

Development of Herbal Toothpaste Using Natural Ingredients

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Date of Submission: 25-07-2025

Date of Acceptance: 05-08-2025

ABSTRACT:

Herbal toothpaste containing natural ingredients is gaining popularity in oral dental care. A detailed study on toothpaste formulated from Neem, tulsi, Clove oil, Aloe vera, Triphala, Activated charcoal, Peppermint oil, Honey, Coconut oil, Tea Tree oil and mint was performed to obtain an overview of the key parameters namely pH, microbial load, spreadability, abrasiveness, stability, texture, foaming ability and taste and odor to create a more effective formulation and stable performance. This study suggests that the composition of herbal-based toothpaste with natural ingredients is as good in terms of results. Neem possesses antibacterial properties, coconut oil possesses binding agent, antimicrobial properties, aloe vera gel possesses healing and soothing, tea tree oil contains antimicrobial and antiseptic properties, peppermint oil contains refreshing taste and antibacterial effects, activated charcoal contains whitening effect. The results indicated that the herbal toothpaste possesses favorable physical properties, appropriate pH levels, and spreadability. In conclusion, the herbal toothpaste containing natural ingredients holds promise as an alternative oral care product.

I. INTRODUCTION

Oral hygiene is an essential aspect of personal health, and the use of toothpaste plays a significant role in maintaining dental cleanliness and preventing oral diseases. Conventional toothpastes often contain synthetic ingredients such as fluoride, artificial sweeteners, preservatives, and chemical-based abrasives, which, in some cases, may lead to side effects like dental fluorosis, gum irritation, or allergic reactions. As a result, there is a growing demand for herbal toothpastes formulated using natural ingredients that offer similar or superior oral care benefits without harmful side effects.

FORMULATION FOR HERBAL TOOTHPASTE

• This formulation uses a combination of natural and herbal ingredients, providing antibacterial, antifungal, whitening, and soothing properties

suitable for daily oral hygiene. The following table assumes preparation of 100 g of herbal toothpaste.

- 1 Neem Extract (*Azadirachta indica*) Antibacterial, anti-inflammatory 3 g
- 2 Clove Oil (*Syzygium aromaticum*) Analgesic, antiseptic 0.7 mL
- 3 Mint Extract (*Mentha*) Cooling, flavoring agent 0.8 mL
- 4 Salt (Sodium chloride) Mild abrasive, antibacterial 1.5 g
- 5 Baking Soda (Sodium bicarbonate) pH buffering, whitening, abrasive 4 g
- 6 Coconut Oil (*Cocos nucifera*) Antimicrobial, base/binder 8 mL
- 7 Activated Charcoal Whitening agent, stain remover 2 g
- 8 Aloe Vera Gel (Aloe Healing, soothing, 4 g
- 9 Tea Tree Oil (*Melaleuca alternifolia*) Antibacterial, antifungal 0.3 mL
- 10 Peppermint Oil Flavor, breath freshener 0.5 mL
- 11 Glycerin Humectant, provides smooth texture 12 mL
- 12 Carboxymethyl Cellulose (CMC) Thickening, binding agent 1 g
- 13 Distilled Water Solvent up to 100 g
- 14 Natural Preservative (e.g. Potassium Sorbate) Prevents microbial growth 0.2 g

II. METHODOLOGY

1. Preparation of Herbal Extracts: • Drying and Powdering: The collected herbal ingredients (neem, tulsi, mint, and triphala) were shadedried to retain their phytochemical constituents. Once dried, they were finely powdered using a mechanical grinder. • Extraction: Aqueous extraction: The powdered herbs were boiled in distilled water for 30 minutes and then filtered. Alcoholic extraction: The herbs were macerated in ethanol (70%) for 48 hours, followed by filtration and solvent evaporation under reduced pressure to obtain a concentrated extract. • Storage: The obtained herbal extracts were stored in amber-colored bottles at 4°C for further use.

2. Formulation of Toothpaste: • Preparation of Base: In a clean, dry mortar and pestle (or homogenizer), calcium carbonate and dicalcium phosphate were mixed to form the abrasive base.

Glycerin was added gradually while continuously stirring to form a paste-like consistency. Sodium alginate (or xanthan gum) was incorporated as a thickening agent to improve texture. Incorporation of Herbal Extracts: The prepared herbal extracts were slowly added to the base with continuous stirring. Essential oils (peppermint, clove) were added for flavor and antimicrobial effects. Sweeteners (honey) were added to improve taste. • Adjustment of Consistency: Distilled water or sorbitol was added in small amounts to obtain the desired viscosity and spreadability. • Final Mixing and Homogenization: The mixture was blended using a mechanical stirrer or homogenizer to ensure uniform distribution of ingredients. The paste was checked for smoothness and free from lumps or phase separation. • Packaging and Storage: The prepared herbal toothpaste was transferred into collapsible tubes or airtight jars. Stored at room temperature for further evaluation.

III. EVALUATION PARAMETERS:

Physical examination

The colour of the toothpaste was assessed visually. Smelling the product revealed the presence of odour. The taste of the formulation was tested manually. The smoothness of the paste formulation was verified by rubbing it between the fingers.

PH

ph ranges : 6.7-7.5

Abrasiveness

To verify for the presence of any sharp or abrasive particles the contents were placed on the finger and scratched on the butter paper for 15-20cm

Spreadability

Slip and drag characteristics of paste are used to determine the spreadability technique. About 1-2g of herbal toothpaste was weighed and placed between two glass slides that were stacked one on top of the other (no sliding was allowed), and the slides were moved in opposing directions. After 3 minutes, measure the amount of toothpaste that has spread (in cm). Repeating the experiment and calculating the average of three readings.

Foaming ability

The foaming power (flammability) of herbal toothpaste was measured by mixing 2g of toothpaste with 5 ml water in a measuring cylinder

and shaking it for 10 times. The total volume of foam was calculated.

Antimicrobial Activity

Antibacterial activity was determined by agar well diffusion method using amoxicillin as standard. Activity of herbal toothpaste was tested against E.coli and lactobacillus.

IV. RESULT & CONCLUSION

The results demonstrated that the formulated toothpaste exhibited good physical stability, optimal pH, acceptable viscosity, and moderate foaming ability, making it suitable for daily use. The incorporation of medicinal plant extracts such as neem, clove, tulsi, triphala, and aloe vera provided significant antimicrobial, anti-inflammatory, and healing properties, which contribute to improved oral hygiene. The toothpaste also exhibited a low abrasiveness index, ensuring safe and effective plaque removal without causing enamel erosion. Additionally, stability studies indicated that the formulation remained physically and chemically stable under various storage conditions, with no microbial contamination observed over 30 days. Overall, the findings of this study support the potential commercialization of herbal toothpaste as a safe, effective, and sustainable alternative for maintaining oral health.

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