

“FORMULATION AND EVALUATION OF HERBAL TOOTHPASTE USING MORINGA POWDER AND TULSI EXTRACT FOR ORAL CARE”

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Abstract:

Herbal toothpaste has gained attention by the performance of the herbal ingredients which contains favourable safety profile and multi action on oral care. The present study was carried out to formulate and evaluate an herbal toothpaste containing moringa oleifera and tulsi (*Ocimum sanctum*) extract for maintain oral hygiene. Toothpaste is an important oral care product used to remove dental plaque, food derbis and control microorganisms. Herbal plants such as moringa and tulsi possess potential antibacterial, antimicrobial, anti-inflammatory and antioxidants properties. Fresh moringa and tulsi leaves were collected, washed, shade dried and powdered. The plant materials were extracted using suitable hydroalcoholic solvents, followed by filtration and concentration below 50°C. The prepared extracts were incorporated into toothpaste formulations along with calcium carbonate, glycerine, sodium lauryl sulphate, gum tragacanth, methyl paraben, sodium saccharin, peppermint oil and distilled water. The formulations were intended to provide cleansing, antimicrobial and refreshing effects. The study indicates that moringa and tulsi extracts have potential for incorporation into herbal toothpaste. Further evaluation of antimicrobial activity, stability, safety and clinical effectiveness is recommended to establish the suitability of the formulation for oral health care.

KEY WORDS: Herbal toothpaste; Moringa oleifera; Tulsi; Antimicrobial activity; Oral hygiene; toothpaste formulation.

INTRODUCTION:

Toothpaste is defined as a dentifrice in the form of a smooth, semisolid, homogeneous mass containing acceptable ingredients such as abrasives/polishing agents, surface active agents, humectants, binding agent, and other appropriate substance for oral health maintenance.

The product can be opaque, transparent or combination thereof coloured or white, packed in a suitable container from which it can be extruded in the form of a continuous mass. Toothpaste is a mass or gel dentifrice used with a toothbrush as necessary to clean and maintain the aesthetics and health of teeth.

Toothpaste is used to promote oral hygiene it serves as a abrasive that aids in removing dental plaque and food from the teeth, assists in suppressing halitosis, and deliver active ingredients to health prevent tooth and gum disease.

Dentin hypersensitivity is a major health care problem affecting both younger and older populations. It is characterized by a short, sharp pain of unexplained reason that might occur in response to chemical or mechanical factors. In older populations dentin hypersensitivity can be associated with root exposure especially after periodontal treatment.

PLANT PROFILE

➤ **Moringa oliefera:**

Moringa (*moringa oliefera*) are used as traditional and medicinal plant. Moringa plant is a natural gift for several issues arises by microorganisms. Moringa plant is also called as “the miracle tree” because each part of moringa plant like plant from leaves, bark, seeds, fruits, root are used by the human in their daily life.

Moringa belongs to the family of Moringaceae. Moringa is fast growing soft wood tree which reach about 12cm in height. This plant can grow in both dry and moist conditions. Flower and fruits of the *moringa oliefera* originates twice in a year.



Figure No: 01 Moringa oliefera

This herbal plant is known to horse radish, drumstick, moringa are the nicknames for *moringa oliefera* called in several names. The leaves of moringa are usually used for food, traditional medicine and traditional ritual ingredients. One of the treatments used by leaves is jaundice.

This moringa leaf contains more vitamin A, calcium, iron, vitamin C and more potassium. Moringa leaves and seeds has both anti-bacterial, anti-inflammatory and anti-fungal activity against the dental caries which also protect against diabetes.

➤ **Tulsi:**

It is a holy plant that has both medicinal and spiritual properties. In ayurveda, it is known by different names such as “Mother Medicine of Nature” and “The Queen of Herbs”. Tulsi is beneficial in relieving cough and cold symptoms due to its antimicrobial, anti-inflammatory, antitussive and anti-allergic properties.

Taking a few leaves of Tulsi along with honey helps relieve cough and flu as it improves immune health. Taking Tulsi tea daily has a calming effect and helps reduce stress. According to ayurveda, tulsi helps reduce asthmatic symptoms due to its kapha-balancing property.

Tulsi is also useful in managing ringworm infection. Applying a paste of tulsi leaves on the affected area helps prevent infection and relieves inflammation as well as pain.

- **Common name:** Tulsi, holly basil
- **Botanical name:** *Ocimum sanctum*
- **Family:** Liliaceae
- **Plant type:** Perennial shrub, aromatic
- **Leaves:** Green or purple depending on the variety oval with slightly toothed, margins
- **Flower:** Small purple or white arranged in terminal spikes

Phytochemical constituents

Tulsi contains a range of biological active compounds.

- **Essential oils:** Eugenol, methyl eugenol, caryophyllene, linalool
- **Flavonoids:** Apigenin, luteolin, orientin, vicenin
- **Phenolics:** Orosmarinic acid, caffeic acid
- **Triterpenoids:** Ursolic acid, oleanolic acid

These compounds contribute to its antimicrobial, anti-inflammatory, antioxidant, and adaptogenic properties.

Pharmacological properties

Tulsi has a wide spectrum of therapeutic activities.

- **Antioxidant:** Neutralizes free radicals
- **Anti-inflammatory:** Reduces inflammation
- **Antimicrobial:** Active against bacteria, fungi, viruses
- **Immunomodulatory:** Protects the liver



Figure No:02 Tulsi

MATERIALS AND METHODS

➤ Materials

1. Raw material

- Tulsi extract
- Moringa oliefera

2. Excipients

- Calcium carbonate
- Glycerine
- Sodium lauryl sulphate
- Gum tragacanth
- Methyl paraben
- Sodium saccharin
- Peppermint oil
- Distilled water

➤ Methods

❖ Preparation of plant extract

Collection

- Collect fresh moringa and tulsi leaves.
- Wash thoroughly with distilled water
- Shade dry for 7-10 days
- Grind into coarse powder

❖ Extraction of moringa oliefera:

Soxhlet method:

1. Weigh 25g of dried leaf powder.
2. Add to 200ml of 50% ethanol.

3. Keep for 36 hours with occasional shaking.
4. Filter through Whatman No.1 filter paper.
5. Concentrate the filtrate using a rotary evaporator or water bath at temperatures below 50° C.
6. Store the extract at 4° C until use.

❖ **Extraction of tulsi:**

Soxhlet method:

1. Weigh 50g of dried leaf powder.
2. Add to 250ml of 70% ethanol (or distilled water for aqueous extraction).
3. Keep for 24-48 hours with occasional shaking.
4. Filter through Whatman No. 1 filter paper.
5. Concentration the filtrate using a rotary evaporator or water bath at temperature below 50° C.
6. Store the extract at 4° C until use.

PREFORMULATION TEST:

TEST	MORINGA POWDER			TULSI		
Seive	80#	100#	120#	80#	100#	120#
Bulk density	0.28	0.30	0.33	0.34	0.36	0.38
Tapped density	0.36	0.39	0.40	0.41	0.45	0.44
Carr's index	22	22	17	0.17	18	15
Hausner's ratio	1.28	1.30	1.21	1.12	1.22	1.18
Angle of repose	34	32	29	29	31	27
Solubility	Soluble in water			Soluble in water		

FORMULATION OF TOOTHPASTE:

Formulation of 3 batches of toothpaste is done by using formulation table

S.NO	INGREDIENTS	BATCH A	BATCH B	BATCH C	MEDICINAL USES
1.	Moringa	2.4g	1.98g	3.0g	Anti-bacterial
2.	Tulsi	3.6g	1.02g	1.5g	Anti-microbial
3.	Calcium carbonate	13.5g	13.5g	12g	Abrasive
4.	Glycerine	3.0g	6.0g	3.0g	Humectant
5.	Sodium lauryl sulphate	0.9g	0.9g	0.9g	Detergent and Foaming Agent
6.	Gum tragacanth	0.45g	1.2g	0.3g	Binding agent
7.	Methyl paraben	0.15g	0.3g	0.15g	Preservatives
8.	Sodium saccharine	0.09g	0.9g	0.06g	Sweetening agent
9.	Peppermint oil	q. s	q. s	q. s	Flavouring agent
10.	Distilled water	q. s	q. s	q. s	Diluent

METHOD OF PREPARATION:

- Weigh the required ingredient of moringa leaf powder and tulsi extract as per the formulation table.
- Mix gum tragacanth with distilled water in mortar and pestle to form a smooth gel.
- Add glycerine and sodium saccharine slowly with continuous stirring.
- Gradually incorporate calcium carbonate until a smooth paste forms.
- Addition of moringa powder and tulsi extract while mixing uniformly.
- Add sodium lauryl sulphate slowly to avoid excessive foaming.
- Add methyl paraben and peppermint oil.
- Mix thoroughly until a homogeneous toothpaste is obtained.
- Fill into collapsible empty toothpaste tubes and seal.

EVALUATION TEST:

1. Organoleptic evaluation:

The herbal toothpaste was visually inspected for the appearance, taste, odour, texture, and colour.

2. pH Determination:

Collect the toothpaste in a clean and dry beaker and rinse the electrode with distilled water and wipe with tissue paper. Then calibrate the electrode with standard acidic and alkali buffer solutions. Immerse the electrode in the sample to ensure that electrode bulb is immersed in the sample and record the pH value.

3. Homogeneity:

The homogeneity of herbal toothpaste was inspected by a sample is extruded from its tube using normal finger or mechanical force at a room temperature 27°C. A homogeneous toothpaste must extrude a smooth, uniform mass free from lumps, hard aggregates, or phase separation.

4. Foamability:

The foamability of herbal toothpaste was inspected by 2g of sample mixed with 5ml of water in a measuring cylinder. The initial volume is recorded, the cylinder is shaken a set number of times, and the final foam volume or height is measured to determine foaming capacity.

5. Spreadability:

The spreadability of herbal toothpaste is evaluated by measuring how easily and widely a fixed sample spreads under a specified load between two glass slides.

6. Abrasiveness:

Evaluations of herbal toothpaste abrasiveness show that many herbal and traditional formulation exhibit higher surface enamel or dentin roughness than standard non-herbal toothpaste.

7. Moisture content:

The evaluated moisture content of herbal toothpaste typically ranges from 7.1 to 7.5 by weight.

RESULT AND CONCLUSION:

TEST		BATCH A	BATCH B	BATCH C
Organoleptic test	Colour	Dark green	Greenish brown	Light green
	Odour	Strong herbal aroma	Fresh mint aroma	Mild herbal aroma
	Taste	Highly bitter	Mild bitter	Slightly bitter
	Texture	Smooth	Smooth	Smooth
	Appearance	Even, no lump	Uniform, glossy paste	Homogenous paste
pH		6.8	7.4	6.43
Foamability test (cm)		3.0	2.5	3.3
Spreadability test (cm)		4.8	4.2	4.5
Abrasiveness test(μm)		28	23	25
Moisture content test (%)		7.4	7.2	7.3

CONCLUSION:

The present study was conducted to formulate and evaluate a herbal toothpaste containing *Moringa oleifera* and *Tulsi* (*Ocimum sanctum*) leaf extracts. Both plants possess potential antibacterial, antimicrobial, anti-inflammatory and antioxidant properties that may support oral hygiene. Three formulations, Batch A, Batch B and Batch C, were prepared using suitable pharmaceutical excipients and evaluated for organoleptic properties, pH, homogeneity, foamability, spreadability, abrasiveness and moisture content. All formulations showed smooth texture, uniform appearance and acceptable physical characteristics. The pH values ranged from 6.43 to 7.40, while foamability, spreadability, abrasiveness and moisture content were within satisfactory ranges. Among the three batches, Batch B showed the most favourable overall properties, particularly lower abrasiveness and acceptable pH and moisture content. Hence, *Moringa* and *Tulsi* may be promising herbal ingredients for toothpaste formulation. Further microbial, stability and safety studies are recommended.

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