

# Plant-Based Remedies for Cough: Revisiting Traditional Approaches in the Modern Era

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## Pills from the literature

### INTRODUCTION

Cough is an essential physiological response that protects the respiratory system by removing harmful substances, mucus, and infectious agents. Nevertheless, when a cough transitions to a chronic or disruptive state, it can markedly detract from an individual's quality of life. Although traditional pharmacological interventions primarily focus on suppressing the cough reflex, this approach may overlook the underlying etiologies. Recently, there has been renewed interest in plant-based remedies that address these root causes rather than merely suppressing symptoms. The review by Pecoraro et al. (2024) explores the therapeutic potential of natural substances for managing cough, shedding light on a biologically grounded and patient-centered approach<sup>1</sup> (2021).

### SUMMARY OF THE REVIEWED ARTICLE

Pecoraro et al. offer a thorough overview of the mechanisms behind cough and the limitations of traditional treatments that suppress its reflex. In a significant simplification, they include:

- **Sensory Receptors and Reflex Arc**

Cough is initiated by activating airway sensory nerves, including rapidly adapting receptors (RARs) and slowly adapting receptors (SARs), which respond to mechanical and chemical stimuli<sup>2</sup> one afferent axon connects to a single sensor. In LLT, different sensors send signals to different brain regions to evoke reflex. Thus, lung inflation activates slowly adapting receptors (SARs). The reflex arc involves afferent pathways, central processing, and efferent pathways coordinating the cough response<sup>3</sup>.

- **Neural Pathways and Sensory Circuits**

The cough reflex involves a complex neural pathway, starting with sensory nerve activation in the airways, which transmits signals via the vagus nerve to the brainstem, particularly the nucleus tractus solitarius (NTS)<sup>4,5</sup>. This pathway is modulated by various sensory inputs and higher brain areas, which can influence the cough motor pattern<sup>4</sup>.

- **Hypersensitivity and Sensitization**

Chronic cough is often associated with increased sensitivity of the cough reflex, akin to chronic pain syndromes, involving both peripheral and central sensitization<sup>6</sup>. Various stimuli can trigger this hypersensitivity, leading to an exaggerated cough response<sup>7</sup>.

Thus, cough is a multifaceted reflex involving intricate interactions between sensory and motor pathways, both peripheral and central, which complicates the development of targeted treatments. The variability in cough mechanisms across different diseases and patients further compounds this complexity, making it challenging to devise universal therapeutic strategies. In this scenario, non-pharmacological approaches, such as the role of natural compounds emphasized by the authors, may show potential in improving patients' quality of life. Many plant-based remedies are noted for their multifunctional properties, including anti-inflammatory, antioxidant, antimicrobial, and mucolytic effects<sup>1</sup>. Natural compounds such as carob syrup, blackcurrant extract, ginger rhizome, marshmallow root, and ivy leaf have been explored for their potential to address inflammation, oxidative stress, and other pathogenic factors

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contributing to cough. These herbal remedies are gaining attention due to their therapeutic effects, which include anti-inflammatory, antioxidant, and antimicrobial properties. This approach targets the underlying causes of cough rather than merely suppressing the reflex, thus preserving the protective function of the cough reflex while addressing the root causes of respiratory issues.

For instance, ivy leaf extract contains saponins and flavonoids, which contribute to its efficacy in reducing inflammation and oxidative stress in respiratory conditions, thereby reducing the duration and severity of cough symptoms with high patient adherence and minimal side effects<sup>8,9</sup>. Clinical studies have shown that ivy leaf extract can significantly decrease pro-inflammatory mediators and oxidative stress biomarkers, effectively treating acute lung injury and respiratory infections<sup>10</sup>. In addition, its secretolytic and broncholytic effects enhance mucociliary clearance, improve sputum rheology, and reduce mucosal edema, which is crucial for effective cough management<sup>11,12</sup>. Besides its anti-inflammatory properties, it exhibits antimicrobial activity, which can help manage infections that contribute to cough. It also acts as a bronchial muscle relaxant, aiding in the relief of cough symptoms<sup>13</sup>. Ginger rhizome extract has been shown to reduce inflammatory stress by decreasing the expression of inflammatory markers such as TNF- $\alpha$  and inhibiting NF- $\kappa$ B. It also activates antioxidant pathways, making it a promising agent for reducing oxidative stress and inflammation in respiratory conditions<sup>14,15</sup>. Ginger's antimicrobial properties further support its use in treating coughs associated with infections, complementing its anti-inflammatory and antioxidant effects<sup>14</sup>. Marshmallow root, known for its mucilaginous properties, can soothe irritated mucous membranes and act as a demulcent, relieving dry coughs and aiding in the expectoration of mucus<sup>16</sup>. Carob syrup, derived from the carob tree, is traditionally used in various cultures for its medicinal properties, including its application in treating coughs. It contains multiple phenolic compounds, including gallic acid, which are known for their antioxidant properties and inflammation. Its properties are preserved even after digestion, suggesting effectiveness in maintaining health benefits when consumed<sup>1,17</sup>.

## CRITICAL ANALYSIS AND BROADER IMPLICATIONS

The emphasis on natural substances as therapeutic agents for cough aligns with the growing trend toward integrative and holistic medicine. The article by Pecoraro et al. provides valuable insights into the synergistic effects of plant-based compounds, supported by evidence of their safety and efficacy in diverse patient populations. However, the article highlights several challenges that deserve further discussion. A significant limitation is the absence of large-scale, randomized clinical trials validating the efficacy of these natural remedies compared to conventional pharmacological treatments. Variability in the quality and standardization of herbal products presents another obstacle, especially in ensuring consistent therapeutic outcomes. Furthermore, while the European Medicines Agency (EMA) has rec-

ognized several plant-based extracts as "well-established use" (WEU) medicines in pediatrics<sup>18</sup>, greater regulatory oversight and standardization are essential to build confidence among healthcare providers and patients. Although the benefits of these natural compounds are well-supported, it is crucial to acknowledge the variability in individual responses and the potential for interactions with other medications. Incorporating these herbal remedies into treatment regimens should be guided by clinical evidence and customized to meet individual patient needs. Additionally, while these natural compounds offer promising therapeutic effects, they should not replace conventional treatments but rather supplement them to enhance overall efficacy and patient outcomes.

## CONCLUSION

The findings of Pecoraro et al. have implications for clinical practice, particularly in primary care settings where cough is a common presenting symptom. Integrating plant-based remedies into treatment plans offers a noninvasive, biologically grounded alternative that minimizes the risk of adverse effects of conventional antitussive medications, which are particularly relevant in pediatric care<sup>1,19</sup>.

Cough remains a complex symptom with diverse etiologies, requiring nuanced and patient-centered management strategies. The review by Pecoraro et al. underscores the potential of plant-based remedies to offer a safer and more holistic alternative to conventional antitussives. A key strength of the article lies in its focus on the "deep roots" of cough. Rather than suppressing the reflex — described metaphorically as the "watchdog of the lung" — the authors advocate attenuating the stimuli that provoke it. The focus is to modulate the inflammatory and sensory pathways that lead to cough hypersensitivity, thereby reducing the frequency and severity of coughing episodes without compromising the protective function of the cough reflex. This approach is particularly relevant in upper respiratory infections, asthma, and gastroesophageal reflux, where inflammation plays a central role. The article also highlights the safety profile of these remedies, making them suitable for vulnerable populations, including children and the elderly<sup>1,19</sup>. This paradigm shift from symptom suppression to root-cause management could guide future research and clinical guidelines. Educating patients and healthcare providers about the evidence-based use of these remedies is essential to their successful integration into mainstream medicine. Future research should prioritize rigorous clinical trials and standardization efforts to validate their efficacy further and expand their role in clinical practice.

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