

Formulation and Development of Guava Leaves Jelly for Mouth Ulcer

Kotkar Priya Haushabap¹, khule jyoti Sunil², Khemnar pradnya Kashinath³, Ms. Tamboli Suhana A⁴, Mr. Giri Mahendra A⁵

^{1,2,3}, *Dr Ithape institute of pharmacy sangamner*

⁴*Guide, Dr Ithape institute of pharmacy sangamner*

⁵*Principal, Dr Ithape institute of pharmacy sangamner*

Corresponding Authors: Kotkar Priya Haushabap

Abstract - Mouth ulcer is one of the most common oral problems affecting individuals of all age groups. It is characterized by painful lesions inside the oral cavity, leading to discomfort during eating, speaking, and swallowing. Conventional therapies used for treatment of mouth ulcer mainly include antiseptics, analgesics, corticosteroids, and antimicrobial agents; however, prolonged use of synthetic drugs may produce adverse effects such as irritation, dryness, burning sensation, and hypersensitivity. Therefore, herbal formulations have gained significant attention due to their safety, effectiveness, low toxicity, and patient acceptability.

Guava leaves (*Psidium guajava* Linn.) possess remarkable medicinal properties including anti-inflammatory, antimicrobial, antioxidant, wound healing, and analgesic activities. The presence of flavonoids, tannins, phenolic compounds, and triterpenoids contributes to its therapeutic efficacy in oral diseases. Herbal jelly dosage form offers several advantages such as ease of administration, prolonged contact time with oral mucosa, soothing effect, improved patient compliance, and pleasant texture.

The present review focuses on formulation and development of guava leaves jelly for management of mouth ulcer. The paper includes detailed information regarding collection and authentication of plant material, drying, powder preparation, extraction, preparation of jelly base, incorporation of extract, moulding, setting, packaging, evaluation parameters, mechanism of action, advantages, limitations, and future scope of herbal jelly formulations.

Keywords: *Psidium guajava* Linn., Mouth ulcer, Herbal jelly, Guava leaves extract, Oral ulcer, Herbal formulation, Anti-inflammatory activity.

I. INTRODUCTION

Mouth ulcers, also known as aphthous ulcers or canker sores, are painful lesions occurring on the mucous membrane of the oral cavity¹. These ulcers are commonly associated with inflammation,

redness, burning sensation, and difficulty in eating or speaking. The condition may arise due to stress, nutritional deficiency, hormonal imbalance, trauma, microbial infection, poor oral hygiene, and weakened immunity.

The prevalence of mouth ulcer has increased significantly due to modern lifestyle, stress, unhealthy food habits, and excessive use of chemical-containing oral products. Although several synthetic medications are available for treatment, repeated use may produce undesirable effects including irritation, altered taste sensation, dryness, and allergic reactions².

Herbal medicine has been used since ancient times for treatment of oral disorders because of its natural origin, safety profile, and therapeutic effectiveness. Guava leaves are widely used in traditional medicine for treatment of oral infections, diarrhea, wounds, inflammation, and gastrointestinal disorders³.

Guava leaves contain various bioactive phytoconstituents such as:

- Flavonoids
- Tannins
- Phenolic compounds
- Saponins
- Terpenoids
- Essential oils
- Antioxidants⁴

These phytochemicals exhibit antimicrobial, antioxidant, wound healing, and anti-inflammatory activities which help in rapid healing of mouth ulcer.

Jelly dosage form is considered highly suitable for oral mucosal application because it provides soothing effect, prolonged retention, improved patient compliance, and easy application⁵. Therefore, development of guava leaves jelly

represents a promising herbal approach for management of mouth ulcer.

II. AIM AND OBJECTIVES

Aim

To formulate and develop herbal jelly containing guava leaves extract for effective management of mouth ulcer.

Objectives

1. To collect and authenticate guava leaves.
2. To prepare dried powder of guava leaves.
3. To prepare aqueous extract of guava leaves.
4. To formulate herbal jelly using suitable excipients.
5. To evaluate physical and pharmaceutical properties of jelly.
6. To study antimicrobial and anti-inflammatory potential of formulation.
7. To develop safe, stable, and patient-friendly herbal dosage form.

III. REVIEW OF LITERATURE

3.1 Mouth Ulcer

Mouth ulcer is a common inflammatory condition affecting oral mucosa. It appears as small painful sores with white or yellow center surrounded by red inflamed margins ⁶

Causes of Mouth Ulcer

- Nutritional deficiency
- Stress and anxiety
- Hormonal changes
- Viral or bacterial infection
- Trauma from sharp teeth or braces
- Spicy food consumption
- Weak immune system
- Vitamin B12 and iron deficiency ⁷

Symptoms

- Pain and burning sensation
- Difficulty in eating
- Swelling and redness
- Irritation during speaking
- White or yellow ulcerative lesion ⁸

Types of Mouth Ulcer

1. Minor aphthous ulcer
2. Major aphthous ulcer
3. Herpetiform ulcer ¹⁰

3.2 Herbal Treatment for Mouth Ulcer

Herbal medicines are increasingly preferred for treatment of oral ulcers because they possess fewer side effects and better patient acceptance.

Advantages of Herbal Therapy

- Natural and safe
- Cost effective
- Minimal adverse effects
- Easy availability
- Better patient compliance
- Multifunctional therapeutic action ¹⁰

Common herbs used in oral ulcer treatment include:

- Guava leaves
- Aloe vera
- Tulsi
- Neem
- Turmeric
- Honey
- Clove

3.3 Guava Plant Profile



Fig No 1: Guava Leaf

Scientific Classification

Parameter	Description
Botanical Name	<i>Psidium guajava</i> Linn.
Family	Myrtaceae
Common Name	Guava
Part Used	Leaves
Biological Source	Dried leaves of <i>Psidium guajava</i>

Morphological Characteristics

Guava is a small tropical tree possessing smooth bark and opposite leaves. Leaves are oval shaped, green in color, aromatic, and rich in medicinal phytoconstituents. ¹¹

Phytochemical Constituents

Guava leaves contain:

- Quercetin
- Flavonoids
- Tannins
- Gallic acid
- Phenolic compounds
- Saponins

- Essential oils
- Terpenoids ¹²

Pharmacological Activities

- Anti-inflammatory activity
- Antimicrobial activity
- Antioxidant activity
- Wound healing activity
- Analgesic activity
- Antiseptic activity

IV. MATERIALS REQUIRED

Plant Material

- Fresh guava leaves

Chemicals and Excipients

Fig No 1: Chemicals and Excipients

Ingredient	Quantity for 100 g
Guava leaves extract	10 g
Honey	20 g
Gelatin	5 g
Glycerin	10 g
Citric acid	0.2 g
Sodium benzoate	0.1 g
Distilled water	q.s to 100 g

V. METHODOLOGY

5.1 Collection and Authentication of Plant Material

Fresh healthy leaves of Guava were collected from naturally grown plants during the suitable harvesting season. Mature leaves free from disease, fungal infection, insect attack, and physical damage were selected carefully to ensure quality and purity of plant material used in the formulation.¹³

The collected leaves were authenticated by an expert in Pharmacognosy or Botany department. The plant was identified as *Psidium guajava* Linn. belonging to family Myrtaceae. Authentication of plant material is an important step in herbal research to confirm the identity, purity, and standardization of crude drug.¹⁴

After collection, the leaves were washed thoroughly under running tap water to remove adhering dust particles, soil, and unwanted foreign materials. The leaves were then rinsed with distilled water to minimize microbial contamination and impurities.¹⁵

5.2 Drying of Leaves

Shade Drying Method

The collected fresh leaves of Guava were subjected to shade drying to remove moisture and preserve active phytoconstituents.¹⁶ Initially, the leaves were washed thoroughly with tap water followed by

distilled water to remove dust and contaminants. Excess water was removed using blotting paper.

The cleaned leaves were spread uniformly in a single layer on stainless steel trays lined with blotting paper. Drying was carried out under shade at room temperature (25–30°C) in a well-ventilated area for 5–7 days. Direct sunlight was avoided to prevent degradation of flavonoids, tannins, and other thermolabile constituents. During drying, the leaves were turned periodically to ensure uniform drying and to avoid fungal growth. Drying was continued until the leaves became crisp and brittle.

The dried leaves were stored in airtight polyethylene bags until further pulverization and extraction process.¹⁷

Importance of Shade Drying

- Prevents degradation of phytoconstituents
- Maintains color and aroma
- Reduces microbial growth
- Preserves antioxidant activity
- Improves shelf life ¹⁸

5.3 Powder Preparation

The shade dried leaves of Guava were subjected to size reduction for preparation of coarse powder. The dried leaves were crushed using mortar and pestle or mechanical grinder to obtain uniform powder. Grinding was carried out carefully to prevent excessive heat generation which may affect the phytoconstituents present in the leaves.¹⁹

The prepared powder was passed through sieve no. 40 to obtain uniform particle size and to improve extraction efficiency. Large particles retained on sieve were reground and sieved again. Finally, the obtained coarse powder was stored in airtight amber-colored container and kept in cool and dry place until further extraction and formulation studies.²⁰

Advantages of Powdering

- Increases surface area
- Improves extraction efficiency
- Enhances solvent penetration
- Facilitates uniform extraction

5.4 Preparation of Guava Leaves Extract

Aqueous Extraction Method

The aqueous extract of Guava leaves was prepared using decoction method for extraction of water-soluble phytoconstituents. Accurately weighed 10 g of previously dried and powdered guava leaves was transferred into a 250 mL beaker containing 100 mL of distilled water. The mixture was heated on a

water bath at maintained temperature of 60–70°C for 30 minutes with intermittent stirring using glass rod to facilitate efficient extraction of active constituents such as flavonoids, tannins, phenolic compounds, and antioxidants.²¹

After completion of heating, the mixture was allowed to cool to room temperature. The obtained extract was filtered initially through muslin cloth to remove coarse plant debris followed by filtration through Whatman No.1 filter paper to obtain clear filtrate. The filtrate was further concentrated on water bath at controlled temperature until semisolid thick extract was obtained. Excess heating was avoided to prevent degradation of thermolabile phytoconstituents.

5.5 Formulation of Guava Leaves Jelly

The herbal jelly containing guava leaves extract was prepared using suitable gelling agents, sweetening agents, preservatives, and stabilizers to obtain a smooth and patient-friendly oral formulation. Initially, gelatin was soaked in a small quantity of distilled water for proper swelling. In another beaker, honey, glycerin, citric acid, and sodium benzoate were dissolved in distilled water with continuous stirring. The swollen gelatin was heated gently until complete dissolution occurred.²² The prepared semisolid guava leaves extract was then incorporated slowly into the jelly base with constant stirring to ensure uniform distribution of phytoconstituents throughout the formulation. Finally, the volume was adjusted using distilled water, and the mixture was stirred continuously to obtain a homogeneous jelly mass free from lumps and air bubbles. The prepared jelly was poured into suitable molds or containers and allowed to cool at room temperature for proper setting.²³

Advantages of Jelly Formulation

- Easy application on oral mucosa
- Pleasant texture and taste
- Prolonged contact time with ulcer surface
- Soothing and cooling effect
- Improved patient compliance
- Better retention of herbal extract²⁴

5.6 Moulding and Setting

The prepared jelly mixture was transferred carefully into clean and dry moulds or airtight containers immediately after preparation to avoid premature setting. The filled containers were allowed to stand undisturbed at room temperature for complete gel

formation. Proper setting is important to achieve desirable consistency, texture, and stability of the formulation.²⁵

After complete setting, the jelly was inspected visually for:

- Uniform appearance
- Smooth texture
- Absence of air bubbles
- Proper consistency
- Uniform color²⁶

The formulated jelly was then packed properly for storage and evaluation studies.²⁷

5.7 Packaging and Storage

The prepared guava leaves jelly was packed in clean, dry, airtight, and light-resistant containers to protect it from moisture, microbial contamination, oxidation, and environmental exposure. Amber-colored glass jars or plastic containers were preferred to maintain stability of phyto constituents present in guava leaves extract.²⁸

The containers were properly labeled with:

- Name of formulation
- Batch number
- Date of preparation
- Storage condition

The formulation was stored at room temperature away from direct sunlight and excessive heat.

Importance of Proper Packaging

- Prevents contamination
- Improves shelf life
- Maintains stability
- Prevents moisture absorption
- Protects phytoconstituents from degradation²⁹

VI. EVALUATION PARAMETERS OF GUAVA LEAVES JELLY

Evaluation of herbal jelly is essential to determine quality, stability, safety, and effectiveness of formulation.³⁰

6.1 Physical Appearance

The prepared jelly was examined visually for:

- Color
- Odor
- Texture
- Transparency
- Homogeneity

A good herbal jelly should possess smooth texture, uniform appearance, and pleasant odor.

6.2 pH Determination

The pH of jelly was determined using digital pH meter. Approximately 1 g of jelly was dissolved in distilled water and pH was measured at room temperature.

Importance

- Ensures compatibility with oral mucosa
- Prevents irritation
- Maintains stability of formulation

Ideal pH range for oral jelly: 5.5 – 7

6.3 Viscosity

Viscosity of jelly was measured using Brookfield viscometer.

Importance

- Determines spreadability
- Affects retention time on ulcer
- Influences patient acceptability

6.4 Spreadability

Spreadability indicates ease of application of jelly on affected area.

Formula

$$S = \frac{M \times L}{T \times S} \quad S = \frac{TM}{L}$$

Where:

S = Spreadability

M = Weight tied to upper slide

L = Length moved by glass slide

T = Time taken

Good spreadability ensures easy application and better patient compliance.

6.5 Homogeneity Test

The prepared jelly was tested for uniform distribution of ingredients by visual inspection. A homogeneous formulation should be free from lumps and coarse particles.

6.6 Stability Study

The formulated jelly was stored under different temperature conditions to evaluate:

- Color change
- Odor change
- Consistency
- Phase separation
- Microbial growth

Stability studies help determine shelf life of formulation.

6.7 Antimicrobial Activity

Antimicrobial activity of guava leaves jelly can be evaluated against oral microorganisms using agar well diffusion method.

Common Test Organisms

- Staphylococcus aureus
- Streptococcus mutans
- Candida albicans

Importance

- Prevents secondary infection
- Reduces microbial load
- Promotes healing of ulcer

6.8 Anti-inflammatory Activity

Anti-inflammatory activity may be evaluated using protein denaturation assay or membrane stabilization method.

Importance

- Reduces swelling
- Minimizes pain
- Accelerates healing process

VII. MECHANISM OF ACTION OF GUAVA LEAVES IN MOUTH ULCER

Guava leaves possess multiple phytoconstituents responsible for therapeutic activity in mouth ulcer treatment.³¹

Anti-inflammatory Action

Flavonoids and tannins inhibit inflammatory mediators and reduce redness, swelling, and irritation.

Antimicrobial Action

Phenolic compounds and essential oils inhibit growth of bacteria and fungi present in oral cavity.

Antioxidant Action

Antioxidants neutralize free radicals and protect damaged oral tissues from oxidative stress.

Wound Healing Activity

Guava leaves stimulate tissue regeneration and accelerate healing of ulcerative lesions.

Analgesic Effect

Bioactive constituents help reduce pain and burning sensation associated with mouth ulcer.

VIII. ADVANTAGES OF GUAVA LEAVES JELLY

- Herbal and natural formulation
- Safe and non-toxic
- Cost effective
- Easy to prepare
- Pleasant and soothing effect
- Improved patient compliance
- Reduced side effects compared to synthetic drugs
- Prolonged retention on oral mucosa
- Multifunctional therapeutic action³²

IX. LIMITATIONS OF HERBAL JELLY FORMULATION

- Possibility of microbial contamination
- Shorter shelf life compared to synthetic products

- Variation in phyto constituent concentration
- Need for proper standardization
- Stability issues under improper storage conditions

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X. FUTURE SCOPE

The development of guava leaves jelly offers significant potential in herbal oral care therapy.

Future studies may focus on:

- Advanced formulation optimization
- Clinical evaluation in human volunteers
- Large scale production
- Taste masking improvement
- Development of sugar-free jelly formulations
- Commercial herbal oral care products
- Combination with other herbal extracts for synergistic activity

Herbal jelly dosage form may become an effective alternative to conventional synthetic oral ulcer treatments due to better safety and patient acceptability.

XI. CONCLUSION

Guava leaves possess significant medicinal properties including anti-inflammatory, antimicrobial, antioxidant, analgesic, and wound healing activities which make them highly effective in management of mouth ulcer. The formulated herbal jelly provides prolonged contact with oral mucosa, soothing action, ease of application, and improved patient compliance. The presence of bioactive phytoconstituents such as flavonoids, tannins, and phenolic compounds contributes to rapid healing and reduction of pain and inflammation.

The formulation and development of guava leaves jelly represents a promising, safe, economical, and natural approach for treatment of mouth ulcer. Further pharmacological and clinical studies are required to establish its therapeutic efficacy and commercial applicability in herbal medicine.

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