RESEARCH PAPER

FORMULATION AND EVALUATION OF HERBAL GEL

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ABSTRACT

Mouth ulcers, commonly known as aphthous ulcers, are painful lesions of the oral mucosa that affect individuals of all age groups and can interfere with eating, drinking, and speaking. Current therapeutic approaches mainly focus on symptomatic relief and may be associated with adverse effects upon long-term use. Herbal medicines have emerged as promising alternatives due to their safety, efficacy, and minimal side effects. The present study was undertaken to formulate and evaluate a herbal gel containing extracts of *Psidium guajava* (Guava), *Curcuma longa* (Turmeric), and *Aloe vera* for the treatment of mouth ulcers. The selected plant extracts possess well-established medicinal properties, including anti-inflammatory, antimicrobial, antioxidant, analgesic, and wound-healing activities. The herbal gel was prepared using a suitable gel base and standardized pharmaceutical techniques. The formulated gel was evaluated for various physicochemical parameters such as appearance, color, odor, pH, viscosity, homogeneity, spreadability, extrudability, and stability. In addition, the anti-mouth ulcer potential of the formulation was assessed through antimicrobial and wound-healing studies relevant to oral ulcer management. The developed formulation exhibited desirable physicochemical characteristics, satisfactory stability, and ease of application. The combination of *Psidium guajava*, *Curcuma longa*, and *Aloe vera* demonstrated synergistic effects in reducing inflammation, inhibiting microbial growth, and promoting tissue regeneration. The gel showed significant potential in accelerating ulcer healing and providing symptomatic relief from pain and discomfort associated with oral ulcers. The findings suggest that the formulated herbal gel may serve as a safe, effective, and economical alternative to conventional treatments for mouth ulcers. Further preclinical and clinical studies are recommended to establish its therapeutic efficacy and safety for routine use in oral healthcare.

Keywords: Mouth Ulcer, Aphthous Ulcer, Herbal Gel, Psidium guajava, Curcuma longa, Aloe vera, Anti-.

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INTRODUCTION

In recent time there is an increase in global utilization of herbal medicine in the treatment of various decease affecting human. The highly safety profile and low cost of herbal medicines have been reported as the major factors responsible for the increased upsurge in herbal medication. The subject of the phytochemical analysis,

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phytochemistry or plant chemistry has developed in recent years as a distinct discipline, somewhere in

between natural product organic chemistry and plant biochemistry and it's closely related to both. It is concerned with the enormous variety of organic substances that are elaborated and accumulated by plants and deals with the chemical structures of these substances, their biosynthesis, turnover and metabolism, their natural distribution and their biological function. Herbal medicine is still the mainstay of about 75–80% of the world population, mainly in the developing countries, for primary health care because of better cultural acceptability, better compatibility with the human body and lesser side effects. However, the last few years have seen a major increase in their use in the developed world.[1,2]

Mouth ulcers:

Mouth ulcers are small, painful sores on the inside lining of the mouth. They usually develop on the inside of the lips and cheeks and on the underneath and edge of the tongue. Medicines from a pharmacist can reduce the pain and help mouth ulcers to heal. Mouth ulcers include lesions, sores, laceration, abrasions, or any open break in the mucosa of the mouth, lips or tongue.[3,4]

Three main types of mouth ulcer:

1. **Minor ulcer:** This is the most common type of ulcer. It accounts for 80% of all mouth ulcers. They are small (2-8mm in diameter) and normally heal naturally within 10-14 days. A minor ulcer will not cause any scarring.
2. **Major ulcer:** This type of ulcer is deeper and larger than a minor ulcer, and usually has a raised or irregular border. A major ulcer is usually 1cm or more in diameter. This type of ulcer will heal more slowly, over a period of several weeks, and can cause scarring. Approximately 10% of mouth ulcers are major.
3. **Herpetiform ulcers:** These ulcers form as multiple, pinhead sized sores. These tiny ulcers often fuse together to form larger, irregular shaped sores which are extremely painful. Approximately 5-10% of mouth ulcers are herpetiform. The mouth and tongue are compared to most other parts of the body - which explains the amount of discomfort, caused by something so small.[5,6]

Figure No. 1. Oral Mouth Ulcer

Plant Profile: *Psidium guajava* :

Figure No 2. Psidium guajava.

The guava (*Psidium guajava*; known as goiaba in Portuguese and guayaba in Spanish) is an evergreen shrub or small tree native to Mexico, the Caribbean, and Central and South America. It is easily pollinated by insects; in culture, mainly by the common honey bee, Apis mellifera.[7,8]

Kingdom: Plantae

Order: Myrtales

Family: Myrtaceae

Subfamily: Myrtoideae

Tribe: Myrteae

Genus: Psidium

Species: *P. guajava*

Curcuma longa

Figure No. 3 Curcuma longa (Flower and Rhizomes)

Curcuma longa consists of the fresh and dried rhizomes (underground stems) of *Curcuma longa* Linn., belonging to the family *Zingiberaceae*.[9,10]

Kingdom: Plantae

Subkingdom: Tracheobionta

Division: Magnoliophyta

Class: Liliopsida

Order: Zingiberales

Family: Zingiberaceae

Genus: Curcuma

Species: *Curcuma longa*

Aloe vera

(a)

(b)

Figure No. 4 Aloe vera (a) Leaves (b) Leaf gel

Aloe vera consists of the dried latex and fresh gel obtained from the leaves of *Aloe vera* (L.) Burm. f., belonging to the family Asphodelaceae (formerly Liliaceae).[11,12]
Kingdom: Plantae
Subkingdom: Tracheobionta
Division: Magnoliophyta
Class: Liliopsida
Order: Asparagales
Family: Asphodelaceae Subfamily: Asphodeloideae
Genus: Aloe
Species: Aloe vera (L.) Burm. f.
Synonyms- Aloe barbadensis Miller, Aloe indica Royle

MATERIALS AND METHODS

MATERIALS

The plant materials selected for the present investigation comprised leaves of *Psidium guajava* L. (family: Myrtaceae), rhizomes of *Curcuma longa* L. (family: Zingiberaceae), and leaves of *Aloe vera* (L.) Burm. f. (family: Asphodelaceae). These medicinal plants were chosen based on their extensive use in traditional systems of medicine such as Ayurveda and their scientifically established pharmacological activities, particularly in the management of oral disorders including mouth ulcers.

Psidium guajava, commonly known as guava, is widely recognized for its antimicrobial, anti- inflammatory, and astringent properties. The leaves are especially rich in tannins, flavonoids (such as quercetin), and essential oils, which contribute to their effectiveness in reducing microbial load and promoting healing of ulcerated tissues. *Curcuma longa*, commonly known as turmeric, has been used for centuries for its potent anti-inflammatory and antioxidant activities. The rhizome contains curcuminoids, primarily curcumin, which are responsible for its therapeutic efficacy in reducing inflammation and accelerating wound healing. *Aloe vera* is well known for its soothing, moisturizing, and wound healing properties, largely attributed to polysaccharides such as acemannan, along with vitamins, enzymes, and amino acids that promote tissue regeneration.[13,14]

Fresh plant materials were collected from authenticated herbal gardens and local sources known for maintaining botanical integrity. The collection was carried out during appropriate seasons to ensure maximum concentration of active phytoconstituents. Leaves of *Psidium guajava* were harvested during the early flowering stage, a phase reported to exhibit enhanced levels of bioactive compounds such as flavonoids and tannins. Mature rhizomes of *Curcuma longa* were procured after complete development to ensure optimal curcuminoid content. Fully expanded, disease-free, and succulent leaves of *Aloe vera* were collected to obtain maximum gel yield and biological activity.[15,16]

Table No. `1 Plant Material and Source

Material/Plant	Source	Specification
Psidium guajava leaves	Local botanical garden	Fresh, disease-free, shade- dried
Curcuma longa rhizomes	Certified herbal supplier	Authentic, free from adulteration
Aloe vera leaves	Greenhouse plants	Mature leaves, free from infection

reproducibility of results.[17,18]

Chemicals and Reagents

All chemicals and reagents used in the study were of analytical grade to ensure accuracy and

Table 2. List of Chemicals and Reagents

Sr. No.	Reagent/Chemical	Category	**Function**
1	Distilled Water	Solvent	Vehicle for gel preparation
2	Ethanol (if required)	Solvent	Helps dissolve herbal extract
3	Triethanolamine (TEA)	Neutralizing agent	Adjusts pH and forms gel structure
4	Hydrochloric Acid (HCl)	pH modifier	Used for pH adjustment (if required)
5	Sodium Hydroxide (NaOH)	pH modifier	Alternative pH adjustment
6	Carbopol dispersion medium	Polymer base	Helps in gel formation

Excipients for Lozenges

The excipients used in the formulation were pharmaceutically acceptable and complied with standard specifications.[19,20]

Table 3 List of Excipients and Their Functions

Sr. No	Excipient	Category	Function
1	Carbopol 934 / 940	Gelling agent	Provides gel consistency
2	Hydroxypropyl methylcellulose (HPMC)	Gelling agent	Alternative thickening agent
3	Glycerin	Humectant	Retains moisture and improves hydration
4	Propylene Glycol	Humectant / Penetration enhancer	Enhances drug absorption
5	Methyl Paraben	Preservative	Prevents microbial growth
6	Coloring Agents	Additive	Improves appearance

METHODS

Pharmacognostical Evaluation

Macroscopic Evaluation

Macroscopic evaluation, also referred to as organoleptic evaluation, is one of the most fundamental and essential

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steps in pharmacognostical studies. It involves the examination of crude drugs using the unaided senses such as sight, smell, taste, and touch to assess their morphological and sensory characteristics. This method provides preliminary yet crucial information regarding the identity, purity, and overall quality of plant materials before they are subjected to further microscopic, physicochemical, and phytochemical analyses.

The macroscopic characteristics of crude drugs are highly specific and serve as reliable diagnostic features for the identification and authentication of plant materials. Parameters such as color, odor, taste, size, shape, surface texture, and structural features are carefully observed and recorded. These characteristics not only help in confirming the authenticity of the plant material but also aid in detecting adulteration, substitution, and contamination, which are common challenges in herbal drug standardization. In the present study, macroscopic evaluation was carried out for the selected plant materials, namely *Psidium guajava* leaves, *Curcuma longa* rhizomes, and *Aloe vera* leaves. Each plant material was examined systematically for its organoleptic and morphological features under natural light conditions.[21,22]

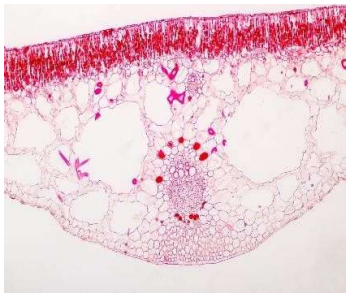
Table 4: Macroscopic Evaluation of *Psidium guajava* Leaves

Parameter	Observation
Color	Fresh leaves exhibit a bright green coloration on the upper (adaxial) surface, while the lower (abaxial) surface appears comparatively lighter. Upon drying, the color changes to dull green or brownish-green due to degradation of chlorophyll. Uniform color indicates proper drying and absence of fungal contamination.
Odor	Leaves possess a mild, characteristic aromatic odor due to essential oils. The intensity decreases upon drying but remains distinguishable. Any foul odor may indicate microbial spoilage or improper storage.
Taste	Distinctly astringent and slightly bitter due to the presence of tannins and polyphenolic compounds, contributing to therapeutic activity.
Size and Shape	Leaves are simple, opposite, and exstipulate. Typically oval, elliptic, or oblong, measuring 5–15 cm in length and 3–7 cm in width. Apex is acute or slightly acuminate; base is rounded or slightly tapering. Margins are entire (smooth).
Surface Charact-eristics	Upper surface is smooth, slightly glossy, and hairless, while the lower surface is rougher with fine pubescence. Prominent lateral veins arise from the midrib, forming a pinnate venation pattern.
Texture	Leaves are coriaceous (leathery), providing mechanical strength. On drying, they become brittle but maintain structural integrity.
Fracture	Short and somewhat fibrous fracture, indicating the presence of vascular tissues.

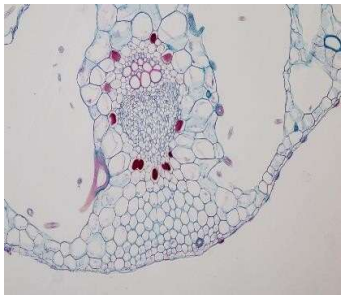
Macroscopic Evaluation of *Psidium guajava* Leaves

Psidium guajava, commonly known as guava, belongs to the family Myrtaceae. The leaves are widely used in traditional medicine due to their antimicrobial, anti-inflammatory, and astringent properties. The macroscopic characteristics of the leaves provide important identification features.

(a)



(b)



(c)

Figure. No. 5 Microscopic Evaluation of Psidium guajava Leaf

A. Microscopic Evaluation of *Psidium guajava* Leaf Description :-

The transverse section (T.S.) of the leaf of *Psidium guajava* exhibits a typical dorsiventral (bifacial) structure, which is characteristic of dicotyledonous leaves. In such leaves, there is a clear differentiation between the upper (adaxial) and lower (abaxial) surfaces, both in terms of anatomical organization and physiological function. The dorsiventral arrangement facilitates efficient photosynthesis and gas exchange by optimizing light absorption on the upper surface and gaseous diffusion through the lower surface The leaf is composed of distinct tissue systems, including the epidermal tissue system, ground tissue system (mesophyll), and vascular tissue system, each contributing to the overall functionality and structural integrity of the leaf.[23,24]

B. Microscopic Evaluation of *Curcuma longa* Rhizome

Transverse Section (T.S.) Features

The transverse section (T.S.) of the rhizome of *Curcuma longa* exhibits a typical monocotyledonous stem-like structure**,** characterized by the absence of secondary growth and the presence of scattered vascular bundles embedded within a parenchymatous ground tissue. This arrangement, commonly referred to as an atactostele**,** is a distinguishing feature of monocot stems and rhizomes. The rhizome is composed of well-differentiated tissue systems, including the protective tissue (periderm), ground tissue (cortex and pith), and vascular tissue system**,** each playing a vital role in the storage, conduction, and structural support of the plant. *Curcuma longa*, commonly known as turmeric, belongs to the family Zingiberaceae. The rhizomes are the most important medicinal part and are widely used for their anti-inflammatory, antioxidant, and wound healing properties. [42,43]

A Transverse Section (T.S.), also known as a cross section, is a section cut at right angles to the longitudinal axis of a plant organ such as a root, stem, leaf, flower, fruit, or seed. The study of transverse sections is one of the most important aspects of plant anatomy and pharmacognosy because it helps in understanding the internal organization of tissues and their functions. Microscopic examination of T.S. features provides valuable information regarding identification, authentication, purity, and classification of plant materials.

In botany, transverse sections are widely used to study the arrangement of epidermis, cortex, vascular tissues, pith, and other specialized structures present in different plant organs. Each plant organ possesses characteristic anatomical features that help in distinguishing monocot and dicot plants as well as identifying medicinal plants used in pharmaceutical and herbal preparations[25,26]

Table :5 Macroscopic Evaluation of Curcuma longa Rhizome

Parameter	Observation
Color	Externally, the rhizomes exhibit a yellowish-brown to orange-brown color. Internally, they display a bright orange-yellow coloration due to the presence of curcuminoids. The intensity of the color serves as an important quality parameter.
Odor	Possesses a strong, characteristic aromatic odor due to volatile oils such as turmerone. The odor is pleasant and easily recognizable.
Taste	Bitter, slightly pungent, and warm. The pungency indicates the presence of active constituents contributing to therapeutic activity.
Size and Shape	Rhizomes are irregularly branched and cylindrical, often showing finger-like projections known as primary and secondary rhizomes. Size varies depending on maturity and cultivation conditions.
Surface Charact-eristics	Outer surface is rough with longitudinal wrinkles, root scars, and nodes. Inner surface is smooth and brightly colored when freshly cut.
Texture	Dried rhizomes are hard and tough, requiring considerable force to break. Texture is fibrous due to vascular bundles.
Fracture	Short and somewhat resinous fracture, revealing a bright orange interior.

Fig. No.6 Microscopic Evaluation of* Curcuma longa *Rhizome

Microscopic Evaluation of Curcuma longa Rhizome Description:- The transverse section (T.S.) of the rhizome of *Curcuma longa* exhibits **a** typical monocotyledonous **s**tem structure**,** characterized by the absence of distinct secondary growth and the presence of numerous scattered vascular bundles embedded within a parenchymatous ground **tissue**. Unlike dicot stems, there is no clear differentiation into cortex, endodermis, and

**Author for Correspondence: Bundhe S. S. & Dongre D. H.*

pith; instead, the internal organization appears relatively uniform, although functionally specialized tissues can still be distinguished. This anatomical arrangement supports the rhizome's primary roles in storage, conduction, and vegetative propagation.[27,28]

Microscopic Evaluation of *Alove vera*

The transverse section (T.S.) of the leaf of Aloe vera reveals a highly specialized succulent anatomical organization, which is distinctly adapted for efficient water storage and survival in arid and semi-arid environmental conditions. Unlike typical dorsiventral leaves of mesophytic plants, the leaf exhibits a thick, fleshy, and undifferentiated internal structure, reflecting its xerophytic nature. The overall morphology is dominated by extensive hydrenchyma (water-storage tissue), which occupies the major portion of the leaf and is responsible for its characteristic gel-like consistency.

Table : 6 Organoleptic and Morphological Characteristics of Aloe vera Leaves

Sr. No.	Parameter	Description
1	Color	Fresh leaves are green to greyish-green in color, sometimes exhibiting white spots or streaks on the surface. The inner gel is colorless, transparent, and mucilaginous.
2	Odor	Leaves possess a faint, characteristic odor that is mild but distinguishable.
3	Taste	Bitter in taste, mainly due to the presence of anthraquinone glycosides such as aloin.
4	Size and Shape	Leaves are thick, fleshy, and lanceolate in shape, tapering towards the apex. They typically measure 20–50 cm in length and 5–10 cm in width at the base.
5	Surface Characteristics	Outer surface is smooth and covered with a waxy cuticle that aids in water retention. Margins are serrated with small, soft spines.
6	Texture	Leaves are succulent and fleshy, containing mucilaginous gel within the parenchymatous tissue, responsible for therapeutic properties.
7	Internal Structure (Visible on Cutting)	Transverse section reveals distinct layers: outer rind, latex layer, and inner gel. The gel is translucent and viscous.

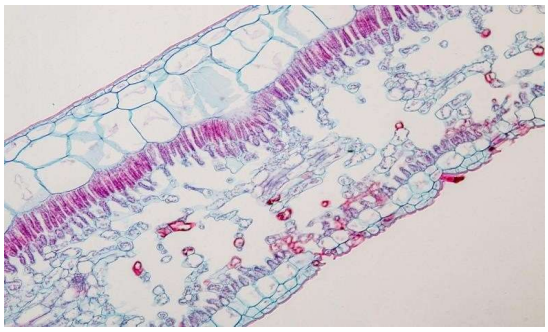


Figure.7 Microscopic Evaluation of Aloe vera Leaf

MICROSCOPIC EVALUATION

Microscopic evaluation is a fundamental step in pharmacognostic studies, enabling the identification, authentication, and standardization of plant materials based on their internal structural characteristics. In the present study, transverse sections (T.S.) of the leaves were prepared and examined under a compound microscope to observe key anatomical features such as epidermal cells, stomata, trichomes, and vascular bundles. In addition, powder microscopy was performed to identify diagnostic characters of the powdered drug.[29,30]

Preparation of Transverse Section (T.S.)

Fresh leaves were collected and thoroughly washed with distilled water to remove adhering dust and contaminants. Thin transverse sections were obtained manually using a sharp blade. The sections were cleared using chloral hydrate solution and stained with suitable reagents such as safranin to enhance the visibility of cellular components. The stained sections were mounted in glycerin and observed under different magnifications of the microscope.

Epidermal Cell

The epidermis forms the outermost protective layer of the leaf and plays a crucial role in minimizing water loss and protecting against environmental stress. In the transverse section, the epidermis appeared as a single layer of closely packed cells covered with a cuticle. The cells were generally rectangular or polygonal in shape with thickened outer walls.[31,32]

Table : 8 Microscopic Features of Epidermal Cells

Sr. No.	**Feature**	**Observation**	**Diagnostic Significance**
1	Cell Layer	Single layered	Protective outer covering
2	Cell Shape	Rectangular/Polygonal	Species identification
3	Cuticle	Thick and prominent	Reduces water loss
4	Cell Wall	Thickened outer wall	Provides mechanical strength

Table No. 9 Plant Materials

Plant Name	Biological Name	Family	Part Used
Turmeric	*Curcuma longa*	Zingiberaceae	Rhizome
Aloe vera	*Aloe vera*	Asphodelaceae	Leaf
Guava	*Psidium guajava*	Myrtaceae	Leaf

Physicochemical Parameters Evaluated :- Physicochemical evaluation constitutes a fundamental

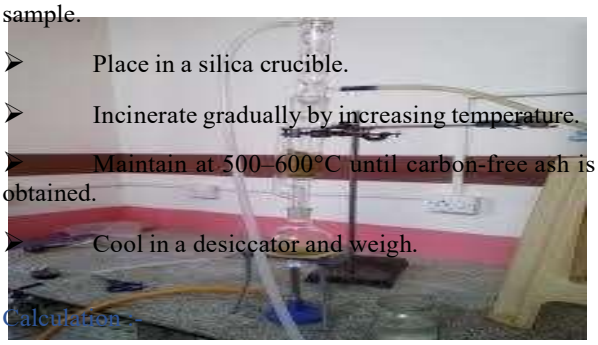
aspect of pharmacognostic standardization of crude drugs. It involves the quantitative determination of various physical and chemical constants that define the identity, purity, and quality of plant materials. These parameters are essential to detect adulteration, substitution, and improper handling of herbal drugs. In medicinal plants such as *Curcuma longa* (turmeric), *Aloe vera*, and *Psidium guajava* (guava), physicochemical parameters provide crucial insight into their therapeutic efficacy and stability when used in pharmaceutical formulations such as gels, creams, and extracts. The evaluation includes determination of moisture content, ash values, extractive values, pH, crude fiber content, swelling index, foaming index, and foreign organic matter. Each parameter reflects a specific quality attribute of the plant material.[33,34]

Ash Values :-

Ash values represent the inorganic residue remaining after the incineration of plant material. These values are critical indicators of the purity, quality, and identity of crude drugs. The determination of ash values is a fundamental pharmacognostic parameter used to evaluate the presence of physiological ash (derived from plant tissue) and non-physiological ash (derived from external contaminants such as soil, sand, or adulterants).

Methodology

- Accurately weigh 2–3 g of air-dried powdered sample.
- Place in a silica crucible.
- Incinerate gradually by increasing temperature.
- Maintain at 500–600°C until carbon-free ash is obtained.
- Cool in a desiccator and weigh.



Calculation :-

$$\text{Total Ash (\%)} = \frac{\text{Weight of Ash}}{\text{Weight of Sample}} \times 100 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(1)$$

Preparation of Extract :-

Extraction is a critical step in the isolation of bioactive constituents from medicinal plants. The efficiency of extraction determines the quality, potency, and reproducibility of herbal formulations. In the present study, three different extraction approaches were employed based on the nature of plant materials:

- Soxhlet extraction (for exhaustive extraction)
- Continuous extraction (principle-based extension of Soxhlet)
- Manual extraction (for fresh gel from *Aloe vera*)

Each method was selected based on plant morphology, chemical composition, and thermal sensitivie

Procedure of Extraction :-

1. The dried and powdered plant material (20–30 g) was placed in a thimble
2. The thimble was inserted into the Soxhlet extractor
3. A suitable solvent (ethanol) was added to the round-bottom flask
4. The system was heated, allowing the solvent to boil and vaporize
5. Vapors condensed in the condenser and dripped into the thimble
6. The solvent extracted soluble constituents and siphoned back into the flask
7. This cycle was repeated for 6–8 hours
8. The extract was collected and concentrated.[35]

Figure. No.8 Soxhlet apparatus

Evaluation Of Herbal Gel :- Evaluation of herbal gel is a critical and indispensable step in the development of a stable, safe, and therapeutically effective topical formulation. It serves as a comprehensive quality assessment process that ensures the prepared formulation meets predefined pharmaceutical standards and is suitable for application on the skin. The evaluation process encompasses a wide range of parameters, including physicochemical properties, rheological behavior, and microbiological stability, each of which contributes significantly to the overall performance and acceptability of the gel.

RESULTS AND DISCUSSION

Results

Pharmacognostical Evaluation

Table 10: Macroscopic Evaluation of Selected Plant Materials

Sr. No.	Plant Material	Parameter	Observation	Standard Reference	Inference/Discussion
1	*Psidim guajaa* leaves	Color	Green (fresh), dull green (dry)	Matches standard flora	Indicates proper drying; absence of fungal growth
		Odor	Mild aromatic	Characteristic	Confirms presence of essential oils
		Taste	Astringent	Due to tannins	Supports anti-ulcer activity
		Shape	Oval/elliptical	Standard morphology	Confirms identity
2	*Curcuma longa* rhizome	Color	Orange-yellow	Due to curcumin	Indicates good quality drug
		Odor	Aromatic	Volatile oils	Confirms authenticity
		Taste	Bitter, pungent	Standard property	Suggests therapeutic activity
3	*Aloe vera* leaves	Color	Green outer, transparent gel	Standard	Indicates freshness
		Texture	Succulent	Hydrenchyma tissue	Confirms water storage function

Microscopic Evaluation

Table11 : Microscopic Features of Plant Materials

Sr. No.	Plant	Feature	Observation	Diagnostic Significance

1	*Psidium guajava*	Leaf type	Dorsiventral	Typical dicot leaf
		Epidermis	Single layered	Protective function
		Stomata	Present (lower surface)	Hypostomatic condition
2	*Curcuma longa*	Vascular bundles	Scattered	Monocot feature
		Starch grains	Abundant	Storage indicator
		Oleoresin cells	Present	Curcumin source
3	*Aloe vera*	Cuticle	Thick	Xerophytic adaptation
		Mucilage cells	Present	Water storage & healing
		Vascular bundles	Small, scattered	Transport system

Powder Microscopy

Table 12 : Powder Microscopic Characteristics

S. No.	Structure	Observation	Significance
1	Epidermal fragments	Distinct cell walls	Identification
2	Stomata	Guard cells visible	Authentication

3	Trichomes	Present	Protective role
4	Xylem vessels	Spiral thickening	Structural confirmation
5	Starch grains	Present	Storage function

Physicochemical Evaluation

Table13 Physicochemical Parameters

Parameter	**Result (Observed)**	**Standard Range**	**Interpretation**
Ash Value	Within limits	Low	Indicates low contamination
Loss on Drying	Acceptable	≤10%	Prevents microbial growth
Extractive Value	High	Variable	Indicates active constituents

Phytochemical Screening

Table 14: Phytochemical Constituents

S. No.	**Phytochemical**	**Test Result**	**Inference**
1	Alkaloids	Present (+)	Antimicrobial activity
2	Flavonoids	Present (+)	Antioxidant

3	Tannins	Present (+)	Astringent, healing
4	Saponins	Present (+)	Penetration enhancer
5	Glycosides	Present (+)	Therapeutic activity
6	Carbohydrates	Present (+)	Energy source
7	Proteins	Present (+)	Structural role
8	Steroids	Present (+)	Anti-inflammatory

Evaluation of Herbal Gel

Table14 : Organoleptic Properties

Parameter	**Observation**	**Interpretation**
Color	Greenish-yellow	Natural plant origin
Odor	Mild	Acceptable
Texture	Smooth	Good formulation
Consistency	Semi-solid	Ideal gel form

Physicochemical Properties of Gel

Table 16: Physicochemical Properties of Gel

Parameter	Result	Ideal Range	Discussion
pH	5.5 – 6.5	Skin compatible	Non-irritant
Viscosity	Optimum	Moderate	Good retention
Spreadability	Good	High	Easy application
Homogeneity	Uniform	No lumps	Proper mixing
Extrudability	Good	Easy flow	User-friendly
Drug Content	95–105%	Acceptable	Uniform distribution

DISCUSSION

The present research work was carried out with the objective of developing and evaluating a polyherbal gel formulation for the treatment of oral ulcers. Oral ulcers are among the most common lesions affecting the oral cavity and are frequently associated with pain, inflammation, redness, irritation, and discomfort during speaking, eating, and swallowing. Recurrent aphthous stomatitis is one of the most prevalent forms of oral ulceration and may significantly affect the quality of life of patients. Conventional therapeutic agents such as corticosteroids, antibiotics, antiseptics, and analgesics provide symptomatic relief but are often associated with side effects, recurrence of ulcers, microbial resistance, and high treatment costs. Therefore, the development of herbal formulations has gained increasing attention due to their safety, affordability, therapeutic effectiveness, and minimal adverse effects.

CONCLUSION

The present investigation successfully achieved the objective of developing and evaluating a poly herbal oral gel formulation for the treatment of oral ulcers. The study demonstrated that the combination of selected medicinal plant extracts could be effectively incorporated into a stable and patient-friendly gel dosage form suitable for oral application.

The selected herbal ingredients, namely *Curcuma longa, Psidium guajava*, and *Aloe vera* exhibited significant therapeutic potential due to their anti-inflammatory, antimicrobial, antioxidant, analgesic, and wound-healing properties. The synergistic interaction of these herbal components contributed to the overall effectiveness of the formulation in managing various symptoms associated with oral ulcers.

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