A REVIEW ON ADHATODA VASICA

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ABSTRACT
Herbal remedies and natural products are being used for an ancient time to cure the diseases. Unlike the existing allopathic system, the herbal remedies have hundreds and thousands of constituents that all work together against the diseases. Vasaka is a well-known herb in indigenous systems of medicine for its beneficial effects, particularly in bronchitis. The plant has been found to be diverse number of pharmacological effect, like it is used for treating cold, cough, chronic bronchitis and asthma. The decoction of its root and bark in doses of 30 grams twice or thrice a day for 3 days can be given for this purpose. The present paper gives an account of updated information on its pharmacological and phytochemical activities. Although the medicinal values of this plant is due to the presence of small doses of active compounds which produce physiological actions in the human and animal body. Some important bioactive compounds have been reported in various part of Adhatoda vasica are essential oil and quinazoline alkaloids. Hence, extract of Adhatoda vasica could form one of the best options for developing novel natural medicine.

Keywords: Adhatoda vasica, phytochemical activities, vasaka, quinazoline alkaloids.

INTRODUCTION
Plants have played a critical role in maintaining human health and civilizing the quality of human life for thousands of years. The use of plants as medicines is as old as human civilization itself and out of about 258,650 species of higher plants reported from the world; more than 10% are used to cure ailing communities. Many of the existing medicinal system such as Ayurveda, Unani, Homeopathy, Naturopathy, Sidha and other alternative medicinal system have been utilizing plants as effective medicines to cure many harmful diseases. Acharya Charaka says that an ideal drug should be available throughout the year, that is, Bahuta, and it should be capable of converting into different dosages forms, that is, Anekavidha Kalpana without altering its pharmacological actions. Vasa is a drug that draws attention because of its use in different Kalpanas and almost every Kalpana of this drug is available in a classic recapitulation of ancient
literature that draws attention with regard to the utility of Vasa in a different formulation. The same is summed up in the form of Bhisakamata as a synonym of Vasa.\textsuperscript{[3]} The plant has been used in the indigenous system of medicine in India for over 2000 years. Vasaka, also called Malabar nut tree, is well known throughout India.\textsuperscript{[4]} It is commonly known as Basak (Bengali); Adadusi, adusa (Gujrathi) ; Arusa, baansa, adulsa (Hindi) ; Bansa, basuti, bhekkar (Panjabi), and shwetavasa, vasa, vasaka (Sanskrit) and Malabar nut (English) in different languages and regions of India.\textsuperscript{[5]}

The plant has been used in the indigenous system of medicine in India for over 2000 years. Adhatoda leaves have been used extensively in Ayurvedic Medicine primarily for respiratory disorders including cough, cold, asthma, bronchitis etc. An important chemical constituent of leaf includes pyrroloquinazoline alkaloids, vasicine, vasicol, adhatonine, vasicinone, vasicinol and vasicinolone. The roots are known to contain vasicinolone, vasicol, peganie and 2’ - hydroxy - 4 - glucosyl - oxychalcone. The flowers contain b-sitosterol-D-glucoside, kaempferol, its glycosides and quercetin.\textsuperscript{[6]}

Vasicine has been considered as active principle of A. vasica which shows numerous pharmacological activities viz., anti-malarial, anti-inflammatory, antioxidant, antidiabetic, Anti-bacterial etc. A. vasica leaves have been used in the treatment of diarrhea, dysentery, tuberculosis, skin diseases, vomiting and leprosy etc. Malla et al., 1982 have reported that A. vasica leaves have been consumed as vegetable in Nepal and India. Review of literature shows that there is no evidence or indication of any serious adverse effect except abortifacient effect of A. vasica extract.\textsuperscript{[7]}

**CLASSIFICATION OF ADHATODA VASICA**

Kingdom: Plantae  
Order: Lamiales  
Family: Acanthaceae  
Genus: Justicia  
Species: J. adhatoda, adhatoda vasica.  
Common name: Adulsa (Vasaka)\textsuperscript{[8]}
OCCURANCE AND DISTRIBUTION

Vasaka (adhatoda vasica Nees) of acanthaceae family is a common dense perennial shrub, commonly grows in waste places and distributed throughout India especially in lower Himalayan range up to an altitude of 1000m and in Maharashtra especially, in konkan region. Besides India, it is found in Myanmar, Sri Lanka and Malaya.

DESCRIPTION

Botanical description

Perennial, evergreen shrub, 1.2 – 2.5 m height. Leaves elliptic - lanceolate or ovate – lanceolate, entire, leathery. The leaves have 10-31cm length and 3-10 cm broad. Flowers white with red or yellow barred throats, in spikes with large bracts. Capsules clavate, longitudinally channeled, 1.9 - 2.2 cm long. Seeds globular. The margin is crenate with acuminate apex. There are 8-10 pairs of lateral veins. Taste is bitter and odour is characteristic.

Microscopic characteristics

Transverse section of leaf shows, dorsiventral surface with 2 layers of palisade cells; in surface view, epidermal cells sinuous with anomocytic stomata on both surfaces, more numerous on the lower; clothing trichomes few, 1-3 rarely upto 5 celled, thin-
walled, uniseriate, up to 500 micron and glandular trichomes with unicellular stalk and 4 celled head measuring, 25-36 micron in diameter in surface view; cystoliths in mesophyll 1 years, elongated and cigar shaped; acicular and prismatic forms of calcium oxalate crystals present in mesophyll; palisade ratio, 5-6, 5-8.5; stomatal index, 10.8-14.2-18.1 for lower surface.

IDENTITY, PURITY AND STRENGTH

Foreign matter - Not more than 2 per cent.
Total Ash - Not more than 21 per cent.
Acid-insoluble ash - Not more than 1 per cent.
Alcohol soluble extractive - Not less than 3 per cent.
Water soluble extractive - Not less than 22 per cent.\textsuperscript{[11]}

CHEMICAL COMPOSITION

The principle constituents of Vasaka are its several alkaloids, the chief one being vasicine. The leaves contain two major alkaloids called vasicine and vasicinone. The pharmacological activities of vasicine and vasicinone are well known. Recent investigations on vasicine showed bronchodilatory activity comparable to theophylline, both in vitro and in vivo. Both the alkaloids in combination showed pronounced bronchodilatory activity. Vasicine also exhibits strong respiratory stimulant activity. There has also been a report of thrombopoetic\textsuperscript{4} (platelet increasing) activity with vasicine. Uterine stimulant activity and moderate hypotensive activity of the alkaloids have been observed. The leaves of Vasaka are rich in vitamin C, carotene and an essential oil. A study showed that Mycobacterium tuberculosis was inhibited by the essential oil (at a specific concentration).\textsuperscript{[12]}
ETHNOMEDICINAL USES

All the parts of *Adhatoda vasica* have been used for their curative effects from ancient times. It has been used in Ayurvedic system of medicine for the treatment of various ailments of respiratory tract in both children and adults.\(^{[13]}\)

**Whole plant**

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*) where it exerts its action as an expectorant and antispasmodic.\(^{[14]}\) The plant is used for treatment of excessive phlegm and menorrhagia in Sri Lanka. It is also used for the treatment of bleeding piles, impotence and sexual disorders.\(^{[15]}\)

**Leaves**

A yogic practice is to chew the leaf buds alone or with a little ginger root, to clear the respiratory passages in preparation for the vigorous breathing exercises. The various preparation of leaves are used for curing bleeding, hemorrhage, skin diseases, wounds,
headache and leprosy in Southeast Asia. The bruised fresh leaves are used for snake-bites in India and Sri Lanka.\cite{16} Usually, yellow leaves are exploited for cough.\cite{17} and smoke from leaves is used for asthma.\cite{18} The plant leaves are used for checking postpartum hemorrhage and urinary trouble.\cite{19} It is found that 70\% of the pregnant women in the Gora village of Lucknow (Uttar Pradesh, India) use the leaves of J. adhatoda to induce abortion.\cite{20} Moreover, it is observed that the Neterhat people in Bihar (India) used a decoction of the leaves to stimulate and heal before and after delivery. The leaf powder boiled in sesame oil is used to stop bleeding, earaches as well as pus from ears and jaundice.\cite{21} Decoction and ash of leaves are used for bronchial complaints such as asthma, tuberculosis, antipyretic and relieve acidity. The leaves are toxic to ‘all forms of lower life’ and have insecticidal effects. It was also used for stomach catarrh with constipation, gout, urinary stone and warmed leaves used externally for rheumatic pains and dislocation of joint. Moreover, the preparation of leaves in spirit is used for curing the wealthy persons suffering from certain humors in Myanmar.\cite{22}

**Root**

The extract of roots of J. adhatoda is commonly used by rural population against diabetes, cough and certain liver disorders. The paste, powder and decoction of root are used for curing tuberculosis, diphtheria, malarial fever, leucorrhoea and eye diseases in Southeast Asia. The paste of roots mixed with sugar and used for treatment of acute nightfall in Sitapur District, Uttar Pradesh, India.\cite{23} Moreover, the macerated roots of J. adhatoda are applied on the pubic region and vagina to help parturition and it facilitates the expulsion of fetus.\cite{24} The root decoction is also used for gonorrhea.

**Flower**

The fresh flowers are used for ophthalmic and various preparations of flowers are used for treatment of cold, phthisis, asthma, bronchitis, cough, antispasmodic, fever and gonorrhea in South-East Asia. The flowers are also used as antiseptic to improve blood circulation and hectic heet of blood.\cite{25}
Fruit

The fruit of J. adhatoda are used for curing cold, antispasmodic, bronchitis, Jaundice, Diarrhea, Dysentery, Fever and as laxative. [25]

**TABLE 1. SOME HERBAL PREPARATION CONTAINING J. ADHATODA.** [26]

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Name of preparation</th>
<th>Indication</th>
<th>Country</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Kada</td>
<td>Asthma</td>
<td>India</td>
<td>Iyengar et al. (1994)</td>
</tr>
<tr>
<td>2.</td>
<td>Fermiforte</td>
<td>Leucorrhoea</td>
<td>India</td>
<td>Shete (1993)</td>
</tr>
<tr>
<td>3.</td>
<td>Salus Tuss</td>
<td>Dry cough, bronchitis, cold, smoker’s cough</td>
<td>Germany</td>
<td>Rote (1997)</td>
</tr>
</tbody>
</table>

MEDICINAL APPLICATION OF ADHATODA VASICA

Healing Power and Curative Properties

The leaves, roots and the flowers are extensively used in indigenous medicine as a remedy for cold, cough, bronchitis and asthma.

Bronchitis and Asthma

In acute stages of bronchitis it gives unfailing relief. Especially where the sputum is thick and sticky. It liquefies sputum so that it is brought up more easily. For relief in asthma, the dried leaves should be smoked. [27]

Tuberculosis

In Ayurveda, a preparation made from vasaka flowers, known as gulkand is used to treat tuberculosis. A few fresh petals of vasaka flowers should be bruised and put in a pot of chilli3 clay. Some sugar crystals are added and the jar kept in the sun. It should be
stirred every morning and evening. The preserve is ready for use in about a month. Even the juice from its leaves is useful in treating tuberculosis. About 30 ml of the juice is taken thrice a day with honey. It relieves the irritable cough by its soothing action on the nerve and by liquefying the sputum, which makes expectoration easier.

**Coughs**

For coughs, 7 leaves of the plant are boiled in water, strained and mixed with 24 grams of honey. This decoction provides relief. Similarly, a confection of vasaka flowers eaten in doses of 12 grams twice daily relieves cough. About 60 grams of flowers and 180 grams of jiggery should be mixed for preparing this confection.

**Intestinal Worms**

Its leaves, bark, the root-bark, the fruit and flowers are useful in the removal of intestinal parasites. The decoction of its root and bark in doses of 30 grams twice or thrice a day for 3 days can be given for this purpose. The juice of its fresh leaves can also be used in doses of a teaspoon thrice a day for 3 days.

**Diarrhea and Dysentery**

The juice from its leaves should be given in doses of 2 to 4 grams in treating diarrhea and dysentery.

**Skin Diseases**

A poultice of its leaves can be applied with beneficial results over fresh wounds, rheumatic joints and inflammatory swellings. A warm decoction of its leaves is useful in treating scabies and other skin diseases. [27]

**Respiratory Disorders**

The leaves are mostly used in the treatment of respiratory disorders in Ayurveda. The alkaloids, vasicine and vasicinone present in the leaves, possess respiratory stimulant activity. [28] Whereas, vasicine, at low concentrations, induced bronchodilation and relaxation of the tracheal muscle. However, at high concentrations, vasicine offered significant protection against histamine-induced bronchospasm in guinea pigs.
Vasicinone, the auto oxidation product of vasicine has been reported to cause bronchodilatory effects both in vitro and in vivo.\[^{29}\]

Genoprotective role

Oxygen species are reported to be harmful for the important cellular constituents like lipids, proteins and nucleic acids. Antioxidants are used to protect this kind of damage caused due to an imbalance in the oxygen radical content in the cells. Both Adhatoda as well as its pure component vasicine are shown to have a very strong antioxidant activity.\[^{30}\]

Uses in traditional medicine

Adhatoda vasica is traditionally used in many of the following ways:

- Juice from the leaves and the decoction of the leaves and roots are helpful in asthma, bronchitis and chronic coughs and breathlessness.
- Used for bleeding due to idiopathic thrombocytopenic purpura, local bleeding due to peptic ulcer, piles, menorrhagia.
- Relief in pyorrhea and for bleeding gums by locally application.
- Relieves or eases muscular spasms, cramps or convulsions
- Stimulates contraction of the uterine muscle, facilitating or speeding up childbirth
- Lowers blood pressure.\[^{31}\]

TOXICITY

Adhatoda is said to be non-poisonous to mammals, but to kill fish, insects, and lower organisms.

SIDE EFFECTS AND POSSIBLE INTERACTIONS

Adhatoda is considered safe in recommended usage and dosing. The safety of this herb has not been tested in children and should be avoided, unless directed by a medical professional. Use of this supplement is not recommended during pregnancy (except at birth, and then only under the direction of a medical practitioner.) Care should be exercised when taking this herb with other drugs or supplements that exhibit expectorant or antispasmodic effects.\[^{32}\]
CONCLUSION

As a consequence of increasing demand for the herbal drug treatment of various ailments, plant drugs from Ayurvedic system are being explored globally. This has resulted in many research studies with varied results, and hence there is a need to summarize them together. In the present review we have made an attempt to congregate the botanical, phytochemical, nutritional, pharmacological and toxicological information on adhatoda vasica, a medicinal herb used in the Indian system of medicine. Investigating the new sources of natural products to isolate more potent alkaloids is still the best possible way to develop safe and effective respiratory disorder treating drugs of this class. This review will definitely help for the researchers as well as practitioners, dealing with this plant to know its nature proper usage.

REFERENCES


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