CODEN [USA]: IAJPBB ISSN : 2349-7750

INDO AMERICAN JOURNAL OF
PHARMACEUTICAL SCIENCES

SJIF Impact Factor: 7.187

https://doi.org/10.5281/zenodo.15785117

Available online at: http://www.iajps.com Research Article

FORMULATION AND EVALUATION OF HERBAL TOOTHPASTE BY USING *MAGNIFERA INDICA* FLOWERS AND *PSIDIUM GUAJAVA* LEAVES EXTRACTS

[1]Mr.Manish Ahire ,[2]Mr.Rahane A.D,[3]Mr.Paresh Chaudhary,[4]Mr.Vaidya.S.A

[1,2,3,4]JES SND Institute of Pharmacy, Babhulgaon Yeola Nashik-423401.

Abstract :

Herbal substances with established medicinal qualities are being investigated as a result of the growing desire for natural and chemical-free dental care solutions. In this study, extracts of guava leaves (Psidium guajava) and mango flowers (Mangifera indica), which are known for their antibacterial, anti-inflammatory, and antioxidant properties, are used to formulate and test a herbal toothpaste. Dried mango flowers and guava leaves were used to make ethanolic extracts, which were then added to a toothpaste base that also contained humectants, binding agents, and natural abrasives.

Physical-chemical characteristics of the toothpaste formulation, such as pH, foaming capacity, abrasiveness, spreadability, and stability, were assessed. Common oral infections including Lactobacillus acidophilus and Streptococcus mutans were used to investigate the antimicrobial activity. The findings showed that the herbal toothpaste had substantial antibacterial activity on par with commercial standards, stable formulation, and good organoleptic qualities. This implies that guava leaves and mango flowers are useful herbal remedies for preserving dental health and can be used as sustainable substitutes in the creation of natural toothpaste formulas.

Keywords :*Herbal substances, antibacterial,stability,Psidium guajava,Mangifera indica.*

Corresponding author:

Mr.Manish Ahire,

JES SND Institute of Pharmacy,

Babhulgaon Yeola Nashik-423401.

QR code

Please cite this article in ***press*** *Manish Ahire al.,* ***Formulation And Evaluation Of Herbal Toothpaste By Using Magnifera Indica Flowers And Psidium Guajava Leaves Extracts,*** *Indo Am. J. P. Sci, 2025; 12(06).*

INTRODUCTION:

The practice of maintaining a clean mouth is known as oral hygiene or oral care, and it helps prevent periodontal diseases, dental caries, gingivitis, bad breath, and other dental conditions. It includes both personal and professional care. Regular cleanings are advised to get rid of tartar that can form despite meticulous brushing and flossing; these are often performed by dentists and dental hygienists [1] Scaling and other tools or equipment to loosen and remove deposits from the teeth are part of professional cleaning. Healthcare professionals advise brushing twice daily to avoid plaque and tartar buildup.With the exception of the spaces between teeth, a toothbrush can remove plaque from the majority of tooth surfaces. Because of this, flossing is also regarded as essential to maintaining dental health. Dental flocks clear plaque from places where cavities could otherwise form. The goal of tooth cleaning is to get rid of plaque, which is primarily made up of germs [2].

One of the most prevalent avoidable conditions that is known to be the main cause of tooth loss and mouth discomfort is dental caries. It is a serious oral condition that affects people of all ages and makes it difficult to achieve and maintain good oral health. The localized breakdown of vulnerable dental hard tissues by acidic byproducts resulting from bacterial fermentation of dietary carbohydrates is known as dental caries[3].

Fig no 1 :Dental carries

An ecological mismatch in the balance between tooth minerals and oral biofilms (plaque) causes this chronic disease, which typically advances slowly in most people. Both the generation of bacterial acid and the buffering effect of saliva and the surrounding tooth structure are to blame for this. As a result, the tooth surface and its surroundings are in a dynamic equilibrium. Enamel, dentine, or cementum demineralizes when the PH drops below a crucial threshold, whereas remineralization, or the gain of minerals, happens when the PH rises.

There are various tooth surfaces where primary caries might develop. The lesion begins and develops beneath the tooth-to-tooth contact area on an approximate surface. In pit and pressure, caries on the occlusal surface is also a localized occurrence.[4].

People use toothpaste to prevent tooth decay and dental cavities, however synthetic toothpaste contains a lot of dangerous chemicals to increase stability, surface tension, and foam. Because sodium laurel sulfate functions as a detergent, emulsifying agent, and cleansing agent, it is primarily used in toothpaste to increase foam. However, because of the harmful mouth cancer it causes, the World Health Organization decided to outlaw sodium laurel sulfate [5].

Fig no 2 :Dentifrice

Dentifrices are solutions designed to be used with a toothbrush to clean the teeth's exposed surface. These have been made in paste and powder form, and to a lesser degree in block and liquid form. Using dentifrices when brushing lowers the risk of tooth decay and promotes gingival health. One of the main secondary effects of tooth cleaning is that good dental health improves overall health.

About 90% of people used to choose herbal medications, drugs, and cosmetics because they were more effective, stable, and strong than synthetic ones, and they did not have any side effects like synthetic drugs or drugs derived from plants or animals did. Herbal toothpaste with a pleasant scent is a wonderful choice for preventing dental cavities and tooth rot. Many herbs that can eliminate foul odors, freshen teeth, and prevent gum disease are used to make herbal toothpastes [6].

Some customers seem to find herbal dentifrices to be an appealing option, and their use is becoming more widely accepted. The belief that herbal toothpaste and other herbal products are natural, chemical-free, and hence better than conventional toothpastes may be partially to blame for this. Anemia and nutritional deficiency conditions are typically linked to

aggressive product advertising, as evidenced by glossitis and intolerance to spicy foods observed in patients attending the oral digestion clinic.
Mango (*Magnifera indica*) blossoms are primarily used to prevent dental cavities and tooth decay. They also help to clean the mouth and eliminate bad breath, treat enamel, and prevent dental cavities. Although guava leaves have been used for centuries, little research has been done on them, so we decided to use their extracts to make herbal toothpaste [7].

Benefits of using herbal toothpaste:
1. The purpose of herbal toothpastes is to combat the microorganisms that cause dental issues.

such as gingivitis, gums, teeth, and cavities.
2. Because they have been around for a long time, some societies use herbal dentifrices for maintaining good oral hygiene.
3. Compared to their chemical counterparts, herbal dentifrices are less costly.

4. One major benefit of herbal toothpastes is their low chemical makeup.
Drug manufacturing chemicals have adverse effects.
5. Unlike many commercial goods, herbal toothpastes don't include fluoride, artificial colors, or artificial flavors [8].

Fig no 3 : Formulation of herbal toothpaste

Materials and Methods :
Magnifera indica extracts, *Psidium guajava* leaf extracts, coconut oil, honey, clove, *Azardichata indica* leaf powder extracts, peppermint powder, salt, charcoal, and tragacanth gum are among the herbal extracts used to make herbal paste.
Chemical: ethanol, hydroalcoholic solution, calcium carbonate, and petroleum ether.
Methods :
Preparation of extracts :
1. Extraction Done by the Cold Maceration Process*:* Petroleum ether was used to defatten the crude powder of the aforementioned herbs—mango flowers, guava leaves, and neem leaves—before the defatted substance was extracted. The left marc was similarly extracted using a hydroalcoholic solution after being allowed to dry at room temperature.
This straightforward and popular method entails letting the plant soak in an appropriate solvent in a closed container. The fresh drug and solvent (water: ethanol: 30:70) are combined at room temperature for simple cold maceration, which is then left for a few days with periodic shaking or stirring. It was a concentrated extract. A desiccator was used to dry the residue that was obtained [9].
2. Preliminary Phytochemical Investigation tests of Extracts:To find out whether chemical constituents such alkaloids, flavonoids, tannins, glycosides, etc. were present, a number of preliminary tests were conducted.
3. Toothpaste Formulation: Using a home mixer, all herbal materials were dried and ground. Weighing out the necessary amount of ingredients, they were then taken to the mortar. Water was blended with calcium carbonate, lemon oil, sodium benzoate, honey, and salt. Glycerine was used as a preservative, along with charcol. This solution was carefully triturated until a paste-like consistency was achieved by adding it drop by drop into a mortar that contained herbal components.

Fig no 4 : Herbal toothpaste after adding excipients .

4. Evaluation parameters were carried out, including the following: detection of sharp and edge abrasive particles; spreadability; foaming power; pH determination; washability; non-irritancy test; viscosity; phase separation; and determination of moisture and volatile matter.

Composition of herbal toothpaste :

Table no 1 : Composition of herbal toothpaste .

Sr.no	Composition	Quantity (Trial 1)	Quantity (Trial 2)	Quantity (Trial 3)	Role
1.	Mango flowers	5 g	5g	5 g	Antibacterial property and toothdecay.
2.	Neem leaves powder	3g	3g	3g	Antibacterial and prevent dental carries .
3.	Guava leaves powder	4g	4g	4 g	Prevent dental carries
4.	Coconut oil	3ml	4ml	5ml	Antimicrobial and antifungal
5.	Clove	2g	3g	4g	Soothes toothache .
6.	Peppermint powder	3 g	4 g	4g	Improve your dental hygiene
7.	Honey	10 ml	10ml	10 ml	Prevent dental carries
8	Salt	0.5 g	1 g	2 g	Abrasive ,remove surface stains and plaque.
9	Charcol	3g	3 g	3 g	Prevent bacterial stains ,remove plaque.
10	Tragacanth gum	3g	4g	5g	Suspending agent
11	Lemon oil	3 ml	4ml	5ml	Foaming agent and flavour
13	Water	Q.S	Q.S	Q.S	For mixing the ingredients
14	Glycerine	Q.S	Q.S	Q.S	Preservative

1. We mix all the herbal extracts in the formulation first, but the first trial did not produce the proper foam, so we had to add more lemon oil in the second trial. In the second trial, the toothpaste produced more flavor and less smell, so we added 5ml of lemon oil to improve the foam.

2. We add tragacanth gum powder for suspending purposes, but in the first trial, no more thickness was produced, so we added more tragacanth gum powder. In the second trial, no good suspending property was obtained either, so in the third trial, we must add roughly 5 g of tragacanth gum in order to obtain both thickness and good suspending property [10].

2. Profile ingredients :

1. *Magnifera indica* [22].

The mango, or *Mangifera indica*, is a big, evergreen tree that is indigenous to Southeast Asia and the Indian subcontinent. It belongs to the Anacardiaceae family. It has been grown and transported all over the world for generations and is well-known for its mouthwatering fruit. Mango trees are commonly planted in gardens, as shade trees, and for their fruit. They are a major fruit crop in many areas and are well suited to tropical and subtropical climes.

- **Scientific name:** *Mangifera indica L.*
- **Common name:** Mango
- **Family:** Anacardiaceae (sumac and poison ivy family)
- **Native to:** Indian subcontinent and Southeast Asia
- **Characteristics:** Large evergreen tree, up to 30 meters tall with a crown width of 30 meters.
- **Leaves:** Simple, alternate, lanceolate, and glossy.
- **Fruit:** Edible stone fruit, a drupe with an outer flesh and a hard stone.

Fig no 5 : Mango (*Magnifera indica*) tree.

Taxonomic classification :

Table no 2 : Taxonomical Classification of *Magnifera indica.*

Kingdom	Plantae
Division	Embryophyta
Class	Dicotyledons
Order	Sapindales
Family	Anacardiaceae
Genus	Magnifera
Species	Indica

2. Azardichata Indica [23].

Table no 3 : Taxonomic Classification of *Azardichata Indica.*

Kingdom	Plantae
Division	Magnoliophytes
Class	Magnoliopsida
Order	Sapindales
Family	Meliaceae
Genus	Azardichata
Species	Indica

The Indian subcontinent is home to the quickly growing evergreen *Azadirachta indica*, also referred to as neem or nim tree. It is a common medicinal plant utilized in conventional systems such as Ayurveda and is a member of the mahogany family (Meliaceae). Neem is highly prized for its wood and as a source of organic insecticides.

- **Appearance:**

A medium to large tree with a round or oval crown, spreading branches, and a thick, furrowed bark.

- **Foliage:**

Pinnate leaves with numerous leaflets, often described as broad and compound.

- **Flowers and Fruits:**

Small, fragrant white flowers in clusters, followed by smooth, green-yellow fruits with a sweet-flavored pulp.

- **Growth:**

A fast-growing tree that can reach heights of 90-98 feet or even 131 feet.

Fig no 6 : *Azardichata indica* (Neem)photo.

3. Psidium guajava :

Table no 4 : Taxonomic classification of Psidium guajava.

Kingdom	Plantae
Division	Magnolioph
Class	Magnoliopsida
Order	Myrtales
Family	Myrtaceae
Genus	Psidium
Species	guajava

Psidium guajava, the scientific name for guava, is a tiny, evergreen tree or shrub that is indigenous to the Caribbean, Central America, and South America. It is a member of the Myrtaceae family and is prized for both its edible fruit and its many therapeutic uses.
According to botany, *Psidium guajava* belongs to the Myrtaceae family, which is sometimes referred to as the myrtle family.

Origin and Distribution: Originally from tropical America, guava trees are currently grown throughout the world's tropical and subtropical zones.

Fig no 7 : ***Psidium guajava*** **(Guava)**

Plant Characteristics:
Usually growing to a height of 3 to 10 meters, it is a little tree or shrub with a shallow root system and low, drooping branches. Its trunk is thin and covered in smooth, light, speckled bark that peels off in thin flakes.

The flowers are white and solitary or in groups of two to three. The leaves are aromatic, evergreen, and opposite, with a noticeable center vein.

4. *Syzium aromaticum*

The clove tree is an evergreen with big leaves and terminal clusters of crimson blooms that can reach a height of 8 to 12 meters (26 to 39 feet). When the flower buds are ready to be harvested, they first have a pale color before progressively turning green and finally turning a vivid crimson. Harvested at a length of 1.5 to 2 centimeters (5⁄8 to 3⁄4 inches), cloves are made up of four unopened petals that create a tiny central ball and a lengthy calyx that ends in four spreading sepals.
Members of the Myrtaceae family, which also includes guavas, include the Syzygium aromaticum tree, whose dried, unopened flower buds are known as cloves.
A common spice in many different cuisines, cloves provide meals like soups, stews, meats, sauces, and baked goods a hearty, spicy taste. Eugenol, one of the molecules found in cloves that gives them their distinct smell and perfume, has been utilized in dentistry and other fields.

Fig no 8 :*Syzium aromaticum*

5. Lemon oil

Lemon oil, sometimes referred to as lemon essential oil, is a fragrant yellow liquid that is usually obtained by steam distillation or cold pressing lemon peels. This multipurpose substance finds usage in aromatherapy, skincare, cooking, and cleaning. Cold-pressed lemon oil is a yellow or yellow-green liquid that is produced by manually pressing the lemon peel without the use of heat. Lemon peels are heated with steam, which is subsequently condensed to extract the oil, creating steam-distilled lemon oil.

Fig no 9:lemon oil

6. Coconut oil

The kernels, meat, and milk of the coconut palm fruit are used to make coconut oil, also known as coconut fat, an edible oil. Below about 25 °C (77 °F), coconut oil is a white solid fat; at higher temperatures, it becomes a transparent, thin liquid. Unrefined types smell strongly of coconut. In addition to being used as a culinary oil, coconut oil is also utilized in industry to make detergent and cosmetics. There are many medium-chain fatty acids in the oil. Because of its unique flavor and high smoke point, coconut oil is frequently used in baking and cooking.

Fig no 10 :Coconut oil

6.Peppermint :

A mix between spearmint and watermint, peppermint is a type of mint. The plant, which is native to Europe and the Middle East, is now grown and dispersed throughout much of the world. Sometimes, it can be found in the wild with its parent species. Although there are around 25 species in the genus Mentha, peppermint is the one that is most frequently used. Chinese peppermint, also known as bohe, is made from the fresh leaves of M. haplocalyx, whereas Western peppermint is made from M. × piperita.

Fig no 11 :Peppermint leaves

Evalution and comparision of herbal toothpaste :

1. Color: A visual inspection revealed the cream's color.
2. Odour: It was discovered that the cream's odour was distinctive.
3. Taste: The product's taste was manually assessed by tasting it. Relative density: Using an RD bottle, the weight in grams of a 10-ml formulation and 10-ml distilled water was used to calculate the relative density.

4. Consistency: The formulation was personally rubbed on the hand to check for consistency. The consistency of the cream is smooth. After application, the cream did not leave any oily residue on the skin's surface.
5. State: A visual inspection of the cream's condition was conducted. The semisolid stage of the cream.

Evalution parameters [10].

1. Physical Inspection

The color of the toothpaste formulation was assessed, and its visual color was examined.
The product's odor was discovered by sniffing it.
Taste: The formulation's taste was manually assessed.

2. Relative density: Using RD bottle evaluation parameters, the relative density was calculated by weighing 10 milliliters of formulation and 10 milliliters of distilled water in grams.

3. Abrasiveness :

On the butter paper, extrude the contents that are 15 to 20 cm long. Do this for ten or more collapsible tubes. Using your fingertip, press the contents of the entire length to check for the presence of hard-edged, sharp abrasive particles. Such particles must not be present in toothpaste.

4. Determination of spreadability:

This technique uses the paste's slip and drag properties. 2g of the prepared paste was applied to the ground slide being examined. To release air and create a consistent layer of paste between slides, the prepared paste was sandwiched between this slide and another glass slide for five minutes. The margins were scraped clean of excess paste. With the aid of a thread fastened to the hook, the top plate was then pulled 80g, and the amount of time (in seconds) needed for the top slide to travel 7.5 cm was recorded. Better spreadability was indicated by a short interval.

6. PH determination:

Fig no 12 :PH determination of herbal toothpaste

Using a pH meter, the PH of the herbal toothpaste formulation was determined. 150ml of a beaker is filled with 10g of toothpaste. Let the 10ml of water that has been heated and cooled. In order to create a suspension, stir vigorously. **6. Uniformity** By exerting normal force at 27±20C, the toothpaste will extrude a homogenous mass from the collapsible tube or any other suitable container. Additionally, the bulk of the contents will extrude from the container's crimp before being gradually rolled [11].

7. Foaming :
A tiny amount of formulation was mixed with water in a measuring cylinder, and the initial volume was recorded before being shaken ten times to assess the toothpaste's foamability. The final foam volume was recorded. Calculating the froth power V1–V2 is the foaming power. V1: The volume of foam with water in milliliters. V2-Water-only volume in milliliters.

8. Stability:
The stability research was carried out in accordance with ICH guidelines. The prepared paste was put into a collapsible tube and kept for three months at various temperatures and humidity levels: 25°C± 2°C at 60% ± 5% relative humidity, 30°C± 2°C at 65% ± 5% relative humidity, and 40°C± 2°C at 75% ± 5% relative humidity. Its appearance, pH, and spreadability were examined.

9. Determination of moisture and volatile matter :
Five grams of the mixture were put in a porcelain dish that was six to eight centimeters in diameter and two to four centimeters deep. The sample is dried at 105°C in an oven. Compute By mass = 100MI/M MI-Loss of mass (g) upon drying M-Mass (g) of the test material.

10. Moisture content :
Ten grams of toothpaste were weighed out in a porcelain dish and baked at 105 degrees Celsius to dry it out. A desiccator was used to chill it. Using the provided formula, the weight loss is expressed as a percentage of the moisture content. % Moisture is calculated by dividing the original sample weight by the dry sample weight[12].

RESULT AND DISCUSSION:

Pytochemical screening

Table no 5 :Phytochemical screening of herbal extracts .

Sr.no	Test	*Azardichata Indica*	*Magnifera Indica*	*Psidium guajava*	*Syzigium aromaticium*
1.	Myers test	+	+	+	+
2.	Dragandroff test	+	+	+	+
3.	Wagner test	+	+	+	+
4.	Hagers test	+	+	+	+
5.	Legels test	+	-	-	-
6.	Killerkillani test	+	-	-	-
7.	Libermann Burchard test	+	-	-	-
8.	Salkawoski test	+	-	-	-
9.	Shinoda test	+	+	+	+
10.	Alkali test	+	+	+	+
11.	Lead acetate test	+	+	+	+
12.	Ferric chloride test	+	+	+	+
13.	Foam test	+	+	+	+

Table no : 6 : Evolution results of herbal toothpaste

Sr.no	Parameters	Result
1.	Colour	Cremish green
2.	Odour	Plescent
3.	Taste	Sweet
4.	PH	7.6
5.	Moisture content	15.46
6.	Spredability	6.2 ± 0.115(cm)

Fig no 13 : Packing and labelled toothpaste .

Discussion:

Over time, the formulation of herbal toothpaste has evolved from traditional empirical formulations to products with increased stability and efficacy that have been scientifically validated. They were mostly created using cold macerations mixed with honey or sugar as natural preservatives. However, their shelf life and efficacy differed due to their lack of standardization. Modern formulations, as opposed to traditional syrups, undergo a rigorous quality control procedure that employs techniques such as HPLC to ensure consistency in the active ingredients. Honey's primary preservatives in the past [13].

In order to prolong the shelf life of herbal toothpaste without compromising its safety, natural preservatives such as sodium benzoate and citric acid are now added. Mango flowers are used to keep the mouth fresh and to remove tooth decay, and neem leaf extracts are used for antibacterial purposes. Traditionally, sodium laurel sulfate was used to make the toothpaste's foam, but because of the risk of cancer, we avoid using sodium laurel sulfate. Instead, we use lemon oil as a flavoring and foaming agent, and guava leaves are the best for preventing dental cavities and decay. To avoid synthetic suspending agents, we must use tragacanth gum powder. Phytochemical screening and all evaluation parameters showed that our formulation was accurate[15].

CONCLUSION :

Herbal toothpaste's formulation and testing show promise as a natural, safe, and efficient substitute for regular toothpaste. The toothpaste promotes dental health without the use of artificial chemicals by combining herbal constituents such as neem, clove, aloe vera, and mint, which have antibacterial, anti-inflammatory, and calming qualities. Its stability, safety, and performance are confirmed to be comparable to those of commercial products by evaluation using characteristics like pH, spreadability, abrasiveness, and antimicrobial activity. Its viability is further increased by consumer acceptability, cost-effectiveness, and environmentally friendly qualities. However, to maximize formulations, guarantee consistency, and satisfy regulatory criteria for broad adoption, continuous research and standardization are crucial.

REFERENCES :

1. L Collins Instant tooth whitening from a silica toothpaste containing blue covarineJ Dent2006361215.
2. AI Al-Kholani Comparison between the efficacy of herbal and conventional dentifrices on established gingivitisDent Res J (Isfahan)2011825763.
3. W Weinert Oral hygiene productsEncyclopedia Ind Chem20051820924.
4. JL Jensen P Barkvoll Clinical implications of the dry mouth. Oral mucosal diseasesAnn NY Acad Sci19988421566210.1111/j.1749-6632.1998.tb09643.x.
5. AI Al-Kholani Comparison between the Efficacy of Herbal and Conventional Dentifrices on Established GingivitisDent Res J (Isfahan)2011825763.
6. K Singh P Singh G Oberai Comparative studies between herbal toothpaste (dantkanti) and nonherbal toothpasteInt J Dent Res 201642536.
7. MPE Slack Practical aspects of antimicrobial chemotherapyOxford Textbook of Medicine1198553043.
8. SJ Patil SD Patil PB Patil PS Patil GB Vambhurkar ID Raut Evaluation of Standardization Parameters of Ayurvedic Marketed Polyherbal Formulation.Asian J Pharm Ana2018842206.
9. T Mangilal M Ravikumar Preparation And Evaluation of Herbal Toothpaste and Compared with Commercial Herbal Toothpastes: An In vitro StudyInt J Ayurvedic Herb Med20166225166.
10. Nikita M. Rathi, Shital V. Sirsat, Sanket S. Toshniwal, Nikita T. Zagare, Shaikh Fazil Shaikh Mahamad,Formulation and Evaluation Study on Herbal Toothpaste : A Review,© 2022 IJNRD | Volume 7, Issue 4 April 2022 | ISSN: 2456-4184 | IJNRD.ORG.
11. Priyal G. 1 , Maji Jose 2 , Shruti Nayak 3 , Vidya Pai 4 , 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.
12. 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.
13. J Okpalugo, K Ibrahim, US Inyang, Toothpaste formulation efficacy in reducing oral flora,Tropical Journal of Pharmaceutical Research, February 2009; 8 (1): 71-77.
14. Kavita Varma Shukla, Deepika Kumari*Formulation Development and Evaluation of Herbal Toothpaste for Treatment

of Oral Disease Journal of Drug Delivery & Therapeutics. 2019; 9(4-s):98-104

15. K.L. Senthilkumar1,*, S. Venkateswaran.1 , A. Vasanthan1 , P. Chiranjeevi1 , N Mohamed1 , S. Dinesh1 , K.L.S. Neshkumar.2,Formulation development and evaluation of novel herbal toothpaste from natural source,International Journal of Pharmaceutical Chemistry and Analysis.
16. Ersoy M, Tanalp J, Ozel E, Cengizlier R, Soyman M. The allergy of toothpaste: a case report. Allergol Immunopathol. 2008;36(6):368–70. doi:10.1016/s0301-0546(08)75871-3.
17. Davies R, Scully C, Preston AJ. Dentifrices- an update. Medicina Oral Patologia Oral. Cirugia Bucal. 2010;15(6):976–82. doi:10.4317/medoral.15.e976.
18. Jardim J, Alves L, Maltz M. The history and global market of oral home-care products. Braz Oral Res. 2009;23:17–22. doi:10.1590/s1806-83242009000500004.
19. Mithal BM, Saha RN. A handbook of cosmetics; 2000. p. 204–12.
20. Kokate CK, Purohit AP, Gokhale SB. Textbook Of Pharmacognosy; 2002.
21. Dange VN, Magdum CS, Mohite SK, Nitlikar M. Review on Oral Care Product: formulation of toothpaste from various and extracts of tender twigs of neem. J of Pharm Res. 2008;1(2):148–52.
22. GM Masud Parvez,Pharmacological Activities of Mango (Mangifera Indica): A Review,Journal of Pharmacognosy and Phytochemistry,2016; 5(3): 01-07.
23. panelJose Francisco Islas a, Ezeiza Acosta b, Zuca G-Buentello a, Juan Luis Delgado-Gallegos a, María 24.Guadalupe Moreno-Treviño c, Bruno Escalante c, Jorge E. Moreno-Cuevas,An overview of Neem (Azadirachta indica) and its potential impact on health,Journal of Functional Foods ,Volume 74, November 2020, 104171.
25.Muhammad Amjad,*1 Abdul Rehman Khan1, Awais Ahmed1, Muhammad Luqman1, Aoun Raza1 and Imtiaz Hussain2,A Review on the Beneficial Properties of Guava Plant,Annals of Plant Sciences ,Volume 10, Issue 12(2021) pp. 4450-4456.