WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 6.805
Volume 5, Issue 3, 1015-1022. Research Article ISSN 2277– 7105

PHARMACOGNOSTIC & PHYTOCHEMICAL CHARACTERIZATION OF *IXORA ALBA* L.

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Article Received on
29 Dec 2015,

Revised on 20 Jan 2016,
Accepted on 11 Feb 2016

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ABSTRACT

Ixora alba L., (Rubiaceae), a small to medium sized hardy shrub, is cultivated for ornamental purposes. Species of *Ixora* have been used in traditional Indian systems of medicine for dysentery, healing of ulcers and, more recently, for an anti-tumour activity. They have also been reported to have anti-inflammatory activity. *Ixora pavetta* roots are reportedly used in urinary diseases. Depending on the medical condition, the flowers, leaves, roots, and the stem are used to treat various ailments in the Indian traditional system of medicine, the Ayurveda, and also in various folk medicines. In the present review, efforts are made in addressing ethnomedicinal uses, chemical constituents, and validate pharmacognostic observations of *Ixora alba* L., in order to assess its ethnopharmacological use and to explore its therapeutic potentials and future opportunities for research. Primary screening of the MeOH extract of *Ixora alba* showed the presence of anthracene and arbutin derivatives, bitter and pungent principles, alkaloids, cardiac glycosides, coumarins, essential oils, flavonoids and tannins.

KEYWORDS: Micro and macromorphology, pharmacognosy, phytochemical constituents.

INTRODUCTION

Pharmacognosy is a branch of science, which deals with the study of the history, distribution, cultivation, collection, processing and preservation of crude drugs (Kokate *et al*., 2007). Many crude drugs provide the natural mixture of medicinal substances like proteins, tannins, alkaloids, glycosides, and essential oils etc, which produce the therapeutic action. The raw material used for manufacturing the drug is sometimes adulterated (Shanmuga Priya *et al*., 2002) and therefore it is necessary to undertake pharmacognostic studies to prove the

authenticity of the plant material. In conventional drug development, the safety (and toxicity, or lack thereof) of the chemical is what influences whether the chemical becomes a medicine. Traditionally used medicinal plants produce a variety of compounds of known therapeutic properties (Albuquerque *et al*., 2006; Agra *et al*., 2007). It is expected that plant extracts showing target sites other than those used by antibiotics will be active against drug-resistant microbial pathogens. However, very little information is available on such activity of medicinal plants (Rajendran and Ramakrishnan, 2009). Plant preparations contain many compounds that work synergistically on multiple parts of the body. This synergy of chemicals helps to balance the overall activity of the herb. Since the chemicals in herbs are non-specific and diluted, there are generally fewer side effects from herbs than from manufactured synthetic drugs. Traditional uses and modern indications: Many species of *Ixora* finds its mention as traditional medicine. The flowers of *Ixora coccinea* have been used in traditional Indian systems of medicine for dysentery, healing of ulcers, anti-tumour activity as well as for an anti-inflammatory activity comparable to indomethacin (Panikkar KR, 1986; Seethadevi B,1991; Latha and Panikkar, 1998). Nayak *et al*, 1999, have reported the increase in hydroxyproline content of the dead space wound when treated with *Ixora coccinea* flower extract. Ether and methanol extracts of *I. coccinea* dry leaves have antimicrobial activity (Annapurna *et al*., 2003). According to Ghani, 2003; *Ixora coccinea L*. leaves are given in diarrhoea whereas flowers are used in the treatment of dysentery, leucorrhoea, dysmenorrhoea, hemoptysis and catarrhal bronchitis. Aqueous leaf extract of *I. coccinea* have been reported by Ratnasooriya *et al*., in 2005 to show antinociceptive activity in mice. Traditional use of leaves of *Ixora acuminata* in jaundice, has been reported by Purkayastha *et al*., in 2005. *Ixora pavetta* roots are reported for its use in urinary diseases (Bapuji and Venkat Ratnam, 2009). Ethnobotanical reference mainly indicates use of *Ixora alba* as medicine for whooping cough, anemia, highly coloured urine and general debility. Despite the use of this plant as medicine, there is a scarcity of scientific data to support its therapeutic application.

Though, study of a drug by means of pharmacognostical and phyto-chemical studies can be done, its authenticity could be equally judged by the physicochemical evaluation. With the same intensions the authentic samples of *Ixora alba* were studied for their physicochemical status as well as microscopic study was done to lay the standards. The extractive values, ash values, moisture contents, and swelling factor provide reliable aid for detecting the adulteration, if any. The aim of this review is to provide a comprehensive overview of the

botany, chemical constituents, traditional uses, pharmacognostic and phytochemical aspects of *Ixora alba* in order to assess its ethnopharmacological use and to explore its therapeutic potentials and future opportunities for research. In the present review, efforts are made in addressing ethnomedicinal uses, chemical constituents, and validate pharmacological observations of *Ixora alba* L., as this species has not been worked upon in details.

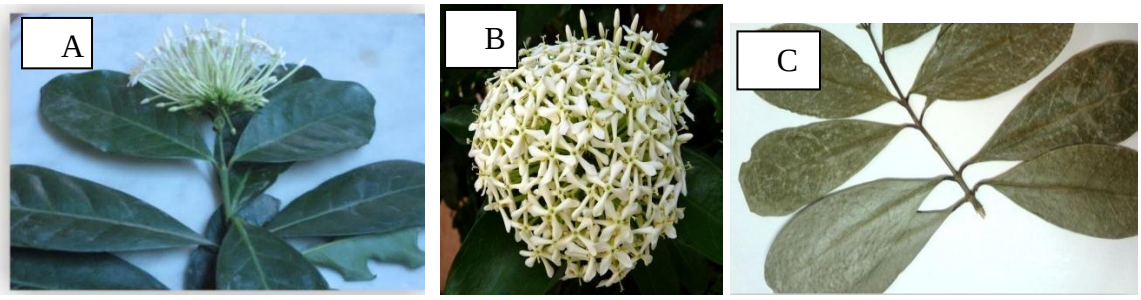


Fig. 1. *Ixora alba* L. (a) *Ixora alba* L.; (b) flower; (c) leaf.

Most of the plants are readily distinguishable in their natural state, but collection, preparation and drying procedure brings about distortion of their natural forms, making their recognition difficult. Crude plant materials are generally subjected to the following tests as per the Pharmacopoeia of India, 1996; The Ayurvedic pharmacopoeia of India, 2001 and Indian Herbal Pharmacopoeia (IHP, 2002).

MATERIAL AND METHODS

Barks of *Ixora alba* were obtained from the local garden, brought to the laboratory and were authenticated by a botanist, and also confirmend by BSI, Pune. The plant parts were washed thoroughly using de-ionized water and dried in the shade for 4-5 days. The sample was ground to a fine powder, dried once again at 110°C for an hour and stored in an airtight container till further use.

Pharmacognostic & Physicochemical evaluation

Macro-morphology plays an important role in preliminary evaluation of the crude drugs. All the standard methods were followed for the pharmacological characterisation of selected plant as per The Homeopathic Pharmacopoeia of India, 1971; Brain and Turner, 1975; The Ayurvedic Pharmacopoeia of India, 2001; Kokate *et al.*, 2007. The dried bark of *Ixora alba* was subjected to standard procedures according to WHO Guidelines for the determination of various physicochemical parameters. The organoleptic characters including colour, odour,

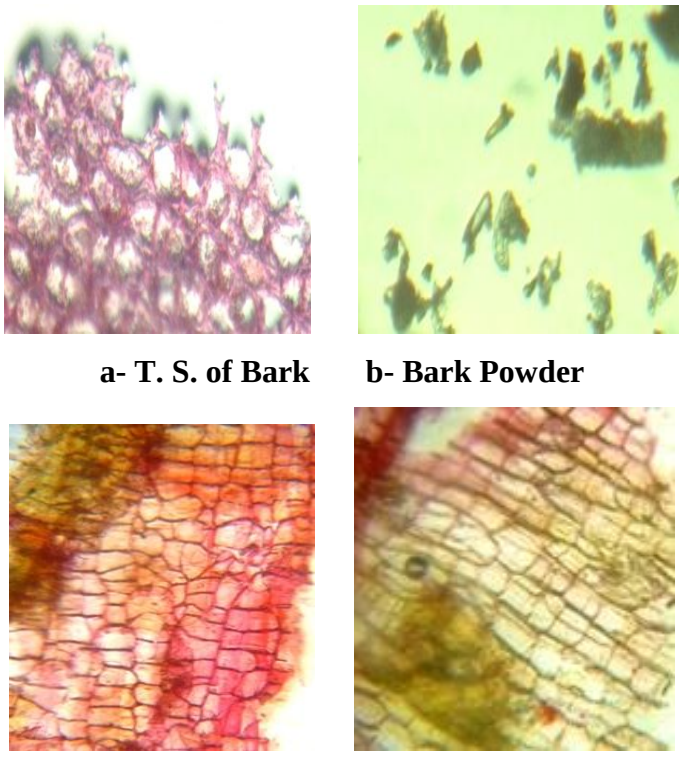
taste and external features of bark of *Ixora alba* were observed. The physicochemical parameters and organoleptic results were recorded in Table 1.

The microscopy of bark was also studied after treatment with different reagents prepared according to WHO Guidelines. The figures were reported as Figure 2, (a,b,c,d).

Phytochemical screening

Preliminary phytochemical screening of the various extracts with different reagents and solvents were performed and the results were recorded in Table 2, 3 and 4. HPTLC allows focusing on essential qualitative criteria of a sample so that similarity can be established very rapidly. At the same time, it can be seen whether two fingerprints are representing the same kind of sample and whether there are significant quantitative differences in the context of certain compounds. Thus fingerprints of HPTLC are used for visual comparisons. The various parameters of HPTLC studies are Stationary phase-HPTLC Silica MERCK 60 F_{254}, Mobile phase-Toluene: Ethyl alcohol: Dioxane (8:2:1), Spotting mode- MAG Linomat IV, Development mode- CAMAG TWIN TROUGH Chamber, Development reagent- 10% Methanolic H_2SO_4 and scanned at 550 nm wavelength.

Microscopic Study of Bark of *I. Alba*



a- T. S. of Bark **b- Bark Powder**

c-L.S. of Bark **d-L.S. showing oil glands**

Figure 2 (a, b, c, d) Identification data: Micoscopic analysis

Table 1: Physicochemical evaluation

Test	***Ixora alba*(bark)**
Length	8.78±0.612
Breadth	1.19±0.207
Colour- external	Buff
- internal	Creamish
Taste	Woody
Odour	Rancid
Texture and Degree of uniformity of particles	Uniform
Texture when rubbed on hand	Sandy
Creptations when pressed	None
Surface appearance by reflected light	None
Powder on a slide +1-2 drops of water	Gets suspended
Powder in a test tube + water (shake thoroughly)	Insoluble : froth formation
Powder pressed between folds of paper	No oily stains
Powder on a slide + 5% caustic alkali	Orange colour
Powder in a test tube + 5% aq. caustic alkali (warm)	Brown colour
Powder in a test tube +66% (v/v) H_2SO_4	Greenish yellow colour
Powder in a test tube + 5% $FeCl_3$ solution	Yellowishbrown colour

Table 2 Moisture content of the powder of *Ixora alba*

	Loss of Moisture	**% Moisture content**
***Ixora alba* (bark)**	0.0664	6.64

Table 3 Percentage Yield of Extract in Different Solvent

***I Ixora alba* (bark)**	**% Yield Extracted(%w/w)**					
	CWE	**CME**	**HME**	**EtOH**	**Pet. Ether**	**Chloroform**
	16.88	8.7	29.7	38.0	1.2	5.9

Table 4 Ash values and % Organic matter of the selected raw material

***Ixora alba* (bark)**	**% Organic matter**	**% Total ash**	**% Acid-Insoluble ash**	**% Water soluble ash**
	90.26	9.74	1.985	2.22

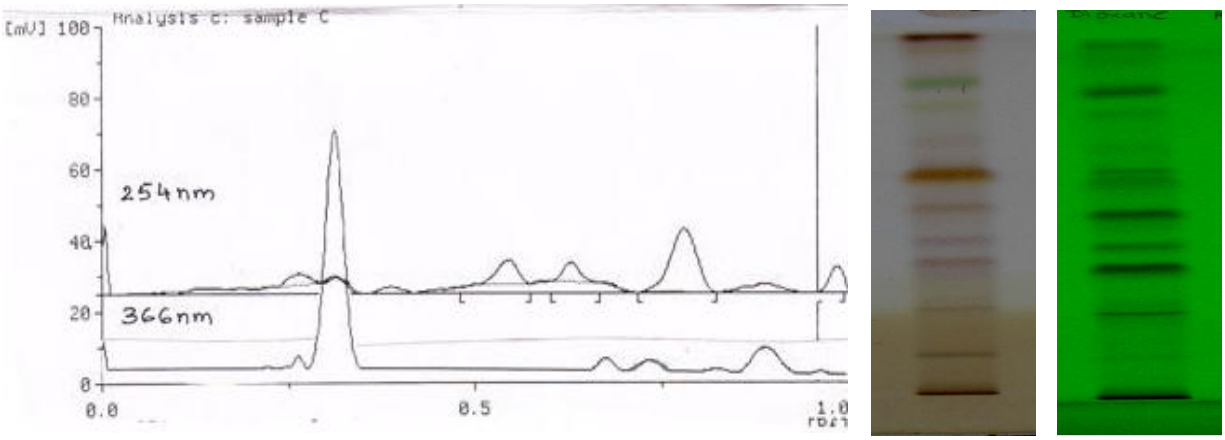


Figure 3: Comparative HPTLC profile of *Ixora alba* at 254 and 366 nm

DISCUSSION AND CONCLUSION

Tree bark is very complex in structure and has the potential of containing many primary and secondary metabolites. Products stored in the bark are useful for preparation of many drugs. The complex structure of the bark can be utilized for botanical identification to maintain the quality and purity of the drug (Brinda *et al*., 2000). Chemical analysis of raw material showed the presence of alkaloids, phenols, carotenoids and gums. Primary screening of the hot methanolic extract of *Ixora alba* showed the presence of anthracene and arbutin derivatives, bitter and pungent principles, alkaloids, cardiac glycosides, coumarins, essential oils, flavonoids and tannins. Derivatisation with ferric chloride reagent for detection of tannins revealed one very prominent bluish black spot of tannin. Generated data can be used for determining correct identity and purity of plants part and detection of adulteration as well. Botanical authentication and physicochemical parameters will give an idea about the quality of drug. All these parameters, which are being reported, could be useful in identification of distinctive features of the drug. These preliminary studies on the methanolic extract provides in part scientific support for the use of this species in traditional medicine. Hence, detailed screening may be done to isolate the active constituent so that it may be scientifically proved to access the pharmacological responses of the plant to ascertain it's folklore uses.

ACKNOWLEDGEMENTS

The authors are grateful to Dr. K.V. Mangaonkar (Principal), Prof. V.V. Dalvie (Head of the Department, Zoology) from Mithibai College for their constant support and encouragement. The authors are also thankful to Dr. A.M. Bhagwat (Director), C.B. Patel Research Centre, Mumbai, for the valuable guidance during the study.

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