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Herbal medicine for asthma: A Systemic Review.

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A B S T R A C T :

Asthma is a common chronic inflammatory disorder marked by reversible airflow obstruction, airway hyperresponsiveness, and airway remodelling. This condition significantly impacts individuals, their families, and society as a whole. Many plants have been documented in traditional medicinal systems as effective for treating various respiratory disorders, including asthma. In the last twenty years, the use of medicinal plants and natural products has markedly risen worldwide. Current synthetic drugs used in asthma pharmacotherapy are unable to treat all stages and targets of the illness. However, specific herbal alternatives employed in asthma have been shown to provide clinical relief and assist in mitigating disease progression. The herbs exhibit significant efficacy in multiple specific biological activities, including bronchodilation, mast cell stabilisation, anti-anaphylactic effects, anti-inflammatory properties, anti-spasmodic actions, anti-allergic responses, immunomodulation, and the inhibition of mediators such as leukotrienes, lipoxygenase, cyclooxygenase, platelet-activating factors, phosphodiesterase, and cytokines in asthma management. This study aims to classify these pharmacological and clinical results based on their purported mechanisms of action. It also signifies the need for the development of polyherbal formulations including multiple herbs that address various aspects of the pathophysiological cascade of asthma for both prevention and treatment. This study sought to aggregate knowledge on plants and their bioactive components with experimentally confirmed antiasthmatic effects. This systematic review sought to evaluate the quality of research on ayurvedic herbs, as well as their efficacy and safety profiles as documented in the literature. .

Keywords: asthma, herbal medicine, antiasthmatic, medicinal plant.

1.Introduction:

The National Institute of Health characterises asthma as a chronic inflammatory disorder of the airways, in which cellular elements such as mast cells, T-lymphocytes, eosinophils, epithelial cells, and neutrophils are significantly involved [1,2]. Asthma is an inflammatory disorder that impacts the airways, causing their constriction and resulting in changes in eosinophils, mast cells, lymphocytes, and cytokine concentrations. The condition is characterised by the intensification of coughing, dyspnea, wheezing, and chest constriction. The asthmatic individual is characterised by heightened IgE levels that attach to mast cell receptors and inflammatory mediators. The interaction between antigen and antibody IgE triggers the activation of an inflammatory cellular response. This leads to the production of mediators including histamine and prostaglandins, which ultimately cause the contraction of airway smooth muscles. Asthma may be triggered by various factors, including viral respiratory infections, certain chemicals, certain drugs, airborne allergens, occupational sensitizers, smoke, and air pollution. Stress, anxiety, or intense emotional stimuli may also trigger asthmatic episodes. They are classified into two primary categories. Exogenous Asthma: It is triggered by allergic reactions to agents such as household dust, pet dander, or specific foods. These situations represent around 10-20%. Intrinsic Asthma It is due to genetic causes, anatomical anomalies, and infections. Both physiological and psychological factors. These occurrences include roughly 50-60% [5,6]. 1.1. Asthma Classification: Moderate: Mild dyspnea; diffuse wheeze; adequate air exchange. The symptoms persist for over two weeks but are not seen on a daily basis. Moderate: Respiratory distress at rest; hyperpnea; use of accessory muscles; significant wheeze. The symptoms occur daily. Severe: Marked respiratory distress; cyanosis; use of accessory muscles; severe wheezing or missing auscultatory sounds. The symptoms occur several times each day, primarily intensifying at night. [7, 8].

1.2.Causes of asthma: :

It is thought to arise from the interaction of environmental influences and genetic predisposition. These factors influence its reactivity and intensity. Environmental factors include cold air, allergies, tobacco smoke, and chemicals. Genetic predisposition: A family history serves as a risk factor for asthma. If one identical twin has asthma, the likelihood of the other twin also having the illness is approximately 25%. It is believed that 25 genes are associated with asthma. 1.3. Symptoms of Asthma: The primary symptoms include: Coughing during the night Difficulty in breathing Wheezing Thoracic tightness, pain, or pressure 1.4. Asthma Pathophysiology: Asthma is an airway disorder defined physiologically by a variable and partially

reversible airflow obstruction, and pathologically by hyperplastic mucus glands, airway thickening due to fibrosis and inflammation, and bronchoconstriction, which is the narrowing of the airways in the lungs caused by the contraction of surrounding smooth muscle. Bronchial inflammation leads to constriction caused by edoema and edoema triggered by an immune response to allergens. 1.5. Management of Asthma: Asthma is incurable; however, it can be controlled with several pharmaceutical medicines that offer quick relief, but they may have some bad effects. Expedited alleviation for asthma includes bronchodilators (delivered by nebulisers or inhalers), anti-inflammatories, anticholinergics, and biological therapeutic agents. To counteract the adverse effects linked to asthma treatment, medicinal plants and herbs are employed concurrently.

Bronchodilators:

Bronchodilator drugs demonstrate an anti-bronchoconstrictor effect, which can be substantiated in vitro by the drug-induced relaxing of precontracted airways (Barns et al. 1988). Bronchodilators rapidly relieve airway obstruction in patients with asthma. This function is believed to be facilitated by a direct impact on airway smooth muscle. However, additional pharmacologic effects on other airway cells, including capillary endothelium to reduce microvascular leakage and mast cells to suppress the production of bronchoconstrictor mediators, may improve the overall alleviation of airway constriction. At present, three classifications of bronchodilators are employed in clinical practice: beta-adrenergic agonists, methylxanthines, and anticholinergics. Anti-inflammatory medications: Although the characteristics of inflammatory responses may differ between diseases, inflammation remains a common element in various respiratory conditions. Anti-inflammatory medicines reduce the inflammatory response by inhibiting the infiltration and activation of inflammatory cells, as well as their production. Release of mediators or the impact of inflammatory mediators themselves. Corticosteroids.

Plants	**Plants part used**	**Mechanism of action**	**Reference**
1.Curcuma longa	Rhizome	Anti-Inflammatory	[13]
2.Nigella sativa	Seed	Bronchodilator	[14]
3.Ginkgo biloba	Leaves	Bronchodilator	[15]
4.Zingiber officinale	Rhizome	Antiasthmatic	[16]
5. Glycyrrhiza glabra	Root	Antiasthmatic	[17]
6.Acalypha indica	Leaves, roots	Bronchodilators	[18]
7.Ephedra sinica	Stem	Bronchodilators	[19]
8.Mangifera indica	Seed	Asthma	[20]
9.Allium cepa	Juice	Mast cell stabilizer	[21]
10.Ocimum sanctum	Leaves	Bronchodilators	[22]
11.Moringa olifera	Seed	Bronchodilators	[23]
12.Boswellia serrata	Gum resin	Antiasthmatic	[24]
13.Acacia catechu	Bark, Fruit	Bronchodilators	[25]
14.Piper longum	Fruit	Antiasthmatic	[26]
15.Tamarindus indica	Bark	Anti-Inflammatory	[27]
16.Mentha spicata	Leaves	Mast cell stabilizer	[28]
17.Mimosa pudica	Leaves	Antiasthmatic	[29]
18.Aerva lanta	Aerial part	Antiasthmatic	[30]

19.Emblica officinalis	Fruit	Asthma	[31]
20.Lepidium sativum	Seed	Bronchodilators	[32]

TABLE 1: LIST OF MEDICINAL PLANTS USED IN ASTHMA

Different herb used in Asthma:

1. **Curcuma longa: -**

Fig.1 Curcuma longa

Botanical Name	Curcuma longa
Kingdom	Plantae
Order	Zingiberles
Family	Zingiberaceae
Genus	Curcuma

Table No 2. Curcuma longa Plant Taxonomy

- Common name: turmeric
- Family: (Zingiberaceae)
- Chemical constituents: Curcumin, Curcuminoids

Curcuma longa has been known to Indians since centuries. It Has been purported to have anti-inflammatory actions. Anti-asthmatic property of Curcuma longa has been tested in Experimental animal model of airway hyperresponsiveness and Has been documented to be effective in improving the Impaired airways feature's[33]

2. **Nigella sativa:**

Fig.2 Nigella sativa

Botanical Name	Nigella sativa
Kingdom	Plantae
Order	Ranunculales
Family	Ranunculaceae
Genus	Nigella

Table No 3. Curcuma longa Plant Taxonomy

- Common name: kalajira
- Chemical constituents: Thymoquinone, flavonoids, unsaturated fatty acid

Petroleum ether fraction of N. sativa seed extract has been Shown to possess spasmolytic and bronchodilators activities in In vitro experiments. Activity is possibly mediated through calcium channel blockade[34].

3. Zingiber officinale: -

Fig.3 Zingiber officinale

Botanical Name	Zingiber officinale
Kingdom	Plantae
Order	Zingiberales
Family	Zingiberaceae
Genus	Zingiber

Table No 4. Zingiber officinale Plant Taxonomy

- Common name: Ginger
- Chemical constituents: Trepenes, phenolic compound, lipids, carbohydrates

It is a powerful natural expectorant used widely in Chinese as Well as Indian formulations for coughs, colds, and chronic Bronchitis. The dried rhizome of ginger contains Approximately 1–4% volatile oils. It is considered to be a Powerful natural anti allergy agent specially acting on Respiratory system[35].

4. Glycyrrhiza glabra:-

Fig.4 Glycyrrhiza glabra

Botanical Name	Glycyrrhiza glabra
Kingdom	Plantae
Order	Fabales
Family	Fabaceae
Genus	Glycyrrhiza

Table No 5. Glycyrrhiza glabra Plant Taxonomy

- Common name: Liquorice
- Chemical constituents: glycyrrhizin, enoxolone , flavonides , glycyrrhetic acid

Induces the adrenal cortex to maken natural . cortisone Thus having a systemic anti- inflammatory effect on the lungs And most other organ's[36].

5. Acalypha indica:-

Fig.5 Acalypha indica

Botanical Name	Acalypha indica
Kingdom	Plantae
Order	Malpighiales
Family	Euphorbiaceae
Genus	Aclypha

Table No 6. Acalypha indica Plant Taxonomy

- Common name: Kuppi
- Chemical constituents: alkaloids, flavonides, tannis, pyroquinioline

According to Siddha Materia Medica, the leaf powder when given in the daose of 950 mg to 1300 mgs, cures respiratory diseases. Expressed juice of the leaves is useful in chronic bronchitis, asthma and consumption[37].

6. Ephedra Sinica:-

Fig.6 Ephedra Sinica

Botanical Name	Ephedra Sinica
Kingdom	Plantae
Order	Ephedrales
Family	Ephedraceae
Genus	Ephedra

Table No 7. Ephedra Sinica Plant Taxonomy

- Common name: mahuang
- Chemical constituents: Flavonoids, tannins, saponins.

This is the most widely known Chinese herb used to treat Asthma. Ephedra plants contain about 2 to 3% naturally-Occurring ephedra alkaloids, mostly ephedrine and Pseudoephendrin Both alkaloids stimulate the alpha and beta-Adrenergic receptors, and in general act similarly to Norepinepherine (adrenaline). This in turn will act to dilate theBronchial tubes (for asthma, hay fever etc) as well as increase CNS and cardiac activity. The only safe recommended use of Ephedra is for short-term Bronchodilator[38,39].

7. Allium cepa :-

Fig.7 Allium cepa

Botanical Name	Allium cepa
Kingdom	Plantae
Order	Asparagales
Family	Lilliaceae
Genus	Allium

Table No 8. Allium cepa Plant Taxonomy

- Common name: Pyaaz, Onion
- Chemical constituents: Allicin, quercetin, fisetin.

Dorsch W et.al, had studied the effect of onion oil on Platelet-activating factor- induced bronchial obstruction by Onion oils. In this study lyophilized onion extract and ether Extracts of onions were separated by chromatographic Methods into several subfractions and tested for their effects on asthmatic reactions of guinea pigs to allergen, histamine, Acetylcholine and platelet-activating factor (PAF) inhalation as Well as on thromboxane biosynthesis of human platelets and Lung fibroblasts. Onion oils are counteracting the bronchial Obstruction due to PAF inhalation. Thus onion oil can be Effectively used in the treatment of asthma[40].

8. Ocimum sanctum:

Fig.8 Ocimum sanctum

Botanical Name	Ocimum tenuiflorum
Kingdom	Plantae
Order	Lamiales
Family	Lamiaceae
Genus	Ocimum

Table No 9. Ocimum sanctum Plant Taxonomy

- Common name: Tulsi
- Chemical constituents: Flavonoids, oleanolic acid, eugenol.

The anti-asthmatic activity of a 50% aqueous ethanol extract of dried and fresh leaves, and the volatile and fixed oils of Ocimum sanctum was evaluated against histamine and Acetylcholine induced pre-convulsive dyspnea (PCD) in guinea Pigs. The 50% ethanol extract of fresh leaves, volatile oil Extracted from fresh leaves and fixed oil from the seeds Significantly protected the guinea pigs against histamine- and Acetylcholine-induced pcd.[41,42].

9.Moringa olifera:

Fig.9 Moringa olifera

Botanical Name	Moringa olifera
Kingdom	Plantae
Order	Brassicales
Family	Moringaceae
Genus	Moringa

Table No 10. Moringa olifera Plant Taxonomy

- Common name: Sehjan, Drumstick Tree
- Chemical constituents:Rutin, gallic acid, lutein.

The present study was carried out to investigate the efficacyAnd safety of seed kernels of Moringa oleifera in the treatment of Bronchial asthma. Twenty patients of either sex with mild-to-Moderate asthma were given finely powdered dried seed Kernel S in dose of 3 g for 3 weeks. The clinical efficacy with respect To symptoms and respiratory functions were assessed using a Spirometer prior to and at the end of the treatment[43].

10. Boswellia serrata:-

Fig. 10 Boswellia serrata

Botanical Name	Boswellia serrata
Kingdom	Plantae
Order	Sapindales
Family	Burseraceae
Genus	Boswellia

Table No 11. Boswellia serrate Plant Taxonomy

- Common name: Indian olibanum tree.
- Chemical constituents: Boswellic Acid.

Boswellia is an Ayurvedic plant that contains anti-Inflammatory triterpenoids called boswellic acids. Boswellic Acid and its derivatives have anti-carcinogenic, anti-tumor, and Blood lipid lowering activities. Dried extracts of the resin of The Boswellia serrata tree have been used since antiquity in India to treat inflammatory conditions. It inhibits proinflammatory 5-lipoxygenase chemicals and blocks leukotriene synthesis and Thus boswellia may helpful in medical conditions involved in nflammation including asthma[44,45].

Conclusion:

The principal method by which the aforementioned plants and substances have confirmed therapeutic effects on asthma is their anti-inflammatory characteristics.

The avoidance of airway remodelling, relaxation of tracheal smooth muscles, antihistaminic properties, reduction of airway hyperresponsiveness, and antioxidant activities are all critical mechanisms of antiasthmatic action. These findings may aid researchers in identifying phytochemicals inside each plant or in familiarising themselves with herbal ingredients for the creation of innovative antiasthmatic drugs. Beyond assessing the safety and adverse effects of the previously mentioned plants and compounds, investigating the additive and synergistic effects of diverse bioactive constituents to create more efficacious formulations with minimised side effects may signify prospective research directions to enhance the clinical utilisation of herbal therapies.

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