

# Ethnomedicinal value and pharmacognosy of the member of Acanthaceae: *Adhatoda vasica* (Linn.)

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## ABSTRACT

Due to fewer side effects of herbal medicines, they have gained considerable importance in recent years. There is a booming business opportunity in herbal medicines market so it is important to tap the knowledge of our tribes in the area of herbal medicines. In the present paper, various medicinal properties such as antitussive, oxytotoxic, insecticide, wound healing, and antispasmodic of *Adhatoda vasica* discussed. Based on these uses, it is concluded that this plant has a great potential to be used as drug in isolation as well as in combination with other drugs.

**Key words:** *Adhatoda vasica*, ethnomedicinal, drug, herbal

## INTRODUCTION

Ethnobotany is the study of interaction of men and plants in natural environment. It shows the effect of vegetal environment on life, customs, beliefs, and history of the primitive societies. These people used the plants around them for therapeutic purposes also. The study of ethnobotany helps in socioeconomic development, resource management, and conservation of biodiversity of a region. On the other hand, pharmacognosy is a branch of medical science which deals with the history, commerce, collection, selection, identification, and preservation of crude drugs. Herbal medicines have gained considerable importance in recent years, as they are safe and have almost no side effects. The World Health Organization (WHO) stated that world trade in medicinal plants is a booming business and is likely to increase significantly in days to come.<sup>[1]</sup> Thereby, it is important to tap the knowledge of our tribes in the area of herbal medicines.<sup>[2]</sup>

*Adhatoda zeylanica* Medic. Syn *A. vasica* (Linn.) Nees and *Justicia adhatoda* (Linn.) are commonly known as Malabar nut (English); arusa, baansa, and adalsa (Hindi); bansa, basuti, bhekkar, and vasaka (Punjabi); basak (Bengali); aradusi and adusa (Gujarati); shwetavasa, vasa and vasaka (Sanskrit); bangra (Garhwal); adusoge (Kannada); pavate (Kurchigida); bahekar, baikar, basuth, and bhenkar (Kashmiri); arus and asing (Kumaon); adalodakam (Malayalam); bakaspati (Oran); arusa and basung (Oriya); adhatodai and pavettai (Tamil); and addasaramu (Telugu). It is well distributed throughout India up to height of 1300 m.

Vasaka belongs to Kingdom: Plantae, Division: Spermatophyte, Class: Dicotyledonae, Subclass: Gamopetalae, Series: Bicarpellatae, Order: Personales, and Family: Acanthaceae. *A. vasica* is an evergreen, perennial shrub of 1–3 m height, having opposite branches. Leaves are simple, petiolate, exstipulate, and lanceolate

to ovate having crenate margin, tapering base, and an acuminate apex. Flowers are white or creamish-white in color arranged in elongated spikes. They are small irregular zygomorphic, bisexual, and hypogynous.<sup>[3]</sup> All plant parts are extensively used for treating cold, cough, whooping cough, chronic bronchitis, and asthma. It is also used as a sedative, expectorant, and antispasmodic.<sup>[4]</sup>

## PHYTOCHEMICALS ISOLATED FROM *A. VASICA*

The chemical compounds found in plant *A. vasica* includes essential oils, fats, resins, sugar, gum, amino acids, proteins, and Vitamins "C".<sup>[5]</sup> The phytochemical analysis shows that phenols, tannins, alkaloids, anthraquinone, saponins, and flavonoids, and reducing sugars were found in the leaves of the plant.<sup>[6]</sup> The screening for mineral elements revealed the presence of macro and microelements. Potassium (K), Calcium (Ca), Iron (Fe), Copper (Cu), Zinc (Zn), Chromium (Cr), Vanadium (V), and Manganese (Mn) were detected in the leaf sample. *A. vasica* has shown highest (68070 ± 35.58 ppm) concentration of Ca.<sup>[7]</sup> Leaves contain pyrroloquinazoline alkaloids, chiefly vasicine (1,2,3,9-Tetrahydropyrrolo[2,1-b]quinazolin-3-ol, C<sub>11</sub>H<sub>12</sub>N<sub>2</sub>O),<sup>[8]</sup> and vasicinone (3-hydroxy-2,3-dihydropyrrolo[2,1-b]quinazolin-9(1H)-one, C<sub>11</sub>H<sub>10</sub>N<sub>2</sub>O<sub>2</sub>).<sup>[9]</sup> Addition of 2-aminobenzylamine to the vicinyl vicinal tricarbonyl reagent leads to the synthesis of vasicine.<sup>[10]</sup> Besides, vasicine and vasicinone the leaves also contain vasicoline, vasicolinone, vasicinol, adhatodine, adhatonine, and anisotine.<sup>[11]</sup> The novel quinazoline alkaloid characterized as 1, 2, 3, 9-tetrahydro-5-methoxypyrrol [2, 1-b]quinazolin-3-ol, and adhavasine has also been isolated from leaves.<sup>[12]</sup> The flowers constitute of triterpenes (α-amyrin), flavonoids (Apigenin, Astragalin, Kaempferol, Quercetin, and Vitexin), and alkanes.<sup>[9]</sup> A new moiety 2'-4-dihydroxy chalcone-

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4-glucoside has been identified in flowers.<sup>[13]</sup> The roots of vasaka contain sitosterol,  $\beta$ -glucoside-galactose, and deoxyvasicine.<sup>[14]</sup>

## ETHNOBOTANY AND PHARMACOGNOSY

All the parts of the plant have been used for therapeutic beneficiary effect from ancient times. It has been found useful in curing respiratory problems such as asthma, bronchitis, and tuberculosis. *A. vasica* is known to control internal and external bleeding in case of ulcer and bleeding gums. It also has antispasmodic, antibacterial, and anti-inflammatory activities. It is used as abortifacient and oxytoxic is known by many tribes.

### Antiasthmatic and Bronchodilator Activity

*Adhatoda vasica* has been used in traditional medicine to treat respiratory disorders. Vasaka has been used most frequently for the treatment of cough, asthma, and colds.<sup>[15]</sup> Ash of leaves, smoke from leaves, and wood are used for the treatment of asthma, cough, and colds.<sup>[16]</sup> Many tribes in India chew leaf buds alone or with ginger to clear respiratory passages. Bhils of South Rajasthan gargle with juice of plant to cure tonsillitis. A decoction of the leaves is effective as an expectorant. The whole plant is used as an ingredient of numerous popular formulations including cough syrup used in combination with ginger (*Zingiber officinale*) and tulsi (*Ocimum sanctum*).<sup>[17]</sup> Kanjang is a fixed combination of *A. vasica*, *Echinacea purpurea*, and *Eleutherococcus senticosus* which have antitussive effect.<sup>[18]</sup> In Sweden, extracts of *A. zeylanica* have been used against cough by early medical practitioners. Spirote is the preparation of Sweden which causes alleviation of the symptoms of cold and cough (mucolytic as well as dry).<sup>[19]</sup>

Both vasicine and vasicinone, the primary alkaloid constituents of vasaka are well established as therapeutical respiratory agents.<sup>[20]</sup> These alkaloids in combination (1:1) showed the bronchodilatory activity both *in vitro* and *in vivo*<sup>[17]</sup> and suppress coughing by their action on neuronal system in the medulla.<sup>[21]</sup>

### Wound-healing Activity

Tribals are known to apply a fine paste of the plant on the wound for healing purpose. The various preparations of leaves are used for curing bleeding and wounds in Southeast Asia.<sup>[22-24]</sup>

The alcoholic extract of the herb shows healing effects in buffalo calves. Vasica improved the braking strength, tensile strength, absorption, and extensibility in the wound repair tissue. The levels of elastin, collagen, hydroxyproline, hexamine, and zinc were also enhanced after the treatment.<sup>[25]</sup> The rate of healing of wounds was found higher in alcoholic plant extracts as compared to pancreatic tissue extracts.<sup>[26]</sup>

### Antimicrobial Activity

Alcoholic extracts of leaves and roots are found to have antibacterial activity against *Staphylococcus aureus* and *E. coli*.<sup>[27]</sup> The water extract was shown to be active against microbial flora causing gingivitis.<sup>[28]</sup> Ethanolic extracts of leaves exhibited antimicrobial activity against *Pseudomonas aeruginosa*, *Streptococcus faecalis*, *Staphylococcus epidermidis*, and *Bacillus subtilis*.<sup>[29]</sup>

Plant extracts showed minimal antifungal properties against *Microsporum gypseum*, *Chrysosporium tropicum*, and *Trichophyton terrestre*.<sup>[30]</sup> Adhatoda alkaloid vasicine

produces benzyl amine, ambroxol, and bromhexine which have inhibitory action on growth of *Mycobacterium tuberculosis*. This, combined with indirect effects including enhancement of lysozyme levels in bronchial secretions and levels of rifampicin in lung tissue and sputum, and possibly clearance of bacilli-laden mucus from cavities and bronchi, suggests a potentially useful adjunctive function for these agents in the therapy of tuberculosis.<sup>[31]</sup>

### As a Cure to Gastric Problems

Plant extracts are used to relieve acidity,<sup>[32]</sup> stomach catarrh with constipation, gout, urinary stone,<sup>[33]</sup> and liver disorders.<sup>[5]</sup> The paste of boiled leaves is used to cure dysentery by Meitei community of Manipur.<sup>[34]</sup> Leaf powder showed a considerable degree of antiulcer activity in experimental rats.<sup>[35]</sup> Syrup of *Adhatoda* showed improvement in symptoms of dyspepsia.<sup>[36]</sup>

Intravenous dose of 5 mg/kg of *A. vasica* was found to increase bile activity in animals and also bilirubin excretion.<sup>[37]</sup> The leaves showed significant hepatoprotective effect on liver damage induced by d-galactosamine in rats.<sup>[38]</sup> Decoction of the leaves stimulated digestion process by activating trypsin enzyme in *in vitro* studies.<sup>[39]</sup>

### Anticholinesterase Activity

Extract of roots causes contraction of intestine and depression of heart rate in guinea pigs. It produces transient hypotension in cats, thus showing good anticholinesterase activity.<sup>[40]</sup>

### Hypoglycemic Activity

The herbal healers of Kolli hills prepared a poly herbal drug formulation by mixing equal proportion of six plants, namely, *Adhatoda vasica* leaves, *Syzygium cumini* bark, *Terminalia arjuna* bark, leaves of *Andrographis paniculata*, flower of *Cassia auriculata*, and leaves of *Aegle marmelos* and used for the effective treatment of diabetes.<sup>[41]</sup>

The methanolic extract of the leaves of *Adhatoda vasica* showed the highest sucrose inhibitory activity with sucrose as a substrate. Further, the result suggested the antidiabetic effect of *A. vasica* is due to the presence of vasicine and vasicinol compounds in the leaves.<sup>[42]</sup> Suspension of non-nitrogenous principle of leaves of vasaka if taken orally at the dose of 25 mg/kg lowers the blood sugar level in rabbits for a short period.<sup>[43]</sup>

### 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>[44]</sup> The leaves were found to be toxic to "all forms of lower life" and have insecticidal effect.<sup>[45,46]</sup> Antifertility effect against several insect species by causing blockage of the oviduct has been shown due to alkaloid vasicinol. Adhatoda's effectiveness as an insect repellent has also been proven.<sup>[47]</sup>

### Antiallergic Activity

The extract containing the alkaloid vasicinol and 20% vasicine inhibited ovalbumin-induced allergic reactions by about 37% at a concentration of 5 mg (Paliwa *et al.*, 2000). Methanolic extract of the plant has been shown to possess antiallergic activity in guinea pigs at doses of 6 mg.<sup>[48]</sup> Vasicinone has been

shown to be a potent antiallergen in tests on mice, rats, and guinea pigs.<sup>[49]</sup>

### Antispasmodic Activity

A bitter taste alkaloid vasicine is used as an expectorant and antispasmodic agent.<sup>[45]</sup> The essential oil from the leaves showed smooth muscle relaxant activity in the isolated guinea-pig tracheal chain.<sup>[50]</sup>

### Antimalarial Activity

Vasicine, a pyrrolquinazoline alkaloid and embelin, and a benzoquinone obtained from *A. vasica* and *Embelia ribes*, respectively, exhibited antiplasmodial activity in schizont maturation inhibition assay and lactate dehydrogenase inhibition assay, which are based on morphological criteria and biochemical reaction, respectively.<sup>[51]</sup>

### Abortifacient and Oxytocic Activity

The Netarhat people in Bihar used a decoction of the leaves to stimulate and heal before and after delivery.<sup>[52]</sup> *A. vasica* has abortifacient properties rendering it useful for inducing abortion. It is used as an abortifacient in the Gora village of Lucknow, Uttar Pradesh.<sup>[53]</sup> Studies have indicated that vasicine is capable of initiating uterine activity which appears to be influenced by the presence or absence of contractions. Research conducted on human myometrial strips taken from both pregnant and non-pregnant for understanding the effects showed that it had results comparable with that of drug oxytocin.<sup>[17]</sup> The studies done on guinea pigs also showed abortifacient effects of *A. vasica*. These effects carried with the use of estrogen as a priming influence indicating that the action of vasicine was probably mediated through the release of prostaglandins.<sup>[53]</sup>

### Other Uses

The fluid extract and tincture were used in England as an antispasmodic, expectorant, and febrifuge. It was said to be beneficial in intermittent, typhus fever, and diphtheria.<sup>[54]</sup> Its local use gives relief in pyorrhoea and in bleeding gums. Decoction of leaves is used for fever (as an antipyretic).<sup>[52]</sup> Externally warmed leaves used for rheumatic pains and dislocation of joint.<sup>[55]</sup> Leaf powder boiled in sesame oil is used to stop bleeding, ear aches, and pus from ears.<sup>[56]</sup> The bruised fresh leaves are used for snake bites in India and Sri Lanka.<sup>[24]</sup> Moreover, the preparation of leaves in spirit is used for curing the wealthy persons suffering from certain humors in Myanmar.<sup>[57]</sup> The root decoction is also used for gonorrhoea.<sup>[58]</sup> The fresh flowers are used for ophthalmia. The flowers are also used as antiseptic to improve blood circulation.<sup>[23,45,57]</sup>

Ethanol extract of leaves causes a significant increase in alkaline phosphatase and decrease in acid phosphatase activity in serum of irradiated Swiss albino mouse.<sup>[59]</sup> Antioxidant effect against lipid peroxide and xanthine oxidase-induced oxidation is exerted by plant extracts.<sup>[60]</sup> Vasicine and vasicinone show a significant reduction in cardiac depressant effect.<sup>[17]</sup>

### CONCLUSION

Ethnomedicinal knowledge has been developed by the tribals through hit and trial methods, and it was transferred from one

generation to another orally. In depth knowledge about the role of plant species helps to extract the active ingredients to develop drugs. *Adhatoda vasica* has therapeutic uses as antitussive, oxytocic, insecticide, wound healing, antispasmodic, and gastric problems traditionally. The presence of several alkaloids such as vasicine and vasicinone, minerals, and Vitamin C shows its pharmacological uses. Thus, this plant has a great potential to be used as a drug in isolation as well as in combination with other drugs.

### REFERENCES

1. WHO. The Use of Traditional Medicine in Primary Health Care. A Manual for Health Workers in South-East Asia, SEARO Regional Health Papers, No. 19. New Delhi: WHO; 1990. p. 1-2.
2. Yadav S, Yadav VK. The science behind taboos: A case study of *Butea monosperma* in the Indian thar desert. Indian Forester 2016;143:1241-2.
3. Shinwari ZK, Shah M. The ethnobotany of Kharan district, Balochistan, Pakistan. Proc Sym Med Plant 1995;12:35-8.
4. Pandita K, Bhatia MS, Thappa RK, Agarwal SG, Dhar KL, Atal CK. Seasonal variation of alkaloids of *Adhatoda vasica* and detection of glycosides and N-oxides of vasicine and vasicinone. Planta Med 1983;48:81-2.
5. Bhat VS, Nasavatl DD, Mardikar BR. *Adhatoda vasica*-an Ayurvedic plant. Indian Drugs 1978;15:62-6.
6. Pathak RP. Therapeutic Guide to Ayurvedic Medicine. A Handbook on Ayurvedic Medicine. Vol. 1: Shri Ramdayal Joshi Memorial Ayurvedic Research Institute; 1970. p. 121.
7. Kumar M, Dandapat S, Kumar A, Sinha MP. Pharmacological screening of leaf extract of *Adhatoda vasica* for therapeutic efficacy. Glob J Pharmacol 2014;8:494-500.
8. Haq ME, Ikram M, Warsi SA. Chemical composition of *Adhatoda vasica* (L.) II. Pak J Sci Ind Res 1967;10:224-5.
9. Amin AH, Metha DR. A bronchodilator alkaloid (vasicinone) from *Adhatoda vasica* Nees. Nature 1959;184:1317.
10. Wasserman HH, Kuo GH. The chemistry and vicinal tricarbonyls: An efficient synthesis of racemic-vasicine. Tetrahedron Lett 1991;32:7131-2.
11. John S, Groeger D, Hesse M. New alkaloids from *Adhatoda Vasica*. Helv Chim Acta 1971;54:826-3.
12. Chowdhury BK, Bhattacharyya P. A further quinazoline alkaloid from *Adhatoda vasica*. Phytochemistry 1985;24:3080-2.
13. Bhartiya HP, Gupta PC. A chalcone glycoside from the flowers of *Adhatoda vasica* (2',4'-dihydroxychalcone 4-glucoside). Phytochemistry 1982;21:247.
14. Iyengar MA, Jambaiiah KM, Kamath MS, Rao GO. Studies on antiasthma Kada: A proprietary herbal combination. Indian Drugs 1994;31:183-6.
15. Maikhuri, R.K. And Gangwar, A.K. 1965. Ethnobiological notes on the Khasi and Garo tribes of Meghalaya, Northeast India. Economic Botany. 47:345.
16. Jain SP, Verma DM. Medicinal plants in the folklore of Northeast Haryana. Natl Acad Sci Lett (India) 1981;4:269-271.
17. Atal CK. Chemistry and Pharmacology of Vasicine-A New Oxytocic and Abortifacient. Canal Road, JammuTawi: Regional Research Laboratory; 1980. p. 37.
18. Narimanian M, Badajyan M, Panosyan V, Gabrielyan E, Panossian A, Wikman G, et al. Randomized trial of a fixed combination (Kan Jang) of herbal extracts containing *Adhatoda vasica*, *Echinacea purpurea* and *Eleutherococcus senticosus* in patients with upper respiratory tract infections. Phytomedicine 2005;12:539-47.
19. Farnlof A. Naturalakemedel and Naturmedel. Stockholm: Halsokas-Tradets Forlog; 1998. p. 109-32.
20. Dorsch W, Wagner H. New antiasthmatic drugs from traditional medicine. Int Arch Allergy Appl Immunol

- 1991;94:262-5.
21. Dhuley JN. Antitussive effect of *Adhatoda vasica* extract on mechanical or chemical stimulation-induced coughing in animals. *J Ethnopharmacol* 1999;67:361-5.
  22. Adnan M, Hussain J, Shah MT, Ullah F, Shinwari JK, Bahadar A, et al. Proximate and nutrient composition of medicinal plants of humid and sub-humid regions in northwest Pak J Med Plant Res 2010;4:339-45.
  23. Atta-Ur-Rahman, Said HM, Ahmad VU. Pakistan Encyclopaedia Planta Medica. Karachi: Hamdard Foundation Press; 1986. p. 181-7.
  24. Roberts E. Vegetable Materia Medica of India and Ceylon. Colombo: Plate Limited; 1931. p. 16-7.
  25. Bhargava MK, Singh H, Kumar A. Evaluation of *Adhatoda vasica* as a wound healing agent in buffaloes. Clinical, mechanical and biochemical studies. *Indian Vet J* 1988;65:33-8.
  26. Zama MM, Singh HP, Kumar A. Comparative studies on *Adhatoda vasica* and pancreatic tissue extract on wound healings in buffaloes. *Indian Vet J* 1991;68:864-6.
  27. George M, Venkatraman PR, Pandalai KM. Investigations on plant antibiotics, Part II, a search for antibiotic substances in some Indian Medicinal Plants. *J Sci Ind Res* 1947;6:42-6.
  28. Patel PK, Bhatt VH. *In vitro* study of antimicrobial activity of *Adhatoda vasica* (leaf extract) on gingival inflammation a preliminary report. *Ind J Med Sci* 1984;38:70-2.
  29. Karthikeyan A, Shanthi V, Nagasathya A. Preliminary phytochemical and antibacterial screening of crude extract of the leaf of *Adhatoda vasica* (L). *Int J Green Pharm* 2009;3:78-80.
  30. Quershii S, Rai MK, Agrawal SC. *In vitro* evaluation of inhibitor nature of extracts of 18-plant species of Chhindwara against 3-keratinophilic fungi. *Hindus Antibiot Bull* 1997;39:56-60.
  31. Grange JM, Snell JC. Activity of bromhexine and ambroxol, semi synthetic derivatives of vasicine from the Indian shrub *Adhatoda vasica*, against *Mycobacterium tuberculosis in vitro*. *J Ethnopharmacol* 1996;50:49-53.
  32. Jain SK. Medicinal plants lore of the tribals of Bastar. *Econ Bot* 1965;19:236-50.
  33. Madaus G. Textbook on the Biological Remedy. Leipzig: Band II George Thieme; 1938. p. 1681-4.
  34. Singh KJ, Huidroml D. Ethnobotanical uses of medicinal plant, *Justicia ada* Hatoda L. By meitei community of Manipur, India. *J Coast Life Med* 2013;1:322-5.
  35. Shrivastava N, Shrivastava A, Banarjee A, Nivsarkar M. Antiulcer activity of *Adhatoda vasica* Nees. *J Herb Pharmacother* 2006;2:43-9.
  36. Chaturvedi GN, Rai NP, Dhani R, Tiwari SK. Clinical trial of *Adhatoda vasica* syrup (vasa) in the patients of non-ulcer dyspepsia (Amlapitta). *Anc Sci Life* 1983;3:19.
  37. Rabinovich MI, Leskov AI, Gladkikh AS. Cholegogic Properties of Peganine: Vrachei; 1966. p. 181.
  38. Bhattacharyya D, Pandit S, Jana U, Sur TK. Hepatoprotective activity of *Adhatoda vasica* aqueous leaf extract on D-galactosamine induced liver damage in rats. *Fitoterapia* 2005;76:223-5.
  39. Vijaya S, Vasudevan TN. The effect of some medicinal plants activity of digestive enzyme. *Ind Drugs* 1994;31:215-7.
  40. Lahiri PK, Prahdan SN. Pharmacological investigation of Vasicinol-an alkaloid from *Adhatoda vasica* Nees. *Indian J Exp Biol* 1964;2:219-23.
  41. Elavarasi S, Saravanan K. Ethnobotanical study of plants used to treat diabetes by tribal people of Kolli Hills, Namakkal District, Tamil Nadu, and Southern India. *Int J Pharmt Res* 2012;4:404-11.
  42. Gao H, Huang Y, Gao B, Li P, Inagaki C, Kawabata J. Inhibitory effect on  $\alpha$ -glucosidase by *Adhatoda vasica* Nees. *Food Chem* 2008;108:965-72.
  43. Modak AT, Rao MR. Hypoglycemic activity of a non-nitrogenous principle from the leaves of *Adhatoda vasica* Nees. *Ind J Pharm* 1966;28:105-6.
  44. Srivastava AS, Saxena HP, Singh DR. *Adhatoda vasica*, a promising insecticide against pests of storage. *Lab Dev* 1965;3:138.
  45. Dymock W, Waeden CJ, Hooper D. Pharmacographia Indica, A History of the Principal Drugs of Vegetable Origin. London: Paul, Trech, Trubner and Co. Ltd; 1890. p. 50-4.
  46. Agarawal S, Chauhan S, Mathur R. Antifertility effects of Embelin in male rats. *Andrologia* 1986;18:125-31.
  47. Saxena BP, Tikku K, Atal CK. Insect antifertility and antifeedant alleochemicals in *Adhatoda vasica*. *Insect Sci Appl* 1986;7:489.
  48. Muller A, Antus S, Bittinger M, Kaas A, Kreher B, Neszmelyi A, et al. Chemistry and pharmacology of antiasthma *Galphimia glauca*, *Adhatoda vasica* and *Picrorhiza kurrooa*. *Planta Med* 1993;59:586-7.
  49. Wagner H. Search for new plant constituents with potential antiphlogistic and antiallergic activity. *Planta Med* 1989;55:235-41.
  50. Cruz D, Nimbkar AY, Kokate CK. Evaluation of essential oil from leaves of *Adhatoda vasica* as an airway smooth muscle relaxant. *Indian J Pharm Sci* 1979;41:247.
  51. Biradra YS. Evaluation of Antimalarial Activity of Selected Plants of Indian Systems of Medicine and Study the Synergistic Activity of the Compounds Present Therein. Vol. 05. Varanasi: B. V. Patel Pharmaceutical Education and Research Development Centre, Nirma University; 2010. p. 87.
  52. Jain SP, Singh SC, Puri HS. Medicinal plants of Neterhat, Bihar, India. *India J Ethnopharmacol* 1994;32:44-50.
  53. Nath D, Sethi N, Srivastava S, Jain AK, Srivastava R. Survey on indigenous medicinal plants used for abortion in some districts of Uttar Pradesh. *Fitoterapia* 1997;68:223-5.
  54. Wren RC. Potter's Cyclopaedia of Botanical Drugs and Preparations. 4<sup>th</sup> ed. London: Potter and Clarke; 1932. p. 217.
  55. Rao RR, Jamir NS. Ethnobotanical studies in Nagaland, 1. Medicinal plants. *Econ Bot* 1982;36:176-81.
  56. Reddy MB, Reddy KR, Reddy MN. A survey of plant crude drugs of Anantpur district Andhra Pradesh, India. *Ind Int J Crude Drug Res* 1989;27:145-55.
  57. Kirtikar KR, Basu BD. Indian Medicinal Plants. 2<sup>nd</sup> ed., Vol. 3. New Delhi: Bishen Singh Mahendra Pal Singh; 1975. p. 1899-902.
  58. Siddiqui MB, Hussain W. Traditional treatment of gonorrhoea through herbal drugs in the province of central Uttar Pradesh, India. *Fitoterapia* 1993;64:399-403.
  59. Kumar A, Ram J, Samarth RM, Kumar M. Modulatory influence of *Adhatoda vasica* Nees leaf extract against gamma irradiation in Swiss albino mice. *Phytomedicine* 2005;12:285-93.
  60. Jahangir T, Khan TH, Prasad L, Sultana S. Reversal of cadmium chloride-induced oxidative stress and genotoxicity by *Adhatoda vasica* extract in Swiss albino mice. *Biol Trace Elem Res* 2006;1-3:217-28.

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