



Formulation And Evaluation of Poly-Herbal Tooth Powder: A Super Germ Fighter

Uggirala Mounika*¹, Chappa Suresh²

¹Assistant Professor, Department of Pharmaceutics, Priyadarshini Institute of Pharmaceutical Education and Research

²Student of B. Pharmacy, Priyadarshini Institute of Pharmaceutical Education and Research

*Address for correspondence: Uggirala Mounika

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ABSTRACT

Daily toothpaste use is required to maintain excellent oral hygiene and health. The three most prevalent dental problems are gingivitis, plaque, and periodontal diseases. Herbal and synthetic ingredients are used to formulate toothpaste. This research was conducted to develop a toothpowder capable of maintaining excellent oral hygiene and overcoming the disadvantages of conventional toothpowder made with synthetic ingredients. Toothpowder is used in conjunction with a toothbrush to maintain oral hygiene and prevent tooth decay. To create the ideal toothpowder, numerous herbal ingredients were combined. These constituents have antibacterial, antiseptic, and cooling properties, allowing them to fulfil all of the necessary criteria for maintaining oral hygiene and preventing bacterial tooth decay. The prepared tooth powder was evaluated for its organoleptic and physical properties, such as colour, odour, flavour, stability, foaming ability, and abrasiveness, to ensure that it possesses all of the characteristics necessary to combat dental diseases. This natural tooth powder was formulated from *Azadirachta indica* (neem leaves), *Psidium guajava* (guava leaves), *Cinnamomum verum* (cinnamon), *Syzygium aromaticum* (clove), *Ocimum sanctum* (Tulsi), *Phyllanthus emblica* (Amla), and halite (crystal salt). The combination of these herbal constituents enabled the production of highly effective toothpowder.

Keywords: oral hygiene, Dentifrices, anti-inflammatory,

INTRODUCTION

Herbal mouthwashes contribute to the maintenance of good oral health by preventing plaque buildup, tissue and gum inflammation, tooth decay, and bad breath. A person should use safe and effective dentifrices because the oral cavity exhibits good absorption due to mucosal membrane, blood tissues, and enzymes; with the help of neem, guava, clove, cinnamon, Tulsi, and crystal salt, an effort is made to create herbal toothpowder^[1-4].

The components used in herbal toothpowder have demonstrated anti-inflammatory action (prevents gingivitis)^[5], anti-microbial activity (avoids plaque formation and tooth decay), and tooth whitening properties.

They are organic and perform more advantageous actions. Due to the presence of various phytochemicals that support oral health maintenance and enhance bodily biological

processes, the raw materials used to make herbal toothpowder have better effects.

Using tooth powder as a prophylactic cosmetic for teeth can help prevent bad breath and tooth decay. Both synthetic and herbal ingredients can be used to make it. However, nowadays, herbal formulations are more popular because they work better at preventing side effects than synthetic formulations tooth powder and paste are applied to the teeth and rubbed against them to help remove minerals and food particles that have been deposited there because of their abrasive properties^[6-8]. Tooth powder is used along with a toothbrush to keep the mouth fresh and stop tooth decay; creating a tooth powder that can be used for good oral hygiene and to counteract the drawbacks of conventional tooth powder made with synthetic ingredients used the goal of this research.

The antibacterial, antiseptic, and cooling properties of various herbal ingredients used to make the tooth powder were used. To create the perfect tooth powder that can satisfy all the necessary properties, the following herbal ingredients were used: amla powder, neem powder, cinnamon powder, clove powder, baking soda, and pink Himalaya. to maintain oral health and guard against tooth decay. Based on its abrasive qualities, tooth powder helps remove deposited food debris and minerals from teeth when applied to the teeth. For one's health, good oral hygiene is crucial^[9, 10].

Due to the variety of phytoconstituents, substitutes, and adulterants in crude drugs' formulations for purity and quality. One of the most frequently used herbs is herbal tooth powder because of its bitterness, aroma, and anti-microbial properties. The number of microbes is estimated at 10 billion. These are areas in the oral cavity. Certain of them pose a threat to the buccal cavity's cleanliness. Traditional herbal tooth powder is used to clean teeth and is also used to treat several oral conditions, including tooth erosion, sensitivity to hot and cold, and toothaches. The main goal of the work is to prepare, evaluate, and compare herbal market and lab herbal preparations using various methods, including phytochemical, physicochemical, and organoleptic analysis. An almost entirely natural tooth-cleaning agent is herbal tooth powder^[11-14].

Dental problems

We all want healthy teeth and gums for a winning smile, fresh breath, and an increase in self-confidence. However, did you know that halitosis is a dental condition that affects roughly 50% of adults and is one of the most easily treatable ones as well? Take a look at halitosis, nine other typical dental issues, and each of their respective solutions.

Tooth Decay

Dental caries or dental cavities are other names for tooth decay. The majority of patients have this issue, which dentists encounter frequently. Almost everyone has experienced tooth decay at some point in their lives. Plaque, a substance formed by bacteria on the teeth' surface, causes tooth decay. A food's sugars are converted into acids by bacteria^[15]. The tooth's enamel, or outer layer, is destroyed and permanently damaged by the acids. The softer layer of dentin beneath the enamel is the target of the acids' first action.

Other symptoms of tooth decay may include:

- Bad breath
- Black or brown spots on your teeth
- An unpleasant taste in your mouth

Gum Disease

Gingivitis is an early and mild form of gum or periodontal disease. It is a bacterial infection caused by the buildup of plaque. The most common symptoms are red, swollen gums that bleed easily. You may also have bad breath and teeth that feel pain when you bite. Not brushing your teeth and using the wrong brushing technique can contribute to gum disease. The same goes for crooked teeth that are difficult to clean properly. Other risk factors include smoking, pregnancy, and diabetes.

Bad Breath

Bad breath or halitosis is one of the most common dental problems. It is also one of the most painful things. One or more foods you eat may also cause your bad breath. Foods like garlic and onion are common. Many different things, including Poor oral hygiene, can cause shortness of breath

- Dry mouth
- Medication
- Infection
- Acid reflex
- Cancer

Sensitive Teeth

While the enamel weakens and exposes the dentin, your teeth are sensitive to hot and cold foods and drinks. Dentin contains tubes that lead to nerves inside the tooth. Hot or cold substances can penetrate the tubes to the nerves and cause severe pain. Your teeth's enamel layer is naturally thin, contributing to your sensitivity. Tooth decay may be the reason for tooth sensitivity, also referred to as dentin hypersensitivity.

Other possible causes include:

- Gum disease
- Root infection
- A cracked or broken tooth
- Worn-down crown or fillings
- Enamel erosion
- Receding gums

Cracked or Broken Teeth

Depending on the severity of the damage, a cracked or broken tooth may be extremely painful for you. No matter how severe you believe the crack or chip to be, it would help if you visited a dentist immediately to have it looked at and treated^[16]. A veneer, crown, or tooth-coloured filling can resolve this dental issue.

Cracked or broken teeth are most often caused by:

- Injury
- Chewing hard foods
- Mouth piercings
- Grinding of teeth while you sleep

Receding Gums

Other common dental issues can contribute to or cause receding gums. Additionally, the condition may result in more serious problems, like tooth loss. This is because the condition exposes the tooth's delicate root, which is vulnerable to damage. Numerous things, such as can contribute to receding gums. Poor oral hygiene

- Brushing your teeth too hard
- High blood pressure
- Hormonal fluctuations in women
- Smoking

Root Infection

Your tooth's base or root may develop bacterial infection and enlargement. The most frequent causes of this are tooth decay, cracks, and fractures. Abscesses may eventually form due to damaged tooth tissues and nerves brought on by root infection. A chronic (long-lasting and persistent) toothache and throbbing is one surefire indicator of root infection. Your

tooth's base or root may develop bacterial infection and enlargement^[17,18]. The most frequent causes of this are tooth decay, cracks, and fractures. Abscesses may eventually form due to damaged tooth tissues and nerves brought on by root infection. A chronic (long-lasting and persistent) toothache and throbbing is one surefire indicator of root infection.

Enamel Erosion

The very slow-moving condition of enamel erosion causes teeth to become discoloured and appear rounded. Its main cause is the long-term consumption of many sugary and acidic foods like soda and sweets. Too often, too hard, and for too long when brushing your teeth is a rare cause.

Dry Mouth

A dry mouth can affect anyone. It is not a normal aspect of ageing, but elderly people are more likely to experience it. Cancer treatments, diseases of the salivary glands, nerve damage, and diabetes are among the causes of dry mouth. HIV/AIDS, particular medications, and other health conditions can all cause dry mouth and throat. Sips of water throughout the day can help combat dry mouth and throat. Additionally, stay away from things that are known to dry things out^[19]. These include caffeine, sweets, alcohol, and tobacco.

Teeth Grinding

The dental term for teeth grinding is called bruxism. Most of the time, grinding happens while you sleep, but it can also happen when you are awake. It might even result in headaches and earaches, harm your teeth, and cause you to experience jaw pain. Grinders may develop as a result of certain dental issues.

These include:

- A new filling or crown that is higher than your other teeth
- An abnormal bit

Types of Tooth Powder

1. Natural tooth powder
2. Herbal tooth powder
3. Synthetic tooth powder
4. Semi-Synthetic tooth powder

Health benefits of tooth powder

- ❖ Neem leaves are most frequently used successfully to treat gum disease and cavities.
- ❖ It stops gums from bleeding and hurting.
- ❖ Due to their antibacterial and anti-microbial qualities, guava leaves have long been used successfully for oral hygiene.
- ❖ These characteristics help to reduce gum inflammation and control plaque.
- ❖ Strong anaesthetics found in clove also serve as antiseptics^[20].
- ❖ That explains why cloves are so good at preventing cavities.
- ❖ Cinnamon extracts and pure compounds exhibit potent anti-microbial properties against oral pathogens and may be useful in treating candidiasis, endodontics, caries and periodontal disease prevention.

- ❖ Tulsi contains an antibacterial, antifungal, and anti-microbial plaque agent.
- ❖ Amla is a potent antioxidant that helps to maintain healthy skin, hair, and nails.

MATERIALS AND METHODS

The various plant parts that have dental-care properties were chosen for study. The plants include Neem leaves, guava leaves, clove, cinnamon bark, Tulsi leaves, and amla fruit.

Ingredients

1. **Neem leaves:**The neem tree, or *Azadirachta indica*, is a tropical evergreen tree that originated in India and is now widespread throughout the region of the southeastern hemisphere. Due to its therapeutic properties, neem is known as "the village pharmacy" in India and has been used in Ayurvedic medicine for more than 4,000 years. In Sanskrit; Neem is also known as "artist," which is a word that means perfect, total, and imperishable. Compounds found in the seeds, bark, and leaves have been shown to have antibacterial, antiviral, antipyretic, anti-inflammatory, anti-ulcer, and antifungal properties.
2. **Guava leaves:**Guava leaves are an effective natural remedy for treating tooth pain brought on by bacterial infections and poor oral hygiene. These leaves are a great natural remedy for treating toothaches because they are rich in flavonoids^[21], which have antibacterial and anti-inflammatory properties.
3. **Clove:**Since ancient times, clove has been used for toothaches. This is because Eugenol, a substance found in cloves, carries anaesthetic and pain-relieving properties. The ability to relieve toothaches is just one of the many advantages of chewing cloves for teeth. Applying clove oil to infected teeth is another option. Apply a cotton swab with one or two drops of clove oil if you have a toothache. Because clove oil should not be consumed, use caution when applying concentrated clove oil. Alternatively, you could daily add 1 drop to your toothpaste.
4. **Cinnamon bark:**A spice known for its therapeutic benefits, warming flavour, and aroma, cinnamon has long been praised. The essential oils for cinnamon are derived from the tree's bark, leaves, fruits, and flowers, and the spice is made from dried bark from different species of the *Cinnamomum* genus. Bacteria and fungi are responsible for many oral infections; cinnamon has been investigated as a potential treatment for dental ailments.
5. **Tulsi leaves:**Due to its ability to strengthen teeth and gums, Tulsi is used to preparing herbal toothpowder. It can eliminate the germs that lead to plaque, bad breath, and dental caries. The herb has natural mouth freshening and mouthwash properties. The extracted essential oil, lotion, soap, perfume, shampoo, and tooth powder are all made from basil, used in the cosmetics industry^[22].
6. **Crystal salt:**Anyone who can notice them will likely focus on the teeth first. encountered everywhere, including at work and home, etc. The beauty of her body, among other things, is to catch the eye of her husband, fiancé, or knight of her dreams, who may be waiting for

her somewhere. And this is not just a problem for women; in the past, salt was frequently used as a toothache. Remedy, the most effective medication and dental health treatment, is salt water gargling.

7. **Amla:** Promotes oral health. Amla contains nutrients, including vitamin C, which can help the body fight infections. As a result, this component may also aid in preventing gum disease, bad breath, and dental infections like tooth decay and cavities. Amla, also

known as Indian gooseberry, is one of the strongest herbs used in Ayurveda and has various health benefits, particularly for the gums and teeth. The first tree ever created in this universe, by Indian mythology, was called Amla. As a result of its powerful antibacterial and astringent qualities, Amla is extremely important for dental health^[23]. According to a dentist, tannins and flavonoids give it strong astringent and anti-inflammatory properties.

Formulation of herbal tooth powder

Table 1: Composition Table

Sl. No	Ingredients	Biological Name	Quantity Taken	Medicinal Uses
1.	Neem powder	Azadirachta indica	4gm	Antiseptic and Anti-inflammatory
2.	Guava leaves powder	Psidium guajava	3gm	Reduces inflammation of swollen gums
3.	Clove powder	Syzygium aromaticum	2gm	Antioxidant toothache dental plaque
4.	Cinnamon bark powder	Cinnamomum verum	2gm	Anti-microbial
5.	Tulsi leaves powder	Ocimum tenuiflorum	2gm	Bactericidal
6.	Crystal salt	-	3gm	Cleaning agent
7.	Amla	Phyllanthus emblica	4gm	Antioxidant

Method of preparation

First, Neem, Guava, and Tulsi fresh leaves are collected. At this point, a small amount of clove, cinnamon, crystal salt, and Amla is taken. Clean all of the ingredients with fresh

water, then air-dry them. With the aid of a mortar and pestle, all of the dried ingredients are ground into powder. By the need, the powders are weighed. e., crystal salt (3gm), neem leaves (4gm), guava leaves (3gm), Tulsi leaves (2gm), clove (2gm), cinnamon bark (2gm), and amla (4gm) powder.



In a Petri dish, blend each powder. The tooth powder is prepared. Put the prepared tooth powder in a tidy, labelled container. To preserve the stability of the product and prevent environmental contamination, store the powder in a cool location^[24].

Evaluation of prepared tooth powder

In terms of colour, prepared tooth powder was assessed. Visual inspection of the colour revealed that the powder has a pleasing hue.

Odour: A pleasant odour was discovered by sniffing the product.

Taste: The product's taste was manually assessed by tasting it, and it was excellent.

Stability: It was kept at various temperatures to test the product's stability. Our prepared tooth powder was most stable when kept in dry, room-temperature environments^[25].

Spreadability: The amount of space a tooth powder can cover, such as the gums, teeth, and gum lines, is measured. Our product has excellent spreadability.

Abrasiveness: Dentifrices often add abrasives to help physically remove stains, plaque, and food particles. Our tooth powder has demonstrated good abrasive properties^[26, 27].

Determination of loss on drying: 2 gm of the sample was taken in the 105°C oven and then cooled. The weight loss is noted. Based on the formula provided, as a percentage loss during drying^[28].

$$\% \text{Loss on drying} = \frac{\text{weight of sample after drying}}{\text{Sample weight}} * 100$$

Determination of pH

A sample of about 1gm was placed in a 25ml beaker. 5ml of recently boiled and cooled water should be added. Added was water, which was 27°C. A thorough suspension was achieved by vigorous stirring^[29]. A pH meter was used to calculate the suspension's pH.

Determination of Bulk density

A sample weighing about 10gm was placed in a dried graduated measuring cylinder. Volume is noted as V1 ml. A bulk-density apparatus was used to run 50 tapings on the sample cylinder^[34]. The powder's volume was calculated using a given formula and recorded as V2 ml.

$$\text{Bulk density} = \text{Untapped density} - \text{Tapped density}$$

Chemical Evaluation

Detection of alkaloids

a) **Dragendroff's test:** The sample was treated after being dissolved in diluted hydrochloric acid. Potassium bismuth iodide solution, also known as Dragendroff's reagent^[30, 31]. There are alkaloids present. A red precipitate is a sign, as shown.

b) **Mayer's test:** sample was dissolved in diluted hydrochloric acid and with Mayer's reagent.

(Solution of potassium mercuric iodide). A yellow colour indicates the presence of alkaloids^[32,33].

The cream precipitates.

CONCLUSION

The ingredients used in this study were screened and chosen based on their ability to maintain oral hygiene and their potential to act as effective toothpowder. Any herbal toothpaste is considered safe to use twice daily and has no negative side effects. Instead, it imparts good freshness and keeps bad odours at bay; using herbal toothpowder is a dependable, safe, and affordable way to maintain oral hygiene. The study concluded that natural tooth powders are safer with fewer side effects than synthetic preparations, are more acceptable in dental research, and are emphasized in this field. The tooth powder's formulation demonstrates anti-microbial activity against pathogens and can be used to maintain oral and dental hygiene. The developed herbal tooth powder is expected to be used by the general public.

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