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Formulation and Evaluation of Polyherbal *Psidium Guajava* Toothpaste

(Guava leaves)

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Abstract

In this study, a toothpaste formulation that is entirely herbal is made. There is a high demand for herbal products these days for the treatment and curing of oral hygiene.

Many people have a variety of oral and dental health issues. There are many diseases and disorders related to teeth, and in order to treat them, dentists prescribe a variety of medications and treatments, some of which are painful and uncomfortable. In fact, for oral and dental hygiene, we use a variety of synthetic toothpastes made with chemical combinations, which can have severe side effects and toxicity. As a result, consumers believe that polyherbal toothpastes are safer, more effective, and less toxic because they contain only natural ingredients that are purely herbal, in addition to synthetic chemicals. This formulation includes herbal products that are some medicinal plants. Guava leaves are the antibacterial, anti- inflammatory and antioxidant that help in toothpaste and other like active ingredient Neem, Tulsi, Clove and some of safe chemical components or excipients like Calcium carbonate, mannitol, sodium lauryl sulphate, Peppermint oil etc. This research the formulation and evaluation parameters like physical characteristics, Foamability, pH, Spreadability, etc.

Dentifrice, sometimes known as toothpastes, are items used to prevent tooth decay and to clean or freshen the mouth. A variety of herbal ingredients were used to make the numerous additional dentifrices made with both synthetic and natural tooth paste. This has cooling, antimicrobial, and antiseptic properties.

Keywords- Anti-cavity, Anti- plaque, Anti-sensitivity, Anti-bacterial, Oral hygiene.

INTRODUCTION

The dental paste for the crown, root enamel, dentine, and pulp to remain healthy, dental plaque must be removed. There are numerous additional issues related to teeth, including dental caries, plaque, oral irritation, bad breath, and tooth decay. such as anti-bacterial, anti-ulcer, anti-caries, wound healing, and numerous other unique qualities like anti-fungal and anti-cancer. Many herbal ingredients are known to have outstanding positive effects on various dental disorders described following guava, neem, tulsi, clove, and other different role through, different mechanism such by enhancing protective coating for teeth, guards against tooth decay, providing fresh scent, improved antibacterial properties, eases dental pain, and less sensitivity. The creation and assessment of herbal toothpaste made from plant leaves is the focus of this work. A dentifrice called toothpaste is used to clean, preserve, and enhance the condition of teeth. In addition to its primary function of encouraging oral hygiene, toothpaste also serves as an abrasive, preventing food particles and dental plaque from adhering to teeth and facilitating their removal. The herbal toothpaste does more than just promote dental health.

Benefits of using toothpaste

1. It helps to reduce dental plaque.
2. It helps to fight against problem like sensitivity of teeth.
3. Help promote healthy teeth and gums.
4. Help maintain natural whiteness of teeth.
5. Long lasting fresh breath.
6. Good abrasive effect.
7. Non-irritant and nontoxic.
8. Impart no stain in tooth.
9. Keep the mouth fresh and clean
10. Prolonged effect.
11. Cheap and easily available.

AIM & OBJECTIVE

Aim: Formulation and evaluation of Polyherbal *Psidium guajava* Toothpaste (Guava leaves)

Objective:

- To formulate toothpaste using guava leaves and other active ingredients (Tulsi, Neem and clove).
- To evaluate herbal toothpaste characterization.

LITERATURE REVIEW

1. Dewangan. y. et.al (2024) This paper is reviewed about **"Formulation and Evaluation of Toothpaste for Sensitivity"** Toothpaste is usually used to clean tooth enamel and mouth. It is also used to solve many gum problems. Many dentists recommend applying toothpaste to treat diseases such as sensitivity, chronic gingivitis, etc toothpastes are used in the treatment of gum disease, bad breath, dry mouth, periodontal damage, and dental caries. To develop a stable and functionally effective toothpaste, eliminating all synthetic additives that are usually included in such Formulation is an important task.

2. Kanoja. A. et.al (2023) This paper is reviewed about **"Formulate and Evaluation Herbal Toothpaste"** Toothpaste is a paste or gel to be used with a toothbrush to maintain and improve oral health and aesthetics. Among these can be compounds to combat dental caries, gum disease, smelly, and dentin hypersensitivity. Furthermore, toothpastes contain abrasives to clean and whiten teeth, flavors for the purpose of breath freshening and dyes for better visual appeal. Effective toothpastes are those that are formulated for maximum bioavailability of their actives.

3. **Senthilkumar. K. et.al (2022)** This paper is reviewed about **"Formulation Development and Evaluation of Novel Herbal Toothpaste from Natural Source"** 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 E. coli. In this exploratory in-vitro study, herbal toothpaste was found to be similarly effective as commercially available toothpastes in terms of all toothpaste evaluation parameters. By expanding natural ingredients for making more and safer natural medicines.

4. **Bhoge. S. et.al (2021)** This paper is reviewed about **"Formulation and Evaluation of New Herbal Toothpaste"** The present formulation has good organoleptic spreading foaming abrasive properly and in vitro antimicrobial properties. It also has the advantage of absence of harmful chemicals & presence of herbal powers with wide spectrum of natural companies beneficial for teeth & oral cavity compared to conventional tooth paste therefore the formulate has future aspect of further insight into such formulate & wide usage.

5. **Yadev. G. et.al (2020)** This paper is reviewed about **" Formulation and Evaluation of Polyherbal Toothpaste"** the toothpaste which are produced by using chemical combinations as this chemicals can cause severe side effects and toxicity, so the consumer believe that polyherbal toothpaste are effective, safe and less toxicity because of use of purely herbal natural ingredients besides the synthetic chemicals, this formulation consist of herbal products which are some medicinal plant like Neem, Tulsi, Clove and some of safe chemical components or excipients like Calcium carbonate, mannitol, sodium lauryl sulphate, Peppermint oil etc.

MATERIALS AND METHODOLOGY

Guava powder:

Fig no. 1.1 Guava powder

Botanical source:

- **Scientific Name:** ***Psidium guajava***
- **Family: Myrtaceae**
- **Common Name:Guava leaves**

Guava leaves numerous bioactive substances with antibacterial, antioxidant, anticancer, and antitumor qualities were found in guava leaves. Guava leaves antibacterial qualities, low cytotoxicity, and exceptional cleaning capacity.

Neem po wder:

Fig no.1.2 Neem powder

Botanical source:

- **Scientific Name:** Azadirachta indica
- **Family:** Mahogany
- **Common Name:** Neem

Neem offers a good remedy for curing mouth ulcers, tooth decay and acts as a pain reliever in teeth pain problems. Neem is a modern medical miracle tree that has been widely utilized in Ayurvedic, Unani, and homeopathic medicine. Inflammation, infections, fever, skin conditions, and dental issues have all been treated with it historically. Each of these has strong antibacterial properties. Rich in antioxidants, neem leaf supports the immune system in the mouth's tissues and gums. Neem is an effective treatment for tooth decay and mouth ulcers. It also relieves toothache pain.

Tulsi powder

Fig no.1.3 Tulsi Powder

Botanical source:

- **Scientific Name:** Ocimum sanctum
- **Family:** Lamiaceae
- **Common Name:** Tulsi

Tulsi 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 (cough-relieving) and anti-allergic properties. Tulsi are on a daily basis has a calming effect and helps reduce stress. According to Ayurveda, Tulsi helps reduce asthmatic symptoms due to its Kapha-balancing property.

Applying a paste of Tulsi leaves on the affected area helps prevent infection and also relieves inflammation as well as pain.

Clove powder

Fig no 1.4 Clove powder

Botanical source:

- **Scientific Name:** Syzygium aromaticum
- **Family:** Myrtaceae

➢ **Common Name:** Clove

Clove includes a substance that keeps your teeth healthy. Cinnamon's flavonoids have anti inflammation properties that can aid with tooth pain and swelling. Additionally, it eases sore gums, particularly in babies who are teething. It makes teeth cleaner. Apart from its delicious flavour, cinnamon powder has great antibacterial properties. The advantages of cinnamon for dental hygiene are well supported by both recent and historical data. It was therefore an obvious choice for a natural toothpaste.

Tragacanth

Fig no. 1.5 Tragacanth

The tragacanth use as a binder in toothpaste.

Calcium carbonate

Fig no. 1.6 Calcium carbonate

That help to abrasive agent in toothpaste.

Mannitol

Fig no. 1.7 Mannitol

Mannitol are sweetener, humectant, bulking agent of toothpaste.

Methyl paraben

Fig no.1.8 Methyl paraben

Methyl paraben are the preservatives use in toothpaste.

Sodium lauryl sulphate

Fig no. 1.9 Sodium lauryl sulphate

The sodium lauryl sulphate helps to toothpaste forming agent and detergent.

Peppermint oil

Fig no.1.10 Peppermint oil

Peppermint oil are flavouring agent, cooling and refreshing taste.

Glycerine

Fig no. 1.11 Glycerine

That are help in glycerine toothpaste humectant.

INGREDIENTS AND THEIR USE:

Sr.no.	Ingredients	Category
1.	Guava powder	Antimicrobial, antioxidant, anticancer, and antitumor
2.	Neem powder	Anti-inflammatory, anti-allergic and dental problems.
3.	Tulsi powder	Anti- bacteria, oral infections and hygiene.
4.	Clove powder	Dental analgesic, Antiseptic
5.	Tragacanth	Binder
6.	Calcium carbonate	Abrasive agent
7.	Mannitol	Sweetener, humectant, bulking agent
8.	Methyl paraben	Preservatives
9.	Sodium lauryl sulphate	Foaming agent and detergent
10.	Peppermint oil	Flavouring agents, cold and refreshing taste
11.	Glycerine	Humectant
12.	Water	Dissolves all ingredients

Table no.1 Ingredients and their uses

FORMLATION AND TABLE

Procedure of formulation

➢ **Dry gum method**

1. Step: All the herbal ingredients are wash and dried

2. Step: Then use electrical grinder all ingredients are fine powder pass throughout the sieve no 80.to maintain the particle size.

3. Step: The required quantity of ingredients was weighed accurately and take mortar and pestle

4. Step: Then firstly add active herbal ingredients.

5. Step: Then solid ingredients calcium carbonate, sodium lauryl sulphate, sodium benzoate, sodium saccharine were weighed accurately.

6. Step: These ingredients were also mixed in a mortar and pestle, then triturated with precisely weighed glycerine and water until a semisolid substance was created.

7. Step: Also herbal ingredients together by uniform mix.

8. Step: At the end, peppermint oil was added as a flavouring agent.

9. Step: Put on container and store in cool and dry place.

FORMULATION TABLE

Sr. no.	Ingredients	Formulation 1	Formulation 2
1.	Guava powder	2 g	4 g
2.	Neem powder	0.5 g	1 g
3.	Tulsi powder	1 g	1 g
4.	Clove powder	1 g	2 g
5.	Tragacanth	0.2 g	0.4 g
6.	Calcium carbonate	5 g	10 g

7.	Mannitol	2.5 g	5 g
8.	Methyl paraben	0.3 g	0.6 g
9.	Sodium lauryl sulphate	0.5 g	1 g
10.	Peppermint oil	0.5 ml	1 ml
11.	Glycerine	2 ml	4 ml
12.	water	Q. S	Q. S

Table no.2 Formulation of toothpaste

RESULT AND DISCUSSION:

EVALUATION PARAMETER FOR TOOTHPASTE

Physical Appearance

The formulated cream was observed for their visual appearance, transparent, colour, consistency, Appearance, colour, Consistency.

Description

A) pH-

Dispense 10 gm of the toothpaste from the container in a 50 mL beaker and add 10 mL of freshly boiled and cooled water (at 27oC) to make 50 percent aqueous suspension. Stir well to make a thorough suspension.

B) Consistency-

The consistency of formulated creams was determined by hands. Take pinch of a cream and rubbed it with fingers.

C) Spreadability-

The spreadability of the formulated cream were determined by 1mg of the cream was sandwiched between 2 slides. A weight of 2kg was placed on upper slide. After 30 mins the diameter of the paste is measured in cm. the experiment is repeated a thrice and average diameter is determined.

D) Foamability-

The foaming power (Foamability) of herbal toothpaste was determined by taking 2g of toothpaste with 5ml water in measuring cylinder initial volume was noted and then shaken for 10 times. Final volume of foam was noted.E

E) **Determination of moisture and volatile matter-**

5g of formulation placed in a porcelain dish and then dried the sample in an oven at 105 C for 30 min and finally, the percentage moisture content was calculated by considered loss of mass on drying to that of the weight of formulation take initially

F) **Anti-microbial Activity:-**

In-vitro anti-bacterial study of formulated paste was performed by disc diffusion method by using Soyabean casein digest medium against a pathogenic bacterial strain E coil. and s. aureus was initially cultured cells were tended to multiple in the agar plates. Initially plates were streaked with inoculum, bores were made with 5mm diameter into the medium using a sterile cork borer. The surface of the agar plate was

rotated to ensure an equal distribution of inoculums present around the bore. Then the formulated paste and marketed formulations were placed in the bores on the cultured plates. The plates were wrapped with paraffin, labelled, and incubated at 37C for the 24 hrs. Each plate was examined after incubation for 24 hrs. The diameter of zone of inhibition (ZOI) was measured in millimetre (mm) with a ruler.

PHYSICAL APPEARANCE

Sr. no.	Parameters	Observation 1	Observation 2
1.	Appearance	Semisolid in nature	Semisolid in nature
2.	Colour	Brown	Brown
3.	Transparent	Non transparent	Non transparent
4.	Consistency	Smooth	Smooth
5.	Odour	Characteristics	Characteristics
6.	Taste	Sweet	Sweet
7.	Stability	Stable	Stable
8.	Spread	Easily spread	Easily spread
9.	Foamability	Good	Good

Table no. 3 physical appearance

DESCRIPTION

Sr. no	Evaluation parameter	Observation 1	Observation 2
1.	pH	7.5	7.7
2.	Consistency	Good	Good
3.	Spreadability	3.33cm/sec	3.4cm/sec
4.	Foam volume	3.7ml	3.9ml
5.	Moisture and volatile matter	27%	27%

Table no.4 Description

Physical Appearance

Fig no.1.12: Formulation no.1

Fig no.1.13: Formulation no.2

Description

pH

Fig no.1.14: Formulation no.1

Fig no.1.15: Formulation no.2

B) Consistency

Fig no.1.16: Formulation no.1

Fig no.1.17: Formulation no.2

C) Spreadability

Fig no.1.18: Formulation no.1

Fig no.1.19: Formulation no.2

D) Foamability test

Fig no.1.20 Formulation no.1

Fig no.1.21 Formulation no.2

Determination of moisture and volatile matter

Fig no.1.22 Formulation no.1 **Fig no.1.23 Formulation no.2**

Antimicrobial activity

Zone of inhibition toothpaste of *S. aureus* and *E. coil*

Fig no 1.24 *S. aureus* **Fig no 1.25 *E. coil***

Sr. no	Compound	*S. aureus*	*E. coil*
1.	Marketed toothpaste	19mm	17mm
2.	F:1	16mm	15mm
3.	F:2	13mm	12mm
4.	F:3	11mm	9mm

Table no.5 Zone of Inhibition

DISCUSSION:

All of the formulations had good viscosity, good spread, good tube extrudability, and pH during our physicochemical evaluation trials. the outcomes of dental paste formulations employing various substances, such as a mixture clove powder and neem guava etc. prevent bacterial development. Our formulation has enhanced physical characteristics, good spreadability, foamability, moisture content, and antibacterial activity were all noted during our quality control test. Good spreading, foam, abrasive, organoleptic, and in vitro antibacterial qualities are all present in the current design. Its absence of chemicals and dangerous substances,

as well as the inclusion of herbal powders and a variety of natural components beneficial for teeth and the oral cavity are further advantages because there is potential for such design to be widely used.

CONCLUSION:

A wide range of substances must be used by the formulator in order to produce the multi-claim products needed for the dental care category. Guava leaves are effective because it contains antibacterial, antioxidant and antimicrobial properties, it enhances the toothpaste ability for oral pathogens while maintaining the safety of oral hygiene. Conventional toothpaste are chemical components which causes irritation or sensitivity and causes side effects. As compared to synthetic formulation the herbal formulation is safe and effective. Comparative analysis with marketed preparation and herbal formulation are effective it is chemical free.

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