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FUTURE PROSPECTS OF COUGH TREATMENT; HERBAL MEDICINES v/s MODERN DRUGS

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ABSTRACT: Drugs currently used to treat cough are among the most widely used over-the-counter drugs in the world, despite a recent analysis suggesting that there is a little evidence to such drugs produce any meaningful efficacy. The primary action of currently available cough suppressants (opiates, dextromethorphan etc.) is on the central cough pathway. The significant side effects of these agents such as constipation, respiratory depression, dependence, drowsiness and death from this action limit their use in human and thus highly unsatisfactory. There is a current huge unmet need for the development of safe, effective antitussive therapeutic options in the treatment of persistent cough as alternative to existing medications. Medicinal plants are an important source for the discovery of novel bioactive compounds, which have served and continue to serve as lead molecules for the development of new drugs. Thus this review may provide an insight into herbs possessing antitussive and expectorant activity individually or in combination. These findings will be useful towards establishing pharmacopoeial standards for crude drugs as well as for formulations which is gaining relevance in research on traditional medicinal system.

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 it.¹ Since ancient times humanity has depended on the diversity of plant resources for food, clothing, shelter, and traditional medicine to cure myriads of ailments. Early humans recognized their dependence on nature in both health and illness².

Nature has been a source of medicinal agents for thousands of years, and an impressive number of modern drugs have been isolated from natural sources, particularly plants and with many based on their use in traditional medicine. By using medicinal chemistry and combinatorial chemical and biosynthetic technology, novel natural product leads will be optimized on the basis of their biological activities to yield effective chemotherapeutic and other bioactive agents³. During the past decades, public interest in natural therapies, namely herbal medicine, has increased dramatically not only in developing countries but mainly in industrialized countries⁴.

Treatment:

The treatment of a cough will depend largely on its severity and underlying cause.

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Self-Care at Home:

If patient have an *acute cough* and have not been to the doctor, he may attempt to use over-the-counter cold remedies to relieve his symptoms. Acute coughs that are caused by allergies are often relieved with allergy medication, and coughs due to environmental irritants will respond to elimination of the agent.

Home care of the chronic cough with a known cause is directed at treating the underlying cause of the cough. This should be done in close consultation with his doctor or with a specialist. Common homely remedies for cough are Turmeric, Ginger, Tulsi, Mulethi, Lemon, Garlic, Onion, and Hot Milk with Honey, Carrot Juice, and Almonds⁵.

Herbal Drugs for Cough:**Needs of Plants:**

Man has been using herbs and plants products for combating disease since times immemorial. Plants have provided, and continue to provide essential material for treatment of numerous diseases, shelter, food, furniture, clothing, writing, weapons, cosmetics and numerous other purposes. Certainly, the great civilizations of ancient Chinese, Indian, and North African provided written evidence of

chronic cough Man's ingenuity in utilizing plants for treatment of wide variety of diseases⁵. Most popular cough medicines throughout the world are based on herbal derivatives. Numerous compounds such as codeine, morphine, noscapine, bromhexine, guaifenesin, ephedrine, cromolyn etc. and their derivatives, isolated from different plant species, are well-established western medicines for treating cough or underlying pathologies¹.

List of traditional medicinal plant for the treatment of bronchial diseases:

Adhatoda zeylanica, *Ailanthus excelsa* Roxb., *Azima tetracantha* Lamk., *Bambusa arundinacea* (Retz.) Willd., *Barleria cuspidata*, Heyne. ex Nees, *Barleria prionitis* L., *Blumea mollis* (D. Don.) Merr., *Boerhavia diffusa* L., *Calotropis procera* (Ait.), R.Br., *Cassia fistula* L., *Curculigo orchioides*, Gaertn., *Datura metal* L., *Desmodium triflorum* (L.) DC., *Lepidagathis cristata* Willd., *Piper longum* L., *Portulaca quadrifida* L., *Solanum surattense* Burm., *Tragia involucrata* L., *Tylophora fasciculata* Ham., *Vicoa indica* (L.) DC., *Vitex negundo* L., *Zaleya decandra* (L.).^{6, 7} There are various herbal cough preparations are available in market in different brands. (Table 1)

Table1: EXAMPLES OF HERBAL COUGH PREPARATION

Formulation	Ingredients
Joshina (Hamdard)	<i>Glycyrrhiza glabra</i> , <i>Viola odorata</i> , <i>Althaea officinalis</i> , <i>Cordia latifolia</i> , <i>Onosma bracteatum</i> , <i>Malva sylvestris</i> , <i>Zizyphus vulgaris</i>
Koflet Cough Syrup (Himalaya)	<i>Vitis vinifera</i> , <i>Ocimum sanctum</i> , <i>Glycyrrhiza glabra</i> , <i>Adhatoda vasica</i> , <i>Viola odorata</i> , <i>Onosma bracteatum</i> , <i>Solanum xanthocarpum</i> , <i>Embelia ribes</i> , <i>Cinnamomum cassia</i> .
D'cold Natural (Paras Pharmaceuticals Ltd.)	<i>Ocimum sanctum</i> , <i>Glycyrrhiza glabra</i> , <i>Adhatoda vasica</i> , <i>Curcuma longa</i> , <i>Alpinia galasya</i> , <i>Piper longum</i> , <i>Zingiber officinalis</i> , <i>Mentha viridis</i> , Honey.
Kafbin (East India Pharmaceuticals)	<i>Glycyrrhiza glabra</i> , <i>Piper longum</i> , <i>Piper nigrum</i> , <i>Zingiber officinalis</i> , <i>Solanum xanthocarpum</i> , <i>Terminilia belerica</i> , <i>Clerodendrum indicum</i> .
MEDICOF Cough Syrup (Bio Sap)	<i>Ocimum sanctum</i> , Dry ginger, <i>Inula racemosa</i> , <i>Hyssop</i> , <i>Viola odorata</i> , <i>Xanthocarpum indicum</i> , <i>Liquorice</i> , <i>Pepper longum</i>
Baidyanath -Kasamrita Herbal Syrup	Somlata, Kantakari, Vasak mool, Mulethi, Tulsi Panchang, Lisora, Gazoban, Kakadsingi, Pipa , Nausada, <i>Pudina Satva</i>
Dabur Honitus Herbal Syrup	<i>Ocimum Sanctum</i> , <i>Glycyrrhiza Glabra</i> , <i>Solanum Xanthocarpum</i> , <i>Viola Odorata</i> , <i>Taxus Baccata</i> , <i>Zingiber Officinal</i> , <i>Piper Longum</i> , <i>Adhatoda Vasica</i> , <i>Hedchium Spicatum</i> , <i>Menthe Piperita</i> Extract.
Zeal Cough Syrup (Medi Power Co.,Ltd)	Extract derived from <i>Ocimum sanctum</i> , <i>Adhatoda zeylanica</i> , <i>Glycyrrhiza glabra</i> , <i>Navsagar</i> , <i>Zingiber officinale</i> , <i>Solanum Xanthocarpum</i> , <i>Trikatu</i> , <i>Sat</i> , <i>Piperment</i> 6mg, <i>Nilgiri Oil</i> .

Plants reported for antitussives and expectorant activity:

Cough suppressant and expectorant activities have been claimed for many medicinal plants, in the

literature. Based on this knowledge, different workers have evaluated botanicals for Antitussives & expectorant activity. (**Table 2**)

TABLE 2: PLANTS REPORTED FOR ANTITUSSIVE AND EXPECTORANT ACTIVITY

Botanical Name(Common Name)	Activity Reference
<i>Abies webbiana</i> Lindl. (Indian Silver Fir)	Antitussive ⁸
<i>Abrus precatorius</i> L. (Indian liquorice)	Antitussive ⁹
<i>Acacia concinna</i> wild. DC(Shikakai)	Expectorant ¹⁰
<i>Acorus calamus</i> L. (Sweet flag)	Antitussive ¹¹
<i>Adhatoda vasica</i> L. Nees (Vasaka)	Expectorant ¹² and Antitussive ¹³
<i>Agaricus albus</i> Linn (Purging agaric)	Expectorant ¹⁴
<i>Ailanthus excelsa</i> Roxb. (Tree of heaven)	Expectorant ¹⁴
<i>Alhagi pseudalhagi</i> Bieb. Desv (Camel thorn)	Expectorant ¹⁴
<i>Allium odorum</i> L. (Sweet leek)	Expectorant ⁹
<i>Allium porrum</i> Linn(Leek)	Expectorant ¹⁴
<i>Althae officinalis</i> Linn (Marshmallow)	Antitussive ¹⁵
<i>Amomum aromaticum</i> Roxb. (Bengal cardamom)	Antitussive ¹⁴
<i>Anagallis arvensis</i> Linn.(Chari saben)	Expectorant ¹⁵
<i>Andrographis paniculata</i> Burm.f.Nees (Kalmegh)	Expectorant ^{9, 12, 16, 17}
<i>Artemisia Vulgaris</i> Linn. (Arbaaka)	Expectorant ¹⁸
<i>Asparagus racemosus</i> Wild (Shatavari)	Antitussive ¹⁹
<i>Azima tetracantha</i> Lam.(Mistletoe)	Expectorant ¹⁴
<i>Bacopa monnieri</i> L.(Brahmi)	Antitussive ^{19, 20}
<i>Balanites aegyptiaca</i> Linn.Delile.(Desert date)	Expectorant ⁹
<i>Balsamodendron Myrrha</i> Nees.(Surasa, Barbara)	Expectorant ⁹
<i>Belamcane chinensis</i> L. (Leopard lily)	Expectorant ⁹
<i>Bischofia javanica</i> B. (Vinegar wood)	Antitussive ⁹
<i>Blepharis linariaefolia</i> Pers. (Naethira Poond)	Expectorant ¹⁸
Bulbus of <i>Fritillaria wabuensis</i> .	Antitussive & Expectorant ²¹
<i>Blumea Balsamifera</i> L. DC (Kukur Sunga)	Antitussive ²²
<i>C. longa</i> Linn(Turmeric)	Antitussive ^{23, 24}
<i>Caesalpinia Bonducella</i> F. (Kuberakshi)	Antitussive ²⁵
<i>Cassia Tora</i> L.(Cakunda)	Antitussive ^{26, 27}
<i>Celosia Cristata</i> Linn. (Cock's comb)	Antitussive ¹⁸
<i>Cephaelis ipecacuanha</i> Rich. (Ipecac)	Expectorant ²⁰
<i>Chelidonium major</i> L.(Tetter wort)	Antitussive ^{28, 29}
<i>Chondrus crispus</i> L. (Pearl Moss)	Expectorant ⁹
<i>Cimicifuga racemosa</i> Nutt. (Black snakeroot)	Expectorant ⁹
<i>Citrus japonica</i> Thunb. (Marumi Kumquat)	Antitussive & Expectorant ⁹
<i>Coleus amboinicus</i> Lour. (Indian borage)	Antitussive ⁹
<i>Cressa cretica</i> Linn(Rudanti)	Antitussive & Expectorant ³⁰
<i>Curcuma Zedoaria</i> Berg. Rosc. (Cochin turmeric)	Antitussive ⁹
<i>Eclipta alba</i> L.(Bhangra)	Antitussive ³¹
<i>Eucalyptus globulus</i> Labill (Australian Fever)	Expectorant ^{31, 32, 33, 34}
<i>Euphorbia antiquorum</i> Linn. (Indian spurge)	Antitussive ^{31, 32, 33, 34}
<i>Euphorbia hirata</i> L.(Snakeweed)	Antitussive ³²
<i>Euphrasia officinalis</i> Linn. (Eyebright)	Antitussive ²⁰
<i>Foeniculum vulgare</i> Meller (Fennel)	Antitussive ³⁰
<i>Ginkgo biloba</i> L. (Balkuwari)	Antitussive ³⁵
<i>Glycyrrhiza glabra</i> Linn. (Liquorice)	Antitussive & Expectorant ^{12, 36, 37}
<i>Inula helenium</i> L. (Tu-mu-xing)	Expectorant ³⁸
<i>Kaempferia galanga</i> L. (Black thorn)	Antitussive ³⁹
<i>Lindera benzoin</i> L. Blume (Spicewood)	Expectorant ⁴⁰
<i>Lobelia inflata</i> Linn.(Indian Tobacco)	Antitussive ⁴¹
<i>Mucuna pruriens</i> (l) dc	Anti-tussive ⁴²
<i>Marsilea minuta</i> l.	Antitussive & Expectorant ⁴³
<i>Ocimum sanctum</i> Linn.(Tulsi)	Antitussive ^{44, 45, 46}

<i>Oldenlandia umbellata</i>	Antitussive ⁴⁷
<i>Papaver rhoeas</i> L.(Red poppy)	Antitussive & Expectorant ¹⁴
<i>Paederia foetida</i>	Antitussive Activity ⁴⁸
<i>Pimpinella anisum</i> L.(Anise)	Expectorant ^{32, 38}
<i>Pistacia chinensis</i> Bunge(Kakar singhi)	Antitussive ³²
<i>Plantago lanceolata</i> L.(Snake Weed)	Antitussive ⁴⁹
<i>Platycodon grandiflorum</i> Jacq. A. DC (Chinese bellflower)	Antitussive & Expectorant ¹⁴
<i>Polemonium reptans</i> L. R(Bluebells)	Expectorant ⁵⁰
<i>Polygala amara</i> L.(Bitter milkworth)	Expectorant & Antitussive ⁵⁰
<i>Polygala senega</i> L.(Sneca Snake root)	Expectorant ^{50, 51}
<i>Polygonum cuspidatum</i> Sieb(Japanese Knotweed)	Expectorant ⁵²
<i>Prunus armenica</i> Linn(Wild Apricot)	Expectorant ³⁸
<i>Sanguinaria canadensis</i> Linne. (Bloodroot)	Expectorant ³⁸
<i>Scoparia dulcis</i> George A.	Antitussive & Expectorant ⁵³
<i>Sida rhombifolia</i> L.(Indian hemp)	Expectorant ³⁸
Stemona alkaloids from <i>Stemona tuberosa</i>	Antitussive ⁵⁴
<i>Thymus vulgaris</i> L.(Garden thyme)	Expectorant ³⁸
<i>Viola odorata</i> L.(Banafsaj)	Expectorant ^{38,52}
<i>Withania Somnifera</i> Dunal. (Ashwagandha)	Antitussive ¹⁸
<i>Zingiber officinale</i> Rosc.(Ginger)	Antitussive ^{55,56}
<i>Ficus racemosa</i>	Antitussive ⁵⁷
<i>Passiflora incarnata</i>	Antitussive ⁵⁸
<i>Ionidium suffruticosam</i> Ging. (Violaceae)	Antitussive ⁵⁹
<i>Trichodesma indicum</i>	Antitussive ⁶⁰
<i>Lagerstroemia parviflora</i> leaf	Antitussive ⁶¹
<i>Drymaria cordata</i> Willd.J	Antitussive ⁶²
<i>Leucas lavandulaefolia</i>	Antitussive ⁶³
<i>Jussiaea suffruticosa</i> linn	Antitussive ⁶⁴
<i>Asparagus racemosus</i> root	Antitussive ⁶⁵
L-ephedrine, amygdalin, and makyokansekito	Antitussive ⁶⁶

Activities reported on marketed cough preparations used as antitussive & expectorant:

- **Narasimha churna:** An Ayurvedic formulation prepared from various medicinal plants which are commonly used in Cough, deficiency of semen, pain, wrinkles in the skin, graying of hair, alopecia, diabetes and anemia. The study was consists of preparation and standardization of Narasimha churna for parameters like physicochemical properties, phytochemical screening and physical properties of final formulation as per WHO guideline and the results were compared with the marketed formulation. These findings will be useful towards establishing pharmacopoeial standards for crude drugs as well as for formulation which is gaining relevance in research on traditional medicinal system.

From this investigation various standardization parameters such as physicochemical standards, chemo profiles and safety evaluation were carried out, it can be concluded that the

formulation of Narasimha churna was in accordance with the standards laid down for churna. The study showed that the contents of formulation present within the permissible limits as per WHO, all these investigations are not specified in the standard literature such as in pharmacopoeia, which could helpful in authentication of Narasimha churna. The result of this study will may be serve as reference monograph in the preparation of drug formulation⁶⁷.

- **Sitopaladi Churna:** Is a polyherbal Ayurvedic formulation used as an antitussive, analgesic and antipyretic. The study was reported on the anti-tussive activity of the macerated extract of Sitopaladi Churna by comparison to other marketed formulations as well as reference drug Codeine phosphate using the acetic acid induced cough models in guinea pigs. The standard drug codeine phosphate brought about a reduction of bouts of cough from 15.62±0.38 to 1.0±0.11 (93.60% inhibition), which was significant (P<0.01). The percentage inhibition of bouts of

cough for in-house formulation (94.28%) was very significant compared to the standard as well as other marketed formulations. Thus the study justifies the traditional claims of Sitopaladi Churna in the treatment of cough⁶⁸.

- **Joshina:** A herbal polypharmaceutical, Unani Syrup given for cough, cold & catarrh. The pharmacological studies were performed on Joshina. The drug has significant antitussive activity against cough induced in guinea pigs by mechanical stimulation which is comparable with codeine (20 mg/kg, p.o.). Joshina is also found to have high potential as an anti-inflammatory, decongestant and expectorant in experimental models. These activities are comparable with that of standard drugs such as phenylbutazone (85mg/kg., s.c.) and nor-adrenaling (1 ug)⁶⁹.
- **Vasu Cough Syrup:** A Polyherbal formulation was evaluated for acute oral toxicity study and anti-tussive activity in sulphur dioxide (SO₂)-induced cough model in mice. Albino mice of either sex, weighing 25-30 g were divided into four groups (n = 6). Group I served as Disease control, Group II received standard drug i.e. Codeine phosphate (10 mg/kg), p.o., group III to IV were given Vasu Cough Syrup 0.25mL/kg and 0.5mL/kg body wt. p.o., dose. After 30 minutes, the mice were exposed to Sulphur dioxide for 30 sec. The mice were then placed in an observation chamber for counting of cough bouts for five minutes. Vasu Cough Syrup showed 63.91% and 70.64% inhibition in frequency of cough at 0.25mL/kg and 0.5mL/kg dose level respectively. It proved significant anti-tussive activity of Vasu Cough Syrup in Sulphur dioxide induced cough model. Thus, Vasu Cough Syrup can be useful as an alternative medicine for cough⁷⁰.
- **Zeal Cough Syrup:** A Polyherbal formulation was evaluated for safety and antitussive activity in Sulphur dioxide (SO₂) induced cough model in mice at different dose level of 0.25ml/kg p.o. and 0.5ml/kg p.o. It was also compared with modern medicine available in the market i.e. Codeine + Chlorpheniramine maleate (10 mg/kg). Both the doses of Polyherbal

formulation showed significant antitussive activity (p<0.001) in Sulphur dioxide induced cough model. Thus, this formulation can prove to be useful for alleviating cough. Hence, it was concluded that, Zeal Cough Syrup is having potent antitussive activity yet safe polyherbal formulation for use in respiratory care⁷¹.

Self formulated polyherbal formulation:

- Ethanolic extracts of fruits of *Terminalia chebula* (Combretaceae), leaves of *Mentha piperita* (Labiata), leaves of *Adhatoda vasica* (Acanthaceae), leaves of *Ocimum sanctum* (Labiatae), rhizomes of *Zingiber officinale* (Zingiberaceae), fruits of *Piper longum* (Piperaceae), roots of *Glycyrrhiza glabra* (Leguminosae) and roots of *Withenia somnifera* (Solanaceae) were investigated for their antitussive effect on citric acid induced cough model in guinea pig. The results showed that the formulated cough syrup exhibited significant antitussive activity in a dose dependent manner the activity was compared with the prototype antitussive agent diphenhydramine HCl.

It was observed that the extract has produced 54%, 70%, 75% reduction in cough bouts at the dose level of 1, 2, 3 ml respectively after 1hr of drug administration. It is evident from the data the highest dose of 3 ml was found to be more effective. It was found that antitussive activity produced by the herbal formulation in the minimum dose was much better than the standard drug⁷².

- The aim of this study was to examine the antitussive activity of the water extract of *Adhatoda vasaka* (Ardusi), *Glycyrrhiza glabra* (Jethimadh), *Zinziber Officinale* (Ginger) & *Ocimum santcum* (Tulsi) in mice. This plant helpful in pediatric, breastfeeding mother, and pregnant women and also in treating various disease and disorders viz. In this formulation uses four different multi uses plants. They were used in other than cough preparation in combination for the efficacy of *Adhatoda vasaka*, *Glycyrrhiza glabra* *Zinziber Officinale*

& *Ocimum sanctum* in reducing cough frequency in mice. In this work performed Sulfur dioxide gas induce model. It stimulated sensory end organs arising in the trachea and bronchi; these fibers are believed to arise from the cough receptors. Thus it produced cough by stimulating sensory end organs in the trachea and bronchi.

At low concentrations it causes bronchoconstriction which depends on intact motor parasympathetic pathways. The results showed that the water extract of *Adhatoda vasaka*, *Glycyrrhiza glabra*, *Zinziber Officinale* (ginger) & *Ocimum sanctum* (tulsi) the oral dose of 100 mg/kg b/w had a cough-suppressive effect. It caused a significant (*p* value) decrease of the number of cough. The antitussive activity of the of *Adhatoda vasaka* & *Glycyrrhiza, glabra* *Zinziber Officinale* (ginger) & *Ocimum sanctum* (tulsi) similar to that of the non-narcotic antitussive agent Codeine⁷³.

- This study was carried out to evaluate antitussive activity of combination of herbal drugs as formulations in sulphur dioxide (SO₂)-induced cough model in mice. Albino mice of either sex, weighing 25-30 g were divided into eight groups, (n =6). Group 1 served as normal control, group 2 mice were given distilled water, group 3 was positive control and received codeine sulphate (10 mg/kg, p.o.) and group 4, 5, 6, 7 received coded 1 formulations 1, 2, 3 and 4 respectively at a dose of 0.3 ml/mice, orally, while group VIII was the vehicle control.

Differnt formulations was formulated by using *Justicia adhatoda* (Vasaka), *Curcuma longa* (Haridra), *Curcuma Zeodaria* (Shati), *Ocimum sanctum* (tulsi), *Piper longum* (pippali), *Solanum surratense* (Kantakari), *Voila odorata* (Banafsha), *Vitis vinifera* (Draksha), *Alpinia galangal* (Kulinjan), *Mentha arvensis* (Sat pudina), *Glycyrrhiza glabra*, *Ammonium chloride* (Navsadar) in different concentrations. Thirty minutes later, the mice were exposed to sulphur dioxide again for 45 sec. The mice were then placed in an observation chamber for counting of cough bouts, by two independent observers, for five

minutes. All the formulations used showed significant antitussive activity in sulphur dioxide induced cough model. Thus, these formulations can prove to be useful for alleviating cough⁷⁴.

- This Study Shows Antitussive Efficacy for Diphenhydramine, less for DXM. Diphenhydramine, a common antihistamine in cough/cold OTCs, proves more effective in suppressing cough than the common antitussive dextromethorphan, researchers say. Diphenhydramine is in FDA's antitussive OTC monograph, but marketers are criticized for not demonstrating its and other cough/cold ingredients' efficacy in trials⁷⁵.
- This study was done on the title of "Antitussive Effect of a Naturally Flavored Syrup Containing Diphenhydramine, Compared with Dextromethorphan and Placebo" on june 2014. The purpose of this study is to evaluate the antitussive (cough-suppressing) effects of two liquid medications: a combination of diphenhydramine and phenylephrine in a naturally cocoa flavoring, and, dextromethorphan syrup, compared with placebo⁷⁶.

Modern Treatment:

The treatment of an acute cough is directed primarily at decreasing the cough in addition to treating the underlying cause. Symptomatic relief of cough can be provided by over-the-counter or prescription cough remedies. The treatment of a *chronic cough* will also be directed at treating the underlying condition. It is important to recognize that treatment may be difficult, may employ multiple approaches, and may not completely eliminate the cough. The treatment of a cough will depend largely on its severity and underlying cause.

A trial of antibiotics or inhaled corticosteroids may be tried in children with a chronic cough in an attempt to treat protracted bacterial bronchitis or asthma respectively. Cough medicines may be given if the patient cannot rest because of the cough or if the cough is not productive, as is the case with most coughs associated with colds or flu⁷⁷. (Table 3, 4)

TABLE 3: CLASSIFICATION OF MODERN DRUGS USED TO TREAT COUGH⁷⁸

Pharyngeal Demulcents	Lozenges, Cough Drops, Linctuses Containing Syrup, Glycerine, Liquorice
Expectorants (Mucokinetics)	Directly acting- Sodium Potassium Citrate, Guaicol, Balsum of Tolu, Vasaka, Reflex acting- Ammonium Chloride, Potassium, Iodide, Carbonate. Mucolytics- Bromhexin, Acetyl Cycteine, Carbocisteine, Ambroxol.
Antitussives (Cough Centre Suppressants)	Opioids- Codeine, Pholocodiene, Morhine, Ethylomorphine. Non Opioids- Chlophedianol, Dextromethorphan, Noscapiene, Antihistamines- Chlorpheniramine, Diphenhydramine, Promethazine

TABLE 4: SOME MARKETED ANTITUSSIVE-EXPECTORANT COMBINATIONS^{79, 80}

Formulation	Ingredients
Benadryl Cough Formula	Diphenhydramine , Ammonium chloride , Sodium Citrate , Menthol
Glycodin Cough Syrup	Terpin Hydrate, Dextromethorphan Hydrobromide , Menthol .
Cadicoff	Dextromethorphan , Chlorpheniramine , Guaiphenesin , Ammonium chloride
Cindexa Cough Syrups	Dextromethorphan, Phenyl Propanolamine Hcl , Chlorpheniramine Maleate
Cinkof Cough Syrups	Bromhexine Hydrochloride, Terbutaline Sulphate , Guaiphenesin
Torex Cough Syrup	Chlorpheniramine Maleate, Ammonium Chloride, Sodium Citrate, Menthol.

CONCLUSION: Cough suppressant and expectorant activities have been claimed for many medicinal plants, in the literature. Based on this knowledge, different workers have evaluated many herbs for Antitussives & expectorant activities which have been compiled and reported in this study. This study also reveals the activities reported on marketed cough preparations used as antitussive & expectorant viz Narasimha churna an Ayurvedic formulation, Sitopaladi Churna is a polyherbal Ayurvedic formulation, Joshina, a herbal polyherbal Unani Syrup and Vasu Cough Syrup, a polyherbal formulation. Many workers reported antitussive & expectorant activities of self formulated cough preparations consisting of different combinations of plants extract. This study also concentrates on modern drugs used in clinical practice for the treatment of cough.

Finally present study concludes by giving a comprehensive view of herbal drugs for the treatment of cough as crude drug as well as polyherbal formulations are good alternatives of modern cough drugs which are having a lot of side effects. This study also suggest the future prospects of conducting clinical research on these polyherbal formulations as well as individual crude drug to give the clinical evidence based strength for using these drugs in the treatment of cough.

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1. Specify designation and current full address of corresponding author.
2. Check for spelling, grammar and punctuation error(s).