REVIEW ARTICLE

A Critical Review on Medicinal Plants for the Treatment of Bronchial Asthma

Krupa Joshi[1], Ashim Kumar Sen[1], Rahul Trivedi[1], Dilsar Gohil[1], Vatsal Gujariya[2]

[1]Department of Pharmacy, Sumandeep Vidyapeeth Deemed to be University, Vadodara, Gujarat, India, [2]Department of Roganidan evam Vikriti Vigyan, Parul Institute of Ayurved, Parul University, Vadodara, Gujarat, India

Abstract

The current study recorded cultural groups' historical education of medicinal herbs and plants used to treat respiratory illnesses like asthma in India. The current study depends on an overview of the scientific literature and contains specific information about how different tribal communities in India use plants and their components to control bronchial asthma. Asthma is a widespread condition that is becoming more frequent all over the world, with the highest frequency in industrial nations. Plants have been used as outstanding sources of medicine throughout antiquity. As a result of the detrimental effects of current asthma medication, individuals are exploring complementary and alternate medicines to cure their asthma. Plants are used to heal a number of human ailments in ayurveda and other Indian literature. There are around 45,000 species of plants in India, with many of them claiming therapeutic benefits. Recent research on plants that have been mentioned or used traditionally for asthma has demonstrated anti-asthmatic, anti-histaminic, and anti-histamine effects. Different herbs and extracts from them provide anti-asthmatic, anti-allergic, and anti-cholinergic characteristics, according to this chapter.

Key words: Anti-allergic, anti-asthmatic, asthma, ayurveda, medicinal plants, treatment

INTRODUCTION

Plants are a rich source of bioactive substances that can be used directly or indirectly to treat a variety of human illnesses. Human societies have been studying and employing numerous plants as well as their products to treat terrible illnesses since time immemorial. Asthma is a devastating condition that claims the lives of millions of people worldwide each year. Asthma is a condition that damages the airways that transport oxygen and carbon dioxide to and from the lungs. Asthmatics are those who have this chronic (long-lasting) illness. Asthma symptoms consist of wheezing, coughing, tightness in the chest, and quickness of breathing. According to the World Health Organization (WHO),[1] around 80% of the world's population, particularly in tribal and rural regions, rely on herbal traditional remedies for their health care requirements. Asthma affects an estimated 300 million individuals globally (WHO, 2004), and approximately 255,000 people died from it in 2005. Low and lower-middle-income nations accounted for 80% of asthma fatalities.[2] In India, a variety of herbs were described in the Ayurvedic and Unani systems of medicine for the care of asthma. Similarly, indigenous knowledge arose independently in numerous regions of the world and was utilized by tribal societies to cure various ailments.[3]

Asthma is defined by the National Institute of Health as just like a severe inflammatory disorder of the airways (resulting in airway narrowing) whereby many cells and cellular elements play a role, including cells called mast cells, eosinophils, T-lymphocytes, neutrophils, and epithelial cells, cytokines, and other inflammatory cell products.[4] Asthma is produced by a complicated combination of inflammatory cells and mediators. Herbal methods of asthma therapy have regained prominence, with controlled clinical trials proving their effectiveness and safety.[5]

Asthmatic individuals have high amounts of particular immunoglobulin E (IgE), which binds to mast cells as well as other inflammatory cell receptors. The interaction

Address for correspondence:
Krupa Joshi, Department of Pharmacy, Sumandeep Vidyapeeth Deemed to be University, Vadodara, Gujarat, India. E-mail: krupaj356@gmail.com

Received: 10-10-2023
Revised: 14-12-2023
Accepted: 26-12-2023

Table 1: List of medicinal plants with their categories for treatment of asthma

Plant name	Common name	Family	Part used/ extract/form	Major chemical constituents	Categories of drugs	References
Adhatoda vasica Nees	Adulasa, Vasaka	*Acanthaceae*	Leaves, Roots	Alkaloids	Bronchodilator	[17]
Alstonia scholaris	Blackboard tree	Dogbane *(Apocynaceae)*	Leaves/Ethanol	Ditamine, Echitamine, and Echitenines	Bronchodilator	[18]
Artemisia caerulescens	Indian wormwood	*Asteraceae*	Aerial parts/ Butanol	Quercetin, isorhamnetin	Bronchodilator	[19]
Belamcanda chinensis	Blackberry Lily	iris *(Iridaceae)*	Leaves/Ethanol	Tectorigenin	Bronchodilator	[20]
Benincasa hispida	Winter Melon	*Cucurbitaceae*	Fruits/Methanol	Triterpenes, Glycosides, Sterols	Bronchodilator	[21]
Coleus forskohlii	Patharchur, Gandhmoolika	*Lamiaceae*	Roots	Forskolin (Diterpenoid)	Bronchodilator	[22]
Gardenia latifolia	Indian Boxwood	*Rubiaceae*	Bark	Saponins	Bronchodilator	[23]
Aloe vera Tourn. ex Linn.	Kumari	*(Liliaceae)*	Leaves/ Aqueous, Chloroform and ethanol	Anthraquinones, sterols, saponins, and carbohydrate	Anti-inflammatory agent	[24]
Curcuma longa	Turmeric	*Zingiberaceae*	Rhizomes	Tumerones, curcuminoids	Anti-inflammatory agent	[25]
Ocimum sanctum	Tulsi	*Lamiaceae*	Leaves/ Aqueous	Myrcenol, Nerol, Eugenol	Anti-inflammatory agent	[26]
Achyranthes aspera	Chaff-flower	*Amaranthaceae*	Aerial parts/ Aqueous	Oleanolic acid	Mast cell stabilizer	[27]
Albizia lebbeck	Frywood, koko, and woman's tongue tree	*Fabaceae*	Stem bark/ Aqueous	Saponins	Mast cell stabilizer	[28]
Bidens parviflora	Blackjack, tickseed sunflowers	*Asteraceae*	Aerial parts	Glycosides	Mast cell stabilizer	[29]

between the IgE antibody and antigen causes a cascade of inflammatory cellular responses, including the production of mediators such as histamines, prostaglandins, and leukotrienes, which causes the airway's smooth muscle contraction and bronchoconstriction.[6-8] Asthma is a widespread condition that is becoming more frequent over the world, with the highest frequency in industrialized nations. Asthma affects around 300 million individuals globally, with a projected 100 million impacted by 2025.[9,10] Asthma prevalence, morbidity, death, and economic burden have all grown globally since the 1970s, especially in children.[2] Anti-inflammatory, immunomodulatory, antihistaminic, soft muscle relaxant, and allergic actions should be present in medicinal plants used to treat asthma.[11] Ayurvedic anti-asthmatic medications should contain anti-kapha and anti-vata characteristics.[12] Supplements containing antioxidants are beneficial in lowering bronchoconstriction severity by blocking pro-inflammatory processes caused by excess reactive oxygen and nitrogen species.[13] As a result of the detrimental effects of current asthma medication, individuals are exploring complementary and alternate medications for the treatment of their asthma [Table 1].[14]

PHARMACOLOGICAL THERAPY OF BRONCHIAL ASTHMA

Previously, most practitioners treated asthma primarily based on the patient's symptoms. Asthma was generally seen as a bronchospasm condition, and methods to avoid or reverse bronchospasm were the cornerstone of therapy. However, when asthma was discovered to be an inflammatory condition rather than a bronchospastic illness in the early 1980s, the primary strategy shifted from symptom control to treatment for underlying airway inflammation.[15]

The frequency and intensity of a patient's symptoms influence the pharmaceutical therapy of asthma. Infrequent

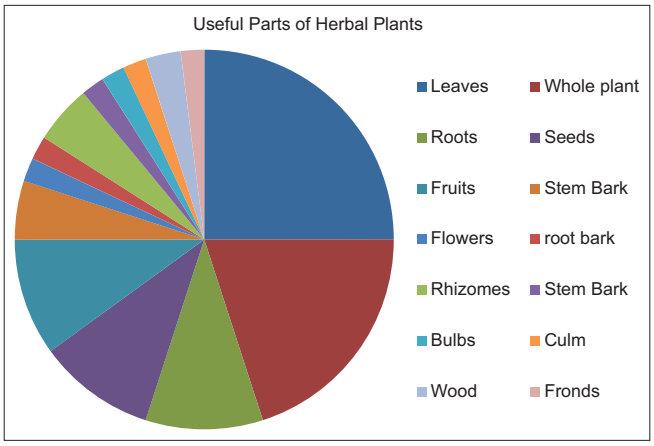

Figure 1: A diagram demonstrating the data of several medicinal plant components taken to relieve asthma

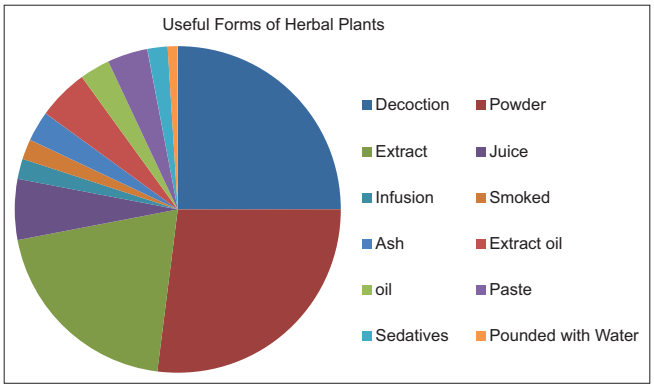

Figure 2: A diagram demonstrating the data of several medicinal plant forms taken to relieve asthma

attacks may be treated by treating each incident as it occurs, but more frequent episodes require preventive treatment. Asthma's medications fall into the following categories.[15,16]

1. Bronchodilators
2. Anti-inflammatory agents
3. Mast cell stabilizers
4. Anti-allergics
5. Anti-spasmodic agents
6. Miscellaneous agents
7. Anti-anaphylactic drugs.

Statistically, the leaves from plant species were used for the treatment of asthma, as well as whole plants, roots, seeds, fruits, stem barks, flowers, and leaves, as well as roots, root barks, flowers, and leaves, rhizome and stems, and the bulbs, culm, dry corms, fronds, and wood [Figure 1].

Some plants can be used in decoction form, others in powder form, and others in extract and juice form. During the asthma attack, several plants' fruits were consumed straight [Figure 2].

Over the last two decades, the usage of therapeutic herbs and natural remedies has expanded substantially all worldwide. Over 400 species of medicinal plants have been employed ethnopharmacologically and historically worldwide to cure the symptoms of asthma and allergic illnesses.

CONCLUSION

Herbal treatments have received attention, with controlled clinical research proving their effectiveness and safety. Pharmacologists, medical practitioners, scientists, and pharmaceutical corporations research plants and herbs that have historically been used to cure a variety of ailments. They find the specific chemical with medicinal qualities after extensive research. In laboratories, these molecules go through different alterations and mutations. After that, it is manufactured in factories and methodically sold. Some herbal alternatives used in these traditions have been shown to give symptomatic treatment as well as aid in illness prevention. In summary, efforts should be undertaken to produce polyherbal formulations including multiple herbs operating at specific locations of the pathogenic cycle of asthma for prevention and management of asthma, as well as later clinical investigations on them.

REFERENCES

1. World Health Organization (WHO). The Global Burden of Disease: 2004 update. Geneva: WHO; 2008. Available from: www.who.int/evidence/bod
2. Braman SS. The global burden of asthma. Chest 2006;130:4-12S**.**
3. Jain SK, Sharma PP. A review of the parallel or unique indigenous uses of twenty-five plants in India and some African countries. Ethnobotany 2000;12:51-5.
4. National Institute of Health. Expert Panel Report 2. Guidelines for the diagnosis and Management of Asthma. Bethesda: NIH Publication. No.97-4051; 1997.
5. Huntley A, Ernst E. Herbal medicines for asthma: A systematic review. Thorax 2000;55:925-9.
6. Holgate ST, Polosa R. Treatment strategies for allergy and asthma. Nat Rev Immunol 2008;8:218-30.
7. Del Donno M, Bittesnich D, Chetta A, Olivieri D, Lopez-Vidriero MT. The effect of inflammation on mucociliary clearance in asthma: An overview. Chest 2000;118:1142-9.
8. Tattersfield AE, Knox AJ, Britton JR, Hall IP. Asthma. Lancet 2002;360:1313-22.
9. Masoli M, Fabian D, Holt S, Beasley R, Global Initiative for Asthma (GINA) Program. The global burden of asthma: Executive summary of the GINA Dissemination Committee report. Allergy 2004;59:469-78.
10. Bousquet J, Bousquet PJ, Godard P, Daures JP. The public health implications of asthma. Bull World Health Organ 2005;83:548-54.
11. Greenberger PA. Therapy in the management of the rhinitis/asthma complex. Allergy Asthma Proc

2003;24:403-7.
12. Lyengar MA, Jambaiah KM, Rao GM. Studies on an antiasthma kada: A proprietary herbal combination part-I clinical study. Indian Drug 1994;31:183-6.
13. Henricks PA, Nijkamp FP. Reactive oxygen species as mediators in asthma. Pulm Pharmacol Ther 2001;14:409-20.
14. Slader CA, Reddel HK, Jenkins CR, Armour CL, Bosnic-Anticevich SZ. Complementary and alternative medicine use in asthma: Who is using what? Respirology 2006;11:373-87.
15. Barnes PJ. New concepts in the pathogenesis of bronchial hyperresponsiveness and asthma. J Allergy Clin Immunol 1989;83:1013-26.
16. Barnes PJ, Chung KF, Page CP. Inflammatory mediators and asthma. Pharmacol Rev 1988;40:49-84.
17. Paliwa JK, Dwivedi AK, Singh S, Gutpa RC. Pharmacokinetics and *in-situ* absorption studies of a new anti-allergic compound 73/602 in rats. Int J Pharm 2000;197:213-20.
18. Channa S, Dar A, Yaqoob M, Anjum S, Sultani Z, Atta-ur-Rahman. Broncho-vasodilatory activity of fractions and pure constituents isolated from *Bacopa monnieri*. J Ethnopharmacol 2003;86:27-35.
19. Morán A, Carrón R, Martín ML, San Román L. Antiasthmatic activity of *Artemisia caerulescens* subsp. gallica. Planta Med 1989;55:351-3.
20. Singh S, Agrawal SS. Broncho-relaxant activity of *Belamcanda chinensis*. Ind J Pharmacol 1990;22:107-9.
21. Kumar DA, Ramu P. Effect of methanolic extract of *Benincasa hispida* against histamine and acetylcholine induced bronchospasm in guinea pigs. Indian J Pharmacol 2002;34:365-6.
22. Marone G, Columbo M, Triggiani M, Cirillo R, Genovese A, Formisano S. Inhibition of IgE-mediated release of histamine and peptide leukotriene from human basophils and mast cells by forskolin. Biochem Pharmacol 1987;36:13-20.
23. Gupta SS. Some observations on the anti-asthmatic effect of the saponins of *Gardenia latifolia*. Aspect Aller Appl Immunol 1974;7:198-204.
24. Vázquez B, Avila G, Segura D, Escalante B. Antiinflammatory activity of extracts from *Aloe vera* gel. J Ethnopharmacol 1996;55:69-75.
25. Ammon HP, Wahl MA. Pharmacology of *Curcuma longa*. Planta Med 1991;57:1-7.
26. Singh S, Agrawal SS. Anti asthmatic and anti-inflammatory activity of *Ocimum sanctum*. Int J Pharmacog 1991;29:306-10.
27. Agrawal BB, Mehta AA. Phyto-Pharmacological Investigation of *Moringa oleifera* and *Achyranthes aspera* for their Antiasthmatic Activity. Ph.D. Thesis. Gujarat: Gujarat University; 2005.
28. Tripathi RM, Sen PC, Das PK. Studies on the mechanism of action of *Albizzia lebbeck*, an Indian indigenous drug used in the treatment of atopic allergy. J Ethnopharmacol 1979;1:385-96.
29. Wang N, Yao X, Ishii R, Kitanaka S. Antiallergic agents from natural sources. 3. Structures and inhibitory effects on nitric oxide production and histamine release of five novel polyacetylene glucosides from *Bidens parviflora* WILLD. Chem Pharm Bull (Tokyo) 2001;49:938-42.

Source of Support: Nil. **Conflicts of Interest:** None declared.