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Research Article

Formulation & Evaluation of Mud Herbal Sensitive Toothpaste

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Sharp tooth pain from bare dentin surfaces affects many people when triggered by cold or touch. This research looks at a natural paste made with mud and herbs instead of standard lab-made chemicals. A mix of healing clays - Dead Sea Mud, Multani Mitti, bentonite, and kaolin - blocks tiny tubes in teeth that cause sensitivity. Each ingredient helps seal these openings through gentle mineral buildup rather than harsh reactions. Added potassium nitrate calms irritated nerves inside the tooth over time without numbing effects upfront. Alongside come plant-based elements: neem powder fights bacteria, mulethi soothes irritation, clove oil supports gum health naturally. Together they form a blend rooted in ancient herb knowledge yet tested with current scientific methods. Results depend on how consistently the mixture covers sensitive zones during daily brushing cycles. A smooth texture came from careful mixing and grinding, done just right. Testing checked both physical traits and sensory qualities once it was ready. It measured a pH of 6.04 - gentle on mouth tissues, well above levels that harm enamel. Beyond balance, spreading felt easy, squeezing out stayed steady, while bubbles formed nicely thanks to Sodium Lauryl Sulphate. Surprisingly, the results show this herbal mud toothpaste stays fresh, works well, does no harm. Pain signals get blocked right at the surface, while inside the tooth, irritation eases through natural reactions. Instead of lab-made chemicals, it leans on earth-sourced minerals. What stands out most is how body-friendly ingredients support gum wellness long term. Behind every number in the study lies proof: simple materials can meet complex needs. Not magic - just smart blending of old wisdom and careful testing.

Keywords: Dentin Hypersensitivity, Mud Herbal Toothpaste, Bentonite Clay, Neem (Azadirachita indica), Potassium Nitrate, Tubule Occlusion, Physicochemical Evaluation, Periodontal Health.

INTRODUCTION

Toothpaste, sometimes referred to as a dentifrice, assists in cleaning teeth in conjunction with a brush. It is responsible for maintenance and improving oral aesthetics. In ancient times, it only functioned as an abrasive, removing debris such as bacteria, food remnants, and stains on the teeth enamel. Nowadays, it is used for much more than simply cleaning; it has components that serve as an anti-cavity, anti-gingivitis, anti-halitosis, anti-sensitivity, among others, and it helps resolve some of the health challenges faced. From being an abrasive, toothpaste has evolved into a proactive agent that delivers active agents directly into the oral cavity [1]. However, most of the conventional pastes for teeth sensitivity rely on artificial numbing agents. Nowadays, however, an interest is developing towards natural solutions – mineral compositions that do not harm a person's health [2]. Thus, there appears a mud-based solution, combining the ancient herbal knowledge with modern concepts regarding oral hygiene. As opposed to the above-discussed paste, it relies on clay-based substances. Indeed, bentonite clay, multani mitti and dead sea mud can all cover open layers of dentin and make them resistant to irritation, providing protection. On top of this, the solution includes extracts from green plants that can protect against bacteria. Neem extract, in particular, provides antimicrobial properties as well as reduces the inflammation in the gums. This means that there is no need to dull pain. It

is necessary to protect dentin, rebuild its protective layer, and restore balance [3].

Fig. No. 1. Herbal Sensitive Toothpaste

Types of Toothpaste

Toothpastes are categorized based on their primary therapeutic or cosmetic function:

1. Fluoridated Toothpaste:

Most often found on shelves, these contain either sod ium fluoride or stannous fluoride built to rebuild tooth surface while stopping decay before it starts. What you see here works quietly beneath the surface.

2. Desensitizing Toothpaste:

Some toothpaste works on touchy teeth by calming n erves inside. One kind uses a salt made of potassium that stops pain signals fast. Another picks minerals li ke strontium or calcium to plug tiny tubes in worn enamel. These blockers slow how deep hot or cold feelings go. Nerve quieting happens when certain ingredients rush in ahead of sharp sensations

3. Anti-Calculus (Tartar Control): Toothpaste:

Some formulas include pyrophosphates; others rely on zinc citrate instead. These help stop soft plaque from turning stiff. Calcification is blocked before it can begin. The biofilm stays looser, less likely to harden. Protection happens step by step, day after day.

4. Whitening Toothpaste:

Some formulas include chemicals such as hydrogen peroxide. These work alongside stronger scrubbing particles that lift marks from the tooth's outer layer. Brightening happens when discoloration is lifted away gradually. Tiny gritty elements help polish while active liquids break down stubborn spots. The mix targets visible dullness without altering the enamel deeply.

Herbal/Natural Toothpaste: From plants, oils, and earth-derived minerals comes a different kind of clean - one that skips lab-made ingredients entirely. This mix fights germs, soothes irritation, and scrubs away buildup without relying on artificial compounds. People who want their mouth care to work with the body, not against it, tend to lean toward these kinds of formulas. Nature's components step in where chemicals used to dominate, offering an option rooted in what grows, not what’s cooked up in a lab [4].

Functions and Uses of Toothpaste

- The process of scrubbing occurs as a result of the friction produced by the bristles, which removes plaque stuck on the teeth. The sticky layer created daily is effectively removed by this procedure. Rather than adhering to its place, the material becomes entangled in the cleaning procedure and is eventually eliminated. Even the layer of enamel will not survive repeated brushings. Bristles are effective in removing any material via physical contact.
- Topical application makes the drug delivery process straightforward, applying the substance directly to the location requiring it. By applying

fluoride to the mouth, the risk of tooth decay is reduced. Sensitive locations can be soothed by the use of clay minerals. The method delivers medication directly to where it is required. Direct physical interaction ensures efficacy and prevents dispersion.

- Smooth teeth create an attractive shine. Stains caused by coffee and smoking may be removed via scrubbing. The smoother surface allows more light to reflect from it, making it shinier. Brighter teeth are obtained through the removal of stains.
- The fresh mouth sensation is a consequence of increased saliva secretion. In addition, flavors are utilized to eliminate odors caused by sulfur components. The foul breath is stopped by blocking the source.
- The process of scrubbing occurs as a result of the friction produced by the bristles, which removes plaque stuck on the teeth. The sticky layer created daily is effectively removed by this procedure. Rather than adhering to its place, the material becomes entangled in the cleaning procedure and is eventually eliminated. Even the layer of enamel will not survive repeated brushings. Bristles are effective in removing any material via physical contact [5].

MATHOD AND MATERIALS

MATERIALS USED:

1. Sorbitol: -

Chemical Name: D-glucitol

Chemical constituents: Polyol (Sugar alcohol)

Uses:

1. Prevents the formulation from dehydrating and cracking.
2. Provides a smooth texture and glossy appearance to the paste.
3. Imparts a safe, non-cavity-causing sweetness.

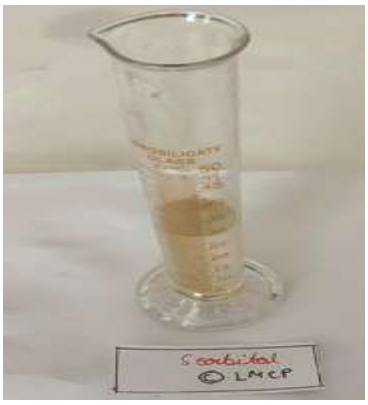

Fig. No. 2. Sorbitol

2. Sodium Lauryl Sulphate (SLS): -

Chemical Name: Sodium dodecyl sulphate

Chemical constituents: Alkyl sulfate (Anionic surfactant)

Uses:

1. Creates the primary foaming action to wash away debris.
2. Facilitates the even dispersion of active ingredients throughout the oral cavity.
3. Assists in dislodging sticky plaque biofilm from the tooth surface.

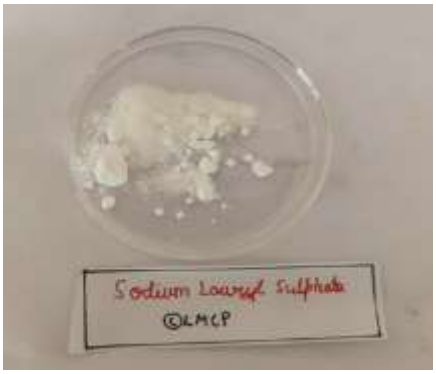

Fig. No. 3. Sodium Lauryl Sulphate: -

3. Xanthan Gum: -

Microbial Source: Extracellular polysaccharide produced by Xanthomonas campestris

Chemical constituents: Glucose, mannose, and glucuronic acid

Uses:

1. Acts as a primary binder to prevent the separation of liquid and solid phases.
2. Provides the toothpaste with optimal thickness and stand-up properties.
3. Stabilizes the heavy particulate clays within the humectant base.

Fig. No. 4. Xanthan Gum

4. Calcium Carbonate: -

Mineral Name: Precipitated Calcium Carbonate (CaCO3)

Chemical constituents: Calcium, carbon, and oxygen

Uses:

1. Mechanically removes plaque and exogenous surface stains.
2. Buffers oral cavity acids to halt enamel erosion.
3. Provides a localized pool of bioavailable calcium in the saliva.

Fig. No. 5. Calcium Carbonate

5. Silica (Silica Gel Powder): -

Chemical Name: Amorphous Silicon Dioxide (SiO2)

Chemical constituents: Silicon and Oxygen

Uses:

1.Acts as a rheology modifier to control the paste's thickness.
2.Functions as a mild, controlled abrasive for cleaning.
3.Ensures the physical stability of the formulation.

Fig. No. 6. Silica

6. Kaolin: -

Chemical / Mineral Name: Hydrated aluminium silicate

Family: Kaolinite clay group

Chemical constituents: Silica, alumina, and water

Uses:

1. Provides non-traumatic, low-abrasion polishing for sensitive teeth.
2. Helps remove superficial stains gently.
3. Assists heavier clays in the micro-occlusion of dentinal tubules.

Fig. No. 7. Kaolin

7. Potassium Nitrate:-

Chemical Name: Potassium Nitrate (KNO3)

Chemical constituents: Potassium ions and nitrate ions

Uses:

1. Chemically depolarizes the dental nerve to block pain signals.
2. Provides rapid relief from hypersensitivity to cold, hot, and sweet stimuli.
3. Acts synergistically with physical tubule-occluding clays.

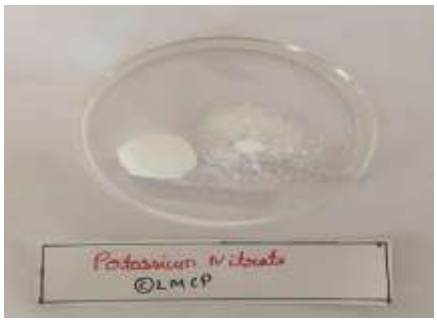

Fig. No. 8. Potassium Nitrate

8. Glycerine: -

Chemical Name: Glycerol

Chemical constituents: Trihydric alcohol (Polyol)

Uses:

1. Acts as a humectant to retain moisture in the paste.
2. Lubricates the oral cavity during brushing to reduce mechanical friction.
3. Serves as an effective solvent to extract and carry herbal phytochemicals.

Fig. No. 9. Glycerine

9. Sodium Benzoate: -

Chemical Name: Sodium salt of benzoic acid

Chemical constituents: Benzoate anion and sodium cation

Uses:

1. Prevents bacterial and fungal contamination inside the tube.
2. Maintains the sterility and safety of the final product.
3. Extends the commercial shelf life of the formulation.

Fig. No. 10. Sodium Benzoate

10. Saccharin: -

Chemical Name: Sodium Saccharin

Chemical constituents: Artificial non-nutritive sweetener

Uses:

1. Dramatically improves the palatability of the toothpaste.
2. Masks the bitter and astringent taste of herbs and clays.
3. Provides sweetness without contributing to tooth decay.

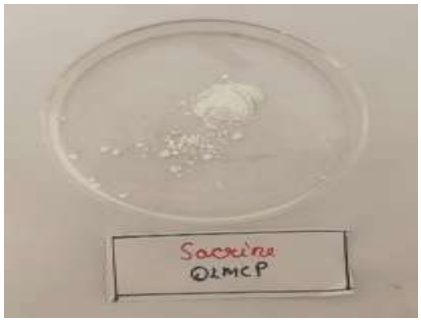

Fig. No. 11. Saccharin

11. Dead Sea Mud: -

Chemical / Mineral Name: Mineral Poloid

Chemical constituents: Magnesium, Calcium, Potassium, Sodium, and Bromides

Uses:

1. Improves the gingival barrier and reduces inflammation.
2. Provides highly bioavailable minerals for structural enamel repair.
3. Draws out toxins and bacterial byproducts from the gum line.

Fig. No. 12. Dead Sea Mud

12. Multani Mitti (Fuller's Earth): -

Chemical / Mineral Name: Hydrous aluminium silicates

Chemical constituents: Silica, iron oxide, lime, magnesia, and water

Uses:

1. Acts as a powerful de-greasing agent that adsorbs environmental toxins.
2. Assists in physically plugging the exposed dentinal tubules.
3. Provides a mild astringent effect to tighten inflamed gingival tissues.

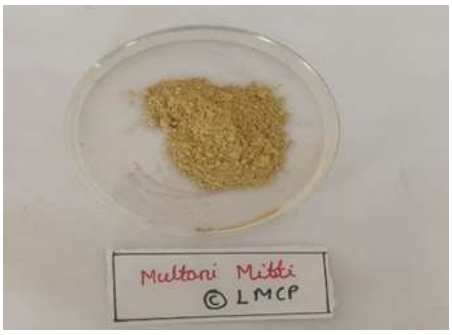

Fig. No. 13. Multani Mitti

13. Bentonite Clay: -

Chemical / Mineral Name: Montmorillonite (Aluminium Silicate)

Family: Smectite clay group

Chemical constituents: Sodium or Calcium montmorillonite

Uses:

1. Swells to create a semi-permanent physical blockade over open dentinal tubules.
2. Functions as a carrier for herbal actives and provides mechanical antibacterial action.
3. Neutralizes acidic oral environments due to its high alkaline pH.

Fig. No. 14. Bentonite Clay

14. Neem Powder: -

Botanical Name: Azadirachta indica

Family: Meliaceae

Chemical constituents: Azadirachtin, Nimbin, Nimbidin, and various Flavonoids

Uses:

1. Provides primary antibacterial, antifungal, and anti-inflammatory defence.
2. Inhibits the proliferation of Streptococcus mutans.
3. Reduces gingival bleeding and treats underlying periodontal inflammation.

Fig. No. 15. Neem Powder

15. Mulethi Powder (Licorice): -

Botanical Name: Glycyrrhiza glabra

Family: Fabaceae

Chemical constituents: Glycyrrhizin, glabridin, and liquiritin

Uses:

1. Soothes irritated oral mucosa and inflamed gums.
2. Provides a natural, non-cariogenic sweetness to the formulation.
3. Helps inhibit acid production by cariogenic bacteria.

Fig. No. 16. Mulethi Powder

16. Clove Oil: -

Botanical Name: Syzygium aromaticum

Family: Myrtaceae

Chemical constituents: Eugenol (up to 90%), beta-caryophyllene

Uses:

1. Acts as a rapid, natural anaesthetic to relieve acute tooth sensitivity.
2. Provides powerful antiseptic action against oral pathogens.
3. Imparts a refreshing, spicy flavour that combats halitosis (bad breath).

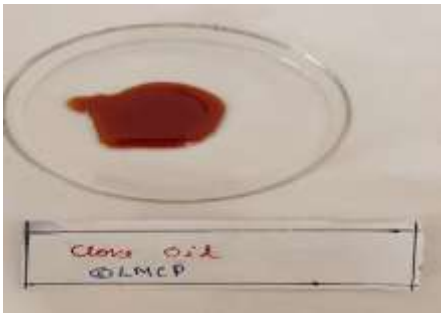

Fig. No. 17. Clove Oil

Table No.1. List of Instruments and Their Roles

S. No.	Equipment	Role in Formulation Process
1	Electronic Weighing Balance	Used to accurately measure the precise weight and quantities of each raw liquid and dry ingredient prior to mixing, ensuring formulation precision.
2	Mortar and Pestle (Porcelain)	Used for the trituration and homogenization process, where all ingredients are manually blended to create a smooth, uniform paste.
3	Sieve (No. 80 Mesh)	Used to filter the dry herbal and mineral powders before mixing, breaking up aggregates to obtain a uniform and standardized particle size.
4	Digital pH Meter	Used to test the acidity/alkalinity of the final toothpaste formulation to ensure it is compatible with oral tissues (neutral to slightly alkaline).

5	Measuring Cylinders & Glass Beakers	Used for the accurate volumetric measurement and transfer of liquid humectants like Sorbitol, Glycerine, and Clove Oil.

Table No. 2. Formulation Profile: Ingredients and Their Roles

S. No.	Ingredients	Uses in Toothpaste Formulation
1	Dead Sea Mud	Reduces gingival inflammation and provides essential trace minerals for potential enamel support.
2	Multani Mitti	Acts as a mechanical adsorbent to pull out toxins and assists in the physical occlusion of open tubules.
3	Bentonite Clay	Swells upon hydration to create a strong physical plug in exposed dentin, providing long-lasting sensitivity relief.
4	Kaolin	Functions as an ultra-fine polishing agent that cleans compromised teeth without causing abrasive trauma.
5	Neem Powder	Inhibits the growth of cavity-causing bacteria and prevents the formation of sticky plaque biofilm.
6	Mulethi Powder	Soothes irritated gums and oral mucosa while providing natural sweetness and mild anti-inflammatory action.
7	Clove Oil	Contains a high concentration of eugenol, providing immediate localized pain relief and strong antiseptic benefits.
8	Sorbitol	Non-cariogenic humectant that prevents the paste from hardening and provides a smooth texture.
9	Glycerine	Powerful solvent and humectant that lubricates the paste and dissolves herbal phytochemicals.
10	Calcium Carbonate	Mild abrasive buffer that neutralizes acidic environments and safely removes surface plaque.
11	Silica	Rheology modifier that controls paste thickness and provides gentle cleaning friction.
12	Sodium Lauryl Sulphate (SLS)	Surfactant that lowers surface tension, creating the foaming action necessary to wash away debris.
13	Xanthan Gum	Hydrocolloid binder that stabilizes the heavy solid clays, keeping them evenly suspended in the liquid phase.
14	Potassium Nitrate	Synthetic active ingredient clinically proven to treat hypersensitivity via nerve desensitization.
15	Sodium Benzoate	Broad-spectrum preservative added to inhibit microbial/fungal growth and extend shelf life.
16	Saccharin	Zero-calorie artificial sweetener used to effectively mask the bitter taste of the herbs and earthy clays.

METHOD OF PREPARATION

Table No. 3. Trial batch Formulation of Mud Herbal Sensitive Toothpaste

S.No.	Ingredients	Category / Phase	Quantity for 61.23g
1	Sorbitol	Humectant / Liquid Phase	15 ml
2	Glycerine	Solvent & Humectant / Liquid Phase	15 ml
3	Potassium Nitrate	Chemical Desensitizer / Active Solute Phase	2.5 g
4	Sodium Benzoate	Preservative / Additive Phase	0.58 g
5	Saccharin (Sacrine)	Sweetener / Additive Phase	0.10 g
6	Calcium Carbonate	Base Abrasive / Powder Phase	12.5 g
7	Silica	Rheology Modifier / Powder Phase	5.0 g
8	Xanthan Gum	Binder & Stabilizer / Powder Phase	0.5 g
9	Sodium Lauryl Sulphate (SLS)	Surfactant / Additive Phase	0.5 g

10	Kaolin	Polishing Agent / Mineral Powder Phase	2.5 g
11	Dead Sea Mud	Therapeutic Mineral / Clay Phase	1.5 g
12	Multani Mitti	Adsorbent Base / Clay Phase	1.5 g
13	Bentonite Clay	Tubule Occluding Agent / Clay Phase	0.5 g
14	Neem Powder	Herbal Antimicrobial / Active Powder Phase	0.5 g
15	Mulethi Powder	Herbal Anti-inflammatory / Active Powder Phase	0.05 g
16	Clove Oil	Essential Oil & Analgesic / Final Additive Phase	4 Drops

Table No. 4. Final batch Formulation of Mud Herbal Sensitive Toothpaste

S.No	Ingredients	Category / Phase	Quantity for 122.50g
1	Sorbitol	Humectant / Liquid Phase	30 ml
2	Glycerine	Solvent & Humectant / Liquid Phase	30 ml
3	Potassium Nitrate	Chemical Desensitizer / Active Solute Phase	5 g
4	Sodium Benzoate	Preservative / Additive Phase	1.16 g
5	Saccharin	Sweetener / Additive Phase	0.20 g
6	Calcium Carbonate	Base Abrasive / Powder Phase	25 g
7	Silica	Rheology Modifier / Powder Phase	10.0 g
8	Xanthan Gum	Binder & Stabilizer / Powder Phase	1 g
9	Sodium Lauryl Sulphate (SLS)	Surfactant / Additive Phase	1 g
10	Kaolin	Polishing Agent / Mineral Powder Phase	5 g
11	Dead Sea Mud	Therapeutic Mineral / Clay Phase	3 g
12	Multani Mitti	Adsorbent Base / Clay Phase	3 g
13	Bentonite Clay	Tubule Occluding Agent / Clay Phase	1 g
14	Neem Powder	Herbal Antimicrobial / Active Powder Phase	1 g
15	Mulethi Powder	Herbal Anti-inflammatory / Active Powder Phase	0.1 g
16	Clove Oil	Essential Oil & Analgesic / Final Additive Phase	4 Drops

The Mud Herbal Sensitive Toothpaste was prepared using the standard trituration method in a clean, controlled environment.

Step 1: Weighing and Collection All dry powders, clays, and liquid humectants were accurately measured using an electronic weighing balance according to the master formula.

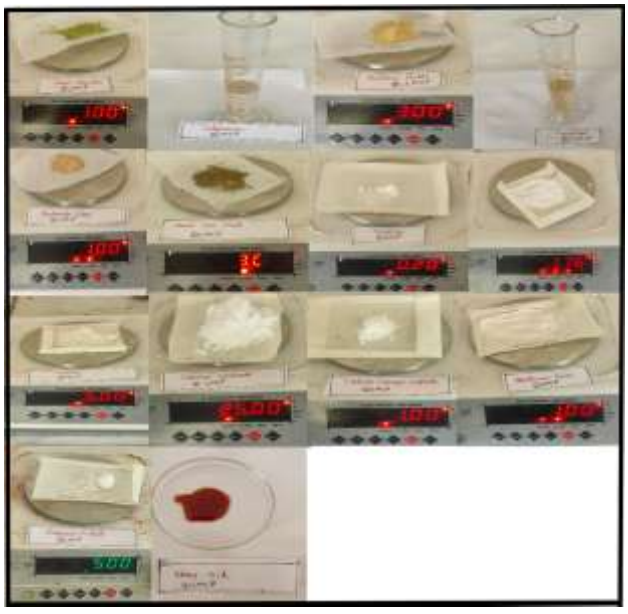

Fig. No. 18. Image of all ingredients weighed on the electronic balance

Step 2: Sieving of Dry Ingredients To ensure a smooth, grit-free final product, all dry mineral powders (Calcium Carbonate, Silica, Kaolin, Bentonite, Multani Mitti) and herbal powders (Neem, Mulethi) were passed through a No. 80 mesh sieve to break down any agglomerates.

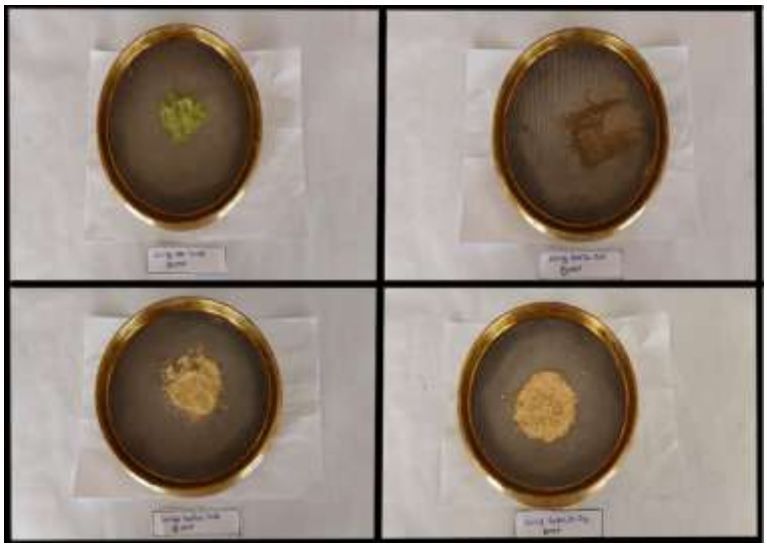

Fig. No. 19. sieving process

Step 3: Preparation of Liquid Humectant Base In a clean porcelain mortar, the liquid phase was initiated by adding Sorbitol and Glycerine. These act as the primary humectant and solvent vehicle for the formulation. To the liquid base, Calcium Carbonate was added gradually with continuous trituration. Next, Xanthan gum was sprinkled slowly into the mixture to begin building the rheological structure (viscosity) of the paste.

Fig No. 20. Adding sorbitol + glycerine+CaCo3 and Xanthum Gum

Sodium Lauryl Sulphate (SLS) was then added carefully. Trituration was kept gentle at this stage to prevent excessive, premature foaming. The primary chemical desensitizing agent, Potassium Nitrate, was triturated into the mixture until completely dissolved in the humectant base. Then Sodium Benzoate was added to preserve the formulation against microbial spoilage.

Fig No. 21. Adding SLS+ Potassium Nitrate and Sodium Benzoate

Saccharine was incorporated to provide sweetness and mask the earthy/bitter notes of the subsequent additions. The therapeutic minerals were introduced to the paste sequentially. Kaolin was added first for its fine polishing properties. Silica was added to adjust the abrasively and finalize the thickness of the paste.

Fig No. 22. Adding Saccharine+ Koalin+ Silica

Dead Sea Mud was then folded into the mixture, imparting its rich mineral profile and characteristic colour. Following this, Bentonite Clay and Multani Mitti were incorporated. Due to their high swelling capacity, intensive trituration was required to ensure a homogeneous, lump-free consistency. Once the mineral base was uniform, the shade-dried and micro-pulverized Neem powder and Mulethi powder were added. Finally, 4 drops of Clove Oil were introduced to the centre of the paste and triturated thoroughly to lock the volatile eugenol into the clay matrix.

Fig. No. 23. Adding Dead Sea Mud+ Bentonite Clay+ Multani Mitti and Neem powder

Step 4: Final Homogenization

The entire mixture was triturated vigorously for an additional 15–20 minutes to ensure a perfectly smooth, glossy, and uniform toothpaste structure.

Step 5: Evaluation and Testing

The finalized paste was subjected to immediate physicochemical evaluation, including pH measurement, spreadability testing, and homogeneity checks.

Step6: Packaging The prepared Mud Herbal Sensitive Toothpaste was transferred into an airtight, squeezable tube container, properly labelled, and stored at room temperature for further stability and antibacterial evaluation.

Evaluation of Mud Herbal Sensitive Toothpaste

Following standard dental and pharmacopeial guidelines, the prepared mud herbal sensitive toothpaste underwent conventional physicochemical and quality control assessments:

- **pH Determination:** pH value of the aqueous suspension of the toothpaste solution in 1% w/v was determined using the pH meter. It is crucial to remember that this is one of the crucial parameters since the pH value should be sufficiently high (due to the presence of Calcium Carbonate and Bentonite) so as to counteract the effect of the plaque.

Fig. No. 24. Evaluation of pH

- **Spread ability Test:** Viscosity of the toothpaste, which means ease of spreading the solution on the surface of the toothbrush bristles and teeth, was tested via the parallel glass plates test method.

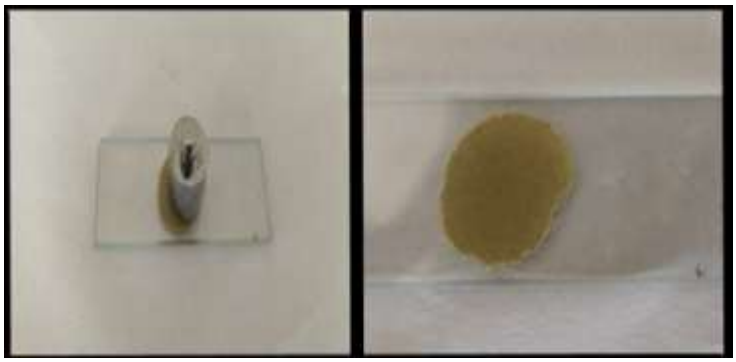

Fig. No. 25. Spread ability Test

- **Foaming Ability Test:** This included shaking of a predetermined amount of toothpaste with distilled water in a measuring cylinder to obtain information about the volume of foaming that will be achieved by Sodium Lauryl Sulphate (SLS) to ensure that it provides enough frothing capacity to remove the released dental debris.

Fig. No. 26. Foaming Ability Test

- **Abrasiveness Assessment:** The abrasiveness of the particulate matter in the toothpaste (Calcium Carbonate, Kaolin, and Silica) was determined through hand rubbing and its application onto a glass slide.

Fig. No. 27. Abrasiveness Assessment

RESULT

Physicochemical and sensory quality control analyses were conducted on the prepared Mud Herbal Sensitive Toothpaste for its safety, stability, and acceptability. This study proves that the trituration and homogenization technique was able to produce a good-quality toothpaste dentifrice.

Table No. 5. The results of the evaluation parameters are summarized in the table below:

Evaluation Parameter	Observation / Result	Reference
Color	Light earthy-green with a smooth, uniform dispersion	Visual Inspection (Standard Organoleptic Evaluation)
Odour	Pleasant, characteristic spicy-herbal aroma (Clove dominating, effectively masking the clays)	Olfactory Assessment (Standard Organoleptic Evaluation)
Appearance & Texture	Smooth, uniform, highly viscous paste without any hard lumps or coarse grittiness	Visual & Tactile Evaluation
pH (1% w/v aqueous dispersion)	6.04	Indian Pharmacopoeia (IP) 2018 (Dentifrice Standards)
Spread ability / Extrudability	Excellent; extrudes easily from the tube and spreads uniformly on bristles without excessive drag	Parallel Plate Method / Standard Tube Extrusion Test
Foaming Ability	Good; produces dense, stable lather upon mechanical brushing	Standard Foam Height Test
Washability (Rinsability)	Good; easily expectorated and rinses cleanly with water, leaving no stubborn clay residue	ICH Guidelines (Topical Formulation Criteria)
Irritancy / Grit Assessment	Non-irritating; provided gentle mechanical polishing without inducing scratching on the enamel or gums	Standard Dentifrice Abrasivity Assessment

CONCLUSION

The combination of these natural ingredients can bring about great relief to aching teeth and inflamed gums. Clay is extracted from the Dead Sea and kaolin is added in order to form an outer coating for open canals within the tooth's surface, while maintaining the acidity of one's mouth to neutral level. The mechanical protection by means of the two aforementioned components comes along with potassium nitrate, which soothes sensitive nerves found within each tooth. Clove oil, along with the antibacterial neem and mulethi, fights cavities, while relieving irritated gum tissues. The paste is firmly held together using xanthan gum, which covers enamel evenly without drips or falling apart. The paste is hydrated via sorbitol and glycerine, providing a soft texture that remains intact even when brushed

frequently. The foaming effect occurs mildly due to activation of sodium lauryl sulphate during the rubbing process. All pieces fit tight and form layers upon layers until everything feels complete. All angles are covered in testing for stability, safety, and comfort, and after passing those tests, the formula becomes loyal to its daily performance without strange odors or residue.

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