

Formulation and Evaluation of Herbal Anti-Ulcer gel to treat Mouth Ulcer.

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Abstract:

This study focuses on making a herbal mouth ulcer healing gel due to its higher cultural acceptability, greater compatibility with the human body, and lower risk of adverse effects. A mouth ulcer is an inflammatory condition that causes pain and is characterised by a yellowish or white depression with red margination. Gels are mostly liquid phases of semi-solid compositions that have been thickened with additional ingredients. Topical gel formulations are used to apply medication to the skin, allow for local action on a particular oral area, or allow for percutaneous penetration of medication. Small sores or abrasions that form in the mouth or along the gum line are called mouth ulcers. Oropharyngeal ulcers and cancer sores are other names for mouth sores. It is advised to treat mouth conditions with a variety of synthetic and semi-synthetic medications. The turmeric plant has long been used to treat a variety of illnesses, including rheumatism, diabetes mellitus, sore throats, coughs, and it also has antibacterial and anticancer properties. Curcuminoids, volatile (essential) oils, fibres, protein, carbs, and carotenoids are a few of the significant phytonutrients found in it. The plant *Curcuma longa*, a member of the ginger family (Zingiberaceae), is the biological source of turmeric.

Index Terms: Antiulcer, Gel, Turmeric, *Psidium guajava* linn, leaf extract, Mouthulcer.

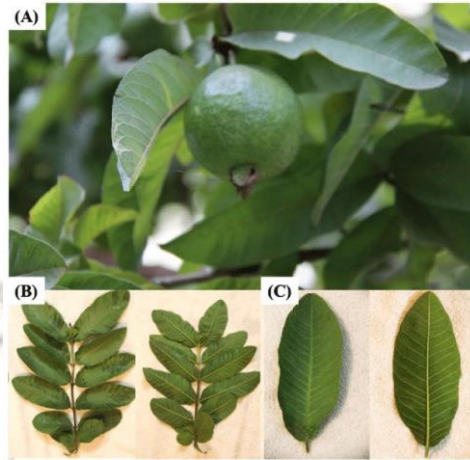
Introduction

Gels are classified as semi-rigid systems where the mobility of the dispersing medium is constrained by an interlacing three-dimensional network of particles or solvated super molecules of the dispersed phase. Gels often have a liquid phase that has been thickened with additional ingredients. They are semi-solid compositions in general. Topical gel formulations are utilised for local action on specific mucosal surfaces, percutaneous drug delivery, and skin application [1]. Small sores that form inside the mouth are known as mouth ulcers, which include canker sores. Mouth ulcers can be brought on by various accidents, allergies, or sensitivities; nevertheless, there is no known reason for them. Mouth ulcers can affect people of all ages. Most of the time, having a mouth ulcer is more of an inconvenience than a serious medical concern.



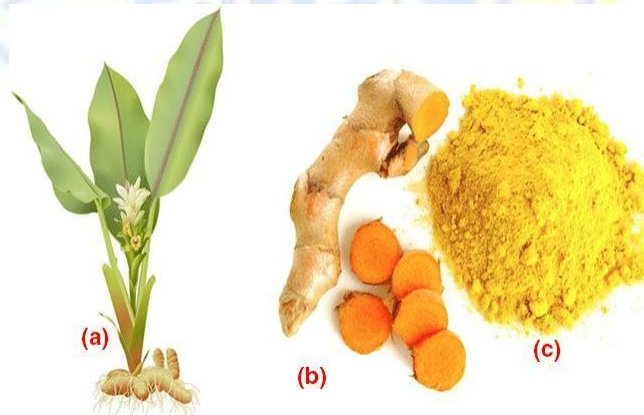
Mouth ulcer

Mouth ulcers are easy to spot. Mouth ulcers are visible immediately. The most common way they manifest themselves is as sores on your lips, gums, tongue, inner cheeks, or roof of your mouth. Mouth ulcers often have a white, yellow, or grey centre and are red around the edges. Herbal medicine (HM) is the foundation of complementary and alternative medicine (CAM), which has recently gained significant acceptance throughout the world and is progressively making its way into the established healthcare system.



Guava leaves and fruits

The Guava plant, *Psidium guajava* L., is a member of the Myrtaceae family of plants. Several indigenous medical systems use the well-known traditional medicinal herb *Psidium guajava*. It is abundantly available all over India. Guava (*Psidium guajava* L.) leaf tea has been used for centuries to treat a variety of ailments, including rheumatism, diarrhoea, diabetes mellitus, sore throats, coughs, and wounds. It also has antibacterial and anticancer properties. It includes significant phytoconstituents such as tannins, triterpenes, flavonoids like quercetin and guajanoic acid, saponins, carotenoids, lectins, leucocyanidin, ellagic acid, amritoside, beta-sitosterol, uvaol, and oleanolic and ursolic acids, among others [5].



Turmeric plant, rhizomes and powder

The plant *Curcuma longa*, a member of the Zingiberaceae family, is the biological source of turmeric. Diaryl heptanoids, a class of compounds that includes several curcuminoids including curcumin, demethoxycurcumin, and bisdemethoxycurcumin, are among the turmeric's phytochemical constituents. The *curcuma longa* plant's volatile oil has anti-inflammatory and anti-arthritis properties, and curcumin's water and fat-soluble extracts have significant antioxidant properties comparable to those of vitamin C.

Materials and equipments

Chemicals

Ethanol, Methanol, Carbopol 940, Methyl paraben, Propyl paraben, Propylene glycol 400, Triethanolamine, Distilledwater. All ingredients of analytical grade purchasedfrom MerckLtd and Thomas Baker Chemical Pvt. Ltd.

Equipments

Digital balance, pH meter, Magnetic stirrer, Digital water bath, Ultra sonicator, Brookfield LVDV – II + Pro viscometer.

Collection and authentication of plant materials

The leaves of plant *Psidium guajava* and rhizomes of *Curcuma longa* were collected from the local area of Digras, Yavatmal, Maharashtra, India in month of December 2022 and the plant specimens are authenticated by Qualichem laboratory, Nagpur.

Preparation of plant extracts

Guava leaves and turmeric rhizomes were cleaned by running water to get rid of any dust before being air dried in the shade for three to four weeks at room temperature. With the aid of a mechanical grinder and a 40-mesh sieve, the dried plant components were ground into a coarse powder. The powder was then put through cold maceration extraction using ethanol, methanol, and water to produce the appropriate extracts. 100 g of dried guava leaf powder and 100 g of turmeric powder were each macerated for 24 hours at room temperature with occasional shaking in 500 ml of ethanol, methanol, and water in a separate conical flask. After 24 hrs combination were sifted through utilizing basic filtration strategy and filtrates were gathered in discrete vessels. To get the concentrate the dissolvable were taken out from the filtrate under decreased tension by utilizing a rotational vaccum evaporator at 45-50°C [7].

Preparation of herbal gel

The exact amount of Carbopol 934 was mixed with an appropriate amount of distilled water while stirring continuously. Using a separate 5 ml of distilled water, the desired quantity of methyl paraben and propyl paraben were dissolved by heating it on a water bath. After cooling, propylene glycol was added to the mixture. *Psidium guajava* powder at various concentrations was added to the previously mentioned mixture, and distilled water was used to dilute it to a final amount of 20 ml. Finally, the Carbopol 934 gel was correctly combined with all of the ingredients while being continuously stirred, and triethanolamine was added drop by drop to the mixture to adjust the pH to the desired range (6.8–7) (Das, 2010).

Formulation table

The method describes above and the formulae weretabulated in Table. Along with control sample gel were prepared by addition of required quantity of *Psidium guajava* leaves extract and *Curcuma longa* rhizomes extract to prepared 1%, 2% and mixed mouth ulcer gel respectively [8].

Composition of various gel formulations

Ingredients	Quantity in gm or ml				
	F1	F2	F3	F4	F5
	-1%	-2%	-1%	-2%	(Mixe d)
Guava leaf extract	0.3	0.6	-	-	0.45
Turmeric rhizomeextract	-	-	0.3	0.6	0.45
Carbopol 940 (1%)	0.3	0.3	0.3	0.3	0.3
Methyl paraben(0.2%)	0.06	0.06	0.06	0.06	0.06
Propyl paraben(0.1%)	0.03	0.03	0.03	0.03	0.03
Propylene glycol 400 (5%)	1.5	1.5	1.5	1.5	1.5
Triethanolamine(1.2%)	0.36	0.36	0.36	0.36	0.36
Glycerine (1.5%)	0.45	0.45	0.45	0.45	0.45
Distilled water	Up to 30ml	Up to 30ml	Up to 30ml	Up to 30ml	Up to 30 ml

Percentage Yield

Weigh the empty container first, then the one containing the gel composition. Subtract the weight of the empty container from the weight of the container containing the gel formulation to get the practical yield. Then the percentage yield was calculated by

the formula given below:

$$\text{Percentage yield} = (\text{practical yield}/\text{theoretical yield}) \times 100$$

Percentage yield of gel formulations were reported in Table

Triethanolamine(1.2%)	0.36	0.36	0.36	0.36	0.36
Glycerine (1.5%)	0.45	0.45	0.45	0.45	0.45
Distilled water	Up to 30ml	Up to 30 ml	Up to 30 ml	Up to 30 ml	Up to 30 ml

Evaluation of Herbal gel:

Physical evaluation

- **Color:** The color of the formulations was checked by visual inspection.
- **Consistency:** The consistency of formulations was checked by applying on skin.
- **Odour:** The odour of the formulations was checked by mixing the gel in water and observing the smell.

Measurement of pH

The pH of gel formulations were determined by using digital pH meter. Take 1 gm of gel and dissolved in 10 ml of distilled water and keep aside for two hours. Then the measurement of pH of formulations become accomplished by using dipping the glass electrode completely into the gel system 3 instances and the common values are suggested.

Homogeneity

All prepared gel formulations were tested for homogeneity by visual inspection after the gels have been set in to the container. They were tested for their presence and appearance of any aggregates.

Viscosity

The measurement of viscosity of the formulated gel was determined by Brookfield Viscometer with spindle no. 1 at 25°C. The gels were rotated at speed 0.3, 0.6 and 1.5 rotations per minute and at each speed, the corresponding dial reading was noted. Then viscosity of the prepared gels were obtained by multiplication of the dial reading with factor given in the Brookfield Viscometer catalogues.

Spreadability

Spreadability is expressed in terms of time in seconds taken by two slides to slip off from gel that is placed in between the slides under the direction of certain load. If the time taken for separation of two slides is less then better the spreadability [12]. Spreadability is calculated by using the formula:

$$S = M \times L / T$$

Where M = weight tied to upper slide
L = length of glass slides
T = time taken to separate the slides

Spreadability of gel formulations were reported in.

Extrudability

Standard collapsible aluminium tubes with caps were filled with the prepared gel, and the ends were crimped shut to seal them. The weight of filled tubes was measured, and the tubes were clamped while being sandwiched between two glass slides. After placing a 500g weight over the slides, the cover was taken off to allow for extrusion. The amount of gel that was extruded was gathered and weighed. Calculating the percentage of extruded gel allowed researchers to determine extrudability.

When it is greater than 90% then extrudability is excellent.

When it is greater than 80% then extrudability is good. When it is 70% then extrudability is fair.

Clarity

The clarity of all the three batches was determined by visual inspection [14].

Gel strength

Gel strength was determined by the time in seconds required by the weight to penetrate in the gel. A 3.5 gm weight was placed on the surface of 5 gm formulated gel. Gel strength was determined by reporting the time in seconds required by the weight to penetrate 0.5 cm in the gel [10]. The gel strength was then reported in **Tables 9 and 10**.

Anti-fungal activity

By using the Cup-plate method, the antifungal activity of each optimised formulation and the blank formulation was evaluated in contrast to the antifungal formulation that is currently on the market (Daktarin oral gel). *Candida albicans* was used to carry out the test for antifungal activity. Bringing and pouring the prepared nutrition into sterile petri dishes, then setting them aside for cooling and drying. A micron wire loop was then used to distribute the *Candida albicans* culture. Holes 6 mm in diameter and 4 mm deep were drilled using a sterile cork borer. Place 0.5 gm of gel from each recipe into the holes after that. Plates were then incubated for 48 hours at 27°C. The zone of inhibition's (in mm) diameter was then determined.

Result and discussion

Physical evaluation

Physical evaluation of gel formulation

Formulations	Color	Consistency	Odour
F 1	Yellowish green	Good	Characteristic
F 2	Yellowish green	Good	Characteristic
F 3	Yellowish green	Good	Characteristic
F 4	Yellowish green	Good	Characteristic
F (mixed)	Yellowish green	Good	Characteristic

Percentage yield

Percentage yield of gel formulations

Formulations	Percentage yield (%)
F 1	96.986
F 2	98.113
F 3	95.425
F 4	96.996
F (mixed)	98.873

pH

pH of gel formulations

Formulations	pH
F 1	6.8
F 2	7.3
F 3	7.2
F 4	6.8
F (mixed)	6.9

Homogeneity

Homogeneity of gel formulations

Formulations	Homogeneity
F 1	Good
F 2	Good
F 3	Good
F 4	Good
F (mixed)	Good

Viscosity

Viscosity of gel formulation

Formulations	Viscosity (cps)
F 1	4700
F 2	4700
F 3	4800
F 4	4600
F (mixed)	4400

Spreadability

Spreadability of gel formulations.

Formulations	Spreadability (gm.cm/sec)
F 1	29.61
F 2	29.13
F 3	24.52
F 4	31.91
F (mixed)	33.23

Anti fungal studies**Antifungal studies of gel formulations.**

Formulations	Zone of inhibition(mm)
	<i>Candida albicans</i>
Standard drug	27
F (mixed)	24
Blank	14

From the above results it is clearly shows that all the prepared gel formulations was yellowish green in color and having good homogeneity and gelling property. The pH of all gel formulations was in the range compatible with normal pH range of the skin. The rheological behavior also indicates that the gels were neither too thick nor too thin. The spreadability shows that with increasing viscosity of formulation, spreadability decreases and vice versa. Extrudability study was done by pressing thumb and it's easily extendable. The gelling and bioadhesive strength of all the batches was found in the suitable range

Conclusion:

In present study, it was demonstrated that the developed herbal gel formulation possess significant, therapeutically efficacious, suitable vehicle for drug delivery in low cost but definitely with high potential. Developed new herbal gel formulation is suitable for mouth ulcer treatment. Natural remedies are more acceptable in the belief that they are safer with lesser side effects than the synthetic medicines. Nowadays herbal formulations have increasing demand in the world market. It is very good attempt to establish herbal gel of guava leaf extract with turmeric rhizome extract. The result showed that due to combination dosage form developed new herbal gel formulation having good antifungal activity as well as anti-inflammatory activity so it is safe, stable and good for mouth ulcer treatment.

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