

## VASAKA - A BOON TO THE INDIAN TRADITIONAL SYSTEM OF MEDICINE

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## ABSTRACT

Adhatoda vasica (L.) (Acanthaceae) has vital medicinal roles, and it is widely used in the indigenous medicine system in India. One of the important goals of the present study is to make report on the phytochemical and different in-vitro/in-vivo pharmacological activity of plant Adhatoda vasica. This study will help to find specific bioactive compounds of vasaka, and their suitable use for human welfare. The bioactive compound vasicine have been isolated from alcoholic extract of vasica leaves using column chromatography. In this review article covered all the reported pharmacological activities of vasaka plant, and their chemical constituents. In-addition; chemical constituents of vasaka has been found active against many diseases such as antimicrobial activity, hepatoprotective, antitussive, antibacterial, anti-inflammatory and antiulcer, anti-urolithiatic, abortifacient, thrombolytic, radio modulator, cardiovascular protection, hypoglycaemic, antitubercular, antioxidant and anticancer.

**KEYWORDS:** Adhatoda Vasica, Vasaka, phytoconstituents, pharmacological activity.

**DURATION:** Received- 31/05/2021, Reviewed- 10/06/2021, Revised/ Accepted- 16/06/2021

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## INTRODUCTION

In the Indian medicine system, a large indefinite number of drugs from plant or mineral origin have been used in various types of diseases and their complications.<sup>[1,2]</sup> The Vasaka plant perennial, evergreen and highly branched with an unpleasant smell and bitter taste, The Vasaka plant contains stem, leaf, flower, fruit, seeds<sup>[3,4]</sup>, leaves, roots, and young plants. These parts of vasaka plant having quinazoline alkaloids like vasicine, 7- hydroxyvasicine, vasicol, vasicoline, vasicinolone, 3- deoxyvasicine, vasicolinone, betaine, steroids carbohydrate, and alkanes. The flowers of A. vasica contains triterpenes (amirine), and flavonoids (Apigenin, astragal, kaempferol, quercetin, vitexin<sup>[5,6]</sup>). Adhatoda vasica, also called as Malabar nut tree. It is part of the Acanthaceae plant family. It is a common small evergreen, sub-herbaceous bush distributed all over India, mostly in the lower altitude of the Himalayas. In the Ayurvedic system of medicine, it is commonly known as arduasi.<sup>[7]</sup>

Quinazoline alkaloids like vasicine, vasicinone, and vasicinolone vasicol are present in the leaves of Vasaka. Quinazoline alkaloids having various others activities such as bronchodilator effect and expectorant. The antispasmodic effects has been found in combination with ginger (*Z. officinale*) and *Ocimum tenuiflorum*<sup>[8]</sup>. Marketed products are available in market with different names like Spirote, Kada, and Fermiforte. These all marketed products are prescribed in the treatment of respiratory disorder and leucorrhoea<sup>[9,10]</sup>. A. vasica may also be prescribed in the treatment of diseases like expectorant, antispasmodic, breathlessness, anthelmintic, bronchial antiseptic, idiopathic thrombocytopenic purpura, Antioxidant, Antibacterial, Antifungal Activity, Hepatoprotective Activity, Antiviral activity, Antidiabetes

activity, Anti-tuberculosis Activity, Hepato suppression, Anticestodal activity, Immunomodulatory activity, Uterine activity, anti urolithiatic and bronchodilator in combination with other plants. Vasika has been utilized as a basic constituent in various formulations. The leaves have been exhibited diuretic activity. It is minimize the bulge in the kidney and ultimately clear urination passage. Individuals abiding from bleeding piles or diarrhea, go along with bleeding, and women enduring from polymenorrhea may take vasika juice 2 to 3 times a day for better activity<sup>[11]</sup>.

Plant specifications: The different parts of A. vasica (root, leaves, and flowers) is used in the form of juice and decoction to provide relief in fever, intrinsic hemorrhage, cough, asthma, consumption, glucoma, kustha, obesity, edema, skin diseases, pradara, difficult labor, vomiting, piles, pox, retention of urine, diseases of the mouth and as Rasayana in different systems of medicine (Ayurveda, Siddha, Unani, Folk, Homeopathy, Sowa Rigpa and Chinese, Modern).

## Vernacular names:

**English:** adhatoda

**Hindi :** basingu, basute, basuti, rus, rusa, vasaka  
Kannada: adusoge, aduthoda, alasoge, atusoge, byalada, edmuttanditappu, edumuttanditappu, yedumuttanditappu

**Marathi :** adulsa, arusa, bakas, vasuka, adoolsa, adoola, baksa, adaso, adulsi, adulso,

**Sanskrit:** vajidanta, vajidantaka, vajidanti, vansa, vasakah, vasha, vasika, vrisha, vrishasinhamukhi, vrsa, vrsah, vrsaka

**Tamil:** attacaram, atutota ilai, kattumurungai, vachai

**Telugu:** adda saramu, adda-sarap, addasaramu, addasarakapu, atarushamu, adasaram, addasaram

**Malayalam:** adel-odagam, atalotakam, adalodagam, atalotakam, ataloetakam, attalotakam

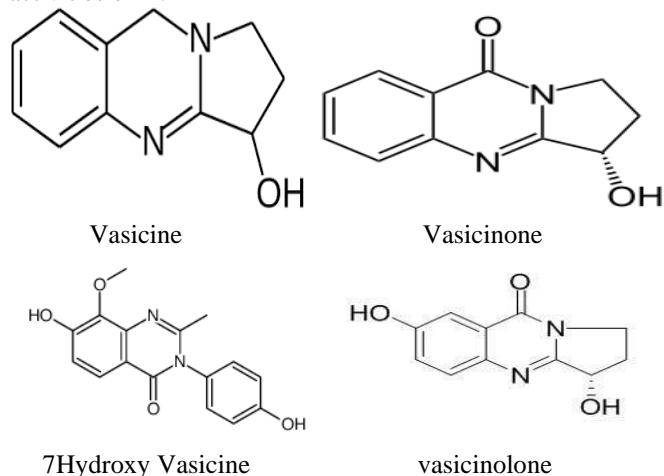
**Tibetan:** basaka, ba-sa, ba-sa-ka, bri-sa

**Urdu:** adoosa, arusa, arusa (bansa), bansa ke pattay, burg arusa, burg bansa, burg-i-arusa deoxyvasicine, maiontone,

vasicinolone, and vasicinol also present in high concentration<sup>[14,15]</sup>. Different Research indicates that the most prominent action produced by vasicina is bronchodilatory activity due to the presence of alkaloids.<sup>[16,17]</sup>

The pharmacologically bioactive alkaloid present in Adhatoda leaves. It is the quinazoline alkaloid known as vasicine, Besides, l-vasicinone, vasicina may be due to the presence of a high concentration of different alkaloids<sup>[12, 13]</sup>.

Phytochemical Studies: The broad spectrum pharmacological activities of A.



## PHARMACOLOGICAL ACTIVITY

### Uterotonic activity

The study of the uterine activity of A. vasicina extract was studied by using in-vitro and in-vivo method, and investigated their effect on different hormones in different animal species. The effect was standardized by oxytocin and methyl ergometrine. The stillbirth miscarriage effect was more prominent in presence of estrogens<sup>[18, 19]</sup>. The in-vivo study of the abortifacient effect was done in rabbits, rats, guinea pigs, and hamsters. The in-vitro study of vasicinone derivatives showed an oxytocic effect at the dose of 1 mg/ml and above<sup>[20]</sup>.

### Antimicrobial and antifungal activity

The alcoholic extract of A. vasicina leaves was prepared for antimicrobial study and the result was mentioned in table 1 and Minimum inhibitory concentration of isolated vasicine against tested bacteria and fungi is shown in table 2<sup>[21]</sup>.

### Antioxidant activity

They were isolated bioactive compound vasicine by using alcoholic extract of A. vasicina leaves. The antioxidant property of vasicine bioactive compound was evaluated and noted using in-vitro method<sup>[22]</sup>. They were found that vasicine having potential bioactive antioxidant active compounds

### Analgesic anti-inflammatory activity

Hydro-alcoholic (95% methanol) extract of A. vasicina powder was evaluated anti-inflammatory activity by using (carrageenan-induced Paw Edema) and analgesic activity (hot plate method) Wistar albino rats model. They were found that vasicina extract showed better activity. It was more effective against inflammation as similar to diclofenac sodium standard drug effect<sup>[23]</sup>.

### Anticancer activity

A. vasicina leaves were collected and extracted by n-hexane (30g), ethyl acetate (20g), and methanol (31g). There after drying studied anticancer activities by using cancerous cell lines e.g., Human HL-60 (Promyelocytic Leukemia), NB-4 (Acute Promyelocytic Leukemia), CEM (Lymphoblast), MOLM-14 (Acute Monocytic Leukemia), K562 (Erythromyeloblastoid Leukemia), Jurkat (T cell lymphoblast) and IM-9 (Myeloma) cells<sup>[24]</sup>. Anticancer bioactive compounds potential properties assessment was done by using docking analysis (using latest docking software autodock tool 1.5.6)<sup>[25]</sup> and Western blotting analysis [26]. They were found that n-Hexane extract showed better anti-cancerous activity at 3 mg/ml concentration.

### Anti-tussive activity

A decoction of A. vasicina leaves was used, and was separate out polysaccharides of A. vasicina. In-addition; The effect of anti-tussive activity on aerosol of citric acid healthy guinea-pigs was evaluated. They were reported that the effect of polysaccharides on cough suppression was dose-dependent. They was found that the mode of action of anti-tussive activity may be relaxation in the bronchial muscle. They revealed that it may act as good bronchial muscle relaxants<sup>[27]</sup>.

### Anti-asthmatic and bronchodilator activity

A decoction of A. vasicina leaves has been used in traditional Indian medicine for thousands of years to treat bronchitis, tuberculosis, and other lung and bronchiole disorders. Dorsch and Wagner (1991) was found alkaloids of A. vasicina showed activity against respiratory disorder<sup>[28]</sup>. Histamine induced broncho-constriction in guinea pigs model were used for the anti-asthmatic study of an extract of A. vasicina leaves. Animals after overnight fasting exposed to allergens in the airtight chamber and pre-convulsion time were recorded immediately after exposure to fresh air<sup>[29]</sup>. They was found that the vasicine shows potential therapeutic bronchodilator activity<sup>[30]</sup>.

### Hepatoprotective Activity

Hepatoprotective activity was studied of ethyl acetate extract of A. vasicina using carbon tetrachloride-induced liver damage in albino rats. They was found that 100mg/kg dose of ethyl acetate extract of A. vasicina lowered ALT, AST, and ALP level while 200 mg/kg dose proven more potent against 1 ml/kg Carbon tetrachloride hepatotoxicity<sup>[31]</sup>.

### Anti-diabetes activity

They were used for antidiabetes activity of ethanolic extract of A. vasicina using streptozocin (STZ) induce diabetes in Wistar rats. They were found that A. vasicina treated rats show a significant increase in AchE, TNF-alpha, and nitrate levels

which proved protective activity of *A. vasica* against diabetic encephalopathy<sup>[32]</sup>.

#### In-Vitro Antiurolithiatic Activity

They were used for antiurolithiatic activity of ethanolic extract of *A. vasica*. Kidney stones were prepared experimentally by using an equimolar solution of CaCl<sub>2</sub> and sodium oxalate. They were found that the ethanolic extract of *A. vasica* at 200 mg/kg dose has shown better activity<sup>[31]</sup>.

#### Inflammatory and hypoxic responses

They have investigated the hypoxia response pathway. It has been associated with pathologies and our recent observations on anti-hypoxic and anti-inflammatory effects using whole aqueous extract of *A. vasica* and its effects on relevant preclinical mouse models. It was found that *A. vasica* can be used for the prevention and management of Covid-19 disease<sup>[32]</sup>. Due to *A. vasica* multi-modal therapeutic potential effects and they found from the survey-based research indicate the potentiality of its use in the management of COVID-19 symptoms.

#### CONCLUSION

The overall study of physicochemical and pharmacological properties of *A. vasica* explores the fact that this plant constitutes therapeutically beneficial compounds with promising pharmacological activity. By summarizing many experiments of works we can conclude that *A. vasica* has a very strong bioactive compounds. In-addition; this study it is clear that *A. vasica* plant is very convenient bioactive compounds where needed to investigate research work that gives novel prospective thought. It could be used for synthesizing its various analogues

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**How to cite this article**

Ruchita Rao, Medhavi Joshi, Chaitanya A. Kulkarni, Pratik Phansopkar, Waqar M. Naqvi, 2021. Rehabilitation of patient with varicose vein along with subcutaneous calcaneal bursitis. Jour. of Med. P'ceutical &Alli. Sci. V 10 - I 3, 1124 P-2874-2876. DOI: 10.22270/jmpas.V10I3.1124.