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Role of Medicinal Plant in the Management of Asthama

Omkar Dilip Bobade[1], Shankar Ashok Dhage[2], Nitin B. Kohale[3], Suraj B. Rathod[4]
Students[1,2], Principal[2] and Assistant Professor[4]
Vardhman College of Pharmacy, Koli, Karanja (Lad), Washim, Maharashtra, India
bobadeomkar3@gmail.com

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. This review reveals that some plants and their extract have antiasthmatic, antihistaminic, anticholinergic and antiallergic activity.*

Keywords: Asthma Antiasthmaticplants, Ayurveda, Herbalmedicines, Antiallergic Activity, Medicinal property

I. INTRODUCTION

Asthma is a complex inflammatory disease that causes narrowing of the airways and is associated with altered levels of eosinophils, mast cells, lymphocytes, cytokines, and other inflammatory cell products. It is well known that asthmatics have elevated levels of certain IgE, which binds to receptors on mast cells and other inflammatory cells. Interactions between IgE antibodies and antigens lead to the activation of many inflammatory cell responses, including the release of mediators such as histamine, prostaglandins, and leukotrienes, which subsequently cause airway smooth muscle contraction and bronchoconstriction. [1], [3]. Asthma is a widespread disease with highest prevalence in developed countries and increasing prevalence worldwide. Asthma affects approximately 300 million people worldwide and is estimated to affect another 100 million by 2025 [4],[5]. Since the 1970s, the global prevalence, morbidity, mortality and economic burden of asthma, especially in children, have increased [6]. Medicinal plants for the treatment of asthma are said to have anti-inflammatory, immunomodulatory, antihistamine, smooth muscle relaxant and allergic activities [7].According to Ayurveda, anti-asthma drugs should possess properties such as anti-kapha and anti-vata [8]. Antioxidant supplements are effective in reducing the severity of bronchoconstriction by inhibiting pro-inflammatory events by counteracting the effects of excess reactive oxygen and nitrogen species [9]. Asthma treatments are inadequate due to side effects, so patients are looking for complementary and alternative medicines to treat asthma [10]. Quercetin is one of the most common flavonoids ingested by humans. Quercetin inhibits mast cellDegranulation and subsequent histamine release.

II. ADVERSE EFFECT OF CURRENT TREATMENT USED IN ASTHMA[11]

IS OPRENA LINE

Causes tachycardia.

SALBUTAMOL

Muscle tremors (dose related), palpitation, restlessness, nervousness, throat irritation and ankle edema.

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THEOPHYLINE

Convulsions, shock, arrhythmias, dependent) flushing, hypotension, diuresis, dyspepsia, insomnia etc. Increased muscle tone, tachapnoea, (dose restlessness, tremors, vomiting, palpitation,

ANTICHOLINERGIC

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).

KETOTIFEN

Sedation, dizziness, dry mouth, nausea and weight gain.

CORTICOSTEROIDS

Cushing's habit, brittle skin, purple streaks, hyperglycemia, muscle weakness, susceptibility to infections, delayed healing of wounds and surgical incisions, gastric ulcers, osteoporosis, glaucoma, growth retardation, psychiatric disorders, hypothalamic-pituitary – Suppression of the adrenal gland (HPA) axis. Etc Therefore, the search for effective, low-risk, non-drug strategies that offer valuable adjunctive or alternative treatments in asthma management is clinically attractive and relevant. Complementary and alternative medicines are of great interest and their use in the treatment and management of asthma is increasing [10]. The current review describes several plants that have been pharmacologically studied for parameters involved in asthma.

III. SOME TRADITIONAL PLANTS WITH ANTIASTHAMATIC POTENTIAL

AERVA LANTA LINN (AMARANTHACEAE)

Aerva lanta (A. lanta) is an erect or deciduous herbaceous roadside weed identified by white axillary clusters of small hairy flowers. Abundant in the plains of temperate regions of India. Ethanol extracts from the aerial parts of A. lanata were tested at oral doses of 100 µg/ml in isolated goat tracheal chain preparation models and 30 and 60 mg/kg in clonidine-induced catalepsy and mast cell degranulation in mice. , has anti-asthmatic.[12]

AGERATUM CONYZOIDES L.

Ageratum conyzoides, also known as A. conyzoides, is an upright, herbaceous annual plant that is native to tropical America but has a distribution range throughout tropical and subtropical regions of the world. By preventing the catalepsy that clonidine-induced in mice, a hydroalcoholic extract of the leaves of A. conyzoides at doses of 250, 500, and 1000 mg/kg exhibits antihistaminic activity[13].

ARGEMONE MEXICANA

In India, Argemone mexicana (A. mexicana) is widespread in fields and roadside. It has antiallergic and antistress properties when administered as an aqueous extract of A. mexicana stem at a dose of 50 mg/kg intravenously (i.v.)[14].

ASYSTASIA GANGETICA T. ADAMS (ACANTHACEAE)

In various regions of Nigeria, Asystasia gangetica (A. gangetica) is used to treat asthma. A. gangetica leaf extracts were tested for antiasthmatic activity using guinea pig trachea, rat stomach strip, guinea pig ileal preparation, and egg albumin-induced acute inflammation, according to Akah et al. According to the findings, the extracts did not have any contractile or relaxing effects in isolated tissue preparations, although they did prevent spasmogen-induced contractions[15]

BACOPA MONNIERI L. (SCROPHULARIACEAE)

Bacopa monnieri: Samiulla et al. tested the ability of B. monnieri leaf extracts to stabilise mast cells in rats using petroleum ether, chloroform, methanol, and water extracts at doses of 10 g/mL. According to research findings, every extract greatly reduces mast cell degranulation[16].

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CASSIA SOPHERA (CAESALPINIACEAE)

Traditional uses of Cassia sophera (C. sophera) include the treatment of bronchitis and asthma. At doses of 250, 500, and 750 mg/kg, the chloroform, ethyl acetate, and ethanol fractions isolated from the ethanol extract of C. sophera leaves exhibit significant antiasthmatic activity in animal models of carrageenan-induced paw edoema, histamine-induced bronchoconstriction, clonidine andHaloperidol-induced catalepsy, milk-induced leukocytosis, andand 750 mg/kg and this activity may be due to presence of flavonoids[17].

CASUARINA EQUISETIFOLIA LINN (CASUARINACEAE)

Evergreen Casuarina equisetifolia (C. equisetifolia) trees are grown along coastal regions from Gujarat to Orissa, in some areas of West Bengal, and in the Andaman Islands. They typically reach heights of up to 50 metres. The trachea's constriction brought on by histamine (10–80 mcg/mL), catalepsy brought on by clonidine, and mast cell degranulation at doses of 100 mg/kg are all inhibited by the methanol extract of wood and bark extracts [18].

CLERODENDRUM SERRATUM LINN (VERBENACEAE)

In traditional Ayurvedic medicine, Clerodendrum Serratum (C. serratum), also known as bharangi, is used to treat pain, inflammation, rheumatism, respiratory illnesses, and malarial fever. With isolated goat tracheal chains, clonidine-induced catalepsy, and milk-induced leucocytosis and eosinophilia in mice at doses of 50, 100, and 200 mg/kg, ethanol extract of C. serratum roots demonstrated antiasthmatic activity[19].

CNIDIUM MONNIERI (UMBELLIFERAE)

As an antipruritogenic substance, Cnidium monnieri (C. monnieri) has been used in Chinese traditional medicine to treat pain in the female genitalia, impotence, and suppurative dermatitis. In passive cutaneous anaphylaxis in rats, Matsuda et al. reported that ethanol extract and Osthol, a chromane isolated from ethanol extract of C. monnieri fruits, had antiallergic activity[20].

CRINUM GLAUCUM (AMARYLLIDACEAE)

South West Nigeria's Yoruba people are fond of Crinum glaucum (C. glaucum). Practitioners of traditional medicine said that it was a successful treatment for cough, asthma, and convulsions. At doses of 100–400 mg/kg, the aqueous extract of C. glaucum exhibits antiallergic activity by reducing the area of dye leakage in passive cutaneous anaphylactic reaction, protecting mast cell degranulation, and preventing histamine-induced bronchoconstriction in the guinea pig[21].

CURCULIGO ORCHIOIDES GAERTN (AMARYLLIDACEAE)

A little herbal plant known as Curculigo orchioides (C. orchioides) is found in abundance in India, China, Malaya, and Japan. Alcoholic extract of C. orchioides rhizomes exhibits antihistaminic and mast cell stabilising activity on Compound 48/80-induced systemic anaphylaxis and mast cell degranulation[22]. Additionally, it prevented the histamine-induced contraction of the goat trachea, guinea pig ileum, and bronchoconstriction in guinea pigs. It also prevented theRat passive paw anaphylaxis caused by egg albumin, the mouse catalepsy caused by clonidine, and the leucocytosis and eosinophilia caused by milk.milk induced leucocytosis and eosinophilia; clonidine induced catalepsy in mice[23].

ECLIPTA ALBA LINN (ASTERACEAE)

At doses of 250 and 500 mg/kg on compound 48/80-induced mast cell degranulation, egg albumin-induced passive cutaneous and paw anaphylaxis, bronchoalveolar lavage (BAL) study on gunea pig trachea, and histamine determination, the 50% ethanol extract exhibits antianaphylactic and antihistaminic activity[24].

EUPHORBIA HIRTA (EUPHORBIACEAE)

Euphorbia hirta, a herbaceous wild plant that grows in India's hotter regions, is sometimes referred to as asthma weed. At dosages (100-1000 mg/kg), an ethanol extract of the entire aerial section of the plant exhibits antihistaminic and

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antiallergic efficacy by preventing mast cell degranulation and suppressing passive cutaneous and paw anaphylactic reactions[25].

FICUS BENGALENSIS LINN (MORACEAE)

The enormous Ficus bengalensis (F. bengalensis) tree grows to a height of around 30 m and spreads out many aerial roots from its branches. When given to mice at a dose of 50 mg/kg of clonidine, ethyl acetate, ethanol, and aqueous extracts ofThe bark of F. bengalensis exhibit antihistaminic activity by inhibiting the catalepsy that drug causes. These effects could be a result of flavonoids[26],[27].

GAKANI

Gakani is a polyherbal medication that includes Syzygium aromaticum (L.) Merr, Securidaca iongipedunculata Tresen, Piper guineense schum Thonn, Gramineae Olax subscorpioidea Oliv., and Gramineae Gramineae Olax subscorpioidea Oliv (Myrtaceae). Gakani, a well-known herbal remedy, was tested for its ability to treat asthma using rat stomach strips, guinea pig ileum preparations, and egg albumin-induced paw edoema. According to the results, the extract prevented histamine and isoprenaline from having an effect on the guinea pig tracheal chain. It demonstrates how histamine and 5-hydroxytryptamine decrease the contraction of an isolated guinea pig ileum and a rat stomach strip (5-HT). Rats exposed to the extract showed good anti-inflammatory effects[28].

HEMIDESMUS INDICUS R. BR. (ASCLEPIADACEAE)

A twining shrub known as Hemidesmus indicus (H. indicus) is frequently seen in India. Using isolated goat tracheal chain preparation, passive paw anaphylaxis in rats, and clonidine-induced catalepsy in mice, Bhujbal et al. reported antiasthmatic activity of an ethanol extract of H. indicus roots at doses of 25, 50, and 100 mg/kg[29].

AMBURANA CEARENSIS (FABACEAE)

The Brazilian northeastern “caatinga” (savannah) is home to the medicinal plant Amburana cearensis (A. cearensis), which is widely used to treat respiratory conditions including asthma. The guinea pig trachea’s KCl-induced contraction was significantly relaxed by the flavonoid isokaempferide that was isolated from the trunk barks of A. cearensis[30].

PLANTS FROM ZINZIBERACEAE

According to Tewtrakul et al., ethanol and water extracts from a few plants in the Zinziberaceae family have antiallergic properties[31].

LEPIDIUM SATIVUM LINN (CRUCIFERAE)

It is a glabrous, annual herb commonly referred to as “Asaliyo” that is grown as a salad plant all over India. Histamine and acetylcholine-induced bronchospasm is inhibited by the ethanol extract and its fractions of ethyl acetate, n-butanol, and methanol[32].

MENTHA SPICATA L

By suppressing antigen-stimulated rat basophile, the four novel flavonoids and three novel glycosides from M. spicata leaves exhibit antihistaminic activity[33].

MOMORDICA DIOICA

Momordica dioica is a creeping plant that climbs. Its fruits and leaves are traditionally used as a treatment for bronchitis, fever, tridosha, leprosy, and asthma. By preventing the 50 mg/kg clonidine-induced catalepsy in mice, methanol and an aqueous pulp extract exhibit antihistaminic effect, which may be attributed to polar constituents[34].

MUCUNA PRURIENS

At doses of 50, 100, and 200 mg/kg, the L-DOPA extracted from the methanol extract of the seed has antihistaminic action by reducing clonidine-induced catalepsy and mast cell degranulation in mice[35].

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MYRICA ESCULENTA BUCH. HAM. (MYRICACEAE)

The common name for Myrica esculenta is Kaiphal. It is used in the ayurvedic medical system to treat bronchitis and asthma. Using acetic acid-induced vascular permeability and allergic pleurisy in mice techniques, Patel et al. found antiallergic and anti-inflammatory effects of ethanol extract of aerial parts[36]. By preventing acetylcholine-induced bronchospasm in guinea pigs, egg albumin-induced anaphylaxis in guinea pigs at doses of 75 mg/kg, and by relaxing guinea pig trachea and ileum caused by histamine and acetylcholine-induced bronchospasm, this plant's stem bark has bronchodilator and antianaphylacticActivity by inhibiting acetylcholine induced bronchospasm in guinea pigs, egg [37].

NYCTANTHES ARBORTRISTIS

It has a long history of usage in the management of asthma. At a dose of 50 mg/kg, the petroleum ether extract inhibits the catalepsy that clonidine causes in mice, demonstrating antihistaminic activity[38].

OLEA EUROPEA (OLEACEAE)

It is a little evergreen tree that grows to a height of 12 to 20 feet, has aged, inflexible limbs, and a grey bark. By preventing histamine-induced contraction of the goat trachea and the guinea pig ileum at concentrations of 100 g/mL and 4 and 8 mg/kg/kg/kg, respectively, as well as catalepsy in mice, aqueous extract of ripe olives exhibits antiasthmatic activity[39].

PHYMATODES SCOLOPENDRIA (BURM.) CHING (POLYPODIACEAE)

A crawling fern called Phymatodes scolopendria grows along Madagascar's eastern coast in the sand. Inhibiting histamine or carbachol-precontracted guinea pig trachea, Ramanitrahasimbola et al. showed bronchodilator activity of 1, 2-benzopyrone (coumarin) extracted from ethanol extract of aerial parts[40].

PIPER BETEL LINN

Traditionally, piper betel has been used to treat rheumatism, asthma, pruritis, cough, and colds. When histamine causes bronchoconstriction in guinea pigs, as well as histamine-induced contraction of the guinea pig tracheal chain that is dose dependent as well as isolated guinea pig ileum preparation, ethanol and an aqueous extract of the leaves at doses of 100 and 200 mg/kg have antiasthmatic activity[41].

STRIGA OROBANCHIOIDES BENTH (SCROPHULARIACEAE)

A parasitic plant called Striga orobanchioides inhabits the roots of several plants. By inhibiting histamine-induced ileal contractions in guinea pigs at concentrations of 2.5 to 25 g/mL in a dose-related manner and by inhibiting mast cell degranulation at doses of 100 and 200 mg/kg, ethanol and aqueous extracts of the entire plant exhibit antihistaminic and mast cell stabilising activity[42]-[49].

SPHAERANTHUS INDICUS KURZ (ASTERACEAE)

A significant plant used in folk medicine is called Sphaeranthus indicus. In comparison to the common medication ketotifen, the ethanol extract at doses of 150 and 300 mg/kg and its ethyl acetate extract at doses of 100, 150, and 300 mg/kg demonstrated marginally superior protection against sheep serum and Compound 48/80-induced mast cell degranulation[50].

III. CONCLUSION

Almost 70 percent of the prescription and OTC (Over the Counter) medicines that are being used for many diseases' treatment is derived from plants and natural sources. Pharmacologists, Medical Doctors, Scientists and pharmaceutical companies study the plants and herbs that are traditionally used for treatment of various diseases. After vigorous study they identify the particular molecule that has therapeutic properties. These molecules do undergo various modifications and mutations in laboratories. And then, it is mass produced in factories and systematically marketed. For example, Digitalin which is a drug used to stimulate the heart. Well, Digitalin comes from an herb called foxglove. Another example is the effective anti-clotting agent called Coumarol, that comes from a herb sweet clover. Another one is

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Reserpine, which is one of the most popular tranquilizers. It is the first ever modern psychiatric drug. Most of the modern tranquilizers are derived from Reserpine. Reserpine comes from a herb named snakeroot. In India they used snakeroot for thousands of years to calm people down. Still another example is Quinine. It is very efficient in reducing fever, especially malarial fever. This drug comes from the Peruvian bark in South America. Another example is Asprin which was derived from white willow bark. Let us see the herbs connection to Asthma. The first ever modern prescription medicine used to treat asthma is ephedrine. It is derived from the Chinese plant known as Ma Huang. Chinese have been using Ma Huang to treat breathing disorders, wheezing etc. for the past 2000 years. The molecule ephedrine was isolated from Ma Huang in1940 and was widely prescribed since then. Cromolyn Sodium is another popular medicine used for the treatment of asthma. Cromolyn was derived from a plant knows as Khellin (Ammi Visnaga) commonly found in Egypt. It was used as a muscle relaxant by Egyptians for many centuries. Dr. Roger Altouynan (the discoverer of Cromolyn molecule), an asthmatic, tried Khellin on himself and found it to be very beneficial. Today cromolyn sodium is one of the first lines of treatment for asthma. Cromolyn sodium has weaned great number of patients away from harmful corticosteroids. Cromolyn effectively prevents asthma attack before it occurs. Prescription medicines Codeine, atropine, hyoscyamine, digoxin, digitoxin, pilocarpine, and quinidine are all derived from plants. Asthma and Allergy are lifestyle diseases and herbs are extremely effective. The goals of medicine no matters to which group it belongs, are the same i.e. welfare of patients. One can look towards a future of integrated medicine and hope that research in alternative medicine will help to cure asthma safe and effectively rather than managing.

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