



FORMULATION AND EVALUATION OF SUGAR FREE POLYHERBAL SYRUP AGAINST COUGH

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Abstract: One frequent respiratory ailment that can have a big influence on quality of life is a cough. Coughing is one of the most common respiratory symptoms and can have a negative effect on one's general health. Polyherbal remedies have long been used in traditional medicine to treat respiratory conditions, such as cough. The purpose of this review is to give a thorough overview of the formulation and manufacture of sugar-free polyherbal cough syrups that use medicinal plants including clove (*Syzygium aromaticum*), cinnamon (*Cinnamomum verum*), ginger (*Zingiber officinale*), tulsi (*Ocimum sanctum*), turmeric (*Curcuma longa*), and honey. The effectiveness of these natural components in reducing cough symptoms can be attributed to their different pharmacological qualities, such as anti-inflammatory, antibacterial, and expectorant actions. The review addresses the pharmacological properties, traditional applications, and phytochemical components of these medicinal plants that are pertinent to the treatment of coughs. Additionally, it examines different formulation approaches and preparation procedures used to create polyherbal syrups without added sugar, with an emphasis on extraction ratio optimization, formulation optimization, and stability issues. Aspects of safety are also covered, such as possible interactions and toxicity profiles. Overall, this review indicates directions for further study and advancement in this area while highlighting the promise of sugar-free polyherbal syrups as secure and practical substitutes for treating cough.

Keywords - Medicinal plants, Cough, Natural cough remedy, *Zingiber officinale*, *Curcuma longa*, Antitussive etc.

I. INTRODUCTION

1.1 Cough - Knowing the Workings

One of the most common symptoms of acute diseases is coughing. The body's defences mechanism triggers this reflexive response to rid the throat and airways of mucus, irritations, and foreign objects. When sensory receptors in the airways identify irritation or inflammation, they send messages to the brainstem, which in turn induce this reaction. Then the brainstem initiates a coordinated contraction of the diaphragm, throat, and chest muscles, which propels the irritant or mucus out of the body with a strong puff of air.

Numerous illnesses, such as allergies, asthma, and acid reflux, as well as respiratory infections including the common cold, flu, and pneumonia, can cause the cough reflex. Coughing can also be triggered on by environmental irritants including smoke, dust, and pollution.

The natural ingredients derived from herbs have the therapeutic ability to heal these kinds of ailments. Numerous phytoconstituents found in these plants, such as phenols, flavonoids, and saponins, have therapeutic qualities that can treat cough symptoms as well as their underlying causes.

1.2 Introduction to Herbal Cough Syrup

Herbal cough syrup is a well-liked natural medicine that effectively treats coughs and related respiratory ailments. Made with a wide range of herbal constituents, including honey, cinnamon, ginger, clove, Tulsi, and turmeric, this syrup has long been used in traditional medicine and is thought to have respiratory system-beneficial effects. The choice and arrangement of these components frequently depend on their individual Rasas, which affects how well they can equilibrate the Tridosha in the body. Herbal cough syrup is a safer option than traditional cough syrups, which are loaded with artificial ingredients that could have unfavourable side effects. Most people believe it to be safe and useful for a variety of purposes. However, caution demands that one see a medical expert before adding any new herbal cure to one's regimen.

1.3 Common ingredients of herbal cough syrup consist of

1. Turmeric: Turmeric is obtained from the rhizomes of the *Zingiberaceae* family plant *Curcuma longa*. Beyond its culinary applications, turmeric has a long history of therapeutic usage in Chinese and Ayurvedic medicine, especially for respiratory conditions like coughs. Curcumin, the main ingredient in turmeric, is well known for having strong antioxidant and anti-inflammatory effects. These characteristics are essential for reducing respiratory system inflammation and enhancing immunological response. Curcumin helps relieve cough symptoms and improve respiratory health by lowering inflammation and boosting immunity.

2. Tulsi: In Ayurvedic medicine, tulsi, or scientifically named *Ocimum sanctum*, is a highly valued herb. It is indigenous to the Indian subcontinent and a member of the *Lamiaceae* family. Tulsi is highly valued for its immunomodulatory, antibacterial, anti-inflammatory, and adaptogenic qualities. It functions as a bronchodilator and expectorant to improve respiratory health while assisting the body in battling stress, inflammation, and infections.

3. Ginger: Ginger is known for its therapeutic qualities and is derived from the rhizomes of the *Zingiber officinale* plant, which belongs to the *Zingiberaceae* family. This adaptable plant is said to have anti-aging properties and to be a natural cough treatment. Bioactive substances found in ginger, such as shogaols and gingerols, have strong antibacterial and anti-inflammatory qualities. Together, these substances lessen inflammation and fight infections that might cause coughing. All things considered; ginger is a safe, natural way to relieve cough symptoms.

4. Clove: The scientific name for clove is *Syzygium aromaticum*, and it comes from the flower buds of the *Myrtaceae* family tree. Cloves are native to Indonesia and are commonly grown in tropical climates. It is highly valued for its powerful therapeutic qualities, which include antioxidant, analgesic, antibacterial, and anti-inflammatory actions. Eugenol, a substance with antibacterial qualities, is found in cloves, which makes them efficient against fungi, bacteria, and viruses. Additionally, because of its numbing and antibacterial properties, clove oil is applied topically to treat toothaches and oral infections. All things considered; clove is a multipurpose spice with many health advantages.

5. Cinnamon: The inner bark of trees in the genus *Cinnamomum*, especially *Cinnamomum verum*, is where cinnamon, also known by its scientific names, *Cinnamomum verum* or *Cinnamomum cassia*, is obtained. Originally from Sri Lanka and other parts of Southeast Asia, cinnamon is now grown in many tropical places across the world. It is prized for both its unique flavor and many health advantages. In addition to having anti-inflammatory, antibacterial, and anti-diabetic effects, cinnamon is high in antioxidants. It has long been used to promote better digestion, control blood sugar, and sharpen the mind. All things considered, cinnamon is a useful spice for both cooking and health.

6. Peppermint: *Mentha × piperita*, the scientific name for peppermint, belongs to the *Lamiaceae* family. The aerial portions of the *Mentha piperita* plant are used to extract peppermint oil. This is a common medical herb used to treat respiratory conditions, such as coughing. Among the many active ingredients in peppermint is menthol, which has calming and anti-inflammatory qualities. These qualities aid in relieving coughing and calming inflammation in the throat. Due of peppermint's ability to effectively relieve cough symptoms, it is frequently used in herbal medicines for respiratory health.

7. Honey: The family Apidae includes honey, a sticky and delicious secretion that is kept in honeycombs by a variety of bee species, including *Apis mellifera*, *Apis dorsata*, *Apis florea*, and *Apis indica*. It has been used as a home treatment for coughs for millennia. Honey is said to have antibacterial and anti-inflammatory qualities, which help to soothe the throat and lessen coughing. Honey is still a popular traditional cough suppressant because of its natural origin and efficacy.

II. AIM AND OBJECTIVES

Aim: To formulate and evaluate sugar free polyherbal syrup.

Objectives: The present inquiry seeks to accomplish multiple goals:

- Find and choose herbs that have been shown to have medicinal benefits for respiratory conditions like sore throats, congestion, and coughing.
- Create a blend that optimizes the therapeutic advantages of these carefully chosen herbs while reducing any possible adverse effects.
- To guarantee the safety, purity, and effectiveness of the herbal cough syrup, prepare it in accordance with recognized quality control standards.
- To determine the safety and efficacy of the herbal cough syrup in treating coughs and other respiratory conditions, conduct clinical trials or research.
- To determine the relative benefits and drawbacks of the herbal cough syrup, compare its safety and efficacy with that of standard cough syrups. This will give you important information about its potential as a supplemental or alternative therapy choice.

III. MATERIAL AND METHODS

3.1 Ingredients used in the sugar free polyherbal syrup preparations

S.NO	INGREDIENTS	QUANTITY
1	Tulsi	5gm
2	Ginger	5gm
3	Peppermint oil	1gm
4	Honey	5gm
5	Turmeric	2gm
6	Cinnamon	1gm
7	Clove	1gm
8	Glycerine	10ml
9	Sorbitol	40ml

10	Sodium Saccharide	0.5gm
11	Sodium Benzoate	2gm
12	Xanthum Gum	2gm
13	Distilled Water	Q.S

3.2 Methodology

- A. Gathering of Herbal Ingredients:** Based on their historical effectiveness and ethno-botanical usage, the herbal ingredients—which include clove, ginger, tulsi, turmeric, cinnamon, and cinnamon—were carefully chosen. These substances were purchased as powders while following specified protocols to guarantee their quality and purity.
- B. Preparation of the Decoction:** First, the chosen herbal powders were precisely measured and blended according to a predetermined ratio. After that, this herbal mixture was mixed with 15 ml of distilled water and heated under regulated conditions for 15 to 20 minutes while being constantly stirred to allow for the complete extraction of bioactive ingredients. After heating, the mixture was carefully filtered to remove any remaining plant material from the liquid component, known as the filtrate. The filter that was left behind was a concentrated herbal extract that was ready to be used.
- C. Preparing Xanthan Gum Solution:** The process began with a slow addition of Xanthan Gum to 5 ml of distilled water. In order to avoid clumping and guarantee even dispersion, the Xanthan Gum was added gradually and methodically. Throughout the integration process, constant stirring was kept up to provide the best possible dispersion and hydration of the gum particles, which resulted in the creation of a stable suspension.
- D. Integration of Decoction and Xanthan Gum Suspension:** To ensure even mixing, the filtered herbal decoction was gradually added to the Xanthan Gum suspension while being constantly stirred. The gradual incorporation of the decoction into the gum suspension promoted uniform dispersion of the herbal ingredients, which improved the formulation's overall medicinal efficacy.
- E. Adding Extra Ingredients (Making the Complete Polyherbal Syrup):** In the integrated mixture, glycerine, sorbitol, honey, peppermint oil, and sodium benzoate were added one after the other. To create a homogenous mixture, each ingredient was carefully added one at a time, combining and dispersing them thoroughly. This crucial stage improved the final polyherbal cough syrup formulation's medicinal qualities, stability, and palatability.

3.3 Evaluation Tests for the Polyherbal Cough Syrup

The following detailed assessment of the manufactured polyherbal cough syrup was conducted using defined metrics and factors:

1. Physicochemical Parameters of Syrup: To guarantee the purity and effectiveness of the herbal syrup, it was evaluated for a number of physicochemical parameters. Among these parameters were:

- Physical Appearance:** Colour, odour, and taste features of the syrup are assessed.
- pH:** Measurement of hydrogen ion concentration to determine syrup's acidity or alkalinity level.
- Density:** A measurement of the syrup's mass per unit volume that sheds light on its concentration and consistency.
- Specific gravity:** To determine the syrup's specific gravity in relation to water, its density can be determined by calculating the ratio of its density to that of a reference material.

Physiochemical parameter	Observed value
1. Colour	Brownish Grey
2. Odour	Aromatic
3. Taste	Sweet
4. pH	7.43
5. Viscosity	960cp

2. Colour Examination: Using a watch glass, it was placed under white tube light against a white background. The syrup's hue was evaluated visually, with the naked eye being used for assessment.

3. Odour Examination: To lessen the impact of prior odour perception, 1.5 ml of the finished syrup were smelled one at a time, pausing two minutes between each sniff.

4. Taste Examination: To evaluate the final syrup's flavour attributes, a tiny amount was placed either directly to the tip of the tongue or to the taste buds on the tongue.

5. pH determination: 4ml of the finished syrup were carefully measured, then put into a 40 ml volumetric flask and diluted with distilled water to volume. After roughly ten minutes of sonication, the pH of the resultant solution was determined with a digital pH meter.

6. Measuring the Viscosity of Syrup: A capillary viscometer was mostly used to measure the viscosity of the syrup. The syrup's viscosity was measured between 21 and 30 degrees.

IV. EFFICACY AND APPLICATIONS OF SUGAR FREE POLYHERBAL SYRUP

Sugar-free polyherbal syrups with cough relief potential have many uses and advantages. An outline of their effectiveness and uses is provided below:

- Efficacy:** Soothing Properties: Herbs with sedative qualities are frequently included in polyherbal syrups. These properties help to relieve sore throats and lessen coughing.
- Expectorant Effects:** Some ingredients in polyherbal syrups have the ability to help the respiratory tract expel mucus, which relieves congestion and coughing.

- **Antitussive Action:** Some herbs have antitussive characteristics that help inhibit cough reflexes and relieve chronic coughing.
- **Antimicrobial Activity:** Herbs having antimicrobial qualities are often used in polyherbal formulations. These formulations can help fight infections that could be the cause of the cough.
- **Dry Cough:** The calming and demulcent qualities of polyherbal syrups help to minimize cough reflexes and soothe throat irritation, making them useful against dry coughs.
- **Productive Cough:** Polyherbal syrups containing expectorant herbs aid in the loosening and expulsion of mucus, thereby opening up the airways, for coughs that are accompanied with mucus production.
- **Throat Irritation:** These syrups work well to relieve sore throats brought on by colds, coughs, or allergens in the air.
- **Respiratory Infections:** Sugar-free polyherbal syrups with antimicrobial qualities can help enhance the body's immune response and reduce symptoms of respiratory infections such as sinusitis or bronchitis.
- **Children and Adults:** Polyherbal syrups are generally appropriate for both children and adults, making them family-friendly medicines.

V. CHALLENGES AND FUTURE DIRECTIONS

Polyherbal syrups without added sugar have a number of benefits, but they also have drawbacks and some possible areas for future development and improvement:

- **Taste and Palatability:** It can be difficult to reduce the amount of sugar in the syrup without sacrificing its pleasing flavour character. Some customers may not enjoy the strong or bitter Flavors that some herbs have to offer. It's important to find appropriate natural taste enhancers or sweeteners to make up for the lack of sugar. The taste and palatability of sugar-free polyherbal syrups can be enhanced with more research and development into natural sweeteners and flavour enhancers. It's critical to investigate cutting-edge components and recipes that boost sweetness and cover up unpleasant tastes without sacrificing health advantages.
- **Formulation Stability:** Sugar extends the shelf life and preserves consistency of syrups by acting as a preservative and stabilizer. It's critical to create substitute techniques that don't rely on sugar additions in order to guarantee stability and stop ingredient separation or deterioration.
- **Herbal Synergy and Efficacy:** When formulating a polyherbal remedy, the synergistic effects and compatibility of many plants must be carefully taken into account. It takes careful study and formulation knowledge to ensure that the chosen herbs function well together and offer the required health benefits without the presence of sugar.
- **Regulatory Compliance:** Complying with regulations pertaining to ingredient safety, labelling, and sugar-free claims complicates the process of developing new products. It is crucial to follow the rules established by regulatory agencies while accurately informing customers about the features and advantages of the product.
- **Nutritional Optimization:** Include herbs high in vitamins, minerals, and antioxidants to improve the syrup's nutritional profile. Emphasizing the product's nutritional advantages can draw in customers who are looking for healthier substitutes for conventional syrups that are high in sugar.
- **Customization & Personalization:** Using consumer data and technology, bespoke formulas catered to each person's preferences and health requirements may be the way of the future. Offering personalization choices according to certain dietary requirements or health objectives might increase customer happiness and loyalty.
- **Clinical Validation:** To bolster the credibility and set sugar-free polyherbal syrups apart from the competition, clinical studies and scientific research confirming the safety and effectiveness of the products should be conducted. Putting money into research with evidence to back up health claims and benefits can increase customer confidence.
- **Sustainable Packaging:** Consumer preferences for items that are environmentally conscious can be aligned with the adoption of eco-friendly packaging materials and sustainable production techniques. Making sustainability a top priority in product development and packaging can improve the syrup's overall attractiveness and marketability.

VI. CONCLUSION

It appears that the utilization of different medicinal plants to make a herbal cough syrup was investigated in this study. To develop a formulation with synergistic benefits for cough treatment, the researchers chose plants based on their pharmacological properties and mixed them in equal amounts. The manufactured cough syrup had noteworthy physical parameters and pharmacological effects, according to the study's findings, indicating its potential efficacy as a cough remedy.

The focus on combinations of herbs speaks to the global interest in complementary and alternative medicine. The growing acceptance of traditional medicine has led to an increased emphasis on researching and creating medications based on various ethnic customs.

The study highlights the adaptability and potential of polyherbal formulations in healthcare by indicating that this technique might be expanded to the formulation of medicines for other ailments as well. It also recognizes the need of recording data about medicinal plants for use in future study and development, including common names, botanical names, active ingredients, and references.

The necessity of more clinical research is emphasized in the conclusion in order to confirm the effectiveness of both individual crude medicines and these polyherbal formulations in treating cough and potentially other conditions. The study's comprehensive perspective highlights the potential of herbal pharmaceuticals as useful substitutes for contemporary drugs, especially when it comes to resolving worries about the unfavorable side effects of some conventional treatments.

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