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Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

J P P Journal of Pharmacognosy and Phytochemistry

ISSN 2278-4136
ISSN 2349-8234
JPP 2013; 2 (3): 1-4

Received: 26-6-2013
Accepted: 24-7-2013

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Pharmacognostical Study of the Whole Plant of *Sida rhombifolia*

Virendra Sharma, SC Mehta and Pooja Sinoriya

ABSTRACT

Sida rhombifolia commonly called Bala or Atibala is claimed by folklore for various aliments like rheumatism, seminal weakness and diarrhea. This study presents a detailed pharmacognostical study of leaves of *Sida rhombifolia.* WHO recommended physic-chemical determinations and authentic phytochemical procedures. The physicochemical, morphological and histological parameters presented in this paper may be proposed as parameters to identify and establish the authenticity of *Sida rhombifolia*.

Keywords: *Sida rhombifolia,* Pharmacognosy, Microscopy, Physico-Chemical.

1. Introduction

The use of traditional medicine and medicinal plants in most developing countries, as a normative basis for the maintenance of good health, has been widely observed [1]. Plants offer novel bioactive compounds with added advantage of ethnobotanical observations, since many species are used in systems of natural and traditional medicine [2]. As per WHO definition, there are three kinds of herbal medicines: raw plant material, processes plant material and medicinal herbal products. Herbal drugs are finished labeled products that contain active ingredients such as aerial or underground parts of plant or other plant material or combination thereof, whether in the crude state or as plant preparations. The use of herbal medicines has increased remarkably in line with global trend of people returning to natural therapies [3].

The plant belonging to the genus *Sida* are found in the temperate region. There are about 200 species known in this genus. One of the species *Sida rhombifolia* L. (also known as Mahabala in Ayurveda) is used as tonic and anti-inflammatory [4]. The roots and leaves are bitter, sweet, emollient, cooling, aphrodisiac, unctuous, strengthening and promote sexual vigour and vital factor. They are good for rheumatism, flatulence, colic, haemothermia, and emaciation, vitiated conditions of tridosa, seminal weakness, arthritis and diarrhea [5]. It is reported to be sweet, sour, astringent, hot and heavy and cures vata ulcers, disorders due to morbid pitta and skin diseases [6].

The present study was undertaken to determine scientifically the pharmacognostical and physic-chemical parameters for standardization of *Sida rhombifolia.*

2. Materials and Methods

2.1 Collection of plant material

The fresh plant material of *Sida rhombifolia* were collected from Jorasi and Malanpur village Dist. Gwalior in the September and were identified and authenticated by Mr. N.K. Pandey, Research officer (Botany) at central research institute (Ay) Gwalior (M.P.).

2.2 Preparation of plant extract

The collected plant material was dried at room temperature, pulverized by a mechanical grinder, sieved through 40 mesh. The powdered material was extracted with methanol using soxhelt extraction apparatus. This methanolic extract was then concentrated and dried under reduced pressure. The methanol free semi-solid mass thus obtained was used for the experiment [7].

2.3 Pharmacognostic evaluation

A. Organoleptic evaluation

The macroscopic characters such as size, shape, margin, apex, surface, colour, odour, taste, nature, texture were studied for morphological investigation [8].

B. Microscopic studies

The leaves of the plants were cut and fixed in FAA (formalin 5 ml + acetic acid 5 ml + 70% ethyl alcohol 90 ml). The specimens were cast into paraffin blocks. The paraffin embedded specimens were section with the help of rotary microtome. The thickness of the sections was 10-12 µm. The section was then stained with toluidine blue.

2.3.1 Sectioning

The paraffin embedded specimens were sectioned with the help of rotary microtome. The thickness of the sections was 10-12 µm. Dewaxing of the section by customary procedure [9]. The sections were stained with Toluidine blue [10]. Since Toluidine blue is a polychromatic stain, the staining results were remarkably good; and some cytochemical reactions were also obtained. The dye rendered pink colour to the cellulose walls, blue to the lignified cell, dark green to suberin, violet to the mucilage, blue to the protein bodies etc. For studying the stomatal morphology, venation pattern and trichome distribution, per dermal sections (sections taken parallel to surface of leaf) as well as clearing of leaf with 5% sodium hydroxide or epidermal peeling by partial maceration employing jeffrey's maceration fluid were prepared [11]. Different cell components were studied and measured.

2.3.3 Physicochemical Parameters

The ash values, extractive values and loss on drying were performed according to the official methods prescribed in Indian Pharmacopeia [12] and the WHO guidelines on quality control methods for medicinal plants materials. Fluorescence analysis was carried out according to the method of Chase and Pratt [13] and Kokoski [14].

2.3.4 Fluorescence Analysis

Fluorescence analysis of the extracts was observed in daylight and UV light (254 nm) in a UV Chamber [12].

2.3.5 Leaf Constants

Palisade ratio is defined as average number of palisade cells beneath each epidermal cell. Vein islet number is defined as the number of vein islets per sq. mm. of the leaf surface midway between midrib and margin. Stomatal number of stomata per sq.mm of epidermis of the leaf.

3. Results and Discussion

3.1 Macroscopic characters

Macroscopically, the fresh leaves of *Sida rhombifolia* is 2.5 to 5 cm long, Shape: ovate-oblong, margin: serrated, Colour: green, Taste: Slimy, Odour: odourless.

3.2 Microscopic features of leaf

The midrib is prominent both on the adaxial and abaxial sides on the adaxial side, it is short, wide, conical humb, on the abaxial side, it is hemispherical body. The midrib is 400 um in vertical plane; its adaxial hump is 60 um wide the abaxial part is 300 um wide (Fig 1). The midrib has a thin layer of epidermis comparising of small squarish, thick walled cells. In the adaxial part the ground tissue forms a thick, vertical pillar of collenchymatous cells, the lower midrib has compact, angular thin walled parenchyma cells. Some of the cells are hemispherical. It has 8-10 parallel files of xylem elements and thick mucilaginous cells are abundant in the phloem.

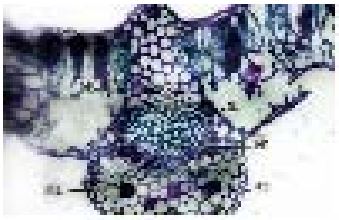

Fig 1: T.S. of *Sida rhombifolia* leaf

3.3 Trichome Pattern of the Epidermis

Trichome is abundant on the leaf, stem and other aerial parts. There are two types of trichome which occur intermixed on the leaf.

3.3.1 Covering Trichome

These trichome are non-glandualar type, they consist of dead cells with thick, lignified walls. The covering trichome is a complex type. It consists of arosette of basal epidermal cells, from each basal cell a trichome arises and spreads horizontally (Fig 2). In surface view, this trichome appears star like and hence they are called stellate trichome (Fig 3). The trichome is 8 um thick and 100-200 um long.

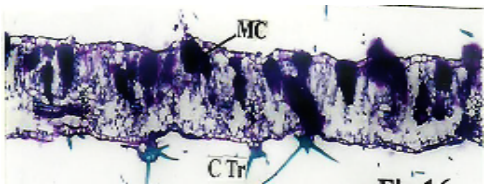

Fig 2: Covering Trichome

Fig 3: Star like Stellate Trichome

3.3.2 Glandular Trichome

These trichomes are secretary in function. Then they less abundant than the stellate trichome. They are multicellular, uniseriate and unbranched. It has a slightly dilated basal cell and a row of eight cells or less, the cell are horizontally rectangular and becomes gradually tapering to a narrow terminal part. The tip bears a small spherical cell. All this cells have dense cytoplasmic contents. The trichome is up to 150 um long (Fig 4).

Fig 4: Glandular Trichome

3.4 Stomata of the Epidermis

The stomata occur on the adaxial side of the lamina. The stomata are anisocytic type; each stoma has three subsidiary cells of which one is smallest. Thin cuticular lamellae are seen on the epidermal surface, the lamellae are parallel to each other, but may be parallel or at right angles to the anticlinal walls (Fig 5).

Fig 5: Anisocytic Stomata

3.5 Physicochemical Parameters

Ash values (Total ash, Acid insoluble ash, Water soluble ash, Sulphated ash, Loss on drying (desiccators), Loss on drying (Hot air oven), Water soluble extractive, Alcohol soluble extractive value of leaf powder are given in table no.1:

S. No.	Physio chemical Constants	*Sida rhombifolia* Values in (%)
1.	Total ash	6.5
2.	Acid insoluble ash	1.2
3.	Water soluble ash	4.5
4.	Water insoluble ash	2.35
5.	Sulphated ash	8.75
6.	Water soluble extractive	5
7	Alcohol soluble extractive	2
8	Loss on drying (desiccators)	0.40
9	Loss on drying (Hot air oven)	0.40

Table 1: Physico -Chemical Standard Values of *Sida rhombifolia*

3.6 Fluorescence Analysis

The fluorescence analysis of the powder drug was done and results are given in table no. 2. The powder was treated with various reagents and the mixture was observed under UV light (254 nm) to see the type of fluorescence.

Table 2: Fluorescence Analysis of Leaf Extract of *Sida rhombifolia*

S. No.	**Chemical Test**	***Sida rhombifolia* Day light**	***Sida rhombifolia* UV light**
1.	Sample as such	Yellow	Dark Yellow
2.	Powder + 1N aq. NaoH	Yellow	Green
3.	Powder + 1N alc. NaOH	Yellow Green	Dark Green
4.	Powder + 1 N HCl.	Greenish Yellow	Green
5.	Powder + 50% HNO_3	Pale Green	Dark Green
6.	Powder + 50% H_2SO_4	Pale Yellow	Green
7.	Powder + Methanol	Green	Blackish Green
8.	Powder + NH_3	White	Green
9.	Powder + I_2	Reddish Orange	Yellowish Brown
10.	Powder + $FeCl_3$	Brownish Orange	Dark Brown

Table 3: Leaf Constant Values of *Sida rhombifolia* 3.)

S. No.	**Leaf constant determination**	***Sida rhombifolia* (Values in um)**		
		Minimum	**Average**	**Maximum**
1	Stomatal Index	7.85	12.34	17.7
2	Stomatal Number	3.0	2.8	17.7
3	Vein-Islet Number	6.2	7.8	11.3
4	Vein termination number	3.0	4.1	6.0

3.7 Leaf Constants

Leaf constant values like Stomatal index, Stomatal number, Vein-islet number and Vein termination number are given in table no. 3

4. Conclusion

In the present investigation, the pharmacognostical and physicochemical characteristics of *Sida rhombifolia* were studied. The morphological and microscopical evaluations were done to ascertain the standard reference values for standardization of the plant materials. In the microscopy, the section study of the leaves of *Sida rhombifolia shows* the presence of collenchymatous cells, parenchyma cells, mucilaginous cells, trichomes (glandular and covering). Anisocytic stomata is present on the adaxial side of the

lamina. Some of the physical parameters have also been studied which are total ash, water soluble ash, loss on drying, water soluble extractive, alcohol soluble extractive and fluorescence analysis.

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