World Journal of Pharmaceutical Science and Research

www.wjpsronline.com

Review Article

ISSN: 2583-6579

SJIF Impact Factor: 6.916

Year - 2026

Volume: 5; Issue: 4

Page: 702-710

MEDICINAL PLANTS WITH ANTIHISTAMINIC AND ANTI-ASTHMATIC POTENTIAL: PHYTOCHEMISTRY AND EXPERIMENTAL EVIDENCE

Tania Maria Subi[1], Roshini K. V.*[2]

[1]Student, Chemists College of Pharmaceutical Sciences and Research, Varikoli, Ernakulam, affiliated to Kerala University of Health Sciences, Thrissur, Kerala- 680596, India.

[2]Associate professor, Department of Pharmacology, Chemists College of Pharmaceutical Sciences and Research, Varikoli, Ernakulam, affiliated to Kerala University of Health Sciences, Thrissur, Kerala-680596, India.

Article Received: 24 February 2026 | | Article Revised: 17 March 2026 | | Article Accepted: 06 April 2026

***Corresponding Author: Roshini K. V.**
Associate professor, Department of Pharmacology, Chemists College of Pharmaceutical Sciences and Research, Varikoli, Ernakulam, affiliated to Kerala University of Health Sciences, Thrissur, Kerala-680596, India. **DOI:** https://doi.org/10.5281/zenodo.19593760

How to cite this Article: Tania Maria Subi, Roshini K. V. (2026) MEDICINAL PLANTS WITH ANTIHISTAMINIC AND ANTI-ASTHMATIC POTENTIAL: PHYTOCHEMISTRY AND EXPERIMENTAL EVIDENCE. World Journal of Pharmaceutical Science and Research, 5(4), 702-710.

ABSTRACT

Asthma is an inflammatory airway disease, which is accompanied by bronchoconstriction, airway hyperresponsiveness, and hypersecretion of mucus, where histamine plays a central role via H1 receptor-mediated smooth muscle contraction and inflammatory signaling. Although the conventional antihistaminic and anti-asthmatics are clinically effective, long-term usage is often characterised by adverse effects, prompting the need for less harmful therapeutic options. Structured literature search was performed in PubMed, Scopus and Google Scholar using relevant search terms, and the studies were identified based on reported antihistaminic, anti-asthmatic, or bronchodilatory effects in peer-reviewed experimental models. This paper critically examines the antihistaminic and anti-asthmatic action of medicinal plants with a focus on the constituent phytochemicals, mechanisms of action, and experimental support. Bioactive compounds such as flavonoids, polyphenols, saponins, and alkaloids can inhibit histamine release, antagonizing H1 receptors, stabilizing mast cells, and inducing bronchodilation. All these pharmacological activities are consistently supported by the evidence in in vitro and in vivo studies provided. Together, medicinal plants are good prospects for the design of complementary or alternative therapeutic interventions in asthma management, but stringent standardization, safety profiling, and clinical validation are necessary to enable their translation to the clinic.

KEYWORDS: Asthma, Histamine, medicinal plants, H1 receptor antagonism, Bronchodilatory activity, Phytochemicals.

1. INTRODUCTION

Asthma is an airway inflammatory chronic disease with a global prevalence of more than 300 million people and continues to be a major health burden across the world. It is distinguished by reversible airway obstruction, bronchial hyperresponsiveness, and chronic inflammation, which results in such symptoms as wheezing, dyspnea, and coughing.

The pathophysiology is complex, and it is characterised by the interaction of inflammatory cells, mediators, and structural airway components. Histamine is one of them, being a major mediator of the allergic response that is released by activated mast cells.[1]

The mechanism of action of histamine is mainly manifested by the activation of the H1 receptors of airway smooth muscle and inflammatory cells, leading to bronchoconstriction, vascular hyperpermeability, and the hypersecretion of mucus. These reactions work in favor of airway constriction and symptom worsening in asthma. Even though standard antihistaminic and anti-asthmatic drugs are commonly used in clinical practice, their long-term adaptation is mostly linked to adverse effects, i.e., sedation, tolerance, and systemic problems, which restrict their long-term use.

The past years have seen an increased interest in the study of medicinal plants as a possible therapeutic option in the management of asthma.[2] This is because medicinal plants have been found to be good sources of bioactive phytochemicals such as flavonoids, polyphenols, saponins, and alkaloids that are known to have considerable antihistaminic, anti-inflammatory, and bronchodilatory effects in laboratory research.[3] These compounds have multiple modes of action, including inhibition of histamine release, H1 receptor antagonism, mast cell stabilization, and modulation of intracellular signaling pathways.

Thus, the current review will critically assess the antihistaminic and anti-asthmatic properties of medicinal plants, especially their phytochemical composition, mechanisms of action, and experimental evidence in support of their application in the creation of safer and more effective pharmacological approaches to the treatment of asthma.[3]

2. METHODS

2.1 Data Sources

An extensive literature review was conducted in PubMed/MEDLINE, Scopus, and Google Scholar. To find the relevant studies, additional PubMed Central (PMC) and Web of Science searches were done.

2.2 Search Strategy

These search terms were used, separately and together, and included: antihistaminic medicinal plants, anti-asthmatic plants, phytochemicals asthma, histamine H1 receptor plant extract, mast cell stabilization herbal, bronchodilatory plant, flavonoids antihistaminic, alkaloids asthma, and polyphenols asthma. The search was refined using Boolean operators (AND, OR). The literature that was published between 2009 and 2025 was searched.

2.3 Study Selection

The inclusion criteria were: (i) studies that reported antihistaminic, anti-asthmatic or bronchodilatory activity of medicinal plant extracts or isolated phytochemicals; (ii) published in peer-reviewed journals; (iii) using in vitro, in vivo or ex vivo experimental models; and (iv) written in English. The exclusion criteria included the following: (i) abstracts and editorials, and grey literature; (ii) the absence of experimental data on antihistaminic or anti-asthmatics effects; (iii) the use of non-plant-compounds as the main intervention.

2.4 Data Extraction

Out of every chosen article, the following data were obtained: name of the plant and family, significant phytochemicals present, experimental model, and the pharmacological activity observed. This information was brought together in narratively and tabulated in Table 1.

3. Antihistaminic and Anti-Asthmatic Mechanisms of Medicinal Plants

Histamine is a key mediator of the pathogenesis of the allergic and asthmatic response, which facilitates bronchoconstriction, heightens vascular permeability, and airway inflammation. It is mostly released by activated mast cells and basophils in response to contact with allergens and has its biological actions mainly through action at H1 receptors on airway smooth muscle cells and inflammatory cells. This stimulation causes intracellular signaling pathways that include the mobilization of calcium, which causes the contraction of smooth muscle, hypersecretion of mucus, and the intensification of inflammatory reactions.

Antihistaminic effects of medicinal plants involve various pharmacological mechanisms, which attack various steps of this pathway. H1 receptor antagonism is considered to be one of the main mechanisms, where the plant-based bioactive compounds block the binding of histamine to its receptors, thus suppressing bronchoconstriction and airway hyperresponsiveness. Other phytochemicals like flavonoids and polyphenols have been shown to have a competitive and non-competitive effect against H1 receptors in experimental models.[3]

Mast cell stabilization is another prominent process that inhibits degradation and consequent release of histamine and other pro-inflammatory agents. A number of plant extracts have been documented to inhibit the process of calcium influx into the mast cells, inhibiting the release of histamine and the allergic reaction. This process plays an important role in antihistaminic and anti-inflammatory actions.[4]

Besides, medicinal plants have a direct bronchodilatory action by regulating intracellular calcium movement in airway smooth muscle cells. The smooth muscle relaxation caused by inhibition of voltage-dependent calcium channels or lowering of intracellular Calcium levels leads to bronchodilation and subsequent increase in airflow.

In addition, the anti-inflammatory and antioxidant effects of medicinal plants are important supportive effects in the treatment of asthma. Another effect of the phytochemicals is the inhibition of the airway hyperresponsiveness and persistent inflammation, involving the control of the major inflammatory pathways such as the suppression of pro-inflammatory cytokines, leukotrienes, and oxidative stress. The therapeutic importance of medicinal plants in the management of histamine-mediated airway responses and their use to treat asthma due to their complex mechanisms is justified. Medicinal plants have various effects on airway responses (Figure 1).

4. Role of Phytochemicals in Antihistaminic and Anti-Asthmatic Activity

The therapeutic capacity of medicinal plants in the treatment of asthma has been attributed in large part to their varied phytochemical makeup, which possesses antihistaminic, bronchodilatory, and anti-inflammatory effects. These bioactive molecules regulate several different targets in airway inflammation and smooth muscle contraction.

Flavonoids, polyphenols, saponins, and alkaloids are some of the most well-studied classes, however, all of which play a major role in the pharmacological effects exhibited in respiratory disorders.[5]

Flavonoids are considered to be one of the most noticeable groups of phytochemicals with the established antihistaminic effect. Quercetin, kaempferol, vitexin, and isovitexin, among others, have been found to inhibit mast cell degranulation and block histamine release, besides displaying antagonistic action on H1 receptors. In addition, flavonoids regulate intracellular calcium release in airway smooth muscle cells, resulting in relaxation, bronchodilation, and reduction of airway hyperresponsiveness.[6]

Polyphenols have been known to have potent antioxidant and anti-inflammatory effects that have an indirect role in asthma control. Polyphenols suppress airway inflammation, suppress pro-inflammatory mediators, eliminate reactive oxygen species, and inhibit contraction of smooth muscles in response to oxidative stress, thus enhancing airway performance.[7]

Saponins have an antihistaminic effect mainly via membrane-stabilizing effects on mast cells, hence inhibiting degranulation and consequent release of histamine. Moreover, they can also control the airway smooth muscle tone, which leads to bronchodilatory effects, which also contributes to their use in asthma management.[8]

The antihistaminic and antispasmodic effects of alkaloids are based on the interaction with the histamine receptor and regulation of the smooth muscle contractility. Even though alkaloids are relatively less investigated than flavonoids, they are also essential in the overall pharmacological effect of medicinal plants.[9]

All these interactions between these phytochemicals are synergistic and together increase the overall therapeutic effect of medicinal plants. This multi-target mode of action highlights why they could serve as effective agents in the treatment of asthma and why they should be further studied in both experimental and clinical studies. These effects are caused by phytochemicals like flavonoids, polyphenols, saponins, and alkaloids (Figure 2).

5. Medicinal Plants with Experimental Evidence

Experimental research has been able to give strong evidence for the antihistaminic and anti-asthmatic effects of many medicinal plants to justify their use in respiratory and allergy diseases in the past. These studies involve in vitro and in vivo models to explain the mechanisms of bioactivity, such as mast cell stabilization, H1 receptor antagonism, and smooth muscle relaxation.

Ocimum sanctum L. (Lamiaceae) shows strong antihistaminic and bronchodilatory activity in isolated tissue preparations, which is believed to be on account of high flavonoid and phenolic contents that stabilize mast cells and relax airway smooth muscle.[10] In the same way, Glycyrrhiza glabra L. (Fabaceae), has anti-inflammatory and anti-asthmatics effects in preclinical models, suppressing histamine-induced bronchoconstriction and airway inflammation by glycyrrhizin and flavonoids, respectively.[11]

Adhatoda vasica Nees (Acanthaceae) has been reported to possess bronchodilatory and antispasmodic effects, and primarily due to alkaloids, vasicine, and vasicinone, which relax smooth muscle and prevent histamine-induced contractionrh4u.[12] Vigna radiata (L.) Wilczek (Fabaceae), which is also referred to as mung bean, is a known source of flavone C-glycosides vitexin and isovitexin. An anti-asthmatic effect has been explored in vitexin using a murine ovalbumin-induced asthma model, with vitexin being shown to have a significant effect on reducing eosinophil and neutrophil infiltration into the bronchoalveolar lavage fluid, lowering Th2 cytokines, decreasing circulating IgE and pulmonary oedema and mucus production. Such results confirm the pharmacological importance of vitexin-containing

plants, such as V. radiata, in the management of respiratory allergy.[13] Curcuma longa L. (Zingiberaceae) also has anti-inflammatory and anti-asthmatic properties in vivo, and curcuminoids decrease airway inflammation and hyperresponsiveness.[14]

Nigella sativa L. (Ranunculaceae), or black seed, contains thymoquinone (TQ), which suppresses airway hyperresponsiveness, histamine-induced bronchoconstriction, and stabilizes mast cells in preclinical models and clinical trials have also shown improved pulmonary function.[15,16] Zingiber officinale Roscoe (Zingiberaceae) or ginger contains gingerols and shogaols that inhibit airway inflammation, relax smooth muscle, and reduce hyperresponsiveness in experimental asthma models.[17]

Petasites hybridus (L.) G.Gaertn., B.Mey. & Scherb. (Asteraceae), or butterbur, contains petasin and isopetasin, which act as selective H1 receptor antagonist and have shown clinical efficacy comparable to cetirizine in histamine-mediated allergic symptoms.[18,19] Andrographis paniculata (Burm.f.) Wall. ex Nees (Acanthaceae) contains andrographolide, which reduces Th2 cytokines, airway eosinophilia, mucus hypersecretion, and inflammation in experimental asthma models.[20] Boswellia serrata Roxb. ex Colebr. (Burseraceae), or Indian frankincense, contains boswellic acids (AKBA), which inhibit leukotriene production, reduce asthma attacks, and improve pulmonary function in clinical trials.[21]

Taken collectively, these studies demonstrate that medicinal plants have multi-targeted pharmacological effects, i.e., inhibition of histamine-mediated airway activity and relaxation of smooth muscle. This type of evidence supports their use as complementary or alternative treatments in the prevention of asthma, and indicates that standardized extracts and translational clinical trials are required to guarantee efficacy and safety. Medicinal plants exhibit antihistaminic potential as shown by experimental data (Table 1).

6. Current Gaps and Future Perspectives

In spite of the considerable preclinical data on the antihistaminic and anti-asthmatic potential of medicinal plants, there are a number of significant limitations. First, the variability of phytochemical content and pharmacological activity of plant extracts is caused by the absence of standardization processes, depending on the species of plant, geographical location, method of extracting the compound, and dose.

Second, there is limited evidence of translation. The majority of the research is based on in vitro or preclinical in vivo models, and well-constructed clinical trials are absent. As a result, the exact mode of action of antihistaminic action of most medicinal plants is yet to be properly understood.

Third, the safety and herb-drug interaction profile is not well defined, especially when used long-term or in combination with other more traditional anti-asthmatics.

Future studies need to focus on:

1. Active constituents, identification, and characterization.
2. Standardization of extracts in order to achieve reproducibility,
3. Strict pre-clinical and controlled clinical trials to ascertain efficacy and safety, and
4. Comparison of combinatorial approaches using conventional drugs to achieve the optimal treatment results and reduce drug side effects.

These gaps will help in developing medicinal plants rationally as complementary or alternative therapies in the management of asthma, and close the translational gap between experimental and clinical research.[22]

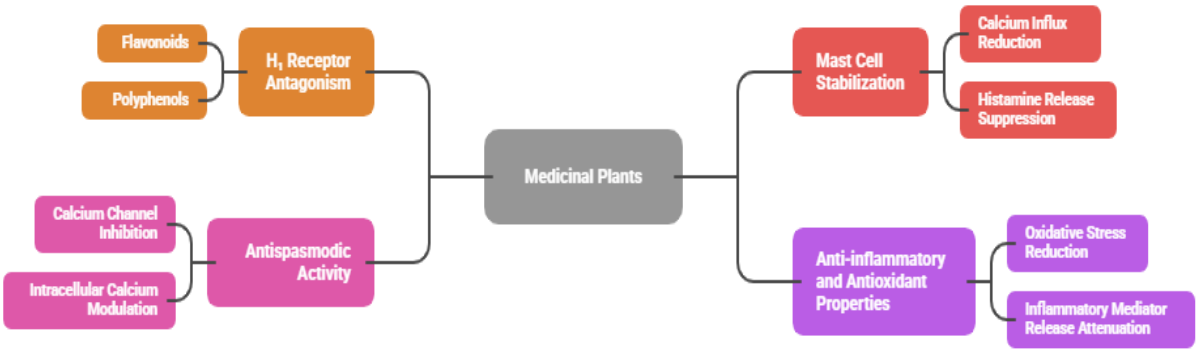

Figure 1: Mechanisms underlying the antihistaminic and anti-asthmatic effects of medicinal plants, based on literature.[3,4] Created by the authors.

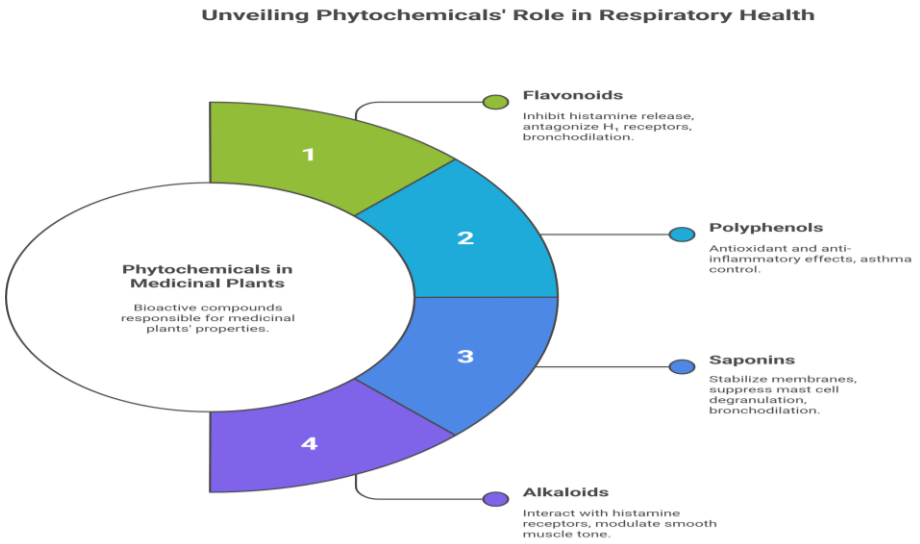

Figure 2: Major phytochemical classes and their mechanisms underlying antihistaminic and anti-asthmatic activity, based on literature.[5-9] Created by the authors.

Table 1: Medicinal plants with reported antihistaminic and anti-asthmatic activity.[10-21]

Medicinal plant	Major constituents	Experimental model	Observed activity
Ocimum sanctum[10]	Flavonoids, phenolics	Isolated smooth muscle	Antihistaminic, bronchodilatory
Glycyrrhiza glabra[11]	Glycyrrhizin, flavonoids	In vivo asthma models	Anti-inflammatory, anti-asthmatic
Adhatoda vasica[12]	Vasicine, alkaloids	Isolated tracheal tissue	Bronchodilatory, antispasmodic
Vigna radiata[13]	Vitexin, isovitexin	Histamine-induced contraction models	Antihistaminic, antispasmodic
Curcuma longa[14]	Curcuminoids	Murine OVA-induced allergic asthma model	Anti-inflammatory, anti-asthmatic
Nigella sativa[15,16]	Thymoquinone	In vivo and clinical studies	Anti-histaminic, bronchodilatory
Zingiber officinale[17]	Gingerols, shogaols	In vitro and in vivo models	Anti-inflammatory, bronchodilatory
Petasites hybridus[18,19]	Petasin, isopetasin	Randomized controlled trials	Hi receptor antagonism, antihistaminic
Andrographis	Andrographolide	In vivo allergic asthma	Anti-inflammatory, anti-asthmatic

paniculata[20]		models	
Boswellia Serrata[21]	AKBA, boswellic acids	In vivo and clinical studies	5-LOX inhibition, anti-asthmatic

7. CONCLUSION

Medicinal plants are one of the abundant sources of bioactive compounds that have strong antihistaminic and anti-asthmatic effects. Phytochemicals of these plants regulate the airway responses involving the histamine receptors in a variety of ways, such as H1 receptor antagonism, mast cell stabilization, smooth muscle relaxation, and anti-inflammatory effects. The utilization of the selected plants, like Vigna radiata, as an adjuvant in the management of the respiratory disorders and allergies is proven by the experimental evidence. Nevertheless, more research that aims at standardizing the extracts, evaluating safety, as well as controlled clinical trials, is necessary to convert the research results into clinically applicable treatments. In general, medicinal plants have considerable potential as complementary or alternative interventions in the management of asthma.

8. ACKNOWLEDGMENT

The authors acknowledge the Department of Pharmacology, Chemists College of Pharmaceutical Sciences and Research, Varikoli, Ernakulam, for providing the academic support and resources necessary to carry out this review. The authors also acknowledge Kerala University of Health Sciences, Thrissur, for institutional affiliation.

9. REFERENCE

1. Goldin J, Hashmi MF, Cataletto ME. Asthma [Internet]. PubMed. Treasure Island (FL): StatPearls Publishing; 2024 [cited 2025 Nov 25]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK430901/
2. Usmani K, Jain SK, Yadav S. Mechanism of action of certain medicinal plants for the treatment of asthma. Journal of Ethnopharmacology, 2023 Dec; 317: 116828. doi:10.1016/j.jep.2023.116828
3. Ghasemzadeh Rahbardar M, Shakeri F, Boskabady MH. Medicinal Plants and Histamine (H1) Receptors: an Updated Review. Pharmaceutical Sciences [Internet], 2025 Jun 11 [cited 2025 Dec 1]; 31(3): 216–36. Available from: https://ps.tbzmed.ac.ir/Inpress/ps-42115.pdf
4. Finn DF, Walsh JJ. Twenty-first century mast cell stabilizers. British Journal of Pharmacology [Internet], 2013 Aug 15 [cited 2025 Dec 2]; 170(1):23–37. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC3764846/
5. Bellik Y, Boukraâ L, Alzahrani H, Bakhotmah B, Abdellah F, Hammoudi S, et al. Molecular Mechanism Underlying Anti-Inflammatory and Anti-Allergic Activities of Phytochemicals: An Update. Molecules [Internet], 2012 Dec 27 [cited 2025 Dec 2]; 18(1): 322–53. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC6269762/
6. Rakha A, Umar N, Rabail R, Butt MS, Kieliszek M, Hassoun A, et al. Anti-inflammatory and anti-allergic potential of dietary flavonoids: A review. Biomedicine & Pharmacotherapy [Internet]. 2022 Dec 1 [cited 2025 Dec 3];156:113945. Available from: https://www.sciencedirect.com/science/article/pii/S0753332222013348
7. Dębińska A, Sozańska B. Dietary Polyphenols—Natural Bioactive Compounds with Potential for Preventing and Treating Some Allergic Conditions. Nutrients [Internet], 2023 Nov 17 [cited 2025 Dec 3]; 15(22): 4823–3. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC10674996/
8. Eun Hee Han, Jin Hee Park, Ji Young Kim, Young Chul Chung, Hye Gwang Jeong. Inhibitory mechanism of saponins derived from roots of Platycodon grandiflorum on anaphylactic reaction and IgE-mediated allergic response in mast cells. Food and chemical toxicology [Internet]. 2009 Jun 1 [cited 2025 Dec 3];47(6):1069–75. Available from: https://pubmed.ncbi.nlm.nih.gov/19425227/

9. Heinrich M, Mah J, Amirkia V. Alkaloids Used as Medicines: Structural Phytochemistry Meets Biodiversity—An Update and Forward Look. Molecules [Internet], 2021 Mar 25 [cited 2025 Dec 4]; 26(7): 1836. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8036335/
10. Saini R, Dhiman NK. Natural Anti-inflammatory and Anti-allergy Agents: Herbs and Botanical Ingredients. AIAAMC, 2021 Jun; 21(2): 90–114. doi:10.2174/1871523021666220411111743
11. Wahab S, Annadurai S, Abullais SS, Das G, Ahmad W, Ahmad MF, et al. Glycyrrhiza glabra (Licorice): A Comprehensive Review on Its Phytochemistry, Biological Activities, Clinical Evidence and Toxicology. Plants [Internet], 2021 Dec 14 [cited 2025 Dec 4]; 10(12): 2751. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC8703329/
12. Singh B, Sharma RA. Anti-inflammatory and antimicrobial properties of pyrroloquinazoline alkaloids from Adhatoda vasica Nees. Phytomedicine [Internet], 2013 Mar [cited 2025 Dec 5]; 20(5): 441–5. Available from: https://pubmed.ncbi.nlm.nih.gov/23357363/
13. Venturini CL, Macho A, Arunachalam K, de Almeida DAT, Rosa SIG, Pavan E, et al. Vitexin inhibits inflammation in murine ovalbumin-induced allergic asthma. Biomedicine & Pharmacotherapy [Internet], 2018 Jan [cited 2025 Dec 5]; 97: 143–51. Available from: https://pubmed.ncbi.nlm.nih.gov/29091859/
14. Haftcheshmeh SM, Mirhafez SR, Abedi M, Heydarlou H, Shakeri A, Mohammadi A, et al. Therapeutic potency of curcumin for allergic diseases: A focus on immunomodulatory actions. Biomedicine & Pharmacotherapy [Internet], 2022 Oct [cited 2025 Dec 6]; 154: 113646. Available from: https://pubmed.ncbi.nlm.nih.gov/36063645/
15. Boskabady MH, Keyhanmanesh R, Saadatloo MA. Relaxant effects of different fractions from Nigella sativa L. on guinea pig tracheal chains and its possible mechanism(s). Indian J Exp Biol, 2008; 46(12): 805–10. PMID: 19245172.
16. Salem ML. Immunomodulatory and therapeutic properties of the Nigella sativa L. seed. Int Immunopharmacol [Internet], 2005 [cited 2025 Dec]; 5(13-14): 1749–70. Available from: https://pubmed.ncbi.nlm.nih.gov/16275613/
17. Townsend EA, Siviski ME, Zhang Y, Xu C, Hoonjan B, Emala CW. Effects of ginger and its constituents on airway smooth muscle relaxation and calcium regulation. Am J Respir Cell Mol Biol [Internet], 2013 Feb [cited 2025 Dec]; 48(2): 157–63. Available from: https://pubmed.ncbi.nlm.nih.gov/23065130/
18. Schapowal A; Petasites Study Group. Randomised controlled trial of butterbur and cetirizine for treating seasonal allergic rhinitis. BMJ [Internet], 2002 Jan 19 [cited 2025 Dec]; 324(7330): 144–6. Available from: https://pubmed.ncbi.nlm.nih.gov/11799030/
19. Lee DK, Haggart K, Robb FM, Lipworth BJ. Butterbur, a herbal remedy, confers complementary anti-inflammatory activity in asthmatic patients receiving inhaled corticosteroids. Clin Exp Allergy [Internet], 2004 [cited 2025 Dec]; 34(1): 110–4. Available from: https://pubmed.ncbi.nlm.nih.gov/14720270/
20. Nie W, Zang B, Wei J, Lu J, Chen Y. Effect and mechanism of andrographolide on mouse asthma model. Evid Based Complement Alternat Med [Internet], 2016 [cited 2025 Dec]. Available from: https://pubmed.ncbi.nlm.nih.gov/27089844/
21. Gupta I, Gupta V, Parihar A, Gupta S, Lüdtke R, Safayhi H, et al. Effects of Boswellia serrata gum resin in patients with bronchial asthma: results of a double-blind, placebo-controlled, 6-week clinical study. Eur J Med Res [Internet], 1998 Nov [cited 2025 Dec]; 3(11): 511–4. Available from: https://pubmed.ncbi.nlm.nih.gov/9810030/
22. Azman S, Sekar M, Bonam SR, Gan SH, Wahidin S, Lum PT, et al. Traditional Medicinal Plants Conferring Protection Against Ovalbumin-Induced Asthma in Experimental Animals: A Review. Journal of Asthma and

Allergy [Internet], 2021 Jun [cited 2025 Dec 12]; 14: 641–662. Available from: https://doi.org/10.2147/JAA.S296391