

A Review on Plant Based Herbal Medicines and Their Pharmacological Action for Asthma

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Abstract—Asthma is a chronic inflammatory disorder of the airways characterized by reversible airflow obstruction, bronchial hyperresponsiveness, mucus hypersecretion, wheezing, cough, and breathlessness. The reviewed studies collectively explore the role of herbal and Ayurvedic interventions as complementary approaches to conventional asthma therapy, which often relies on bronchodilators and corticosteroids but may produce long-term adverse effects. Clinical evaluation of *Boswellia carterii* demonstrated that its extract containing 37.5% boswellic acids improved pulmonary function (FEV1, PEF), reduced asthma attack frequency—particularly in severe persistent cases—and showed good tolerability. Boswellic acids act by inhibiting 5-lipoxygenase and leukotriene synthesis, thereby reducing airway inflammation. An Ayurvedic comparative clinical study on Kantakari Ghrita and Vasa Ghrita for Tamaka Shwasa (bronchial asthma) reported significant symptomatic and objective improvements, with 76.79% overall improvement in the Kantakari group compared to 37.94% in the Vasa group. These formulations, administered through Snehapana followed by Virechana, aim to correct Kapha-Vata imbalance and clear airway obstruction. Studies on Shati (Simhayadi Kwath with Shati Churna) showed reductions in eosinophil count, ESR, and serum IgE, indicating anti-inflammatory and immunomodulatory effects. *Euphorbia hirta* and *Lobelia inflata* are traditionally recognized for bronchodilatory, expectorant, and antispasmodic properties. Overall, the combined findings suggest that these herbal therapies possess anti-inflammatory, bronchodilatory, and immunomodulatory actions that may complement standard asthma treatment. However, larger, long-term randomized controlled trials are required to establish standardized dosing, long-term safety, and definitive clinical efficacy

Index Terms—*Boswellia carterii*, bronchodilatory, Kantakari Ghrita, bronchial asthma, Asthma; Herbal therapy; Ayurveda, Shati, *Euphorbia*, *Jatamansi*, *Lobelia*; Bronchodilator, Anti-inflammatory, Immunomodulatory Phytoconstituents.

I. INTRODUCTION

Asthma is a chronic inflammatory disorder of the airways characterized by variable and reversible airflow obstruction, bronchial hyper-responsiveness, and recurrent respiratory symptoms. It affects both children and adults and is one of the most common long-term respiratory diseases worldwide. In asthma, the bronchial tubes become inflamed, narrowed, and filled with excess mucus. When exposed to triggers such as allergens, cold air, smoke, or exercise, the airways overreact, leading to breathing difficulty. Although asthma cannot usually be cured, it can be effectively controlled with proper treatment and trigger avoidance^[19]. Herbal medicine plays a supportive and complementary role in managing Asthma, especially by reducing inflammation, improving breathing, and strengthening respiratory health. Anti-inflammatory, immunomodulatory, antihistaminic, smooth-muscle relaxant, and allergic properties should all be present in medicinal plants used to treat asthma. Ayurveda states that anti-asthmatic medications should contain qualities like anti-vata and anti-kapha. By preventing pro-inflammatory events brought on by an excess of reactive oxygen species and reactive nitrogen species, antioxidant supplements effectively lessen the severity of bronchoconstriction. Patients are looking for complementary and alternative medicine to treat their asthma because current asthma therapy is not working well enough because of side effects. One of the most common flavonoids that people consume in food is quercetin.^[20]

Symptoms of Asthma

Asthma symptoms are typically variable, recurrent, and often worse at night or early morning. The severity

and frequency differ from person to person. Major Symptoms includes wheezing, shortness of breath (Dyspnea), chest tightness cough

Types of asthma

Asthma can be classified in several ways, most commonly by cause (phenotype) and severity

A. Based on cause/phenotype

Sr.no	Types	Symptoms	Causes
1.	Allergic (Extrinsic) Asthma	eczema, allergic rhinitis	Triggered by allergens such as dust mites, pollen, mold, or animal dander
2.	Non-Allergic (Intrinsic) Asthma Not related to allergens	Shortness of breath, coughing	Triggered by infections, stress, cold air, or irritants
3.	Exercise-Induced Asthma (Exercise-Induced Bronchoconstriction)	Symptoms occur during or after physical activity. Common in athletes and children	Triggered by cold, dry air during exercise
4.	Occupational Asthma	Symptoms improve away from work. Important to identify early	Caused by exposure to workplace irritants (chemicals, dust, fumes)
5.	Nocturnal Asthma	Symptoms worsen at night	Causes sleep disturbance. Indicates poor asthma control

B. Based on Severity

frequency and lung function:

Asthma is also classified according to symptom

Sr.no	Class of asthma	Symptoms	Night symptoms	Functions
1.	Intermittent Asthma	Symptoms ≤ 2 days/week	Night symptoms ≤ 2 times/month	Normal lung function between attacks
2.	Mild Persistent Asthma	Symptoms > 2 days week but not daily	Night symptoms 3-4 times/month	—
3.	Moderate Persistent Asthma	Daily symptoms	Night symptoms > 1 time/week	Some limitation of activity
4.	Severe Persistent Asthma	Symptoms throughout the day	Frequent night symptoms	Marked activity limitation

Diagnosis of Asthma

testing demonstrating variable and reversible airflow limitation

Diagnosis of asthma is based on clinical history, physical examination, and objective lung function

Sr. No	Diagnosis	Tests/Function
1	Clinical History	• Recurrent wheezing • Episodic breathlessness • Night or early morning symptoms • Symptoms triggered by allergens or exercise • Family history of asthma or allergy • Relief with bronchodilator medication
2	Physical Examination	During an asthma attack, findings may include: • Expiratory wheeze • Prolonged expiration • Use of accessory respiratory muscles • Tachypnea (rapid breathing) • In severe cases: silent chest (medical emergency)

		Between attacks, examination may be normal.
3	Spirometry (Gold Standard)	Spirometry is the most important diagnostic test Typical Findings - Reduced FEV₁ (forced expiratory volume in 1 second) - Significant improvement after bronchodilator (reversibility) - Reversibility criterion
4	Peak Expiratory Flow (PEF)	- Measures maximum speed of expiration - Useful for home monitoring - Shows diurnal variability
5	Bronchoprovocation Test	- Used when spirometry is normal but asthma is suspected. - Methacholine challenge - Exercise challenge - Positive test indicates bronchial hyper-responsiveness.
6	Allergy Testing	May include: - Skin prick test - Serum IgE levels Helps identify triggers, especially in allergic asthma.
7	7. Additional Tests (When needed)	- Chest X-ray (to rule out other diseases) - Fractional exhaled nitric oxide (FeNO) - Blood eosinophil count - Sputum eosinophils

II. THE MEDICINAL PLANTS

A. Review Stage

Medicinal Plants	Biological source/family/ chemical constituents	Dose of marketed formulation
<i>Griitha</i>	BS: Ghritha is the clarified butter obtained from the milk of cow or buffalo by heating. Family: <i>Bovidae</i>. CC: Butericacid, palmitic acid stearic acid, oleic acid, linoleic acid.	Pediatric dose:1-3gm depending on age (Like: Dabur or baidyanath)
<i>Boswellia</i>	BS: Boswellia consist of the oleo-gum- resin obtained from the steam bark of <i>boswellia serrata roxb</i>. Family: <i>Burseraceae</i> CC: Boswellic acid Essential oils Gum Resin	Tablet / capsule: 150-250mg. Clinical/ general supplement: dose:300-1000mg per day
<i>Shati</i>	BS: Shati consists of dried rhizomes of <i>hedychium spicatum Sm</i>. Family: <i>zingiberaceae</i> CC: Resins, starch, flavonoides, hedychenol, Lenalol, α-pinene, β-pinene.	Powder/ churna:1-3g. Capsule/tablet: 250-500mg. Syrup/ liquid:5-10ml.
<i>Euphorbia</i>	BS: Euphorbia consist of the latex obtained from the plant <i>euphorbia hirta L</i>. Family: <i>euphorbiaceae</i>. CC: flevonoides, triterpenoides, tannins, alkaloids, phenolic	Powder/ churna:2-4g. Capsule/tablet: 250-500mg. Syrup/ liquid:5-10ml

	compound.	
<i>Jatamansi</i>	BS: Jatamansi is consist of the dried rhizomes and rootes of <i>Nardostachys jatamansi</i> DC. Family: <i>Caprifoliaceae</i> . CC: sesquiterpenes, jatamansic acid, coumarils, alkaloids , resins and volatile oils.	Powder/ churna:1-3g. Capsule/tablet: 250-500mg. Syrup/ liquid:5-10ml
<i>Lobelia</i>	BS: Lobelia consist of the dried leaves and flowering topes of <i>Lobelia inflata</i> L. Family: <i>Cempanulaceae</i> CC: lobeline, lobelanidine, norlobelanine, resin, fixed oil, gum.	Capsule/tablet: 100-500mg. Tincture:0.2-0.6ml Liquid herbal formulation /syrup:0.6-1g.

1.GRITHA

In Ayurveda, Ghrita (clarified butter or medicated ghee) is widely used as a therapeutic agent in the management of respiratory disorders such as Asthma, which is described as Tamaka Shwasa in classical texts. Ghrita is considered a superior medicinal base because of its Snigdha (unctuous), Madhura (sweet), and Yogavahi (catalytic) properties that help carry the active components of herbs deep into tissues. In asthma, the imbalance of Vata and Kapha doshas leads to obstruction in the respiratory channels, causing breathlessness, wheezing, and cough. Medicated ghrita helps pacify these doshas, reduces airway inflammation, and loosens accumulated mucus in the lungs. It also nourishes body tissues and improves immunity due to its Rasayana (rejuvenative) effect. Various formulations like Vasa Ghrita and Pippalyadi Ghrita are traditionally recommended to improve respiratory function and provide relief in chronic asthma conditions^[1] Pollution, allergies, smoking, urbanization, and changes in lifestyle are all contributing factors to the rise in instances. Long-term management is necessary because to its chronic and recurrent nature. Impacts on quality of life include worry, decreased productivity, and disturbed sleep. Long-term allopathic therapy side effects: Tremors, throat irritation, dependence, and decreased lung function might result from prolonged use of bronchodilators and corticosteroids. Cost burden: Taking medication continuously might be costly. Need for safer substitutes: Ayurvedic and herbal treatments may offer comprehensive, affordable care with fewer side effects.

Major plants in GRITHA

1. *Solanum xanthocarpum* (Kantakari): - Solasodine, Solasonine, Solamargine, Steroidal alkaloids,

Flavonoids

2. *Adhatoda vasica* (Vasa): - Vasicine, Vasicinone, Essential oils, Tannins, Saponins
3. *Tinospora cordifolia* (Guduchi): - Tinosporin, Tinosporide, Berberine Alkaloids Glycosides
4. *Ocimum sanctum* (Tulsi): - Eugenol, Ursolic acid, Rosmarinic acid, Flavonoids
5. *Glycyrrhiza glabra* (Yashtimadhu): - Glycyrrhizin, Liquiritin, Flavonoids, Saponins

Herbal anti-asthmatic drugs act through multiple mechanisms to relieve and manage symptoms of asthma. They produce bronchodilation by relaxing the bronchial smooth muscles, which helps open the airways and improve breathing; for example, vasicine obtained from the plant *Adhatoda vasica* (Vasa) shows strong bronchodilatory activity. These herbal drugs also exhibit anti-inflammatory effects by reducing airway inflammation through phytoconstituents such as flavonoids and alkaloids. Many herbs have mucolytic and expectorant properties, which help to thin thick mucus and promote its removal from the respiratory tract, thereby improving airflow. In addition, some medicinal plants possess immunomodulatory activity, which helps regulate immune hypersensitivity reactions commonly associated with asthma; for instance, *Tinospora cordifolia* (Guduchi) is known for its immune-regulating properties. Herbal medicines may also show antihistaminic effects, reducing allergic responses that trigger asthma attacks, along with antioxidant activity that protects airway tissues from oxidative stress and damage. From an Ayurvedic perspective, these herbs work through principles such as Kapha Shamana, which reduces excess mucus and airway obstruction; Vata Anulomana, which normalizes the movement of air in the respiratory system; and Deepana and Pachana, which improve

digestion and prevent the formation of Ama (toxic metabolic waste), thereby supporting overall respiratory health.^[2,3,4]

2. BOSWELLIA

Boswellia is a genus of trees known for producing aromatic resin commonly called Frankincense. These trees grow mainly in dry regions of India, Africa, and the Middle East. For thousands of years, Boswellia resin has been valued in traditional medicine and religious ceremonies due to its fragrance and therapeutic properties. The resin contains active compounds known as boswellic acids, which are believed to have anti-inflammatory and analgesic effects. Because of these properties, Boswellia extracts are widely used in herbal medicine to help manage conditions such as Arthritis, Asthma, and other inflammatory disorders. In modern times, Boswellia is also used in dietary supplements and pharmaceutical research. Its ability to reduce inflammation and support joint health has attracted scientific interest, leading to several studies exploring its potential health benefits. Overall, Boswellia remains an important medicinal plant with both historical and modern significance. Boswellia serrata (Salai Guggal); β -Boswellic acid; Acetyl- β -boswellic acid; 11-keto- β -boswellic acid (AKBA) Acetyl-11-keto- β -boswellic acid^[6] Boswellia serrata (Indian frankincense) helps in asthma mainly by reducing airway inflammation. Its active compounds, especially acetyl-11-keto- β -boswellic acid (AKBA), block the enzyme 5-lipoxygenase (5-LOX), which decreases the production of leukotrienes—chemicals that cause bronchoconstriction, mucus secretion, and airway swelling. It also lowers Th2 cytokines such as IL-4 and IL-5 and reduces IgE levels, which are involved in allergic asthma. By suppressing inflammatory pathways like NF- κ B and reducing eosinophil infiltration in the lungs, Boswellia helps decrease airway inflammation and improve breathing. Clinical studies have shown improvement in symptoms and lung function in some asthma patients.^[5]

3. SHATI

Shati, commonly known as *Hedychium spicatum*, is a medicinal plant widely used in traditional Indian medicine systems such as Ayurveda. It belongs to the Zingiberaceae family, which also includes ginger and turmeric. The plant is mainly found in the Himalayan

regions of India and grows well in moist, subtropical climates. Shati is valued for its aromatic rhizomes, which contain several bioactive compounds with therapeutic properties. In traditional medicine, the rhizome is used as an expectorant, digestive stimulant, and anti-inflammatory agent. It is commonly prescribed for respiratory disorders such as cough, asthma, and bronchitis, as well as for digestive problems like indigestion and loss of appetite. Apart from medicinal uses, Shati is also used in perfumery and herbal formulations because of its pleasant fragrance. Due to its diverse pharmacological properties, Shati continues to be an important plant in herbal medicine and modern phytochemical research.^[7] *Hedychium spicatum* (Shati) actively contains Essential oils, flavonoids.^[8] Phytoconstituents reduce inflammation by inhibiting cytokines, NF- κ B pathways, and ROS production; they lower eosinophils, IgE, and histamine while promoting bronchodilation and mucolysis.^[7] Sitosterol and its glucosides, furanoid diterpenes like hedychenone and 7-hydroxyhedychenone, and essential oils like cineole, terpinene, limonene, phellandrene, p-cymene, linalool, and terpineol have all been identified as important components of rhizome. According to reports, β -sitosterol inhibits nuclear factor- κ B phosphorylation, vascular adhesion molecule-1, and intracellular adhesion molecule-1 production in human aortic endothelial cells activated by TNF- α .^[32,33]

4. EUPHORBIA

The genus “Euphorbia” includes more than 2000 species distributed globally in tropical and subtropical regions. Several species, particularly “*Euphorbia hirta*”, have been extensively used in Ayurvedic, Chinese, and African traditional medicine for bronchial asthma, cough, and bronchitis.^[10] Phytochemical investigations of Euphorbia species reveal the presence of diverse bioactive compounds responsible for pharmacological activity.^[11] Asthma is a long-term respiratory condition marked by bronchoconstriction, inflammation of the airways, and increased formation of mucous. *Euphorbia hirta* has long been used to treat asthma, and more recent research has examined the antiasthmatic activity of *Euphorbia hirta* in animal models of asthma and offered scientific proof of its antiasthmatic qualities^[23, 24]. The findings demonstrated that in asthmatic rats,

the methanolic extract of *Euphorbia hirta* considerably reduced bronchoconstriction, improved lung function, and lowered airway inflammation^[26, 30]. According to the study's findings, *Euphorbia hirta* may be used to treat asthma and other respiratory conditions as a natural antiasthmatic. *Euphorbia hirta* is thought to have antiasthmatic properties since it contains flavonoids such as rutin and quercitrin. It has been demonstrated that these substances prevent the release of histamine and other inflammatory mast cell mediators. Additionally, these substances lessen airway resistance and relax bronchial smooth muscle.^[21,22,23]

5. JATAMANSI

Nardostachys jatamansi DC., belonging to the family Valerianaceae, is a perennial rhizomatous herb widely distributed in the Alpine Himalayas at altitudes of 3000–5000 meters. The rhizomes and roots constitute the medicinally important parts of the plant. It has been extensively used in Ayurveda, Unani, and other traditional systems of medicine for centuries. In Ayurveda, *Jatamansi* is described as “Kasawasahara”, meaning it alleviates cough and breathing difficulties, indicating its importance in respiratory disorders such as asthma. Besides its respiratory benefits, the plant is known for neuroprotective, hepatoprotective, antioxidant, tranquilizing, antihypertensive, and anti-inflammatory properties. Experimental studies have validated its usefulness in histamine-induced bronchial asthma models.^[13] *Nardostachys jatamansi*'s main active ingredients are jatamansone (valeranone), nardostachone, seychellene, patchouli alcohol, elemol, and calarene are the main constituents of sesquiterpenes. coumarins; Neolignans and Lignans β -sitosterol, resin, starch, sugar, gum, terpenes, phenolic compounds, flavonoids, and tannins are other components etc. Sesquiterpenes and coumarins are thought to be the main bioactive substances that give *N. jatamansi* its pharmacological properties, including its possible anti-asthmatic actions. *Nardostachys jatamansi* has been shown to have anti-asthmatic properties in guinea pig models of histamine-induced bronchial asthma. The plant has bronchodilatory properties; its sesquiterpenes and volatile oils may counteract histamine-induced bronchoconstriction, causing the smooth muscles in the airways to relax.^[9,34] Its ability to relieve bronchial muscle spasms is further supported by its longstanding use as an

antispasmodic. Furthermore, *N. jatamansi* has strong antioxidant activity that protects airway tissues from inflammatory damage by lowering oxidative stress and lipid peroxidation. By lowering asthma-related airway inflammation, the plant's phytoconstituents further enhance its anti-inflammatory properties. Additionally, its calming and CNS depressive properties may lessen the worsening of asthma symptoms brought on by stress.^[24,25,26]

6. LOBELIA

Lobelia inflata, commonly known as Indian Tobacco, belongs to the Campanulaceae family and has a long history of use in Native American traditional medicine. It was traditionally employed as an emetic, expectorant, and respiratory stimulant. In modern complementary medicine, *Lobelia* is used as an adjunctive therapy for asthma and other respiratory disorders. The herb is particularly valued for its ability to stimulate breathing, support the cough reflex, improve vascular tone, and reduce bronchospasm. Due to increasing prevalence of allergic respiratory diseases and long-term adverse effects associated with corticosteroids and other pharmaceuticals, *Lobelia* has gained attention as a promising complementary therapy in asthma management.^[16]

Out of the almost 400 species in the genus *Lobelia*, *Lobelia inflata* has the largest concentration of active ingredients in its seeds and blooms, making it the most therapeutically significant species, especially in respiratory medicine. In addition to beta-amyrin palmitate, lobelic acid, gums, resin, fixed oils, and mineral salts including calcium, potassium, and ferric oxide, the plant contains a number of significant phytoconstituents, primarily piperidine alkaloids like lobeline, lobelanine, and lobelanidine. Among these, lobeline is the main lipophilic alkaloid that may pass across the blood-brain barrier and is principally in charge of the plant's respiratory effects. *Lobelia inflata* has a multifactorial anti-asthmatic effect. Lobeline increases phrenic nerve activity and respiratory drive via activating carotid body chemoreceptors and pulmonary afferent neurons. The herb functions as an expectorant at modest dosages, encouraging the expulsion of bronchial secretions. By stimulating J-receptors in the lungs and upper airways, it also modifies the cough response and facilitates the removal of mucus. Additionally, lobeline helps regulate bronchial smooth muscle tone and may

reduce bronchospasm. It also prevents calcium ions from entering adrenal chromaffin cells, which lowers the release of catecholamines and may lessen wheezing brought on by stress. Additionally, lobeline promotes the production of prostacyclin from lung endothelial cells, which may assist reduce inflammation and pulmonary vascular tone, contributing to its positive effects in asthma and other pulmonary disorders^[18, 27,28,29]

Home Remedies for Asthma (Supportive)

Sr.no	Remedies	Preparation	Benefits
1	Vasaka (Adhatoda) decoction	Boil 5–7 leaves in 1 cup water Reduce to half Take twice daily	expectorant, bronchodilator
2	Licorice tea	½ tsp licorice powder in warm water Take once daily	anti-inflammatory, soothing Avoid in hypertension.
3	Boswellia resin	Small pinch of resin powder with honey Once daily	anti-inflammatory
4	Ginger + Honey	1 tsp ginger juice + 1 tsp honey Twice daily	anti-inflammatory, bronchodilator support.

III. CONCLUSION

In conclusion, asthma is a chronic inflammatory airway disorder that often requires long-term management, and although conventional therapies such as inhaled corticosteroids and β_2 -agonists remain the mainstay of treatment, they may not always provide complete control and can produce adverse effects with prolonged use. Herbal and Ayurvedic therapies have emerged as scientifically promising complementary approaches due to their multi-target pharmacological actions and comparatively safer profiles. Medicinal plants such as *Boswellia serrata*, *Hedychium spicatum*, *Euphorbia hirta*, *Nardostachys jatamansi*, and *Lobelia inflata*, along with classical Ayurvedic formulations such as *Kantakari Ghrita* and *Vasa Ghrita*, exhibit bronchodilatory, anti-inflammatory, antihistaminic, mucolytic, antioxidant, and immunomodulatory activities. Boswellic acids, vasicine, thymoquinone, curcumin, lobeline,

sesquiterpenes, flavonoids, and essential oils are important phytoconstituents that help manage asthma by inhibiting 5-lipoxygenase and leukotriene synthesis, suppressing pro-inflammatory cytokines, lowering serum IgE and eosinophil counts, relaxing bronchial smooth muscles, stabilizing mast cells, and protecting the airway epithelium with antioxidants. Improvements in lung function measurements, a decrease in the frequency of asthma attacks, a drop in inflammatory markers, and improved symptom control with acceptable tolerance have all been shown in clinical and experimental trials. Before widespread clinical use, however, consistent dosing, quality control, toxicity assessment, and long-term clinical trials are still crucial. Therefore, herbal and Ayurvedic therapies may improve patient outcomes, lower recurrence, and improve overall asthma quality of life when used in conjunction with conventional medication under appropriate physician care.

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