Formulation And Evaluation on Herbal Neem Toothpowder

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***Abstract*—This abstract presents the development and evaluation of herbal tooth powders to provide a natural alternative for oral care. With growing concerns about the potential risks associated with synthetic chemicals and additives commonly found in commercial toothpastes, the demand for herbal and natural oral care products is on the rise. A blend of carefully selected botanical substances with proven efficacy in improving oral health was used to create the Herbal Tooth Powder. These blends contained the antibacterial, anti-inflammatory, and refreshing properties of herbs. The powder formulation was created to ensure ease of use and efficient cleaning while improving general oral health. The present study evaluated the organoleptic, phytochemical, physicochemical, rheological, and safety parameters of a newly formulated tooth powder. Organoleptic analysis revealed that the powder possesses an olive-green color, characteristic odor, astringent taste, fine texture, and a powdered appearance physicochemical evaluation showed a pH of 5.3, and a moisture content of 0.3%. Rheological properties included a bulk density of 0.49 g/mL, good foaming characteristics, and an angle of repose of 25.17°, indicating excellent flow properties. Oral hygiene is a very important for health. Tooth powder is work such as breath is freshening and teeth whitening. It can aid in the elimination and masking. Oral hygiene is an important key to maintain the good appearance, impression of an individual and gives confidence. Dentifrices are the product which is used to maintain the oral hygiene such as Freshness of mouth and to avoid tooth decay. The oral hygiene can be maintained throughout the day by using various dentifrices prepared by herbal and synthetic ingredients. This work was carried out to prepare Tooth powder which can be used as a tool for proper oral hygiene and to overcome the side effect of the conventional Tooth powder prepared by synthetic ingredients.**

***Index Terms*—Herbal, Oral hygiene, Neem, Tooth powder, Formulation, Evaluation, Natural, Oral care products, Botanical substances, Ease of use, Efficient cleaning.**

I. INTRODUCTION

In all over the world, the toothpowder is commonly used product in day-to-day life. Toothpowder is generally used in the market today like fluoride toothpowder, whitening toothpowder, sensitive toothpowder, Tartar control toothpowder. Toothpowder has been used since the ancient past and are one of the main irreplaceable products of oral health care. In ancient (5000 BC), the Egyptians used a paste made from ingredients like burnt eggshells, ox hoof ash, myrrh and pumice to clean teeth. Greeks and Romans also used toothpowder made of ingredients like crushed bones, oyster shells, and charcoal. In the ancient (500 BC), the people of India and China also used toothpowder with ingredients like salt, Ginseng and herbal mints. In 19th century, the toothpowder or powder came into general use. In 1890, Colgate introduced its toothpowder in a tube similar to modern-day toothpowder tubes and the ingredients was precipitated carbonate of calcium, carbonate of magnesium and soap.

Hindustan Lever Limited firstly introduced toothpowder to India in 1975 and Close Up was the Brand Name of the first Gel toothpowder in India, available in a variety of Flavors. Nowadays, dental hygiene is one of the most important aspects of your health. Neem is the one of the best dental products used to clean teeth, gum problem and improve dental health. Neem is a tropical plant native to Asia; neem has been a natural dental hygiene solution for centuries. In India and some parts of Africa people have historically used the twigs of a neem tree to brush their teeth. Nearly all parts of the neem tree have effective cleaning properties, including seeds, twigs and leaves. The Name Azadirachta Indica was first published by Adrien-Henri de Jussieu in 1830. In 1753, Carl Linnaeus had described two species, Melia azedarach and Melia azadirachta. Azadirachta Indica is considered to be native to the Indian region and

Bangladesh in the Indian subcontinent and to Combodia, Laos, Myanmar, Thailand and Vietnam in Indochina. It has been widely introduced elsewhere in tropical and subtropical regions, from South America to Indonesia. Toothpowders are the most common preventive means in oral health care. Many commercially available dentifrices claim to have antimicrobial properties, but little research has been conducted to investigate these claims. Therefore, this study was conducted to evaluate the efficacy of different toothpowder formulations in reducing the oral microbial load. The selected tooth paste formulations were effective in controlling the microbial load and therefore contributing to maintain good oral hygiene. The main purpose of toothpowder is to reduce oral bacterial flora and deliver fluoride to the teeth. This is because fluoride has been proven to protect teeth against attack from bacteria and can be found naturally in many everyday things including food and drink in water. Toothpowder that efficiently reduces oral bacterial flora should contribute to dental health. They usually contain natural ingredients such as special mineral salts e.g., Sodium Fluoride and Sodium Chloride, and plant extracts like lemon, eucalyptus, rosemary, chamomile, sage and myrrh. Dental plaque is a microbial biofilm that is invariably present on the hard and soft tissues of the oral cavity. It contains a complex blend of various microorganisms. Optimal plaque control forms the basis for prevention and control of dental caries and as well the periodontal disease. Elimination of microbial dental plaque biofilm prevents gingivitis, periodontitis and dental cavities. A wide range of chemicals, mainly antimicrobial agents, have been added to dentifrices in order to produce a direct inhibitory effect on formation of plaque.

Neem or Azadirachta indica is a plant that has been used for medicinal purposes in India for >4000 years. This plant is also often called as the Indian lilac and is a member of the mahogany family. Neem has been listed as one of the plants used in the Indian system of natural treatment, the Ayurveda. The leaves, stems, flowers, fruits, seeds, and oils of this plant have been used to cure various conditions such as wounds, cough, Fever, loss of appetite, skin diseases, and diabetes mellitus. Neem leaves have antibacterial, anti-inflammatory, antifungal, antiseptic, antitumor, antihyperglycemic, antiulcer, and antiviral effects. In addition, neem leaves have the ability to reduce the number of Streptococcus mutans, a common plaque-forming bacteria found in the oral cavity.

Types of Tooth Powder

Whitening Tooth Powder:

➢It is used to freshen breath; help heal gums and reduce the amount of inflammation in the mouth.

➢It can also polish and whiten teeth.

➢The application method using cotton swab dipping into tooth powder and cleaning inner and outer surface slightly every day.

Natural Tooth Powder:

➢Ingredients like sea salts, which acts as an abrasive, natural chalk, and certain essential oils like peppermint, eucalyptus, and wintergreen are common ingredients in natural tooth powders.

➢ Sore or bleeding gums also can benefit from herbal tooth powder. Herbal tooth powder can have a variety of ingredients, powdered chalk and white clay are common.

➢It has been around for centuries, and many believe it to be an essential part of any teeth cleaning regimen.

➢To be applied on the surface of the teeth with the help of toothbrush.

Homemade Tooth Powder:

➢These powders can be made at home.

➢Homemade herbal tooth powders can be beneficial because they may cost less, and ingredients are free from chemicals produces good effect.

➢It involves chewing sticks made from young woody stem or root pieces.

Advantages:

1. Powders are used both internally and externally.
2. They are more stable than liquid dosage form.
3. Powders are convenient to handle, store and carry than liquid dosage forms.
4. Some products are administered by mixing with food.
5. Bulky and large dose drug can be convenient to administer conveniently.
6. A tablet/ capsule meant for adults can be improvised in the form of powders by dose dividing.
7. They are more chemically stable to solid state than liquid state.
8. They are less susceptible to microbial growth than liquid dosage forms.
9. Provide means of dispensing of incompatible drugs in divided form.

Disadvantages:

• Not suitable for oral administration of bitter drugs.
• Dispensing of powder is a time-consuming process.
• In powders for external use, it requires finest state of sub- division in powders. Hence, become costly.
• Powders are inconvenient to handle and administer as compared to tablets and capsules.
• Less dose accuracy than that can be achieved with tablets or capsules.
• Coarse powders are friable or undergo size reduction to further fines.

II. AIM AND OBJECTIVE OF WORK

AIM: The main aim is to compile the available information related to herbal toothpowder like its introduction, different formulations and different parameters on which this herbal toothpowder can be evaluated.

The main aim of using neem powder is to leverage its natural properties for various purposes, including medicinal, agricultural, and even industrial applications.

Objective: Neem leaves are known to have antibacterial, anti-inflammatory, antifungal, antiseptic, antitumor, antihyperglycemic, antiulcer, and antiviral effects. In addition, they can reduce the counts of plaque-forming bacteria in the oral cavity. This study aimed to evaluate the effect of an herbal toothpowder containing neem leaves extract against gingivitis. The objective is to harness the bioactive compounds in neem, such as azadirachtin, for its antibacterial, antifungal, antiviral, anti-inflammatory, and insecticidal effects.

III. PLAN OF WORK

Literature Review:

Dental caries is the microbial infectious diseases. In recent years, it is the most comment health problem in the world (White, 1997; Stamm, 2007). It is a chronic disease which destroy the tooth tissue and affect chewing and aesthetic appearance and result in plaque. Fermentable carbohydrates are the sources of development of plaque forms and are carried continuously on the tooth surface (Collins, 2016). In all age groups, it can be avoided by brushing with a tooth brush with toothpowder. Brushing with toothpowder is important for several reasons. First and foremost, a toothpowder and a correct brushing action to work for the removal of plaque, sticky harmful films of bacteria that grows on the teeth that cause cavities, gum diseases and eventual tooth loss if not controlled. Second, toothpowder contains fluoride which makes entire tooth structure more resistant to decay and promotes remineralization, aids in repairing early decay before the damage can even be seen. Third, special ingredients in the toothpowder help to remove stains overtimes fourth, toothpowder help freshen breath and leave the mouth with a clear feeling (Wade and Addy, 1992).

Toothpowder has various uses, such as freshening the breath, helping to prevent oral problems including halitosis, whitening the teeth, and helping with overall teeth cleanliness. Moreover, it can be easily made at home using basic ingredients and a simple procedure. Currently, toothpowder serves two basic functions – therapeutic and preventive. In general, American Dental Association-approved toothpowder contains fluoride and other active ingredients which serve specific functions such as tooth whitening, minimizing gingivitis, and preventing halitosis (bad breath) and tooth erosion.

Although mechanical control of microbial plaque by self-care efforts is important to prevent the plaque accumulation, this alone will not suffice. Chemical control of dental plaque is an adjunct therapy which may facilitate the removal and prevent the accumulation of microbial plaque, potentially reducing the dependence on mechanical oral care behaviours (Van and Hioe, 2005). Consequently, the use of both chemical and mechanical plaque control is recommended for optimal oral hygiene (Barnett, 2006; Serrano et al., 2015). Various chemical agents have been used in toothpowder and mouth rinses and a few have been shown to reduce dental plaque formation (Moran, 2008; Teles and Teles, 2009). Due to an increased awareness of indigenous medical practices in various parts of the world, the use of “herbal” medicine has engendered interest and facilitated the growth of complementary and alternative therapies in health care promotion. Herbal ingredients have been present in oral care products, more commonly in South Asian countries, for some time (Al-Kholani, 2011; Hosamane et al., 2014; Abhishek et al., 2015). In the rural regions of South Asian countries, use of natural products like Neem twigs, charcoal powder, and others have been an important part of regular oral hygiene

practice for centuries. Many of the herbal or plant extracts have been promoted as possessing anti-inflammatory, antipyretic, analgesic, antibacterial, antiviral, anticarcinogenic and antioxidant activities using in vitro, in vivo, and animal studies (Kumar and Navaratnam, 2013; Mohammad, 2016). Based on these observations, several oral care product manufacturers and multinational companies have incorporated herbal ingredients into their products. Manufacturers of these products use a wide range of herbal ingredients which they claim mimic the benefits of traditional toothpowder - the ability to fight plaque, freshen breath and prevent gum disease. The tendency to "go natural" has fuelled an increase in demand for such products by consumers with many opting for them because they are not tested on animals, carry no side effects, use no animal products, are vegan friendly, contains no added artificial colors or flavors, and for cultural reasons. In some regions, sale of herbal products outnumbers fluoride-based toothpowder (Herbal Toothpowder Market 2017).

The difference kinds of toothpowder may have all these properties but they focus on one type of things, which makes them different from others. For example: Colgate mainly focus on teeth whitening, close up focus on removing bad breath. Every toothpowder has its own way of cleaning the teeth. Other than using only chemical we have need to induce some of our traditional cleansing agents to the toothpowder. This new idea was formed 'preparation of the toothpowder using Ayurveda products. (Peter and Clair, 2020).

Though conventional toothpowder is usually safe for use, an overdose of some of these ingredients could be fatal. An overdose may result in stomach pain or an intestinal blockage. Hence there arise the significance of the formulation of the herbal toothpowder.

IV. METHODOLOGY

1. NEEM

Botanical Identification: Azadirachta Indica, commonly known as neem, Nimtree or Indian Lilac, is a tree in the mahogany family Meliaceae. It is one of two species in the genus Azadirachta, and is native to the Indian Subcontinent and most of the countries in Africa. It is typically grown in tropical and semi-tropical regions. Neem trees also grow on islands in southern Iran. Its fruits and seeds are the source of neem oil.

Nomenclature
Kingdom: Plantae
Division: Magnoliophyta
Class: Magnoliopsida
Order: Sapindales
Suborder: Rutinae
Family: Meliaceae
Genes: Azadorachta
Species: Azadirachta Indica
Scientific Name: Azadirecta Indica
Other Name: Nimba, Arista (Sanskrit), Margosa
Binomial Name: Azadirachta Indica
MACROSCOPY
Leaves: They are alternate, extipulate, leaflets 7 – 17, alternate or opposite, very shortly stalked, 1cm long.
Colour: Dark green
Odour: Typical
Taste: Bitter
Shape: Lanceonate
Dental application of Neem:

•Antioxidant:

The process, through which free radicals are created, is a normal function of the body but the resulting molecules are unstable and can damage other Cells. A series of disorders, including cardiovascular disease, eye health, cataracts and macular degeneration, age related neurodegeneration (decline of the brain cells and nervous system) and even cancer occurs due to high levels of free radicals. Azadirachtaindica protects against chemically induced carcinogens and liver damage by boosting antioxidant levels. To control the harmful bacteria is one of the goals of successful acne treatment.

•Anti-inflammatory:

Neem is a strong antioxidant, neutralizing free radicals that may influence the development of some conditions. It is also a strong anti-inflammatory agent. Neem has antimicrobial effects and may be effective against several types of bacteria, viruses, and fungi.

•Anti-bacterial:

Its antibacterial properties due to the presence of nimbidin, Azadirachtin, and nimbinin help to remove many oral aerobic and anaerobic pathogens existing in the oral cavity. Neem bark and leaf extract is most effectively used in preventing cavities and gum disease.

•Tooth Decay:

Infections, tooth decay, bleeding and sore gums have all been treated successfully with daily use of neem mouth rinse or neem leaf extract added to the water.

Chemical constituents:

Various parts of plant is used for various therapeutic and commercial purpose due to presence of different types of chemicals in different parts of this plants. Some of them being:

•Leafs: quercetin, nimbosterol,nimbin.

•Flowers: nimbosterol, kaemperol, melicitrin.

•Bark: nimbin, nimbidin, nombosterol, margosine.

•Seed: azadirachtin, azadiradione, nimbin, vepinin, vilasinin, fraxinellone.

2. SILICA

Silica, also known as silicon dioxide (SiO2), is a chemical compound made of silicon and oxygen. It is a naturally occurring mineral found in various forms like quartz, sand, and different types of rock. Silica is highly abundant in the Earth's crust, making up about 59% of its mass.

Characteristics:

- Chemical Formula: SiO2
- Forms: Silica exists in both crystalline and amorphous forms. Examples of crystalline forms include quartz, tridymite, and cristobalite. Amorphous forms include silica gel and opal.
- Abundance: A major component of the Earth's crust and the main constituent of many rocks.
  - Uses:
- Construction: Used in concrete, bricks, and other building materials.
- Glass Manufacturing: A key ingredient in glass production.
- Electronics: Used in the production of microchips and solar cells.
- Pharmaceuticals: Used as an excipient in supplements and medications.
- Food Industry: Used as a processing aid and to prevent clumping in food products.
- Other Applications: Used in ceramics, paint, rubber, and various other industrial applications.

3. CALCIUM CARBONATE

Calcium carbonate is a chemical compound with the chemical formula $CaCO_3$. It is a common substance found in rocks as the minerals calcite and aragonite, most notably in chalk and limestone, eggshells, gastropod shells, shellfish skeletons and pearls. Materials containing much calcium carbonate or resembling it are described as calcareous. Calcium carbonate is the active ingredient in agricultural lime and is produced when calcium ions in hard water react with carbonate ions to form limescale.

Composition and Properties:

- Chemical Formula: CaCO3
- Elements: Carbon (C), Oxygen (O), and Calcium (Ca)
- Appearance: White, odorless powder or colorless crystals
- Solubility: Practically insoluble in water
- Natural Forms: Calcite, aragonite, and vaterite
- Abundance: One of the most abundant minerals on Earth, accounting for about 4% of the Earth's crust

Uses:

- Medical:
- Antacid: Relieves heartburn, acid indigestion, and upset stomach
- Calcium Supplement: Used to treat calcium deficiency
- Industrial:
- Filler: Used in paper, plastics, coatings, and paints
- Cement: Used in the production of cement
- Flux: Used in metallurgical processes like smelting
- Aggregate: Used in concrete and asphalt mixes
- Agricultural Lime: Used to adjust soil pH
- Other:
- Food Additive: Used as a food firming agent and food coloring
- Building Material: Used in mortars and other construction materials

4. SODIUM LAURYL SULPHATE

Sodium lauryl sulphate (SLS) is a common surfactant and detergent used in many personal care and household products, including shampoos, soaps, and toothpastes. It's known for its ability to create foam and emulsify oils, making it effective for cleaning and removing dirt and oil. However, it can also cause skin irritation in some individuals.

- SLS is an anionic surfactant, meaning it has a negative charge and interacts with oil and water molecules.
- It's derived from coconut and palm kernel oil, but can also be manufactured.
- Its chemical formula is NaC12H25SO4.

USES:

1. Personal Care Products:

- Shampoos: SLS is a key ingredient in shampoos due to its ability to create a rich lather and effectively remove dirt, oil, and grime from hair and scalp.
- Body Washes and Hand Soaps: SLS helps produce a lather and helps clean the skin, effectively removing dirt and oils.
- Toothpastes: It aids in cleaning teeth and helps remove food debris by breaking down surface tension and acting as a foaming agent.
- Facial Cleansers: SLS can be used in facial cleansers to remove impurities and leave the skin feeling fresh.
- Bubble Bath: SLS contributes to the frothy and bubbly experience of bubble bath.

2. Cleaning Products:

- Household Cleaners: SLS is used in various household cleaners, including dish soaps and laundry detergents, to effectively remove stains and grime.
- Industrial Cleaners: Due to its powerful cleaning abilities, SLS is used in industrial-strength cleaning products, such as engine degreasers and floor cleaners.

3. Food Additives:

- Marshmallows and Dried Egg Products: SLS is used as an emulsifier, helping to create a light and fluffy texture.
- Fruit Juices and Punches: It helps acids mix better with liquids, enhancing the overall consistency and stability of the beverage.

4. Other Uses:

- Herbicides: SLS can be used as a surfactant in herbicides to improve absorption and reduce the time it takes for the product to be drain fast.
- Cosmetics: SLS can be used to alter the surface tension of the stratum corneum, making the skin more permeable and allowing for better absorption of skin-enhancing molecules.

5. SODIUM FLUORIDE

Sodium fluoride (NaF) is a white, odorless powder that is soluble in water. It is an inorganic compound with the formula NaF. Sodium fluoride is commonly used as a dental hygiene agent to prevent cavities and is also used in water fluoridation.

Characteristics of Sodium Fluoride:

- Formula: NaF
- Appearance: White, odorless powder
- Solubility: Soluble in water
- Melting point: 993 °C
- Density: 2.78 g/cm³
- pH: 7.4

Uses of sodium fluoride:

- Dental care: Used in toothpastes, mouthwashes, and dental treatments to prevent cavities and strengthen tooth enamel.
- Water fluoridation: Added to drinking water to prevent tooth decay in the community.
- Preservative: Used as a preservative in blood samples to stabilize glucose.
- Other uses: Used in cleaning compounds, glass manufacturing, and as an insecticide.
- Radiographic imaging: Used as a source of fluoride ion in PET scans for bone imaging.

6. PEPPERMINT OIL

Peppermint oil, extracted from the peppermint plant (Mentha x piperita), is a concentrated essential oil used for various purposes, including flavoring food, and adding fragrance to products, and for potential health benefits. It is commonly known for its cooling and soothing properties, often used topically or aromatically.

- Composition: Peppermint oil is primarily composed of menthol and menthone, along with other volatile oils.

Uses:

- Flavoring: A common ingredient in foods and beverages, such as gum, toothpaste, and candy.
- Fragrance: Used in soaps, cosmetics, and other personal care products.
- Topical Application: Can be used to relieve muscle aches, joint pain, itching, and headaches when diluted with a carrier oil.
- Aromatherapy: Inhaling peppermint oil is thought to promote mental clarity, reduce stress, and aid in respiratory issues.

- Digestive Issues: Peppermint oil may help relax smooth muscles in the digestive tract, potentially reducing spasms and easing symptoms of IBS (irritable bowel syndrome).
- Pain Relief: May help relieve tension headaches and other types of pain through topical application or aromatherapy.
- Other Potential Uses: Historically used for various conditions, including colds, sinus infections, and nausea, though more scientific evidence is needed for some of these uses.
- Safety: Generally safe when used as directed, but it's important to dilute it when applying topically and avoid use in infants and children.
- Interactions: May interact with certain medications, so consulting with a healthcare professional is recommended before use, especially if taking other drugs.

7. XANTHAN GUM

Xanthan gum is a polysaccharide with many industrial uses, including as a common food additive. It is an effective thickening agent and stabilizer that prevents ingredients from separating. It can be produced from simple sugars by fermentation and derives its name from the species of bacteria used *Xanthomonas campestris*.

Uses:

Food Industry:

- Thickener and Stabilizer: Xanthan gum is a common ingredient in sauces, dressings, and other food products, helping to prevent separation and maintain a uniform texture.
- Gluten-Free Baking: It mimics the elasticity and structure of gluten in gluten-free baked goods, helping them retain moisture and lift.
- Ice Cream: Xanthan gum helps improve the texture and mouth feel of ice cream, making it smoother and preventing crystal formation.
- Other Applications: It's used in various other food products, including meat and poultry products, dairy products, and beverages.

Personal Care Products:

- Texturizing Agent: Xanthan gum can be added to lotions, creams, and other skincare products to improve their texture and consistency.
- Skin Conditioning: It can help to hydrate and moisturize the skin.

Industrial Applications:

- Oil Drilling: Xanthan gum is used in drilling mud to thicken the fluid and help carry drill cuttings to the surface.
- Paints and Coatings: It's used as a thickener and stabilizer in latex and water-based paints.
- Pharmaceuticals: Xanthan gum can be used as a suspension agent in certain medications.

Other Applications:

- Toothpaste: Xanthan gum is used as a binding agent in toothpaste to maintain its consistency.
- Saliva Substitute: Xanthan gum can be used to help thicken saliva for those with dry mouth.
- Swallowing Aid: It can be used to help improve swallowing and reduce the risk of aspiration in people with swallowing disorders.

8. SODIUM HYDROXIDE

Sodium hydroxide, also known as caustic soda or lye, is a strongly alkaline compound with the chemical formula NaOH. It is a white, odorless solid that readily dissolves in water, and this process releases heat. Sodium hydroxide is highly corrosive and can cause severe burns and irritation to the eyes, skin, and other body parts. It is used in various industrial processes, cleaning products, and soap making.

Properties of Sodium Hydroxide:

- Chemical Formula: NaOH
- Appearance: White, crystalline solid
- Odor: Odorless
- Corrosiveness: Highly corrosive and can cause severe burns
- Solubility: Soluble in water
- Heat Generation: Releases heat when dissolved in water or neutralized with acid
- Alkalinity: Strongly alkaline with a pH of 13

Uses:

- Industrial Processes: Used in the production of various chemicals, pulp and paper, textiles, and petroleum refining
- Cleaning Products: A key ingredient in drain cleaners, oven cleaners, and other industrial cleaning agents
- Soap Making: Used in the saponification process to produce soap
- Food Industry: Used for peeling fruits and vegetables, and in food processing

- Water Treatment: Used in municipal water treatment facilities to adjust pH levels and remove heavy metals
- Other Uses: Used in the manufacture of rayon, cellophane, bleaches, dyes, and drugs

TABLE 1: Trial Batch Formula

Sr.no	Ingredients	F1	F2	F3	Role
1	Neem Powder	25gm	24gm	23gm	Anti-inflammatory
2	Silica	45gm	43gm	40gm	Abrasive
3	Calcium Carbonate	12gm	14gm	13gm	Abrasive
4	Sodium Lauryl Sulphate	11gm	12gm	17gm	Detergent
5	Sodium Fluoride	3gm	3gm	3gm	
6	Peppermint Oil	2ml	2ml	2ml	Flavouring agent
7	Xanthan Gum	1gm	1gm	1gm	Thickening agent
8	Sodium Hydroxide	1gm	1gm	1gm	PH adjusters

Method of Preparation

1. Neem leaves were taken from local sources and dried for two to three days. The dried leaf was then crushed into fine particles using a tool for grinding.
2. At a temperature of roughly 400°C, the powder is activated. Following that, the powder was sieved using a 90 micron IS standard sieve size. Using filter paper, sieved particles are filtered before being rinsed with double distilled water.
3. The dried, cleaned powder is then prepared for use as a bio coagulant. To protect it from moisture, the fine powder was gathered and placed in an airtight container.
4. All the ingredient were weighed accurately by using weighing balance, measuring cylinder.
5. All ingredient were mix in the mortar-pestle and tartrate in the powder form.
6. The mixture was pass through the 80-no. sieve to get fine powder.
7. After that it was storage in air-tight container.

Fig no: - 1: Final Appearance of Herbal Toothpowder

V. EVALUATION TEST OF TOOTHPOWDER

Organoleptic Properties

Color: The prepared tooth powder was evaluated for its color. The color was checked visually.

Odor: Odor was found by smelling the product.

Taste: Taste was checked manually by tasting the product.

Texture: Texture was evaluated in relation to product quality.

Appearance: The appearance was visually evaluated.

Particle Size: Particle size was assessed using the sieving method utilizing I.P. Standard sieves by mechanically shaking for 10 minutes. Particle size is a parameter that affects many qualities including spread ability, grittiness, etc.

PHYSICO-CHEMICAL EVALUATION

Determination of pH

Using a digital pH meter, the pH of the prepared herbal tooth powder was determined. Add 5g of tooth powder in 50ml of beaker. To this freshly boiled and cooled distilled water was added. Stir vigorously and make a mixture and its pH was measured.

Fig no: - 2: Digital pH Meter

Determination of Bulk density

It is the weight of a powder volume unit. Expressed in g/ml. In a dried graduated measuring cylinder (10ml), approximately 5g of sample was weighed. The volume occupied by the powder was given in the formula for calculating the bulk density.

$$D = M/V$$

D = Bulk density, M = Mass of particles, V = Total volume occupied

Fig no: - 3: Bulk Density

Determination of Tapped density

The increase in bulk density that results from mechanically tapping a container containing a powder sample is known as tapped density. 5g weighed formulation was taken and slowly added to the graduated cylinder (10ml). After that initial volume was noted and the sample is then tapped until no further volume reduction occurred. The value obtained after tapping was noted. Continued tapping until no

further change in volume was observed. Tapped density was calculated by given formula.

Tapped density = Weight of powder (g) / Tapped density (ml)

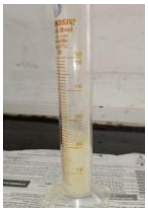

Fig no: - 4: Tapped Density

Determination of Angle of repose [Flow property]

The funnel was taken and fixed with a burette stand. The graph paper was placed below the funnel and distance between lower tip of the funnel and sheet was adjusted to height of 2cm.Add 25 g of powder and poured into funnel and it started following down onto the graph paper. Sample was poured in funnel from top till a heap of powder formed and touched the lower tip of the funnel. Then the circle was drawn around the graph paper. The average diameter and radius of the circle followed by height was recorded and calculated by using given formula

$$\Theta = \tan^{-1} H/R$$

H=Height of the powder cone, R=Radius of the powder cone.

a) Sample poured in Funnel b) Cone shape pile

Fig no: - 5: Angle of Repose

Determination of foaming power

50 ml of water was added to 2 g of tooth powder that had been placed in a measuring cylinder. After noting the initial volume, shaking was done ten times. The final volume of foam was measured and calculated using the given formula.

Foaming power = V1-V2

V1 = Volume in ml of foam with water, V2 = Initial volume with water.

Fig no: - 6: Foam ability

Determination of Spread ability.

About 0.6 g of sample was weighed and placed at the center of the glass slide and another glass slide was placed over it carefully. To prevent sliding, a 1.13 kg weight was positioned in the middle of the plate above the glass slide. After 30 minutes, the sample diameter (in centimeter) was measured.

Fig no: - 7: Spread ability

Determination of Abrasiveness

The fineness of the powder was measured using the abrasiveness parameter. A fingertip was used to quantify, 1g of sample and rub it on a glass slide for 15 minutes. It was noted that the slide's surface had scratches. The findings were arbitrarily expressed as "positive" and "negative" indicators in order to show the scratches on the glass slide. More positive signs indicated abrasiveness that was greater.

Moisture Content

This method uses the Loss on Drying (LOD) method. The moisture analyzer weighs a sample, heats it up to dry it, and weighs it again once it's dry. The weight after drying is subtracted from the weight before, so the loss of moisture is determined using the loss of ash.

Formula for moisture content

% Moisture content = Original sample weight−Dry sample weight.

VI. RESULT AND DISCUSSION

1) Organoleptic Properties

Sr.no	Parameter	F1	F2	F3
1	Colour	Olive green	Olive green	Olive green
2	Odour	Characteristics & pungent	Characteristics & pungent	Characteristics & pungent
3	Taste	Sweet	Sweet	Sweet
4	Texture	Fine	Fine	Fine
5	Appearance	Powder	Powder	Powder
6	Abrasiveness	Good	Good	Good

TABLE 2: Organoleptic Evaluation of Herbal Toothpowder

2) Physico-Chemical Properties

Sr.no	Parameter	F1	F2	F3
1	Determination of pH	5.1	5.3	5.1
2	Determination of Bulk density	0.49 gm/ml	0.49 gm/ml	0.50 gm/ml
3	Determination of Tapped density	0.39 gm/ml	0.40gm/ml	0.39 gm/ml
4	Determination of Angle of repose	26.33	25.17	25.19
5	Determination of Foaming power	Good	Good	Good
6	Determination of Spreadability	3.5cm (Easily spreadable)	3.3cm (Easily spreadable)	3.9cm (Easily spreadable)
7	Moisture Content	0.47%	0.3%	0.47%

TABLE 3: Physico-Chemical Properties of Herbal Toothpowder

1) In the present study formulated and evaluated Herbal tooth powder.
2) The organoleptic property showed an Olive-green color characteristics odor with a Characteristics & pungent.
3) The powder has 0.49gm/ml of bulk density.
4) The angle of repose was determined to find out the flow property and it shows good flow property with 25.17.
5) The pH of the formulation was found to be 5.1.
6) Tooth powder is a good to use a very mild abrasive that gently scrubs and beautifully polish our teeth.
7) Any herbal toothpaste is considered safe to use twice can be maintained in a reliable. Safe and inexpensive way by using herbal Toothpowder
8) In this formula 2 was better as compare to other formulation.

VII. SUMMARY AND CONCLUSION

In the present work, was observed toothpowder have to maintain oral hygiene. Oral hygiene can be maintained in a reliable, safe and inexpensive way by using herbal tooth powder. Usage of herbal tooth powder twice a day is safe and effective.

The formulation and evaluation of the herbal tooth powder yielded promising results, suggesting its potential as a natural and effective dental care product. The use of carefully selected herbal ingredients provided antimicrobial properties, helping to maintain oral hygiene and prevent common oral health issues.

The evaluated tooth powder demonstrates favorable organoleptic, phytochemical, physicochemical, and rheological properties, along with excellent safety profiles. Its optimal pH, low moisture content, and good flow properties ensure stability and ease of use. The absence of adverse effects in patch tests confirms its suitability for safe application. These findings highlight the tooth powder's potential as a natural and effective oral care product. Future research, including clinical trials, will further substantiate its therapeutic claims and commercial viability.

The fine texture and pleasant aroma of the tooth powder enhance its user friendliness and consumer appeal. Overall, herbal tooth powders offer a natural and chemical-free alternative for maintaining oral hygiene. They can be an excellent option for individuals who prefer natural products and are looking to incorporate herbal remedies into their oral care routine. Further research and testing can be conducted to optimize the formulation and assess long-term effects.

Natural plant products are an important source to control bacterial pathogens. Therefore, in the Present study an herbal tooth powder was developed and evaluated for antimicrobial activity which has shown excellent results.

The ingredients are used in the present work, was screened and selected to possess anti-microbial effect and to maintain oral Hygiene as it claimed by its results as effective tooth Powder. Our herbal tooth powder is considered safe to use twice a day and it does not cause any harmful effects.

Our herbal tooth powder is considered safe to use twice a day and it does not cause any harmful effects, instead, it imparts good freshness and away from bad odor.

Powders are pharmaceutical solid dosage form which is applied to provide cleanliness and Polishes in teeth to prevent dental caries. Tooth powders are common oral care product used to control plaque and other deposits from tooth surface thereby reducing gingivitis.

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