

Ethno-medicinal and Ayurvedic Approach in the Management and Treatment of Asthma (*Swash Roga*): A Scientific Review

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Abstract

In *Ayurveda*, Asthma is known as '*Shwas Roga*'. *Samprapti* (Pathogenesis) of the *Shwas Roga* according to *Ayurveda* is the vitiated '*Pranvayu*' combined with vitiated '*Kapha dosha*' in the lungs causing obstruction in the '*Pranavaha srotasa*' (Respiratory system). This results in gasping and laboured breathing which is known as '*Shwas Roga*'. Asthma is a chronic illness involving the respiratory system in which the airway occasionally constricts, becomes inflamed, and is lined with excessive amounts of mucus, often in response to one or more triggers. These episodes precipitate by exposure to an environmental stimulant (or allergen), cold air, warm air, moist air, exercise or exertion, or emotional stress. *Ayurvedic* medicines are very safe and cure the problem to a great extent. Researchers of various disciplines are working on this problem to find out the solutions. Various modern means and measures have been discovered in this regard. Even then the effective drug without any side-effects has not been established yet. *Ayurveda* is the rich source of the therapeutic measures that can control the disease. Out of such therapeutic measures, various herbs, poly-herbal and herbo-mineral compounds were selected in different studies for the benefit of the increasing number of asthma patients and have been found to be effective. The aims of the present review are to establish the importance of Ethno-medicinal and Ayurvedic approach in the management and treatment of Asthma and explore any new interventions needed.

Key words: Asthma, *Shwas Roga*, *Ayurveda*, Ethno-medicine and Medicinal Plants

According to Global Asthma Report-2014 among many diseases or disorders, asthma is a serious disorder effecting 334 million peoples of the world. Although there is a significant increase in the prevalence of the number of patients suffering from asthma in every age group during the last decade, the largest increase of 73 per cent was reported among children and young adults under the age group of 18 years. Asthma is the 14th most important disorder in the world in terms of the extent and duration of disability (Global Asthma Report, 2014). India has documented an estimated approx 15-20 million asthmatic patients (Bijanzadeh, 2011). Keeping above facts in the view, it becomes important to take a review of existing measures and treatments available and

explore the possible interventions needed to serve the society at large.

Asthma: According to Modern Medical System

Asthma is a chronic illness involving the respiratory system in which the airway occasionally constricts, becomes inflamed, and is lined with excessive amounts of mucus, often in response to one or more triggers. These episodes may be triggered by such things as exposure to an environmental stimulant (or allergen), cold air, warm air, moist air, exercise, exertion or emotional stress. In children, the most common triggers are viral illnesses such as those that cause the common cold (Zhao *et al.*, 2002). This airway

narrowing causes symptoms such as wheezing, shortness of breath, chest tightness, and coughing. The airway constriction responds to bronchodilators. Between episodes, most patients feel well but can have mild symptoms and they may remain short of breath after exercise for longer periods of time than the unaffected individual. The symptoms of asthma, which can range from mild to life threatening, can usually, be controlled with a combination of drugs and environmental changes. Public attention in the developed world has recently focused on asthma because of its rapidly increasing prevalence, affecting up to one in four urban children (Lilly, 2005).

The word 'asthma' is derived from the Greek *aazein*, meaning "sharp breath." The word first appears in Homer's *Iliad* (Marketos *et al.*, 1982). Hippocrates was the first to use it in reference to the medical condition, in 450 BC. Hippocrates thought that the spasms associated with asthma were more likely to occur in tailors, anglers, and metalworkers. Six centuries later, Galen wrote much about asthma, noting that it was caused by partial or complete bronchial obstruction. In 1190 AD, Moses Maimonides, an influential medieval rabbi, philosopher, and physician, wrote a treatise on asthma, describing its prevention, diagnosis, and treatment (Rosner, 1981).

In some individuals asthma is characterized by chronic respiratory impairment. In others it is an intermittent illness marked by episodic symptoms that may result from a number of triggering events, including upper respiratory infection, stress, airborne allergens, air pollutants (such as smoke or traffic fumes), or exercise. Some or all of the following symptoms may be present in those with asthma: dyspnea, wheezing, stridor, coughing, and inability for physical exertion. Some asthmatics that have severe shortness of breath and tightening of the lungs never wheeze or have stridor and their symptoms

may be confused with a Chronic Obstructive Pulmonary Disease (COPD)-type disease.

An acute exacerbation of asthma is referred to as an *asthma attack*. The clinical hallmarks of an attack are shortness of breath (dyspnea) and either wheezing or stridor (Longmore, 2007, p.172-4). Although the former is "often regarded as the *sine qua non* of asthma (Fadden, 2000, p.1508-16), for some patients present primarily with coughing, and in the late stages of an attack, the air motion may be so impaired that no wheezing may be heard. When present the cough may sometimes produce clear sputum. The onset may be sudden, with a sense of constriction in the chest, breathing becomes difficult, and wheezing occurs (primarily upon expiration, but can be in both respiratory phases). Asthma is defined simply as reversible airway obstruction⁷. Reversibility occurs either spontaneously or with treatment. The basic measurement is peak flow rates (a person's maximum speed of expiration, as measured with a peak flow meter) and the following diagnostic criteria are used by the British Thoracic Society (Pinnock & Shah, 2007). $\geq 20\%$ difference on at least three days in a week for at least two weeks; $\geq 20\%$ decrease in peak flow following exposure to a trigger (e.g., exercise). These parameters are the supportive evidence for the diagnosis of initial stage of Asthma.

Asthma is categorized by the United States National Heart, Lung and Blood Institute as falling into one of four categories: mild intermittent, mild persistent, moderate persistent and severe persistent. The diagnosis of "severe persistent asthma" occurs when symptoms are continual with frequent exacerbations and frequent night time symptoms, result in limited physical activity and when lung function as measured by PEV or FEV₁ tests is less than 60% predicted with PEF variability greater than 30%. During an asthma episode, inflamed airways react to environmental triggers such as smoke, dust, or

pollen. The airways narrow and produce excess mucus, making it difficult to breathe. In essence, asthma is the result of an immune response in the bronchial airways (Maddox & Schwartz, 2002).

Asthma: According to Indian Medical System (Ayurveda)

According to *Acharya Charaka* Asthma is known as '*Shwas Roga*'. *Samprapti* (Pathogenesis) of the *Shwas Roga* according to *Ayurveda* is "The vitiated '*Pranvayu*' combined with deranged '*Kapha dosha*' in the lungs causing obstruction in the '*Pranavaha srotasa*' (Respiratory passage). This results in gasping and laboured breathing. This condition is known as '*Shwas Roga*'"

Five types of '*Shwas Roga*' are described in *Charak Samhita*;

- 1). *Maha-shwas*
- 2). *Urdhva-shwas*
- 3). *Chinna-shwas*
- 4). *Tamak-shwas*
- 5). *Kshudra-shwas*

Among these five types first three are not curable. *Tamak* means darkness. During the attack patient feels dark, black in front of his eyes. He can't see anything and becomes breathless. *Tamak shwas* is '*Yappya*' i.e. controllable; many times it becomes an emergency and finally causes death of the patient. As it is supposed to be *Yappya*, but when there are recurrent attacks, and remains long period without the proper treatment, it becomes '*Asadhya*' means incurable. *Tamak shwas* is also divided in 2 subtypes; (i) *Santamak*- In which fever and fainting are the associated symptoms. This is aggravated in night. (ii) *Pratamak*- Caused by psychological factors and patient can get relief with cold air and cold food. The last one is *shadhya* i. e. Curable. More than 75% of the cases belong to these last two categories (Shastri & Chaturvedi, 1988).

LITERATURE REVIEW

Alternative Measures to manage and treat Asthma

Many asthmatics, like those who suffer from other chronic disorders, use alternative treatments; surveys show that roughly 50% of asthma patients use some form of unconventional therapy (Blanc, Trupin & Earnest, 2001; Shenfield & Lim, 2002). A Cochrane systematic review of acupuncture for asthma found no evidence of efficacy (McCarney, Brinkhaus & Lasserson, 2004). A similar review of air ionisers found no evidence that they improve asthma symptoms or benefit lung function; this applied equally to positive and negative ion generators (Blackhall, Appleton & Cates, 2003). A study of "manual therapies" for asthma, including osteopathic, chiropractic, physiotherapeutic and respiratory therapeutic manoeuvres, found there is insufficient evidence to support or refute their use in treating asthma (Hondras, Linde & Jones, 2005), these manoeuvres include various osteopathic and chiropractic techniques to "increase movement in the rib cage and the spine to try and improve the working of the lungs and circulation"; chest tapping, shaking, vibration, and the use of "postures to help shift and cough up phlegm." On the other hand, one meta-analysis found that homeopathy has a potentially mild benefit in reducing symptom intensity (Reilly, Taylor & Beattie, 1994). However, the number of patients involved in the analysis was small, and subsequent studies have not supported this finding (White, Slade & Hunt, 2003). Several small trials have suggested benefits from various *yoga* practices, ranging from integrated *yoga* programs (Nagendra & Nagendra, 1986) - *yogasanas*, *Pranayama*, meditation, *kriyas*- to *sahajayoga* (Manocha, Marks & Kenchington, 2002), a form of meditation.

Ethno-medicinal and Ayurvedic measures to treat Asthma

Indian system of medicine i.e Ayurveda along with various classic and compiled texts has a long-standing tradition that offers a unique insight into comprehensive approach to asthma management through proper care of the respiratory tract (See Table 1). Various scientifically explored exhaustive reports have been published in Indian and International journals. In many clinical studies herbs and herbo-mineral preparations of *Ayurveda* has been found useful in different types of Respiratory disorders like Bronchial Asthma. A herbo-mineral combination found to be very effective in Asthma patients in General Practice comprises of *Glycyrrhiza glabra*, *Justicia gendarussa*, *Solanum surattenes*, *Adhatoda vasica*, *Ocimum sanctum*, *Cinnamomum zeylanicum*, *Zingiber officinale*, *Abhrak Bhasma*, *Swarn Basant Malti*, *Sanjivani Vati* etc. To treat this widespread disease there is a high prevalence of usage of classical medicine as described in ancient *ayurvedic* texts (See Table 2). The use of plants is as old as humankind and it has been steadily increasing over the past 10 years. Plant-based remedies are now one of the most popular complementary treatments. Herbal supplements are receiving increasing exposure through media, including the Internet, in lay journals and more recently in the scientific press. Interest in herbal medicine has been facilitated by multiple factors, including the perception that pharmaceutical medications are expensive, overprescribed and may often be dangerous. Alternatively, herbal medicine is often perceived as being "natural" and therefore is considered safe (Szelenyi & Brune, 2002).

The antitussive activity of *Adhatoda vasica* (AV) extract was evaluated (Dhuley, 1999) in anaesthetized guinea pigs and rabbits and in unanaesthetized guinea pigs. AV was shown to have a good antitussive activity. Intravenously, it was 1/20–1/40 as active as codeine on mechanically and electrically induced coughing in

rabbits and guinea-pigs. After oral administration to the guinea-pig the antitussive activity of AV was similar to codeine against coughing induced by irritant aerosols.

Adhatoda vasica (L.) Nees is a well-known plant drug in *Ayurvedic* and *Unani* medicine. It has been used for the treatment of various diseases and disorders, particularly for the respiratory tract ailments (Ubonwan *et al.*, 2000). Tetragalloyl quinic acid from *Galphimia glauca*, suppressed allergen- and PAF-induced bronchial obstruction, PAF-induced bronchial hyperreactivity (5 mg/kg orally) in vivo and thromboxane biosynthesis in vitro. Hitherto unknown alkaloids from *Adhatoda vasica* showed pronounced protection against allergen-induced bronchial obstruction in guinea pigs (10 mg/ml aerosol). Androsin from *Picrorhiza kurroa* prevented allergen- and PAF-induced bronchial obstruction (10 mg/kg orally; 0.5 mg inhalative) (Dorsch & Wagner, 1991).

Magnolol derived from *M. officinalis* showed the most potent inhibition of the enzyme (IC₅₀, 1.8 x 10⁽⁻⁴⁾ M). Although this activity was less than that of glycyrrhizin, the inhibition mechanism (non-competitive) was different from a known competitive mechanism (Homma *et al.*, 1994). In a study *Ocimum sanctum* (*Tulsi*) extract was administered to 20 patients with shortness of breath secondary to tropical eosinophilia in an oral dosage of 500 mg TID (thrice in a day) and an improvement in breathing was noted. It has also shown to be protective against histamine-induced bronchospasm in animals (Vats *et al.*, 2004).

The leaf infusion or fresh leaf juice is commonly used in cough, mild upper respiratory infections, bronchospasm, stress-related skin disorders and indigestion. It is combined with ginger and *maricha* (black pepper) in bronchial asthma. It is given with honey in bronchitis and cough (Chemexcil, 1992). In Preliminary pharmacological investigations (Singh *et al.*, 1970) of *Ocimum sanctum* and its extracts found to be

effective in treating respiratory tract disorders and infections of pathogenic staphylococci (Bhat & Broker, 1953).

Spices are the most attractive ingredients to confer an authentic taste to food. As they are derived from plants, they harbour allergenic potency and can induce symptoms ranging from mild local to severe systemic reactions. Due to the content of pharmacologically active substances of spices, the diagnosis of allergy and the differentiation from intolerance reactions may be difficult. Association with inhalative allergies via IgE cross-reactivity, but also direct gastrointestinal sensitization plays a role in allergic respiratory disorders (Isabella & Erika, 2004).

In a placebo-controlled study the effect of ginger and fenugreek was examined on blood lipids, blood sugar, platelet aggregation, fibrinogen and fibrinolytic activity and found them to be effective (Bordia, Verma & Srivastava, 1997).

In a placebo controlled clinical trial DCBT4567-Astha-15 (Plant based formulation for Bronchial Asthma), salbutamol and salbutamol + theophylline patients showed statistically significant improvement in FEV₁, while placebo patients did not show any improvement (Murali, 2006).

In a couple of studies *Piper longum* was found effective in childhood asthma (Dahanukar, Karandikar & Desai, 1984; Fernanades, Taraves & Athavale, 1980). In many clinical studies and scientific reviews herbs and herbo-mineral preparations of *Ayurveda* have been found to be useful in different types of Respiratory disorders like Bronchial Asthma (Govindan *et al.*, 1999; Gupta, Rai & Gupta, 1976; Huntley & Ernst, 2000; Singh, 1986).

The leaves of the *Justicia adhatoda* plant containing the alkaloid, vasicine (C₁₁H₁₂N₂O), which is responsible for low-level, persistent bronchodilatation, and an essential oil which is chiefly responsible for expectorant action (*Kapha Nihsarak Activity*). The leaves and roots contain other alkaloids-vasicinone, vasicinolone, and

vasicol-which may contribute to the bronchodilatory effect through anticholinergic action on the vagal innervations of the bronchi (Nadkarni, 1993, p.41; Kala, Kumar & Gauthaman, 2009). *Curculigo orchioides* is one of the important plants mentioned in *Ayurveda* and *Unani* system for asthma (Pandit *et al.*, 2008; Nadkarni, 1999, p.411-412; Kiritikar & Basu, 1999, p.1103). *Myricaesculenta* is known traditionally in *Ayurveda* to possess anti-asthmatic activity. *M. esculenta* (75 and 150 mg/kg, p.o.) significantly inhibited the rise in plasma exudation (57.12% and 59.77%, $P < 0.01$) induced by acetic acid in mice. These findings demonstrate that the crude extract from the stem bark of *M. esculenta* possesses antiallergic activity (Patel *et al.*, 2010). *Ailanthus excelsa* has been used in Indian system of medicine in the treatment of asthma, bronchitis, cold, colic pain, etc. Stem bark of *A. excelsa* has been used as a decoction in traditional claims. The aqueous extract of stem bark in doses of 100, 200, 400 mg/kg showed significant activity (Kumar *et al.*, 2010). Treatment with ethanolic extract of *Myrica sapida*, 75 mg/kg, orally resulted in significant protection against acetylcholine aerosol induced bronchospasm and allergen induced anaphylaxis in guinea pigs. Ethanolic extract of *M. sapida* (75 mg/kg, p.o.) prevented the potentiation of responses and also produced a decrease in pD₂ value of histamine and acetylcholine in guinea pig tracheal strip (Patel, 2008). *An Elaeocarpus sphaericus fruit extracts* protected guinea-pigs against bronchospasm induced by histamine and acetylcholine aerosols (Singh, Acharya & Bhattacharya, 2000). A research work on Tamalaki (*Phyllanthus fraternus* Webster) suggests its antihistaminic property in experimental model and effective in nonbacterial upper respiratory disorders (Binay *et al.*, 2009). Some of the herbs and their active chemical constituents which have a role in the management of asthma are compiled here and tabulated (See Table 3).

DISCUSSION

In today's stressful modern urbanized living, incidence of Asthma is considerably increasing. The rapid industrialization, excessive crowding, Increasing pollution are some of the factors responsible for this increase in incidence of Bronchial Asthma. Allergic respiratory disorders, in particular asthma are increasing in prevalence, which is a global phenomenon. Even though genetic predisposition is one of the factors for the increased prevalence - tobacco smoke contribute more significantly (Reference). The authors perceive the similar development, or at least initiation of such type of database in our country also. *Ayurveda* is highly esteemed as a rich source of knowledge of therapeutic agents for the prevention and treatment of asthma and its ailments. Although the contribution of modern synthetic medicine for elevating the human sufferings cannot be undermined, but it's equally true that most of them leave unwanted harmful side/toxic effects on the human system disturbing the basic physiology.

CONCLUSION

In current scenario there has been serious realization of side-effects associated with synthetic drugs and as a result the world has started

exploring the ethno-medicine and *Ayurveda* as agents of therapy which, apart from being comparatively economical and easily available, are relatively free from the hazardous side effects, toxicity and development of resistance towards causative organisms. In-depth review of literature and scientific work is still required in the field of ethno-medicine and *Ayurveda* regarding assessment of heavy metals and presence of aflatoxins (WHO Guidelines) etc. to call them safe Indian medicinal plants. It is also envisaged that this review attracts researchers to help developing countries like India to treat the Asthma at very low cost. *Ayurvedic* medicines are very safe and cure the problem to a great extent. Scholars of various disciplines are working on the problem and various modern techniques and therapies have been discovered. Even then the effective drug without any adverse reaction couldn't be established. *Ayurveda*, the rich source of variety of formulations and therapies may offer some scientific solutions that can control Asthma.

So it is concluded that there is need from scholars, practitioners and researchers to show interest in scientific evaluation of such a ethno-medicinal and *Ayurvedic* remedy which can help in eliminating disorders like Bronchial Asthma and related disorders.

Table (1): Dravyas (Medicinal Herbs) acting on Respiratory System*

S. No.	Karma (Action) according to Ayurveda	Reverse pharmacological correlates	Dravyas (Medicinal Plants)
1.	<i>Shwasankendrottejaka</i>	Respiratory Centre Stimulant	<i>Kupilu, Coffee, Suchi, Som Kapoor, Vidahi Dravya</i>
2.	<i>Shwasankendravsadak</i>	Respiratory Centre Depressant	<i>Ahiphen, Vatsnabh, Vrhat Panchmool</i>
3.	<i>Shwasanottejak</i>	Respiratory Stimulant	<i>Jarak Dravya</i>
4.	<i>Chedan or Shlesmahara</i>	Expectorants	<i>Guggulu, Hingu, Lavang, Palandu, Vasa, Khoobkala, Vanafsha, Kunduru, Shlesmatak, Go-jihva, Yastimadhu, Ela, Talish, Vibhitak, Sitopala</i>
5.	<i>Kashara</i>	Anti-tussive	<i>Draksha, Abhaya, Amalaki, Pippali, Duralabha, Sringi, Kantkari, Punarnava, Bhuamalaki, Kasmard, Vanshlochan, Vidarigandhadi, sursadi, Ahiphen, Praval, Sringa, Mukta</i>
6.	<i>Shwashara</i>	Bronchial Antispasmodics	<i>Shati, Pushkarmool, Amlavetas, Ela, Hingu, Tigru, Jivanti, Bharangi, Dugdhika, Arka, Dhatoor, dashmool, Vidarigandhadi</i>
7.	<i>Hikkanigrahan</i>	Anti Hiccup	<i>Shati, Pushkarmool, Badarbeej, Kantkari, Abhya, Duralabha, Pippali, karkatsringi, Mayurpicch, Haridra, yav, Erandmool, Manahshila, Kush, Ushir</i>
8.	<i>Kanthy</i>	Beneficial for Throat	<i>Sariva, Ikshumool, Madhuyasti, Pippali, Draksha, Vidari, Katphal, Vrhati, Kantkari, Saindhav, Nausadar</i>
9.	<i>Shlesmaputihara</i>	Pulmonary Antiseptic	<i>Jyotismati, Tailparni, Hingu, Rason</i>

* (Sharma, 2002, p. 86-87)

Table (2): Major Classical Ayurveda Drugs indicated in Respiratory disorders*

S. No.	Drug Type	Name of the Drugs
1.	<i>Churna</i> (Powder)	<i>Sringyadi Churna, Haridradi Churna, Muktadi Churna, Talisadi Churna, Madhuyasti Churna, Som Churna, Sitopaladi Churna, Shatyadi Churna, Karpuradi Churna</i>
2.	<i>Kwath</i> (Decoction)	<i>Dashmool Kwath, Kantkari Kwath</i>
3.	<i>Pak-Avleh</i>	<i>Vasa-Haritaki Avleh, Agastya-Haritaki, Vyadhri-Haritaki, Chyvanprash, Vasavleh</i>
4.	<i>Vati</i> (Tablets)	<i>Eladi Vati, Khadiradi vati, Sanjivani Vati, Lavangadi Vati, Arogyavardhini Vati, Ark Vati, Shwasantak Vati</i>
5.	<i>Asava-Arishta</i>	<i>Vasarista, Kankasava, Maha-Drakshasava</i>
6.	<i>Ras- Rasayan</i> (Herbomineral Preparation)	<i>Shwaskuthar Ras, Shwas-kas Chintamani Ras, Lakshmi Vilas Ras, Nagvallabh Ras, Mall Sindoor, Ras Sindoor, Anandbhairav Ras, Kaphkuthar ras</i>
7.	<i>Bhasma</i> (Ash)	<i>Abhrak Bhasma, Sringa Bhasma, Roupya Bhasma, Godanti Bhasma, Praval Bhasma, Tankan Bhasma</i>

* (Shukla, 2003, p. 428-35)

Table (3): List of Various Medicinal Plants Acting on Respiratory Disorders

S. No.	Botanical Name	Common Name	Action
1.	<i>Asystasia gangetica</i>	Foxglove	Inhibition of the contraction evoked by spasmogens and the IC (inhibitory concentration is a measure of the effectiveness of a substance in inhibiting a specific biological or biochemical function) (Akah <i>et al.</i> , 2003)
2.	<i>Alstonia scholaris</i>	Sitwan chaal/ milky pine	Bronchodilation (Shabana <i>et al.</i> , 2005)
3.	<i>Andrographis paniculata</i>	Kalmegh, Indian Echinacea	Inhibit NF-Kappa B activity (Boa <i>et al.</i> , 2009)
4.	<i>Allium cepa</i>	Pyaz, Onion	Counteraction of the bronchial obstruction (Dorsch <i>et al.</i> , 1987)
5.	<i>Albizia lebbek</i>	Shirish	Used to treat asthma, mast cell degranulation, antihistamine (Muthaliar, 1998, p.359)
6.	<i>Acalypha indica</i>	Kuppi	Useful in chronic bronchitis and asthma (Gupta & Gupta, 1998)
7.	<i>Benincasa hispida</i>	Ash Gourd	Protective effect against bronchospasm induced by histamine (Kumar & Ramu, 2002)
8.	<i>Curcuma longa</i>	Turmeric/Haldi	Improve impaired airways features pro-inflammatory mediators (Chainani-Wu, 2003)
9.	<i>Camellia sinensis</i>	Tea	Inhibition of the release of antigen-induced leukotriene (LT) (Massaki <i>et al.</i> , 1997)
10.	<i>Calotropis procera</i>	Madaar/ Arka	Traditional treatment of asthma (Sharma & Sharma, 1999)
11.	<i>Cannabis sativa</i>	Bhang	Bronchodilator when administered orally or as an aerosol and the effect is of long duration (Williamson & Evans, 2000)
12.	<i>Hedychium spicatum</i>	Kapur Kachari	Valued for treatment of bronchial asthma (Sekhar <i>et al.</i> , 2003; Talalaj & Czechowicz, 1989, p.138)
13.	<i>Lafoensia pacari</i>	Didal	Effective eosinophilic inflammation suppressors (Alexandre <i>et al.</i> , 2008)
14.	<i>Moringa oleifera</i>	Sehjan, Drumstick Tree	Useful in patients of bronchial asthma (Agrawal & Mehta, 2008)
15.	<i>Nigella sativa</i>	Kalajira	Possess spasmolytic and bronchodilatory activities (Gillani <i>et al.</i> , 2001)
16.	<i>Nardostachys jatamansi</i>	Jatamansi	Bronchodilatory effects (Satyavati <i>et al.</i> , 1992, p. 312)
17.	<i>Oscimum sanctum</i>	Tulsi	Anti-asthmatic (Singh <i>et al.</i> , 1991; Joshi <i>et al.</i> , 2006)
18.	<i>Picrorhiza kurroa</i>	Kutki	Potent antiasthmatic herb in Indian traditional medicine (Dorsch <i>et al.</i> , 1991; Rajaram, 1975; Shan <i>et al.</i> , 1977)
19.	<i>Plantago major</i>	Plantain	Inhibition of mast cell degranulation, reduce swelling and inflammation (Ringborn, 1998)
20.	<i>Pimpinellaanisum</i>	Anise, Anason	Bronchodilatory effect (Boskabady <i>et al.</i> , 2001)
21.	<i>Solanum melongena</i>	Eggplant / Brinjal	Exert a bronchospasmogenic effect (Mans <i>et al.</i> , 2004)
22.	<i>Saussuria lappa</i>	Costus, Kut Root	Decrease bronchial muscle inflammation, relieve the bronchial asthma and prevented relapse (Chopra <i>et al.</i> , 1928)
23.	<i>Scutellariabaicalensis</i>	Baikal skullcap	Asthma, applicable to extensive allergy related diseases (Nagai <i>et al.</i> , 1975)
24.	<i>Tinospora cordifolia</i>	Guduchi	Reduce bronchospasm (Badara <i>et al.</i> , 2005)
25.	<i>Xanthoxylum nepalensis</i>	Prickly Ash, Toothache Tree	Treat inflammatory diseases such as asthma, bronchitis (Kumar <i>et al.</i> , 2000)

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