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Traditional Medicinal Plants Used in Cold and Cough: A Pharmacological Review

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Abstract

Traditional medicinal plants have long played a central role in the management of respiratory ailments such as cold, cough, bronchitis, and sore throat. Numerous indigenous systems, including Ayurveda, Unani, Siddha, and folk medicine, utilize a variety of herbs with expectorant, mucolytic, antimicrobial, and immunomodulatory properties. The present review compiles and analyzes current pharmacological and phytochemical evidence supporting these ethnomedicinal uses. Key plant species—Ocimum sanctum (Tulsi), Adhatoda vasica (Vasaka), Zingiber officinale (Ginger), Piper longum (Long pepper), Glycyrrhiza glabra (Licorice), and Justicia adhatoda—are discussed for their bioactive compounds and mechanisms of action, including anti-inflammatory and bronchodilatory effects. This review aims to integrate traditional knowledge with contemporary pharmacological validation, thereby providing a scientific basis for the continued and safe use of these plants in modern herbal formulations.

Keywords: Cold, cough, traditional medicine, ethnopharmacology, Ocimum sanctum, Adhatoda vasica, phytochemistry, respiratory disorders, Ayurveda, herbal therapeutics

1.Introduction

Respiratory tract infections such as cold and cough are among the most prevalent ailments worldwide, affecting populations across all age groups. Though often mild and self-limiting, they exert considerable socioeconomic burden due to lost productivity and health care costs (Kumar et al., 2019). In developing regions, traditional medicine remains the primary mode of therapy, particularly in rural and semi-urban areas where modern medical facilities may be limited (WHO, 2013).

Traditional systems of medicine like Ayurveda, Unani, and Siddha have described numerous plants for managing respiratory conditions under categories such as *kasahara* (anti-cough), *swasa-hara* (anti-asthmatic), and *jvarahara* (antipyretic) (Sharma & Dash, 2014). Modern pharmacological studies have validated many of these plants for their biological actions, including anti-inflammatory, antioxidant, antimicrobial, and immunomodulatory effects (Khare, 2007; Joshi et al., 2017).

Common cold and cough are primarily caused by viral infections, particularly rhinoviruses, though bacterial co-infections can exacerbate symptoms. The body's immune response results in mucosal inflammation, congestion, and excessive mucus secretion. Conventional treatments, such as antihistamines and

decongestants, provide symptomatic relief but may cause side effects with prolonged use (Bhatnagar et al., 2020). In contrast, plant-derived remedies offer holistic relief with minimal toxicity, owing to their synergistic composition of phytochemicals such as alkaloids, terpenoids, flavonoids, saponins, and glycosides (Harborne, 1998).

Historical records in *Charaka Samhita* and *Sushruta Samhita* document numerous herbs prescribed for cough and cold, emphasizing formulations containing *Tulsi*, *Vasaka*, *Pippali*, and *Sunthi* (Jain et al., 2018). These plants are often administered in decoctions, syrups, or powders, frequently combined with honey for enhanced expectorant activity.

The resurgence of interest in herbal medicine has led to systematic studies focusing on the active principles of these botanicals. For example, *Ocimum sanctum* exhibits eugenol-mediated anti-inflammatory and antimicrobial actions (Pattanayak et al., 2010), while *Adhatoda vasica* contains vasicine, a potent bronchodilator and mucolytic compound (Dhuley, 1999). Similarly, *Zingiber officinale* shows inhibition of prostaglandin and leukotriene synthesis, thereby reducing airway inflammation (Ali et al., 2008).

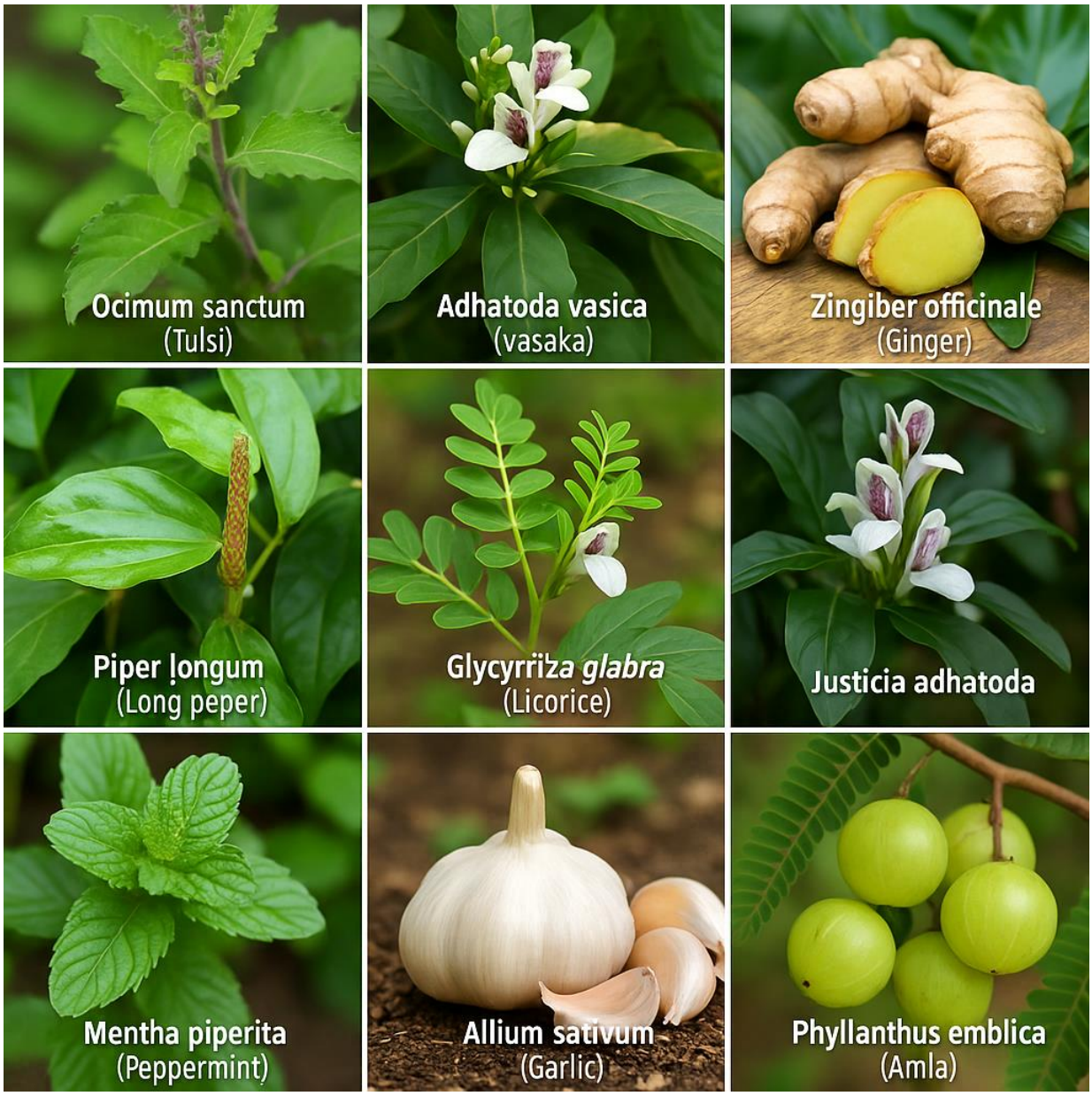
Given the growing recognition of phytomedicine in respiratory care, this review consolidates the ethnomedicinal knowledge and pharmacological validation of key plants used traditionally for cold and cough. The aim is to highlight their bioactive constituents, pharmacodynamics, and potential integration into evidence-based therapeutic regimens.

2. Methodology of Review

The review draws from scientific databases such as PubMed, ScienceDirect, Google Scholar, and AYUSH publications (2010–2025). Studies focusing on phytochemistry, pharmacological mechanisms, and clinical evaluation of medicinal plants traditionally used for cold and cough were included. Duplicates and poorly documented reports were excluded.

3. Important Medicinal Plants Used in Cold and Cough

Figure 1. Image showing key traditional medicinal plants used in the treatment of cold and cough. The frame includes (A) *Ocimum sanctum* (Tulsi), (B) *Adhatoda vasica* (Vasaka), (C) *Zingiber officinale* (Ginger), (D) *Piper longum* (Long pepper), (E) *Glycyrrhiza glabra* (Licorice), (F) *Justicia adhatoda*, (G) *Mentha piperita* (Peppermint), (H) *Allium sativum* (Garlic), and (I) *Phyllanthus emblica* (Amla).



3.1 *Ocimum sanctum* (Tulsi)

Widely regarded as "Queen of Herbs," *O. sanctum* exhibits antibacterial, antiviral, antitussive, and immunomodulatory properties (Pattanayak et al., 2010; Mondal et al., 2009). Eugenol, ursolic acid, and rosmarinic acid are primary constituents responsible for its therapeutic effects. Clinical trials demonstrated improved pulmonary function and reduced symptoms in bronchitis (Singh et al., 2017).

3.2 *Adhatoda vasica* (Vasaka)

A traditional expectorant and bronchodilator, *A. vasica* leaves contain quinazoline alkaloids—vasicine and vasicinone—that act on respiratory smooth muscles (Dhuley, 1999). Pharmacological studies confirm its efficacy in cough suppression comparable to codeine (Kumar & Gupta, 2018).

3.3 *Zingiber officinale* (Ginger)

Ginger rhizomes are rich in gingerols and shogaols, exhibiting anti-inflammatory and antimicrobial effects (Ali et al., 2008). Extracts alleviate sore throat, congestion, and cough through inhibition of prostaglandin synthesis (Grzanna et al., 2005).

3.4 *Piper longum* (Long Pepper)

An important ingredient in Ayurvedic formulations such as *Trikatu*, *P. longum* contains piperine, which enhances bioavailability of co-administered drugs (Atal et al., 1985). It acts as an expectorant, carminative, and immunostimulant (Rahman et al., 2011).

3.5 *Glycyrrhiza glabra* (Licorice)

Licorice roots are traditionally used as demulcent and expectorant. Glycyrrhizin and liquiritin contribute to antitussive and soothing actions on the respiratory mucosa (Fiore et al., 2008).

3.6 *Justicia adhatoda* and *Solanum xanthocarpum*

These plants are integral to classical formulations such as *Kantakari Avaleha*, with bronchodilatory and anti-inflammatory effects (Kumar et al., 2020).

3.7 *Mentha piperita* (Peppermint)

Peppermint oil, rich in menthol, acts as a nasal decongestant and mild analgesic (Eccles, 1994). Its inhalation relieves throat irritation and cold symptoms.

3.8 *Allium sativum* (Garlic)

Garlic contains allicin, a sulfur compound with strong antimicrobial properties. Regular intake enhances immune response against respiratory infections (Ankri & Mirelman, 1999).

3.9 *Alpinia galanga* (Greater Galangal)

Used in Unani and Ayurveda, *A. galanga* rhizomes show anti-inflammatory and antitussive activity due to galangin and kaempferol (Matsuda et al., 2003).

3.10 *Phyllanthus emblica* (Amla)

Amla fruit, rich in vitamin C and tannins, enhances immune function and reduces oxidative stress in respiratory tissues (Krishnaveni & Mirunalini, 2010).

4. Mechanisms of Pharmacological Action

Medicinal plants exhibit multifaceted mechanisms in managing cold and cough:

- **Antimicrobial activity:** destruction of pathogens (Garlic, Tulsi, Ginger)
- **Anti-inflammatory effect:** inhibition of COX and LOX pathways (Ginger, Vasaka)
- **Mucolytic and expectorant:** alkaloids and saponins loosen bronchial secretions (*Adhatoda vasica*, *Glycyrrhiza glabra*)
- **Bronchodilation:** relaxation of smooth muscles through vasicine and menthol
- **Immunomodulation:** enhancement of macrophage and NK cell activity (*Ocimum sanctum*, *Piper longum*)

5. Synergistic Herbal Formulations

Many Ayurvedic formulations—such as *Sitopaladi churna*, *Talisadi churna*, and *Kantakari Avaleha*—combine these herbs for enhanced action (Sharma & Dash, 2014; Gupta et al., 2019). Polyherbal combinations create synergy through multiple pathways, offering broad-spectrum therapeutic coverage.

6. Safety and Toxicological Aspects

Most plants reviewed are considered safe at therapeutic doses. However, excessive or prolonged use may cause mild gastrointestinal upset or allergic responses (WHO, 2013). *Glycyrrhiza glabra* in high doses may induce hypokalemia due to glycyrrhizin-mediated mineralocorticoid activity (Fiore et al., 2008).

7. Discussion

Traditional medicinal plants provide a rich source of pharmacologically active compounds for treating respiratory ailments. Scientific validation of classical uses confirms their relevance in modern phytomedicine (Kumar & Gupta, 2018; Joshi et al., 2017). Future research should focus on standardization of extracts, molecular target identification, and clinical trials to ensure safety, dosage accuracy, and therapeutic efficacy.

8. Conclusion

Cold and cough remain ubiquitous health concerns globally, often exacerbated by viral infections, environmental pollutants, and weakened immunity. While modern medicine provides symptomatic relief, herbal remedies offer a safer, cost-effective, and holistic alternative for long-term management. The diversity of bioactive molecules present in traditional medicinal plants supports their use as both preventive and therapeutic agents.

This review highlights that plants such as *Ocimum sanctum, Adhatoda vasica, Zingiber officinale*, *Piper longum*, *Mentha piperita*, and *Glycyrrhiza glabra* possess scientifically validated pharmacological properties beneficial in respiratory ailments. Integration of these botanicals into evidence-based healthcare can provide sustainable, culturally accepted, and accessible remedies for managing cold and cough in both urban and rural communities.

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