



# Journal of Medicinal Plants Studies

## Pharmacognostic Study and Establishment of Quality Parameters of Leaves of *Adhatoda vasica*. Linn

Arabind Kumar<sup>\*1</sup>, Vipin K Garg<sup>1</sup>, Ratendra Kumar<sup>1</sup>, Lubhan Singh<sup>1</sup>, Shivani Chauhan<sup>1</sup>, Sweety<sup>1</sup>

1. Department of Pharmaceutical Technology, M.I.E.T., Meerut, U.P., India- 250005  
[E-mail: [arvindkumarshk@gmail.com](mailto:arvindkumarshk@gmail.com); Tele: 9719532526]

---

*Adhatoda vasica* Nees (Family - *Acanthaceae*), commonly known as Vasaka or Arusha is found commonly in India. These species are rich source of polyphenolic compounds, flavonoids which are responsible for strong anti-oxidant properties that help in prevention & therapy of various oxidative stress related diseases. In present investigation, pharmacognostic study of *Adhatoda vasica* (leaves) was carried out to lay down the standards which could be useful in future experimental studies. However, no conclusive pharmacognostic study of its leaves has been performed yet. The study includes macroscopy, microscopy, preliminary phytochemical screening, physicochemical evaluation and fluorescence analysis. Highest extractive values were found with water and ethanol. The fluorescence analysis under visible light and under UV light by treatment with different chemical reagents showed different color changes. The presences of alkaloids, steroids, flavonoids, saponins were confirmed during preliminary phytochemical screening. Conclusion: Such a study would serve as a useful gauge in standardization of the plant material, isolation of medicinally important phytoconstituents, performing pharmacological investigations and ensuring quality formulations.

---

**Keyword:** *Adhatoda vasica*, Pharmacognostic, Phytochemical, fluorescence analysis.

### 1. Introduction

*Adhatoda vasica* Nees (family *Acanthaceae*), commonly known as Vasaka or Arusha is a well-known herb in indigenous systems of medicine for its beneficial effects. Vasaka, also called Malabar nut tree, is well known throughout India. The Vasaka plant perennial, evergreen and highly branched with unpleasant smell and bitter taste, the plant lives for multiple seasons and retains its leaves throughout the year. It is a shrub 1.0 m to 2.5 m in height, with opposite ascending branches. It grows all over the India and in the lower Himalayan ranges. Beside India, it is found in Myanmar, Sri Lanka, Burma and Malaysia in Ayurvedic medicine, *Adhatoda*

*vasica* has been used for a multitude of disorders including; bronchitis, leprosy, blood disorders, heart troubles, thirst, asthma, fever, vomiting, loss of memory, leucoderma, jaundice, tumors, mouth troubles, sore-eye, fever, and gonorrhoea. *Adhatoda vasica* is useful in treating bronchitis, tuberculosis and other lung and bronchiole disorders<sup>[2,3]</sup> *Adhatoda vasica* Linn. also has anti-inflammatory, analgesic, diarrhoea, dysentery, antioxidant, hepatoprotective, Sedative, antispasmodic, anthelmintic properties<sup>[4]</sup>, Antimicrobial activity<sup>[5]</sup>, Antidiabetic activity<sup>[6]</sup>, Wound healing effect<sup>[7]</sup>, Infertility<sup>[8]</sup>, Anti-ulcer<sup>[9]</sup>, Antibacterial<sup>[10]</sup>, Antihistaminic effect, moderate hypotensive activity,

thrombopoietic activity<sup>[11]</sup>. cardiac depressant, uterotonic and abortifacient. The leaves are found to activate the digestive enzyme trypsin. An extract of the leaves showed significant antifungal activity against ringworm<sup>[12]</sup>.

This plant contains alkaloids, tannins, flavonoids, terpenes, sugars, and glucosides. The principle constituents of Vasaka are its several alkaloids, the chief one being vasicine. The leaves contain two major alkaloids called vasicine and vasicinone. The leaves of Vasaka are rich in vitamin C, carotene and essential oil. The roots are known to contain vasicinolone, vasicol, peganine, sitosterol,  $\beta$ -glucoside-galactose and deoxyvasicine and 2'-hydroxy-4-glucosyl-oxychalcone. The flowers contain b-sitosterol-D-glucoside, kaempferol, its glycosides and quercetin. Minor alkaloids include Adhatonine, Vasinol<sup>[3,4,12,13,14]</sup>.

## 2. Materials and Methods

### 2.1 Plant Collection, Identification and Extraction

Leaves of *Adhatoda vasica* were collected from Maliyana, Meerut District, Uttar Pradesh, India in August 2012. It was authenticated by Dr. A. K. Gupta (Reader) Dept. of Botany Meerut College Meerut (U.P.) India. The plant having voucher specimen number MCM/Bot-5 was deposited in the Department of Botany, Meerut College Meerut (U.P.) India, for future reference. The leaves were dried under shade and reduced mechanically to moderate coarse powder. The coarse powders were analyzed for following Pharmacognostic parameters.

## 2.2 Pharmacognostical Studies

### 2.2.1 Macroscopy

Morphological studies of leaves such as color, size, odor, taste, surface characteristic and fracture were examined using the terms and outlined given in Evans<sup>15</sup>.

### 2.2.2 Microscopy

A free hand transverse section of fresh leaf was taken, cleaned in chloral hydrate solution with gentle warming. A drop of concentrated hydrochloric acid and phloroglucinol was used to detect the lignified cells in the cross sections and in the powder drugs. That was mounted on slide in glycerin and studied under microscope according to the standard method given in the textbook of pharmacognosy by T E. Wallis. Photomicrographic images were taken by using Trino CXR camera<sup>[16]</sup>.

## 2.3 Quantitative Evaluation of the Powdered Leaves

The moisture content of the powdered material was determined by the loss on drying method. The ash value and the acid insoluble ash value were determined using methods described in the British Pharmacopoeia<sup>[17]</sup>. The extractive (Petroleum ether, diethyl ether, chloroform, 99% ethanol, methanol, hydroalcoholic and aqueous values were determined using methods described in Brain and Turner<sup>[18]</sup>. Average of three determinations for each procedure was calculated. The preliminary phytochemical screenings of *Adhatoda vasica* leaves extracts was carried out according to Harbone J.B<sup>[19]</sup>.

## 2.4 Fluorescence Characteristics of Powdered Drug under Ultra-Violet Light

Powdered drug was screened for fluorescence characteristic with and without chemical treatment. The observations pertaining to the color in day light and under ultra-violet light (short and long) was noticed<sup>[20]</sup>.

## 3. Result

### 3.1 Macroscopic and Sensory Characters:

The leaves are pale green, fruity in young in odor, taste in bitter, oblong shape, 8.0 to

14.2 cm in length, 4 to 5 cm in width in size, glabrous in surface characteristics.

**3.2 Microscopic Characters:** The transverse section of leaf showed palisade, epidermis, spongy mesophyll, phloem, xylem and abaxial surface as shown in **Fig 1**.

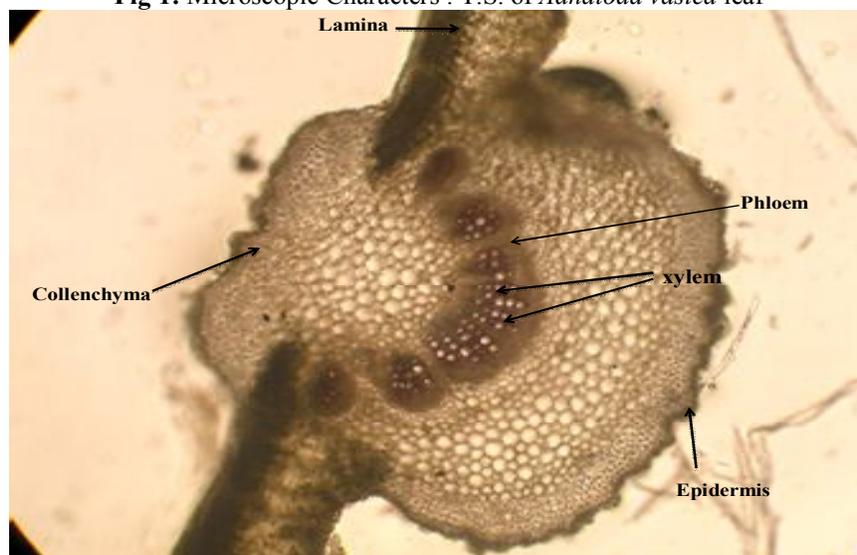
**3.3 Physicochemical Studies:** The moisture content was 9.8% (leaves) which were not so high as to facilitate bacterial growth. The other physicochemical parameters which ascertain the quality, purity and also help in evaluating the crude drug, and the total ash value, acid insoluble ash value and water soluble ash value which were determined to be not more than 12.0 %w/w, 1.5 %w/w, 4.0

%w/w (leaves) respectively which indicated the presence of the total foreign inorganic matter. While study of extractive values can serve as a valuable source of information and provide suitable standards to determine the quality of plant material in future investigations or application. (**Table 1 & 2**)

**3.4 Phytochemical Investigation:** Preliminary phytochemical screening was performed to find out the phytoconstituent present in the leaves of *Adhatoda vasica*. Linn (**Table 3**)

**3.5 Fluorescence Analysis:** The results are summarized in **Table 4**.

**Fig 1:** Microscopic Characters : T.S. of *Adhatoda vasica* leaf



**Table 1:** Ash value of *Adhatoda vasica* leaves

S.No.	Physical contents	Value (%)
1.	Total ash value	12.0
2.	Acid insoluble ash	1.5
3.	Water soluble ash	4.0
4.	Loss on drying	9.8

**Table 2:** The Extractive value study of the *Adhatoda vasica* leaves

S.No.	Nature of Extract	Color	Percentage Yield (%)
1.	Petroleum ether	Light yellow	0.8
2.	Diethyl ether	YellowishBrown	2.3
3.	Chloroform	Yellowish Green	2.6
4.	Ethanol (99%)	Pale Green	3.2
5.	Methanol	Green	6.4
6.	Hydroalcoholic	Dark Brown	14.3
7.	Aqueous	Dark Brown	26.2

**Table 3:** Fluorescence analysis of leaves Powder

S.N.	Solvents Treatment	Visible light	Short UV (252 nm)	Long UV (366 nm)
1.	Drug as such	Olive	Green	Olive dark
2.	Drug Ammonia soln.	Violet brown	Dark green	Green yellow
3.	Drug + Picric acid	Olive	Olive dark	Dark gray
4.	Drug + FeCl <sub>3</sub> 5% soln.	Dark brown	Dark green	Black
5.	Drug + Iodine soln. (5%)	Dark gold	Dark green	Invisible
6.	Drug + 1M.NaOH in water	Dark brown	Lawn green	Dark green
7.	Drug + Petroleum ether	Brown	Green	Lawn green
8.	Drug + Chloroform	Dark olive green	Green	Olive dark
9.	Drug + 1M.H <sub>2</sub> SO <sub>4</sub>	Dark goldenrod	Forest green	Dark brown
10.	Drug + 1M.HCl	Brown	Dark green	Olive dark
11.	Drug + Methanol	Olive	Dark green	Olive dark

**Table 4:** Qualitative phytochemical examination of various extracts of *Adhatoda vasica*

S.N.	Name of the test	Type of extracts				
		Diethylether	Chloroform	Methanol	Hydro alcohol	Aqueous
1.	Test for Saponin Glycosides					
a.	Foam test	–	–	+	+	+
b.	Heamolytic test	–	+	+	+	+
2.	Test for Alkaloids					
a.	Dragendorff's test	–	–	+	+	+
b.	Mayer's test	–	+	+	+	+
3.	Test for Tannins					
a.	Drug + 5% FeCl <sub>3</sub> solution	+	+	+	+	+
b.	Drug + Lead acetate solution	–	+	+	+	+
4.	Test for Flavonoids					
a.	Shinoda test	–	–	+	+	+
b.	Drug + Lead acetate solution	–	–	+	+	+
5.	Test for Steroids					
a.	Salkowski test	+	+	+	+	+

<b>b.</b>	Liebermann-Burchard test	–	+	+	+	+
<b>6.</b>	Test for Carbohydrates					
<b>a.</b>	Molish's test	+	+	+	+	+
<b>7.</b>	Vitamin C	–	–	+	+	–
<b>8.</b>	Test for cardiac glycosides					
<b>a.</b>	Beljet's test	–	–	+	+	–
<b>b.</b>	Legal's test	–	–	+	+	+

#### 4. Discussion

The leaves of *Adhatoda vasica* was pale green in color, with fruity odour and Bitter taste. The size was 8.0 to 14.2 cm in length and 4 to 5 cm in width. The shape of leaves is oblong with glabrous, shiny surface characteristics. The leaves of *Adhatoda vasica* were subjected to microscopical studies using transverse section. The transverse section of leaves of *Adhatoda vasica* showed fibres, starch grain, oil globules. Physiochemical parameters and extractive value of leaves were studied and results were shown in Table 1 and 2 respectively. Preliminary phytochemical studies on the plants revealed the presence of alkaloids, glycoside, tannins, saponin, steroids, tri-terpenoid and flavonoids.

#### 5. Conclusion

The pharmacognostic standards for the leaves of *Adhatoda vasica* are laid down for the first time in this study. Morphological and anatomical studies of plant parts will enable to identify the crude drug. The information obtained from preliminary phytochemical screening will be useful in finding out the genuity of the drug. Ash values, extractive values can be used as reliable aid for detecting adulteration. These simple but reliable standards will be useful to a person in using the drug as a home remedy. Also the manufacturers can utilize them for identification and selection of the raw material for drug production. So further study should be carried out in future to

isolate the specific chemical constituents as well as detailed pharmacological activity will be carried out in proper scientific way.

#### 6. References

1. Vinothapooshan G., Sundar K. Immunomodulatory activity of various extracts of *Adhatoda vasica* Linn. in experimental rats. *Afr. J. Pharm. Pharmacol*, 2011; 5(3):306-310.
2. M.Sunita, Dhananjay Singh. Quantitative Analysis of Total Phenolic Content in *Adhatoda vasica* Nees Extracts. *Int.J. PharmTech Res.*2010, 2(4):2403-2406.
3. Sampath Kumar K.P., Bhowmik D. et al. Indian traditional herbs *Adhatoda vasica* and its Medicinal application. *J. Chem. Pharm. Res*, 2010; 2(1): 240-245.
4. Mulla A.W., More.D.S et al. Evaluation of anti-inflammatory and analgesic activities of ethanolic extract of roots *Adhatoda vasica* Linn. *Int.J. PharmTech Res*, 2010; 2(2): 1364-1368.
5. Sheeba B.J, Mohan T.S. Antimicrobial activity of *Adhatoda vasica* against clinical pathogens. *Asian J. Plant Sci, Res.*2012; 2 (2):83-88.
6. Bhatt M., Gahlot.M. et al. Phytochemical investigation and antidiabetic activity of *adhatoda zeylanica*. *Asian J Pharm Clin Res*, 2011; 4(2): 27-30.
7. Vinothapooshan G.and Sundar K. Wound healing effect of various extracts of *Adhatoda vasica*. *IJPBS*, 2010; 1(4):530-536.
8. M.D. Ganguli and Paramesh R. Clinical evaluation of *Evecare syrup* in the treatment of infertility in women: An open study. *IJCP*, 2010; 20(11):767-771.
9. Vinothapooshan G., Sundar K. Anti-ulcer activity of *Adhatoda vasica* leaves against gastric ulcer in rats. *JGPT*, 2011; 3(2):7-13.

10. Kavitha G.,S.Rajan *et al.* Screening of Antibacterial and phytochemical activity of *Adhatoda vasica L.* against clinically isolated respiratory pathogens. *IJPRBS*, 2012; 1(4):203-214.
11. Mahajan N., K.I.Dhar *et al.* Synthesis of some N-heterocyclic analogs of vasicine. *IJPSR*, 2010; 1(2):78-86.
12. Khare C.P, *Indian Medicinal Plants-An illustrated dictionary; Springer-Verleg Berlin*, 2007; 18-19.
13. Borooah D.D. Effect of *Adhatoda vasica* Leaf extract prepared by two different methods on mitosis of root meristematic cells of *allium cepa l.* *J. Adv. Lab. Res. Bio*,2011;2 (4): 170-174.
14. Ahmad S., Garg. M. *et al.* A phyto-pharmacological overview on *Adhatoda zeylanica* medic. *Natural product radiance*, 2009; 8 (5): 549-554.
15. Evans W.C, *Trease and Evans-Pharmacognosy*, 15 edition, Elsevier Science limited. 2002; 538-539.
16. Wallis TE: *Practical Pharmacognosy. J & A Churchill Ltd.*, London, Edition V, 1984.
17. British Pharmacopoeia. 1980. Vol. II. Ash Value, Acid Insoluble Ash, Water Soluble Extractive, (Her Majesty's Stationary Office, London), Appendix XI.A108-113.
18. Brain K.R. and Turner T.D. *The Practical Evaluation of Phytopharmaceuticals* (Wright Scientecnica, Bristol), 1975; 81-82.
19. Harborne J.B. *Phytochemical methods- A guide to modern techniques of plant analysis'* Third edition, published by *Springer* (India) Pvt. Ltd, 1998; pp. 49-129.
20. Kokashi C.J, Kokashi RJ, Sharma M. Fluorescence of powdered vegetable drugs in ultra-violet radiation. *J American Pharm Assoc*, 1958; 47:715-717.