WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.453
Volume 14, Issue 3, 273-289. Review Article ISSN 2277–7105

# A REVIEW OF PHYTOCONSTITUENTS & THERAPEUTIC USES OF *JUSTICIA ADHATODA* (L.): A PLANT OF DIVERSE MEDICINAL PROPERTIES USED IN UNANI SYSTEM OF MEDICINE

**Rehmat Jahan*, Shoeb Ahmed Ansari, Asma Sattar Khan, Khadija Abdul Hafiz and Usha Devi**

Drug Standardization Research Institute, PCIM&H Campus, Kamla Nehru Nagar, Ghaziabad, UP.

Article Received on
10 December 2024,

Revised on 30 Dec. 2024,
Accepted on 19 Jan. 2025

DOI: 10.20959/wjpr20253-35403

***Corresponding Author**
**Dr. Rehmat Jahan**
Drug Standardization Research Institute, PCIM&H Campus, Kamla Nehru Nagar, Ghaziabad, UP.

## ABSTRACT

*Justicia adhatoda* (L.), also known as Arusa is an important medicinal plant extensively used in Unani system of medicine for a wide range of ailments like influenza, tuberculosis, bronchitis, gastric ulcers etc. Although every part of the plant has some therapeutic values, its leaves contain wondrous medicinal properties. The leaves have several biologically active phytochemicals such as alkaloids, tannins, saponins, phenolics and flavonoids. The major chemical constituents of leaves are pyrroloquinazoline alkaloids-vasicine, vasicol, vasicinone, vasicinol, vasicinolone, adhatonine along with other minor constituents. The plant possesses diverse pharmacological activities. In Unani system of medicine, the plant is described to have anti-spasmodic (Dāfi‘-i-Tashannuj), germicidal (Dāfi‘-i-Jaraseem), expectorant of phlegm (Munaffith-i-Balgham) and antipyretic (Dāfi‘-i--Ḥummā) properties. The leaf juice is beneficial in the treatment of dysentery and diarrhoea. Various other activities like radio modulation, hypoglycaemic effect, cardiovascular protection, antitubercular, antiviral, hepatoprotective and antioxidant activities have also been reported. The present study is aimed to review the medicinal properties and therapeutic values of *Justicia adhatoda* L. reported in various research publications, books and classical Unani literature.

**KEYWORDS:** Vasicine, Vasicinol, Bronchodilator, Expectorant, Respiratory conditions.

## INTRODUCTION

*Justicia adhatoda* (L.), sometimes referred to as Malabar nut, Arusa, Adulsa, Vasa or Vasaka, is a plant of exceptional medicinal values whose leaves, blossoms, fruits and roots are widely used as sedative, expectorant and antispasmodic to treat asthma, chronic bronchitis, cold and whooping cough.[37] It is significantly efficacious in chronic bronchitis and asthma. This plant is a rich source of Vitamin C.[4] The juice of leaves is used in diarrhoea and dysentery and powdered leaves are used in malarial fever.[24]

*Justicia adhatoda* (Fig. I) is a small evergreen sub herbaceous plant which grows all over the plains of India and the lower Himalayan ranges. The plant has minutely pubescent entire leaves arising from swollen nodes, the flowers are white or purple in color.[24] The leaves are opposite, short petioled, broad, lanceolate, long tapering or pointed, smooth on both surfaces, and of a yellowish green or dark green colour. The taste is bitter and aromatic.[29]

## BOTANICAL DESCRIPTION (Morphology)

***Habit:*** A tiny evergreen perennial shrub upto 2.5 m tall.[1, 2,19,21,23]

***Stem:*** Long, erect, cylindrical, solid, swollen nodes, green to pale-green in color, having terete, glabrous, opposite ascending branches with yellowish bark.[1]

***Leaves:*** Ovate-lanceolate, elliptic, 10-18x3-7 cm, base cuneate, margin entire, apex acute, minutely pubescent, lateral nerves 8-12 pairs base narrowed into petiole.[2,19,20,21,23,26]

***Inflorescence:*** Dense, short pedunculate with axillary racemose.[26,27]

***Flower***: Flower white streaked and dotted with pink crowded in stalked axillary spikes, usually clustered in towards the end of the branches; peduncles 3-10 cm, stout, shorter than the leaves; bracts reaching 1-2 by 0.5-1.2 cm, elliptic subacute, glabrous or nearly so, 5-7 nerved, closely reticulately veined, white in dense bracteate peduncled spikes which is 6 inches long; bracteoles 1.5-2x0.3-0.4 mm, oblong-lanceolate, acute, with ciliolate margins, 1-nerved, reticulately veined; calyx rather less than 1.3cm, long, glabrous or slightly pubescent, divided to within 2 mm, of the base; sepals imbricate, oblong -lanceolate, acute, 3-nerved, reticulately veined; corolla white, with lower lip steaked purple and a few irregular pinkish colored bars in throat, 2.5-3 cm long, pubescent outside; tube 1-2 cm, long, the lower half cylinder, 4 mm diameter, the upper half much laterally inflated; upper lip 2 x 1.3 cm. long, ovate – oblong, curved, obtuse, notched; lower lip as long as the upper, the lobes 1.3cm,

deep, along rounded, the middle lobe the broadest; stamens glabrous; ovary and style-base minutely hairy filaments hairy at the base, long, stout, curved, lower anther-cells minutely apiculate at the base; ovary pubescent; lower part of style pubescent, capsule 1.5-2 by 0.6-0.8 cm. clavate, subacute, shortly and bluntly pointed, pubescent; solid stalk flattened, 1cm long.[1,19,23,26,27]

***Seeds***: 5-6mm long, orbicular-oblong, tubercular -verrucose, glabrous.[1,26]

**Fig. I: Justicia Adhatoda (L.) Plant.**

## TAXONOMIC CLASSIFICATION

The taxonomic classification for *Justicia adhatoda* is given in Table I:[4]

**Table I**

| Taxonomical Rank | Taxon |
|---|---|
| Kingdom | Plantae |
| Division | Angiosperms |
| Class | Eudicots |
| Order | Lamiales |
| Family | Acanthaceae |
| Genus | Justicia |
| Species | J. adhatoda |
| Common name | Adulsa, Vasaka |

## GEOGRAPHICAL DISTRIBUTION

*Justicia adhatoda* (L.) is an evergreen shrub that is native to the Indo-Malayan region.[4] In India, it is mainly grown in tropical and subtropical regions of Lower Himalayas.[15] The plant is largely found in a number of Indian states viz West Bengal, Punjab, Himachal Pradesh and

Utter Pradesh.[9,10,27,28] It is also widely distributed in Indonesia, China, Nepal, Pakistan, Sri Lanka, Burma, Malaysia and Malay Peninsula.[16,23]

## CHEMICAL CONSTITUENTS

The leaves of *Justicia adhatoda* (L.) contain several alkaloids (vasicine, vasicinone, vasicinol, adhatodine, adhatonine, adhavasinone, anisotine and peganine), betaine, steroids, carbohydrate and alkanes. Leaves are also rich in vitamin C and carotine.[30] The large amount of viscine is found in root bark.[15,20] Flowers contain tritriacontane, kaempferol, quercetin and β- sitosterol.[23] The leaves also contain phenol, terpenoids, quinazolone, sitosterol, tritriacontane, calcium, magnesium, potassium, sodium, ferrum, cadmium, copper, titanium etc.[6,23]

Flavonoids (astragalin, kaempferol, quercetin, vitexin) alkanes, steroids, vasicinine triterpenes are present in flowers. Glycosides and minor alkaloids include adhatonine, vasinol are also found.[1]

## PHARMACOLOGICAL ACTION

There are several pharmacological actions (Af'al) of Arusa described in classical Unani books/manuscripts. Some of them are given in Table II.

**Table II**

| Unani Activities | References |
|---|---|
| Dāfi'-i-Tashannuj (Antispasmodic) | 8,10,12,13,15,16,18,26,28,29,17 |
| Ḥābis-i-Dam (Haemostatic) | 10,23 |
| Dāfi'-i-Ḥummā (Anti- pyretic) | 6,10,11,12,13 |
| Dāfi'-i-Jaraseem (Germicidal) | 10,13,17 |
| Muṣaffī-i-Dam (Blood purifier) | 10,11,16,18 |
| Munaffith-i-Balgham (Expectorant of phlegm) | 3,8,10,11,12,17 |
| Jādhib (Absorbent) | 11 |
| Tiryāq (Antidote) | 11, 18 |
| Qātil-i-Dīdān-i-Am'ā'(Anthelmintic) | 7,10,11,24,16,26 |
| Dāfi'-i-Uṭāsh (Quench the thirst) | 7,11,16 |
| Mudirr-i-Ḥayḍ (Emmenagogue) | 7,10,12,14,26 |
| Mudirr-i-Bawl (Diuretic) | 11,15,16,18 |
| Dāfi'-i-Ṣafrā' (Removal of bile) | 3,7,9,12,14 |
| Mukhrij (Expectorant) | 3,13,15,18,20,24,26,28,29 |
| Muḥallil (Resolvent) | 15,24 |
| Waja' al-Mafāṣil (Arthritis) | 15,16,18 |
| Dāfi'-i-Ta'affun (Antiseptic) | 16,18,19,26 |
| Muḥarrik- (Stimulant) | 13 |
| Muqawwī-i-Raḥim (Uterine Tonic) | 26 |

| | |
|---|---|
| Dāfi‘-i-Sual (Anti-Tussive) | 1,18,29 |
| Musakkin (Sedative) | 26 |
| Musakhkhināt (Calorifacient) | 3,7,9,26 |

## PHARMACOLOGICAL STUDIES

***Anti-asthmatic and bronchodilator Activity*:** The alkaloid constituents of the plant mainly vasicine and vasicinone possess medicinal properties against respiratory disorder. The extracts of leaves and roots showed soothing effects against the throat. It also acts as an expectorant to cure bronchitis, bronchiole and lung problems. Arusa in combination with *Aloe indica* has been reported to be useful in patients with cough and cold.[4,18,24,35]

***Anti-allergic Activity*:** When tested on guinea pigs, the plant's methanolic extract showed anti-allergic and anti-asthmatic properties when inhaled or given at a dosage of 6 mg per animal or 2.5 gm/kg, respectively.[4] At a dosage of 5 mg, the extract containing the alkaloid vascinol and 20% vasicine reduced ovalbumin-induced allergy responses by roughly 37%.[1]

***Abortifacient and uterotonic Activity*:** Vasicine hydrochloride, an abortifacient, was tested in a pilot study on 25 mid-trimester pregnant patients. One intra amniotic injection of 10-80 mg of aqueous solution of vasicine hydrochloride was administered. Twelve instances received doses greater than 60 mg, and all of them failed. It was found that the amount of medication used had a direct correlation with the installation of the abortion time. The medication is safe and did not have any negative side effects.[32] The herb was found to induce uterine contractions, with effectiveness similar to the drug oxytocin.[1] *Justicia adhatoda* has been used to induce abortion and stimulate uterine contractions to aid childbirth due to its abortifacient and uterotonic properties. Studies have shown that the alkaloid vasicine has significant uterotonic activity in humans.[35]

***Anthelmintic Activity*:** The leaves (oil) as well as alkaloid vasicine and vascinone were served for anthelmintic activity.[18] The ovicidal and larvicidal effects of extracts against gastrointestinal nematodes of sheep were analyzed in vitro. The aqueous and ethanolic extracts, ranging from 25-50 mg/ml concentration, revealed strong ovicidal and larvicidal properties.[1]

***Anti-tubercular Activity*:** The in-vitro experiment conducted on Mycobacterium tuberculosis demonstrated that two derivatives of vasicine, bromohexine and ambroxol, were effective in inhibiting the growth of M. tuberculosis.[4,24] Vasicine is responsible for the production of

bromhexine and ambroxol, which are two commonly utilized mucolytics. These substances exhibit a growth inhibitory effect on Mycobacterium tuberculosis that is dependent on pH levels. Furthermore, *Justicia adhatoda* appears to exert indirect effects on tuberculosis by enhancing the levels of lysozyme and rifampicin in bronchial secretions, lung tissue, and sputum, indicating its potential significance as an adjunctive treatment in tuberculosis management.[1]

***Anti-inflammatory Activity***: The primary alkaloid found in the *J. adhatoda* plant, known as Vasicine, exhibits anti-inflammatory properties. A modified hen's egg chorioallantois membrane assay was performed to assess the anti-inflammatory effects of the methanolic extract, which includes both the non-alkaloid fraction, the saponins and the alkaloid components of the *Justicia adhatoda* plant. The findings indicated that the alkaloid content demonstrated significant activity at a dosage of 50 mg/kg, comparable to hydrocortisone, whereas the methanolic extracts displayed a reduced activity level of 100%.[4]

***Hepatoprotective Activity*:** The extract of ethyl acetate derived from *Justicia adhatoda* demonstrates hepatoprotective properties when evaluated for its efficacy against liver damage induced by CCL4 in Swiss albino rats at dosages ranging from 50 to 100 mg/kg.[4] Recent findings indicate that the ethyl acetate extract of *Justicia adhatoda* exhibits a significant hepatoprotective effect against liver damage induced by CCL4.[1]

***Radio modulatory Activity*:** The extract derived from the leaves of the plant exhibits radio modulation properties that counteract radiation-induced changes in hematological parameters, as observed in the peripheral blood of Swiss albino mice. The findings indicated a notable rise in serum alkaline phosphatase levels, while a reduction in acid phosphatase activity was recorded in the irradiated animals that had been pretreated with the leaf extract throughout the duration of the study.[4]

***Anti-microbial Activity:*** The oil extracted from the leaves, flowers, and roots demonstrated considerable efficacy against tubercle bacilli.[18] The chloroform fraction includes phytochemicals like vasicine, vasicinone, vasicine acetate, 2-acetyl benzyl amine, and vasicinolone, all of which demonstrate anti-inflammatory and antimicrobial effects.[33] The alcoholic extract of leaves and roots showed antibacterial activity against Staphylococcus aureus and Escherichia coli.[1]

***Anti-bacterial Activity:*** Through the use of a paper disc and dilution method, the alkaloid content of *Justicia adhatoda* plant leaf extract was extracted and demonstrated strong anti-bacterial activity against Pseudomonas aeruginosa in in-vitro studies. The plant's antibacterial activity against gram-positive strains of Streptococcus faecalis, Staphylococcus aureus, Staph epidermidis, and gram-negative strains of E. coli was also demonstrated by a number of published studies.[4,24]

***Cholagogue activity*:** *Justicia adhatoda* has been found to have cholagogue activity, increasing bile production in laboratory experiments. When given to animals, it increased bile excretion by 40-100% and also increased bilirubin excretion, indicating its potential to stimulate liver function.[35]

***Immunomodulatory Activity:*** Diethyl ether, chloroform, and methanolic extracts obtained from *Justicia adhatoda* leaves have all been shown in numerous experimental investigations to possess the immunomodulatory property. In order to determine the immunomodulatory activity, male Wistar rats were given an oral dosage of 400 mg/kg, which increased the percentage of neutrophil adhesion to nylon fibers and increased host immunity.[4]

***Antiulcer Activity:*** Srivastava's study investigated that the anti-ulcer properties of *Justicia adhatoda* leaves using two models. The results showed that the leaf powder had significant anti-ulcer activity in rats, with the highest effect (80%) seen in the ethanol-induced ulcer model. The study suggests that *Justicia adhatoda* has potential as a therapeutic agent for treating ulcers.[34]

***Wound healing Activity*:** From various reported studies it was found that the alcoholic and chloroform extracts isolated from leaves of *Justicia adhatoda* plant showed healing effect and act as an ointment.[4] Studies on its role in wound repair found that it improved tissue strength, absorption, and elasticity. Additionally, treated animals showed increased levels of key proteins and nutrients, including elastin, collagen, and zinc, which are essential for wound healing.[35]

***Hypoglycemic/ Anti-diabetic Activity:*** Bromhexine, which affects mucus glycoproteins, was tested on diabetic patients and found to help regulate glucose levels in their urine, but had no effect on non-diabetic patients. This may be due to its impact on glycoprotein levels or how the body breaks down these materials. Moreover, vasicine has shown to play a role in sucrose

metabolism.[1] Flavonoids possess notable antidiabetic properties and are significant phytoconstituents found in the flowers of *J. adhatoda*. Their antidiabetic effects are mediated through several mechanisms, including the inhibition of apoptosis and the promotion of pancreatic β-cell regeneration, the reduction of insulin resistance and oxidative stress, the enhancement of insulin secretion, the suppression of β-amylase and α-glucosidase activity, the inhibition of aldose reductase, the improvement of glucose uptake and utilization by peripheral tissues, and the stimulation of hepatic glucokinase activity.[31]

***Anticholinesterase Activity*:** Studies found that vasicine, a compound extracted from the roots, has anti-cholinesterase activity.[4]

***Insecticidal Activity*:** *Justicia adhatoda* has been used in India for centuries as an insecticide. Its leaves have shown to control insect pests in oil seeds, and its alkaloid vasicinol has been found to have antifertility effects on insects. It has also been proven to be an effective insect repellent.[1] *Justicia adhatoda* leaves have been found to control insect pests in both laboratory and warehouse settings. The plant has also been shown to have antifertility effects on insects, possibly by blocking their reproductive tract, and has been proven to be an effective insect repellent.[35]

***Antioxidant and anti-clastogenic activity:*** Its antimutagenic efficacy is supported by the antioxidant and anti-clastogenic efficacy against cadmium chloride-induced renal oxidative stress and genotoxicity in Swiss albino mice.[36]

***Thrombolytic and cardioprotective activity:*** A naturally occurring substance exhibiting thrombolytic activity may also possess cardioprotective characteristics. The alkaloids and terpenoids derived from the plant are recognized for their thrombolytic effects and plant is also rich in alkaloids, flavonoids, sterols, and glycosides. It possesses a diverse array of therapeutic properties, with cardio protection being the most significant.[40]

## THERAPEUTIC USES

In Unani system of medicine, Arusa has been utilized for a number of therapeutic benefits. Its numerous therapeutic uses (Table III) can be accounted it as a highly valuable plant.

**Table III**

| Therapeutic Uses in Unani System of Medicine | References |
|---|---|
| Ḍīq-al-Nafas/Rabw (Asthma/bronchial asthma) | 3,7,8,9,10,11,12,13,14,15,16,18,19,21,23,24,26,29 |
| Surfa Rutubiyya (Productive Cough) | 3,6,7,8,9,10,11,13,14,15,16,23,24,26 |
| Sill (Phthisis/ Tuberculosis) | 3,7,8,9,10,11,12,13,14,15,18,23,26,28 |
| Hurqa al-Bawl (Burning Micturition) | 3,7,9,11,14,18 |
| Judhām (Leprosy) | 7,10 ,11,14,16,18 |
| Jarab-wa-Ḥikka' (Scabies and Pruritus) | 10,11,18,26 |
| Surkh-bada (Cellulitis) | 11 |
| Jarayān al-Dam (Hemorrhage) | 7 |
| Yarqān (Jaundice) | 7,9,11,14,16,18 |
| Sozāk (Gonorrhoea) | 7,9,11,16,29 |
| Bawāsīr Dāmiya (Bleeding haemorrhoid) | 7 ,11,23 |
| Sayalān al-Raḥim (Leucorrhoea) | 7,16 |
| Sarsām (Meningitis) | 7 |
| Shahīqa (Whooping Cough) | 10,13,26 |
| Zukām Balghamī (Phlegmatic coryza) | 3,10,11,12,13 |
| Qay'-wa- Ghathayān (Vomiting and Nausea) | 7,9,11,14,16 |
| Ḥummā Balghamiyya wa Ḥummā al-Ghibb (Phlegmatic and Bilious Fever) | 11,16 |
| Nafth al-Dam (Haemoptysis) | 7,17 |
| Nāṣūr (Fistula) | 7,11 |
| Ramad (Conjunctivitis) | 7,15 ,16,21,26 |
| Waja' al-Asnān (Toothache) | 7 |
| Ittisa' al-Shu'ab (Bronchiectasis) | 8 |
| Ātshak (Syphilis) | 7 ,14 |
| Nakseer, Ru'āf (Epistaxis) | 7,10,11,13,18, |
| Ishāl (Diarrhea) | 7 ,16,25,26,30 |
| Zaḥīr (Dysentery) | 25,26,30 |
| Dhāt al-Janb (pleuritis) | 7,8 |
| Ṣudad (Obstruction) | 11 |
| Ḥaṣā al-Mathāna (Bladder Stones) | 11 |
| Iltihab al-Shu'ab Hadd-wa-Muzmin (Acute and Chronic Bronchitis) | 3,15 ,16,23,24,26,30 |
| Waja'al-Mafāṣil (Arthritis/Arthralgia) | 15,16,24 |
| Waja'al-A'ṣāb (Neuralgia) | 15,24,26 |
| Baraṣ (Vitiligo) | 16,18 |
| Sal'a Ghuddiyya (Glandular Tumors) | 16,18,26,30 |
| Amrāḍ-i-Jild (Skin disease) | 5,18,26,30 |
| Poulticing wounds and boils and fish poison | 5,24,26 |
| Musqit-i-Janin (Abortifacient) | 18,25,26 |
| Qillat-i- Safihāt (Thrombocytopenia) | 23 |
| Nazeef-ma-baad-al Wiladat (Post Partum Haemorrhage) | 25,26,30 |
| Sharā (Urticaria) | 26 |
| Sumūm Qātil al-Hasharāt (Insecticide) | 28 |
| Ḥummā Dā'ira (Intermittent Fevers) | 29 |
| Surfa Nazlī (Catarrhal cough) | 17 |

## TRADITIONAL USES

***Flower:*** Flowers of Arusa are beneficial in the treatment of tuberculosis (Ḍīq) and rush (Hiddāt) of blood. They provide relief in burning (Ḥurqa) sensation, urine frequency and redness of urine (Ḥumra al-Bawl). Massaging with mixture of flower and oil removes firmness of feet.[7]

***Root:*** The paste obtained by grinding of root bark with cow's ghee is beneficial in syphilis (Ātshak). Root bark is useful in renal calculus (Ḥaṣā al-Kulya).[11] It is also beneficial in cough (Su'āl / Surfa), asthma (Ḍīq-al-Nafas), bilious tuberculosis (Ṣafrāwī-diq) and phlagmous tuberculosis (Balghami-diq), haemorrhage (Jarayān-al-Dam), jaundice (Yarqān), nausea & vomiting (Qay'-wa-Ghathayān) and leprosy (Judhām).[7,9,10]

***Leaves:*** are used for healthy menstrual bleeding (Mudirr-i-Ḥayḍ), toothache (Waja' al-Asnān), ascites ( Istisqā' Ziqqī), bronchial asthma (Rabw), phthisis (Sill), cough (Su'āl / Surfa), vermicidal (Qatl-i-Dīdān), bloody diarrhea (Ishāl al-Dam), whooping cough (Shahīqa), meningitis (Sarsām), intestinal worms (Dīdān al-Am'ā'), nausea (Ghathayān), vomiting (Qay'), jaundice(Yarqān), scabies and pruritus (Jarab-wa-hikka), leprosy (Judhām), gonorrhoea (Sozāk), urethritis (Warm-al-Ālāt-e-Bawl) and for healthy teeth.[7,9,10,11] The combination of Dar-e-filfil and Arusa leaves help in removing phlegm & beneficial in Fistula (Nasur).[7]

***Shoots:*** Grinding its shoots and consuming it orally is beneficial for leucorrhoea (Sayalān al-Raḥim) and gonorrhoea (Sozāk).[11]

***Seeds:*** Seeds are beneficial in cough (Su'āl / Surfa), asthma (Rabw), bilious and phlegmatic fever (Ḥummā Balghamiyya wa Ḥummā al-Ghibb), vomiting (Qay'), jaundice (Yarqān).[10.11]

***Fruit:*** The fruit alleviates cough (Su'āl) and is useful in conditions such as epistaxis (Ru'āf), bronchiectasis (Ittisa' al-Shu'ab), flatulence (Nafkh-i-Mi'da).[8, 9]

***Whole plant:*** The plant is used as an absorbent and antidote. It is also used for blood purification (Muṣaffī-i-Dam) and treatment of cellulitis (Surkhbadah), scabies (Jarab), haemorrhoid (Bawāsīr), burning micturition (Hurqa al-Bawl).[11] It also shows good results in the treatment of Jaundice (Yarqan) when used with potassium nitrate (Shura-e-Qalmi).[7]

## ETHNOBOTANICAL USES

*Justicia adhatoda* (L.) has been used to treat in various of respiratory tract and chest Infections. It is also used to treat sexual problems, impotence, and bleeding piles. Indian traditional systems of medicine have employed various components of the plant to cure a variety of conditions, including rheumatism, tuberculosis,[1,16] edema, asthma, colds, coughs,[15] lumbar discomfort, sprains and sexual illnesses.[1]

**i) *Roots:*** Decoction of the root has been utilized for the treatment of gonorrhea and serves as an expectorant, anti-spasmodic, and anthelmintic agent. It is applied to the abdomen and vagina shortly before childbirth to aid in facilitating a smoother delivery.[1,16] The powdered form of the root is employed in the management of malarial fever.[16]

***ii) Leaves*:** Various preparations derived from leaves have been used for the treatment of conditions such as haemorrhage, skin disorders, wounds, headaches and leprosy.[4,1] The fresh juice extracted from leaves, combined with honey and ginger juice, is effective in alleviating all forms of acute cough, chronic bronchitis, breathlessness and asthma.[1,15] Crushed fresh leaves have also been employed in the treatment of snake bites.[4] The leaf powder boiled in sesame oil is known to halt ear pus and alleviate earaches.[22] Externally warmed leaves are applied to relieve rheumatic pain,[15] joint dislocations, stomach catarrh accompanied by constipation, gout and fever.[1,22]

***iii) Flowers:*** The flowers are recognized for their expectorant and anti-asthmatic properties, as well as their antiseptic qualities. They are beneficial in treating bronchitis, cough, antispasmodic conditions, high fever and gonorrhea. The flowers enhance blood circulation and alleviate excessive heat in the blood and they are also used in the treatment of ophthalmia.[1,15]

### *Systemic uses*

***External uses:*** The paste has anti-Inflammatory, antibacterial, and analgesic (pain-relieving) properties, making it effective for treating skin diseases. Applying the paste locally can be useful for managing conditions such as arthritis, inflammatory ulcers, nerve disorders and various skin diseases. For disorders like amnesia and convulsions, an oil massage is recommended on the affected areas.[1]

***Internal* uses**

***Nervous system*:** *Justicia adhatoda* (L.) usage leads to widening of vessels and activation of vagus nerve (Cranial Nerve X). This leads to a decrease in heart rate (bradycardia) and consequently a decrease in blood pressure.[1] The depression of vagal terminations further relieves irritation and spasm of bronchioles.[15]

***Digestive system*:** Due to its astringent properties, it is beneficial for treating diarrhea and dysentery, particularly in cases of bleeding disorders.[1]

***Circulatory system*:** The flowers improve the circulation of blood.[16] It is highly beneficial for conditions related to bleeding disorders. It possesses haemostatic properties and acts as a blood purifier.[1]

***Respiratory system:*** The primary function of Arusa is attributed to its influence on blood circulation and its interaction with the vagus nerve, particularly affecting the lungs. It facilitates the liquefaction of organ (aazaa), which can then be expectorated. This process results in bronchodilation, thereby easing the act of breathing. The effects of *Justicia adhatoda* are prolonged, making it beneficial for conditions such as asthma, breathlessness, and throat infections. Its leaves combined with dhatura leaves are smoked, they provide relief from breathlessness.[1]

***Urinary system*:** The flowers are utilized in the treatment of dysuria, painful urination, and lessen strangury Conditions.[1,16]

***Skin:*** It possesses diaphoretic properties, making it beneficial for treating skin infections, particularly those characterized by discharge and bleeding.[1]

**VERNACULAR NAME**

**Table IV**

| Language | Vernacular Name | References |
|---|---|---|
| Urdu | Bansa, Arusa | 24 |
| Sanskrit | Vasa, Vasaka, Acchadayati, Simhasya, Atarusha, Vrisha, Bhishagmata, Sinhaparni, Vansa, Amalaka, Bashika, Kanthiravi, Nasa, Pancha mukhi, Kasnotpatana, Rakrappittaghni | 15,21,23,24,25 26,29,30 |
| English | Malabar Nut, Vasaka | 15,23 |
| Hindi | Adosa, Arusha, Bansa, Rus, Adusa, Adalsa, | 3,4,15,21,23,24,25,26,29,30 |

| | | |
|---|---|---|
| | Adulaso, Adarsa, Adalsa | |
| Tamil | Eadadad, Adathodai, Adadoda,Vachai, Abadodai | 3,23,24,25,26 |
| Bengali | Adulsa, Bakash, Vasaka, Arusha | 3,15,16,24,25,28,29,30 |
| Canarese | Pavettai, Daccan Aratora | 16 |
| French | Carmantine, Noyer de Ceylan, Noyer de Indes | 16 |
| Konkani | Adolso, Kumaon, Bashangarus, Basinga | 16 |
| Marathi | Adulsa, Adusa, Adulsi, Baksa, Vasuka | 3,24,25,30 |
| Mundari | Arandiba, Hereba, Lupuba | 16 |
| Naga | Teeshae | 16 |
| Nepali | Alesi, Asuru, Kath | 16 |
| Oudh | Rus | 16 |
| Persian | Bansa | 15,24 |
| Tulu | Edumuttanditappu, Uriya Basongo, Rottoomuli | 16 |
| Telugu | Addasaramu, Adam kabu, Adampaka | 3,4,15,23,24,25,30 |
| Punjabi | Vamsa, Bhekkar | 24 |
| Gujrati | Adusol, Araduso, Aduraspee, Bansa, Asoge, Alduso | 3,15,16,24,25,29,30 |
| Kannada | Adusogae, Adu, Muttada, Soppu | 4,23,25,30 |
| Malayalam | Adolokam, Ataloetakam | 3,4,15,23,25,30 |
| Farsi | Khwaja | 7 |
| Arabic | Hashish-tus-sual, Adusha | 3,4,7 |
| Kumaon | Bashangarus, Basinga | 24 |

## CHARACTERISTICS OF PLANT IN UNANI CLASSICAL LITERATURE

Various Unani classical books/ manuscripts have described a number of assorted properties of Arusa. Some of them such as temperament, adverse effects, substitute, dosage etc. are given in Table V.

**Table V**

| | | |
|---|---|---|
| **Mizāj** (Temperament) | Leaves -Hot $1^0$ Dry$1^0$ | 7,8,9,10,11,12,14,15 |
| | Roots - Hot $1^0$ Dry$1^0$ | 7,8,9,10,11,12,14,15 |
| | Flower- Cold Dry | 3,14 |
| **Muḍirr Atharāt** (Adverse Effect) | Mubarriden (for Barid Mizaj) | 10 |
| | Muzir-e-Bah | 9,12 |
| **Badal-i-Adwiya** (Drug Substitute) | Flower of Bela | 9,12 |
| **Muṣliḥ** (Corrective) | Mirch Siyah-wa-Shehed | 9,10,12 |
| **Miqdār-i-Khuraq** (Dosage) | Leaves: 4g-10g | 3 |
| | Leaves Powder: 3g | 38 |
| | Root: 2-3 g | 3 |
| | Flower: 1-2g | 3 |
| | Joshanda and Khisanda:5g-12g | 10,17 |

| | | |
|---|---|---|
| | Joshanda and Khisanda: 1g-6g | 9 |
| **Murakkabāt** (Formulations) | Sharbat-e- Eijaz | 8,38,39 |
| | Syrup Vasaka | 3,8,10,12 |
| | Sharbat-e-Sadar | 39 |
| **Hiss-e-Mustamilah** (Part Used) | Leaves, Roots, Flowers, Bark, Leaves oil | 5,12,15,23 |
| **Season** (Flower and Fruit) | December – April | 6,19,21,27,28 |

## DISCUSSION

Although *Justicia adhatoda* or Arusa has versatile medicinal properties, it has been extensively used in traditional medicines for the treatment of a broad range of inflammatory and respiratory ailments. Even in modern clinical practices, it is recommended for strong bronchodilatory and antitussive effects. Its active ingredients and their derivatives such as Bromhexine and Ambroxol are effective against various respiratory problems like asthma, COPD and tuberculosis. Several studies have shown that its chief alkaloid vasicine has exhibited broad-spectrum antibacterial activity. Vasicine inhibits bacterial growth by interacting with bacterial cell membranes. It reduces biofilm formation that is essential for bacterial growth and survival. Due to its tremendous medicinal properties and easy availability, Arusa is a highly valuable plant in traditional systems of medicine.

## CONCLUSION

Arusa is a prominent herb recognized in traditional medical systems for its positive impacts, especially in the treatment of respiratory diseases. It is also known for its richness in Vitamin C. The leaves and roots contain vasicine, vasicinone, vasicol and various other alkaloids which provide bronchodilation through anticholinergic action on vagal innervation. A wide range of pharmacological properties are associated with its activities, including anti-microbial, antioxidant, anti-inflammatory, anti-diabetic, anti-tubercular, antipyretic, hepatoprotective, insecticidal and anti-cancerous. Only few investigations have been done on toxicological aspects of *J. adhatoda* L. There is negligible data available for acute adverse or serious side effects of the plant. Though the plant has incredible medicinal values, there is still a lot of scope for research on toxicological studies.

## ACKNOWLEDGEMENT

The authors are extremely grateful to the Director-General, CCRUM, New Delhi for his constant encouragement and providing necessary research facilities.

## REFERENCES


1. Makadi A., Kulkarni D.V. "Review on Potential Natural Medicinal Herb" World Journal of Pharmaceutical Research, 2021; 10(9): 406-426.
2. T. Pullaiah & D. Ali Moulali Flora of Andhra Pradesh, 2nd ed. Scientific Publishers (India), New Delhi.1997:715.
3. Anonymous, "Standardization of Single Drugs of Unani Medicine" CCRUM, Department of Ayush, Ministry of Health and Family Welfare, Govt. of India, New Delhi, 2006; Vol. IV: 16,22.
4. Choudhary S., Kaurav H., Chaudhary G., Shuddhi Ayurveda: "A Review Based upon its Medicinal Properties" International Journal Research in Ayurveda and Pharmacy, 2021; 12(3): 1-9.
5. Chopra R.N., Nayar S. L., Chopra I. C., "Glossary of Indian Medicinal Plant" Council of Science and Industrial Research, New Delhi, 1956; 45.
6. Maheshwari J.K., "The Flora of Delhi" Council of Scientific and Industrial Research, New Delhi, 1990; 271.
7. Hakeem Najmul Ghani, "Khazainul-ul-Advia" Idara Kitab-ul-shifa, New Delhi, YNM: 224.
8. Hakeem Syed Safiuddin Ali, "Unani Advia Mufradah" Qaumi Council Braye Farogh Urdu Zuban, New Delhi, 2004; 26.
9. Hakeem Mohd Abdul hakeem, "Bistanul- Mufradat" Idara Kitab-ul-shifa, New Delhi, 2002; 62.
10. Hakeem Kabiruddin, "Mukhzanul Mufradat" Aijaz Publishing House, New Delhi, YNM, 116-117.
11. Hakeem Mohammad Azam Khan, "Muheet-e-Azam" CCRUM, Ministry of Health and Family Welfare, Govt. of India, 2012; Vol-I: 284-286.
12. Anonymous, "Tibbi Pharmacopoeia" Board of Unani and Ayurvedic System of Medicine, Nisar Art Press Lahore, 1965; 77.
13. Anonymous, "Mukhzanul-Advia Doctary" Tibbi Kutub Khana, Lahore, 1933; 1361.
14. Munshi Ghulam Nabi, "Mukhzanul Mufradat-wa-Murakkabat Khwasul Advia" CCRUM, Ministry of Health and Family Welfare, New Delhi, 2007; 38.
15. Nadkarni A K "Indian Materia Medica" Popular Prakashan Pvt. Ltd, Mumbai-400034, 1998; Vol-1: 40-43.
16. Kiritikar K. R., Basu B. D., "Indian Medicinal Plant" 2nd ed. Oriental Enterprises, Dehradun, India, 2001; Vol-8: 2615-2618.

17. Hakeem Mohammad Kabiruddin, "Ilmul Advia Nafeesi" Aijaz Publishing House, New Delhi, 2007; 243-244.
18. Anonymous "Indian Medicinal Plants" ICMR, New Delhi, 2004; Vol-1: 257-276.
19. Kanjilal P.C., "A Forest Flora Pilibhit, Oudh, Gorakhpur and Bundelkhand" Narendra Publishing House, Delhi, 1982; 6: 281-282.
20. Greenish H. G., "Materia Medica" Scientific Publishers, 5A, New Delhi Road, Jodhpur, 1999; 3rd ed: 60.
21. Basant Lal Gupta "Forest Flora of Chakrata, Dehradun and Saharanpur" Forest divisions, United Provinces, 1928; 3rd ed.: 367-368.
22. Anonymous, "Major Herbs of Ayurveda" British Library Cataloguing in Publication Data, 2002; 20-23.
23. Prajapati N. D., Purohit S. S., Sharma A. K., Kumar T., "A Handbook of Medicinal Plants" Jodhpur, 2003; 17.
24. Chopra R.N, Chopra I.C, Handa K.L, Kapur L.D "Chopra's Indigenous Drugs of India" Calcutta-12, 1958; 264-266.
25. Anonymous "The Useful Plants of India" National Institute of Science Communication, New Delhi-110012, 2000; 14.
26. Anonymous "The Treatise on Indian Medicinal Plants" National Institute of Science Communication, New Delhi, 1997; Vol-V: 48-53.
27. Collett H. S. C., "Handbook of the Flowering Plants of Simla and the Neighbourhood" International Book distributors, Dehradun, 1984; 376-377.
28. Haines H. H., "The botany of Bihar and Orissa" Bishen Singh Mahendra Pal Singh, Dehradun, 1988; Vol-III-IV: 694-695.
29. Khory R.N "Bombay Matria Medica and their Therapeutics" Periodical Expert Book Agency, D-42, Vivek Vihar, Delhi, 1986; 423-424.
30. Anonymous, "The Useful Plants of India" Publication & Information Directorate Council of Scientific& Industrial Research, New Delhi, 1986; 14.
31. Jayaweera U., Shivashekaregowda N.K.H, Herapathdeniya S.K.M.K, Pranagama P.A. "Ethnopharmacological uses, Phytochemistry, Pharmacological Activities and Toxicity of *Justicia adhatoda* L.": Discover Plants, 2024; 1(41): 1-40.
32. Chandokhe N., "Vasicine-the Alkaloid of *Adhatoda Vasica* a Novel Abortifacient". Indian Drugs, IJP, 2014; 1(3): 425-429.
33. Singh B., Sharma R. A., "Anti-inflammatory and Antimicrobial properties of Pyrroloquinazoline Alkaloids from *Adhatoda vasica* Nees" Phytomedicine, 2013; 20(5):

441-445.

34. Shrivastava N, Shrivastava A, Banerjee A, Nivsakar M, "Anti-ulcer Activity of *Adhatoda vasica* Nees" Journal of Herbal Pharmacotherapy, 2006; 6(2): 43-49.
35. Mastan A., "Incredible Health Benefits of Adusa" IJUIM, Department of Unani, All India Institute of Medical Sciences, Chhattisgarh, India, 2020; 4(3): 27-30.
36. Singh R., Tiwari A., "*Adhatoda vasica*: A Miracle and Boon for Asthmatic people - A Review" Research Journal of Pharmacognosy and Phytochemistry, 2016; 8(4): 1-2.
37. Kumar N "Pharmaceutical Attributes of Vasa (*Adhatoda Vasica* L.)" World Journal of Pharmaceutical Research, Amity University, Haryana, 2016; 5(4): 437-455.
38. Anonymous, The Unani Pharmacopoeia of India, Govt. of India, Ministry of Health and Family Welfare, Department of AYUSH, New Delhi, 2009; Vol-VI, Part-I: 13,14.
39. Anonymous, National Formulary of Unani Medicine, New Delhi, Central Council for Research in Unani Medicine, Department of AYUSH, Ministry of Health and Family welfare, Govt. of India, 2006; Part-1: 223-224.
40. Shoaib A., "An Ethnobotanical Review of *Adhatoda vasica*" Cellular and Molecular Biology, 2021; 67(4): 248-263.