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REVIEW ON "EVALUATIONS AND FORMULATIONS OF HERBAL TOOTHPASTE"

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ABSTRACT

Toothpaste is an essential oral-care product widely used as part of daily hygiene practices. Its primary function is cleaning of teeth and the oral cavity, while also supporting management of various dental issues. Many dental professionals recommend toothpaste formulations for conditions such as dentinal hypersensitivity, plaque accumulation, and chronic gingivitis due to their therapeutic components and targeted action. In recent years, herbal toothpastes have gained significant attention as consumers increasingly prefer natural, plant-based alternatives to conventional synthetic formulations. These products are developed using extracts from healing plants recognized for their antimicrobial germ-fighting, anti-inflammatory, also antioxidant features. Usual botanical contents include fresh ginger root, Chinese cinnamon simnia, Indian copal resin, Indian gum Arabic tree (Acacia nilotica) leaf essence, fresh lemon essence, margosa bark and stem, guava leaves, Kalmi bark, and various other phytochemicals traditionally utilized in oral healthcare. The evaluation of herbal toothpaste involves several analytical, physicochemical, and quality-control tests. Standard assessments include physical appearance, roughness, malleability, acidity and alkalinity, uniformity, Foam ability, and overall formulation constancy. Additional investigative parameters such as moisture and volatile matter content, water content, sensory characteristics, fragrance quality, retention behavior, shelf-life stability, and total flavonoid concentration provide deeper insight into product performance. Studies focusing on antimicrobial activity and long-term stability further contribute to determining product efficacy and consumer safety. This review article aims to consolidate and analyze available scientific literature on herbal toothpastes, covering their composition, formulation strategies, traditional medicinal relevance, and evaluation criteria. By compiling current evidence, formulators, & industry professionals curious in exploring or developing herbal oral-care products.

KEYWORD: Herbal toothpaste, Guava leaves, Ginger, Babul.

INTRODUCTION

Toothpaste is still one of the most common apparatuses utilized to anticipate dental issues. Indeed in spite of the fact that numerous toothpastes say they can slaughter microbes, not much investigation has truly checked if these claims are genuine. That's why this thought was done to see how well distinctive toothpaste sorts can lower the number of organisms in the mouth. It appears that these toothpastes can really offer assistance to decrease microscopic organisms, which is great for keeping the mouth clean. In any case, the best way to keep your mouth solid is by brushing appropriately and utilizing great dental propensities, not fair the sort of toothpaste you utilize.[1]

One of the most common diseases of the mouth in the world is continuous gingivitis. Plaque from the teeth is the main factor that causes gingivitis to develop. However, because mechanical cleaning techniques have drawbacks, adding secure & efficient drugs to toothpaste is seen helpful addition in mechanical plaque reduction. Studies have It has been shown that some ingredients, such as triclosan or chlorhexidine, are added to toothpaste in order to instantly stop plaque from forming.[2]

A number of substances included in mouthwashes and dental paste have been demonstrated to be able to slow the formation of plaque on teeth. The growing recognition of traditional medical practices in many areas of the world has led to an increase in interest in herbal medicine as well as the expansion of alternative and complementary medicine inside medical institutions.[3]

Delivering fluoride to teeth and reducing oral bacterial flora are two of toothpaste's main purposes. This is because it has been demonstrated that fluoride, a chemical which is found organically in numerous common items involving meals and water to drink, protects teeth against infection by bacteria.Dental health should be enhanced with tooth paste that effectively lowers the number of oral germs. Gum often contains triclosan. Due to its capacity to fight germs, it is an element utilized for avoiding disease of the gums. It is also known that the sodium fluoride, which is the active component, has against germs qualities. Triclosan and fluoride is not included in natural toothpastes.[4]

Objectives

- Examine how well herbal toothpaste reduces gingivitis and dental plaque in comparison to traditional formulations.
- To examine the antibacterial qualities of popular herbal components used in toothpaste, including tea tree oil, neem, clove, miswak, and aloe vera.
- To evaluate herbal toothpaste's contribution to preventing common oral illnesses and preserving general oral hygiene.
- To evaluate the safety profiles of toothpaste formulations based on herbs vs those based on chemicals

Ideal Properties of Herbal Toothpaste

1. Has a powerful cleaning and scrubbing effect.
2. Safe to use, without causing irritation or toxicity
3. Does not cause any discoloration or marks on teeth
4. Helps keep the mouth clean and in good health.
5. Provides effects that last for a long time.
6. Easy to obtain and reasonably priced
7. Should not damage oral tissues or saliva

8. Must not cause any tooth staining.
9. Aims to remove dental plaque and deposits.
10. Helps improve appetite and promotes a sense of well-being.
11. Supports the overall health of the mouth, gums, and teeth.
12. Assists in reducing inflammation and controlling infections.[5]

Advantages of Home Grown Toothpaste

1. It has been demonstrated that fluoride is cavity preventive.
2. Chemicals are not necessary for anyone's health, yet store-bought toothpaste does include these dangerous ingredients. We must make use of the typical choices that are now available in order to prevent tooth decay.
3. There are several advantages of using herbal toothpaste.
4. Commercial tooth adhesive contains sodium tree sulfate, which can irritate and aggravate the gums during brushing. However, homegrown toothpaste has no chemical additives
5. Common oral hygiene products are effective in eliminating bacteria and maintaining a healthy mouth
6. Mentha piperita and Mentha spicata oils included in homegrown toothpaste aid in the destruction of germs.

The Dawbacks of homegrown tooth paste

1. The safest alternative is naturally approved home-grown toothpaste; otherwise, our teeth can be in danger.
2. They might start with manufacturers that are unfair in their business practices or who fail to adequately identify ingredients, such as fluoride, as some people find concerning
3. Fluorosis is a condition that can result when using excessive amounts of toothpaste with fluoridated over an extended period of time.
4. Toothpaste has been proven to be the real culprit in the enhancement of certain circumstances, including tooth impact and finish thinning, and it may be extremely damaging if consumed in any quantity continuously.
5. The dynamic fixer used in many toothpastes, triclosan, reacts with the chlorine in common water to produce chloroform, a cancer-causing agent
6. This may impair the developing kid's mind, according the some studies[14]

Fig. No. 1: Herbal Toothpastes[6]

FORMULATION

1. Production of zingiber officinal Toothpaste

Serial number	Component(gram)	Quantity (weight/weight)%
1	Zingiber officinale oil (API)	2 millilitre
2	Sodium.lauryl.sulphate(SLS)	1.5 gram
3	Sodium.succinate	0.2 gram
4	Sodium. Benzoate	0.1 gram
5	Limestone (Caco3)	44milliliter
6	Glycerin	40mililitre
7	Mentha piperita oil	Quantity .sufficient

Base preparation

1. To guarantee consistent sized particles, all solids were precisely weighed in accordance with the formula and run through a sieve (No. 80).
2. A semisolid paste was created by gently combining these powdered ingredients with the measured glycerin in a pestle and mortar.
3. Incorporation of biological components: The produced base was carefully mixed with the necessary amount of herbal extract, namely Zingiber officinale oil.
4. Lastly, to add taste, Mentha piperita oil was incorporated into the concoction.[7]

2. Herbal toothpaste formulation

A home mixer was used to grind all of the components once they had been dried. After being weighed, the necessary quantities were put in a blender. Clarified liquid mixed with a solution of c, lauryl sulfate of sodium,limestone (Caco3), methyl fiber, Apis mellifera, and glycerin. This combination was then supplemented with acacia leaves. The mortar containing the herbal powders was gradually filled with the resultant solution, drop by drop, and thoroughly triturated until a homogenous slurry was produced.[8]

Serial number	Component	Amount
1	Azadirachta indica	0.5
2	Vachellia nilotica leaf	0.5
3	Psidium guajava leaf	0.5
4	Holarrhena pubescens	0.5
5	*Cinnamomum camphora*	0.5
6	Apis mellifera	0.5
7	Limestone (Caco3)	3.5
8	Table salt(Nacl)	0.2
9	Sodium.lauryl.sulphate.(SLS)	0.5
10	Para-hydroxy benzoic acid	0.3
11	Glycerol	2
12	Clarified water (H2o)	Quantity sufficient

3. Polyherbal tooth paste formulation

Using a mortar and pestle, combine carboxymethyl cellulose with methyl and propyl parabens. After dissolving the lauryl sulfate of sodium in 25 milliliters of clarified water, 5 grams of glycerol are added. The mixture was well mixed. The Punica granatum, magnifera indica, and citrate peel extracts were then combined with calcium carbonate to create a smooth stick. Lastly, to accentuate the flavor, a few drops of mentha oil is added.

Ingredient follows bellow in table[9]

Sr. no	Ingredients	Quantity
1	Punica granatum peel extract	5gram
2	Citrate peel extract	5gram
3	magnifera indica peel extract	5gram
4	Carboxy methyl cellulose	3gram
5	Limestone(Caco3)	20gram
6	Methylparaben	0.5gram
7	Glycerol	5gram
8	Sodium lauryl sulphate (SLS)	1gram
9	Propylparaben	0.25gram
10	Clarified water (H2o)	25milliliters
11	Mentha oil	0.5%

INGREDIENTS

1. Neem (Azadirachta indica)

Fig. no. 2: *Neem*: Azadirachta indica.

Key components: Azadirachtin, Nimbin, Nimbidin.

Properties

1. Antibacterial Action

Neem has strong antibacterial qualities that offer help in engaging dangerous minuscule living beings in the mouth, which can reduce plaque course of action and lower the chance of getting cavities and gum contamination. You can moreover utilize neem toothpaste along with other incredible verbal care homes to offer help and expect cavities.

2. Anti-inflammatory Benefits

Neem toothpaste can offer help to calm gum disturbance, ease torment, and back for the most part gum prosperity, making it a great elective for those who as often as possible endure from gingivitis or periodontal issues.

3. Unused Breath

The characteristic deodorizing qualities of neem can effectively fight awful breath, keeping your mouth feeling clean and unused all day long.

4. Delicate, In any case Practical

Compared to toothpaste that contains unforgiving chemicals, neem toothpaste is a smooth but reasonable way to take care of your verbal well-being, It is particularly remarkable for those who have unstable gums or teeth[16,15]

2. Eugenol oil (Syzygium aromaticum)

Fig. 3: Eugenol oil: Syzygium aromaticum.

Key components: - eugenol Oil of clove, too called clove oil or eugenol.

It is a basic oil made from the clove plant, Syzygium aromaticum. Clove oil is frequently utilized in fragrance based treatment and to include flavor to nourishment, tea, and toothpaste.In elective pharmaceutical, it might be utilized as a topical treatment to offer assistance with toothache. Be that as it may, there isn't sufficient therapeutic verification to say it works well as a torment reliever

Properties

- **Helps avoid cavities: -** A review in the Universal Diary of Dentistry found that clove fundamental oil can decrease tooth decalcification, particularly from apple juice. Analysts too found that it can offer assistance to modify minerals in teeth, which is an enormous bargain. This implies clove oil can work well with fluoride to halt cavities.
- **Reduces dental inconven**ience**:** Have you ever listened to individuals utilizing clove oil to numb their gums when they have a toothache? This is since cloves have pain-relieving properties. One thought in the Diary of Dentistry appeared that cloves are as successful as benzocaine when utilized as a topical anesthetic for dental issues. Inquire about moreover recommends that cloves can offer assistance ease the torment of going to the dentist.
- **Keeps microscopic organisms at narrows:** A ponder in the Diary of Normal Items appeared that cloves can halt the development of microscopic organisms that cause gum illness. Another ponder in the Diary of Indian Society of Periodontology found that utilizing cloves in mouthwash or verbal washes can offer assistance in battle plaque and gum aggravating.[15,16]

2. Ginger (Zingiber officinale)

Fig. 4: Ginger: Zingiber officinale.

Key Components: Gingerols, shogaols

Properties

- Makes a difference, decreases irritation, and secures cells.
- A few have the capacity to murder microscopic organisms.
- Progresses bloodstream

Utilized in toothpaste

- Diminishes swollen gums,
- Makes a difference in controlling awful microbes, liberates breath, and keeps the mouth clean.
- Whether new or dried, it includes a solid, hot taste and scent.
- Individuals regularly drink ginger tea or other drinks made with ginger since they can offer assistance with assimilation and ease nausea.
- Ginger moreover has numerous wellbeing benefits since it contains anti-inflammatory, antioxidant, anti-nausea, and germ-fighting properties. It is frequently utilized in medications to offer assistance with disturbed stomach, sickness, absorption issues, sore throat, and joint torment.
- It is too found in wellbeing supplements, normal cures, and medicines. Considers recommend that ginger may offer assistance to control blood sugar levels and progress heart wellbeing by bringing down cholesterol levels [15]

4. Guava leaves (Psidium guajava)

Fig. no. 5: Guava leaves: Psidium guajava.

Key components: Tanin, flavonid, polyphenols

Utilized in toothpaste

- **Antibacterial Action**

Guava clears out have substances like quercetin, tannins, and flavonoids that halt destructive microscopic organisms in the mouth, such as Streptococcus mutans, Lactobacillus, and Porphyromonas gingivalis.When utilized in toothpaste, it makes a difference lower the sum of plaque on teeth and stops tooth

- **Anti-inflammatory**

The extricate from guava takes off and has solid anti-inflammatory impacts that decrease swelling and bothering in the gums and mouth tissues. This makes a difference over gingivitis and makes gums feel more comfortable.

- **Astringent Property**

Since guava takes off have a parcel of tannins, they have a common astringent effect.This fixes the gums, brings down dying, and makes the tissues around the teeth stronger

- **Antioxidant**

Guava clears out are full of polyphenols and vitamin C, which offer assistance expel destructive free radicals.In toothpaste, this ensures the mouth tissues from harm caused by free radicals and keeps gums healthy.Wound-Healing The extricate from guava clears out makes a difference tissues develop back faster.It speeds up the mending of little mouth bruises, cuts, and chafed gums.[17]

5. Babool leaves (Vachellia nilotica)

Fig. no. 6 Babool leaves: Vachellia nilotica.

Key components:- Tanin, gallic acid, flavonoid

- Babool is a popular blossoming tree that developed in the Indian subcontinent. For a long time, individuals have utilized it in conventional medication because of its numerous recuperating qualities
- In Ayurveda, it is seen as a solid herb that makes a difference in keeping the body solid and adjusted. One of its uncommon benefits is how it makes a difference with health. Saltbark takes off, and twigs of the babool tree contain tannins, flavonoids, and antimicrobial substances to ensure the health of the teeth and gums.
- These common chemicals halt destructive microscopic organisms in the mouth from developing, which in anticipating differences anticipate tooth rot, plaque buildup, and gum diseases. The astringent, moreover, s of babool moreover make the gums more grounded, diminish dying, and boost health.
- Babool is too supportive in decreasing terrible breath since it battles the microscopic organisms that cause obnoxious smells. This is why it has been utilized customarily as a characteristic toothbrush, called datun, in numerous country and tribal regions of India. Chewing only twigs not as it were cleans the talsosically but moreover discharges the accommodating compounds that advance more advantageous gums and fresher breath.

Utilization of Vachellia nilotica

- Its astringent tannins help strengthen gums.
- It has an impact on the management of plaque accumulation.
- Lessens bleeding from the gums
- Combats harmful oral germs by acting as a typical antibacterial.

- It can help cure periodontitis and gingivitis.
- It has a restorative effect on the gums.
- Improves the healing of minor gum injuries.
- When combined with other herbs, it helps reduce tooth pain and affectability. functions as a typical cleaning and foaming agent.
- Traditionally used for verbal care as datun, or chewing adhere.

6. Turmeric (Curcumina longa)

Fig. 7: Turmeric: Curcumina longa.

Key component: Curcumin, Demethoxy Curcumin.

Utilization of curcumin longa

- **Anti-inflammatory:** It improves gum comfort by easing the swelling, discomfort, and redness that are frequently associated with gingivitis.
- **Antibacterial:** It aggressively combats dangerous oral bacteria like Streptococcus mutans, which is the primary cause of tooth disease and dental caries.
- **Anti-plaque:** It lowers the likelihood of dental tartar and plaque formation by preventing the buildup of sticky bacterial residues on teeth.[18]

MARKETED PRODUCTS

Product	Company
● **Himalaya complete care** 	**Himalaya Wellness company**

• **Colgate Herbal** 	**Colgate - Palmolive**
• **Vicco vajradhanti** 	**Vicco Laboratories**
• **Dant kanti** 	**Patanjali Ayurved. Ltd.**
• **Dabur herbal toothpaste** 	**Dabur .Ltd**
• **Vithoba herbal toothpaste** 	**Vithoda Industry. Pvt.Ltd.**

ANALYSIS PARAMETERS

1. Physiological Assessment

Color: The manufactured toothpaste was visually examined to determine its color and guarantee a consistent appearance throughout the formulation.

Scent: The product's scent was assessed by lightly inhaling the formulation to detect any pleasant or disagreeable odors

Flavors: To evaluate the toothpaste's acceptability, a little amount of the formulation was carefully tasted.

2. Density in Relation

A relative density (RD) bottle was used to calculate the formulation's relative density. Ten milliliters of the toothpaste mixture and ten milliliters of distilled water were weighed independently. Next, the relative density was computed by contrasting the A relative density (RD) bottle was used to calculate the formulation's relative density. Ten milliliters of the toothpaste mixture and ten milliliters of distilled water were weighed independently. The total mass of the formulation was then compared to the mass of an equivalent amount of distilled water in order to determine the relative density.[10]

3. Homogeneity

The toothpaste was examined for uniformity and smoothness by checking its ability to be dispensed from a collapsible tube under normal pressure. A consistent formulation should come out evenly, with most of the contents emerging from the crimped end of the tube before being gradually rolled out, indicating proper homogeneity.

4. Fragrance Test

The fragrance evaluation was carried out through personal sensory assessment. Feedback was collected from five individuals to determine the acceptability of the scent. The aroma of the toothpaste was compared with that of a standard reference toothpaste and graded based on the following criteria:

A) The fragrance closely matches that of the reference toothpaste.

B) The scent is similar to the reference but not too strong or overpowering.

C) The aroma is less pleasant compared to the reference toothpaste.

5. Content of Moisture

A precisely measured 10 grams of toothpaste were placed on an earthenware surface and baked upto 105 degrees Celsius.. The sample has been dried and then chilled in a desiccator. The following calculation was used to determine the percentage of moisture loss

% Moisture content = Weight of the initial sample - Weight of the dry content × 100
mass of the dry content

6. Consistency

The normal ICH criteria were followed for conducting the stability evaluation. For three months, the toothpaste mixture was kept in collapsible tubes in different humidity levels and temperature (25°Celsius, 2 °Celcius, 60 °C, 65 °C, and 5 °C). Important factors including spreadability, pH, and physical appearance were routinely evaluated over the storage period to ascertain the product's stability under various environmental circumstances.[11]

7. pH Determination

One gram of the manufactured herbal toothpaste was diluted in one hundred milliliters of distilled water to determine the formulation's pH. A standard color chart was used to compare the color shift that occurred when a drop of this diluted mixture was applied to pH indicator paper. After then, the matching pH value was noted.

8. Viscosity

A Brookfield viscometer of the kind was used to measure the viscosity in each toothpaste formulation. The prepared formulation transferred into a small- diameter bottle, and the viscometer spindle was immersed in the sample for two minutes. The viscosity of each sample of multi-herbal toothpaste was measured using a number 64 spindle running at one hundred revolutions per minute. For every formulation, Enter observations is obtained three each times for each formulation; average result was computed and recorded.

9. Foaminess

The single gram of the paste was put into a test tube with a stopper, and ten milliliters of water were added to increase the volume in order to test for foamability. After that, a hollow tube is then sealed & shaken at a constant rate of two shakes each second for required duration. The height is ensuing foam has measured after tube is shaken and left undisturbed for fifteen minutes.[12]

10. Determination Abrasiveness

A 15- to 20-cm-long toothpaste strip had been extruded onto butter paper. To collect materials of not less than ten collapsible tubes, this process was repeated. Each sample's whole length was carefully inspected from the fingertip to look for any abrasive, gritty, or pointy particles. Such particles should not be included in toothpaste formulas.

11. Determination of Spreadability

A measured quantity of toothpaste was put in the middle of a spotless glass plate to assess spreadability. A 1 kilogram weight was placed atop an additional glass plate that had been delicately placed on top. The weight was taken off after a certain amount of time, and the spread sample's dispersion was assessed by measuring its diameter in centimeters.

12. Extrudability

The manufactured toothpaste was put inside an expandable metal container, coated using a conventional cover, and its ends were crimped in order to assess extrudability. Every filled tube's original weight was noted. After that, a clamp was utilized to secure these tubes in place Between both two sheets of transparent glass The paste is allowed to extrude after a 500 g weight was attached and the cover was taken off. The total quantity extrusion was computed by measuring the amount of toothpaste that was released from the tube.[13]

CONCLUSION

Study successfully formulated and evaluated an herbal toothpaste using natural ingredients with proven antimicrobial and therapeutic benefits. The product showed good physical characteristics, including proper color, consistency, homogeneity, and fragrance. Key evaluation parameters—such as pH, viscosity, spreadability, foamability, abrasiveness, moisture content, and extrudability were within acceptable limits, making the formulation suitable for daily oral care.Stability testing under different temperature and humidity conditions confirmed that the toothpaste remained stable without significant changes in appearance, ph, or performance. The herbal components contributed to

antimicrobial, anti-inflammatory, and soothing effects while reducing the risk of side effects linked to synthetic agents.Overall, the formulated herbal toothpaste is safe, effective, and user-friendly, offering a promising natural alternative to conventional products. It also provides strong potential for commercial development and further research to enhance its long-term stability and therapeutic value.

REFERENCES

1. Priyal G., Maji Jose, Shruti Nayak, Vidya Pai, Sudeendra Prabhu, Evaluation of efficacy of different tooth paste formulations in reducing the oral microbial load - An in-vivo study,Biomedicine, 2021; 41(2) Supplementary issue: 465-471.
2. Jinfeng He, Yalan Deng, Fangzhi Zhu, Ting Zhong, Nanyu Luo, Lei Lei, Li Cheng, and Tao Hu, The Efficacy and Safety of a Herbal Toothpaste in Reducing Gingivitis: A Double-Blind,Randomized,Placebo-Controlled, Parallel Allocation Clinical TrialHindawi Evidence-Based Complementary and Alternative Medicine Volume 2019
3. Chandrashekar Janakiram 1, Ramanarayanan Venkitachalam 2, Paul Fontelo 3, Timothy J. Iafolla 4 and Bruce A. Dye 4*Effectiveness of herbal oral care products in reducing dental plaque & gingivitis –a systematic review and meta-analysis, Janakiram et al. BMC Complementary Medicine and Therapies (2020) 20:43
4. J Okpalugo, K Ibrahim, US Inyang, Toothpaste formulation efficacy in reducing oral flora,Tropical Journal of Pharmaceutical Research, February, 2009; 8(1): 71-77.
5. Reynolds, E. C. (1994). Contents of toothpaste- safety implications. Aust Prescr, 17(2), 49-51. Saeed, S. (2008). “n vitro antibacterial activity of clove against gram negative bacteria. Pakistan Journal of Botany, 40(5), 2infections Chowdhary Banani R, Garai Arnav, Deb Madhuparna, Bhattacharya Souptik. Herbal toothpaste- A possible remedy for oral cancer. Journal of Natural Products, 2013; 6: 44-55.
6. Chowdhary Banani R, Garai Arnav, Deb Madhuparna, Bhattacharya Souptik. Herbal toothpaste- A possible remedy for oral cancer. Journal of Natural Products, 2013; 6: 44-55.
7. K.L. Senthilkumar.1, S.Venkateswaran.1, A. Vasanthan1, P. Chiranjeevi 1, N Mohamed 1, S. Dinesh 1, K.L.S. Neshkumar. Formulation development and evaluation of novel herbal toothpaste from natural source International Journal of Pharmaceutical Chemistry and Analysis, 2022; 9(1): 17–21.
8. Pavan Deshmukh, Roshan Telrandhe, Mahendra Gunde, Formulation and Evaluation of Herbal Toothpaste: Compared With Marketed Preparation, Roshan T et al; Int J. Pharm. Drugs. Anal, 2017; Vol: 5(10); 406-410
9. Mahendra Sekar,Muhammad Zulhilmi,AbdullahFormulation,Evaluation & Antimicrobial Properties of Polyherbal Toothpaste Int J Curr Pharm Res, 8(3): 105-107.
10. Review on formulation and evaluation of herbal toothpaste by Nikita M. Rathi, Shital V. Sirsat, Sanket S. Toshniwal, Nikita T. Zagare, Shaikh Fazil Shaikh Mahamad
11. Review on formulation and evaluation on Herbal Toothpaste by Mr. Sable Kundan 1,Mr. Bhati Deepak2, Mr. Havelikar Ujwal3 Mr. Ghuge Saurabh Dr. Thorat Rajendra
12. Review on formulation and evaluation on Herbal Toothpaste by K.HealthL. Senthilkumar1,*, S. Venkateswaran.1, A. Vasanthan1,P. Chiranjeevi1, N Mohamed1, S. Dinesh1, K.L.S. Neshkumar
13. Review on formulation and evaluation on Herbal Toothpaste by Prabhu K. Halakatti*1, Anita Desai1,Mahantesh Moogi2, Mahantesh Patted2, Ashok Gumtaj2, PallaviToothpaste.
14. Stephen Mason., Impact of toothpaste on oral health related quality of life in peoplewith. dentine hypersensitivity. BMC Oral, 2019; 19: 226.

15. Pavithra, K., & Vadivukkarasi, S., *Evaluation of antioxidant and antimicrobial efficacy of some medicinal plants.* Journal of Pharmaceutical Sciences and Research, 2015; 7(7): 434–439.
16. Zinge, S., Patel, K., & Nile, N., Formulation and evaluation of Ayurvedic herbal toothpaste. International Journal of Creative Research Thoughts (IJCRT), 2025; 13(6).
17. Biswas, B., et al., Antimicrobial activity of guava leaf extracts against oral pathogens. Journal of Medicinal Plants Research, 2013; 7(7): 503–508.
18. Priyanka, O., & Gupta, A., Therapeutic applications of *Curcuma longa* in oral health: A review. *Journal of Indian Society of Periodontology*, 2020; 24(2): 144–150.