

# Antitussive, Antispasmodic, and Demulcent Botanicals to Relieve Cough

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## Discussion

### COUGH AND TRADITIONAL HERBAL MEDICINE

Respiratory conditions are widespread in occurrence, severity, symptomatology, and duration. The common cold and influenza are relatively mild infections with quick recovery time. Some types of influenza, along with pneumonia, tuberculosis, and other respiratory conditions can be life-threatening with severe symptoms. Many chronic conditions, including asthma and bronchitis, require long-term treatments. Viral and bacterial infections play a role in many respiratory conditions. Herbal medicine can address these conditions by offering support to the immune and respiratory systems and enhancing recovery.

Respiratory health is influenced by environmental factors, pollution, chemical inhalation, exercise, immune status, genetics, diet, and other lifestyle factors. Cough is often the first symptom of acute illness, irritation of the upper respiratory system, or of disease. Cough is a physiological reflex and protective mechanism that helps clear mucus, infections, allergens, or other substances from the respiratory tract including the larynx, pharynx, trachea, and bronchi of the lungs. Respiratory tract infections are some of the most widespread diseases and include a wide range of conditions including the common cold, influenza, tuberculosis, whooping cough, pneumonia, and others. Many upper respiratory tract conditions such as influenza are primarily caused by viral infections. Bacterial infections are usually implicated in lower respiratory tract diseases such as pneumonia and tuberculosis.<sup>1</sup>

Traditional medicines including Chinese, Ayurvedic, European, and indigenous North American have successfully and safely used botanicals for thousands of years to prevent and treat respiratory illness.<sup>1</sup> Over time traditional herbal practitioners developed the ability to finely diagnosis the cause of respiratory illness and coughs. This led them to choose precise therapeutic approaches and botanical medicines. Herbs with specific actions were utilized to treat cough depending on its cause; whether it is a dry or wet cough, the degree of infection, the strength of the patient, age of the patient, and other considerations. Herbs are still used throughout the world to

treat respiratory conditions and support respiratory health. In modern times, herbs, essential oils, and combination herbal remedies are highly researched and used clinically.<sup>2</sup>

Typically, botanicals with specific and diverse therapeutic foci are combined into a synergistic formulation targeted for the individual's needs. Antitussive and antispasmodic herbs help modulate the cough response to either calm spasmodic coughing or to facilitate coughing. Expectorant herbs help expel phlegm from the respiratory tract. Mucolytic herbs help to thin mucus so it can be expectorated. Demulcent herbs calm, soothe, and nourish inflamed tissues to promote healing. Modern studies find many of these herbs exert powerful antimicrobial and antiviral influence to help kill the pathogens, and herbs with diuretic, diaphoretic, or laxative properties help the body expel the pathogens.

### DEFINITIONS:

*Antitussive:* These herbs help calm cough. They are used along with other herbs that address the underlying causes of the cough and promote healing.

*Antispasmodic:* These herbs help calm spasmodic coughs and relax bronchial constriction.

*Expectorant:* Expectorants help clear secretions from the lungs and respiratory system.

*Mucolytic:* These herbs help thin phlegm so it can be expectorated from the system.

*Moisten dryness:* Herbs to moisten dryness are indicated when there is a dry cough to keep the infection from going deeper into the system. The lungs are easily injured by heat and dryness so herbalists use demulcent and moistening herbs to protect the lungs during infections and as restoratives after respiratory illness. These herbs can work well with mucolytic herbs.

*Demulcent:* Demulcent herbs are soothing to the mucous membranes of the body and promote tissue healing.

Traditional Classification of Herbs Used for Coughs							
	Anti-Spasmodic	Anti-Tussive	Expectorant	Mucolytic	Demulcent	Moistens dryness	Anti-Microbial
Elecampane		✓	✓			✓	✓
Drosera	✓					✓	✓
Plantain	✓		✓		✓		✓
Mullein	✓		✓	✓	✓		
Lobelia	✓		✓				
Horehound			✓				
Licorice			✓		✓	✓	✓
Ginger			✓	✓			✓
Fenugreek				✓	✓	✓	
Malabar Nut Tree	✓	✓	✓				✓
Thyme	✓		✓	✓			✓
Nutmeg							✓
Capsicum							✓

## Antitussive, Antispasmodic, and Demulcent Botanicals to Relieve Cough

The herbs outlined below can be combined in a formula for short-term use to help relieve cough and respiratory illness including flus and colds. These botanicals can also be utilized long-term for chronic respiratory conditions such as those associated with allergies, autoimmune deficiency, chronic infection, or toxic exposure. Taken together, these herbal medicines alleviate symptoms directly, address the underlying issues, and strengthen the respiratory system.



### Elecampane (*Inula helenium*)

The perennial herb Elecampane, a member of the Compositae family, is traditionally valued as a diaphoretic and expectorant. Its traditional use in Chinese medicine and by Native Americans is for respiratory conditions including bronchitis and tuberculosis.<sup>3-5</sup> Chinese medicine used Elecampane as an expectorant, antitussive, diaphoretic, and bactericidal.<sup>6</sup> Specific for cases with copious phlegm, the Eclectic physicians valued Elecampane for bronchial coughs, especially in children. The root offers both a relaxing effect with its mucilage content and a stimulating effect from its essential oil compounds. The Eclectic physicians considered Elecampane a nutritive tonic beneficial for recovery from illness or overwork.<sup>7</sup>

Elecampane root is shown to exert strong antimicrobial

activity. It is found to be antioxidant, anti-inflammatory, anti-proliferative, hepato-protective, and cytotoxic.<sup>3,6,8</sup> An in vitro study with Elecampane extract found significant antimicrobial activity against bacterial species including *Bacillus cereus*, *B. subtilis*, *Escherichia coli*, and *Staphylococcus aureus*. It also inhibits fungal species including *Candida albicans* and *Aspergillus niger*.<sup>8</sup>

Studies find Elecampane is especially high in the polysaccharide inulin (up to 44%).<sup>9</sup> It is high in sesquiterpene lactones, essential oils (up to 5%), thymol compounds, terpenes, and phenolic acids (including caffeic acid and others). It also contains sterols (including B-sitosterol) and flavonoids (epicatechin, catechin gallate, and others).<sup>3-8</sup>

The sesquiterpenes are found to exert antibacterial activity.<sup>3-8</sup> The sesquiterpene lactones and thymol derivatives in Elecampane are considered responsible for the powerful antimicrobial actions of the root.<sup>3</sup> Thymol is known to be strongly antimicrobial and four thymol derivatives are found in Elecampane. These thymol compounds are found effective against *S. aureus*, methicillin-resistant *S. aureus*, and other bacteria.<sup>4,10</sup>

Elecampane root is high in a number of hydroxycinnamic acid derivatives and conjugates of caffeic acid. These compounds

are known as potent free-radical scavengers. They inhibit lipid peroxidation and also possess antiviral activity.<sup>4</sup> The phenolic and flavonoid content contributes to the roots antioxidant effect.<sup>9</sup>



#### Sundew (*Drosera rotundifolia*)

This small herbaceous plant naturally grows in wet, boggy, muddy areas and is known for its carnivorous ability to trap and digest insects. The flowers open only in sunshine. Sundew extract is a highly revered medicinal, used for centuries by European and American herbalists for respiratory conditions. It exerts antitussive influence and is found beneficial especially to alleviate dryness, inflammation, and irritation. Practitioners use it for the dry, spasmodic cough often found in whooping-cough, measles, asthma, and chronic bronchitis.<sup>11-13</sup> Sundew is traditionally used effectively in formulations to treat tuberculosis and other respiratory conditions.<sup>12,14</sup>

Sundew is found to exert antimicrobial and antispasmodic activity. It demonstrates antiviral, antibacterial, and antifungal properties. It is found beneficial against both gram-positive and gram-negative bacteria.<sup>12,14,15</sup> The key compounds in Sundew are considered to be naphthoquinones and flavonoids to which are attributed its antimicrobial influence.<sup>14,16,17</sup>

#### Plantain (*Plantago major*)



Numerous Plantain species are grown and used medicinally around the world including Europe, China, Africa, and the Americas. European herbal medicine revered Plantain leaf almost as a panacea, utilizing it for a wide variety of conditions and ailments. Valued as a folk remedy and powerful medicinal, Plantain is known for its nourishing and restorative qualities. It is traditionally used to enhance wound healing because it supports tissue healing and health. Plantain is noted especially for its beneficial action on the respiratory system.<sup>18-21</sup> It has been used for centuries to treat a variety of viral disease including colds and influenza.<sup>21,22</sup>

Studies find that Plantain leaf exerts anti-inflammatory, antioxidant, anti-ulcerogenic, expectorant, and spasmolytic activities. It is found to be immune-modulating and immune-stimulating.<sup>19,21</sup> Two Bulgarian clinical trials found that Plantain may be effective in the treatment of chronic bronchitis.<sup>23</sup>

Plantain leaf compounds include polysaccharides, lipids (especially alpha-linolenic acid and linoleic acid), caffeic acid derivatives, flavonoids (especially ellagic acid), tannins, iridoid glycosides, and terpenoids, along with some alkaloids and organic acids.<sup>18,21,22,24,25</sup> Plantain leaf also contains the carotenoid complex and some vitamin C.<sup>22</sup> The high mucilage content of Plantain leaf, which contributes to its

soothing and healing qualities, consists of polysaccharides.<sup>24</sup> Polysaccharides are noted for their diverse bioactivity as antioxidant, antiulcer, and immunomodulatory agents.<sup>20</sup> Water-soluble compounds in Plantain are found to stimulate immune response, especially on proliferation of human lymphocytes. Plantain leaf extract is found to exert high antioxidant activity, which is attributed to its abundant phenolic compounds.<sup>21,24</sup>

#### Mullein (*Verbascum thapsus*)



Mullein commonly grows in sunny meadows, roadsides, or in disturbed areas. It is easily noticeable with its tall, stately growth along with soft, green, fuzzy leaves and yellow flowers. All parts of the plant are used medicinally for a variety of conditions. Mullein leaves are a highly revered medicinal for respiratory health. Because of their antispasmodic, expectorant, mucolytic, and demulcent activity the leaves are traditionally used for bronchitis, tuberculosis, asthma, and whenever there is a dry cough.<sup>26,27</sup> Mullein leaves contain flavonoids, saponins, tannins, terpenoids, iridoid glycosides, polysaccharides, proteins, lipids, and essential oils.<sup>27,28</sup>

#### Lobelia (*Lobelia inflata*)



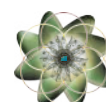
Lobelia is known as an antispasmodic, expectorant, and diaphoretic and is revered by Native American herbalists and American Eclectic physicians. It is traditionally valued for many types of respiratory complaints and congestive conditions. The leaves are used as a tea or tincture for asthma, cough, and to relieve broncho-constriction. It is commonly combined with other herbs, including Ginger and Hyssop, for respiratory conditions.<sup>29-31</sup>

Lobelia contains piperidine alkaloids, gums, resins, and minerals including calcium, potassium, and ferric oxide. The alkaloid lobeline is found to facilitate the cough reflex and benefit the respiratory tract.<sup>30</sup>

#### Horehound (*Marrubium vulgare*)



Horehound is esteemed by traditional herbalists throughout Europe and in the Americas for respiratory conditions. It is known as a stimulant tonic, expectorant, and diuretic. Found to exert a stimulant action on the laryngeal and bronchial mucous membranes, Horehound is traditionally used to benefit respiratory function and as an herbal syrup for coughs, cold, asthma, bronchitis, chronic catarrh, and other respiratory conditions.<sup>31-34</sup> Marrubium species are found to exert antimicrobial activity. They contain diterpenes, sterols, and flavonoids.<sup>33</sup>





### Licorice (*Glycyrrhiza glabra*)

Revered for thousands of years by herbalists worldwide, Licorice is renowned for its soothing quality and ability to calm inflammation anywhere in the body. Licorice is traditionally used to soothe respiratory tissues, calm irritated mucous membranes, and help alleviate bronchitis and coughs. It is a powerful demulcent and can act as an expectorant. Licorice acts as a synergist to moderate and harmonize the characteristics of other botanicals in a formula.

Noted for its anti-inflammatory, antioxidant, and immunomodulating influence, Licorice acts as an antimicrobial and is found to exert influence against *Staphylococcus aureus*.<sup>35-40</sup> Licorice extract is shown to increase immune function including production of interferon and NK (natural killer) cells.<sup>41</sup> Constituents of Licorice include triterpenoid saponins (mainly glycyrrhizin), various polyphenols, polysaccharides, and flavonoids. Multiple flavonoids have been isolated from Licorice, many of which show broad-spectrum antibacterial effects.<sup>36,42-44</sup>



### Ginger (*Zingiber officinale*)

Ginger, a world-renowned and well-loved herb, has been used as a cooking spice, herbal remedy, and revered medicine for centuries. It is a daily household remedy for digestive upset, sore throat, colds, and flu. Ginger aids circulation and is used to warm the system during cold weather. Herbalists also use Ginger to enhance the effectiveness of other herbs in a formula by supporting digestion and circulating the herbs.<sup>45</sup> Its active ingredients are its many volatile oils.<sup>46-48</sup>

Ginger has a thermogenic and diaphoretic effect.<sup>49</sup> It demonstrates impressive antioxidant<sup>50,51</sup> and anti-inflammatory activity.<sup>52</sup> Ginger is found to contain nearly a dozen antiviral compounds.<sup>53</sup>



### Fenugreek (*Trigonella foenum-graecum*)

Fenugreek is a renowned culinary spice and potent herb used for multiple medicinal purposes throughout the world. It is widely known as a mucolytic that helps decongest sinus passages and is traditionally combined with Thyme or other herbs for this purpose. Fenugreek is soothing to the mucous membranes of the sinuses. Recognized as an anti-inflammatory, its active constituents include alkaloids, flavonoids, plant sterols, and saponins.<sup>54,55</sup>



### Malabar Nut Tree (*Justicia adhatoda*)

This small, evergreen, perennial shrub grows throughout India and parts of Asia. Malabar nut

tree is highly revered in Ayurvedic and Unani (ancient Greek) medicines where they have been used for over 2000 years. Known in India as Vasaka, this plant is used as an expectorant and combined in formulas for chronic fever, malarial fever, cough, whooping cough, chronic bronchitis, asthma, and other respiratory conditions. It is traditionally used for its antitussive, anti-asthmatic, and antibacterial actions.<sup>56-61</sup>

It is said that yogis chew the leaves alone or with some Ginger root to clear their respiratory passages and prepare them for vigorous breathing exercises.<sup>59,60</sup> Malabar nut tree leaf decoction is found to soothe throat irritation, act as an expectorant, and to loosen phlegm in the respiratory tract.<sup>60,61</sup>

Malabar nut tree is found to exert antitussive, sedative, expectorant, and antispasmodic activity,<sup>57,60,61</sup> antioxidant activity,<sup>58,62</sup> and anti-inflammatory, antimicrobial, and antibacterial influence.<sup>58,59</sup> Important constituents of Malabar nut tree include alkaloids, saponins, phenolic compounds, flavonoids, sterols, and minerals.<sup>56,57,62</sup> The leaves are rich in vitamin C, carotene, essential oils, fatty acids, resins, and polysaccharides.<sup>57-59</sup>

The most well-studied pyrroloquinazoline alkaloid is vasicine which is found to exert broncho-dilatory activity.<sup>56-58</sup> Vasicine and vasicinone are well-established as therapeutic respiratory agents.<sup>60</sup> Vasicine shows broncho-dilatory activity in vitro and in vivo. One of the main metabolites of vasicine, vasicinone, shows broncho-dilatory activity in vitro and broncho-constrictory activity in vivo. This suggests a modulating effect on respiration.<sup>57</sup>

### Thyme (*Thymus vulgaris*)



The aromatic evergreen herb Thyme, rich in natural essential oils, is an age-old medicinal and cooking spice well-known for its potent antibacterial and antiseptic qualities. A perennial herb from the Mediterranean region, Thyme is grown worldwide. Thyme is naturally rich in volatile oils (including thymol) and phenolic compounds, along with flavonoids, tannins, and saponins.<sup>63-65</sup> All the oils found in *T. vulgaris* belong to the thymol chemotype and are found to display significant antimicrobial and antioxidant activity.<sup>65,66</sup>

Thyme is traditionally revered as a mucolytic, expectorant, and anti-spasmodic. Thyme is found to exert significant antimicrobial activity and is found to be highly antibacterial and antifungal.<sup>66</sup> Modern research associates these actions with its volatile oil and phenolic components.<sup>63,64</sup>

### Nutmeg (*Myristica fragrans*)



Nutmeg is a highly-prized spice and medicinal since antiquity and has a history of traditional

use as a treatment for multiple conditions, from stomach cramps to plague.<sup>67</sup> Nutmeg has also been used to enhance blood circulation, calm digestive issues, and for respiratory conditions including cough and the common cold.<sup>67,68</sup> It was often included as an ingredient in cough syrups.<sup>68</sup>

This sweet, spicy nut grows on evergreen trees native to the Indonesian rain forest.<sup>67,68</sup> It contains an abundance of carbohydrates, proteins, phenolic compounds, terpenoids, and lignans. Nutmeg seed also contains carotenoids, many minerals, and vitamins C and E.<sup>67,69</sup> It contains about 6% to 16% volatile oils. Seed extracts show significant antioxidant and antimicrobial activity.<sup>68-71</sup>

Studies find Nutmeg seed extract is effective against a number of bacteria and fungi including *Staphylococcus aureus* and *Aspergillus niger*.<sup>69</sup> The pinene compounds along with eugenol and other volatile oil compounds are considered responsible for this antimicrobial activity.<sup>69</sup> Their antimicrobial action is related to their ability to inactivate microbial adhesion, enzymes, and cell envelope proteins.<sup>68</sup>

#### Cayenne (*Capsicum annuum*)



*Capsicum annuum* fruits are used worldwide as a culinary spice, medicinal, and to prolong food storage. Capsicum fruits are one of the oldest domesticated crops in the Western hemisphere and there is evidence of preserved peppers dating to 2500 BC in South America. Traditional Mesoamericans used Capsicum peppers for numerous medicinal purposes including treatment of respiratory conditions.<sup>72</sup>

Cayenne extract shows strong antibacterial activity.<sup>73-75</sup> The pungent alkaloid capsaicin from the red pepper *Capsicum annuum* is of great interest to researchers and clinician alike.<sup>72</sup> Capsaicin is a naturally occurring alkaloid and a member of the vanilloid family of compounds, which includes vanillin from vanilla, eugenol from cloves, and zingerone from ginger. It is not water-soluble, but is lipid soluble.<sup>76</sup> It is found to exert anti-inflammatory, antioxidant, thermogenic influence and to benefit other physiological functions.<sup>74</sup> Capsicum fruits contain high amounts of several nutrients including vitamin C.<sup>72</sup>

*For more information on any of the ingredients listed here, including extensive research or individual monographs compiled by Donnie Yance, please email [info@naturaedu.com](mailto:info@naturaedu.com).*

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## Malabar Nut Tree

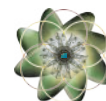
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