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Review Article

A review on nutraceutical used in treatment of asthma

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Abstract

Asthma, a chronic respiratory disease characterized by airway inflammation and obstruction, affects millions globally. Conventional treatments often have limitations and side effects, leading to growing interest in complementary and alternative therapies, including nutraceuticals. This review briefly explores the potential of three traditionally used herbs – liquorice root (*Glycyrrhiza glabra*), ginger (*Zingiber officinale*), and malabar nut (*Adhatoda vasica*) – as nutraceuticals in the management of asthma. These herbs possess various bioactive compounds with reported anti-inflammatory, bronchodilatory, expectorant, and immunomodulatory properties that may help alleviate asthma symptoms and improve respiratory function. While preliminary research and traditional use suggest promising effects, further rigorous clinical trials are warranted to establish their efficacy, optimal dosage, safety, and potential interactions with conventional asthma medications. This review highlights the need for continued scientific investigation into these nutraceuticals as potential adjuncts in asthma therapy.

Keywords: Asthma, nutraceutical, Malabar nut, Liquorice root, Ginger, antioxidant, anti-inflammatory, bronchodilatory.

Introduction

Asthma is a persistent inflammatory condition affecting the airways, leading to increased sensitivity and recurring symptoms like wheezing, chest tightness, and coughing. The underlying causes involve a combination of airway inflammation, muscle constriction, damage to the airway lining, excessive mucus production, heightened airway responsiveness, and swelling[1]. Asthma is often categorized as an allergic condition, marked by increased levels of IgE antibodies, which are a type of immunoglobulin. Asthma is caused by a complex and poorly defined interaction of genetic predisposition and environmental stimulation[2].

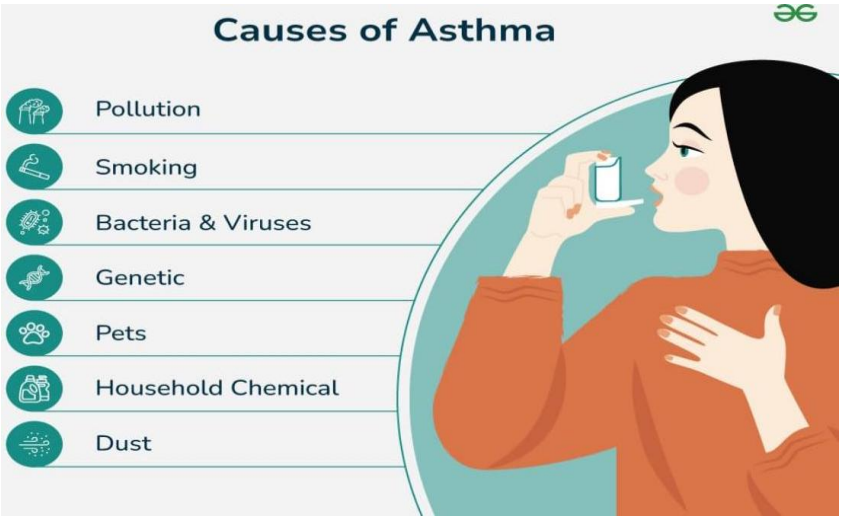

Figure 1: Causes of asthma

Types of asthma:

1 Child-Onset Asthma

Child-onset asthma begins in childhood due to genetic sensitivity to environmental allergens. Atopic children have a hypersensitive immune response to substances like animal proteins, fungi, pollen, dust mites, and dust. Exposure to these allergens can trigger asthma as their airway cells react strongly[3].

2 Adult-Onset Asthma

Adult-onset asthma develops after age 20, is less common than child-onset asthma, and affects women more. About 50% of cases are allergy-related, while others are non-allergic (intrinsic asthma). Triggers include allergens, chemicals, plastics, metals, medications, or wood dust[4].

3 Exercise-Induced Asthma

Exercise-induced asthma refers to coughing, wheezing, or shortness of breath that occurs during or after physical activity. Fitness level plays a role, as an unfit person may quickly become breathless. Like other forms of asthma, it involves inflammation of the airways and excess mucus, making breathing difficult[5].

4 Cough-Induced Asthma

Cough-induced asthma is hard to diagnose, as it requires ruling out conditions like chronic bronchitis or sinus issues. It often involves coughing without other asthma symptoms, which can occur anytime and may disrupt sleep[6].

5 Occupational Asthma

This form of asthma is caused by triggers found in the workplace. Substances like chemicals, vapors, gases, smoke, dust, fumes, or particles can provoke it. Other causes include viruses (like the flu), molds, animal products, pollen, changes in humidity or temperature, and even stress[7].

6 Nocturnal Asthma

Nocturnal asthma occurs between midnight and 8 AM, often triggered by dust, pet dander, or sinus issues. Symptoms like wheezing or shortness of breath may wake patients, usually around 2–4 AM. Without daytime signs, it's harder to diagnose, delaying treatment. The exact cause remains unclear[8].

7 Steroid-Resistant Asthma (Severe Asthma)

Most asthma patients respond to inhaled steroids, but some are steroid-resistant. Asthma involves airway inflammation and immune activation, which glucocorticoids target. However, steroid-resistant patients have higher airway immune activity than those with steroid-sensitive asthma[9].

Liquorice root: An Overview of Their Medicinal Properties

Liquorice (*Glycyrrhiza glabra* L.) belongs to the Fabaceae family and is a perennial herb native to the Mediterranean. It grows in subtropical climates, reaching 1.4m, with oval leaflets, purplish flowers, and flat pods. The bright yellow taproot is used medicinally. Found in regions like the former U.S.S.R., Turkey, Iran, China, India, and others, liquorice contains Glycyrrhizin, Glycyrrhetinic acid, Liquiritigenin, Isoliquiritigenin treats gastric ulcers, inflammation, mouth ulcers, spasms, cough, asthma, bronchitis, and Addison's disease[10].

Figure 2: liquorice root

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It also aids in respiratory issues, skin disorders, oral hygiene, cancer prevention, and depression. Liquorice (*Glycyrrhiza glabra*) is a perennial herb native to Europe and Asia, widely known for its medicinal properties. It has been used for centuries in traditional medicine systems such as Ayurveda, Traditional Chinese Medicine (TCM), and Unani. The sweet-tasting root contains glycyrrhizin, a bioactive compound responsible for many of its therapeutic effects. In Asian countries like India, China, and Iran, liquorice holds a significant place in herbal medicine due to its soothing, anti-inflammatory, and immune-modulating properties.

Relevance in Asthma Treatment:

Liquorice is particularly important in managing respiratory disorders such as bronchial asthma. Its anti-inflammatory and bronchodilatory effects help reduce airway inflammation and ease breathing. Glycyrrhizin and flavonoids present in the root suppress allergic reactions and reduce mucus secretion, making it useful in both acute and chronic asthma. In Asia, especially in India and China, liquorice is commonly included in herbal formulations for asthma due to its effectiveness and safety profile when used in proper doses. Ongoing research is also exploring its role in modulating immune responses in allergic astama[10].

Ginger: An Overview of Their Medicinal Properties

Ginger (*Zingiber officinale*) belongs to the family Zingiberaceae which is widely used globally for its medicinal and culinary value, and is prescribed in various traditional systems of medicine, including

Ayurveda, Siddha, Unani, and others, for treating various diseases. Ginger is a perennial herb growing up to 90 cm tall, characterized by aromatic, thick, lobed rhizomes, narrow oblong lanceolate leaves, and small, rare flowers with a superior calyx and greenish corolla[11]. India is the world's largest ginger producer, with cultivation widespread across the country. The states of Odisha, West Bengal, North Eastern regions, and Kerala are particularly well-suited for ginger growth due to their climate. For over 2,000 years, ginger has been valued in India and neighbouring countries for its medicinal properties, used in both Ayurvedic and Chinese medicine to treat various ailments, including heart issues, stomach problems, diarrhea, and nausea[12].

Figure 3: Rhizome of Zinger officinale

The essential oil of Z. officinale rhizome Is composed of 28 compounds, with sesquiterpene being the primary constituent at 53.57%. The major components include eudesmol, γ-terpinene, α-curcumene, zingiberene, alloaromadendrene, α-pinene, δ-cadinene, elemol, farnesal, E-β-farnesene, neril acetate, and β-myrcene, with concentrations ranging from 2.8% to 8.19%[13].

Secondary metabolite compounds are organic compounds derived from plants that have bioactive ability, for example phenolic, flavonid and terpenoidgroups. The phenolic compounds represent one of the main groups of secondary metabolites in plants and they are present in foods and nutraceutics. These phytochemicals have a wide range of biological actions, including the ability to act as antioxidants, ameliorate inflammation, modulate enzyme activity, and regulate gene expression. Flavonoids are important in plant biochemistry and play an important role in plant physiology, acting as antioxidants, enzyme inhibitors, pigments and light screens.

Relevance in Asthma Treatment:

Ethanol extract of ginger might also possess significant anti-inflammatory and immunomodulatory activity against allergic airway inflammation. Ginger's potential anti-inflammatory, antioxidant, and bronchodilatory effects may help alleviate asthma symptoms by reducing inflammation in the airways, relaxing airway smooth. muscles, and inhibiting inflammatory mediators, although more research is needed to confirm its efficacy as a treatment[14].

Malabar nuts: An Overview of Their Medicinal Properties

Figure 4: Malabar nut

Adhatoda vasica, commonly known as Vasaka, is a plant native to India, found up to 1,300m altitude. Its various parts, including leaves, flowers, fruits, and roots, are used to treat respiratory issues like cough, bronchitis, asthma, and as a sedative and expectorant. Traditionally, it's also used by midwives during childbirth. The plant's extracts are rich in terpenes and phenolics, which are believed to contribute to its medicinal properties[15].

Adhatoda vasica has distinctive leaves that grow in opposite pairs, are lance-shaped, and have short stalks. When dried, they turn brownish-green and have a bitter taste and smell. The plant produces showy white flowers with purple accents in dense terminal spikes, and its fruit is a small capsule containing four seeds. The plant is used to treat various respiratory issues, including tuberculosis, bronchitis, and coughs, with a decoction made from its leaves providing relief from cold symptoms[16].

Adhatoda vasica contains various chemical constituents, including essential oils, fats, sugars, and vitamins. Its leaves are rich in phenols, flavonoids, alkaloids, and other compounds. The most notable phytochemical is vasicine, a bitter quinazoline alkaloid found in flowers, roots, and leaves, with potential pharmacological benefits. Other compounds like epitaraxerol and peganidine are also present. Elemental analysis reveals the presence of various major and minor trace elements, including potassium, sodium, calcium, and iron[17].

The seeds of *Adhatoda vasica* contain 25.8% oil, comprising a mix of glycerides, including arachidic acid, lignoceric acid, oleic acid, cerotic acid, and linoleic acid, with concentrations ranging from 3.1% to 49.9%. The oil also contains other compounds, such as β-sitosterol (2.6%) and behenic acid (11.2%)[17].

Adhatoda vasica, also known as Malabar nut, is a reliable herb for asthma treatment due to its potent respiratory benefits. The plant's alkaloids, vasicine and vasicinone, effectively relieve bronchial congestion, soothe sore throats, and act as an expectorant to clear mucus. With anti-inflammatory and antispasmodic properties, Malabar nut reduces airway inflammation and relaxes airway muscles, providing relief from asthma symptoms. Its unique combination of bioactive compounds makes it a trusted remedy for alleviating asthma symptoms and promoting respiratory health[18].

Conclusion:

The combination of Malabar nut, ginger, and liquorice root shows promise in alleviating asthma symptoms. Malabar nut relieves bronchial congestion, soothes sore throats, and acts as an expectorant to clear mucus, while also reducing airway inflammation and relaxing airway muscles. Ginger's anti-inflammatory and antioxidant properties help reduce airway inflammation and protect the lungs from oxidative stress, potentially relaxing airway muscles and improving breathing. Liquorice root's anti-inflammatory properties also reduce airway inflammation, and may soothe sore throats and relieve coughs, with potential immunomodulatory effects. While more research is needed, this combination may provide a synergistic effect in alleviating asthma symptoms, and it's essential to consult with a healthcare professional before adding them to your treatment plan.

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