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REVIEW ARTICLE

Antiasthmatic Potential of *Shirisha* (*Albizia lebbeck* (L.) Benth)

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ABSTRACT

Background: Medicinal plants or their preparations play a major role in the prevention, treatment of various diseases as well as improve quality of life with maintenance of health. Bronchial asthma is a common respiratory disease that affects about 18% of world's population. In Ayurveda perspective, bronchial asthma along with other conditions related to difficulty in breathing is described under *shwasa roga*. Numerous herbs have been described in Ayurveda treatises that are useful in *shwasa roga*, and *shirisha* (*A. lebbeck*) is one among them.

Aim: To critically analyze the antiasthmatic activity of Medicinal plants *shirisha* (*Albizia lebbeck*) and its importance in the management of *shwasa roga*.

Results: This review study mainly focuses on the *shwasahara karma*, i.e., antiasthmatic action of a popular Medicinal plants, specifically *Shirisha.* Various research papers and studies have been reviewed and referred in the present study to establish the antiinflammatory, hepatoprotective, eosinophil lowering, mast cell stabilizing, immunomodulatory, antihistaminic, and antiasthmatic action of *shirisha*. Other than its use as a single drug, there are different ayurvedic formulations indicated in *shwasa roga* that have *shirisha* as one of their main contents.

Conclusion: Despite various uses of shirisha in different disease conditions, *shirisha* has very effective antiasthmatic action. Several research studies (both *in vitro* and *in vivo*) have been done that establishes antiasthmatic, antiinflammatory, antihistaminic, etc. activity of *shirisha*. It is concluded that *shirish* (*A. lebbeck*) is a very competent medicinal plant that can be used as a single herb or in formulation in the management of bronchial asthma.

Clinical significance: *Shirish* is an excellent Medicinal plant that possesses promising bronchodilation, antiinflammatory, and antiasthmatic activity. *Shirisha* can be used as a single herb or in compound formulation in asthmatic patients. Including such kind of medicinal plants can minimize the dependency on inhalers, reduces the frequency as well as duration of acute or chronic cases of asthma.

Keywords: *Albizia lebbeck*, Antiasthmatic, Bronchial asthma, *Shirisha*, *Shwasa roga.*

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BACKGROUND

Ayurveda—Traditional Indian system of medicine is becoming increasingly popular nowadays. It is not only a system of medicine but also a science in which the knowledge of living healthy life is imparted and also deals with the knowledge of various sciences pertaining to health. The current Western system of medicine provides treatment to various diseases but many modern medications have side effects and withdrawal symptoms that itself invites others problems. In such circumstances, Ayurveda can be taken into account for an individual needs and their specific disease conditions. Medicinal plants or their preparations play a major role in the prevention, treatment of various diseases as well as improves quality of life with maintenance of health. Their properties and actions are understood thoroughly by ancient *acharyas* before becoming part of the Ayurvedic pharmacopeia. Among various diseases, bronchial asthma is one among the common diseases in which use of medicinal plants can contribute more in its management, especially in chronic conditions.

Disease Description

Asthma is a common and chronic respiratory disease that affects 1 to 18% of the population in different countries.[1] India has an estimated 15 to 20 million asthmatics.[2] Bronchial asthma is a common disorder which is characterized by the inflammation and obstruction of airways. Asthmatics harbor a special type of inflammation in the airways that makes them more responsive than nonasthmatics to a wide range of triggers, leading to excessive narrowing with consequent reduced airflow and symptomatic wheezing and dyspnea.[3] Asthma affects people of all ages but it usually starts in childhood.

An extensive description of *shwasa roga* is present in almost all ayurvedic treatises. *Shwasa roga* is a disease related to *pranavaha srotas*[4] and is caused by vitiated

vata-kapha dosha which afflicts *rasa dhatu* and its site of origin is *pitta sthana*.[5] In ayurvedic perspective, difficulty in breathing or labored breathing is the main cardinal feature of *shwasa roga*. Among the five types of *shwasa roga*, clinical features and types of *Tamaka shwasa* are similar to pattern and associated features found in bronchial asthma.[6]

Drugs that alleviate *shwasa* or difficulty in breathing are *Shwasa hara*. *Shwasa hara* drugs and formulation mainly have *ushna*, *kapha-vata shamaka*, *vatanulomana*, and *agni-deepana* properties. Use of drugs having such properties has also been described in the management of *shwasa roga*.[7] *Acharya charaka* has specified a group of 10 drugs that have *shwasahara* property.[8] There is an extensive description of various herb or plant that bears *shwasahara* property and which are also useful in *Tamaka shwasa*. Flower juice of *shirisha* is also described in the treatment of *shwasa roga* associated with vitiated *kapha-pitta dosha*.[9]

Shirisha

Botanical name: *Albizia lebbeck* (L). Benth
Family: Fabaceae
Subfamily: Mimosoideae
Vernacular names:
Sanskrit: Mridupuspa, Shukapriya,
Hindi: Shirish
English: Parrot tree, Sizzling tree
Urdu: Darash
Bengali: Sirosh
Telugu: Dirisanamu
Kannada: Bagemara

Plant Description: It is a large deciduous, erect, and spreading tree about 15 to 18 m high with dark gray bark which is irregularly cracked. The leaves are bipinnate with 8 to 18 leaflets; leaflets are 3.3 to 5.0 cm × 1.7 to 2.5 cm, shortly petioled, oblong, oblique, obtuse and glabrous, or glabrescent. Inflorescence is in globose heads of greenish-yellow flowers. The flowers are shortly pedicelled and fragrant. Pods are yellowish-brown, 15.0 to 25.0 cm × 307 to 4.3 cm, flat, thin, form, straw-colored and 6 to 10 seeded with brown spots and depressions alternately on either side over the seeds.[10]

Distribution and Habitat: The tree occurs wild in the sub-Himalayan tract in North India and valleys in western and southern India. It is also grown as avenue tree throughout India.[11] It is quite commonly seen in all parts of India, usually planted, tropical, and subtropical regions of Asia and Africa. It is native to deciduous forests in Asia from eastern Pakistan through India and Sri Lanka to Burma. It is cultivated in farmlands, along roadsides, on irrigated plantations, along rivers and as an ornamental plant in gardens due to its pleasant appearance.[12]

Phytochemical Profile[12]*:* The phytochemical profile of this plant reveals that the bark contains 7 to 11% tannins; D-catechin D-leucocyanidin and it yield seven compounds including frieedlan-3-one-and y-sitosterol. The leaves contain echinocystic acid and it yielded flavon, vicenin II and β-sitosterol. Flowers yield triterponiodssapononslabbekanin D and 4 saponins glycosides lebbckannins D, F, G, and H. Mature leaves of *A. lebbeck* contained keto acids including phosphoenolpyruvate, glyoxylate, oxaloacetate, and α-oxoglutarate; vicenin-2, reynoutrin, rutin, myricitrin, and robinin from leaves. Leaves also have alkaloids, flavonoids, tannins, saponins. Compositional studies indicated carbohydrates as major components while saponin was found as a major antinutrient in both pods and seeds. The amino acid profile indicated that arginine and lysine are present in excessive amounts in seeds, while glutamic acid and aspartic acid are present in the highest concentrations in pods. While the linoleic acid was detected as the major fatty acid in pod and seed oil, α-tocopherol was determined as the major tocopherol component in oil.

Ayurvedic properties:[13]

The guna or properties of shirisha in Ayurveda are described in Table 1.

Karmas:[15]

The karmas or therapeutic action of shirisha in Ayurveda are as follows:
Shothahara (relieves inflammation)
Vranahara (ensures quick wound healing)
Vishapaha (useful in treating poisoning)
Varnya (good for skin, improves complexion)
Twak Doshahara (detoxifies skin and useful in skin diseases)
Parts used: Seeds, flowers, leaves, stem bark.
Classical Ayurvedic formulations of shirisha:[15,16]
Mahasirisha agada, *Shirisharishata*, *Shirishadibeeja lepa*, *Shirishadya Anjana*, *Kandarpasara taila, Brihat Marichadi Taila*, *Vajraka taila, Ayaskriti, Devdarvarista.*

RESULTS

Research studies on *shirisha* with special reference to its antiasthmatic action are as follows.

Table 1: Ayurvedic properties of shirisha

Rasa	Madhura, tikta, Kashaya
Guna	Laghu, Ruksha, Teekshna
Veerya	Kinchit Usna
Vipaka	Katu
Prabhava	Vishagna[14]

In vitro Studies

Antimicrobial activity: Methanol-soluble bark extracts of *A. lebbeck* have good antimicrobial activity against *Escherichia coli* and *Staphylococcus aureus*. On preliminary screening, methanol-soluble bark seems to be effective against both Gram-positive and Gram-negative bacteria.[17]

Antioxidant activity: Study of *A. lebbeck* revealed the IC50 values 240, 100, 160, and 135 µg/mL for DPPH scavenging, deoxyribose degradation, nitric oxide, and H_2O_2 scavenging assays respectively, which were comparable to the IC50 values of standard ascorbic acid. The plant *A. lebbeck* was found to be a rich source of phyto-constituents having immense antioxidant potential and the leaves as good source for mineral nutrients.[17]

Hepatoprotective activity: The methanolic, ethanolic, and acetone seed extracts of *A. lebbeck* were assessed for their hepatoprotective activity on human liver hepatocellular carcinoma (HepG2) cell line against paracetamol as a liver damage inducing agent. The cell line viability was assessed by 3-(4, 5-dimethyl thiazol-2-yl)-5-diphenyltetrazolium bromide assay. The maximum cells viability of 131.6 ± 9.39% was observed in methanolic seed extract of *A. lebbeck* (50 µg/mL).[18]

Mast cell stabilizing activity: *A. lebbeck* at different concentrations has got potent mast cell stabilizing property and the IC50 value of *A. lebbeck* was found to be 85 µg/mL. This inhibitory potential of catechin from *A. lebbeck* is perhaps due to modulation of two important effector's functions, histamine release, and cytokine expression of antigen—immunoglobulin E (IgE)-activated mast cells.[19]

In vivo Studies

Antiasthmatic activity: Decoction of *shirisha* bark has shown partial protection of guinea pigs against bronchospasm induced by acetylcholine and histamine.[20] Decoction made from the bark of *shirish* in the dose of 40 mL per day was given in 30 asthmatic patients along with *shatyadi choorna*. Significant relief in different parameters like 51.80% improvement in *shwasakasta* (dyspnea), 62.24% improvement in *ghurghur shabda* (wheezing), 53.29% improvement in *peenas* (coryza), 44.20% improvement in forced expiratory volume 1, 34% improvement in peak expiratory flow rate (PEFR), and 46.54% improvement in absolute eosinophil count.[21]

Immunomodulatory effect: The hot aqueous extract and butanolic fraction of *A. lebbeck* bark were administered once daily for 1 week in mice immunized previously with sheep red blood cells. At the dose levels tested (6.25, 12.5, and 25 mg/kg, p.o.), *A. lebbeck* treated mice developed higher serum antibody titers compared with the vehicle treated group, and the effect was comparable to the standard drug muramyl dipeptide (MDP).[22]

Antiinflammatory activity: The petroleum ether and ethanol extracts of *A. lebbeck* at 400 mg/kg showed maximum inhibition of inflammation induced by carrageenan (petroleum ether—48.6%; ethanol—59.57%), dextran (petroleum ether—45.99%; ethanol—52.93%), cotton pellet (petroleum ether—34.46%; ethanol—53.57%), and Freund's adjuvant (petroleum ether—64.97%; ethanol—68.57%).[23]

Antihistaminic activity: Histological analysis of the lungs of guinea pigs treated with *Shirisha* has shown reduction in tissue edema, epithelial cell hypertrophy, infiltration of inflammatory cell, and airway lumen plugging, thereby decreasing inflammation and bronchoconstriction, which leads to normal lumen size.[24]

Pulmonary eosinophilia: Preliminary screening in 35 cases of tropical pulmonary eosinophilia treated with extracts of *Shirisha pushpa* in a dose of 200 mg twice a day with water indicated 82% marked response, 12% good response, and 6% poor response. No adverse effects were reported in the study.[25]

Research Studies on Antiasthmatic Effect of Ayurvedic Formulation having *Shirisha*

- *Ayurvedic nebulizing fluid:* An Ayurvedic nebulizing fluid had been assessed which contains 50 parts of aqueous extract of stem bark/leaves of *shirisha*. The result revealed that stem bark aqueous extract showed the best antihistaminic and antitussive activity.[26]
- *Shirishavleha:* Comparative analysis of *shirishavleha* prepared separately from bark and heartwood groups showed good outcome in diminution of symptoms of *Tamaka Shwasa* along with statistical significance of objective parameters like absolute eosinophil count, PEFR, erythrocyte sedimentation rate, and total leukocyte count.[27]
- *Shirishadi kashaya:* This formulation has shown good results in reducing the frequency and severity of bronchial asthma along with significant changes in PEFR.[28]
- *Shirisharista:* A comparative clinical study on shirisharista prepared from bark, sapwood, and heartwood (*sara*) of *A. lebbeck* has been assessed for antiasthmatic activity. This study was conducted over 41 patients and it is observed pharmacologically that shirisharista prepared from *sara* shows significant antiinflammatory, antitussive actions, and significant increase in antihistaminic activity.[29]
- *Shirishadi* compound*:* Extract of *Shirishadi* compound (containing *shirish*, *nagarmotha*, and *kantkari* in equal parts) is taken for nebulization in the dosage of 2.5 mg (2.5 mL) twice in a day for first 15 days and then si opus sit, followed by oral administration of *Shirishadi Ghana Vati*—500 mg with lukewarm water, twice in a day for 1 month has been given in 20 patients of

bronchial asthma. This formulation has shown significant antiasthmatic activity and improvement is seen in parameters like dyspnea, cough, wheezing, PEFR, forced vital capacity.[30]

DISCUSSION

Airway inflammation and remodeling are the important pathological events that take place in bronchial asthma. There are numerous cells like mast cells, basophils, eosinophils, and inflammatory mediators like histamine, cytokines, leukotrienes, IgE that are involved in the pathogenesis of asthma. Because of its antiinflammatory action, *shirisha* has a significant role in reducing inflammation of the airways. As *shirish* has mast cell stabilizing activity and antihistaminic activity, it significantly reduces the allergic response of atopic patients and reduces the severity and duration of acute episodes of asthma. Having a good immunomodulatory property, *shirisha* checks the occurrence of secondary infection in asthmatic patients. It also performs bronchodilating action and relieves bronchospasm. In Ayurveda perspective, digestion plays an important role in the pathogenesis of *tamaka shwasa* vis-à-vis bronchial asthma. It is also mentioned that the site of origin of *shwasa roga* is *pitta sthana*. Thus, hepatoprotective activity of *shirisha* plays an important role in contravening the pathology of *shwasa roga*.

CONCLUSION

Shirisha (*A. lebbeck*) is a very essential medicinal plant described in our traditional system. Despite its uses in various disease conditions, *shirisha* has very effective antiasthmatic action. Several research studies (both *in vitro* and *in vivo*) have been done that establish the antiasthmatic, antiinflammatory, antihistaminic etc. activity effect of *shirisha*. Classical Ayurvedic formulations, like *shirishavleha*, *shirishadi kwatha*, etc., also signify its importance in the treatment of bronchial asthma. It is concluded that *shirish* (*A. lebbeck*) is a very competent medicinal plant that can be used as a single herb or in formulation, in the management of bronchial asthma.

CLINICAL SIGNIFICANCE

Bronchial asthma is a prevalent respiratory disorder seen in childhood to elderly people. Use of corticosteroids and bronchodilators in orally or through inhalers are the common medications of asthmatics. *Shirish* is an excellent Medicinal plants that possesses promising bronchodilation, antiinflammatory, and antiasthmatic activity. *Shirisha* can be used as a single herb or in compound formulation in asthmatic patients. Including such kind of medicinal plants can minimize the dependency on inhalers, reduces the frequency as well as duration of acute or chronic cases of asthma.

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हिन्दी सारांश

शिरीष (एल्बिजिया लेब्बेक (एल.) बेन्थ) की श्वासरोगरोधी क्षमता

पृष्ठभूमिः आयुर्वेदिक औषधीय पादप एवं उनके औषधयोग विभिन्न रोगों के निराकरण रोकथाम व चिकित्सा स्वास्थ्य संवर्धन के साथ जीवनगुणवत्ता की उन्नति में महत्त्वपूर्ण भूमिका प्रदान करते हैं। तमकश्वास श्वसनतंत्र का एक सामान्य रोग है जो कि 18 प्रतिशत विश्वजनसंख्या को प्रभावित करता है। आयुर्वेद में श्वासकष्ट संबंधी अवस्थओं के साथ तमक श्वास को श्वासरोग के अन्तर्गत वर्जित किया गया है। आयुर्वेदिक ग्रन्थों में वर्जित विभिन्न वनस्पतियाँ श्वासरोग में उपयोगी होती है, शिरीष (एल्बिजिया लेब्बेक) उनमे से एक है।

उद्देश्यः आयुर्वेदिक औषधीय पादप शिरीष (एल्बिजिया लेब्बेक) की श्वासरोगरोधी गतिविधि का सूक्ष्य विश्लेषण करना तथा श्वास रोग की चिकित्सा में इसके महत्त्व को जानना

परिणामः यह समीक्षात्मक अध्ययन प्रसिद्ध आयुर्वेदिक औषधि विशेषकर शिरीष के श्वासहरकर्म यथा श्वसरोगरोधी गतिविधि पर प्रमुख रूप से केन्द्रित है। वर्तमान अध्ययन में शिरीष के शोथरोधी, यकृत संरक्षण, इयोसिनोफिल न्यूनीकरण, मास्ट कोशिका स्थायीकरण, व्याधिक्षमता संवर्धन, हिस्टामिनरोधी तथा श्वासरोगरोधी कर्म की स्थापना हेतु विभिन्न अनुसंधान लेखों एवं अध्ययनों की समीक्षा की गई है तथा उनका उल्लेख किया गया है। शिरीष के एकल औषध के रूप में प्रयोग के अतिरिक्त ऐसे कई आयुर्वेदिक औषधयोग श्वास रोग हेतु निर्दिष्ट किए गए है जिनके मुख्य घटकों में शिरीष भी एवं घटक है।

निष्कर्षः विभिन्न रोगों में शिरीष के उपयोगों के अतिरिक्त, शिरीष बहुत ही प्रभावी अस्थमा–रोधी औषध है। कई शोध अध्ययन (इन–विट्रो और इन– विवो दोनों) से शिरीष की अस्थमा–रोधी, शोथ–रोधी, हिस्टामिन–रोधी इत्यादि कर्म होना प्रमाणित होता है। अतः यह निष्कर्ष निकालता है कि शिरीष (अल्बिजिया लीब्बेक) एक बहुत ही सक्षम आयुर्वेदिक औषध है जिसे एकल अथवा औषधीय योग के रूप में ब्रोन्कियल अस्थमा के प्रबंधन में प्रयोग किया जा सकता है।

नैदानिक महत्वः शिरीष एक श्रेष्ठ आयुर्वेदिक औषधि है जिसमें आशातीत श्वसनिकाविस्फारक, शोथरोधी एवं श्वासरोगरोधी गतिविधि पाई जाती है। श्वासरोग मुक्त रोगियों में शिरीष एकल औषध या औषधयोग के रूप में प्रयोग की जा सकती है। इस प्रकार की आयुर्वेदिक औषधि का प्रयोग श्वसित्र पर निर्भरता व आवृत्ती को कम कर सकती है साथ ही साथ तीव्र या जीर्ण श्वासरोग के मामलों की अवधि को भी कम कर सकती है।

कुंजी शब्दः एल्बिजिया लीब्बेक, श्वासरोगरोधी, तमक श्वास, शिरीष, श्वासरोग।