INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES
[ISSN: 0975-4725; CODEN(USA):IJPS00]
Journal Homepage: https://www.ijpsjournal.com

Review Article

A Review Of The Impact Of Different Herbs As An Anti-Asthmatics

Divyanshu Gahane, Aishwarya Deshmukh, Shyam Rangari*, Milind Umekar

Department of pharmaceutical chemistry, Smt. Kishoritai Bhoyar College of Pharmacy, Kamptee, Nagpur 441002

ARTICLE INFO

Received: 07 Feb 2024
Accepted: 11 Feb 2024
Published: 13 Feb 2024
Keywords:
Asthma, Mast cells, widespread illness, hyperreactivity, Inflammation, IGE
DOI:
10.5281/zenodo.10652917

ABSTRACT

Millions of people worldwide suffer from asthma, a disease that causes inflammation and bronchial hyperreactivity, and in the upcoming years, it will be more fatal to control. Factors such as prenatal tobacco smoke, genetics, antibiotic use, lung function, environmental tobacco exposure, allergic sensitization, sex and gender, and smoking contribute to its prevalence, morbidity, mortality, and economic burden. Treatment includes bronchodilators, inhibitors of IgE, and other medications. However, current treatments can cause adverse effects, leading to the search for low-risk, non-drug strategies, such as herbal remedies. Traditional herbs have a greater impact on illness with minimal side effects and have been widely used in developing nations. Certain herbs, such as haridra/turmeric, lobelia, black seed, adhatoda, and camphor, have the potential to mitigate symptoms by decreasing inflammation. Herbs like cardamom, garlic, and tulsi also have potent antiasthmatic action and anti-inflammatory, immunomodulatory, antihistaminic, smooth-muscle relaxant, and allergic properties.

INTRODUCTION

The incidence of asthma is a widespread illness that is increasing globally, with developed nations having the highest frequency. Approximately 300 million people worldwide suffer from asthma, and by 2025, an additional 100 million people are expected to be impacted [1]. Since the 1970s, the global prevalence, morbidity, mortality, and economic burden of asthma have increased particularly in children [2]. It is a condition of bronchial hyperreactivity associated with inflammation. The antibody IgE adheres to mast cells. and when it is exposed to antigens (foreign particles), the antigen binds to this IgE (bound to mast cells), which, on activation, leads to the degranulation of mast cells and results in the release of mediators.

***Corresponding Author:** Shyam Rangari
Address: *Department of pharmaceutical chemistry, Smt. Kishoritai Bhoyar College of Pharmacy, Kamptee, Nagpur 441002*
Email : shyamrangari98@gmail.com
Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

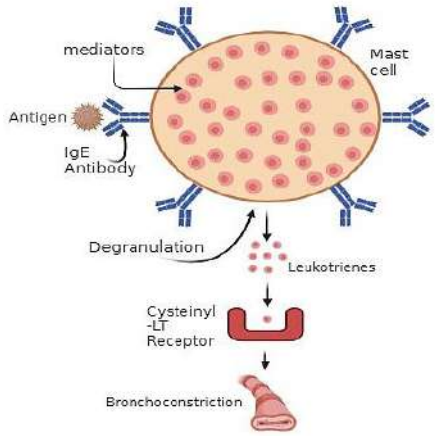

Fig – 1 Pathophysiology Of Asthma

Mediators released from mast cells include leukotrienes (LTs), prostaglandins (PGs), platelet-activating factor (PAF), histamine, and protease enzymes. These mediators can lead to bronchoconstriction (and thus an acute attack of asthma) as well as inflammation leading to hyperreactivity [3].

FACTORS RESPONSIBLE FOR ASTHMA –

1. **Prenatal Tobacco Smoke -**

Prenatal maternal smoking has been consistently associated with early childhood wheezing [4], and there is a dose-response relationship between exposure and decreased airway calibre in early life [5]. Prenatal maternal smoking is also associated with increased risks of food allergy, cytokine responses in the cord blood, and concentrations of nitric oxide in exhaled air in newborns. Studies have shown a clear prenatal effect of smoking; this effect is increased when combined with postnatal smoke exposure [6].

2. **Genetics**

Family and twin studies have indicated that genetics plays an important role in the development of asthma and allergy [7]

3. **Antibiotic Use**

Early childhood asthma and chronic wheezing were linked to a higher incidence of antibiotic usage, according to longitudinal cohort studies [8,9].

4. **Lung Function**

Reduced airway diameter during infancy has been identified as a risk factor for episodic wheeze and may be linked to exposure to ambient tobacco smoke during pregnancy and postpartum. Furthermore, the presence of airways with decreased caliber has been associated with increased bronchial responsiveness and increased symptoms of wheezing.[10] Maternal smoking with in-utero nicotine exposure has been correlated with this type of lung dysfunction [11].

5. **Exposure to Environmental Tobacco**

Inhalation of tobacco smoke by the mother during pregnancy, in particular, has been repeatedly linked to wheezing symptoms in the respiratory system. Exposure to environmental tobacco smoke also consistently worsens asthma symptoms and is a risk factor for severe asthma. [12,13]

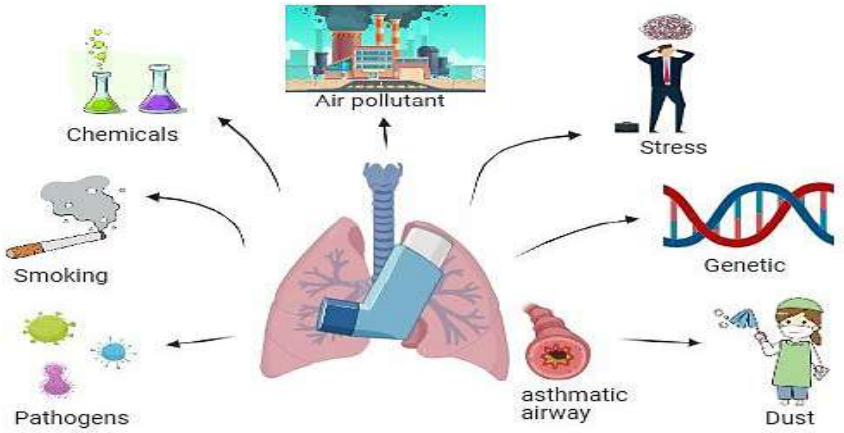

Fig.no.2 Different factors responsible for asthma

6. Allergic Sensitization

The incidence of asthma has been correlated with total blood immunoglobulin E level, a stand-in for sensitivity to allergens. [14], but this is not always associated with asthma. However, it is well-recognized that sensitization to aeroallergens, particularly those originating from house dust mites, cats, and cockroaches, is associated with asthma. Immune responses in developing newborns and early children may have an impact on asthma development [15].

7. Sex and Gender

There is a time-dependent relationship between sex and asthma development. Until age 13–14 years, the incidence and prevalence of asthma are greater among boys than among girls [16]. Studies through puberty have shown a greater incidence of asthma among adolescent and young adult females [17,18]. Although mechanisms explaining gender disparities are yet unknown.

8. Other Risk Factors for Adult Asthma

Smoking tobacco [19] or marijuana [20,21] may give rise to symptoms suggesting asthma, although symptoms of cough and sputum production, suggesting chronic bronchitis, are more common.

TREATMENT APPLIED TO ASTHMA

The drugs effective for the treatment of acute attacks of bronchial asthma are bronchodilators (sympathomimetics, parasympatholytics, and methyl xanthines). Adrenergic drugs (β2 agonists) act by stimulating GPCRs that result in the activation of adenylyl cyclase and finally an increase in cAMP, which causes smooth muscle relaxation (bronchodilation). For example, salbutamol (albuterol), metaproterenol, pirbuterol, and terbutaline are fast-acting drugs by the inhalational route they are used for aborting an attack of acute asthma. Anticholinergic drugs cause dilation of mainly large airways. These are less efficacious and slower-acting bronchodilators than sympathomimetics. These drugs are more effective for COPD than for bronchial asthma. Ipratropium, tiotropium, and umiclidinium are anticholinergic drugs (M3 antagonists) that can be used only by inhalation. Other drugs used in asthma include those inhibiting IgE (omalizumab), stabilizing mast cells (sodium cromoglycate), decreasing the production of mediators (corticosteroids and zileuton), and inhibiting the actions of mediators (zafirlukast and montelukast) [22].

MANY ADVERSE IMPACTS OF CURRENTLY USED ASTHMA TREATMENTS

A. Bronchodilator's (including sympathomimetic, anticholinergic)

Some of the side effects of these drugs are Ankle edema, palpitations, restlessness, anxiety, throat discomfort, and muscle tremors (dose-related).

The following side effects related to the use of anticholinergic are Dry mouth, trouble swallowing and speaking, red rash, photophobia, blurred vision in the near field (due to atropine and its congeners), palpitations, ataxia, delirium, hallucinations, hypotension, fast and weak pulse, convulsions, and coma (in cases of severe poisoning).

B. Theophylline

Side effects observed mainly Convulsions, shock, arrhythmias, increased muscle tone, tachypnoea, (dose-dependent) flushing, hypotension, restlessness, tremors, vomiting, palpitation, diuresis, dyspepsia, insomnia, etc.

C. Corticosteroids

Cushing's habitus, fragile skin, purple striae, hyperglycemia, muscular weakness, susceptibility to infection, delayed healing of wounds and surgical incisions, peptic ulceration, osteoporosis, glaucoma, growth retardation, psychiatric disturbances, suppression of hypothalamic-pituitary-adrenal (HPA) axis, etc [23] Consequently, the search for effective low-risk, non-drug strategies that provide a valuable adjunctive or alternative treatment in asthma

management is clinically attractive and relevant. The use of herbal remedies in the management and treatment of asthma is growing at a significant rate. Oxidative stress in the lungs can contribute to inflammation and airway constriction, so antioxidants may help people manage asthma by countering the effects of excess reactive oxygen species and reactive nitrogen species. Antioxidant supplements effectively lessen the severity of bronchoconstriction by decreasing pro-inflammatory processes. The inflammation associated with asthma causes the airways to swell and narrow, resulting in symptoms such as coughing, chest tightness, wheezing, and shortness of breath. Certain herbs have the potential to mitigate these symptoms by decreasing inflammation. For those who suffer from asthma, immune-boosting herbs are especially helpful because a robust immune system is better able to handle triggers and may lessen the frequency of asthma attacks. Anti-inflammatory, immunomodulatory, antihistaminic, smooth-muscle relaxants, and allergic properties are desirable in medicinal plants used to treat asthma [24]. Ayurveda states that medications used to treat asthma should possess qualities like anti-kapha and anti-vata [25].

The present review describes some plants that have been pharmacologically evaluated for those parameters involved in asthma.

DIFFERENT HERBS USED FOR ASTHMA -

1. Haridra/Turmeric

Synonyms –

Indian Saffron, Curcuma, Turmeric, Haldi

Curcumin, a natural product from the rhizomes of Curcuma longa (turmeric), belongs to the family Zingiberaceae. The presence of an important constituent, curcumin, may have potential effects on controlling allergic diseases by inhibiting the production of cytokines, eosinophil function, and IgE synthesis [26]. Using a constant volume body plethysmograph, the effect of curcumin on airway hyperresponsiveness in sensitized guinea pigs was revealed. Curcumin dramatically reduced ovalbumin-induced airway constriction and airway hyperreactivity in guinea pigs. [27]. Curcumin also has a wide range of beneficial properties, including anti-inflammatory, anti-oxidant, anti-rheumatic, anti-carcinogenic, anti-coagulant, anti-fertility, anti-diabetic, anti-bacterial, anti-viral, anti-fibrotic, hypolipidemic, and hypoglycaemic activities [28].

2. Lobelia

Synonym –

Indian Tobacco, Indian Weed asthma weed, Gagroot, vomit wort

Lobelia inflata, an herbal species, belongs to the family Campanulaceae, also known as Lobelia, which contains (piperidine) alkaloids, mainly lobeline; other constituents include resin, gum, lipids, and chelidonic acid.

It facilitates expectoration, aids in secretion release, and supports breathing. A respiratory stimulant called Lobeline stimulates the afferent neurons in the lungs [29], and the use of Lobeline for treating chronic obstructive pulmonary disease in horses has been investigated in veterinary medicine. [30]. Through several methods, including activating extrapulmonary capillary receptors (J-receptors), lobelia promotes the cough reflex [31]. The larynx and trachea are the most common locations for eliciting the cough reflex, where nerve fibers associated with “rapidly adapting receptors" and laryngeal J-receptors can be stimulated and trigger a cough. J-receptors are known to be activated by capsaicin, lobeline, bradykinin, sulfur gases, and mechanical manipulation [32–33].

3. Black Seed

Synonym –

Black caraway, nigella

Black seed is the common name for the seeds of the Nigella sativa plant that belongs to the family Ranunculaceae, also known as Nigella.

It is proven that volatile oil from Nigella sativa protected guinea pigs against histamine-induced bronchospasm, but it did not affect histamine H1 receptors in isolated tissues [34]. However, increasing respiratory rate and intratracheal pressure in guinea pigs due to intravenous administration of volatile oil from Nigella sativa has been demonstrated [35]. Asthma patients may benefit from Nigella sativa's antihistaminic action, which may also have an anti-inflammatory impact and inhibit the inflammatory effects of histamine generated by mast cells and basophils. The arachidonic acid metabolic pathways 5-lipooxygenase and cyclooxygenase, as well as membrane lipid peroxidation, have been shown to be inhibited by the essential oils of Nigella sativa and thymoquinone [36]. In addition, the antitussive effect of Nigella sativa has been proven [37], And also the prophylactic effect of Nigella sativa seed extract in asthmatic patients [38].

4. Vasaka

Synonyms –

Adhatoda, Adulsa, Malabar nut, Vasuka

The plant Adhatoda vasica, belonging to the family Acanthaceae, is used as an ingredient in 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 [39]. Usually, yellow leaves are exploited for coughing [40], and smoke from leaves is used for asthma [41]. The extract of the roots of Adhatoda vasica is commonly used by the rural population against diabetes, cough, and certain liver disorders [42]. Various preparations of flowers are used for the treatment of colds, phthisis, asthma, bronchitis, coughs, antispasmodics, and fevers [43]. The fruit of Adhatoda vasica is used for curing colds and bronchitis [44]. In traditional medicine, adhatoda has been used to treat respiratory conditions. Both vasicine and vasicinone, the primary alkaloid constituents of Adhatoda, are well-established as therapeutic respiratory agents [45]. Adhatoda leaf and root extracts help relieve common colds and coughs, as well as bronchitis and other lung and bronchiole problems. Adhatoda leaves can be used to make a decoction that soothes throat discomfort and works as an expectorant to clear the respiratory tract of mucus. To evaluate the antitussive activities of Adhatoda extract in anesthetized guinea pigs, rabbits, and unanesthetized guinea pigs, the plant showed good antitussive activity [46]. Recent investigations using vasicine showed bronchodilatory activity both in vitro and in vivo [47].

5. Camphor

Synonym –

Kapoor, Kapur

The Lauraceae family plant Cinnamomum camphora is steam-distilled to produce camphor oil. Traditional medicine has long used Cinnamomum camphora, sometimes known as camphor, to treat conditions involving inflammation, including rheumatism, sprains, bronchitis, asthma, indigestion, and muscle aches [48]. The modulatory effect of Cinnamomum camphora on macrophage-mediated inflammatory production, NO release, PGE2 release, functional activation of adhesion molecules, and oxidative stress to understand its anti-inflammatory action [49]. The anti-inflammatory actions of Cinnamomum camphora may be due to the modulation of macrophage-mediated inflammatory events such as cytokine secretion and the production of inflammatory mediators [50].In several studies, the chemical composition and antioxidant, anti-inflammatory, and anti-cholinesterase (AChE) activities of sage (Salvia species) were evaluated. It was shown that their major monoterpenoid components, such as camphor, camphene, 1,8-cineole, α-pinene, β-pinene, and borneol, were responsible for the anti-inflammatory and anti-cholinesterase activities of

these essential oils, which are relevant to treating patients with asthma [51,52].

6. Cardamom

Synonym –

Cardamom, elaichi

Elettaria cardamomum (family Scitaminaceae) is commonly known as “cardamom” and locally known as "elaichi." For culinary purposes, cardamom has been used in traditional medicine for asthma, constipation, colic, diarrhea, dyspepsia, hypertension, and epilepsy and is considered useful as an antibacterial, antifungal, antiviral, carminative, diuretic, and stomachic [53–54]. The cardamom extract was then studied in isolated tracheal tissues to elucidate the possible mode of bronchodilator action, where the crude extract of cardamom caused relaxation of both carbachol and K+-induced contractions, like verapamil, a Ca++ antagonist [55] used as the positive control. The inhibitory effect of the crude extract of cardamom against the two spasmogens indicates a nonspecific trachea-relaxant effect, mediated through a Ca++ channel blocker-like mechanism [56]. Ca++ antagonists are known to be effective in asthma [57], and the presence of such activity, as observed in this study, may explain the medicinal use of cardamom in such a disorder of airway hyperactivity. The flavonoids are well known for their bronchodilatory activity [58], and the presence of such a class of compounds in cardamom is likely to contribute to its relaxing airway action.

7. Garlic

Synonyms –

Garlic, allium

The bulbs of the Allium sativum Linn. family Liliaceae, also known as garlic, have been used as herbal medicine to treat asthma, bronchitis, influenza, and colds [59]. Besides, it serves as a treatment for respiratory infections [60]. It is commonly used to treat bronchopulmonary diseases as an expectorant antiseptic and asthma [61]. A study used BALB/c mice as a model to examine the effects of intraperitoneal injection of aged garlic extract (AGE) on established allergic airway inflammation. The percentage of eosinophils in bronchoalveolar lavage fluid (BALF), immunoglobulin G1 (IgG1) levels in serum and BALF, the percentage of mucous-producing goblet cells, and peribronchial and perivascular inflammation were all reduced following the injection of AGE. The results also demonstrated that garlic extract was able to downregulate levels of IL-4, IL-5, and IL-13 and to upregulate IL-10 expression in BALF. These findings suggest that garlic extract might offer clinical advantages or benefits as a supplementary component to enhance asthma treatment. As well as modulating the immune responses of Th1 and Th2 cells, garlic extract might exert an antiasthmatic effect through the regulation of other cytokines.[62]

8. Ginkgo biloba

Synonyms –

Maidenhair tree, Kew tree

The plant Ginkgo biloba, which belongs to the family Ginkgoaceae, has many constituents from which di-terpene lactone, namely ginkgolides B, is used in treating severe sepsis. Ginkgo extract is traditionally used for asthma. It has been reported that ginkgolide B is a potent inhibitor of PAF-induced thrombocytopenia and bronchoconstriction. It has been determined that G. biloba is a functional food that can alleviate airway inflammation [63]. It has been demonstrated that G. biloba contains polyphenolic compounds with anti-inflammatory qualities, such as flavonoids [64]. G. biloba has long been used in traditional Chinese medicine to treat lung conditions such as asthma, coughs, and other lung problems. Bi-flavones in G. biloba could inhibit leukocyte elastase activity [65]. Ginkgolide B and ginkgolide mixtures could improve inflammation in an experimental LPS-induced inflammatory

lung model [66]. Ginkgo biloba extracts could suppress pulmonary fibrosis of lung tissue and have protective effects by regulating the balance of M1/M2 macrophages [67]. Another benefit of EGb761 is its preventive effect against acute lung injury by decreasing the function of JNK- and Akt-mediated NF-kB activation pathways [68].

9. Tulsi

Synonyms –

Sacred basil, holy basil

The therapeutic potential of the essential oils extracted from the fresh leaves of Ocimum sanctum L. (Tulsi), which belongs to the family Lamiaceae, has been found to be largely due to eugenol (a major constituent of the essential oil), which is a phenolic compound (l-hydroxy-2-methoxy-4-allylbenzene). Eugenol and the essential oils have also been observed to possess membrane-stabilizing properties on synaptosomes, erythrocytes, and mast cells, which account for the therapeutic potential of Tulsi in the management of neurological (e.g., convulsions and epilepsy), inflammatory, and allergic disorders [69, 70, 71]. The significant antiasthmatic activity of OS may be due to its smooth muscle relaxant property, which is attributed to the elevation of cAMP in bronchial smooth muscle cells and the blocking of replication of smooth muscle cells. [72] Its smooth muscle relaxant property has also been shown on intestinal smooth muscle when it was administered parenterally and orally, modulating humoral responses at various levels in the immune system, such as antibody production (IgE production in the case of asthma), the release of mediators of hypersensitivity reactions (such as histamine, PGs, and LTs), and tissue response to these mediators [73–75]. The activity of OS may be due to eugenol in the volatile oil. It may be predicted that the hydroxy group in the fourth position of the phenyl ring is responsible for bronchial smooth muscle relaxation. The presence of methoxy and propylene groups on the phenyl ring may confer maximum β-activity and selectivity. The presence of ursolic acid in the volatile oil may be responsible for anti-inflammatory activity, which may be due to inhibition of COX [76].

CONCLUSION

Herbs have been used for centuries to treat respiratory conditions such as asthma and are thought to be superior to synthetic or semi-synthetic treatments. As several toxicological studies have demonstrated, these techniques have been widely employed throughout and are proven to be efficient with little to no negative effects. The development of new asthma drugs strategically benefits from the use of herbal treatments made from medicinal plants. Herbal plants are thought to have great therapeutic and economic value for asthma. In the domains of the chemical, agricultural, food, and pharmaceutical industries, this is vital. Each species contains a vast range of chemical components, such as volatile oils, carbohydrates, alkaloids, tannins, glycosides, resins, and so on. This species has a great therapeutic value because of its chemical components. Herbs have been found to have a wide range of pharmacological properties that make them indispensable in the chemical, agricultural, food, and pharmaceutical industries. These properties include antimicrobial activity, antioxidant activity, anti-inflammatory and analgesic activity, antitumor activity, anti-diabetic and anti-obesity activities, immunoregulation activity, insecticidal and acaricidal activities, cardiovascular protective activity, cytoprotective activity, and neuroprotective activity.

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HOW TO CITE: Divyanshu Gahane, Aishwarya Deshmukh, Shyam Rangari, Milind Umekar, A Review Of The Impact Of Different Herbs As An Anti-Asthmatics, Int. J. of Pharm. Sci., 2024, Vol 2, Issue 2, 285-296. https://doi.org/10.5281/zenodo.10652917