

HERBAL ANTITUSSIVES AND EXPECTORANTS – A REVIEW

Seema Gairola^{1*}, Vikas Gupta², Parveen Bansal³, Ranjit Singh¹, Mukesh Maithani¹¹School of Pharmaceutical Sciences, Shobhit University, Meerut, India²University Centre of Excellence in Research, BFUHS, Faridkot, India³Department of Biochemistry, PGIMER, Chandigarh, India*Corresponding author's E-mail: rimpygairola32@gmail.com

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ABSTRACT

The problems emerging from the treatment of cough during many types of respiratory diseases by conventional opioid antitussive agents, such as codeine and codeine-like compounds. Medicinal plants are potential source of substances with high-antitussive efficiency with minimal unwanted effects. Recent trends of modern phytotherapy include specification of active substances responsible for therapeutic effect as well as their quantification in the healing drugs, which enables the treatment rationalization, especially the dosing and pursuing of adverse effects. This review is intended to describe the current status of plant used as antitussive and expectorant and their active compounds with cough-suppressing activity.

Keywords: Cough, Antitussive activity, Medicinal plants, expectorants.

INTRODUCTION

There are many types of drugs that are used to suppress cough and are often prescribed in combination. Before dealing with the particular type of drug used, it is important to consider briefly the nature of cough production, its role in disease and desirability of suppressing it¹. The studies showing that about 95 million units of pediatric drugs were sold for coughs and colds every year in the United States².

The sale of pediatric and adult cough medication represents a significant proportion of the pharmaceutical market in many Countries³. In most countries, these pharmaceutical preparations are sold as over-the-counter (OTC) drugs, a category that includes the following therapeutic classes: cough suppressants, expectorants, and mucolytics⁴. In 2006, the American College of Chest Physicians published nine guidelines for treating acute cough which do not recommend use of OTC drugs⁵. Another concern regarding cough medications is fixed-dose combinations because using two or more drugs in the same formulation, besides having no supporting therapeutic grounds or scientific evidence, increases the risk of adverse events⁶.

Cough is a useful physiological mechanism that serves to clear the respiratory passages of foreign material and excess secretions and should not be suppressed indiscriminately⁷. Cough is thought to be caused by a reflex. It occurs due to stimulation of mechano- or chemoreceptor in throat, respiratory passage or stretch receptor in the lungs⁸. The sensitive receptors are located in the bronchial tree, particularly in the junction of the trachea. These receptors can be stimulated mechanically or chemically e.g. by inhalation of various irritants than nerve impulses activate the cough center in the brain⁹.

Traditionally cough is classified as either productive, *i.e.* producing mucus usually with expectoration, or nonproductive (dry)¹⁰. Therefore, the use of an effective antitussive agent such as dextromethorphan or codeine to suppress the debilitating cough suffered by such patients seems appropriate¹¹. Non-Narcotic antitussive agents anesthetize the stretch receptor located in respiratory passages, lungs and pleura by dampening their activity and thereby reducing the cough reflex at its source. Narcotic antitussive agents depress the cough center that is located in the medulla, thereby raising its threshold for incoming cough¹².

Expectorants are the mixtures have a definite but limited place in medicine. They are not curative, but undoubtedly alleviate the symptoms of patients in certain stages of bronchitis or tracheitis¹³. They help to raise secretions from the respiratory passages. Even though they are used by 10% of American children weekly, they are not recommended in children 6 years of age or younger due to lack of evidence showing effect, and concerns of harm¹⁴. Statistical data analysis convinced the FDA that guaifenesin loosens and thins sputum and bronchial secretions and makes expectoration easier by increasing sputum volume and reducing sputum viscosity¹⁵. In the 1990s only a few of the early natural expectorants are in widespread use and some of these have been chemically modified to improve efficacy or physical characteristics¹⁶. Plants having antitussive and expectorant activity are listed in table 1.



Table 1: Plants having Antitussives and Expectorant activity

S. No.	Botanical Name (Common Name)	Family	Part used	Chemical Constituent	Activity	Reference
1	<i>Abies webbiana</i> Lindl. (Indian Silver Fir)	Pinaceae	L	Flavonoids, biflavonoid glycosides and phytosterols.	Antitussive	[17]
2	<i>Abrus precatorius</i> L. (Indian liquorice)	Leguminosae	R, L, S	(L+) abrin, glucosides (abralin, haemagglutinin), N-Methyltryptophan and Urease.	Antitussive	[18]
3	<i>Acacia concinna</i> wild. DC (Shikakai)	Mimosaceae	L	Saponin, lupeol, aspinasterol and acacic acid lactone. It also contains hexacosanol and aspinasterone	Expectorant	[19]
4	<i>Acorus calamus</i> L. (Sweet flag)	Araceae	Rz	Sesquiterpenes, phenylpropanes, cis-isoasarone, acorone, ketones.	Antitussive	[20]
5	<i>Adhatoda vasica</i> L. Nees (Vasaka)	Acanthaceae	L, R, F, B	vasicine, vasicinone, Maiontone. vasicinolone, vasicol, kaempferol	Expectorant	[21]
6	<i>Agaricus albus</i> Linn (Purging agaric)	Agaricaceae	WP	Agaric acid (agaricin) present to the extent of 14-16%.	Expectorant	[22]
7	<i>Ailanthus excelsa</i> Roxb. (Tree of heaven)	Simaroubaceae	B	Quassinoids including ailanthone derivatives.	Expectorant	[22]
8	<i>Alhagi pseudalhagi</i> Bieb. Desv (Camel thorn)	Fabaceae	WP	Flavonoids, tannins, sterols, triterpene, saponins and anthroquinones	Expectorant	[22]
9	<i>Allium odorum</i> L. (Sweet leek)	Liliaceae	L,B	Sulfur compounds, saponins And alkaloids.	Expectorant	[18]
10	<i>Allium porrum</i> Linn (Leek)	Liliaceae	L	Non-toxic saponins, thiosulphates, flavonoids, quercetin and kaempferol.	Expectorant	[22]
11	<i>Althae officinalis</i> Linn (Marshmallow)	Malvaceae	L,R	Starch, mucilage, pectin, flavonoids, phenolic acids, tannins, quercetin, kaempferol.	Antitussive	[23]
12	<i>Amomum aromaticum</i> Roxb. (Bengal cardamom)	Zingiberaceae	Fr	Essential oil from seeds 1-1.5% containing cineole.	Antitussive	[22]
13	<i>Anagallis arvensis</i> Linn. (Chari saben)	Primulaceae	L	Saponins, valerian, cyclanins.	Expectorant	[23]
14	<i>Andrographis paniculata</i> Burm.f. Nees (Kalmegh)	Acanthaceae	L	Diterpenoid lactones (andrographolides), paniculides, farnesols and flavonoids	Expectorant	[18,21,24,25]
15	<i>Artemisia Vulgaris</i> Linn. (Arbaaka)	Asteraceae	F,R	A volatile oil, an acrid resin and tannin.	Expectorant	[26]
16	<i>Asparagus racemosus</i> Wild (Shatavari)	Liliacea	R, L	Asparagamine A, quercetin, rutin hyperoside, Mucilages,	Antitussive	[27]
17	<i>Azima tetraacantha</i> Lam. (Mistletoe)	Salvadoraceae	L	Alkaloid, azocarpine, carpine.	Expectorant	[22]
18	<i>Bacopa monnieri</i> L. (Brahmi)	Scrophulariaceae	R, S, F, Fr	Alkaloid, brahmine	Antitussive	[27,28]
19	<i>Balanites aegyptiaca</i> Linn. Delile. (Desert date)	Smaroubaceae	S	Diosgenin, steroidal saponins, balanitins	Expectorant	[18]
20	<i>Balsamodendron Myrrha</i> Nees. (Surasa, Barbara)	Burseraceae	R, L, Se	Polysaccharides, volatile oil, eugenol, monoterpenes	Expectorant	[18]
21	<i>Belamcana chinensis</i> L. (Leopard lily)	Iridaceae	Rz	Belamcandin, tectoridin, shekanin and Iridin.	Expectorant	[18]
22	<i>Bischofia javanica</i> B. (Vinegar wood)	Euphorbiaceae	L, Sh	Tannin, Vit c.	Antitussive	[18]
23	<i>Blepharis linariaefolia</i> Pers. (Naethira Poondu)	Acanthaceae	L	Sesquiterpene lactones.	Expectorant	[26]
24	<i>Blumea Balsamifera</i> L. DC (Kukur Sunga)	Asteraceae.	L	Borneol, caryophyllene, ledol phytol, caryophyllene oxide, guaiol.	Antitussive	[29]
25	<i>C. longa</i> Linn (Turmeric)	Zingiberaceae	Rz	Curcumin, Essential oil, ketone, alcohol, Zingiberine.	Antitussive	[30,31]
26	<i>Caesalpinia Bonducella</i> F. (Kuberakshi)	Leguminosae	Se, R, B, L	Aminoacids, aspartic acid, arginine, phenolic.	Antitussive	[32]
27	<i>Cassia Tora</i> L. (Cakunda)	Caesalpinaceae	Se, L	Emodin, glucose, chrysophanol, rhein, oleic, linolic, palmitic	Antitussive	[33,34]
28	<i>Celosia Cristata</i> Linn. (Cock's comb)	Amaranthaceae	F, Se	Betanin, Amarantinin, Isoamarantinin, Celosianin, Protein.	Antitussive	[26]
29	<i>Cephaelis ipecacuanha</i> Rich. (Ipecac)	Rubiaceae	L	Emetine, cholin, cephaeline ipecacuanhic acid, and nauseating ethereal oil.	Expectorant	[28]
30	<i>Chelidonium major</i> L. (Tetter wort)	Papaveraceae	R	Chelidonine, homochelidonine, berberine, protopine.	Antitussive	[35,36]
31	<i>Chondrus crispus</i> L. (Pearl Moss)	Gigartinaceae	Fr	Polysaccharides, carrageenan, tannins, iodine, bromine, iron,	Expectorant	[18]

S. No.	Botanical Name (Common Name)	Family	Part used	Chemical Constituent	Activity	Reference
32	<i>Cimicifuga racemosa</i> Nutt. (Black snakeroot)	Ranunculaceae	Rz, R	Tannins, isoferulic acid, salicylic acid, Mucilage ,starch, actein, cimigoside,	Expectorant	[18]
33	<i>Citrus japonica</i> Thunb. (Marumi Kumquat)	Rutaceae	L, Fr	Essential oil, sugar and organic acids	Antitussive & Expectorant	[18]
34	<i>Coleus amboinicus</i> Lour. (Indian borage)	Labiatae	L	The whole plant contains an essential oil consisting of carvacrol.	Antitussive	[18]
35	<i>Cressa cretica</i> Linn (Rudanti)	Convolvulaceae	WP	Alkaloid, β sitosterol, scopoletin, quercetin glycosides, umbelliferone.	Antitussive & Expectorant	[37]
36	<i>Curcuma Zedoaria</i> Berg. Rosc. (Cochin turmeric)	Zingiberaceae	RZ, L	α -pinene, D-camphene, cineol, D-camphor, D-borneol, zingiberene	Antitussive	[18]
37	<i>Eclipta alba</i> L. (Bhangra)	Asteraceae	R, Se	Flavonoids(Apigenin, luteolin) Isoflavonoids (Wedelolactone), Ecliptal, Terthienyl aldehyde	Antitussive	[38]
38	<i>Eucalyptus globulus</i> Labill (Australian Fever)	Myrtaceae	L,B	crystallized resin, cymenes, terpenes, flavonoids, including quercetin, tannins, volatile oils	Expectorant	[38-41]
39	<i>Euphorbia antiquorum</i> Linn. (Indian spurge)	Euphorbiaceae	WP	Euphorbin 35%, Latex two kinds-one is soluble in ether other is insoluble.	Antitussive	[38-41]
40	<i>Euphorbia hirata</i> L. (Snakeweed)	Euphorbiaceae	S, L, F	Gallic acid, quercetin, Phenyl glycoside and Sucrose.	Antitussive	[39]
41	<i>Euphrasia officinalis</i> Linn. (Eyebright)	Scrophulariaceae	L	Aucubin, Catalpol, Luproside, Verproside, Eukovoside, Tannins.	Antitussive	[28]
42	<i>Foeniculum vulgare</i> Meller (Fennel)	Umbelliferae	Se, L, R	Aromatic oil, fixed oil, Anethol and Fenchone.	Antitussive	[39]
43	<i>Ginkgo biloba</i> L. (Balkuwari)	Ginkgoeae	L	Flavonoids, flavones, flavonols, tannins, biflavones ,terpenoids	Antitussive	[42]
44	<i>Glycyrrhiza glabra</i> Linn. (Liquorice)	Papilionaceae	R	Glycyrrhizin, Glycosides such as glycyrrhizol, glabrin A and B,	Antitussive & Expectorant	[21,43,44]
45	<i>Inula helenium</i> L. (Tu-mu-xing)	Compositae (Asteraceae)	R	Monoterpenes, Diterpenes, Flavonoids, Glycolipids	Expectorant	[45]
48	<i>Kaempferia galanga</i> L. (Black thorn)	Zingiberaceae	L, Rz	Cinnamate ,pentadecane, 1,8-cineole, Terpenoid	Antitussive	[46]
49	<i>Lindera benzoin</i> L. Blume (Spicewood)	Lauraceae	B,L.	Linderol, Linderone, Linderolactone.	Expectorant	[47]
50	<i>Lobelia inflata</i> Linn. (Indian Tobacco)	Lobeliaceae	Se	Lobeline, Lobelachrin, Lobelia acid.	Antitussive	[48]
51	<i>Ocimum sanctum</i> Linn. (Tulsi)	Lamiaceae	L, Se, R	Eugenol, carvacrol, methyl eugenol, α -cymene, camphene, α - cymene, p-cymene.	Antitussive	[49,50]
52	<i>Papaver rhoeas</i> L. (Red poppy)	Papaveraceae	F,	Cyanidine derivatives., alkaloid rheadine ,morphine, thebine and narcotine	Antitussive & Expectorant	[22]
53	<i>Pimpinella anisum</i> L. (Anise)	Apiaceae	Se	volatile oil, coumarin, β amyryn, stigmasterol, flavonoid glycosides	Expectorant	[39, 45]
54	<i>Pistacia chinensis</i> Bunge (Kakar singhi)	Anacardiaceae	Galls	volatile oil, turpentine oil, Hydrocarbon.	Antitussive	[39]
55	<i>Plantago lanceolata</i> L. (Snake Weed)	Plantaginaceae	L, Se, R.	Polysaccharides, tannins, iridoid glycosides	Antitussive	[51]
56	<i>Platycodon grandiflorum</i> Jacq. A. DC (Chinese bellflower)	Campanulaceae	R	Triterpenoid saponin, Platycodigenic acid, Platycodigenin,	Antitussive & Expectorant	[18]
57	<i>Polemonium reptans</i> L. (Bluebells)	Poemoniaceae	R	It contains triterpene saponins.	Expectorant	[52]
58	<i>Polygala amara</i> L. (Bitter milkwort)	Polygalaceae	Rz	phenol glycosides, polygalite	Expectorant & Antitussive	[52]
59	<i>Polygala senega</i> L. (Sneca Snake root)	Polygalaceae	Rz	Sitosterol (b-sitosterol), Dehydrocholic acid (3,7,12-trioxocholic acid, steroids	Expectorant	[52,53]
60	<i>Polygonum cuspidatum</i> Sieb (Japanese Knotweed)	Polygonaceae,	R,L	anthraquinones and anthraglycosides primarily emodin, rhein, chrysophenol, tannins, resveratrol.	Expectorant	[54]
61	<i>Prunus armenica</i> Linn (Wild Apricot)	Rosaceae	Se	Amygdalin (cyanhydrine-glycoside), emulsion	Expectorant	[45]
62	<i>Sanguinaria canadensis</i> Linne. (Bloodroot)	Papaveraceae	R	Sanguinarine, chelerythrine, protopine, citric and malic acids.	Expectorant	[45]
63	<i>Sida rhombifolia</i> L. (Indian hemp)	Malvaceae	L, R	Pseudoephedrine, beta-Phenethylamine.	Expectorant	[45]
64	<i>Thymus vulgaris</i> L. (Garden thyme)	Lamiaceae	F, L	It contains 2% essential oil.	Expectorant	[45]
65	<i>Viola odorata</i> L. (Banafsaj)	Violaceae	L, F, R	Volatile oil, salicylic acid methyl ester, saponins, alkaloids.	Expectorant	[45,54]
66	<i>Withania Somnifera</i> Dunal. (Ashwagandha)	Solanaceae	R,L	Withanine alkaloid, Somniferine, Tropine, Hygrine, Anaferine.	Antitussive	[26]
67	<i>Zingiber officinale</i> Rosc. (Ginger)	Zingiberaceae	Rz	Zingiberene, camphene, β -pinene, myrcene, limonene, 1,8-cineole , β -phellandrene.	Antitussive	[55,56]

L-Leaves, F-Flower, S-Stem, Sh-Shoot, Se-Seeds, Rz-Rhizomes, Fr-Fruit, R-Root, WP-Whole Plant



CONCLUSION

The past two decades have seen a worldwide upsurge in the use of traditional medicine (TM) and Complementary and alternative medicine (CAM) in both developed and developing countries. Current world-wide interest in traditional medicine has led to rapid development and studies of many remedies employed by various ethnic groups of the world. The information is recorded in common name of botanical name, common name, family, part used, active constituent, & reference. Scientists from divergent fields are investigating new plants with antitussive and expectorant activity.

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