IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 6, May 2025
Impact Factor: 7.67

Formulation and Evaluation of Moringa oleifera-Enriched Herbal Tooth Powder

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Abstract: *The present study focuses on the formulation and evaluation of an herbal tooth powder (tooth powder) using Moringa oleifera leaves powder as the main ingredient, combined with other traditional herbal components including neem, clove, turmeric, liquorice, mint, rock salt, and activated charcoal. Herbal oral care formulations have gained popularity due to their safety, efficacy, and natural therapeutic actions such as antibacterial, anti-inflammatory, and astringent effects. The formulation was prepared using standard procedures and evaluated for organoleptic, physicochemical, and functional parameters including pH, moisture content, water and acid soluble extractive values, spreadability, and abrasiveness. The results showed the formulation had a neutral pH of 7.0, low moisture content (3.6%), acceptable extractive values (water: 8.4%, acid: 2.8%), good spreadability (5.1 cm), and mild abrasiveness. All values were within standard acceptable ranges, confirming the formulation's safety and effectiveness. This study highlights the potential of Moringa oleifera-based tooth powder as a natural, stable, and efficient alternative to chemical-based oral hygiene products.*

Keywords: Herbal tooth powder, Moringa oleifera, Oral hygiene, Physichochemical evaluation, Natural formulation

I. INTRODUCTION

WHO estimates that 80 of the world's population, particularly those living in developing nations, calculate on plantderived specifics for their healthcare, and there's growing interest in traditional drug worldwide.(1) Natural products are secure, affordable, and work as strong backups for the chemotherapeutics now in use, which have negative side goods and increased bacterial resistance. India, a country famed for its ancient medical practises, has long been intrigued by the hunt for indispensable remedial modalities including natural particulars.(2) Maintaining excellent appearance, one's opinion of themselves, and their sense of confidence all depend heavily on oral hygiene. The crown and the root are thetwo introductory factors of a tooth. Enamel, the hardest towel in the tooth, covers the tooth's external face at the tooth's crown. Away from hydroxylapatite, the main constituents of enamel include keratin and water. Dentine is the subcaste of hydroxylapatite that lies beneath the enamel.(3) also, 70 of the collagen water is present. The primary element in dentine is fluorine. Slaver is also present in the mouth, making it easier to swallow food. The primary substance used to slick reflections and maintain an ideal oral terrain is slaver. The lingual, labial, buccal, and palatal glands are the larger and lower bonesThat continuously induce slaver to keep the terrain around the teeth in a dynamic state. Slaver contains inorganic substances similar calcium, chloride, sodium, phosphate, potassium ions, bacteria, enzymes, proteins, and mucin polysaccharide.(4) The three most significant dental problems are math, shrine, and periodontal infections. Math is formed as a result of mineralized deposit, which is substantially brought on by bacterial action. These ails can be treated and averted by brushing daily and using effective toothpastes and tooth mucilages because they're primarily brought on by neglect in acceptable dental care.(5) Dental shrine are sticky flicks that fleeces teeth and may contain bacteria. Dental shrine hardens and becomes hard to remove if it isn't excluded while It's still soft.(6) Tooth damage from dental shrine can affect in tooth decay or tooth loss. A severe goo infection called periodontitis can kill the jawbone in addition to causing goo and bone damage. Although frequent, periodontitis is largely avoidable. Generally, shy dental hygiene is themalefactor. Loss of teeth can affect from periodontitis.(7) Dentifrice can be made using both natural and artificial substances. When opposed to phrasings using synthetic

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constituents, herbal phrasings are now largely demanded and necessary due to their effectiveness in precluding adverse goods. Grounded on their abrasive rates, tooth mucilages and pastes are applied to the teeth and rub against them, helping to remove the minerals and food patches that have been deposited there.(10,11)

The herbal dentifrices come in a variety of forms, including toothpaste, mouthwash, and tooth greasepaint. Because tooth greasepaint and toothpaste contain chemicals with antibacterial and antiseptic parcels and that feel fresh and cool, they're helpful at removing shrine.(12)Myrobalan greasepaint Amla greasepaint, clove greasepaint, cinnamon greasepaint, neem greasepaint, are some of the constituents which were employed in this work to formulate ideal tooth greasepaint which may satisfy all the specified parcels to stay the mouth clean and forestall carries(13). In the current study, A herbal dentifrice was studied using organoleptic, physiochemical, physical, and phytochemical parcels. Tooth greasepaint helps whiten teeth and freshens breath(14)For its superior quality and longer shelf life, herbal tooth greasepaint is well regarded. A tooth- drawing agent comprised nearly entirely of natural accoutrements is known as herbal tooth greasepaint(15).

The primary thing of this invention is to produce a expression that may be used to replace the disadvantages of earlier tooth mucilages with a natural herbal tooth greasepaint. Another thing is to produce a high- quality tooth greasepaint that, when applied constantly, can effectively shield teeth against toxin, toxic residue, and inflammation. It should not leave stains on teeth or fritters after use, have a nice odour, and meet ornamental norms. A demand of the expression would be to fade teeth by removing stains. a expression with natural sweet and medicinal sauces that are safe, biodegradable, and have veritably low mammalian toxin is yet another thing of the current invention. These sauces are helpful for epoxies and teeth.(16) The aim of this study is to formulate and evaluate moringa oleifera enriched herbal toothpowder.

II. DRUG EXCIPIENT PROFILE

1 Moringa Leaf Powder

Fig. 1.1: Moringa

Common Name: Moringa, Drumstick tree
Scientific Name: Moringa oleifera
Family: Moringaceae
Parts Used: Leaves
Role: Antioxidant, anti-inflammatory, antimicrobial
Therapeutic Use: Supports oral hygiene, reduces gum inflammation

2. Turmeric Powder
Common Name: Turmeric
Scientific Name: Curcuma longa
Family: Zingiberaceae
Parts Used: Rhizome
Role: Antibacterial, anti-inflammatory
Therapeutic Use: Reduces oral bacteria, aids in treating gingivitis and periodontitis

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Fig.1.2: Turmeric

3. Clove Powder

Fig.1.3: Clove

Common Name: Clove
Scientific Name: Syzygiumaromaticum
Family: Myrtaceae
Parts Used: Dried flower buds
Role: Analgesic, antiseptic, antibacterial
Therapeutic Use: Relieves toothache, treats oral infections

4. Neem Powder

Fig.1.4: Neem

Common Name: Neem
Scientific Name: Azadirachtaindica
Family: Meliaceae
Parts Used: Leaves, bark, twigs
Role: Antibacterial, antifungal, anti-inflammatory
Therapeutic Use: Prevents plaque, treats gum disease

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5. Liquorice Root Powder

Fig.1.5: Liquorice

Common Name: Liquorice, Mulethi
Scientific Name: Glycyrrhiza glabra
Family: Fabaceae
Parts Used: Root
Role: Antimicrobial, anti-inflammatory
Therapeutic Use: Soothes sore gums, prevents cavities

6. MintCrystals

Fig.1.6: Mint

Common Name: Mint
Scientific Name: Mentha spp.
Family: Lamiaceae
Parts Used: Leaves
Role: Antibacterial, cooling, refreshing
Therapeutic Use: Freshens breath, supports oral hygiene

7. Rock Salt

Fig.1.7: Rock Salt

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Common Name: Rock Salt, SendhaNamak
Scientific Name: Halite (mineral form of sodium chloride)
Family: Mineral (not a plant)
Parts Used: Crystals
Role: Mild antiseptic, cleansing
Therapeutic Use: Helps reduce oral bacteria, soothes gums

8. Activated Charcoal Powder

Fig.1.8: Activated Charcoal

Common Name: Activated Charcoal
Scientific Name: Activated Carbon
Family: Inorganic substance
Parts Used: Processed charcoal from coconut shells, wood, etc.
Role: Adsorbent, detoxifying agent
Therapeutic Use: Removes stains, absorbs toxins and plaque from teeth.

III. METHODOLOGY

Moringa leaves, powder neem powder, clove powder, rock salt, turmeric powder, licorice powder, mint powder,activated charcoal etc are collected from local drug store named **wagdoleayurvedics, satara** for the preparation of herbal tooth powder.

Sr. No.	Ingredients	Quantity for 200 gm Batch
1.	Moringa Leaves Powder	99.0 gm
2.	Neem Powder	39.6 gm
3.	Clove Powder	19.8 gm
4.	Turmeric Powder	9.9 gm
5.	LicoricePowder	9.9 gm
6.	Mint Powder	9.9 gm
7.	Rock Salt	9.9 gm
8.	Activated Charcoal	2 gm
Total		200 gm

Table No. 1.Proportion of herbal tooth powder with quantities

Method of preparation of herbal tooth powder:-

Firstly, we collect and clean the ingredients by ensuring all the raw materials arepure, dryandfree from contaminants.

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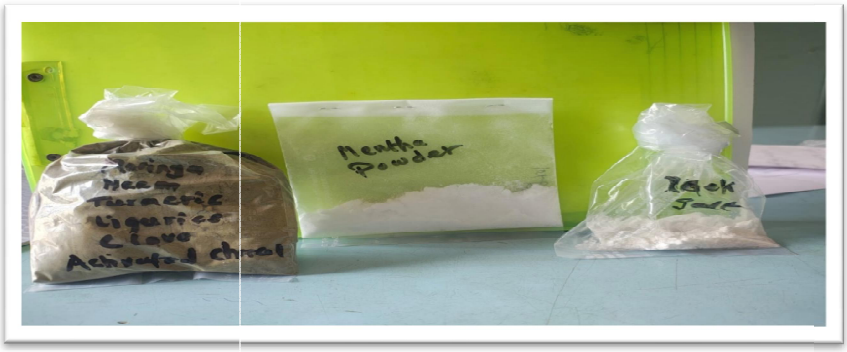

Fig.2.1: Collection of ingredient

Then to sift each ingredient through and 80-100 mesh sieve to achieve a fine texture

Fig.2.2: Sifting

Next to weigh the ingredients accurately using a digital weighing balance to maintain the exact rrequired quantities.

Fig.2.3: Weighing

After weighing, proceeding to mix the ingredients. nowtake a stainless steel/glass mixing bowl, add the moringa powder first, and then gradually add each ingredient. to mix them thoroughly for 15 minutes to ensure even distribution.

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Fig.2.4: Mixing

And finally packingof prepared churna into suitable HDPE containers.

Fig.2.5: Packing

IV. EVALUATION OF HARBAL DANTA MANJAN

The prepared herbal tooth powder was evaluated for its various parameters such as organoleptic evaluation, patch test, physicochemical evaluation.

ORGANOLEPTIC EVALUATION :-

Organoleptic properties for several sensory aspects, such as colour, aroma, and taste, were carefully noted down as illustrated. Separate analyses of the organoleptic and . Pysicochemical properties powder, such as colour, aroma, texture, and appearance, were performed.

Colour

The prepared tooth powder was evaluated for its colour. The colour was checked visually by naked eye.

Odour

Odour was checked by smelling the product.

Taste

Taste was manually checked by tasting the product.

Texture

Texture was evaluated in relation to product quality.

Appearance

The appearance was visually evaluated

PHYSICO- CHEMICAL EVALUATION:-

Determination of pH (1% Solution)

1 g of the herbal tooth powderpowder was dissolved in 100 ml of distilled water. The pH of the 1% solution was measured using a Ph paper.

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Determination of Moisture Content (Loss on Drying)

About 2–5 g of the sample was weighed and dried in a hot air oven at 105°C until constant weight was achieved. The loss in weight was calculated as percentage moisture content by using the formula:

$$\text{Moisture content (\%)} = \left(\frac{Initial\ Weight - Final\ Weight}{Initial\ Weight} \times 100\right)$$

Determination of WaterSoluble Extractive Value

5 g of the herbal tooth powderpowder was macerated with 100 ml of distilled water for 24 hours with occasional shaking. The mixture was filtered. 25 ml of the filtrate was evaporated to dryness, and the residue was weighed. The percentage of water soluble extractive value was calculated by the given formula:

$$\text{Water Soluble Extractive (\%)} = \left(\frac{Weight\ of\ residue \times 100}{Weight\ of\ sample}\right)$$

Determination of Acid Soluble Extractive Value

5 g of the herbal tooth powderpowder was macerated with 100 ml of 0.25 N HCl for 24 hours with occasional shaking. The mixture was filtered. 25 ml of the filtrate was evaporated to dryness, and the residue was weighed. The percentage of acid soluble extractive value was calculated by the given formula:

$$\text{Acid Soluble Extractive (\%)} = \left(\frac{Weight\ of\ residue \times 100}{Weight\ of\ sample}\right)$$

Determination of Spreadability

About 0.6 g of sample was weighed and placed at the center of the glass slide and another glass slide was placed over it carefully. To prevent sliding, a 1.13 kg weight was positioned in the middle of the plate above the glass slide. After 30 minutes, the sample diameter (in centimeter) was measured.

Determination of Abrasiveness

The fineness of the powder was measured using the abrasiveness parameter. A fingertip was used to quantify, 1g of sample and rub it on a glass slide for 15 minutes. It was noted that the slide's surface had scratches. The findings were arbitrarily expressed as "positive" and "negative" indicators in order to show the scratches on the glass slide. More positive signs indicated abrasiveness that was greater.

V. RESULTS AND DISCUSSIONS

EVALUATION OF HERBAL TOOTH POWDER

The prepared herbal tooth powderwas subjected to under mentioned evaluation.

ORGANOLEPTIC EVALUATION

Distinct parameters were studied such as: Color, Odour, Taste, Texture and Appearance.

Colour

The colour of the formulated and evaluated herbal tooth tooth powderis showngreen.

Odour

The formulated tooth powder is pleasant odour because in this study prefered using menthol crystals which act as flavouring and Freshening agent.

Test

The prepared tooth powder is of astringent taste. As the Moringa leaves are used so it testes astringent.

Texture

The texture of the is fine and smooth.

Appearance

Appearance of the product is powdered form. And also the acceptable appearance was observed.

Parameters	Result
Color	Green
Odour	Pleasant
Taste	Astringent

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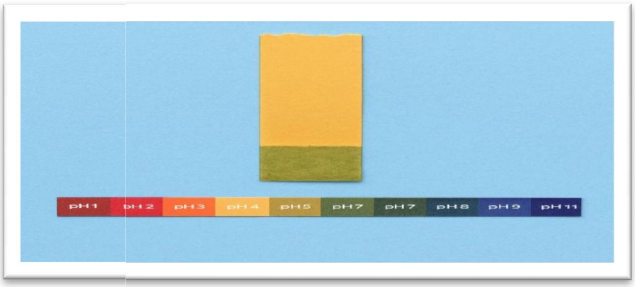
Texture	Fine
Apperance	Powder

Table 2: Organoleptic Evaluation

PHYSICO-CHEMICAL EVALUATION

Determination of pH The pH of the formulation was found to be 7 according to the standards.As the standard value ranges between 6.5 to 8 so the ph found is said to be in standards.

Fig.3.1: Determination of pH



Moisture Content (loss on drying)

The moisture content was 3.6%, which is well below the acceptable limit of 8%. This low moisture content indicates good stability and reduced microbial risk.

Water Soluble Extractive Value

The extractive value in water was8.4%, suggesting a high content of water-soluble active constituents. This implies potential effectiveness in oral cleansing and therapeutic action.

Acid Soluble Extractive Value

The acid soluble extractive value was 2.8%, which is within the permissible limit, indicating the presence of safe acid-soluble minerals.

. **Fig.3.2: Electric Shaker (orbital)**

FUNCTIONAL TESTS

Spreadability

The spreadability was found to be 5.1 cm, which falls within the optimal range (4–6 cm). This indicates good application quality and uniform coverage when used.

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Fig.3.3: Sample

Fig.3.4 Spreadable

Abrasiveness

The abrasiveness was found to be mild, with no visible scratches on the glass slide. This indicates that the powder is safe for regular use and does not damage the tooth enamel.

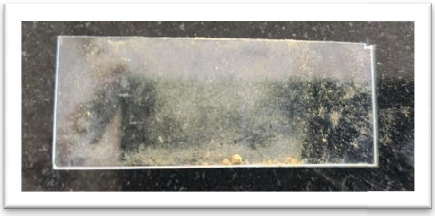

Fig.3.5: Rubbed Sample Slide

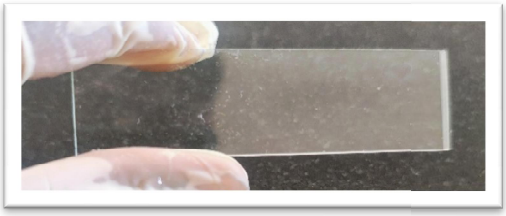

Fig.3.6: Scratches on slide

Sr. No.	Parameter	Observation/ Result	Standard /Expected Value
1.	pH (1% Solution)	7.0 (Neutral)	6.5 – 8.0
2.	Moisture Content (%)	3.6 %	Not More Than 8 %
3.	Water Soluble Extractive (%)	8.4 %	NLT 5 %
4.	Acid Soluble Extractive (%)	2.8 %	NMT 5 %
5.	Spreadability (cm)	5.1 cm	4 – 6 cm
6.	Abresiveness	Mild(No Scratches)	Should not Damege Enamel

Table No. 4. Physicochemical and Functional Evaluation of Herbal Tooth powder

Comparative Analysis

The results obtained from the evaluation of the herbal tooth powder formulation were compared to standard expectations, and it was found that all parameters were within acceptable and desirable limits. This indicates that the formulated product is safe, stable, and effective for maintaining oral hygiene.

V. CONCLUSION

The herbal tooth powder formulated using Moringa oleifera leaves powder and other traditional ingredients demonstrated desirable organoleptic, physicochemical, and functional properties. The pH of the formulation was neutral (7.0), ensuring compatibility with the oral environment. The low moisture content (3.6%) enhances shelf-life and minimizes microbial risk. Both water soluble (8.4%) and acid soluble (2.8%) extractive values were within standard limits, indicating the presence of effective active constituents. The spreadability and abrasiveness results confirmed that the formulation is easy to apply and safe for regular use without damaging tooth enamel. Overall, the developed herbal tooth powder is effective, natural, and safe for maintaining oral hygiene and serves as a potential alternative to synthetic commercial tooth powders.

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