



FORMULATION AND EVALUATION OF HERBAL TOOTHPASTE

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Abstract: Toothpaste is a paste or gel that we apply to our teeth with a toothbrush as a cleaning agent, oral hygiene tool, and dental care item to maintain their health and appearance. One of the many compounds present in modern toothpaste is sodium lauryl sulfate, a substance prevalent in commercial toothpaste that is bad for our gums. We created natural herbal preservatives and excipients to replace these harmful or expensive chemicals, making our toothpaste more profitable than regular toothpaste. They are a homogenous, semisolid, smooth mass that contain the right components and are excellent for maintaining dental health. Clove (a disinfectant to fight microorganisms), aloe (a mitigating and antibacterial specialist), vajradanti (flushes the plaque arrangement), fenugreek (oil and dampen), turmeric (takes out pain and expands), cinnamon (forestalls toothache), pepper (decreases the risk of tooth rot), amla (astringent properties), and liquorice (stops the dying) are some of the natural ingredients used in toothpaste. To improve oral health, we set out to make a toothpaste. toothpaste that is gentle on the mouth and teeth. No chemical preservatives are employed; instead, volatile plant oils are used to produce all extractions. This toothpaste can be used to treat a number of dental issues, including gingivitis, tooth decay, cavities, bleeding dental gums, foul breath, and dental caries.

Keywords: natural herbal extraction, economic viability, and oral hygiene.

Introduction: The area of the mouth that is in contact with the inside of the jaw, behind the teeth and gums, above the soft and hard palates, and below the tongue is referred to as the oral depression. The mouth cavity is the initial component of the digestive system. There are several structures in the mouth: the cheeks, the bony roof, the teeth, the tongue, and the floor of the mouth (below the teeth). A person's mouth, which significantly affects their general health, is referred to as having "oral health". A person's oral wellness, which is a state free from mouth and facial pain, oral infections and wounds, periodontal (gums) disease, tooth decay, tooth loss, and other illnesses and disorders, should be evident in their ability to chew, bite, smile, talk, and be in excellent psychosocial health. Two disorders mostly affect oral health.

1. Dental caries (tooth rot), which is brought on by bacterial cycles that demineralize tooth surfaces, is what causes cavities or gaps in teeth.
2. Periodontal (gum) disease is a condition in which the tissues and bones that support and surround the teeth are harmed by inflammatory responses to bacterial biofilm along the gum line.

Use toothpaste to safeguard, maintain, and clean your teeth. It makes oral hygiene more effective. It freshens your breath and has a flavor and perfume you'll enjoy. The secret to keeping your mouth healthy is to clean your teeth with toothpaste twice a day. They may all be recalled if they used the same toothpaste;

Plaque reducing agents, antibacterial agents, breath fresheners, desensitizing agents, abrasives, and whitening agents are just a few examples.

Teeth, which are calcified structures in the mouth, are used to separate food. Teeth are made up of many tissues that vary in thickness and tensile strength.

Two crucial parts of a tooth are the crown and the root. The implanted tooth roots are located in either the maxilla (upper jaw) or the mandible (lower jaw), and they are shielded by our gums. The portion of a tooth that is visible and protrudes above the gum line is called the crown.

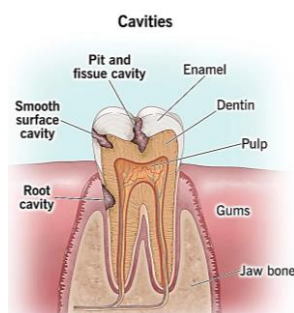


Fig no.:01 Dental cavities

The crown is covered in a strong, white lacquered coating. The mineral hydroxylapatite, a translucent calcium phosphate, is the primary ingredient in polish. Although enamel is the hardest material in the body, it is also delicate, brittle, and prone to injury from abrasives or acidic meals. The layer underneath the lacquer is referred to as dentin. Dentin is a naturally occurring connective tissue that has been calcified and has a protein structure similar to that of bone. Dentin is a protective layer, however it is frequently less durable than lacquer and is more prone to degradation. However, a healthy mouth only has a little gap between the gums and enamel, which exposes little to no dentin. Cementum, a distinctive material that resembles bone, covers the roof of a tooth. Hydroxyapatite makes up about 45% of it, followed by collagen at 33% and water at 22%. The crown of the tooth, where cementum is ejected from cementoblasts, is where it is thickest. It has a softer yellowish tint than the veneer or dentin. Its primary purpose is to act as a passageway for the periodontal tendons to connect to the tooth and stabilize it. The center area of a tooth that is lined with delicate connective tissue is referred to as the dental pulp. The pulp, which enters the tooth by an incision close to the apex of the root, contains veins and nerves. The pulp is frequently referred to as the nerve of the tooth. A sparse biofilm known as the pellicle quickly starts to coat the tongue, gums, and teeth following a thorough cleaning. Spit proteins are what give rise to the pellicle. The pellicle generates plaque, which looks like gel as a result of bacterial development and stains from food and drink. When plaque microbes eat the sugars and starches in food sources, they break down the calcium and phosphorus in tooth polish. When significant demineralization has taken place, microscopic organisms can penetrate the dentin and cause rot. Dental caries is another term for tooth decay or cavities.

The gums can become irritated by gum disease, a mild gum condition brought on by plaque that is visible below the gum line. Two to fourteen days after plaque formation, salivary minerals join with the plaque to form calculus, also known as tartar, a calcified deposit that can only be removed by a trained cleaner. Oral hygiene, the practice of keeping the mouth clean, can prevent dental caries, gingivitis, periodontal disease, bad breath, and other dental disorders. Included are both private and occupational care. Immediately after meals and at least twice daily (morning and night), dental specialists advise thorough tooth brushing. Additionally, it's believed that flossing is crucial for maintaining tooth cleanliness. Dental floss can prevent cavities by removing plaque from the spaces between teeth and along the gum line, where periodontal disease commonly begins. The bulk of plaque may be eliminated with a toothbrush, which can also reduce the pH of the tooth surface and neutralize corrosive acids. Tartar can be removed at regular cleanings, which are normally carried out by dentists and dental hygienists. Tartar can still develop even when you frequently brush and floss. Another service that a professional cleaning could do is scaling your teeth, which involves using a number of equipment to remove stains from your teeth.

Take care of your teeth and gums With the correct care, one's teeth and gums can stay healthy for the rest of their lives. With better oral and gum health, the risk of tooth decay and gum disease lowers. These easy steps can help you take good care of your teeth and gums: brushing, flossing, rinsing, eating healthfully, and seeing the dentist.

Tips for brushing teeth

Ideally, you should brush your teeth after each meal. It is advised to wait 30 minutes after eating so that any lacquer that weakened due to corrosion during that time can resolidify and avoid being wiped away. When

you brush your teeth, plaque, a bacterial film that adheres to the teeth, is eliminated. When plaque-forming bacteria come into contact with food, they release acids into the surrounding environment. These acids result in cavities.

To scrub:

Brush the teeth at a 45-degree angle up to the gum line using a soft toothbrush that has a pea-sized amount of toothpaste on the head. While you are brushing your teeth, use a gentle circular motion. Continue utilizing this motion while you clean each tooth separately. Keep the bristle tips and gum line in a straight line. Avoid pressing the bristles flat on the teeth with pressure. All that is needed to clean teeth is the toothbrush's tips.) You should let the bristle slide between your teeth.

- Give the biting surfaces of your teeth a thorough brushing from top to bottom. Make sure the fibers go into the craters and gaps.
- Use the same gentle circular motion to brush the backs of the upper and lower teeth on the side that is exposed to the tongue.
- Move the toothbrush in a small circle while aiming the head in all directions toward the base of the mouth to clean in between the bases of the front teeth.
- When cleaning the inside of the upper front teeth, slant the brush head upward and downward, pointing the tip toward the roof of the mouth. Make sure you use the toothbrush to create a little circle.
- Lightly brush your tongue up and down, beginning at the rear. Don't scrub, please. This makes your breath taste better and aids in the eradication of bacteria.
- Brush your teeth for two to three minutes, then rinse your mouth with water.
- Swap out your toothbrush every three to four months, at the absolute least.

Fortunately, gum disease can be avoided if bacteria are not regularly removed from the mouth by brushing and flossing. Using toothpastes that stop plaque from regrowing simplifies the prevention of gum disease.

Normal tooth paste

A few of the many factors that affect how a tooth appears and is perceived include lighting conditions, clarity, haziness, light dispersion, glitter, and the human eye and mind.

A thin polish covers the outside of teeth. The polish layer, which is more white and hazy, gives the tooth tone hues like blue, pink, and green. Underneath the enamel, in the dentin, which is less translucent, darker and more yellow-brown in color than enamel, is located. The primary component of the tooth is dentin, which shapes a large portion of the tooth's structure and greatly affects the color of the tooth overall. The dental mash, a thin connective tissue, can be found inside the tooth's core. The pulp appears pink or scarlet because of its vascularity, although it hardly ever pokes through the enamel and dentin that cover it until tooth wear (or occasionally internal resorption) lowers the thickness of these layers. changes in tooth color caused by ethnicity, gender, and geography. Compared to men, women frequently have slightly whiter teeth. Because female teeth are smaller than those of men, less dentin may be visible through the enamel. For the same reason, the larger molars and the canine (cuspid) teeth are typically darker. Due to changes in the veneer to dentin ratio, child teeth, also known as deciduous teeth, are frequently whiter than the adult teeth that come after them.



Fig no.02:Gum disease

There are three stages of gum disease:

- **Gingivitis:** The gum inflammation that results from plaque buildup at the gum line is the first stage of gum disease. Toxins are created that can irritate the gum tissue and lead to gingivitis if regular brushing and flossing are insufficient to clear the plaque. While flossing and brushing, there may be some bleeding. Since the bone and connective tissue that support the teeth are still healthy at this early stage of gum disease, damage can be repaired.
- **Periodontitis:** At this point, the supporting bone and connective tissues that keep the teeth in place have suffered irreparable harm. The gums may start to develop a pocket below the gum line, which collects food and plaque. In most cases, more damage can be avoided with proper dental care and better at-home hygiene.
- **Advanced periodontitis:** During this stage of gum disease, the tissues and bone that support the teeth are lost, which can lead to teeth shifting or becoming loose. Your bite may be impacted, and if vigorous therapy is unable to save them, teeth may need to be improved.

Gums and Brushing Technique:

One might be tempted to brush their teeth as thoroughly as possible in an effort to maintain them clean. Gums are a fragile tissue, though, thus improper brushing could cause damage. The ideal toothbrush features soft nylon bristles with rounded edges, whether it is an electric or manual model. Brushes with hard or medium-hard bristles increase the risk of teeth breaking or chipping, which can lead to swollen, painful, or red gums. To avoid harming the gums and teeth, rub and clean them in gentle, circular motions. Although frequent, this method can hurt and irritate the gums, making them uncomfortable and raising the possibility that they could bleed or recede.

Gums and Flossing Technique:

By flossing every day, plaque that a toothbrush can't reach can be removed. When flossing, caution must be taken to prevent infected or bleeding gums. Make sure to gently slide the floss up and down, tracing the contours of each tooth, rather than forcing it between the teeth. Use floss above the gum line at least once a day to get rid of additional plaque.

We treat a range of analogous issues with our herbal toothpaste, including advanced periodontitis, gingivitis, and dental cavities. This technique can help prevent problems with the gums and teeth. They can be used to treat a range of dental problems because they are created entirely of natural substances. Even the additives, which are also created during extraction. The spices have no flavor. In addition to guava leaf powder, aloe, vajradanti, powders (fenugreek, curcumin, acacia, cinnamon, amla, sugarcane, licorice, and black pepper), oils (clove, coconut, neem, and peppermint), and honey, medical toothpaste also contains herbal constituents. These little changes not only strengthen teeth but also help maintain the mouth healthy and clean⁴²⁻⁴³.

Methods of crude herbal preparation : -

Psidium Guajava : First, the leaves are gathered from the college campus as needed, gently cleaned with distilled water, dried in the shade, and then ground in a blender. In order to achieve equal particle size, the powder is sieved before being put into an airtight container.

Aloe vera: a gel type of aloe vera. Freshly harvested aloe leaves should be cleansed with distilled water before having the tips and butts from the upper and bottom aloe skin removed. The skin was then peeled, submerged in water, and rinsed to remove the yellowish gelatinous liquid from it. After being scooped, the gel is re-mixed until it is frothy and liquid.

Barleria Prionitis (Powder) A blender is used to grind the leaves after they have been carefully removed from the garden, rinsed with distilled water, and dried in the shade. The powder is sieved to achieve uniform particle size before being stored in an airtight container.

Glycyrrhiza Glabra: We get dried licorice roots from nearby herbal shops. They are further cleaned and dried to remove dust before being combined into a fine powder. Shift through to get homogenous particles. The powder has been gathered and placed in an airtight container.

Acacia gum : Acacia arabica, the powdered version of acacia gum, is available in herbal stores. The gums are further dried. Measured gum was gathered in a mortar, pulverized, and prepared as needed.

Turmeric : Before being turned into turmeric powder and maintained in a closed container to make curcumin, the turmeric root should be washed, thinly sliced, and allowed to air dry.

Powdered fenugreek: Fenugreek seeds that are acquired from nearby vendors are used to make the powder known as trigonella foenum graecum. To get the stones off, they are washed.

Cinnamon Powder : Put the cinnamon sticks in the blender and process on high for 30 seconds to make cinnamon powder. After verifying and stirring, repeat. Sifting the powder into a dish, then continuing to combine the bigger portion.

Pepper: Place the pepper on a dry pan. To dry roast, allow 4–5 minutes. It has begun to cook. Let it go. Blend it in a blender until a powdery substance develops.

Amla powder: Before blending with the other components, amla needs to be cut into pieces and dried in the sun for a few days. Once the materials are reduced to a fine powder, they should be sifted through a sieve

Formulation : There are two of toothpaste formulation procedures ,

1. Dry gum method
2. Wet gum method

❖ Dry Gum method :

Ingredients	Quantity(per 20gm contains)
Calcium carbonate (Abrasive agent)	10gm
Fenugreek powder (surfactant)	0.6gm
Aloevera (Humectant)	8.5gm
Acacia gum (Binding agent)	0.5gm
Coconut oil (Liquid phase)	1.1gm
Liquorice powder (Sweetening agent)	0.2gm
Honey	0.2gm
Peppermint oil (Flavouring agent)	0.5ml
Neem powder (Preservative)	0.1gm
Turmeric powder	0.1gm
Guava leaf powder (Anti-caries)	0.3gm
Vajhradanti powder	0.2gm
Clove oil (Essential oil)	1ml
Black Pepper Powder (Anti-plaque)	0.2gm

>The solid ingredients, including calcium carbonate, Feenugrek, liquorice powder, neem powder, amla, guava leaf, cinnamom powder, and black pepper powder, were precisely weighed as specified in the recipe and sieved with sieve number 80 in order to maintain the recipe's precise weights and sieving instructions were followed for the solid ingredients, which included calcium carbonate, Feenugrek, liquorice powder, neem powder, amla, guava leaf, cinnamom powder, and black pepper powder. These ingredients were also blended in a mortar and pestle and then triturated with weighed honey, aloe vera, and coconut oil to create a semisolid product. Peppermint oil was utilized as a final touch after the addition of clove oil. To maintain the particle size, clove oil was also combined in a mortar and pestle, these materials were then triturated with precisely weighed honey, aloe vera, and coconut oil to produce a semisolid product. Clove oil was added, and peppermint oil was used as a finishing touch.



EVALUATION

In order to evaluate the herbal immune booster tea, organoleptic, physical, and phytochemical tests were conducted on the product.

▪ Organoleptic Test:

The manual tests for color, smell, look, smoothness, and texture that are part of the organoleptic test were carried out.

Sl No.	Parameters	Observations
1	Colour	Brown
2	Odour	Characteristics
3	Appearance	Paste
4	Taste	Sweet
5.	Stability	Stable
6.	Spread ability	Easily spread
7.	Foamability	Good
8.	Abrasiveness	low abrasive

PHYSICAL TEST:

PH:To make a half-fluid suspension of 10 grams of toothpaste, combine it with 10 mL of freshly bubbled, cold water (at 27°C) in a 50 mL measuring glass. Thoroughly mix for the optimal suspension. Quickly ascertain the PH of the suspension using a PH meter.

HomogeneityWhen average power is applied at 27°C, the toothpaste should discharge in a homogenous mass from the folding cylinder or another suitable holder. The weight of the contents should also be applied gradually and separated from the fold of the holder.

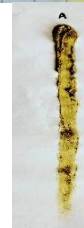
Sharp and edge-grating particlesThe items were placed on the finger and scratched on the margarine paper for 15-20 cm to look for any sharp or edge-grating particles. I experienced a cycle like that frequently. There were no pointed or angular particles.

FormabilityUsing 2g of homemade toothpaste and 5ml of water in an estimating chamber, the combustibility of the mixture was calculated. The mixture was then vigorously shaken multiple times. An estimate of the total amount of foam was made.

Assurance of dampness and unstable matter : To test for moisture and other unexpected materials, 5 grams of handmade toothpaste were placed in a porcelain dish with a diameter of 6 to 8 cm and a depth of 2 to 4 cm. It was dried at 105 degrees Celsius in a burner.

Assurance of spread capacity: The spread capacity approach is influenced by the glue's slide and drag properties. No sliding was allowed, therefore two glass slides measuring 10 by 10 cm were stacked on top of one another, with 1-2g of homemade toothpaste distributed evenly between them. The slides were then relocated into limiting bearings after that. After three minutes, measure the amount of toothpaste that has spread (in cm). computing the average of the three measurements and repeating the analysis.

Tube extrudability: A clean, collapsible plastic tube with a 5 mm nasal tip aperture was filled with the formulation, and pressure was applied to the tube using a finger. The tube's extrudability was then determined by measuring the amount of paste that emerged from the tip when pressure was applied to it.



Result :

Sl no.	parameters	results
01	pH test	09
02	Homogeneity	Homogenous
03	Spread capacity	2.73
04	Sharp edge test	No sharp edge
05	Tube extrudability test	Good

Discussion:

Natural elements including clove, aloe vera, vajradanti, neem, and guava leaf were used to create the herbal toothpaste mixture. To compare the various attributes of created herbal toothpastes, evaluation tests of the products were conducted. Tables were used to present all of the parameter evaluation's findings. The proposed herbal toothpaste produced results in the current investigation that were comparable to, and occasionally even slightly better than, those of the herbal toothpastes that were commercialized. Visual inspection revealed the manufactured herbal toothpaste to be a yellowish brown hue. Aromatic and distinctive odors of the product were detected by inhalation. Manual evaluation was done of the formulation's flavor when all samples were stored for a total of 30 days at a temperature of 34 +/-30C. It attested to the toothpaste's consistency. All collapsible tubes were kept at a normal temperature range of 45 to 20 C for 10 days without displaying any signs of corrosion or internal damage. It was determined that the tube inertness of every commercially available herbal toothpaste package, including Colgate Vedshakti, Dabur Red, Dabur Meswak, and Patanjali Dantkanti, was good. By rubbing the paste formulation between the fingertips, the smoothness was evaluated. The pH of herbal toothpaste was measured and compared to other herbal toothpastes that are sold commercially. It was discovered to be 8. Herbal toothpaste that has been formulated specifically has been shown to lose the least amount of moisture while drying.⁴⁴

Conclusion: The investigation's findings enable the formation of the following conclusions. This herbal toothpaste is safer and has fewer side effects than synthetic toothpaste with a chemical base, which is vital for maintaining oral hygiene and preventing dental cavities. The Bureau of Indian Normal standards were used to compare all commercially available herbal toothpaste and lab-made variations. By functioning as an antibacterial agent, a properly produced toothpaste helps shield teeth and gums from conditions like E. coli. In an exploratory in-vitro trial, herbal toothpaste was discovered to be as effective to commercially available toothpastes in terms of all toothpaste assessment parameters. The created herbal toothpaste has a bright future in dental research and therapy for the general public thanks to the enhancement of organic components to produce more and safer natural medicines people as a whole, society, and nation. It was noted that the herbal toothpaste produced was of the highest caliber. In dental searches, herbal toothpaste is more frequently suggested than synthetic toothpaste, and it is also safer and linked to less side effects. The formula of the toothpaste enables both pathogen-fighting antimicrobial action and preservation of oral cleanliness. market structure and formulation contrasted. It is thus shown that the commercially accessible formulations (Colgate, Dabour Red, and Dantakanti) have a similar degree of enthralling intensity and patronizing attention. Future prospects for the creation of herbal toothpaste in the fields of natural medicine and public health are promising⁴⁵.

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