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Formulation and Evaluation Toothpaste of Clove Oil

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Abstract: *India is home to roughly 45,000 ancient medicinal factory species, primarily set up in regions similar to the Japanese chain, Eastern Himalayas, Western Ghats, and the Andaman and Nicobar islets. Of these, around 3,000 shops have been officially proved for their medicinal parcels, although ancient interpreters reportedly employed nearly 6,000 species for remedial purposes. As the largest patron of medicinal sauces encyclopedically, India is frequently referred to as the" Botanical Garden of the World."*

Interestingly, there are presently about 250,000 registered Ayurvedic medical interpreters in the United States, pressuring the growing global interest in traditional Indian drugs. The present study was accepted with the idea of developing and assessing a polyherbal dentifrice formulated using generally available medicinal sauces in Lucknow, aimed at addressing colorful dental affections.

One of the crucial constituents considered is clove, the sweet flower cub of Syzygium aromaticum, a species belonging to the Myrtaceae family. Cloves hold significant medicinal value in Ayurveda, with colorful corridors of the factory — including its canvases , dried flower kids, leaves, and stems — being employed for remedial operations. It's most generally applied directly to the epoxies to relieve toothaches, ease pain during dental procedures, and manage other oral health issues. The essential oil painting deduced from cloves contains a bioactive emulsion known as eugenol, which exhibits analgesic and antimicrobial parcels, potentially abetting in pain reduction and infection control.(1)

Keywords: Antimicrobial activity, Chamomile flower,Clove flower,Oral hygieneToothpaste

I. INTRODUCTION

Clove, scientifically known as Syzygium aromaticum (synonyms: Eugenia aromatica, Eugenia caryophyllus , or Eugenia caryophyllus), belongs to the family Myrtaceae.[2] clove is the aromatic flower buds of the Syzygium aromaticum tree, a member of the Myrtaceae family. While primarily recognized as a widely used spice, cloves are native to regions of Asia and South America. Thanks to the varied harvest seasons in different countries, cloves remain available throughout the year. Various parts of the clove plant—including its oils, dried flower buds, leaves, and stems—are traditionally utilized for medicinal purposes. Cloves are most commonly applied directly to the gums to alleviate toothaches, relieve pain during dental procedures, and address other oral health concerns. [3] It looks like you're sharing a text extract about clove and its medicinal uses. Clove (Syzygium aromaticum) is a medium-sized plant known for a variety of biological activities, including antioxidant and antimicrobial properties. It has been used in traditional medicine. alleviate dental pain. Today, several toothpastes incorporate clove oil for its therapeutic benefits. Popular brands include: Kudos Neem Clove ,Colgate Sensitive,Colgate Cibaca Vedshakti,Colgate Swarna Vedshakti ,Promise Clove Oil.

Detailed phytochemical analysis of clove buds has revealed the presence of several bioactive compounds, notably flavonoids such as kaempferol.ferol and quercetin in glycosylated forms), phenolic acids (caffeic, ferulic, elagic , gallic and salicylic acids) and derivatives of hydroxyl-benzoic acids, hydroxy-cinnamic acids and hydroxy phenyl propanes. Clove buds have also been reported to contain 18% of essential oil (clove oil) which contain eugenol (~75%), eugenyl

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acetate (~16%), β-caryophyllene (~5%) and α-humulen, β-pinene, limonene, farnesol, benzaldehyde, 2-heptanone, ethyl hexanoate.[4]

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II. MATERIAL AND METHODS

Factory profile Clove(Lavang)

Botanical name : Syzygium aromaticum. **Common name** : lavang. **Kingdom** : Plantae
Class : Dicotyledons. **Order** : Myrtales. **Family** : Myrtaceae
Genus : Syzygium. **Species** : aromaticum (5)

Formulation of clove toothpaste

Sr.no	Ingredient (gm)	Quantity(W/W) %
1	Clove oil	2 ml
2	Sodium lauryl sulphate	1.5 gm
3	Sodium benzoate	0.1 gm
4	Sodium saccharin	0.2 gm
5	glycerine	40 ml
6	Calcium carbonate	44 gm
7	Peppermint oil	Quantity sufficient

INGREDIENT

Ingredient	Images	Role
Clove oil		Freshens breath Natural Preservatives Pain relief Antibacterial action

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Sodium lauryl sulphate		Foaming agent Cleansing agent Emulsifying agent Enhance mouthfeel
Sodium benzoate		Preservatives Stabilizing agent Mild antimicrobial property
Sodium saccharin		Artificial sweetener Enhance flavor Stable & safe
Glycerin		Humectant Texture & consistency Sweetening effect Add shine to teeth
Calcium carbonate		Mild Abrasive Polishing agent Thickening agent PH Stabilizer
Peppermint oil		Flavoring agent Breath fresher Soothing effect Mild Antimicrobial Property

Clove oil Clove oil is a natural essential oil extracted from the dried flower buds, leaves, and stems of the clove plant (Syzygium aromaticum), native to Indonesia. It is well known for its distinct, spicy aroma and medicinal properties. The primary active compound in clove oil is eugenol, which contributes to its strong antimicrobial, analgesic, anti-inflammatory, and antiseptic effects. Traditionally, clove oil has been widely used in dental care to relieve toothaches, reduce gum inflammation, and fight oral infections. It is effective against several oral pathogens, including Streptococcus mutans, which causes dental caries. 6]

Sodium Lauryl sulphate: Sodium lauryl sulfate(SLS) is an extensively used surfactant and emulsifying agent set up in numerous toothpaste phrases. It acts as a soap that creates a raging effect when brushing, helping the toothpaste spread unevenly over the teeth and epoxies. This froth is allowed to help in the physical junking of food patches, debris, and shrines. Also, SLS contributes to the invariant texture and stability of toothpaste by keeping its constituents well-blended. (7)

Sodium benzoate: Sodium benzoate is generally used in toothpaste phrasings as a preservative due to its antimicrobial parcels. It helps to help the growth of bacteria, fungi, and incentive, thereby extending the shelf life of the product and maintaining its safety for dragged use Sodium benzoate works by inhibiting the metabolic processes of microorganisms, making it less likely for the toothpaste to come defiled over time(8).

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Sodium saccharin: Sodium saccharin is a widely used artificial sweetener in toothpaste formulations. It is approximately 300 to 500 times sweeter than sucrose, making it effective in improving the taste of toothpaste without adding significant calories or sugar. This sweetness helps to mask the often bitter or unpleasant flavors of other active ingredients, making the toothpaste more palatable, especially for children. Sodium saccharin is non-cariogenic, meaning it does not contribute to tooth decay..[9]

Glycerine: Glycerine, also known as glycerol, is a pivotal element in toothpaste phrasings due to its multiple salutary parcels. It primarily serves as a humectant, which helps to retain moisture within the toothpaste, preventing it from drying out and icing a smooth, harmonious texture. This moisture retention also contributes to the toothpaste's stability, keeping the expression homogenous over time. (10)

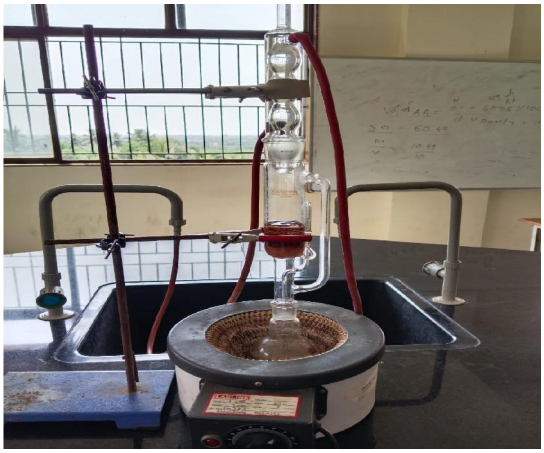
Calcium: Calcium carbonate is a generally used abrasive agent in toothpaste phrasings. It plays a vital part in the mechanical dumping of sanctum, food patches, and face stains from the teeth. As a mild abrasive, calcium carbonate helps in polishing the teeth without causing devilish wear and tear and gash or damage to the enamel. Its fairly low abrasiveness makes it an ideal choice for maintaining oral hygiene while icing that the face of the teeth remains complete. (11)

Peppermint oil: Peppermint oil is a widely used natural essential oil in toothpaste formulations, valued for its refreshing flavor and therapeutic properties. Its primary role is to impart a cool, minty taste and fresh aroma, which enhances the overall sensory experience of brushing and leaves the mouth feeling clean and revitalized. Beyond its flavoring function, peppermint oil possesses mild antimicrobial, anti-inflammatory, and analgesic properties, which can help in reducing oral bacteria, soothing minor gum irritation, and alleviating discomfort from toothaches. [12]

Methods

1. Weighing and Particle Size Standardization of Solid Components: Precise quantities of calcium carbonate, sodium lauryl sulphate, sodium benzoate, and sodium saccharin were measured according to the formulation requirements. These solids were subsequently passed through a 80 mesh sieve to ensure uniform particle size distribution and improve blend homogeneity. **2. Incorporation with Glycerin:** The sieved powders were transferred into a clean mortar and gradually incorporated with pre-weighed glycerin. The mixture was triturated continuously to form a smooth, homogeneous semi solid base.

3. Integration of Herbal Extract: A measured quantity of ginger oil, serving as the herbal active component, was introduced into the semisolid base and mixed thoroughly to ensure even dispersion. **4. Flavor Enhancement:** To improve palatability, a calculated amount of peppermint oil was added as a flavouring agent and mixed until a uniform aromatic preparation was obtained[13]



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III. EVALUATION PARAMETERS

Physical Evaluation of Toothpaste Formulation

1. Color Assessment: Visually inspect the toothpaste under standardized lighting conditions and document its colour characteristics. The hue should be uniform and consistent with the intended formulation. **2. Odor Evaluation:** Smell the toothpaste sample to identify its fragrance. The scent should be agreeable and consistent with the added flavouring agents, such as peppermint, herbal, or fruit-based aromas.[14] **3. Appearance Analysis:** Examine the texture and consistency of the toothpaste. It should exhibit smoothness, uniformity, and a homogenous blend without any visible granules, air bubbles, or phase separation. **4. Taste Testing:** If ethically permissible and approved, perform a sensory test using a small amount of toothpaste to ensure the flavour is palatable and matches the intended profile (e.g., minty or herbal). Safety and ethical guidelines must be strictly followed during this step.[15]

Spreadability Test of Toothpaste

1. Weigh exactly 1 gram of the toothpaste sample 2. Place it centrally between two clean, pre-measured glass slides (typically 10 cm × 10 cm).3. Apply a standardized weight (commonly 500 grams) on the upper slide for a fixed period—generally 5 minutes—to allow the paste to spread.4. Carefully remove the weight and the upper slide. 5. Measure the spread diameter or area of the toothpaste layer. 6. Repeat this procedure three times and record the average spread to enhance accuracy. [16]

Test of Foaming

1. Measure out around 10 grams of toothpaste. 2. Fill a 100 ml graduated cylinder with 50 ml of distilled water and mix it in. 3. Using a stopper, close the cylinder and shake it vigorously for one minute (or, depending on the technique used, 25 shakes in 30 seconds). 4. Let it stand for five minutes. 5. Calculate how much foam was created above the liquid level and note the result in milliliters (ml). [17]

Test of fragrance

1. Fill a clean glass beaker with roughly 10 grams of toothpaste. 2. To create a homogenous slurry, add 10 mL of distilled water and stir well with a glass rod. 3. Let the panel of assessors smell the sample and note how they perceive the fragrance. [18]

PH test- Paper or strips are widely accessible and easy to use. Applying a tiny bit of toothpaste to a spotless surface or directly onto the strip will cause it to change color according to the pH level. The pH can then be ascertained by comparing the color shift to the chart that came with the pH strips. [18]

Test of homogeneity- Using normal force at 27±20C, the toothpaste will extrude a uniform mass from the collapsible tube or any other appropriate container. Additionally, the majority of the contents must protrude from the container's crimp before being gently rolled. [19]

Stability of storage 1. Storage of Samples: Samples of toothpaste should be prepared and kept in appropriate, labeled containers. **2. Conditions of Storage:** Keep the samples in a variety of settings, including:Room temperature (25 ± 2°C) Temperature in the refrigerator (4 ± 2°C) circumstances that are accelerated (40 ± 2°C and 75% RH) **3. Time of Observation:** Observations should be checked and documented at regular intervals, such as 0, 7, 15, 30, and 60 days. [20]

Applications of clove toothpaste

A] Anti-inflammatory Properties: Clove contains eugenol, a compound that has anti-inflammatory effects. Using clove toothpaste can help reduce gum inflammation and provide relief from gum diseases such as gingivitis and periodontitis.[21]

B] Pain Relief: Clove oil has natural analgesic (pain-relieving) properties. Clove toothpaste may provide temporary relief from toothaches and sore gums by numbing the affected area due to the presence of eugenol.

C] Antibacterial Effects: Clove has strong antimicrobial properties. It can help reduce the growth of harmful bacteria in the mouth, promoting better oral hygiene and reducing plaque buildup, which may lead to cavities and gum disease.[22]

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D] Freshens Breath: Clove is a natural breath freshener. Regular use of clove toothpaste can help combat bad breath (halitosis) and leave the mouth feeling clean and refreshed. [23]

Result:

A toothpaste formulation containing clove oil was successfully prepared using the ingredients. The formulation exhibited a smooth, homogeneous texture with a pleasant aroma of clove.

Evaluation Parameters and Results

Parameters	**Results/ Observation**
Physical examination Colour Odour Appearance Taste	1.Off White to light brown 2.Pleasant clove aroma 3.Smooth, homogeneous 4.Pleasant, slightly spicy clove taste with mild sweetness.
Determination of Spreadability	Good, easily spreadable with smooth consistency.
Foaming Agent Test	Moderate foam formation with good foam stability for about 3 minutes.
Fragrance Test	Pleasant, strong clove aroma retained throughout the storage period**.**
PH test	PH of 6.8 , within the acceptable range
Homogeneity Test	Uniform distribution, no visible separation
Storage Stability Test	Stable with no phase separation or color change after 30 days

The formulated clove oil toothpaste demonstrated desirable physicochemical characteristics and good antimicrobial activity, indicating its potential as a natural, effective oral care product.

IV. CONCLUSION

The formulation of clove oil toothpaste was successful, showing promising characteristics for oral care use. The toothpaste exhibited good physical properties, including a smooth appearance, pleasant clove fragrance, and acceptable pH. It demonstrated effective spreadability, moderate foaming ability, and stability over a 30-day period. The antimicrobial activity was confirmed through inhibition of bacterial growth, supporting its potential as a natural and effective oral care product. Overall, the clove oil toothpaste formulation is stable, effective, and safe for use.

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