Formulation, Evaluation and Anti-Bacterial Activity of Herbal Gel for Mouth Ulcer by Using Jasminum Officinale.

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Abstract

Mouth ulcers are a common oral condition causing discomfort and affecting daily life. The present study focuses on the formulation, evaluation, and anti-bacterial activity of a herbal gel using Jasminum officinale (common jasmine), a plant known for its medicinal properties. The plant contains a variety of bioactive compounds, including alkaloids, flavonoids, tannins, and essential oils, which contribute to its anti-inflammatory, antioxidant, and antibacterial effects. The herbal gel was formulated by extracting active ingredients from Jasminum officinale and incorporating them into a gel base suitable for topical application. The gel's physicochemical properties, including pH, viscosity, and spreadability, were assessed to ensure suitability for oral mucosa use. In-vitro antibacterial activity was evaluated against common oral pathogens, such as Streptococcus mutans and Candida albicans, using standard methods. The gel exhibited significant antibacterial activity, demonstrating its potential as a natural treatment for mouth ulcers. This study emphasizes the potential of Jasminum officinale in developing alternative therapeutic formulations for oral health.

Keywords: Jasminum officinale, herbal gel, mouth ulcer, antibacterial activity, formulation, evaluation, Streptococcus mutans, Candida albicans, natural treatment, oral health.

INTRODUCTION

Jasminum officinale, known as the **common jasmine** or simply **jasmine**, is a species of flowering plant in the olive family Oleaceae. It is native to the Caucasus and parts of Asia, also widely naturalized.
It is also known as **summer jasmine poet's jasmine**,]**white jasmine**, **true jasmine** or **jessamine**,and is particularly valued by gardeners throughout the temperate world for the intense fragrance of its flowers in summer.

Description

Jasminum officinale is a vigorous, twining deciduous climber with sharply pointed pinnate leaves and clusters of starry, pure white flowers in summer, which are the source of its heady scent. The leaf has 5 to 9 leaflets.

Distribution

It is found in the Caucasus, northern Iran, Afghanistan, Pakistan, the Himalayas, Tajikistan, India, Nepal and western China (Guizhou, Sichuan, Xizang (Tibet), Yunnan). The species is also widely cultivated in many places, and is reportedly naturalized in Spain, France, Italy, Portugal, Romania, Croatia, Bosnia and Herzegovina, Montenegro, Serbia, Algeria, Florida and the West Indies.

Chemical composition

J. officinale has been found to contain alkaloids, coumarins, flavonoids, tannins, terpenoids, glycosides, emodine, leucoanthocyanins, steroids, anthocyanins, phlobatinins, essential oil and saponins.

Jasminum Officinale

Kingdom	Plantae
Subkingdom	Viridiplantae.
Division	Tracheophyta.
Class	Magnoliopsida.
Order	Lamiales.
Family	Oleaceae.

Genus	Jasminum L.
Species	*Jasminum Officinale.*

Botanical Name: Jasminum.

Common Name: *Jasminum officinale.*
Synonyms: Common jasmine, jessamine, true jasmine.
Plant Family: Oleaceae.

Fig1.*Jasminum officinale* Leaves

Leaves:

Leaf Colour-

- Dark Green.

Leaf Arrangement-

- Opposite, imparipinnate.
- *Jasminum officinale* has opposite, pinnate leaves.

Leaf Shape-

- Ovate or lanccolate, acuminate.
- The leaves are acute, sessile.

Leaf Surface-

- The leaves are glabrous.

Leaf Margin-

- narrow margined.

Leaf Dimension-

- Leaflets 3-7cm the terminal 2.5-7.5 by 1-2.5 cm usually distinctly larger than the rest.

Flowers:

Flowers are aphrodisiac, antiseptic, antispasmodic, and tonic

Flower Shape-

- Star Shape
- The *Jasminum officinale* have its sweetly scented flowers.
- The flowers are tubular, with joined petals and five speeding lobes
- White is the common petal colour.
- The aroma of jasmine is calming and soothing.

Fig.2. *Jasminum officinale* Flower

Blooming Season-

- Summer or Winter

- It can be easy to grow in well-drained soil.

Inflorescences-

- Five to twelve flowers arranged in an umbellate fashion. the flowers are Tubular with joined petals and five spreading lobes.
- Terminal inflorescences with 5 to 12 flowers are arranged in an umbellate fashion.

Stem:

- Jasmines are evergreen or deciduous climbers with twining stems.

Uses

Used for the wounds, skin diseases, ulcers the oral cavity.

- Jasmine is analgesic, antidepressant, antiseptic, expectorant, aphrodisiac, sedative, stomachic, diuretic, depurative, astringent, stimulating, anti-oxidizing, anthelmintic anti -ulcer and anti-inflammatory in nature.
- Should have phytochemical, medicinal and pharmacological properties.
- *Jasminum officinale* leaves are used in mouth ulcer.
- And also used stress related condition.
- It is used in skin related diseases.
- Jasmines are used for cultivation in temperature region.
- Jasmine also has a reputation as an aphrodisiac and used for all kinds of sexual problems.
- The leaf juices can be applied to clear up corns and treat mouth ulcerations
- The anti-secretary and antioxidant components of Jasminum may also treat peptic ulcer.
- Jasminum also produces an antibiotic effect upon typhoid fever and staph infections.
- The juice of the leaf is applied to corns and ear discharges, the leaves and the barks contain salicylic acid and are used as analgesic, febrifuge, etc.
- The roots are used in the treatment of ringworm.
- Used for mouth ulcer.
- Some early research suggests that inhaling fragrance from a small amount of jasmine absolute ether improves mental alertness. However, inhaling a larger amount of fragrance from jasmine absolute ether seems to have a relaxing effect. Other research suggests that jasmine odour does not affect concentration.
- Liver problems such as hepatitis and cirrhosis.
- Stomach pain due to severe diarrhoea (dysentery).
- Increasing sexual desire (as an aphrodisiac).
- Cancer treatment.
- To cause relaxation (as a sedative).
- One of the uses of J. officinale in urinary infections and diuretic the leaves of stem, bark, and root of Jasminum has demonstrated detectable antibacterial activity against many microorganisms.

Health Benefits of Jasmine:

1) Enhances Digestion-
The richness of antioxidants in the jasmine flower help in interacting with the gastric enzymes thereby boosting digestion, relieving flatulence, abdominal pain, diarrhoea, dyspepsia and irritable bowel syndrome. It also functions to promote the growth of good bacteria in the gut and has been found to eliminate harmful bacteria and AMA toxins from the body.

2) Promotes Heart Health-
Being a powerhouse of antioxidants, jasmine is extremely beneficial for promoting heart functions and reducing the risk of heart ailments. The presence of anti-coagulant and anti-fibrinolytic properties reduce the bad cholesterol (i.e., low-density lipoproteins) and prevent blockage and formation of clots in the arteries that can lead to abnormal heart rhythm, heart attack or conditions like atherosclerosis
3) Boon for Weight Loss-
Jasmine flowers are considered a boon by people undergoing a weight loss regimen. The presence of EGCG i.e., epigallocatechin and gallic acid, in the leaves prevent weight gain by speeding up your metabolism. It washes out the harmful toxins from the body and helps in burning out the excess fat faster.
4) Improves Cognitive Functioning-
Jasmine is an ancient and traditional remedy to increase the functioning of the brain. The potent antioxidants and polyphenols present in this scented flower improves the brain activity and helps in the secretion of mood-enhancing neurotransmitters like serotonin and dopamine. It also promotes memory capacity, focus, concentration, calmness, alertness of an individual. Hence, it can be considered as a brain booster and is extremely beneficial in treating psychotic conditions like depression, insomnia, and ailments like Alzheimer's disease and Parkinson's disease.

5) Manages Diabetes-
The hypoglycaemic property of the jasmine flower plays a significant role in alleviating the blood sugar level of the body. The production of insulin from the pancreatic β-cells become active on the consumption of jasmine tea due to the presence of bioactive catechins. Regular consumption of jasmine as tea or in dishes significantly reduces the breakdown of starch into glucose which in turn lowers the fasting blood sugar and insulin.

Phytochemical Screening Methods:

A phytochemical test on Jasminum officinale confirmed flavonoids, saponins, phenols, and tannins. The highest total phenol and flavonoid contents in the ethyl acetate fraction of J. officinale are 103.01±1.1 mg GAE/g and 80.29±1.03 mg QUE/ value found in methanol crude extract.
Preliminary phytochemical analysis revealed that the flower of J. sambac contains antioxidants, coumarins, cardiac glycosides,essential oils, flavonoids,phenolics, saponins, steroids, alkaloids, anthraquinones, and tannins .

Phytochemical Type	Test Name
Flavonoids	Magnesium and hydrochloric acid reduction
Phytosterols	Libermann-Burchard's test

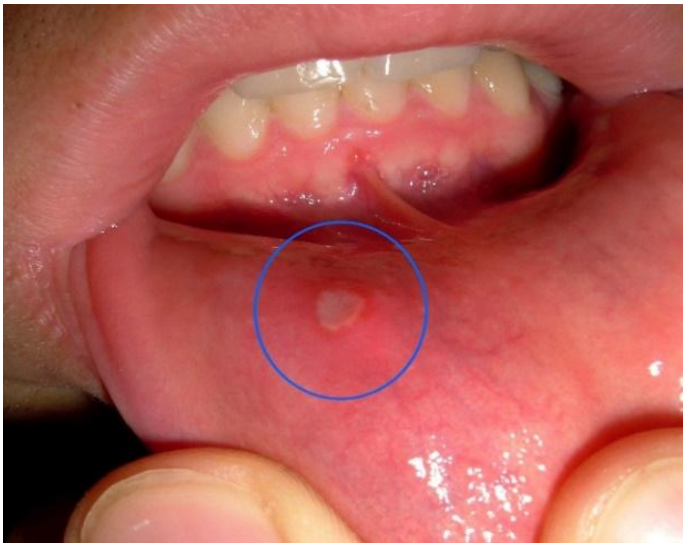
	Salkowski's test
Phenols	Ferric Chloride test

GC-MS

The optimum GC-MS conditions used for the analysis were 250 oC inlet temperature, 150 oC MSD detector temperature, and GC oven temperature program as follows: 100 oC initial temperature, increased to 270 oC at 4 oC/min, final temperature 270 oC and held for 7.5 min.

Results: Thirty compounds were identified, representing 99.28 % of the oil content. The major volatile components of the flower were 3,7,11,15- tetramethyl-2-hexadecen-1-ol （phytol） (25.77 %), 3,7,11- trimethyldodeca -1,6,10-trien-3-ol (12.54 %) and 3,7,11,15- tetramethyl -1-Hexadecen-3-ol (12.42 %).

Mouth Ulcer



Mouth ulcers are 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 sores, lesions, abrasions, laceration or any open break in the mucosa of the lips, mouth or tongue.

Mouth ulcers are also called stomatitis and are a symptom of a variety of mild to serious diseases, disorders and conditions. Mouth ulcers can result from infection, vitamin deficiencies, trauma, inflammation, malignancy and other diseases and abnormal processes.

- **Causes:**
- The exact reason of mouth ulcers developed is not yet clearly defined. Approximately 40% of people who get mouth ulcers have a family history of the same. In some cases, the ulcers are related to diseases.
- These include Injury from badly fitting dentures, harsh brushing of teeth’s, etc.
- Changes in hormone levels. Some women find that mouth ulcers occur just before their periods.
- A lack of iron or a lack of certain vitamins (such as vitamin B12 and folic acid) may be a factor in some cases.
- Rarely, a food allergy may be the cause.
- Stress is said to trigger mouth ulcers in some people.

- Some medicines can cause mouth ulcers. Examples of medicines that can cause mouth ulcers are: nicorandil, ibuprofen etc.
- Mouth ulcers are more common in people with Crohn's disease, coeliac disease, HIV infection etc.
- Bacteriology In the mouth there are many good and bad micro-organisms and bacteria, which now have access.

Review of Literature

Sr. No	Title	Parts used	Author Name
1	Evaluation Of Anti -bacterial activity of *Jasminum Officinale*.	Leaves	Al. Khazraji (2015)
2	Evaluation of flower of *Jasminum Officinale* for Anti-bacterial activity.	Flower	Srinivas Ampati (2013)
3	Determination of Anti- bacterial activity of leaf extract of *Jasminum Officinale* against oral pathogens in ulcer treatment.	Leaves	Kanchan N. Manganti. Dr. Shubhangi S. Motey. Dr. Umesh K. Bhalekar(2019)
4	Anti- bacterial activity of *Jasminum Officinale* leaves.	Leaves	Sandip Padma Usha Gavni (2009)
5	Determination of Anti-bacterial activity of leaf extract of *Jasminum Officinale.*	Leaves	B.T. Pawar (2015)
6	Pharmacology and properties of *Jasminum Officinale.*	Leaves	Ali -Esmail Ali- Snafi (2018)

Table No. 1 Literature Review

Aim:

Formulation , Evaluation and Antibacterial Activity of Herbal Gel for Mouth Ulcer.

Objective :

1. Formulation of herbal gel.
2. Evaluation parameter of herbal gel.
3. Antibacterial activity.

Plan Of Work

Procurement of plant

Identification and Authentication

Collection and processing of leaves

Hot Continuous Soxhlet Extraction with Methanol

Formulation of gel

Evaluation Parameter

Materials and Methods

Collection:

The leaves of *Jasminum officinale* (Oleaceae) were collected from Parner, Nagar. They were separated, washed thoroughly with tap water and shade dried.

Authentication:

The plant was authenticated by Dr. N. M. Ghangaonkar Head of Department of Botany of C.T. Bora College, Shirur by comparing morphological features of crude drug sample.

Chemicals:

Tincture Benzoin, And Glycerine.

Formulation Table:

Ingredient	**F1**	**F2**	**F3**	**F4**
Extract	9gm	10gm	11gm	12gm
Tincture benzoin	13ml	12ml	11ml	10ml
Glycerine	8ml	8ml	8ml	8ml

Table No. 2 Formulation Table

Procedure:

A) Take the drug (extract of leaves)
B) Freshly prepare the tincture of benzoin (benzoin +ethanol) and mix in extract.
C) Also add the Glycerine.
D) Mix all the ingredients and prepare the gel.

Evaluation Parameters:

A) Physical evaluation:

Physical parameters such as colour, odour and consistency were checked visually.

1.Colour: The colour of the formulations was checked by visual inspection.

2.Consistency: The consistency of formulations was checked by applying on skin

3.Odour: The odour of the formulations was checked by mixing the gel in water and observing the smell.

B) Measurement of pH:

The pH of gel formulations was determined by using digital pH meter.

Take 1 gm of gel and dissolved in 10 ml of distilled water and keep apart for two hours. Then the measurement of pH of formulations was done by dipping the glass electrode completely into the gel system three times and the average values are reported.

C) Viscosity:

The measurement of viscosity of the formulated gel was determined by Brookfield Viscometer with spindle no. 1 at 25°C. The gels were rotated at speed 0.3, 0.5 and 1.5 rotations per minute and at each speed, the corresponding dial reading was noted. Then viscosity of the prepared gels was obtained by multiplication of the dial reading with factor given in the Brookfield Viscometer catalogues.

D) Spreadability:

Spreadability is expressed in terms of time in seconds taken by two slides to slip off from gel that is placed in between the slides under the direction of certain load. If the time taken for separation of two sides is less then better the Spreadability.

Spreadability is calculated by using the formula:

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

Were,

M= weight tied to upper slide

L= length of glass slides

T= time taken to separate the slides.

Antibacterial Activity

Aim:- To perform Anti- Bacterial test of Herbal gel.

Requirements: -

1. **Chemicals: -** Yeast Extract, Peptone, Sodium Chloride, Agar, Streptomycin.

2. **Apparatus: -** Beaker, Conical Flask, Measuring Cylinder, Pipette, Test Tubes, Glass Rod, Spreader, Test Tube Holder, Stirrer, Petri-dish.

3. **Equipment: -** Laminar Air Flow, Weighing Balance, Incubator, Autoclave, Hot Air Oven, Microwave.

Procedure:

1) 2.5 gm of Nacl was suspended and dissolved in distilled water.
2) Peptone and yeast extract were dissolved in it completely.
3) Agar-Agar was mixed and volume was made up to 500ml by adding distilled water.
4) It was digested in microwave oven.
5) Nutrient medium was sterilized by autoclaving it.
6) It was poured in perti-dish and allowed to solidify.

Ingredients	**Quantity (gm/lit)**
Yeast extract	2
Peptone	5
Sodium chloride	5
Agar	15

Table No. 3 Preparation of Nutrient Agar Medium

Preparation of *Streptomycin*: -

0.05 gm of *Streptomycin* was weighed and dissolved in 5 ml of distilled water.

Preparation of Bacteria: -

4 ml of bacterial suspension was taken and diluted it with approximately 6 ml of distilled water

Procedure: -

1) Spread the bacteria on nutrient media uniformly by using spreader. (Strain used: Staphylococcus)
2) 2 Petri plates were made of each compound of different concentrations. They were named and numbered. (e.g.F1.1, F1.2 resp.) and third petri plate was taken with standard *streptomycin* and name as F1.3.
3) Bacteria were inoculated on petri plates with the help of small paper circle (Diameter5mm approx.) at four edges of petri plates.
4) The inoculation of bacteria with streptomycin was kept as control.
5) All the Petri plates were packed properly with the help of cello tape.
6) Placed all the Petri dish in an incubator for 24 hours at $27^{o}C$.

Procedure of Antibacterial Activity:

1. The antibacterial activity was determined by agar well diffusion method.
2. Agar- agar and Petri plates was sterilized and cooled.
3. Agar- agar was then poured into the sterilized petri plates and allow to solidify.
4. Then 8 hours inoculated young cultures of test organism were spread uniformly with the help of sterile cotton swab on Agar- agar plates.

5. After that well was made in the plate with the help of sterile cork borer and filled with the leaves extract.
6. For comparative study the well loaded with ethanol serve as control. The plate was then incubated at 37^0C for 24 hrs. and were observed for zone of inhibition.

Expected Outcomes :

Physical Properties:

The gel should have a smooth, homogeneous texture without any lumps.

The color and odor of the gel should be characteristic of Jasminum officinale.

pH Analysis:

The pH of the gel should fall within the acceptable range for oral application (approximately 6.5 to 7.5) to ensure it is non-irritating.

Viscosity :

The gel should have an appropriate viscosity to allow easy application and adherence to the oral mucosa.

Spreadability:

The gel should spread easily on the affected area without being too runny or sticky.

Stability Studies:

The formulation should remain stable in terms of appearance, pH, and efficacy over the testing period under various storage conditions.

2. Antibacterial Activity Outcomes:

Zone of Inhibition:

The gel should demonstrate significant antibacterial activity against common oral pathogens such as Streptococcus mutans, Staphylococcus aureus, or Candida albicans.

Minimum Inhibitory Concentration (MIC):

The MIC of Jasminum officinale extract in the gel should be determined and should be within an effective range.

Comparative Effectiveness:

The herbal gel should show comparable or superior antibacterial activity compared to commercially available mouth ulcer gels.

3. Therapeutic Effectiveness :

Healing Efficacy:

The gel should promote faster healing of mouth ulcers by reducing inflammation, pain, and microbial load.

Safety Profile:

The formulation should be non-toxic, non-irritating, and safe for regular use in the oral cavity.

4. Consumer Acceptability :

The gel should have good sensory properties (pleasant taste and odor) and ease of application, ensuring patient compliance.

Overall:

The study aims to develop a safe, effective, and natural alternative for mouth ulcer treatment, leveraging the antimicrobial and healing properties of Jasminum officinale.

Future Aspects

The formulation and evaluation of herbal gels for mouth ulcers using Jasminum officinale (commonly known as jasmine) present promising future aspects in both pharmaceutical research and clinical applications. Here are some key areas of focus for the future:

1. Advanced Formulation Techniques

Nanotechnology: Developing nanoemulsions or liposomal gels for better penetration and sustained release of active compounds.

Biopolymeric Systems: Exploring bioadhesive polymers to enhance the residence time of the gel in the oral cavity.
pH-sensitive Systems: Designing pH-responsive gels to optimize drug release in the oral environment.

2. Exploration of Bioactive Compounds
Isolation of Active Ingredients: Identifying and isolating bioactive compounds in Jasminum officinale, such as flavonoids and phenolic compounds, that contribute to antibacterial and healing properties.
Synergistic Effects: Combining Jasminum officinale with other herbal extracts to enhance efficacy against mouth ulcer-causing bacteria.

3. Enhanced Antibacterial Studies
Broad-spectrum Activity: Evaluating antibacterial activity against a wider range of oral pathogens, including Streptococcus mutans and Candida albicans.
Mechanism of Action: Investigating the precise mechanism through which Jasminum officinale exerts its antibacterial effects.

4. Clinical Trials
Conducting extensive preclinical and clinical studies to validate the safety, efficacy, and acceptability of the herbal gel for diverse populations.
5. Consumer-friendly Development
Aesthetic Improvement: Optimizing the color, flavor, and texture to improve patient compliance.
Sustainability: Emphasizing eco-friendly and sustainable extraction and manufacturing processes.
6. Integration with Modern Medicine
Combination Therapies: Exploring the use of the herbal gel alongside conventional treatments to improve outcomes.
Standardization: Establishing standardized protocols for the formulation and testing of herbal products to ensure consistency and reproducibility.
7. Commercial Potential
Market Trends: Tapping into the growing market for natural and herbal remedies as an alternative to synthetic drugs.
Regulatory Approvals: Navigating regulatory pathways for the approval of herbal medicinal products.

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