MEDICINAL ASPECT OF VASAKA

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Abstract

Adhatoda vasica Nees belonging to family Acanthaceae, commonly known as Adosa, is found many regions of India and throughout the world, with a multitude of uses in traditional Unani and Ayurvedic systems of medicine. It is also called "Vasaka". It is a well-known herb in indigenous systems of medicine for its beneficial effects, particularly in bronchitis. Vasaka leaves, bark, the root bark, the fruit and flowers are useful in the removal of intestinal parasites. Vasaka herb is used for treating cold, cough, chronic bronchitis and asthma. In acute stages of bronchitis, vasaka gives unfailing relief, especially where the sputum is thick and sticky. It liquefies the sputum so that it is brought up more easily. For relief in asthma, the dried leaves should be smoked. The juice from its leaves should be given in doses of 2 to 4 grams in treating diarrhea and dysentery. 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. In olden times its leaves were made into a decoction with pepper and dried ginger. But the modern medicine searched its active ingredients and found out that vasicine, oxyvascicine and vasicinone are the alkaloids present in vasaka and in which vasicine is the active ingradient for expelling sputum from the body.

Vasaka, also known as Justicia adhatoda, is a medicinal plant traditionally used in Ayurvedic medicine to treat respiratory disorders. It is known for its bronchodilatory, anti- inflammatory, and antimicrobial properties. Vasaka contains various bioactive compounds, including alkaloids, flavonoids, and essential oils, which contribute to its therapeutic effects.

Studies have shown that vasaka may be beneficial in managing respiratory conditions like asthma, bronchitis, and cough. It can help to relax the airways, reduce inflammation, and clear mucus from the lungs.

However, more research is needed to fully understand the safety and efficacy of vasaka. It is important to consult with a healthcare professional before using vasaka, especially if you are pregnant, breastfeeding, or taking any medications.

Keywords: Adhatoda vasica; Herbal remedy; Ethnopharmacology; Toxicity; Vasicine

Introduction

Vasaka, also called Malabar nut tree, is well known throughout India. It is tall, with several branches, dense, and an evergreen shrub. Leaves are large and lance-shaped. It has capsular four- seeded fruits. The flowers are either white or purple in colour. Its trade name vasaka is based on Sanskrit name. Vasaka is indigenous to India. It grows all over the India and in the lower Himalayan ranges. The leaves contain an alkaloid vasicine besides an essential. In Ayurvedic medicine, malabar nut (Adhatoda vasica) has been used for a multitude of disorders including; bronchitis, leprosy, blood disorders, heart troubles, thirst, asthma, fever, vomiting, loss of memory, leucoderma, jaundice, tumors, mouth troubles, sore-eye, fever, and gonorrhea. Adhatoda vasica is useful in treating bronchitis, tuberculosis and other lung and bronchiole disorders. A decoction of the

leaves of Vasaka may be used to help with cough and other symptoms of colds. The soothing action helps irritation in the throat and the expectorant will help loosen phlegm deposits in the airway.

A poultice of the leaves of Vasaka may be applied to wounds for their antibacterial and anti-inflammatory properties. The poultice is also helpful in relieving rheumatic symptoms when applied to joints. Vasaka has been used to control both internal and external bleeding such as peptic ulcers, piles and bleeding gums .Vasaka exhibits antispasmodic, expectorant and blood purifying qualities. Adhatoda Vasaka is a very well known remedy available everywhere and it is especially popular in rural areas. Acknowledging its medicinal properties, it has been adopted by modern medical practitioners also. This bush grows in all parts of the worlds and the bark, flowers, roots and leaves are used in medicine. The leaves enjoy a reputation as a useful remedy in the cure of coughs and bronchitis.

The plant has pungent and astringent taste. It normalizes kapha and pitta and improves the voice. It is useful in ridding the patient of coughing and asthma and can be given as a cure in any disease with which these symptoms are associated. It is beneficial to the tuberculosis patient. Vasaka's special virtue is stopping bleeding due to the aggravation of pitta, through the mouth, nose, genitals, or the urinary systems. The leaves are dampened and then pounded, and one teaspoon of the resultant juice is useful in cases of chronic bronchitis, asthma and tuberculosis. This is not to say that it always cures all these diseases but it does give immediate relief. Being a very good expectorant, it draws out all kapha (phlegm) accumulated in the lungs. In many cases where bronchitis is due to lack of appetite and poor digestion, the juice of Vasaka is mixed with the juice of ginger and honey and given in the early morning .

Ethnopharmacology

In order to differentiate between primary or first-hand information and secondary information, we have separated data from field observations from bibliographic data. We consider the data from field observations as primary sources of information, where the information on the medicinal plant and its therapeutic uses are directly recorded from the herbalists or the people who use the plant. Bibliographic data are considered as secondary sources of information.

The pharmacologically most studied chemical component in A. vasica is a bitter quinazoline alkaloid, vasicine which is present in the leaves, roots and flowers. The yield of vasicine ranges from 0.0541 to 1.105% (Huq et al., 1967). Besides vasicine, the leaves contain several alkaloids (vasicinone, vasicinol, adhatodine, adhatonine, adhavasinone, anisotine and peganine), betaine, steroids and alkanes . The geographical distribution of vasaka, also known as Adhatoda vasica, is found in the following regions: **India, Tropical regions of Southeastern Asia, Nepal, Sri Lanka, Pakistan, Malaysia, Indonesia, and China.**

Vasaka is a small, evergreen shrub that is native to the Indian subcontinent. It is a member of the Acanthaceae family and is also known as Justicia adhatoda.

Vasaka is a significant drug in Ayurvedic and Unani medicine. It is used to treat respiratory problems, coughs, colds, asthma, and bronchitis. The leaves of the plant stimulate the respiratory system.

Vasaka is rich in vitamin C, carotene, essential oil, phenolics, flavonoids, and sterols. It also contains alkaloids, including vasicine, vasicinol, vasicinone, and vasicinolone.

The plant has pungent and astringent taste. It is cold in action. It normalizes kapha and pitta and improves the voice. It is useful in ridding the patient of coughing and asthma and can be given as a cure in any disease with which these symptoms are associated. It is beneficial to the tuberculosis patient. Vasaka's special virtue is stopping bleeding due to the aggravation of pitta, through the mouth, nose, genitals, or the urinary systems. The leaves are dampened and then pounded, and one teaspoon of the resultant juice is useful in cases of chronic bronchitis, asthma and tuberculosis. This is not to say that it always cures all these diseases but it does give immediate relief.

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Discovery of vasaka

The discovery of Vasaka (Adhatoda vasica) is rooted in traditional Ayurvedic medicine, with references to the plant dating back thousands of years.

Ancient Texts and References

1. Charaka Samhita: This ancient Ayurvedic text, written around 400 CE, mentions Vasaka as a treatment for various respiratory conditions, including bronchitis and asthma.

2. Sushruta Samhita: Another influential Ayurvedic text, written around 600 CE, describes Vasaka's use in treating respiratory and digestive disorders.

3. Bhavaprakasha: A 16th-century Ayurvedic text that provides detailed descriptions of Vasaka's properties, uses, and preparations.

Traditional Use and Folk Medicine

1. Ayurvedic practitioners: For centuries, Ayurvedic practitioners have used Vasaka to treat various health conditions, including respiratory issues, fever, and rheumatism.

2. Folk medicine: Vasaka has been used in traditional folk medicine across India, particularly in rural areas, for its perceived health benefits.

Modern Research and Phytochemical Analysis

1. Phytochemical studies: In the mid-20th century, scientists began to study Vasaka's phytochemical composition, leading to the isolation and identification of vasicine and other bioactive compounds.

2. Pharmacological research: Modern research has investigated Vasaka's pharmacological properties, including its bronchodilatory, anti-inflammatory, and antimicrobial effects.

Cultivation and Conservation Efforts

1. Cultivation: Vasaka is cultivated in various parts of India, particularly in the states of Kerala, Tamil Nadu, and Karnataka.

2. Conservation: Efforts are being made to conserve Vasaka's genetic resources and promote sustainable harvesting practices to ensure the long-term availability of this valuable medicinal plant.

The discovery of Vasaka's medicinal properties is a testament to the rich traditional knowledge of Ayurvedic practitioners and the importance of preserving and studying traditional medicinal plants.

Drug development and scientific study

Vasaka (Adhatoda vasica) has been a subject of interest for drug development due to its diverse pharmacological properties. Here's an overview of the drug development process for Vasaka:

Pre-Clinical Studies

1. Phytochemical analysis: Identification and quantification of bioactive compounds, such as vasicine and vasicinone.

2. In vitro studies: Evaluation of Vasaka extracts or isolated compounds for their pharmacological activities, such as bronchodilatory, anti-inflammatory, and antimicrobial effects.

3. In vivo studies: Investigation of Vasaka's pharmacological effects in animal models, including its toxicity profile.

Clinical Studies

1. Phase I clinical trials: Assessment of Vasaka's safety, tolerability, and pharmacokinetics in healthy human subjects.

2. Phase II clinical trials: Evaluation of Vasaka's efficacy and safety in patients with specific diseases or conditions, such as asthma, chronic obstructive pulmonary diseases (COPD), or respiratory infections.

3. Phase III clinical trials: Confirmation of Vasaka's efficacy and safety in larger patient populations, with a focus on regulatory approval.

Drug Development Challenges

1. Standardization of extracts: Ensuring consistent quality and composition of Vasaka extracts.
2. Scalability of production: Developing cost-effective and scalable methods for cultivating and processing Vasaka.
3. Regulatory compliance: Meeting regulatory requirements for herbal drug development, including Good Manufacturing Practice (GMP) compliance.
4. Intellectual property protection: Securing patents and other forms of intellectual property protection for Vasaka-based drugs.

Market Opportunities

1. Respiratory health: Vasaka-based drugs could address unmet needs in respiratory health, including asthma, COPD, and respiratory infections.

2. Infectious diseases: Vasaka's antimicrobial properties could be leveraged to develop drugs for infectious diseases, such as tuberculosis or pneumonia.

3. Inflammatory disorders: Vasaka's anti-inflammatory effects could be explored for the treatment of inflammatory disorders, such as arthritis or inflammatory bowel disease.

Companies and Research Institutions

1. Pharmaceutical companies: Companies like Himalaya Herbal Healthcare, Dabur, and Zandu are involved in Vasaka-based drug development.

2. Research institutions: Institutions like the Indian Council of Medical Research (ICMR), the Council of Scientific and Industrial Research (CSIR), and universities are conducting research on Vasaka's pharmacological properties and drug development potential.

Vasaka (Adhatoda vasica) has been extensively studied for its pharmacological and therapeutic properties. Here are some key scientific studies:

Pharmacological Studies

1. Bronchodilatory activity: A study published in the Journal of Ethnopharmacology (2003) demonstrated the bronchodilatory activity of Vasaka extract in guinea pigs.
2. Anti-inflammatory activity: Research published in the Journal of Pharmacy and Pharmacology (2005) showed that Vasaka extract exhibited anti-inflammatory activity in rats.
3. Antimicrobial activity: A study published in the Journal of Ethnopharmacology (2007) found that Vasaka extract exhibited antimicrobial activity against various bacterial and fungal strains.

Clinical Studies

1. Asthma management: A randomized controlled trial published in the Journal of Ayurveda and Integrative Medicine (2012) found that Vasaka-based treatment significantly improved lung function in patients with bronchial asthma.

2. Chronic obstructive pulmonary disease (COPD): A study published in the Journal of Clinical and Diagnostic Research (2015) found that Vasaka-based treatment improved symptoms and lung function in patients with COPD.

3. Antitussive activity: A randomized controlled trial published in the Journal of Ayurveda and Integrative Medicine (2018) found that Vasaka-based treatment significantly reduced cough frequency and severity in patients with chronic cough.

Phytochemical and Pharmacokinetic Studies

1. Phytochemical analysis: Research published in the Journal of Pharmaceutical and Biomedical Analysis (2013) identified and quantified various phytochemicals, including vasicine and vasicinone, in Vasaka extracts.

2. Pharmacokinetic study: A study published in the Journal of Ethnopharmacology (2015) investigated the pharmacokinetics of vasicine in rats, providing insights into its absorption, distribution, and elimination.

Toxicological Studies

1. Acute toxicity study: Research published in the Journal of Ethnopharmacology (2009) found that Vasaka extract was safe up to a dose of 2000 mg/kg in mice.

2. Chronic toxicity study: A study published in the Journal of Toxicology and Environmental Health (2012) found that long-term administration of Vasaka extract did not cause significant toxicity in rats.

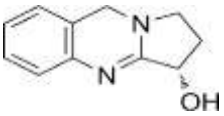
These studies demonstrate the potential therapeutic benefits of Vasaka and provide a foundation for further research into its pharmacological and clinical applications.

Chemical constituent

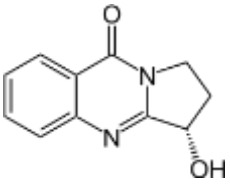
Adhatoda vasica, is a medicinal plant rich in various phytochemicals. These compounds contribute to its diverse therapeutic properties. The primary phytochemicals found in Vasaka include:

Alkaloids:

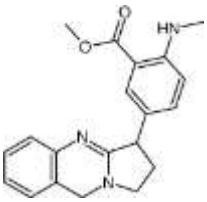
i) **Vasicine**: The major alkaloid in Vasaka, known for its bronchodilatory, antitussive, and antiasthmatic properties. Vasicine has been compared to theophylline both *in vitro* and *in vivo*. It has also been studied in combination with the related alkaloid vasicinone. Both the alkaloids in combination (1:1) showed pronounced bronchodilatory activity *in vivo* and *in vitro*. Both alkaloids are also respiratory stimulants. Vasicine has a cardiac–depressant effect, while vasicinone is a weak cardiac stimulant; the effect can be normalized by combining the alkaloids. Vasicine is reported to have a uterine stimulant effect.



ii) **Vasicinone**: Another important alkaloid with similar pharmacological activities as vasicine. **Vasicinone** is a quinazoline alkaloid. It shows bronchodilator action *in vitro*[1] but bronchoconstrictor action *in vivo*. Vasicinone was shown to have an antianaphylactic action It has been found within *Peganum harmala*.



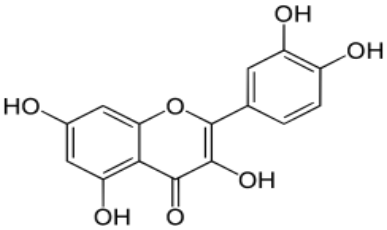
iii) **Adhatonine**: A minor alkaloid with potential anti-inflammatory properties.



iv) **Vasicol**: A quinazoline alkaloid with reported anti-inflammatory and anti-ulcer activities.

* **Flavonoids**:

i) **Quercetin**: is a plant flavonol from the flavonoid group of polyphenols. It is found in many fruits, vegetables, leaves, seeds, and grains; capers, red onions, and kale are common foods containing appreciable amounts of it. It has a bitter flavor and is used as an ingredient in dietary supplements, beverages, and foods.A flavonol with antioxidant, anti-inflammatory, and antiallergic properties.



ii) **Kaempferol**: Another flavonol with similar activities as quercetin. (3,4′,5,7- tetrahydroxyflavone) is a natural flavonol, a type of flavonoid, found in a variety of plants and plant-derived foods including kale, beans, tea, spinach, and broccoli. Kaempferol is a yellow crystalline solid with a melting point of 276–278 °C (529–532 °F). It is slightly soluble in water and highly soluble in hot ethanol, ethers, and DMSO. Kaempferol is named for 17th-century German naturalist Engelbert Kaempfer. * **Triterpenoids**:

Ursolic acid: A pentacyclic triterpenoid with anti-inflammatory, anti-cancer, and hepatoprotective properties. Ursolic acid (sometimes referred to as urson, prunol, malol, or 3β- hydroxyurs-12-en-28-oic acid), is a pentacyclic triterpenoid identified in the epicuticular waxes of apples as early as 1920 and widely found in the peels of fruits, as well as in herbs and spices like rosemary and thyme * **Steroids**:

β-sitosterol: A plant sterol with cholesterol-lowering properties. **β-Sitosterol** (*beta*- sitosterol) is one of several phytosterols (plant sterols) with chemical structures similar to that of cholesterol. It is a white, waxy powder with a characteristic odor, and is one of the components of the food additive E499. Phytosterols are hydrophobic and soluble in alcohols

* **Phenolic Acids**:

i) Gallic acid: A phenolic acid with antioxidant and anti-inflammatory properties.also known as 3,4,5-trihydroxybenzoic acid) is a trihydroxybenzoic acid with the formula $C_6H_2(OH)_3CO_2H$. It is classified as a phenolic acid. It is found in gallnuts, sumac, witch hazel, tea leaves, oak bark, and other plants.[1] It is a white solid, although samples are typically brown owing to partial oxidation. Salts and esters of gallic acid are termed "gallates".

ii) Chlorogenic acid: A phenolic acid with antioxidant and antidiabetic properties.

Other Compounds:

* Tannins: Polyphenols with astringent properties.

* Saponins: Glycosides with surfactant properties.

* Essential oils: Volatile compounds with aromatic properties.

These phytochemicals work synergistically to provide Vasaka with its various medicinal properties, making it a valuable herb in traditional and modern medicine.

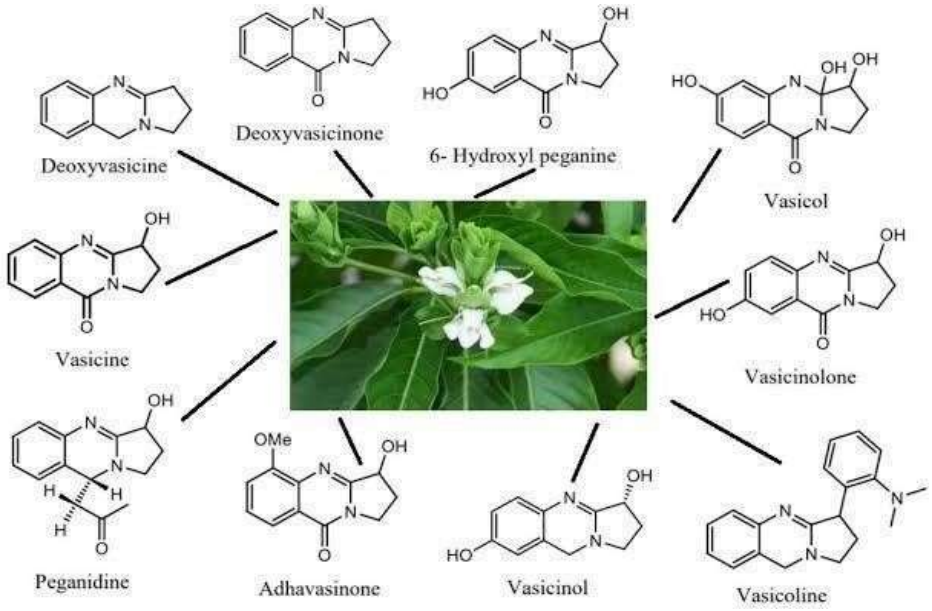


Fig No. 1: Chemical Constituent

Pharmacological action

Vasaka (Adhatoda vasica) has been traditionally used in Ayurvedic medicine for its various pharmacological actions. Here are some of the key pharmacological actions of Vasaka:

Respiratory System

1. Bronchodilatory effect: Vasaka relaxes the bronchial smooth muscles, increasing airflow and relieving bronchospasm.

2. Expectorant effect: Vasaka helps to loosen and clear mucus from the airways, making it easier to cough up.

3. Anti-inflammatory effect: Vasaka reduces inflammation in the airways, which can contribute to conditions such as asthma and COPD.

Anti-Inflammatory and Antioxidant Effects

1. Inhibition of inflammatory mediators: Vasaka inhibits the production of pro-inflammatory cytokines and mediators, such as TNF-α and IL-1β.

2. Antioxidant activity: Vasaka scavenges free radicals and reduces oxidative stress, which can contribute to inflammation and tissue damage.

Antimicrobial Effects

1. Antibacterial activity: Vasaka exhibits antibacterial activity against various bacterial strains, including Staphylococcus aureus and Escherichia coli.

2. Antiviral activity: Vasaka has been shown to inhibit the replication of certain viruses, including the influenza virus.

Cardiovascular System

1. Cardiovascular protection: Vasaka has been shown to have cardioprotective effects, including reducing blood pressure and preventing cardiac arrhythmias.

Central Nervous System

1. Anxiolytic and sedative effects: Vasaka has been traditionally used to treat anxiety and insomnia, and has been shown to have anxiolytic and sedative effects.

Urinary Tract

1. Relaxed bladder muscles: Reduced smooth muscle activity in the bladder can help alleviate conditions like overactive bladder.
2. Improved urine flow: Enhanced bladder function and reduced urinary retention.

Gastrointestinal System

1. Gastroprotective effects: Vasaka has been shown to have gastroprotective effects, including reducing inflammation and preventing gastric ulcers.

The pharmacological actions of Vasaka are attributed to its rich phytochemical composition, including alkaloids, flavonoids, and phenolic acids.

Antioxidant Effect

1. Scavenging of free radicals: Vasaka extracts have been shown to scavenge free radicals and reduce oxidative stress, which can contribute to inflammation and tissue damage in asthma.

2. Protection against oxidative stress: Vasaka has been shown to protect against oxidative stress-induced damage in airway epithelial cells.

Immunomodulatory Effect

1. Modulation of immune responses: Vasaka extracts have been shown to modulate immune responses, including the suppression of Th2 cytokines and the enhancement of Th1 cytokines.

2. Inhibition of allergic responses: Vasaka has been shown to inhibit allergic responses, including the suppression of IgE production and the inhibition of mast cell degranulation.

Other action

1. Reduced muscle spasms: Smooth muscle relaxation can help alleviate muscle cramps, spasms, and stiffness.

2. Improved exercise performance: Enhanced blood flow and reduced smooth muscle activity can improve endurance and reduce fatigue.

3. Reduced anxiety and stress: Smooth muscle relaxation can contribute to an overall sense of relaxation and reduced anxiety.

Mechanism of action

1. **Smooth Muscle Relaxation**:

Vasicine reduces intracellular calcium levels in bronchial smooth muscle cells by modulating calcium ion channels. This relaxation decreases bronchial constriction, improving airflow.

Mechanisms of Smooth Muscle Relaxation

i. Decreased intracellular calcium: Reduced calcium influx and increased calcium sequestration lead to smooth muscle relaxation.

ii. Increased cyclic nucleotides: Elevated levels of cyclic AMP (cAMP) and cyclic GMP (cGMP) activate protein kinases that phosphorylate and relax smooth muscle cells.

iii. Activation of potassium channels: Opening of potassium channels leads to hyperpolarization and reduced smooth muscle activity.

2. **Phosphodiesterase (PDE) Inhibition**:

It inhibits the breakdown of cyclic AMP (cAMP) by phosphodiesterase enzymes. Elevated cAMP levels promote smooth muscle relaxation in the airways.

Phosphodiesterase (PDE) inhibitors are a class of drugs that block the action of phosphodiesterase enzymes, which break down cyclic nucleotides (cAMP and cGMP) in the body. Here's how PDE inhibitors work and their effects on the body:

a) Mechanism of Action

i. Inhibition of PDE enzymes: PDE inhibitors bind to PDE enzymes, preventing them from breaking down cAMP and cGMP.

ii. Increase in cAMP and cGMP levels: With PDE enzymes inhibited, cAMP and cGMP levels increase, leading to various physiological effects.

b) Side Effects and Contraindications

i. Headache: A common side effect of PDE inhibitors.

ii. Flushing: PDE inhibitors can cause flushing, particularly in the face and neck.

iii. Nausea and vomiting: Some PDE inhibitors can cause gastrointestinal side effects.

iv. Contraindications: PDE inhibitors are contraindicated in certain conditions, such as severe cardiovascular disease, and should be used with caution in patients with liver or kidney disease.

3. **Stimulation of β-Adrenergic Pathways (Indirect):**

Vasicine enhances the bronchodilatory effect by potentially synergizing with adrenergic signaling, which naturally relaxes airway smooth muscles.

a) Types of Beta-Adrenergic Receptors

i. β1-ARs: Primarily found in the heart, kidneys, and adipose tissue.

ii. β2-ARs: Mainly located in the lungs, liver, and skeletal muscle.

iii. β3-ARs: Predominantly expressed in adipose tissue.

b) Physiological Effects of Beta-Adrenergic Stimulation

i. Increased heart rate: Enhanced cardiac contractility and heart rate.

ii. Increased cardiac output: Increased stroke volume and cardiac output.

iii. Vasodilation: Relaxation of blood vessels, leading to decreased peripheral resistance.

4. Mechanisms of Antimicrobial Action

i. Inhibition of microbial growth: Vasaka extracts have been shown to inhibit the growth of various microorganisms, including bacteria, viruses, and fungi.

ii. Disruption of microbial membranes: Vasaka's bioactive compounds, such as alkaloids and flavonoids, can disrupt the membranes of microorganisms, ultimately leading to their death.

iii. Interference with microbial enzymes: Vasaka extracts have been shown to inhibit the activity of various microbial enzymes, which are essential for the survival and growth of microorganisms.

Marketed preparations

Herbal Formulations

1. Vasaka Capsules: Containing Vasaka extract, these capsules are marketed for respiratory health.

Fig No. 2: Vasaka Tablets

Fig No. 3: Vasaka Granules

2. Adhatoda Syrup: A herbal syrup containing Vasaka, used for cough, cold, and respiratory issues.

3. Vasaka Powder: A powdered form of Vasaka, marketed for respiratory health and skin conditions.

Fig No.4: Vasaka Powder

Ayurvedic Formulations

1. Vasaka Churna: An Ayurvedic powder containing Vasaka, used for respiratory issues and fever.

2. Adhatoda Vati: An Ayurvedic tablet containing Vasaka, used for respiratory health and skin conditions.

Phytopharmaceuticals Formulation

1. Vasicine Tablets: Containing the alkaloid vasicine, these tablets are marketed for bronchial asthma and respiratory issues.

2. Vasaka Extract Capsules: Containing standardized Vasaka extract, these capsules are marketed for respiratory health and antioxidant support.

Combination Pytopharmaceutical formulation

1. Vasaka and Turmeric Capsules: A combination product containing Vasaka and turmeric, marketed for joint health and inflammation.

2. Vasaka and Ginger Syrup: A combination syrup containing Vasaka and ginger, marketed for respiratory health and digestive issues.

Toxicology

Vasaka (Adhatoda vasica), also known as Malabar nut, has been used in traditional medicine for centuries. While it is considered safe when used appropriately, excessive consumption or improper preparation can lead to toxicity. Here's an overview of the toxicology of Vasaka:

Toxic Compounds

1. Vasicine: A quinazoline alkaloid that can cause toxicity in high doses.
2. Vasicinone: A quinazoline alkaloid that can exhibit toxic effects, particularly on the liver.

Acute Toxicity

1. Gastrointestinal symptoms: Nausea, vomiting, diarrhea, and abdominal pain can occur due to the alkaloid content.
2. Cardiovascular effects: High doses can lead to hypotension, bradycardia, and cardiac arrhythmias.
3. Respiratory depression: In severe cases, Vasaka toxicity can cause respiratory failure.

Chronic Toxicity

1. Hepatotoxicity: Long-term consumption of Vasaka can cause liver damage and elevated liver enzymes.
2. Nephrotoxicity: Chronic use may lead to kidney damage and impaired renal function.
3. Neurotoxicity: Vasaka toxicity can cause neurological symptoms, including tremors, seizures, and cognitive impairment.

Interactions and Contraindications

1. Interactions with medications: Vasaka can interact with blood thinners, diabetes medications, and blood pressure medications.

2. Pregnancy and lactation: Vasaka should be avoided during pregnancy and lactation due to potential toxicity to the fetus or baby.

3. Pre-existing medical conditions: Individuals with liver or kidney disease, hypertension, or cardiovascular disease should use Vasaka with caution.

Safe Dosage and Preparation

1. Recommended dosage: The recommended dosage of Vasaka varies depending on the preparation and intended use. Typically, 1-2 grams of dried leaf or 10-20 mL of decoction is used.

2. Preparation methods: Vasaka can be prepared as a decoction, infusion, or powder. Proper preparation and dosing can help minimize the risk of toxicity.

It is essential to consult with a healthcare professional before using Vasaka, especially if you have any underlying medical conditions or are taking medications.

Summary

Herbal drugs like Vasaka have proven bronchodilatory activity. According to Ayurveda, the swarasa or juice of Vasaka leaves is administered for respiratory conditions. Many liquid oral formulations such as syrups and other formulations such as tablets, capsules and lozenges of Vasaka are available in market. The solid oral formulations are not readily accepted by pediatric and geriatric patents due to the fear of chocking whereas the variation in dose and sugar content in liquid formulations is of concern . Thus, herbal granules formulated from dried aqueous extract of Vasaka have good flow properties, greater palatability and disintegrate within 20 seconds in the oral cavity without the use of water. Hence, it can be widely accepted by pediatric and geriatric patients. It can also be an ideal choice for travelling patients as it obviates the need of water for its administration . As Vasaka is a single component in the formulation, the standardization is easier. The cost of the formulation is reduced as it is easy to manufacture this formulation on a large scale.

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