

Formulation And Evaluation of Herbal Aqueous Gel for Mouth Ulcer Treatment

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Abstract—Mouth ulcers often cause pain and irritation of the sores by salty, spicy and sour food items and may cause discomfort while healing occurs due to the use of chemical formulations. This project focuses on the preparation of an herbal mouth ulcer healing gel because of better cultural acceptability, better compatibility with human body and lesser side effects. The gel was prepared by using alcoholic extract of Psidium guajava, and Aloe vera leaves and aqueous extract of liquorice. Developed formulations were transparent, homogeneous and pH ranges from 6.8-7. Formulation showed acceptable rheological behaviour with applicable Spreadability and Extrudability properties. Anti- fungal studies of formulations showed excellent efficacy against *Aspargillus aureus*, *Candida albicans*. Therefore, developed formulations have potential to treat mouth ulcers. However, further clinical studies are required to establish clinical efficacy of prepared herbal gels.

I. INTRODUCTION

The study of medicinal plants as a source of pharmaceutical chemicals has gained popularity all over the world. Plants are widely acknowledged as the primary therapeutic source for treating a variety of infectious ailments in impoverished nations like India. According to estimates from the World Health Organization, 6 million people and 80% of the world's population exclusively use traditional medicines for their basic medical needs.

The utilization of plant extracts or their active ingredients is a significant component of the treatment. Numerous scientists across the world have proven to humanity the efficacy of herbal therapy by conducting indepth research. India has a long history of medical knowledge based on plants. Plant-based medicines are progressively gaining popularity all over the world. About half of the top twenty-five pharmaceutical items in the world come from natural sources. Due to

their high levels of alcohol content and a few chemical components, commercially available gels with synthetic and semi-synthetic active ingredients have a number of drawbacks including tooth staining, irritation, and burning.

The current study focuses on the utilization of herbal powdered Guava, Aloe vera, and Acacia Leaves in pharmaceutical gel for the treatment of mouth ulcers. commonly referred to as Peru, guava, or amrud.

A biological source is *Psidium guajava* belongs to family Myrtaceae. Chemical composition contains Flavonoids, Terpinoids, Steroids, Carbohydrates, Oils, Lipids, Glycosides, Alkaloids, Tannins and Saponins. Used as Antioxidant, Antibacterial activity, Anti-inflammatory activity, Anticancer activity (Wang,2014).

When the *Acacia arabica* (family Mimosaceae) is widespread over dry and sandy areas of India. It is referred to as the "babul tree" and "Babul" locally. This plant has been identified as having the following chemical components: gum with Arabic acid mixed with calcium, magnesium, and potassium; a tiny amount of malic acid; sugar; moisture at 14%; and ash at 3-4%.

Tannin is present in considerable amounts in the bark; pods have a tannin content of about 22.44%.

Aloe vera belonging to the family Liliaceae is commonly known as "aloe gel." It is known as "Korphan" locally, and it may be found all over India. This plant contains the chemicals aloin, isobarbaloin, and emodin. Within Ayurveda. In America, leaves are successfully utilized to treat localized chronic ulcers. When a few weeks, the ulcers heal after the pain gradually lessens.

Aloe vera powder and gum acacia were mixed in recent studies, and the resulting solution was given

orally to rats at a dose of 200 mg/kg to treat gastric ulcers brought on by indomethacin. The extract exhibited strong antiulcer activity that was comparable to the control. Herbal medicine is important from a medical and financial aspect. Although the benefits of herbal medicines have grown, industrialized and developing nations place a higher priority on their safety, effectiveness, and quality. Patients are taking herbal treatments more frequently because they avoid the common adverse effects of allopathic medications. It is not surprising that 2 billion people, or one-fourth of the world's population, rely on traditional medicines to cure a variety of illnesses. Since the beginning of time, medicinal plants have been a significant source of treatments for human illnesses.



Fig 1: Herbal Aqueous Gel Solution Mouth Ulcer:

Mouth ulcers are painful, tiny sores that generally appear in the mouth or at the gum line. Eating, drinking, and talking may become awkward around them.

Canker sores and sores caused on by hand, foot, and mouth diseases are two examples of mouth ulcer types. Mouth ulcers are rarely communicable and often go away on their own in 1 to 2 weeks.



Fig 2: Mouth ulcer Diagnosis of Mouth Ulcer:

Physician will be able to diagnose mouth ulcers through a visual exam. Patient might be tested for other medical conditions if you have frequent, severe mouth ulcers.

Aphthous Ulcer:

Aphthous ulcer is another name for a canker sore. The medical term “aphtha” has a few definitions but is mostly used to refer to a small ulcer.

Usually, self-treatable.

Causes:

Mouth ulcers have no known primary cause, but a number of risk factors and triggers have been discovered.

An increased risk of getting mouth ulcers is seen in infants and young children, adolescents, and people with a family history of the condition.

Triggers Include:

- a) Minor mouth injury from dental work, hard brushing, sports injury, or an accidental bite
- b. Dental braces
- b) Toothpaste or mouthwash that contains sodium lauryl sulphate (SLS)
- c) An allergic response to oral bacteria
- d) Bacterial, viral, or fungal infections in the mouth, such as hand, foot, and mouth disease
- e) Sensitivities to acidic foods and beverages like strawberries, citrus fruits, pineapple, chocolate, and coffee
- f) Certain nutrient deficiencies, especially vitamin B9 (folate), vitamin B12, zinc, and iron
- g) Hormonal changes, such as those that occur during menstruation or pregnancy

Emotional stress j. Lack of sleep

Mouth ulcers can also be a sign of conditions that are more serious and require medical treatment, such as:

- a) Celiac disease
- b) Inflammatory bowel disease (IBD), including ulcerative colitis
- c) Diabetes
- d) HIV
- e) Some autoimmune diseases, including:
- f) Lupus
- g) Oral lichen planus Symptoms:

Symptoms of mouth ulcers may vary depending on their cause, but they typically include: a. Painful sores that may be yellow, white, or red b. Sores on the inside of the mouth, such as on your tongue or the insides of your cheeks or lips c. Areas of redness surrounding the sores d.

Pain that worsens when you eat, drink, or talk Types of Mouth Ulcers:

You may have more than one mouth ulcer at the same time.

Mouth ulcers are not usually contagious unless they're caused by an infection such as hand, foot, and mouth disease.

Canker sores are the most common type of mouth ulcer, with 20% of people having a canker sore at least once. There are three main types of canker sores:

- 1. Minor
- 2. Major
- 3. Herpetiform

1. Minor Canker Sore:

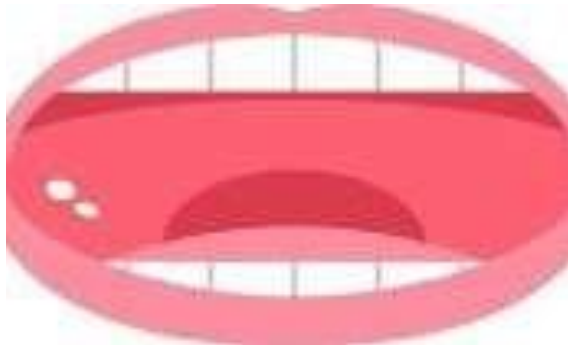


Fig 3:

Minor canker sores are small oval or round ulcers measuring under 5 millimeters (mm). They heal within 1 to 2 weeks and don't cause scars. According to DermNet New Zealand, 80% of people with canker

sores have minor canker sores, making them the most common type.

2. Major canker sore



Fig 4:

Major canker sores are larger and deeper than minor ones. They often measure over 10 mm.

They have irregular edges and can take weeks or months to heal. Major canker sores can result in long-term scarring.

Heals within 6 weeks.

3. Herpetiform canker sore



Fig 5:

Herpetiform canker sores are pinpoint-sized, occur in clusters, and often appear on the tongue. Sometimes the clusters can merge to form one large sore.

Herpetiform canker sores have irregular edges and often heal, without scarring, within 1 month.

They're called "herpetiform" because they may resemble the sores caused by herpes.

Herpetiform canker sores are not otherwise associated with herpes infection. Heals within 2 weeks.

Mouth Ulcer Treatment:

Most mouth ulcers don't need treatment.

However, if you get mouth ulcers often or they're extremely painful, a number of treatments and home remedies can decrease pain and healing time. These

include: a. covering the ulcer with a paste made from baking soda

- a) using other topical pastes
- b) placing milk of magnesia on the ulcer
- c) using a mouth rinse made from salt water and baking soda
- d) using a mouth rinse that contains a steroid to reduce pain and swelling
- e) applying ice to the ulcer
- f) placing a damp tea bag on the ulcer
- g) taking supplements if you have deficiencies in certain nutrients, including vitamin B9 (folate), vitamin B12, zinc, and iron
- h) using over-the-counter topical products that are made with benzocaine, like Orajel and Anbesol
- i) trying natural remedies, such as echinacea, myrrh, and licorice root (may come in various forms, like teas or oils)

Prevention of Mouth Ulcer:

a. Avoid specific food products:

Try not to consume foods that are spicy, too salty, or acidic that can irritate your mouth. If you are aware of foods that you are allergic to, avoid them completely.

b. Have a balanced diet:

Plan your meals in such a way that your food becomes your medicine. By having a balanced diet, you tend to reduce the scope of any nutritional deficiency, and possibly limit the frequency of canker sores. As always, be sure to include fresh fruits, vegetables, and whole grains in your diet.

c. Avoid oral irritation:

People who wear braces tend to bruise their lips, gums, or tongue with their orthodontia's sharp edges, causing oral irritation. Conversely, if you have a sharp tooth or other natural oral protrusion, canker sores may also emerge at those points of aggravation. Consult your orthodontist or dentist to try and limit these factors.

d. Maintain oral hygiene:

Keeping your mouth clean with regular tooth-brushing and flossing can help reduce oral ailments encase. Just be sure to always use a soft toothbrush and follow the proper brushing technique. Note: Not only can vigorous tooth-brushing be a possible trigger for a canker sore formation, but it can also harm your gums and wear down your tooth enamel.

Lower your stress levels: If stress triggers your canker sores, try some stress relieving activities like mindful breathing or meditation.

Herbal Aqueous Gel:

The word "gel" was coined by 19th Century Scottish Chemist Thomas Graham by Clipping from gelatin. A gel is a semi-solid that can have properties ranging from soft and weak to hard and tough.

Gels are defined as a substantially dilute cross-linked system, which exhibits no flow when in the steady-state, although the liquid phase may still diffuse through this system.

A gel has been defined phenomenologically as a soft, solid or solid-like material consisting of two or more components, one of which is a liquid, present in substantial quantity.

By weight, gels are mostly liquid, yet they behave like solids because of a three-dimensional cross-linked network within the liquid. It is the crosslinking within the fluid that gives a gel its structure (hardness) and contributes to the adhesive stick (tack). In this way, gels are a dispersion of molecules of a liquid within a solid medium.

The process of forming a gel is called gelation.

An Herbal Aqueous Gel is defined as a semisolid formulation containing herbal components extracted from plants as a main ingredient and excipients intended for topical use.

Due to their higher cultural acceptance, better compatibility with the human body, and less side effects, herbal medicines continue to be the major form of primary healthcare for around 75– 80% of the world's population, primarily in developing nations.

Herbal remedies are substances found in plants or parts of plants that are used to treat wounds, infections, and illnesses, as well as to promote health and healing. It is a medication or preparation made from a plant or plants that can be utilized for a variety of objectives. The earliest type of medical treatment that humans have ever used is herbal medicine.

The herbal mouth ulcer gel contains:

1. Powdered Guava
2. Aloe Vera
3. Acacia

II. LITERATURE REVIEW

- 1) R. Bhramaramba et al., zzi. Sudheer Babu², Ch. Divya Naga Deepthi – studied the Formulation Development and Evaluation of Unit Moulded Herbal Semisolid Jelly useful in treatment of Mouth Ulcer. international Journal of PharmTech Research ODEN (USA): IJPRIF ISSN: 0974-4304 Vol.3, No.3, pp 1705-1713, July-Sept 2011
- 2) Y. Thorat, Asha M. Sarvagod, et al. – +1 author A. Hosmani Published 2 September 2015 Medicine International Journal of Pharmacy and Pharmaceutical Sciences studied the Treatment of mouth ulcer by curcumin loaded thermoreversible mucoadhesive gel.
- 3) Abhay Rathod, Mr. Madane et al. – studied the formulation and evaluation of herbal aqueous gel for mouth ulcer treatment. the data reported in this study revealed that the produced herbal gel formulation had significant therapeutic efficacy and was a good delivery system for drugs at a reasonable cost but undoubtedly with tremendous potential. A newly created herbal gel mixture is effective for treating mouth ulcers.
- 4) Sabir Shaikh, Amol Shete, Rajendra Doijad, Et al. – studied the formulation and evaluation of pharmaceutical aqueous gel of powdered guava leaves for mouth ulcer treatment. The data presented in this 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.
- 5) Mohd. Asif Dosani¹, Sakarkar D.M., Kosalge S.B., Sheikh Shafiq, et al – International Journal of PharmTech Research CODEN (USA): IJPRIF ISSN: 0974-4304 Vol.3, No.3, pp 1705-1713, July-Sept 2011 studied the -Formulation Development and Evaluation of Unit Moulded Herbal Semisolid Jelly useful in treatment of Mouth Ulcer.

III. PLAN OF WORK

1. literature survey
2. Selection of drug
3. Collection of plant material
4. preparation of herbal gel
5. Evaluation of Aq.gel

- Physical Appearance
 - PH measurement
 - Homogeneity
 - Viscosity
 - Spreadability
 - Clarity
 - Gel strength
 - Bioadhesive strength
6. Result and conclusion

IV. DRUG PROFILE

1. Guava:



Fig 6:

Botanical Name: Psidium guajava, linn

Family: Myrtaceae

Origin: Tropical America (from Mexico to Peru)

Guava is a subtropical crop. It is one of the most common and major fruits of India and is considered the fourth most important fruit in area and production after mango, banana, and citrus. It is a hardy and prolific bearer and highly remunerative fruit. Guava is native to tropical America and seems to have been growing from Mexico to Peru. It is believed to be introduced in to India during early 17th century. In A.P it is commercially grown in Telangana, North coastal districts and Anantapur in Rayalaseema. Guava is the rich source of Vitamin C, and a fair source of Vitamin A and B2 and minerals like calcium, phosphorus and iron. The vitamin C content of Guava is 2-5 times higher than oranges.

Guavas may help boost heart health in a number of ways.

Many scientists believe that the high levels of antioxidants and vitamins in guava leaves may help

protect your heart from damage by free radicals (6Trusted Source).

The higher levels of potassium and soluble fiber in guavas are also thought to contribute to improved heart health.

Additionally, guava leaf extract has been linked to lower blood pressure, a decrease in “bad” LDL cholesterol, and a rise in “good” HDL cholesterol (7Trusted Source).

Since high blood pressure and high levels of LDL cholesterol are linked to higher risks of heart disease and stroke, taking guava leaf extract could lead to valuable benefits.

What’s more, the fruit may have benefits for heart health as well.

A 12-week study in 120 people found that eating ripe guava before meals caused an overall decrease in blood pressure by 8–9 points, a reduction in total cholesterol by 9.9%, and an increase in “good” HDL cholesterol by 8% (8Trusted Source).

This same effect has been seen in several other studies

2. Aloe Vera:



Fig 7:

Botanical Name: Asphodelaceae

Family: Asphodelaceae (Liliaceae)

Kingdom: Plantae

Origin: Aloe vera originated in the Arabian Peninsula. Notably, this is right on the northernmost extreme of the natural range of aloes, where conditions are extremely hot and dry.

Several species are cultivated as ornamentals for their attractive architectural leaves and colorful flowers. Spiral aloe (*Aloe polyphylla*) is a popular specimen for its compact geometric spiral of spiny leaves. Arabian aloe (*A. rubroviolacea*) has long blue-green leaves with red teeth and is planted outdoors in warm climates; the leaves turn red if exposed to full sun.

Snake, or mountain, aloe (*A. broomii*) is a common potted plant grown for its dense rosette of triangular leaves with dark teeth.

The juice of some species, especially the popular potted plant known as true aloe (*Aloe vera*), is used as an ingredient in cosmetics and in medicine as a purgative and as a treatment for burns. The gelatinous interior of the leaves is commonly applied directly to the skin as a beauty treatment or to soothe sunburns.

Aloe Vera or *Aloe barbadensis* is a plant with a short stem that stores water in its leaves. It is also known as ‘Ghrirkumari’ in Hindi. The leaves are greenish in colour with serrated margins. Aloe Vera is excellent for our health. The gel present in the leaves can be consumed by making juice out of them. Aloe Vera contains vitamin C, vitamin E, vitamin B9, and vitamin B12. It also contains minerals like calcium, copper, sodium, magnesium, potassium, selenium, manganese. Aloe Vera application on the skin helps to keep skin hydrated, improves elasticity and prevents the development of wrinkles. The aloe vera benefits extend further, keeping the skin glowing and soft, while also acting as a preventive measure against acne. Applying a thin layer of aloe vera gel for the face can help alleviate sunburn, moisturize, and enhance the skin’s overall radiance. e, zinc etc.

3. Acacia:



Fig 8:

Botanical Name: Acacia

Family: Fabaceae

Kingdom: Plantae

Origin: Australia, South Africa, the Southwestern United States, and South and Central America.

Several acacia species are important economically. Gum acacia (*Acacia senegal*), native to the Sudan region in Africa, yields true gum arabic, a substance used in adhesives, pharmaceuticals, inks, confections,

and other products. The bark of most acacias is rich in tannin, which is used in tanning and in dyes, inks, pharmaceuticals, and other products. Several Australian acacias are valuable sources of tannin, among them the golden wattle (*A. pycnantha*), the green wattle (*A. decurrens*), and the silver wattle (*A. dealbata*). A few species produce valuable timber, among them the Australian blackwood (*A. melanoxylon*); the yarran (*A. omalophylla*), also of Australia; and *A. koa* of Hawaii. Many of the Australian acacia species have been widely introduced elsewhere as cultivated small trees valued for their spectacular floral displays.

Once the second largest genus in the pea family with over 1,000 species, *Acacia* has undergone a number of major taxonomic revisions to better reflect its phylogeny (evolutionary history); many former species are now placed in the genera *Vachellia* and *Senegalia*.

V. MATERIAL AND METHOD

1. Collection of Plant Materials:

Psidium guajava, aloe vera, and acacia leaf fresh plant materials were collected from my farmhouse.

Fresh plant leaves were washed with running tap water and distilled water before being dried in the shade.

All additional analytical-grade components were bought from local chemicals store.



Fig 9: Extraction apparatus: Extraction of Guava Powder by Using Soxhlet Apparatus.

Properties of Gel

1. The gelling agent must be inert, safe and cannot react with other constituents.
2. The gelling agent should produce a functional solid-like nature at the time of storage which is easily broken when exposed to shear forces produced by squeezing the tube, trembling the bottle or at the time of topical application.
3. It should have appropriate anti-microbial agent.
4. The topical gel must not be gluey.
5. The ophthalmic gel must be sterilized.
6. The apparent viscosity or gel strength increases with an increase in the effective crosslink density of the gel.
7. They exhibit the mechanical features of the solid state.
8. Each constituent is continuous throughout the system.
9. There is high degree of attraction amongst the dispersed phase and water medium so the gels remain equally distributed upon standing and doesn't freely settle.

2. Preparation of Herbal Gel:

1. With constant stirring, the specified amount of Carbopol 934 was dissolved in the necessary amount of distilled water.
2. The necessary amounts of methyl paraben and propyl paraben were dissolved in 5 ml of distilled water by heating on a water bath, and then propylene glycol was added when it had cooled.
3. *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.
4. Specific amount of menthol and sucrose was added in it, as a flavouring agent.
5. 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.

The composition of herbal gel prepared from the powdered guava leaves coded as F1, F2, and F3, tabulated in Table. The composition of herbal gel prepared from the powdered guava leaves coded as F1, F2, and F3 is tabulated in Table

Table 1:

Ingredients	F1	F2	F3
Guava leaves powder	2%	1%	0.5%
Aloe vera leaves powder	2%	1%	0.5%
Acacia Leaves Powder	2%	1%	0.5%
Menthol powder	1 %	1%	0.5%
Sucrose	1%	1%	1%
Carbopol 934	2%	2%	2%
Methyl Paraben	0.0015 %	0.0015 %	0.0015 %
Propyl Paraben	0.01%	0.01%	0.01%
Triethanolamine	q.s + pH 6.5-7	q.s + pH 6.5-7	q.s + pH 6.5- 7
Distilled water	Up to 20ml	Up to 20 ml	Up to 20 ml

3. Evaluation of Herbal Gel:

• Physical Appearance:

Physical characteristics including colour and appearance were examined.

• pH Measurement:



Fig 10: PH measurement

Using a digital pH metre, the pH of herbal gel compositions was assessed. 10 ml of distilled water were used to dissolve 1 g of gel, which was then set aside for two hours.

Three measurements of the formulation's pH were made, and the average results are provided. In table no. 2, the pH of the gel formulation was listed.

• Homogeneity:

After the gels had been placed in the container, visual inspection was used to check for homogeneity in all generated gel compositions.

They were examined for the presence of any aggregates and how they looked. In table no. 2, homogeneity of the gel formulation was recorded.



Fig 11:

• Viscosity:

A Brookfield viscometer was used to determine the viscosity (DV-III programmable Rheometer). At 250C, formulated gels underwent rheological behavior testing.

The measurement covered a speed range of 10 to 100 rpm, with a pause of 30 seconds between each speed before proceeding in reverse.



Fig 12:

• Spreadability:

Wooden blocks and a glass slide were used to determine spreadability.

Weights weighing around 20 grams were added to the pan, and the duration it took for the upper slide to entirely detach from the fixed slide was recorded. This ground slide has 2 gram of extra gel that was being studied on it.

The gel was then placed in a sandwich between this glass slide and another slide with a fixed ground slide

and a hook. To generate a consistent gel film and remove air between the slides, a 1 kg weighted was placed on top of the slides for 5 minutes. On the edges, extra gel was scraped off.

The top plate was then pulled with the aid of a line linked to a hook, and the amount of time, in seconds, needed for the top slide to travel 7.5 cm was recorded. Better spreadability is indicated by a shorter or smaller interval.

Spreadability of gel was calculated using the following formula.

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

Where, S = Spreadability,

M = Weight in the pan which is tied to the upper slide,

L = Length moved by the glass slide

T = Time in second taken to separate the slide completely each other.

Spreadability of gel was reported in table no 2.

Clarity:

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



Fig 13

- Gel Strength:

Gel strength was determined by the time in seconds required by the weight to penetrate in the gel. A Sample amount of 5 gm of each of the optimize batches was taken and 3.5 gm weight was placed on the surface of gel.

The time in seconds required by the weight to penetrate 0.5 cm in the gel. The gel strength was then reported in table no 3.

- Bioadhesive Strength:

A glass slide and wooden block apparatus were used to measure Bioadhesive strength. The force necessary to

separate the formulation from the cellophane membrane is measured by the Bioadhesive strength.

A predetermined amount, or 1 gm of prepared gel, was placed on a glass slide and covered in cellophane. The glass slide provided intimate contact when it was placed on the fixed slide. To achieve close contact between the formulation and membrane, a two-minute contact time was allowed. Up until the slides came off the contraption, weight was added to the pan.

The formula was used to calculate the Bioadhesive force, which was expressed as the detachment stress in dyne/cm² (Jaiswal, 2012).

In table No. 3, the Bioadhesive strength was reported.

$$\text{Detachment stress} = m \cdot g / A$$

Where, m = Weight required to detach two glass slides from each other (gm). g = Acceleration due to gravity i.e.

980/s². A = Area of membrane exposed (cm²).

VI. RESULTS

The results strongly indicate that all of the produced gel compositions are with excellent homogeneity and gelling.

All gel compositions had pH levels that were in the range that is suitable with the skin's typical pH range. With this, the rheological behaviour was investigated. rheometer with a measurement range of 2.92 to 3.111 Pa. S. that is showed that the gel's consistency wasn't either thin or too little. Investigation of spreadability shows that when formulation viscosity increases reduced spreadability and vice versa. By pushing thumb, an extrudability investigation was conducted, and it's extended with ease. The bio adhesive strength and gelling of all the batches were found to be in the desired range.

Aspergillus aureus and Candida albicans are the primary microorganisms responsible for mouth ulcers, and all three batches of the produced formulation shown antifungal activity against these two microorganisms.

The formulation can also be used to treat mouth ulcer infection. The powdered guava leaves contain flavonoids and hence exhibit a significant antioxidant effect.

VII. CONCLUSION

The data reported in this study revealed that the produced herbal gel formulation had significant therapeutic efficacy and was a good delivery system for drugs at a reasonable cost but undoubtedly with tremendous potential. A newly created herbal gel mixture treating mouth ulcers.

Nowadays there is a lot of demand for herbal formulations in the market due to their cost effectivity and absence of any side effects. From the above experimental data it is clear that a gel formulation with herbal ingredients such as aloe,neem and tulsi has good characteristics, viscosity and also possesses a good antimicrobial activity which is necessary in the management of mouth ulcers.

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