

# Formulation and Evaluation of Herbal Tooth Powder

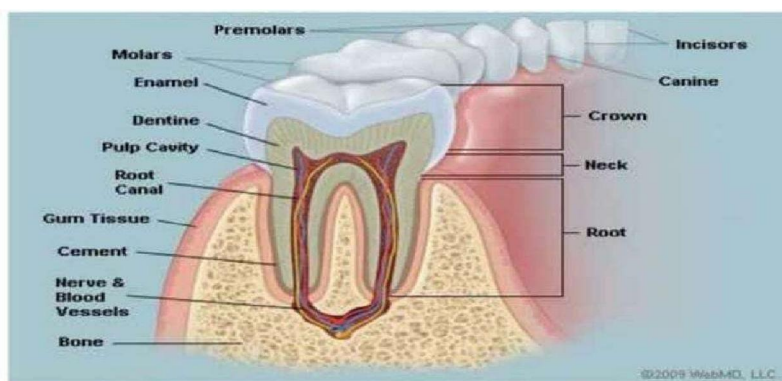
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**Abstract:** Oral hygiene is an important key to maintain good appearance, impression of an individual and gives confidence. It is found that 10 billions of microbes are present in oral cavity, some of them are hazardous to hygiene of buccal cavity. Diseases in oral cavity have been considered as major threat affecting to health.

**Keywords:** Oral hygiene

## I. INTRODUCTION

Oral hygiene is an important key to maintain good appearance, impression of an individual and gives confidence. It is found that 10 billions of microbes are present in oral cavity, some of them are hazardous to hygiene of buccal cavity. Diseases in oral cavity have been considered as major threat affecting to health. Traditionally, herbal tooth powders are used as tooth-cleaning agents, and also used in various oral diseases like gum disease, tooth erosion, tooth sensitivity, toothaches and get rid of teeth from growth of bacterial colonies. Today, a large no. of these formulations are available in market. They are standardized/evaluated on various parameters to determine their efficacy and performance. This presentation includes the formulation and standardization procedures for Herbal tooth powder.



## TOOTH ANATOMY

### Pharmaceutical Powder

- Defined as a dry, solid substance, composed of finely divided drugs with or without excipients and intended for internal or external use.
- It is a solid substance in finely divided state typically obtained by crushing, grinding, or comminuting.

## TOOTH POWDER

- Mildly abrasive powder used in combination with a toothbrush to maintain oral hygiene.
- Smooth, uniform, free or sluggishly flowing fine powder dentifrice formulation, free from any foreign matter.
- Can be used as prophylactic cosmetic to prevent tooth decay and bad breath.



**Ideal Properties**

- Good abrasive effect
- Non-irritant and non-toxic
- Impart no stain on tooth
- Keep the mouth fresh and clean
- Prolonged effect
- Cheap and easily available



**Types**

Classified into the following two types based on foaming properties:

- Foaming
- Non-foaming

**General Ingredients**

- Abrasives/Polishing Agents
- Foaming/Wetting/Cleaning/Surface active Agents
- Sweetening Agents
- Flavoring agents

**Foaming/Wetting/Cleaning/Surface active Agents**

- Either a surface-active agent or a soap used to aid the action of abrasives by reducing the surface tension and wetting the surface of the teeth.
- They penetrate and loosen surface deposits, emulsify and suspend the debris, which the dentifrices remove from tooth surface.
- Surface active agents are foaming agents employed at levels of 0.5-2% to provide necessary foaming action.
- The most popular is sodium lauryl sulphate.
- Other surfactants:
  - Sodium lauryl sacrosinate
  - Sodium lauryl sulfoacetate
  - Dioctyl sodium sulfosuccinate.
- Soap is generally used for lather making and cleansing action in dentifrices.
- The soap should be completely saponified, should contain 2% moisture, not more than 0.3% free alkali, calculated as sodium carbonate.

**Sweetening Agents**

- Added to mask the bitter tastes of ingredients specially foaming agent and flavor oils.
- Nutritive sweeteners like carbohydrates cannot be used hence synthetic compounds like saccharine, aspartame, cyclamates or potassium acesulfame (Ace-K) can be used in concentrations between 0.05-0.25%.

**Flavoring Agents**

- Dentifrices flavors belong to a class which not only satisfy the requirements of the formula but also satisfy the psychology of the consumer who is looking forward to fresh breath after brushing.
- Therefore, they should help prepare a product which have a pleasant long- lasting effect and which preferably has a medicinal or freshening impact.
- Generally used at level between 0.2-2%.
- Examples: Spearmint oil, Peppermint oil, Oil of winter green, Clove oil, Eucalyptus oil, Anise oil, Sassafras oil etc.

**Miscellaneous Agents**

- Titanium dioxide may be added as a whitening agent whenever desired.
- Buffers salts such as sodium phosphate may be used to maintain pH at the desired levels.
- Certified colors may be added.
- Therapeutically active ingredients may be added to improve the performance.

**OTHER SUBSTANCES**

- Fluorides of sodium and stannous
- Astringents
- Preservatives
- Antibacterial agent
- Antiplaque agents
- Anti-tartar agents
- Whitening agents
- Anticaries agents
- Anti-gingival agents

**HERBAL TOOTH POWDER**

- Herbal tooth powder is a tooth-cleaning agent that is almost entirely made from all- natural ingredients to refresh breath, help heal gums, rid teeth of bacteria and reduce the amount of inflammation in the mouth.
- Prepared by using various herbal ingredients which possess the antibacterial, antiseptic and cooling properties.

- The primary function of tooth powder was the cleaning of the accessible surfaces of the teeth but now a days various herbal tooth powder formulations are effective against wide range of oral microorganisms, and also posses ingredients to work against caries, tartar, gingival etc.



**LARGE NO. OF HERBS ARE IN USE FOR THE TOOTH POWDER**

Piper longum	Acacia arabica	Embelia ribes	Acacia arabica
Cinnamomum camphora	Azadirachta indica	Cinnamomum cassia	Eugenia jambolana
Piper nigrum	Zanthoxylum alatum	Piper cubeba	Caryophyllus aromaticus
Zingiber officinale	Mentha spicata	Melia azadirachta	Rubia cordifolia
Terminalia chebula	Quercus infectoria	Caryophyllus aromaticus	Cinnamomum zeylanicum
Zanthoxylum alatum	Piper longum	Infectoria Gall	Zizyphus jujuba
Cichorium intybus	Anacyclus pyrethrum	Vitex negundo	Barleria prionitis
Syzygium aromaticum	Syzygium aromaticum	Emblica officinalis	Juglans regia
Mentha species	Piper nigrum	Terminalia belerica	Acacia catechu
Suddha Garika	Menthe piperata	Terminalia chebula	Mimusops elengi
Sudandhit dravya	Curcuma longa	Acacia catechu	Glycyrrhiza glabra
	Sepia officinalis	Acacia arabica.	Zanthoxylum rhetsa
	Potash alum	Prunus amygdalus	Hemidesmus indicus
		Camphora officinarum	Quercus infectoria
			Emblica officinalis
			Terminalia chebula
			Terminalia belerica
			Carum copticum
			Anacyclus pyrethrum

**HERBS FOR TOOTH PREPARATIONS**

Azadirachta indica	Neem	Leaf	Toothache. Antibacterial, Dental Carries
Barleria	Vajradanti	Entire herb	Strengthen teeth, toothache
Syzygium aromaticum	Clove	Bud	Toothache, Antiseptic
Glycyrrhiza glabra	Yastimadhu	Roots	Natural Sweetener & Flavor
Salvadora persica	Pilu	Twigs	Anti-microbial
Acacia arabica	Babul	Bark	Teeth Disorders

**Anti-bacterial Herbs in Tooth Powder**

- The root and rhizome of Glycyrrhiza glabra, root of Moringa oleifera, Terminalia chebula, Clove oil are well known for their activity against the microorganisms found in oral cavity.
- They have been found effective against the dental pathogens such as Lactobacillus acidophilus, Streptococci salivarius, Streptococci sanguis, Streptococcus aureus and Streptococcus mutans.

Babul (Bark)	Vachellia nilotica	Antibacterial, Antioxidant
Bakul (Bark)	Mimusops elengi	Anti-ulcer activity
Jambul (Bark)	Syzygium cumini	Strengthens gums & teeth, Anti-infective, Astringent
Lavang	Syzygium aromaticum	Antibacterial, Antioxidant
Manjishtha	Rubia cordifolia	Antioxidant
Bor	Ziziphus mauritiana	Debridement
Acrod	Juglans Regia	Antioxidant
Akkal kadha	Anacyclus pyrethrum	Reduce toothache
Jeshthamadh	Glycyrrhiza glabra	Reduce tooth decay
Ajwan	Trachyspermum ammi	Reduce toothache
Dalchini	Cinnamomum verum	Prevent tooth decay by antibacterial action
Khair	Senegalia catechu	Prevent gingivitis
Patang	Coesalpinia Sappan	Natural dye
Harada vajradanti	Barleria Prionitis	Strengthens teeth
Anantmul	Hemidesmus indicus	Astringent
Amala	Phyllanthus emblica	Antibacterial, Strengthens gums & teeth
Behada	Terminalia bellirica	Antimicrobial and Anti-inflammatory
Kavab Chini	Piper Cubeba	Flavoring agent

**Formulation and Preparations**

- The main components of toothpowders are solid particles of very fine size and the end product is also a very dry powder. Since the main components like abrasives, surface active agent are solid powders, it is required that they all are in very fine particle size, comminuted, if desired, passed through a sieve and mixed in a mortar in the lab scale and in blenders on an industrial scale.
- The flavoring oils are added in the end either by spaying on the powder mixture or first blending with one of the components and then mixing this blend to the rest of the mixture by the method of dilution or geometric progression.

**Standardizations/Evaluation Parameters**

Organoleptic Properties: Identification of Color, odor, taste. Spreadability:

- Complex characteristic features of a powder (as obviously influenced by particle properties) evaluated by spreading the powder manually.
- This allow the powder to be spread uniformly as a thin layer of a few multiples of particle size without the formation of any empty patches, presence of agglomerates and rough surfaces.
- Stability: Product maintained at different temperature conditions to check its stability.

**DETERMINATION OF MOISTURE & VOLATILE MATTER**

**• PROCEDURE**

In a previously dried and weighed petri dish, take about 2 g of the material, accurately weighed. Dry it at 105+-2°C in an oven for 4 h or till constant mass. Cool in a desiccator and weigh.

**• CALCULATION**

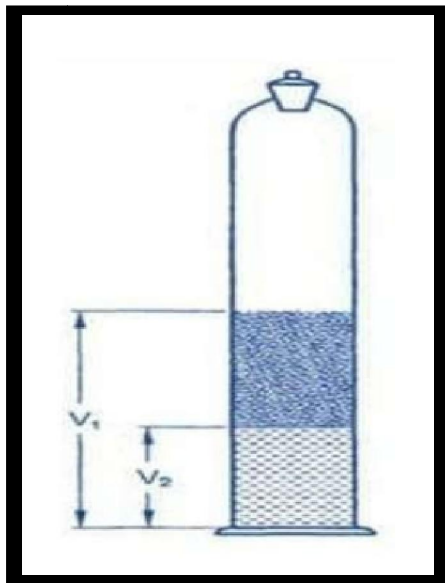
Moisture and volatile matter, percent by mass = 100 (M-M1)/M

Where, M = mass of the material taken for the test in g M1 =mass of the material after drying in g.

**• PROCEDURE**

**DETERMINATION OF PH**

Dispense 10 g of the tooth powder from the container in a 50 ml beaker and add 10 ml of freshly boiled and cooled water (at 27°C) to make 50% aqueous suspension. Stir well to make a thorough suspension. Determine the pH of the suspension within 5 rein, using a pH meter.



**DETERMINATION OF FOAMING POWER**

• A suspension of the material in water is taken in a graduated cylinder and given 12 shakes. The volume of the foam formed is observed after keeping the cylinder for 5 min.

• Foaming power, ml =V1-V2 Where,

v1 = volume of foam plus water, in ml V2 = volume of water only, in ml.

Determination of Foaming Character (WHO Guideline 2002)

• 1 gm of drug taken in 500ml conical flask containing 100ml of boiling water.

• Moderate boiling temperature maintained for 30min. Cooled and filtered in 100 ml volumetric flask and volume made up to 100ml with water.

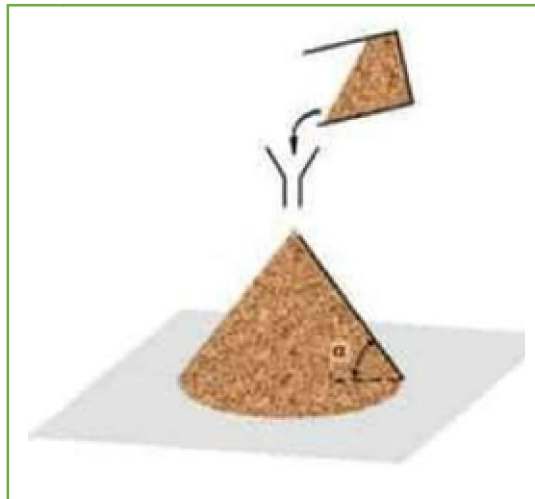


- The decoction poured into 10 test tubes in successive portions of 1-10ml and the volume of each test-tube made up to 10ml with water.
- Then test-tubes shaken for 15 sec & allowed to stand for 15 min and the height of the foam measured.
- The foaming index calculated according to the height of foam observed in every test-tube.

#### Determination of Flow Property

- A funnel fixed with clamp to the stand. A graph paper kept below The funnel and the height between graph paper and bottom of The funnel stem measured. Then, 50 gm of powder weighed and Poured into funnel by blocking the orifice of the funnel by thumb, The thumb was removed. The powder started flowing down onto The graph paper and formed a cone shaped pile until the peak of Pile become touched to the bottom of the funnel stem.

Then, the angle of repose was calculated by following formula:



#### Determination of Density

##### Bulk Density

- 50 gm of powder accurately weighed and carefully introduced into a 100ml graduated measuring cylinder.
- The cylinder dropped at 2-seconds interval onto a hard surface three times from a height of a 1 inch to equalize upper surface of powder.
- Then, the volume of powder noted and the bulk density in gm/ml calculated as:

$$\text{Bulk density} = \frac{\text{Wt. of drug}}{\text{Bulk volume}}$$

##### Topped Density

- 50 gm of powder accurately weighed and carefully introduced into a 100ml graduated measuring cylinder.
- Measuring cylinder fitted on the tapped density apparatus. The instrument was switched on. It raised the cylinder on the base from a height of about 4 inches.
- Number of strokes given until further bulk volume was changed. Then, volume of powder was noted and the tapped density in gm/ml was calculated as:

$$\text{Tapped density} = \frac{\text{Wt. of drug}}{\text{Tapped vol.}}$$

#### Determination of Particles Size by Mechanical Sieve Shaker

- Select standard sieve set. Arranged them in such a manner that the coarsest at the top and finest at the bottom.
- 50 gm powder weighed and placed on the coarsest sieve set. Above sieve set fixed on a mechanical shaker and clamp it tightly.
- Switch on the mechanical shaker and timer set for 15min. When the shaker automatically stops, sample collected which retained on each sieve into a paper and weighed.

- Average particle size is calculated as:

$$\text{Avg. Particle Size} = \text{End}/2d$$

Where, End Sum. of arithmetic mean x wt. retained on a sieve EdSum. of wt. retained on a sieve.

### **In-vitro Antibacterial Activity**

#### **Preparation of Extracts**

- Herbal tooth powder materials subjected to exhaustive Soxhlet extraction using alcohol as solvent. After completion of extraction extract collected, filtered and concentrated under vacuum.
- The concentrated extract used to evaluate in-vitro anti-bacterial activity of the tooth powder.

#### **Agar Well Diffusion Method**

- Preparation of Agar media

9.5 gm Mueller-Hinton Agar (MHA) suspended in a 500ml conical flask and 250ml distilled water added. Then, heated on hot plate with frequent agitation until it completely dissolved. Then, media was sterilized in autoclave at 121°C for 1 hour.

#### **Procedure**

- Approx. 25ml of agar poured into sterile petri-dish and allowed to solidify.
- 50µl of bacterial inoculums was spread on the solidify agar media by using sterile spreader.
- In plate two wells (5mm diameter) punched into the agar by using sterile cork borer. Then, working concentration of 100mg, 150mg, 200mg and 250mg dilution were prepared from 500mg/ml of stock solution extract and 150µl of extract separately added into wells and allowed to diffuse at room temperature.
- Equal volume of alcohol was used as negative control and standard antibiotic (Chloramphenicol) used as positive control.
- The plates incubated for 24 hours at 37°C and the diameter (in mm) of clear zone of growth inhibition was recorded and measured with the help of radius scale

### **Determination of Anti-oxidant Activity**

- FRAP Assay
- Beta Carotene Bleaching Assay

### **Radioactivity Detector**

Two recommended methods for determination of the radioactivity of the dentifrice slurries:

- Gieger-Muller Planchet Counter
- Liquid Scintillation Detector.

### **Abrasivity**

For determination of Dentifrice Abrasivity using The ADA Laboratory Method a cross brushing machine is used.

### **USE HARBEL TOOTH POWDER**





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