

Pharmacognostical and Phytochemical Evaluation of *Adhatoda Vasica* Leaf

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Abstract: *Adhatoda vasica* is distributed throughout tropical and sub tropical parts of India. Their leaves are used as expectorant and bronchodilator. Detailed morphological and qualitative as well as quantitative microscopic study was carried out. This was followed by phytochemical screening of the species. Leaf surface microscopy of *Adhatoda vasica* shows polygonal thin walled epidermal cells and diacytic stomata and the chief powder characteristics of leaf powder are 2-4 celled blunt covering trichomes, sessile glandular trichomes, acicular and prismatic calcium oxalate crystals. The present work can serve as a useful tool in the identification, authentication and standardization of the plant material and also their formulations as well as serving as a guide for isolating novel phytoconstituents from the plant.

Keywords: Pharmacognostical study, physico-chemical study, phytochemical study, Vasaka

1. INTRODUCTION

Adhatoda vasica Linn (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 as Malabar nut tree, is well known throughout India [1, 2]. 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 variety 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* Linn. also has anti-inflammatory, analgesic, diarrhoea, dysentery, antioxidant, hepatoprotective, sedative, antispasmodic, anthelmintic properties, antimicrobial activity, antidiabetic activity, wound healing effect, infertility, anti-ulcer, antibacterial, antihistaminic effect, moderate hypotensive activity, thrombopoietic activity, cardiac depressant, uterotonic and abortifacient[3,4]. The leaves are found to activate the digestive enzyme trypsin. An extract of the leaves showed significant antifungal activity against ringworm. 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, β -glucoside-galactose and deoxyvasicine and 2'-hydroxy-4- glucosyl-oxychalcone[5,6,7]. The flowers contain b-sitosterol-D-glucoside, kaempferol, its glycosides and quercetin. Minor alkaloids include Adhatonine, Vasinol[8].

2. MATERIALS AND METHODS

2.1. Plant Collection and Identification

The leaves of *Adhatoda vasica* were collected from Botanical garden of Govt. Ayurvedic Mahavidyalaya and identified by Dr. Hari Om Gupta, Department of Dravya Guna, Govt.

Ayurvedic Mahavidyalaya, and the herbarium has been deposited at Department of Pharmacognosy, Pioneer Pharmacy Degree College, Vadodara. The leaves were dried under shade and reduced mechanically to moderate coarse powder. The coarse powders were analyzed for the pharmacognostical parameters.

2.2. Pharmacognostical Studies

Macroscopic study:

Morphological studies of leaves such as color, size, odor, taste, surface characteristic and fracture were examined using the terms and outlined given in Ayurvedic Pharmacopoeia [8].

Microscopic study:

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 Practical Pharmacognosy[9]. Photomicrographic images were taken by using Fujifilm camera.

2.3. Quantitative Microscopical Parameters

The leaves were observed under the microscope for various quantitative parameters like stomatal number, stomatal index, vein islet number, vein termination number according to the standard method given in the textbook of Practical Pharmacognosy [10].

2.4. Phytochemical Screening

The drug was powdered and their aqueous and methanolic extracts were prepared. Various tests were performed as per mentioned in the textbook of Practical Pharmacognosy, for detection of alkaloids, saponins, carbohydrates, phytosterols, phenolic glycoside, proteins, gum and mucilage, flavonoids, volatile oil and fixed oil[9,10].

2.5. Physico-Chemical Study

The percentage of foreign matter, loss on drying, total ash and acid insoluble ash were determined according to the method described in WHO guidelines on quality control methods for medicinal plants materials [9, 10].

2.6. Fluorescence Analysis

The dried leaf powders were subjected to fluorescence analysis, as it is and also after treating separately with 1M HCl, 1M H₂SO₄, 1M NaOH, and ammonia against normal and ultra-violet light (254 nm). Color reaction of petroleum ether, chloroform, methanol and water extract was also observed in normal light and UV light (254 nm)[6].

3. RESULTS

3.1. Macroscopic Study

The leaves of *Adhatoda Vasica* are light-green in colour, characteristic odour, taste is bitter, size is 10-13 cm long. The shape of leaves is ovate-lanceolate, apex is acuminate, margin slightly crenate to entire, base is symmetric, venation is pinnate and texture is leathery as shown in Fig. 1.



Fig1. Macroscopical figure of *Adhatoda Vasica* leaf

3.2. Microscopic study

The transverse section of leaf showed palisade layer, epidermis, spongy mesophyll, trichomes phloem, xylem, collenchyma and cystolith as shown in Fig. 2 and Table 1.

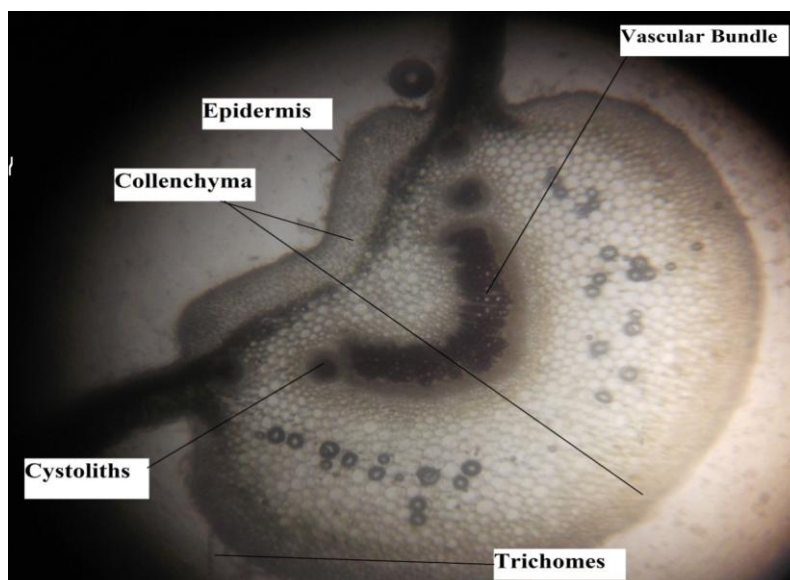


Fig2. Microscopical diagram of T.S. of *Adhatoda Vasica* leaf

Table1. Microscopical Characters of *Adhatoda Vasica* leaf

| Parameters | Observation |
|---------------------|---|
| Nature of lamina | Dorsiventral |
| Transverse Section | Cystolith was observed in cortical parenchyma |
| Palisade | double layers |
| Trichomes | 2-4 celled blunt |
| Covering trichomes | Sessile |
| Glandular trichomes | |
| Epidermal cell | Polygonal thin walled |
| Stomata | Diacytic |

3.3. Surface Preparation

The surface preparation of leaf showed the presence of diacytic stomata as shown in Fig. 3.

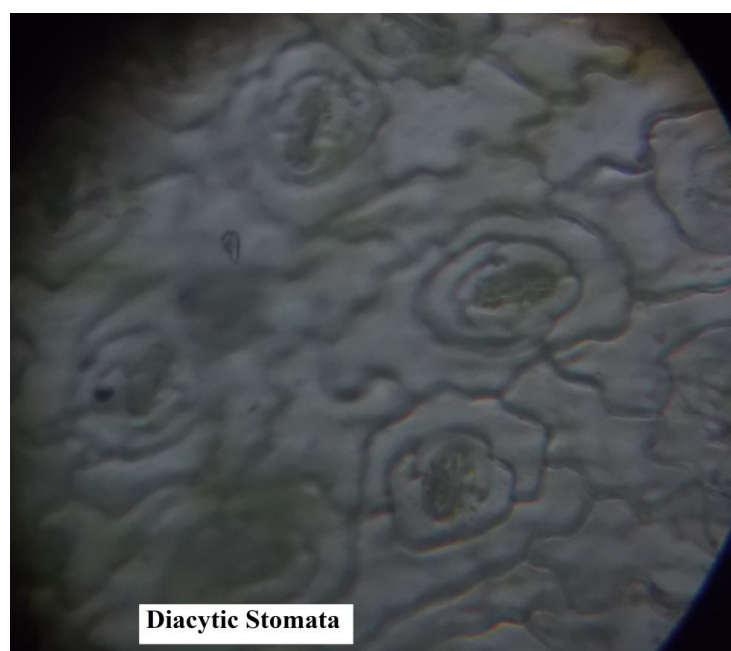


Fig3. Surface Preparation of *Adhatoda Vasica* leaf

3.4. Quantitative Microscopical Parameters

The quantitative microscopical parameters like stomatal number, stomatal index, vein islet number and vein termination number were observed as shown in Table 2.

Table 2. Quantitative Microscopical Parameters of *Adhatoda Vasica* leaf

| Parameters | Measured value |
|-------------------------|----------------|
| Stomatal number | 6.4-7.4-8.4 |
| Stomatal index | 11.5-12.5-13.5 |
| Vein islet number | 23-25 |
| Vein termination number | 35-37 |

3.5. Phytochemical Screening

Preliminary phytochemical screening was performed to find out the phytoconstituent present in the leaves of *Adhatoda vasica*. Linn as shown in Table 3.

Table 3. Phytochemical Screening of *Adhatoda Vasica* leaf

| Chemical Test | <i>Adhatoda Vasica</i> Leaf | |
|----------------------------|-----------------------------|-----------------|
| | Methanol Extract | Aqueous Extract |
| Alkaloids | +ve | +ve |
| Saponin | +ve | +ve |
| Carbohydrates | +ve | +ve |
| Phytosterols | +ve | -ve |
| Phenolic glycoside/Tannins | +ve | +ve |
| Proteins | -ve | -ve |
| Gum and Mucilage | -ve | -ve |
| Flavonoids | +ve | +ve |
| Volatile Oil | -ve | -ve |
| Fixed Oil | -ve | -ve |

3.6. Physico-Chemical Parameters

The physico-chemical parameters like foreign matter, ash value, acid insoluble ash, water soluble ash, loss on drying, water soluble extractive value and alcohol soluble extractive value were observed as shown in Table 4.

Table 4. Physico-chemical Parameters of *Adhatoda Vasica* leaf

| Parameters | Measured Value (%w/w) |
|----------------------------------|-----------------------|
| Foreign matter | Nil |
| Total ash value | 14.0 |
| Acid insoluble ash | 0.9 |
| Water soluble ash | 3.0 |
| Loss on drying | 07 |
| Water soluble extractive value | 28.5 |
| Alcohol soluble extractive value | 5.6 |

3.7. Fluorescence Analysis

The results are summarized in Table 5.

Table 5. Fluorescence Analysis of *Adhatoda Vasica* leaf powder

| Solvent Treatment | Dry Powder | Drug + Ammonia solution | Drug + 1 M HCl | Drug + 1 M H ₂ SO ₄ | Drug + 1 M NaOH | Drug + Chloroform | Drug + Methanol | Drug + Petroleum Ether |
|-------------------|------------|-------------------------|----------------|---|-----------------|-------------------|-----------------|------------------------|
| Visible light | Olive | Violet brown | Brown | Dark golden | Dark brown | Dark olive green | Olive | Brown |
| Short UV (254 nm) | Green | Dark green | Dark green | Forest green | Lawn brown | Green | Dark green | Green |

4. DISCUSSION

The leaves are light-green in colour, characteristic odour, taste is bitter, size is 10-13 cm long. The shape of leaves is ovate-lanceolate, apex is acuminate, margin slightly crenate to entire, base is

symmetric, venation is pinnate, and texture is leathery. The transverse section of leaf showed palisade, epidermis, spongy mesophyll, trichomes phloem, xylem, collenchyma and cystolith. The quantitative microscopical parameters were studied and results were shown in Table-2. Preliminary phytochemical screening revealed the presence of alkaloids, saponin, carbohydrate, phytosterol, tannin, and flavonoids.

5. CONCLUSION

The detailed pharmacognostic and physico-chemical 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.

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