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Formulation and comparative standardization of toothpaste

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Abstract
The herbal toothpaste is prepared by using herbal extract cinnamon, neem, babul, guava and the other ingredient calcium carbonate, sodium lauryl sulphate, glycerin, gum tragacanth, water, saccharin, flavor and preservative. The herbal extract gives antimicrobial and antiinflametry activity and prevent and reducing the tooth decay, dental caries and given to freshness of mouth. The formulated herbal toothpaste is compare with marketed toothpaste they gives beneficial action and safety. The observation are found to be from physical examination appearance, spread ability, relevant density, viscosity, pH, homogenecity, foam ability, determination of moisture and volatile matter, antibacterial activity and Extrudability. The herbal toothpaste is no side effect and they prevent dental caries and dental disease.

Keywords: herbal toothpaste, standardization, evaluation and comparison with marketed preparation

Introduction
The oral disease, and oral cavity those are problem in worldwide and therefore beneficial reduced by using herbal toothpaste and they gives no side effect compaire with other marketed product. Recently herbal toothpaste are increasing demand worldwide because these are less side effect and beneficial to for oral cavity and tooth decay. The other medicines are more side effect like allergies and tooth decay etc. But the cinnamon and neem is the most widely used herbal medicinal plant in worldwide and they gives no side effect. The activity of cinnamon antiinflametry and, antimicrobial as a Neem also used as a chewing sticks in African & Indian countries and as well as used in antiseptic, astringent and cure the dental disease. The extract of Neem is superior activity antiviral and ant hyperglycemic *in vitro* and *in vivo*. The herbal toothpaste is most effective on teeth they prevent yellow coloration film of bacteria on teeth. In this formulation used of extract Neem as antimicrobial activity, guava as a astringent activity, cinnamon as antiinflametry activity, babbul as astringent, calcium carbonate used as a adhesives & sealants, sodium lauryl sulphate as a detergent, Glycerine as a sweetening and preserving agent and attracts moisture, gum tragacanth as a natural polysaccharide thickening agent, water as a dilution purposes, saccharine as a sweetener, flavors as acceptance of children and masking the odour, and preservative as a prevent the growth of microorganisms. The study of herbal toothpaste formulate by using herbal extract in toothpaste and compaire study with marketed toothpaste and determine the parameter like colour, Spredability, foam ability, Extrudability and anti-bacterial activity [1, 2].

Role of ingredients used in formulation [2]
Binder - to provide the consistency like gum tragacanth, Abrasive- solid insoluble particle causing abrasive removes debris and residual stain from teeth like- calcium carbonate, Preservative. - Prevent the growth of microorganism like alcohol sodium benzoate, Surfactant -produces foam and aid in the removal of debris –SLS. Sweeteners and flavors each improve test of toothpaste ex saccharin, Flavour; clove oil. Humectants to prevent the loss of water and subsequent hardening of the product upon exposure to air –Glycerin.

Objective
The objective of this research work was to formulate the toothpaste which does not cause any side effects or adverse reactions. The paste also acts as a fairness of teeth expert in day to day life by removing tooth cavity. It also possesses nutritional value which provided required nutrients to the teeth.

Used
- Cleaning
- Polishing
- Removal of stain
- Reduction of oral malodors Reduce incidence of tooth decay
- To treat teeth infections
- Freshness of mouth

Materials and Methods
Chemicals
Calcium carbonate, Sodium lauryl sulfate (Loba Chemicals), Glycerine, Gum tragacanth, Sacchaeine.

Plant Material
The following ingredient Neem, Gauva, Babul and Cinnamon were collected from the plant present at medicinal garden, as well as aayush pharmacy store in malakapur.

Table 1: Composition of toothpaste

Sr.no	Ingredients	Concentration (gm.)
1	Calcium carbonate	28.0
2	Sodium lauryl sulfate	0.5
3	Glycerine	11.0
4	Gum tragacanth	0.75
5	Water	9.7
6	Saccharine.	0.05
7	Flavour	q.s
8	Preservative	q.s

Formulation [3]

All herbal ingredients were dried and grounded using domestic mixer. The required quantity of ingredients were weighed and taken in mortar. Calcium carbonate, sodium lauryl sulfate, Gum tragacanth, Saccharine, Glycerine was mixed in water. Acacia were added into the above mixture. This solution was added drop wise into mortar containing herbal ingredients and triturated well until a paste consistency is formed. Table 1 and 2 shows composition of chemicals and plant extracts

Table 2: Plant extracts

Ingredient	Quantity(g)
Neem stem & bark	2.5
Babul leaves	2.5
Gauva leaves	2.5
Cinnamon	2.5

Evaluation parameter

The including parameters were checked to evaluate the marketed herbal formulation and in lab formulation.

Appearance [4]

The formulated toothpaste and marketed toothpaste were subjected to detect any change in appearance of toothpaste when kept for long period of time.

pH [2, 5]

pH of formulated herbal toothpaste was determined by using pH meter. 1g of toothpaste placed in 100ml of beaker. Allow the 10ml of distil water. Stir vigorously and make a mixture.

Homogenecity [4, 5]

The lab scale as well as marketed formulations produces uniform distribution in the cream. This was confirmed by visual appearance and by touch

Foamability [6, 11]

The foamability of formulated toothpaste evaluated by taking small amount of formulation with water in measuring cylinder initial volume was noted and then shaken for 10 times. Final volume of foam was noted.

Determination of sharp and edge abrasive particles [6]

Pick out the content 15-20 cm long on the butter paper; repeat the same process for at least ten collapsible tubes. Press with the contents of the entire length with fingertip for the presence of sharp and hard edged abrasive particles. Toothpaste shall not contain such particles

Determination of moisture and volatile matter [7]

5 g of formulation placed in a porcelain dish in it. Dry the sample in an oven at 105^0C.

Calculation

% by mass = 100MI/M, MI-Loss of mass (g) on drying

M- Mass (g) of the material taken for the test.

Extrudability [8]

In this method, the formulated paste were filled in standard capped collapsible aluminum tube and sealed by crimping to the end. The weights of tubes were recorded. The tubes were placed between two glass slides and were clamped. 500g was placed over the slides and then cap was removed. The amount of the extruded paste was collected and weighed. The percent of the extruded paste was calculated.

Accelerated Stability Testing [8, 9]

Accelerated stability testing of prepared formulations was conducted for 2 most stable formulations at room temperature, studied for 7 days, at 400^0Cfor 20 days. The formulations were kept both at room and elevated temperature and observed on 0th, 10th, 20th, and 30th, determined various parameter (By using Remi Environmental Test Chamber, India).

Determination of Viscosity [10]

By using a Brookfield Viscometer, the viscosity of formulation was determining using spindle number 4 at a 50 rpm at a temperature of 25^0C.

Spreadability [10, 11]

In this method slip and drag characteristics of paste involve. Formulated paste (2g) placed on the ground slide under study. The formulated paste placed like sandwich between this slide and another glass slides for 5min to expel air and to provide a uniform film of the paste between slides. Excess of the paste was scrapped off from the edges. The top plate was then subjected to pull of 80g with the help of string attached to the hook and time (sec) required by the top slide to cover a distance of 7.5cm was noted. A short interval indicated better spread ability.

Formula was used to calculate spread ability

$$S=M\times L/T$$

Where,

S= Spreadability

M= Weight in the pan (tied to the upper slide)

L= Length moved by the glass slide

T=Time (sec) taken to separate the upper slide from the ground slide.

Determination of Microbial Content [12]

5gm of cream was dissolved in nutrient agar culture and volume adjusted to 100ml with the same medium. About 10ml of sample was transferred into 100ml of nutrient agar culture broth and incubated for 18-24 hours at 43-45°C. A subculture was prepared on a plate with nutrient agar culture and incubated at 43-45°C for 18-24 hours. 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*.

Comparison: Formulated herbal toothpaste with marketed preparation

The formulated herbal toothpaste was compared with marketed preparation follows Antimicrobial activity, Spreadability, Foamability, pH determination, % Moisture content.

Relative density [13, 14]

Relative density was determination by weight in gram taken in 10 ml formulation and 10 ml distilled water using specific gravity determinations gravity bottle.

Results and Discussion

Appearance

No variation in colour was seen

pH of the Cream

The pH of the cream was found to be in range of 7-8.2

Homogenecity

Both formulations produce uniform distribution in the toothpaste. This was confirmed by visual appearance and by touch

Viscosity

The viscosity of was cream was found to be in the range of 70,000-100,000 cps which indicates that the cream is easily spreadable.

Table 3: Physicochemical parameters & Evaluation results

Sr. no	Parameters	Marketed formulation	In lab formulation
1	Appearance	Greenish brown	Greenish brown
2	P^H	8.2	7.9
3	Homogeneity *By visual *By touch	Homogeneous Smooth	Homogeneous Smooth
4	Odour	Characteristic	Characteristic
5	Spredability	3.5cm/sec	3.9cm/sec
6	Microbial content	No growth of microbes	No growth of microbes
7	Relative density	10.2	9.7
8	Viscosity	70,320- 100,000cP	79346-999,500 cP
9	Abrasiveness	Good abrasive	Good abrasive
10	Foamability	10	10.2

Table 4: Extrudability

Extrudability	Mean of tree tube
Net weight of formulation in tube (g)	20
weight of toothpaste extruded (g)	18.30
Extrudability amount percentage	91.5%

Table 5: Percent Moisture Content Comparison

Formulation	% Moisture Content Comparison
Marketed Formulation	15.20%
Lab Formulation	15.90%

Table 6: Accelerated Stability Testing

Days	Temperature	Formulation	Parameter			
			A	B	C	D
0	At 40ºC± 2ºC	MF	NCC	8.2	##	3.5cm/sec
		LF	NCC	7.9	##	3.9cm/sec
10	At 40ºC± 2ºC	MF	NCC	8.1	##	3.4cm/sec
		LF	NCC	7.6	##	3.7cm/sec
20	At 40ºC± 2ºC	MF	NCC	8.15	##	3.4cm/sec
		LF	NCC	7.65	##	3.2cm/sec
30	At 40ºC± 2ºC	MF	NCC	8.06	##	3.3cm/sec
		LF	NCC	7.26	##	3.1cm/sec

MF= Marketed formulation, LF= Lab formulation, A= colour, B= pH, C= Homogeneity

D= Spredability, NCC = Not change in colour, ## = Homogenous

Discussion

In the present work, it was decided to extract and formulate herbal toothpaste. The study revealed that the marketed as well as lab formulations found to be more stable. Both formulations marketed and In Lab had almost constant pH, homogeneous, Spredability appearance, and. The stable formulations were safe in respect to mouth problem and sensitization. The extract of Neem has antiseptic activity, Cinnamon has anti-inflammatory activity, and also increases whitening of teeth, the clove oil increases freshness of the mouth as well as anesthetic helps to reduce pain and good properties. Hence all these properties are beneficial to normal human tooth and mouth it is safe and stable too.

Conclusion

The extract of neem, cinnamon oil, guava and babbule was used for the formulation of toothpaste. The neem and cinnamon play a main role in herbal medicinal toothpaste. Evaluation parameter of the toothpaste suggested that there was no large variation between marketed toothpaste and herbal medicinal toothpaste. The formulation toothpaste and marketed during stability study those the study show that, The formulation of toothpaste containing herbal extract can be possible which is used as good toothpaste.

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