



Preparation and evaluation of herbal toothpaste for treatment of oral disease

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ABSTRACT

Dentifrices are products used for oral hygiene, such as mouth freshness and to prevent tooth decay. Using different dentifrices prepared from herbal and synthetic ingredients, oral hygiene can be preserved during the day. Cavity is that by having the most protective measure for the host, most current dental wellness moving mankind spittle acts as a protective problem against cavity growth. Saliva is rich in proteins and amino acids, which help to sustain the oral cavity's homeostasis. The toothpaste used in this study was made with a range of herbal ingredients that have antibacterial, antiseptic, and cooling properties.

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INTRODUCTION

In India, there are 45000 ancient medicinal plant species in the Japanese row, Eastern Himalayas, Western Ghats, and Andaman and Nicobar Islands [1]. However, more than 6000 ancient practitioners use the formally documented plants with healthy potential area unit 3000. India is the largest producer of safe herbs and is referred to as the "major botanical garden." There are currently 2,50,000 registered Ayurvedic medical practitioners in the unit [2].

Oral health is a component of overall health and is vital to a child's conventional growth. Cavity is that by having the most protection mechanism for the host, most current dental wellness moving humanity spittle acts as a protective problem against cavity growth. Saliva is rich in proteins and amino acids, which help to sustain the oral cavity's homeostasis [3-4]. India is one of the most important countries in the world for its ancient script, number system, and Vedas. In India, about 60 % of the world's population uses drugs. These are not only used in primary health care, and not only in rural areas in developing countries, but also in developed countries where modern medicinal products are primarily used.

While traditional medicines are made from medicinal plants, minerals, and other natural sources, herbal medicines made from organic matter are only made from medicinal plants. As the source of plants and an essential part of the health care system in India, medicines have been used [5].

Most practitioners should produce and share their own recipes with the Indian medicine method, so it requires proper documentation and research. Herbal medicines are becoming more common in the West, with approximately 40% of the population claiming that they have used them to treat medical diseases in the previous year. Traditional drugs are becoming more popular because of public knowledge, education, and government interest in reducing the negative effects of adverse drug reactions and the high cost of modern medical systems [6].

There are approximately 45,000 medicinal plant species in India with locations in the eastern Himalayas, Western Ghats, and the Andaman and Nicobar Islands regions. The medicinal potential of plants is 3000 by the officially accepted, then traditional experts are used, and more than

6000. India is the world's largest producer of medicinal herbs and is known as the "Botanical Garden" [7]. For the preservation of periodontal and oral health, the effective removal of dental plaque is necessary. While self-care efforts are critical for mechanical control of microbial plaque to prevent plaque accumulation, this alone will not be enough. Chemical plaque control is an adjunct therapy that may help in the removal and prevention of microbial plaque accumulation, potentially reducing the need for mechanical oral hygiene. Consequently, for optimum oral hygiene, the use of both chemical and mechanical plaque control is recommended [8, 9].

In toothpastes and mouth rinses, various chemical agents have been used and a few have been shown to decrease the development of dental plaque. The use of 'herbal' medicine has created interest and encouraged the advancement of complementary and alternative therapies in the promotion of health care because of an increased awareness of indigenous medical practices in different parts of the world. In oral care products, herbal ingredients have been available, more generally in South Asian countries, for some time. Sanguinarine, propolis, *Azadirachta indica* (neem), charcoal, clove, and miswak are the most common herbal ingredients to be incorporated into oral care products (e.g., toothpaste and mouth rinse) [10-13]. Natural products such as neem twigs, charcoal powder, and other natural products have been a significant part of daily oral hygiene practice in rural South Asian countries for centuries [14].

Many of the herbal or plant extracts were promoted by *in vitro*, *in vivo*, and animal studies as possessing anti-inflammatory, antipyretic, analgesic, antibacterial, antiviral, anti-carcinogenic and antioxidant activities [15-19]. Several oral care food producers and international corporations have integrated herbal ingredients into their products on the basis of these findings. These toothpastes are made with a variety of natural ingredients that, according to the manufacturers, imitate the benefits of conventional toothpastes, such as the ability to combat plaque, freshens breath, and avoid gum diseases [20-26].

The desire to 'go natural' has fueled a rise in market demand for these products, with many obviously opting for them because they are not tested on animals, do not have side effects, do not

use animal products, are vegan-friendly, do not have any artificial colours or flavours added, and for cultural reasons [27-29]. Sales of herbal products outnumber fluoride-based toothpastes in some countries. There are currently approximately 2,5,000 identified Ayurvedic system medicinal experts affiliated with approximately 7,00,000 of the new drug system [30-37].

Ayurveda is a form of traditional medicine that is used by 70% of the population in rural India. There are several types of alternative medicines available in India for those who do not want to practise conventional medicine or who cannot stop it. Ayurveda and Kabiraji (herbal medicine) are two common forms of alternative medicine widely available in India [38].

Ayurvedic medicines are a form of medicine that originated in India thousands of years ago. It gives sick patients or patients different strategies and jobs for relief. One of the aspects that ayurveda does is use plant-based medicines. Toothpaste is a liquid made with gel or paste that is used with the aid of a toothbrush to clean and preserve oral hygiene. It is a popular dental care product used by the group. Brushing the teeth twice a day is recommended by most dentists and is highly effective for plaque removal, although it is not possible to avoid bacterial infection. It would help to minimise the risks of periodontal inflammation, which is mostly caused by bacteria or oral flora, by removing the plaque. To fix this question, the patient should use toothpaste that has a higher antibacterial activity [39].

Most of the toothpaste currently available in the market includes two kinds of ingredients, the active and non-active components of toothpaste, or the excipient. An active ingredient in toothpaste is abrasive, which helps to remove the plaque. It accounts for at least half of the toothpaste's overall preparation. It is highly helpful in minimizing periodontal disease. Sodium bicarbonate, calcium carbonate, and aluminium hydroxide are the most widely used abrasives. Whitening agents assist in the removal of stains on the teeth, but the effects are only temporary [40]. Peroxide and bleach are the most widely used whitening agents on the market for toothpaste. To reinforce the enamel and avoid cavities, fluoride and its derivatives are used. Sodium fluoride, sodium monofluorophosphate, olaflur, and stanous fluoride are the most

common fluorides used. Stannous fluoride between them demonstrates powerful gingivitis controls. The concern now is that most people are unaware of the long-term consequences of using commercial toothpastes. This is because the toothpastes that are sold contain chemicals that are deemed harmful and could affect the body in the future [41].

Recently, some questions have been raised regarding fluoride's potentially harmful effects when used for a prolonged period. The bleach and peroxide used in the toothpaste as whitening agent is considered as harmful as they can cause small amounts of mouth and skin irritation and large amounts of chemical burn. In conventional systems, the physical or social disparity of diagnosis, mitigation, and eradication is used by various indigenous plants [42]. With whole plants of various organs such as leaves, branches, barks, base, flowers, seeds, etc., the drugs are obtained. The active chemical components used in medicinal plants are the source of medicinal plants because synthetic drugs and antibiotics are correlated with the health hazards and toxicity associated with the growth of human diseases in order to prevent the indiscriminate use of synthetic drugs and antibiotics with substantial therapeutic assistance.

Toothpastes have been used since antiquity and are one of the most common and indispensable components of oral health care. The production of toothpaste formulations started as early as 300-500 BC in China and India. Squashed bone, pulverized egg and clam shells were used as abrasives as part of tooth cleaning during that time period. In the nineteenth century, modern toothpaste formulations were developed. Later on, those formulations were integrated with chalk and soap. After 1945, numerous advances in detergent formulations began, with sodium lauryl sulphate being used as an emulsifying agent. In recent years, the focus has shifted towards the release of active ingredients during formulation developments to prevent and /or treat oral illness.

Toothpaste is a dentifrice that is used for the cleansing, cleaning and improvement of teeth. Toothpaste is primarily used to encourage oral cleanliness and often serves as an abrasive to help avoid dental plaque and food particles from the teeth, to help with halitosis removal and/or veiling, and to release active ingredients such as fluoride to help prevent tooth and gum disease.

The bulk of the brushing is done with the aid of excipients used in toothpaste by the mechanical use of the toothbrush. Since the ancient past, toothpaste has been used and is one of the principal irreplaceable elements of oral health treatment. The production of toothpaste formulations started as early as 300-500 BC in China and India. Squashed bone, pulverised egg, and clam shells were used as abrasives as part of tooth cleaning during that time period. In the nineteenth century, modern toothpaste formulations were developed. Later on, those formulations were integrated with chalk and soap.

After 1945, numerous advances in detergent formulations began, with sodium lauryl sulphate being used as an emulsifying agent. In recent years, the emphasis has turned towards the release of active ingredients to prevent and/or treat oral disease during the production of formulations. Toothpaste is a dentifrice that is used for the cleansing, cleaning and improvement of teeth. Toothpaste is usually used to improve oral health, but it often acts as an abrasive, removing dental plaque and food particles from the teeth, aiding in the elimination and/or veiling of halitosis, and releasing active ingredients such as fluoride to help prevent tooth and gum disease (eg. Gingivitis).

The bulk of the brushing is done with the aid of excipients used in toothpaste by the mechanical use of the toothbrush. As they contain active chemical ingredients such as polyphenols, gums, alkaloids, glycosides etc, the polyherbal and herbal formulations are very safe. It has also been shown that these formulations have various biological activities. This opens a new door for formulating and testing new herbal toothpaste formulations [43, 44].

MATERIALS AND METHODS

Collection of Plants:

The fresh matured leaves of the *Malvastrum coromandelianum*, Tulsi leaf, Bay leaf, Guava leaf were collected randomly, from Sangli region, Maharashtra, India.

Identification of Plants:

Department of Botony, Yashwantrao Chavan College of Science, Karad has identified the plant and authenticated it.

- **Tulsi Leaf**

It consists of fresh and dried leaves, such as *Ocimum sanctum* L, of the genus *Ocimum*. It's an outstanding mouth freshener and oral disinfectant, with a long-lasting freshness. More than 99 % of the germs and bacteria in the mouth are killed and this impact will last the entire day. It may also be used to treat mouth ulcers. Finally, it is also known to help inhibit oral cancer development, which can be caused by tobacco chewing. It kills the bacteria that cause dental cavities, plaque, tartar, and bad breath while also protecting the teeth. It also has astringent effects, which cause the gums to contract around the teeth, preventing them from falling out.

- **Bay Leaf**

It is made from dried *Cinnamomum tamala* leaves. Bay leaves have compounds which help in whitening the teeth naturally. It also helps to maintain the gums in a good condition and also avoids the accumulation of cavities.

- **Guava Leaf**

It consists of *Psidium guajava* dried leaves. Guava bark and leaf extracts have been shown to have an *in vitro* toxic effect against many bacteria. Guava leaves are rich in flavonoids. Flavonoids have been shown to have antibacterial effects. This anti-bacterial property is what benefits the teeth and gums of guava leaves. To relieve toothaches and to treat bleeding gums and bad breath, leaves are chewed. To relieve mouth sores and inflamed and bleeding gums, Guava leaf decoction is gargled to relieve mouth sores and inflamed and bleeding gums.

Method Drying

The leaves of all plants were cleaned, washed to remove dirt in running tap water and dried first in air and then in a hot air oven at a temperature of 55°C until constant weight was achieved.

Preparation of the Toothpaste

In addition to the aqueous solution of preservative, surfactant, and sweetener combining, the binder was combined with solid abrasive and other powders and then poured into an appropriate mixture. The flavour was applied after the homogeneous paste had been developed.

Table 1: Formulation of Toothpaste

Sr no.	Ingredients	Quantity
1	Malvastrum coromandelianum powder	1 gm
2	Bay leaf powder	0.5 gm
3	Tulsi leaf powder	1 gm
4	Tragacanth	1.2 gm
5	Guava leaf powder	1 gm
6	Calcium carbonate	46.5 gm.
7	Sodium saccharin	0.05
8	Sodium lauryl sulphate	1.3 gm
9	Methyl paraben	0.15
10	Sorbitol	30 gm.
11	Peppermint oil	1 ml.
12	Water	q.s

Evaluation

pH

A net quantity of 5gm of sample was accurately weighed and put in a 150 ml beaker, to which 45 ml of freshly boiled and cooled water was added at 27°C, and the pH was measured using a pH metre within 5 minutes.

Organolaptic Properties

After testing and extrudability, the formulation was evaluated for organolaptic characteristics such as shape, colour, and texture.

Volatile Matter and Moisture Content

The required quantity of sample to be taken in the dish & drying must be carried out until the weight is constant. Weight loss would imply a percentage of moisture & volatile matter loss.

Foaming Power

A sample of 5gm was taken in a 100 mL glass beaker. 10 mL of water was added to this. The beaker was then shaken with a glass rod and set aside for 30 minutes. The beaker contents were stirred and transferred to the 250 mL measuring cylinder. The residue in the beaker was moved to the cylinder along with another 5-6 mL. of water. The cylinder content was changed to 50 mL with ample water. Material was stirred with glass rod cylinders. The cylinder was stopped stirring and given 12 full shakes as soon as the temperature of the contents reached 30 minutes. After allowing the cylinder to sit for 5 minutes, the foaming strength was measured.

Microbial Assay

The antibacterial activities of the various formulations were calculated by the method of

diffusion of modified agar wells. 0.2 mL of *S. aureus* 24 hour broth culture was seeded onto nutrient agar plates in this process. They allowed the agar plates to solidify. In each plate, a sterile 8 mm borer was used to cut equidistance wells. Into the well, 0.5 mL of formulations or herbal extract was added. The plates were incubated for 24 hours at 37°C. By evaluating the zones of inhibition, the antibacterial activity was evaluated.

Spreadability Test

1 gm of tooth paste is measured in the centre of a 10x10 cm glass plate, and another glass plate is carefully placed over it. A 2 kg weight is put in the middle of the plate. The diameter of the paste is measured in centimetres after 30 minutes. The experiment is repeated three times to determine the average diameter.

Particle Size

In 25 mL of water, 2 gm of sample is distributed & then passed through 150 & 50 mesh sieves. No more than 0.5% of particles should pass through sieve no. 150 and no more than 2% of particles should pass through sieve no. 50.

RESULTS AND DISCUSSION

- pH- 7
- Colour- green
- Volatile matter- 4gm
- Foaming power- 100%
- Microbial assay- zone of inhibition (diameter in mm.): - toothpaste- 13 mm., standard drug (ofloxacin)-24 mm., control-0 mm.
- Spreadability - 7 mm.
- Particle size - % of particles passing sieve no. 150- 0.41%
- % of particles passing sieve no. 50- 1.6%

CONCLUSION

The new formulation has excellent organoleptic, spreading, foaming, abrasive, and antimicrobial properties *in vitro*. In contrast to traditional toothpastes, it also has the benefit of the absence of toxic additives and the inclusion of herbal powders with a wide variety of natural compounds beneficial for teeth and oral cavity. The formulation therefore has future prospects for further insight into such formulation & wide use.

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