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"GREEN DENTAL CARE"- ECO-FRIENDLY TOOTHPASTE AND TOOTHBRUSH

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Abstract

Green dental care offers innovative, cost-effective toothpaste and toothbrush combos designed for environmentally conscious consumers. The toothbrush handle is designed using *Simarouba glauca* stem to improve comfort and usability. These products prioritize sustainability by using natural ingredients like Tulsi, Neem, Mint, Coconut oil, Salt and Triphala and biodegradable materials, effectively reducing plastic waste and chemical exposure. The initiative aims to provide affordable, high-quality dental care solutions without creating any environmental distress. By promoting eco-friendly practices, current work encourages healthier smiles while fostering a commitment to environmental stewardship. This combination of effectiveness, affordability, and sustainability positions Green Dental Care as a leader in the growing market for responsible dental hygiene products.

Keywords- Triphala, Neem, *Simarouba glauca*, sustainability

Introduction

Conventional toothpaste often contains synthetic ingredients like sodium lauryl sulphate (SLS), triclosan, and fluoride, which may lead to various adverse effects. For instance, while fluoride is beneficial for dental health in moderation, excessive amounts can be harmful and have been associated with health issues such as thyroid disorders, developmental delays in children, and even cancer (Masoumeh et al. 2019). Triclosan, an antimicrobial agent, has been shown to disrupt hormonal balance and contribute to antibiotic resistance (Lisa et al 2017). Moreover, SLS, a common foaming agent, can irritate sensitive skin and gums, leading to dryness and inflammation (Charbonnier et al. 2001). On top of these health concerns, the plastic packaging used by many traditional toothpaste brands is often non-recyclable, further contributing to environmental pollution. These factors raise significant problems for both human health and the health of our planet(Ana et al 2023).

Common preservatives in toothpaste include formaldehyde and ethylene diamine tetra acetic acid (EDTA). EDTA is a chelating agent that binds to metals in the body and may cause nutritional imbalances if ingested in high amounts (Zahed et al 2013). There are also concerns about its environmental impact, as it can persist in water systems and threaten aquatic life. Formaldehyde, which has antimicrobial and preservative properties, is recognised as an irritant and a carcinogen. Even low levels of formaldehyde exposure over time have been linked to skin irritation, respiratory issues, and an increased risk of cancer, particularly in the throat and nasal passages. (Sushmita et al 2024)

The increasing popularity of sustainable and eco-friendly personal care products has led to the rise of eco-friendly toothpaste. Unlike conventional toothpaste, which is often packaged in non-recyclable plastic tubes, eco-friendly alternatives prioritise natural or organic ingredients, minimize waste, and utilize packaging that is recyclable, compostable, or

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biodegradable (Mubarik et al 2024). This shift not only benefits personal health by avoiding potentially harmful synthetic ingredients but also helps reduce our environmental footprint. By choosing eco-friendly toothpaste, consumers can contribute to a healthier planet while caring for their dental hygiene (Ayodejii et al 2024).

The current work showcases biological alternatives to harmful toothpaste and plastic toothbrushes, emphasising oral wellness while protecting the environment. This toothpaste avoids harsh chemicals and unnecessary additives, promoting a healthier environment and providing a safe, effective clean. It is paired with a biodegradable toothbrush made from renewable resources, contributing positively to environmental health with each use.

The stem of *Simarouba glauca* is used to make toothbrushes because it is included in the official compendium and is commonly used in the folk medicine traditions of many countries. This family is extremely important in pharmaceutics. In addition to their insecticidal, curative, and tonic properties, various genera within this family are used to treat a range of issues, including worms, viruses, diabetes, gastritis, inflammation, malaria, tumours, ulcers, and other ailments. (Shanmuga et al 2022).

Recent ethnobotanical research has significantly contributed to the prevention and treatment of illnesses in living organisms, leading to the development of numerous herbal therapeutic products, both known and unknown. The Simaroubaceae family is particularly noted for its chemical diversity, which includes alkaloids, anthraquinones, coumarins, flavonoids, mono- and sesquiterpenes, questioned, and steroids, in addition to its ethnopharmacological applications.(Sadique et al 2021)

By adopting natural toothpaste and toothbrushes, a more eco-friendly and health-conscious dental routine can be achieved. Natural toothpastes, free from synthetic chemicals, use plant-based and biodegradable ingredients that are gentler on teeth and gums, and less damaging to the planet. This approach not only fosters healthier oral care while avoiding harmful additives but also helps to cut down on plastic waste (Aida et al 2022). The eco-friendly toothbrush typically utilizes sustainable materials such as *Simarouba glauca* stem or biodegradable coconut fibres, enhancing the overall commitment to a sustainable lifestyle.(Fabrica et al 2024)

Materials and methods

Sample Collection and Preparation

Leaves of *Azadirachta indiaca* , *Psidium guajava* were collected from Rajgurunagar, Pune District, Maharashtra, India. *Spinach leaves were collected from farm.* Triphala was purchased from herbal medicine store. Soyabean seeds, coconut oil, cloves (*Syzygium aromaticum*) and hone were procured from retail store. Tulsi (*Ocimum bassilicum*) and Mint leaves (*Mentha piperita*) leaves were collected from home garden. All the leaves (1 g each) were washed with water and oven dried at 60^0C for 1 day. The dried leaves were powdered in grinder.

Formulation of a toothpaste

Powdered form of neem leaves, Spinach, gauva leaves were mixed then 1 1gm of soabean seed powder were added. Sodium chloride was added in this. Clove powder, and triphala powder were mixed in to it. Mint and Basil leaves extract were added. All the ingredients were blend until they were smooth and well combined. Consistency were adjusted b adding

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coconut oil and honey. Little turmeric was also added to this. Toothpaste were transferred to tube and stored in a cool, dry place.

Preparation of toothbrush

The toothbrush handle was designed using the stem of *Simarouba glauca* to improve comfort and usability. The stem was trimmed to about 18 to 20 cm (7 to 8 inches) in length. After smoothing the edges, natural oil or wax was applied for a protective coating. Coconut fibres were used for making toothbrush bristles.

Result and Discussion

The prepared toothpaste avoids hazardous substances and is made from natural ingredients, providing a gentle yet effective cleaning experience. It whitens teeth while promoting gum health. When combined with a toothbrush made of natural and recycled materials, this set is both long-lasting and biodegradable, helping to reduce plastic waste. This environmentally conscious product not only cleans teeth effectively but also aligns with a more economical and sustainable lifestyle. It demonstrates that natural and eco-friendly solutions can provide excellent dental care without compromising quality. Neem leaves, and guava leaves due to their antibacterial, anti-inflammatory, and antifungal properties, as well as their effectiveness served as natural whitening agents (Mahfuzul et al 2007). Sodium chloride (NaCl) used in toothpaste acts as a mild abrasive, helping to remove plaque and surface stains while promoting fresh breath (Alex et al 2020). Soybean is included for its natural emollient properties, which help moisturise the gums and soothe oral tissues while providing mild antibacterial benefits. Cloves, Triphala, and spinach contribute antimicrobial, anti-inflammatory, and antioxidant benefits, aiding in gum soothing, breath freshening, and overall oral health. Coconut oil also serves as a natural preservative.

Ingredients used in common toothpaste	Harmful effects	References
Sodium Monoflurophosphate	Discolouration, Poisoning and allergic reactions etc.	Adam et al 2023
Calcium carbonate, Silica	Enamel damage, Sensitive, Pain etc.	West et al 2012
Sodium lauryl sulphate	Mouth irritation, skin. Cancer , burning Sensation etc.	Hamoun et al 2023
Glycerol, sorbitol, glycol	Diarrhoea in children etc	Marianne et al 2024
Peppermint, wintergreen	Allergic reaction etc	Caterina et al 2004
Potassium nitrate, stomium chloride	Gum disease, cavities etc	Karim et al 2013
Zink nitrate	Hypersensitivity, Mouth ulcer, skin irritation etc	Zivi et al 2024
Aluminium hydroxyde	Expose tooth root	Joon et al 2021

Table 2.1 Ingredients used in Common toothpaste and their Harmful effects

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Table 2.2 Ingredients used in Eco toothpaste and their role

Ingredients	Role	References
Neem Ash, $Nacl_2$	Abrasives- Remove plaque, food particle and surface stains.	Ajay et al 2021
Coconut oil, Honey	Humectants- Keep toothpaste from drying out of.	Banjo et al 2023
Mint and Basil leaves	Flavouring- As a flavouring agent .	Raffaele et al 2022
Neem, triphala, cloves , ginger	Ant sensitivity agents .	Shokoh et al 2020
soybean	help moisturize the gums and soothe oral tissues.	Sup K et al 2021

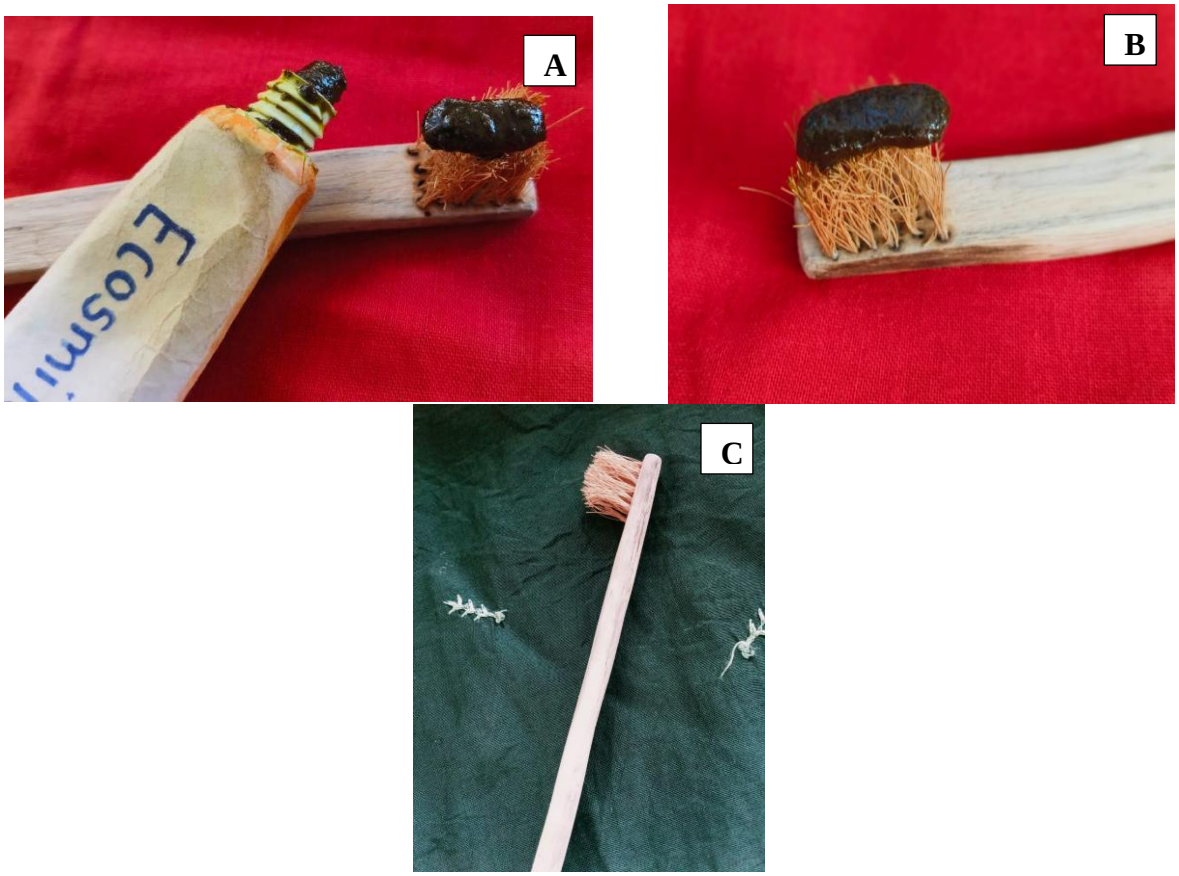

Fig. A, B Toothpaste showing semisolid consistency on handmade toothbrush, C- Toothbrush prepared from the stem of *Simarouba glauca* and the bristles made up of coconut coir.

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Conclusion

Choosing affordable, environmentally friendly toothpaste and toothbrush sets not only helps the environment but also promotes a more sustainable way of life by using natural and biodegradable components to maintain dental health and reduce environmental impact.

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