

Anti Asthmatic Herbal Drugs – A Compilation

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ABSTRACT

Asthma is a common disease that is rising in prevalence worldwide with the highest prevalence in industrialized countries. Asthma affects about 300 million people worldwide and it has been estimated that a further 100 million will be affected by 2025. Plants are always an exemplary source of drugs; in fact many of the currently available drugs were derived either directly or indirectly from them. In the past decade, research has been focused on scientific evaluation of traditional drugs of plant origin for the treatment of various diseases. Since the time immemorial, various herbs are used as antiasthmatic with efficient therapeutic response. India has about 45,000 plant species and among them several thousand are claimed to possess medicinal properties. Researchers conducted in the last few decades on the plants mentioned in ancient literature or used traditionally for asthma have shown antiasthmatic, antihistaminic and antiallergic activity. An attempt has been made to review antiasthmatic medicinal plants in the present article.

Keywords: Asthma, Antiasthmatic, traditional drugs, Antiallergic activity, medicinal plants.

INTRODUCTION^{1,2}

Asthma is a chronic disease characterized by acute exacerbation of coughing, dyspnoea, wheezing and chest tightness. Patients usually have reduced forced expiratory volume in one second as well as reduced airflow. Other features of asthma are airway inflammation and bronchial hyper-responsiveness, which are not unique to the other diseases. Because the passages are narrowed and air flow reduced, mucus also builds up in the lungs, and this makes it even more difficult to breath. The mucus is also a breeding-ground for bacteria, so attacks of bronchitis may arise as a complication of the asthma.

Many asthma attacks are triggered by allergens, such as dust, mould spores, mites, animal hair or feathers but the onset may equally be caused by cold air, or it may be preceded by an infection such as a cold. Certainly, stress and more specifically acute anxiety are known to be the immediate trigger for many attacks, and this can sometimes give rise to a vicious circle of asthma - anxiety about the asthma - further attacks. Thus a wide range of etiological factors can be involved in this all too common problem. A number of different groupings can be applied:

- **Extrinsic asthma** - caused by allergic responses to house dust, animal fur, or

various foods. Such causes 10-20% of adult asthma.

- **Intrinsic asthma** - caused by genetics, structural problems, infections, pollutants and stress - both physiological and psychological. Such causes 30-50% of adult asthma.

The symptoms of people with asthma differ greatly in frequency and degree. Some have an occasional episode that is mild and brief; otherwise they are symptom free. Others have mild coughing and wheezing much of the time, punctuated by severe exacerbation's of symptoms following exposure to known allergens, viral infections, exercise or nonspecific irritants. A series of stages have been characterized for describing the severity of an acute asthma attack:

1. **Mild**
mild dyspnoea; diffuse wheezes; adequate air exchange.
2. **Moderate**
respiratory distress at rest; hypernea, use of accessory muscles; marked wheezes.
3. **Severe**
marked respiratory distress; cyanosis; use of accessory muscles; marked wheezes or absent breath sounds.
4. **Respiratory failure**

Severe respiratory distress; lethargy; confusion; prominent pulsus paradoxus. Use of accessory muscles.

Adverse effects of current treatments used in asthma^{3,4}

1. Isoprenaline: Causes tachycardia.
2. Salbutamol
Muscle tremors (dose related), palpitation, restlessness, nervousness, throat irritation and ankle edema.
3. Theophylline
Convulsions, shock, arrhythmias, increased muscle tone, tachapnoea, (dose dependent) flushing, hypotension, restlessness, tremors, vomiting, palpitation, diuresis, dyspepsia, insomnia etc.
4. Anticholinergics
Dry mouth, difficulty in swallowing and talking, scarlet rash, photophobia, blurring of near (Atropine and its congeners) vision, palpitation, ataxia, delirium, hallucinations, hypotension, weak and rapid pulse, cardiovascular collapse with respiratory depression, convulsions and coma (in severe poisoning).
5. Ketotifen
Sedation, dizziness, dry mouth, nausea and weight gain.
6. 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 hypothalamo-pituitary-adrenal.

Management of asthma in traditional medicinal system – Ayurveda²

Ayurveda is an example of a long-standing tradition that offers a unique insight onto comprehensive approach to asthma management through proper care of the respiratory tract. This includes maintaining the nourishing functions of the lungs in providing oxygen to the body. Ayurvedic formulations used in the management of asthma therefore judiciously combine herbs for breathing support with anti-oxidant herbs to support digestive,

cardiac and nerve functions, expectorant herbs as well as soothing herbs. The following components are normally included in the Ayurvedic approach to the management of asthma.

Essential components

- Long-term administration of pulmonary tonics to strengthen the lungs.
- Administration of relaxing expectorants to prevent building up of sputum.
- Antispasmodic preparations to help/mitigate the effect of the bronchospasm on the pulmonary muscles.

Ancillary components

- Demulcents could be used to sooth irritation of mucous surfaces.
- Anti-spasmodic would prevent the over production of sputum in lungs or sinuses.
- Anti-microbial compounds would prevent secondary infections.
- Nervine support herbs are needed to enable adaptation to stress, since excessive stress or nervous debility may aggravate the symptoms of asthma.

Herbal drugs used in asthma

Asthma is a global problem. Many synthetic drugs are used to treat acute symptoms of asthma, but they are not completely safe for long term use. Hence search has been started once again to look back to traditional medicine which can be used to treat asthma. Some traditional plants with antiasthmatic potential

1. *Achyranthes aspera* (Amaranthaceae)⁵
Ethanollic extract of *Achyranthes aspera* shows bronchoprotective effect in toluene diisocyanate (TDI) induced occupational asthma in Wistar rats. The total and differential leucocytes were counted in blood and bronchoalveolar (BAL) fluid. Liver homogenate was utilized for assessment of oxidative stress and lung histological examination was performed to investigate the inflammatory status of airway. The results suggest that

Achyranthes aspera treated rats did not show any airway abnormality.

2. *Aerva lanta* Linn (Amaranthaceae)⁶

Ethanol extract of aerial parts of *Aerva lanta* at 100 µg/mL in the isolated goat tracheal chain preparation model and 30 and 60 mg/kg doses orally in clonidine-induced catalepsy and mast cell degranulation in mice possesses antiasthmatic activity.

3. *Ageratum conyzoides* (Asteraceae)⁷

Hydro alcoholic extract of leaves of *Ageratum conyzoides* at doses of 250, 500 and 1000 mg/kg shows antihistaminic activity by inhibiting clonidine induced catalepsy in mice.

4. *Amburana cearensis* (Fabaceae)²¹

Amburana cearensis (*A. cearensis*) is a medicinal plant common to the Brazilian Northeastern "caatinga" (savannah), and popularly used in respiratory tract diseases including asthma. The flavonoid isokaempferide isolated from Trunk barks of *A. cearensis* shows significant relaxation of KCl induced contraction on guinea pig trachea.

5. *Argemone Mexicana* (Papaveraceae)⁸

Argemone mexicana (*A. mexicana*) is common everywhere by road-sides and fields in India. It possesses antiallergic and antistress activity of aqueous extracts of *A. Mexicana* stem at dose 50 mg/kg, i.p. using milk-induced leucocytosis and milk-induced eosinophilia.

6. *Asystasia gangetica* (Acanthaceae)⁹

Asystasia gangetica (*A. gangetica*) is used in many parts of Nigeria for the management of asthma. Akah, et al. evaluated hexane, ethylacetate, and methanol extracts of the leaves of *A. gangetica* for antiasthmatic activity using guinea pig trachea; rat stomach strip; guinea pig ileal preparation and egg albumin-induced acute inflammation. The results indicated that the extracts did not exhibit contractile or relaxant activity in isolated tissue preparations; however, they inhibited the contraction evoked by spasmogens.

7. *Atropa belladonna* (Solanaceae)⁴⁷

Atropa belladonna Extract Specification:BDN-Extract Ratio 10:1 has been used in folk medicine as a remedy for stomach and abdominal pain, asthma, bronchitis, and muscular pain. Applied externally, *Atropa belladonna* Extract has been used for gout and ulcers. In medicinal plasters, *Atropa belladonna* Extract is currently used to combat intestinal and digestive spasms, excessive perspiration, and bronchial asthma.

8. *Azadirachata indica* (Meliaceae)⁴¹

The young branches of *Azadirachata indica* plant are useful in asthma, piles, tumors and urinary discharges from ancient times.

9. *Bacopa monnieri* L (Scrophulariaceae)¹⁰

Bacopa monnieri; Samiulla, et al. evaluated petroleum ether, chloroform, methanol and water extracts of *B. monnieri* leaves at doses 10 µg/mL for mast cell stabilizing activity in rats. The result of investigation observed that all the extract significantly inhibits mast cell degranulation.

10. *Boswellia serrata* (Bursaceae)¹¹

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 to inhibit leukotriene biosynthesis. In a six week, double blind, randomised clinical trial of 80 adult patients with bronchial asthma Gupta and co-workers compared the effect of *B serrata* gum resin with placebo (lactose). The alcoholic extract of *B. serrata* roots containing Boswellin, boswellic acids which Inhibit LT biosynthesis and block synthesis of 5-HETE & LTB₄.

11. *Cassia sophera* (Caesalpinaceae)¹²

Cassia sophera (*C. sophera*) is used in traditionally for treatment of asthma and bronchitis. Chloroform, ethyl acetate and ethanol fractions isolated from ethanol extract of leaves of *C. sophera* possesses significant antiasthmatic activity in carrageenan induced paw edema, histamine induced bronchoconstriction, clonidine and haloperidol induced

catalepsy, milk induced leukocytosis, and eosinophilia and passive paw anaphylaxis animal models at doses 250, 500 and 750 mg/kg and this activity may be due to presence of flavonoids.

12. Casuarina equisetifolia Linn (Casuarinaceae)¹³

Casuarina equisetifolia (*C. equisetifolia*) is evergreen tree, the methanol extract of extracts of wood and bark possesses antihistaminic activity by inhibiting the histamine induced contraction of trachea (10-80 µg/mL), clonidine induced catalepsy and mast cell degranulation at doses 100 mg/kg.

13. Clerodendrum Serratum Linn (Verbenaceae)¹⁴

Clerodendrum Serratum (*C. serratum*), known as bharangi in ayurveda, ethanol extract of roots of *C. serratum* showed antiasthmatic activity using isolated goat tracheal chain preparation, clonidine induced catalepsy; Milk induced leucocytosis and eosinophilia in mice at doses 50, 100 and 200 mg/kg.

14. Cnidium monnieri (Umbelliferae)¹⁵

Cnidium monnieri (*C. monnieri*) in traditional medicine of China has been used for treatment of pain in female genitalia, impotence and suppurative dermatitis as an antipruritic agent. Matsuda et al. reported antiallergic activity of ethanol extract and Osthol a chromane isolated from ethanol extract of fruits of *C. monnieri* in passive cutaneous anaphylaxis in rats.

15. Crinum glaucum (Amaryllidaceae)¹⁶

Crinum glaucum (*C. glaucum*) is popular in Yoruba of South West Nigeria. Traditional medicine practitioners reported it as an effective remedy in the relief of cough, asthma and convulsions. The aqueous extract of *C. glaucum* possesses antiallergic activity at doses 100-400 mg/kg by reduction in area of dye leakage in passive cutaneous anaphylactic reaction, protecting degranulation of mast cell and histamine induced bronchoconstriction in the guinea pig.

16. Curculigo orchioides Gaertn (Amaryllidaceae)^{17,18}

Curculigo orchioides (*C. orchioides*) is a tiny herbal plant widely distributed in India, China, Malaya, and Japan. Alcoholic extract of *C. orchioides* rhizomes at doses (100-400 mg/kg) shows mast cell stabilizing and antihistaminic activity on Compound 48/80-induced mast cell degranulation and systemic anaphylaxis. It also inhibited histamine induced contraction in goat trachea, guinea pig ileum and bronchoconstriction in guinea pigs; egg albumin induced passive paw anaphylaxis in rats; milk induced leucocytosis and eosinophilia; clonidine induced catalepsy in mice.

17. Curcuma longa (Zingiberaceae)¹⁹

Curcumin, the other active constituent of *C. longa*, inhibits prostaglandin synthesis. The alcoholic extract 50 mg/kg; rhizome tumerones, curcuminoids Inhibits histamine release from rat peritoneal mast cells.

18. Cynodon dactylon (Poaceae)²⁰

Cynodon dactylon is one of the most commonly occurring perennial grass throughout India, commonly known as Dhub. The petroleum ether, chloroform and 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, compound 48/80-induced anaphylaxis.

19. Eclipta alba Linn (Asteraceae)²²

The 50% ethanol extract shows antianaphylactic and antihistaminic activity at doses 250 and 500 mg/kg on compound 48/80-induced degranulation of mast cell, egg albumin induced passive Cutaneous and paw anaphylaxis; bronchoalveolar lavage (BAL) study on guinea pig trachea; and determination of histamine.

20. Emblica officinalis (Euphorbiaceae)⁴²

The fruits of *Emblica officinalis* are sour, astringent, bitter, acrid, sweet, cooling,

anodyne, ophthalmic, carminative, digestive, stomachic, laxative, alterant, aphrodisiac, rejuvenative, diuretic, antipyretic and tonic. They are useful in vitiated conditions of tridosh, diabetes, cough, asthma, bronchitis, cephalgia, ophthalmopathy, dyspepsia, colic, flatulence, hyperacidity, peptic ulcer, erysipelas, skin diseases, leprosy, haematogenesis, inflammations, anemia.

21. *Euphorbia hirta* (Euphorbiaceae)²³

Popularly known as asthma weed, *Euphorbia hirta* is an herbaceous wild plant which grows in the hotter parts of India. Ethanol extract of whole aerial part of the plant at doses (100-1000 mg/kg) shows antihistaminic and antiallergic activity by inhibiting inhibited the passive cutaneous anaphylaxis and paw anaphylaxis reaction; protection of mast cell from degranulation.

22. *Ficus bengalensis* Linn (Moraceae)²⁴

Ethyl acetate, ethanol and aqueous extracts as well as fractions isolated from aqueous extract of *F. bengalensis* bark possesses antihistaminic activity by inhibiting clonidine induced catalepsy in mice at dose 50 mg/kg. This activity may be due to presence of flavonoids.

23. *Fumaria parviflora* (Fumariaceae)⁴³

The antiasthmatic activity of Ayurvedic polyherbal formulation (PHF) each 20 ml contains, extracts of *Swertia chirata*, *Azadirachata indica*, *Terminalia chebula*, *Terminalia bellerica*, *Emblica officinalis*, *Trichosanthes cucumerina*, *Adhatoda vasica*, *Tinospora cordifolia*, *Fumaria parviflora*, *Eclipta alba* each 731 mg. Antiasthmatic mechanism of using propranolol, which antagonized relaxant effect of PHF on histamine induced contraction, showed PHF activity through goat tracheal β receptor activation. This proving antiasthmatic potential of PHF.

24. *Hemidesmus indicus* R. Br. (Asclepiadaceae)²⁵

Bhujbal et al. Reported antiasthmatic activity of ethanol extract of *H. indicus* roots at doses 25, 50, 100 mg/kg using isolated goat tracheal chain preparation,

passive paw anaphylaxis in rat and clonidine induced catalepsy in mice.

25. *Inula Racemosa*²⁶ (Asteraceae)

Inula Racemosa Hook is widely used in the treatment of contagious fevers, angina pectoris, heart disease, ischemic heart disease, cough, hiccup, bronchial asthma, indigestion, flatulence, inanorexia and in fever. These are also used to boost the appetite. The alcoholic and aqueous extract root shows significant antiasthmatic activity.

26. *Lepidium sativum* Linn (Cruciferae)²⁸

Lepidium sativum commonly known as Asaliyo, the ethanol extract and ethyl acetate, n-butanol and methanol fractions isolated from ethanol extract inhibit bronchospasm induced by histamine and acetylcholine.

27. *Leptadenia reticulata*

(Asclepiadaceae)⁴⁸

The plant is stimulant and restorative. It is occasionally used in nose, eye and ear troubles, while the leaves and roots are useful in skin affections and wounds. The leaves are useful in asthma and cough and against ringworms.

28. *Liquorice* (Papilionaceae)⁴⁹

Liquorice is used for allaying coughs and catarrhal infections. Useful in irritable conditions of mucous membrane of Urinary organs. Useful in sore throat, cough, anorexia and persistent low fever. Useful in flavouring of tobacco, confectionary, beverages, jams and marmalades.

29. *Mentha spicata* L (Lamiaceae)²⁹

The four new flavonoids and three new glycosides isolated from ethyl acetate soluble fractions of *M. spicata* leaves shows antihistaminic activity by inhibiting antigen stimulated rat basophile.

30. *Mimosa pudica* (Fabaceae)⁴⁰

The aqueous root extraction of *Mimosa pudica* plant showed excellent protection in guinea pigs against the histamine-induced bronchospasm.

31. *Momordica dioica* (Cucurbitaceae)³⁰
Momordica dioica is climbing creeper plant. Its fruits and leaves are traditionally used as medicinal agent of asthma, leprosy, bronchitis, fever, tridosha. Methanol and aqueous extract of pulp possesses antihistaminic activity by inhibiting clonidine induced catalepsy in mice at dose 50 mg/kg; this activity may be due to polar constituents.

32. *Mucuna pruriens* (Fabaceae)³¹
The L-DOPA isolated from methanol extract of seed possesses antihistaminic activity by inhibiting clonidine induced catalepsy and mast cell degranulation in mice at dose 50, 100 and 200 mg/kg.

33. *Myrica esculenta* Buch. Ham. (Myricaceae)

Myrica esculenta is commonly known as Kaiphal. It is used for treatment of asthma and bronchitis in ayurvedic system of medicine. Patel³² et al. reported antiallergic and anti-inflammatory activity of ethanol extract of aerial parts using acetic acid induced vascular permeability and allergic pleurisy in mice methods at doses 75 and 150 mg/kg.

Stem³³ bark of this plant possesses bronchodilator and antianaphylactic activity by inhibiting acetylcholine induced bronchospasm in guinea pigs, egg albumin induced anaphylaxis in guinea pigs at dose 75 mg/kg and by relaxing histamine and acetylcholine induced guinea pig trachea and ileum.

34. *Nyctanthes arboristis* (Oleaceae)³⁴
It is used traditionally in the treatment of asthma. The petroleum ether extract shows antihistaminic activity by inhibiting clonidine-induced catalepsy in mice at dose 50 mg/kg.

35. *Olea europea* (Oleaceae)³⁵
Aqueous extract of ripe olives possesses antiasthmatic activity by inhibiting clonidine induced peritoneal mast cell degranulation in rats and catalepsy in mice at doses 4 and 8 mg/kg and also by protecting histamine induced contraction of goat trachea and guinea pig ileum at concentration of 100 µg/mL.

36. *Phymatodes scolopendria* (Polypodiaceae)³⁶
Ramanitrahambola et al. reported bronchodilator activity of 1, 2-benzopyrone (coumarin) isolated from ethanol extract of aerial parts by inhibiting histamine or carbachol precontracted guinea pig trachea.

37. *Piper betel* Linn (Piperaceae)³⁷
Piper betel is traditionally used to cure cough, cold, pruritis, asthma and rheumatism. Ethanol and aqueous extract of leaves at doses 100 and 200mg/kg possesses antiasthmatic activity on histamine induced bronchoconstriction in guinea pig and histamine induced dose dependent contraction of guinea pig tracheal chain and isolated guinea pig ileum preparation.

38. *Pinus roxburghii* (Pinaceae)⁵⁴
Pinus roxburghii plants gum is bitter and heating, oleaginous, purgative, carminative, emmenagogue, expectorant, aphrodisiac, fattening, diuretic, anthelmintic and analgesic and is used in diseases of vagina and uterus, eye, good in dyspepsia, ulcer, diaphoresis, scabies, asthma, chronic bronchitis, ozoena, piles, diseases of liver (hepatoprotective), and spleen, gleet, ear discharge, toothache, lumbago, tuberculous glands.

39. Plants from Zinziberaceae²⁷
Tewtrakul et al. reported antiallergic activity of ethanol and water extract of some plants of Zinziberaceae family.

40. *Premna obtusifolia* (Verbenaceae)⁵⁰
The roots of *P. obtusifolia* are sweet, bitter, astringent, acrid, cordial, thermogenic, anodyne, anti-inflammatory, cardiotoxic, laxative, stomachic, expectorant, depurative, digestive, carminative, febrifuge, antibacterial and tonic. Roots are useful in vitiated conditions of vata and kapha. Roots are useful in inflammations, cardiac disorders, cough, asthma, bronchitis, leprosy, skin diseases, flatulence, anorexia, constipation and fever. Roots are the ingredients in Dushmula, well-known Ayurvedic medicine. Leaves are stomachic, carminative and galactagogue.

They are useful in dyspepsia, flatulence, colic, cough, fever, rheumatism and tumors.

41. Semecarpus anacardium
(Anacardiaceae)⁵¹

The resinous juice is applied to heel cracks. In traditional medicine, it is highly valued for the treatment of tumours and malignant growths. The fruit is reported to be caustic, astringent, alterative, antirheumatic, carminative, counterirritant, rubefacient and vesicant. It is also used in anorexia, cough, asthma, indigestion, enlargement of the spleen, alopecia, ulcers, corns, leprosy, leucoderma, rheumatism, piles and for various nervous diseases.

42. Striga orobanchioides Benth
(Scrophulariaceae)³⁸

Ethanol and aqueous extracts of whole plant shows antihistaminic and mast cell stabilizing activity by inhibiting histamine-induced contractions of the guinea pig ileum at the concentration 2.5-25 µg/mL in a dose related manner and inhibiting degranulation of mast cells at dose 100 and 200 mg/kg.

43. Sphaeranthus indicus Kurz
(Asteraceae)³⁹

Sphaeranthus indicus is a medicinally important plant used as folk medicine. The ethanol extract at the doses of 150, 300 mg/kg and its ethyl acetate extract at the dose of 100, 150 mg/kg and 300 mg/kg showed slightly better protection against sheep serum and Compound 48/80-induced mast cell degranulation than the standard drug ketotifen.

44. Swertia chirata (Gentianaceae)⁴⁴

Swertia chirata used for tonic to heart, liver and eyes, resolvent, drying, astringent, liquifying, balgham, cough, scanty urine, melancholia, dropsy, sciatica, skin diseases. According to G. K. Nair and M. Mohanan, this herb is an excellent drug for intermittent fevers, skin diseases, intestinal worms, bronchial asthma, burning of the body and regulating the bowels.

45. Terminalia belerica (Combretaceae)⁴⁵

The leaf galls of *Terminalia belerica* are used as a substitute for Karkatshringi, which is widely used in Ayurvedic and other traditional systems of medication. Karkatshringi is the main component of Karkatadi churna, Balabhadra churna, Sringadi churna which are used in treatment of asthma, tuberculosis, indigestion, heart diseases, fevers and liver disorders

46. Terminalia chebula (Combretaceae)⁴⁶

Terminalia chebula is good for chronic cough, coryza, sorethroat and asthma. It is used along with holistic herbal formulations in Ayurveda.

47. Tephrosia purpurea (Leguminosae)⁵²

Tephrosia purpurea plants used in ayurvedic system mostly for asthma. M.L.Khare et al the ethanolic and aqueous extract of whole plant extracts in to two different dosage forms of 250mg/day for a month period, given orally, has cured persons of different age groups suffering from chronic bronchial asthma without any side effect.

48. Trachyspermum ammi
(Umbelliferae)⁵³

T. ammi is administered as a household remedy for stomach disorders, a paste of crushed fruits is applied externally for relieving colic pains; and a hot and dry fomentation of the fruits applied on chest is used as a common remedy for asthma.

CONCLUSION

The abundance of availability and ease of production when compared to the synthetic drugs makes the herbal plants the best choice for the treatment of asthma. Although purity of extracts, the selectivity of action and occurrence of side effects are the matters of concern. Therefore the use of these plants is primarily done on basis of balance between activity and toxicity.

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