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Review Article

**FORMULATION AND EVALUATION OF A MOUTH ULCER  
HERBAL GEL USING GUAVA LEAF (PSIDIUM GUAJAVA)  
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<sup>7</sup>Assistant Professor, NRI Institute of Pharmacy, Bhopal, India<sup>8</sup>Professor, NRI Institute of Pharmacy, Bhopal, India**Abstract:**

The present study focuses on the formulation and evaluation of a herbal mouth ulcer gel using guava leaf extract obtained from *Psidium guajava*. Mouth ulcers are common oral lesions associated with pain, inflammation, and discomfort during eating and speaking. Herbal medicines have gained importance due to their safety, effectiveness, and minimal side effects compared to synthetic preparations. Guava leaves are rich in flavonoids, tannins, and phenolic compounds possessing antimicrobial, anti-inflammatory, antioxidant, and wound healing properties, making them suitable for the treatment of oral ulcers.

The guava leaves were collected, dried, powdered, and extracted using a hydroethanolic solvent extraction method. The obtained extract was incorporated into a gel base prepared using suitable polymers and excipients. Formulation was prepared by extract and evaluated for physicochemical parameters such as appearance, homogeneity, pH, viscosity, spreadability, extrudability, and drug content. The formulation showed satisfactory physical characteristics with good consistency, acceptable pH, excellent spreadability, and stability. Phytochemical screening of the concentrated extract confirmed the presence of Quercetin (flavonoids), tannins, and saponins. Quercetin is a powerful anti-inflammatory and antioxidant. The gel was formulated using 1% w/v chitosan as a gelling agent, stabilized in a 1% glacial acetic acid medium. The formulated gel was dark in green color and pH ranges from 5.5 to 6.5, ensuring mucosal compatibility. All physicochemical parameters, including spreadability and consistency, were within acceptable pharmaceutical limits. Quercetin combined with a chitosan-based drug delivery system offers an herbal alternative for the treatment of aphthous ulcers. The herbal gel demonstrated significant antimicrobial and healing activity against microorganisms commonly associated with oral infections. The study concludes that guava leaf extract can be effectively formulated into a mouth ulcer gel with promising therapeutic potential. The developed herbal formulation may serve as a safe, economical, and effective alternative for the management of mouth ulcers and oral inflammation.

**KEY WORDS:** Hydroethanolic solvent, Quercetin, Aphthous ulcer, *Psidium Guajava*, Chitosan, Anti-inflammatory, Antioxidant, Formulation.

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**INTRODUCTION:**

Gels are typically semi-solid formulations having a liquid phase that has been thickened with other components. (Auta J 2007) Demand for medicinal plants is increasing in both developing and developed countries. Research on medicinal plants is one of the leading areas of research globally. Herbal remedies have now been extensively investigated for their effectiveness in preventing and treating oral diseases. Herbs have long been used to clean teeth and gums and to treat various oral disease. Uses of percutaneous penetration of medicament or local action to certain mucosal surface (Singh 2014). The Commercially available gels and Synthetic and semi-synthetic medicaments are suggested to treat mouth ulcers like antibiotics and antiseptics, local anaesthetics, local analgesic, steroidal and non-steroidal anti-inflammatory drugs. Topical steroids are the most frequently used treatments but they have some serious adverse effects on the continuous application like adrenal insufficiency, immunosuppression, osteoporosis, hyperglycaemia, gastrointestinal disturbance, staining of teeth, irritation, and burning sensation only because presence of high degree of alcohol content and some organic compounds. World Health Organization (WHO) has defined herbal medicines are finished, labelled medicinal products that contain active ingredients, aerial or underground parts of the plants or other plant material or combination. The present investigation deals with use of herbal powdered Guava Leaves in the treatment of mouth ulcer in pharmaceutical gel. The use of plant-based medications is gaining huge popularity due to better patient compliance and because of the side effects and the adverse effects of synthetic chemicals. Several studies have reported, the use of plant parts of extract such rhizome of *Curcuma longa*, leaves of *Psidium guajava*, leaves of *Piper betel*, *Zingiber Officinale*, in the form of mouth wash, paste, or mucoadhesive gels for the treatment of oral ulcers.



Fig.no.1: Gel

both medicinal and economical. Although herbal medicines have benefits to increased, their safety, efficacy, quality and importance of industrialized and developing countries. Herbal medicines are getting increasing patient compliance as they are avoiding typical side effects of allopathic medicines. It is no wonder that the world's one-fourth population i.e. 2.075 billion people are

dependent on traditional medicines for the treatment of various diseases. Medicinal plants have been a major source of cure for human disease since time immemorial.

**Mouth Ulcer-**A mouth ulcer is a break or breach in the mucous membrane, which is lines the inside of the mouth. Ulcers are usually yellow or white colour and usually looks like a depression in mouth that is the mucous membrane (Dosani 2011) Characterized by inflammation and pain also called a mouth ulcer or mucosal ulcer. Mouth sores, also known as aphthous sores, can be painful when we eat, drink or brush our teeth. Common causes of mouth sores include a lack of nutrients like iron, vitamins especially B12 and C, poor oral hygiene, disease, depression, indigestion, mechanical damage, food intolerance, hormonal imbalance, skin disease etc.



Fig.no.2: Mouth ulcer

Types of mouth ulcer-

Clinical classification of recurrent aphthous stomatitis (RAS):

1. Minor aphthous ulcers (80-85% cases).
2. Major aphthous ulcers (10mm deeper and irregular edges).
3. Herpetiform ulcers (multiple dot-sized, 1-3mm deeper).

Commonly known as Guava, Peru, Amrood. A biological source is *Psidium guajava* belonging to family Myrtaceae. Chemical composition contains Triterpenoids, Steroids, Carbohydrates, Oils, Lipids, Glycosides, Alkaloids, Tannins, and Saponins, Flavonoids are found in this plant especially quercetin is found as the major components. It demonstrated several activities including Antibacterial, Anti-diarrhoeal, Anti-ulcer, Anticancer, Antioxidant activity (Wang, 2014). Importance of herbal medicine has



Fig.no.3: Mouth ulcer

**METHODOLOGY:**

**Material use** - Glacial acetic acid, Chitosan (gelling agent), Propylene glycol, Methyl Paraben, Propyl Paraben.

Sr. No.	Name of Ingredient	Manufactured By
1.	Glacial acetic acid	Celanese Corporation
2.	Chitosan (gelling agent)	Panvo Organic
3.	Propylene glycol	Repsol
4.	Methyl Paraben	Salicylates & Chemical Pvt. Ltd.
5.	Propyl Paraben	Clariant



Fig.no.5: Maceration and Concentration method

**Collection-** Fresh leaves of guava were collected from a clean area of Bhopal, Madhya Pradesh, India during October 2025. The collected leaves were washed with distilled water to remove impurities and then shade-dried.



Fig.no.4:Dried leaves and powdered form

**Extraction-** The collected leaves of guava were shadedried at room temperature (25-30°) for 7 days and powdered. The powdered material was subjected to extraction using maceration method. A quantity of the coarse powder (50gm) was placed in light-resistant, stoppered container. A total of 500 ml of 50% (v/v) hydroethanolic solution was added, corresponding to a 1:10 w/v ratio. The container was sealed and allowed to stand (macerate) at room temperature for 7 days, with shaking 3-4 times per day to ensure through solvent-drug contact. After 7 days the mixture was filtered through a muslin cloth then Whatman No.1 filter paper also used to obtain a clear extract. Then concentrate the extract on a water bath at 50-60°C this process removes the ethanol and a significant portion of the water. And the extract was stored in an airtight, light-resistant container at 4°C for further use.

Formulation Table & Method :

S.NO.	Test	Phytochemical class	Expected result	Expected observation
1.	Shinoda test	Flavonoids	Positive (+)	A pink, magenta, or bright red colour will appear.
2.	Ferric chloride test	Tannins (phenolics)	Positive (+)	A dark blue, black, or greenish-blue precipitate will form.
3.	Salkowski test	Triterpenoids	Positive (+)	A reddish-brown colour ring will form at the junction.
4.	Froth test	Saponins	Positive (+)	A stable, persistent froth (>1cm) will form.
5.	Dragendorff test	Alkaloids	Positive (+)	Orange or reddish-brown precipitate will form.
6.	Legal's test	Glycosides	Positive (+)	Pink or red colour will appear.



Fig.No.5: Phytochemical Screening and Filtration

*PHYTOCHEMICAL SCREENING:*

Preliminary phytochemical screening of the extract was carried out to detect the presence of flavonoids, tannins, triterpenoids, saponins, alkaloids, and glycosides using standard procedure-

*FORMULATION OF GEL:*

Step 1: Preparation of the solvent system (acidic medium).

First, Take approximately 50ml of distilled water in a beaker.

↓

Then add 1ml of Glacial Acetic Acid to the water.

↓

After that stir well to make a 1% - 2% acetic acid solution. (Chitosan insoluble in neutral water).

Step 2: preparation of the chitosan gel base.

Firstly, place the beaker with the Acetic acid solution on a magnetic stirrer.

↓

Then add very slowly sprinkle of the chitosan powder into the stirring solution.

↓

After that allow to stir continuously for 4 to 6 hours or overnight until a clear, viscous, bubble free gel is formed.

Step 3: Preparation of the drug phase.

Firstly, take a small beaker, and add 10ml of propylene glycol.

↓

Then add methyl paraben and propyl paraben to the propylene glycol.

↓

After that heat slightly 40-50°C to ensure the parabens dissolve completely.

↓

Next add the concentrated extract of guava leaf to this mixture and stir until uniform.

Step 4:

Finally, add the drug phase (step 3) into the Chitosan Gel base (step 2) with continue stirring.

↓

Then volume make up to 100ml with the distilled water.

↓

And reduce the stirring speed to avoid trapping air bubbles. And stir for more 30 minutes to ensure homogeneity.

Sr.no.	Name of ingredients	Quantity	Used
1.	Glacial acetic acid	1ml	It helps to dissolve the chitosan.
2.	Chitosan (Gelling agent)	1gm	It forms the gel and sticks inside the mouth.
3.	Propylene glycol	5ml	Co-solvent it dissolves the hard extract.
4.	Methyl paraben	0.1gm	Prevent bacterial growth.
5.	Propyl paraben	0.01gm	Prevent fungal growth.
6.	Guava leaf extract (API)	1gm	Antimicrobial and anti-inflammatory properties.
7.	Distilled water	150ml	It makes up the final vol. (vehicle)

#### Evaluation:

##### Organoleptic properties-

Organoleptic evaluation refers to the evaluation of the formulation by the colour, odour, taste and texture.

Colour	Greenish – brown
Odour	Aromatic
Taste	Bitter
Texture	Fine & Dry

##### Moisture Content:

It was determined using the loss on drying method about 2 grams of powder were dried in a hot air oven at 105°C till a constant weight was achieved. The percentage of moisture loss was calculated.

Moisture content =  $(W1-W2)/(W)*100$  Where,

W is the weight of the sample (2g),

W1 is the weight of the sample before drying W2 is the weight of the sample after drying.

Moisture Content was found to be – 8.5 %

##### Ash Value :

Ash value was found to be – 7.7 %

##### PH Determination :

The pH of developed gel formulation was determined using digital pH meter. 1gm of gel was dissolved in 100ml distilled water and kept aside for 2 hours. The measurement of pH each formulation was done in triplicate and average values are calculated. The pH of the gel is likely be between 6-6.5.

##### Antimicrobial Activity:

Antimicrobial studies are performed to evaluate the effectiveness of the prepared herbal gel against pathogenic microorganisms responsible for oral infections and mouth ulcers. Psidium guajava (guava) leaves contain flavonoids, tannins, triterpenoids, and phenolic compounds that exhibit significant antimicrobial activity against bacteria and fungi (Streptococcus mutans and Candida albicans).

**Result:**

The *Psidium guajava* herbal gel generally shows significant antimicrobial activity against oral pathogens due to the presence of bioactive phytoconstituents such as quercetin, tannins, and flavonoids. Studies have reported good inhibition against *Streptococcus mutans* and *Candida albicans*, indicating its usefulness in mouth ulcer and oral infection treatment.

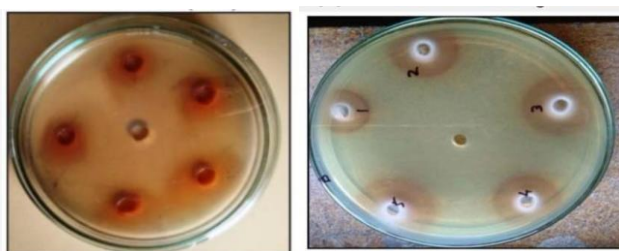
**Observation :**

The antimicrobial activity is determined by measuring the diameter of the clear zone (zone of inhibition) formed around the well.

A larger zone of inhibition indicates stronger antimicrobial activity.

**CONCLUSION:**

The formulated *Psidium guajava* herbal gel exhibited effective antimicrobial activity against common oral pathogens. The gel may serve as a safe and natural alternative for the management of mouth ulcers and oral microbial infections due to its broad-spectrum antimicrobial properties and fewer side effects compared to synthetic formulations.



**Fig : S. Mutans**

**Stability Study :**

Stability study was done with open and close container and it's showed that open container containing gel was not stable and close container gel was stable.

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