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Research Paper

Research On Incorporation and Preparation of Herbal Syrup by Using Synergic Effect of Tulsi and Lemon

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ABSTRACT

Herbal syrups are widely used in traditional and modern medicine due to their therapeutic activity, safety, and patient compliance. The present study focuses on the formulation and evaluation of a herbal syrup prepared by using the synergistic effect of Tulsi (Ocimum sanctum) and Lemon (Citrus limon). Tulsi possesses antimicrobial, antiinflammatory, antioxidant, and immunomodulatory activities, while lemon acts as a rich source of vitamin C and provides antioxidant and antimicrobial properties. The herbal syrup was prepared using aqueous extraction methods and evaluated for organoleptic properties, pH, viscosity, stability, and microbial activity. The prepared syrup showed good appearance, pleasant odor, acceptable viscosity, and stability during storage

INTRODUCTION

Herbal formulations have gained significant attention in recent years due to their therapeutic benefits, natural origin, and minimal side effects. Among various herbal preparations, herbal syrups are widely preferred because they are easy to administer, palatable, and suitable for all age groups. Medicinal plants have been traditionally used in healthcare systems for the prevention and treatment of various diseases. The combination of herbs with complementary pharmacological activities can produce a synergistic effect, resulting in enhanced therapeutic efficacy.

Tulsi (*Ocimum sanctum*) is an important medicinal herb commonly known as the “Queen of Herbs.” It possesses antimicrobial, anti-inflammatory, antioxidant, antitussive, and immunomodulatory properties. Tulsi is widely used in traditional medicine for the treatment of cough, cold, fever, respiratory disorders, and infections. It also helps in strengthening the immune system and improving overall health.

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Lemon (*Citrus limon*) is a rich source of vitamin C, flavonoids, and antioxidants. Lemon exhibits antimicrobial, antioxidant, and detoxifying activities and is commonly used to improve digestion, boost immunity, and provide refreshing effects. The acidic nature and pleasant flavor of lemon also improve the taste and acceptability of herbal formulations.

The present research work focuses on the incorporation and preparation of a herbal syrup using Tulsi and lemon based on their synergistic effect. The combination is expected to enhance antioxidant and immunity-boosting activities while providing better therapeutic benefits compared to individual ingredients. The formulated herbal syrup was prepared using suitable excipients and evaluated for various physicochemical parameters such as pH, viscosity, taste, color, and stability. This study aims to develop a safe, effective, and stable herbal syrup that can be used as a natural health supplement for promoting general wellness and immunity.

Aim :

To formulate and evaluate a herbal syrup by incorporating Tulsi and Lemon based on their synergistic effect for enhancing antioxidant, antimicrobial, and immunity-boosting properties.

Objective :

The incorporation and preparation of a herbal syrup using the synergistic effects of tulsi (holy basil) and lemon can serve multiple purposes :

1. Promoting Health : The syrup aims to combine the medicinal properties of tulsi And lemon to enhance overall health and well-being. Tulsi is renowned for its antioxidant, antimicrobial, and adaptogenic properties, while lemon contributes vitamin C and adds flavor.
2. Enhancing Flavor : By utilizing lemon, the syrup becomes more palatable and enjoyable to consumes, while still retaining the distinct herbal essence of tulsi.
3. Boosting Immunity : The syrup is formulated to support the immune system, as both tulsi and lemon possess immune-boosting properties.
4. Supporting Respiratory Health : The inclusion of ingredients that promote respiratory health is important, as tulsi has traditionally been used to alleviate respiratory issues, and lemon provides a refreshing effect.
5. Natural Ingredients : Emphasis is placed on using natural ingredients to cater to healthconscious consumers who seek alternatives to synthetic medicines.
6. Convenient Consumption : The syrup offers a convenient form of intake, making it easier for individuals who may find it challenging to consume herbs in other forms such as teas or capsules.
7. Traditional Wisdom : The syrup draws upon traditional knowledge and practices that recognize the individual and synergistic benefits of tulsi and lemon.

In conclusion, the objective is to harness the combined benefits of tulsi and lemon in a herbal syrup that is natural, flavorful, and promotes overall well-being.

Plan of work :

1. **Selection of Herbal Ingredients**

Selection of Tulsi and Lemon based on their medicinal and synergistic properties.

2. **Collection and Authentication of Materials**

Collection of fresh Tulsi leaves and lemons followed by identification and authentication of raw materials.

3. **Preparation of Extracts**

Preparation of Tulsi extract and lemon juice/extract using suitable extraction methods.

4. **Formulation of Herbal Syrup**

Preparation of syrup base using sucrose, purified water, preservatives, and flavoring agents followed by incorporation of herbal extracts.

5. **Optimization of Formulation**

Adjustment of concentration, taste, viscosity, and pH for better stability and acceptability.

6. **Evaluation of Herbal Syrup**

Evaluation of physicochemical parameters such as:

- Color o Odor o Taste o pH
- Viscosity o Specific gravity

7. **Stability Study**

Study of formulation stability under suitable storage conditions.

8. **Microbial and Antioxidant Study**

Assessment of antimicrobial and antioxidant activity of the prepared syrup.

9. **Data Analysis and Interpretation**

Recording and interpretation of obtained results.

10. **Conclusion and Documentation**

Preparation of final report and conclusion based on evaluation studies.

Drug Profile :

The analysis and examination of herbal syrups that incorporate and prepare tulsi (Ocimum sanctum) and lemon (Citrus limon) to harness their synergistic effects highlight the medicinal benefits of these powerful botanicals, presenting a promising avenue for natural health remedies. This review of existing literature delves into the individual advantages of tulsi and lemon, their combined effects, and previous studies on similar herbal combinations.

TULSI :

TULSI IS ALSO KNOWN AS SACRED BASIL OR HOLY BASIL.

BIOLOGICAL SOURCE :

Tulsi is derived from the fresh and dried leaves of OCIMUM SANCTUM LINN, which belongs to the LABIATAE Family.

Geographical Source :

Tulsi (*Ocimum sanctum* / *Ocimum tenuiflorum*) is mainly found throughout India and is widely cultivated in tropical and subtropical regions. It commonly grows in:

- India
- Sri Lanka
- Nepal
- Bangladesh
- Thailand
- China

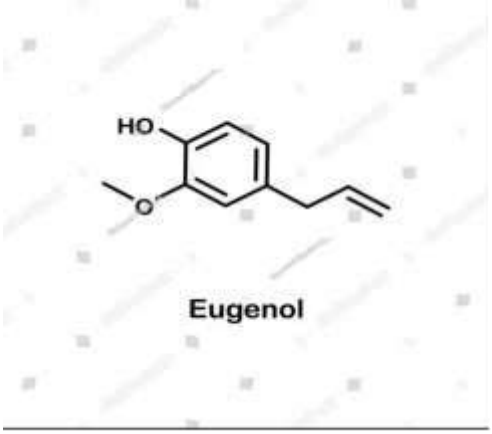
In India, Tulsi is cultivated in almost all states and is commonly grown in household gardens, farms, and temple areas due to its medicinal and religious importance.

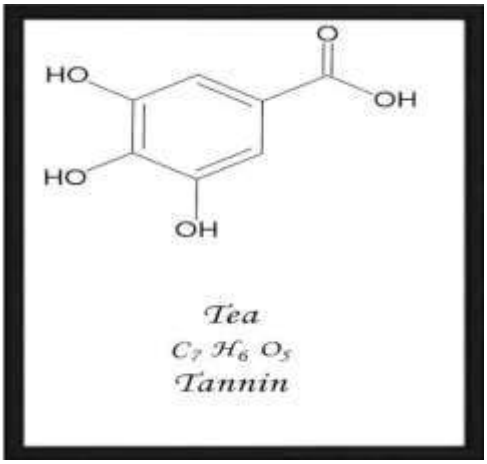
Characteristics :

- Aromatic medicinal herb
- Belongs to family Lamiaceae
- Green or purple oval leaves
- Strong pleasant smell
- Pungent and slightly bitter taste

Chemical Components :

- Eugenol
- Ursolic acid
- Rosmarinic acid
- Linalool
- Carvacrol
- Caryophyllene
- Ocimene
- Flavonoids
- Tannins
- Saponins
- Essential oils
- Vitamin A
- Vitamin C





Medicinal Properties Of Tulsi (Ocimum Sanctum) :

Tulsi, also known as holy basil, holds a revered position in traditional Ayurvedic medicine and has undergone extensive research to explore its therapeutic potential :

1. Antioxidant Activity : Tulsi is abundant in phenolic compounds and flavonoids, which possess potent antioxidant properties. These compounds scavenge free radicals, safeguarding cells against oxidative stress and inflammation.
2. Immunomodulatory Effects : Studies suggest that tulsi extracts can enhance immune function by stimulating the production of immune cells and cytokines, which play vital roles in the body's defense mechanisms.
3. Anti-inflammatory Properties : Tulsi extracts have exhibited anti-inflammatory effects by inhibiting pro-inflammatory enzymes and cytokines, potentially contributing to its therapeutic potential in managing inflammatory conditions.

LEMON :

Scientific Name : Citrus Limon

Botanical Family : Rutaceae

It is a small tree with irregular branches that are armed with thick spines, stiff, and sharp. The leaves are typically 5 to 7.5 cm long, while the white flowers are about 2 cm long. The fruit is round, ranging from 3 to 6 cm in size, greenish-yellow in color, with plenty of acidic pulp and small white seeds that are oval in shape.

GEOGRAPHICAL ORIGIN :

Lemons originated in India and were introduced to America by Columbus during his second voyage.

CHEMICAL CONSTITUENTS :

- Vitamin C (Ascorbic acid)
- Citric acid
- Flavonoids
- Limonene
- Hesperidin
- Pectin
- Calcium
- Potassium
- Magnesium
- Essential oils
- Sugars
- Carotenoids
- Fiber
- Phenolic compounds

MEDICINAL PROPERTIES OF LEMON (CITRUS LIMON) :

- Antioxidant property
- Antimicrobial property
- Anti-inflammatory property
- Immunity-boosting property
- Digestive supportive property
- Detoxifying property
- Antipyretic (fever-reducing) property
- Hydrating property
- Cardioprotective property
- Skin-protective property
- Vitamin C rich nutritional property
- Helps in relieving cough and cold symptoms

SYNERGISTIC EFFECTS OF TULSI AND LEMON :

1. **Enhances immunity-boosting activity**

Tulsi strengthens the immune system, while lemon provides vitamin C that helps improve body defense mechanisms.

2. **Provides strong antioxidant effect**

Both Tulsi and lemon contain antioxidants that help neutralize harmful free radicals and protect body cells.

3. **Improves antimicrobial action against infections**

Tulsi has natural antimicrobial compounds and lemon has acidic components that together help fight bacteria and viruses.

4. **Helps reduce inflammation**

The anti-inflammatory properties of Tulsi and lemon help reduce swelling, irritation, and inflammation in the body.

5. **Protects the body from oxidative stress**

Their combined antioxidant activity helps prevent cellular damage caused by oxidative stress.

6. **Supports respiratory health**

Tulsi helps relieve cough and cold symptoms, while lemon soothes the throat and supports respiratory function.

7. **Improves digestion and detoxification**

Lemon aids digestion and detoxification, while Tulsi supports healthy metabolism and gut health.

8. **Lemon enhances taste and acceptability**

Lemon provides a refreshing flavor that improves the palatability of Tulsi-based herbal syrup.

EVALUATION PARAMETERS :

Physical Appearance : The syrup was evaluated for color, odour, taste.

Ph Determination : The ph of the syrup was measured using a digital ph meter.

Viscosity : Viscosity was determined using a Brookfield viscometer.

Stability Study : The formulation was stored at room temperature and observed for changes in color, odour, and preparation.

METHODS AND MATERIALS :

Materials Required

Materials	Quantity
Tulsi leaves	20 g
Lemon juice	10 mL
Sucrose	60 g
Purified water	100 mL
Sodium benzoate	0.2 g
Citric acid	0.5 g
Flavoring agent	q.s.

q.s. = quantity sufficient

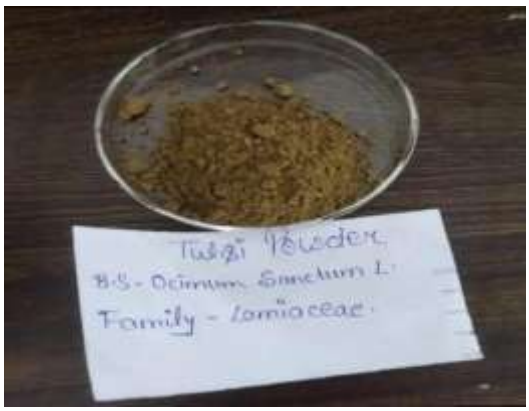
Method of Preparation of Herbal Syrup :

Step 1: Collection of Materials

Fresh Tulsi leaves and fresh Lemon were collected. All materials were cleaned properly with purified water to remove dust and impurities.

Step 2: Preparation of Tulsi Extract

- About 20 g of Tulsi leaves were shade dried and crushed.
- The crushed leaves were boiled with 50 mL purified water for 15–20 minutes.
- Boiling helps to extract active constituents present in Tulsi.
- The mixture was cooled and filtered using muslin cloth or filter paper to obtain clear Tulsi extract.



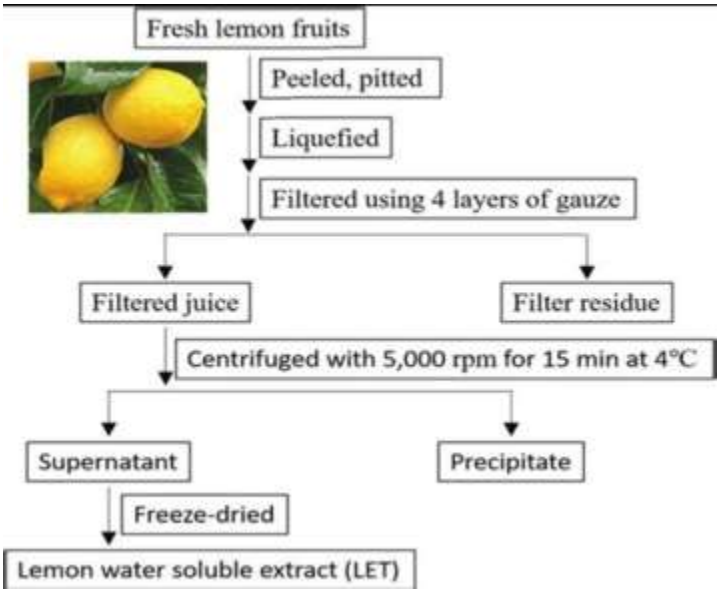
Step 3: Preparation of Lemon Juice

- Fresh lemons were cut into halves.
- Juice was extracted manually using a juice extractor.
- The juice was filtered to remove seeds and pulp.
- About 10 mL of filtered lemon juice was collected.

Step 4: Preparation of Syrup Base

- 60 g of sucrose was dissolved in 50 mL purified water by gentle heating.
- Continuous stirring was carried out until a clear syrup solution was obtained.
- 0.5 g citric acid and 0.2 g sodium benzoate were added to the syrup base.
- Citric acid improves taste and stability, while sodium benzoate acts as a preservative.

Figure 12: Extraction of tulsi powder



Step 5: Incorporation of Herbal Ingredients

- The prepared Tulsi extract was added slowly into the syrup base with continuous stirring.
- Lemon juice was then added gradually to the mixture.
- The solution was stirred continuously to ensure uniform mixing and proper incorporation of herbal ingredients.

Step 6: Filtration

- The final syrup was filtered again using filter paper to remove any unwanted particles and obtain a clear syrup preparation.

Step 7: Volume Adjustment

- The final volume of the syrup was adjusted to 100 mL using purified water if required.

Step 8: Packaging and Storage

- The prepared herbal syrup was filled into clean, dry, amber-colored bottles.
- The bottles were sealed properly and stored in a cool and dry place for further evaluation studies.

MATERIALS NEEDED :

1. Tulsi (Holy Basil) : Fresh or dried tulsi leaves
2. Lemon : Fresh lemons for zest and juice
3. Sweetner (optional) : Honey or sugar
4. Water : Filtered water for boiling and infusion
5. Tools : Saucepan or pot , wooden spoon , Fine mesh sieve or cheesecloth, funnel , clean bottles or jars , labels

Methods :

- Preparing Ingredients
- Tulsi Leaves : Wash fresh leaves or measure dried leaves
- Lemon : Wash lemons, zest, and juice
- Infusion Process :Combine Ingredients : Mix tulsi leaves, lemon zest, and water in a pot Adjust water based on desired syrup amount
- oil and simmer : Boil mixture, then simmer for 20-30 minutes Straining and Sweetening
- Strain Mixture : Cool Mixture, strain through sieve or cheesecloth
- Sweeten (Optional) : Add honey or sugar Bottling and Preservation
- Cooling : Allow the syrup to cool to room temperature before moving on to the bottling stage.
- Bottling the syrup : using a funnel, pour the cooled syrup into clean, sterilized bottle.
- Labelling : labelled the bottle with the syrup's name ("Tulsi Lemon Syrup"), the ingredients used and the date of preparation.
- Storage : Keep the bottled syrup in a cool and dark place.

List Of Instruments :

Sr. No	Instrument	Use
1.	Beaker	Used for mixing and Beaker preparation of solutions
2.	Measuring Cylinder	Used for accurate measurement of liquids
3.	Conical Flask	Used for Preparation and storage of Ectracts
4.	Glass rod	Used for stirring the formulation
5.	Heating Mantle / Hot plate	Used for hrating and boiling
6.	Weighing Balance	Used ofr Accurate weighing of ingredient
7.	Funnel filtration	Used for filtration of extract
8.	Muslin cloth	Filtration of extract

Determination of pH Meter of pH

Sr. No	Instrument	Use
1.	Viscometer	Viscosity of syrup
2.	Mortor and pestle	Used for crushing tulsi leaves
3.	Juice extractor / squezzer	Used for extraction of lemon juice
4.	Pippete/ Dropper	Used for transforming liduid in small quantities
5.	Ambered colored bottle	Used for storage of prepaed syurup

Phytochemical Analysis Techniques :

Alkaloids :

1. Mayer's Test :

Principle : Alkaloids react with Mayer's reagent to form a cream-colored precipitate.

Procedure : Add Mayer's reagent to the extract.

Observation : Cream or pale yellow precipitate confirms alkaloids.

2. Wagner's Test :

Principle : Wagner's reagent reacts with alkaloids to form reddish-brown precipitate.

Procedure : Add Wagner's reagent to the plant extract.

Observation : Formation of reddish-brown precipitate indicates alkaloids.

3. Dragendorff's Test :

Principle : Alkaloids react with Dragendorff's reagent to produce an orange or reddish-brown precipitate.

Procedure : Take 2ml of plant extract.

Add few drops of Dragendorff's reagent.

Observation : Orange or reddish-brown precipitate indicates the presence of alkaloids

RESULT

The herbal syrup prepared by using Tulsi (Ocimum sanctum) and Lemon (Citrus limon) showed satisfactory pharmaceutical and therapeutic properties. The formulation was evaluated for various parameters such as

appearance, color, odor, taste, pH, viscosity, stability, and antimicrobial activity.

The syrup was found to be clear, pleasant in taste, and yellowish-green in color with a characteristic aromatic odor of Tulsi and Lemon. The pH of the formulation was within the acceptable range for oral herbal preparations, indicating good stability and suitability for consumption.

The synergistic combination of Tulsi and Lemon demonstrated enhanced antimicrobial and antioxidant activity due to the presence of phytoconstituents such as flavonoids, alkaloids, tannins, vitamin C, and essential oils. The formulation also exhibited soothing and immunityboosting effects.

Stability studies revealed that the syrup remained stable under room temperature conditions without any significant change in color, odor, or consistency for the study period. No microbial growth or phase separation was observed during storage.

The prepared herbal syrup was found to be safe, effective, economical, and easy to prepare. The study confirms that the synergic effect of Tulsi and Lemon can be successfully utilized in the formulation of an herbal syrup for cough relief, immunity enhancement, and general wellness.

DISCUSSION

The present study successfully formulated a herbal syrup using the synergistic combination of Tulsi and Lemon. The prepared syrup showed good color, taste, odor, and consistency, making it suitable for oral administration. Phytochemical screening confirmed the presence of beneficial constituents such as flavonoids, alkaloids, tannins, and phenolic compounds, which contribute to antimicrobial and antioxidant activities.

Tulsi is well known for its antibacterial, anti-inflammatory, and immunityboosting properties, while Lemon provides vitamin C and antioxidant effects. The combined action of both ingredients enhanced the therapeutic potential of the formulation. The syrup also showed acceptable pH, viscosity, and physical stability without precipitation or phase separation.

The formulation may help in relieving cough, cold, throat irritation, and improving immunity. Additionally, the herbal syrup is economical, natural, and associated with fewer side effects compared to synthetic preparations. Therefore, the study indicates that Tulsi and Lemon can be effectively used together in the preparation of a stable and beneficial herbal syrup.

CONCLUSION

The present study successfully formulated and evaluated a herbal syrup using the synergistic combination of Tulsi and Lemon. The prepared formulation showed good organoleptic properties such as acceptable taste, odor, color, and consistency, making it suitable for oral use. Phytochemical screening confirmed the presence of important bioactive compounds including flavonoids, alkaloids, tannins, and phenolic compounds, which are responsible for antimicrobial, antioxidant, and anti-inflammatory activities.

The evaluation parameters such as pH, viscosity, and physical stability were found to be within acceptable limits, indicating that the syrup formulation was stable and effective. Tulsi contributed immunity-boosting and antimicrobial properties, while Lemon enhanced the antioxidant activity and improved the palatability of the syrup due to its vitamin C content and refreshing flavor.

The synergistic effect of Tulsi and Lemon may help in relieving cough, cold, throat irritation, and improving overall immunity. The herbal syrup was also found to be economical, easy to prepare, and safer compared to synthetic formulations because of fewer side effects. Therefore, the study concludes that Tulsi and Lemon can be effectively

incorporated into a stable and beneficial herbal syrup with promising therapeutic applications.

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