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REVIEW ON: TRADITIONAL PLANT HAVING ANTI ASTHMATIC ACTIVITY

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Abstract:
Asthma is a common disease that is rising in prevalence worldwide with the highest prevalence in industrialized countries. Asthma affect about 300 million people worldwide and it has been estimated that a further 100 million will be affected by 2025. Since the ancient times, plants have been exemplary sources of medicine. Current asthma therapy lack satisfactory success due to adverse effect, hence patients are seeking complementary and alternative medicine to treat their asthma. Ayurveda and other Indian literature mention the use of plants in various human ailments. India has about 45,000 plant species and among them several thousand are claimed to possess medicinal properties. Researches 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.

Keywords: *Asthma, Antiasthmatic plants, Ayurveda, Herbal medicines, Antiallergic activity, Medicinal property*

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INTRODUCTION:

Plant biodiversity forms the most common source of medicines. Today, there has been a shift towards the traditional herbal medicines and a large number of drugs are derived from the natural sources either directly or indirectly. The medicinal properties offered by the plants are due to compounds synthesized in their secondary metabolism which includes flavonoids, alkaloids, tannins, steroids, glycosides, phenols, fixed oils, saponins etc. and are stored in the specific parts of plants such leaf, bark, flower, seed, fruit and root. These secondary metabolites and their derivatives exhibited significant biological and pharmacological properties. They act as antioxidants, free radical scavengers, antiproliferativeagents and defend the plant against microorganisms. Free radicals have been implicated in the etiology of diseases such as cancer, coronary heart diseases, neurodegenerative diseases, inflammation, asthma, ageing processes etc. In the living system, oxygen consumption leads to the such generation of free radicals and reactive oxygen species. Antioxidants react with free radicals and protect the body from the damaging oxidation reactions. They reduce the oxidative damage to cellular components such as lipids, proteins, enzymes and DNA and retard the process of chronic illness and lipid peroxidation. Avariety of natural and synthetic antioxidants are in use today. Synthetic antioxidants were reported to be responsible for liver damage and carcinogenesis. Natural antioxidants were presumed to be safe. Medicinal plants were reported to be an important source of natural antioxidants.Therefore there is an upsurge of interest in exploring the active constituents in medicinal plants and the properties exhibited by these compounds.

Asthma is a chronic inflammatory disorder of the airways in which many cells and cellular elements play a role, in particular masts cells, eosinophils, T lymphocytes, macrophages, neutrophils and epithelial cells. In susceptible individuals, this inflammation causes 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 that is often reversible either spontaneously or with treatment. The inflammation also causes an associated increase in the existing bronchial hyper-responsiveness to a variety of stimuli. As of 2009, 300 million people worldwide were affected by asthma leading to approximately 2,50,000 deaths per year. Asthmatic patients experience intermittent attacks of wheezing, shortness of breath, and cough. The strongest risk factors for developing asthma are a combination of genetic predisposition with environmental exposure to inhaled substances and particles that may provoke allergic reactions or irritate the airways such as indoor allergens like house dust, mites, pollution and pet dander, Outside allergens such as pollens and moulds, tobacco smoke, chemical irritants in the workplace, air pollution. Other triggers can include cold air, extreme emotional arousal such as anger or fear, and physical exercise. Even certain medications like aspirin, other non steroidal anti-inflammatory drugs, and beta-blockers can trigger asthma.

Nearly 7–10% of the world population suffers from bronchial asthma. Among several respiratory diseases affecting man, bronchial asthma is the most common disabling syndrome. Despite the availability of a wide range of drugs, the relief offered by them is mainly symptomatic and short lived. Moreover, these drugs produce side effects. Therefore, there is a dire need to identify effective and safe remedies to treat bronchial asthma. The current accepted modern medicine or allopathy has gradually developed over the years by scientific and observational efforts of scientists. However, the basis of its development remains rooted in traditional medicine and therapies. Herbal medicines are being used by nearly about 80% of the world population, primarily in developing countries for primary health care. Assessing the current status of health care system in adequacies of synthetic drugs is likely to be more glaring in the coming years. It has been reported that there has been an alarming increase in number of diseases and disorders caused by synthetic drugs prompting a switch over to traditional herbal medicine.

According to World Health Organisation (WHO) estimates 300 million people suffer from Asthma, 255, 000 people died of Asthma in 2005 (WHO 2004) and over 80% of asthma deaths are reported from low and lower-middle income countries. Asthma creates a substantial burden on individuals and families as it is more often under-diagnosed and under-treated. In India, an estimated that 57,000 deaths were attributed to Asthma in 2004 (WHO 2004) and it was seen as one of the leading cause of morbidity and mortality in rural India (1).

Factors causing asthma:

Asthma is caused by environmental and genetic factor (2) which can influence how severe asthma is and how well itresponds to medication (3).. EnvironmentalMany environmental risk factors have been associated withasthma development and

morbidity in children, but a fewstands out as well-replicated or that has a meta-analysis ofseveral studies to support their direct association.Environmental tobacco smoke, especially maternal cigarette smoking, is associated with high risk of asthma prevalence andasthma morbidity, wheeze, and respiratory infections (4) Poor air quality, from traffic pollution or high ozone levels has been repeatedly associated with increased asthmamorbidity and has a suggested association with asthmadevelopment that needs further research (5). Recent studiesshow a relationship between exposure to air pollutants (e.g.from automobile exhaust) and childhood asthma. Thisresearch finds that the occurrence of the disease andexcervation of childhood asthma are affected by outdoorpollutants (6).

The hygiene hypothesis is a hypothesis about the cause of asthma and other allergicdisease, and is supported by epidemiologic data for asthma. For example, asthma prevalence has been increasing in developed countries along with increased use of antibiotics, c-sections, and cleaning products (7).

Caesarean sections have been associated with asthma when compared with vaginal birth; a meta-analysis found a 20% increase in asthma prevalence in children delivered by Caesarean section compared to those who were not. It was proposed that this is due to modified bacterial exposure during Caesarean section compared with vaginal birth, which modifies the immune system (as described by the hygiene hypothesis)biological stress has long been suspected of being an asthma trigger, but only in recent decades has convincingscientific evidence substantiated this hypothesis. Rather than stress directly causing the asthma symptoms, it is thought that stress modulates the immune system to increase the magnitude of the airway inflammatory response to allergens and irritants (4,8).

Viral respiratory infections at an early age, along with siblings and day care exposure, may be protective against asthma, although there have been controversial results, and this protection may depend on genetic context (4, 9-12).

Antibiotic use early in life has been linked to development of asthma in several examples; it is thought that antibiotics makeone susceptible to development of asthma because they
modify gut flora, and thus the immune system (as described by the hygiene hypothesis) (19). Use of these things may negatively affect exposure to beneficial bacteria and other immune system modulators that are important duringdevelopment, and thus may cause increased risk for asthma and allergy.

Recently scientists connected the rise in prevalence of asthma, to the rise in use of paracetamol, suggesting the possibility that paracetamol can cause asthma (11). It has been suggested that viral infections such as HSV, VSV and CSV are correlated to asthma episodes (4,9,12).

Genetics:
Over 100 genes have been associated with asthma in at least one genetic association study. However, such studies must be repeated to ensure the findings are not due to chance.

Through the end of 2005, 25 genes had been associated with asthma in six or more separate populations (13). Scientific evidence substantiated this hypothesis. Rather than stress directly causing the asthma symptoms, it is thought that stress modulates the immune system to increase the
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one susceptible to development of asthma because they modify gut flora, and thus the immune system (as described by the hygiene hypothesis) (10). The hygiene hypothesis is a hypothesis about the cause of asthma and other allergic disease, and is supported by epidemiologic data for asthma. For example, asthma prevalence has been increasing in developed countries along with increased use of antibiotics, c-sections, and cleaning products (7). Use of these things may negatively affect exposure to beneficial bacteria and other immune system modulators that are important during development, and thus may cause increased risk for asthma and allergy.

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Pathophysiology :
Asthma is an airway disease that can be classified physiologically as a variable and partially reversible obstruction to air flow, and pathologically with overdeveloped mucus glands, airway thickening due to scarring and inflammation, and bronchoconstriction, the narrowing of the airways in the lungs due to the tightening of surrounding smooth muscle. Bronchial inflammation also causes narrowing due to edema and swelling caused by an immune response to allergens.

Bronchoconstriction
During an asthma episode, inflammed airways react to environmental triggers such as smoke, dust, or pollen. The airways narrow and produce excess mucus, making it difficultto breathe. In essence, asthma is the result of an immune response in the bronchial airways (14). The airways of asthma patients are "hypersensitive" to certain triggers, also known as stimuli (see below). (It is usually classified as type I hypersensitivity) (15). in response to exposure to these triggers, the bronchi (large airways) contract into spasm (an"asthma attack"). Inflammation soon follows, leading to a further narrowing of the airways and excessive mucus production, which leads to coughing and other breathing difficulties. Bronchospasm may resolve spontaneously in 1–2 hours, or in about 50% of subjects, may become part of a 'late' response, where this initial insult is followed 3–12 hours later with further bronchoconstriction and inflammation . The normal caliber of the bronchus is maintained by a balanced functioning of these systems, which both operate reflexively. The parasympathetic reflex loop consists of afferent nerve endings which originate under the inner lining of the bronchus. Whenever these afferent nerve endings are stimulated (for example, by dust, cold air or fumes) impulses travel to the brain-stem vagal center, then down the vagal efferent pathway to again reach the bronchial small airways. Acetylcholine is released from the efferent nerve endings. This acetylcholine results in the excessive formation of inositol 1, 4, 5 - trisphosphate (IP3) in bronchial smooth muscle cells whichleads to muscle shortening and this initiates bronchoconstriction.

Bronchial inflammation
The mechanisms behind allergic asthma - i.e., asthma resulting from an immune response to inhaled allergens - are the best understood of the causal factors. In both people with asthma and people who are free of the disease, inhaled allergens that find their way to the inner airways are ingested by a type of cell known as antigen-presenting cells, or APCs. APCs then "present" pieces of the allergen to other immune system cells. In most people, these other immune cells (TH0 cells) "check" and usually ignore the allergen molecules. In asthma patients, however, these cells transform into a different type of cell (TH2), for reasons that are not well understood. The resultant TH2 cells activate an important arm of the immune system, known as the humoral immune system. The humoral immune system produces antibodies against the inhaled allergen. Later, when a patient inhales the same allergen, these antibodies "recognize" it and activate a humoral response. Inflammation results: chemicals are produced that cause the wall of the airway to thicken, cells which produce scarring to proliferate and contribute to further 'airway remodeling', causes mucus producing cells to grow larger and produce more and thicker mucus, and the cell-mediated arm of the immune system is activated. Inflamed airways are more hyper-reactive, and will be more prone to bronchospasm.

The "hygiene hypothesis" postulates that an imbalance in the regulation of these TH cell types in early life leads to a long-term domination of the cells involved in allergic responses over those involved in fighting infection. The suggestion is that for a child being exposed to microbes early in life, taking fewer antibiotics, living in a large family, and growing up in the country stimulate the TH1 response and reduce the odds of developing asthma (26).

• Allergens from nature, typically inhaled, which include waste from common household pests, the house dust mite and cockroach, as well as grass pollen, mold spores, and pet epithelial cells (17). • Indoor air pollution from volatile organic compounds, including perfumes and perfumed products. Examples include soap, dishwashing liquid, laundry detergent, fabric softener, paper tissues, paper towels, toilet paper, shampoo, hairspray, hair gel, cosmetics, facial cream, sun cream, deodorant,cologne, shaving cream, aftershave lotion, air freshener and candles, and products such as oil-based paint (17).
• Medications, including aspirin, (18), β-adrenergic antagonists (beta blockers) (19,20) Food allergiessuch as milk, peanuts, and eggs. However, asthma is rarely the only symptom, and not all people with food or other allergies have asthma (21).
• Various industrial compounds and other chemicals,

notably sulfites; chlorinated swimming pools generate chloramines—monochloramine (NH_2Cl), dichloramine ($NHCl_2$) and trichloramine (NCl_3)—in the air around them, which are known to induce asthma (22).

• Psychological stress. There is growing evidence that psychological stress is a trigger. It can modulate the immune system, causing an increased inflammatory response to allergens and pollutants (8)

Pathogenesis:

The fundamental problem in asthma appears to be immunological: young children in the early stages of asthma show signs of excessive inflammation in their airways. Epidemiological findings give clues as to the pathogenesis: the incidence of asthma seems to be increasing worldwide, and asthma is now very much more common in affluent countries.

Importance of traditional medicines in management of asthma:

Medicinal plants, since time immemorial, have been used in virtually all cultures as a source of medicine. It has been estimated that about 80-85% of population both in developed and developing countries rely on traditional medicine for their primarily health care needs and it is assumed that a major part of traditional therapy involves the use of plant extracts or their active principles (23,24,25). Due to lack of organized health care systems in developing countries, people with chronic diseases like asthma are among the worst suffers in their communities today. Hence, majority of the populations still have limited access or no access, especially those in remoteareas, to modern medicines. Instead they use traditional medicines for a range of disease complications (26,27).The active principles of many plant species are isolated for direct use as drugs, lead compounds or pharmacological agents.

Some traditional plants with antiasthmatic activity

Asystasiagangetica: (Family-Acanthaceae: Common name Foxglove).

Asystasiagangetica is a traditional medicine which is used to treat a wide variety of diseases in Nigeria and other parts of world, commonly known as creeping foxglove. The leaf of Asystasiagangetica T. Adams is also used in many parts of Nigeria for the management of asthma. Therefore a study was performed to evalutate the antiasthmatic effect of the plant. Result indicated that hexane, ethylacetate, and methanol extracts of the leaves of Asystasiagangetica, obtained by successive sohxlet extraction inhibited the contraction evoked by spasmogens and the IC (50) values were calculated. The extracts relaxed histamine-precontracted tracheal strips in the following degree of potency-ethylacetate extract>hexane extract=methanol extract. This study shows that the leaves of Asystasiagangentica have antiasthamatic potency (28).

Adhatodavasica: (Family-Acanthaceae : Common name-Adusa). 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 (29). Adhatodavasica 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 disease. It is also used widely to relieve asthma. Adhatodavasica 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 respiratorystimulant activity (28). Its essential oil exhibited antitussive (cats), expectorant (rats and rabbit), and antiasthmatic (guinea pig) activity in in-vivo experiments (30).

Allium cepa: (Family-Lilliaceae: Common name-Pyaaz,Onion).

Dorsch W et.al, had studied the effect of onion oil on platelet-activating factor-induced bronchial obstruction by onion oils. In this study lyophilized onion extract and ether extracts of onions were separated by chromatographicmethods into several subfractions and tested for their effects on asthmatic reactions of guinea pigs to allergen, histamine, acetylcholine and platelet-activating factor (PAF) inhalation as well as on thromboxane biosynthesis of human platelets and lung fibroblasts. Onion oils are counteracting the bronchial obstruction due to PAF inhalation. Thus onion oil can be effectively used in the treatment of asthma (31).

Atropa belladonna: (Family-Solanaceae : Common name-Devils Cherries).

Synonyms -Belladonna. It is a powerful antispasmodic in intestinal colic and spasmodic asthma. Occasionally the leaves are employed as an ingredient of cigarettes for relieving asthma (32).

Benincasahispida: (Family-Cucurbitaceae: Common name-Ash Gourd).

Methanolic extract of Benincasahispida (MEBH) showed excellent protection in guinea pigs against the histamineinduced bronchospasm even at a very

low dose, 50mg/kg, p.o However at a higher dose of 400 mg/kg, MEBH did not offerany significant protection against acetylecholine challenge. Therefore it can be deduced that the MEBH is unlikely to have muscarinic action. Result suggested that the plant has a protective effect against bronchospasm induced by histamine (33).

Blumealacera: (Family-Compositeae: Common name-Kukurmutta / kukronda).

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 cigarrette using this herb in combination of other herbs. In many parts of India, it is known as Janglimuli(29).

Cuminumcyminum: (Family-Umbelliferae : Common name-Jeera).

The relaxant effect of Cuminumcyminum is well established. It acts as a powerful Bronchodilator. It makes breathing easy andfree of blocks (28).

Cinnamomumcassia : (Family-Laureaceae : Common name-.Chinese cinnamon / Dalchini).

Enhances expectoration of fluids in lungs. It has powerful anti edemic properties - prevents stagnation of fluids (mucous) in lungs (28).

Clerodendrumserratum: (Family-Verbenaceae :Commonname- Bharnagi).

Clerodndrumserratum is called as Bharnagi in Indian system of traditional medicine and the juice of bharangi root is given in cough and asthmatic conditions with some other drugs like ginger etc. It is given with ghee and honey in bronchial asthma and also gives with hot water when one suffers with high cough and asthma (34).

Curcuma longa: (Family-Zingiberaceae : Common name-Turmeric/Haldi).

Curcuma longa has been known to Indians since centuries. It has been purported to have anti-inflammatory actions (35, 36). Anti-asthmatic property of Curcuma longa has been tested in experimental animal model of airway hyperresponsiveness and has been documented to be effective in improving the impaired airways features (37) .A study from Journal of Alternative and Complementary Medicine confirms thatcurcumin is safe in several human trials and inhibits a number of pro-inflammatory mediators that play an important role in asthma (38)

Zingiberofficinale: (Family- Zingiberaceae: Common name-Ginger)

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 apowerful natural anti allergy agent specially acting on respiratory system (28).

CONCLUSION:

India has a rich cultural heritage of traditional medicines. The crude drugs being always available easily in abundance, comparatively cheaper, with negligible side effects and have frequently been prescribed to patients of all age groups. The multiple therapeutic action and uses of these drugs are sufficiently described in classical literature on indigenous medicines in many medicinal plant books. Among several respiratory diseases affecting human, bronchial asthma is the most common disabling syndrome with a worldwide incidence of 155 millions. It is a disease that does not have the boundaries of age, race and gender. The availability of effective medications is not withstanding with present challenges and the prevalence of asthma is continuously increasing with time. Moreover the side effects of these drugs are also quite disturbing. Hence there is an increasing demand for use of traditional herbal drug. world has started exploring the herbs 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, here it does not mean that plants are hundred percent safe but in-depth review of literature and scientific work is still required in the field of medicinal plants regarding assessment of heavy metals and presence of aflatoxins (WHO Guidelines) etc to call them safe Indian medicinal plants.

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