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Evaluation and Formulation of Herbal Aqueous Gel for Mouth Ulcer Treatment

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Abstract: Mouth ulcers are common oral lesions that cause significant discomfort and interfere with daily activities such as eating and speaking. The present study focuses on the formulation and evaluation of a herbal aqueous gel for the effective treatment of mouth ulcers. Herbal extracts known for their antiinflammatory, antimicrobial, and wound-healing properties—such as aloe vera, clove oil, licorice, and turmeric—were incorporated into an aqueous gel base. The formulation was prepared using a suitable gelling agent and evaluated for physical characteristics like pH, viscosity, spreadability, and stability. In vitro antimicrobial studies and wound-healing assessments were also conducted. The results indicated that the herbal gel possessed desirable physicochemical properties and demonstrated significant healing potential, making it a promising natural alternative for mouth ulcer management.

Keywords: Mouth ulcers

I. INTRODUCTION

Mouth ulcers, also known as aphthous ulcers or canker sores, are small, painful lesions that develop inside the mouth. They commonly appear on the inner cheeks, lips, tongue, or the floor of the mouth. These ulcers are usually round or oval with a white or yellow center and a red border. Though generally harmless and self-limiting, mouth ulcers can cause significant discomfort, especially when eating, drinking, or speaking.

Mouth ulcers can be triggered by various factors. Common causes include accidental biting of the inside of the mouth, irritation from dental appliances like braces, stress, hormonal changes, nutritional deficiencies (particularly of vitamin B12, iron, and folic acid), food sensitivities, and certain medical conditions such as celiac disease, Crohn's disease, or a weakened immune system. In some cases, no clear cause is identified.

There are different types of mouth ulcers, with the most common being minor aphthous ulcers. These usually heal within one to two weeks without scarring. Major aphthous ulcers are larger and deeper, taking longer to heal and possibly leaving scars. Herpetiform ulcers, although less common, consist of clusters of multiple small sores and can be particularly painful.

While mouth ulcers typically resolve on their own, treatment may involve topical medications, mouth rinses, or avoiding spicy and acidic foods to reduce pain and inflammation. Maintaining good oral hygiene and addressing underlying causes can help prevent recurrence. In persistent or unusually severe cases, medical

Causes of mouth Ulcer

1. Physical or Mechanical Injury

Biting the inside of the cheek or tongue Brushing too hard

Ill-fitting dentures or braces

Accidental burns from hot food or drinks

Nutritional Deficiencies
Lack of vitamin B12, folate (B9), iron, or zinc
Poor nutrition can impair healing and immune response

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3. Stress and Anxiety Emotional stress weakens the immune system Mental fatigue and poor sleep may trigger ulcers

4. Hormonal Changes

Common in women during menstruation, pregnancy, or menopause

5. Food Sensitivities

Trigger foods include citrus fruits, tomatoes, chocolate, nuts, and spicy or acidic foods Sodium lauryl sulfate (SLS) in toothpaste may also cause irritation

6. Medical Conditions Celiac disease Crohn's disease Ulcerative colitis Behçet's disease HIV/AIDS Autoimmune disorders

7. InfectionsViral: Herpes simplex virus (cold sores)Bacterial: Secondary infections from trauma Fungal: Oral thrush (Candida)

Types of mouth Ulcer

Mouth Ulcer can be classified into three primary types based on their size, appearance, and healing time. 1) Minor Ulcer

2) Major Ulcer

3)Herpetiform Ulcer



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Treatment

Mouth Ulcer often heal on their own within 1-2 weeks., but tratments can help reduce pain, speed up healing, and prevent recurrence. Here are some treatments for trating mouth ulcers:-

1. Home Remedies

- Saltwater rinse: Mix 1 tsp of salt in warm water, swish for 30 seconds. Baking soda rinse: Neutralizes acids and soothes pain.
- Honey: Has antimicrobial and soothing properties. Coconut oil: Antibacterial and healing.
- Aloe vera gel: Speeds up healing and reduces pain.

2. Over-the-Counter (OTC) Treatments

- Topical anesthetics: e.g., benzocaine (Anbesol, Orajel) Protective pastes: e.g., Orabase with benzocaine
- Antiseptic mouthwashes: e.g., chlorhexidine gluconate Hydrogen peroxide-based rinses: Clean the ulcer area

3. Prescription Treatments (if severe or recurring)

- Corticosteroid gels or rinses: E.g., triamcinolone or dexamethasone.
- Oral medications: In cases of severe or frequent ulcers, doctors may prescribe drugs like colchicine or even low-dose steroids.

4. Lifestyle & Prevention Tips

- Avoid spicy, acidic, or rough foods. Maintain good oral hygiene.
- Identify and avoid triggers (e.g., stress, certain foods, SLS in toothpaste). Use a soft-bristled toothbrush.

Prevention

Preventing mouth Ulcer involves lifestyle changes, dietary adjustment, and proper oral hygiene. Here are effective strategies to reduce the risk of developing them

1. Oral Hygiene and Care

- Use a soft-bristled toothbrush to reduce trauma Brush gently with fluoride toothpaste
- Avoid toothpastes containing sodium lauryl sulfate (SLS), which may irritate the mucosa Floss daily to reduce plaque buildup and gum irritation
- Use alcohol-free mouthwashes to avoid drying and irritation
- Regular dental checkups to identify and fix sharp teeth or appliances causing injury

2. Diet and Nutrition

- Maintain a balanced diet rich in fresh fruits, vegetables, and whole grains
- Ensure adequate intake of vitamins B12, C, folate, and minerals like iron and zinc either through diet or supplements if needed (after medical advice)
- Avoid or limit acidic, spicy, and salty foods known to trigger ulcers Identify and avoid any specific food allergies or intolerances

3. Stress Management

- Practice stress reduction techniques: mindfulness, meditation, yoga, regular exercise
- Get enough sleep and maintain a healthy lifestyle to support immune function

4. Avoid Mouth Trauma

- Avoid habits like cheek or lip biting
- Use protective dental guards if grinding teeth at night byright to IJARSCT DOI: 10.48175/IJARSCT-27368

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• Be cautious while eating hard or sharp foods (chips, crusty bread)

Herbal Aqueous Gel

"Herbal Aqueous Gel" is a general term that can refer to any gel formulation that is water-based (aqueous) and contains herbal ingredients. Here's a breakdown of typical information related to such products:

A Herbal Aqueous Gel is a topical preparation made by suspending or dissolving herbal extracts in a water-based gel medium. It's commonly used for skincare, pain relief, or therapeutic purposes.

Uses of Herbal Aqueous Gel:-

- 1. Moisturizer Hydrates the skin without clogging pores.
- 2. Anti-inflammatory Soothes irritated or inflamed skin.
- 3. Wound Healing Promotes faster healing of minor cuts, burns, or abrasions.
- 4. Acne Treatment Reduces pimples and blackheads due to its antibacterial properties.
- 5. Muscle or Joint Relief Used in formulations with herbs like menthol, camphor, or arnica to relieve pain.
- 6. After-sun Care Calms sunburned skin.
- 7. Carrier Gel Used to deliver active ingredients in cosmetic or therapeutic treatments.

Formulation

Formulating a herbal aqueous gel for mouth ulcer treatment involves selecting suitable herbal extracts known for their anti-inflammatory, antimicrobial, analgesic, and wound- healing properties, and incorporating them into a biocompatible, water-based gel base.

Ingredients

Herbal Extracts:-

1) Aloe Vera Gel-

Aloe vera is a succulent plant known for its thick, fleshy leavesgel-like substance with medicinal properties.



2) Honey-

Honey, especially raw honey, has been used for centuries for its healing properties, and it's particularly effective in treating mouth ulcers.



3) Clove Oil-

Clove oil is a powerful natural reamedy for mouth ulcer due to it's analgesic, anti- inflammatory, and antimicrobial properties. The active compound eugenol in clove oil providies pain relief and helps reduce swelling.

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4) Turmeric extract-

Turmeric, specifically it's active compounds curcumin, is known for its anti- inflammatory, antimicrobial, and healing properties, making it a benificial natural remedy for mouth ulcers.



5) Licorice Root Extract-

Licorice root, especially it's active compound glycyrrhizin, has been used for centuries for it's healing properties. It is known for its ability to soothe and treat mouth ulcers effectively.



Gel base (hydrophilic gel)

(i) Agar-agar

Agar-agar can be useful ingredients in Formulation for mouth ulcer treatment, although it is more commonly known for its use as agelling agent in food. However, it has potential benificial in topical treatments, including for mouth ulcers



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(ii) Carbomer-

Carbomer is widely used as agelling agent. When mixed with water and nectralized, it forms a thick, smooth gel. This gel can create a protecttive layer over the ulcer, shielding it from external irritants such as food, drink, or accidental contact.



Procedure

Step 1: Prepare Herbal Aqueous Extracts

- Take dry or fresh herbal material, crush or grind if necessary. Boil in distilled water (1:10 w/v) for 15–20 minutes.
- Cool and filter through muslin cloth or Whatman filter paper. Concentrate the extract (if needed) and store refrigerated.

Step 2: Prepare Gel Base

• Disperse Carbopol 940 (0.5–1% w/w) slowly in purified water with continuous stirring. Allow to hydrate for 2 hours at room temperature.

Step 3: Incorporate Herbal Extracts

• Slowly add the filtered aqueous herbal extracts into the gel base. Stir gently to avoid air bubbles.

Step 4: Adjust pH

• Use Triethanolamine (TEA) dropwise to bring pH to 6.0–7.0 (optimal for oral mucosa). This also activates Carbopol to form a clear gel.

Step 5: Add Preservative (Optional)

• Add Sodium benzoate (0.1%) or Methylparaben if long-term storage is required.

Step 6: Final Mixing and Packaging

- Mix thoroughly and ensure uniformity.
- Fill into sterilized, air-tight containers or tubes.

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Evaluation

1. Physicochemical Evaluation:

Appearance: The gel should be clear, smooth, and free from any Visibal particles.

pH Level:T he pH should be within the safe range for oral use, typically between 4.5 and 6.5

,to avoid irritation to the mucous membrane.

Viscosity: The gel should have the appropriate thickness, making it easy to apply and stay in place on the appropriate thickness, making it easy to apply and stay in place on the ulcer without dripping.

2. Microbial Evaluation:

Preservative Efficacy:Ensure the gel is free from harmful microbial contamination. This includes testing for bacterial, yeast, and molds to ensure the preservative system is effective. stability: check if the gel maintains it's microbial safety and integrity over time under different storage conditions (temperatures, humidity).

3. In Vitro Evaluation:

Anti-inflammatory Activity: use tests like enzyme cell-based assays to assess the gels ability to reduce inflammation, which is crucial for healing mouth ulcers.

Antibacterial Activity: Evaluate teh gel ability to inhibit bacteria growth, especially those that can cause secondary infections in mouth ulcers.

4. Cilical Evaluation:

Skin Irritation Test : perform patch tests to ensure the gel does not cause irritation or allergic reactions when applied to the oral mucosa.

Efficacy Test :Conduct clinical trials or consumer studies to evaluate the gels effectiveness in reducing pain relief, ulcer healing time, and patient satisfaction.

5. Stability studies:

Physical stability: The gel should remain stable in terms of appearance, texture, and viscosity over time under various conditions (e.g. temperature fluctuations, light exposure).

chemical stability: Ensure the active herbal ingredients retain their potency and effectiveness over time.

Result:

The herbal aqueous gel formulated for the treatment of mouth ulcers demonstrated promising therapeutic and userfriendly characteristics. The preparation showed stability in both physical and chemical aspects throughout the formulation and storage period. The herbal actives were effectively incorporated into the gel base and remained evenly distributed without degradation or separation.

The gel provided a soothing and cooling sensation upon application, suggesting anti- inflammatory and analgesic action. This effect aligns with the known properties of the incorporated herbs, such as antimicrobial, wound-healing, and astringent effects - which help reduce ulcer pain, support tissue regeneration, and prevent secondary infections.

Users experienced prolonged retention of the gel at the application site, contributing to sustained symptom relief. The mucoadhesive nature of the gel helped reduce the need for frequent re-application and enhanced local bioavailability of the herbal compounds. The release profile of the actives was found to be steady and controlled, indicating the gel can maintain effective concentration over time without abrupt dosing. Safety assessments also confirmed the absence of irritancy or allergic reactions, which makes the gel suitable for repeated use on sensitive oral tissues.

Overall, the herbal gel met the expected criteria for mouth ulcer relief in terms of comfort, adherence, and therapeutic efficacy.

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II. CONCLUSION

The study successfully demonstrated that a herbal aqueous gel can be formulated as a safe, stable, and effective topical treatment for mouth ulcers. The gel harnesses the natural healing, anti-inflammatory, and antimicrobial properties of plant extracts to offer symptomatic relief and faster healing.

The aqueous nature of the gel promotes hydration of the ulcer surface, helping soothe inflamed tissues and accelerate epithelial repair. Its biocompatibility and non- irritating profile make it especially suitable for use in delicate oral environments.

Unlike many synthetic ulcer treatments, this gel avoids harsh chemicals or anesthetics, making it a more holistic and patient-friendly option — especially for individuals seeking herbal or side-effect-free alternatives.

Given its demonstrated benefits, the herbal aqueous gel formulation is ready to be considered for further pharmacological testing and clinical validation. With proper standardization and packaging, it holds significant promise as an over-the-counter treatment for recurrent aphthous ulcers and other minor oral lesions.

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