

The Role of Parijatak and Bael Patra in Polyherbal Cough Formulations

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ABSTRACT

Herbal remedies' natural properties, perceived safety, and effectiveness have all helped to fuel their growing appeal. The purpose of this study was to manufacture, test, and evaluate the therapeutic properties of vegetable oils utilizing extracts from two plants, parijat (*Nyctanthes arbor-tristis*) and bael (*Aegle marmelos*), that have long been used in conventional medicine. Prior to undergoing in vitro and in vivo investigations of the syrup's pharmacological activities, which include antimicrobial, antioxidant, anti-inflammatory, and gastroprotective effects, Santi syrup was prepared in compliance with standard protocols and evaluated for a variety of physicochemical parameters, including pH, viscosity, specific gravity, and microbial load. The combined effects of the bioactive compounds present in the plant extracts are responsible for the herb syrup's potent antibacterial, anti-inflammatory, antioxidant, and gastroprotective qualities, as shown by the results. This information about the herbal composition suggests a possible therapeutic use of the syrup in pathological conditions related to oxidative stress, microbial infections, inflammation, and stomach ulcers. Herbal formulations such as this provide an alternative approach to modern synthetic drugs, offering fewer side effects and better compatibility with the human body. The phytochemical constituents present in Parijat and Bael extracts, including flavonoids, alkaloids, tannins, and phenolic compounds, play a significant role in enhancing the medicinal potential of the syrup. The synergistic action of these compounds contributes to the overall therapeutic efficacy of Santi syrup. Furthermore, continuous evaluation of its stability and safety profile ensures its suitability for long-term use. Hence, this study supports the traditional claims associated with these plants and highlights their potential for the development of effective, affordable, and natural therapeutic formulations in the field of herbal medicine.

Keywords: Herbal Syrup, Bael (*Aegle Marmelos*), Parijat (*Nyctanthes Arbor-Tristis*), Antioxidant, Antimicrobial, Anti-Inflammation

INTRODUCTION

Due to increased awareness of their possible therapeutic advantages and a demand for more natural treatments, herbal medicines have made a comeback in popularity throughout the globe in recent years. more environmentally friendly and sustainable healthcare alternatives. Numerous therapeutic plants have garnered interest because of their intriguing pharmacological characteristics and long history of conventional usage, such as Parijat (*Nyctanthes arbor-tristis*) and Bael (*Aegle marmelos*). This aims to shed light on this by examining the formulation, evaluation, and pharmacological analysis of a herbal syrup made using extracts from different plants. the product's potential medicinal uses. [1-3]

1. Rationale and Background

Because of their abundance of bioactive chemicals with diverse pharmacological effects, medicinal plants have always been a vital component of healthcare systems. Herbal treatments continue to be valuable, even with the progress of modern medicine, especially in areas where mainstream medicine is inaccessible or where indigenous people favor traditional healing methods. In addition, the growing worries regarding the efficacy and safety of synthetic medicines have sparked greater curiosity in herbal remedies as potential alternatives or complementary treatments. Two such plants whose therapeutic properties are acknowledged in several traditional medical systems, including Ayurveda, Siddha, and Unani, are Parijat and Bael (*Aegle marmelos*). (*Nyctanthes arbor-tristis*). The wood apple, or bilva, is indigenous to the Indian subcontinent and has a long history of use in the treatment of respiratory

Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.



illnesses, diabetes, and gastrointestinal problems. Its pharmacological effects are brought about by a wide range of phytochemicals, including flavonoids, tannins, alkaloids, and essential oils. "Night-flowering jasmine," "Harsingar," or Parijat is valued for its analgesic, antipyretic, and anti-inflammatory qualities. It is frequently employed in traditional medicine to alleviate pain, lower temperature, and cure rheumatic illnesses. [4-6]

2. The Importance of Herbal Remedies in Today's Healthcare System

Several factors contribute to the increased global interest in herbal remedies, including the perception that plant-based treatments are safe and well tolerated. Their holistic therapeutic method and capacity to satisfy unmet medical needs. Additionally, efforts to examine easily accessible preventive measures have been motivated by the growing incidence of chronic illnesses, the development of antibiotic resistance, and the rising expense of healthcare. alternative treatment choices that are sustainable, affordable, and accessible. Herbal remedies offer a vast source of

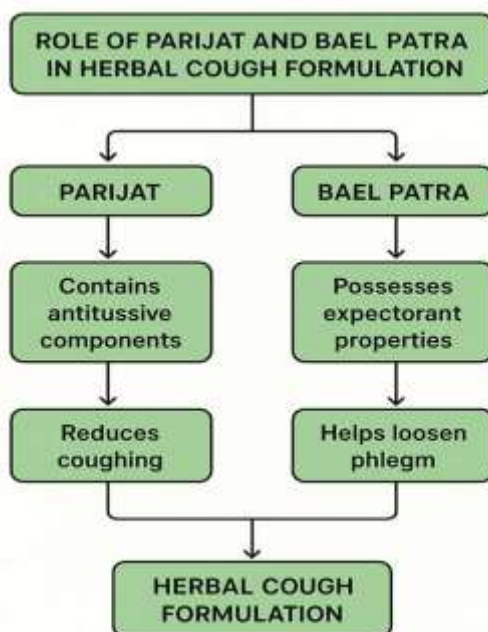
possible therapeutic chemicals due to the numerous combinations of bioactive substances they contain, making them an appealing route for drug development and discovery. [7, 8]

3. A Summary of Parijat and Bael Plants

Known for its fragrant fruits that have a unique flavor and nutritional content, the bael (*Aegle marmelos*) is a member of the Rutaceae family. Due to its therapeutic characteristics, the Bael tree's leaves, roots, bark, and fruits are all used in traditional medicine. The phytoconstituents in Bael, such as marmelosin, umbelliferone, rutin, and quercetin, have been linked to a number of pharmacological effects, including antidiabetic, anti-inflammatory, antimicrobial, antiulcer, and hepatoprotective properties. In contrast, parijat (*Nyctanthesarbor-tristis*), a member of the Oleaceae family, is widely recognized for its therapeutic and aesthetic value. The plant is well Known for its fragrant, star-shaped flowers, which bloom in large numbers at night and have a potent fragrance. [9-12]

Information on Herbal Cough Syrup Formulation Containing Parijat and Bael

Sr. No	Parameter	parijat (<i>Nyctanthesarbor-tristis</i>)	bael (<i>Aegle marmelos</i>)	Combined Role in Polyherbal Formulation
1.	Botanical Name	<i>Nyctanthesarbor-tristis</i>	<i>Aegle marmelos</i>	---
2.	Family	Oleaceae	Rutaceae	---
3.	Plant part used	Leaves, flowers	Fruit pulp, leaves	Extracts used together in syrup base
4.	Phytochemical constituents	Alkaloids, flavonoids, glycosides, tannins.	Marmelosin, tannins, coumarins, pectins, aegelin	Provide synergistic, antioxidant and antimicrobial effects
5.	Pharmacological Actions	Anti-inflammatory, antipyretic, antitussive, antimicrobial. Expectorant	Mucolytic, demulcent, expectorant, antioxidant.	Help relieve cough and throat irritation
6.	Mechanism of action	Reduces cough reflexes and inflammation in respiratory tract	Loosens mucus, reduces infection, and soothes mucous membrane	Provides holistic relief in cough and respiratory discomfort
7.	Therapeutic Role in Cough Syrup	Relieves sore throat, suppresses dry cough	Reduces mucus viscosity and chest congestion	Enhances cough relief and Respiratory comfort
8.	Other benefits	Acts as an immune booster	Improves digestion and acts as antioxidant	Promotes overall health and recovery
9.	Formulation type	Extract or decoction used in liquid formation	Fruit pulp extract in syrup base.	Used together to produce a balanced and effective herbal syrup



Flowchart: Role of parijatak and bael patra in polyherbal cough formulations

AIMS AND GOALS: -

Objective: To create a stable and effective herbal syrup formulation using extracts from Parijat and Bael.

Goals:

1. Improvement of the extraction technique:

The extraction procedure must be optimized in order to maximize yield and phytochemical content in high-quality Bael and Parijat extracts. [13, 14]

2. Composition of Herbal Syrup:

To produce a herbal syrup with standardized extracts of Parijat and Bael, assuring dosage homogeneity, palatability, and stability. [15, 16]

3. Physical and Chemical Features:

To explain the herbal syrup's physical and chemical properties, such as its pH, viscosity, and solubility. [17, 18]

4. Pharmacological Study:

The agar well diffusion technique is used to screen for antibacterial activity against certain bacterial and fungal species. [19, 20]

Investigation into Therapeutic Applications:

To examine the potential therapeutic applications of the herbal syrup in the treatment of various medical conditions, including respiratory illnesses, gastrointestinal problems, inflammatory diseases, diabetes, and microbial infections. [21, 22] Plant Profile: -

Bael (Aegle marmelos):



Fig: Bael (Aegle marmelos)

Botanical Name: Aegle marmelos

Common Names: Bael, Wood Apple, Bilva

Family: Rutaceae [23]

Plant Description:

The Bael (Aegle Marmelos (Linn)), commonly known as the “Bale fruit tree,” is a little, slender, fragrant tree that flourishes wild in India’s deciduous

forests. It is a member of the Rutaceae family. It may be found in both the western Himalayas, where it reaches an altitude of 1200 meters, and on Andaman Island. The tree is 6.0 to 7.5 meters tall. It is tall with a diameter of 90 to 120 cm. This tree is often seen as holy by the Hindu community because its leaves are presented to Lord Shiva during prayer. The tree is a representation of Lord Kailashnath in Hindu mythology. The fruit, leaves, stems, and roots of this tree are used in traditional medicine to address a wide range of human diseases at every stage of life.[26-28]



Fig: Aegle Marmelos Leaves (Indian Bael)



Fig: Aegle Marmelos Fruit (Indian Bael)

Taxonomical classification:

Kingdom: - Plantae
Division: - Magnoliophyta
Class: - Magnoliopsida
Order: - Sapindales
Family: - Rutaceae

Sub-family: - Aurantioideae

Genus: - Aegle

Species: - A.marmelos

Common name: - Bael Patra, Bael [24,25]

Botanical description of A marmelos

Leaves

The leaves of A. marmelos are fragrant, deciduous, and trifoliate. They can be solitary or complex and feature three to five oval, pointed, shallowly toothed leaflets. The leaflets measure 4–10 cm in length and 2.5–5 cm in width. While the terminal leaflet has a long petiole, the lateral leaflets do not. Each leaf has three to five leaflets. A leaf's petiole is long and hairless. Damaged mature leaves exude an unpleasant stench. [29,30]



Fig: Leaves

Flower

Four to seven fragrant, upright, stalked, and pleasantly scented flowers in a cluster that is 2 cm wide. The flowers have at least fifty greenish filaments and four to five recurved fleshy petals that are greenish on the outside and yellowish on the inside. The calyx is shallow and has five short, wide teeth, while the capitate stigma ovary is oblongovoid and has a thick, short style that tapers somewhat. [31,32]



Fig: Flower

Fruit

Fruits are pyriform, spherical, fragrant, light orange, fibrous, oval, oblong, and up to 20 cm in diameter. They have a solid, smoothwoody shell known as the pericarp. Early on, the crust is gray-green, but it eventually turns orange or yellowish before drying out to a very hard, orangered texture. The fruit has a solid center with eight to twenty hardly perceptible triangular segments encircled by thin, dark orange walls. The fruit's flesh is pale orange, sweet, fragrant, astringent, and resinous. Its slow ripening process could take up to a year for the fruit to reach full maturity. [33]



Fig: Fruit

Traditional Uses:

In traditional medicine, bael has long been used, especially in Ayurvedic, Siddha, and Unani systems. The leaves, roots, bark, and fruits of the Bael tree are among the parts that are used to cure skin diseases, fever, diabetes, respiratory illnesses, and gastrointestinal disorders. The fruit pulp, which can be eaten fresh or dry, is thought to provide laxative, anti-diabetic, and digestive benefits [34]

Phytochemical Constituents:

Numerous phytochemicals, such as alkaloids (such marmelosin), flavonoids (like rutin), tannins, essential oils, coumarins, and terpenoids, are found in bael. [35-37]

Parijat (Nyctanthesarbor-tristis):



Fig: Parijat (Nyctanthesarbor-tristis)

Botanical Name: Nyctanthesarbor-tristis

Common Names: Parijat, Night-flowering Jasmine, Harsingar

Family: Oleaceae [38,39]

Plant description:

A small to medium-sized deciduous tree or shrub, Parijat has spreading branches and a short, twisted stem. It usually reaches a height of 10 meters. The dark green, opposite, lanceolate to elliptic leaves have serrated edges and are simple. The fragrant, white, orangecentered blooms bloom in abundance at night and fade in the morning. The fruit is a tiny, brown capsule with many seeds within. [42]

Taxonomical classification

Plant Name: Jasminum grandiflorum Linn
Subkingdom: Tracheobionta – Vascular plants
Super division: Spermatophyta – Seed plants
Division: Magnoliophyta – Flowering plants
Class: Magnoliopsida – Cotyledons
Order: Scrophulariales
Family: Oleaceae
Genus: Jasminum
Species: Grandiflorum Linn
Common Names: Parijat, Night-flowering Jasmine, Harsingar [40,41]

Botanical description of Parijat (Nyctanthesarbor-tristis):

Leaves

Description of the leaves: Dark green, oval, opposite, rough-textured leaves with serrated edges. [43]



Fig: Leaves

Flower

Flower description: Tiny, fragrant blooms with a bright orange tubular corolla and five to eight white petals grouped in a pinwheel configuration. At night, they blossom, and in the morning, they fall off [44]



Fig: Flower

Fruit

Fruit Characteristics

Type: Capsule

Shape: Round to flat, often 2-celled

Size: Small, about 1.0–2.0 cm in diameter

Surface: Hard, brownish to grey, with a smooth outer covering

Seeds: Each fruit usually contains 1–2 brown, flat seeds with a wing-like structure for dispersal [45, 46]



Fig: Fruit

Traditional Uses:

Because of its analgesic, anti-inflammatory, antipyretic, and anti-rheumatic qualities, parijat has been prized in traditional medicine. Many traditional medicines use the leaves, blossoms, and seeds to alleviate arthritis, lower fever, ease pain, and enhance digestion. In addition, parijat is utilized as a decorative plant in temples and gardens and in aromatherapy. [47]

Phytochemical constituents:

Among the bioactive substances that provide parijat its therapeutic qualities include nyctanthic acid, oleanolic acid, flavonoids, terpenoids, and tannins. [48, 49]

Mechanism of Action in Cough Relief

Sr. No.	Action	Parijat Role	Bael Patra Role	Combined Effect
1.	Anti-inflammatory	Reduces airway inflammation via inhibition of prostaglandins and cytokines	Suppresses inflammatory mediators (COX, TNF- α)	Soothes throat and bronchi
2.	Antimicrobial	Effective against bacterial respiratory pathogens	Inhibits bacterial and fungal growth	Prevents secondary infections
3.	Expectorant	Promotes mucus clearance	Loosens phlegm and facilitates expectoration	Clears respiratory tract
4.	Antioxidant	Neutralizes free radicals	Protects lung tissues from oxidative stress	Prevents tissue damage
5.	Immunomodulatory	Enhances immune defense	Strengthens mucosal immunity	Increases body resistance

MATERIAL AND METHODS

Formulation table: -

Sr no	Ingredients	F1	F2	F3
1	Bael extract	15ml	16ml	16ml
2	Parijatak extract	10ml	8ml	8ml
3	Honey	12ml	24ml	24ml
4	Citric acid	0.15gm	0.2gm	0.30gm
5	Water	QS	QS	QS

- Note: - For 60 ml [50]
- Method: -
- collection and Authentication of Plant Materials:

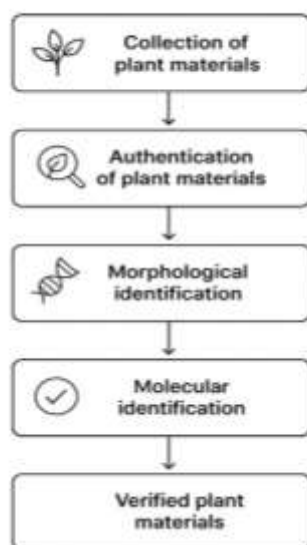
- Gather the dried leaves and fruits of *Nyctanthes arbor-tristis* (Parijat) and *Aegle marmelos* (Bael) that are mature and healthy.
- Have a knowledgeable botanist verify the plant materials.

3. Based on early research or a review of the literature, ascertain the proper concentration of each extract.

4. To create the herbal syrup, combine the concentrated extracts with appropriate excipients like honey or sugar syrup.

5. Make sure the mixture is well homogenized. [51-53]

COLLECTION AND AUTHENTICATIO OF PLANT MATERIALS



Flowchart: collection and Authentication of Plant materials Extraction of Plant Materials: A. Bale extract:

1. Chop the outer layer of a Bael fruit into small pieces (about 250g in weight).
2. The fragments are slowly heated in 100 ml of distilled water to extract the extract.
3. The extract was filtered after it had cooled.



BAEL EXTRACT

Fig: bael extract

B. Parijat extract:

1. Use 10g of dried parijat seeds. To make it a rough powder, add 100 ml of distilled water.
2. Apply heat to the extract to get half of the starting solution.
3. The extract was filtered after it had cooled. [54]



Fig: Parijat Extract



Fig: Extraction Formulation of Herbal Syrup

Formulation of syrup:

1. Weigh precisely 16 milliliters of bael extract.
2. Accurately weigh eight milliliters of parijat extract.
3. Combine the two extracts, then add 24 milliliters of honey and 0.30 milligrams of citric acid as a buffer.
4. If required, use heat to create a consistent syrup.
5. Use distilled water to create a volume of 60ml.
6. Fill the amber-colored bottle and keep it somewhere cool. [55, 56]



Fig: Formulated Syrup

Evaluation parameters:

1. The procedure for determining density

1. Clean the specific gravity bottle completely with nitric acid or chromic acid.
2. Rinse the bottle at least twice or three times with distilled water.
3. If required, rinse the bottle with an organic solvent, like acetone, and pat dry.
4. Weigh an empty, dry bottle using a capillary tube stopper (W1).
5. Fill the bottle with an unidentified liquid, cap it with a stopper, and then use tissue paper to wipe away any remaining liquid from the exterior of the tube.
6. Weigh a container of an unknown liquid using an analytical balance (w2).
7. Calculate the weight of the unknown liquid in grams (w3).

Density formula:

W3/V is the weight of the liquid being tested divided by its volume. This is the density of the liquid being tested (syrup).

2. The process of determining specific gravity

1. Use chromic or nitric acid to thoroughly clean the specific gravity flask.
2. At least two or three times, rinse the bottle with clean water.
3. If necessary, rinse the bottle with acetone or a similar organic solvent, then pat it dry.
4. Use a capillary tube stopper to weigh the dry, empty bottle.
5. Use tissue paper (w2) to drain any extra liquid from the side tube, then seal the container with a stopper after filling it with distilled water.
6. Use the analytical balance to weigh the water- and cork-filled bottle.
7. With clean water, repeat processes 4 through 6 after completely emptying and drying the liquid being tested.
8. Use an analytical balance to weigh the container holding the liquid under test (wa) and the Stopper.

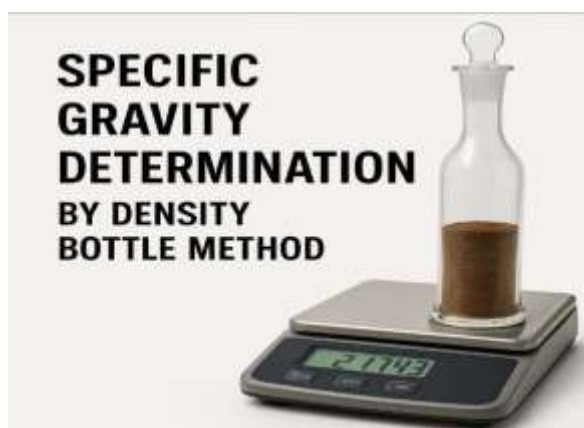


Fig. Specific Gravity Determination

3. A Technique for Determining Viscosity

1. By adding heated chromic acid, completely clean the Ostwald viscometer. If necessary, use an organic solvent like acetone.
2. The viscometer should be placed vertically on a suitable platform.
3. Pour water into the dry viscometer up to the level indicated by the letter G.
4. Determine how long it takes for water to travel from point A to point B.
5. Repeat step 3 at least three times to ensure an accurate reading.
6. Add the viscometer until it reaches its mark. Measure the amount of time it takes for the liquid to reach point B after washing it with the test fluid.
7. Calculating the densities of liquids according to the instructions in the density determination experiment. [57-59]



Fig. Viscosity Determination

4. pH determination:

Two methods are used to determine the pH of syrup.

1) A pH paper.

Procedure:

1. Take a small amount of the syrup in a clean beaker. If the syrup is very viscous, dilute with a few drops of distilled water to facilitate interaction with the pH paper.
2. Dip the pH paper strip into the syrup sample for 1–2 seconds. Ensure that the strip is fully immersed in the sample.
3. Remove the strip and immediately compare the color change with the provided standard color chart.
4. Record the pH value corresponding to the closest match on the chart.
5. Repeat the test at least two times to ensure reproducibility. [60-63]



Fig: pH determination

Therapeutic Actions:

Combined Therapeutic Actions of Bael (Aegle marmelos) and Parijat (Nyctanthesarbor-tristis):

- **Digestive Health:** Indigestion, diarrhea, and dysentery can be effectively treated with Bael and Parijat because they both have carminative, digestive stimulant, and antidiarrheal properties.
- **Anti-inflammatory Activity:** Bael and Parijat's anti-inflammatory properties help reduce inflammation brought on by diseases like gastritis, arthritis, and respiratory disorders.
- **Immune Modulation:** Parijat exhibits immunomodulatory qualities that strengthen the body's defenses against infections and might help treat autoimmune diseases.
- **Antimicrobial Actions:** Both herbs' antimicrobial qualities make them effective against bacterial, fungal, and parasitic illnesses, among other microbial infections.
- **Analgesic Properties:** Parijat has analgesic properties that help reduce pain from ailments like menstrual cramps, headaches, and arthritis.
- **Gastrointestinal Disorders:** Peptic ulcers, gastritis, and irritable bowel syndrome are among the gastrointestinal conditions that can be treated with herbal syrups that contain Bael and Parijat.
- **Natural and Holistic Approach:** Using herbal syrup that contains Bael and Parijat is in line with traditional medical concepts and provides a natural and holistic approach to wellbeing and health. These botanicals work in concert to optimize their medicinal benefits and reduce adverse effects. [64-66]

Advantages of Combining Bael (Aegle marmelos) and Parijat (Nyctanthesarbor-tristis) in Herbal Syrup:

- **Synergistic Therapeutic Effects:**

Combining Bael and Parijat in herbal syrup allows one to take advantage of their complementary medicinal effects. Their combined antibacterial, anti-inflammatory, and digestive qualities make for a powerful combination that treats several health issues at once.

- **Improved Digestive Support:**

Parijat's carminative qualities enhance Bael's well-known digestive stimulating qualities. By reducing the symptoms of dysentery, diarrhea, and indigestion, they offer all-encompassing assistance for digestive health.

- **Comprehensive Immune Modulation:**

The immunomodulatory qualities of pari jat and the antibacterial actions of bael provide a comprehensive strategy for immune support. The herbal syrup helps prevent and manage infections because of this combination, which fortifies the body's natural defenses.

- **Better Pain Relief:**

The analgesic qualities of pari jat work in tandem with Bael's anti-inflammatory effects to provide pain relief. This combination is very helpful for treating headaches, menstrual cramps, arthritis, and other forms of discomfort.

- Flexible Support for the Respiratory System: Parijat's antibacterial actions target respiratory infections, while Bael's anti-inflammatory qualities assist reduce respiratory strain. Asthma, bronchitis, cold, and cough symptoms can all be effectively relieved by this herbal syrup's dual action.
- Balanced Formulation:

A well-balanced blend of bioactive substances, including as flavonoids, alkaloids, and essential oils, is provided by Bael and Parijat. By doing this, the herbal syrup is certain to offer all-encompassing medicinal advantages without overtaxing any one physiological system. [67, 68]

RESULT AND DISCUSSION

Physicochemical Evaluation:

Table: result of evaluation test [69]

Sr. No	Test	F1	F2	F3
1	Organoleptic character Color Odour Test	Light Brown Aromatic Sweet	Light Brown Aromatic Sweet	Light Brown Aromatic Sweet
2	pH determination 1.pH paper	3	3	4
3	Viscosity	1.8	1.9	2.0
4	Specific gravity	1.38	1.35	1.36
5	Density(g/cm ³)	1.36	1.36	1.35

CONCLUSION

This study conducted a comprehensive investigation to develop, evaluate, and pharmacologically investigate a herbal syrup containing extracts of Bael (*Aegle marmelos*) and Parijat (*Nyctanthes arbor-tristis*). Following thorough testing and analysis, several significant findings were made that shed light on the syrup's safety profile and potential medical applications.

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HOW TO CITE: Vaishnavi Kanade*, Maaz Aaqil, Achal Bagore, Sakshi Jadhav, Sakshi Kadam, The Role of Parijatak and Bael Patra in Polyherbal Cough Formulations, *Int. J. Sci. R. Tech.*, 2025, 2 (11), 251-265. <https://doi.org/10.5281/zenodo.17560360>