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FORMULATION AND EVALUATION OF HERBAL TOOTHPOWDER

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ABSTRACT

Herbal tooth powders are made with a variety of readily available substances. Therefore, it is beneficial for the standardization of herbs and their products to employ contemporary techniques that emphasize these factors. The primary objective of dentifrices is to maintain oral hygiene, which includes preventing tooth decay and maintaining breath freshness. You can use a range of dentifrices consisting of natural and synthetic ingredients to maintain the health of your mouth throughout the day. Several plant components with cooling, antibacterial, and antiseptic qualities were employed to make the teeth powder. Ingredients made from herbs Zinda tilismath oil, camphor, neem powder, rock salt, turmeric powder, pomegranate powder, orange powder, amla powder, miswak powder, tulsi powder, clove powder, cinnamon powder, peppermint powder, and camphor.

KEYWORDS: *Oral Hygiene, Herbal Toothpowder, Antibacterial.*

INTRODUCTION

The herbal dental care products are designed to help clean the oral cavity and teeth. Tooth powder is used as a preventative dental cosmetic to help prevent tooth decay and bad breath. Tooth paste and powder are applied and rubbed against the teeth to help remove the minerals and food particles that have accumulated on the teeth. Tooth powder is used in conjunction with a toothbrush to maintain oral hygiene, which includes breath freshness and tooth decay prevention.(1)

Oral health info sheet, WHO, 2012. Many herbal and mineral medications that are proven to be beneficial for oral hygiene are mentioned in our traditional medical system, Ayurveda, as a result of all these facts. Because they are thought to be safer and have fewer adverse effects than synthetic ones, natural therapies are more widely accepted.

There is a growing desire in society to rely on natural substances for medical care, even though many toothpaste formulations with antibacterial qualities are effective. Ayurveda has identified numerous herbs that have a profound impact on oral hygiene and have also found their way into dentistry.

Natural products are secure, affordable, and work as strong substitutes for the chemotherapeutics now in use, which have negative side effects and increased bacterial resistance. India, a country renowned for its ancient medical practises, has long been intrigued by the search for alternative therapeutic modalities including natural items.(2)

➢ Types of oral and Dental Disease

1. Cavities

Many toothpaste formulations with antibacterial properties are h elpful, but there is an increasing desire in society to rely on natur al chemicals for medical care. Many herbs that are used in dentis try have been proven to have a significant effect on oral cleanlin ess by Ayurveda.(3)

2. Periodontitis

Jaw and bones may become infected when periodontitis worsens. It cause an inflammatory response across the entire body.

3. Cracked and Broken Teeth

A tooth can fracture or break due to injury, consuming harsh foods, or nighttime teeth grinding. If you have a cracked or broken tooth, it's crucial to visit a dentist promptly to address potential pain and prevent further complications.(4)

4. Gum Diseases

Gingivitis, or gum disease, occurs when poor brushing and flossing habits lead to plaque buildup, causing gum inflammation. This condition is characterized by increased bleeding during oral hygiene routines. If left untreated, gingivitis can progress to periodontitis, a more severe infection with potentially serious consequences.

5. Sensitive Teeth

Drinking or eating cold or hot things may cause pain or discomfort. Tooth sensitivity is
additionally, called dentin hypersensitivity. It might possible come from:

- Receding gums
- Cracked tooth
- Gum disease
- Worn down fillings or crowns

Some people naturally have sensitive teeth due to thinning enamel. Oral hygiene routine can
help to cure naturally sensitive teeth.

6.

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6.Oral Cancer

It embraces cancer of the
- Gums
- Tongue
- Lips
- Cheek
- Floor of the mouth

The leading causes of mouth cancer are smoking and chewing tobacco.

A tooth has two main parts: the crown and roots. The crown is covered with enamel, the hardest tissue, composed of hydroxyapatite, water, and keratin. Beneath the enamel lies dentine, also containing hydroxyapatite. Saliva plays a crucial role in oral health, lubricating food and maintaining a healthy environment. Produced by glands like labial, lingual, buccal, and palatal, saliva keeps the mouth in a dynamic state, facilitating easy food consumption.

Powder

Pharmaceutical powders are solid dosage forms containing finely divided substances, available in crystalline and amorphous forms, and can be used internally or externally. They play a significant role in pharmacy, with their properties and behavior being crucial in processing and finished dosage forms. Although their use as a dosage form has declined, powders remain important in pharmaceutical development and manufacturing.

➢ **Advantages of Toothpowder**

1. Many toothpowders contain natural ingredients, making them a popular choice for those seeking alternative oral care.
2. Toothpowder can be more affordable than toothpaste.
3. Some toothpowders allow for customization with additional ingredients like essential oils.
4. Toothpowder can help maintain fresh breath.
5. Some toothpowders contain ingredients that help control plaque.

➢ **Disadvantages of Toothpowder**

1. Lacks the cavity-fighting component fluoride.
2. Leaves a bad aftertaste in your mouth.
3. Too much abrasiveness can be bad for your tongue.
4. The ADA has not given any powders its seal of approval.

Toothpowder

Tooth powder is a mild, fine powder used with a toothbrush to maintain oral hygiene.

Its manufacturing involves ensuring a homogeneous distribution of ingredients without contamination. Available in fluoride and non-fluoride types, tooth powder helps strengthen enamel, prevent decay, and inhibit bacterial growth, providing a unique approach to oral care.[5]

Ideal Properties

- Keep the mouth fresh and clean.
- Non-irritant and non-toxic.
- Impart no stain on teeth.
- Good abrasive effect.
- Improve gum health.
- Must reduce tooth decay.
- It should possess good flavours.
- It provides healthier gum.
- Eliminate bacteria causing bad breath.
- Compatible with sweetening and flavouring agents.
- It provides polishing effect.
- Economically and easily available.
- It should not damage tooth enamel because of abrasiveness.

Stages of Dental Caries

1. White Spot Stage

The mineral matrix of teeth is dissolved by the acid that is created by the bacteria and yeast in tooth plaque. A chalky white spot on the tooth is the first sign of dental caries. At this point, the underlying lesion is reversible, and the surface is undamaged. It can be challenging to differentiate between white spots caused by developing caries and developmental hypocalcification. Additionally, the black staining stage replaces the white spot.[6]

2. Cavity stage

The surface eventually breaks or becomes "cavitated" if the mineral loss from acid challenge persists, and the damage cannot be undone. A significant portion of the tooth may be lost if the condition worsens. Typically, active cavitated lesions have a golden-brown colour. Lesions that have been there for a long time are darker, often almost black. Since halted decay is frequently the darkest, colour depth is not a reliable indicator of the severity of the lesions.[6]

Pathophysiology

- **Enamel**

When the enamel loses minerals, it develops several distinct zones: the translucent zone, dark zones, body of the lesion, and surface zone.[7] The translucent zone coincides with a 1/2% loss of minerals[8], while the dark zone is a slight remineralization of enamel. The body of the lesion experiences the greatest de-mineralization and destruction, while the surface zone remains relatively mineralized until the loss of tooth structure results in a cavitation.[9] Caries demineralizes enamel in the direction of the enamel rods, creating various triangular patterns between pit and fissure, and smooth-surface caries.[10]

- **Dentine**

The distinct regions of dentine that are impacted by caries are the zone of destruction, the zone of bacterial penetration, and the advancing front, which extend from the deepest layer to the enamel.[8] A zone of acid-demineralized dentine, devoid of microorganisms, is represented by the advancing front.

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➢ **Drugs**

1. Neem

Figure no: (1)

Synonyms: Holy tree, margosa, nim tree.
Biological source: It is obtained from fully matured seeds of Azadirachta indica Linn.
Family: Meliaceae.
Chemical Constituents: It contains glycerides of saturated and unsaturated fatty acids. The main fatty acids are oleic (50 per cent) and stearic (20 per cent) acids. It contains nimbidin, nimbin, nimbinin and nimbidol. The unsaponifiable part contains nimbosterol (0.03 per cent).
Uses: Nimbin, nimbidin and related compounds possess anti-viral activity.
As non-edible oil, it is used for soap making and for manufacture of oleic and stearic acids.
It is indicated in rheumatism and as a pesticide and in medicated soaps for skin diseases

2. Amla

Figure no: (2)

Synonym: phyllanthusemblica L.
Family: Euphorbiacea
Common name: Amla
Chemical Constituents: Ellagic acid, chebulinic acid, gallic acid, gallic acid, chebulagic acid, apeigenin, quercetin, corilagin, leutolin.
Uses: Amla can be used for the management of dementia, Alzheimer's disease and Parkinson's disease due to its anti-cholinesterase activity. Amla also has antioxidant anti-inflammatory property. It fights against free radicals and inhibits the inflammatory mediators to reduce brain damage and improve cognitive function.

3. Turmeric

Figure no: (3)

Synonym: Curcuma aromatica, curcuma domestica
Biological source: It is obtained from dried rhizomes of curcuma longa.
Chemical Constituents: α-phellandrene (1%), sabinene (0.6%), cineol (1%), borneol (0.5%), zingiberene (25%) and sesquiterpines (53%), curcumin (3–6%).
Uses: It is an important ingredient for mouthwashes, teeth whitening treatments, and it's also used as pocket irrigation for cleansing plaque, and as a dental sealant to prevent tooth decay. By using turmeric, you prevent gum disease, gum pain, gum inflammation, and reduce the risk of cavities.

4. Orange:

Figure no: (4)

Synonym: Orange
Biological source: The orange peel is the fresh or dried outer part of the pericarp of Citrus aurantium Linn.
Family: Rutaceae.
Chemical constituents: Pectin, cellulose, hemicellulose, citric acid, limonene.

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Uses: Orange peels can get rid of the yellow tint on your teeth. Orange peel contain limonene, which reduces tooth staining.

5. Clove

Figure no: (5)

Synonyms: Caryophyllum, Clove flower, Clove buds.
Biological Source: Colve consists of dried flower buds of Eugenia caryophyllus. It should contain not less than 7.0 per cent (w/w) Of eugenol calculated on dried basis.
Family: Myrtaceae
Chemical Constituents: Volatile Oil, 10 percent to 13 percent oftannin (gallotannic acid), resin, chromone and eugenin. The volatile oil of the drug contains eugenol (about 70 to 90 percent).
Uses: Clove is used as a dental analgesic, carminative, stimulant, flavouring agent, an aromatic and antiseptic.

6. Cinnamon

Figure no: (6)

Synonyms: Dalchini, cinnamon bark
Biological source: Cinnamon is the dried inner bark of the coppiced shoots of Cinnamomum zeylanicum Nees.
Chemical composition: Cinnamaldehyde, cinnamate, cinnamic acid, and numerous essential oils
Family: Lauraceae
Uses: It can lower blood sugar levels, reduce heart disease risk factors and has a plethora of other impressive health benefits. Just make sure to get Ceylon cinnamon or stick to small doses if you're using the cassia variety.

7. Tulsi

Figure no: (7)

Synonyms: Sacred Basil, Holy Basil.
Biological Source: It is obtained from fresh and dried leaves of Ocimium sanctum Linn
Family: Lamiaceae.

Chemical Constituents: Tulsi leaves contain bright, yellow coloured and pleasant volatile oil (0.1-0.9percent). It contains approximately 70percent Eugenol, Carvacol, (3percent) and eugenol-methyl- ether (20) percent. It also contains caryophyllin.

Uses: It has Anti-inflammatory properties. And used as stimulant. The tulsi is a herbal ingredient in toothpowder. It is very effective for oral cavity. The powdered tulsi leaves used to kill the halitosis and maintaining good oral health. It is treatment of gingival and periodontal diseases.

8. Peppermint

Figure no: (8)

Synonyms: Oleum mentha piperita, Colpermin, Mentha Oil.
Biological source: It is obtained from fresh flowering tops of the plants known as Mentha piperita Linn.
Family: Labiatae.
Chemical constituents: Peppermint oil contains chiefly menthol to the extent of 70 per cent. Other important constituents of the

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peppermint oil are menthone, menthofuran, jasmone, menthyl acetate.

Uses: Peppermint or Mentha oil is used as carminative (prevent flatulence) stimulant, and flavouring agent. It has mild antiseptic properties too. Both mentha oil and menthol have calcium channel blocking activity causing spasmolyjc and smooth muscle relaxant effects, and hence useful in irritable bowel syndrome.

9. Camphor

Figure no: (9)

Synonyms: Gum Camphor

Biological source: Camphor is a solid ketone, obtained from the volatile oil of Cinnamomum camphora (L.)

Family: Lauraceae.

Uses: Reduce pain related to cold sores, insect stings and bites, minor burns, and hemorrhoids. Camphor is used externally as a rubefacient, counterirritant and internally as a stimulant, carminative and antiseptic. It is a topical antipruritic and anti-infective, used as 1–3% in skin medicaments and in cosmetic.

It is also used to manufacture some plastics, celluloid, in lacquers, var-nishes, explosives, pyrotechnics, as mouth repellent, and in embalming fluids.

10. Rock Salt

Figure no: (10)

Comparable to table salt chemically is pink Himalayan salt. It has a sodium chloride content of up to 98%. The remaining salt is made up of trace minerals like potassium, magnesium, and calcium. Halite, or rock salt, is mined in Pakistan's Punjab province to produce Himalayan salt.

Use of Himalaya Pink Salt in Oral Hygiene helps in preventing the build-up of plaque and tartar. Also fight halitosis, also used as flavouring and sweetening agent.

11. Miswak

Figure no: (11)

Synonym: Miswak, siwak sewak.

Biological source: It is obtained from Salvadora persica.

Family: Salvadorecea.

Uses: Anti-plaque, anti-gingivitis, anti-cariogenic, promotion of gingival wound healing, whitening properties, orthodontic chain preservation.

12. Zinda Tilismath

Figure no: (12)

Chemical Constituents: Eucalyptus Oil, Menthol, Thymol, Camphor, Alkanna Tinctoria.

a. Toothache relief: - Zinda Tilismath helps alleviate toothache pain and inflammation.
b. Gum inflammation: - Reduces swelling and inflammation of gums (gingivitis).
c. Mouth ulcers: - Treats mouth sores, aphthous ulcers, and oral mucositis.
d. Bad breath (Halitosis): - Freshens breath and reduces odor-causing bacteria.
e. Gum bleeding: -Controls bleeding gums and prevents further inflammation.
f. Dental plaque: -Inhibits plaque formation, reducing the risk of tooth decay.

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g. Tooth sensitivity: - Relieves sensitivity and discomfort.

13. Pomegranate Peel

Figure no: (13)

Synonym: Pomegranate.
Biological source: It is a ripe fruit Punica granatum L.
Family: Punicaceae.
Uses: High in vitamin C and powerful antioxidants. Pomegranate peel Powder with sweet taste contains almost double the number of antioxidants than the pulp or juice, improves digestion. It can also be used as Natural moisturizer; Helps
With pimples or acne. Pomegranate peel extracts have been used to help hair loss. Good For Teeth Pomegranate is one of the most essential ingredients in various toothpowders and toothpastes.

Tooth Powder Other Measures

Prevention and control

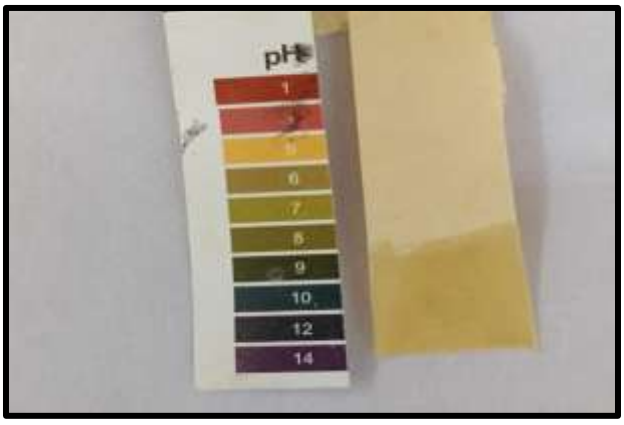
1) Oral hygiene

Personal hygiene care consists of correct brushing and flossing everyday.[11] correct brushing and flossing is to remove and prevent the production of plaque or dental biofilm. Professional hygiene care consists of frequent dental examinations and professional prophylaxis (cleaning).[12] Dental sealants
The molars' chewing surfaces are coated with a thin substance that resembles plastic to keep food from becoming stuck in cracks and pits.[13]

2) Dietary modification

It is advised to cut back on snacking because it provides a steady flow of food for the oral bacteria that produce acid. It is advised to clean your teeth after meals since chewy, sticky items (such sweets or dried fruit) tend to stay on your teeth longer. For kids, the American Diabetes Association and the American Paediatric Association advise minimizing the amount of sugar-filled beverages consumed and avoiding feeding babies bottles while they are sleeping. Reducing dental biofilm is facilitated by chewing gum that contains the sugar alcohol xylitol.[12]

- **Evaluation method**
- **Determination of pH:**



A 1%w/v dispersion of tooth powder is prepared in distilled water and shaken gently for 30 minutes for homogenous dispersion. The dispersion is filtered through Whatman filter paper at room temperature and the pH of the filtrate is measured by digital pH meter. The measurement of sample is performed in triplicate and the results is expressed as the mean of measured observations. The acceptable pH between 5.5-10.5.

- **Foaming Index**

It is determined by taking 10ml of 1%w/v dispersion of tooth powder in 100ml measuring cylinder. The dispersion is stirred

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mechanically for 30 minutes for creating the foams. When the maximum foams are produced, the volume occupied by the foams is recorded and the mean of the three respective observations is recorded. Result calculated by measuring the height of foam developed in the measuring cylinder.

- **Bulk Density**

The tooth powder is poured freely in 100ml measuring cylinder up to the mark with their natural flow. The upper surface of powder is made regular with the help of spatula. The volume occupied by the powder is noted down and represented as bulk volume and the weight as bulk mass. The bulk density is determined by using following expression.

$$\text{Bulk Density} = \frac{mass\ of\ the\ powder}{bulk\ volume\ occupied\ by\ powder}$$

As the b\ulk volume of the powder increases the bulk density increases.

- **Tapped: Density**

It is determined by using tapped density test apparatus. The powder taken in measuring cylinder (50ml) of the apparatus is tapped in up and down position up to the specified distance until it is compressed to the constant volume. The open end of the measuring cylinder is covered with aluminum foil to prevent the loss of lines due to dusting at the time of tapping. The tapped density is determined by following

$$\text{Tapped Density} = \frac{mass\ of\ the\ powder}{bulk\ volume\ occupied\ by\ powder}$$

As the tapped volume increases density decreases.

- **Abrasiveness**

It is the measurement of the powder fineness that by rubbing on the teeth surface scrubs out the adhered particles of consumed food articles rubbing the known amount of powder on glass slide for 15 minutes with the help of fingertip in the similar manner of brushing the teeth. The surface of the slide is observed microscopically and the scratches on slide generated by rubbing the powder is noted down. The results are expressed arbitrarily in positive and negative signs indicating the scratches on glass slide. More positive signs indicated the more abrasiveness.[14]

- **Angle Of Repose**

It is determined by heap method. Briefly the powder is poured through a glass funnel from a definite distance to the smooth horizontal surface until a heap of maximum height is formed in a conical form. The diameter and the height of the heap is determined, and the tangent of the angle is determined by following expression

$$\text{Angle of repose}(^0) = \tan\left(\frac{h}{r}\right)$$

Where, 'h' is the height of heap and 'r' is the radius heap made by powder. The table shows,

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The powder having angle of repose 25 exert an excellent powder flow. The powder having angle of repose between 25-30 exert good powder flow.
The powder having angle of repose between 30-40 exert passable powder flow.
The powder having angle of repose greater than 40 exert very poor powder flow.

Table no.01

Angle of Repose	Types of Flow
25	Excellent
25-35	Good
35-40	Passable
>40	Very Poor

- **Organoleptic Test**
  Colour- Greenish yellow
  Odour- Pungent
  Taste- Slightly bitter
- **Test Result**

Test	Result
Determination of pH	4 dark yellow
Bulk Density	0.39
Tapped Density	0.517
Angle of repose	33.69 (Good)
Foaming index	Good
Abrasiveness	Good Abrasive
Stability	Stable

CONCLUSION

Tooth powders help to control plaque, reduce gingivitis, and prevent dental caries by cleaning and polishing teeth. They also freshen breath and eliminate bad odour, promoting overall oral hygiene without causing harmful effects.
Tooth powder offers a reliable, safe, and affordable way to maintain oral hygiene. Its effective components, such as Neem, Miswak, Rocksalt, helps to prevent oral diseases by controlling plaque and gingivitis, making it a valuable tool in oral healthcare.

RESULT

The formulation and evaluation of herbal toothpowder showed promising results, including effective plaque control, gingivitis prevention, and breath freshening properties. The natural ingredients ensured a smooth texture, pleasant aroma, and gentle action on gums, making it a safe and potentially effective alternative for oral care.

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