

Approaches towards herbal mouth ulcer gel and Medicinal plants used for treatment of Mouth Ulcer

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Abstract- Mouth ulcers are common painful lesions of the oral cavity that interfere with eating, speaking, and overall quality of life. The present study aims to develop and evaluate an herbal gel containing powdered *Psidium guajava* and *Cordia dichotoma* for the effective management of mouth ulcers. Both plants are traditionally known for their anti-inflammatory, antimicrobial, antioxidant, and wound-healing properties. The powdered plant materials were incorporated into a suitable gel base using an appropriate gelling agent to obtain a stable and patient-friendly formulation. The prepared herbal gel was evaluated for physicochemical parameters. In addition, antimicrobial activity against selected oral pathogens was assessed to support its therapeutic potential. The formulated gel exhibited acceptable physicochemical characteristics, good spreadability, and pH compatibility with oral mucosa. The presence of bioactive phytoconstituents suggests enhanced wound-healing and antimicrobial activity, making the formulation suitable for oral application. The study concludes that the developed polyherbal gel of *Psidium guajava* and *Cordia dichotoma* has promising potential as a safe and effective alternative for the treatment of mouth ulcers. Further clinical studies are recommended to establish its efficacy in human subjects.

Index Terms- Mouth ulcer, formulated gel, *Psidium guajava* and *Cordia dichotoma*.

➤ INTRODUCTION

Oral ulcers are common, non-specific symptoms with various aetiologies in the oral cavity; traumatic, infective, aphthous ulceration due to dermatoses, drugs induced ulceration as a marker of systemic disease and malignant ulceration. Aphthous ulcer which is the commonest oral ulcer, heals in 10–14 days without treatment. Lesions appear as small round/oval ulcers with pseudo membrane and an associated erythematous halo in non-keratinizing epithelium. Currently, physiotherapy for this disease revolves around symptom management rather than prevention of injury and regeneration. Mouthwashes provide immediate pain relief, but they do not because of their moisturising effect[1]. An oral ulcer (also referred to as a mouth ulcer, mucosal ulcer) is defined as an ulcer occurring on the mucous membrane of the oral cavity. They are painful circular or oval shaped ulcers inside the mouth, on the insides of cheeks and/or lips. Mouth ulcers are extremely common, and they occur with a more general association linked to numerous pathophysiological processes, but having no major pathology in you as the most likely explanation. Mouth ulcers are not caused due to smoking or alcohol it is common in toddlers and infants, The following lists some of the factors that tend to send us to the dentist Kilburn for treatment: Nutritional deficiencies like iron, vitamins especially B12 and C Imbalance of oral hygiene Infections Stress Constipation Food allergy Mechanical injury Some uneatable stuff. [2]

➤ TYPES OF MOUTH ULCER

- **Minor ulcer:** Minor aphthous ulcers are the most common type, making up about 80% of all cases. They are usually small—around 2 to 8 mm in size—and tend to heal on their own within about 10 days to 2 weeks. These ulcers are typically shallow, less than 1 cm in diameter, and may appear either as single sores or in small clusters. The good news is that they usually heal completely without leaving any scars.[3]



Fig 1.1: Minor ulcer

- **Major Ulcer:** They are a common form of mouth ulcer, also known as aphthous ulcers, and make up about 80% of all cases. These sores are typically small, measuring around 2–8 mm in diameter, and usually heal on their own within about 10–12 weeks.[3]



Fig 1.2: Major ulcer

- **Herpetiform ulcer:** Herpetiform ulcers are named for the way they appear in clusters, not because they are related to the herpes virus. They consist of many tiny, pinhead-sized sores that can appear in large numbers—anywhere from 10 to 100 at a time. These small lesions often merge together, eventually forming larger ulcerated areas or plaques.[3]



Fig 1.3: Herpetiform ulcer

➤ HERBAL GEL

Gel formulations are commonly used for topical drug delivery because they are easy to apply, stay in contact with the affected area for longer, and generally cause fewer side effects compared to other topical forms or oral medications. Medicinal plants are an important source of natural therapeutic agents and are often considered safer alternatives to synthetic drugs. Various parts of plants—such as leaves, roots, stems, fruits, seeds, and bark—are used to obtain valuable phytochemicals. These plants contain biologically active compounds that play a significant role in drug discovery and development. Plant extracts have been widely used to treat a range of health conditions, including bacterial infections, ulcers, arthritis, and inflammatory disorders.[4]

▪ Advantages of Gel Formulations:

Gel formulations offer several important benefits compared to traditional semisolid dosage forms:

1. They are relatively easy and simple to prepare.
2. Gels have a smooth, non-greasy texture, making them more comfortable to use.
3. They adhere well to the site of application, allowing better contact with the affected area.
4. Gels are generally biocompatible and considered environmentally friendly.
5. They can remain stable and effective even under various stress conditions.[5]

▪ Ideal Properties of a Topical Gel:

1. The gel should be uniform in appearance and preferably transparent.
2. It should easily flow or spread when a small force is applied, such as during shaking or application.
3. The formulation should be chemically inert and stable.
4. It should be non-sticky and comfortable on the skin.[4]
5. The gel should not interact with other components present in the formulation.[4]

➤ ETIOLOGY OF MOUTH

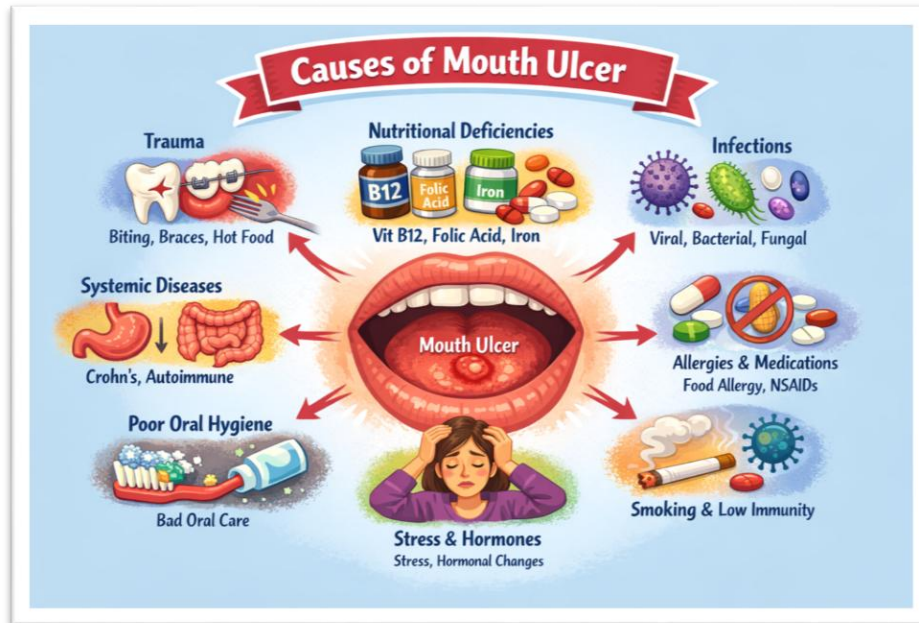


Fig 2.1: Etiology of mouth ulcer

1. Local traumatic factors:

Traumatic ulcers occur as a result of physical, thermal, or chemical injury and are among the most common types of ulcers seen in clinical practice. They can be caused by accidental biting during chewing or by sharp, hard foods, leading to acute ulceration. These types of ulcers usually heal within a few days without any complications. However, continuous or repeated irritation—such as from sharp edges of teeth, dental restorations, or poorly fitting dentures—can lead to chronic traumatic ulcers that may persist for a longer time.[6]

2. Nutritional deficiencies:

Deficiencies in essential micronutrients can lead to both obvious and serious health problems, as well as more subtle effects like reduced energy levels, poor mental clarity, and a decline in overall functioning. These deficiencies can also affect the supporting structures of the body, leading to delayed wound healing and reduced resistance to oral infections. In the oral cavity, such deficiencies especially severe folate deficiency can result in the development of lesions. The mouth is often involved in conditions that affect the skin or multiple organ systems, and in many cases, oral symptoms may appear before signs become evident in other parts of the body.[7]

3. Infections :

In children, oral enanths are frequently seen alongside systemic viral infections. *Helicobacter pylori* (*H. pylori*) is a gram-negative bacterium that primarily colonizes the gastric mucosa and is well known for its role in peptic ulcer disease. However, its involvement in recurrent aphthous stomatitis (RAS) remains controversial. Earlier studies suggested that *H. pylori* might act as a triggering factor, as the bacterium was isolated from active oral ulcers and treatment of the infection was associated with healing of the lesions.[8]

4. Systemic diseases:

Systemic disorders can significantly affect oral health, with ulceration being one of the most common manifestations. The differential diagnosis of such oral ulcers includes conditions like chancre, acute necrotizing ulcerative gingivitis (ANUG), early squamous cell carcinoma, leukaemia, traumatic abscesses, and cyclic neutropenia. In many cases, the oral cavity may serve as an early indicator of underlying systemic or blood-borne diseases before other clinical signs become apparent. Anaemia, defined as a reduction in circulating red blood cells, can also present with oral symptoms. In particular, pernicious anaemia and iron deficiency anemia may cause small, superficial ulcers that closely resemble aphthous ulcerations.[9]

5. Drug-induced causes:

Widespread sloughing and ulceration can develop within a few days of starting certain therapies, and the associated pain is often severe enough to require opioid analgesics or even modification or discontinuation of chemotherapy. Topical steroids are generally not effective in managing these types of ulcerations. Histopathological examination typically shows non-specific ulceration with a dense inflammatory cell infiltrate. In addition, many medications are known to induce oral ulcerations. These include beta-blockers, immunosuppressants, anticholinergic bronchodilators, platelet aggregation inhibitors, vasodilators, protease inhibitors, antibiotics, non-steroidal anti-inflammatory drugs (NSAIDs), antiretrovirals, and various antihypertensive drugs.[10]

6. Stress and hormonal factors:

Another factor that has been associated with exacerbations of recurrent aphthous stomatitis (RAS) is psychological stress. Stress is thought to primarily trigger the onset of ulcer episodes rather than significantly affecting their duration. Psychogenic influences may also alter immune responses in other conditions with a suspected autoimmune basis, such as lichen planus and chronic inflammatory bowel diseases. In addition, some studies have reported a relationship between serum sex hormone levels and the course of RAS. Disease flare-ups are observed more frequently during the luteal phase of the menstrual cycle and in menopause, whereas remission is often noted during pregnancy and in women using oral contraceptives.[11]

7. Allergic and hypersensitivity reactions:

Hyperimmunoglobulin D syndrome (HIDS) is an autosomal recessive condition that typically begins in the first year of life. It is characterized by recurrent febrile episodes lasting about 4–7 days, along with symptoms such as palpable lymphadenopathy, splenomegaly, and mucocutaneous lesions. Aphthous-like oral ulcers are seen in nearly 49% of cases, often occurring in large numbers. In fact, their severity and frequency can be so prominent that patients are sometimes initially misdiagnosed with Behçet's disease before the correct diagnosis of HIDS is established. Hyperimmunoglobulin D syndrome (HIDS) is an autosomal recessive condition that typically begins in the first year of life. It is characterized by recurrent febrile episodes lasting about 4–7 days, along with symptoms such as palpable lymphadenopathy, splenomegaly, and mucocutaneous lesions. Aphthous-like oral ulcers are seen in nearly 49% of cases, often occurring in large numbers. In fact, their severity and frequency can be so prominent that patients are sometimes initially misdiagnosed with Behçet's disease before the correct diagnosis of HIDS is established.[8]

8. Poor oral hygiene:

It was revealed that poor oral hygiene is related to oral hygiene and that the oral *H. pylori* infection rate is higher than the gastric *H. pylori* infection rate, indicating that the oral cavity may be a potential storage site for *H. pylori* infection. Our research indicates that dentists should suggest that individuals with poor hygiene be more focused on *H. pylori* infection to facilitate prompt treatment.[12]

➤ MEDICINAL PLANTS USED FOR THE TREATMENT OF MOUTH ULCER

1. GUAVA



Fig 3.1: Guava

- **Biological source:** *Psidium guava*
- **Family:** *Myrtaceae*
- **Chemical constituents:** Tannin, resin, and crystals of calcium oxalate
- **Uses:** Antimicrobial effects antioxidant and Anti-inflammatory properties
- **Mechanism of action:** Flavonoids and tannins contribute to its antibacterial properties, helping to combat gut infections.[13]

2. NEEM



Fig 3.2: Neem

- **Biological source:** *Azadirachta indica*
- **Family:** *Meliaceae*
- **Chemical constituents:** Nimbidin, phenolic compounds, saponin, and flavonoids.

- **Uses:** Anti-inflammatory, antibacterial, antifungal
- **Mechanism of action:** Antimicrobial Action: Neem's extracts and constituents inhibit the growth of various bacteria, fungi, and viruses.[14]

3. CORDIA DICHOTOMA



Fig 3.3: Cordia dichotoma

- **Biological source:** *Cordia dichotoma*
- **Family:** *Boraginaceae*.
- **Chemical constituent:** Flavonoids, saponins, alkaloids
- **Uses:** Expectorant, laxative, anti-inflammatory
- **Mechanism of action:** Scavenging free radicals, boosting antioxidant enzymes.[15]

4. ALOE GEL



Fig 3.4: Aloe gel

- **Biological source:** Aloe vera
- **Family:** *Liliaceae*
- **Chemical constituents:** Aloin, Isobarbaloin, and Emodin
- **Uses:** Reducing inflammation, and providing antioxidant effects
- **Mechanism of action:** Wound Healing, They can decrease inflammation and promote tissue repair, aiding in skin healing.[14]

5. GARLIC



Fig 3.5: Garlic

- **Biological source:** *Allium sativum*
- **Family:** *Liliaceae*
- **Chemical constituents:** Volatile oil, starch, mucilage
- **Uses:** Manage high blood pressure, antioxidant, anti-inflammatory, and antimicrobial properties.
- **Mechanism of action:** Antimicrobial Action: Allicin and other compounds interact with thiol groups in enzymes, disrupting the function of various microbes.[16]

6. PAPAYA



Fig 3.6: Papaya

- **Biological source:** *Carica papaya*
- **Family:** *Caricaceae*
- **Chemical constituents:** Papain, chymopapain
- **Uses:** Wound healing, antioxidants and anti-inflammatory
- **Mechanism of action:** Enzymatic Action: Papain and chymopapain are proteolytic enzymes that break down proteins, aiding indigestion and wound healing.[17]

7. TURMERIC



Fig 3.7: Turmeric

- **Biological source:** *Curcuma Longa*
- **Family:** *Zingiberaceae*
- **Chemical constituents:** Curcumin, demethoxycurcumin and bisdemethoxycurcumin
- **Uses:** Anti-inflammatory and antioxidant effects
- **Mechanism of action:** Antioxidant Effects; Curcumin can neutralize free radicals, which are harmful unstable molecules that contribute to cellular damage and disease.[14]

8. GINGER

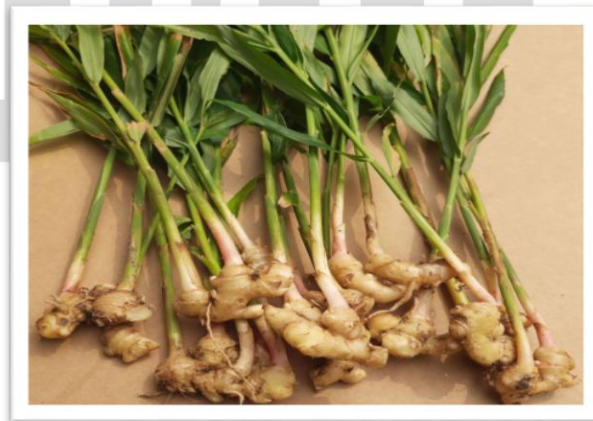


Fig 3.8: Ginger

- **Biological source:** *Zingiber officinalis*
- **Family:** *Zingiberaceae*
- **Chemical constituents:** Phenolic compounds, Flavonoids.
- **Uses:** Antiulcer, Gastrointestinal benefits as an anti-inflammatory
- **Mechanism of action:** Anti-inflammatory and antioxidant properties, as well as its ability to enhance the natural defensive mechanisms. [18]

9. LIQUORICE



Fig 3.9: Liquorice

- **Biological source:** *Glycyrrhiza glabra*
- **Family:** *Leguminosae*
- **Chemical constituents:** Triterpenoids saponin.
- **Uses:** Antiulcer
- **Mechanism of action:** Boosting protective gastric mucus and blood flow.[14]

10. BETEL LEAVES



Fig 3.10. Betel leaves

- **Biological source:** *Piper betle L.*
- **Family:** *Piperaceae*
- **Chemical constituents:** Eugenol, Phenolic compound, Alkaloids
- **Uses:** Antimicrobial, Anti-inflammatory, Analgesic, Antioxidant
- **Mechanism of action:** The active phenolic compounds in Betel leaf disrupt microbial cell membranes, reduce inflammation, and promote healing of oral tissues.[19]

➤ MEDICINAL AND TRADITIONAL USES

❖ Medicinal Uses of Herbal Mouth Ulcer Gel

1. Healing of Aphthous Ulcers: Herbal gels promote faster healing of canker sores by:

- Stimulating tissue regeneration
- Enhancing collagen formation
- Accelerating epithelial repair

Herbs commonly used: *Aloe vera, Turmeric, Licorice, Honey, Neem*. [20]

2. Anti-inflammatory Action: Herbal ingredients reduce swelling, redness, and irritation in ulcerated tissue through natural anti-inflammatory compounds such as:

- Curcuminoids (from turmeric)
- Glycyrrhizin (from licorice)
- Aloin (from aloe vera) [20]

3. Pain Relief and Soothing Effect: Many herbal gels provide topical analgesia that reduces:

- Burning sensation
- Sensitivity when eating or drinking
- General discomfort

Soothing agents: *Aloe gel, Honey, Clove oil, Peppermint*. [5]

4. Antimicrobial Protection: Herbal mouth-ulcer gels help control:

- Bacterial growth
- Fungal contamination
- Secondary infections

Herbs with antimicrobial activity: *Neem, Tulsi, Turmeric, Licorice, Clove*. [20]

5. Antioxidant Activity: Many herbs reduce oxidative stress in ulcerated mucosa, improving healing:

- Polyphenols in *green tea*
- Antioxidants in *aloe*
- Flavonoids in *licorice* [20]

❖ Traditional Uses of Herbs in Mouth Ulcer Treatment

1. Ayurveda: Ayurvedic texts recommend herbs for:

- *Mukha Rogas* (oral diseases)
- Soothing inflamed oral mucosa
- Purifying mouth disorders

Traditional herbs used:

- Turmeric (Haridra): antiseptic, anti-inflammatory.
- Licorice (Yashtimadhu): known for wound healing.
- Neem: antimicrobial, detoxifying.
- Amla: rich in vitamin C, used for recurrent oral ulcers. [5]

2. Traditional Chinese Medicine (TCM): Herbs used historically for:

“Heat toxins” causing mouth sores

- Wound healing and soothing mucosa
- Common TCM plants
- Honeysuckle
- Liquorice root
- Aloe vera.[20]

3. Folk & Home Remedies: Across cultures, natural substances have been applied directly to ulcers:

- Honey: natural antibacterial and wound healer.
- Coconut oil: anti-inflammatory and soothing.
- Tulsi (Holy basil) leaves: chewed for mouth ulcer relief.[5]

➤ CONCLUSION

Medicinal herbs offer a promising and effective approach for the management of mouth ulcers due to their anti-inflammatory, antimicrobial, antioxidant, and wound-healing properties. Among these, *Psidium guajava* (guava) has shown significant therapeutic potential, as its leaves contain flavonoids, tannins, and other bioactive compounds that help reduce inflammation, inhibit microbial growth, and promote faster healing of oral ulcers. In addition, herbal remedies such as aloe vera, turmeric, licorice, and honey have demonstrated considerable effectiveness in reducing pain, accelerating ulcer healing, and preventing recurrence, with minimal side effects. Compared to conventional treatments, these herbal therapies are generally safer, more economical, and culturally acceptable, making them suitable for long-term use. However, despite encouraging findings, most studies are limited by small sample sizes and lack of standardized formulations. Therefore, further well-designed clinical trials and proper standardization of herbal preparations are necessary to validate their efficacy and safety. In conclusion, medicinal herbs, particularly *Psidium guajava*, can serve as valuable alternatives or complementary therapies in the treatment of mouth ulcers, contributing to improved patient care and supporting the integration of traditional medicine into modern healthcare systems.[21]

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