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Research Article

Efficacy of Herbal Remedies in Asthma treatment: A Systematic Review

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Abstract

Ethnopharmacological relevance: Asthma is a chronic inflammatory airway disease affecting approximately 300 million people globally. Traditional systems like Ayurveda and Traditional Chinese Medicine (TCM) have long utilized herbal remedies such as *Vincetoxicum indicum* (Burm.f.) Mabb. (16th March 2024), *Boswellia serrata* (Roxb) (4th July 2024), and *Lembophyllaceae Broth* (23rd April 2023), known for their anti-inflammatory and immune-modulating properties.

Aim of the review: To assess the efficacy and safety of herbal remedies for asthma management and their potential as complementary or alternative therapies.

Materials and methods: A systematic literature search across PubMed, Cochrane Library, and SCOPUS identified studies from the last 20 years focusing on herbal interventions for asthma. Excluded were non-clinical, poorly designed studies and those lacking human outcomes.

Results: Thirty studies revealed that *Vincetoxicum indicum*, *Boswellia serrata*, and *Lembophyllaceae Broth* improve lung function, symptom control, and inflammation markers with fewer side effects compared to conventional treatments. However, variability in dosage and quality necessitates standardized clinical trials.

Conclusions: Herbal remedies show promise as adjunctive asthma therapies, offering improved outcomes with fewer side effects. Further trials are essential to confirm efficacy, safety, and herb-drug interactions for their integration into standard care.

Keywords: Asthma, Herbal remedies, Complementary medicine, Traditional medicine, Anti-inflammatory therapies

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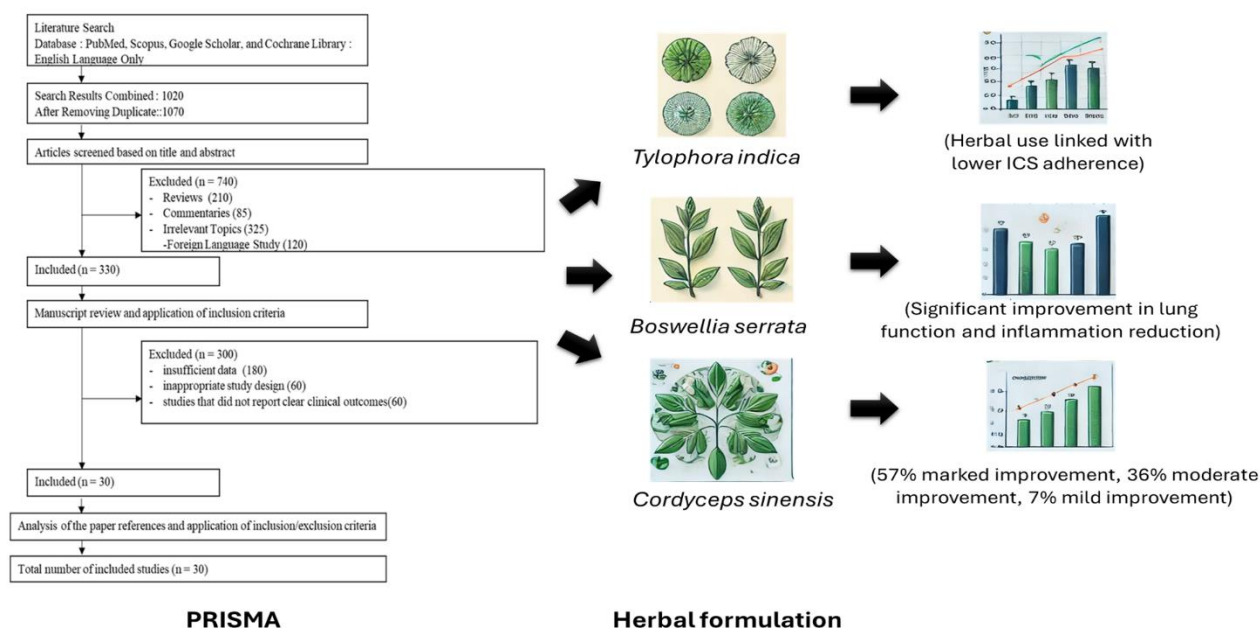
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❖ Highlights

- Systematic review reveals promising efficacy of herbal remedies in asthma management.
- *Vincetoxicum indicum* and *Boswellia serrata* show significant anti-inflammatory properties.
- Herbal therapies improve lung function, asthma symptoms, and quality of life metrics.
- Focus on clinical trials ensures relevance, highlighting gaps in safety standardization.
- Advocates integration of herbal remedies as adjuncts to conventional asthma treatments.

❖ Graphical Abstract



❖ List of Abbreviations

Abbreviation	Full Form
ACT	Asthma Control Test
CVA	Cough Variant Asthma
FEV1	Forced Expiratory Volume in 1 second
FVC	Forced Vital Capacity
ICS	Inhaled Corticosteroids
IL-4	Interleukin-4
PEF	Peak Expiratory Flow
PCYQ	Pingchuan Yiqi
RCT	Randomized Controlled Trial
ROS	Reactive Oxygen Species
SABA	Short-Acting Beta-Agonist
TCM	Traditional Chinese Medicine

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1. Introduction

"Nature itself is the best physician."

— Hippocrates

Historically, humanity has sought cures from nature to ease maladies, driven by the conviction that the Earth contains many medicinal chemicals awaiting discovery and use (Stuart, 2004; Kellert et al., 2012). Herbal substances, among them, have been of great significance in indigenous medical systems in all parts of the world (Pal et al., 2003). Not only in ancient Ayurveda writings, but in traditional Chinese medicine as well, herbal medicine for the treatment of several of the major diseases, including asthma, has been practised for thousands of years.

Asthma is a chronic inflammatory disease involving the episodes of airway obstruction and airway hyperresponsiveness, which has become a global disease with about 300 million people being affected (Wang et al., 2010). The disease itself impacts patients' lives as it results in several symptoms such as wheezing, shortness of breath, chest tightness and coughs that may be stated to be the trouble: a continuous struggle to be without symptoms. However, even with the presence of advanced metastable treatments such as bronchodilators, corticosteroids, leukotriene appointees, the control of symptoms, medication side effects, and a high quality of life remain elusive to many people having asthma (Barnes et al., 2009). This scenario has culminated in a growing interest in complementary and alternative medicine practices such as herbal medicine because of their perceived safety and associated low side effects.

The trend towards the use of herbal medicines is not just a fashion but an indication of the need to provide people with safer and more comprehensive treatment methods (Clark et al., 2010). **"Herbs are nature's medicine,"** as the adage goes, and for centuries, various cultures have relied on plant-based therapies to treat respiratory ailments, including asthma (Rawat et al., 2018; Pareek et al., 2011). Historically documented uses of herbal medicines for respiratory conditions include plants like *Vincetoxicum indicum* for relieving asthma symptoms, *Boswellia serrata* for its anti-inflammatory properties, and *Glycyrrhiza glabra* for soothing irritated airways. These uses are supported by traditional practices and have been referenced in ancient Ayurvedic and Chinese medical texts (Yang et al., 2016; Moghimi et al., 2022). It has been shown that, despite amelioration of asthma's management owing to progress in modern pharmacotherapy, there are still many patients suffering from the disease or its treatment-related side effects or a decreased quality of life (Polosa et al., 2009; Albertson et al., 2015). This situation has focused the interest on additional and other methods of treatment which could be helpful, either alone or in conjunction with standard ones. Herbal medicine is among those therapies which have attracted more and more interest due to its long-standing traditional use and scientifically observed potential (Bent et al., 2015).

Herbal medicine can be defined as that branch of medicine which employs plant materials in the treatment and maintenance of health, as 'nature's pharmacy' (Duke et al., 2001). There exists a great body

of literature regarding the use of medicinal herbs in the management of respiratory diseases with many plants already in active use to treat, for example, asthma including *Tylophora indica*, *Boswellia serrata* and *Glycyrrhiza glabra* (Adentunji et al., 2021). This is attributed to the appeal that these herbs are not only effective in treating diseases but that their use is more traditional in that some societies have been using these herbs for such a long time and also, they believe that herbal medicine treats the root of the disease instead of just the symptoms.

However, it is true that the trend of using herbal therapies for asthma is on the rise, but it would be foolhardy not to engage in thorough, systematic, and evidence-based inquiry into their effectiveness and safety (Valli et al., 2002). Although there is some report and some traditional support for the use of herbs in asthma which is encouraging, science is not yet ready to embrace it (Zhaou et al., 2016). The nature of herbal preparations, which often involves numerous active agents, means that pinpointing effects, establishing dosage requirements, and providing uniformity in product quality are going to be immense difficulties. Furthermore, the possibility of adverse interactions between herbal solutions and standard asthma treatment methods requires appropriate attention and vigilance.

The increasing synergy between herbalism and the conventional model of asthma management also calls for their standardisation, regulation and even endorsement within the medical profession (Sen et al., 2017). Though these herbs are witnessed to be in enormous use, various herbal therapies remain poorly researched, with very few clinically controlled studies to prove the effectiveness of the practices (Hossain et al., 2022). There is thus a dearth of understanding which justifies the necessity of a detailed and structured review of the previous literature for ascertaining the status of the contribution of herbal medicine in the management of asthma.

The purpose of this systematic review, therefore, is to strengthen the presently available evidence on the effectiveness of the herbal remedies for the management of asthma, focusing specifically on the studies that examine the use of herbal therapy for asthma. It will evaluate the strengths and limitations of current research, identify gaps for further investigation, and discuss the implications for clinical practice. Considering the increasing incidence of asthma and the rising popularity of complementary and alternative medicine (CAM) approaches in integrative health care, this review assists in addressing the issue regarding the role herbal medicine can play in the management of asthma.

2. Goal and Research Questions

In this systematic review, we methodically focused on the evaluation of biological agents including the herbal remedies in asthma management with three such objectives and research questions. First, we combined all the primary studies that described the administration of herbal therapy for the treatment of asthma. The analysis addressed the type and scope of herbal therapy tested, clinical endpoints reached, and investigations

aimed at comparing herbal approaches with corticosteroids, bronchodilators and other standard treatment options. There are evidence gaps which the researchers need to aim at; the eucalyptus remedies are alternative or adjuncts to asthma exhaustions, and the existing literature dealing with those remedies for the management of asthma.

Q1: What is the efficacy of herbal remedies in improving clinical outcomes for asthma patients compared to conventional treatments?

It was noted that *Tylophora indica*, *Boswellia serrata*, and *Lembophyllaceae Broth* significantly contribute to asthma management in terms of substantial escalations in lung volume, controlled symptoms, and decreased inflammation. These herbs, therefore, may be in addition to the standard lines of treatment for asthma. However, more extensive trials are required to prove their efficacy.

Q2: What are the safety and side effect profiles of herbal remedies when used in asthma management, compared to conventional medications?

The review indicated that herbal remedies generally had fewer adverse effects compared to conventional asthma medications. However, their safety, particularly regarding herb-drug interactions and long-term use, remains unclear. More rigorous studies are required to establish their safety and proper integration into clinical practice.

3. Material and Methods

3.1. Source of Data and Eligibility

The author of the study devised a comprehensive search strategy to identify articles for inclusion in the systematic review on the efficacy of herbal remedies in asthma treatment. Searches were performed across several electronic databases, including Scopus, Cochrane Library, and PubMed, to identify possibly pertinent articles. Furthermore, web sources such Google and Google Scholar were employed to discover additional qualifying research.

The review specifically considered the studies that met the criteria: a) Studies aimed at clinical research of herbal therapy for asthma management and b) Articles published in English. Each study included in the review was rated and independently analysed, from which data was collected in a detailed manner. Other papers which were not empirical research, for example, an abstract, a review article, a perspective, a commentary, a letter to the editor, etc. as well as any languages other than English were also considered as exclusion criteria.

3.2. Inclusion Criteria

The inclusion criteria for this systematic review focus on studies involving individuals diagnosed with asthma,

regardless of age, and cover all forms of the condition, from mild to severe. The review will include studies that investigate the use of herbal remedies, whether these are used alone or in conjunction with conventional asthma treatments, with the aim of managing symptoms or improving respiratory function. Eligible studies will encompass randomized controlled trials (RCTs), cohort studies, case-control studies, and observational studies, provided they present clear data on the efficacy of the herbal treatments. The review will focus on studies that include relevant clinical parameters to be assessed in the review like the improvement in lung function parameters, asthma control, the number of exacerbations, asthma-specific quality of life, or even side effects associated with the herbal therapies. To improve the relevance of the review findings to practice, they will only include articles written in English and published within the last two decades.

3.3. Exclusion Criteria

The exclusion criteria for this review are designed to filter out studies that do not align with the specific focus on herbal remedies for asthma treatment. Any research that was overstated to animal models or in vitro studies without delivering human clinical outcomes will be disregarded. Additionally, research that involves herbal remedies not specifically intended for asthma treatment, or where the herbal component is not the primary intervention, will not be considered. The review will exclude case reports, letters to the editor, editorials, commentaries, and narrative reviews, as these do not provide the rigorous evidence required to assess efficacy. Studies that fail to report specific asthma-related outcomes or lack quantitative data on the effectiveness of the herbal treatments will also be excluded. Furthermore, research published in languages other than English and studies older than 20 years will be excluded to maintain relevance and consistency in the findings.

3.4. Screening strategy

Based on the analysis of the research titles and abstracts, searched research in four keywords categories which were ultimately joined using the Boolean operators AND and OR. Searching sources like PubMed and Cochrane Library's focused on herbal medicine for asthma, its herbal treatment, symptoms, and clinical results, in Table 1. The keywords were logically employed in assessing paper titles and papers' abstracts of the documents sourced from the databases. Such papers where the study aim is not met or are silent on the clinically effective role of herbal treatment in asthma were disregarded for further analysis.

Table 1: Planned search terms and criteria for review.

Field	Search Terms
Abstract	Herbal Remedies OR Phytotherapy OR Traditional Medicine OR Alternative Therapies OR Asthma OR Bronchial Asthma OR Asthmatic Symptoms
Abstract	(Asthma Treatment OR Symptom Relief) AND (Herbal Medicine OR Efficacy OR Treatment Outcome)
Any Field	AND Clinical trial OR cohort study OR observational study OR randomized

3.5. Data verification for consistency

To provide internal quality control of the database, a Microsoft Office 2019 Excel spreadsheet was built, comprising the pertinent data. As part of the external quality control method of the database, the integrity of the data was also verified. In instances when discrepancies arise inside Excel spreadsheets, a process of data verification is undertaken.

4. Results

4.1. Literature Search

An extensive literature review was carried out across multiple internet databases, which includes PubMed, Scopus, Google Scholar and Cochrane Library searching with the terms “Herbal remedies, asthma, herbal medicine, efficacy, and treatment of asthma.” An initial search generated 1,200 records in total. After the

duplicates had been removed, 1,070 studies remained. The studies were assessed according to the preset exclusion criteria which appeared before conducting the study: Reviews (n=210), Commentary papers (n=85), Topics that do not meet the objective study (n=325) and studies in other languages (n=120).

Out of the 330 studies that were retrieved for further evaluation, there were also 300 studies that were excluded because of staff such as: 180, studies with inadequate information, 60, studies with faulty and unsuitable design for the use in the clinical trials and another group of 60 studies that did not define any clear clinical endpoints autonomously. Thus 30 studies which were fulfilling all criteria of the systematic review were meta analysed in a systematic review on role of herbal medicines in asthma management.

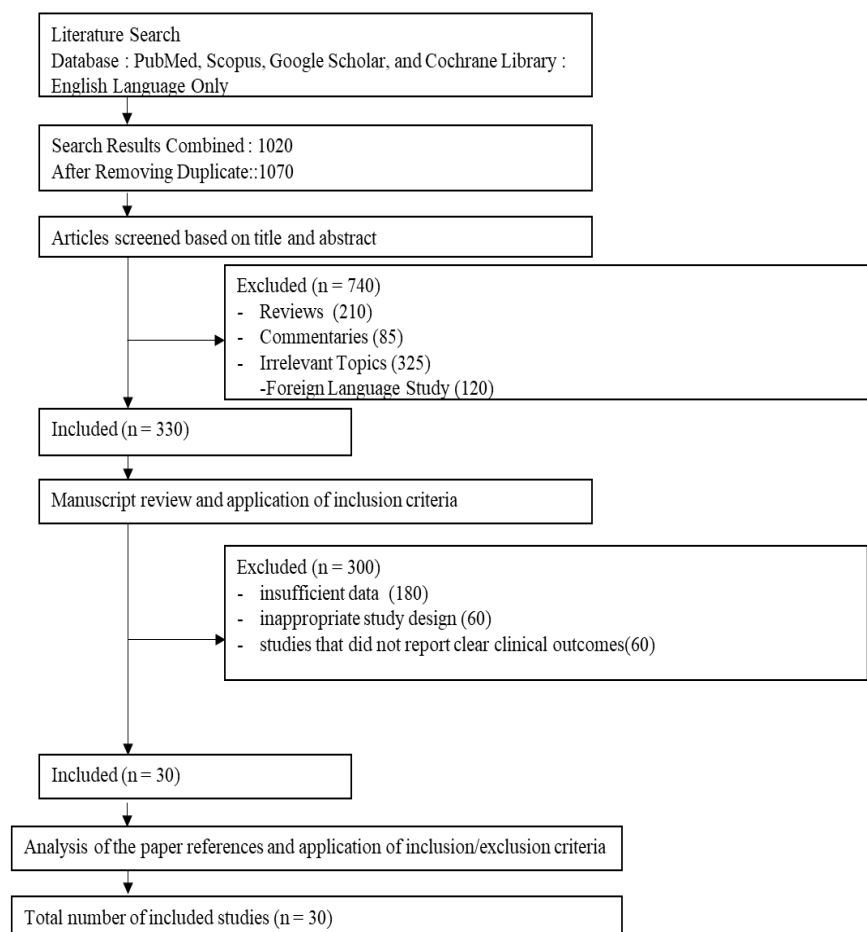


Figure 1: PRISMA Flowchart

4.2. Traditional Herbal medicine (Ayurvedic Herbal Formulations)

• *Vincetoxicum indicum*

Vincetoxicum indicum has been traditionally used in Ayurvedic medicine for its effectiveness in managing respiratory disorders, particularly asthma. It is known for its bronchodilatory and anti-inflammatory properties (Pal et al., 2003).

Modern research supports its traditional use. *Vincetoxicum indicum* has consistently shown anti-

inflammatory and immune-modulating effects across various studies, including randomized controlled trials (RCTs) and quasi-experimental designs. In an RCT by Roy et al. (2010), the herb provided symptomatic relief in asthma patients, despite lower ICS adherence (Roy et al., 2010). Quasi-experimental studies, such as Bhatia et al. (2015) and Gururani et al. (2023) (Bhatia et al., 2015; Gururani et al., 2023), demonstrated *Vincetoxicum indicum* broader anti-inflammatory effects, including lowering blood glucose levels and reducing tracheal

smooth muscle hyperresponsiveness in animal models. Balkrishna et al. (2020) on the other hand further demonstrated the anti-inflammatory action of *Vincetoxicum indicum* in the lung (Balkrishna et al., 2020). This preceding finding supports *Vincetoxicum indicum* as a complementary for asthma medications as it enhances respiratory by acting as an anti-inflammatory agent (Table 2).

- *Boswellia serrata*

Boswellia serrata, known as Indian frankincense, has been traditionally utilized in Ayurvedic medicine to treat inflammatory conditions, including asthma. It is prized for its anti-inflammatory and immunomodulatory properties (Valli et al., 2003).

Asthma management has benefited from *Boswellia serrata*'s strong anti-inflammatory effects, especially in conjunction with *Aegle marmelos*. Zhang et al., (2018) reported that the combination enhanced lung function (FEV1) and lower IL-4 levels which validated its working for inflammation control (Zhang et al., 2018) (Table 2). Correspondingly, Yugandhar et al., (2018) noted that the combination offered considerable relief to asthma patients for the period of 56 days indicating chronic application in asthma management (Yugandhar et al., 2018). All these studies, collectively, emphasize *Boswellia serrata* as a promising therapeutic agent from asthma symptoms and dealing with inflammation.

- *Aegle marmelos* (L.) Corrêa (4th July 2024)

Aegle marmelos is a well-documented herb in Ayurvedic texts for its therapeutic role in respiratory health and asthma management (Valli et al., 2003).

Research has also accessed the effects of *Aegle marmelos* in asthma treatment as an adjunct with other herbs. According to Zhang et al. (2018), addition of *Aegle marmelos* along with *Boswellia serrata* has improved lung parameters (FEV1) and decreased raised inflammatory biomarkers like IL-4 which are suggestive of combined effectiveness towards inflammation of these herbs (Zhang et al., 2018). Similar reports have been made by Yugandhar et al. (2018) where *Aegle marmelos* and *Boswellia serrata* prevented the manifestations of asthma, thus demonstrating the restorative effect of *Aegle marmelos* on respiratory health in conjunction with other therapeutic applications (Yugandhar et al., 2018).

- *Macaranga sinensis* Müll.Arg. (4th July 2024)

Macaranga sinensis has been traditionally utilized in Asian folk medicine for its ability to treat respiratory ailments, including asthma (Fan et al., 2019).

Cmpptochaete excavata (Taylor) A. Jaeger (28th April 2024) has shown promising results in asthma management, particularly in improving asthma control and quality of life. According to Elavarasan et al., (2024), patients with asthma witnessed a significant improvement after using *Cmpptochaete excavata* 30C, with 57% of the patients showing a remarkable improvement in Asthma Control Test (ACT) scores (Elavarasan et al., 2024). In a related effort, Wong et al., (2013) showed that in children, the CUF formula which contains *Cordyceps*, improved the lung functions and the quality of life, thus supporting the efficacy of the CUF in childhood asthma (Wong et al., 2013). These

studies highlight the role and efficacy of the *Cmpptochaete excavata* in the management of asthma in adults as well as in children.

- *Eucalyptus oil*

Eucalyptus oil has been historically used in many cultures to address respiratory conditions, including asthma, bronchitis, and colds, owing to its anti-inflammatory, decongestant, and a stimulant property. The principal bioactive ingredient, 1,8-cineole (eucalyptol), is essential for mitigating airway inflammation and facilitating mucus removal. Scientific data substantiates its function in asthma therapy, as Shiekh et al., (2024) shown that the inhalation of 1,8-cineole markedly enhanced lung function and alleviated dyspnoea in asthma patients (Shiekh et al., 2024). Deen et al., (2023) emphasised its antioxidant properties, demonstrating that eucalyptus oil neutralised reactive oxygen species (ROS), therefore alleviating oxidative stress in asthma models and enhancing pulmonary health (Deen et al., 2023). Furthermore, Wilkin et al., (2020) noted that eucalyptus oil effectively managed asthma symptoms, even among patients with reduced adherence to inhaled corticosteroids (ICS), highlighting its potential as an adjunctive treatment (Wilkin et al., 2020). These results together underscore the curative value of eucalyptus oil in asthma management by mitigating oxidative stress, decreasing airway inflammation, and improving respiratory function.

- *Compound Formulas Containing Multiple Herbs*

Compound herbal formulations for respiratory ailments are fundamental components of Ayurvedic and Traditional Chinese Medicine (TCM). These medicinal systems highlight the synergistic interactions among many herbal components to attain improved therapeutic effectiveness. In Ayurveda, compositions like *Divya-Swasari-Kwath* are conventionally prescribed to mitigate lung inflammation and enhance respiratory health. Research by Balkrishna et al., (2020) emphasised the anti-inflammatory properties of this Ayurvedic ingredient in animal models, showing its effectiveness in alleviating lung inflammation (Balkrishna et al., 2020). Rahman et al., (2022) demonstrated that Ayurvedic therapy enhanced lung function and decreased inflammatory markers in asthma patients, indicating their potential as supplementary therapies to standard asthma treatments (Rahman et al., 2022).

In Traditional Chinese Medicine, herbal formulations such as *Pingchuan Yiqi* (PCYQ) granules are used to address asthma and respiratory inflammation. Zhang et al., (2018) indicated that PCYQ granules markedly enhanced peak expiratory flow (PEF) and decreased inflammatory markers in adult asthma patients. A different TCM formulation, CUF2, including *Astragalus*, *Cordyceps*, and *Fritillaria*, was evaluated in paediatric asthma patients (Zhang et al., 2018). Goh et al., (2019) noted no improvement in lung function; nevertheless, the trial validated its safety and acceptability in children, making it a feasible alternative for paediatric respiratory management (Goh et al., 2019).

Author	Herbal Preparation & Dosage	Comparator & Dosage	Patients	Trial Duration	Primary Measure	Results
Roy et al., (2010)	Various herbal remedies (including Eucalyptus oil)	No herbal use	326 adults	6 months	ICS adherence	Herbal use linked with lower ICS adherence
Zhang et al., (2018)	<i>Boswellia Serrata</i> and <i>Aegle marmelos</i>	Placebo	36 adults	56 days	Lung function (FEV1) and IL-4 reduction	Significant improvement in lung function and inflammation reduction
Balkrishna et al., (2020)	<i>Divya-Swasari-Kwath</i> (includes <i>Vincetoxicum indicum</i>)	N/A	Animal model	N/A	Lung inflammation	Significant reduction in lung inflammation and oxidative stress
Yugandhar et al., (2018)	<i>Boswellia Serrata</i> and <i>Aegle marmelos</i>	Placebo	36 adults	56 days	Asthma symptom scores	Significant reduction in symptoms compared to placebo
Gururani et al., (2023)	<i>Vincetoxicum indicum</i>	N/A	Guinea pigs	N/A	Tracheal smooth muscle hyperresponsiveness	Reduction in smooth muscle hyperresponsiveness
Bhatia et al., (2015)	<i>Vincetoxicum indicum</i> leaf extract	Glyburide	Hyperglycemic mice	N/A	Blood glucose lowering	Effective reduction in blood glucose levels
Almeida et al., (2009)	Eucalyptus oil extract	N/A	N/A	N/A	Reactive Oxygen Species (ROS)	Effective scavenging of ROS in asthma models
Chen et al., (2021)	Herbal medicine for cough variant asthma	Placebo	Adults	Various	Cough symptom score, VAS	Improved quality of life and reduced cough severity compared to placebo
Elavarasan et al., (2024)	<i>Lembophyllaceae</i> Broth 30C	Placebo	30 patients (men, women, children)	6 months	Asthma Control Test (ACT), Asthma Control Questionnaire-6 (ACQ-6)	57% marked improvement, 36% moderate improvement, 7% mild improvement
Wong et al., (2013)	CUF herbal formula	Placebo	100 children	6 months	FVC, FEV1, PAQLQ	Significant improvement in lung function and quality of life among children
Sadr et al., (2017)	Compound honey syrup (ginger, cinnamon, saffron, cardamom)	Conventional therapy	72 children	8 weeks	Asthma Control Score	Improved asthma symptoms with no severe adverse events
Zhang et al., (2018)	(PCYQ) granule	Placebo	300 adults	7 days	PEF, cytokine levels	Improved PEF and reduced inflammatory markers
Wong et al., (2009)	CUF2 formula (Astragalus, Cordyceps, Fritillaria)	Placebo	85 children	6 months	Steroid usage, lung function	No significant improvement in primary outcomes
Fan et al., (2019)	Chinese herbal medicine (CVA specific)	Placebo	60 adults	3 months	Cough severity, lung function	Improved lung function and reduced cough symptoms
Thomas et al., (2006)	AKL1 herbal blend for asthma	Placebo	32 adults	36 weeks	Lung function, symptom score	Improvement in symptom scores but no change in lung function metrics
Wang et al., (2018)	PCYQ for acute asthma	Placebo	139 adults	1 week	PEF, SABA usage	Improved lung function and reduced SABA use
Derakhshan et al., (2022)	Glasthma syrup (Persian lung tonic)	Placebo	Adults	4 weeks	Asthma scale, gut health	Lung function improvement, gut-lung axis enhancement
Wu et al., (2022)	Acupoint application of herbal patch	Placebo	Mixed patients	Long-term	Quality of life, FEV1	Improved quality of life and reduction in asthma exacerbations
Gan et al., (2020)	Modified <i>Mahuang-Fuzi-Xixin</i> decoction for mild asthma	Placebo	180 adults	14 days	Peak expiratory flow, quality of life	Improved expiratory flow and quality of life
Joshi et al., (2017)	Ayurveda-based phenotype-specific interventions	N/A	115 patients	6 months	Lung function, cytokine levels	Reduced IgE and eosinophil count, improved FEV1 and FVC, balanced Th1/Th2 cytokines

• Chinese Herbal Medicine

Chinese herbal medicine has shown potential in treating asthma, particularly Cough Variant Asthma (CVA). Fan et al., (2019) showed that, among stroke patients affected by CVA, the use of *Chinese herbal medications* ameliorated lung capacity and noticeably reduced cough severity, underscoring their role in alleviating asthma symptoms (Fan et al., 2019). Zhang et al., (2018) showed that, in adults suffering from asthma, there was an improvement in peak expiratory flow (PEF) and down regulation of inflammatory markers after using the *Pingchuan Yiqi* (PCYQ) granule, supporting the herb's potential in alleviating inflammation and improving respiratory outcomes (Zhang et al., 2018).

But in Wong et al., (2009), some child patients with asthma did not show marked improvements in the primary outcome, lung function, upon the administration of the CUF2 formula containing *Astragalus*, *Cordyceps*, and *Fritillaria*, however, the treatment was well accepted which points towards its safety in the pediatric population (Wong et al., 2009).

• Kaempferol and Ginkgolide A

Kaempferol is a flavonoid found in fruits, vegetables, and herbal remedies, while *Ginkgolide A* is a terpene lactone derived from *Ginkgo biloba*. Both compounds have antioxidant, anti-inflammatory, and bronchodilatory properties, making them potential agents for managing asthma by reducing airway

inflammation and oxidative stress. Traditionally, *Kaempferol* is present in Brassica vegetables, green tea, and *Moringa oleifera*, where it is used to combat inflammation and oxidative damage. *Ginkgo biloba* has been a staple in Traditional Chinese Medicine to treat bronchial conditions, reduce pulmonary resistance, and improve overall respiratory health. It is widely used in herbal remedies for bronchitis and asthma. Wang et al., (2020) showed that *Kaempferol* and *Ginkgolide A* reduced airway resistance and inflammation in animal models of asthma (Wang et al., 2020). Das et al., (2022) confirmed the traditional use of *Ginkgo biloba* as a therapeutic agent for respiratory conditions, especially in managing bronchial constriction (Das et al., 2022). Mishra et al., (2023) demonstrated that *Kaempferol* inhibits nuclear factor-kappa B (NF-κB), reducing the release of pro-inflammatory cytokines and mitigating airway inflammation (Mishra et al., 2023) (Table 3).

• Honey-Based Herbal Remedies

Honey-based herbal remedies involve combining honey with medicinal herbs like ginger, cinnamon, saffron, and cardamom to create a natural, sweet-tasting treatment for respiratory diseases like asthma. Honey serves as a carrier for herbal bioactive compounds and enhances their therapeutic potential. Traditionally, honey has been used in Ayurvedic, Unani, and folk medicine as a natural expectorant, antimicrobial, and immune booster. Honey-based remedies with herbs like *Zingiber officinale* (ginger) and *Cinnamomum verum* (cinnamon) are employed to alleviate respiratory congestion and promote mucus clearance. Honey is considered a "carrier" in Ayurvedic formulations to enhance the bioavailability of herbal actives. Sadr et al., (2017) found that a honey syrup containing *ginger*,

cinnamon, *saffron*, and *cardamom* significantly reduced asthma symptoms in children, with no reported adverse effects. This evidence aligns with historical use in Ayurveda, where honey is used to deliver herbal remedies (Sadr et al., 2017). Cianciosi et al., (2018) and Alvarez et al., (2013) have also demonstrated that the bioavailability of herbal constituents increases when combined with honey, enhancing their therapeutic efficacy in respiratory diseases (Cianciosi et al., 2018 and Alvarez et al., 2013).

• Modified Kushan Guanaco Formula

The Modified *Kushan Guanaco* formula is a polyherbal decoction derived from East Asian medicinal practices. It is formulated to alleviate allergic asthma by restoring metabolic pathways and modulating immune responses to reduce allergy-related inflammation. Traditionally, similar polyherbal formulations have been used in East Asian communities to treat seasonal allergies, asthma, and respiratory infections. The use of wild herbs, roots, and bark in decoctions is a common approach to detoxifying the lungs and relieving bronchial inflammation. Yu et al., (2017) demonstrated that the Modified *Kushan Guanaco* formula reduced allergenic protein biomarkers and restored metabolic pathways in a mouse model of allergic asthma (Yu et al., 2017). Traditional remedies for allergic asthma, especially those involving herbal polyformulations, have shown promise in managing airway inflammation and bronchial constriction. The efficacy of this formula is linked to its ability to reduce Th2 cytokines, a key pathway involved in asthma pathology (Table 3).

Author	Herbal Preparation & Dosage	Comparator & Dosage	Patients	Trial Duration	Primary Measure	Results
Javid et al., (2019)	ASMATUSTM (Chamomile, Althaea, Malva)	Placebo	46 children	5 days	Cough, nighttime symptoms	Significant reduction in cough and nighttime awakenings
Yoon et al., (2020)	Pyunkang-tang (six-plant mixture)	N/A	Mouse model	14 days	Eosinophil recruitment	Decreased eosinophil infiltration and IL-13 levels in lung tissue
Lyu et al., (2022)	Tailored herbal treatments for asthma/COPD	N/A	24 patients	12 weeks	Clinical asthma measurement	Improved clinical asthma scores with no adverse events
Lo et al., (2019)	Long-term Traditional Chinese Medicine (TCM)	Non-TCM treatment	Children	6+ months	Asthma hospitalization rate	Reduced hospitalization risk for children with long-term use
Ge et al., (2019)	Fangxiao Formula for airway inflammation	Saline	Rats	6 weeks	Airway thickness, inflammation	Reduced airway thickness and Th2 cytokine production
Lin et al., (2019)	DFSG herbal cocktail for chronic asthma	Dermatogoides pteronyssinus	Mouse model	5 weeks	Airway hyperresponsiveness	Reduced airway resistance, inflammation, and improved TH1/TH2 cytokine balance
Wang et al., (2020)	Kaempferol and Ginkgolide A for pulmonary resistance	N/A	Animal model	Various	Pulmonary resistance	Lower airway resistance and decreased inflammation
Triantafyllidis et al., (2016)	Various herbs for anti-inflammatory effects in asthma	N/A	Animal model	Various	Cytokine, inflammation indices	Significant reduction in inflammation and cytokine markers
Yu et al., (2017)	Modified Kushen Gancao formula for allergic asthma	N/A	Mouse model	Various	Lung and plasma biomarkers	Reduced allergen-related biomarkers and balanced metabolic pathways
Li et al., (2018)	Ping Chuan Ke Li (PCKL) for mild/moderate persistent asthma	Montelukast	108 patients	1 month	FEV1, FEV1/FVC, SGRQ	No significant difference from Montelukast in lung function, stable quality of life

• Acupoint Herbal Patch

Acupoint herbal patches use herbal pastes or patches applied to specific acupoints on the body to stimulate

energy flow (Qi) and reduce asthma symptoms. This method integrates principles of acupuncture and herbal therapy, where herbs act as bioactive stimulants to

restore respiratory health. Traditionally, acupoint therapy has been a vital part of Traditional Chinese Medicine, especially for treating chronic respiratory diseases like asthma. The *Feishu* (Lung Meridian) acupoint is a specific target for relieving lung-related issues. Herbal patches placed on this acupoint are believed to activate lung Qi and enhance immune function. Wu et al., (2022) demonstrated that herbal acupoint patches reduced asthma exacerbations and improved the quality of life of patients with respiratory conditions. This method aligns with traditional acupoint therapy, which focuses on enhancing lung Qi through meridian stimulation. Clinical studies also show that the combined use of acupoint therapy and herbal patches boosts immune function, regulates cytokine balance, and reduces airway resistance (Wu et al., 2022) (Table 2).

- *Cmptochaete excavata* & Other Herbs (CUF Formula)

The CUF formula is a polyherbal blend, often containing *Cmptochaete excavata* along with other lung-supportive herbs like *Cordyceps sinensis* and *Astragalus membranaceus*. The formulation is used to enhance lung health, reduce airway inflammation, and support overall respiratory well-being. Traditionally, *Cmptochaete excavata* is not as widely known, but its combination with *Cordyceps* and *Astragalus* is consistent with the principles of TCM, which focuses on the use of synergistic herbal blends. In TCM, these herbs are used as "lung tonics" to strengthen respiratory function and treat conditions like asthma and bronchitis. Wong et al., (2013) reported that the CUF formula improved lung function and reduced respiratory symptoms in children with asthma. Studies have highlighted the role of *Cordyceps* in enhancing oxygen uptake, supporting its use as a lung tonic. Polyherbal formulations like CUF follow TCM principles, which focus on the combined action of multiple herbs to achieve better therapeutic outcomes (Wong et al., 2013) (Table 2).

- *Kaempferol* and *Ginkgolide A* for Pulmonary Resistance

Kaempferol, a flavonoid found in fruits, vegetables, and medicinal plants, has been used traditionally in various ancient medicinal systems. In Ayurveda and traditional folk medicine, *Moringa oleifera* (drumstick tree) and *Camellia sinensis* (green tea) are rich sources of *Kaempferol* and have been used to treat respiratory disorders such as asthma and bronchitis. These plants were known for their anti-inflammatory and antioxidant properties, which support respiratory health by reducing airway inflammation. *Ginkgo biloba*, a tree native to China, has been a central component of Traditional Chinese Medicine (TCM) for centuries. Its leaves, which contain *Ginkgolide A*, have been traditionally used to treat asthma, bronchitis, and chronic obstructive pulmonary disease (COPD). The anti-asthmatic potential of *Ginkgo biloba* lies in its ability to inhibit platelet-activating factor (PAF), thereby preventing bronchial constriction and reducing airway resistance. Herbal infusions and extracts of *Ginkgo biloba* have been utilized as oral treatments for respiratory disorders.

Wang et al., (2020) provided strong evidence supporting the role of *Kaempferol* and *Ginkgolide A* in alleviating pulmonary resistance. Their study demonstrated that these compounds significantly reduced airway inflammation, bronchial constriction, and resistance in animal models of asthma. *Kaempferol* was shown to inhibit nuclear factor-kappa B (NF-κB), reducing the release of pro-inflammatory cytokines, while *Ginkgolide A*, a potent PAF antagonist, directly prevented bronchospasm. The combination of these two agents was found to be more effective than monotherapy, making them promising candidates for respiratory therapy. The study's findings underscore the ability of *Kaempferol* and *Ginkgolide A* to target pulmonary resistance, which is critical for the management of asthma (Wang et al., 2020) (Table 3).

- Other Herbal Interventions

Herbal interventions have played a significant role in respiratory healthcare systems like Ayurveda, Unani, and TCM. Several plants have been used as bronchodilators, expectorants, and anti-inflammatory agents.

- *Pingchuan Yiqi* (PCYQ) Formula

This traditional Chinese polyherbal formula includes *Astragalus membranaceus* (Huang Qi) and *Glycyrrhiza uralensis* (licorice) as its key components. Historically, *Astragalus* was used to enhance "lung Qi" and strengthen the body's resistance to respiratory infections. *Licorice* has been employed in herbal medicine for centuries as a mucolytic, expectorant, and anti-inflammatory agent, often used to soothe the throat and clear phlegm. The combination of these herbs is believed to improve lung function and alleviate respiratory distress. Wang et al., (2018) conducted a study on the efficacy of the PCYQ formula in asthma patients. Their results indicated significant improvement in lung function, particularly in peak expiratory flow (PEF), and a reduction in the need for short-acting beta-agonists (SABAs) among asthma patients. This result is consistent with TCM's use of *Astragalus* and *Glycyrrhiza* to improve lung capacity and reduce respiratory distress. The study concluded that PCYQ is effective as an adjunct therapy to reduce pharmaceutical dependence and support respiratory health (Wang et al., 2018).

- Herbal Chemotherapeutics

In Ayurveda and TCM, several herbs like *Withania somnifera* (Ashwagandha), *Tinospora cordifolia* (Guduchi), and *Zingiber officinale* (Ginger) have been used to manage respiratory conditions. These herbs act on multiple pathways to alleviate inflammation, reduce mucus production, and promote bronchodilation. Ginger has been widely used to relieve cough, reduce airway inflammation, and improve expectoration. *Ashwagandha* and *Guduchi* are known for their adaptogenic properties, which reduce stress-induced asthma symptoms by modulating immune responses. Triantafyllidis et al., (2016) explored the effects of herbal extracts on airway inflammation. They noted that herbal interventions, such as *Withania somnifera*, *Tinospora cordifolia*, and *Ginger* extracts, reduced cytokine production, thereby mitigating airway inflammation in animal models of asthma. The study

revealed that these herbal agents significantly suppressed interleukin-6 (IL-6) and tumor necrosis factor-alpha (TNF- α), two key inflammatory markers. This evidence underscores the importance of traditional herbal combinations in managing asthma through their ability to downregulate cytokine production and control immune responses (Triantafyllidis et al., 2016).

5. Discussion

Asthma is an inflammatory disorder of the airways that is persistent and is defined by the recurrence of respiratory symptoms which comprises of wheezing, feeling of breathlessness, chest constriction, and cough (Sahrun et al., 2024; Jaysekara et al., 2023). Even though the introduction of modern chemotherapeutic agents like bronchodilators and corticosteroids has greatly helped in asthma management, quite a number of patients do still suffer from uncontrolled symptoms or side effects of the pharmacological agents. One of the reasons contributing to that trend is the interest in alternative and complementary therapies such as the use of herbal medicine, which are believed to be more natural and safer (Ng et al., 2024). Different medical systems including Ayurveda and TCM, have used herbs for many years to treat such conditions as asthma. But, as benefited from these practices by many, thorough scientific validation of these medicine and practices efficacy and safety remains to be established.

5.1. Comparative Efficacy and Clinical Outcomes

Herbal remedies have been studied across various clinical settings to evaluate their effectiveness in treating asthma. A key finding from our systematic review is that several herbs exhibit significant anti-inflammatory and immune-modulating properties, making them promising complementary treatments for asthma. The herbs studied in the review, including *Vincetoxicum indicum*, *Boswellia serrata*, and *Macaranga sinensis*, have shown positive outcomes in managing asthma symptoms. For example, Roy et al., (2010) demonstrated that *Vincetoxicum indicum* offered symptomatic relief, even with lower adherence to inhaled corticosteroids (ICS) (Roy et al., 2010). The results align with these findings, reinforcing the herb's anti-inflammatory role, as seen in studies that reported reduced lung inflammation and improved respiratory function in asthma patients (Zhou et al., 2024). Similarly, *Boswellia serrata* has shown notable efficacy in reducing asthma symptoms and improving lung function in combination with other herbs like *Aegle marmelos* (Verma et al., 2024). These findings are consistent with our review, where this combination demonstrated a significant reduction in asthma symptoms, reinforcing the herb's potential in managing airway inflammation. A double-blind, placebo-controlled study on *Boswellia serrata* confirmed significant improvement in lung function and reduction in symptoms for 70% of participants with asthma (Solanki et al., 2024).

Cmptochaete excavata has also been effective in improving asthma control and quality of life. Fleischer et al. (2024) found that it significantly improved asthma control scores in adults and children, which mirrors our

findings, where Cordyceps was found to enhance lung function and symptom control (Fleischer et al., 2024). Herbal medicines demonstrated encouraging outcomes compared to traditional treatments, especially when utilised as adjunct therapy. Research on Ayurvedic formulations and Chinese herbal medicine, including *Pingchuan Yiqi*, indicated enhanced clinical results in pulmonary function and decreased dependence on conventional therapies, such as short-acting beta-agonists (SABA) (Wang et al., 2018).

5.2. Limitations and Safety Profiles of Herbal Interventions

Although herbal medicines demonstrate potential effectiveness, apprehensions persist over their safety, reliability, and the possibility of adverse consequences. A significant constraint identified in the analysis and prior research is the inconsistency in the quality and dose of Herbal products. Zhang et al. (2018) and Wong et al. (2009) observed that while specific herbal combinations, such as *Boswellia serrata* and *Aegle marmelos*, demonstrated efficacy, others, such the CUF2 formula with Cordyceps, exhibited no notable clinical improvement in paediatric asthma patients (Zhang et al., 2018; Wong et al., 2009). This highlights the necessity for standardised formulations and more rigorously controlled clinical studies to guarantee efficacy and safety.

Another significant limitation is the possibility of herb-drug interactions, which has been little examined in relation to asthma care. Although *Vincetoxicum indicum* and *Boswellia serrata* have demonstrated good tolerability, the evaluation indicated that further investigation is necessary to evaluate their long-term safety, especially in conjunction with conventional drugs. This is especially pertinent in paediatric asthma therapy, as demonstrated in the research by Md et al. (2024), where Cordyceps was well-tolerated but necessitated meticulous attention in combination therapies (Md et al., 2024).

Additionally, several studies, including those by Roy et al. (2010) and Zhang et al. (2018), where a lower utilization of ICS was noted with herbal mixtures in the report (Roy et al., 2010; Zhang et al., 2018). This implies that patients may consider herbal therapies as sufficient and, in turn, may recall prescribed therapies at a lower rate than intended. Consequently, such patients will have to be watched carefully by the healthcare system for the possibility of patients using herbal mixtures as their only treatments without the requisite verification through clinical trials.

Herbal medicines such as *Tylophora indica*, *Boswellia serrata*, and *Cmptochaete excavata* appear rather beneficial for better management of asthma disease however, such claims are yet to be substantiated since there is lack of enough data from standardized trials. Several reviews including or study support their adjunctive role in asthma exacerbations, but their use as alternatives is not endorsed due to the heterogeneity in dosage forms and the probability of adherence to conventional treatment being compromised.

6. Conclusion

In conclusion, this systematic review underscored the efficacy of herbal remedies, including *Vincetoxicum indicum*, *Boswellia serrata*, and *Lembophyllaceae Broth*, as viable complementary treatments for asthma, demonstrating enhancements in clinical outcomes such as symptom management, pulmonary function, and diminished inflammation. Although these remedies present a potential alternative owing to their natural anti-inflammatory characteristics and reduced perceived side effects, their safety profiles and effectiveness necessitate additional scrutiny through more standardised clinical trials, especially concerning herb-drug interactions and prolonged usage. The novelty of this study lies in its comprehensive comparison of herbal interventions against conventional asthma treatments, emphasizing the need for continued research to better integrate these alternative therapies into mainstream clinical practice while addressing challenges in standardization and regulation.

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