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FORMULATION AND EVALUATION OF A TOOTH POWDER CONTAINING THE ACTIVE PRINCIPLES OF MIMUSOPS ELENGI AGAINST ORAL PATHOGENS

[1]*Gunda Mahesh and [2]Prof. Dr. V. Gopal

[1]Ph.D Research Scholar, MTPG & RIHS, Pondicherry University, Pondicherry.
[2]Principal College of Pharmacy, MTPG & RIHS Pondicherry. Govt. of Puducherry Institution.

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***Corresponding Author**
Gunda Mahesh
Ph.D Research Scholar,
MTPG & RIHS, Pondicherry University, Pondicherry.

ABSTRACT

Tooth powder is used in combination with tooth brush to maintain the oral hygiene such as freshness of mouth and to avoid tooth decay. This work was carried out to prepare a tooth powder which can be used as a tool for proper oral hygiene and to overcome the side effects of the conventional tooth powder prepared by synthetic ingredients. The tooth powder was prepared by using various herbal ingredients which posses the anti-bacterial, antiseptic and cooling properties. *Mimusops elengi*, clove, liquorice, palm candy, mentha & acacia are the herbal ingredients were used in this work to formulate ideal tooth powder which can satisfy all the required properties to keep the mouth fresh and to prevent tooth decay. The prepared tooth powder was evaluated for its organoleptic and physical characteristics such as color, odor, taste, stability, foamability, pH, moisture content, swelling index, flow property, bulk density, tapped density, abrasiveness and *in-vitro* anti-microbial activity to ensure that it posses all the desired futures to use against the dental diseases. The result was found to be within the permitted limits.

KEYWORDS: Anti-microbial activity, tooth powder, tooth decay.

INTRODUCTION

Oral hygiene is an important key to maintain good appearance, impression of an individual and gives confidence. Tooth powder promotes oral hygiene, serves as an abrasive that aids in removing the dental plaque and food from the teeth and also helps to prevent tooth and gum diseases like Gingivitis, cavities and stained teeth.

The plaque, calculus, gum diseases are the major issues related to tooth. It is mainly caused by bacterial action and mineralized deposition leads to plaque, calculus these diseases are mainly due to the negligence in proper caring of tooth, so it can be prevented and controlled by proper brushing by using effective tooth powders & tooth pastes.[1,2]

Tooth powder can be used as prophylactic cosmetic for tooth to prevent tooth decay and bad breath.[3] It can be prepared by synthetic and herbal ingredients now-a-days herbal formulations are high in demand due to its efficiency to avoid the side effects when compared with synthetic formulations. Tooth pastes and tooth powders are based on its abrasive property, the paste and powder applied on the tooth to rub against the tooth which helps to remove the deposited food debris and minerals from tooth.

Ideal Properties[4,5]

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

Formulation of herbal tooth powder

S. No.	Name	Botanical Name	Part Used	Quantity	Category
1	Bakul	*Mimusops elengi*	Bark	5g	Anti microbial
2	Liquorice	*Glycyrrhiza glabra*	Root	1g	Frothing agent
3	Palm candy	*Arenga pinnata*	Crystals	1g	Nutrient & sweetener
4	Clove	*Syzygium aromaticum*	Flower buds	0.5g	Anti bacterial preservative
5	Mentha	*Mentha arvencis*	Leaf	1g	Analgesic
6	Acacia	*Acacia Arabica*	Gum	1g	Stabilizer, binding agent
7	Salt	Sodium chloride	Crystals	1g	Preservative, abrasive agent

MATERIALS AND METHODS

Herbal tooth powder was prepared by using clove, *Mimusops elengi*, liquorice, palm candy, mentha, salt and acacia. *Mimusops elengi*, clove, mentha possesses the anti microbial activity, palm candy and liquorice gives sweetening & frothing effect salt used to preserve product and acacia used to gives foaming. All the ingredients should be complied with the Indian standards. All the herbal ingredients were dried and a grounded using domestic mixer. The required quantities of the ingredients weighed and taken into a mortar. Triturated throughly until fine powder is formed.

Evaluation of Tooth Powder[6,7,8]

Colour: The prepared tooth powder was evaluated for its color. The color was checked visually under normal lamp.

Odour: Odour was checked by smelling the product.

Taste: Taste was manually checked by tasting the product.

Stability: The stability study was performed as per ICH guidelines. The product was Maintained in different temperatures conditions to check its stability.

Foamability: The foamability of the product was evaluated by taking 2gms of tooth powder with water in a measuring cylinder initial volume was noted as v_1 and then shaken for ten times. Final volume of foam was noted v_2.

pH: pH of formulated herbal tooth powder was determined by using pH meter. 5gm of tooth powder placed in 100ml of beaker. Allow the 10ml of boiled and then cool water. Stir vigorously to make a suspension and measured the pH.

Moisture Content: 5gm of formulation placed in a porcelain dish containing 6-8 cm in a diameter and 2-4 depth in it. Dry the sample in an hot air oven at 1000^0 c for 5mins.

Calculation % by mass = 100 x MI/M

MI = loss of mass[g] on drying, M = mass [g] of the material taken for the test

Swelling Index[9]: 2gm of prepared formulation was accurately weighed and transfer to a 50ml stoppered measuring cylinder the initial volume occupied by the Powder was noted and the volume was made upto 100ml with distilled Water. The cylinder was stoppered, shaken gently, and set aside for 24hrs.The volume occupied by the prepared formulation was noted after 24hrs.Swelling index (SI) is expressed in percentage and was calculated by the following equation.

SI(%) = [Vt-Vo/Vo]x100

Where Vo is the initial volume of the powder in a graduated cylinder.

Vt denotes the volume occupied by the powder after 24 hrs.

Flow Property[10]: A funnel was taken and fixed with a clamp to the sand. A graph paper was kept below the funnel and the height between graph paper and bottom of the funnel was measured. Then 50gm of powder was weighed and poured into funnel by blocking the orifice of the funnel by thumb, the thumb was removed. The powder s2tarted 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.

$$\text{Tan } \theta = H/R$$

H = Height of powder, R = Radius of graph paper

The flow property was observed as

(powder flow property when θ<25 Excllent, 25-30 good, 30-40 passable, >40 very poor)

Bulk Density[11]: 20gm of powder was accurately weighed and carefully introduced into a 100ml graduated (1ml) measuring cylinder. The cylinder was dropped at 2sec interval onto a hard surface three times from a height of a one inch to equalize upper surface of powder. Then, the volume of powder was noted and the bulk density in gm/ml was calculated as:

Bulk density = Wt. of drug/bulk volume

Tapped Density: 20gm of powder was accurately weighed and carefully introduced into a 100ml graduated (1ml) measuring cylinder. Measuring cylinder was 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 w2as changed. Then, volume of powder was noted and the tapped density in gm/ml was calculated as

Tapped density = Wt. of drug/tapped volume

Abrassiveness: It was evaluated manually by using tooth brush.

***In-Vitro* Anti-Microbial Activity**

Preparation of Extract: The prepared powder material subjected to cold maceration method using alcohol as solvent. After completion of extraction we are collected extract, it was filtered and concentrated. The concentrated extract was used for *in-vitro* anti-microbial activity.[13] *In-vitro* anti-microbial activity was measured by using agar well diffusion method. Then working concentration of 100mg, 150mg, 200mg and 250mg were prepared from 500mg/ml of stock solution and allowed to diffuse at room temperature. Equal volume of alcohol was used as negative control and standard Antibiotic (ciprofloxacin) was used as positive control. The plates were incubated for 24hrs at 37^0c and the diameter (in mm) of clear zone of growth inhibition was recorded and measured with the help of radius scale.

RESULTS AND DISCUSSION

S. No.	Parameter	Observations
1	Colour	Brick red
2	Odour	Characteristic , pungent
3	Taste	Astringent then sweet
4	Stability	Stable
5	Foamability	Good
6	pH	7.93
7	Moisture content	3.4% w/v
8	Swelling index	1cm
9	Flow property	Poor
10	Abrasiveness	Good

11. Anti microbial activity: The formulated herbal preparation exhibited fairly good anti staphylococcus aureus activity as compared to the standard drug ciprofloxacin. The formulation exhibited an impressive zone of inhibition of 18.06mm at MIC of 500mg/ml, where as ciprofloxacin exhibited 23mm ZOI at MIC of 500mg/ml. Therefore it may be concluded that formulated preparation have potential to exhibit anti-microbial activity.[14,15]

CONCLUSION

The research concluded that herbal tooth powder an emphasizing and more acceptable in dental research and they are safer with minimum 2side effect than synthetic preparation. The formulated tooth powder capable to the tooth and oral hygiene and show the anti-microbial activity against pathogens. The formulated herbal tooth powder has been good scope in future in nature remedies research and dental health of public.

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