifolia*, *Sida acuta*, *Sida veronicaefolia*, *Sida rhombifolia*, *Sida spinosa*, *Sida carpenifolia*, *Sida humilis*, *Sida veronicaefolia* are used in Ayurvedic system (Mudaliar, 1998).

The study was carried out to standardize the Pharmacognostic and qualitative analysis of various phytochemicals parameters of *Sida acuta* leaves.

2. MATERIALS AND METHODS

Collection and Authentication of Plant Material: The healthy and disease free leaves of *Sida acuta* were collected from Medicinal plants garden of Vindhya Herbal, Bhopal (MP) during the month of August to October 2014 and authenticated at Vindhya Herbals (A Unit of M.P. State Minor Forest Produce Cooperative Federation), Bhopal (MP).

Pharmacognostic Analysis: Pharmacognostic analysis (macroscopic and microscopic) of plant material studied according to methods and procedure described in literatures (Evans, 2002; Wallis, 1985). T.S. (Transverse sections) of Leaf was prepared as per procedure and stained with saffranin and Fast green (Dwivedi, 1990). Powder microscopic analysis was performed according to standard procedure (Khandelwal, 2007; Khasim, 2002) and stomatal index also analyze by standard method. The microphotographs were taken by digital camera Canon Photo shot G2 installed with Bright field microscope.

Physico-Chemical Constants: Physico-chemical constants (Horwitz, 1980; Mohideen, 2002; Anonymous, 1966) and fluorescence character (Anonymous, 1966) were also observed and reported under ultra violet light (254 nm) and day light.

Extraction of Plant Material: The healthy and disease free leaves of *Sida acuta* were collected from Medicinal plants garden of Vindhya Herbal, Bhopal (MP) were cleaned, dried under shade at room temperature, powdered coarsely with the help of mechanical grinder and stored in air tight container. For extraction - 100 gms of coarsely powdered leaves were taken and successively extracted with different solvents viz. Petroleum ether > Chloroform > Methanol (40-60) in Soxhlet extractor for 16-18 hours. Then, the extracts in round bottom flask were filtered in hot condition and concentrated that filtered extract using rotary evaporator then residues taken into glass petty dish and

dried in desiccators over sodium sulfite below 60°C. These Freshly prepared extracts were used to phytochemical analysis for the detection of various phytochemicals using standard protocols.

3. RESULTS AND DISCUSSION

Pharmacognostic Observations: Pharmacognostic observation and evaluation plays a major role in standardization and identification of drug. The complete morphology sudy of *Sida acuta* leaves was performed to analyze proper identification and standardization of drug.

Microscopy of Leaf (T.S): The lamina in transverse section (T.S.) shows the dorsiventral structure. The single layered adaxial epidermis and three layered palisade mesophyll is observed. Four to five layers of Spongy mesophyll, made-up of rotund cells of various sizes. Calcium oxalate crystals (Fig.1B) were seen in some cells. In between palisade tissue and spongy tissue, mucilage cells were seen. The lower epidermal cells measure Equal anticlinally and periclinally the lower epidermis present excepting to which glandular trichomes are borne in depression. The midrib shows a small projection on the adaxial face and a convexity on the abaxial face. The adaxial and abaxial subepidermal cell layers along the rib are composed of collenchyma. A large crescentic collateral vascular bundle traverses the rib. The remaining area is occupied by parenchyma cells. Some of these cells and phloem cells contain crystals 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. The large pentagonal to heptagonal cells with curved wall were composed in the adaxial foliar epidermis. Cruciferous anisocytic stomata are present (Fig.1E). Slightly smaller cells with strongly wavy margins were united to from the abaxial foliar epidermis. It is profusely perforated by anisocytic stomata. Glandular and stellate trichomes occur (Fig.1C). These characteristic stellate trichomes with eight arms are numerous (Fig.1D). 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.1C).

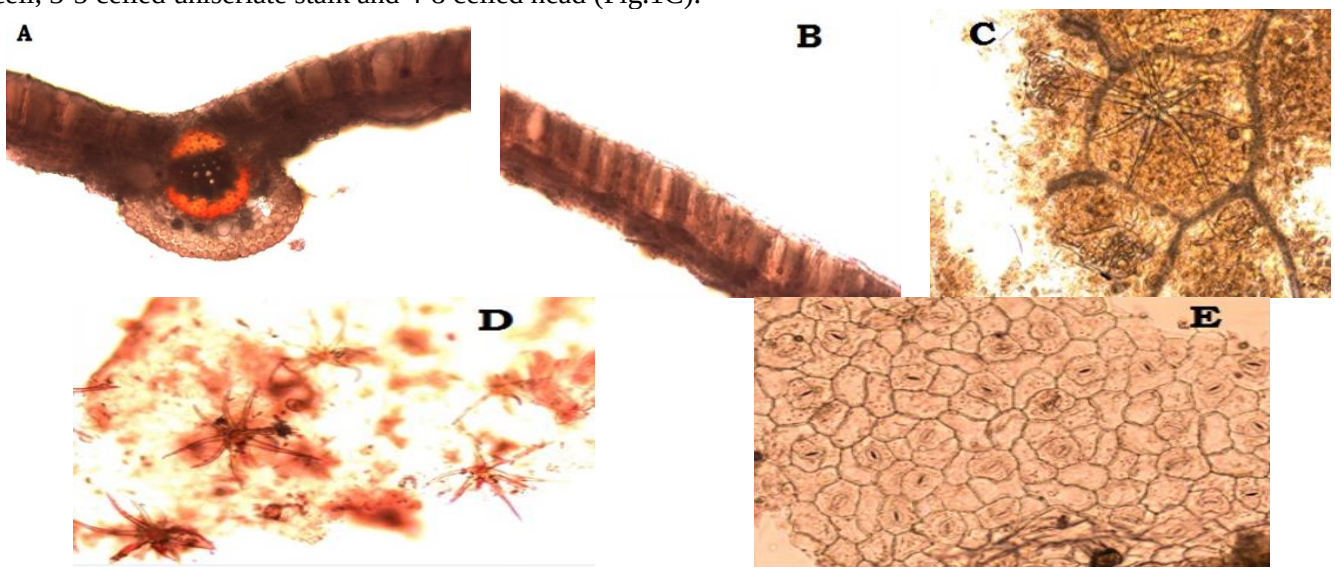

Figure.1. A) T.S. Of young leaf, B) Mesophyll zone, C) View of leaf with stellate and glandular trichome, D) Stellate trichome, E) Anisocytic stomata

Quantitative Microscopy: Quantitative microscopy of drug powder was determined by methods prescribed (Khandelwal, 2007; Khasim, 2002) and recorded in Table.1.

Table.1. Quantitative Microscopy of Powdered Leaves of *Sida Acuta*

Stomatal Number	Upper epidermis	3.00- 7.10-12.00 + 0.94
	Lower epidermis	9.00-17.20-31.00 + 2.14
Stomatal Index	Upper surface	8.00-15.80-23.01 + 1.90
	Lower surface	18.37-31.00-32.00 + 2.88
Vein islet no.	37.00-38.10-41.00 + 1.05	
Vein termination no.	13.00-18.10-23.00 +1.19	
Palisade ratio.	10.00 -11.40 -14.18 + 0.54	

Physico Chemical Constants: Physico-Chemical constants were determined and recorded in Table.2.

Fluorescence Analysis: Fluorescence analysis of drug powder and extracts were carried out and recorded in Table.3 and 4.

Table.2. Physico-Chemical Constants

I: Ash Value	
a) Total ash	7.45 %
b) Water soluble ash	2.78%
c) Alkalinity of water soluble ash	0.03%
d) Acid insoluble ash	0.66%
II: Solubility	
a) Alcohol	8.54%
b) Water	19.65%
III Extractive Values	
a) Alcohol	1.55%
b) Hexane	4.50%
c) Benzene	0.78%
d) Chloroform	1.03%
e) Water	2.87%
IV. Qualitative Inorganic Tests	
a) Acid radicals	Sodium, Potassium, Iron, Calcium
b) Basic radicals	Carbonate, Sulphate, Chloride, Phosphate
V. Moisture Content	
a) Moisture Content	10.02+ 0.74 % W/W

Table.3. Fluorescence Analysis of Drug Powder

Material	**Day Light**	**UV Light**
Drug Powder	Brownish green	Green
Drug Powder + 1N NaOH (aqu.)	Pale Brown	Dark green
Drug Powder + 1N NaOH (alc.)	Pale green	Parrot green
Drug Powder + 1N HCI	Light Brown	Pale green
Drug Powder +50% H_2SO_4	Green	Brownish green

Table.4. 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

Phytochemical Screening: Phytochemical screening of *Sida acuta* leaves shows presence of as alkaloids, carbohydrates, tannins, flavanoids, glycosides and saponins. Test were performed on freshly prepared extract and recorded in Table.5.

Table.5. Preliminary Phytochemical Screening of Leaf Extracts Of *Sida Acuta*

Phytoconstituents	**Petroleum ether**	**Chloroform extract**	**Ethanol extract**
Carbohydrates	-	+	+
Alkaloids	+	+	+
Phytosterols	+	-	+
Saponins	-	+	+
Fixed oils	+	+	+
Tannins	+	-	-
Flavonoids	-	+	+

4. CONCLUSION

In present study on selected plant materials were carried out to standardize various parameters such as including pharmacognostic and phytochemical screening which could be helpful in authentification of *Sida acuta*. The presence of characteristic glandular trichomes and stellate, calcium oxalate crystals and siphonostelic vasculature in the petiole and palisade and mucilage cells (three layered), 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 results of present study will serve as reference standard in the preparation of monograph for its proper identification and detection of adulteration/ substitution of *Sida acuta* leaves.

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