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ASTHMA AND HERBAL DRUGS

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ABSTRACT

Asthma is disease of the human respiratory system in which the airways constrict and become narrow, often in response to a "trigger" such as exposure to an allergen, cold air, exercise or emotional stress. Due to rapid industrialization and urbanization, asthma prevalence is predicted to increase more rapidly in the coming years. Despite the availability of a wide range of drugs for the treatment of asthma, the relief offered 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. The importance of herbal medicine in the treatment of asthma is indisputable. Four of the five classes of drugs currently used to treat asthma namely; β_2-agonists, anticholinergics, methylxanthines and cromones have origins in herbal treatments going back at least 5000 years. In the present article an attempt has been made to review antiasthmatic medicinal plants with their active chemical constituent and possible mechanism of action.

INTRODUCTION: The term "asthma" comes from the Greek meaning, "to breathe hard." *The Global Initiative for Asthma* was created to increase awareness of asthma among health professionals, public health authorities and the general public to improve prevention and management through a concerted worldwide effort. *Bronchial Asthma* according to the *GINA* guidelines final update November 2006 is clearly defined as*:* A chronic inflammatory disorder of the airways in which many cells and cellular elements play a role. The chronic inflammation is associated with airway hyper responsiveness that leads to recurrent episodes of wheezing, breathlessness, chest tightness and coughing, particularly at night or in the early morning. These episodes are usually associated with widespread, but variable, airflow obstruction within the lung that is often reversible either spontaneously or with treatment [1].

Various research studies indicates that airway hyper responsiveness is important in the pathogenesis of asthma and the level of airway hyper responsiveness usually correlates with the clinical severity of asthma [2]. Based on the presence and absence of an underlying immune disorder asthma may be classified as a) extrinsic asthma in which asthmatic episode is initiated by type I hypersensitive reaction induced by an exposure to an extrinsic antigen and b) intrinsic asthma, in which the triggering mechanisms are non immune and stimuli that have little or no effect in normal subjects can trigger bronchospasm [3]. Due to rapid industrialization and urbanization, asthma prevalence is predicted to increase more rapidly in the coming years. Although limited data is available on the asthma prevalence in India, according to the "*Global Burden of Asthma Report*", the increase is likely to be dramatic, particularly in India. A wide variation ranging from 4-19% is reported in the prevalence of asthma in school-going children from different parts of India. The prevalence of current-wheezing in children in Delhi is 16.7% and the cumulative prevalence is 20.8% [4].

Pathophysiology of Asthma: Bronchial asthma is characterized pathologically by an infiltration of eosinophils into the airway submucosa. Eosinophil activation results in the secretion of an array of highly charged cytotoxic cationic proteins such as major basic protein, and is believed to play a central role in the etiology of this disease by inducing damage to the airway epithelium [5]. The pathophysiology of asthma involves the development of acute and chronic inflammation in airway narrowing by producing increased vascular permeability, edema, and airway smooth muscle contraction [6].

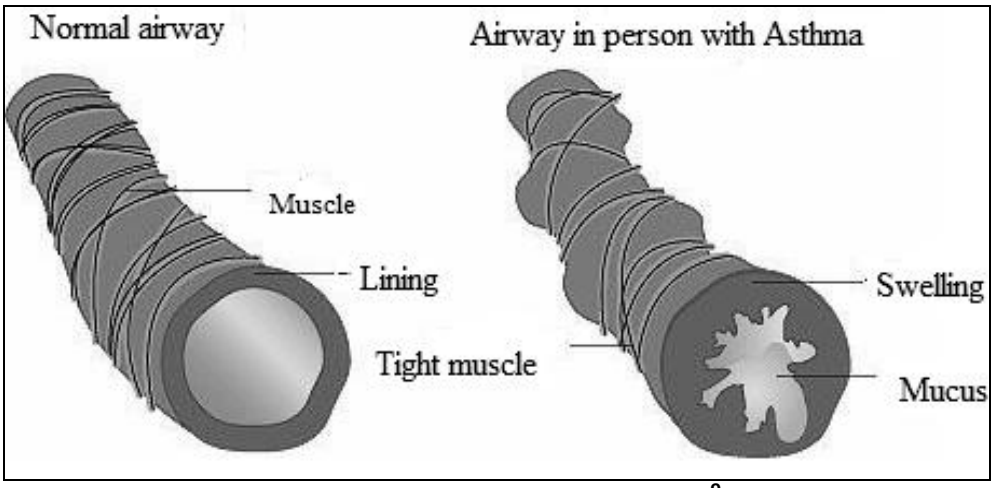

FIG.1: PATHOPHYSIOLOGY OF ASTHMA [9]

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 hypersecretion[7]. It is observed that those patients who have died due to asthma are due to considerable increase in the thickness of the airway wall throughout the bronchial tree, partly as a result of smooth muscle hypertrophy [8].

Treatment: The following category of drugs can be used alone or in combination for the treatment of asthma [10].

1. **Bronchodilators**

- Beta 2 Adrenergic agonists
- Muscarnic antagonists
- Methyl xanthines

2. **Anti inflammatory agents**

- Glucocorticoids
- Mast cell degranulation blockers (Mast cell stabilizers)

3. **Newer drugs**

- Leukotriene antagonists
- Anti I_g E antibodies
- Allergy vaccination

Herbal Drugs used for Asthma: Though the large numbers of drugs are available for the treatment of asthma, the relief offered by them is mainly symptomatic and short lived. Moreover the side effects of these drugs are also quite disturbing. Recently there has been a shift in universal trend from synthetic to herbal medicine, which we can say 'Return to Nature'. 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 [11]. A large number of medicinal plants have been used traditionally for the treatment of asthma and have been scientifically proven to have antiasthmatic properties.

Important medicinal plants having anti-asthmatic potential are *Achyranthes aspera,* [12] *Allium cepa,* [12, 13] *Adhatoda vasica,*[14, 15] *Albizzia lebbeck,* [16, 17] *Achillea mellifolium,*[18] *Asystasia gangetica,*[19] *Acorus calamus, Ammi visnaga, Boswellia serrata,*[20] *Balanites roxburghii*,[21] *Cedrus deodara,*[22] *Curculigo orchioides,*[23] *Clerodendron phlomidis,*[24] *Curcuma longa*,[25] *Cassia sophera,*[26] *Centipeda minima,*[27] *Ephedra gerardiana*,[28] *Eucalyptus globules,*[29] *Aegle marmelos*,[30] *Hedychium spicatum,*[31,32] *Glycyrrhiza glabra,*[33,34] *Inula racemosa,*[35] , *Moringa oleifera,*[36] *Myrica sapida*,[37] *Nigella sativa, Ocimum sanctum, Picorrhiza kurroa,*[38] *Lipidum sativum,*[39] *Passiflora incarnata,*[40] *Solanum xanhocarpum*,[41, 42] *Terminalia belerica,*[43] *Tinospora cordifolia,*[44] *Tamarandus indica* [45].

Following **table 1** gives a brief review of the antiasthmatic plant with their chemical constituent and probable Mechanism of action.

TABLE 1: BRIEF REVIEW OF ANTIASTHMATIC PLANTS

PLANTS	FAMILY	PART USED	CHEMICAL CONSTITUENTS	MECHANISM OF ACTION
Achyranthes aspera	Amaranthaceae	Fruit	Saponin C Saponin D	Mast cell stabilizer
Allium cepa	Liliaceae	Bulb	Quercetin	1. Mast cell stabilizer 2. Lipoxygenase inhibitor 3. PAF inhibitor 4. COX inhibitor
Adhatoda vasica	Acanthaceae	Leaves, root	Alkaloids	1. Bronchodilator 2. Anti-anaphylactic

Albizzia lebbeck	Leguminosae	Bark	Alkaloids, tannins, flavonoids,	1. Bronchodilator 2. Mast cell stabilizer
Achillea mellifolium	Asteraceae (compositae)	Flower	Alkaloids	Inhibits action of histamine, acetylcholine and 5-HT
Asystasia gangetica	Acanthaceae	Leaves	Triterpenoids, saponins, Steroidal aglycone	1. Bronchodilator 2. Anti-inflammatory
Acorus calamus	Araceae	Rhizome	Asarone	Inhibits action of histamine, acetylcholine and 5-HT
Ammi visnaga	Umbelliferae	Seeds	Khellin	Bronchodilator
Boswellia serrata	Burseraceae	Root	Boswellin, Boswellic acid	Inhibits leukotriene biosynthesis
Balanites roxburghii	Simarubaceae	Stem bark	Alkaloids	1. Bronchodilator 2. Mast cell stabilizer
Cedrus deodara	Pinaceae	Wood	Himacholol	Mast cell stabilizer
Curculigo orchioides	amarylliaceae	Rhizomes	Triterpenoids sapogenins and saponin glycosides	1. Antihistaminic 2. Anti-inflammatory
Clerodendron phlomidis	Verbenaceae	Leaves	Flavonoids, terpenoids, steroids	1. Antihistaminic 2. Mast cell stabilizer
Curcuma longa	Zingiberaceae	Rhizome	Curcuminoids	Inhibits histamine release
Cassia sophera	Caesalpiniaceae	Leaves	Flavonoids, glycosides	1. Bronchodilator 2. Antihistaminic 3. Antiallergic 4.anti-inflammatory
Centipeda minima	Compositae	Whole plant	Pseudoguainolide, sesquiterpene, lactone, flavonoids	Antiallergic
Ephedra gerardiana	Ephedraceae	Stem	Ephedrine	Bronchodilator
Eucalyptus globules	Myrtaceae	Leaves	Volatile oil	Anti-inflammatory
Aegle marmelos	Rutaceae	Leaves	Alkaloid-aegeline	Antihistaminic
Hedychium spicatum	Zingiberaceae	Rhizome	Sitosterol, Volatile oil	Anti inflammatory
Glycyrrhiza glabra	Leguminosae	Root	Glycyrrhizinic acid	1.Antihistaminic 2.Antiallergic
Inula racemosa	Asteraceae	Roots	Inulin, sesquiterpene lactone-alantolactone	Antihistaminic
Moringa oleifera	Morangaceae	Seed	Tannins, steroids, triterpenoids, flavonoids, alkaloids, saponins	Antihistaminic
Myrica sapida	Myricaceae	Bark	Glycosides	Mast cell stabilizer
Nigella sativa	Ranunculaceae	Seed	Volatile oil, fatty acid	Bronchodilator
Ocimum sanctum	Labiateae	Leaves	Ursolic acid	Mast cell stabilizer
Picorrhiza kurroa	Scrophulareaceae	Roots	Picorrhizin	Antihistaminic
Lipidum sativum	Cruciferae	Seeds	Alkaloids, Flavonoids	Bronchodilator
Passiflora incarnata	Passifloraceae	Leaves	Benzoflavone	Bronchodilator
Solanum xanhocarpum	Solanaceae	Flowers	Phyto-sterol, alkaloids, flavonoooids, Steroids	1. Antihistaminic 2. Mast cell stabilizer

Terminalia belerica	Combrataceae	fruits	Beta sitosterol, Gallic acid, ellagic acid, glycoside	Mast cell stabilizer
Tinospora cordifolia	Mensipermaceae	Stem	Alkaloids	1. Antihistaminic 2. Mast cell stabilizer
Tamarindus indica	Caesalpiniaceae	leaves	Flavone, Glycosides	1.Brochodialator 2. Antihistaminic 3. Anti-inflammatory

CONCLUSION: Many synthetic drugs are used to treat asthma, but they are not completely safe for long term use. Nature has bestowed our country with an enormous wealth of medicinal plants; therefore India has often been referred to as the Medicinal Garden of the world. Scientifically explored exhaustive reports published in Indian and international journals suggest the importance of herbal medicine in the treatment of asthma is indisputable.

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