

Pharmacognostic and Physicochemical Appraisal of Vasaka (*Justicia adhatoda* Linn.) Leaf

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Dr. Tushar P. Dukre^{1*}, Sanket P Ambre², Jayesh J Walunj³ and Gaurav R Jadhav⁴

¹Research Guide, Department of Pharmacognosy, Shri Swami Samarth Institute of Pharmacy, Malwadi (Bota), 422 602, (MH), India

^{2,3,4}Final Year B. Pharmacy, Shri Swami Samarth Institute of Pharmacy, Malwadi (Bota), 422 602, (MH), India

*Corresponding Author: Dr. Tushar P. Dukre, Department of Pharmacognosy, Shri Swami Samarth Institute of Pharmacy, Malwadi (Bota), 422602, Maharashtra, India.

Abstract

Pharmacognosy was initially described by C. A. Sydler as the study of therapeutic plants or products. The physical, chemical, and biological properties are used in these investigations. Adulsa (or Vasaka) is the popular name for the plant *Justicia adhatoda* (Linn.), which is a member of the Acanthaceae family. Adhatoda leaves have a long history of usage in Ayurvedic medicine, mostly for respiratory conditions. In the current pharmacognostic study of vasaka (leaves), major pharmacognostic techniques such as macroscopy, microscopy, surface preparation, powder characteristics, and physicochemical characteristics were used to identify the presence of trichomes and vascular bundles as well as moisture content, ash values, and extractive values in various parameters.

Keywords: *Justicia adhatoda*; Pharmacognosy; Morphology; and Microscopy

Introduction

The term of Pharmacognosy was utilized by C. A. Seydler. Pharmacognosy is defined as "The investigation of medicinal products obtained from natural sources including plants, creatures and minerals". It is also defined as "The investigation of the physical, chemical, biochemical and biological properties of drug medications, medication substances or potential medications of natural origin and additionally the search for new medications from natural sources". The word Pharmacognosy has been coined by the merger of two Greek words Pharmakon (drug or medication) and Gnosis (to acquire the knowledge of) i.e., the information of medications [1].

The morphological evaluation is also called as Organoleptic or Macroscopical evaluation, which means those evaluation done by “sense of organ” and the evaluation which possible by “naked eyes”. The morphological evaluation is refer as, the drugs are identified by colour, odour, taste, size, shape and special features like touch, texture, sound, etc. The study of form of a crude drug is Morphology, while the description of the form is Morphography. The colour, shape and size of crude drugs should be noted as described in official book, which may vary depending upon several factors.

The microscopical evaluation method allows more detailed examination of drug and it can be used to identify organised drugs by their histological characters. The evaluation is impossible with naked eyes; possible with a “Microscope” is named Microscopical Evaluation [2].

It is a highly valued Indian medicinal plant which is used in the treatment of respiratory diseases like asthma, cough, bronchitis and tuberculosis. The flowers, leaves and root have antispasmodic property. The activities against tuberculosis were reported by many researchers quite early. It has been used extensively as an important herbal drug in treating a wide variety of diseases and the leaves of the plant are the main source of drug formulation. For instance, the source of the drug ‘vasaka’ is well known in the indigenous system of medicine for its beneficial health effects, particularly in treating bronchitis. The different parts of the plant is used in the Indian traditional medicine for the treatment of various diseases like asthma, joint pain, lumber pain and sprains, cough, eczema, malaria, rheumatism, swellings, venereal diseases [3].

Generally spread *Adhatoda vasica* (presently *Justicia Adhatoda*) of family Acanthaceae—a notable medication plant in Ayurvedic and Unani medication has been known to have colossal natural potential. The plant has been utilized in the native arrangement of medication in India for over 2000 years [4].

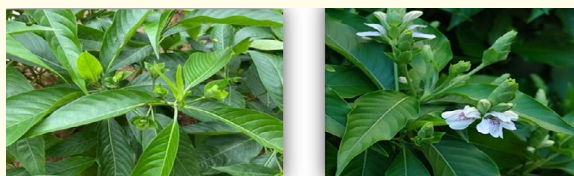


Figure 1: *Justicia adhatoda* flower and leaves.

Plant Profile

Scientific Classification [5]

<i>Justicia adhatoda</i>	
Kingdom	Plantae
Order	Lamiales
Family	Acanthaceae
Class	Magnoliopsida
Genus	<i>Justicia</i>
Species	<i>Justicia adhatoda</i>
Botanical Name	<i>Justicia adhatoda</i>

Table 1: Scientific classification of *Justicia adhatoda*.

Vernacular names [6]

<i>Justicia adhatoda</i>	
English	Malabar nut
Tamil	Adhathodai
Telugu	Vasa, Addasaramu
Hindi	Arusha, Adusa, Bansa
Sanskrit	Vasaka
Bengal	Adusa, Bakash, Vasok
Gujarati	Araduso, Aduloso
Konkani	Adusoge

Table 2: Vernacular name of *Justicia adhatoda*.**Botanical Description**

Adhatoda vasica is a small evergreen plant, of the Acanthaceae family, with broad, lanceolate (sharp and pointed like a lance) leaves measuring 10 to 16 centimeters in length and 5 centimeters wide. They become greenish-brown when dried and have a bitter taste. They have a smell similar to strong tea. The wood of the stem is soft, and makes a great charcoal for gunpowder. The flower has large, attractive, white petals, streaked with purple on the lower lip. The fruit is a small capsule with four seeds [7]. The *Justicia adhatoda* Linn. has anti-inflammatory, analgesic, diarrhoea, dysentery, antioxidant, hepatoprotective, Sedative, antispasmodic, anthelmintic properties, Antimicrobial activity, Antidiabetic activity, Wound healing effect, Infertility, Antiulcer, Antibacterial, Antihistaminic effect, moderate hypotensive activity, thrombopoietic activity, Cardiac depressant, uterotonic and abortifacient. The digesting enzyme trypsin is shown to be activated by the leaves [8].

Material and Methods**Pharmacognostic Evaluations****Collection of Plant**

The Leaves *Justicia adhatoda* of were collected from Malwadi during the month of May-June, 2022. The Fresh leaves of plant were cleaned and used for further evaluation [9].

Morphological Study

The fresh leaves were also subjected to investigation. Studies, such as shape, size, outer surface, inner surface, fracture, taste and odour of bark, were carried out [10, 11].

Microscopical Study

The microscopical study of leaves of *Justicia adhatoda* was performed by using transverse section method. In this, methods the transverse section of leaves were taken by soft hand with the help of sharp blade. After that, the thin sections were transfer into watch glass containing water to remove the adulteration. The section is broadly divided into the lamina and the midrib. The lamina of the leaf shows three distinct regions such as upper epidermis, lower epidermis and the mesophyll. Then the section were stained by using staining reagents and again transfer into watch glass containing water to remove excessive staining. The section was placed on the surface of clean glass slide with one or two drop of water / glycerin (to avoid the dryness/evaporation). The section observed under the compound microscope [12-14].

Surface Preparation

The surface preparation study was performed by using a fresh leaves of *Justicia adhatoda*. The green surface of leaves was removed by using sharp razor and transparent surface observed under the microscope by using 10X, 40X, 100X lenses [15].

Powder Characteristics

The fine powder of dry leaves of *Justicia adhatoda* was firstly stain with phloroglucinol + HCl (1:1) and observed under the microscope for evaluation [16].

Physicochemical Evaluation

The Various Physicochemical properties such as Foreign Organic Matter, Moisture Content, Total Ash Value, Acid Insoluble Ash Value, Water Soluble Ash Value, Extractive Value (Alcohol Soluble and Water Soluble) [17, 18].

Result and Discussion

Pharmacognostic Evaluations

Morphological Study

The leaves are deciduous, alternate, and borne as single or compound. In compound leaves, the leaflets have 2 to 5 frivoulsly toothed, pointy, oval-ovate or ovate shapes. A leaflet is 6 to 7 cm wide and 27 to 28 cm long (Figure 2). The midribs of the thin leaflets can be seen clearly from below. The petiole of the terminal leaflet is longer. After a dormant or reproductive phase, fresh leaf appears glossy and is pink or Greenish in colour with characteristic taste and typical aroma type odour.

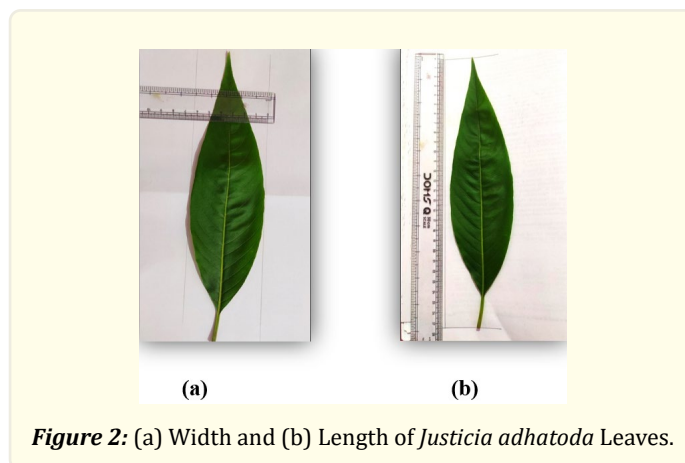


Figure 2: (a) Width and (b) Length of *Justicia adhatoda* Leaves.

Microscopical Study

The micro-chemical tests for microscopical studies were performed by using phloroglucinol and Sudan red III the observations are as mentioned in the table 3.

Test No.	Test	Observation	Inferences
1.	Phloroglucinol + Conc. HCl (1:1)	Pink	Xylem, Phloem (V.B.)
2.	Sudan Red III	Red	Epidermis, Oil Globules
3.	Dil.Sulphuric Acid	Soluble	Calcium Oxalate Crystal
4.	Conc.Hydrochloric Acid	Soluble	Calcium Oxalate Crystal

Table 3: Micro-chemical tests of *Justicia adhatoda* Leaves.

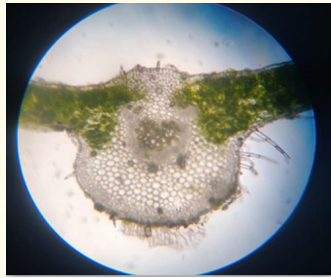


Figure 3: T. S. of *Justicia adhatoda* leaves.

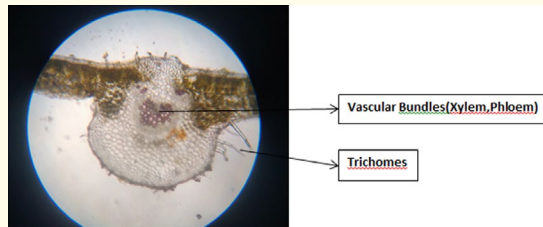


Figure 4: T. S. of *Justicia adhatoda* leaves for Test No.1.

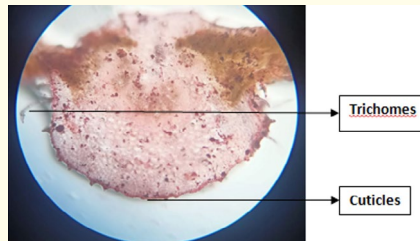


Figure 5: T. S. of *Justicia adhatoda* leaves for Test No.2.

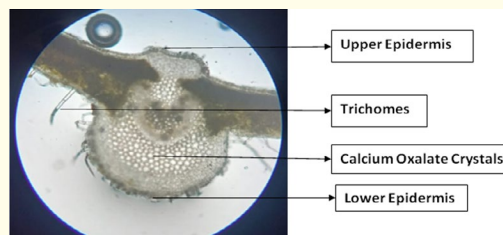
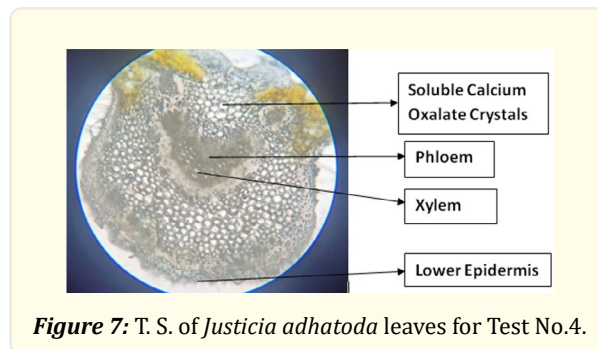
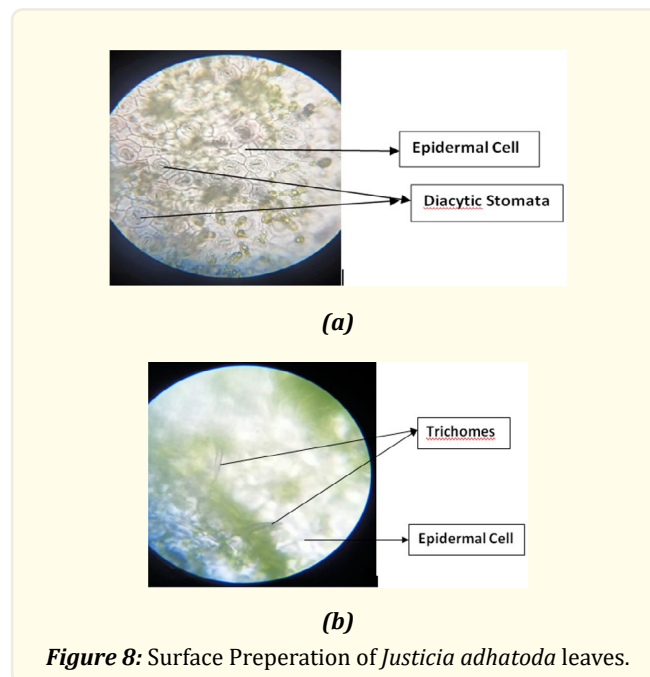


Figure 6: T. S. of *Justicia adhatoda* leaves for Test No.3.



Surface Preparation

The surface preparation was performed by removing green surface of leaf. The Diacytic Stomata with epidermal cells were identified in this study as shown in figure. 5.



Powder Characteristics

The powder characteristics were performed, The Vascular Bundle, Calcium Oxalate Crystals and Trichomes are observed.



Figure 9: Trichomes with Crystal Oxalate.

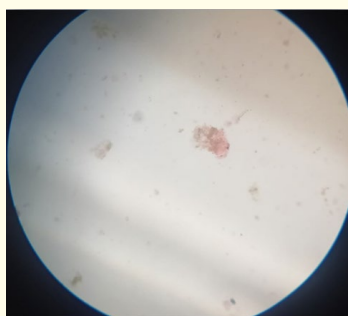


Figure 10: Vascular Bundles (Xylem and Phloem).

Xylem- Distribute the water and minerals from the roots.

Phloem- Carries food downward from the leaves to the roots.

Physiochemical Evaluation

Physiochemical Studies such as Foreign Organic Matter, Moisture Content, Total Ash Value, Acid Insoluble Ash Value, Water Soluble Ash Value, Extractive Value (Alcohol Soluble and Water Soluble). Were presented in the table.

Parameters	Values
Foreign Organic Matter	0.0%
Moisture Content	12.30%
Total Ash Value	16.66%
Acid Insoluble Ash Value	2.33%
Water Soluble Ash Value	3.0%
Alcohol Soluble Extractive Value	0.24 gm
Water Soluble Extractive Value	0.76 gm

Table 4: Physiochemical Characteristics of *Justicia adhatoda* Leaves.



Figure 10: Foreign Organic Matter.

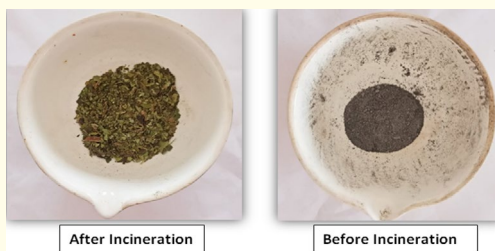


Figure 11: Total Ash Value.

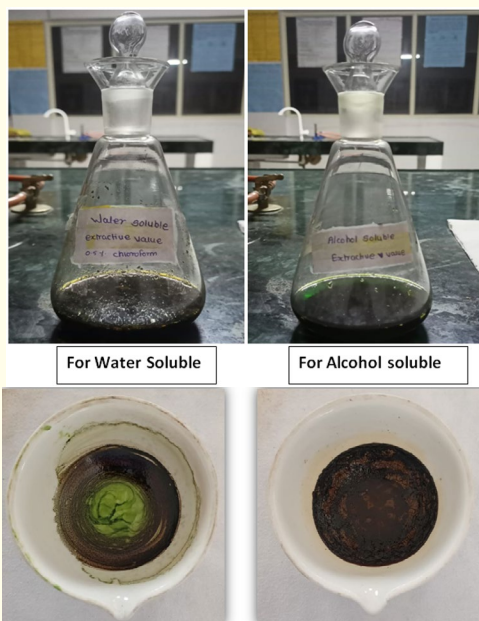


Figure 12: Extractive Value (Water Soluble and Alcohol Soluble).

Summary and Conclusion

In this work, the precise pharmacognostic and physicochemical requirements for *Justicia adhatoda* leaves are established for the first time. The identification of the crude medicine will be possible through morphological and anatomical investigations of plant parts.

Ash values and extractive values are effective tools for spotting adulteration. When utilising the medicine as a home cure, a person may find these straightforward yet trustworthy guidelines helpful. Additionally, the producers might use them to identify and choose the raw materials needed to make drugs. Therefore, additional research should be done in the future to identify particular chemical components and to thoroughly examine the pharmacological activity in a scientifically sound manner.

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