ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24SEP090

Formulation and Evaluation of Poly Herbal Toothpaste

Bhagyashree A. Shingte[1]; Shronavi M. Pawar[2]; Paurnima R. Chavan[3]; Kajal B. Malave[4]
YSPM's YTC's Yashoda College of Pharmacy Wadhe Satara

Abstract:- Herbal toothpaste formulations have gained significant attention due to their potential therapeutic benefits and natural origins. This study aims to prepare and evaluate a polyherbal toothpaste incorporating extracts of ginger, lemon, liquorice, and amla. Wet gum method is one process used to create a herbal toothpaste. Evaluation parameters included physical characteristics like colour, texture, pH, and functional properties like antimicrobial activity, spreadability, foaming property, homogeneity, abrasiveness, whitening effect. Results demonstrated that the herbal toothpaste exhibited desirable physical properties, with a balanced semisolid texture and appealing colour. Moreover, the toothpaste demonstrated notable antimicrobial activity against Candida albicans. This study provides valuable insights into the development of herbal toothpaste formulations enriched with natural extracts, offering promising alternatives for oral care with potential therapeutic benefits.

I. INTRODUCTION

Oral hygiene is essential to maintain good appearance and impression of individual persons which improves the self-confidence. The crown and the root make up the two primary components of the tooth. The hardest tissue in the tooth is found on the crown, which is surrounded by an outer layer of enamel. Aside from keratin and water, hydroxylapatite is the main component of enamel[5]. The layer beneath enamel is called dentine, and it is made up of hydroxylapatite composite, which holds 70% of the water-containing collagen. Dentine's primary component is fluorine. Saliva is a crucial component meant to keep the environment around teeth active[2]. The three main dental problems are tooth decay, plaque, and periodontal diseases[6]. The formation of calculus is primarily due to bacterial action and mineralized deposition. Since most of these illnesses are brought on by improper dental care, they can be managed and avoided with good brushing and the use of powerful toothpastes[12].

Toothpaste has been used since the ancient past and is one of main irreplaceable components of oral health care. The design of toothpaste formulations began in China and India, as 300- 500 BC[4]. A toothpaste is also known as dentifrice is used to clean, preserve, and enhance the condition of teeth. In addition to being used primarily to clean teeth, toothpaste also serves as an abrasive to help remove food particles and dental plaque from teeth, helps to remove or mask bad breath, and releases active ingredients like fluoride to help prevent gum and tooth disease[1].

These days, a lot of branded mouthwashes and tooth pastes with synthetic chemicals with antimicrobial activity have been introduced by the advent of modern technology. However, these products have a number of serious side effects, including teeth discoloration, weakening enamel, irritation and dry mouth, gingival scaling, and adverse systemic effects when consumed. Therefore, these attributes serve as a stimulus for the development of a tooth paste with an herbal ingredients and natural antibacterial components. The purpose of making the herbal tooth paste is to combat the germs that cause a variety of dental issues[12].

Herbal dentifrices come in a variety of forms, including toothpaste, mouthwash, and tooth powder. Strong antibacterial and antifungal qualities are provided by the extract of medicinal plants found in herbal tooth paste. This minimizes the risk of cavities and tooth decay by controlling the accumulation of plaque and tartar, strengthening and promoting healthy gums and teeth[6]. To keep teeth clean and in good condition, toothpaste is a dental preparation that is used as an add-on to a toothbrush. Using more than one plant in a therapeutic preparation is known as Polyherbal formulation[3] as this toothpaste doesn't include gelatin, artificial flavors, or chalk powder, it's ideal for people with sensitive teeth. The natural freshness of the herbs has a calming effect on the tongue, and they dissolve readily in saliva[6].

A. Advantages of the Toothpaste:

- Preventing dental diseases is one of its benefits.
- It makes teeth cleaner.
- It prevents bad odour.
- Prevents periodontal disease.
- Dental issues can be resolved with regular usage of herbal toothpaste.
- Herbal toothpaste has no adverse effects[9].

B. Ideal properties of Toothpaste:

- Effective abrasive action.
- Nontoxic and non-irritating.
- Don't leave any stains on teeth.
- Maintain a clean and fresh mouth.
- Long lasting Effect.
- Accessible and cost-effective.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24SEP090

C. Components used in Toothpaste:

➢ *Abrasive Role:*

- Helps to remove dirt, stains, and plaque from surface of tooth.
- They remove biofilm and adhering particles from enamel, increasing the cleaning power of toothpaste.
- Help to stop the build-up of plaque and tartar. Concentration: 9-13%
- Examples: Calcium carbonate, silica, sodium bicarbonate, dicalcium phosphates and sodium metaphosphates[13].

➢ *Humectant Role:*

- Ensure moisture content.
- Stop plug-in nozzle tube development.
- Prevent drying of toothpaste. Concentration: 37 to 45 %
- Examples: Polyethylene glycol, propylene glycol, sorbitol, xylitol, and glycerol

➢ *Binding Agent Role*:

- Provide the visco-elasticity properties to the toothpaste.
- Helps to maintain the consistency of the toothpaste Concentration: 0.8 % to 2.5 %.
- Examples: agar, carrageenan, gum tragacanth, isapgol mucilage.

➢ *Preservatives Role*:

- Inhibits the growth of micro-organisms in the toothpaste.
- Improve the shelf life of the tooth paste. Concentration: 0.05 -0.5 %.
- Examples: Formaldehyde, benzoic acid, parabens, phenolics and citric acid.

➢ *Foaming Agents Role*:

- Used to improve the cleaning power.
- Effects and lowers the surface tensions of tooth paste in oral cavity.
- Dissolve plaque by penetrating tooth.
- Enables dispersion of toothpaste. Concentration: 1 – 2 %
- Examples: Sodium lauryl sulphate, sodium stearyl lactate, amine fluorides, dioctyl sodium sulfosuccinate.

➢ *Flavouring Agent Role*:

- Used to mask the unpleasant taste or smell of other ingredients
- Provide refreshing taste.
- Enhance the fragrances of herbal preparation. Concentration: 1 -6 %.
- Examples: Clove oil, peppermint oil, eucalyptus, spearmint, aniseed, fennel.

➢ *Coloring Agent Role*:

- Used to color the herbal preparation.
- Provide homogenous color throughout the shelf life. Concentration: 1 – 2 %.
- Examples: Titanium, chlorophyll dioxide.

➢ *Sweeteners Role*:

- Used to improve the taste of tooth paste by giving sweet taste.
- Mask the bitter taste of other ingredients.
- Promotes palatability of the product. Concentration: 18 to 24 %.
- Examples: Saccharine, aspartame, sorbitol and xylitol.

II. METHOD OF FORMULATION

There are two types of methods for formulation of toothpastes, viz.

A. Dry Gum Method
B. Wet Gum Method

A. Dry Gum Method:

In this method, all the solid components of the formulation like abrasive agent, binding agent etc., except the surfactants are mixed in a dry mixer. The mixer may be an agitation mixer which consists of slow rotating blades. The liquid components such as the humectants and water are gradually added to the dry mix. The mixing process is carried out till a smooth paste is formed. The remaining ingredients like the surfactants and the flavouring agents are added to the homogenous paste under vacuum[5].

B. Wet Gum Method:

A liquid phase is created in this method by mixing all of the liquid components. To create mucilage, the liquid phase and binding agent are combined while being constantly stirred. In an agitation mixer, the solid ingredients—apart from the surfactants—are subsequently added gradually to the mucin, blending them evenly to create a homogenous paste. Subsequent components, such as flavouring, colouring, and surfactants, are introduced to the homogenous paste while it is under vacuum[5].

➢ *Objectives:*

- To know the concept of herb toothpaste.
- To understand role of different types of herb which have antimicrobial and whitening property.
- To collect information on method of preparation of toothpaste.
- To understand different role of ingredients used to prepare toothpaste.
- To prepare toothpaste using ginger, lemon, liquorice, amla.
- To evaluate the toothpaste: Physical evaluation (colour, odor, taste), determination of pH, determination of spreadability, determination of antimicrobial property,

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24SEP090

foaming property, whitening effect, homogeneity, moisture content, determination of sharp and edge abrasive particles.

➢ *Need:*

- **Removal of Plaque and Food Debris**: Toothpaste contains mild abrasives that help remove plaque, a sticky film of bacteria that forms on teeth, as well as food debris trapped between teeth and along the gum line. This prevents the buildup of plaque, which can lead to tooth decay and gum disease.
- **Prevention of Tooth Decay:** Most toothpaste contains fluoride, a mineral that helps strengthen tooth enamel and makes teeth more resistant to decay caused by acids produced by bacteria in the mouth. Fluoride also promotes remineralization, the process by which minerals such as calcium and phosphate are redeposited into weakened areas of enamel, helping to reverse early stages of tooth decay.
- **Freshening Breath:** Many toothpaste formulations include flavoring agents such as mint or spearmint to leave the mouth feeling clean and fresh, combating bad breath caused by bacteria in the mouth.
- **Reduction of Gum Disease**: Some toothpaste formulas contain antimicrobial agents such as triclosan or essential oils, which can help reduce the buildup of bacteria that cause gum disease and inflammation.
- **Desensitizing**: Toothpaste designed for sensitive teeth often contains compounds like potassium nitrate or strontium chloride, which help block pain signals from reaching the nerve of the tooth, providing relief from sensitivity to hot, cold, or sweet foods and drinks.
- **Whitening:** Many toothpaste brands contain mild abrasives or whitening agents such as hydrogen peroxide or baking soda, which can help remove surface stains and lighten the color of teeth over time, resulting in a brighter smile.

III. REVIEW OF LITERATURE

Table 1: Review of Literature

SR.no	Author	Title	Abstract
1	Suresh Gunaki, E. N. Gaviraj, C. V.Nagathan, B.S. Hunasagi, Sandeep Chandakavate	Preparation and Evaluation of Poly- Herbal Toothpaste	Using several established techniques, the poly-herbal toothpaste was successfully prepared by using Cassia simmia, Babul leaves extract, ginger, lemon extract assessed, and it was found to be less likely to cause adverse effects than synthetic toothpaste. In order to increase the effectiveness and safety of toothpaste made using polyherbs.
2	Pushpalatha C, Arshiya Shakir	PotentialBenefits of Ginger in Maintenance of Oral Health	Ginger's ability to prevent prostaglandin formation led to the first reports of its anti-inflammatory properties in the early 1980s. To gain the benefits of ginger in preventing oral illnesses, many formulations incorporate ginger. The characteristics of ginger and how it can be taken orally are outlined in this chapter. This chapter focuses on the ingredients and characteristics of ginger, its use in the mouth, and its potential use in dentistry in the future.
3	Indrayani D. Raut, Dipak S. Gumate, Supriya S. Patil, Vaishnavi R. Patil	Formulation and evaluation of polyherbal toothpaste Using medicinal plants	The goal of the study was to make herbal toothpaste with clove powder, ginger, tulsi leaves, and neem leaves. The homogeneity, spreadability, foaming power, stability, PH, moisture content, and volatile matter of the toothpaste were all examined. Since the results were within reasonable bounds, there is hope for both public dental health and future dental research. There are important ramifications for oral health from this research.
4	Preena Sidhu a, Swapnil Shankargouda, Avita Rath, Priyadarshini Hesarghatta Ramamurthy, Bennete Fernandes, Ashish Kumar Singh	Therapeutic benefits of liquorice in dentistry	Oral ailments such as dental caries, gingivitis, periodontitis, pharyngitis, and oral cancer have been found to benefit from the anti-inflammatory, anti-adhesive, and anti-microbial characteristics of liquorice. In order to include herbs into dental products that can improve oral health, it is important to investigate the beneficial phytochemicals found in liquorice. The therapeutic effects of liquorice in dentistry should be investigated and evaluated by more in vivo research.
5	Harpreet Singh Grover, Himanshu Deswal, Yogender Singh, Amit Bhardwaj	Therapeutic effects of amla in medicine and dentistry: A review	Numerous phytochemical constituents found in amla, including as flavonoids, tannins, and alkaloids, have been demonstrated to provide beneficial biological effects. It eliminates excessive salivation and internal body heat, which makes it a component in many Ayurvedic medications and tonics. Amla has been the subject of studies assessing its antioxidant potential. Amla helps diabetics avoid ulcers.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24SEP090

➢ *Profile of Herbs:*

- *Ginger*

Fig 1: Ginger

- **Synonyms:** Rhizoma zingiberis, Zingibere.
- **Biological Source:** Ginger consists of the dried rhizomes of the Zingiber officinale Roscoe, belonging to family Zingiberaceae.
- **Geographical Source:** It is mainly cultivated in West Indies, Nigeria, Jamaica, India, Japan, and Africa.
- **Chemical Constituent:** Ginger contains 1 to 2% volatile oil, 5 to 8% pungent resinous mass and starch. The volatile oil is responsible for the aromatic odour and the pungency of the drug is due to the yellowish oily body called gingerol which is odourless. Volatile oil is composed of sesquiterpene hydrocarbon like α-zingiberol; α-sesquiterpene alcohol α-bisabolene, α-farnesene, α- sesquiphellandrene. Less pungent components like gingerone and shogaol are also present.

✓ *Uses:*

- Anti-inflammatory Properties: Bioactive substances found in ginger, such as zingerone and gingerol, have anti-inflammatory qualities. These substances might aid in lowering gum and oral tissue inflammation.
- Antibacterial Activity: Oral infections, such as bacteria and fungus, are susceptible to the antibacterial activity of ginger. This antibacterial activity might aid in the prevention of gum disease, tooth decay, and other oral health issues.
- Discomfort Relief: The analgesic qualities of ginger can help reduce gum and tooth discomfort. Its application to dental care could ease discomfort in the mouth.
- Freshens Breath: By counteracting odor-causing substances in the mouth, the aromatic components in ginger can aid in improving breath freshness.
- Stimulates Saliva Production: Chewing ginger or using mouthwashes containing ginger might increase salivation. Saliva is essential for preserving oral health[15].

- *Amla:*

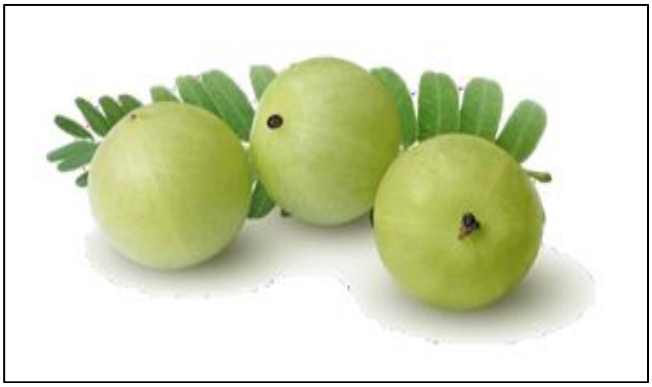


Fig no.2- Amla

- **Synonym:** Emblica, Indian goose berry, amla.
- **Biological Source:** This consists of dried, as well as fresh fruits of the plant Emblica officinalis Gaerth (Phyllanthus emblica Linn.), belonging to family Euphorbiaceae.
- **Geographical Source:** It is a small- or medium-sized tree found in all deciduous forests of India. It is also found in Sri Lanka and Myanmar.
- **Chemical Constituents:** It is highly nutritious and is an important dietary source of vitamin C, minerals, and amino acids. The pulpy portion of fruit, dried and freed from the nuts contains: gallic acid 1.32%, tannin, sugar 36.10%; gum 13.75%; albumin 13.08%; crude cellulose 17.08%; mineral matter 4.12%; and moisture 3.83%.

✓ *Uses:*

- Antioxidant qualities for general well-being.
- Anti-inflammatory properties to lessen irritation and inflammation.
- Antimicrobial action against oral germs, which aids in the avoidance of cavities and dental illnesses.
- Encouragement of wound healing, which is advantageous following oral surgery or trauma.
- Immune support to strengthen the body's ability to fight off infections[17].

- *Liquorice:*

Fig 3: Liquorice

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24SEP090

- **Synonyms**: Radix Glycyrrhiza, Sweet liquorice.
- **Biological Source:** Liquorice consists of subterranean peeled and unpeeled stolons, roots and subterranean stems of Glycyrrhiza glabra Linn, and other species of Glycytrhiza, belonging to family Leguminosae**.**
- **Geographical Source:** It is mainly found in China, Europe, India, Iraq, Japan, Kurdistan, Spain, Turkey, and the United States.
- **Chemical Constituents:** The chief constituent of liquorice root is Glycyrrhizin (6–8%), obtainable in the form of a sweet, which is 50 times sweeter than sucrose, white crystalline powder, con-sisting of the calcium and potassium salts of glycynhizic acid. Glycyrrhizic acid on hydrolysis yields glycyrrhetic or glycyrrhetinic acid.

✓ *Uses:*

- Antibacterial qualities: Liquorice may have antibacterial qualities that lower the incidence of dental caries and oral infections.
- Anti-inflammatory properties: Liquorice's constituents can help in lowering oral cavity inflammation, which may be beneficial for gum disease or other oral diseases.
- Wound healing: Liquorice may help mouth wounds heal, which could help with oral injuries or post-surgery recovering.
- Antioxidant activity: Antioxidants included in liquorice may shield oral tissues from oxidative stress, hence reducing the chance of developing oral illnesses.
- Analgesic effects: liquorice may have the ability to reduce pain, which may provide comfort for those experiencing discomfort in their mouth16.

- *Lemon-*

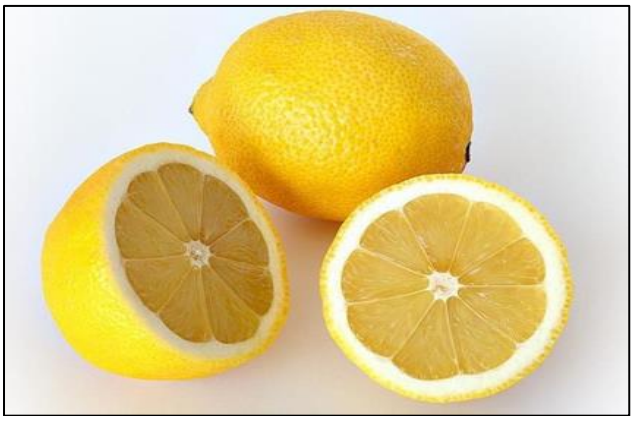


Fig 4: Lemon

- **Synonym**: Fructus Limonis
- **Biological Source:** Lemon Juice is obtained from the fresh ripe fruit of Citrus limon (L.) Burm. f. (C medico var. limon Linn.), belonging to family Rutaceae.
- **Geographical Source:** It is cultivated in California. West Indies, Italy, Spain, Sicily, Portugal, Florida, California, Jamaica, and Australia; grown all over India, particularly in home gardens and small-sized orchards.
- **Chemical Constituents:** Lemon contains volatile oil (2.5%), vitamin C, hesperidin and other flavone glycosides, mucilage, pectin and calcium oxalate. The important constituents of the volatile oil are limonene (90%), citronellal, geranyl acetate, α-pinene, camphene, linalool, terpineol, methyl heptenone, octyl and nonyl aldehydes, γ-terpinene, β-pinene, neral, and geranial.

✓ *Uses:*

- Lemon is used as a flavouring agent, perfumery, stomachic, and carminative.
- The oil, externally, is a strong rubefacient and if taken internally in small doses has stimulating and carminative properties.

IV. EXCIPIENT PROFILE

A. Calcium Carbonate- Molecular Formula –
Chemical compound with the formula $CaCO_3$.

- **Appearance:** white, odourless powder or crystals
- **Source:** It is one of the most abundant minerals on earth and is found in various forms, including limestone, marble, and chalk.

➢ *Uses*

- In healthcare, it is commonly used as a dietary supplement to prevent or treat calcium deficiency and as an antacid to relieve heartburn and indigestion. Calcium carbonate has several other industrial applications, including in the manufacturing of paper, plastics, paints, and ceramics.
- It is also used as a filler and whitening agent in various products.
- It is also used in wide range of industries, including construction, agriculture, and health care.

B. Sodium Lauryl Sulphate:
Sodium lauryl sulfate (SLS) is a widely used anionic surfactant in various personal care and cleaning products due to its excellent foaming and cleansing properties. It's derived from coconut oil or palm kernel oil and undergoes a chemical process to become SLS.

- **Chemical Formula:** $C_{12}H_{25}NaO_4S$
- **Appearance:** White or off-white powder or crystalline solid.

➢ *Uses:*

- SLS acts as a detergent, emulsifier, and foaming agent.
- It helps to remove dirt, oil, and grease from surfaces and enhancing the lathering and cleaning abilities of products like shampoos, toothpaste, body washes, and household cleaners.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24SEP090

C. Glycerine:

Glycerine, also known as glycerol or glycerin, is a colorless, odorless, viscous liquid with a sweet taste. It is a trihydric alcohol, meaning it contains three hydroxyl groups (-OH) in its molecular structure. Glycerine is commonly used in various industries, including pharmaceuticals, food and beverage, cosmetics, and personal care products, due to its humectant, solvent, and lubricating properties.

- **Chemical Formula:** $C_3H_8O_3$
- **Physical Properties:**

✓ Molecular Weight: 92.09 g/mol
✓ Density: 1.261 g/cm³
✓ Boiling Point: 290°C (554°F)
✓ Melting Point: 17.8°C (64°F)

- **Solubility**: Glycerine is soluble in water and alcohol.

➢ *Uses:*

- Pharmaceuticals: Glycerine is used as a solvent, sweetening agent, and humectant in cough syrups, elixirs, and pharmaceutical formulations.
- Food and Beverage Industry: It serves as a sweetener, solvent, and humectant in food products such as baked goods, candies, and beverages.
- Cosmetics and Personal Care: Glycerine is a common ingredient in skincare products like moisturizers, lotions, and soaps due to its moisturizing and emollient properties.
- Industrial Applications: It is used in the production of dynamite, as a plasticizer in the manufacturing of nitroglycerin, and as a component in the production of various chemicals.
- Health Considerations: Glycerine is generally considered safe for consumption and topical use, but excessive intake may cause gastrointestinal discomfort. It is non-toxic and non-irritating when used externally.

D. Sodium Benzoate:

Sodium benzoate is the sodium salt of benzoic acid, commonly used as a food preservative and antimicrobial agent. Here's a detailed profile with references:

- **Chemical Formula**: $C_7H_5NaO_2$
- **Appearance**: White crystalline powder or granules.
- **Solubility**: Highly soluble in water.

➢ *Uses:*

- Food and Beverage Industry: Preservative in acidic foods and beverages (Juices, soft drinks, pickles).
- Cosmetics and Personal Care Products: Preservative in cosmetics, skincare products, and oral care products.
- Pharmaceuticals: Preservative in liquid medications.
- Industrial Applications: Used in dye manufacturing and as a corrosion inhibitor.

E. Sodium Saccharine:

Sodium saccharine is an artificial sweetener with about 300–400 times the sweetness of sucrose (table sugar). Here's a profile of sodium saccharin:

- **Chemical Formula**: $C_7H_4NNaO_3S$
- **Appearance**: White, crystalline powder.
- **Taste**: Intensely sweet taste.
- **Solubility**: Highly soluble in water.

➢ *Uses:*

- **Food and Beverage Industry**: Used as a non-nutritive sweetener in various food and beverage products, including diet sodas, tabletop sweeteners, candies, and baked goods.
- **Pharmaceuticals**: Sometimes used to sweeten medicines and dental products.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24SEP090

V. MATERIAL AND METHOD

A. Method of Preparation:

Trituration with a mortar and pestle is one process used to create a basis for herbal toothpaste.

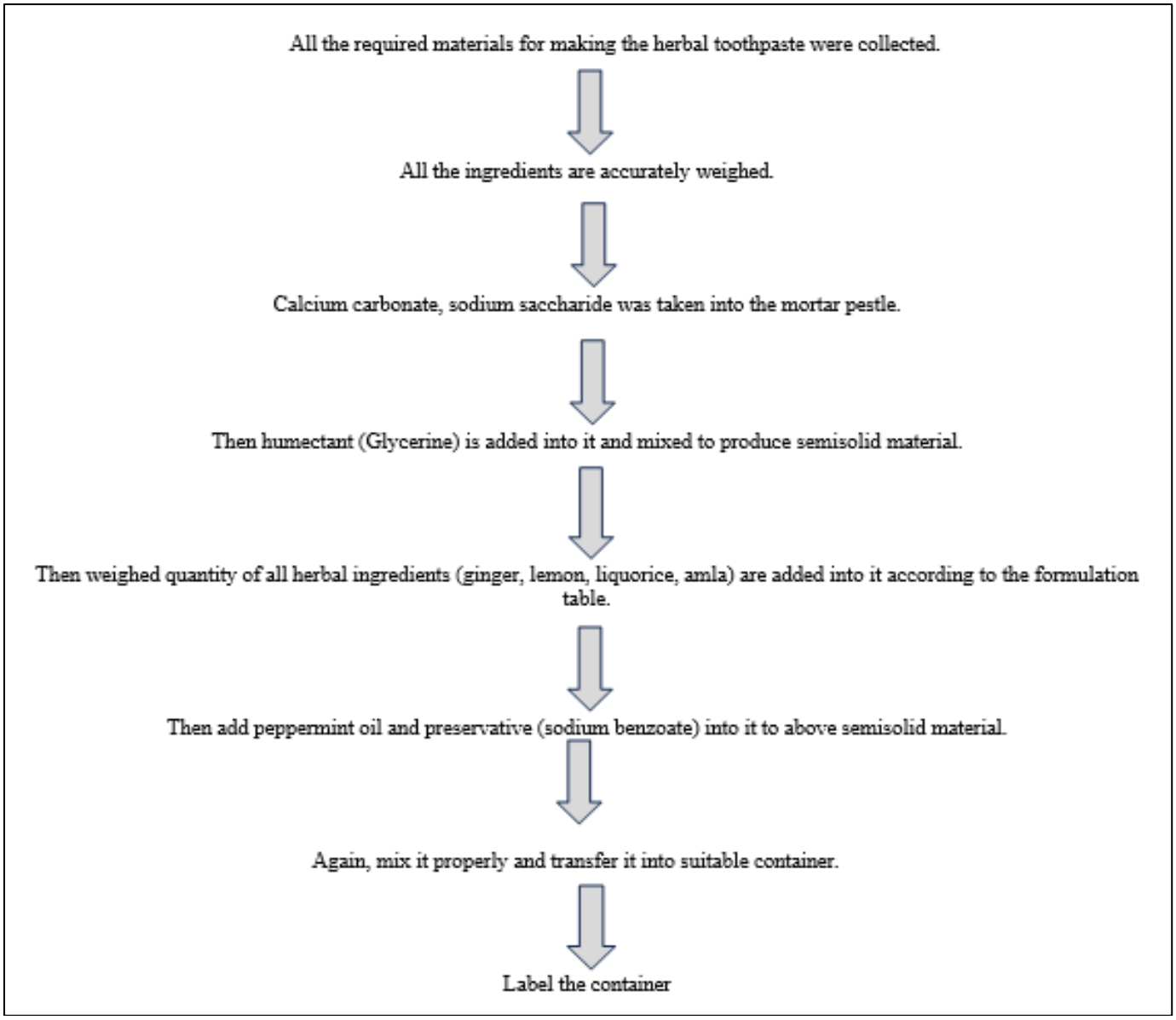


Fig 5: Method of Preparation

Table 2: Formulation Table

Sr.No	Ingredients	F1	F2	F3
1	Ginger	2 ml	4 ml	8 ml
2	Lemon	1 ml	1 ml	1 ml
3	liquorice	2 gm	2 gm	2 gm
4	Amla	2 gm	2 gm	2 gm
5	Calcium carbonate	11 gm	11 gm	11 gm
6	Sodium lauryl sulphate	0.5 gm	0.5 gm	0.5 gm
7	Glycerine	10 ml	9 ml	7.5 ml
8	Sodium benzoate	0.025 gm	0.025 gm	0.025 gm
9	Sodium saccharine	0.05gm	0.05 gm	0.05 gm
10	Peppermint oil	q.s	q.s	q. s

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24SEP090

B. Evaluation Test:

➢ *Physical Evaluation:*

- **Colour:** The consistency and conformance to the desired colour of the toothpaste's look are assessed visually.
- **Odour:** The toothpaste's fragrance is evaluated.
- **Taste:** To make sure the flavour is agreeable and meets expectations, it is tested[4].

➢ *Determination of Ph:*

Using a pH meter, the pH of the herbal toothpaste formulation was determined. Put 10g of toothpaste in a 150ml beaker. Permit the 10ml of water to boil before cooling down. Stir it vigorously, create a suspension[7].

➢ *Determination of Spreadability:*

The technique used for determining the drug's characteristic involved, placing 2 grams of the prepared paste on the ground slide under investigation, sandwiching it between the slide and another glass slide for 5 minutes to release air and create a uniform paste film between the slides, scraping off any excess paste from the edges. The top plate was then pulled with 80 grams using a string that was attached to the hook, and the amount of time (sec) that the top slide needed to cover a distance of 7.5 cm was recorded. A short interval suggested better spreadability[7].

➢ *Antimicrobial Properties:*

The disc diffusion method was used to conduct an in-vitro anti-bacterial research of the prepared paste against the pathogenic bacterium Candida albicans. Initially, the cultured cells were allowed to multiply in agar plates. Plates were first sprayed with inoculum, then sterile cork borer was used to create holes in the medium. To guarantee that the inoculums surrounding the hole were distributed equally, the agar plate's surface was rotated. Next, the the prepared paste were added to the bores on the cultured plates. After being labelled, the plates were incubated for twenty-four hours at 37ºC. Every plate was inspected following a 24-hour incubation period. Using a ruler, the zone of inhibition (ZOI) diameter was measured in millimeters (mm)[9].

➢ *Foaming Property:*

A small amount of the toothpaste formulation was combined with water in a measuring cylinder, and the cylinder was shaken ten times to determine the foam ability of the toothpaste. The total amount of foam was recorded.

Determination of foaming power Foaming power = V1–V2

Where, V1- Volume in ml of foam with water.
V2- Volume in ml of water only[7].

➢ *Whitening Effect:*

Paste's cleaning efficacy was evaluated on egg shells that had previously been painted with food coloring. After soaking a toothbrush in water, shake off any extra moisture. Use the moist toothbrush to brush one side of an egg five to ten times. Examine the egg to check whether any colour has been lost. Five to ten brushstrokes should be used for every toothpaste application[1].

➢ *Homogeneity:*

Using a normal force and a temperature of 27 ± 20^{0C}, the toothpaste should extrude a homogeneous mass from the collapsible tube or other appropriate container. The majority of the contents should also extrude from the container's crimp before being gently rolled[9].

➢ *Moisture Content:*

10 grams of toothpaste were weighed out in a porcelain dish and dried at 105 degrees Celsius in the oven. It was placed in a desiccator to cool. The weight loss is expressed as a percentage of moisture content and calculated using the provided formula[3].

% Moisture = Original sample weight – dry sample weight/ Original sample weight X 100

➢ *Determination of Sharp And Edge Abrasive Particles:*

To check for the presence of any sharp or abrasive particles, place the contents on the finger and scratch the butter paper for a length of 15-20 cm. carried out the identical procedure ten times. There were no sharp or edge-abrasive particles present.

VI. RESULT

Table 3: Physical Examination

Sr. No.	Parameters	Observation		
		F1	F2	F3
1	Colour	Brown	Brown	Brown
2	Odour	Pleasant	Pleasant	Pleasant
3	Taste	Better	Better	Better

Table 4: Determination of pH

Sr. No.	Parameters	Observation		
		F1	F2	F3
2	pH determination	6.37	6.71	6.49

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24SEP090

F1 F2 F3

Fig 6: pH Determination Test

Table 5: Determination of Spreadability

Sr. No.	Parameter	Observation		
		F1	F2	F3
3	Spreadability	5.41	5.75	6

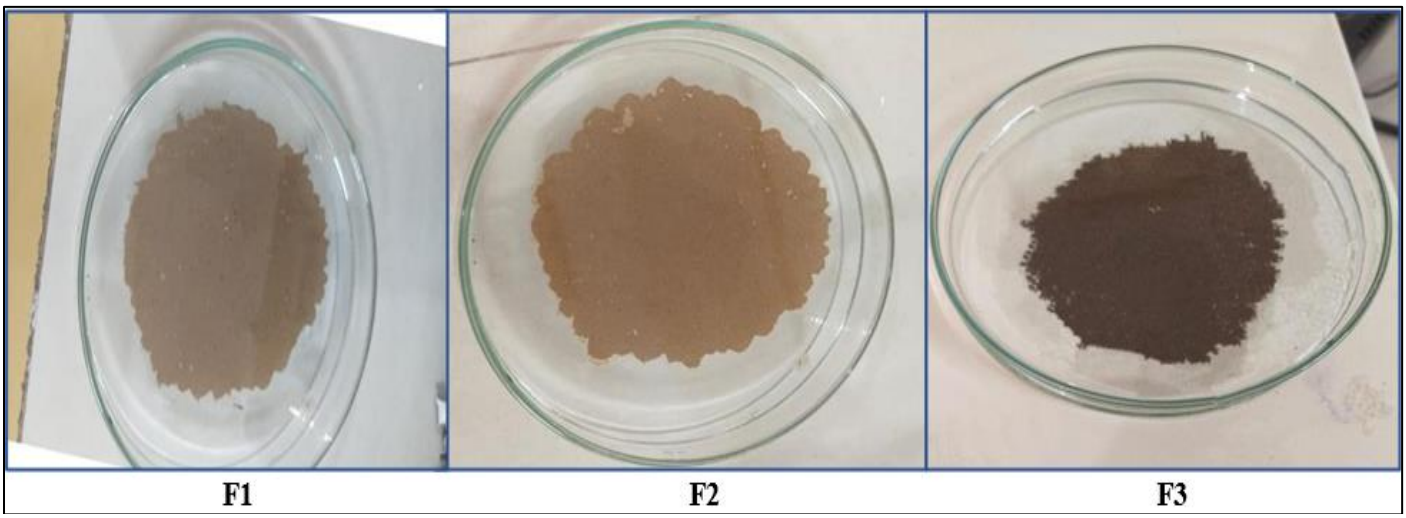


Fig 7: Spreadability Test

Table 6: Determination of Antimicrobial Activity

Sr. No.	Parameters	Observation		
		F1	F2	F3
4	Antimicrobial activity	15	20	15

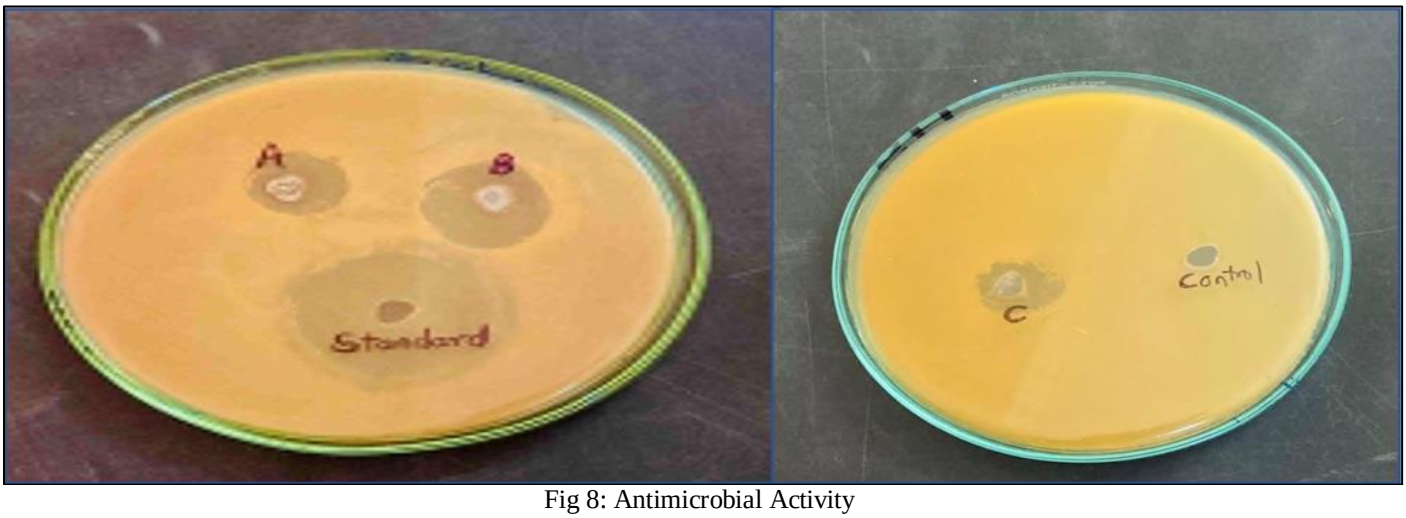
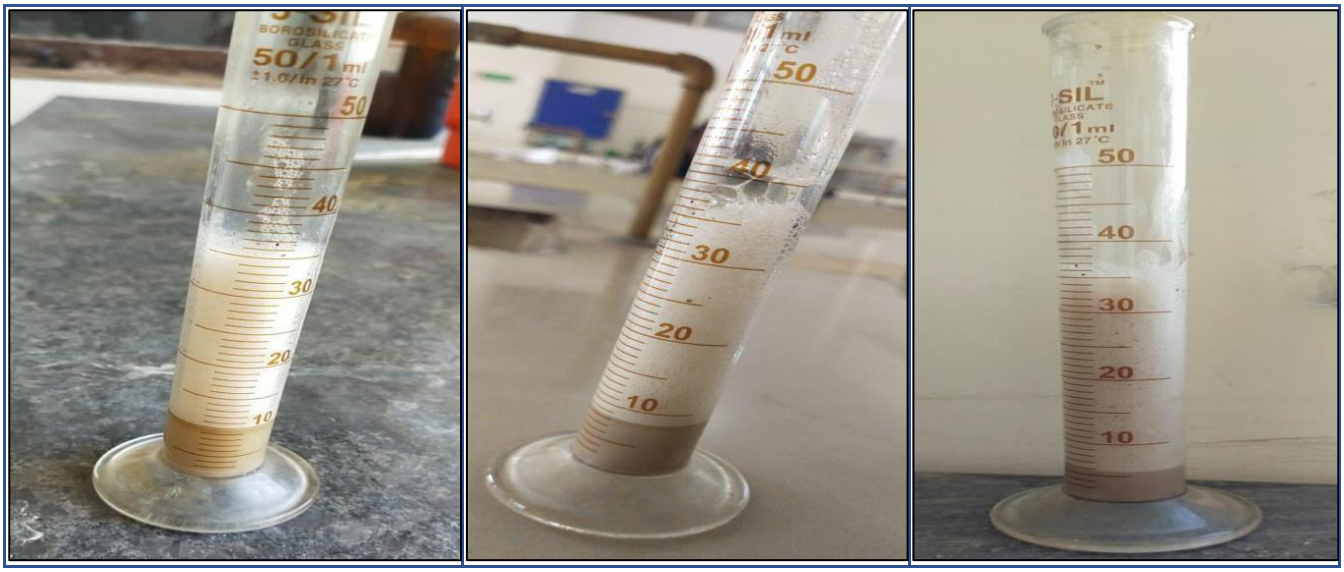


Fig 8: Antimicrobial Activity

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24SEP090

Table 7: Determination of Foaming Ability

Sr. No.	Parameter	Observation		
		F1	F2	F3
5	Foaming Determination	27	28	27



F1 F2 F3

Fig 9: Foaming Index Determination

Table 8: Whitening Effect

Sr. No.	Parameter	Observation		
		F1	F2	F3
6	Whitening Effect	+	+	+

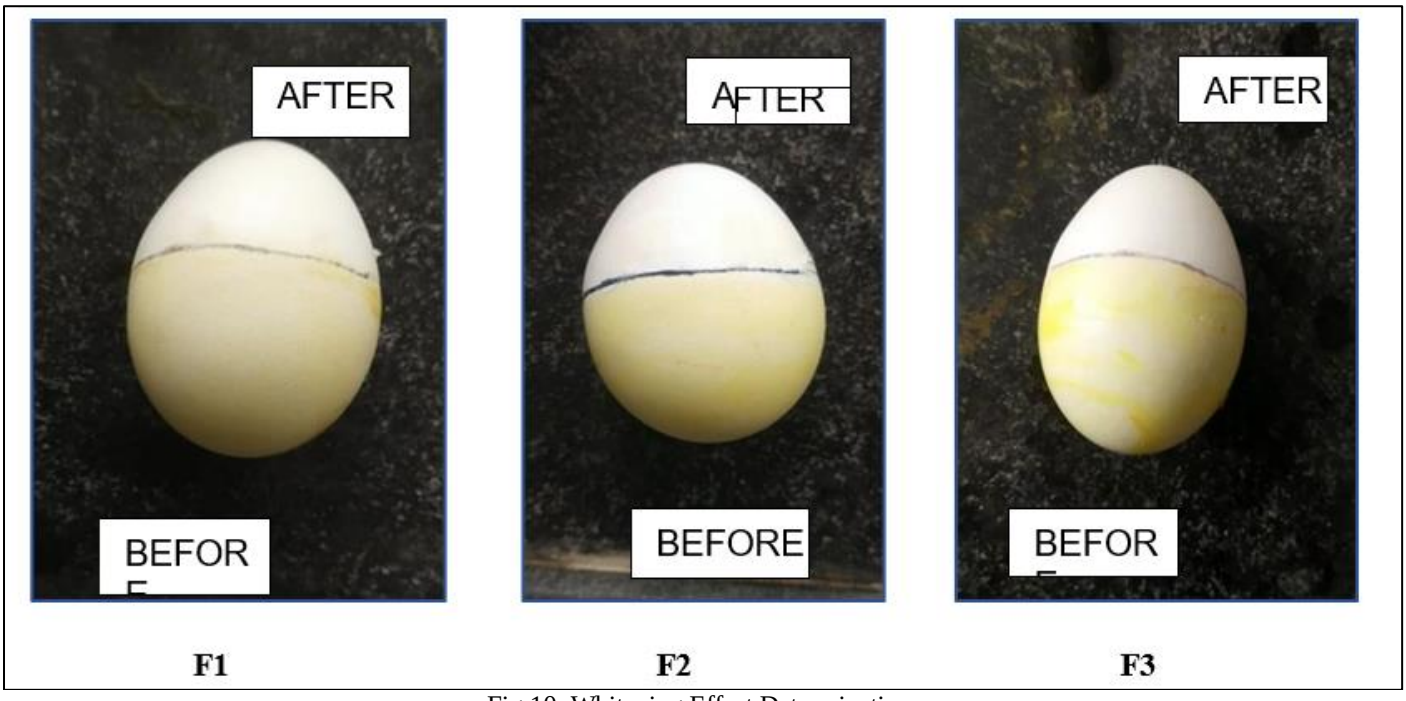


Fig 10: Whitening Effect Determination

Table 9: Homogeneity

Sr. No.	Parameters	Observation		
		F1	F2	F3
7	Homogeneity	Good	Good	Good

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24SEP090

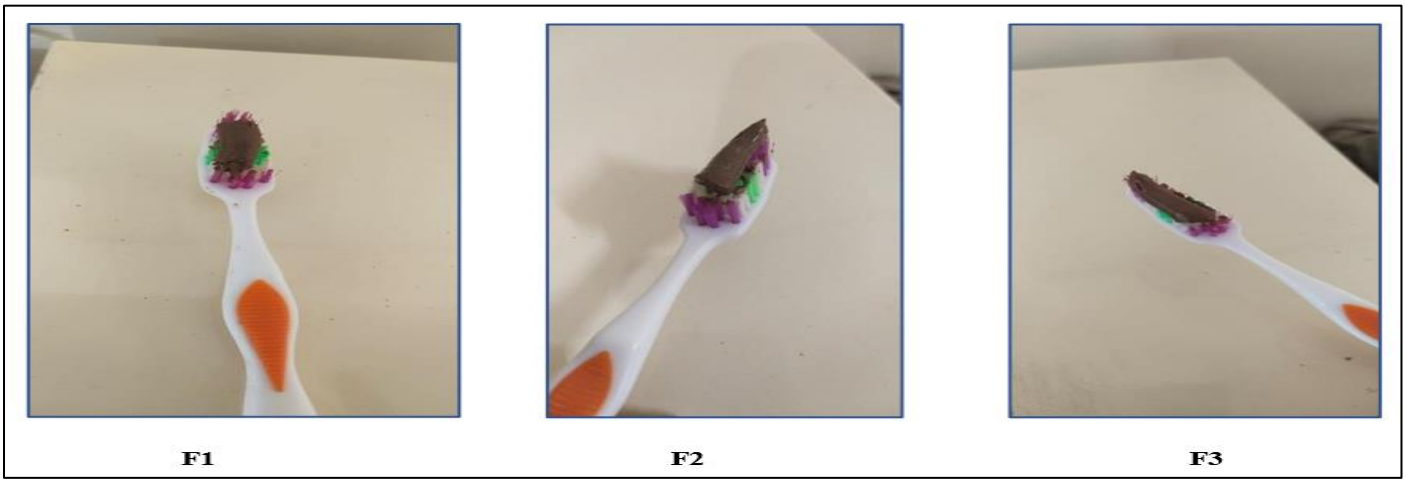


Fig 11: Homogeneity Determination

Table 10: Moisture Content

Sr. No.	Parameters	Observation		
		F1	F2	F3
8	Moisture content	10	18	24

Table 11: Determination of Sharp and Edge Abrasive Particles

Sr. No.	Parameters	Observation		
		F1	F2	F3
9	Abrasiveness	Good Abrasiveness	Good Abrasiveness	Good Abrasiveness

VII. CONCLUSION

The herbal toothpaste is prepared by using ginger, lemon, liquorice, amla using wet gum method. Three batches are prepared by varying the concentration of ginger. The prepared three batches are evaluated by using various tests like physical evaluation test (colour, odor, taste), determination of pH, determination of spreadability, determination of antimicrobial property, foaming property, whitening effect, homogeneity, moisture content, determination of sharp and edge abrasive particles. Amongst the three batches F2 is the optimized batch.

- Future Perspectives: Though the concentration of ginger of F3 batch is more, still we get less antibacterial activity as compared with F2; we cannot justify the reason behind it. So we have to check the antimicrobial activity against the Candida albicans.

REFERENCES

[1]. Gautam, D., Palkar, P., Maule, K., Singh, S., Sawant, G., Kuvalekar, C., Rukari, T., & Jagtap, V. A. (2020). Preparation, evaluation and comparison of herbal toothpaste with marketed herbal toothpaste. Asian Journal of Pharmacy and Technology, 10(3), July-September. https://doi.org/10.5958/2231-5713.2020.00028.8

[2]. Kholani, A. I. (2011). Comparison between the efficacy of herbal and conventional dentifrices on established gingivitis. Dental Research Journal (Isfahan), 8(2), 57-63.

[3]. Gaikwad, M. Y., & Pagare, S. G. (n.d.). Formulation and evaluation of polyherbal toothpaste. International Journal of Pharmaceutical Research and Applications. https://doi.org/10.35629/7781-0804806809

[4]. Gunaki, S., Gaviraj, E. N., Nagathan, C. V., Hunasagi, B. S., & Chandakavate, S. (n.d.). Preparation and evaluation of poly-herbal toothpaste. International Journal of Recent Advances in Multidisciplinary Topics.

[5]. Khandgaonkar, M., & Gayke, B. (n.d.). Formulation and evaluation of polyherbal toothpaste: To overcome oral problems. International Journal for Research in Applied Science & Engineering Technology. https://doi.org/10.22214/ijraset.2023.54838

[6]. Raut, I. D., Gumate, D. S., Patil, S. S., & Patil, V. R. (n.d.). Formulation and evaluation of polyherbal toothpaste using medicinal plants. International Journal of Pharmacy and Pharmaceutical Research.

[7]. Nishad, U., Ali, M., & Maurya, A. (2020). Formulation and evaluation of a polyherbal toothpaste using medicinal plants. Journal of Pharmaceutical Science and Research, 12(1), 105-111.

[8]. Narayanasamy, A. S., Sharmila, N., Nivetha, V., Sri, V., & Archana. (2023). Formulation and evaluation of poly herbal toothpaste. Journal of Pharmaceutical Research International, 35(19), 13-18. https://doi.org/10.9734/JPRI/2023/v35i197396

[9]. Bangar, P. K., & Shelke, D. S. (2022). Formulation and evaluation of herbal toothpaste. International Journal of Advanced Research in Science, 2(2). https://doi.org/10.48175/568

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24SEP090

[10]. Jensena, J. L., & Barkvoll, P. (1998). Clinical implications of the dry mouth: Oral mucosal diseases. Annals of the New York Academy of Sciences, 842(1), 156-162.
[11]. Mohire, N. C., & Yadav, A. V. (2010). Chitosan-based polyherbal toothpaste: A novel oral hygiene product. Indian Journal of Dental Research, 21(3), 380-384.
[12]. Lakshmi, S. V. V. N. S. M., Suryam, G., MD, F., Satya, B. L., Pavithra, M. N., & Raju, A. V. R. (n.d.). Herbomineral toothpaste: A novel formulation for dental caries – An in vitro study. Asian Journal of Pharmaceutics.
[13]. Ali, S., Farooq, I., Shahid, F., Hassan, U., & Zafar, M. S. (2020). Common toothpaste abrasives and methods of evaluating their abrasivity. J Oral Res 2020; Perspectives S3(1):9-15. doi:10.17126/joralres.2020.055
[14]. Moharamzadeh, K. (2017). Biocompatibility of dental biomaterials. In Biocompatibility of Dental Biomaterials. https://doi.org/10.1016/B978-0-08-100884- 3.00008-4.
[15]. Pushpalatha, C. (2018). Ginger - A natural medicine and its uses in dentistry. Drug Invention Today, 10(1), 68-70.
[16]. Sidhu, P., Thakur, S., Khinda, V. I., Kaur, R., & Thakur, R. (2020). Therapeutic benefits of liquorice in dentistry. Journal of Ayurveda and Integrative Medicine, 11(1), 82-88.
[17]. Grover, H. S., Deswal, H., Singh, Y., & Bhardwaj, A. (2015). Therapeutic effects of amla in medicine and dentistry: A review. Journal of Oral Research and Review, 7(2), July-December.
[18]. Singh, S., & Sharma, A. (2018). Herbal toothpaste—A possible and an alternative dentifrice: A review. Pharmacognosy Reviews, 12(23), 163–168. https://doi.org/10.4103/phrev.phrev_40_18
[19]. Sridhar, G., Vadivel, S. A., Elayakathiravan, R., Parthiban, B., Sivasakthi, M., & Thrisha, M. (2023). Herbal toothpaste: An overview. Volume 22, Issue 11, 1-6.
[20]. Shahidulla, D., Begum, N., & Sultana, N. (2022). Herbal toothpaste: An overview. International Journal of Novel Research and Development, 7(11), 1-5.