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FORMULATION AND EVALUATION OF HERBAL TOOTH POWDER USING *MIMUSOPS ELENGI*, MISWAK AND *MONGIFERA INDICA* LEAVES

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ABSTRACT:

Many ancient medical systems, including Ayurveda, have utilised Mimusops elengi (Linn.) more significant in periodontal therapy and has a variety of dental applications. The current review emphasizes the characteristics of M. elengi that have been demonstrated, as well as thepotential for using it as an efficient suture coating material, to reduce bacterial load followingperiodontal surgery. The data gathered here will help to advance the ongoing inquiry into M. elengi's role in periodontal therapy. For the sake of maintaining good oral hygiene and health, dentifrices are essential in daily living. The three main dental issues are gingivitis, plaque, andperiodontal disorders. These serious problems are brought on by neglecting proper care for teeth and practicing poor oral hygiene. This resulting in gum tissue inflammation, this carelessness promotes plaque accumulation on teeth and ultimately results in gingivitis and tooth loss. Due to the use of chemicals, the majority of synthetic dentifrice preparations, including toothpaste and toothpowder, have adverse effects that include gum irritation, cankersores, burning, and inflammation.

Keywords: Tooth powder, Inflammation, Gum Irritation, Gingivitis, Mimusops elengi

1. INTRODUCTION

Herbal dentifrices aid in preserving good oral health by reducing tissue inflammation, tooth decay, foul breath and plaque build-up on the gums. Every individual must use safe and effective dentifrices since the

oral cavity exhibits good absorption capability due to the existence of blood tissues, enzymes and mucosal membranes (Devi et al., 2019). The majority of artificial tooth products contain sodium lauryl sulphate and fluorides. Fluorides are hazardous to humans because they disrupt the nervous and endocrine systems (Devi et al., 2019; Kanduti et al., 2016). Risky sodium lauryl sulphate causes mouth irritation and neurotoxicity in the body (Bondi et al., 2015). Utilizing potent herbal dentifrices will help youavoid this. An attempt is made to formulate herbal toothpowder by using mimusops elengi, miswak, mongifera indica, liquorice,sodium benzoate, sodium lauryl sulphate, clove, peppermint oil, stevia and salt. The components utilised in herbal toothpowder have demonstrated anti-inflammatory, anti-microbial, and tooth-whitening properties. These properties reduce plaque build-up and teeth decay. They act more benevolently because they are natural. The raw ingredients used to make herbal toothpowder work better because they contain a variety of phytochemicals that help to maintain mouth health and enhance bodily biological processes (Zahidin et al., 2017).

The mimusops elengi bark is used to treat gum and tooth disorders as well as biliousness and as a cooling, cardiac tonic, alexipharmic, stomachic, anthelmintic, tonic, and astringent (Ashok and Koti, 2010; “Kirtikar, K.R. and Basu, B.D. 2001). The flower is calming and astringent tothe bowels; it is used to treat biliousness, liver issues, disorders of the nose, headaches, and asthma with its smoke (Baliga et al., 2011). The fruit is flatulent, healthy for the teeth, and astringent to the bowels (Gami and Parabia, 2010). The seed is used to treat head problems andcorrect loose teeth. The root is also used as a gargle to treat gum relaxing and is an aphrodisiac,diuretic, bowel astringent, and excellent for gonorrhoea (Shanmugam et al., 2011). Theflowers, which bloom twice a year, have a light scent and a strong perfume (Koti et al., 2010).

The Salvadora persica miswak, which is known by the Arabic name "miswak," is widely distributed around the world. Arabs in past used it to polish and whiten teeth. Chemical study

of S. persica miswak has revealed the presence of m-anisic acid, salvadourea, gypsum, chlorides, -sitosterol, glycosides including salvadoside, salvadoraside, and flavonoids like quercetin glucoside, quercetin, kaempferol, and quercetin rutin. The S. persica tree's roots and bark contain 27% ash, greater proportion of alkaloids including fluorides and chlorides, trimethylamine and salvadorine, moderate concentrations of silica, sulphur, vitamin C, modest amounts of flavonoids, saponins, tannins, and sterols. Along with additional sulfur-containingorganic compounds (salvadourea and salvadorine), significant levels of sodium and potassiumchloride were also found (Farag et al., 2021).

A broad family of organic micronutrients called polyphenols, which are present in plants and have a variety of health advantages, are also abundant in mango (Shahidi et al., 1992). Mangiferin, gallic acid, gallotannins, quercetin, isoquercetin, ellagic acid, and -glucogallin aresome of the polyphenols found in mango mesocarp

(Berardini et al., 2005, 2004), with gallic acid being the most prevalent phenol component in this fraction (Masibo and He, 2008). The mesocarp fraction has also been found to contain up to 25 different carotenoids, including provitamin A, lutein, -carotene, and -carotene, which give this part of the fruit its yellow colour.

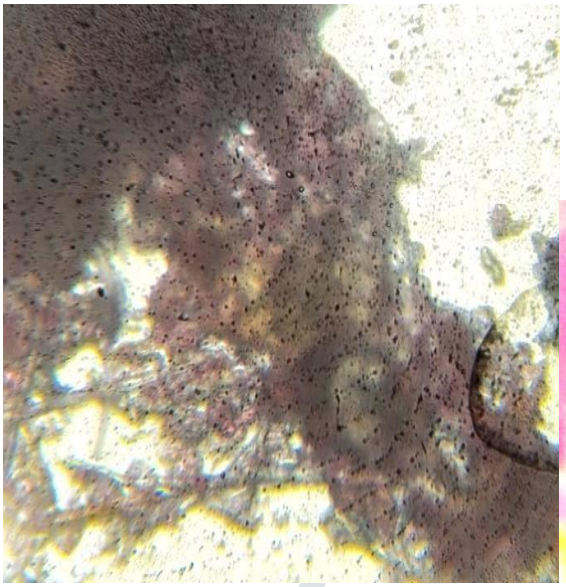
1.1. Phytochemical screening of mimusopselengi buds: The phytochemical screening of mimusopselengi buds were carried out using specific tests and the results are given in the below table 1.

Table 1. Phytochemical screening of mimusopselengi buds:

Chemical Constituent	Tests	Colour	Present/Absent
Alkaloids	1.Dragendroff's test 2.Mayer's test 3.Hanger's test	Orange brown Cream Reddish brown	- + +
Carbohydrates	1. Molish's test 2. Fehling's test 3.Iodine test	Violet color Brick redBlue color	+ + -
Glycoside	1.Keller-killia test	Reddish brown	+
	2.Borntragers test	Reddish pink	+
Steroids / Terpeniods	1.Salkowski test	Yellow	+
Proteins	1. Biuret test 2. Ninhydrin test	Purple Violet color	+ +
Saponin	1. Foam test 2. Liebermann burchards test	Yellow Red violet	+ -
Tannins	1. GELATIN TEST 2. Lead acetate test	White pptWhite ppt	+ +

1.2. Powder analysis of Mimusops Elengi buds:

Powder buds is brown, non-aromatic, astringent. The microscopic examination of the powder shows fragments of cork cells, Vessels and fibers of various shapes and thickness, tannin cells,stone cells contents.



2. MATERIALS AND METHODS:

The herbal toothpowder was prepared by Using mimusops elengi, miswak, mongifera indica, liquorice, sodium benzoate, sodium lauryl sulphate, clove, peppermint oil, stevia and salt. All the herbal ingredients were weighed according to ascending order of its weight. Weighed ingredients were triturated using mortar and pestle. The powdered herbal materials were passed

through a sieved with the mesh size 85 and stored in air tight container. The composition for the formulation of herbal tooth powder is summarized in the table 2.

Table 2 – Formulation of herbal toothpowder

S. No.	Ingredients	Quantity (25gm)
1.	Mimusopselengi	8 gm
2.	Miswak	8 gm
3.	Mongifera indica	5 gm
4.	Sodium lauryl sulphate	1gm
5.	Sodium benzoate	0.5 gm
6.	Liquorice	0.5 gm
7.	Salt	1gm
8.	Stevia	1gm
9.	Clove	Q.S
10.	Pippermint oil	Q.S

3. EVALUATION OF TOOTH POWDER:

3.1. Organoleptic Parameters

The prepared herbal toothpowder was assessed for organoleptic parameters like color, odour, taste, appearance, solubility and flow.

3.2. Determination of loss on drying

Five gram of herbal toothpowder was dried at 105 ° C in the oven and cooled. Both pre and post- weight of the toothpowder was estimated. The loss of weight is recorded as percentage loss on drying and calculated by the given formula.

3.3. Determination of pH

About 2gm of sample was taken in 25ml beaker. To this added 5ml of freshly boiled and cooledwater at room temperature (27°C). Stirred well to make a through suspension. pH of suspension was determined using Sorensen pH meter.

3.4. Determination of Bulk density

About 20gm of sample was weighed and placed it in 100ml dried graduated measuring cylinder and note volume as V_1 mL. Cylinder containing sample was placed in bulk density apparatus and operated for 100 tapping. The volume occupied by the powder was recorded as V_2 ml andcalculated by given formula.

Bulk density = Untapped density – Tapped density

3.5. Tapped Density

It was discovered utilizing tapping density test equipment. The powder was placed in the measurement cylinder (50mL) of the device, and it was tapped in an upward and downward motion for the predetermined number of times until it was compacted to the desired volume. To stop fines from being lost during tapping owing to dusting, the open end of the measuring cylinder was covered with aluminum foil. The last constant volume was recorded and shown as tapped volume. Using the following formula, the tapped density was calculated.

$$\text{Tapped density} = \frac{\text{Tapped mass of tooth powder}}{\text{Tapped volume of tooth powder}}$$

3.6. Porosity

The mass of the powder and the air that is trapped therein occupy the vacuum space. Thefindings were as follows:

$$\%Prosity = 1 - \frac{Tapped\ volume\ x100}{Bulk\ volume}$$

3.7. Carr's index (compressibility index) and Hausner's ratio

This straightforward ratio (Carr's index), which is based on the reduction in powder volume during tapping, can be used to forecast the flowability of powders. The amount of free-flowing powder increases as the number decreases. The value rises in direct proportion to a powder's adhesion and friction characteristics. The following formula was used to get the Hausner's ratio and Carr's index (compressibility index):

Carr's index = $\frac{100 \times (Vo - Vf)}{Vo}$

Hausner's ratio = $\frac{Vo}{Vf}$

Where 'V_0'is the initial volume of the powder taken in the measuring cylinder and 'V_f' is the final volume of powder after tapping.

3.8. Angle of Repose

A heap approach that was previously reported was used to determine it. In a nutshell, the powder was applied to the smooth horizontal surface using a glass funnel from a specific distance, building up a conical-shaped mound of the maximum height. The heap's height and diameter were measured, and the following expression was used to calculate the tangent of theangle.

3.9. Abrasiveness:

It is the determination of powder fineness that, when applied to the teeth's surface, removes attached food particles and preserves the teeth's glossy, smooth surface. It was measured by using a fingertip to massage a predetermined quantity of each powder on a glass slide for 15 minutes, much like when cleaning teeth. Microscopically, the slide's surface was examined, and the scratches left by the powder's rubbing were recorded. The results were randomly reported as positive and negative signals denoting glass slide scratches. The increased abrasiveness was suggested by more encouraging indicators.

3.10. Determination of foaming power

About 5gm of sample was taken in measuring cylinder with sufficient amount of water. Initial volume was noted and then shaken for 10 min. The final volume of foam was noted and calculated by using given formula.

Foaming power = V_1-V_2

V_1 = Volume in ml of foam with water, **V_2** = Initial volume with water

3.11. Antimicrobial evaluation

The common pathogenic bacteria prevalent in the oral cavity, such as Staphylococcus sorbinus[ATCC33478], Staphylococcus salivarius [MTCC 1938], and Lactobacillus acidophilus [MTCC 447], were the focus of the comparative antimicrobial activity investigation of tooth powders. They were purchased from IMTECH in Chandigarh (India). The antibacterial effectiveness of teeth powders was examined using the agar well diffusion method7, and the microorganisms were cultured on Muelleur Hinton agar media. Double-distilled

water was used to dissolve the required quantity of the media, and it was then held at 1210C for 15 minutesbefore autoclaving. The necessary quantity of test microorganism suspension was added to theliquefied medium as an inoculant. At a temperature of 40–500 C, the suspension was added tothe medium, and the infected media was then poured right away into petri plates to a depth of 3–4 mm. Placing the plates on a flat surface was completed after making sure that the media layers were of the same thickness. Following the media's solidification, cork borer was used to create cavities in the media. Zenflox®-OZ tablets (Ofloxacin-200 mg+Ornidazole-500 mg, Pharma Force Lab., Paonta Sahib, H.P.), which are equal to 10 mg of ofloxacin, were dissolved in 500 litres of double-distilled water in order to produce a solution that contained 10 mg of each tooth powder and control. The cavities formed in media that had solidified received a 45 L addition of the dispersion. In order to reduce the impacts of the variation in application timesbetween the test and control teeth powders, the plates were pre-incubated for an hour at room temperature. These inoculation plates were incubated in a B.O.D. incubator for 24 hours at 370 C (NSW-152, New Delhi). The size of the circular inhibitory zones was measured, and the control and tooth powder antimicrobial activities were compared.

4. RESULTS AND DISCUSSION

The prepared herbal toothpowder underwent the above assessment. The average of three replicates was used for all outcomes**.**

4.1. Organoleptic Evaluation:

Different aspects, such as colour, odour, taste, appearance, solubility, and flow, were investigated and the results were given in the table 3.

Table 3. Organoleptic evaluation of Herbal tooth powder.

S.No	Parameters	Observation
1.	Color	Greenish black
2.	Odor	Aromatic
3.	Taste	Aromatic
4.	Appearance	Acceptable
5.	Solubility	Soluble in water
6.	Flow	Good flow

The prepared herbal toothpowder was found to be a greenish black hue in colour, aromatic, acceptable in terms of sight, taste, and odour. Herbal toothpowder is water soluble and has highflow characteristics.

The herbal toothpowder formulation has good stability and has just an 7% drying loss. Dentifrice made from natural ingredients has a pH value of 6, which is compatible and does not cause any oral irritation. Bulk

densities of the prepared tooth powder for untapped and tapped densities are found to be 34.4 and 28.6, respectively, and the difference between these two numbers is 5, indicating a good porosity value.

The herbal toothpowder has good flow properties, as evidenced by the angle of repose value of 27.61.

4.2. Physical Evaluation:

Physical evaluation including Loss on drying (%), pH value, Bulk Untapped density, tapped density, Angle of repose, and Foaming power was done using the recommended procedure andtabulated in the table 4.

Table 4. Physical evaluation of prepared herbal tooth powder

S.No	Parameters	Observation
1.	Loss on drying(%)	7 %
2.	pH (1%W/W)	6
3.	Bulk untapped density(gm/ml)	34.4
4.	Tapped density (gm/ml)	28.6
5.	Angle of repose	27.61
6.	Foaming power	0.6ml

The herbal tooth powder has a 0.6ml foaming capacity. The herbal dentifrice in the current work is better suited for consumer application because consumers currently prefer foamlesstoothpowders.

4.3. Chemical Evaluation:

The developed herbal toothpowder was tested chemically, and the results of the findings wereshown in table 5.

Table 5. Chemical evaluation of prepared herbal tooth powder

S.No	Test	Result
1.	Dragendroff‘s test	Present (+)
2.	Mayer’s test	Present (+)
3.	Lead acetate test	Present (+)
4.	Alkaline reagent test	Present (+)
5.	Fehling’s test	Absent (-)
6.	Molisch’s test	Absent (-)

The prepared herbal toothpowder exhibits the presence of flavonoids and alkaloids, that are responsible for the anti-inflammatory effect, and also lacks carbohydrates, according to theaforementioned chemical analysis.

Conclusion:

Herbal dentifrices aid in preserving excellent oral health by reducing plaque build-up, tissue and gum irritation, tooth damage, and foul breath. Herbal tooth powder can be used to improve

oral hygiene in a reliable, comfortable, and affordable manner. Use of effective and safe dentifrices is mandatory for oral care due to the existence of high vascular tissues, enzymes and mucosal membrane in the oral cavity, that promotes excellent absorption. Considering aforesaid requirements mimusops elengi which is a main ingredient in herbal tooth powder along with other herbs showed synergistic effect as it has been utilized in traditional Ayurvedic medicine for treating toothache, headaches, poisonous cases, oral cavity problems, specificallyloose teeth, diarrhoea, and other chronic diseases. Mineralization of teeth also occurred as calcium and phosphorus present the leaves. Oral hygiene can be maintained in a reliable, safe and inexpensive way by using herbal tooth powder. Hence, the prepared herbal toothpowder can be used to reduce inflammation, plaque formation and foul breath.

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