WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.453
Volume 14, Issue 11, 2369-2384. Research Article ISSN 2277–7105

FORMULATION AND EVALUATION OF DRY POWDER HERBAL GARGLE

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Article Received on
23 April 2025

Revised on 11 May 2025
Accepted on 31 May 2025

DOI: 10.20959/wjpr202511-37108

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ABSTRACT

Syzygium cumini leaf extract possess a range of pharmacological properties such as anti-diabetic, anti-inflammatory, antiulcerogenic, cardioprotective, antidiarrheal, antimicrobial, antioxidant and hepatoprotective activities. Herbal gargles have attracted considerable interest as possible substitutes for traditional oral care products because of their believed natural ingredients and reported health benefits. This review intends to present a thorough summary of the effectiveness of herbal gargles in enhancing oral health and preventing a range of oral issues. Our oral cavity is an ideal environment for various species of bacteria, both benign and harmful to humans. Since ancient times, medicinal plants have been viewed as a repository of diverse biological activities in Ayurveda, Unani, and Siddha, playing a crucial role in cleansing teeth and preventing various human pathogens that cause unpleasant odors, inflammation of the tooth root, and dental plaque. In this research, herbal gargles were assessed based on various parameters such as Tapped density, bulk density, Cars index and Hausner ratio and organoleptic characters such as odour, stability study, colour, phase separation, homogeneity, antibacterial effects. Herbal gargles demonstrate promise as supplementary options traditional oral care, and they are appropriate for individuals of all ages due to their minimal side effects.

KEYWORDS: Gargle, Syzygium cumini, Herbal gargles, Extraction, Formulation, and Evaluation.

INTRODUCTION

There has been a growing demand for health-enhancing foods by consumers internationally. This has resulted in a new terminology connecting nutrients and pharmaceuticals, referred to as 'Nutraceuticals'. Nutraceuticals are dietary supplements that provide a concentrated form of a bioactive component found in food and are utilized with the aim of improving health in dosages that occasionally surpass the ordinary. The therapeutic properties of various herbal plants have been recorded in ancient Indian texts, and the formulations have been shown to be effective in addressing diseases (Zeisel, 1995).[1]

The earliest recorded mentions of mouth rinsing are found in Ayurveda and Chinese medicine dating back to 2700 BC. A mouth gargle acts as a chemotherapeutic agent employed as an effective home care method by the user.[2] During the Greek and Roman eras, mouth rinsing became widespread among the Hippocrates. They suggested a blend of salt, alum, and vinegar.[2] Gargles are liquid solutions utilized to address issues related to the pharynx and nasopharynx by forcing air from the lungs through the gargle while it is retained in the throat. Typically, gargles must be mixed with water prior to use. Gargles serve to deliver the medication onto the mucosal surface of the throat.[3,4] The formulations should possess acceptable organoleptic properties and act quickly.

Natural: Natural gargles, also referred to as herbal gargles. e.g.: liquorice, clove, ginger, salt water.

Chemical: Gargles composed of chemical compounds. e. g.: Methyl salicylate, Saccharine sodium.[5]

Figure No. 1: Jamun leaf.[6]

Figure No. 2: Jamun Leaf Powder.[7]

Uses of Gargle

i. **Sore throat:** While they're very old home remedies, doctors commonly recommend Trusted Source salt water gargles for sore throats.[8] They're especially effective for colds or flus that cause a mild sore throat. If they don't fully relieve symptoms on their own, you can combine them with over-the-counter (OTC) medications like acetaminophen (Tylenol) or ibuprofen (Advil).[9]

ii. **Sinus and respiratory infections:** Additionally, Gargle may help reduce how severe an infection is. For example, they can help.

- colds
- flus
- strep throat
- mononucleosis

Since inflammation of the throat can also occur with certain allergies — such as pollen and pet dander —gargles may also help with uncomfortable sore throat symptoms due to allergic reactions.

iii. Dental health: Gargle can draw out water and bacteria while protecting the gums, so gargles may be effective for improving gum and dental health. They may also help prevent gingivitis, periodontitis, and cavities.[10]

iv. Gargling offers several benefits, primarily related to throat and oral health. It can kill germs, reduce inflammation, and improve vocal health, making it a useful remedy for conditions like sore throats, tonsillitis, and even some infections.

v. Simple to utilize for the management of pharyngeal infections by merely gargling the solution made with air from the lungs.

vi. Alleviate discomfort in Mild Throat Infection.

vii. Provided in concentrated form to minimize container dimensions.

viii. Appropriate for a range of medications such as antibiotics and antiseptics.[11]

MATERIAL AND METHODS

Excipient is a substance created in conjunction with the active component of a medication. Excipients fulfill various functions, including ensuring long-term stability, increasing the volume of solid formulations that contain powerful active ingredients in minimal quantities (commonly known as "bulking agents," "fillers," or "diluents"), or improving the therapeutic effects of the active ingredient in the final dosage form. They can promote drug absorption, decrease viscosity, or improve solubility.[10] Excipients can also assist in the production process by enhancing the handling of active materials, allowing for better powder flowability, or preventing denaturation and aggregation throughout the anticipated shelf life. The choice of excipients is influenced by factors such as the route of administration, dosage form, and active ingredient.[12]

1. Syzygium cumini

Figure No. 3: Jamun Powder.

Taxonomy

Kingdom: Plantae

Order: Myrtales

Family: Myrtaceaess

Genus: Syzygium

Species: S. cumini

Binomial name: Syzygium cumini.

Botanical description of the jamun

Jamun is a large and evergreen tree attaining a height up to 25-30 meter tall in India and Oceania or up to 12-15 m in Florida, USA, with a broad crown up to 11 m in diameter and a trunk diameter of 0.6-0.9 m though it usually has a multi-stemmed from branching close to the ground. The tree bark is light greyish and silver in colour and is very much resistant to water stagnation. Leaves are simple, opposite, entire, and elliptic of broadly oblong. Leaves have a turpentine smell and 10-25cm long, 3.0-10 cm wide pinkish when young, becoming leathery, glossy, dark-green above, lighter beneath, with a conspicuous, yellowish midrib when mature. Inflorescence of Jamun is borne in the axils of the leaves on the branchlets. Flowers are tiny, fragrant and appear in clusters of 2.5-10 cm long, hermaphrodite and light yellowish-white in colour and borne without any stalks. Stamens are as long as calyx and the leaves have a pleasant aroma. Fruits are oval to elliptical in shape, appear in clusters of just a few or 10-40 with round or oblong in shape and the colour varies from dark purple to black in colour. The skin is thin, smooth, glossy and adherent. The pulp is purple or white, very juicy and normally encloses a single, oblong, green or brown seed up to 4 cm long and some are seedless. The fruit is usually astringent, sometimes unpalatably and the flavour varies from acid to fairly sweet (Mortan, 1987).[15] The leaves of this plant are used as astringents and have anti-inflammatory quality. The new leaves combine to form a paste, which it works by applying it to the affected areas of the skin and also aids in the quicker wound healing. Additionally, it is employed to treat retching, hemorrhoids, asthma, bronchitis, mouthwash, dysentery, anti-venom and oral ulcerations. The juice of an oral dose of jamun leaf can be used to treat opium poisoning. Centipede bites and poisoning. Fresh leaf paste is combined with milk, which is administered orally to treat indigestion and diabetes. The sensitive leaf of Jamun is often consumed to cure jaundice and may be used for regulating as well as for fortifying gums. The condition of having constipation.[16]

Pharmacological activities of Jamun

i. Anti-microbial: The leaves of the jamun tree have a high degree of antimicrobial activity again gram-positive and gram-negative bacteria alike. The benefit is that these trees can be a source of local supply. Inexpensive and eco-friendly method of eliminating any microbial contamination, particularly in less developed nations.[17]

ii. Antibacterial property: The capacity to kill bacteria Seeds yielded a variety of phytochemical extracts. Antioxidant characteristics that can be used for additional purposes treating a variety of deadly illnesses, it was also discovered that the antibacterial activity of

extracts made from methanol was greater. According to Pareek et al. (2015).[18] stem and leaf extracts possessed outstanding antibacterial activity against all bacteria and the greatest antibacterial action was against Roultella plantikol. Pseudomonas aeruginosa, Salmonella sp., Bacillus subtilis, E. coli.

iii. Antifungal and antiviral properties: The hot and cold crude extracts of Jamun leaf were discovered to have Additionally, the bark possessed antiviral activity against the H5N1 strain of avian influenza. virus. The impact of water extract on the virus was investigated by Singh et al. (1971) Singh R. Inactivation of Potato virus X by plant extracts/Inattivazione del virus X dellaPatata da parte di estratti di piante. Phytopathologia Mediterranea. 1971; 10(2): 211-3. Potato X virus was found to be susceptible to the bark of the Jamun tree. The extract possessed antiviral activity. The confirmation was also made that the anti-fungal action of Jamun bark and leaves against Rhizoctonia solani. Bark extracts had superior efficacy as in comparison to the extracts from the leaves for their antifungal activity.[19]

Medicinal Uses

Jamun leaves have various medicinal uses, primarily due to their astringent, antimicrobial, and anti-inflammatory properties. They are traditionally used for managing blood sugar, improving digestion, and treating oral health issues like mouth ulcers and gum inflammation.

i. Blood Sugar Regulation

Jamun leaves contain alkaloids that can help lower blood sugar levels. They are used as a natural remedy for diabetes or for individuals at risk of developing the condition. The polyphenols in jamun leaves have antioxidant properties, which may help reduce oxidative stress and improve overall metabolic health.

ii. Digestive Health

Jamun leaves possess astringent properties that can help with diarrhea, dysentery, and other digestive disorders. They can also aid in maintaining healthy bowel movements.

iii. Oral Health

The astringent and antimicrobial properties of jamun leaves can help with gum inflammation, bad breath, and mouth ulcers. A decoction of jamun leaf powder can be used for gargling to treat mouth ulcers.[20]

iv. Liver Support

Helps detoxify the liver, Supports bile production and digestion.

v. Skin and Wound Healing

Antibacterial and anti-inflammatory properties help in treating acne, eczema, and minor wounds.

vi. Weight Management

Aids metabolism and may help control fat absorption.[21]

2. Sodium lauryl sulfate

Sodium Lauryl Sulfate also referred to as Sodium lauryl sulfate or Sodium dodecyl sulfate is a synthetic organic compound widely used in personal care products as an anionic surfactant. It is similarly used in pharmaceutical products taking advantage f its surfactancy properties. In the pharmacopoeia, Sodium lauryl sulfate is described as a mixture of sodium alkyl sulfates, consisting chiefly of sodium lauryl sulfate [$CH_3(CH_2)_{10}CH_2OSO_3Na$]. The Ph. Eur and B.P specified the assay content of Sodium lauryl sulfate which should be not less than 85% of sodium alkyl sulfates calculated as $C_{12}H_{25}NaO_4S$.[13]

Figure No 4: SLS.[14]

Figure No 5: Chemical Structure of SLS.

Table no. 1: Chemical characteristics of Sodium Lauryl Sulfate.

Chemical name	Sulfuric acid monododecyl ester sodium salt
Empirical Formula	$C_{12}H_{25}NaO_4S$
Molecular Weight	288.38 g/mol
Physical form	Solid, powder
Appearance	White or cream to pale yellow coloured crystals
Melting point	204-207 ℃
Solubility	Freely soluble in water

Advantages of Gargle

Simple to utilize for addressing infections of the pharynx by merely gargling the solution with air from the lungs. Alleviate Discomfort in Minor Throat Infections. Provided in concentrated form to minimize container size. Appropriate for an assortment of medications such as antibiotics**,** antiseptics.[22]

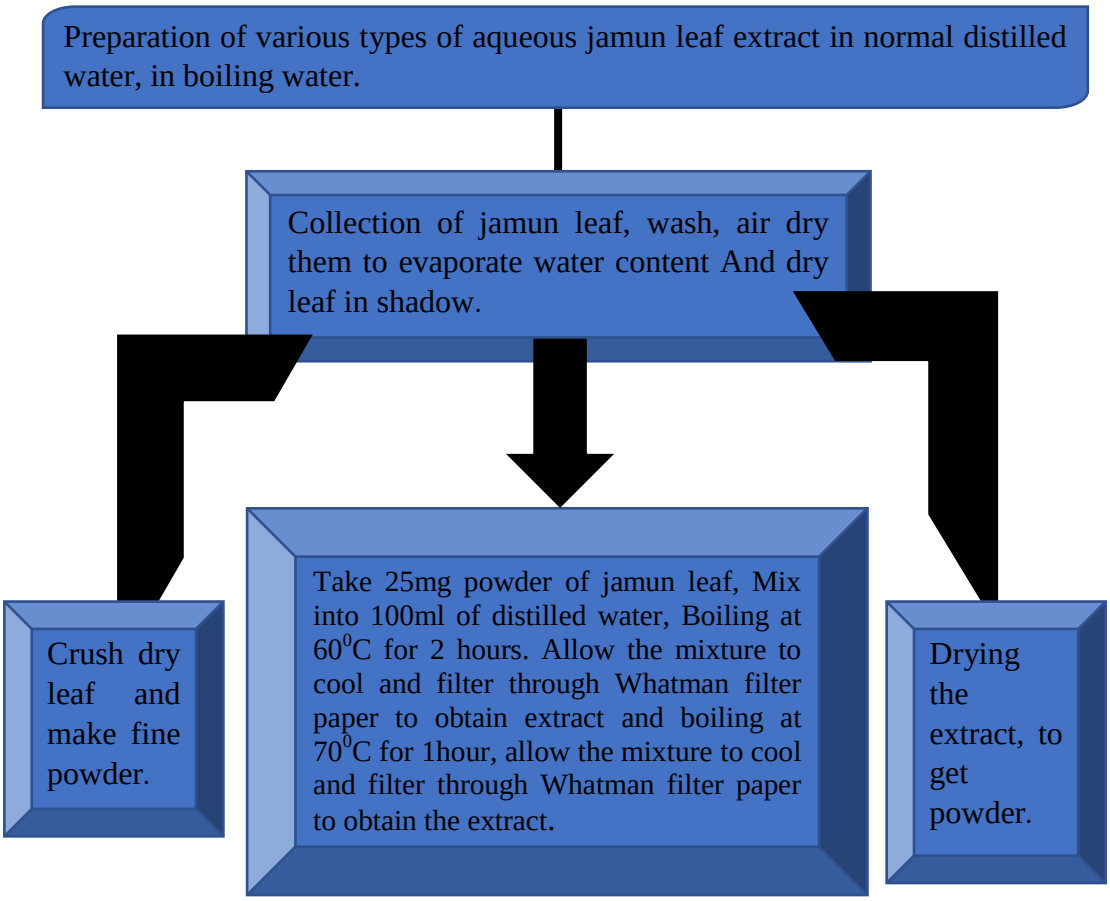
Table No. 2: Ingredients and its roll.

Ingredients	Image	Role of Ingredient
Jamun leaf powder		Antibacterial
Clove Powder		Analgesic and Anti-inflammatory
Liquorice Powder		Sweetener
Alovera Powder		Moisturizing actions
Saunf Powder		Flavoring Agent

Sodium lauryl sulfate		Emollient

Extraction of Plant Extract

Water extract was prepared by taken another way in extraction, 25 gram of Syzygum cumini, crashed leaves were boiled in 100ml distilled water in water bath at (60 ℃) for 2 hours and in (70 ℃) for 1 hour and filtered.[23]



Method and Formulation

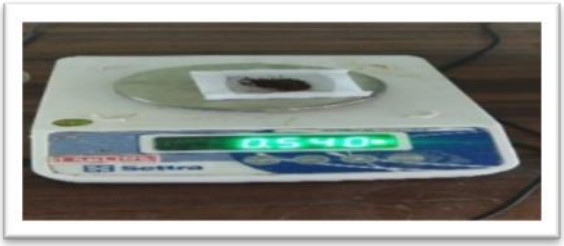
Jamun leaves

Dry jamun leaves

Jamun leaf powder

Extraction of jamun leaves

Filtration



Weighing of powder

Method of formulation of gargle

Weighted quantity of each herbal ingredients taken (Clove powder, Licorice powder, Alovera powder,Saunf powder).

↓

Extract were taken mixed thoroughly in mortar and pestle properly.

↓

Added the sodium lauryl sulphate of 0.5gm.

↓

Mix it well.

↓

The powder passed the sieve.

↓

The powder is get added into water according to the quantity of powder.

Organoleptic Character

- **Colour**: Dark Brownish
- **Odour**: Characteristics
- **Stability studies:** Stability test aims to ensure that the gargle formulations are usable and can maintain the same characteristics in the long term basis. The formulation and preparation of a pharmaceutical product is incomplete without proper stability studies of the prepared product This is done in order to determine the physical and chemical stability of the prepared product.

Table No. 3: Formulation Table.

Sr.no.	Ingredient	Batch 1	Batch 2	Batch 3	Batch 4	Batch 5
1	Jamun leaves	2gm	3gm	4gm	5gm	6gm
2	Clove powder	0.5gm	0.5gm	0.5gm	0.5gm	0.5gm
3	Licorice powder	3gm	3gm	2gm	1gm	1gm
4	Alovera powder	1gm	1gm	1gm	2gm	1gm
5	Saunf powder	3gm	2gm	2gm	1gm	1gm
6	Sodiun lauryl sulphate	0.5gm	0.5gm	0.5gm	0.5gm	0.5gm

Evaluation of Gargle

I. Bulk Density

Precisely weigh 5 grams of powdered color, then transfer it into a 100 milliliter measuring cylinder. Read the unclear apparent after carefully leveling the powder blend without compacting it. worth.

Bulk density= Bulk mass/Bulk volume.

ii. Tapped Density

Precisely weigh 10g of powdered color, then transfer it into a 100ml measuring cylinder. Next, using mechanical tapped thickness, carefully tap the chamber holding the example by elevating the chamber and allowing it to fall under its own weight. Analyzer at a nominal speed of 300 droplets per second.

Tapped Density=Mass/Tapped Volume.

iii. % Carr's index

The simplest way of measurement of free flow of powder is compressibility, an indication of the ease with which compressibility. compressibility a material can be induced to flow given by The compressibility index of the granules was determined by Carr's index (I), which is calculated by using the following formula:

(Tapped density- Bulk density)/ tapped density*100

iv. Housner's Ratio

Hausner predict the flow properties of powder by using interpartical friction. This is a simple index that can be determined on small qantities of powder. It calculated by following formula-

Tapped density /Bulk density.

Table No. 4: Chemical Test.

Test	Procedure	Observation	Result
Test for alkaloids	Mayer's test: 3ml filtrate was taken in test tube and add few drops of Mayer's reagent**.**	cream precipitate was observed, indicates presence of alkaloids	
Test for tannins	To the extract, a few drops of dilute solution of ferric chloride was added.	Color of the solution changed to the dark blue shows the presen ce of tannins	
Test for flavonoids	Ferric chloride test: to the small quantity of alcoholic solution of extract, few drops of neutral ferric chloride was added.	Color changed to blakish red colur indicates the presence of flavonoids.	
Test for carbohydrate	Fehling;s test: small portion of the extract was treated with fehling's solution and then heated on water bath.	brick red color precipited was not found and blue colur is obtained indicating absence of carbohydrate.	
Test for terpenoids	Salkowski test: extract was mixed with chloroform and concentrated sulphuric acid was carefully added to form a layer.	Reddish brown coloration indicates the presence of terpenoids	

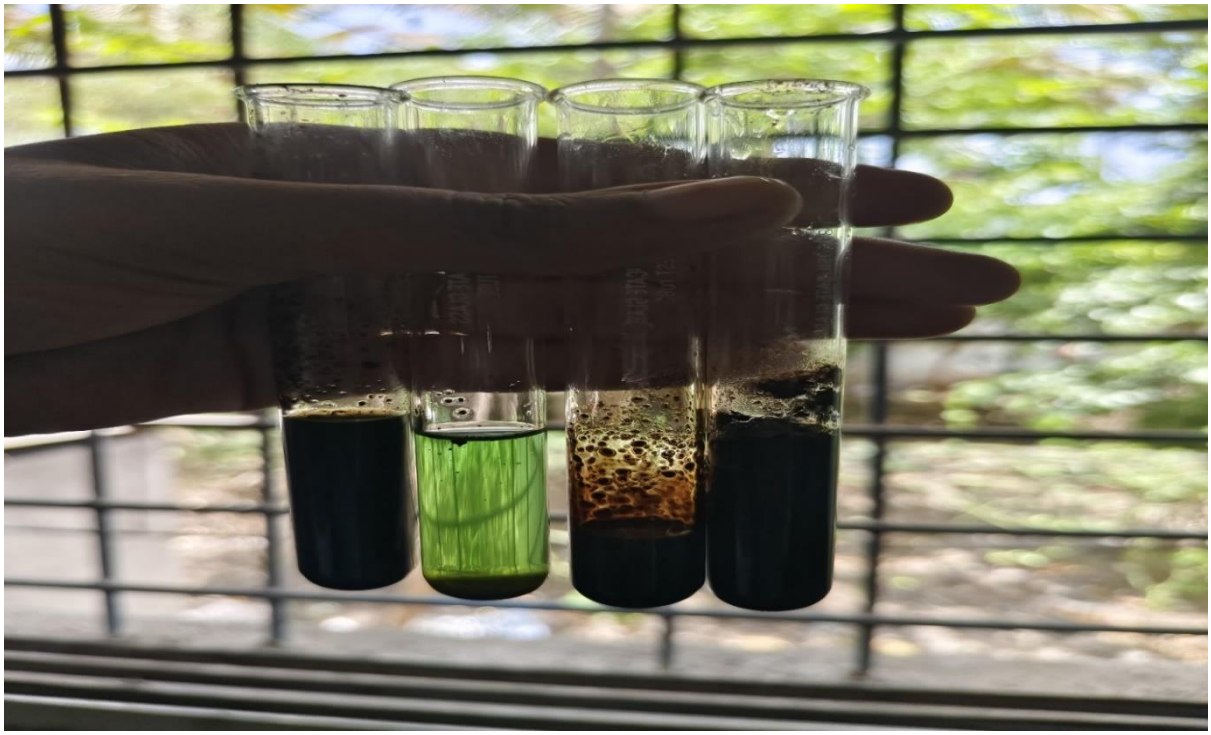


Figure No. 6: Chemical test.

RESULT AND DISCUSSION

The look of gargle retained its colour and homogeneity after a one-month examination. This mouth-gargle entirely prepared from plants parts and safe for health.

Table No. 5: Evaluation of Gargle.

Evaluation Parameters	Batch F1	Batch F2	Batch F3	Batch F4	Batch F5
Bulk density	2.17	2.77	2.04	1.81	1.85
Tapped density	3.1	3.3	3.12	3.12	3.3
Hausner Ratio	1.42	1.19	1.52	1.17	1.78
Carrs index	300	1.19	1.52	1.17	400

CONCLUSION

The present liquid herbal gargle can work in long way to help people to cure the various throat disorder Present herbal formulation is acceptable for a long period. Furthermore, the prepared herbal gargle were standardized by various physicochemical studies like appearance of solution, consistency, phase separation and all test results are in limit. So the prepared herbal formulation is very good and safe for any age group.

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