Pharmacognotical studies on the Leaves of Alstonia scholaris R. Br.

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ABSTRACT

Alstonia scholaris R. Br. (Apocynaceae) is popularly known as “Saptaparni” or “Devil’s tree”, which is used in the traditional systems of medicine. The leaf is considered one of the important plant organs for the treatment of various disorders such as Beriberi disease, congestion of liver, in ulcer, dropsy, and stomachic pains. The current study has therefore been carried out to provide requisite pharmacognostic details. Morphological and anatomical aspects as well as differential microchemical response have been worked out to identify the diagnostic features of the leaf. Some of the diagnostic characters noted are verticillate arrangement of the leaves at node, dark green color of the upper surface, coriaceous nature, papilllose abaxial epidermis and giant stomata. Physical constant values involving moisture content, ash and extractives as well as qualitative and quantitative estimation of various phytochemicals have been studied. The presence of lipid, saponin, tannin, alkaloid, phenol, steroid, flavonoid, and some other chemical constituents are recorded.

Keywords: Alstonia scholaris, leaf drug, pharmacognosy

INTRODUCTION

Alstonia scholaris R. Br. (Apocynaceae) is popularly known as the “Saptaparni” or ‘Devil’s tree’. It is a well known remedy for the treatment of various types of disorders in the ayurvedic, homoeopathic and folklore system of medicine in India1, 2. Distribution of the plants were extensive mostly in dried forests of India, the Western Himalayas, Western Ghats, and in the Southern region. Different parts of the A. scholaris tree have been widely used in the traditional systems of medicine. The leaf is considered as one of the important plant organs for the treatment of several ailments. The tender leaves in the form of poultice are good for ulcers, whereas the decoction of leaves is given in the Beriberi disease and in congestion of the liver. The crushed leaves boiled in the edible oil are administered internally for the dropsy3. The juice of the leaves with ginger is found useful after confinement4, 2.

In recent years, there has been rapid increase in the standardization of selected medicinal plants of potential therapeutic significance. A perusal of existing reports does not reveal the comprehensive pharmacognostic studies on the leaves of A. scholaris except some works which are mostly on the leaf chemical contents; particularly on several indole alkaloids and few on other phytochemicals as well as on antibacterial activity5–12. The present pharmacognostic investigation of the leaves in A. scholaris is therefore undertaken.

MATERIALS AND METHODS

The fresh leaves of A. scholaris R. Br. were collected in the month of October (2005) from the Botanical Garden of Dr. Babasaheb Ambedkar Marathwada University, Aurangabad. The plant was identified with the help of Flora of Marathwada13 and a voucher specimen has been deposited at the Botany department of the university. The leaves were washed and used for the present study.

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Microscopic Characters

For microscopic studies, the leaves were cut and removed from the plant and fixed in FAA (Formalin 5 ml + Acetic acid 5 ml + 70% Ethanol 90 ml). After 24 hours of fixing, the epidermal peels and transsections of leaf and petiole were taken by free hand. The sections were stained in safranin (1%), light green (1%) and mounted in DPX after the customary dehydration. Some hand sections were also examined in glycerin. Microphotographs of leaf were taken by using Jenaval and Mirax Laborec Cameras affixed to microscope.

Quantitative Microscopy

The leaf epidermal studies were carried out on fresh specimens. Peels were removed mechanically using some chemicals. They were stained in 1% safranin mounted in glycerin and made semi-permanent by ringing with DPX solution. Stomatal index (SI) and stomatal frequency was calculated14, 15. The vein islet number and vein termination number the leaf were determined according to the reported method16.

Histological colour reaction

The histochemical colour reactions were performed by the standard methods17, 18.

Physio-chemical characters

Physiochemical values such as the moisture content, percentage of total ash, acid insoluble ash and acid soluble ash; extractive values like chloroform-soluble extractives, alcohol-soluble extractives and water-soluble extractives were calculated according to the methods described in the Indian pharmacopoeia19, 20.

Phytochemical Evaluation

Phytochemical studies such as qualitative and quantitative were done from the shade-dried powdered material. For qualitative phytochemicals, standard prescribed methods21–25 and for quantitative phytochemicals, the recommended procedures were followed for determining reducing sugar26, fat/ lipids27, alkaloid28, tannin, phenolics29, and saponin30.
RESULTS AND DISCUSSION

Leaves are simple, petiolate verticillate at the node; they are ovate to oblanceolate, length 5 to 15 cm and breadth 2 to 6 cm, narrow at the base, entire, coriaceous, rounded or bluntly acuminate at the apex. Upper surface is dark green, glabrous while lower surface is rather pale and covered with whitish bloom. Midrib is prominently raised and the lateral nerves are 50 to 60 in number, close to each other, nearly horizontal and parallel. In transaction view, the shape of the midrib appears as Plano convex with flat adaxial side and hemispheri-
cal abaxial side. The adaxial epidermis consists of large thick walled, barrel shaped cells covered with thick striated cuticle. The abaxial epidermis is papillae and comparatively of smaller cells. The papillose are tall and variable in shape. The stomata are sunken and exclusively to the lower surface. The hypodermis is of single layered and placed on adaxial surface of the leaf. The mesophyll consists of palisade and spongy tissues. The palisade is 1-2 layers and spongy tissue is of loosely arranged cells. Vascular bundles are bicolateral and extend through mesophyll and arc shaped xylem strand surrounded by phloem on both sides. The sclerenchymatous cells are also encircled the vascular tissue [Fig. 1 and 2].

The cross-sectioned outline of petiole shows the shape of more or less rectangular with shallow adaxial concavity. The epidermal layer consists of thick cuticle; inner to epidermis is made up of a narrow zone of 3-8 layered collenchymatous hypodermis. The remaining ground tissue is parenchymatous with large, circular thin walled cells, having crystals of calcium oxalate. Vascular system consists of bicolateral arc shaped xylem is located centrally, surrounded by sclerenchymatous cells. Moreover two cortical bundles occur adaxially one to each side [Fig. 2].

The leaf microscopic characters like of stomatal frequency, stomatal index, vein islet number, and vein termination were determined [Table 1]. The quantitative determinations of some pharmacognostic parameters are useful for setting standards for crude drugs. The vein islet and vein termination numbers and other parameters determined in the quantitative microscopy, are relatively constant for plants and can be used to differentiate closely related species.

The histochemical colour reactions were carried out on transverse section of the fresh leaf (Table 2). The results indicated that presence of lignin, starch, fats, alkaloids, saponins, tannins, flavonoids and calcium oxalate crystals. Histochemical localization of certain important compounds enables to get a preliminary idea of type of compounds and their accumulation in the plant tissues. Based on this study, one can chose the organ or tissue where the required compounds are located.

The physio-chemical characters of the dried leaf powder were calculated in terms of air dried sample [Table 3]. Physical standards like such as moisture content, ash values, extractive values etc. play an important role in the drug evaluation. In the present plant, moisture content is low (05.35 %) and total ash calculated is 15.85 %. The leaf shows higher extractive values in alcohol than that of water and chloroform. The moisture content of the drug is not high, thus it discourages bacterial, fungi or yeast growth, as the general requirement for moisture content in crude drug is not more than 14 %.[20] Equally important in the evaluation of crude drugs, is the ash value and acid insoluble ash value determination. The total ash is particularly important in the evaluation of purity of drugs, i.e. the presence of or absence of foreign inorganic matter such as metallic salts or silica.
concern. They are subjected to variability as derived from heterogeneous sources. So in the present investigation efforts were made to provide scientific data to standardize the plant material for further studies. The present study on micro morphological features, other physical values and chemical parameters on the leaf of *Alstonia scholaris* will help to identify the correct species of the plant, since no such scientific data are available for the same.

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