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Formulation & Evaluation of Medicated Toothpaste

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ABSTRACT :

This study incorporates herbal ingredients that are readily available, cost-effective, and efficacious into personal care items. Psidium Guajava, a member of the Myrtaceae (Guava) family, possesses various beneficial properties such as antibacterial, anti-cancer, anti-diabetic, and antioxidant attributes within its leaves. Guava leaf extract has a long history of use for its therapeutic benefits. The primary objective of this research is to utilize this herbal component to develop a toothpaste capable of effectively combating oral bacteria. Guava leaves were procured from Nesari, Maharashtra, and underwent extraction after thorough cleaning and sun-drying for three days. Cold maceration with 70% ethanol was employed for the extraction process to harness its antibacterial potential.

The resultant extract was used as the main ingredient in formulating herbal toothpaste, with extensive laboratory testing conducted to assess parameters such as pH, spreadability, foaming capacity, moisture content, and zone of inhibition. All evaluation tests yielded results within acceptable parameters. The antibacterial efficacy of guava leaf extract against Escherichia coli, Staphylococcus aureus, and other bacteria, facilitated by its constituents like saponins, tannins, and flavonoids, was evaluated using ethanol extraction and the agar well diffusion method. Additionally, the extract demonstrated potential for treating sore gums, owing to the presence of pentacyclic tri-terpenoid guajanoic acid as its major component..

Keywords : Medicated ,toothpaste ,Antimicrobial , Antifungal , antimalarial , cost effective , herbal formulation , Dental care , Plant extracts.

Introduction:

Cosmetics comprise a blend of natural and synthetic chemicals, serving various purposes. They include personal care items for cleansing and protecting the body, as well as makeup to enhance appearance or alter features. Cosmetic formulations may even incorporate fragrances for scent enhancement.
Throughout history, from the Sumerians to modern times, cosmetics have been employed for millennia. During the middle Ages, Europeans used cosmetics for whitening and adding colour to the face. However, the acceptance of cosmetics has varied over time, with periods of condemnation in Western history as societal attitudes shifted.
Throughout history, despite changes in societal views on beauty products, many individuals have intermittently utilized cosmetics to achieve their desired look. In the late 19th and early 20th centuries, shifting attitudes towards cosmetics spurred industry growth, with figures like Elizabeth Arden and Max Factor laying the groundwork in the US. Revlon and Estée Lauder further expanded the market pre- and post-World War II, leading to widespread cosmetic use by mid-20th century and a thriving multibillion-dollar industry by the 21st century.
The term "herbal formulation" refers to products containing herbs or processed herbs in specific quantities, offering nutritional, cosmetic, or medicinal benefits. Traditional and alternative medicine rely heavily on herbal therapy worldwide due to the perception of herbal remedies as safe, effective, and low in adverse effects. This is supported by the World Health Organization and national initiatives, acknowledging the affordability and accessibility of traditional medicine, particularly in developing nations. Herbal medicine, explored for millennia, presents advantages over synthetic alternatives, including nutritional benefits, fewer side effects, and historical derivation of potent modern medications.
The chemical agent that could replace patient-dependent mechanical plaque control, reducing and preventing oral disease. Self-performed mechanical plaque removal is one of the most accepted methods, but it's time-consuming, and some lack motivation for these procedures. Therapeutic effects of plants have benefited oral health worldwide for thousands of years. Traditional medicine has advantages over side effects like allergies. Neem, one of the most widely researched tropical trees, has therapeutic actions. Its components were analysed twenty years ago. Chewing sticks, widely used in the Indian subcontinent, the Middle East, and Africa since ancient times, have gained attention.
Dental caries are increasing in underdeveloped and developing countries, necessitating the promotion of traditional preventive measures that are acceptable, easily available, and cost-effective. Neem's antibacterial activity has been evaluated since ancient times, serving various purposes like astringent, antiseptic, insecticidal, anti-ulcer, and teeth cleaning in dental diseases. Neem leaf extract has shown superior antiviral and antihyperglycemic activity in vitro and in vivo on animals, along with good broad-range antibacterial activity. Nanotechnology involves creating materials, drugs, and devices to manipulate matter at specific sizes and enhance drug targeting. Various herbal ingredients can be developed into

nanomaterials to enhance their actions. The study is a two-group comparative study. Food debris are easily rinsed off white small particles on teeth, while dental plaque, a thin film of bacteria that sticks to teeth, can't be rinsed off and appears yellow. There's a close relationship between tartar, calculus, and periodontal disease.

MATERIAL & METHODOLOGY

Plant profile: Guava (Peru)
Botanical name: psidium guajava L
Common name:

- Marathi –Peru
- Hindi – Amarood
- **Tamil** - கொய்யா,கொய்யா

Kingdom: Plantae
Phylum: Angiosperms
Class*:* *Eudicots*
Order: *Myrtales*
Family: *Myrtaceae*
Genus: *Psidium*
Species: Psidium Guajava
Popular name: Peru
Habitats: Guava has been successfully introduced and cultivated in subtropical regions around the world. Subtropical climates with mild winters and hot summers provide suitable conditions for guava cultivation. It can tolerate occasional frosts, but prolonged exposure to freezing temperatures can damage the plant.

1. Cultivation

Guava comes in different varieties, such as Allahabad Safeda, Lucknow 49, Apple Guava, etc.
Choose a variety that suits your climate, soil type, and market demand.
Guava thrives in a warm climate with plenty of sunlight.
Select a well-drained site with good air circulation to prevent diseases.
Guava grows well in a wide range of soil types but prefers well-drained soils with pH ranging from 5.5 to 7.0.
Prepare the soil by ploughing or digging to a depth of 50-60 cm and incorporate organic matter like compost or well-rotted manure.
Guava can be propagated through seeds, cuttings, or grafting.
Grafting onto seedling rootstocks is the most common method for commercial cultivation as it ensures true-to-type plants.
Plant guava during the rainy season or early summer.
Dig pits of 1m x 1m x 1m size and fill them with a mixture of soil and organic manure.
Maintain a spacing of 6-8 meters between plants for proper growth.
Train the young plants to have a central leader by removing competing leaders.
Prune annually to remove dead or diseased branches and to maintain shape and size.
Guava requires regular watering, especially during the dry season and fruit development stage.
Drip irrigation is preferred to avoid waterlogging and minimize evaporation losses.
Apply fertilizers based on soil nutrient analysis and plant requirements.
A balanced fertilizer like NPK (Nitrogen, Phosphorus, and Potassium) can be applied during the growing season. Keep the area around the guava plants free from weeds, which compete for nutrients and water.
Mulching with organic materials can help suppress weed growth.
Common pests of guava include fruit flies, scales, mealybugs, and nematodes.
Diseases like anthracnose, wilt, and powdery mildew can affect guava plants.
Use integrated pest management techniques including biological control, cultural practices, and judicious use of pesticides.
Guava trees start bearing fruit within 2-4 years of planting.
Harvest the fruits when they attain the desired size and colour. Guavas are usually harvested when they are fully mature but still firm.
Handle the fruits carefully to Sort the fruits based on size, colour, and ripeness.
Pack them in ventilated containers or boxes to avoid damage during transportation.
Store guavas at cool temperatures to prolong shelf life.
Microscopically character: The microscopically characteristics of guava include the presence of numerous small, round to oval-shaped seeds embedded in a fleshy pulp. Under a microscope, you may also observe the cellular structure of the fruit's flesh, which consists of parenchyma cells filled with cell sap and occasional vascular bundles. Additionally, you might detect the presence of stomata on the surface of the leaves, which aid in gas exchange during photosynthesis.

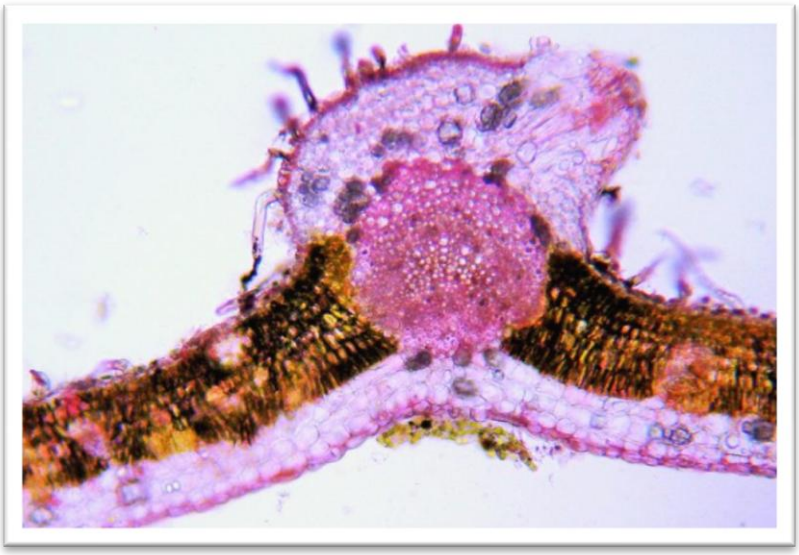

Fig. no.1 Microscopy of Guava

Medicinal uses:

- Anti-microbial
- Anti-bacterial
  Anti-ulcer
- Anti-inflammatory
- Anti-hyperlipidaemia

Chemical constituents of guava leaves:

Guava leaves contain various chemical constituents, including flavonoids, tannins, triterpenoids, and essential oils. Flavonoids like quercetin and kaempferol are known for their antioxidant properties. Tannins contribute to the astringent taste and have potential health benefits. Triterpenoids have been studied for their anti-inflammatory effects, while essential oils provide fragrance and may have antimicrobial properties.

Methodology:

Method:Dry gum method

Sr. No	Ingredient	Formula 1	Formula 2	Formula 3
1	Psidium guajava(leaf extract)	3gm	2gm	4gm
2	Calcium carbonate	10.5gm	10.4gm	10.3gm
3	Sodium lauryl sulphate	3gm	4gm	2gm
4	Methyl cellulose	1.5gm	1.5gm	1.6gm
5	Gum acacia	4.5gm	4.5gm	4.5gm
6	Sodium benzoate	0.3gm	0.3gm	0.3gm
7	Sodium saccharin	0.4gm	0.4gm	0.4gm
8	Peppermint oil	q.s	qs	qs
9	Glycerine	15ml	15ml	15ml

Procedure

Dry Gum Method

The solid ingredients calcium carbonate, sodium lauryl sulphate, glycerine, sodium benzoate, sodium saccharine were weighed accurately as mentioned in the formula and sieved with sieve no.80 so as to maintain the particle size.

These ingredients were also mixed in a mortar and pestle, then triturated with precisely weighed glycerine until a semisolid substance was created.

Addition of herbal ingredients-At the end, peppermint oil was added as a flavour.

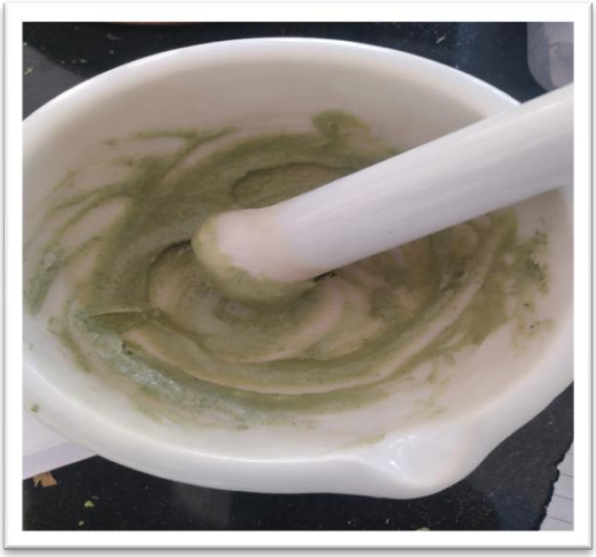

Fig.No.2 formulation of guava

Evaluation parameter:

Sr no	Test	Observation	Inference
1	To test for protein, combine 3gm powder with 5ml of millions reagent	Black red ppt	Protein is present
2	Lead acetate test for tannin-0.5gm powder +1% lead acetate	White ppt	Tannins is present
3	Benedict's test for carbohydrate- combine equal volume of powder solution with benedict's reagent and heat 5min in water bath	Red colour solution	Carbohydrate is present
4	Wagner's test for alkaloids-2,3ml powder solution + few drop of Wagner's reagent	Reddish brown colour	Alkaloids is present

Evaluation parameter

1. Abrasiveness

On the butter paper, extrude the content to a length of 15-20 cm. For at least ten collapsible tubes, carry out the same procedure again. To check for the presence of sharp, hard-edged abrasive particles, press the contents of the length with the tip of your finger. Such particles shouldn't be present in toothpaste.

2. pH measurement

10 g of toothpaste in a 150 ml beaker should be weighed. 10 ml of boiled and chilled water should be used. Stir everything thoroughly to create a suspension. Using a pH metre, determine the suspension's ph.

3. Foaming ability

Take a suspension of the substance and shake it vigorously 12 times in a measuring cylinder. Count the amount of foam that is formed after 5 minutes of shaking. Procedure: Put 5 g of toothpaste in a glass beaker with 100 ml of water. 30 minutes should pass after adding 10 ml of water and covering the glass beaker with a watch glass. If there is detergent in the suspension, warm it up just enough to get rid of it. Transferring the suspension to a 250 ml measuring cylinder after stirring it with glass rods. Check to see whether any foam is generated (more than 2 mL). By adding 5–6 ml of water, transfer the beaker's residual residue to the measuring cylinder. 50ml of water is then used to fill the cylinder. At 300C, stir the mixture with up-and-down motions to get a homogeneous suspension. After shaking, leave the cylinder standing for five minutes. Finally, take note of the volume that foam and water produced.

4. Loss of drying

In a porcelain dish with a 6 to 8 cm diameter and a depth of 2-4 cm, weigh 5 g of the sample. I kept the sample in the oven for 24 hours at 1050C. The sample was taken out of the oven after 24 hours, and a new weight was taken to determine the sample's overall moisture content.

5. Antimicrobial activity

On a petri dish, a sterile nutrient agar medium was produced and aseptically applied. A volunteer with distinctive teeth had the skin on their teeth cleansed with distilled water and allowed to dry. A cotton swab was then placed on the area and rubbed until it completely reached the skin around the teeth after being saturated in 5 cc of distilled water. This mixture was evenly applied to the previously ready surface. After solidifying, wells were drilled into agar plates containing inoculums using a sterile cork borer (6 mm in diameter). Then, an impact was created by omitting the herbal

toothpaste before being inoculated on the petri plates of agar media. For 30 minutes, the plates were chilled to allow the toothpaste to properly diffuse into the agar.

Result & Discussion

Phytochemical screening

1. Phytochemical	Psidium guajava
2. Alkaloids	Present
3. Tannins	Present
4. Protein	Present
5. Terpenoids	Present
6. glycosides	Present

Evaluation parameter of Medicated Toothpaste

Sr no	Parameters	Observation
1	Colour	Greenish
2	Odour	Characteristic
3	Taste	Sweet
4	Stability	Stable
5	Spreadiblity	Easily spreadable
6	Abrasiveness	Good abrasive
7	Foam ability	good

Conclusion

Medicated toothpaste containing guava extract has shown promising results in dental care. Guava is rich in antioxidants, antimicrobial, and anti-inflammatory properties, which can help combat plaque, gingivitis, and bacterial growth in the mouth. Studies have indicated that guava extract can inhibit the growth of bacteria like Streptococcus mutants, a major contributor to dental decay.

Furthermore, the presence of compounds like flavonoids and tannins in guava extract may promote gum health by reducing inflammation and strengthening gum tissue. Incorporating guava extract into toothpaste formulations could potentially enhance its effectiveness in preventing cavities and maintaining oral hygiene. However, further research is needed to fully understand the long-term effects and optimal concentration of guava extract in toothpaste formulations

Acknowledgement :

Medicated toothpaste containing guava leaves harnesses the natural antibacterial properties of guava to promote oral health. Guava leaves contain compounds like flavonoids and tannins, which possess antimicrobial and anti-inflammatory properties. These help combat bacteria in the mouth, reduce plaque formation, and soothe gum inflammation.

Regular use of guava leaf-infused toothpaste can help prevent dental problems like cavities, gingivitis, and bad breath. Additionally, its natural ingredients make it a safer alternative for those sensitive to chemical additives in traditional toothpaste formulas. However, while it offers benefits, it's essential to use it as part of a comprehensive oral hygiene routine, including regular brushing, flossing, and dental check-ups.

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