



DEVELOPMENT OF POLYHERBAL MOUTH ULCER FROM *PSIDIUM GUAJAVA* AND *MUSA PARADISIACA*

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Abstract: The development of a polyherbal gel using *Psidium guajava* (guava leaves) and *Musa paradisiaca* (banana peel) for the treatment of mouth ulcers. The formulation was evaluated for phytochemical constituents, antimicrobial activity, and physical properties. Results revealed the presence of flavonoids and other bioactive compounds with wound-healing, anti-inflammatory, and antimicrobial effects. The gel demonstrated activity against *Escherichia coli*, *Staphylococcus aureus*, and *Candida albicans*. Physical assessments confirmed appropriate pH, spread ability, and non-irritant nature. Overall, the polyherbal gel presents a safe and effective natural alternative to conventional ulcer treatments.

Key Words: Polyherbal gel, spread ability

I. INTRODUCTION

Aphthous is a word that comes from the Greek word "aphtha," which means ulcer (Gurav and Husukale.,2023). A rupture or breach in the mucous membrane lining the interior of the mouth is known as a mouth ulcer. (Shaikh., et.al.,2018). Mouth ulcers are uncomfortable mucosal sores that frequently appear on the tongue, gums, face, or lips (Shi. et al.,2021). Although the lesion is harmless and can heal itself, pains and discomfort caused by a mouth ulcer affect eating, drinking, brushing, and even speaking Typically, aphthous stomatitis begins in childhood or adolescence and manifests as repeated tiny, round, or ovoid ulcers with erythematous haloes, yellow or gray floors, and constricted margins (Scully., et.al.,2001). ng, leading to a decline in the patient's quality of life and work efficiency. (Shi., et.al.,2021). The most common causes of mouth ulcers include iron and vitamin deficiencies, particularly those involving B12 and C, poor oral hygiene, infections, stress, indigestion, mechanical injury, food allergies, hormonal imbalances, and skin conditions (Gurav and Husukale.,2023) Mouth ulcers can be categorized as mild, large, or herpetiform based on their size and quantity. The primary varieties of oral ulcers are: Minor Ulcers often go away in ten to two weeks and have a diameter of 2 to 8 mm (Shubham Mittal., et.al.,2018). Major Ulcers are larger, deeper, and frequently have an uneven or elevated border. This kind of ulcer may leave a scar in the mouth and take several weeks to heal (Shubham Mittal., et.al.,2018). Herpetiform Ulcers An ulcer of this kind is made up of dozens of tiny lesions that are roughly the size of pinheads (Shubham Mittal. et al.,2018).

II. *PSIDIUM GUAJAVA* (GUAVA LEAVES)

Guava is another name for the plant *Psidium guajava*. The guava tree bark is thin, smooth, flaky, and reddish brown. (Bulugahapitiya., et.al.,2021). It is a common medicinal plant found throughout India that is a member of the Myrtaceae family (Richa Singh. et al.,2020). Guava leaves are also used extensively for their antispasmodic, cough sedative, anti-inflammatory, antidiarrheic, antihypertensive, antiobesity, and antidiabetic qualities (Kumar., et.al.,2021). *Psidium guajava* has been used as an herbal remedy for several oral conditions, including ulcers, swollen gums, sore throats, and toothaches. Additionally, guava leaf decoction has been used as mouthwash (Pooja Mishra., et.al.,2022). The powdered guava leaves showed a strong antioxidant effect and included flavonoids. The herbal formulation was found to be stable, safe, and effective in treating oral ulcers when compared to synthetic formulations (Vaibhavi Shirke.,2023). This plant contains flavonoids, alkaloids, carotenoids, and phenols, with quercetin being the main constituent. The current study examines the

use of guava leaf ethanolic extract in a gel formulation for the treatment of oral ulcers (Patil., et.al.,2022) The bioactive and therapeutic qualities of guava leaves are mainly determined by the presence of a distinct range of bioactive polyphenolic chemicals, such as quercetin and other flavonoids, as well as ferulic, caffeic, and gallic acids (Kumar., et.al.,2021). Clinically significant properties of guava leaf have been reported, including anti-inflammatory, antihypertensive, antioxidant, and antitumor activities, and also been shown to possess antiviral and antibacterial properties (Yin., et.al.,2014).

III. MUSA PARADISIACA (BANANA PEEL):

The Musaceae family of plants includes banana plants. Although they belong to the same family, banana plants are descended from three genera: Musa, Ensete, and Musella (Mathew & Negi, 2017). Bananas are rich in nutrients, the peel has been traditionally used as medicinal material for the treatment of various ailments such as burns, anemia, diarrhea, ulcers, inflammation, diabetes, cough, snakebite, and excess menstruation (Fries., et al., 1950)- (Vu., et.al.,2018). Banana peel is rich in dietary fiber, proteins, essential amino acids, polyunsaturated fatty acids, and potassium (González-Montelongo., et.al.,2010). Banana Peel includes various nutrients such as vitamin A, vitamin C, gallic acid, dopamine, vitamin E, vitamin B6, sitosterol, malic acid, succinic acid, palmitic acid, magnesium, phosphorus, potassium, fiber, and iron (Chabuck., et.al.,2013) Banana peel may contain tannins, which are important phytochemicals with a wide range of medicinal properties, including anticancer, anti-inflammatory, antioxidant, and antibacterial activities (Aboul-Enein., et.al.,2016)

IV. REVIEW OF LITERATURE:

MOUTH ULCER:

One kind of ulcer that develops on the oral cavity's mucous membrane is called a mouth ulcer. Other names for mouth ulcers are mucosal ulcers and oral ulcers. The origins of mouth ulcers are reddish in color and round or oval in shape (Sonali Nikam et.al.,2024). Poor oral hygiene, stress, indigestion, mechanical injury, food allergies, hormonal imbalance, microbial infection, skin illness, and other nutritional deficiencies especially those related to iron and vitamins B12 and C are the main causes of mouth ulcers (Shubham Mittal, Ujjwal Nautial.,2019).

TYPES OF MOUTH ULCER:

MINOR MOUTH ULCER:

Mild canker sores are small, oval or round ulcers. These typically have a diameter of 2 to 8 mm and can take anywhere from 10 to 14 days to clean up (Sonali Nikamet et, al.,2024).

MAJOR MOUTH ULCER:

Larger, deeper, and uneven borders typically 1 cm or more are characteristics of canker sores. Repairing these uneven margins may take up to six weeks. Largemouth ulcers carry the risk of leaving permanent scars (Sonali Nikam et.al.,2024).

HERPETIFORM:

Adults are most frequently affected with herpetiform canker sores, which are tiny and typically occur in clusters of 10 to 100. This kind of mouth ulcer has uneven margins and usually heals in one to two weeks without leaving any scars (Sonali Nikam et.al.,2024)

SYMPTOMS:

The main symptom of canker sores is pain, the canker sore may tingle, burn, or feel rough in the affected area of your mouth. Bread crusts, acidic fruits, and spicy foods might aggravate the pain by damaging the mouth's already sensitive lining. Additionally, it might hurt more because of the sound your mouth makes when you chew or speak (Sonali Nikam et.al.,2024).

V. HERBAL REMEDIES FOR MOUTH ULCER:

It is possible to develop an effective substitute for manufactured medications by using medicinal herbs. Worldwide, the usage of the medication derived from medicinal plants is steadily gaining traction (Sabir Shaikh et.al.,2018). The potential of herbal formulations to prevent and treat oral disease has been the subject of more exhaustive research in recent years. Herbs have long been used in traditional medicine to treat a variety of oral diseases, including periodontal diseases, dental caries, and oral cancer, among other major issues with oral health (Sabir Shaikh et.al.,2018). Herbal treatments are more commonly accepted by patients and the general public and have been utilized for a long time (Jitendra Kumar et.al.,2022).

VI. CHEMICAL COMPOSITION:

Tannis, phenols, triterpenoids, flavonoids, essential oils, saponins, carotenoids, lectins, vitamins, fiber, and fatty acids are all abundant in guava. In comparison to citrus fruits, guava fruit has a higher vitamin C content (80 mg/100g) and significant levels of vitamin A. Guava leaves contain a lot of flavonoids, including quercetin, which has anti-diarrheal properties (S. Anbuselvi and Jeyanthi Rebecca.,2017). The compounds derived from guava leaf extracts have multidirectional biological activities, including hypoglycemic, anticancer, and antioxidant properties (Manoj Kumar et.al.,2021). Guava leaves are known to have antibacterial qualities since they contain a variety of organic and inorganic antioxidants as well as anti-inflammatory chemicals (Manoj Kumar et.al.,2021). blossoming guava leaves demonstrated their anticoagulant properties in plasma by decreasing thrombin clotting time and blocking antithrombin III activity. Also, they inhibit the activity of two enzymes linked to the development of both diseases (xanthine oxidase and angiotensin 1-converting enzymes) in rat tissue homogenates, flavonoids, and phenolic acids in the leaves may help prevent and treat gout and hypertension (Elizabeth Díaz-deCerio et.al.,2017). Flavanol glycoside, flavanol glycoside, and naringenin are all present in Cavendish banana peel extract. Chemicals from banana peel extracts include lutein, α - and β -carotene, auroxanthin, violaxanthin, neoxanthin, β cryptoxanthin, is lutein, and α -cryptoxanthin. The primary phytochemicals found in fruits and vegetables that have an impact on human health are phenolics and carotenoids. The advantageous phytochemicals found in bananas are the main topic of this section. (Singh., et, al.,2016). One of the most significant foods high in antioxidants is the banana. A chemical is considered an antioxidant if, at low concentrations, it can delay, retard, or halt the oxidation or free radical-mediated oxidation of a substrate, resulting in the creation of stable radicals after scavenging (Singh., et, al.,2016). Bioactive substances such as flavonoids and phenolic acids, which have strong antitumor and antioxidant properties, are present in banana pulp (Borges et.al., 2014).

VII. AIM AND OBJECTIVE

AIM: Formulate gel for mouth ulcers by using ethanol extract of *Psidium guajava* and *Musa paradisiaca*.

OBJECTIVE:

1. Ethanol extraction of *Psidium guajava* and *Musa paradisiaca* by Soxhlet method.
2. To examine the phytochemical analysis of *Psidium guajava* and *Musa paradisiaca*.
3. To examine the Quantitative test for Flavonoids of ethanol extract of *Psidium guajava* and *Musa paradisiaca*.

To examine the anti-bacterial, and anti-fungal activity of the plants.

VIII. METHODOLOGY

COLLECTION OF PLANT SAMPLE (*Psidium guajava*):

The collected Guava leaves were washed with water and dried for 5 days. After drying the sample was grind using a grinding machine. After storing the sample for further use.

COLLECTION OF BANANA PEEL SAMPLE (*Musa paradisiaca*):

The banana peel was collected from different areas. The collected peel was sun-dried for 5 minutes. After drying the sample was grind using a grinding machine. After storing the sample for further use.

PREPARATION OF EXTRACT:

In both *Psidium guajava*, and *Musa paradisiaca*, 10 grams of powder was mixed in 100ml distilled water, after 5 minutes, the mixture was kept in a water bath for 15 minutes, and then cooled and filtered using the filter paper method. Then the extract was stored and used for the test.

IX. PHYTOCHEMICAL TEST FOR *PSIDIUM GUAJAVA* AND *MUSA PARADISIACA*:

The phytochemical analysis for the ethanol extract of *Psidium guajava* and *Musa paradisiaca*. Various phytochemical tests are done and they are Flavonoids, Triterpenoids, Steroids, Carbohydrate, Glycoside, Alkaloids, Tannins, Saponins, Phenols, Oils.

RESULT:**Table No:1 Phytochemical Analysis of *Psidium guajava* and *Musa paradisiaca***

Phytochemical Test	(<i>Psidium guajava</i>) positive/negative	(<i>Musa paradisiaca</i>) positive/negative
Alkaloid	+	+
Flavonoids	+	+
Tannins	+	+
Saponins	+	+
Steroids	+	-
Glycosides	+	+
Carbohydrates	-	+
Oils	+	-
Triterpenoids	+	+

INTERPRETATION:

Phytochemical analysis in *Psidium guajava* shows the presence of alkaloids, flavonoids, Tannis, saponins, steroids, glycosides, oils, and triterpenoids. This indicates the presence flavonoids of in oils can cure mouth ulcers. In *Musa paradisiaca* shows the presence of Alkaloids, Flavonoids, Tannis, Saponins, Glycosides, Carbohydrates, Proteins, Fats, and Triterpenoids. This indicates the presence of carbohydrates, Flavonoids, and Oils can prevent the fungal organism (ex: *Candida albicans*) from causing mouth ulcers.

X. QUANTITATIVE TEST ANALYSIS:

Quantitative analysis is determined for both the samples *Psidium guajava* and *Musa paradisiaca* for flavonoid testing. For analysis, Quercetin is the standard, extract as test samples, added Distilled water and made up to 4 ml. Sodium Nitrite (NaNO_3), Aluminum Chloride (AlCl_3) is added and incubate at room temperature for 5 minutes. After cooling add the Sodium Hydroxide (NaOH) and incubate at room temperature for 6 minutes, now using colorimeter the readings are noted at 400nm based on concentration.

RESULT:

Quantitative analysis has been done for ethanolic extract of *Psidium guajava* it shows the presence of flavonoids. 25.5µg of flavonoid is present in 1ml of *Psidium guajava* extract. Quantitative analysis has been done for ethanolic extract of *Musa paradisiaca*. It shows the presence of flavonoids. 20µg of flavonoid is present in 1ml of *Musa paradisiaca* extract.

INTERPRETATION:

The quantitative analysis of *Psidium guajava* for Flavonoids results in 1ml of *Psidium guajava* sample extract containing 2mg of flavonoids, which helps to cure from Anti-microbial and Anti-fungal properties. The Quantitative analysis of *Musa paradisiaca* for Flavonoid results in 1ml of *Musa paradisiaca* sample extract containing 2.5mg of flavonoids. Which has high anti-microbial and antifungal activity and can cure minor mouth ulcers.

XI. PREPARATION OF POLYHERBAL GEL FOR MOUTH ULCER:**PROCEDURE:**

0.1g of carbopol 934 is mixed with a few drops of distilled water and stirred continuously to form a gel consistency. On other side, 5 ml of distilled water and 0.1g of Methyl Paraben is diluted and kept for heating in Heating Mantle for few minutes. After cooling, add 0.05g of guava leaf powder and 0.03g of Banana peel to it, and made up to 10 ml using distilled water. Later pour the prepared mixture into carbopol and stir well continuously. Then add 200µg of Triethanolamine and the gel consistency is formed. Now the herbal mouth ulcer gel is formed.

RESULT:

The polyherbal gel was successfully prepared using a combination of *Psidium guajava* and *Musa paradisiaca* powder.



Fig No 1: Polyherbal Herbal gel for mouth ulcer

XII. ANTIMICROBIAL ACTIVITY:

To identify Anti-microbial Activity by using the Well Diffusion method

PROCEDURE:**1. Inoculate Agar Plates:**

Using a sterile loop, streak the surface of nutrient agar plates with a standardized bacterial culture. Ensure even distribution of the culture.

2. Prepare Discs:

Sterilize paper discs by autoclaving. Impregnate the discs with the antibiotic solution or the test substance of interest. Ensure that the concentration is consistent on each disc.

3. Create Wells:

Use sterile forceps to place the impregnated paper discs on the surface of the inoculated agar plates. Gently press the discs onto the agar to ensure good contact.

4. Incubation:

Incubate the agar plates inverted (lid down) at the appropriate temperature for bacterial growth (usually 37°C) for 16-24 hours

5. Examine Inhibition Zones:

After incubation, observe the plates for zones of inhibition around the discs. Inhibition zones are areas where bacterial growth is suppressed due to the action of the tested substance.

6. Measure Zones:

Use calipers to measure the diameter of the clear zones of inhibition in millimeters. This provides a quantitative assessment of antibacterial activity.

7. Control Plates:

Always include control plates, such as a positive control (known antibiotic) and a negative control (sterile disc impregnated with the solvent). This helps validate the assay. Larger inhibition zones indicate greater antibacterial activity. Compare the test substance's inhibition zones to those of the positive control to determine its effectiveness.

8. Interpretation:

Larger inhibition zones indicate greater antibacterial activity. Compare the test substance's inhibition zones to those of the positive control to determine its effectiveness.

9. Record and Report:

Record the results, including the diameter of inhibition zones and other relevant observations. The well diffusion method is a valuable tool for preliminary screening of antibacterial activity. It provides a visual representation of the effectiveness of substances against specific bacterial strains.

RESULT:

Antimicrobial test has been done for herbal gel and the test are anti-bacterial and anti-fungal by using microorganisms they are *Escherichia Coli*, *Candida spp.*, *Staphylococcus aureus*.

- *Escherichia coli* in the zone of inhibition - 9.0mm in diameter
- *Candida spp.* In the zone of inhibition - 8.0mm in diameter

- *Staphylococcus aureus* in the zone of inhibition - 10mm in diameter

DISCUSSION:

The antimicrobial activity of the herbal gel was evaluated using three different microorganisms, *Escherichia coli*, *Candida spp.*, and *Staphylococcus aureus*. The zones of inhibition were observed for each microorganism. *Escherichia coli* showed a zone of inhibition of 9.0 mm. This indicates that the gel possesses antibacterial activity against *Escherichia coli*. *Candida spp.* A zone of inhibition of 8.0 mm was observed against *Candida spp.*, The result indicates that the herbal gel may be effective against fungal infections. *Staphylococcus aureus* showed the largest inhibition zone of 10 mm against *Staphylococcus aureus*; this result indicates that the herbal gel is possesses antibacterial activity against *Staphylococcus aureus*.

XIII. PHYSICAL EXAMINATION:

PHYSICAL APPEARANCE:

Physical aspects such as look and color were evaluated.

4.10.2 MEASUREMENT OF pH:

The pH indicator strip was used to measure the herbal gel compositions' pH. Ten milliliters of distilled water were used to dissolve one gram of gel, which was then left for two hours. Three measurements of the formulation's pH were made, and the average results are given.

4.10.3 HOMOGENEITY:

Visual examination was used to check the homogeneity of all created gel compositions once the gels were placed in the container. They underwent testing to check for the existence and appearance of any aggregates.

4.10.4 SPREADABILITY:

Spread ability was assessed using glass slide equipment. 10 grams of weight were added to the pan, and it was recorded how long it took for the upper slide to fully detach from the fixed slide. On this ground slide, an extra 2 grams of the gel under investigation was put. The gel was sandwiched between this slide and another glass slide with a fixed ground slide and hook. For 5 minutes, a 1 kg weighted plate was placed on top of the slides to create a homogenous gel coating and eliminate air gaps. The excess gel was removed from the edges. The top plate was pulled with a line linked to the hook, and the time in seconds taken for the top slide to traverse a 2.5 cm distance was recorded.

Table No:2 Physical Examination of Mouth Ulcer Gel

Temperature	Physical Appearance	pH	Homogeneity	Spread ability
Room temperature	Brownish	8	Good	2 cm 3sec
Refrigerator temperature	Brownish	8	Good	2.5 cm 3 sec

XV. SUMMARY AND CONCLUSION:

The following provides an overview and conclusion of the study: The polyherbal gel for Aphthous stomatitis was prepared from the *Psidium guajava* and *Musa paradisiaca* and various analyses were done. Phytochemical Screening, quantitative analysis for flavonoids, anti-bacterial and anti-fungal activity, and physical examination, of the powdered form of *Psidium guajava* and *Musa paradisiaca* is determined. Numerous biochemical components were found in the phytochemical analysis of extracts like Alkaloids, Flavonoids, Tannins, Saponins, Steroids, Glycosides, Carbohydrates, Proteins, Fats, Oils, and Triterpenoids. The leaf extract of *Psidium guajava* and *Musa paradisiaca* included a significant number of flavonoids according to a quantitative examination. The Flavonoids present in both *Psidium guajava* and *Musa paradisiaca* indicate the wound healing properties. It was also discovered that the herbal gel exhibited a note-worthy degree of overall anti-microbial and anti-fungal activity. The polyherbal gel was examined under microorganisms like *Escherichia. coli*, *Staphylococcus aureus*, and *Candida albicans*. Under physical examination, the physical appearance in color, pH, homogeneity, spread ability, Additionally investigation of both samples like guava leaf and banana peel powder facilitates the discovery of biochemical components possessing medicinal qualities.

XVI . REFERENCES:

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