Adhatoda vasica: A Review On its Phytochemistry and Pharmacological Activity

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Abstract

Vasica Adhatoda Nees, also known as Justicia adhatoda L., is a member of the Acanthaceae family and is regarded as the most important plant in the entire globe. It is distributed in many parts of India and all across the world and is also known by the common names Vasaka,Vasica, Adosa, and Malbur nut. It is a well-known plant in the medical systems of Ayurveda and Unani. It works well for headaches, diarrhea, chronic bronchitis, colds, cough, whooping cough, fever, asthma, dyspnea, phthisis, and dysmenorrhea. Throughout the acute stages of bronchitis, vasaka continuously relieves symptoms, especially when the sputum is thick and sticky. To make sputum easier to eject, it thins it out. To treat asthma, the dried leaves should be smoked. To treat tuberculosis, Ayurveda utilizes gulkand, a medication made from vasaka flowers. The juice from its leaves should be given in doses of 2 to 4 grams to cure diarrhea and dysentery. New petals from vasaka flowers should be damaged before being put in achina clay pot. several sugars Crystals are put inside the jar, which is then exposed to the sun.Stir it every morning and every evening.

Keywords: *Adhatoda, Vasica, Vasaka , phytoconstituents ,pharmacological activity ,asthama ,cough,vasaka ,plants,leaves*

Introduction

Adhatoda victoria Nees, a member of the Acanthaceae family and generally referred to as "Adosa," is a tiny, evergreen shrub that is ubiquitous around the world and in many parts of India. It has a wide range of applications in conventional Ayurveda. Vasica is most known for its capability to cure respiratory conditions.conditions. Vasica leaves have an energizing effect on the respiratory system. Vasica displays an expectorant and antispasmodic effect, and has been widely used for millennia. success in the treatment of respiratory illnesses such chronic bronchitis and asthma. [1] This is a crucial plant that is widely distributed throughout the Indian subcontinent, including in Punjab, Bengal, Nepal, Assam, and Sri Lanka. It is a native of Asia. At a height of 1300 meters above sea level, it also covers the Indian plains andHimalayan mountain ranges [2]. According to the Ayurvedic medical system, it is used to prevent and treat a number of ailments.(3) . Large, lance-shaped leaves are seen. It produces fruits with four seeds per cap. Either white or purple blooms are present. Based on a Sanskrit name, it goes by the commercial name vasaka. India is the home of Vasaka. Both the lower Himalayan ranges and all of India are home to its growth. Aside from an essential, the leaves also contain the alkaloid vasicine. In the Ayurvedic Malabar nut (Adhatoda vasica) has been utilized as medication for a variety of conditions, including; Leprosy, blood disorders, heart issues, thirst, asthma, fever, vomiting, loss of appetite, bronchitis,memory, gonorrhea, leucoderma, jaundice, tumors, oral issues, painful eyes, and fever. Bronchitis, TB, and other lung and bronchiole diseases .(4)Blood purification, expectorant, and antispasmodic properties are all present in vasaka. Adhatoda Vasaka is a well-known remedy that is available everywhere and is particularly well-known in rural areas. Recognizing its therapeutic benefits, it has been used in conjunction with cutting-edge clinical practitioners. The bark, flowers, roots, and leaves of this bush are used in medicine, and it grows everywhere on earth. The leaves are well known for being an effective cure for bronchitis and coughing. The taste of the herb is astringent and bitter. When it moves, there is no blood. It improves the voice

and normalizes kapha and pitta. This can be used as a treatment for all illnesses and helps individuals with coughs and asthma. The pharmacological activities, traditional uses, andphytochemical investigations to enhance the medication's this review intends to assess the pharmacological activities, traditional uses, and phytochemical investigations to enhance the medication's potency and pave the way for potential future research areas. Additionally, it will serve as a foundation for investigating the evolution of medicinal herbs' curative capabilitie[5]. The whole herb contains a significant amount of vasicine [6,7] A. vasica is an evergreen herb that grows to a height of 2 meters. It has long, opposing branches and enormous, lance-shaped leaves that exstipulate and range in color from dark green to yellowish. The Purple or white pedunculate blooms can be foundT [8] his study provides updated data on phytoconstituents from A. vasica, as well as their potential participation in conventional and medical therapy for different illnesses. According to literature, it can treat cough, cardiac problems, bacterial infections, and reproductive problems [9].

Vernacular name:

Hindi : Adosa, adalsa,vasakaSankrit : Amalaka,bashika Marathi : vasuk
Telugu : Adasaram
Bengali: Basak English : malabarnut

Table: 1 Botanical Classification of Adhatoda vasica

Taxonomical Rank	**Taxon**
Kingdom	Plantae
Order	Lamiales
Family	Acanthaceae
Genus	Justicia
Species	J. adhatoda
Common name	Adulsa (Vasaka)

Fig.1.1Adhatoda vasica leaves

Fig .1.2 Adhatoda vasica flower

Fig.1.3 Adhatoda vasica roots

Distrubation:

The evergreen shrub Adhatoda vasica is a tiny member of the Acanthaceae family. It is dense, perennial, and has many branches. This plant can grow to a height of 1-3 to 6 meters(10). It includes opposing long branches. On the

abaxial side of the stem, it is woody. and, from the adaxial side, herbaceous. The flowers are big and full. large-braced, bisexual, zygomorphic, tiny terminal spikes uneven, hypogynous, and having a white, pink, or purple look breadth
2.2 cm - 0.8 cm and length 1.9-2.2 cm(11,12). The flavor and The plant has a harsh, bitter odor(13). The plant's leaves are straightforward, tapering in base, dark green; reticulate, opposite, and brief peduncle, hairy, elliptically or ovately lanceolate, breadth 4–7 cm and length 7–19 cm (14).

Taste:

Calaseon, Malmfors, Wikman, & Bruhn (2000) describe a bitter flavor.

Colour:

White blooms adorn the leaves, which are dark green above and pale yellow below.

Odour: Unpleasant smell

Parts used:

Steam: mudir-e-haiz (emmenagogue) to induce uterine contractions during childbirth, antispasmodic, and abortifacient.

Leaf: mudir-e-haiz (emmenagogue), an antispasmodic and abortifacient that causes uterine contractions during childbirth.

Flower: used to treat whooping cough, asthma, bronchitis, bronchiectasis, and upper respiratory tract infections such as the common cold and flu. Qulqand, a flower-based candy and sugar) is thought to be helpful for all respiratory conditions.

Fruit: Its fruit and seed are used to relieve ear discomfort.

Root: used to treat whooping cough and TB.

The Whole herb: It is employed to treat fever, blood purification, and habis-u-dam (haemoptysis), particularly for epistaxis and hemoptysis. Also, the decoction is recommended for leprosy and scabies

Uses :

Asthama
Bronchits
Tuberculosis
Fever

Chemical Constituents:

The Adhatoda vasica plant contains a variety of chemical substances. The fruit, flower stalk, roots, leaves, and seeds all contain a variety of chemical components, including necessary oils, fats, gum, sugar,resins, proteins, and vitamins C (15) . The analysis's findings revealed that J. adhatoda leavescomprise anthraquinone, alkaloids, phenols, flavonoids, and saponins. and lowering the sugar (16). In terms of pharmacology, the most research Vasicine, a bitter quinazoline alkaloid, is a phytochemical component.

(1, 2, 3, quinazoline-3-ol, 9- tetrahydropyrrole [2, 1-b], Found in roots, flowers, and leaves (C11H12N2O) (17.) The combination of To make vasicine, combine vicinyl with 2-amino benzylamine. Tricarbonyl reagent (vasicinone) (18.) Triterpenoid number two: 3-D-hydroxyl friedoolean-5-ene together with two other substances Aerial portions also contain substances called peganidine and epitaraxerol. of Vasco da Gama Nees. Principal tracing elements (19)

Main alkaloids	Vasicine Vasicol Vasicinone
Minor alkaloids	Adhatonine Vascinol Vasicinolone
Flower content	Kaempferol Quercetin
New moiety in flower	2,4dihydroxychalconeand glucoside
Leaves	Vsicoline Adhatodine Vasicolinine Anisotine

Morphology:

Leaves:

The two main alkaloids found in the plant's leaves and roots are vasicinone (0.027%) and vasicine (0.85%) (20.)The plant's leaves also have other alkaloid components including as Adhatodine, Adhatonine, Adhavasinone, Vascinone, and Vascinol. Hydroxypeganine and Anisotine. In addition, it includes a tiny amounts of steroids, betaine, crystalline acid, and essential oils and(21-23)alkanes.

Flower: It contains alkanes(24-26)dihydrochalcone–4–glucoside, flavonoids (Astragalin, Kaempferol, Quercetin, Vitexin, Apigenin), and triterpenes (alpha-amyrin).

Root: People in rural areas utilize root extracts to treat liver disorders, diabetes, coughs, and colds6 (27) In South-East Asia, diphtheria, malaria, and other illnesses are treated with powder, paste, and root extracts. leucorrhea, TB, and ocular disorders. Within Sitapur the Uttar Pradesh (India) district, root paste combined with Sugar is utilized to treat severe issues that arise at night(28.) Moreover, the The vagina and pubic area are covered with liquefied roots, which assist with parturition(29)

Medicinal Applications of Adhatoda vasica Enlist:

A) Healing power and healing properties

B) Bronchitis and Asthma

C) Tuberculosis

D) Skin diseases

Fig.2 Adhatoda vasica

(A) Healing power and healing properties

The capacity for and aptitude for healing Indigenous medicine makes extensive use of the leaves, roots, and flowers as a treatment for asthma, bronchitis, colds, and coughs.

(B) Bronchitis and Asthma

It offers ongoing pain alleviation for bronchitis in its acute stage. in particular where there is sticky phlegm. Smoking dried leaves can help to lessen asthma symptoms

C) Tuberculosis

Ayurveda uses gulkand, a remedy produced from the blossoms of the vasaka plant, to treat tuberculosis. Chopped fresh vasaka petals should be placed in a clay jar that is chilled. We add a few sugar crystals and keep them in the sun. Morning and night, you must stir everything. About a month will pass before the box is usable. The juice from its leaves can be used to cure tuberculosis. Three times every day30 cc of juice are consumed with honey. With its calming effects, it calms an irritating cough and helps to liquefy sputum, which aids expectoration.

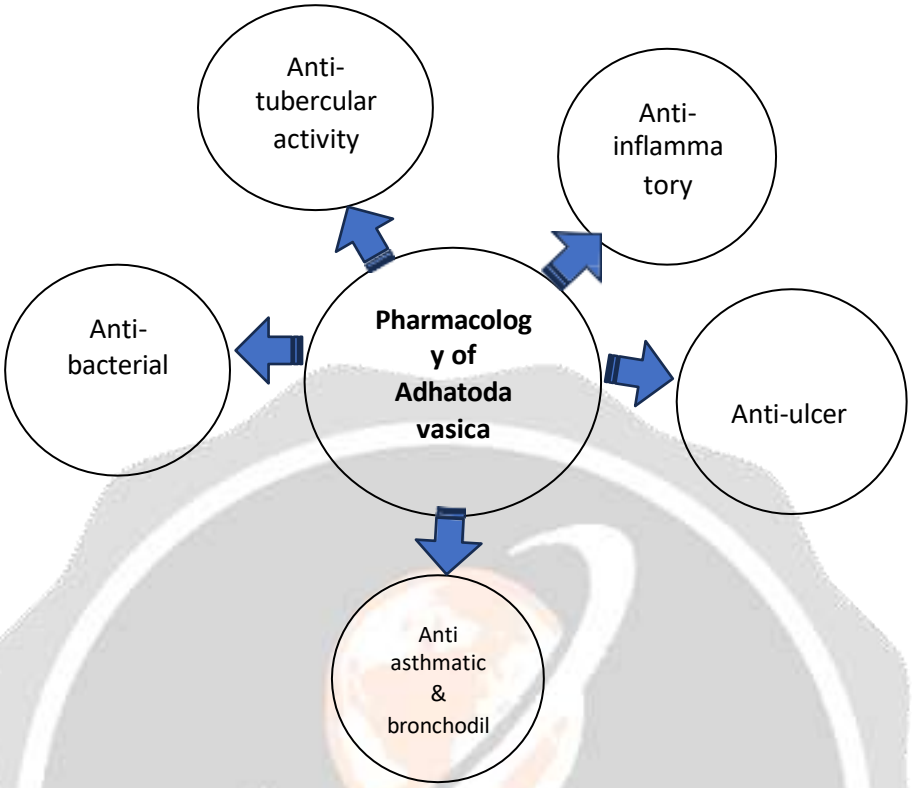
(D) Cough

7 plant leaves are boiled in water, filtered, and combined with 24 grams of honey to treat coughs. This concoction brings comfort. Similar to this, a vasaka flower confection taken twice daily in dosages of 12 grams cures cough. To make this treat, combine 180 grams of jaggery and about 60 grams of flower

(E) Skin Diseases

Its leaves can be used as a poultice to treat inflammation-related swellings, rheumatic joints, and fresh cuts. Scabies and other skin conditions can be treated with a heated infusion of the plant's leaves.

Pharmacology:



Anti-ulcer activity:

The antiulcer activity demonstrated enormous promise as an antiulcer drug and was established using ethanol-induced, pylorus ligation plus aspirin-induced models (Chaturvedi, Rai, Dhani, and Tiwari (1983). mostly successful in treating ulcers brought on by the Aspirin and ethanol, although the potent anti-ulcerogenic Adhatoda showed efficacy in ethanol- induced ulcers.leaf powder, (Shriivastava, Banerjee, Nivasarkar, & Srivastava, (2006)). Thus, it can be said that Adhatoda possesses an immunological Possibility of acting as an antiulcer

Anti–inflammatory activity:

Rat paws were used to test the anti-inflammatory effects of carrageenan and formalin using an ethanolic vasaka extract (200–400 mg/kg/per oral). This research discovered a potent anti-inflammatory impact.(30) A research team calculated the potential anti-inflammatory effects bycomparing the aqueous and butanol fraction to the metabolites of acid arachidonic. This study's findings demonstrate that the plant source's watery fraction prevents the work on the arachidonic acid pathway by either platelet-activating factor, thrombooxygenase, or cyclo- oxygenase. Thus, they demonstrate the hidden the process by which it exerts anti- inflammatory effects .(31)

Anti-tubercular activity:

The alkaloid vasicine from adhatoda yields the chemical components ambroxol and bromhexine, which are two common mucolytics. growth-inhibiting consequences on These substances' Mycobacterium tuberculosis has been determined. Adusa also affects TB indirectly. via raising the levels of rifampicin and lysozyme in bronchialsputum, lung tissue, and secretions, suggestingthat it could be utilized as an adjuvant in the treatment of tuberculosis.(32,33)

Anti-bacterial:

Adhatoda vasica leaf extract has a moderate level of antibacterial activity (34.) The antibacterial activity against the 11 mm Bacillus subtilis bacterium strains and 15 mm Vibrio cholera in petroleum ether extract, as well as Vibrio cholera (13 mm) and Bacillus subtilis (11 mm) in The disc diffusion technique was used to determine the ethanol extract. The plates were incubated there at 37 o C for a day to let the organism to grow to its full potential and the

test's activity agents were quantified using the plates' zone of inhibition.

Anti asthmatic & bronchodilator:

Treatments for upper respiratory infections, cough, and bronchitis include extracts from leaves and roots. It also relieves congestion by acting as an expectorant. Within aerosolized histamine, acetylcholine, and guinea pigs caused constriction of the bronchi (35). Singh and associates.
2014 36 suggest that vasaka has anti-asthmatic properties. direct stabilization of mast cells, obstructing the lipoxygenase/cyclooxygenase enzyme, or via lowering the activating factor for platelets(39). As an The plant source, a bronchodilator, has been used for decades to address asthma. Both vasicinone and vasicine, both alkaloids well-known for their curative properties on respiratory system, which aids in this operation (37,38) however, between the two vasicinone (an oxidized product)

Conclusion:

This brief overview thoroughly documents the traditional applications of Adhatoda vasica in treating a variety of diseases, as well as a wide range of biological activity that have been well- reported. Given its various applications, more research on activity screening and the structure- activity link is needed to delve deeper. Research aimed at finding and creating novel agents would benefit from the current review. for use in medicinal applications and agro- industries that rely on naturally occurring plant-based products.Many biological activities of Athatoda vasica have been demonstrated by numerous experimental investigations. It belongs to a category of herbal remedies with highly potent conceptual or both a solid experimental foundation and a conventional one for its application. Vasicine is the main alkaloid found in plant leaves. This results in a slight but long-lasting bronchodilatation.

References

[1] Claeson UP, Malmfors T, Wikman G, Bruhn JG. Adhatoda vasica: a critical review of ethnopharmacological and toxicological data. Journal of Ethnopharmacology 2000; 72:1

[2] Gedam A, Kshirsagar R, Sawate A, Patil B. Studies on physico chemical characteristics andcomparative study on extraction yield of Adulasa (Adhatoda vasica) leaf. J Pharmacogn Phytochem. 2017;6(5):244-247

[3] Prajapati N, Purohit S, Sharma D, Tarun K. A Handbook of Medicinal Pants. 1st Edn,agrobiaos. Jodhpur, India. 2003:13-14

[4] Dept. of Pharmaceutical Sciences, Coimbatore Medical College, Coimbatore [2] Rajeev Gandhi College of Pharmacy, Maharajganj, UttarPradesh J. Chem. Pharm. Res., 2010, 2(1):240-245

[5] Kumar, N. Pharmaceutical attributes of vasa (Adhatoda Vasica Linn.)-a review. World J. Pharm. Res., 2016, 5(4), 437-455.

[6] Atal, C. Chemistry and pharmacology of vasicine: a new oxytocic and abortifacient; Jammu-Tawi: Regional Research Laboratory: India, 1980.

[7] Huq, M.E.; Ikram, M.; Warsi, S. Chemical composition of Adhatoda vasica Linn. II. Pak. J.Sci.

[8] Singh SK, Patel JR, Dangi A, Bachle D, Kataria RK. A complete over review on Adhatoda vasica a traditional medicinal plants. Journal of Medicinal plants studies. 2017;5(1):175-180.

[9] Sayeed A, Madhukar G, Maksood A, Mhaveer S. Tanvir md, Ansari SH, A phyto pharmacological overview on Adhatoda zylanica Medic. Syn A vasica (Linn) Ness Natural product radiance. 2009;8:549-554.

[10] Pandita K, Bhatia MS, Thappa RK, Agarwal SG, Dhar KL, Atal CK. Seasonal variation ofalkaloids of *Adhatoda vasica* and detection of glycosides and N-oxides of Vasicine and vasicinone. Planta medica 1983 Jun; 48(06): 81-2.

[11] Shinwari ZK, Shah M, Awan R. The Ethnobotany of Kharan Distt. In Baluchistan. Proc. Symp. Med. Pl 1995; 44: 29-35.

[12] Panara K, Singh S, Joshi K, Kumar AP, Karra N. Review on research studies of Vasapatra (Leaf of *Adhatoda vasica* Nees.). Int J Pharmacogn 2014; 1: 168-73.

[13] Pa R, Mathew L. Antimicrobial activity of leaf extracts of *Justicia adhatoda* L. incomparison with Vasicine. AsianPacific Journal of Tropical Biomedicine 2012 Jan 1; 2(3):S1556-60.

[14] Kumar KS, Debjit B, Pankaj T, Rakesh K. Indian traditionalherbs *Adhatoda vasica* andits medicinal application.Journal of Chemical and Pharmaceutical Research 2010;2(1): 240-5.

[15] Bhat VS, Nasavatl DD, Mardikar BR. *Adhatoda vasica*-AnAyurvedic medicinal plant.Indian Drugs 1978; 15(62): 6.

[16] Pathak RR. Therapeutic guide to Ayurvedic medicine. Ahand book of Ayurvedicmedicine. Shree BaidyanathAyurved Bhawan Pvt. Ltd. Patna; 1970. p. 25-330.

[17] Chowdhury BK, Bhattacharyya P. Vasicine and relatedcompounds. 4. Adhavasinone-A new Quinazolone alkaloidfrom *Adhatoda vasica* Nees. Chemistry & Industry 1987Jan; 5(1): 35-6.

[18] Wasserman HH, Kuo GH. The chemistry of vicinaltricarbonyls. An efficient synthesis of (±)-Vasicine.Tetrahedron letters 1991 Nov 25; 32(48): 7131-2.

[19] Jabeen S, Shah MT, Khan S, Hayat MQ. Determination ofmajor and trace elements in ten important folk therapeuticplants of Haripur basin, Pakistan. Journal of Medicinal Plants Research 2010 Apr 4; 4(7): 559-66

[20] Haq ME, Ikram M, Warsi SA. Chemical composition of*Adhatoda vasica* (L.) II. Pak.J.Sci. Ind. Res 1967; 10: 224-

[21] Lahiri PK, Pradhan SN. Pharmacological investigation ofVasicinol-alkaloid from*Adhatodavasica* Nees. IndianJournal of Experimental Biology 1964 Jan 1; 2(4): 219.

[22] Bhattacharyya D, Pandit S, Jana U, Sen S, Sur TK.Hepatoprotective activity of *Adhatoda vasica* aqueous leafextract on D-galactosamine-induced liver damage in rats.Fitoterapia 2005 Mar 1; 76(2): 223-5.

[23] Joshi BS, Newton MG, Lee DW, Barber AD, Pelletier SW.Reversal of absolute stereochemistry of the pyrrolo [2, 1-b]quinazoline alkaloids Vasicine, vasicinone, vasicinol andvasicinolone. Tetrahedron: Asymmetry 1996 Jan 1; 7(1)

[24] Haq ME, Ikram M, Warsi SA. Chemical composition of*Adhatoda vasica* (L.) II. Pak. J.

Sci. Ind. Res 1967; 10: 224-5

[25] Rawat MS, Pant S, Badoni YS. Negi. Biochemicalinvestigation of some wild fruits ofGarhwal Himalayas,Prog Hortic 1994; 26: 1-2.

[26] Bhartiya HP, Gupta PC. A chalcone glycoside from theflowers of *Adhatoda vasica*.Phytochemistry 1982 Jan 1;21(1): 247.

[27] Madaus G. Textbook on the biological remedy, band IIGeorge Thieme; 1938. p. 1681-1684.

[28] Bhat VS, Nasavatl DD, Mardikar BR. *Adhatoda vasica*-AnAyurvedic medicinal plant.

Indian Drugs 1978; 15(62): 6

[29] Badruzzaman Siddiqui M, Husain W. Traditional treatmentof gonorrhoea through herbaldrugs in the province ofcentral Uttar Pradesh, India. Filoterapia-Milano 1993; 64:399.

[30] Chakraborty A, Brantner AH. Study of alkaloidsfrom Adhatoda vasica Nees on their antiinflammatoryactivity. Phytother Res. 2001;15(6):532-534.

[31] Ahmad R, Raja V, Sharma M. Hepatoprotectiveactivity of ethyl acetate extractof Adhatoda vasicainSwiss albino rats. Int J Cur Res Rev. 2013;5(06).

[32] Narimaian M, Badalyan M, Panosyan V, Gabrielyan E,Panossian A, Wikman G *et al*.Randomized trial of afixed combination (KanJang) of herbal extractscontaining

Adhatodavasica, *Echinacea purpurea* and*Eleutherococcus senticosus* in patients with upperrespiratory tract infections. Phytomed 2005; 12(8):539-

[33] Grange JM, Snell NJC. Activity of bromhexine andambroxol, semi-synthetic derivatives of vasicine fromthe Indian shrub*Adhatoda vasica*, againstMycobacterium tuberculosis *invitro*. JEthnopharm1996; 50(1):49-53.

[34] Claeson, U.P.; Malmfors, T.; Wikman, G.; Bruhn, J.G. *Adhatodavasica*: a critical reviewof ethnopharmacological and toxicological data. *J. Ethnopharmacol.*, **2000**, *72*, 1-20

[35] Dangi A. Phytochemical screening andassessment of Adhatoda vasica (Leaf) forantiasthmatic activity. Panacea Journal of Pharmacyand Pharmaceutical Sciences ISSN: 2349-7025.2015;4(3):680-704.

[36] Singh P, Anand A, Kumar V. Recentdevelopments in biological activities of chalcones: Amini review.

European journal of medicinal chemistry.2014;85:758-777.

[37] Gandhi SJ, Ahire RD, Sanap MD, Chavhan AB,Chudhari JS, Ahirrao R. STANDARDIZATION OFAMLA AND VASAKA. Pharma Science Monitor.2015;6(2).

[38] Srinivasarao D, Jayarraj IA, Jayraaj R, PrabhaML. A study on antioxidant and anti-inflammatoryactivity of vasicine against lung damage in rats. IndianJ Allergy Asthma Immunol. 2006;20(1):1-7.

[39] Claeson UP, Malmfors T, Wikman G, Bruhn JG. Adhatoda vasica: a critical review of ethnopharmacological and toxicological data. J Ethnopharmacol. 2000;72(1-2):