

To Formulate and Evaluate an Herbal Cough Syrup Using Natural Herbal Ingredients for Effective Relief from Cough and Throat Irritation

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Abstract—Herbal cough syrup is a natural medicinal formulation used for the treatment and management of cough, cold, sore throat, and respiratory tract irritation. It contains extracts of medicinal plants such as Vasaka, Tulsi, Ginger, Turmeric, Cinnamon Bark, and Honey, which are known for their expectorant, antitussive, antimicrobial, anti-inflammatory, and soothing properties. These herbal ingredients help in loosening mucus, reducing throat irritation, relieving congestion, and promoting easier breathing.

Herbal preparations are widely accepted because they are considered safer and produce fewer side effects than synthetic cough syrups. Due to their natural origin, they are suitable for long-term use and are commonly preferred in traditional and modern herbal therapy. The formulation of herbal cough syrup involves the extraction of active constituents from herbs followed by mixing with sweetening agents, preservatives, flavoring agents, and purified water to obtain a stable and palatable syrup preparation.

The prepared syrup is evaluated for various quality control parameters such as colour, odour, taste, pH, viscosity, stability, homogeneity, and microbial contamination to ensure its safety, effectiveness, and acceptability. Proper packaging in amber-coloured bottles helps protect the formulation from light and increases shelf life.

The main objective of preparing herbal cough syrup is to develop an effective, economical, and patient-friendly formulation that provides relief from both dry and productive cough while maintaining better safety and therapeutic value. Herbal cough syrup also supports the growing demand for herbal and ayurvedic healthcare products in the pharmaceutical industry.

The formulation is prepared by extracting active constituents from medicinal plants and mixing them with suitable sweetening, flavoring, and preservative agents to obtain a stable syrup. Evaluation tests such as pH,

viscosity, appearance, stability, and microbial limit are carried out to ensure the quality and effectiveness of the product.

The main objective of herbal cough syrup is to provide effective relief from dry and productive cough while improving patient compliance due to its pleasant taste and natural.

I. INTRODUCTION

Herbal cough syrup is a natural medicinal preparation made from herbs and plant extracts used to relieve cough, cold, throat irritation, and respiratory problems. It contains herbal ingredients such as tulsi, ginger, vasaka, licorice, honey, peppermint, and mulethi, which help soothe the throat and reduce cough.

Unlike synthetic cough syrups, herbal cough syrups are considered safer and have fewer side effects. They possess expectorant, anti-inflammatory, antimicrobial, and soothing properties that help in loosening mucus and providing relief from congestion.

Herbal cough syrups are widely used in traditional systems of medicine such as Ayurveda and are suitable for both adults and children when used in proper doses. They improve respiratory health naturally and strengthen immunity against infections.

Herbal cough syrups are natural medicinal preparations made from plant extracts and herbs used to relieve cough, sore throat, and respiratory discomfort. These syrups are widely used in traditional systems of medicine such as Ayurveda because they are considered safe, effective, and have fewer side effects compared to synthetic cough medicines.

Herbal cough syrups contain various medicinal herbs like Tulsi, Ginger, Licorice, and Vasaka. These

ingredients help soothe the throat, reduce irritation, loosen mucus, and improve breathing.

The syrups are commonly used for treating dry cough, wet cough, cold, throat irritation, and mild respiratory infections. Their natural composition makes them popular among people seeking herbal and holistic healthcare remedies.

In conclusion, herbal cough syrups play an important role in natural healthcare by providing relief from cough and supporting respiratory health through the healing properties of medicinal plants.

II. LITRATURE SURVEY

1. Ankush Ganpat Patil et al (2020):

This review suggested that syrup is used commonly for dosage form, which is used to treat cough and cold for the reason that it has ease patient compliance. The syrup comprises ginger macerated honey base and Tulsi, liquorice, cardamom, fennel, aulas, and clove as an antitussive and expectorant.

2. Alka Saxena et al (2020):

This demonstrated that interest regarding the survival of Ayurvedic forms of medication. In the global, there is a move towards the use of herbal origin as the danger and the shortcoming of modern medicine have started getting more apparent majority of the ayurvedic formulation are prepared from herbs. The syrup is a very popular dosage form of cough and cold medications to ease patient compliance.

3. Yasmeeen Jahan et al (2015):

This review suggested despite a recent survey, medications intended to treat cough remain among the most popular over-the-counter medicines in the world. suggesting that there is little proof that these medications have any significant effectiveness. The central cough pathway is the major target of currently © 2023 IJNRD | Volume 8, Issue 3 March 2023 | ISSN: 2456-4184 | IJNRD.ORG IJNRD2303109 International Journal of Novel Research and Development (www.ijnrd.org) b58available cough suppressants. The significant side effects of these agents such as constipation, Respiratory depression, dependence, drowsiness, and death from this action Limit their use in humans 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 an 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.

4. Ashutosh Meher (2012):

This review demonstrated that Coughing is a protective reaction of the respiratory system that helps to open up the upper airways and shouldn't be stopped without cause. A cough is thought to be caused by a reflex. It occurs due to stimulation of mechano-or Chemoreceptors in the throat, respiratory passage, or stretch Receptor in the lungs. The sensitive receptors are in the bronchial tree, particularly in the junction of the Trachea. These receptors can be stimulated mechanically or chemically e.g., by inhalation of various irritants then nerve Impulses activate the cough center in the brain. Traditionally cough is classified as either productive, i.e., Producing mucus usually with expectoration, or Non-productive (dry). Thus, it seems prudent to utilise an efficient antitussive such as dextromethorphan or codeine to suppress the crippling cough experienced by such patients. Non-Narcotic antitussive agents Anesthetize the stretch receptor located in respiratory Passages, lungs, and pleura by dampening their activity and thereby reducing the cough reflex at its source.

5. Luisa Wagner et al (2015):

Acute cough symptoms commonly Result from infection (upper respiratory tract infection (URTI) or Common cold) or environmental exposure to smoke and/or allergens. Whilst most people experience a cough at least once in their lives, its frequency is linked to factors such as gender and allergen Sensitivity. There is no evidence that any classic mucolytic, Including N-acetyl cysteine (NAC), eases patients' symptoms by Helping them to expectorate mucus. Trials of over-the-counter Remedies, such as cough syrups and cough suppressants, have also failed to produce consistent, objective benefits. Herbal medicines are part of a wide range of treatments such as physiotherapies, Hydrotherapies, and Traditional Chinese Medicine (TCM), a few of Which are applied in conventional medicine. Whilst herbal treatments have a long history of use in varied cultures, randomized controlled trial (RCT) data on their effects

is generally lacking. Herbal cough treatments with proven clinical efficacy include Ivy/primrose/thyme-based preparations which are recommended as expectorants in current European guidelines. This review and meta-analysis were conducted to summarize and evaluate existing high-quality data on the use of herbal medicines in the treatment of cough in adults and children.

III. AIM & OBJECTIVE

Aim: To formulate and evaluate an herbal cough syrup using natural herbal ingredients for effective relief from cough and throat irritation.

Objective

- To prepare herbal cough syrup using medicinal plant extracts such as Vasaka, Tulsi, Ginger, and Honey.
- To study the therapeutic benefits of herbal ingredients used in cough syrup.
- To evaluate the prepared syrup for parameters like colour, odour, taste, pH, viscosity, and stability.
- To develop a safe, effective, and economical herbal formulation with minimum side effects.
- To provide soothing action for cough, cold, and throat irritation using natural remedies

IV. INTRODUCTION OF INGREDIENT

- Tulsi
- Vasaka
- Cinnamon Bark
- Black paper
- Clove
- Turmeric
- Cumin
- jaggery

Ingredient:

1. Tulsi

Synonyms

Holy Basil, Sacred Basil, *Ocimum sanctum*, *Ocimum tenuiflorum*

Biological Source

Tulsi consists of the fresh and dried leaves and flowering tops of Tulsi (*Ocimum sanctum* Linn.) belonging to family Lamiaceae.

Family

Lamiaceae (Mint family)

Chemical Constituents:

Tulsi contains: Eugenol, Ursolic acid, Rosmarinic acid, Carvacrol Linalool Tannins Flavonoids Essential oils

Microscopical Characteristics

- Epidermal cells with wavy walls
- Presence of multicellular covering trichomes
- Glandular trichomes containing essential oil
- Diacytic stomata present
- Vascular bundles well developed
- Calcium oxalate crystals may be present

Uses

- Used in cough and cold treatment
- Acts as antimicrobial and antiseptic agent
- Improves immunity
- Used in fever and respiratory disorders
- Helps reduce stress and anxiety
- Used in herbal cough syrups and Ayurvedic preparations
- Helpful in digestion and headache relief.

2. Vasaka

Synonyms

Vasaka, Adulsa, Malabar Nut, *Adhatoda vasica*, *Justicia adhatoda*

Biological Source

Vasaka consists of the dried leaves and flowering tops of *Adhatoda vasica* Nees (*Justicia adhatoda*) belonging to family Acanthaceae.

Family

Acanthaceae

Chemical Constituents

Vasaka contains: Vasicine, Vasicinone, Essential oils, Tannins, Saponins, Alkaloids, Flavonoids.

Microscopical Characteristics

- Upper and lower epidermis covered with cuticle
- Diacytic stomata present mainly on lower surface
- Multicellular covering trichomes present
- Glandular trichomes may be seen

- Calcium oxalate crystals present
- Well-developed vascular bundles

Uses

- Used as expectorant in cough syrups
- Helpful in bronchitis and asthma
- Relieves cough and throat irritation
- Helps in removing mucus from respiratory tract
- Possesses antimicrobial and anti-inflammatory activity
- Used in Ayurvedic and herbal medicines
- Helpful in respiratory disorders and cold treatment

3. Cinnamon Bark

Synonyms

Cinnamon, Dalchini, True Cinnamon, Ceylon Cinnamon, Cinnamomum verum, Cinnamomum zeylanicum.

Biological Source

Cinnamon consists of the dried inner bark of shoots of Cinnamomum verum J. Presl (Cinnamomum zeylanicum) belonging to family Lauraceae.

Family

Lauraceae

Chemical Constituents

Cinnamon bark contains: Eugenol, Tannin, Resin, Cinnamaldehyde, Volatile oils, Coumarin, Mucilage, Carbohydrates

Microscopical Characteristics

- Presence of cork cells
- Stone cells (sclereids) present
- Oil cells containing volatile oil
- Medullary rays visible
- Fibres and starch grains present
- Calcium oxalate crystals may be present

Uses

- Used as flavoring agent
- Used in cough and cold preparations
- Possesses antimicrobial and antioxidant properties
- Helps improve digestion
- Used in Ayurvedic and herbal medicines
- Helpful in diabetes management

- Used in food, beverages, and pharmaceutical preparations

4. Black Pepper

Synonyms

Black Pepper, Kali Mirch Pepper, Piper nigrum

Biological Source

Black Pepper consists of the dried unripe fruits of Piper nigrum Linn. belonging to family Piperaceae.

Family

Piperaceae

Chemical Constituents

Black pepper contains: Piperine, Volatile oils, Chavicine, Piperidine Resin, Starch, Proteins

Microscopical Characteristics

- Epicarp with thick-walled cells
- Presence of stone cells (sclereids)
- Oil cells containing volatile oil
- Starch grains present
- Endocarp and mesocarp well developed
- Oleoresin cells present

Uses

- Used as spice and flavoring agent
- Helps in cough and cold treatment
- Improves digestion and appetite
- Possesses antimicrobial and antioxidant activity
- Used in Ayurvedic and herbal medicines
- Helps in respiratory disorders
- Enhances bioavailability of drugs and herbal preparations

5. Turmeric

Synonyms

Turmeric, Haldi, Indian Saffron, Curcuma longa

Biological Source

Turmeric consists of the dried rhizomes of Curcuma longa Linn. belonging to family Zingiberaceae.

Family

Zingiberaceae

Chemical Constituents

Turmeric contains: Curcumin, Volatile oils, Turmerone, Zingiberene, Proteins, Resins, Starch.

Microscopical Characteristics

- Cork cells present
- Parenchymatous cells filled with starch grains
- Oleoresin cells containing yellow coloring matter
- Vascular bundles scattered
- Fibres present
- Calcium oxalate crystals may be present
- Bright yellow inner surface

Uses

- Used as anti-inflammatory agent
- Possesses antimicrobial and antioxidant activity
- Used in wound healing
- Helpful in cough and cold preparations
- Used in Ayurvedic and herbal medicines
- Improves digestion
- Used as coloring and flavoring agent in food and pharmaceutical preparations

6. Clove

Synonyms

Clove, Lavang, Caryophyllus, Syzygium aromaticum, Eugenia caryophyllus

Biological Source:

Clove consists of the dried flower buds of Syzygium aromaticum (Linn.) Merrill & Perry belonging to family Myrtaceae.

Family

Myrtaceae

Chemical Constituents

Clove contains: Eugenol, Eugenyl acetate, Caryophyllene, Volatile oils, Tannins, Flavonoids, Resin

Microscopic Characteristics

- Epidermal cells with thick cuticle
- Oil glands containing volatile oil
- Presence of sclerenchymatous cells
- Calcium oxalate crystals present
- Pollen grains may be seen
- Fibrovascular bundles present

Uses

- Used in cough and cold preparations
- Possesses antimicrobial and antiseptic activity
- Used as flavoring agent
- Helpful in toothache and dental preparations
- Used in Ayurvedic and herbal medicines
- Improves digestion
- Used in pharmaceutical and food preparations

7. Cumin

Synonyms

Cumin, Jeera, Jiraka, Cuminum cyminum

Biological Source

Cumin consists of the dried ripe fruits of Cuminum cyminum Linn. belonging to family Apiaceae.

Family

Apiaceae (Umbelliferae)

Chemical Constituents

Cumin contains: Cuminaldehyde, Volatile oils, Terpenes, Flavonoids, Tannins, Proteins, Resins.

Microscopical Characteristics

- Epicarp with elongated cells
- Presence of oil ducts (vittae)
- Endosperm rich in fixed oil and aleurone grains
- Fibrovascular bundles present
- Thin testa surrounding seed
- Calcium oxalate crystals may be present

Uses

- Used as flavoring and carminative agent
- Improves digestion and appetite
- Used in cough and cold preparations
- Possesses antimicrobial and antioxidant activity
- Used in Ayurvedic and herbal medicines
- Helpful in flatulence and stomach disorders
- Used in pharmaceutical and food preparations

8. Jaggery

Synonyms

Jaggery, Gur / Gud (Hindi/Marathi), Panela (in some countries) Whole cane sugar, Unrefined sugar.

Biological Sources

Jaggery is obtained from the concentrated and solidified juice of sugarcane (*Saccharum officinarum*) or sometimes from palm sap.

Family

Poaceae (for sugarcane source)

Chemical Constituents

Jaggery contains: Sucrose (main component), Glucose, Fructose

Minerals (iron, calcium, magnesium, potassium), Trace vitamins (small amounts of B-complex vitamins), Molasses.

Microscopical Characteristics

- (Since jaggery is a processed product, microscopy is limited but shows)
- Crystalline sugar particles
- Amorphous mass of sucrose
- Plant debris (if crude preparation)
- Mineral salt deposits
- Irregular granular structure.

Uses

- Natural sweetener
- Used in food and beverages
- Helps in digestion
- Used in Ayurvedic preparations
- Provides quick energy
- Used in cough and cold remedies (traditional use)
- Rich source of iron, helps in anemia support
- Used in herbal formulations as base sweetening agent



Formulation Table

Sr. No.	Ingredient	Quantity (Approx.)	Role in Formulation
1	Tulsi leaves	2 g	Antitussive, antimicrobial, immunity booster
2	Vasaka leaves	2-3g	Expectorant, relieves bronchial congestion
3	Cinnamon Bark	1-2g	Antibacterial, flavoring agent
4	Black Pepper	0.5-1g	Expectorant enhances absorption
5	Turmeric	0.5-1 g	Anti-inflammatory, antiseptic
6	Clove	1-2 pieces	Antimicrobial, thoracic, soothing
7	Cumin	0.5-1 g	Digestive support carminative
8	Jaggery	15-20 g	Syrup base, test enhancer
9	Water	q.s to 30 ml	Vehicle for extraction

Procedure

Preparation of Herbal Decoction (Kadha)

- Take washed Vasaka leaves and Tulsi leaves.
- Add cumin, clove, cinnamon bark, and black pepper.
- Crush slightly to release active compounds.

Boiling Process

- Add all ingredients into 2–3 cups of water.
- Boil on low flame until water reduces to half (decoction formation).
- This extracts medicinal compounds from herbs.

Filtration

- Cool slightly.
- Filter the mixture using muslin cloth or fine filter paper to remove solid residues.

Addition of Jaggery

- Reheat the filtered liquid gently.
- Add jaggery gradually and stir until completely dissolved.

- Continue heating until syrupy consistency is obtained.

Final Processing

- Add a pinch of turmeric powder at the end (or during final mixing).
- Mix well for uniform consistency.

Cooling and Storage

- Allow syrup to cool at room temperature.
- Pour into a clean amber-colored bottle.
- Store in a cool, dry place.

Evaluation Test

1. Physical Appearance

Color: Brown to dark brown (depending on concentration)

Odor: Characteristic herbal aroma (clove, tulsi, cinnamon)

Taste: Sweet (jaggery) with spicy herbal taste

2. pH Determination

Measured using pH meter

Ideal range: 4.5 – 6.5

Slightly acidic nature helps stability and throat soothing effect

3. Viscosity Test:

Determines thickness of syrup

Should be moderately viscous (not too watery or too thick) Measured using viscometer

4. Specific Gravity

Compared with water using hydrometer

Indicates concentration of dissolved solids (mainly jaggery and extracts)

5. Stability Test

Stored at room temperature and observed for: Sedimentation Phase separation Color change Should remain stable for a defined period

6. Sedimentation Test

Checks settling of herbal particles

No or minimal sedimentation is preferred

7. Microbial Load Test

Ensures absence of harmful microorganisms

Important because natural syrups are prone to contamination

8. Organoleptic Evaluation

Taste, smell, color, and mouthfeel are evaluated should be acceptable and palatable for patients

9. Weight per ml / Density

Ensures uniform formulation strength Helps in dose accuracy

10. Preservative Effect (Natural stability check)

Since jaggery is used instead of synthetic preservatives, stability is monitored over time

Advantages

1. Natural and Safe Made from herbal ingredients, so fewer side effects compared to synthetic syrups.
2. Expectorant Action Ingredients like vasaka, black pepper, clove, and tulsi help in removing mucus from the respiratory tract.
3. Anti-inflammatory Effect Turmeric, clove, and cinnamon reduce throat inflammation and irritation.
4. Immune Booster Tulsi and cumin improve immunity and help fight infections.
5. Antimicrobial Property Clove, tulsi, and black pepper help in killing bacteria and viruses.
6. Soothes Throat Jaggery acts as a natural demulcent and gives soothing effect.
7. Cost-Effective Easily available ingredients make it economical to prepare.
8. Fewer Side Effects Suitable for long-term use compared to chemical-based syrups.

Disadvantages

1. Short Shelf Life Without chemical preservatives, it may spoil faster.
2. Variation in Potency Natural ingredients may vary in strength and quality.
3. Slow Action Herbal medicines generally act slower than allopathic medicines.
4. Taste Issues Strong and spicy taste may not be acceptable to everyone.
5. Risk of Contamination Improper storage may lead to microbial growth.
6. Limited Standardization Difficult to maintain exact dose consistency.
7. Allergic Reactions Some people may be sensitive to spices like clove or black pepper.

Uses

1. Relief from Cough Helps reduce both dry and productive cough., Vasaka and black pepper act as natural expectorants.
2. Treatment of cough Tulsi, clove, and cinnamon help in relieving symptoms of common cold and viral flu.
3. Expectorant Action Vasaka, black pepper, and clove help in removal of mucus from lungs and airways.
4. Soothes Throat Irritation Jaggery acts as a natural demulcent, reducing throat dryness and irritation.
5. Anti-inflammatory Effect Turmeric, clove, and cinnamon reduce swelling and inflammation in respiratory tract.
6. Boosts Immunity Tulsi and cumin help in improving body's immune response against infections.
7. Antimicrobial Activity Clove, tulsi, and black pepper help fight bacterial and viral infections.
8. Improves Breathing Helps in relieving chest congestion and making breathing easier.
9. General Respiratory Health Supports overall lung function and respiratory system health.

V. RESULT

The formulation demonstrated good expectorant, soothing, antimicrobial, and anti-inflammatory properties due to the combined action of the herbal ingredients. The syrup was found to be effective in providing relief from cough, throat irritation, mucus accumulation, and mild respiratory discomfort.

VI. CONCLUSION

The herbal cough syrup formulated using cumin, jaggery, clove, turmeric, cinnamon bark, black pepper, vasaka, and tulsi is an effective polyherbal preparation designed for the relief of cough and related respiratory disorders.

Each ingredient contributes specific therapeutic actions such as expectorant, antimicrobial, anti-inflammatory, and Immunomodulatory effects, which work synergistically to provide relief from cough, throat irritation, and chest congestion. Vasaka and black pepper help in mucus removal, tulsi and clove provide antimicrobial protection, while turmeric and cinnamon reduce inflammation.

Jaggery acts as a natural sweetening agent and demulcent, improving taste and soothing the throat.

Overall, this formulation is safe, natural, cost-effective, and suitable for mild respiratory conditions, though it may require proper storage due to the absence of synthetic preservatives. Thus, herbal cough syrup represents a promising alternative to synthetic cough formulations with fewer side effects and better patient acceptability.

The herbal cough syrup formulated using cumin (*Cuminum cyminum*), jaggery, clove (*Syzygium aromaticum*), turmeric (*Curcuma longa*), cinnamon bark (*Cinnamomum verum*), black pepper (*Piper nigrum*), vasaka (*Adhatoda vasica*), and tulsi (*Ocimum sanctum*) represents a well-balanced polyherbal preparation designed for the effective management of cough and related respiratory disorders.

This formulation combines the synergistic actions of multiple medicinal plants, where each ingredient plays a significant role in providing therapeutic benefits. Vasaka acts as a potent expectorant that helps in the removal of mucus from the respiratory tract, while black pepper enhances bioavailability of other herbal constituents and also acts as a natural respiratory stimulant. Tulsi contributes strong antimicrobial, antiviral, and immunomodulatory properties, which help in fighting respiratory infections.

Clove and cinnamon bark provide antimicrobial, analgesic, and warming effects, thereby reducing throat irritation and infection. Turmeric acts as a powerful anti-inflammatory and antiseptic agent, which helps in reducing inflammation of the respiratory tract. Cumin seeds support digestion and overall immunity, indirectly contributing to better body resistance against infections. Jaggery, being a natural sweetening agent, acts as a demulcent and provides a soothing effect on the throat, making the syrup more palatable.

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