



USE OF HERBAL MEDICINE FOR THE TREATMENT OF ASTHMA

Amit Kumar Das*, Susmita Basak, Dhruvo Jyoti Sen and Beduin Mahanti

School of Pharmacy, Techno India University, EM-4, Sector V, Bidhannagar, Kolkata, West Bengal 700091.

***Corresponding Author: Amit Kumar Das**

School of Pharmacy, Techno India University, EM-4, Sector V, Bidhannagar, Kolkata, West Bengal 700091.

Article Received on 21/03/2021

Article Revised on 11/04/2021

Article Accepted on 01/05/2021

ABSTRACT

Asthma is a common chronic disease with underlying inflammation of the airway. Advances in science have led to increased understanding of the heterogeneous nature of asthma and its complex mechanism. Asthma mainly affects the human respiratory system in which the airways constrict and become narrow. Due to rapid industrialization and urbanization, asthma prevalence eroded by them is mainly symptomatic and short lived. Moreover, the side effects of these drugs are also quite disturbing. Medicinal plants have been known for millennia and are highly esteemed all over the world as a rich source of therapeutic agents for the prevention of diseases and ailments. Herbs have been the highly esteemed source of medicine throughout human history. They are widely used today indicating that herbs are a growing part of modern, high-tech medicine. About 25-30 percent of today's prescription drugs contain chemical moieties derived from plants. The Indian system of medicine in Ayurveda along with classic texts like Bhaishajya Ratnavali has a long-standing tradition that offers a unique insight into a comprehensive approach to asthma management through proper care of the respiratory tract. Ayurvedic formulations used in the management of asthma, therefore, judiciously combine herbs to support the physiology of respiration, these herbs apart from exerting bronchial action also possess concomitant properties like antioxidant to support the digestive, cardiac, nerve functions and expectorant as well as just plain soothing herbs. Scientifically explored exhaustive reports have been published in Indian and International journals. Some of these herbs and their active chemical constituents which have a role in the management of asthma are compiled here and discussed in this review.

KEYWORDS: Asthma, Herbal medicine, Herbs.

1. INTRODUCTION

The term "asthma" comes from the Greek meaning, "to breathe hard."^[21] Asthma long-term chronic inflammatory disease that affects the respiratory system of the human body which causes difficulty in breathing.^[1] Patients are suffering from difficulty in breathing (dyspnea), coughing, chest tightness, coughing. It mainly blocks the respiratory system and prevents oxygen from reaching the lungs.^[31] Asthma is a common disease for all ages. It affects approximately 400 million people worldwide, almost 7.5% of world's population and another 100 million people are going to be infected by 2025.^[3] A survey report by the National Asthma Campaign found that Herbal medicine is the 3rd most popular choice of both adults and children, those who are suffering from asthma.^[4] The historical importance of herbal medicine for treatment of asthma is undeniable. This review provides a critical analysis of Herbal medicine which is used for the treatment of asthma.

2. Historical background- Asthma as a disease is so powerful that it is difficult to identify. During the seventeenth century, once English physicians Thomas

Willis and Sir John Floyer mentioned that asthma, as a specific form of disordered breathing, must be treated differently from other forms of breathlessness cases. By the late nineteenth century, physicians believed that asthma was a disease which had a specific set of causes, clinical consequences, and requirements for treatment, despite the diversity of individual experiences. Because of the spectrum of severity within asthma, some people with asthma only rarely experience symptoms, usually in response to triggers, where a other more severe cases may have marked airflow obstruction at all times.^[16] Asthma exists in two states: the steady-state of chronic asthma, and the acute state of an acute asthma exacerbation. The symptoms are different depending on what state the patient is in. Common symptoms of asthma in a steady-state include: night time coughing, shortness of breath with exertion but no dyspnea at rest, a chronic 'throat-clearing' type cough, and complaints of a tight feeling in the chest.^[5] Severity often correlates to an increase in intensity of symptoms. Symptoms can worsen gradually and rather insidiously, up to the point of an acute exacerbation of asthma. It is a common misconception that wheezing is common in patients with

asthma but in some cases, patient never wheeze, patient may be confused with another Chronic obstructive pulmonary disease such as emphysema or chronic bronchitis.^[17]

3. Definition of Asthma- Asthma is the common inflammatory disease of people of all age's people worldwide. The inner walls of an asthma patient are normally infected. Patients are mainly suffering from breathing problems, coughing, wheezing, chest tightness. An asthma attack occurs when the symptoms become severe.^[26] Asthma is a long-lasting chronic disease but it can be managed by proper treatment. Sometimes it could lead to the death of asthmatic patient. An asthmatic attack is the situation when muscles around the airways are triggered to tighten.^[27] It blocked the airways and prevented the passage of oxygen to lungs.^[38] There are many reasons which are responsible for asthma such as-

- i). Inflammation
- ii) Obstruction of airway
- iii) Irritability in the airway
- iv) Environment
- v) Allergies
- vi) Genetics
- vii. Hormonal Factors

4. How Asthma Affect Breathing- Airways become inflamed and sensitive during an Asthma attack. Swelling narrows the airways, making breathing difficult, often leading to panting and gasping fits. Three factors cause this narrowing:-

- i) Inflammation- Inflammation is the main reason for narrowing the airways during asthma attacks.^[29]
- ii) Bronchospasm-The larger tubes that split off from your trachea and into your lungs are called bronchial tubes which are surrounded by muscles. When the muscles of bronchial tubes contract in asthma, they obstruct airways, this process referred as bronchospasm.^[36]
- iii) Hyperactivity-A chronic condition including attention difficulty, hyperactivity and impulsiveness. It often begins in childhood and can persist into adulthood. It may contribute to low self-esteem, troubled relationships and difficulty at school or work.^[25]

5. Classification of Asthma- According to The National Asthma Education and Prevention program asthma is classified as-

- i) Intermittent Asthma
- ii) Mild persistent Asthma
- iii) Moderately persistent Asthma
- iv) Severe persistent Asthma

These classifications are based on severity, which is determined by symptoms and lung function tests.

Classification is based on symptoms before treatment, this may change over time.^[27]

Asthma in children younger than age 4 can be hard to diagnose. And its symptoms may be different from asthma in older children or adults.

5.1- Intermittent asthma- Asthma is considered intermittent if without treatment any of the following are true:

- Symptoms (difficulty breathing, wheezing, chest tightness, and coughing):
- Occur on fewer than 2 days a week.
 - Do not interfere with normal activities.
 - Night time symptoms occur on fewer than 2 days a month.

Lung function tests are normal when the person is not having an asthma attack. The results of these tests are 80% or more of the expected value and vary little from morning to afternoon.^[26]

5.2- Mild Persistent- Asthma is considered mild persistent if without treatment any of the following are true:

- Symptoms occur on more than 2 days a week but do not occur every day.
- Attacks interfere with daily activities.
 - Nighttime symptoms occur 3 to 4 times a month.^[30]

5.3- Moderate persistent asthma

Asthma is considered moderate persistent if without treatment any of the following are true:

- Symptoms occur daily. Inhaled short-acting asthma medication is used every day.
- Symptoms interfere with daily activities.
 - Night time symptoms occur more than 1 time a week, but do not happen every day.
 - Lung function tests are abnormal (more than 60% to less than 80% of the expected value), and PEF varies more than 30% from morning to afternoon.^[31]

5.4-Severe persistent asthma- Asthma is considered severe persistent if without treatment any of the following are true:

- Symptoms:
- Occur throughout each day.
 - Severely limit daily physical activities.
 - Night time symptoms occur often, sometimes every night.
 - Lung function tests are abnormal (60% or less of expected value), and PEF varies more than 30% from morning to afternoon.

6. Types of Asthma- Asthma can occur in many different ways and for different reasons, but the reasons are mostly common like airborne pollutants, viruses, mold, smoking etc. There is a list below of some common types of asthma.^[25]

1. Childhood Asthma- Children aged between 5-14 almost affected 9.7% And 4.4% children affected of age group between 0-4. Some cases asthma may be improved when the child become adult.^[29]

2. Adult-onset asthma- Adult-onset asthma is asthma that develops in adulthood. In most cases, people develop asthma during childhood, though it can arise at any age. According to the American Lung Association (ALA), 1 in 12 adults has asthma. Asthma is a chronic lung disease that leads to problems breathing.^[27]
3. Occupational asthma-Occupational asthma is asthma that's caused by breathing in chemical fumes, gases, dust or other substances on the job. Occupational asthma can result from exposure to a substance you're sensitive to causing an allergic or immunological response to an irritating toxic substance.^[36]
4. Seasonal Asthma- Seasonal asthma is also known as allergic asthma. This condition is caused by allergens and other triggers that occur at specific times of the year. Pollen is one of the most common causes of seasonal asthma. Different types of pollen may be prevalent during the spring.

7. Symptoms and Diagnosis Of Asthma- Asthma is difficult to identify, a Asthmatic patient can be suffer from asthma without any symptoms until he/she suffers from an attack.^[34] However there are few symptoms which will help us to identify asthma patients like-

1. Wheezing
2. Chest Tightness
3. Breathing Problem
5. Chronic cough
6. Breathless during speaking
7. Disturbance in sleeping
8. Antianxiety or Panic feeling.

Though, it is very difficult for a doctor or a patient to even understand that they are suffering from Asthma. Thus, when the person have above mentioned symptoms they must contact to the doctor.^[1,14,35]

8. Pathophysiology of Asthma-The gross pathology of asthmatic airways displays lung hyperinflation, smooth muscle hypertrophy, lamina reticularis thickening, mucosal edema, epithelial cell sloughing, cilia cell disruption, and mucus gland hypersensitivity.^[21] Asthma is associated with T helper cell type-2 (Th2) immune responses, which are typical of other atopic conditions. Asthma triggers may include allergic and non-allergic (e.g., viral infections, exposure to tobacco smoke, cold air, exercise) stimuli, which produce a cascade of events leading to chronic airway inflammation.^[35] Elevated levels of Th2 cells in the airways release specific cytokines, including interleukin (IL)-4, IL-5, IL-9 and IL-13, and promote eosinophilic inflammation and immunoglobulin E production. Chronically the airways' smooth muscle may increase in size along with an increase in the numbers of mucous glands. Other cell types involved include: T lymphocytes, macrophages, and neutrophils. There may also be involvement of other components of the immune system including: cytokines,

chemokines, histamine, and leukotrienes among others.^[29]

Other mechanisms involved in asthma physiopathology are the inhalation of drugs, as well as respiratory viruses, which promote an immune response mediated by IG antibodies. This process promotes an increase of the inflammatory cells influx, releasing inflammatory mediators responsible for the damage process Based on the factors and mechanisms presented above, asthma symptoms can be observed at different levels according to etiology and severity of clinical aspects, which define their classification.^[1] The asthma severity is subdivided into (i) mild/low, also defined as intermittent/persistent, when the symptoms appear more than twice a week and their exacerbations can affect the daily activities of the patient; (ii) moderate, in which the daily symptom occurrence and their exacerbations affect the patient activities, requiring to use of short-acting β 2-adrenergic drugs; or (iii) severe asthma, in which the patient presents persistent symptoms, physical activity limitations, and frequent exacerbations.^[2]

9. Some Herbal plant for the treatment of Asthma: -

Being universal, the role of plants has always stood a golden mark to exemplify the outstanding phenomenon of symbiosis. The existence of life in the universe is not endurable without the plants. According to the World Health Organization (WHO), herbal medicines have been defined as the finished, labeled medicinal products that contain active ingredients, aerial or underground parts of the plant or other plant material or combinations. For the assessment of safety, efficacy and quality of herbal medicines, a specific set of guidelines has been set by the World Health Organization (WHO). As per the estimation of WHO, around 80% of the world's population presently use herbal medicine for primary health care (WHO technical report series 1996).^[32]

9.1- Traditional Indian Herbs

i) *Picrorrhiza kurroa* (Kutki)-Common name of the plant is Picrorrhiza, katuka, kutki. It is mainly obtained from roots of the Scientific Name of the plant (*Picrorrhiza kurroa*) belonging to the family **Plantaginaceae**.

P kurroa is a small herb with tuberous roots that is used in ayurvedic medicine for the treatment of various conditions including lung diseases such as asthma and bronchitis. It is mainly found in Nepalese Himalayan part of the country India and Nepal. It is one of the oldest medicinal plants traded from the Karnali zone.^[7,39]



Fig. 1: *Picrorrhiza kurroa* (Kutki).

ii) *Solanum xanthocarpum* (**choti Kateri**)-Common Name of the plant is Choti Kateri, Yellow-berried nightshade, Kantakari. The whole part of the plant is used for different types of asthma treatment. Scientific name of the plant is (*Solanum virginianum*) which belongs to the family **Solanaceae**.

It is mainly found in the southern part of India. *S xanthocarpum* and *S trilobatum* as a powder of the whole dried plant or decoction are widely used to treat respiratory disorders by practitioners of the Siddha system of medicine in Southern India.^[4,40]



Fig. 2: *Solanum xanthocarpum* (choti Kateri).

iii) *Boswellia serrata* (**B serrata**) Common Name of the plant is -Indian frankincense, Indian oli-banum, Salai guggul, and Sallaki in Sanskrit. It is mainly obtained from resin (gum) from the plant. The Scientific name of the tree is (*Boswellia serrata*), which belongs to the family **Burseraceae**. The gum resin of *B serrata* is known in the Indian Ayurvedic system of medicine as Salai guggal and contains boswellic acids which have been shown biosynthesis. It help patients from Asthma.^[11] The plant is native to much of India and the Punjab region that extends into Pakistan.^[33,41]



Fig. 3: *Boswellia serrate*.

iv) *Tylophora indica* (**Tamarind**)-Common name of the plant is Tamarind. The leaves and fruit of the plant have been extensively used in the treatment of various inflammatory and allergic disorders like bronchial asthma, bronchitis, and whooping cough. The plant belongs to the family **Fabaceae** and the scientific name of the plant is (*Tamarindus indica*).

T Indica is a plant indigenous to India and reputed to be able to provide relief to patients with bronchial asthma.^[13] *T Indica* has been traditionally used for the treatment of bronchial asthma, jaundice and

inflammation. It has antitumor, immunomodulatory, antioxidant, antiasthmatic, muscle relaxant. Although the leaf and root of this plant are widely used for treating jaundice in northern Karnataka, there is a paucity of scientific evidence regarding its usage in liver disorder. The other reported activities include immune-modulatory activity, anti-inflammatory activity, anticancer activity, antihistamine and anti-rheumatic. This plant is traditionally used as folk remedy in certain regions of India for the treatment of bronchial asthma, inflammation, bronchitis, allergy and dermatitis. Dried leaves are emetic diaphoretic and expectorant.^[42]



Fig 4. *Tylophora indica* (Tamarind).

V) *Blumea lacera* (**Jangli Muli**)-Common name of the plant is Malayalam. Kukkura-chedi, Rakila, Jangli muli, *Blumea lactifolia*, *Blumea glandulosa*, *Blumea bodinieri*.

Dried Leaves of the plant are mainly used for the treatment of Asthmatic Patients.

Scientific Name of the plant is (*Blumea lacera*), which belongs to the family **Asteraceae** (Sunflower family).

In case of acute Asthmatic attack the patients are advised to inhale the fumes of dried *Blumea* leaves for regular use, healers recommend to prepare herbal cigarettes using this herb in combination with other herbs. In many parts of India, it is known as Janglimuli.^[14,43]

Vi) *Aegle marmelos* (**Bhel**)- *Aegle marmelos*, commonly known as bael, bili, or bhel, Bengal quince, Japanese bitter orange, wood apple, Golden apple. Its leaf extract is being used in Indian system of medicine as an antidiabetic agent and traditional texts of India prescribe it in the management of asthma.

The scientific Name of the plant is (*Aegle marmelos*) which belongs to the family **Rutaceae**.

It is a species of tree native to the Indian subcontinent and Southeast Asia. It is present in India, Bangladesh, Sri Lanka, Nepal, Thailand, and Malaysia as naturalized species. The effect of alcoholic extract on the leaves of Golden Apple. Corr. A guinea pig isolated ileum and tracheal chain was investigated using the isolated organ bath method. 1mg/ml and 2mg/ml doses of the alcoholic extract of this plant produced a positive relaxant effect in isolated guinea pig ileum and tracheal chain, respectively

in addition, they antagonized the contractions, which are produced by histamine. Because the alcoholic extracts elicited the antagonistic effect against histamine and also relaxed the histamine-induced contractions, it can be concluded that relaxations induced by *A. marmelos* in both guinea pig ileum and tracheal chain were due to the depression of H1-receptors. This study shows that *Aegle marmelos* can be used effectively in the treatment of asthmatic disorders.^[44]



Fig. 5: *Aegle marmelos* (Bhel).

vii) *Cynodon dactylon* (Dhub): *Cynodon dactylon* is one of the most commonly occurring perennial grass throughout India, commonly known as Dhub. Other synonymous of the tree is Bermuda grass, Dhoob, dūrvā grass, ethana grass, dubo, Bahama grass, devil's grass, couch grass, Indian doab, arugampul, grama, wiregrass and scutch grass.

The scientific name of the plant is (*Cynodon dactylon*), Which belongs to the family **Poaceae**. Methanol extracts of whole plant and fractions isolated from chloroform extract possess antianaphylactic activity but fractions isolated possesses more potent activity at doses 10, 25, 50 and 100 mg/ kg using compound 48/80-induced mast cell degranulation, determination of level of nitric acid in serum.^[31]

vii) *Lepidium sativum* Linn (Garden cress): This plant is commonly known as Garden Cress, Garden pepper cress, Pepper grass, pepperwort, Poor man's pepper, Halima, halim shaak. In India this plant is also used as salad plants but it's seed contains asthmatic disorders. Scientific name of the plant is (*Lepidium sativum* L). This plant belongs to the family **Brassicaceae**.

It is an erect, glabrous annual herb cultivated throughout India. The ethanol extract and ethyl acetate, n-butanol and methanol fractions isolated from ethanol extract inhibit bronchospasm induced by histamine and acetylcholine.^[31,35]



Fig. 6: *Lepidium sativum* Linn (Garden cress).

Viii) *Aleurites moluccana* (Indian Walnut)-This plant is commonly known as CandleNut, Candleberry, Indian walnut, Kemiri, Varnish tree, Kukui nut tree, Akhrot, Jangli Akhrot. Scientific name of the plant is (*Aleurites moluccana*) and it belongs to the family **Euphorbiaceae**. Another plant-based medicine used for the treatment of asthma is *Aleurites moluccana*, a native tree of Indonesia and India which has been used in traditional remedies not only for the treatment of asthma but for pain, fever and headaches. It's fruit are mainly used for the treatment of asthma. More recently, the anti-nociceptive effects of a moluccana and its mechanical anti-hypersensitivity properties have been investigated. Multiple active compounds in plant extracts can have several benefits to patients. The use of this plant in traditional remedies for asthma suggests that there is a possibility for the active compounds of *A. mullucanna* to be adapted to produce a phytomedicine for asthma and its related symptoms.^[12]



Fig. 7: *Aleurites moluccana* (Indian Walnut).

ix) *Adhatoda vasica* (Malabar Nut)-This plant is commonly known as Malabar nut, adulsa, adhatoda, vasa, vasaka, adusha.

Biological name of the plant is (*Justicia adhatoda*) which belongs to the family **Acanthaceae**. The traditional healers are using this herb for the treatment of chronic Asthma. Adusa is known as Vasa or Vasak in Sanskrit and is a reputed drug for Asthma mentioned in Ayurveda. Malabar Nut is considered in the east to be the best possible treatment for all chest diseases and used in India as an expectorant, antitussive and in other respiratory diseases. It is also used widely to relieve asthma. *Adhatoda vasica* has been traditionally used in the management of allergic disorders and bronchial asthma. Research performed over the last three decades revealed that the alkaloids present in the leaves, vasicine and vasicinone, possess powerful respiratory stimulant activity.^[16]

X) *Ocimum sanctum* (Tulsi) *Ocimum tenuiflorum*, also known as *Ocimum sanctum*, Tulsi, or Holy Basil from the family **Lamiaceae** has been described as the "Queen of plants" and the "mother medicine of nature" due to its perceived medicinal qualities. Biological Name of the plant is (*Ocimum tenuiflorum*).^[19]

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 patients from asthma. It is native to the Indian subcontinent and widespread as a cultivated plant throughout the Southeast Asian tropics.^[9,50]



Fig. 8: *Ocimum sanctum* (Tulsi).

9.2-Traditional Chinese herbs and asthma

i) *Ginkgo biloba* (Ginkgo)-*Ginkgo biloba*, commonly known as ginkgo or ginkgo, also known as the maidenhair tree, is a species of tree native to China. It is the only living species in the order Ginkgoales, which first appeared over 290 million years ago. Concentrated ginkgo leaf liquor is used in china for the treatment of asthma. Scientific Name of the tree is (*Ginkgo biloba*), which belongs to the family **Ginkgoaceae**.

It is clinically proven that the process can take 3-4 weeks during some cases. the ginkgolides in the extract act as anti-inflammatory agents and reduce airway hyperresponsiveness and bronchospasm.^[4,50]

ii) *Ligusticum wallichii* (*L wallichii*)-This plant is commonly known as Szechuan lovage, and chuānxiōng in Chinese is native to India, Kashmir, and Nepal. Mainly its leaf extract used for treatment of asthma patients.

The scientific name of the tree is (*Ligusticum striatum*) which belongs to the family **Apiaceae**. *Ligusticum striatum* is a flowering plant in the carrot family best known for its use in traditional Chinese medicine where it is considered one of the 50 fundamental herbs. A clinical trial of Shao et al 5 performed a randomised controlled trial of *L wallichii* (10 ml thrice daily) in 150 adult patients with moderate or severe asthma. FEV1 was significantly increased in the *L wallichii* group compared with baseline after one month, although only by 13% ($p < 0.01$). Subjective symptoms were reported to improve with treatment but no details were given. Parallel studies on guinea pigs in the same paper showed *L wallichii* to relax tracheal smooth muscle and decrease levels of thromboxane B2. It is one of most popular herbs in china for the treatment of asthma.^[34]

iii) *Datura metel* (Thorn Apple)-This plant is commonly known in Europe as Indian Thornapple,

Hindu Datura, or Metal and in the U.S.A. as Devil's Trumpet or Angel's Trumpet.

The scientific name of the tree is (*Datura metel*), which belongs to the family **Solanaceae**. The whole plant, but especially the leaves and seed, is antiasthmatic, antispasmodic, antitussive, and bronchodilator. In China, the plant is used in the treatment of asthma. In Vietnam, the dried flowers and leaves are cut into small chips and used in antiasthmatic cigarettes. Total alkaloid content of the leaves is 0.426%, which is mainly atropine. The seeds contain 0.426% alkaloids, which is mainly hyoscyamine. The roots contain 0.35% hyoscyamine.^[34]

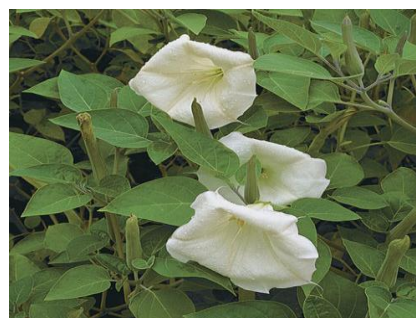


Fig. 9: *Datura metel* (Thorn Apple).

iv) *Ephedra sinica* (Ma Huang)-This plant is commonly known as yellow horse, sea grape, ma huang, Indian common mallow. Scientific Name of the plant is (*Ephedra viridis*) which belongs to the family **Ephedraceae**.

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 pseudoephedrine Both alkaloids stimulate the alpha and beta- adrenergic receptors, and in general act similarly to norepinephrine (adrenaline). This in turn will act to dilate the bronchial 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 bronchodilation.^[13]

v) *Zingiber officinale* (Ginger)-This tree in commonly known as aela, adrak, ginger, geung, sang geung.

It is mainly obtained from roots. Scientific name of the tree is (*Zingiber officinale*), which belongs to the family **Zingiberaceae**.

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.^[17]



Fig. 10: *Zingiber officinale* (Ginger).

9.3- Some more plants which help us to reduce Asthma

i) *Asystasia gangetica*: (Family-Acanthaceae: Common name Foxglove). *Asystasia gangetica* is a traditional medicine which is used to treat a wide variety of diseases in Nigeria and other parts of the world, commonly known as creeping foxglove. The leaf of *Asystasia gangetica*. T. Adams is also used in many parts of Nigeria for the management of asthma. Therefore a study was performed to evaluate the antiasthmatic effect of the plant. Results indicated that hexane, ethyl acetate, and methanol extracts of the leaves of *Asystasia gangetica*, obtained by successive Soxhlet extraction inhibited the contraction evoked by spasmogens and the IC values were calculated. The extracts relaxed histamine-precontracted tracheal strips in the following degree of potency-ethyl acetate extract > hexane extract = methanol extract. This study shows that the leaves of *Asystasia gangetica* have antiasthmatic potency.^[29,37]

ii) *Tussilago farfara*: (Family-Asteraceae: Common name Coltsfoot) It is a native to Europe and Asia. Due to its expectorant and cough-suppressing properties, coltsfoot has been used to treat a variety of respiratory conditions, including asthma, emphysema, and smoker's cough. In a Chinese trial 75% of patients suffering from bronchial asthma showed some improvement after treatment with this plant, though the antiasthmatic effect was short-lived.^[18]

iii) *Xanthoxylum nepalensis*: (Family- Berberidaceae: Common name-Prickly Ash, Toothache Tree). *Xanthoxylum nepalensis* is used in traditional herb remedies to treat inflammatory diseases such as asthma, bronchitis, rheumatism, and skin disorders presumed to be mediated by leukotrienes. The methanolic extracts of The leaves of *Xanthoxylum nepalensis* were tested for their activity to inhibit the biosynthesis of leukotriene B4 in bovine polymorphonuclear leukocytes. The leaves of *Xanthoxylum nepalensis* were shown to be the most potent inhibitor with an IC50 value of 11 µg/ml.^[37]

IV) *Withania somnifera*: (Family- Solanaceae: Common name Indian Ginseng) *Withania somnifera* is an anti stress herb having powerful anti inflammatory properties. It significantly reduces inflammation and blockages in

the respiratory tract. Taken over a period it builds immunity to allergic triggers.^[25]

V) *Terminalia belerica*: (Family-Combretaceae: Common name-Bibhitaki) The dried fruit contains about 20% of both condensed and hydrolysable tannins. Other constituents include lipids, βsitosterol, saponins, gallic and ellagic acids along with their derivatives, glycosides and various carbohydrates. *Terminalia belerica* has proven anti asthmatic, antispasmodic, expectorant and antitussive (anti cough) effects. It is commonly used to treat coughs and sore throat. An open clinical study in 93 patients suffering from respiratory conditions found that bibhitaki (*Terminalia bellerica*) had antiasthmatic, antispasmodic, expectorant activity.^[38]

VI) *Tragia involucrata*: (Family- Euphorbiaceae: Common name- Bichuti.). *Tragia* has powerful wound healing properties particularly in the respiratory tract. It heals the inflammation and polyps in the respiratory tract. The relaxant effect of *Cuminum cyminum* is well established. It acts as a powerful Bronchodilator.^[37]

VII) *Scutellaria baicalensis*: (Family-Labiatae: Common name Baikal skullcap) The root of this plant has been used in traditional Chinese medicine (TCM) for a variety of conditions including asthma. Chinese skullcap contains flavone derivatives including baicalin, wogonin and baicalein which inhibit histamine release from mast cells in vitro. Baicalin showed antiasthmatic activity (antihistamine and anticholinergic activity) in isolated tracheal muscle from asthmatic guinea pigs. Reducing hypersensitivity and inflammation in airways is vital to managing asthma. Baicalein, a flavonoid, is anti-allergic but only slightly soluble in water.^[36,19]

VIII) *Pimpinella anisum*: (Family-Umbelliferae: Common name-Anise, Anason, Anis, Anasur, Anisu). It is a flowering plant, native of Egypt, Greece, Crete and Asia Minor studied the relaxant effect of *Pimpinella anisum* on isolated guinea pig tracheal chains and its possible mechanism(s). The bronchodilatory effects of aqueous and ethanol extracts and essential oil were examined on precontracted isolated tracheal chains of the guinea pig by 10 µM methacholine in two different conditions including: non incubated tissues (group 1) and incubated tissues with 1 µM propranolol and 1 µM chlorpheniramine (group 2). Aqueous and ethanol extracts, essential oil and theophylline (1 mm) showed significant relaxant effects compared to those of controls. Although the relaxant effect of essential oil was lower than theophylline, there was no significant difference between the effect of aqueous and ethanol extracts and that of theophylline. There was also no significant difference between the relaxant effects obtained in group 1 and 2 experiments. These results indicated bronchodilatory effects of essential oil, aqueous, and ethanol extracts from *P. anisum*. The volatile oil, mixed with spirits of wine forms the liqueur Anisette, which has a

beneficial action on the bronchial tubes, and for bronchitis and spasmodic asthma.^[19,25,36]

IX) Aloe vera –Aloe vera is a succulent plant species of the genus Aloe. An evergreen perennial, it originates from the Arabian Peninsula, but grows wild in tropical, semi-tropical, and arid climates around the world. It is cultivated for agricultural and medicinal uses. The species is also used for decorative purposes and grows successfully indoors as a potted plant.

The scientific name of the plant is *Aloe vera*, It belongs to the family **Asphodelaceae**.

Aloe vera gel can be effectively used to combat Asthma in a safe, natural way. The immuno modulating properties of aloe vera gel intervene in the overactive immune mechanism of the patient and co-ordinate biochemical reactions. This supports pulmonary respiration to reduce or eliminate the inflammation in the air passages and normalise breathing.^[45]



Fig. 11: Aloe Vera.

CONCLUSION

Herbal approaches have regained their popularity, with their efficacy and safety aspects being supported by controlled clinical studies. The herbal approaches have offered effective mast cell stabilizers like sodium cromolyn and sodium cromoglycate developed from khellin and anti-leukotriene products.

Like -boswellic acids. Herbal approaches have given us the ample aspect to explore flora for the betterment and eradication of various diseases. On going research worldwide has provided valuable herbal alternatives and these herbs, have shown interesting results in various target specific biological activities such as bronchodilation, mast cell stabilization, anti-anaphylactic, anti-inflammatory, antispasmodic, anti-allergic, immunol modulators and inhibition of mediators viz, leukotrienes, lipoxygenase, cyclooxygenase, platelet activating, phosphodiesterase and cytokine, in the treatment of asthma. Some herbal alternatives employed in these traditions are proven to provide symptomatic relief and assist in the inhibition of disease development as well. In nutshell, attempts should be made to develop such poly herbal formulations which not only act at particular sites of the pathophysiological cascade of

asthma but also give us the vast scope for the treatment of asthma and subsequent clinical studies on them.

REFERENCES

1. <https://www.hindawi.com/journals/ecam/2020/1021258>, (Viewed on 03/05/2021).
2. URATA*,w,S.YOSHIDAw,Y.IRIEw,T.TANIGAWAw,H.AMAYASUw,M.NAKABAYASHIz,K.AKAHORIZ. Treatment of asthma patients with herbalmedicine TJ-96: a randomized controlled trial Y. rmed.2002.1307, 2002; 96: 469-474.
3. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4958455/>,(Viewed on 03/05/2021).
4. AHuntley, E Ernst. Herbal medicines for asthma: a systematic review. Thorax., 2000; 55: 925-929.
5. <https://onlinelibrary.wiley.com/doi/full/10.1002/msj.20294>, (viewed on 03/05/2021).
6. Hari Kishan Gonuguntla*, Parankusam Rao, Bhukya Naik. Asthma diagnosis and treatment - 1011. OZAC- a herbal medicine for bronchial asthma. Gonuguntla et al. World Allergy Organization Journal, 2013; 6(1): P11. Pubmed
7. Saloomeh Fouladi, Mohsen Masjedi, Mazdak Ganjalikhani Hakemi, Nahid Eskandari. The Review of in Vitro and in Vivo Studies over the Glycyrrhizic Acid as Natural Remedy Option for Treatment of Allergic Asthma. Iran J Allergy Asthma Immunol, February, 2019; 18(1): 1-11.
8. Yuan-Bin Chen, Johannah L Shergis, 2 Zhen-Hu Wu, Xin-Feng Guo, Anthony L Zhang, Lei Wu, Fei-Ting Fan. Herbal Medicine for Adult Patients with Cough Variant Asthma: A Systematic Review and Meta-Analysis. Hindawi.com/journals, 2021 |Article ID 5853137 | <https://doi.org/10.1155/2021/5853137>.
9. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6157154/>, (viewed on 07/05/2021).
10. <https://www.emjreviews.com/respiratory/article/asthma-diagnosis-and-treatment>, (Viewedbon 07/05/2021).
11. Irwin Ziment, MD,a and Donald P.Tashkin, MDb Sylmar and Los Angeles, Calif. Alternative medicine for allergy and asthma. J ALLERGY CLIN IMMUNOL(2000) VOLUME 106, NUMBER 4, p-603-614 Received for publication May 1, 2000; revised June 2, 2000; accepted for publication June 8, 2000.
12. Vaishnavi Sivakali Subramanian* Vishnu Priya, R.Gayathri. Herbal Remedies for Asthma –A Review. Journal of Pharmaceutical Science & Research, 2016; 8(6): 431-433.
13. Rebecca Clarke*, Fionnuala T Lundy and Lorcan McGarvey. Herbal treatment in asthma and COPD current evidence. Clarke et al. Clinical Phytoscience, 2015; 1: 4. DOI 10.1186/s40816-015-0005-0.
14. Ranjeeta Prasad, Rahul Dev Lawania, Manvi, Rajiv Gupta*. Role of Herbs in the Management of Asthma Article in Pharmacognosy. Phcog Rev., 2009; 3(6): 247-258. © Phcog.Net 2009 | www.phcog.net

15. Satish Kumar Sharma, Isha Talwar. Role of Herbal Medication in Treatment of Asthma. *European Journal of Molecular & Clinical Medicine* ISSN 2515-8265., 2020; 07(06): 1016-1025.
16. Ranjeeta Prasad, Rahul Dev Lawania, Manvi, Rajiv Gupta*. Role of Herbs in the Management of Asthma. *Phcog Rev.*, 2009; 3(6): 247-258.
17. <https://www.medicalnewstoday.com/articles/323523>, accessed on 07/05/2021.
18. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6157154/#!po=20.5882>, accessed on 07/05/2021.
19. Vandenplas*, J-L. Malo*. Definitions and types of work-related asthma: a nosological approach. *Eur Respir J.*, 2003; 21: 706–712, ISSN 0903-1936. DOI: 10.1183/09031936.03.00113303
20. R. N. Kale*, R. N. Patil and R. Y. Patil. Asthma and herbal drugs. *Ijpsr*, 12/2010, vol 4, P-625-637
21. [https://www.jacionline.org/article/0021-8707\(54\)90154-9/abstract](https://www.jacionline.org/article/0021-8707(54)90154-9/abstract), (accessed on 07/05/2021).
22. OSCXR SS\~\~\~ORI~, *JR., &1.n., CHARLOTTESVILLE, VA. Diagnosis and classification of asthma. Article in *Chest*, July 1953. DOI: 10.1378/chest.101.6.393S. Source: PubMed.
23. Leslie C. Grammer and Paul A. Greenberger. Diagnosis and Classification of Asthma. *CHEST/101/6/JUNE.1992/Supplement* chestjournal.chestpubs.org
24. Dr. R Khajotia. Classifying Asthma Severity and Treatment Determinants. National Guidelines Revisited Article in *Malaysian Family Physician* - December 2008 Source: DOAJ *Malaysian Family Physician*, 2008; 3(3). ISSN: 1985-207X (print), 1985-2274. (electronic)
25. Atul Bhargava*, Dr. Jyotsana Khandelwal*, Dr. Deepak Sharma*. Role of various therapies in asthma management. *Int J Med Sci Educ*, Jan-March, 2019; 6(1): 51-57. www.ijmse.com
26. Tacila Pires Mega, Pablo de Moura Santos*, Adelmir Souza-Machado, Lúcia de Araújo Beisl Costa Noblat*, Álvaro Augusto Cruz*. Use of medicinal herbs by patients with severe asthma managed at a Referral Center. *Brazilian Journal of Pharmaceutical Sciences*, jul./sep, 2011; 47: 3.
27. OSCXR SSORI, *JR., & .n., CHARLOTTESVILLE, VA. Asthma: Classification of Causes. Received for publication Oct. 28, 1953. From the Allergy-Arthritis Division, Department of Internal Medicine, School of Medicine of the University of Virginia, 151-167.
28. <https://www.emjreviews.com/respiratory/article/asthma-diagnosis-and-treatment/>, (Accessed on 07/05/2021).
29. <https://www.medicalnewstoday.com/articles/323523>, (accessed on 07/05/2021).
30. GENE L. COLICE, JENNIFER VANDEN BURGT, JESSIE SONG, PATTI STAMPONE, and PHILIP J. THOMPSON. Categorizing Asthma Severity. *Am J Respir Crit Care Med.*, 1999; 160: 1962–1967. Internet address: www.atsjournals.org
31. Quan Doa,* Tran Cao Sona, Jamil Chaudrib. Classification of Asthma Severity and Medication Using TensorFlow and Multilevel Databases. *Quan Do et al./ Procedia Computer Science*, 2017; 113: 344–351. 3452 Quan Do, Tran Cao Son, Jamil Chaudri/ *Procedia Computer Science* 00 (2017) 000–0, Science Direct
32. <https://en.m.wikipedia.org/wiki/Asthma>, (Accessed on 10/05/2021).
33. Some medicinal plants with antiasthmatic potential: a current status. Dnyaneshwar J Taur*, Ravindra Y Patil. *Asian Pac J Trop Biomed*, 2011; 1(5): 413-418.
34. Sharma Vikas, Dhar K. L*, Sharma Pooja,* Sharma Parul.* *Indian Herbal Medicine-A Natural Cure to Asthma*. IJPPR, December, 2013; February, 2014; 5(4): 302-310.
35. Sunil Jawla, O. P. Mogla, Y. Kumar. Herbal Remedies for Asthma: An Overview. *J.Chem. Pharm. Res.*, 2010; 2(1): 267-272.
36. https://www.medicinenet.com/asthma_pictures_slide_show/article.htm, (accessed on 10/05/2021).
37. <https://www.medlife.com/blog/what-is-asthma-symptoms-causes-treatment/#>, (Accessed on 10/05/2021).
38. <https://www.uofmhealth.org/health-library/hw161158>, (accessed on 10/05/2021)
39. <https://www.ncbi.nlm.nih.gov/books/NBK7223/>, (Viewed on 10/05/2021).
40. Atmakuri LR, Dathi S. Current trends in herbal medicines. *J Pharm Res.*, 2010; 3: 109–113.
41. Barns PJ. New concept in the pathogenesis of bronchial hyperresponsiveness and asthma *J AllergyClin Immunol*, 1989; 83: 1013–1026. doi:10.1016/0091-6749(89)90441-7. [PubMed]
42. Hashimoto K, Yanagisawa T, Okui Y, Ikeya Y, Maruno M, Fujita T. Studies on anti-allergic components in the roots of *Asiasarum sieboldi*. *Planta Med.*, 1994; 60: 124–127. doi: 10.1055/s-2006-959432.[PubMed] [Cross Ref]
43. Neszmelyi A, Kreher B, Muller A, Dorsch W, Wagner H. Tetra Galloyl Quinic acid, the major Antiasthmatic Principle of *Galphimia glauca*. *Planta Med.*, 1993; 59: 164–167. Doi: 10.1055/s-2006-959635. [PubMed][Cross Ref]
44. Vazquez B, Avila G, Segura D, Escalante B. Anti-inflammatory activity of extracts from *Aloe vera* gel. *J Ethnopharmacol*, 1996; 55: 69–75. [PubMed]
45. M.Imran Qadir* Medicinal and Cosmetological Importance of *Aloe vera* International Journal of Natural Therapy., 2009; 2: 21-26.
46. Moran A, Carron R, Martin ML, San Roman L. Anti-asthmatic activity of *Artemisia caerulescens* subsp.gallica. *Planta Med.*, 1985; 55: 351–353. doi:10.1055/s-2006-962026. [PubMed] [Cross Ref]
47. <http://apeda.gov.in/apedawebsite/>, (accessed on 15/05/2021).
48. Bernstein IL Cromolyn sodium in the treatment of asthma: coming of age in the United States. *J Aller Clin Immunol*, 1985; 76: 381–388. [PubMed]

49. Persson CG, Draco AB. Xanthine as airway anti-inflammatory drugs. *J Allergy Clin Immunol*, 1988; 81: 615–617. doi: 10.1016/0091-6749(88)90203-5.[PubMed] [Cross Ref]
50. Singh S, Agrawal SS. Anti asthmatic and anti-inflammatory activity of *Ocimum sanctum*. *Int J Pharmacog*, 1991; 29: 306–310. Doi:10.3109/13880209109082904. [Cross Ref]