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# Formulation and Evaluation of Polyherbal Cough

## Syrup

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Abstract: Cough is one of the most common health conditions experienced by individuals across the world throughout history. It serves as a protective reflex of the body to clear the respiratory tract. Coughs can be classified based on various factors, including signs and symptoms, duration, type, and character. Among the different dosage forms used in the treatment of cough and cold, syrups are the most widely prepared, used, and preferred. Herbal syrups, in particular, are favored due to their natural origin and minimal side effects compared to synthetic syrups.

Medicinal plants are extensively used as primary healthcare agents, especially in Asian countries. Herbal ingredients possessing expectorant and antitussive properties are commonly incorporated in cough syrup formulations. This study briefly explores the nature of cough and its treatment through herbal remedies. As a liquid dosage form, herbal cough syrup is easier to administer than solid dosage forms and provides faster and more effective relief.

The study discusses the method of preparation of herbal cough syrup, including the materials used and their respective quantities. Three honey-based batches were formulated with concentrations of 35 percent weight/volume, 40 percent weight/volume, and 45 percent weight/volume. The final syrups were subjected to quality evaluation through post-formulation studies.

Keywords: Cough, Herbal Syrup, Herbal Formulation, Herbal Treatment

### I. INTRODUCTION

### What is Meant by Cough?

Cough is a common symptom associated with various acute health conditions. It occurs when the body's natural cough reflex is triggered. This reflex acts as a defense mechanism, helping to clear the airways and throat of mucus, irritants, or foreign substances.

When the respiratory tract becomes irritated or inflamed, sensory receptors send signals to the brainstem, which initiates the reflex. This process involves coordinated muscle contractions in the chest, diaphragm, and throat, resulting in a sudden expulsion of air that helps eliminate the irritants.

Several factors can activate the cough reflex, including:

- 1. Respiratory infections such as the common cold, influenza, and pneumonia
- 2. Chronic conditions like asthma, allergies, and acid reflux
- 3. Environmental triggers such as smoke, dust, and air pollution

These conditions can often be managed using herbal remedies. Medicinal herbs contain natural compounds such as saponins, flavonoids, and phenols, which help reduce inflammation and soothe respiratory irritation.

Cough, medically known as "tussis," is a protective reflex that clears the throat and airways of mucus, fluids, microbes, irritants, or other foreign substances. The cough reflex involves three key stages:

1. Inhalation

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- 2. A forceful exhalation against a closed glottis
- 3. A rapid release of air when the glottis opens, producing the recognizable coughing sound. (12) (17)

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Cough is frequently associated with various respiratory diseases such as asthma, viral infections, tuberculosis, lung cancer, and pulmonary embolism. If persistent, coughing can lead to airway inflammation and aggravate the condition, resulting in a cycle of continued coughing.

Respiratory tract infections are especially common in children. While many of these infections resolve naturally with few complications, cough remains a primary symptom and a frequent reason for clinical visits.

#### Why Choose Herbal Cough Syrup Over Allopathic Cough Syrup?

Herbal cough syrups are made from plant-derived ingredients that have been traditionally used to treat cough and support respiratory health. In contrast, allopathic cough syrups typically contain synthetic compounds that focus on symptom relief rather than addressing the root cause.

#### **Benefits of Herbal Cough Syrup Include:**

1. Natural origin: Made from plant-based ingredients, herbal syrups are generally considered safe and non-toxic. They are free from synthetic additives such as artificial colors, flavors, and preservatives.

2. Gentle action: Herbal formulations tend to be milder and are less likely to cause adverse effects like drowsiness, dizziness, or stomach upset.

3. Immune-boosting properties: Many herbal syrups contain ingredients like ginger, elderberry, or Echinacea, which support the immune system and promote faster recovery.

4. Lower risk of side effects: Due to their natural composition, herbal syrups are well-tolerated and are suitable for individuals sensitive to synthetic drugs.

#### **Types of Cough**

Coughs can be classified based on their characteristics and duration:

#### A. Based on Type

#### 1. Dry Cough

Also called a non-productive or unproductive cough, this type does not produce mucus. Symptoms include:

- 1. Persistent throat irritation
- 2. Lack of mucus production 3.Short, dry coughing episodes
- 4.A constant tickling sensation in the throat. (17)(19)

Recommended treatment: Use of antitussives or cough suppressants

#### 2. Wet Cough

Also referred to as a productive cough, it is characterized by the presence of mucus.

- Symptoms include:
- 1. Production of mucus or phlegm
- 2. Wheezing during breathing 3. Tightness in the chest 4. Breathing discomfort. (16) (17)

Recommended treatment: Use of expectorants to help clear mucus from the airways

#### **B.** Based on Duration of Cough

a) Acute Cough Duration: Lasts for less than three weeks.

#### **Common Causes:**

- 1. Common cold
- 2. Upper respiratory tract infections
- 3. Chronic obstructive pulmonary diseases
- 4. Environmental pollution
- 5. Infectious bronchitis (18) (19)

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#### b) Sub-Acute Cough Duration: Persists for three to eight weeks.

Respiratory Causes:

- 1. Pneumonia
- 2. Bordetella pertussis infection
- 3. Non-Respiratory Causes:
- 4. Gastroesophageal reflux disease
- 5. Rarely, Tourette's syndrome.(18)(19)

#### c) Chronic Cough Duration: Lasts for more than eight weeks.

Respiratory Causes:

- 1. Chronic obstructive pulmonary diseases
- 2. Asthma
- 3. Lung cancer
- 4. Tuberculosis
- 5. Pneumoconiosis (18)(19)

#### **Cough in Pediatric Population:**

Cough is a common issue in children and a frequent reason for doctor visits. It functions as a protective reflex to clear the respiratory tract of irritants, pollutants, and foreign substances.

Formulation and Evaluation of polyherbal Cough Syrup

#### 1. Allergies or Sinusitis Symptoms:

- 1. Persistent cough
- 2. Itchy throat
- 3. Runny nose
- 4. Watery eyes
- 5. Sore throat
- 6. Skin rashes

Diagnosis: Confirmed through allergy testing to identify specific triggers, followed by targeted treatment and management.

#### 2. Asthma

Diagnostic Challenge:

Symptoms can differ significantly among children.

Common Signs:

- 1. Wheezing cough, especially during nighttime
- 2. Cough triggered by physical activity like playing or exercising

Treatment: Tailored based on the specific cause and severity of the condition.

#### 3. Infections:

Common Cold: Usually results in a mild to moderate dry cough.

Influenza: Often associated with a severe, dry, and persistent cough.

Croup: Characterized by a distinctive "barking" cough, especially noticeable at night, often with noisy or labored breathing.

#### C. Other Causes of Cough:

Persistent cough following a previous respiratory illness (habit cough) Inhalation of foreign objects like food particles or small items Exposure to environmental irritants such as:

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Cigarette smoke Air pollution Smoke firecrackers

Herbal Treatment for Cough:

1. Natural and Safer Alternative: Herbal remedies are often preferred for treating cough because they are derived from natural sources and tend to have fewer side effects compared to synthetic drugs.

2. Significance in Healthcare: Herbal formulations play a key role in managing various respiratory and chronic health conditions such as asthma, tuberculosis, pneumonia, cough, diabetes, cancer, kidney problems, allergies, and viral infections.

3. Widespread Global Use: The World Health Organization (WHO) reports that approximately 80 percent of the global population relies on herbal medicine as their primary form of healthcare.

4. Historical and Traditional Relevance:

Herbal treatments have been deeply rooted in traditional medical systems, particularly in Asian countries, where they have been used for centuries.

5. Holistic Approach: Herbal medicine focuses on maintaining overall well-being and managing long- term conditions rather than treating acute or life-threatening medical emergencies

6. Limitations of Synthetic Drugs: Conventional medications may cause several adverse effects, including nausea, vomiting, drowsiness, changes in appetite, allergic reactions, dependency, and even potential long-term damage to internal organs.

7. Increasing Research Interest: Recent scientific studies have shown growing interest in herbal medicine due to its generally lower risk of side effects during treatment and in the post-therapy period.

#### **AIM & OBJECTIVES:**

Aim: Formulation and Evaluation of Polyherbal Cough Syrup

#### **Objectives of the Study:**

1. To provide relief from both dry (non-productive) and wet (productive) types of cough.

- 2. To enhance the body's natural immune defense.
- 3. To assist in managing common respiratory conditions such as the common cold, sore throat, and bronchitis.
- 4. To promote easier, unobstructed breathing by reducing airway irritation.
- 5. To be especially effective for coughs caused by allergies or smoking.
- 6. To deliver a safe, non-alcoholic herbal remedy.
- 7. To help break down and expel thick mucus and phlegm from the respiratory tract.
- 8. To ensure the formulation is non-habit-forming and free from addictive substances.
- 9. To alleviate chest congestion by clearing out existing sputum and preventing further mucus accumulation.

#### **II. LITERATURE REVIEW**

1. Alastair Sutcliffe et al. (2013): Cough is described as a protective reflex of the respiratory system that serves to clear the upper airways. It is triggered by the stimulation of mechanoreceptors or chemoreceptors in the throat, respiratory passages, or lung stretch receptors. These sensitive receptors, particularly concentrated in the tracheobronchial junction, are activated either mechanically or chemically by inhalation of irritants. This stimulation sends impulses to the cough center in the brain. Coughs are broadly classified into productive (with mucus expectoration) and nonproductive (dry). Effective antitussive agents such as dextromethorphan or codeine are used to suppress debilitating coughs. Non-narcotic antitussives work by anesthetizing the stretch receptors, thereby reducing cough at its source.

2. Maher Ashutosh et al. (2012): Ayurveda, the ancient Indian system of medicine, emphasizes the use of polyherbal formulations. Modern scientific inquiry seeks to validate these remedies through clinical studies. These formulations are gaining international recognition for their safety and efficacy. Ayurvedic preparations include solid (pills, powders),

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liquid (asavas, aristhas), and semisolid (ghritas, avlehas) dosage forms. Syrups are prepared by soaking herbal decoctions or powders in sugar or jaggery solutions. One such formulation, Adulsa syrup, is listed in the Ayurvedic Formulary and consists of multiple medicinal herbs.

3. Swain Pramod Kumar et al. (2013): Respiratory tract infections represent a major global health concern due to their high prevalence and associated costs. The World Health Organization identifies honey as a potential demulcent for treating cough. The study aimed to assess public perceptions regarding a proposed randomized controlled trial comparing honey with a placebo for pediatric cough relief. It also evaluated potential participation rates and the influence of demographic factors on trial design. A total of forty parents with children aged 1 to 6 years presenting with upper respiratory infections were included.

4. Payal Chauhan and Falguni Tandel et al. (2019): Developing polyherbal medicines is a complex process influenced by various factors impacting their biological efficacy and therapeutic consistency. The study reviewed techniques for extraction, characterization, and quantification of phytoconstituents in herbal cough syrups. It emphasized the need for regulatory approval processes to ensure batch-to-batch consistency and standardization using analytical markers. The study also investigated various marketed syrups like Adulsa syrup, Honitus syrup, Linkus syrup, and Zeal syrup, focusing on their plant ingredients and phytochemical properties.

5. Vandana V. Kadlag et al. (2011): This study focused on standardizing Adulsa syrup, an Ayurvedic formulation with Adhatoda vasica (Vasaka) as a primary ingredient. Using High- Performance Thin Layer Chromatography (HPTLC), researchers identified and quantified vasicine, a key active compound. The acetone:alcohol (1:1) extract yielded the highest vasicine content. Spectroscopic techniques (Infrared, Ultraviolet, and High-Performance Liquid Chromatography) were employed. The standard calibration curve showed a strong linear correlation (r = 0.9982), and vasicine recovery was calculated at 103.82 percent. Stability tests included exposure to acidic, alkaline, and photodegradation conditions.

6. Ayush B. Chavha (2018): Cough, both chronic and acute, significantly affects quality of life. Polyherbal formulations have traditionally been used to manage respiratory conditions. This study involved preparing a cough syrup using a combination of herbs such as Vasaka (Adhatoda vasaka), Ginger (Zingiber officinale), Turmeric (Curcuma longa), Tulsi (Ocimum sanctum), and Liquorice (Glycyrrhiza glabra). The formulation was standardized and evaluated for physical and physicochemical properties, confirming its efficacy in reducing cough symptoms and ensuring safety.

#### Plan of Work:

- 1. Perform a detailed review of existing literature related to herbal treatments for cough.
- 2. Select suitable medicinal plants, materials, and standard preparation methods.
- 3. Collect the necessary herbal ingredients required for formulation.
- 4. Properly dry and process the collected herbs to prepare them for extraction.
- 5. Extract the active phytochemicals from the raw plant materials using appropriate techniques.
- 6. Formulate the polyherbal cough syrup using the extracted components.
- 7. Analyze and interpret the evaluation results.
- 8. Summarize the findings and present final conclusions.

#### **Evaluation of the Formulated Syrup:**

Assess the quality and characteristics of the syrup based on the following parameters:

- a) Colour
- b) Odour
- c) Taste
- d) PH level
- e) Viscosity

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#### **III. MATERIALS AND METHODS**

Various herbal components are utilized in the preparation of the herbal syrup intended for therapeutic use in treating cough and related conditions.

#### 1. Turmeric

Family: Zingiberaceae Synonyms: Curcuma, Haldi, Rhizome, Curcuma Biological Name: Curcuma longa Common Names: Turmeric, Haldi Biological Source: Dried rhizomes of Curcuma longa Linn Chemical composition: carbohydrates, protein, fat, mineral

Chemical composition: carbohydrates, protein, fat, minerals moisture, and volatile oils, as well as a variety of bioactive compounds.

#### Uses:

Acts as an antiviral agent Functions as an antifungal Possesses anti-inflammatory properties Helps in protecting the lungs



Fig.no.1Turmeric

#### 2. Tulsi

Family: Lamiaceae Synonyms: Holy basil, Sacred basil Biological Name: Ocimum sanctum, Ocimum tenuiflorum

Common Name: Tulsi

Biological Source: Obtained from the fresh leaves of Ocimum sanctum Chemical constituents: volatile oils, phenolic compounds, flavonoids, and terpenoids.

#### Uses:

Exhibits antibacterial properties Acts as an insect-repellent agent Functions as a natural antiseptic Possesses antiviral activity Works as a natural antibiotic

Acts as an antitussive (helps relieve cough)



Fig.no.2 Tulsi

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#### 3. Ginger:

Family: Zingiberaceae

Synonyms: Zingiber, Rhizome, Zingiberis Biological Name: Zingiber officinale Common Names: Ginger, African Ginger

Biological Source: Derived from the dried rhizomes of Zingiber officinale

Chemical composition: Gingerols, shogaols, and paradols compounds), as well as terpenes like zingiberene and bisabolene. Other constituents include carbohydrates, lipids, amino acids, vitamins, and minerals.

#### Uses:

Acts as an antitussive (relieves cough)

Serves as an antiemetic (prevents nausea and vomiting) Used as a carminative (relieves gas and bloating) Aids in enhancing digestion



Fig.no.3 Ginger

#### 4. Honey:

Family: Apidae Synonym: Madh Common Name: Madh

Biological Source: A natural substance produced and stored by honeybees, primarily Apis mellifera and other species of Apis, within the honeycomb.

chemical constituents: carbohydrates, water, and minor amounts of other compounds like vitamins, minerals, amino acids, enzymes, and organic acids.

#### Uses:

Commonly used as a natural sweetener Also used for medicinal purposes



Fig.no.4 Honey

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#### 5. Clove:

Synonyms: Caryophyllus aromaticus L, Eugenia aromatica L. (Baill), Eugenia caryophyllus (Spreng) Family: Myrtaceae

Biological Source: Derived from the dried flower buds of Eugenia caryophyllus chemical constituents:

Eugenol, eugenyl acetate,  $\beta$ -caryophyllene, tannins, flavonoids Uses:

Helps in treating skin-related problems Used to relieve nausea

Provides relief from toothaches Beneficial in managing cold and cough



Fig.no.5 Clove

#### 6. Peppermint:

Family: Lamiaceae

Synonyms: Mint, Mentha, Pudina Biological Name: Mentha piperita Common Names: Pudina, Mentha

Biological Source: Extracted from the stems, leaves, and flowers of Mentha piperita

Chemical Constituents: Peppermint contains 3 to 10 percent methyl acetate, 1 to 17 percent menthofuran, 3 to 6 percent 1,8-cineol, 7 to 48 percent menthol, and

20 to 46 percent menthone.

Uses:

- 1. Assists in soothing inflammation of the mucous membranes
- 2. Serves as a natural source of aroma
- 3. Helps alleviate dry cough
- 4. Frequently used in the treatment of colds and a variety of respiratory conditions



Fig.no.6 Peppermint

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7. Liquorice:

Family: Leguminosae

Synonym: Liquorice root

Biological Name: Glycyrrhiza glabra

Common Name: Mulethi

Biological Source: Derived from the dried peeled or unpeeled roots and stolons of the Glycyrrhiza glabra plant chemical constituents: Glycyrrhizi, Glycyrrhetinic acid, Liquiritin, Isoliquiritin, Liquiritigenin, Herniarin, Umbelliferone, Polysaccharides, Essential oils, Starch, Sugars

#### Uses:

1. Acts as a soothing agent that relieves irritation in tissues

2. Helps expel mucus from the respiratory system by promoting its removal



Fig.no.7 Liquorice

#### 8. Adulsa:

Synonym: malbar nut,vasa, vasaka. Biological name: Justicia adhatoda Common name: Malabar nut, vasa. Biological source: consist of fresh or dried leaves of Justicia adhatoda.

Family: fabacease.

Chemical constituents: quinoline alkaloinds, vasicine, vasicol, adhatonine, vasicinone, betain, vasakin. Uses:

- 1. relive sore throat
- 2. strengthens immune system
- 3. treats common cough
- 4. treats indigestion and infection



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Fig.no.8 Adulsa DOI: 10.48175/IJARSCT-27248





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#### 9. Cardamom:

Synonyms: Other names for cardamom include small cardamom, elachi, ailum, cardamon, and cardamum.

Biological Source: Cardamom is derived from the dried ripe fruits (trilocular capsules) of the plant Elettaria cardamomum. It belongs to the Zingiberaceae family, also known as the ginger family.

Chemical Constituents: The essential oil in cardamom is the main source of its aroma and flavor. Major constituents include 1,8-cineole, alpha-terpinyl acetate, linalool, and other terpenes.

#### Uses:

Cardamom is used as a spice, flavoring agent, and has traditional medicinal uses.



Fig.no.9 Cardamom

Table no.1 Herbal Ingredients

Formulation Table:

Three formulation of herbal cough syrup were prepared as shown

SR NO	INGREDI ENTS	QUAN TITY				USES	
		F1	F2	F3			
1	Ginger	2-3g	2-3g	2-3g		Antitussive, expectorant	
2	Liquorice	4g	4g	4g		expectorant	
3	Tulsi	15- 20leav es	15- 20lea <u>xes</u>	15-	201e	avestitussive,	
4	Cinna 2g mon			2g		2g	Aromatic,
5	1-: Turme	2g		1-2g		1-2g	expectora
	2g Carda			2g		2g	nt Antitussiv
6	m			35% Base	4( Ba	9% 45% Base se	vis@osity modifi
7	Honey						Aromatic, flavouring agent
8	Peppermi	2g	2g	2g		pain relief	

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#### **Method of Preparation:**

The herbal cough syrup was formulated using the decoction method. The step- by-step procedure for preparing the herbal cough syrup is illustrated in the chart.

#### **Preparation of Extract By Decoction method:**

- 1. Take an appropriate quantity of each herbal Ingredients except Honey
- 2. Mix the herbs thoroughly in 500 millilitres of water.
- 3. Connect a reflux condenser and gently boil the mixture using a water bath for approximately 3 hours.
- 4. Continue boiling until the total volume is reduced to one- fourth of the original quantity.
- 5. Allow the liquid to cool, then filter it to obtain the final decoction.

#### Fig.no.10: Method of Preparation



Fig.no.11 Method for Evaluation



Fig.no.12 Method for Extraction

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#### Preparation final cough syrup:-



#### Fig. No.13 Well labelled ,polyherbal cough syrup

To prepared final cough syrup honey was mixed slowly side by side continous stirring in decoction solution. Herbal cough syrup was prepared and use for cough.

Evaluation parameters

#### III. RESULT AND DISCUSSION :

SR.NO.	TEST	PROCEDURE
1	<u>Colour</u> examinatio n	<ol> <li>2ml of syrup was taken on a watch glass</li> <li>Watch glass was placed again stwhite background under white tube light.</li> <li>Colour was observed.</li> </ol>
2	<u>our</u> examination	<ul> <li>1.2 ml of prepared syrup was</li> <li>Od taken and smelled by an individual.</li> <li>2. The time interval between two smelling was 2 min to nullify effect of previous</li> </ul>
3	Taste examinatio n	smelling A pinch of final syrup was taken & was examined on taste buds on tongue
4	PH estimation	<ol> <li>10ml of prepared syrup was taken in 100ml volumetric flask.</li> <li>Makeup volume upto100ml with distilled water.</li> <li>Sonicate for 10min</li> <li>PH was measured using digital pH meter</li> </ol>

Table no.2 Evaluations parameters

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SR NO	TEST	
1	Moistur e	
2	Ethanol soluble	
3	Water soluble	

Table no.3 preformulations study

Form ulatio n	Colour	Odou	Tast
F1	Yellowis h	Aromati	Swe
F2	Yellowis h	Aromati	Swe
F3	Yellowis h	Aromati	Swe

Table no.4 post formulation study

#### a. Colour:

The herbal cough syrup formulation exhibited a brownish colour. The detailed observations for colour are presented in Table 2



b. Odour :

According to the data in Table 2 the odour of the formulated cough syrup batches was aromatic for all three batches, namely F1, F2, and F3

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C. Taste :

As shown in Table 2, the taste of the formulated cough syrup batches was sweet for F1,F2,F3 d. PH:-

Table 2 provides the pH values for the formulated cough syrup batches.

pH measured was 5.89 for batch F1, 5.68 for batch F2, and 5.76 for batch F3

e. iscosity

Viscosity measurements for the formulated cough syrup batches are recorded in Table 2

the viscosity was found to be 3.14 centipoise forbatch F1, 3.46 centipoise for batch F2, and 3.78 centipoise for batch F3.

#### IV. SUMMARY AND CONCLUSION

This study was conducted with the goal of developing and assessing a polyherbal cough syrup formulated using several medicinal plants recognized for their effectiveness in treating respiratory conditions. The main objective of the formulation was to alleviate symptoms associated with both dry and productive coughs, including sore throat, bronchitis, and common cold, while also enhancing immune response

Here different formulations, labeled F1, F2, and F3, were prepared using a blend of natural ingredients such as Adulsa, Tulsi, Liquorice, Ginger, Clove, peppermint, Turmeric, Cinnamon, and Honey. These components were selected for their known antitussive, expectorant, soothing, and antimicrobial properties. The formulations were evaluated based on their organoleptic properties, pH levels, and viscosity. Among the tested batches, Formulation F3 was found to be the most effective due to its ideal viscosity and pleasant sensory profile .

Results of this study highlight that herbal cough syrups provide a safer and more natural option compared to conventional allopathic syrups, which often include synthetic ingredients and may lead to side effects. The developed herbal syrup is alcohol-free, non-addictive, and well-accepted by users because of its sweet taste and aromatic quality. Overall, this project reinforces thepotential of herbal medicines and promotes further research and standardization to ensure their role in effective and reliable healthcare.

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