Review Article

Formulation of Herbal Mint Fresh Toothpaste

Ayan Ahmad[1], Praveen Kumar Ashok[2],Jhuma Samanta[2], Amandeep Singh[3], Babita[4]

[1]Student, School of Pharmaceutical Sciences, Jigyasa University, Dehradun, Uttarakhand,India
[2]Professor, School of Pharmaceutical Sciences, Jigyasa University, Dehradun,Uttarakhand,India
[3]Principal and Professor, School of Pharmaceutical Sciences, Jigyasa University, Dehradun,Uttarakhand,India
[4]Assistant Professor, School of Pharmaceutical Sciences, Jigyasa University, Dehradun,Uttarakhand,India

Abstract

The increasing consumer preference for natural, safe, and multifunctional oral care products has accelerated interest in herbal mint fresh toothpaste as an alternative to conventional synthetic dentifrices. Herbal formulations incorporate plant-based ingredients possessing antimicrobial, anti-inflammatory, antioxidant, and breath-freshening properties, including Mentha piperita (peppermint), Mentha arvensis (field mint), Azadirachta indica (neem), Salvadora persica (miswak), Aloe vera, and Glycyrrhiza glabra (liquorice). Mint oils rich in menthol enhance flavor, impart a cooling sensation, and suppress oral pathogens. Natural abrasives such as calcium carbonate and hydrated silica facilitate effective plaque removal without damaging enamel, while humectants and natural binders maintain paste consistency and stability.

Several studies indicate that herbal mint toothpastes demonstrate comparable efficacy to synthetic formulations in reducing dental plaque, gingivitis, halitosis, and oral microbial load, with fewer adverse effects such as fluorosis and mucosal irritation. The growing global demand for eco-friendly and chemical-free oral care products further strengthens the market potential of herbal mint formulations. However, challenges remain regarding batch-to-batch variability, standardization of herbal ingredients, stability of essential oils, and regulatory compliance. Overall, herbal mint fresh toothpaste represents a safe, effective, and sustainable approach to oral hygiene with strong prospects for future innovation in natural dentifrices.

Keywords: Herbal toothpaste, mint extracts, antimicrobial activity, natural abrasives, oral hygiene

Introduction

Herbal mint fresh toothpaste has gained significant attention as a natural alternative to conventional synthetic dentifrices due to its favorable safety profile, therapeutic efficacy, and minimal adverse effects. In recent decades, growing awareness regarding the long-term side effects associated with synthetic ingredients such as sodium lauryl sulfate, triclosan, artificial sweeteners, and excessive fluoride has shifted consumer preference toward herbal and plant-based oral care formulations. Herbal dentifrices utilize medicinal plants and essential oils that possess well-documented antibacterial, anti-inflammatory, antioxidant, and breath-freshening properties, making them particularly appealing to health-conscious and environmentally aware populations [1].

Oral hygiene plays a crucial role in maintaining overall systemic health, as poor oral conditions are strongly associated with periodontal diseases, dental caries, halitosis, and systemic disorders such as cardiovascular disease, diabetes mellitus, and respiratory infections. Dental plaque, a biofilm composed of pathogenic microorganisms, is the primary etiological factor for most oral diseases. Effective control of plaque and oral microbial load is therefore essential for preserving both oral and general health. Toothpaste remains the most commonly used oral hygiene product worldwide, serving not only as a cleansing agent but also as a vehicle for delivering therapeutic agents to the oral cavity.

Among herbal ingredients, mint species—particularly Mentha piperita (peppermint) and Mentha spicata (spearmint)—are extensively incorporated into toothpaste formulations due to their alleviating irritation, preventing microbial infections, and characteristic cooling sensation, pleasant aroma, and potent antimicrobial activity. Mint essential oils are rich in bioactive constituents such as menthol, menthone, menthyl acetate, and 1,8-cineole, which exhibit significant inhibitory effects against oral pathogens including Streptococcus mutans, Lactobacillus species, and anaerobic bacteria responsible for halitosis. Menthol activates cold-sensitive receptors in the oral mucosa, providing an immediate sensation of freshness and comfort while contributing to analgesic and anti-inflammatory effects [2].The formulation of herbal mint fresh toothpaste typically involves a synergistic combination of functional excipients and herbal actives. Natural abrasives such as calcium carbonate or hydrated silica aid in effective plaque and stain removal without damaging tooth enamel. Humectants like glycerin or sorbitol prevent drying and maintain the desired consistency of the paste, while natural binders such as gum tragacanth, xanthan gum, or sodium carboxymethyl cellulose ensure uniform dispersion of ingredients. Mild foaming agents derived from natural sources, such as soapnut (Sapindus mukorossi) extract or herbal saponins, enhance cleansing action while minimizing mucosal irritation.Mint essential oil serves as the primary flavoring and therapeutic agent in herbal toothpaste formulations. In addition, complementary botanicals such as Azadirachta indica (neem), Ocimum sanctum (tulsi), Syzygium aromaticum (clove), Salvadora persica (miswak), and Aloe vera are frequently incorporated to enhance antibacterial, anti-inflammatory, wound-healing, and soothing effects on gingival tissues. The combined action of these herbal ingredients contributes to improved oral hygiene, reduction of gingival inflammation, prevention of oral infections, control of halitosis, and prolonged breath freshness [3].The rising global demand for chemical-free, eco-friendly, and biocompatible oral care products has further strengthened the market potential of herbal mint fresh toothpaste. Advances in phytochemical research and pharmaceutical formulation technology have enabled better standardization, stability, and performance of herbal dentifrices, making them comparable to synthetic counterparts in terms of

*Correspondence
Dr.Praveen Kumar Ashok
Professor, School of Pharmaceutical Sciences, Jigyasa University, Dehradun,Uttarakhand,India
E-Mail: praveen.kumar@jigyasauniversity.edu.in

efficacy. Consequently, herbal mint toothpaste has emerged as a promising, sustainable, and consumer-acceptable substitute for conventional synthetic toothpaste formulations, offering both therapeutic benefits and enhanced patient compliance [4].

History of Herbal Mint Fresh Toothpaste Formulation

The development of herbal mint fresh toothpaste is rooted in traditional oral care practices combined with modern pharmaceutical formulation science. Its evolution can be broadly classified into distinct historical phases.

Ancient Herbal Oral Care (3000 BCE – 1500 CE)

The earliest dentifrices were documented in Egyptian medical papyri, where tooth powders and pastes composed of dried flowers, salt, pepper, and crushed mint were used for cleaning teeth and freshening breath [5].

Ancient Greece and Rome

Greek and Roman civilizations practiced oral hygiene using crushed herbs, mint leaves, vinegar, and pumice. Mint was valued for its refreshing aroma and cooling sensation [6].

Ayurveda (India)

Ayurvedic texts such as the Charaka Samhita and Sushruta Samhita describe the use of Pudina (Mentha arvensis) along with neem, triphala, and clove in herbal tooth powders (Dantadhavana churna) for maintaining oral health [7].

Early Tooth Powder Era (1700–1900)

With advancements in dentistry, tooth powders became more standardized. Common ingredients included peppermint or spearmint powder, charcoal, chalk, myrrh, clove, and cinnamon. Mint was primarily used for breath freshness and its mild antimicrobial activity due to menthol content [8].

Development of Modern Toothpaste (1900–1970)

The transition from tooth powders to creamy toothpaste formulations marked a major milestone. Humectants such as glycerin prevented drying, while surfactants improved cleansing efficiency. Essential oils, particularly peppermint and spearmint, replaced harsh chemical flavoring agents. By the mid-20th century, mint became the universally accepted base flavor due to its cooling action, antimicrobial activity, and high consumer acceptance [9].

Rise of Herbal Toothpaste (1970–Present)

Growing concerns regarding synthetic chemicals led to renewed interest in herbal toothpaste. Chemical abrasives were replaced by natural calcium carbonate, harsh surfactants by herbal saponins, and synthetic preservatives by essential oils. Modern phytochemical research revealed that mint oils contain menthol, menthone, 1,8-cineole, and menthyl acetate, which justify their continued use in contemporary herbal toothpaste formulations [10].

Types of Herbal Mint Toothpaste Formulations

Herbal mint toothpastes are formulated using combinations of herbal actives and mint oils to provide antimicrobial, anti-inflammatory, deodorizing, refreshing, and whitening effects. Based on functional objectives, they may be classified as follows:

Antibacterial Herbal Mint Toothpaste

Designed to control oral bacteria, reduce plaque, and prevent gingivitis. Key ingredients include peppermint or spearmint oil, neem extract, clove oil, tea tree oil, aloe vera gel, and mild abrasives such as calcium carbonate or silica [12].

Anti-inflammatory / Gum-care Herbal Mint Toothpaste

Formulated to prevent bleeding gums and soothe inflammation, containing peppermint oil, turmeric (curcumin), triphala, aloe vera, and liquorice extract [13].

Whitening Herbal Mint Toothpaste

Aimed at removing surface stains and enhancing tooth brightness using spearmint or peppermint oil, herbal charcoal, sodium bicarbonate, hydrated silica, and antibacterial herbs such as clove and neem [14].

Fresh-breath Herbal Mint Toothpaste

Developed to control halitosis and provide long-lasting freshness through peppermint and spearmint oils, eucalyptus oil, fennel extract, and tea tree oil.

Anti-caries (Fluoride-free) Herbal Mint Toothpaste

Designed to prevent dental caries without fluoride, incorporating mint oils, miswak extract, neem, xylitol, and calcium-based minerals for remineralization.

Sensitive-teeth Herbal Mint Toothpaste

Formulated to reduce dentin hypersensitivity using potassium nitrate, clove oil, aloe vera, and triphala.

Advantages of Herbal Mint Fresh Toothpaste

Herbal mint toothpaste offers multiple therapeutic and cosmetic benefits due to its natural composition.

Antimicrobial Activity

Mint essential oils exhibit significant antibacterial action against major oral pathogens, reducing plaque formation and maintaining oral microbial balance [18].

Natural Breath Freshening

Menthol vapors provide immediate cooling and deodorizing effects, reducing volatile sulfur compounds responsible for halitosis.

Anti-inflammatory Effects

Combined with aloe vera, liquorice, and neem, mint helps reduce gingival inflammation and irritation

Safety and Biocompatibility

Herbal formulations generally exclude triclosan, SLS, artificial sweeteners, and preservatives, making them suitable for long-term use with reduced risk of mucosal irritation.

Natural Whitening

Mild herbal abrasives gently remove surface stains without damaging enamel, enhancing overall dental aesthetics.

Limitations of Herbal Mint Fresh Toothpaste

Despite their numerous advantages, herbal mint fresh toothpastes possess certain limitations that may affect their widespread clinical acceptance and long-term effectiveness when compared with conventional synthetic and fluoridated dentifrices. These limitations are largely associated with formulation constraints, variability of herbal ingredients, stability concerns, and regulatory challenges.

Reduced Protection Against Dental Caries

One of the primary limitations of herbal mint toothpastes is reduced protection against dental caries due to the absence or low concentration of fluoride. Fluoride is well known for its ability to enhance enamel remineralization, inhibit demineralization, and suppress acid-producing cariogenic bacteria such as Streptococcus mutans. Herbal formulations mainly depend on antibacterial herbs, mint oils, and calcium-based abrasives, which may not provide equivalent caries-preventive efficacy, especially in individuals with high caries risk, poor oral hygiene, or frequent sugar consumption.

Variability in Antimicrobial Efficacy

The antimicrobial activity of herbal mint toothpaste may vary significantly depending on the source, quality, and processing of herbal raw materials. Factors such as plant species, geographical origin, harvesting season, drying conditions, extraction technique, and concentration of active phytoconstituents (e.g., menthol in mint oil) can influence therapeutic efficacy. This batch-to-batch variability may result in inconsistent antimicrobial performance compared to synthetic formulations containing standardized chemical agents.

Stability Issues and Shorter Shelf Life

Herbal ingredients, particularly essential oils and aqueous plant extracts, are inherently unstable and susceptible to degradation upon exposure to light, heat, moisture, and oxygen. Mint essential oil may undergo oxidation or volatilization during storage, leading to loss of flavor, reduced antimicrobial activity, and changes in organoleptic properties. Additionally, the limited use of strong synthetic preservatives in herbal formulations increases the risk of microbial contamination, thereby reducing shelf life and necessitating controlled storage conditions.

Risk of Allergic Reactions and Oral Sensitivity

Although herbal products are generally considered safe, certain individuals may experience hypersensitivity or allergic reactions to specific herbal components or essential oils. Mint oil, clove oil,

cinnamon oil, and tea tree oil have been associated with oral mucosal irritation, burning sensation, contact dermatitis, or stomatitis in sensitive individuals. Such reactions, though relatively uncommon, warrant caution in pediatric patients, pregnant women, and individuals with known allergies.[13]

Limited Foaming and Consumer Acceptance

Herbal mint toothpastes often replace synthetic surfactants such as sodium lauryl sulfate with natural foaming agents like soapnut-derived saponins. While this reduces mucosal irritation, it may result in lower foaming action. Since many consumers associate foaming with cleansing efficiency, reduced foam may negatively influence user perception and acceptance despite adequate cleaning performance.

Regulatory and Standardization Challenges

1. Another significant limitation is the lack of harmonized regulatory guidelines for herbal toothpaste formulations. Variations in national and international regulations complicate product approval, quality assessment, labeling, and marketing. Furthermore, the absence of well-defined pharmacopoeial standards for many herbal ingredients restricts consistency, reproducibility, and large-scale industrial manufacturing.
2. In conclusion, although herbal mint fresh toothpaste offers a natural and biocompatible approach to oral hygiene, limitations related to caries prevention, stability, standardization, safety, and consumer perception must be addressed. Advances in formulation technology, improved standardization of herbal extracts, and supportive clinical evidence are essential to enhance their therapeutic reliability and global acceptance.

Method of Preparation

Herbal mint toothpaste is prepared by first obtaining herbal extracts from dried leaves of Mentha piperita and other selected medicinal plants such as Azadirachta indica, Salvadora persica, and Aloe vera using maceration or solvent extraction. A binder such as sodium carboxymethyl cellulose or xanthan gum is dispersed in purified water and allowed to hydrate to form a smooth gel base.Separately, abrasives like calcium carbonate are mixed with humectants such as glycerin or sorbitol to obtain a uniform paste, after which the binder gel is incorporated slowly with continuous stirring. The prepared herbal extracts are then added into the base in measured quantities, followed by the addition of sweetening agents, preservatives, and mint oil as a flavoring agent. The mixture is stirred thoroughly until a smooth and homogeneous paste is obtained, and the final consistency is adjusted with purified water. The prepared toothpaste is then packed into suitable containers and stored under hygienic conditions for further evaluation. This method ensures uniform distribution of herbal actives and acceptable organoleptic properties in the final product[14]

Evaluation Parameters of Mint Herbal Toothpaste

Mint-fresh herbal toothpaste is evaluated based on physicochemical, microbiological and performance-based parameters to ensure safety, stability, and effectiveness.

Organoleptic Evaluation

Assesses consumer-acceptable characteristics.

Parameters

• Color: Should be uniform (usually green/white depending on mint and herbal extracts).

•Odor: Characteristic fresh minty smell (peppermint/spearmint).

•Taste: Pleasant, cooling, non-bitter.

•Appearance: Smooth, glossy, homogeneous without lumps.

Method

• Take 2–3 g of paste and examine visually and by smelling/tasting in small quantity.

Compare with standard marketed sample

pH Measurement

•To check oral safety and enamel compatibility.

Procedure

•Prepare 1% w/v slurry (1 g toothpaste in 100 mL distilled water).

•Stir for 30 minutes.

•Measure using a calibrated digital pH meter.

Range : pH 6.0 – 8.0

•This is mild, safe for oral tissues, and does not damage tooth enamel.

Foaming Ability / Foaming Power

•Herbal mint toothpaste uses surfactants (SLS or natural saponins) to create foam.

Method (Cylinder Shake Method)

•Prepare 1% toothpaste solution.

•Transfer 10 mL into a graduated cylinder.

•Shake for 10 seconds.

•Measure foam height before and after shaking.

Conclusion

Herbal mint fresh toothpaste represents a successful integration of traditional herbal knowledge with modern pharmaceutical formulation science, offering a safe, effective, and consumer-friendly approach to daily oral hygiene. The incorporation of mint oils, particularly from Mentha piperita and Mentha spicata, along with complementary herbal ingredients such as neem, tulsi, clove, miswak, and aloe vera, provides a synergistic combination of antimicrobial, anti-inflammatory, antioxidant, and breath-freshening effects. This multifaceted therapeutic action contributes to effective plaque control, reduction of gingival inflammation, prevention of oral infections, and long-lasting oral freshness.

Compared to conventional synthetic dentifrices, herbal mint toothpaste formulations demonstrate improved biocompatibility and reduced incidence of adverse effects such as mucosal irritation, dryness, and chemical sensitivity. The use of natural abrasives ensures gentle yet effective cleaning without damaging tooth enamel, while herbal excipients enhance patient comfort and acceptability. As a result, herbal mint toothpaste has emerged as a viable and attractive alternative for individuals seeking chemical-free, eco-friendly, and sustainable oral care products.

Future Prospects

Future developments may focus on enhanced efficacy through advanced extraction techniques, incorporation of probiotics or nanotechnology, and expansion into global markets driven by increasing demand for natural oral care products.

References

1. Martin MR and David G: Pharmaceutical Dosage Forms: Disperse system. Marcel Dekker Inc., New York 1996; 2:423-447.
2. Mehata RM: A Textbook of Pharmaceutics-II. Vallabh Prakashan, 5th edition 2015: 215-218.
3. Dave K, Panchal L, and Shelat PK: Development and Evaluation of Antibacterial Herbal Toothpaste containing Eugenia caryophullus, Acacia nilotica and Mimusops elengi. International Journal of Chemistry and Pharmaceutical Sciences, IJCPS 2014; 2(3): 666-673.
4. Rajeswari R: Aloe vera: The Miracle Plant Its Medicinal and Traditional Uses in India, Journal of Pharmacognosy and Phytochemistry 2012; 1(4): 118-24.
5. Wynn RL: Aloe vera gel: Update for dentistry. Gen Dent2005; 53(1): 6-9.
6. Patent US2994642-sodium chloride toothpaste has silicagel carrier.
7. Subramaniam T, Subramaniam A, Chowdhury A, Das S and Gill M: Versatility of Aloe vera in Dentistry- A review; IOSR Journal of Dental and Medical Sciences 2014; 13(10): 98-102.
8. Meena M, Figueiredo NR and Trivedi K: Aloe vera – An Update for Dentistry 2013; 2(4): 1-4.
9. Monica B and Monisha R: Aloe vera in dentistry- a review; IOSR Journal of Dental and Medical Sciences.2014; 13(12): 18-22.

10. Wadhawan R, Khan SDAA, Solanki G and Sabir S: Aloe vera: a boon in dentistry; International Journal of Pharmacy Review & Research 2014; 4(3): 147-151.
11. Sundarkar P: Use of Aloe vera in dentistry. Journal of Indian Academy of Oral Medicine and Radiology 2011;23(3): S389-91.
12. Meena M: Aloe vera - An Update for Dentistry, Journal ofdentofacial sciences 2013; 2(4): 1-4.
13. Sajjad A: Aloe vera: An ancient herb for the modern dentistry-a literature review. Journal of Dental Surgery2014: 1-6.
14. Esha Vatsa, Mehak Aggarwal, Shipra Gautam "Formulation and Evaluation of Polyherbal Facial Scrub" Just Agriculture multidisciplinary e-Newsletter, 2021; 1(9): 1-6.

Conflict of Interest:Nil
Source of support:None