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FORMULATION AND EVALUATION OF HERBAL TOOTH POWDER

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ABSTRACT

Oral hygiene is an essential component of overall health, with poor practices leading to dental caries, periodontal diseases, and systemic complications. Conventional synthetic dentifrices, though effective, are often associated with undesirable side effects such as irritation and toxicity. Herbal formulations offer a natural, safe, and cost-effective alternative. The present study focused on the formulation and evaluation of a poly-herbal tooth powder using ingredients including Achyranthes aspera, Syzygium aromaticum, Mentha arvensis, Psidium guajava, Cinnamomum tamala, and others, selected for their antimicrobial, anti-inflammatory, astringent, and cleansing properties. The prepared formulation was assessed through organoleptic, physicochemical, rheological, phytochemical, and pharmacological screening. Positive properties like good flowability, acceptable pH, foaming capacity, and mild antibacterial activity against Escherichia coli were found in the results. Phytochemical analysis confirmed the presence of alkaloids, tannins, saponins, flavonoids, and glycosides, contributing to its therapeutic potential. Overall, the herbal tooth powder exhibited promising attributes as a natural dentifrice with potential benefits in maintaining oral hygiene and preventing dental disorders. In order to establish its efficacy for use on a large scale, further optimization and clinical evaluation are suggested.

KEYWORDS: Herbal tooth powder, Oral hygiene, Poly-herbal formulation, Antimicrobial activity.

1. INTRODUCTION

Tooth powder

Herbal tooth powder has been used for centuries, and many people consider it an essential component of any dental hygiene routine. The health of each person is a prized possession. The quality of life is significantly impacted by oral health, which is a crucial component of overall health. A healthy dentition is an essential component of dental health.

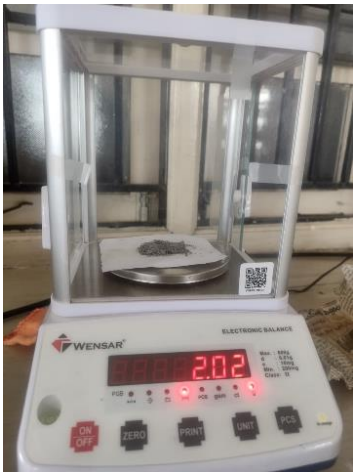
An essential oral hygiene practise, brushing your teeth prevents the build up of oral biofilms that could otherwise result in tooth caries, gingivitis, and periodontal disease. The infection will spread and eventually cause tooth loss if it is not treated. Opportunistic bacteria, which are typically not harmful, make up the mouth's natural flora. This situation's imbalance leads to tooth decay and infection. Tooth decay is caused by the acid-producing bacteria Streptococcus mutants, which ferments carbohydrates. Herbal remedies have been used for a long time, are easier on patients, and are well-liked by the general public. Our only chance for sustainable supply of more affordable medications for the world's expanding population is that medical plants. Environmentally friendly methods are used for the production and processing of medicinal plants and herbal products. In developing nations like India with vast agro-climatic, cultural, and ethnic biodiversity, the availability of medicinal plants is not a problem. There are claims that certain herbal components have amazing beneficial benefits on a range of dental issues, such as by creating a protective layer over teeth, supplying freshness, exerting an antibacterial impact, and reducing dental pain . Herbalism is the practise of using plants and plant-based products for medical purposes. A herbal product can be made from any part of the plant, but the roots, leaves, flowers, bark, and seeds are the most common. Even in the field of dentistry, interest in using products with a herbal base is growing. There are many herbs that have been shown to have an antiseptic effect.

Numerous herbs are being used in India today to clean teeth. It will be crucial to maintain dental health and treat periodontal issues in a more cost-effective and secure manner if herbs are found to reduce plaque. Abrasives like crushed bone, scrambled eggs, and oyster shells were once used to remove dirt from teeth in early attempts at dental cleaning. The first significant development was tooth powders, which contained ingredients like powdered charcoal.

Bark powder and some flavour additives are applied to the teeth with a simple stick. There are often no chemicals, harmful substances, water, preservatives, etc. in tooth powder. It is simple to use, effectively cleans teeth, and promotes dental health. Due to the unpleasant side effects of manmade treatments, researchers are attempting to focus more on herbal medications. The effects of isolated plants and plants are anti-inflammatory, anti-cancer, and immune-boosting. Making tooth powders at home is easy and inexpensive. Different crude medications are added to herbal tooth powders to assist clean the mouth. The physiochemical characteristics of allopathic and herbal powders may depend on the micromeritics of the particles as all of these ingredients are made up of fine particles. Due to greater public knowledge of the poisonous and harmful effects of chemicals, people are becoming more interested in using substances that are natural, and the creation of cosmetics is a result of the long standing usage of herbal treatments. In the past, natural products were used to keep their breath fresh and maintain good oral hygiene. Toothpowder is the most often used method of oral hygiene due to budget considerations as well as the false belief that these locally produced herbal products may be good for dental and gingival health. In order to maintain good oral hygiene and avoid mouth infections, using herbal products is advised. Toothpowder and toothpaste share the same ingredients, but toothpowders don't have any humectants, water, or binding agents. The formulation was assessed in accordance with Indian Herbal Pharmacopoeia standards and WHO recommendations. The main purpose of toothpowder is to clean the available

surfaces. Finding an effective herbal dental care formulation could be a good alternative to using antibiotics to treat oral infection diseases like dental caries because the majority of representative human cariogenic bacteria are moderately resistant to antibiotics.

2. INGREDIENTS USED IN THE FORMULATION



❖ 1. The aspera of Achyranthes

Synonym: Prickly Chaff Flower

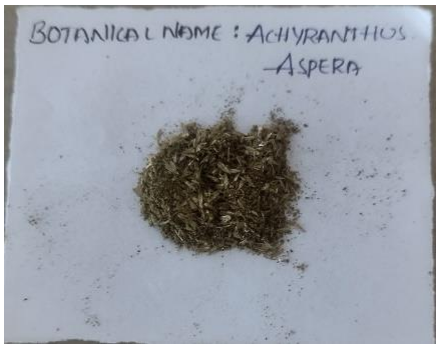
Biological Source: Dried aerial parts of Achyranthes aspera

Family: Amaranthaceae

Part Used: The entire plant, particularly the seeds and leaves

Chemical Constituents: Alkaloids, saponins, flavonoids, ecdysterone, triterpenoids

Uses: Anti-inflammatory, wound healing, toothache relief, laxative, expectorant



❖ 2. Syzygium aromaticum

Synonym: Lavangam

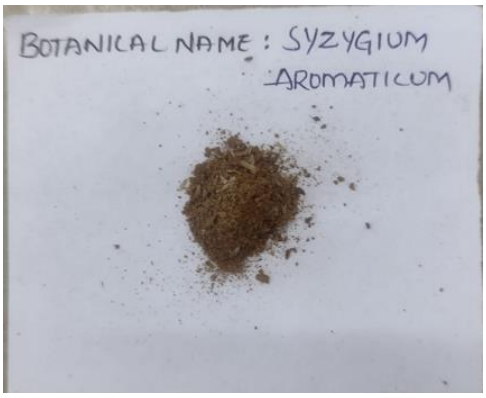
Biological Source: Dried flower buds of Syzygium aromaticum

Family: Myrtaceae

Part Used: Flower buds

Chemical Constituents: Eugenol (main), caryophyllene, eugenol acetate, tannins

Uses: Antiseptic, analgesic, dental pain relief, flavoring agent, antimicrobial



❖ **3. Mentha arvensis / Mentha spicata**

Synonym: Pudina

Biological Source: Leaves of Mentha arvensis / Mentha spicata

Family: Lamiaceae

Part Used: Leaves

Chemical Constituents: Menthol, menthone, flavonoids

❖ **4. Charcoal**

Synonym: Activated Charcoal

Biological Source: Derived from carbon-rich materials (e.g., wood, coconut shell)

Chemical Constituents: Pure carbon (porous form)

Uses: Teeth whitening, toxin adsorbent, gas relief, water purification

❖ **5. Guajava Psidium**

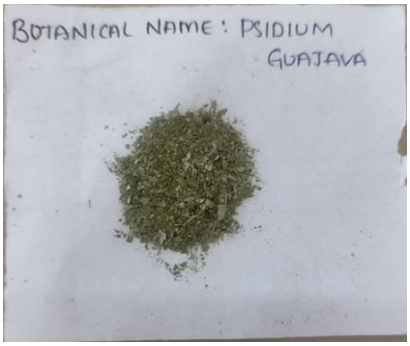
Biological Source: Leaves of Psidium guajava

Family: Myrtaceae

Part Used: Leaves

Chemical Constituents: Flavonoids (quercetin), tannins, saponins, essential oils

Uses: Oral hygiene, antimicrobial, antioxidant, wound healing



❖ **6. Cowdong**

synonum: Gomayya

Biological source: Fecal waste of cow dung

Uses: Mosquito repellent, antiseptic

❖ **7. Salt**

Synonym: Sodium Chloride

Biological Source: Mineral origin

The Chemical Components: NaCl

Uses: Oral rinse, anti-bacterial, osmotic action, mouth ulcer relief

❖ **8. Trachyspermum ammi**

Also known as carom seeds

Biological Source: Dried fruits of Trachyspermum ammi

Family: Apiaceae

Part Used: Seeds (fruits)

Chemical Constituents: Thymol (main), p-cymene, γ-terpinene

❖ **9. Cinnamomum tamala**

Synonym: Tejpatta

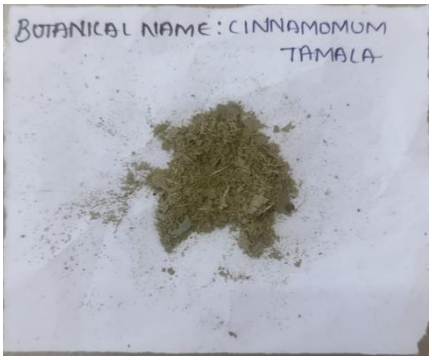
Biological Source: Dried leaves of Cinnamomum tamala

Family: Lauraceae

Part Used: Leaves

Chemical Constituents: Cinnamaldehyde, eugenol, essential oils

Uses: Antiseptic, antioxidant, mouth freshener, flavour



❖ **10. Jethimadh**

Synonym: liquorice

Biological source: roots of glycyrrhiza glabra

Uses: flavouring agent Roots are used in part.

Chemical Constituents: Glycyrrhizin, flavonoids, saponins, liquiritin

Formulation of herbal tooth powder:

Sl. No	Ingredients	Weight	Uses
1.	Aspra	2gm	Laxative
2.	Syzygium	1gm	Antiseptic
3.	Pudina	2gm	Analgesic
4.	Charcoal	1gm	whitening
5.	Guajava	2gm	Hygeine
6.	Cow dung	1gm	Antiseptic
7.	Salt	1gm	Oral rinse
8.	Seeds	1gm	Antiseptic
9.	Tamala	2gm	Flavour
10.	Jethimadh	1gm	Analgesic

PROCEDURE

- Using a handheld mixer, all of the herbal ingredients were dried and ground.
- The powdered herbal materials were sieved through a meshsize.
- Then these powdered ingredients were weighed according to the requirements and used for further formulations.
- In order to physically combine the powder mortar & pastel were used.
- Final formulation was sieved through sieve no44 and was stored in airtight container.

3. Evaluation Parameters

A) ORGANOLEPTIC EVALUATION

The organoleptic characteristics of various sensory characters, such as color, odor, and taste, were meticulously recorded and shown. Organoleptic properties for several sensory aspects, such as colour, aroma, and taste, were carefully noted down as illustrated. Separate analyses of the organoleptic and morphological qualities of the raw medications and powder, such as colour, aroma, texture, and appearance, were performed.

B) RHEOLOGICALEVALUATION

1. Bulk density

The bulk density of the powder is determined by measuring the volume of known mass of powdered sample in graduated cylinder.

Bulk Density:- Weight / Bulk Volume

2. Tapped density

The tapped density is determined by mechanically tapping a graduated cylinder containing the powdered sample.

Tapped Density :- Weight / Tapped Volume

3. Angle of Repose

The angle of repose is determined by fixed funnel method ,in which the containers are filled with a sample and gradually lifted up ,allowing the sample accumulate and form a conical heap on the surface

$$Tan\theta = h/r$$

ANGLE OF REPOSE	FLOW PROPERTIES
>25	Excellent
25-30	Good
30-40	Passable
>40	Very poor

C) PHYSICO-CHEMICAL EVALUATION

1) Determination of pH

Take 10g of tooth powder in 150 ml of beaker. Add 10 ml of freshly boiled and cooled water at 27. stir well to make through suspension determine the pH of suspension within 5 minutes using pH meter.

2) Foaming power

The product was evaluated for foam ability by taking a small amount of preparation with water in measuring Cylinder Initial volume was noted and then shake it for 10 minutes. The final foam value was noted

The foam value is calculated as:V2-V1/V1 ×100

3) Moisture content

Weigh 10g of toothpowder and dried it inovenat105 then it was cooled, the loss of weight is recorded as percentage moisture content and calculated by the given formula.

%Moisture content= (Original sample weight – Dried sample weight)/(Original psample weight) × 100

4) Ash worth: In a silica crucible, accurately weigh about 3 grams of herbal tooth powder. Incinerate the powder drug by gradually increasing the heat until the sample is free of carbon, then cool it. Weigh the ash and determine the percentage of total ash in comparison to the sample that was air dried.

$$\% \text{ Ash value} = \text{Ash Value} / \text{Weight of Sample} \times 100$$

4. RESULTS AND DISCUSSION

1) Organoleptic Evaluation

The prepared poly-herbal toothpowder was discovered to have good texture , nice color and fresh mouth feel after taste.

Prepared herbal toothpowder

Sl. No	Parameters	Result
1	Color	Grey Brown
2	Odour	Characteristic's
3	Taste	Astringent
4	Appearance	Powder
5	Texture	Fine

2) Physicochemical Assessment

The prepared formulation was proved to have good foaming power, sufficient moisture content and suitable ph.

S. No	Parameters	F1	F2	F3
1	PH	6-7	6-7	6-8
2	Foaming Index	-	-	-
3	Ash value	5.45%	6%	6.5%
4	%Moisture content	5% w/w	6% w/w	7% w/w

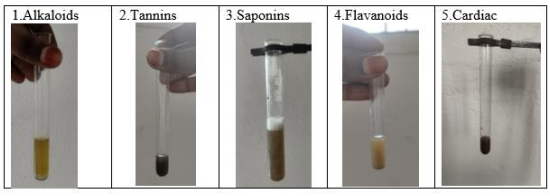
3) Rheological Assessment

The prepared herbal toothpowder had excellent flow ability, compressibility, and flow character, according to the rheological evaluation.

S. No	Parameters	F1	F2	F3
1	Bulk density	0.5 g/ml	0.4	0.7 g/ml
2	Tapped density	0.6 g/ml	0.7	0.5 g/ml
3	Carr's Index	16	18	14
4	Hausner's ratio	1.2	1.4	1.1
5	Angle of repose	28^o	30^o	25^o

4) Phytochemical Analysis

Sl. No	Test	Result
1	Alkaloids	Positive
2	Tannins	Positive
3	Saponins	Positive
4	Flavanoids	Positive
5	Cardiac Glycosides	Positive



5) Pharmacological Screening

Invitro Antibacterial activity

Prepared Aqueous extract of herbal tooth powder formulation was tested for antibacterial potency by agar diffusion method, and it was found that the aqueous extract has mild antibacterial activity against selected strains which was clear from the results (moderate zone of inhibitions were seen around the wells i.e. 5 mm). This study identifies batch F1 as an optimized batch.

5. CONCLUSION

In the current studies, polyhedral tooth powder was created using the best method, and it was evaluated for a number of factors, including organoleptic features, powder characteristics, phytochemical analysis, and pharmacological research. The prepared formulation was observed to have a pleasant mouthfeel, great colour, and good texture after test. The produced compound has effective antibacterial and anti-inflammatory properties. Organoleptic characteristics of the produced formulation were equivalent to those of the commercial product. It was discovered that the produced formulation had adequate oral freshness and good foaming power. According to the findings of the pharmacological screening, the formulation has a mild anti- bacterial.

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