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Formulation and Evaluation of Mimosa Pudica Incorporated Toothpaste

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ABSTARCT: Mimosa pudica known for its medical qualities, it has potential for use in toothpaste and other dental care products. Alkaloids, flavonoids, and tannins represent a few of its bioactive substances that have antibacterial, anti-inflammatory, and antioxidant properties that may help to improve dental health. According to studies, it may lessen plaque, dangerous germs, and gum inflammation, hence preventing gum disease and cavities. This study looks at the advantages of Mimosa pudica toothpaste, including its function in boosting gum health and fresh breath, as well as its safety and effectiveness when compared to conventional alternatives. Although further research is required to validate its broad usage, it provides a natural substitute for traditional toothpaste with fewer adverse effects.

I. INTRODUCTION

Cosmetics known in everyday language as makeup includes products which help to enhance the beauty of the human body. Youth in particular use such products. In accordance with The Drug and Cosmetics Act of 1940 and the USFDA, cosmetics are supposed to be applied externally with the intention of enhancing beauty and are not to affect the structure or the function of the human body. They range from skin and body care to scent, which is a common attribute shared by many societies. Cosmetics are, more often than not, chemical products derived from plants or man-made materials and their application physically makes one beautiful or healthier since they moisturize skin and leave active ingredients on the skin. Today, modern cosmetics are manufactured in controlled conditions and only those that are safe and effective are released into the market.

HERBAL TOOTHPASTE

DEFINITION

Toothpaste is a paste or gel dentifrice used with a toothbrush to clean and maintain the aesthetics and health of teeth. Toothpaste is used to promote oral hygiene. It is an abrasive that aids in removing dental plaque delivers active ingredients and it help to prevent tooth decay, dental caries and gum disease. Large amounts of swallowed toothpaste can be poisonous. Common colours for toothpaste include white (sometimes with coloured stripes or green tint) and blue.

MIMOSA PUDICA

Mimosa pudica Linn. (Family: Mimosaceae) is grown as an ornamental plant owing to its thigmonastic and nyctinastic movements. Mimosa pudica is also employed in the avoidance or cure of regarding several disorders like dental problems, cancer, diabetes, hepatitis, obesity, and urinary infections. There are anticancer alkaloids mimosine and other numerous phytochemicals; such as tannins, steroids, flavonoids, triterpenes, and glycosyl flavones, that are chemical substances of mimosa pudica. Various therapeutic activities such as antioxidant, antibacterial, antifungal, and anti- inflammatory amongst others have been associated with different parts of Mimosa pudica. Glucuronoxylan polysaccharide extruded from seeds of Mimosa pudica is used for drug delivery systems because of its high swelling index. This review presents a critical bioactive constituents of the plant with a view to its pharmaceutical and herbal purposes.

Wound healing activity: Based on the findings, the Mimosa pudica shoot methanolic extract, Mimosa pudica leaf methanolic extract exhibited very good wound healing activity. This activity may be related to the presence of some phenols in the methanolic extract.

Antibacterial Activity: The antimicrobial activity of methanolic extract of Mimosa against and Staphylococcus aureus, Klebsiella pneumonia at different concentration levels was also evaluated. The antibacterial effects of mimosa could be attributed to the presence of bioactive constituents like terpenoids, flavonoids, glycosides, alkaloids,

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quinines, flavonoids, glycosides, alkaloids, quinines, phenols, tannins, saponins and coumarin.

Analgesic and anti-inflammatory activity: Mimosa pudica ethanolic herb extract was evaluated through doses of 200 and 400 mg/kg for anti-inflammatory and analgesic activities. The extract caused significant inhibition of carrageenan induced paw oedema in a manner that is dose dependent. Among the two experimental models of analgesic activity investigated, the greatest anti-nociceptive activity was produced in the acetic acid induced writhing model. This is unlike the tail flick model, where analgesic activity was detectable but less than in the former model. This extract is latently expected to contain flavonoids that may enhance the analgesic and anti-inflammatory properties.

METHOD OF EXTRACTION

Soxhlet Extraction

10g of the dry leaves of Mimosa pudica and 360mL of ethanol 90% (v/v) were added into the round bottom flask. The extraction was conducted at 72 °C for 24hrs. After that, the extract was filtered and evaporated.

Phytochemical Screening

To identify the phytochemical in plant extract chemical tests were carried out.

1. **Test for flavonoids**

- Alkaline reagent test

Two to three drops of sodium hydroxide were added to 2 mL of extract. Initially, a deep yellow colour appeared but it gradually became colourless by adding few drops of dilute HCL, indicating that flavonoids were present.

- Shinoda's test

The test solution of the extracts was dissolved in 95% ethanol. To this, a small piece of magnesium foil metal was added; this was followed by 3-5 drops of the concentrated HCl. The intense cherry red color indicated the presence of flavonoids.

2. **Test For Tannins**

Preparation of 0.1% ferric chloride: To 99.9 ml of distilled water 0.1ml of ferric chloride reagent was added.

- Ferric chloride Test

1 ml of the sample taken and a few drops of 0.1% ferric chloride was added and observed for brownish green or blue, black colouration.

3. **Test For Saponins**

To 1 ml of extract 5 ml of distilled water was added and shaken vigorously. Observed for soaking appearance indicates the presence of saponins.

4. **Test for Alkaloid**

1 ml of sample was taken to that few drops of Dragandorff reagent was added and observed for orange red colour.

5. **Test for Steroids**

1 ml of the filtrate was taken to that 10% concentration H_2SO_4 was added and observed for green colour.

6. **Test for Anthraquinones**

1 ml of sample was taken to that aqueous ammonia (shaking) was added and observed for change in colour of aqueous layer (Pink, Red or Violet)

FORMULATION OF HERBAL TOOTHPASTE

INGREDIENTS	QUANTITY(gm)	CATEGORY
Mimosa pudica extract	1.0 ml	Antibacterial agent
Clove	0.5	Flavor, dental analgesic
Calcium carbonate	12.5	Abrasive
Glycerin	2.5 ml	Humectant

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Tragacanth gum	0.25	Anti inflammatory
Sodium lauryl sulfate	0.5	Surfactant
Sodium chloride	0.25	Abrasive
Sorbitol	0.25	Humectant
Neem powder	0.5	Anti bacterial, preservative
Carboxy methyl cellulose	0.25	Thickening agent
Distilled water	10 – 20 ml	Vehicle

PROCEDURE

- The herbal toothpaste was made using all of the above mentioned ingredients.
- Weight all the ingredients accurately.
- Intially add mimosa pudica extract to the motar. Then calcium carbonate, sorbitol, and sodium lauryl sulphate are added and triturate well.
- To that mixture, add carboxymethyl cellulose, tragacanth gum, and glycerine are combined thoroughly.
- Sodium chloride andneem powder are then added to the previously mentioned combination. Powdered clove is added as a flavouring agent.
- Then, distilled water is added to the powder mixture to make it into a paste, and the trituration continues until a thick paste is produced.

EVALUATION OF TOOTHPASTE

1. Organoleptic evaluation

- Colour – This was observed using the naked eye.
- Odor – An odour was detected through smelling.
- Taste – The formulation was tasted manually in order to check its flavour.

2. Abrasiveness

Expel the material onto butter paper till about 15 to 20 cm sticks are formed. This is the procedure for making about ten to eleven collapsible tubes with the rest of them. Any search for sharp particles or hard edged particles through fingertip pressure that run along the length of the object should yield negative results. Such particles are not acceptable in a toothpaste formulation.

3. Appearance

The formulated toothpaste and marketed toothpaste were subjected to detect any change in the appearance of the toothpaste as a result of storage for a long time.

4. pH

A pH meter was used to ascertain the pH of the herbal toothpaste that had been formulated. A portion of the toothpaste (1g) was introduced into a 100ml beaker. Distilled water in the amount of 10ml was allowed. A mixture was prepared after vigorous stirring.

5. Homogeneity

The formulations for the lab scale and the marketed formulations yield a similar consistency in cream. This was verified by visual inspection and by touch.

6. Foamability

The foamability of formulated toothpaste is measured by sealing a water and sample mixture measuring 30 millilitres in a graduated cylinder. The film's base state is recorded. The film is then shaken 10 times. Volume of foam produced after shaking the container and adhering on walls.

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7. Moisture determination and volatile matter

5 gms of the formulation was introduced into the porcelain dish and placed in a hot air oven set at a temperature of 105 degrees Celsius to dry the specimen.

% by mass = (M1/M)100
M1 = g loss of mass on drying
M = Mass g of material grain taken for the test.

8. Extrudability

In the preparation of solid dosage form, the paste was put in to collapsible aluminum tubes with standard diameter and length,. The tubes were weighed before the paste was put inside. The tubes were sandwiched between two glass plates. 500g was then put on the top of the slides and cap removed the cap.Support for the extruded mass was cut and its weight measured. Percentage of extrusive paste was measured in weight which had the pieced of extruded mass.

9. Spreadability

The characteristics of slip and a drag of a paste are involved in this method. A completely spreadable paste (2g weight) is allowed to be spread on the bottom surface of the slide being tested. Dispersions are applied in this form when a slide is placed over a glass microscope slide.

S = M x L/T
S= Spreadability
M= Weight in the pan
L= Length moved by the glass slide
T= Time(sec) taken to separate the upper slide

13. Determination Of Microbial Content

5gm of cream was dissolved in nutrient agar culture and volume adjusted to 100ml with the same medium. About 10ml of sample was transferred to 100ml of nutrient agar culture broth and incubated for 18-24hrs at 43-45°C. A subculture was prepared on a plate with nutrient agar culture and incubated at 43-45 °C for 18-24hrs. The growth of red, generally non mucoid colonies of gram negative rods appearing as reddish zones indicates the presence of E.coli, if not then it indicates the absence of E.coli.

14. Stability studies

Stability studies of toothpaste are crucial to ensure the product remains safe, effective, and appealing throughout its shelf life.

- Physical Stability: This includes assessing changes in appearance, colour, consistency, and texture of the toothpaste over time. It ensures that the product maintains its intended physical characteristics.
- Real-time Stability Testing: Toothpaste is also stored under normal storage conditions (typically controlled room temperature) for an extended period to monitor changes over time.
- Shelf-life Determination: Based on the results of stability studies, manufacturers establish an expiration date or shelf-life for the toothpaste, indicating how long it can be expected to maintain quality under recommended storage conditions.

II. RESULT AND DISCUSSION

Sl: No	EXPERIMENT	OBERVATION	INFERENCE
1.	**TEST FORFLAVANOID** a) Alkaline reagent test: Two to three drops of sodium hydroxide were added to 2 mL of extract. b) To 1 ml of extract 5 ml of dilute ammonia solution was added, followed by addition of concentrated sulphuric acid along the sides of the tube.	Initially, a deep yellow colourappearedbutitgraduallybecamecolourlessby addingfewdropsofdiluteHCL. Appearance of yellow colouration.	Presence of flavanoid

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			Presence of flavanoid
2.	TEST FOR TANNINS: Preparationof0.1%ferricchloride To99.9mlofdistilledwater,0.1mlofferric chloridereagent wasadded. a) FerricchlorideTest 1ml of sample was taken and 0.1% ferric chloride was added.	brownishgreenor blue, blackcolouration.	Presence of tannins
3.	TEST FOR SAPONINS: FrothingTest To1mlofextract,5mlofdistilledwaterwasadd edandshakenvigorously.	Formationoffoamindicatesthepresenceof saponins.	Presence of saponins
4.	TEST FOR ALKALOIDS: Mayer'sTest 1mlofsamplewastakenandfewdropsof Mayer'sreagent(potassium mercuriciodide)addedtothesideofthetest tubes.	A whitecreamy precipitate.	Presence of alkaloid
5.	TEST FOR STEROIDS: Salkowski Test 1 ml of the filtrate was taken, to that 10% concentrated H2SO4 was added.	Appearance of green colour	Presence of steroid
6.	TEST FOR ANTHARAQUINONES: 1mlofsamplewastakentothataqueousammo nia(shaking)wasadded.	Appearance of colour change in aqueous layer (pink,red or violet).	Presence of anthraquinones

EVALUATION

1. Organoleptic properties
- Colour : Pale green
- Odour : Characteristic
- Taste : Characteristic

2. Abrasiveness – Good

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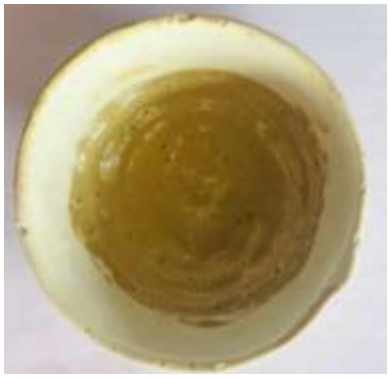

Fig.28

3. pH- 8.9

Fig.29

4. Foamability – Good

Fig. 30

5. Moisture content and volatile matter - 1.8

Fig.31

6. Spreadability – Easily spreadable

Fig.32

7. Tube Extrudability – Good
8. Determination of antibacterial activity

- Klebsiella species: 23
- Staphylococcus aureus: 26

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PACKAGING

- The toothpaste has to be packed in a PVC Collapsible tube, so that it can be easily extracted andspreadon to thebrush.
- Thetubehastobeoffoodgradequalityasthepasteis indirectcontactwiththepackagingmaterial.
- All the brands were packed in PVC collapsible tubes within printed cardboard box for outercovering. The tooth powders, too were packed in adequate PVC bottles. Hence all scored equalpoints.

LABELLING

- Red mark means it contains naturaling redients and chemical ingredients.

DIRECTION FOR USE

Apply just a pea-sized amount of toothpaste to the brush. Rather than moving across your teeth, brush with small circular motions. Hold your brush at a 45° angle while brushing the front of your teeth. Clean insides of your teeth by opening wide and angling your toothbrush toward the gum line.

STORAGE:

- Conditionsforsafestorage:
  Storeatcontrolledroom temperatureat20-25°C.

III. CONCLUSION:

This herbal toothpaste plays an important role in maintaining oral hygiene and avoiding dental caries, and it is also safer and has less negative effects than chemically based synthetic toothpaste. Toothpaste that has been specially formulated is capable of maintaining tooth and oral hygiene and has antibacterial activity against microorganisms such as staphylococcus aureus and klebsiella pneumonia .

Mimosa pudica contains alkaloid, tannins, flavonoids etc , help to prevent tooth problems. Soxhlet extraction method is used for the extraction of mimosa pudica.

Herbal toothpaste was found to be effective toothpastes in terms of all toothpaste evaluation parameters. By expanding natural ingredients for making more and safer natural medicines, the designed herbal toothpaste has a bright future in research and dental care for the public,society, and nation.

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