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Original Article

Formulation and Evaluation of Ginger Herbal Cough Syrup

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ABSTRACT

The formulation and evaluation of herbal ginger syrup aim to harness the medicinal properties of ginger (Zingiber officinale) in a convenient, consumable form for the management of various health issues. Ginger, known for its anti-inflammatory, anti-nausea, and digestive benefits, has been incorporated into a syrup with the addition of natural sweeteners like honey and flavor-enhancing ingredients such as lemon. The syrup is designed to alleviate conditions such as nausea, indigestion, and respiratory discomfort. The formulation process involves selecting optimal concentrations of ginger extract, stabilizers, and preservatives to ensure the syrup's efficacy, safety, and shelf stability. The evaluation of the syrup includes assessments of its organoleptic properties, physical characteristics (e.g., pH, viscosity), microbiological safety, and overall therapeutic effectiveness through various in-vitro and in-vivo testing methods. This herbal ginger syrup offers a promising natural alternative for improving digestive health, boosting immunity, and treating common ailments. It is a valuable addition to the growing field of herbal remedies, with the potential for widespread use in both traditional and modern medicine.

Keywords: Herbal Ginger Syrup, Formulation, Evaluation, Zingiber off icinale, Anti- inflammatory, Digestive Health, Nausea Relief, Natural Sweeteners, Honey, Shelf Stability, Organoleptic Properties, Therapeutic Effectiveness Herbal Remedies

INTRODUCTION

What is Herbal Syrup?

Herbal syrup is a liquid herbal preparation made by extracting the medicinal properties of herbs and blending them with a sweetener (such as honey, sugar, or maple syrup). It is a traditional method of preserving and delivering herbal medicine in a palatable and easily consumable form.

Herbal syrups are commonly used to address various health concerns, including respiratory ailments, digestive issues, immune support, and general wellness. These syrups are preferred for their pleasant taste, long shelf life, and ease of administration, making them suitable for both adults and children1.

Importance of Herbal Syrup in Traditional and Modern Medicine Herbal syrups have been used for centuries across different medical traditions, including:

- Ayurvedic Medicine – Herbal syrups are prepared to balance body energies and support immunity.
- Traditional Chinese Medicine (TCM) – Used to tonify the body, clear phlegm, and nourish vital organs.
- Western Herbalism – Herbal syrups are used for treating colds, flu, coughs, and digestive disorders.
- Modern Herbal Medicine – Natural alternatives to pharmaceutical syrups for treating common ailments.
- By combining water-based extractions (decoctions or infusions) with sugar- based preservatives, herbal syrups provide a natural and effective remedy while ensuring longer shelf life2.

Benefits of Herbal Syrups

Herbal syrups offer multiple advantages over other herbal preparations:

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1. Enhanced Palatability – The addition of sweeteners masks the bitterness of certain herbs.
2. Increased Bioavailability – Water-based extractions make it easy for the body to absorb the active compounds.

a. Longer Shelf Life – The sugar or honey acts as a natural preservative, allowing the syrup to last for months.
b. Ease of Consumption – Suitable for children and elderly individuals who may struggle with tinctures or capsules.
c. Customizable Formulations – Multiple herbs can be blended to target specific health concerns.
d. Natural and Holistic – Made from whole plants without artificial additives, making them a safer alternative to synthetic drugs3.

Common Types of Herbal Syrups and Their Uses

Herbal syrups can be formulated for various health benefits:

Type of Herbal Syrup	Key Herbs Used	Health Benefits
Cough & Cold Syrup	Ginger, Thyme, Licorice, Elderberry	Soothes sore throat, clears congestion
Immune-Boosting Syrup	Echinacea, Astragalus, Turmeric	Strengthens immunity
Digestive Syrup	Ginger, Peppermint, Fennel	Relieves bloating, indigestion, nausea
Sleep & Relaxation Syrup	Chamomile, Lavender, Valerian	Promotes relaxation and better sleep
Energy & Vitality Syrup	Ginseng, Ashwagandha, Maca	Increases stamina and reduces fatigue

What is Ginger Herbal Syrup?

Ginger herbal syrup is a natural, plant-based remedy made from ginger extract, sweeteners, and other herbal ingredients. It is commonly used for digestive health, immune support, cough relief, and anti-inflammatory benefits. This syrup is a concentrated liquid formulation that combines the medicinal properties of ginger with a palatable and soothing consistency, making it easy to consume4.

Why Ginger?

Ginger (Zingiber officinale) is a widely used medicinal herb with a rich history in traditional medicine systems, such as Ayurveda, Traditional Chinese Medicine (TCM), and herbal folk remedies. It contains bioactive compounds like gingerol, shogaol, and zingerone, which are responsible for its therapeutic effects5.

Key Benefits of Ginger Herbal Syrup:

1. Digestive Aid – Stimulates digestion, relieves bloating, and prevents nausea.
2. Anti-Inflammatory – Reduces inflammation, making it useful for arthritis and muscle pain.
3. Cough & Cold Relief – Acts as an expectorant to clear mucus and soothe sore throats.
4. Immune Booster – Strengthens the immune system and fights infections.
5. Anti-Nausea – Helps with motion sickness, morning sickness, and post chemotherapy nausea.
6. Antioxidant & Antimicrobial – Protects against oxidative stress and fights harmful microbe6.

Traditional and Modern Uses

Ginger syrup has been used for centuries in various cultures:

- Ayurvedic Medicine – To balance digestion and respiratory health.
- Traditional Chinese Medicine (TCM) – To warm the body and improve circulation.
- Western Herbalism – As a natural remedy for flu, colds, and stomach issues.
- Modern Medicine – Often used as a complementary treatment for nausea, pain relief, and inflammation. Biological Information of Ginger (Zingiber officinale)

1. Scientific Classification

Category	Details
Kingdom	Plantae

Phylum	Angiosperms (Flowering plants)
Class	Monocots
Order	Zingiberales
Family	Zingiberaceae
Genus	*Zingiber*

Morphology (Botanical Description)

Ginger (Zingier officinal) is a herbaceous perennial plant primarily grown for its rhizome, which is used as a spice and medicinal herb

Roots (Rhizome):

The ginger rhizome is an underground, thickened stem with light brown outer skin and yellowish interior flesh. It grows horizontally and has a knobby appearance. It stores essential oils and bioactive compounds.

Stem:

The aerial stem is pseudo stem-like, formed from tightly packed leaf sheaths. It grows up to 1– 1.5meter stall.

Leaves:

Ginger leaves are lanceolate (long and narrow), bright green, and arranged alternately along the stem. They are simple, linear, and pointed, with parallel venation, growing up to 6–12 inches (15–30 cm) long.

Flowers:

Ginger flowers are yellow-green with purple edges, small, and arranged in cone-shaped inflorescences. The flowers are zygomorphic (bilaterally symmetrical). They are rarely seen in cultivated plants because the plant is mainly propagated through its rhizome.

Fruits and Seeds:

Ginger rarely produces fruit under cultivation.

The fruit is a capsule, but seed production is uncommon due to the vegetative propagation of the plant.

Traditional & Modern Uses of Ginger

A. Traditional Uses

- Ayurveda: Used for digestion, respiratory health, and joint pain.
- Traditional Chinese Medicine (TCM): Considered a warming herb, used for colds, flu, and nausea.
- Folk Medicine: Used in herbal teas, decoctions, and syrups to relieve colds, indigestion, and fatigue.

B. Modern Medicinal Applications

- Ginger Tea & Syrup – Used for colds, coughs, and sore throat.
- Ginger Extract & Capsules – Used in dietary supplements for joint health and digestion.
- Ginger Oil – Used for aromatherapy and massage to reduce muscle pain.
- Pharmaceuticals – Found in anti-nausea and digestive medications.
- Cosmetics & Skincare – Used in anti-aging and acne treatments due to antioxidant properties7.

Morphological Characteristics of Honey

1. Color

- Variety: Honey color can range from light yellow to dark amber or even brown, depending on the floral source and environmental factors.
- Influence of Nectar Source: The color can vary depending on the type of flowers from which bees collect nectar. Darker honeys (e.g., buckwheat or tupelo honey) often have a stronger taste, while lighter ones (e.g., acacia or clover honey) tend to be milder.

2. Viscosity

Honey is a high-viscosity liquid, meaning it is thicker and slower- moving than water. Its viscosity is primarily influenced by its sugar content and water content. Honey's thickness also increases when the water content decreases or when it crystallizes.

3. Crystallization

- Crystallization occurs when honey solidifies into a semi-solid form, especially when it contains a high amount of glucose.
- Some honey types, like clover and rapeseed honey, tend to crystallize more quickly due to their glucose-to-fructose ratio.
- Crystallized honey forms as tiny crystals and may feel grainy, whereas crystallized honey remains in a smooth liquid form.

4. Texture

- Honey's texture is typically smooth and sticky in its liquid state, but it can change to a grainy or creamy texture when crystallized.
- The texture of honey varies based on its processing and crystallization process.

5. Odor

- The odor of honey is often sweet, floral, or herbal, depending on the flowers from which the nectar was collected.
- The fragrance of honey is one of the key identifying factors and varies in strength and complexity.

6. Taste

- Honey has a sweet taste, which can range from mild to robust, depending on its source.
- It may also have notes of floral, fruity, spicy, or earthy flavors, based on the specific nectar source.
- Some types of honey, such as buckwheat honey, have a stronger, richer flavor, while others, like acacia honey, have a milder sweetness.
- Water Content:
  Honey contains 17-20% water. The lower the water content, the more concentrated the honey. Honey with higher water content is more prone to fermentation and spoilage8.

Uses of Honey

Medicinal Uses

- Cough and Sore Throat Relief: Honey is widely known for its soothing properties and is often used to relieve a sore throat or cough. It has antibacterial and anti- inflammatory properties that help reduce irritation.

- Wound Healing: Due to its antibacterial, antifungal, and antioxidant properties, honey has been used in traditional medicine to promote wound healing and prevent infection. It can be applied to minor burns, cuts, and abrasions9.

Therapeutic Uses

- Allergy Relief: Local honey, particularly raw honey, is thought to help with seasonal allergies when consumed regularly. It may help build tolerance to local pollen and reduce allergy symptoms.
- Boosting Immune System: Honey, especially varieties like manuka honey, can help strengthen the immune system and fight off infections due to its natural antibacterial and antiviral properties10.

Morphological Characteristics of Lemon Juice

1. Appearance

- Color: Lemon juice is typically pale yellow to greenish-yellow. The color can vary depending on the ripeness of the lemons and how fresh the juice is.
- Clarity: Freshly squeezed lemon juice is typically clear, but it may contain small suspended particles (such as pulp) or cloudiness if the juice is unfiltered.
- Viscosity: Lemon juice has a watery consistency, but it is slightly viscous compared to pure water, largely due to the presence of dissolved sugars, citric acid, and other organic compounds.

2. pH Level

- Lemon juice is acidic, with a pH range of 2.0 to 3.0, primarily due to the high concentration of citric acid. This acidity is one of its most defining morphological characteristics.
- The acidic nature of lemon juice contributes to its tart taste and its ability to preserve food and act as an antibacterial agent.

3. Flavor

- Lemon juice has a sharp, sour, and tangy flavor, largely attributed to citric acid, which is the primary organic acid in lemons

4. Aroma

- The bitterness of lemon juice can vary depending on the ripeness of the fruit, with unripe lemons tending to have a stronger, more bitter taste. Aroma
- Lemon juice has a fresh, citrusy aroma that is refreshing and bright. The zesty fragrance is highly recognizable and often linked to its high concentration of volatile oils like limonene, which is present in the lemon peel and sometimes transferred into the juice during squeezing11.
- The smell of lemon juice is both fragrant and sharp, which makes it a popular addition to food, drinks, and cleaning products

5. Texture

- The texture of lemon juice can be smooth and liquid, though unstrained juice may contain small pulp particles or seed fragments from the lemon.
- Commercially produced lemon juice, often filtered and processed, is typically smooth and clear, while freshly squeezed juice may have a slightly thicker texture due to the pulp.

6. Composition

- Citric Acid: The primary organic acid in lemon juice, contributing to its sour taste and acidity.
- Sugar: Lemon juice contains small amounts of natural sugars, primarily glucose and fructose, which balance its tartness. Vitamins and Minerals: Lemon juice is rich in Vitamin C (ascorbic acid), potassium, and trace amounts of calcium, magnesium, and phosphorus.
- Essential Oils: Lemon juice may contain traces of limonene and citral, which are aromatic compounds responsible for its strong citrus fragrance

7. Water Content

- Lemon juice is composed of approximately 85-90% water, making it a highly hydrating liquid. This water content gives it a relatively low viscosity compared to thicker juices like orange juice12.

Uses of Lemon Juice:

Culinary Uses

- Food Flavoring: Lemon juice is a popular ingredient for enhancing the flavor of both sweet and savory dishes, including salads, marinades, sauces, and dressings.
- Beverages: It is often used to flavor water (e.g., lemon water), lemonade, cocktails, and other drinks.
- Desserts: Lemon juice is used in making lemon tarts, lemon cakes, mousse, sorbet, and puddings for its tangy flavor.

Health and Medicinal Uses

- Vitamin C: Lemon juice is a rich source of Vitamin C, which is essential for boosting the immune system and protecting the body from infections and free radicals.

Household Uses

- Disinfectant: Due to its antibacterial and antifungal properties, lemon juice is a popular natural cleaner. It can be used to disinfect surfaces, remove stains, and deodorize areas in the home.
- Glass Cleaner: Lemon juice is effective in cleaning glass and mirrors, leaving a streak- free shine.

Cosmetic Uses

- Dandruff Treatment: Lemon juice's antifungal and antibacterial properties can help treat dandruff and itchy scalp when applied topically.
- Hair Lightening: Lemon juice is known for its natural bleaching properties. It can be used as a natural hair lightener, especially when combined with sunlight, giving hair a brighter, sun-kissed appearance.

Therapeutic Uses

- Sore Throat Relief: Lemon juice, when mixed with honey, is commonly used as a soothing remedy for sore throats due to its antibacterial and anti-inflammatory properties13.

Morphological Characteristics of Clove Extract

1. Color:

- Dark Brown to Amber: Clove extract typically appears as a dark brown to amber colored liquid, with the intensity of color varying depending on

the concentration and method of extraction. It may sometimes have a reddish tint

2. **Consistency:**

- Viscous Liquid: The extract is generally thick and viscous, often resembling syrup. The thickness may vary based on the concentration of the extract or if it is diluted with solvents like alcohol or water.

3. **Odor:**

- Strong, Spicy, and Pungent: The extract has a distinctive, strong aromatic fragrance, which is highly characteristic of cloves. It is sharp and slightly sweet with spicy undertones, largely due to the compound eugenol, the main active ingredient in clove

4. **Taste:**

- Sharp, Bitter, and Spicy: The flavor profile of clove extract is intensely spicy and bitter, with the characteristic warmth of clove. This is due to eugenol and other essential oils in the extract.

5. **Solubility:**

- Soluble in Alcohol and Oil: Clove extract is highly soluble in alcohol (such as ethanol) and vegetable oils due to its essential oil content. It may not dissolve well in water unless it is prepared as a diluted tincture14.
- Active Components:
- The main active compound in clove extract is eugenol, a phenolic compound responsible for its aroma and many of its therapeutic properties. The extract may also contain other compounds such as acetyleugenol, beta- caryophyllene, caryophyllene oxide, and tannins, which contribute to its medicinal properties.

6. **Appearance of Solid Particles:**

- Presence of Essential Oils: Clove extract may contain suspended essential oils or small solid particles, especially if it's in a crude or unrefined form. These oils contribute to its texture and appearance15.

Uses of Clove Extract

Medicinal Uses

Pain Relief:

- Clove extract is widely used as a natural pain reliever, especially for toothaches and gum pain. The eugenol in clove extract acts as a local anesthetic and antiseptic, providing temporary relief when applied topically to the affected area.
- Antibacterial and Antifungal:
  Due to its antibacterial and antifungal properties, clove extract is used in treating a variety of infections, including oral thrush, skin infections, and fungal conditions. It is often applied topically or included in oral care products like mouthwashes and toothpaste

Culinary Uses

- **Flavouring Agent:**

Clove extract is used as a natural flavouring in both sweet and savoury dishes. It imparts a spicy, warm flavour to baked goods, desserts (such as pies, cakes, and puddings), beverages (like spiced tea and mulled wine), and curries.

- **Preserving:**

Clove extract is sometimes used in pickling and preservation due to its antimicrobial properties, which help inhibit the growth of bacteria and fungi in food.

Cosmetic Uses

- Skin Care:

The antioxidant and anti-inflammatory properties of clove extract make it
beneficial in skincare. It helps with conditions like acne, eczema, and psoriasis by reducing redness and swelling. It is used in facial masks, lotions, and creams.

- Hair Care:

Clove extract is used in hair care products for its antifungal properties. It helps to treat dandruff, soothe an itchy scalp, and promote healthy hair growth. It can

be added to shampoos or massaged directly onto the scalp.

- Aromatherapy:

Due to its strong, aromatic scent, clove extract is used in aromatherapy to uplift the mood and relieve stress. It is commonly used in essential oils and diffusers for relaxation and to clear the mind.

Household Uses

- Natural Disinfectant:

Clove extract has antibacterial and antiviral properties, making it a useful ingredient in natural cleaning products. It can disinfect surfaces and remove odors, acting as a natural deodorizer for the home.

- Insect Repellent:

The strong aroma of clove extract acts as an insect repellent, keeping pests such as mosquitoes and ants at bay. It can be used in sprays or applied to exposed skin when diluted with a carrier oil.

- Therapeutic Uses
- Oral Health:

Clove extract is often included in mouthwashes and toothpaste due to its antiseptic and analgesic properties. It helps in treating toothaches, gum disease, and bad breath.

- Stress Relief:

Clove extract is sometimes used in aromatherapy to reduce stress and anxiety, offering a sense of calm and relaxation16.

Morphological Characteristics of Cinnamon

1. Cinnamon Bark (Whole)

- Color:

The outer surface of the cinnamon bark is light brown to reddish- brown, while the inner bark is typically a pale brown.

- Shape and Texture:

Cinnamon bark comes in rolled-up quills (sticks) that are formed from thin, delicate layers of bark. The bark itself is thin, smooth, and has a flaky texture on the outside, with the inner side being soft and fibrous.

2. Ground Cinnamon

- Color:

Ground cinnamon is usually a fine powder ranging in color from light to medium brown, depending on the variety of cinnamon used.

- Texture:

The texture is very fine and soft, allowing it to easily dissolve or mix into liquids and foods.

- Smell:

It has the same warm, spicy, sweet aroma as the whole bark but is more concentrated due to the fine powder form.

- Taste:

The flavor is intensely sweet-spicy and slightly bitter. It is more pungent in ground form and is often used to enhance the flavor of both sweet and savory dishes17.

Chemical Composition (Key Active Compounds)

- Cinnamaldehyde: The primary compound responsible for cinnamon's distinctive flavor and medicinal properties.
- Cinnamic acid: Contributes to its antioxidant and anti-inflammatory effects.
- Eugenol: Present in smaller amounts, contributing to the spicy aroma.
- Coumarin: Found in higher amounts in cassia cinnamon, which is commonly sold as cinnamon. Excessive intake of coumarin can be harmful, but Ceylon cinnamon (true cinnamon) has much lower levels of coumarin.

3. Cinnamon Oil (Essential Oil)

- Color:
  Yellow to light brown in color. Consistency:
  Viscous liquid that is thicker than many other essential oils.
- Aroma:

Very strong, spicy, and sweet, characteristic of cinnamon, and far more concentrated than in the whole bark.

- Uses:

Primarily used in aromatherapy, massage oils, and in products like toothpastes or mouthwashes due to its antibacterial properties18.

Uses of Cinnamon:

Medicinal and Therapeutic Uses

Blood Sugar Control:

- Cinnamon extract has been shown to improve insulin sensitivity and help lower blood sugar levels. It is often used in dietary supplements to aid people with type 2 diabetes in managing their condition.
- Antioxidant and Anti-inflammatory:
  The antioxidants in cinnamon extract help neutralize free radicals, protecting cells from damage. It is used to reduce inflammation and may be beneficial for treating conditions like arthritis and muscle pain.

Culinary Uses

- Flavoring and Seasoning:

Cinnamon extract is used as a flavoring agent in a variety of culinary applications. It can be added to baked goods, beverages, desserts, and savory dishes. The concentrated extract provides a rich, warm, and spicy flavor without needing to use large quantities of cinnamon powder or sticks. Infusions and Beverages: Cinnamon extract is used in making infused teas, cinnamon-flavored liqueurs, hot beverages, or mulled wine for a more concentrated cinnamon flavor.

- Preservation and Pickling:

Due to its antibacterial and antimicrobial properties, cinnamon extract is sometimes used in pickling and food preservation to extend shelf life and inhibit microbial growth.

Cosmetic Uses

Skin Care:

- The antioxidant and anti-inflammatory properties of cinnamon extract make it a popular ingredient in skincare products. It helps treat acne, blemishes, and skin irritation by reducing inflammation and redness. It can also help brighten the skin and even out skin tone.
- Anti-Aging:

Cinnamon extract is used in anti-aging skincare products because it helps neutralize free radicals, reducing the appearance of fine lines, wrinkles, and skin damage caused by environmental stressors

Oral Health

- Mouthwash and Toothpaste:

Due to its antibacterial properties, cinnamon extract is included in oral
hygiene products like mouthwashes, toothpastes, and gum to help prevent bad breath, gum disease, and oral infections.

- Toothache Relief:

The analgesic properties of cinnamon extract can provide temporary relief from toothaches when applied topically, making it useful in natural home remedies.

Aromatherapy and Mental Health

- Stress Relief and Mood Enhancement:

Cinnamon extract is used in aromatherapy to create a warm, comforting atmosphere. It is believed to help reduce stress, anxiety, and mental fatigue. The soothing scent is often used in diffusers or essential oils.

- Cognitive Function:

Cinnamon extract is sometimes used to improve memory, focus, and cognitive function due to its stimulating properties. It is thought to help enhance brain activity and mental clarity19.

Uses of Rose Water

Culinary Uses

Flavouring Agent: Rose water imparts a subtle floral essence to a variety of dishes, including desserts like cakes, pastries, and ice creams, as well as beverages such as lemonade and teas. It's a staple in Middle

Eastern and South Asian cuisines, enhancing sweets like Turkish delight and Gulab jamun.

Skincare and Cosmetics

Toner and Astringent: Rose water serves as a natural toner, helping to balance the skin's pH, tighten pores, and provide hydration. Its anti- inflammatory properties can soothe skin irritation and redness.
Moisturizer: When combined with glycerin, rose water can be used as a hydrating spray, keeping the skin soft and plump.
Anti-Aging: The antioxidants in rose water help fight oxidative stress, reduce signs of aging, and promote healthy skin.

Aromatherapy

Stress Relief: The soothing aroma of rose water is used in aromatherapy to reduce stress and promote relaxation. It can be added to diffusers or used in massage oils.

Medicinal Uses

Digestive Aid: Rose water's anti-inflammatory and antispasmodic properties relax intestinal muscles, reducing cramping, bloating, and indigestion. It also stimulates bile production, aiding in digestion and detoxification20.

Formulation Table for Ginger Herbal Syrup

Ingredient	Purpose	Quantity (% w/w)
Ginger Extract (Decoction or Juice)	Active ingredient (anti-inflammatory, digestive aid, cough relief)	40-50%
Honey or Sugar Syrup	Sweetener & natural preservative	30-40%
Lemon Juice or Citric Acid	Preservative & flavor enhancer	5-10%
Glycerin or Alcohol (Optional)	Additional preservative	5-10%
Clove Extract (Optional)	Antimicrobial & flavoring agent	1-2%
Cinnamon Extract (Optional)	Enhances taste & provides warmth	1-2%
Water	Adjusts consistency	q.s. (to 100%)

Example Ginger Syrup Formulation

Ingredient	Quantity (% w/w)
Fresh Ginger Extract (Decoction)	45%
Honey	40%
Lemon Juice	7%
Clove Extract	3%
Cinnamon Extract	3%

Preparation Steps

1. Prepare the Ginger Extract

Slice fresh ginger and simmer in water for 30–45 minutes until the volume is reduced to half.
Strain the liquid and let it cool slightly.

2. Combine with Sweetener

While warm, mix the ginger extract with honey or sugar syrup and stir until fully dissolve

3. Add Preservatives & Flavor Enhancers

Stir in lemon juice, clove extract, and cinnamon extract.

4. Thickening (Optional)

If a thicker syrup is needed, dissolve xanthan gum in warm water before mixing it in

5. Bottling & Storage

Pour into sterilized glass bottles and store in the refrigerator.
Shelf life: 2–6 months (refrigerated)21.

Evaluation Tests

1. Physical and Sensory Evaluation

- Appearance: Assess the syrup's color, clarity, and texture. The syrup should be smooth, clear (or appropriately cloudy depending on ingredients), and of the expected color (often amber or golden).
- Taste: Evaluate the flavor for balance between the herbal taste and sweetness. The syrup should be pleasant without being too strong or too mild.
- Smell: Evaluate the aroma of the syrup. It should have a natural, herbal scent without any off-putting odors or signs of spoilage.

2. Chemical Analysis

- pH Level: Measure the acidity or alkalinity of the syrup. Herbal syrups often have a pH between 4 and 6, which is important for both efficacy and safety.
- Sugar Content: Check the concentration of sugar or sweeteners, which can affect the syrup's viscosity, stability, and sweetness.
- Active Compound Content: In some cases, herbal syrups are tested for the concentration of key active compounds (such as gingerol in ginger syrup). This could be done through lab tests (e.g., High-Performance Liquid Chromatography, HPLC).

3. Microbial Testing

- Microbial Contamination: Test for the presence of harmful microorganisms, such as bacteria, yeast, and molds. Herbal syrups are prone to microbial growth if not prepared and stored correctly.

4. Stability Testing

- Shelf Life: Store the syrup under different conditions (room temperature, refrigeration, etc.) and monitor for any changes in taste, color, smell, or consistency over time. Stability tests help predict how long the syrup will remain effective and safe.
- Viscosity: Measure the thickness or flow rate of the syrup. A significant change in viscosity can indicate that the syrup is losing its quality or that ingredients are separating22.

RESULT

Herbal cough syrup were prepared containing the crude drugs like clove, cinnamon, honey ginger.

Evaluation Parameter

Test Type	Test Description	Observation
Physical and Sensory Evaluation	Appearance	The syrup should be clear or slightly turbid, with no visible particles or foreign matter.
	Odor (Smell)	Should have a characteristic herbal smell, without any unpleasant or off odors.
	Taste	The taste should match the herbal formulation, potentially slightly sweet or bitter.
	Viscosity	The syrup should be thick, smooth, and not too watery or excessively thick.
	pH Testing	pH of the syrup should be checked to ensure it falls within an acceptable range.
Chemical Analysis	Identification of Active Ingredients	Confirm the presence of active herbal compounds using techniques like HPLC or TLC.
	Ingredients	the therapeutic range.
	Additives and Preservatives	Testing for unwanted additives or preservatives, ensuring they're within allowed limits.
Microbial Testing	Total Aerobic Count (TAC)	Microbial test to determine the total count of aerobic bacteria.
	Specific Pathogen Testing	Tests for pathogens like E. coli, Salmonella, and Staphylococcus aureus.
	Fungal Contamination	Test for molds and yeasts using agar plates.
	Preservative Efficacy	Tests to verify that preservatives prevent microbial growth during storage.
Solubility Testing	Solubility in Water	Check if the syrup dissolves evenly in water.
	Solubility in Organic Solvents	Test solubility in organic solvents based on the herbal ingredients.

CONCLUSION

The Pre-formulation studies of all three formulations were within specifications. Also, the physiochemical properties of prepared syrup like colour, odour, pH, taste were satisfactory but among the all three formulation is was within the all specification, it has proper concentration of honey as per IP and also a good preservative. The present study helps to develop effective and safe herbal cough syrup with 40% W/V honey as a base of cough syrup

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