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## Medicinal uses and Pharmacological activity of *Adhatoda vasica*

Atul Kumar Gangwar and Ashoke K.Ghosh

### ABSTRACT

The present survey of this plant reveals that *Adhatoda vasica* Nees belonging to family Acanthaceae, commonly known as Adosa, is found many regions of India and throughout the world, with a multitude of uses in traditional Ayurveda. Vasica is most well-known for its effectiveness in treating respiratory conditions. The fresh leaves of Vasica are chewed, sometimes with ginger, by yogis, or sadhus, because of their stimulant effect on the respiratory system. Vasica is an antispasmodic and expectorant, and has been used for centuries with much success to treat asthma, chronic bronchitis, and other respiratory conditions. Larger trials are required to prove it's all activities before it is recommended in future for clinical use, but it carries a great potential to be developed as a drug by the pharmaceutical industry. In this paper general medicinal uses and pharmacological activities of various parts of the plants have been revived.

**Keywords:** *Adhatoda vasica*, Adosa, Antispasmodic, Vasicine, Expectorant, Abortifacient and Anti-tubercular activity.

### 1. Introduction

*Adhatoda vasica* Nees belonging to family Acanthaceae, commonly known as Adosa, is a small, evergreen shrub found many regions of India and throughout the world, with a multitude of uses in traditional Ayurveda. Vasica is most well-known for its effectiveness in treating respiratory conditions. The leaves of Vasica are shows stimulant effect on the respiratory system. Vasica shows an antispasmodic and expectorant effect, and has been used for centuries with much success to treat asthma, chronic bronchitis, and other respiratory conditions. The powdered of herb, boiled with sesame oil, is used to heal ear infections and arrest bleeding. Boiled leaves are used to treat rheumatic pain, and to relieve the pain of urinary tract infections. It is also believed to have abortifacient properties. It is used in some parts of India to stimulate uterine contractions, thus speeding childbirth<sup>[1]</sup>.

### 2. Vernacular names

Hindi	:	Adosa, adalsa, vasaka
Sanskrit	:	Amalaka, bashika,
Bengali	:	Basak
Tamil	:	Adatodai
Marathi	:	Vasuka
Telugu	:	Adasaram
Malayalum	:	Ata-lotakam

### 3. Plant Description

*Adhatoda vasica* Nees. belongs to the medicinal family Acanthaceae. It is an evergreen shrub of 1-3 feet in height with many long opposite branches. Leaves are large and lance-shaped. Stem herbaceous above and woody below. Leaves opposite and exstipulate. Flower spikes or panicles, small irregular zygomorphic, bisexual, and hypogynous<sup>[2]</sup>. It has capsular four seeded fruits. The flowers are either white or purple in colour. Its trade name Vasaka is based on Sanskrit name<sup>[3]</sup>. Inflorescences in axillary spicate cymes, densely flowered; peduncles short; bracts broadly ovate, foliaceous. The leaves, flowers, fruit and roots are extensively used for treating cold cough, whooping cough, chronic bronchitis and asthma, as sedative, expectorant and antispasmodic<sup>[4]</sup>.

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1  
Fig 1: Whole plant



2  
2-Fresh leaves

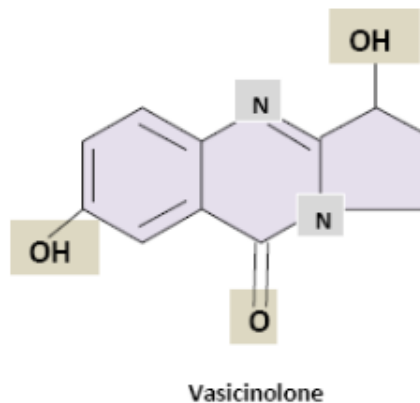
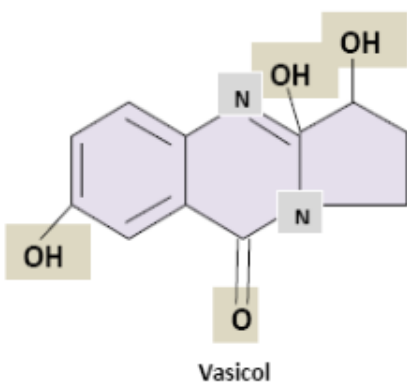
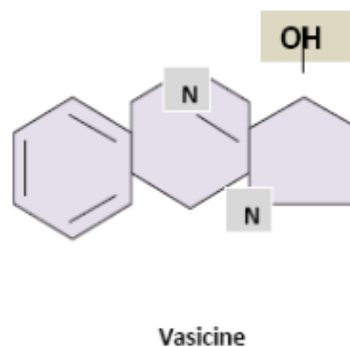
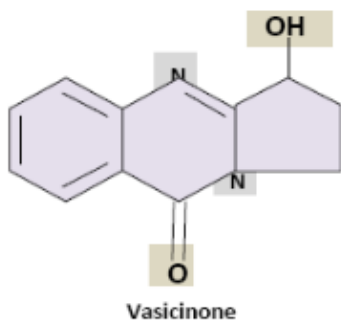


3  
3- Dried leaves

#### 4. Phytochemistry

The vast variety of pharmacological uses of Adhatoda is believed to be the result of its rich concentration of alkaloids [5, 6]. The prominent alkaloid found in Adhatoda leaves is the quinazoline alkaloid known as vasicine [7]. In addition to vasicine, the leaves

and roots of Adhatoda contain the alkaloids l-vasicinone, deoxyvasicine, maiontone, vasicinolone and vasicinol [8]. Research indicates that these chemicals are responsible for Adhatoda's bronchodilatory effect [9, 10].



#### 5. Pharmacological Activity

##### 5.1 Anti-asthmatic and bronchodilator activity

Adhatoda has been used in traditional medicine to treat respiratory disorders. Both vasicine and vasicinone the primary alkaloid constituents of Adhatoda are well established as therapeutical respiratory agents [11]. Extracts of Adhatoda's leaves and roots are useful in treating bronchitis, and other lung and bronchiole disorders, as well as common coughs and colds. A decoction of the leaves of Adhatoda has a soothing effect on irritation in the throat,

and acts as an expectorant to loosen phlegm in the respiratory passages. To evaluate the antitussive activities of Adhatoda extract in anesthetized guinea pigs and rabbits and in unanesthetized guinea pigs showed the plant to have a good antitussive activity [12]. Recent investigations using vasicine showed bronchodilatory activity both *in vitro* and *in vivo* [13].

##### 5.2 Wound healing activity

For the purposes of the study, wounds were created along the

vertebral columns of buffalo calves, and alcoholic and chloroform extracts of *Adhatoda* in a powdered form were applied. As compared to control animals, the calves treated with *Adhatoda vasica* showed significantly improved healing. *Vasica* improved breaking strength, tensile strength, absorption and extensibility in the wound repair tissue. In addition, the levels of elastin, collagen, hydroxyproline, hexosamine and zinc were greatly increased in the animals treated with *Adhatoda*. The alcoholic extract of the herb was found to be the most effective <sup>[14]</sup>.

### 5.3 Anti-ulcer activity

*Adhatoda vasica* was studied for its anti-ulcerogenic activity against ulcers induced by ethanol, pylorus, and aspirin. *Adhatoda* leaf powder showed a considerable degree of anti-ulcer activity in experimental rats when compared with controls. The highest degree of activity was observed in the ethanol-induced ulceration model <sup>[15]</sup>. These results suggest that in addition to its classically established pharmacological activities, *Adhatoda vasica* has immense potential as an anti-ulcer agent. Further research showed that a syrup of *Adhatoda* improved symptoms of dyspepsia <sup>[16]</sup>.

### 5.4 Cholagogue activity

In laboratory experiments on cats and dogs, *Adhatoda vasica* was found to increase bile activity when the animals were given an intravenous dose of 5 mg/kg. In dogs, the amount of excreted bile increased by 40-100%. The animals also showed an increase in bilirubin excretion <sup>[17]</sup>.

### 5.5 Anti-allergy activity

The extract containing the alkaloid vasicinol and 20% vasicine inhibited ovalbumin-induced allergic reactions by about 37% at a concentration of 5 mg <sup>[18]</sup>. Vasicinone has been shown to be a potent anti-allergen in tests on mice, rats and guinea pigs <sup>[19]</sup>.

### 5.6 Anti-tubercular activity

A chemical constituent of *Adhatoda* alkaloids, vasicine, produces bromhexine and ambroxol – two widely-used mucolytics. Both of these chemicals have a pH-dependent growth inhibitory effect on *Mycobacterium tuberculosis*. Indirect effects of *Adhatoda* on tuberculosis include increased lysozyme and rifampicin levels in bronchial secretions, lung tissue and sputum, suggesting that it may play an important adjunctive role in the treatment of tuberculosis <sup>[20, 21]</sup>.

### 5.7 Abortifacient and uterotonic activity

*Adhatoda vasica* has abortifacient and uterotonic properties, making it useful for inducing abortion and for stimulating uterine contractions in order to speed childbirth <sup>[22]</sup>. Studies on human subjects have shown that the alkaloid vasicine has significant uterotonic activity. This action appears to be influenced by the presence or absence of certain estrogens. In research on the activity of vasicine in stimulating uterine contractions, human myometrial strips taken from the uterus of both pregnant and non-pregnant women were treated with *Adhatoda*. The herb was found to induce uterine contractions, with effectiveness similar to the drug oxytocin <sup>[23]</sup>. During the research period, the anti-reproductive properties of *Adhatoda vasica* were anecdotally confirmed by local women <sup>[24]</sup>. Animal studies have also demonstrated *vasica*'s abortifacient properties. Aqueous or 90% ethanol plant extracts were given orally to test rats and guinea pigs for 10 days after insemination. Leaf extracts of *Adhatoda vasica* were 100% abortive at doses

equivalent to 175 mg/kg <sup>[25]</sup>. *Adhatoda vasica* was also shown to have an abortifacient effect on guinea pigs, with effectiveness varying depending on the stage of pregnancy. The effects were more marked when estrogens were used as a priming influence, indicating that the actions of vasicine was probably mediated via the release of prostogladins <sup>[26]</sup>.

### 5.8 Insecticidal activity

*Adhatoda vasica* has been used for centuries in India as an insecticide. Its leaves have been shown to control insect pests in oil seeds, in both laboratory and warehouse conditions <sup>[27]</sup>. Research has shown *Adhatoda*'s alkaloid, vasicinol, to have an antifertility effect against several insect species by causing blockage of the oviduct. Research has also proven *Adhatoda*'s effectiveness as an insect repellent <sup>[28]</sup>.

### 5.9 Anti-bacterial activity

A leaf extract was investigated for antibacterial activity using the paper disc and dilution methods. *In-vitro* screening showed a strong activity of *Adhatoda*'s alkaloids against the bacteria *Pseudomonas aeruginosa*. Significant antibacterial activity against the Gram-positive bacteria strains *Streptococcus faecalis*, *Staphylococcus aureus*, *Staph epidermidis* and the gram-negative *E. coli* were also noted <sup>[29]</sup>.

## 6. Conclusion

*Adhatoda vasica* possesses numerous biological activities proved by many experimental studies. It represents a class of herbal drug with very strong conceptual or traditional base as well as a strong experimental base for its use. Thus, this plant has great potential to be developed as drug pharmaceutical industries, but before recommending it for clinical use in these conditions, there is a need to conduct clinical use in these conditions, there is a need to conduct clinical trials and prove its clinical utility.

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