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Review

THERAPEUTIC APPLICATIONS OF POTENTIALLY USEFUL PLANTS IN BRONCHIAL ASTHMA

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Abstract

Bronchial asthma is characterized by hyper responsiveness of tracheobronchial smooth muscle to variety of stimuli resulting in narrowing of air tubes often accompanied by increased secretion , mucosal edema and mucus plugging. Extrinsic asthma is mostly episodic less prone to status asthmaticus. Intrinsic asthma tends to be perennial status asthmaticus is more common. The knowledge of herbal plant parts is more effective and useful in the treatment of many diseases including bronchial asthma.Among many respiratory diseases bronchial asthma is more common and people suffer from chronic illness in the respiratory system. Andrographis paniculata, Astercantha longifolia, Leaf of “parsley, Rumex vesicarius and Rauvolfia serpentina are some of the important plants which are discussed and studied in this short review. This review summarises the role of the potential plants in the treatment of bronchial asthma.

Key words: Bronchial asthma, herbal plant, Andrographis paniculate, Astercantha longifolia

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Introduction:

Asthma is a commonly rising disease which affects 7% of total population and approximately 300 million worldwide. And it is estimated that further more population will be affected additional nearly 100 million by the year 2025 [1] . Traditionally , nearly 80% of the people still depends upon herbal drugs for their proper health care. India has nearly 45,000 of herbal plants which plays important role in curing many health disease [2] This article is a short review about therapeutic potential of some medicinal plants that used in the treatment of bronchial asthma. Asthma is a chronic inflammatory disease of the airways that causes periodic attacks of coughing,wheezing,shortness of breath and chest tightness. Allergies are strongly linked to asthma and to other respiratory disease [3,4] . Bronchial asthma is a condition of lungs which is characterized by periodic reversible constriction of the bronchi [5] . Bronchial asthma can be diagnosed using some test like spirometry,peak expiratory flow (PEF) and chest x-ray [6]. Asthma is thought to be caused by genetic and environmental factors [7] . Causative agents that causes asthma is known as Allergens. Some of the causative agents that triggers may include smoking and second hand smoke,infection like cold and flu,allergens such as pollen, dust,excerise,air pollution and toxins,weather and drugs ,food additives and emotional stress and anxiety [8] .

Relevance of potential plants in bronchial asthma treatment :

Herbal medicine have become primary source of the health care all over the world [9] . Traditionally , there are number of herbs which is good in the treatment of respiratory diseases like picrorrhiza kurroa, solanum xanthocarpum, cedrus deodara, urinaria etc are available in the world [10] . The major plants like Andrographis paniculata, Astercantha longifolia, Calotropis gigantea, Saururus chinensis and Pimpinella anisum are briefly discussed below

Andrographis paniculata:

Andrographis paniculata belongs to the family Acanthaceae which is native to India and Sri Lanka. Andrographis paniculata (Family- Acanthaceae) (English name-King of Bitters, Tamil name-Nilavempu) , an annual herbaceous plant is extensively cultivated in Southern Asia, China and some parts of Europe. It grows erect to a height of 30-110 cm in moist,shady places [11]. In traditional medicine, A. paniculata is widely used to get rid of body heat, dispel toxins from the body; prevent common cold, upper respiratory tract infections including sinusitis and fever and as an antidote against poisons of snakes and insects [12]. The plant has been reported to exhibit various mode of biological activities in vivo as well as in vitro viz., antibacterial , antiviral , anti-inflammatory , anti HIV (Human immunodeficiency virus) , immunomodulating/ immunostimulatory and anticancer . The plant showed potential therapeutic action in curing liver disorders, common cough and colds in human [13]. Clinically, the use of this herb is reported in contemporary and ancient Chinese writings . In Traditional Chinese Medicine, Andrographis paniculata is a bitter and ‘cold property’ herb. It is used in the treatment of ‘hot’ conditions such as acute infections and fever, including throat infection, pneumonia, tonsillitis, dysentery, gastroenteritis and pyelonephritis. It is used in Malaysian folk medicine for diabetes and hypertension [14] . Yeung et al. [15] reported that A. paniculata had pharmacological properties which include antibacterial, immunological, antivenomous and antithrombotic properties. More recently, A. paniculata has been used in the treatment of chronic bronchitis, administered via aquapuncture, i.e. the injection of an infusion into acupuncture points [16]. A.paniculata can be used in any form such as tablet or injection.

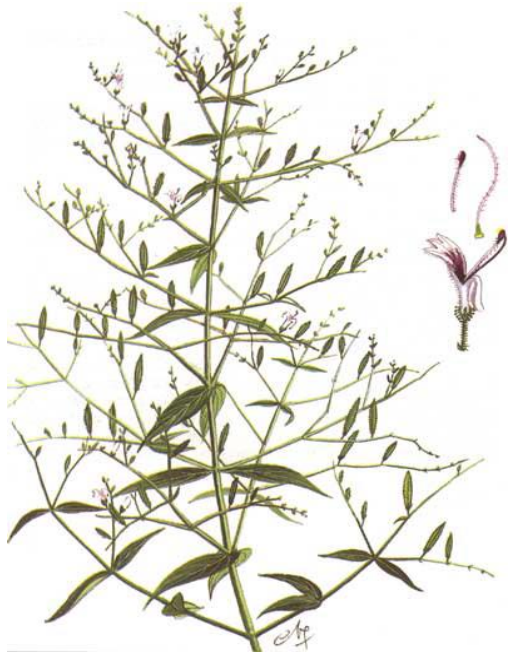

Figure -1

Botanical name: *Andrographis paniculata*
Common name: Creat,kariyat,Indian echinacea
Chemical composition: Plant contains 14-deoxy-11 dehydroandrographolide,Andrographolide,paniculide A,B and C.Root contains andrographine, panicoline
Parts used : whole plant and leaves
Traditional uses : cold and flu.
Medicinal uses: Antibiotic, antiviral, anti parasite and immune system stimulant. It used in viral hepatitis, children bowel complaints, gastric acidity , liver congestion, flatulence, malaria, sore throat, liver disease, TB, pneumonia, sinusitis, wounds, respiratory diseases etc .

Therapeutic potential of andrographis paniculata in bronchial asthma:
Persistent activation of nuclear factor (NF) kappa B has been associated with the development of asthma. Andropholide the principal active component of the medicinal plant Andrographis paniculata has been to inhibit NF kappa B activity. Findings implicate that therapeutic value of Andropholide in the treatment of asthma and it may act by inhibiting the NF kappa B pathway at the level of inhibitory kappa B kinase beta activation [17] . Herba Andrographidis has been used clinically for symptomatic treatment of the common cold and uncomplicated sinusitis,pharyngotonsillitis, pneumonia and bronchitis.

Astercantha longifolia:
Astercantha longifolia belongs to the family **Acanthaceae** which is native to India. A.longifolia is a perennial , thorny shrub and grows in tropical climate upto 90cm . Asteracantha longifolia is a source of the ayurvedic drug, 'Kokilaaksha' and the Unani drug, Talimakhana. A. longifolia used as general tonic, sedative,antihistaminic, hepatostimulant and diuretic [18] . A. longifolia is known since the ancient ages in

India for its medicinal values. The roots of A. longifolia Nees used as tonic, hypnotic, antidiarrhoeic, antidysentric, aphrodisiac, hepatoprotective and antianaemic . The seeds of A. longifolia were used in impotency and seminal or other debilities as an aphrodisiac.

Figure 2

Botanical name: *Astercantha longifolia , Hygrophila Auriculata*
Common name: Astercant,chulli,culli
Chemical composition: Palmitic acid,stearic acid,oleic acid and linolelic acid.It also contains nutrients like alkaloids,flavonoids,lipase and terpenoids
Parts used: roots,leaves,seeds,dried whole plant
Traditional uses : Cold , cough, jaundice, anaemia, rheumatism, pain, urinary infection, inflammation.
Medicinal uses: Anti tumour, anti inflammatory, anti asthmatic, liver diseases, analgesic.

Therapeutic potential of astercantha longifolia (al) in bronchial asthma:
The methanolic extracts of Astercantha longifolia inhibits the biosynthesis of leukocyte iene B4 in bovine polymorphonuclear leukocytes and exhibited potent inhibitory action with IC50 values of 20 [19] Extracts of Astercantha longifolia also have anti inflammatory and analgesic properties . Inflammatory response was studied by ethanol extract of AL plants . Formalin test was chosen to evaluate the potential analgesic effect of extract because of its advantage over models of the pain. High plant regeneration in A.longifolia was achieved from leaf explant implanted on MS medium supplemented with NAA (.5 mg/L) +BA (.2 mg/L) through intervening callus phase. Alcoholic extracts of A.longifolia seeds are safer for oral administration at small and moderate doses not at high doses because of the toxicity [20].

Calotropis gigantea :

Calotropis gigantea belongs to the family **Asclepiadaceae** which is native to Cambodia, Indonesia, Malaysia, Philippines, Thailand, Sri Lanka, India, China and Pakistan. It is a large shrub growing to 4 m (13 ft) tall. It has clusters of waxy flowers that are either white or lavender in colour. Each flower consists of five pointed petals and a small, elegant "crown" rising from the centre, which holds the stamens [21]. Whole plant was used to treat common diseases such as fever, rheumatism, indigestion, cold, eczema, diarrohea, for the treatment of boils and for the treatment of jaundice. The root was used for the treatment of eczema, leprosy, elephantiasis, asthma, cough, rheumatism and diarrhoea. In case of diarrhoea it changed the faecal matter into a semisolid mass within the first day of treatment. The stem was used for the treatment of skin diseases, intestinal worms, leprosy and cure leucoderma [22].

Figure 3

Botanical name: *Calotropis gigantea*
Common name: Crown flower
Chemical composition: Laurane, Saccharose, B-amyrin; a&B calotropeols; holarrhetine, Cyanidin-3-rhamnoglucoside; Taraxsterol isovalerate; Giganteol; Calotroposide;Calactin, Calotoxin; Calotropins DI &DII, Gigantin etc.
Parts used: Root bark, flowers, leaf, latex, seeds.
Traditional uses: Fever, rheumatism, indigestion, cough, cold, eczema, asthma, elephantiasis, nausea, vomiting, diarrhea, tonic, expectorant, depurative,anthelmintic, bitter, digestive, astringent, stomachic.
Used in vomiting therapy and purgation therapy.It is capable of inducing vomiting and purgation.Useful in skin diseases,abdominal tumors, bloating, in the treatment of ascites,improves digestion, eases bowel movements, anti inflammatory, brings about quick wound healing, relieves itching, skin diseases, spleen disorders, intestinal worm infestation, asthma etc.

Therapeutic potential of calotropis gigantea in bronchial asthma:

Different agonists like acetylcholine, histamine, 5-hydroxyltryptamine and bradykinin are responsible for contractile responses . In isolated guinea pig ileum preparation,there is a right side shift of dose response curve of histamine in the presence of ethanol extract of calotropis gigantea indicating antiasthmatic action. Allergic asthma is a chronic inflammatory process occurring due to exposure of allergen resulting in the activation of T-lymphocyte with subsequent release of inflammatory mediators. Immuno-modulating agents are useful in the treatment of asthma by inhibiting the antigen-antibody (AG-AB) reaction and there by inhibiting the release of inflammatory mediators . Calotropis gigantea has been reported to possess anti-inflammatory activity [23]. All the parts, viz, root, stem, leaf and flowers of Calotropis are in common use in indigenous system of medicine . Compounds derived from the plant have been found to have emote-cathartic and digitalic properties. The principal active medicinals are asclepin and mudarin. Other compounds have been found to have bactericidal and vermicidal properties. The root bark is an emetic, the flower a digestive, and a tonic is used for asthma and catarrh. The ethanolic extract Calotropis gigantea showed significant anti – inflammatory activity, suggesting that it predominantly inhibits the release of inflammatory mediators. The ethno-medico-botanical study on the plant Calotropis reveals activities like anti diabetic, anti inflammatory, anti oxidant, wound healing, cytotoxicity etc [24].

Saururus chinensis :

Saururus chinensis belongs to the family Saururaceae which is native to eastern and southern Asia and North America. It is also known as lizard's tail family and it is herbaceous flowering plants. It grows in low damp places more than 1 metre high. Each flower resemble lizard's tail. It used as " folk'' medicine for conditions such as hepatitis, edema, pneumonia, jaundice, and gonorrhea [25].Other previous reports have shown that an extract of S. chinensis roots has various positive effects, including antioxidant, anti-inflammatory, antiviral, antihypertensive, anti-septic, and anti-cancer activities [26].

Figure 4

Botanical name: *Saururus chinensis*
Common name: lizard's tail
Chemical composition : sauchinone A , licarin B ,saucernetin,Saucerneol I,Kaemferol,Kaemferol- 3-O-rhamnopyranosyl(1→6)glucopyranoside, luteolin , quecretin-7-O-β- D-glueopyranoside , quecretin-7-O -α-D-glueopyranoside,ursolic acid, ellagic acid, p-hydroxybenzoic acid,gallic acid, 3,4-dihydroxybenzoic acid, caffeic acid,stearic acid and β-sitosterol
Parts used: Whole plant,root,leaves,flower
Traditional uses: beriberi, pneumonia, edema, urination, jaundice, and gonorrhea.
Medicinal uses: Antiperiodic, parasiticide,antimalarial, diuretic, eliminative, laxative and parasiticide,antiphlogistic, depurative, diuretic, febrifuge and refrigerant,calculus of the urinary system, rheumatoid arthritis, boils and abscesses, rashes and fungal infections of the skin ,as a poultice to clean abscesses and boils.

Therapeutic potential of saururus chinensis in bronchial asthma:
Saururus chinensis inhibited the LPS-stimulated neuroinflammatory responses in BV-2 microglia via regulation of NF-κB signaling. The antioxidant active constituents of SC might be partly involved in delivering such effects. Based on the traditional claims and our present results Saururus chinensis can be potentially used in treating inflammatory-mediated neurodegenerative diseases [27] The ethanol extract of S. chinensis (ESC) inhibited generation of the cyclooxygenase-2 (COX-2) dependent phases of prostaglandin D2 in bone marrow-derived mast cells in a concentration-dependent manner with an IC50 value of 14.3 m g/ml. ESC also inhibited leukotriene C4 production with an IC50 value of 0.3 m g/ml. This demonstrates that ESC has COX-2/5- lipoxygenase dual inhibitory activity. The oral administration (50—200 mg/kg) of ESC reduced the number of infiltrated eosinophil in a bronchoalveolar lavage fluid.
Furthermore, ESC (100 mg/kg) inhibited the eotaxin and IL-4 mRNA expression levels. These results suggest that the anti-asthmatic activity of S. chinen- sis might in part occur via the inhibition of eicosanoid generation, degranulation as well as the down regulation of IL-4 and eotaxin mRNA expression . Methanol extract from leaves of S. chinensis exerts antiproliferative activity on several carcinoma, but not on normal cells [28].
Pimpinella anisum (anise):
Pimpinella anisum belongs to the family **Umbelliferae** which is native to eastern Mediterranean and Southwest Asia. Anise is a herbaceous annual plant growing to 3 ft (0.9 m) or more tall. It is also known as Anise [29]. This annual herb has been widely cultivated throughout the world. The dried fruits, usually called seeds, have been used for centuries for flavoring pastries, candies, and beverages. The oil distilled from the seed is preferred over the seed for flavoring because the seed has an undesirable appearance in some edible products. The oil is also used in medicines, perfumes, soaps.

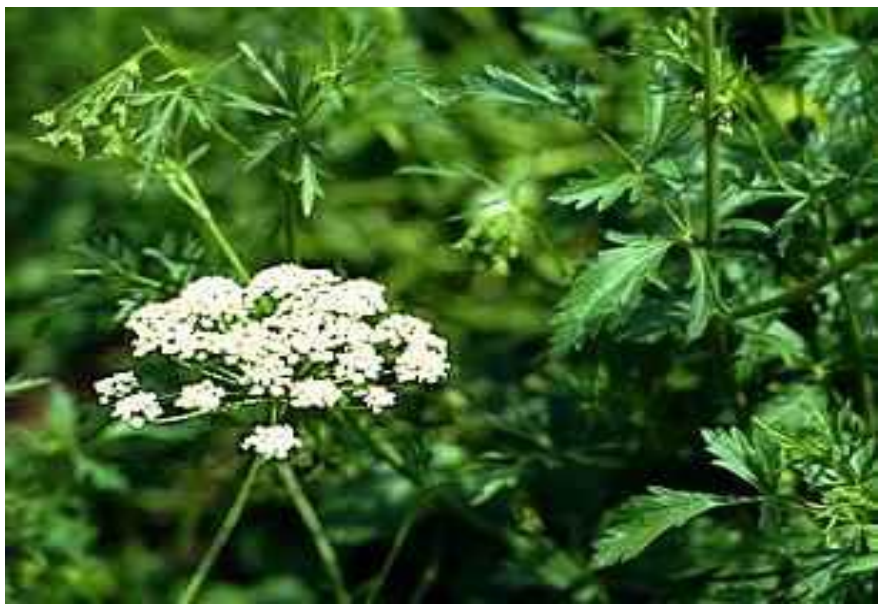

Figure 5

Botanical name: *Pimpinella anisum*
Common name: Aniseed
Chemical composition: Moisture: 9-13%, Protein: 18%, Fatty oil: 8-23%, Essential oil: 2-7%, Starch: 5%, N-free extract: 22-28%, Crude fibre: 12-25%, Essential oil yielded by distillation is generally around 2-3% and anethole makes up 80-90% of this.
Parts used: seeds
Traditional uses: bronchitis,preparation of tea,chocolate ,digestive problems.
Medicinal uses: Carminative effect, asthma, bronchitis, diarrhoea, stomach ache, menstrual cramps

Therapeutic potential of pimpinella anisum in bronchial asthma:
Extract and essential oil of Pimpinella anisum revealed that aniseeds can cause gastric protection, muscle relaxant, and affect digestive system. In diabetic patients, it has hypoglycemic and hypolipidemic effects and reduces lipid per-oxidation. Furthermore, aniseeds showed anticonvulsant effect, reduced morphine dependence, and induced conditioned place aversion in mice. Aniseed also has beneficial effects on dysmenorrhea and menopausal hot flashes in women. The aqueous extract was found to be the most potent antibacterial extract, also the activity against both gram(+ve) and gram(-ve) bacteria suggest its potential use as a broad spectrum antibacterial agent. Further considering the cost, availability and extractability percentage of the aqueous extract, it can be considered & used as a cheap alternative to substitute antibiotics, especially in animal and poultry feeds. MTT and LDH assays revealed that ethanolic extract have cytotoxic activity on human prostate cancer cell line [PC-3] at concentrations found safe to normal cells (rat skeletal muscle cell line [L6]). Treatment with anise seeds extract caused anti proliferative and apoptotic effects, with IC50 value of 400 µg/mL to cancer cells. Thus, anise could be one of the foods that attribute to cancer prevention and treatment [30] . 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 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 [31] .

Conclusion:

In this study, we have reported the description and therapeutic uses of some these mentioned above plants which are helpful in treating bronchial asthma.

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