

A review on *Adhathoda vasica* – An inevitable drug of Indian medicine

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Abstract

Adhatoda vasica (L.) Nees (family Acanthaceae) is an evergreen shrub 1–2.5 m high with opposite ascending branches, simple large leaves and terminal spike inflorescence, is a well-known plant drug in Ayurvedic and Unani medicine. The important secondary metabolites found in these plants are alkaloids- Vasicine and its derivatives that are used in the treatment of Bronchitis and Asma and even for Tuberculosis. The plant shows strong pharmacological activity particularly on anti-inflammatory, anti-microbial, reproductive disorders, cardiac diseases and many more. This review includes data regarding the systematics, phytochemical and ethnopharmacological studies that demarcate *Adhathoda vasica*, a versatile native plant of Indian subcontinent with high commercial reputation and thus can be encouraged for its diversified medicinal and other applications.

Key Words: *Adhatoda vasica*, Vasicine, Anti-asmatic, bronchodilator activity, Abortifacient and uterotonic activity

Introduction

Medicinal plants have an important role in Sustaining the health and well-being of mankind. A plant is an immediate source of medicine, that can be extracted, purified and preserved. A large number of natural drugs that cannot be synthetically duplicated, may therefore be identified and selected for possible use. In view of the large number of active compounds present in plants, we can only wonder at the huge reservoir nature has to offer; in which unlimited resources of medical ingredients are still untapped. One of the main advantages is undoubtedly the opportunity to use a wide range of essential elements provided by a plant origin for the humans. *Adhatoda vasica* (L) Nees is a well-known plant drug used both in Ayurveda and Unani medicines. Traditionally this plant was used for the treatment of various chronic diseases such as bronchial infections, cardiac diseases and various bacterial infections.

The leaves, flowers, fruit and roots are extensively used for treating cold cough, whooping cough, chronic bronchitis and asthma, as sedative, expectorant and antispasmodic (Pandita et al 1983). The present review study includes the systematics, phytochemical constituents and pharmacological studies of *Adhatoda vasica* (L) Nees, that demarcate this plant for its diversified medicinal applications.

Taxonomical classification

Kingdom- Plantae

Phylum- Tracheophyta

Class – Magnoliopsida

Order – Personales

Family – Acanthaceae

Genus – *Adhatoda*Species – *Vasica***SYNONYMS:** *Adhatoda zeylanica* Medic, *Justicia adhatoda* (Linn)**Vernacular Names**

Language	Name
Bengali	Bakasa, Vakasa
English	Malabar Nut, Vasak
Gujarati	Araduso
Hindi	Visondo, Aduza, Vasaka, Bansa, Adalsa
Kannada	Adasodai, Adasogai
Malayalam	Adalodakam
Marati	Adulararala
Sanskrit	Adarooshaka, Vasa
Tamil	Adatodai, Atatodai
Telugu	Adasamaru, Adapaka, Adasarum

Plant description

It is an erect evergreen shrub 1–2.5 m high with opposite ascending branches, simple opposite large leaves which are 10 - 19 cm long, 4-7 cm wide, minutely pubescent and broadly lanceolate. The inflorescence is dense, short pedunculate,

bractate terminal spike with white, pink or purple flowers. The fruit is a four seeded small capsule. The plant grows throughout the Indian peninsula and in the lower Himalayan ranges, up to an altitude of 1300 m above sea level. It is also found in Burma, Malaysia and Sri Lanka.

Parts used: Leaves, roots, flowers, and stem bark

Bio chemical constituents

The whole plant contains alkaloids as the major secondary metabolite and were present in different organs in different forms. The leaves contain an essential oil and alkaloids vasicine, N-oxides of vasicine, vasicinone, deoxyvasicine, and maintone. (Dharet al, 1981; Jain & Sharma, 1982) The roots contain vasicinolone, vasicol, pegamine and 2'glucosyl-oxychalcone. The flowers are rich in – sitosterol-D-glucoside, Kaempferol, its glycosides and quercetin.

Pharmacological Activity

The Plant *Adhatoda vasica* shows vast variety of pharmacological uses and it is believed to be the result of its rich concentration of secondary metabolites especially alkaloids. (Shrivastava et al, 2006; Maikhuri et al 1965)

Anti-microbial activity

Laboratory experiments were conducted to test the anti-microbial activity of *Adhatoda vasica* extracted using different solvents against various gram positive and gram negative bacterial strains and was found that gram positive bacteria were more affected than the gram negative ones (Shehla Sammi, Qammer Shahzad, et al, 2020).

Anti-bacterial activity

The leaf extracts of *Adhatoda* showed significant reduction in the growth of both gram- positive and gram-negative bacteria when studied using paper disc and dilution methods. The in-vitro screening showed strong anti-bacterial activity of the alkaloids present in *Adhatoda*.(Patel and Venkatakrishna, 1984).

Anti-asthmatic and bronchodilator activity

In traditional medicines the plant *Adhatoda* has been used to treat respiratory diseases. The primary alkaloid constituents of this plant namely Vasine and Vasicinone are well established therapeutical respiratory agents (Dorsch and Wagner, 1991). The leaf and root extracts of *Adhatoda* are useful in the treatment of Bronchitis,

common cough, cold and other lung and bronchiole disorders. The leaf decoction has a soothing effect against the throat irritation and it also act as an expectorant that loosen phlegm in the respiratory tracts. Experiments in unanesthetized guinea pigs and anesthetized guinea pigs and rabbits using extracts of *adhatoda* plant to study antitussive activity found that the plant extract showed good antitussive activity (Dhuley, 1999). Both in vitro and in vivo bronchodilatory activity were observed in the investigations using vasicine (Lahiri and Pradhan, 1964).

Abortifacient and uterotonic activity

Studies conducted on experimental organisms and humans, it was found that the extracts of *Adhatoda vasica* induced the abortion and has showed significant uterotonic activity (Claeson et al, 2000).

Wound healing activity

To study the wound healing property of *Adhatoda*, Physical wounds were created in buffalo calves in their vertebral columns and were treated with alcoholic and chloroform powdered extracts of *Adhatoda*, found that their wounds were healed significantly when compared to control ones. The application of extract improved breaking strength, tensile strength, absorption and extensibility of the wound repair tissues. The levels of elastin, collagen, hydroxyproline, hexamine etc were found to be increased in *Adhatoda* treated animals (Bhargava et al, 1988).

Anti- Ulcer activity

The leaf powder of *Adhatoda vasica* showed significant degree of anti-ulcer activity in ulcer induced experimental rats using alcohol, pylorus and aspirin (Shrivastava et al, 2006).

Anti-tuberculosis activity

The alkaloid vasicine present in *Adhatoda* induce the production of two mucolytic chemicals Bromhexine and ambroxol that change the pH of the medium and thus inhibit the growth of *Mycobacterium tuberculosis*. Studies reported that *Adhatoda* play an important role in the treatment of tuberculosis. (Narimain et al,2005; Grange and Snell, 1996).

Insecticidal activity

In India *Adhatoda vasica* has been used for centuries as an insecticide. The leaves and the seed oil have been used for the control of pests both in laboratory and ware house conditions. (Srivastava et al, 1965). The alkaloid present in *Adhatoda* have an infertility effect against certain insect species by blocking their oviduct and it have insect repellent action (Saxena et al, 1986).

Conclusion

There are several experimental reports that explain the extensive biological activities of *Adhatoda vasica*. The use of this plant as a drug has strong conceptual or traditional base and also has a strong experimental support. So, in the Pharmaceutical industry, this plant has a great potential to be developed as a drug ,after being subjected to clinical trials to explore the clinical utility of this drug.

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