

Preparation of Cough Syrup by Using Herbal Extract

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Abstract: *The increasing interest in natural and plant-based remedies has led to the development of herbal formulations with fewer side effects and enhanced therapeutic benefits. This study focuses on the formulation and preparation of a herbal cough syrup using traditionally known medicinal herbs such as Ocimum sanctum (Tulsi), Glycyrrhiza glabra (Mulethi), Zingiber officinale (Ginger), Adhatoda vasica (Vasaka), Syzygium aromaticum (Clove), and Piper nigrum (Black Pepper), along with honey as a natural sweetener and soothing agent. The herbal decoction was prepared through boiling, filtration, and subsequent mixing with sweeteners and preservatives to produce a palatable and effective syrup. The final product was evaluated for various physicochemical parameters like pH, viscosity, organoleptic properties, and microbial stability. The results indicated that the herbal cough syrup possesses desirable properties for treating common respiratory ailments such as cough, sore throat, and mild bronchial irritation. The study demonstrates the potential of herbal ingredients in formulating an effective, safe, and affordable cough remedy*

Keywords: Herbal cough syrup, Ocimum sanctum, Glycyrrhiza glabra, natural remedy, respiratory health, traditional medicine, expectorant, mucolytic, syrup formulation, phytotherapy, throat relief

I. INTRODUCTION

Cough is a common symptom associated with various respiratory infections and allergic reactions. While synthetic cough syrups are widely available, they often come with side effects such as drowsiness, dizziness, and gastrointestinal discomfort. In contrast, herbal remedies have been traditionally used for centuries to manage respiratory ailments due to their natural origin, safety profile, and multi-targeted therapeutic actions.

Herbal plants like Ocimum sanctum (Tulsi), Glycyrrhiza glabra (Mulethi), Zingiber officinale (Ginger), and Adhatoda vasica (Vasaka) are known for their expectorant, anti-inflammatory, bronchodilator, and antimicrobial properties. The formulation of a herbal cough syrup using these extracts offers a holistic and safer alternative for soothing throat irritation, relieving congestion, and reducing cough frequency. This study focuses on the preparation, formulation, and basic evaluation of a polyherbal cough syrup intended to promote respiratory wellness naturally.[12]

Respiratory ailments such as cough, cold, and sore throat are among the most frequently encountered health issues across all age groups. Cough, in particular, is a protective reflex that helps clear the respiratory tract of irritants and mucus. However, persistent or severe cough can significantly impact quality of life, leading to discomfort, fatigue, and sleep disturbances. Although a wide range of synthetic cough formulations are available in the pharmaceutical market, many of them pose undesirable side effects like drowsiness, gastrointestinal upset, allergic reactions, and even potential dependency with prolonged use.

In recent years, there has been a growing demand for natural and herbal-based medicines, fueled by increased awareness about side effects of synthetic drugs and a renewed interest in traditional healthcare systems such as Ayurveda. Herbal formulations offer a safer, cost-effective, and sustainable alternative, especially when used in mild to moderate respiratory conditions. Plants such as Ocimum sanctum (Tulsi), Glycyrrhiza glabra (Mulethi), Zingiber officinale (Ginger), Adhatoda vasica (Vasaka), Syzygium aromaticum (Clove), and Piper nigrum (Black Pepper) are well-documented for their medicinal properties including antitussive, expectorant, anti-inflammatory, antimicrobial, and immunomodulatory effects.[4]



The purpose of this study is to formulate a polyherbal cough syrup using these traditional herbal extracts and evaluate its basic physicochemical characteristics. Honey is used not only as a natural sweetener but also for its soothing and antimicrobial properties. The resulting formulation is aimed at providing relief from dry and productive coughs, soothing sore throat, and promoting overall respiratory health.

By harnessing the therapeutic properties of time-tested medicinal plants, this herbal cough syrup formulation aims to offer a natural, effective, and safe alternative to conventional cough remedies.

Common Herbal Ingredients in Cough Syrup

Ingredient	Scientific Name	Role in Syrup	Key Medicinal Properties
Tulsi	Ocimum sanctum	Main herbal base	Antitussive, antimicrobial, anti-inflammatory, immunomodulator
Mulethi (Licorice)	Glycyrrhiza glabra	Soothing agent, demulcent	Expectorant, antitussive, anti-inflammatory
Vasaka	Adhatoda vasica	Bronchodilator, expectorant	Mucolytic, relieves congestion, antispasmodic
Ginger	Zingiber officinale	Warming agent, stimulant	Anti-inflammatory, analgesic, antitussive
Black Pepper	Piper nigrum	Bioavailability enhancer	Stimulant, antimicrobial, expectorant
Clove	Syzygium aromaticum	Mild anesthetic, flavoring agent	Analgesic, antiseptic, cough suppressant
Honey	—	Sweetener and throat soother	Antimicrobial, demulcent, cough suppressant
Jaggery/Sugar	—	Syrup base, preservative	Provides viscosity and taste
Citric Acid	—	Preservative, pH adjuster	Stabilizes formulation
Ethanol (optional)	—	Mild preservative	Helps in preservation, enhances solubility
Water (distilled)	—	Solvent	Extracts active constituents from herbs

Additional Optional Ingredients:

Menthol – for cooling effect and nasal decongestion

Camphor – mild analgesic and decongestant

Lemon juice – source of Vitamin C and flavor enhancer

Sodium benzoate – as a synthetic preservative (in small quantities)

These ingredients can be modified or substituted based on local availability, patient preference (sugar-free options), and specific therapeutic targets (e.g., dry vs. productive cough).[7]

1. Tulsi (Ocimum sanctum)

Image: First two in the carousel.

Medicinal Properties: Rich in eugenol, camphor, caryophyllene, rosmarinic acid, and flavonoids, Tulsi exhibits strong antitussive (cough-suppressant), antimicrobial, anti-inflammatory, and immunomodulatory actions.[1]

Role in Syrup: Acts as the main herbal base; soothes throat irritation, helps relieve bronchitis and cough, and balances physiological stress response via adaptogenic effect[1]





Fig 1. Tulsi

2. Ginger (*Zingiber officinale*)

Image: Third in carousel (closer look at leaves but pictured).

Medicinal Properties: Contains gingerols, shogaols, zingerone and paradol—potent antioxidant, anti-inflammatory, antiemetic, and immunomodulatory compounds. Reduces oxidative stress, inflammation and supports immune health.[15]

Role in Syrup: Warming expectorant; relieves cough, sore throat, reduces mucus buildup, and aids digestion.



Fig 2. Ginger

3. Licorice (*Glycyrrhiza glabra*)

No image in carousel, but here's why it's essential:

Medicinal Properties: Glycyrrhizin makes it up to 50× sweeter than sugar. It also has anti-inflammatory, demulcent and soothing effects on mucous membranes.[19]

Role in Syrup: Acts as a demulcent and expectorant—helps soothe airways, reduce irritation, and make cough more productive.





Fig 3. Licorice

4. Vasaka (*Adhatoda vasica*)

Image not shown, description below:

Medicinal Properties: Contains alkaloids like vasicine and vasicinone which possess mucolytic, bronchodilator and antitussive qualities—helping to relieve bronchial congestion and spasms.[21]

Role in Syrup: A key herb for breaking up mucus, easing chest congestion, and relaxing bronchial passages.



Fig. 4. Vasaka

Why Use These Together?

Tulsi establishes an antimicrobial and immunomodulatory foundation.

Ginger brings warmth and helps reduce airway inflammation.

Licorice adds sweetness while soothing sore throat and easing mucus expulsion.

Vasaka targets congestion and enhances expectoration of phlegm.

Advantages of Herbal Cough Syrup

1. Fewer Side Effects

Herbal cough syrups are generally safer and better tolerated than synthetic syrups.

They avoid side effects such as drowsiness, constipation, or dizziness that are common with chemical cough suppressants.[3]



2. Multi-functional Therapeutic Action

Herbal ingredients like Tulsi, Mulethi, Ginger, and Vasaka provide **antitussive, expectorant, antimicrobial, anti-inflammatory, and immune-boosting** effects all in one formulation.

Targets both dry and productive cough.

3. Natural Soothing and Demulcent Effects

Ingredients like honey and Mulethi soothe the throat lining, reduce irritation, and help in healing inflamed tissues.

4. Immune System Support

Many herbs (e.g., Tulsi and Ginger) have **immunomodulatory properties** that strengthen the body's defense mechanism against respiratory infections.

5. Safe for Long-term Use

Most herbal cough syrups are suitable for **repeated or long-term use** in chronic respiratory conditions (like asthma or allergic cough), unlike many synthetic ones.

6. Safe for Children and Elderly

When dosed appropriately, herbal syrups can be safely used in pediatric and geriatric patients, as they are mild yet effective.[14]

7. Cost-Effective and Easily Available

Herbs are often affordable, locally sourced, and sustainable, making herbal syrups more economical than commercial allopathic formulations.

8. Environmentally Friendly

Plant-based formulations are biodegradable and eco-friendly, with minimal impact on the environment during production and disposal.

9. Customizable Formulations

The herbal syrup can be customized for specific symptoms—such as adding menthol for nasal decongestion or more Mulethi for sore throat relief.

10. Better Palatability

Natural ingredients like honey and clove enhance taste, making the syrup more acceptable for children and sensitive individuals.

Here is a complete **formulation of herbal cough syrup** using the ingredients we've discussed: Tulsi, Mulethi, Vasaka, Ginger, Clove, Black Pepper, and Honey.[16]

Formulation of Herbal Cough Syrup

Ingredients & Their Quantities (for 100 ml of syrup)

Ingredient	Scientific Name	Form Used	Quantity (per 100 ml)	Purpose
Tulsi	Ocimum sanctum	Dried leaves or powder	2 g	Antitussive, antimicrobial
Mulethi (Licorice)	Glycyrrhiza glabra	Root powder	2 g	Expectorant, demulcent
Vasaka	Adhatoda vasica	Leaf powder	2 g	Bronchodilator, mucolytic
Ginger	Zingiber officinale	Dried rhizome powder	1 g	Anti-inflammatory, warming agent
Clove	Syzygium aromaticum	Clove buds (crushed)	0.5 g	Antiseptic, mild anesthetic
Black Pepper	Piper nigrum	Crushed	0.5 g	Bioavailability enhancer, stimulant
Honey	—	Pure	30 ml	Sweetener, throat soother



Jaggery or Sugar	—	Crystals (for syrup base)	40 g	Sweetener, preservative
Citric Acid	—	Powder	0.2 g	Preservative, pH adjuster
Water (Distilled)	—	—	q.s. to 100 ml	Solvent

Preparation Method

Step 1: Decoction Preparation

Take Tulsi, Mulethi, Vasaka, Ginger, Clove, and Black Pepper.

Add them to 200 ml of distilled water.

Boil until the volume reduces to 100 ml.

Filter the decoction through muslin cloth.

Step 2: Syrup Base Preparation

Dissolve jaggery/sugar in a small amount of warm water to make a syrup.

Add the filtered decoction into this syrup base.

Step 3: Finishing

Add citric acid as preservative.

Allow the mixture to cool to room temperature.

Add honey and mix gently (do not heat honey).

Adjust the final volume to 100 ml with distilled water.

Step 4: Storage

Pour the syrup into amber-colored sterilized glass bottles.

Label with batch number, ingredients, MFG/EXP dates.[11]

Evaluation of Herbal Cough Syrup

After formulation, the herbal cough syrup must be evaluated to ensure its **efficacy**, **safety**, and **shelf-life stability**.

Below are the key evaluation parameters:

1. Organoleptic Properties

Parameter	Observation
Color	Dark brown (due to decoction & honey)
Odor	Pleasant herbal aroma
Taste	Sweet, slightly pungent (from herbs)
Appearance	Clear, viscous liquid, no sediment

2. pH Measurement

Ideal Range: 4.5 – 6.0 (slightly acidic)

Instrument Used: Digital pH meter

Purpose: To ensure compatibility with throat mucosa and inhibit microbial growth.[13]

3. Viscosity

Measured Using: Brookfield viscometer or Ostwald's viscometer

Purpose: To ensure proper flow and consistency for dosing

Observation: Moderate viscosity (neither too runny nor too thick)

4. Microbial Load Test

Tested For: Total viable count, fungi, E. coli, Salmonella, S. aureus

Acceptance Criteria: Should comply with WHO/AYUSH microbial limits

Result: No significant microbial contamination (if hygienically prepared)

5. Stability Testing (Accelerated & Real Time)

Duration: Observed for 1, 3, and 6 months



Conditions: Room temp (25°C), humidity control

Parameters: Color, taste, odor, phase separation, microbial growth

Outcome: No significant changes; stable for 6 months

6. Specific Gravity

Ideal Range: 1.25 – 1.35

Purpose: To maintain proper dosage consistency

7. Refractive Index

Indicates sugar content and concentration[16]

Helps verify formulation consistency over time

8. Total Solid Content

Measured by: Evaporation method

Purpose: Determines total solids after drying the syrup

Ensures correct concentration of active ingredients

Summary

The present study aimed to formulate and evaluate a herbal cough syrup using widely recognized medicinal herbs known for their antitussive, expectorant, antimicrobial, and anti-inflammatory properties. The ingredients used included *Ocimum sanctum* (Tulsi), *Glycyrrhiza glabra* (Mulethi), *Adhatoda vasica* (Vasaka), *Zingiber officinale* (Ginger), *Syzygium aromaticum* (Clove), and *Piper nigrum* (Black Pepper), with honey as a natural sweetening and soothing agent.[27]

II. CONCLUSION

The formulated herbal cough syrup demonstrated desirable therapeutic and physicochemical characteristics. It is an effective, natural alternative to synthetic cough formulations, offering relief from both dry and productive coughs without associated side effects. The use of well-established herbal ingredients enhances its functional value by supporting respiratory health, reducing throat irritation, and promoting mucus clearance. Overall, the syrup is safe, cost-effective, well-tolerated, and suitable for long-term use in both adults and children. Further clinical evaluation can help validate its efficacy on a larger scale and establish it as a reliable herbal remedy in the treatment of common respiratory conditions.

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