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## Review Article

# Formulation and Evaluation of Herbal Cough Syrup Containing Natural Antitussive Agent

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## ABSTRACT

The present study was aimed at formulating and evaluating a polyherbal cough syrup containing Tulsi, Ginger, Clove, Fennel, Cardamom, Turmeric, Cinnamon, Mentha, and Honey. These herbal ingredients were selected for their traditional use in the management of cough, throat irritation, and respiratory discomfort. The syrup was prepared using decoction and maceration techniques, followed by incorporation into a honey-based formulation. The prepared syrup was evaluated for various physicochemical parameters including color, odor, taste, pH, viscosity, density, and stability. The formulation exhibited a reddish-brown color, aromatic odor, slightly pungent taste, pH range of 5.8–6.3, and satisfactory viscosity and density values. Preliminary phytochemical screening confirmed the presence of bioactive constituents such as alkaloids, flavonoids, tannins, glycosides, saponins, and terpenoids. The formulation showed good stability and acceptable organoleptic properties. The study concludes that the developed polyherbal cough syrup may serve as a safe, effective, and economical natural remedy for the relief of cough and associated respiratory conditions.

## INTRODUCTION

The respiratory system enables the body to take in oxygen and expel carbon dioxide. It consists of organs such as the nasal cavity, trachea, lungs, and diaphragm that coordinate the process of breathing. Air moves through these passages into the lungs, where tiny structures called alveoli allow gas exchange with the blood. This process

supports cellular respiration, which produces energy for the body. Efficient functioning of this system is essential for sustaining life and maintaining internal balance. (1, 2)

Cough is a common health issue affecting people of all ages and is often treated using over-the-counter syrups. Most conventional cough syrups act by suppressing the brain's cough reflex but can

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lead to side effects such as drowsiness, constipation, difficulty in breathing, addiction, and in some cases, death. Due to these risks, many people are turning to safer, natural alternatives. Ayurveda medicine, which uses herbs and natural ingredients, is gaining popularity as a more suitable option for cough relief. Herbal cough syrups are especially favored because they are easy to consume and generally well tolerated. This study focuses on the preparation and evaluation of an herbal cough syrup made with traditional ingredients such as licorice, Tulsi, cinnamon, ginger, clove, and honey. These herbs are known for their soothing and medicinal properties in treating respiratory conditions. The syrup was formulated in a laboratory and tested for pH, viscosity, density and stability to ensure quality. The results showed that the herbal formulation was stable and had good physical characteristics. Additionally, antitussive activity was tested, and the herbal syrup demonstrated better cough relief at a lower dose compared to a standard allopathic medicine. These findings support the potential of herbal syrups as effective and safer alternatives for managing both dry and wet coughs. With increasing awareness about the side effects of chemical drugs, herbal formulations provide a promising option for natural, side-effect-free cough treatment. [3]

Cough is a very common problem which almost everyone faces, especially during seasonal changes. It is actually a protective reflex of our body to clear the respiratory tract, but when it becomes persistent, it causes irritation, discomfort and even affects sleep. Nowadays, many cough syrups available in the market contain synthetic drugs which may cause side effects like drowsiness. Because of this, people are shifting towards herbal medicines. Herbal cough syrups are made from natural ingredients and are considered safer and more suitable for long-term

use. In this project, I have tried to prepare a herbal cough syrup using easily available ingredients like ginger, tulsi and honey, and also studied its basic properties.(4)

Cough is one of the most common symptoms associated with respiratory tract infections and diseases such as bronchitis, asthma, and common cold. It is a natural reflex mechanism that helps clear mucus, irritants, and foreign particles from the respiratory tract. However, persistent coughing can lead to discomfort, throat irritation, and disturbed sleep. Modern cough syrups contain synthetic drugs such as Antihistamines, antitussives, and decongestants. These may produce side effects like drowsiness, dizziness, constipation, and drug dependency. Due to these limitations, there is a growing demand for herbal formulations, which are considered safer and more compatible with the human body a bacterial, viral, or fungal infection can result in inflammation and fluid in the lungs, which is known as a cough it can induce fever and make breathing difficult. Your body produces a cough as are action to irritation of the throat or airways. An irritant causes your nerves to fire, sending a signal to your brain. Vasaca cough syrup is typically a sweetened beverage that contains cough suppressant medication. In India, the number of people suffering from asthma is rising daily for a variety of manmade or environmental factors. (5, 6)

In this project, a herbal cough syrup is formulated using natural ingredients like *Ocimum sanctum* (Tulsi), *Zingiber officinale* (Ginger), *Syzygium aromaticum* (Clove), *Foeniculum vulgare* (Fennel), *Elettaria cardamom* (Cardamom), *Mentha piperita* (Mint), and *Apis mellifera* (Honey). These ingredients provide antitussive, expectorant, antimicrobial, anti-inflammatory, and soothing effects, making the formulation effective in relieving cough These are all used to



treat coughs, skin infections, and skin eruptions. Coughing may be caused by the respiratory tract (7)

## 1.1 Types of coughs

### a. Depending upon type

Further cough is classified into two types as

#### 1. Dry cough

A cough that doesn't generate mucous is called a dry cough.

Coughing is a tickly, unpleasant sensation that occurs when your lungs or airways are inflamed.

Your cough will be dry and ineffective if you don't have mucus, which is typically produced when you have an illness.

Asthma, bronchitis, acid reflux, and allergies are common reasons.

#### 2. Wet cough

A productive cough, often known as a wet cough, can be uncomfortable and bothersome.

This kind of cough frequently indicates an underlying medical condition and produces mucus or phlegm.

For a wet cough to be effectively managed and relieved, it is essential to comprehend its causes,

symptoms, and treatment and prevention techniques.

### b. Depending on duration

It may be classified into acute, sub-acute and chronic cough depending upon duration

#### 1. Acute cough

The cough lasting for less than 3 weeks are categorized under this type.

Causes for acute cough is due to common cold, URTI, COPD, environmental pollution, and infective bronchitis

#### 2. Sub-acute cough

The cough lasting for at least the period of 3 to 8 weeks is categorized under this type.

The respiratory causes are pneumonia, and B. pertussis infection.

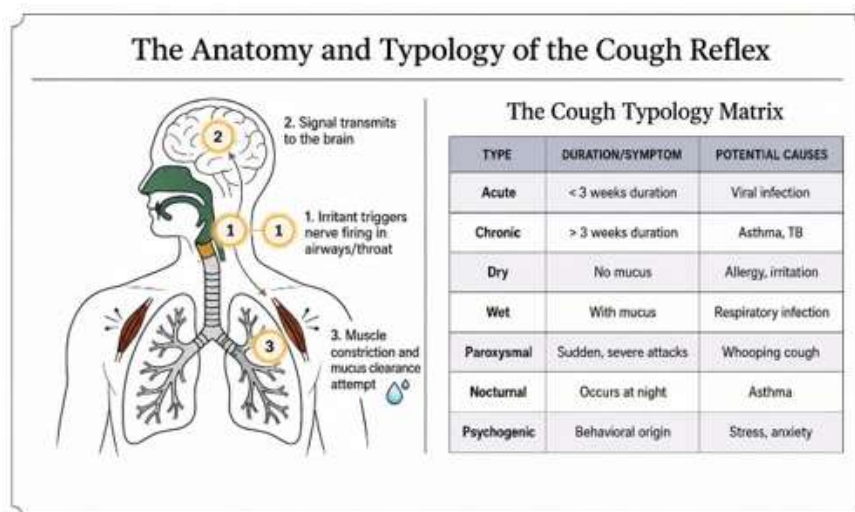
Non respiratory causes are GERD and rarely Tourette's syndrome

#### 3. Chronic cough

The cough lasting for more than period of 8 weeks or more are chronic coughs.

The respiratory causes are COPD, asthma, lung cancer, tuberculosis, and pneumoconiosis





### 1.2 Problems of Synthetic drug:-

Traditional synthetic medications for coughs (such as codeine, dextromethorphan, antihistamines, and bronchodilators) are frequently prescribed; however, prolonged use can result in side effects such as drowsiness, sedation, constipation, gastrointestinal upset, dizziness, and dependence. As the limitations of synthetic medications become more well-known and increasing concern arises regarding the safety of synthetic medications, herbal treatments are being viewed as possible safer and more effective treatments for coughs and respiratory disorders.

### 1.3 Importance of Herbal Medicine:-

People have been using herbal medicine for a long time to help with health issues, including cough and respiratory problems. Recently, the amount of interest in herbal medicine has been increasing because they are more natural and have fewer side effects than synthetic drugs. People also tend to prefer the use of herbal medicine because they cost less than conventional drugs and usually have better patient acceptance. Many different types of plant materials contain many types of chemicals (phytochemicals), like Alkaloids, Flavonoids, Terpenes, GLYCOSIDES, Essential Oils, and

Tannins. These phytochemicals have been found to help patients with various types of health issues by providing pharmacological benefits such as cough relief, anti-inflammatory, antimicrobial, antioxidant, expectorant, etc. Herbal medicine is preferred by most people when treating respiratory distress because it provides symptom relief without causing many of the negative effects associated with conventional cough suppressants, such as sedation, dependency, and gastrointestinal irritation. In addition, combining multiple herbs together (polyherbal formulations) enhances the therapeutic effect of the combined herbs and improves both the safety and effectiveness of treatment. Therefore, there is an increasing recognition that herbal medicines are safe and effective alternatives to prescribing pharmaceutical drugs for treating cough and other respiratory conditions.

### 1.4 Polyherbal Concept and Selected Herbs:-

Polyherbal formulations have become popular due to their availability as compounds with the ability to work in synergy, thus resulting in an improvement in the overall efficacy of the treatment provided. Polyherbal products differ from single-herb products by virtue of the fact that they may contain multiple bioactive

phytoconstituents which act through different mechanisms giving rise to enhanced pharmacological properties while at the same time reducing side effects. Due to the ability to provide antitussive, expectorant, antimicrobial, anti-inflammatory, antioxidant, and soothing effects simultaneously, polyherbal formulations represent an excellent option for the treatment of coughs and respiratory disorders. The product formulation contains many of the medicinal herbs traditionally used for respiratory relief, including *Ocimum sanctum* (Tulsi), which exhibits anti-infective, antitussive, and immunomodulatory effects; *Zingiber officinale* (Ginger), which has anti-inflammatory and expectorant effects; *Mentha piperita* (Peppermint), which provides a cooling and soothing feeling to the throat; and *Syzygium aromaticum* (Clove) and *Cinnamomum zeylanicum* (Cinnamon), *Apiaceae* (Umbelliferae) (Fennel), *Zingiberaceae* (Cardamom), *Lauraceae* (Cinnamon), *Zingiberaceae* (Turmeric), both of which provide additional antibacterial and antioxidant properties in the formulation. Honey The combination of these herbal ingredients in the formulation provides a synergistic effect, and may therefore enhance the efficacy of the product when used for the management of coughs and other respiratory conditions.

### 1.5 Need and objective of present study:-

Cough is a common symptom associated with respiratory tract infections, allergies, and environmental irritants. Although various synthetic cough preparations are available, their prolonged use may be associated with undesirable effects. Medicinal plants have been traditionally used for the management of cough and throat discomfort due to their therapeutic properties. Tulsi, Ginger, Clove, Fennel, Cardamom, Turmeric, Cinnamon, Mentha, and Honey are known for their soothing, antimicrobial, anti-

inflammatory, and expectorant activities. Combining these natural ingredients in a single formulation may provide effective relief from cough while improving patient acceptability and safety. Therefore, the present study was undertaken to formulate and evaluate a polyherbal cough syrup using these herbal ingredients and to assess its quality and suitability as a natural cough remedy.

- To prepare a polyherbal cough syrup using selected medicinal herbs and natural honey.
- To study the compatibility of herbal ingredients used in the formulation.
- To evaluate the organoleptic characteristics of the prepared syrup, including color, odor, taste, and appearance.
- To determine important physicochemical parameters such as pH, viscosity, and specific gravity.
- To assess the stability of the formulation under suitable storage conditions.
- To evaluate the homogeneity and overall quality of the prepared syrup.
- To develop a palatable and patient-friendly herbal formulation.
- To provide a safe, effective, and economical herbal alternative for cough management.
- To promote the use of herbal ingredients with traditional therapeutic benefits in modern pharmaceutical formulations.

## 2. DRUGS PROFILE

### 2.1 Tulsi



Synonym: - Talus, Tulsi

Biological source: - the sparkling and dried lives of the *Ocimum sanctum*.

Family: - Lamiaceae

Chemical constituents: Eugenol, Methyl eugenol, beta-caryophyllene.



**Fig.No.1: Tulsi**

Uses:

- As anti-tussive
- Anti-bacterial
- As stimulant
- As insecticide

## 2.2 Ginger

Synonym: zingibere, rhizome zingiberis.

Biological source: It consist of dried rhizomes of *Zingiber officinale*

Family: Zingiberaceae



**Fig.No.2: Ginger**

Chemical constituents: Ginger contains about 0.25-3% of volatile oil, 5-8% resinous matter, 56% starch and protein. Volatile mixture contains a mixture of more than 25 constituents containing monoterpenes and sesquiterpenes. The pungent taste of ginger is due to presence of gingerol.

Uses:

- Used as carminative.
- As anti-tussive.
- Aromatic and stimulant.
- As anti-emetic.
- Used to improve digestion.

## 2.3 Peppermint

Synonym: Mint, *Mentha*, Pudina

Biological source: extracted from stem, leaves and flowers of *Mentha piperita*.

Family: Lamiaceae

Chemical constituents: menthol, menthone, limonene,  $\beta$ -pinene, menthyl acetate, cineol, piperitone, menthofuran



**Fig.No.3: Peppermint**

Uses:

- Reduce nausea.
- Common cold and other conditions.

- Aromatic.
- Treatment on dry cough.
- Beneficial against bacterial infections.

## 2.4 Clove

Synonym: clove flower, clove buds, caryophyllum.

Biological source: dried flower buds of *Eugenia caryophyllus*

Family: Myrtaceae



**Fig.No.4: Clove**

Chemical constituents: eugenol is the major compound accounting for at least 50% . the remaining 10-40% consist of eugenyl acetate beta-caryophyllene and alpha-humulene

Uses:

- As expectorant.
- A popular spice.
- Stimulant.
- Aromatic.
- Used for relieving tooth ache.

## 2.5 Cinnamon

Synonym: cinnamon bark, kalmi-dalchini, Ceylon cinnamon.

Biological source: dried inner bark of shoots of coppiced trees of *Cinnamomum zeylanicum*.

Family: Lauraceae

Chemical constituents: 0.5-1% volatile oils, 1.2% tannins, mucilage, calcium axalate, starch, mannitol and cinnamon oils.

Uses:

- Remedy for tooth ache.
- Full of antioxidants.
- Aromatic, flavouring agent.
- Food preservative.



**Fig.No.5: Cinnamon**

## 2.6 Honey

Synonym: Madha



**Fig.No.6: Honey**

Biological source: honey is a sugary substance/secretion deposited in the honey comb by the hive bee *Apis mellifera* and other species of *apis* belonging to the family *Apidae*

Family: *Apidae*

Chemical constituents: it contains glucose 30-40%, fructose 40-50%, some small quantities of sucrose, dextrin, formic acid. Also contains proteins, enzymes, vitamins, coloring matter.

Uses:

- Used as demulcent and sweetening agent.
- Used as antiseptic.
- It is applied to burns and wounds.
- Used in preparations of syrups, soft drinks, candies, etc.

## 2.7 Fennel

Synonym: . Fennel, Saunf, *Foeniculum*

Biological source: Fennel consists of the dried ripe fruits (cremocarp) of *Foeniculum vulgare*

Family: *Apiaceae* (*Umbelliferae*)

Chemical constituents: Major components (volatile oil): Anethol (main constituent), Fenchone, Estragole

Other: Fixed oil, Proteins, Flavonoids

Uses:

- Carminative (relieves gas)
- Digestive
- Mild expectorant

- Flavoring agent, Used in cough preparations



Fig.No.7: Fennel

Synonyms: Glycerol, Propanetriol, 1,2,3-trihydroxypropane

Uses / Indications:

- ✓ Ingredient in cough syrups (soothing throat irritation)
- ✓ Laxative (suppositories/enema) for constipation
- ✓ Used in topical preparations as moisturizer
- ✓ Solvent/vehicle in pharmaceutical formulations
- ✓ Used in ophthalmic preparations to reduce intraocular pressure

## 2.8 Cardamom

Synonym: Cardamom, Small cardamom, Elaichi.

Biological source: Cardamom consists of the dried ripe fruits (capsules) of *Elettaria cardamom*

Family: *Zingiberaceae*



**Fig.No.8: 8 Cardamom**

Uses in General:

- Carminative,
- Digestive
- Stimulant
- Flavoring agent (foods, syrups)
- Mild
- expectorant

### 2.9 Turmeric:

Synonym: Turmeric, Haldi, Curcuma

Family: Zingiberaceae

Biological source: Turmeric consists of the dried rhizomes of *Curcuma longa*

Chemical Constituent: Curcuminoids, Demethoxycurcumin, Bisdemethoxycurcumin

Volatile oil: Turmerone, Zingiberene, Atlantone

Other: Starch, Proteins



**Fig.no.9 Turmeric:**

Uses in General:

- Ingredient in cough syrups (soothing throat irritation)
- Anti-inflammatory
- Antioxidant
- Antimicrobial
- Wound healing
- Hepatoprotective, Used in skin and digestive disorders

### 3. MATERIALS AND EQUIPMENT

**Table.No.1: List of drug and excipients**

Sr.no	Ingredients
1	Tulsi
2	Ginger
3	Clove
4	Fennel
5	Cardamom
6	Cinnamon
7	Turmeric
8	Mentha
9	Honey

**Table.No.2: Equipment and Glassware Used**

Sr. No	Glassware
1	Beaker
2	Measuring cylinder
3	Reflux condenser
4	Spatula

5	Funnel
6	Round bottom flask
7	Specific gravity bottle
8	Density bottle

Which are useful in identification of specific material by experience and with sense of colour, Odour and Taste.

## 4. EXPERIMENTAL WORK

### 4.1 Preformulation study:

**4.1.1 Organoleptic properties:** These are preliminary characteristics of any substance.

### 4.2 Formulation and Development of Herbal Cough Syrup:

These are the natural herbal drug which is used for the preparation of Herbal Cough Syrup

**Table. No. 3: Formulation Table**

Sr. no	Ingredient	Biological Name	Uses	Part used
1	Tulsi	Ocimum sanctum	Antitussive	Leaves
2	Ginger	Zingiber officinale	Antibacterial	Rhizomes
3	Clove	Syzygies aromaticum	Expectorant	Flower buds
4	Fennel	Foeniculum vulgare	Antimicrobial	Seeds
5	Cardamom	Elettaria cardamom	Anti-inflammatory	Seeds
6	Cinnamon	Cinnamomum verum	Sweetening agent	Bark
7	Turmeric	Curcuma longa	Soothing agent	Rhizomes
8	Menthe	Mentha piperita	Preservative	Leaves
9	Honey	Natural product	Flavoring agent	Whole

### 4.3 Methodology:-

Method of herbal cough syrup

A) Decoction Method

B) Maceration Method

C) Final Herbal Cough Syrup

#### A) Decoction Method:-

The decoction method is a process in which hard and coarse plant material (like roots, bark, seeds) are boiled in water to extract their active constituents. The following steps are used in decoction method.

1. Selection of herbs
2. Drying and size reduction
3. Boiling (Decoction preparation)

4. Filtration

5. Concentration

6. Addition of sweetening agent

7. Cooling and storage

Take 5-7gram each ingredient



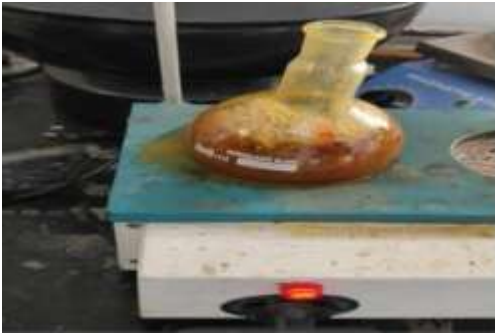
as herbs mixed by using 500 ml water



Boil until the total volume converts 1/4part of previous



Then the liquid was cool and filter Attach reflux condenser and boiled the material carefully by using water bath for 3hrs.



### B) Maceration Method: -

The maceration method is a process in which soft plant material are soaked in suitable solvent (usually ginger +honey) at room temp to 24 hrs stored.

The following steps are used in maceration method.

1. Selection of Herbs
2. Cleaning and Size Reduction
3. Soaking (Maceration Process)
4. Maceration Time
5. Filtration
6. Pressing the Marc
7. Addition of Sweetening Agent
8. Preservation

Take 35ml to 40ml and 45ml honey in beaker.



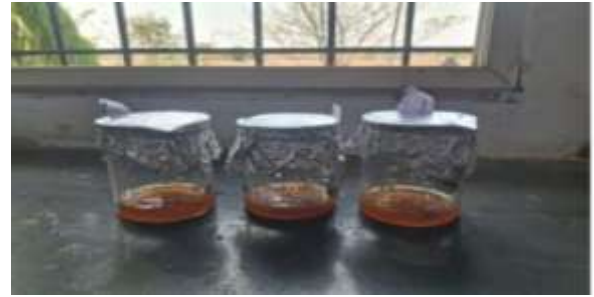
Mix 1.75gm, 2gm and 2.5gm Ginger with 35ml, 40ml and 45ml honey in the 250ml either and pack with the help of aluminum foil paper



Allow beaker to stand 24hrs at room temperature



After 24hrs the preparation was filtered and filters are as final oral form.



### C) Final herbal cough syrup: -

A final herbal cough syrup is a ready-to-use liquid dosage form prepared from medicinal plant extracts, combined with a suitable base (usually honey or sugar syrup), and standardized to deliver soothing, expectorant, and antimicrobial effects.

The following steps are used in final herbal cough syrup method.

1. Selection of Ingredients
2. Preparation of Raw Materials
3. Extraction Process (Decoction Method)
4. Preparation of Syrup Base
5. Incorporation of Extract
6. Filtration
7. Packaging
8. Labeling

The prepared final cough syrup 35ml of macerated ginger with honey adds 25ml of decoction mixed slowly by continuous stirring.



Over 40ml and 45ml macerated ginger with honey add 15 ml and 20 ml of decoction was mixed slowly by continuous stirring.



Herbal cough syrup was prepared and solubility was checked by detecting the clarity.



## 5. EVALUATION PARAMETER

### 5.1. Evaluation of formulated of herbal syrup:-

Evaluation of herbal syrup was done according to Bureau of Indian standards and these test were performed for all herbal syrup formulation, This test includes

1. Physical examination (colour, odour, taste)
2. PH
3. Viscosity
4. Stability
5. Density

Sr. No	Parameter	Method used	Purpose
1.	Colour	Visual inspection	Appearance
2.	Odour	Smelling test	Acceptability
3.	Taste	Sensory evaluation	Patient Compliances
4.	PH	Digital PH meter	Stability
5.	Viscosity	Ostwald viscometer	Flow property
6.	Stability	Storage study	Shelf life

### 5.2 Organoleptic characters:

Table No 4: Organoleptic characterization of all extract

Sr. No	Herbal drugs	Organoleptic Properties		
1.	Tulsi	green	Musky	1.5-6cm
2.	Ginger	Light brown	Aromatic	2-10cm
3.	Clove	Dark brown	Spicy sweet	13-19mm
4.	Fennel	Greenish to yellowish green	Sweet aromatic	4-8mm
5.	Cardamom	Light green	Strong pleasant, spicy	4-8mm
6.	Cinnamon	Brown	Strong sweet	10-20mm
7.	Turmeric	Yellow	Warm aromatic and slightly pungent	3-7mm
8.	Mentha	Green	Aromatic	4-10mm
9.	Honey	Brownish yellow	Sweet aromatic	-

## 6. RESULT AND DISCUSSION

Identification and authentication of plant: - Plant specimen of Tulsi, ginger, clove, fennel, cardamom, turmeric, cinnamon, Mentha, honey were collected in a plastic bag Tq. Pathri Dist. Parbhani, Maharashtra, India during the month of April and then it was processed and mounted on herbarium sheet as per procedure of botanical

survey of India for identification and authenticated by Prof. Ms Ugale P.N. In Botany, Department of Botany, College of Agriculture, Pathri Dist. parbhani, Maharashtra, India.

After identification the seeds and bark were washed gently with tap water followed by distilled water to remove the adhering dust and soil particle, and dried in the shaded place at room temp, after

drying the seeds bark and rhizomes leaves are the placed in round bottom flask.

## 6.1 Organoleptic Properties

**Table.no. 5: Organoleptic evaluation of formulation**

Sr. No	Parameter	Observation
1.	Colour	Brownish
2.	Odour	Aromatic
3.	Taste	Sweet
4.	pH	5.8 – 6.3
5.	Viscosity	Moderate

**6.2 pH determination:-** pH of the final preparation of syrup was determined by using digital pH meter and observed pH of syrup is 5.8-6.3.

**6.3 Viscosity Determination:-** The viscosity of syrup was determined by using a viscometer mainly capillary viscometer and the observed viscosity of the final syrup is 850cp

**6.4 Density Determination:-** Density of syrup determined by using the density bottle method and observed density of final syrup is 1.41g/ml.

**6.5 Stability study:-** The formulated polyherbal cough syrup was evaluated under suitable storage conditions to assess its physical appearance, pH, viscosity, and overall stability.

The formulation remained stable without significant changes in its quality parameters throughout the study period.

**Table.no.6: Evaluation of Cough Syrup**

Parameter	Result
Colour	Reddish Brown
Odour	Aromatic
Taste	Slightly pungent
pH	5.8 – 6.3
Viscosity	Moderate
Specific gravity	1.2g/ml

## 7. SUMMARY

The present study focused on the formulation and evaluation of a polyherbal cough syrup containing Tulsi, Ginger, Clove, Fennel, Cardamom, Turmeric, Cinnamon, Mentha, and Honey. The selected ingredients possess soothing, anti-inflammatory, antimicrobial, and expectorant properties that may help in relieving cough and throat irritation. The prepared syrup was evaluated for various physicochemical parameters and showed satisfactory quality and stability. The formulation may serve as a safe, effective, and economical herbal alternative for the management of cough and respiratory discomfort. This study successfully developed a polyherbal cough syrup with desirable pharmaceutical properties and good stability. The formulation met all evaluation criteria and was found to be microbiologically safe. Its natural composition and patient-friendly characteristics make it a suitable option for cough management. Further studies may help establish its clinical effectiveness and therapeutic potential.

## 8. FUTURE PROSPECTIVE

- Clinical Study – Additional clinical investigations are warranted to validate the safety and efficacy of the formulated polyherbal cough syrup for humans.
- Expanded Antimicrobial Study – The formulated syrup can now be tested against a broader array of pathogenic microorganisms, which leads to respiratory tract infections.
- Phytochemical Standardization – A comprehensive phytochemical analysis will be conducted on the formulation's individual ingredients to identify and quantify active constituents that provide therapeutic effects.
- Long-term Stability Studies – Shelf-life and storage conditions for the formulated syrup



will need to be established using the ICH recommended methods for long-term storage.

- **Optimization of Formulation** – By adjusting the concentration of herbal extracts in the formulation, therapeutic benefits and acceptability can be improved.
- **Toxicity Assessment** – In vivo studies of acute and chronic toxicity will be conducted to confirm safety associated with prolonged use of the syrup.
- **Comparative Studies** – A comparative evaluation will be performed to determine how well the formulated syrup performs in relation to commercially available herbal and synthetically prepared cough syrups.
- **Scaling Up / Commercialization** – The formulation, once approved by the clinical trials, will be available for newer forms of commercial production of cough syrup as an alternative remedy for treating acute and chronic coughs.
- **Modification of Delivery System** – The syrup can also be modified into a sugar-free syrup, a syrup suitable for use in children, and/or a longer-acting delivery system to ensure patient compliance.
- **Evaluation of Other Herbal Products** – Additionally, if necessary, other herbal extracts (validated to have antitussive, expectorant, or anti-viral properties) could be incorporated into the syrup to further enhance its therapeutic availability.

## 9. CONCLUSION

The formulated polyherbal cough syrup containing Tulsi, Ginger, Clove, Fennel, Cardamom, Turmeric, Cinnamon, Mentha, and Honey

demonstrated satisfactory quality, stability, and acceptability. Owing to the combined therapeutic properties of its herbal ingredients, the formulation may provide effective relief from cough and throat irritation and can be considered a safe, economical, and natural alternative for respiratory health management. The present study successfully formulated and evaluated a polyherbal cough syrup using selected medicinal plant extracts. The developed formulation exhibited satisfactory physicochemical characteristics, including appropriate pH, viscosity, specific gravity, and acceptable organoleptic properties. Stability studies confirmed that the syrup remained stable under recommended storage conditions, while microbial analysis established its safety for oral administration.

The synergistic action of the herbal ingredients suggests its potential effectiveness in relieving cough and soothing respiratory discomfort. Therefore, the formulated polyherbal cough syrup represents a safe, stable, and promising herbal alternative for the management of cough and related respiratory ailments.

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Nil

## AUTHORS CONTRIBUTIONS



All the authors have contributed equally

## CONFLICTS OF INTERESTS

Declare none

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