REVIEW article

Cough care with medicinal herbs: Safe and natural alternatives

Iftear Kazim Rafi

Department of Pharmacy, Jahangirnagar University, Dhaka-1342, Bangladesh

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Abstract: The word cough refers to a powerful, explosive expiration that clears the tracheobronchial tract of fluids and foreign items. This review article aimed to outline the plants used in ethnobotany and traditional culture for the treatment and alleviation of cough. Alternative therapy is required due to the issues that arise when using traditional opioid antitussive medications, such as codeine and compounds similar to codeine, to treat cough in a variety of respiratory disorders. Medicinal plants may contain compounds with strong antitussive benefits and few side effects. Treatment rationalization is made possible by recent advancements in modern phytotherapy, such as the identification of active compounds that provide therapeutic activity and their measurement in medicinal medications, particularly about dose and the tracking of side effects. This review aims to explain the current trends and uses of medicinal plant species that are used as an expectorants and cough suppressants.

Introduction

Coughing is a sudden, often repeated action that helps remove fluids, irritants, foreign objects, and bacteria from the main breathing passages. The brain detects a foreign item in the throat or upper airway and tells the body to cough to get rid of it when it gets irritated or clogged. Coughing is frequently quite natural. Coughing helps clear your throat of irritants like mucus. However, chronic coughing may also indicate several other conditions [1, 2]. It is one of the most common health problems. Coughing may also be caused by respiratory tract infections, such as the common cold, acute bronchitis, pneumonia, pertussis, flu, and smoking, as well as diseases including lung cancer, tuberculosis, and asthma. The common cold is usually the source of acute coughs, or coughs that last less than three weeks. There is growing recognition of the connection between adult pertussis and troublesome coughing [3]. Chest discomfort, congestion, and an itchy throat are some signs of a cough. Coughing repeatedly causes pain and irritation, which fuels further coughing [3, 4]. By recognizing the allergens that impact individuals and limiting exposure to them, one can lessen allergy flare-ups. Trees, pollen grains, dust mites, animal hair, mold, and insects are examples of common allergens. Clinicians often face difficulties while treating persistent coughing. People most frequently complained of a chronic cough that persisted after eight weeks of treatment. Persistent coughing may affect up to 40.0% of persons [5, 6]. Patients with cough-variant asthma, postnasal drip syndrome, and gastroesophageal reflux disease have higher amounts of inflammatory mediators in their lower airways. A multidisciplinary approach is usually required since a persistent cough has so many possible causes. As the therapy coordinator, the patient's primary care physician may refer them to an otolaryngologist, pulmonologist, or both. The assistance of a gastroenterologist, neurologist, speech therapist, allergist, and immunologist is helpful to the workup [7].

Coughing can additionally be brought on by illnesses that affect the lung tissue, such as bronchiectasis, cystic fibrosis, intestinal lung disease, and sarcoidosis [8]. Sneezing can also be caused by mediastinal masses or lung tumors, whether benign or deadly. By irritating the nerve, diseases of the external auditory canal (such as wax) can also cause coughing. Coughing is associated with cardiovascular diseases such as pulmonary infarction, aortic aneurysms, and heart failure [9]. Nocturnal cough is associated with heart failure because the heart is unable to adapt to the increased volume shift to the pulmonary circulation, resulting in coughing and pulmonary edema. Moreover, coughing can be used for social reasons, such as attracting attention to oneself or giving a statement before entering a house.

Herbal medicines containing active ingredients that have an expectorant and antitussive effect: Saponins are among the herbal remedies with the best-understood mechanisms of action because of their ability to alter the features of coughing and the quality of sputum. Glycid and non-glycid components are found in heteroside saponins. Its pharmacological actions are caused by the aglycone, which is its non-glycid component. The saponins irritate the vagal nerve reflexively when taken orally in therapeutic dosages. The airways produce more mucus as a result of this. Inflammation in the respiratory and cough tracts also causes expectoration to increase. Nevertheless, increased saponin levels can induce bleeding, diarrhea, and emesis because they irritate the mucosal membranes of the gut and intestines [10]. Flavonoids are substances are made up of flavonol glycosides and their aglycones. Flavonoids can decrease xanthine oxidase and cholinesterase activity by blocking oxidizing and reductive reactions. The therapeutic advantages of flavonoids, which are utilized to treat cardiovascular issues, thromboembolic outcomes, and renal diseases, are likely to have positive and advantageous effects when combined with antitussive-expectorant activity [11]. Essences are substances that include aromatic terpenes. These are volatile compounds that irritate a variety of body tissues, including the epithelium of the airways, by directly stimulating secretory cells. They have antibacterial and antiphlogistic properties and increase the mobility of the ciliary epithelium. Fructus anisi, Fructus foeniculi, Fructus melissae, H. seu, and Fructus thymi are used to make important medications. Consuming aetheric oil can have negative effects, including nausea, allergic responses, and renal parenchymal damage. Sometimes, so-called slime-type medicines are used to treat upper airway inflammations associated with dry, annoying coughs. Folium plantaginis, Folium et Flos malvae, Folium et Flos althaeae, and Radix are the most well-known. When slime drugs come into contact with the mucous membrane of the airways, they form a protective layer on their outermost layer. The respiratory receptors (also called rapidly adapting cough receptors, or RARs) on myelinated vagal nerve fibers and the nerve terminals of non-myelinated C-fibers are less irritated by this layer. This reduces the irritation of the damaged mucous membrane caused by foreign substances or inflammatory mediators, which causes coughing [12]. Pectin is said to protect the mucous membranes in the stomach. Under experimental conditions, pectins isolated from citrus fruits (30.2%) had an antitussive effect similar to that of peripherally acting antitussive drugs like prenoxdiazine (23.7%) and dropropizine (27.4%) (dose of 50.0 mg/kg b.w.). However, the exact mechanism of pectins' antitussive action is unknown [13, 14].

Adhatoda vasica has several biological properties, such as immunomodulation, anti-inflammatory, antispasmodic, antiallergic, and cough suppression. Arabinogalactan samples extracted from the plant showed a 67.0% decrease in coughing [15]. When given orally to the guinea pig, A. vasica had an antitussive effect similar to codeine against coughing caused by unpleasant aerosols [16].

Acorus calamus has historically been utilized for its effects on the lungs and digestive tract. This plant soothes congestion, gets rid of phlegm, and calms the mind. Asthma, chronic bronchitis, tinnitus, insomnia, cardiovascular conditions, and forgetfulness have all historically been treated with it. The plant extracts exhibited cytotoxic properties [17].

Garlic (*Allium sativum*) can help prevent lung disease, wound infections, the common cold, malaria, wheezing, hypertension, mental sickness, kidney and liver diseases, asthma, and diabetes. It prevents flu and cold symptoms by strengthening the immune system. It possesses anticancer and chemopreventive qualities as

well. Moreover, aged garlic extract exhibits hepatoprotective, neuroprotective, and antioxidative properties, even if other preparations could encourage oxidation [18, 19].

Angelica archangelica's fruits and roots are used as a tonic for colds and respiratory system issues, as well as for digestive issues and flatulence. It is often used to treat chronic bronchitis, dyspepsia, and overall weakness [20]. The primary active ingredient in the herb extract that prevented the effects of acetylcholinesterase was imperatorin [21]. Extracts from *Astragalus membranaceus* reduced collagen deposition, mucus production, and inflammatory infiltration in the lung tissues. It suppresses cough frequency [23] and has antiasthmatic properties [24]. By modifying mast cell-mediated allergic reactions in allergic rhinitis, it exerts an anti-allergic impact. By lowering TNF-alpha production and blocking NF-kappa B activity, its usage during the attack or remission phase of asthma may limit the progression of inflammation.

Lavender angustifolia soothes and calms the nerves. It often relieves tension, anxiety, depression, panic, and hysteria. It effectively relieves headaches, insomnia, and migraines. Lavender oil is useful for colds, laryngitis, halitosis, breathing problems, mouth infections, and the common cold. The steam from steaming flowers is inhaled as a cold remedy [25].

The cough reflex in unsensitized guinea pigs is decreased by the polysaccharide rhamnogalacturonan, which is present in *Althaea officinalis*. However, experiments revealed that in inflammatory environments, a plant polysaccharide's antitussive effect wore off more quickly. According to particular resistance values, there was no difference in the airway responsiveness of the sensitized and unsensitized animal groups to rhamnogalacturonan in in vivo situations. Rhamnogalacturonan, which is extracted from *Althaea officinalis* mucilage, has a strong cough suppressive effect and shortens the length of guinea pig coughing episodes [26]. Coughs caused by infections are commonly treated with herbal remedies to increase immunity or speed healing. Extracts of thyme, primrose, or both mixed with thymol are examples of such medicines. *Thymus vulgaris* can help regulate the immune system, reduce muscle spasms, and contains anti-inflammatory and antioxidant properties. Thymol, found in thyme oil, is the active ingredient that provides thyme with its medicinal properties. In addition to its expectorant and pectolytic properties, primrose is a saponin agent with antibacterial, anti-inflammatory, and spasmolytic properties. The aforementioned extracts are frequently utilized as combination drugs due to their diverse activity profiles and synergistic effects [27]. The medicinal qualities of peppermint (Mentha piperita) leaves and eucalyptus oil (Eucalyptus citriodora Hook., family Myrtaceae) are widely recognized. Peppermint's menthol relieves sore throats and breaks down mucus by acting as a decongestant. Inhaling peppermint vapors from a steam bath or sipping peppermint tea can also be beneficial. To relieve coughs, an ointment made of beeswax, coconut oil, and eucalyptus oil is applied topically [28]. One of the most well-liked natural cough remedies is ginger. Water is added with crushed fresh ginger with some lime juice. Three to four times a day, this mixture is used to relieve gut congestion, persistent coughing, and sore throats. You might add some honey and lemon juice [29, 30]. Holy basil, also known as tulsi (*Ocimum sanctum*), is a plant that may be used medicinally to treat colds and coughs. The antitussive and warming qualities of tulsi can help treat colds and coughs. Tulsi helps improve the immune system, which lessens the symptoms of the flu, cough, and high blood pressure [31, 32]. Having a cup of Tulsi tea on a daily basis may help lower stress levels. Tulsi is a plant that helps treat colds and coughs because it has bactericidal and anti-allergic qualities [33]. An extract of *Salvia officinalis* (Echinacea or sage) is as efficient and well accepted for treating acute sore throats as a spray that contains lidocaine and chlorhexidine [34]. The efficacy and tolerance profile of a 15% sage spray demonstrated that this medication provides patients with acute pharyngitis with a safe and useful therapeutic alternative [35]. The development of human pathogenic influenza viruses was inhibited by a liquid extract of the elderberry plant, *Sambucus nigra* [36]. In vitro, it prevented the spread of Human Influenza A (H_1N_1). Flavonoids from the elderberry extraction bound to H_1N_1 virions and prevented the viruses from infecting host cells, according to the Direct Binding Assay [37]. Elderberry extract appears to be a safe, effective, and reasonably priced way to treat influenza [33]. Primula,

which is known as the actual primrose. The antioxidant and expectorant qualities of herbal teas and other formulations made from medicinal plants like *Primula elatior* (L.) are well-known. These plants' roots and blooms have comparable biological characteristics. This study evaluated the content and concentration of phenolic components in raw materials derived from wild-grown *P. veris* and *P. elatior* using the rapid and simple HPLC-DAD technique (high-performance liquid chromatography with diode-array detection) [38].

In traditional Chinese medicine, *Tussilago farfara* flower buds are frequently used to treat bronchitis, asthma, and coughs. The plant has been used for almost the same purposes as herbal treatment throughout Europe, except that the leaves are favored over the flower buds [39]. In addition to its complex chemical makeup, honey is a sweet, viscous liquid that contains flavonoids, vitamins, trace minerals, free amino acids, and 25 carbohydrates. Honey has strong antioxidant properties as well. Moreover, honey has antiviral, antibacterial, and anti-inflammatory qualities [40-42]. The honey and ginger extract combination contains antibacterial and anti-itch properties. This has no negative side effects and can be used to treat both productive and dry cough [43]. The bark of aster and mulberry roots has been mentioned in ancient literature as having antitussive properties [44]. The bark of mulberry roots reduced airway inflammation and hyper-responsiveness in an ovalbumin-sensitized mouse model of asthma [45]. It has been demonstrated that compounds obtained from the root of *Aster tataricus* possess expectorant [46], anticancer [47], and antioxidant properties [43]. Ovalbumin-sensitized mice showed less airway hyper-responsiveness when given an extract from the similar species *Aster yomena*, which is also used to treat cough [48].

Conclusion: This study provides a succinct review of natural remedies for cough therapy, arguing that both crude and polyherbal formulations are effective alternatives to modern cough medications, which have several disadvantages. It is also suggested that more research be done on poly-herbal combinations and individual basic remedies to provide clinical justification for employing them to treat cough.

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