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A Review On Formulation and Evaluation of Herbal Tooth Powder

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Abstract: *A substantial number of commercially available dentifrices, including both toothpowders and toothpastes that are synthetically manufactured, are known to cause adverse effects. These side effects, which include gum irritation, a pronounced burning sensation, and localized inflammation, are often attributable to the chemical agents used in their formulations. In response to these concerns, the current study endeavors to provide a viable alternative for consumers by formulating a herbal toothpowder. This formulation utilizes a blend of natural substances, specifically: Guava Tree Leaf, Clove, Ginger, Amla, Acacia Bark, Liquorice, Camphor and Charcoal. Within the framework of this work, the developed herbal toothpowder was not only formulated but also subjected to a standardization process. This involved a comprehensive analysis of necessary evaluation parameters, encompassing organoleptic properties, physical characteristics, and a detailed phytochemical evaluation. Furthermore, this research article provides a concise overview that highlights the risks, various types, and the pathophysiological basis of treatment modalities associated with prevalent teeth diseases and their related complications.*

Keywords: Herbal, Liquorice, Clove, Charcoal, Oral hygiene, Tooth Powder

I. INTRODUCTION

Oral hygiene is a vital aspect of overall health, significantly influencing an individual's appearance, self-confidence, and social interactions. A healthy and radiant smile not only leaves a positive impression but also enhances personal assurance in daily life. In recent years, there has been a notable increase in public interest toward natural oral care products. This trend stems from growing awareness about the potential of herbal ingredients in preventing and treating common dental issues such as: Halitosis : Persistent bad breath, Dental caries : Tooth decay, Plaque formation, Dental caries : Gum inflammation. A Natural Alternative Herbal tooth powder represents a significant advancement in natural oral care. Unlike conventional toothpaste, herbal tooth powders typically contain: Traditional medicinal herbs with proven antibacterial properties, Natural cleaning and polishing agents, Plant-based ingredients that strengthen gums, Essential oils for fresh breath. These formulations avoid harm of chemicals while leveraging nature's pharmacy for oral health maintenance. Scientific Validation of Herbal Ingredients means Extensive research has validated the efficacy of medicinal plants in oral care. Studies demonstrate that herbal ingredients possess like Significant antibacterial properties, Anti-inflammatory effects, Antioxidant capabilities, Natural cleansing action. These properties effectively combat oral pathogens while being gentle on teeth and gums.

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Fig.1: HARBAL TOOTH POWDER

Anatomy of Teeth:

Teeth are the hard, white structures in our mouth that you use to bite and chew the food. They are the first step in the digestive system, breaking down food into smaller pieces to make it easier to swallow and digest. Beyond eating, teeth are also essential for clear speech, helping form words and sounds correctly, and they play a key role in shaping our face and smile.

A. Components of the Tooth

Crown

- this are tooth's exposed surface above the gum line.
- This protected by an enamel coating.

Cervix of the neck

- It is the small space between the root and the crown.
- It surrounded by gingiva, or gum.

The root

- It is tooth-anchored portion that is encased in the jawbone.
- the bone are via the periodontal ligaments.

B. Layers of a Tooth

1. Enamel

· outermost layer
· hardest substance in human body
· composed of 96% minerals
· translucent appearance
· non-regenerative

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2. Dentin

· bulk of tooth structure
· located beneath enamel
· yellowish in colour
· contains microscopic tubules
· sensitive to stimuli.

3. Pulp

· The pulp is the soft, living part inside the center of our tooth

C. Periodontium: The Tooth's Support System

Gums (Gingiva): These are the soft, pink tissue that can see. They form a tight seal around the tooth, acting like a protective cuff to shield the sensitive roots and bon underneath.

Periodontal Ligament: This is a system of tiny, tough fibers that act like a shock absorber and a hanger. It connects the root of our tooth to the jawbone, holding the tooth firmly in place while cushioning the force of your bite and chewing.

Cementum: This is a hard, bone-like layer that covers the entire root of the tooth. Its main job is to be an anchor point, providing a surface for the fibers of the periodontal ligament to attach to.

Alveolar Bone: This is the specific part of our jawbone that forms a "socket" or a pocket for each tooth. It is the structural foundation that surrounds and supports the roots, keeping your teeth stable.

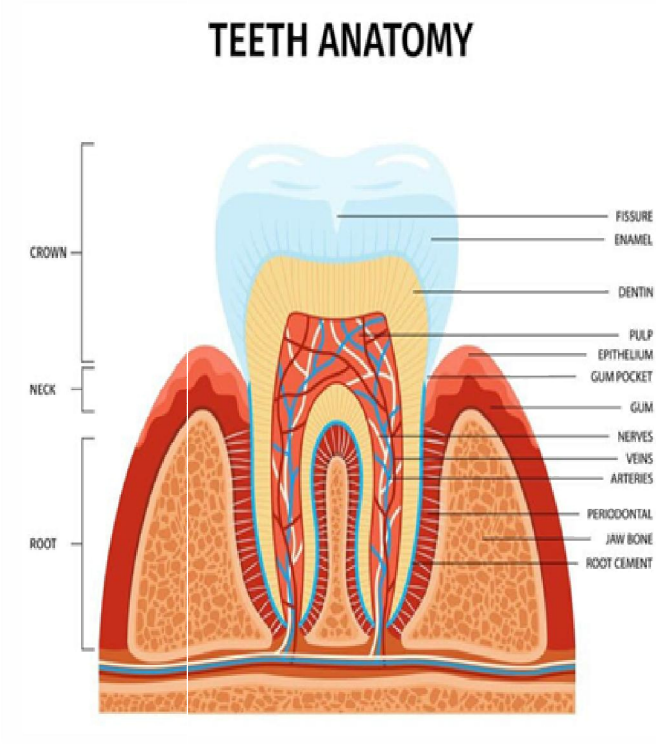

FIG.2: ANATOMY OF TEETH

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TYPES OF TOOTH POWDER:

1. Whitening Tooth Powder:

This product helps gums, freshens breath, and lessens oral irritation. People use it to whiten and polish their teeth.

2. Natural Tooth Powder:

This product contains ingredients including sea salt, which acts as an abrasive, natural chalk, and some essential oils, such as eucalyptus and peppermint.

3. Herbal Tooth Powder:

This product can also help with bleeding or sore gums. may contain a range of substances. White clay, powdered chalk, and baking soda are frequently used. Many people consider herbal tooth powder, which has been used for generations, to be an indispensable component of any teeth-cleaning routine.

4. Homemade Tooth Powder-

These powders also can be made at home. Homemade herbal tooth powder can be beneficial because they may cost less and the person making it will know what ingredients he is putting in his mouth or in the mouth of the children.

Features Of High-Quality Herbal Tooth Powder :

It relieves dental sensitivity.
It relieves toothaches.
It makes teeth whiter and more radiant.
Plaques are removed by it.
It combats and revitalizes foul breath.
It gets rid of stains from tea, coffee, and other drinks.
It treats gum irritation and keeps it from returning.
It aids in bringing out the lighter shade of the lips.

RESOURCES AND METHODS:

ASSEMBLY OF HERBAL Components AND EXCIPIENT PROFILE

• The profiles of herbal components and excipients were gathered from the local market.

SELECTION OF HERBAL INGREDIENTS

• the formulation must entail a meticulous selection of herbal components recognized for their health advantages.
• These may encompass plants such as Amla, Clove, and Guava leaf.

PROFILE OF EXCIPIENT SELECTION

• Choose a suitable base material that has a gentle abrasive effect for dental cleansing without damaging the enamel.

TOOTH POWDER PREPARATION:

The herbal ingredients were cooked in the shade and ground into a powder with a mixer. Following that, the powdered herbal ingredient is put through a sieve equipment with extremely fine pore diameters, making it simple to mix and store in an airtight container. The formulation of herbal tooth powder summarizes the powdered herbal ingredient.

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A COMPONENT OF HERBAL TOOTHPASTE:

Main Active Ingredient

Guava Leaves

FIG.3: GUAVA LEAVE

Synonyms: Strawberry Guava and True Guava

Biological Source: It consist of dry leaves of the plant *Psidium guajava* L. is a South American native.

Family: Myrtaceae.

Shape: Elliptical to oval shape.

Size: 7 to 15 cm length and 3 to 5 cm width

Chemical Constituents: It consist of Gallic Acid, Catechin, Quercetin and groups like Tannins, Flavonoids, Essential oil.

Uses: Guava leaves are use for oral hygiene for their Antibacterial and Antimicrobial properties. It also show the Analgesic activity. It use in the treatment of Inflammation.

Mechanism of Analgesic Action (MOA) of Guava Leaves in Oral Care

1. Phytoconstituents Function

Quercetin, Kaempferol, and Guaijaverin are flavonoids that reduce pain mediators by blocking the COX and LOX enzymes. Astringent tannins shrink gums and lessen sensitivity. Triterpenoids (oleanolic acid, ursolic acid): Affect nerve endings' ability to perceive pain. Essential oils (limonene, cineole, and eugenol-like substances) have a mild numbing effect that is similar to a topical anesthetic.

2. Pain Relief Using Stepwise MOA

Step 1: Pain Mediators are Inhibited

Toothache and gum discomfort typically entail the release of: Pain, edema, and sensitivity are caused by prostaglandins (PGE2, PGI2).

Histamine and leukotrienes exacerbate pain and inflammation. Guava flavonoids partially block the Lipoxygenase (LOX) and Cyclooxygenase (COX-1 & COX-2) pathways.

Prostaglandins → Decrease transmission of pain signals.

Leukotrienes → Decrease discomfort from inflammation.

Step 2: Astringent Effect on Oral Tissues

Oral Tissues Are Astringent Guava leaf tannins cause proteins in the mucosal tissue to precipitate. This creates a barrier that protects the tooth surface and gums: minimizes inflammation by tightening the gingiva. reduces the sensitivity of nerves to outside stimuli (brushing, hot/cold food).

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Step 3: Effect of Local Anesthesia

The oral mucosa interacts with terpenoids and essential oils. They alter nerve ending ion channels (Na+ channels). This lessens neuron excitability, which in turn lessens the brain's ability to receive pain signals.

Step 4: Anti-inflammatory Synergy

Synergy to Reduce Inflammation Gingivitis, ulcers, and bacterial infections are frequently associated with oral cavity pain. Guava extracts lower the inflammatory cytokines TNF-α, IL-1β, and IL-6. Reduced inflammation leads to less nerve ending compression, which alleviates pain.

Step 5: Indirect Analgesic Effect

Indirect Analgesic Effect of Antimicrobial Support Guaijaverin, a flavonoid found in guava leaves, has antibacterial properties against Porphyromonas gingivalis, Streptococcus mutans, and microorganisms that cause plaque. Guava indirectly lessens gum disease and cavity discomfort by lowering bacterial toxins and infection.

OTHER INGREDIENTS

GINGER:

FIG.4: GINGER

Synonyms: Zingiber, Rhizoma zingiberis

Biological Source: It consist of dried rhizomes of the *Zingiber officinale Roscoe.*

Family: Zingiberaceae.

Size: The rhizomes are 5 to 15 cm long, 3 to 6 cm wide, and about 1.5 cm thick.

Chemical Constituents: Gingerol, Shogaols, Zingiberol

Uses: It is use to prevent cavities and remove plaque. It is also use in the treatment of cold, cough, asthma.

LIQUORICE:

FIG.5: LIQUORICE

Synonyms: Sweet liquorice, Radix Glycyrrhizae.

Biological Source: It consist of the dried, peeled or unpeeled, roots, rhizome or stolon of *Glycyrrhiza glabra Linn.*

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Family: Leguminosae.
Shape: Liquorice are Unpeeled drug straight and nearly cylindrical.
Size: length are 10 to 50 cm and diameter are 2 cm.
Chemical Constituents: Glycyrrhizine, Glycoronic acid, Glycyrrhitic acid, Volatile oil.
Uses: It is use as sweetening agent. It is use in bronchial problems like cold, bronchitis, flu and coughs. It is use as Anti cavity agent in dental products.

AMLA:

FIG.6: AMLA

Synonyms: Amla, Indian goose berry, Emblica.
Biological Source: It consist of dried, as well as fresh fruits of the plant *Emblica officinalis Gaerth.*
Family: Euphorbiaceae
Shape: ***Amla fruits are depressed, globose***
Size: 1.5 to 2.5 cm in diameter
Chemical Constituents: It is the most nutritious and the source of Vitamin C , minerals and amino acid. Emblicanin A and B, Gallic acid.
Uses: It is use as Antioxidant in dental products. The dried fruit of amla is useful in haemorrhage, diarrhoea, diabetes and dysentery.

CLOVE:

FIG.7: CLOVE

Synonyms: Clove flowers, Clove buds
Biological Source: It consist of the dried flower buds of Eugenia caryophyllus Thumb.
Family: Myrtaceae.

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Shape: Straight and Cylindrical
Size: 10 to 13 mm long, 4 mm wide and 2 mm thick
Chemical Constituents: Eugenol, Caryophyllene, Resin, Gum
Uses: Anti Inflammatory agent. Use as Antiseptic, Carminative, Aromatic, Stimulant and Flavouring agent.

CAMPHOR:

FIG.8: CAMPHOR

Synonyms: Japan Camphor, Gum Camphor.
Biological Source: It is obtained from the volatile oil of *Cinnamomum camphora L.*
Family: Lauraceae.
Chemical Constituents: Cineole, Linalool, Terpineol, Borneol.
Uses: It is use as Refreshing agent. It is use in various soaps, shampoos and sprays. It has strong smell hence it is use to relive cold and cough.

CHARCOAL:

FIG.9: CHARCOAL

Synonyms: Activated Coal, Coal
Biological Source: It is obtained from various plant and animal also.
Family: Contain various families.
Uses: It is help to remove the extrinsic stain of teeth. It is use as Whitening agent in various tooth powders and tooth paste.

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EVALUATION PARAMETERS :

Determination of pH

To determine the ph of the Herbal Tooth Powder we use digital pH meter. Add 5g of tooth powder in 50ml of beaker and add to this freshly boiled and cooled distilled water. Stir it vigorously. Make a mixture and its pH was measured.

Determination of Bulk density

The formula for calculating the bulk density

Bulk density = Mass of particles / Total volume occupied

Determination of Tapped density

The formula for calculating the tapped density

Tapped density= Mass / Final volum

Determination of Spreadability

This test are use to determine how uniformly the powder form a thin texture.

Determination of Foaming power

It is determine by a simple cylinder test.

II. CONCLUSION

Products made from natural plants are a valuable way to manage bacterial infections. As a result, a herbal tooth powder was created for the current study and tested for antibacterial activity, yielding outstanding results. The components are utilized As indicated by its results, the tooth powder used in this study was tested and chosen for its antimicrobial properties and ability to preserve oral hygiene. Our herbal tooth powder is thought to be safe to use twice day and has no negative side effects.

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