



Research Article

Formulation and Evaluation of Periodontic Gel from Herbal Extracts *Psidium guajava* and *Punica granatum*

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ABSTRACT

Herbal medicines is still the mainstay of about 75-80% of the world's population, mainly in developing countries, for primary health care because of better compatibility with human body, cultural acceptability and lesser side effects. Plants for thousands of years have been used to enhance health and for medicinal purposes. *Psidium guajava* and *Punica granatum*, are one which has an enormous wealth of medicinal value. It for long has been known for its anti-inflammatory, antimicrobial, antioxidant, antidiarrheal, antimutagenic properties. Despite of its widespread biologic uses there is a dearth of information on its therapeutic effect in the treatment of periodontal diseases. The objectives of present investigation were to formulate and evaluate herbal gel for periodontic treatment. Six formulations were made, two are of aqueous extract, two are of methanolic extract, two are of finely dried leaf, Carbopol 934 is used as a gel base. Formulations were evaluated for various parameters like physical appearance, pH, homogeneity, spreadability, viscosity, extrudability. The formulated gels were transparent, homogeneous and pH ranges from 7 to 7.5. Formulation showed acceptable rheological behaviour with applicable spreadability and extrudability properties. Present herbal formulation was developed with very safe with good stability and effective over to synthetic formulations for the treatment of periodontics. This research work gives the information reported in this contributes scientifically to recognizing the importance of the pomegranate and guava as a target in the search for new biotechnological investments and herbal formulation.

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INTRODUCTION

The "medicinal plant" include various types of plants used in herbalism ("herbology" or "herbal medicine"). It is the use of plants for medicinal purposes, and the study of such uses. The word "herb" has been derived from the Latin word, "herba" and an old French word "herbe". Now a days, herb refers to any part that of plant like fruit, seed, stem, bark, flower, leaf, stigma (or) a root, as well as a non-woody plant. Earlier, the term "herb" was only applied to non-woody plants, including those that come from trees and shrubs. These medicinal plants are also used as food, flavonoid, medicines and perfumes and also in certain spiritual activities, "herbal medicines are one type of dietary supplement. They are sold as tablets, capsules, powders, tea extracts and fresh or dried plants [1].

Mostly people used herbal medicines to maintain or improve their wealth. Many people believe that products labelled "natural" are always safe and good for them. Traditional medicine is "the knowledge, skills and practices based on theories, beliefs and experiences indigenous to different cultures used in the maintenance of health and the prevention, diagnosis, improvement or treatment of physical and mental illness. Medicinal plants are the back bone of traditional medicines which means that more than 3.3 billion people in less developed countries utilize the medicinal plants on the regular basis. Among ancient civilizations, India has been known to the rich repository of medicinal plants. The forest in India is the principal repository of large number of medicinal and aromatic plants, which are largely collected as raw materials for manufacture of drugs and perfumery products [2, 3].

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Introduction to Periodontics

- The term periodontal Diseases composes of wide variety of chronic inflammatory conditions of gingiva's (gums the soft tissue surrounding the teeth).
- Periodontitis is one of the most common disease associated with the oral cavity.
- Periodontitis is defined as an inflammatory disease of supporting tissue of teeth caused by specific microorganisms.
- Periodontal disease is a complex infectious disease.
- Some of the most common organisms associated with periodontal diseases are prophyromnasgingivalis, Bacteroidesforsthuis & Actinobacillus.
- Periodontitis and periodontal diseases are two infections of the oral cavity.^[4]

Risk Factors:

- Smoking
- Poor oral hygienic(calculus)
- Obesity
- Alcohol Consumption

Signs & Symptoms:

- Plaque accumulation, calculus Formation
- Gingiva
- Swelling
- Gingival bleeding

MATERIALS AND METHODOLOGY

Apparatus:

Beakers, glass rod, measuring cylinder, electronic weighing Balance, hot air oven, Petri plates, heating mantle, Round bottom flask, Magnetic stirrer, Mechanical stirrer, Percolator.

Chemicals:

Carbopol 934 (gelling agent), Saccharin (sweetening agent), Sodium Benzoate (preservative), Methyl Paraben (anti fungal preservative), Polyethylene glycol (PEG)-400 (polymer), Ethanol(solvent), Triethanolamine, all the required chemicals are taken from the SCIPS laboratory.

Method of Preparation:

Preparation of herbal gel (*Psidium guajava*):

- Required quantity of gelling agents was weighed, that is 0.3gm of carbopal934 is taken and dispersed in 5mL of distilled water and place the beaker on magnetic stirrer at a speed of 1200rpm for 30min to form a homogeneous dispersion.

- Then measure 5mL of aqueous extract of guava liquid and add 15mL of polyethylene glycol-400 in a suitable beaker and place it on magnetic stirrer at a speed of 1200rpm for 20min to form a homogeneous mixture.
- In another beaker, weigh accurately about 0.18gm of methyl paraben and 0.5gm of sodium benzoate, 0.5gm of saccharin. Add 5mL of distilled water to it and mix well, place it on magnetic stirrer and adjust the speed of stirrer of 1200rpm for 15min to form a homogeneous mixture.

Preparation of herbal gel (*Punica granatum*):

- Required quantity of gelling agents was weighed, that is 0.3gm of carbopal934 is taken and dispersed in 5mL of distilled water and place the beaker on magnetic stirrer at a speed of 1200rpm for 30min to form a homogeneous dispersion.
- Then measure 5mL of aqueous extract of pomegranate liquid and add 15mL of polyethylene glycol-400 in a suitable beaker and place it on magnetic stirrer at a speed of 1200rpm for 20min to form a homogeneous mixture.
- In another beaker, weigh accurately about 0.18gm of methyl paraben and 0.5gm of sodium benzoate, 0.5gm of saccharin. Add 5mL of distilled water to it and mix well, place it on magnetic stirrer and adjust the speed of stirrer of 1200rpm for 15min to form a homogeneous mixture.

Collection and Preparation of Herbal Leaf Powder:

Collect required amount of guava and pomegranate leaves from fresh diseasefree plants. Wash them with water and air dry them in shade for 20 to 30 days until the leaves dry completely. Then smash the leaves into small pieces in a mixer to make them a fine powder. And pack them in air free containers to avoid environmental air exposure.

Extraction of Herbals:

Aqueous Extract of Guava:

Weigh accurately about 5gm of dry powder of guava (*Psidium guajava*) leaves, and placed it in round bottomed flask, take 50mL of distilled water in measuring cylinder, pour them into RB-flask and shake for 5min to mix well. Then heat for 10min by placing it into heating mantle. After that cool the extract in a suitable beaker. Then cover the mouth of beaker completely with aluminum foil and place it in refrigerator ^[5].

Aqueous Extract of Pomegranate:

Weigh accurately about 5gm of dry powder of pomegranate (*Punicagranatum*) leaves, and placed it in round bottomed flask, take 50ml of distilled water in measuring cylinder, pour them into RB- flask and shake for 5min to mix well. Then heat for 10min by placing it into heating mantle. After that cool the extract in a suitable beaker. Then cover the mouth of beaker completely with aluminum foil and place it in refrigerator.

Percolation Extraction of Guava:

This is the procedure used most frequently to extract the active ingredients in the preparation of tinctures and fluids extract. A percolator (a narrow, cone shaped vessel open at both ends) is generally used. In a clean percolator, 30gm of fine powdered guava (which is moisture with 30ml or few ml of ethanol or methanol should be evenly spread up on the cotton swab in percolator. Then place a filter paper on the powered drug. Place some amount of sand on the filter paper (which is previously sterilized in hot air oven). Then add 150mL of ethanol or methanol on it, to saturate the material. The percolator is allowed to stand for 24hours to macerate the drug. The outlet of percolator then it is opened and the liquid contained there is allowed to drip slowly. Additional menstrum is added as required until the percolate measures about three-quarters of the required volume of the finished products. The extracted liquid from lower lid is collected in a beaker, and should be covered with aluminum foil and keep in a refrigerator.

Percolation Extraction of Pomegranate:

This is the procedure used most frequently to extract the active ingredients in the preparation of tinctures and fluids extract. A percolator (a narrow, cone shaped vessel open at both ends) is generally used. In a clean percolator, 30gm of fine powdered pomegranate (which is moistened with 30mL or few ml of ethanol or methanol should be evenly spread up on the cotton swab in percolator. Then place a filter paper on the powered drug. Place some amount of sand on the filter paper (which is previously sterilized in hot air oven). Then add 150mL of ethanol or methanol on it, to saturate the material. The percolator is allowed to stand for 24hours to macerate the drug. The outlet of percolator then it is opened and the liquid contained there is allowed to drip slowly. Additional menstrum is added as required until the percolate measures

about three-quarters of the required volume of the finished products. The extracted liquid from lower lid is collected in a beaker, and should be covered with aluminum foil and keep in a refrigerator [6].

Evaluation Parameters:

Physical Appearance

Physical characteristics including the colour and appearance of the gel were examined.

Measurement of pH [7]

Using a digital pH metre, the pH of herbal gel formulations was measured.

1 gm of gel dispersed in 10 mL of distilled water. Hold back for two hours. The measurement of pH of formulation was carried out in three times. Following the generation of average results, Table 2 contains the pH of the gel formulation.

Homogeneity [8]

All prepared gel formulations were tested for homogeneity by visual inspection after the gels have been set in to the container. They were examined for the presence and appearance of any aggregates. In Table 2, homogeneity of gel formulation was reported.

Spreadability [9]

Wooden blocks apparatus and a glass slide were used to measure spreadability.

About 20 gm weights were added to the pan. The times were observed for upper slide to move separate completely from the fixed slide. An excess amount of gel (2 gm) under study, was placed on this ground slide. After that, the gel was placed in between these slides. An additional glass slide having the fixed ground slide is provided with the hook.

To create a homogenous gel film and eliminate air between the slides, a 1 kg weighted was placed on top of the slides for 5 minutes. The excess gel was scraped off the edges. The top plate was then pulled with the aid of a string attached to the hook, and the amount of time, in seconds, needed for the top slide to travel a distance of 7.5 cm was recorded. Better spreadability is indicated by a shorter or smaller interval. The following formula was used to determine the spreadability of gel [10]. The spreadability of gel was reported in Table 2.

In Table 2, the spreadability of gel was.

$$\text{Spreadability} = \frac{M \times L}{T}$$

Where, M = Weight in the pan which is tied to the upper slide, L = Length moved by the glass slide
T = Time in second taken to separate the slide completely each other.

Viscosity ^[11]

The Brookfield viscometer was used to measure the viscosity. At 25°C, formulated gels underwent rheological behaviour testing. The measurement covered a speed range of 10 to 100 rpm, with a pause of 30 seconds between 2 successive speeds and then in a reverse orders.

Clarity ^[12]

Visual inspection was used to determine the clarity of all the six batches.

Gel Strength

Gel strength was determined by the amount of time in seconds required by the weight to penetrate the gel. Each optimise batch's sample amount of 5 gm was taken, and 3.5 gm of weight was placed on the gel's surface. The time in seconds required by the weight to penetrate 0.5 cm in the gel was noted. The gel strength was reported in Table 2.

RESULTS

Table 1: Composition of various gel formulations containing dried powdered pomegranate leaves and guava leaves.

Ingredients	F1 (aqueous extract)	F2 (aqueous extract)	F3 (methanol extract)	F4 (methanol extract)	F5 (dried leaf extract)	F6 (dried leaf extract)
Pomegranate	5mL	-	5mL	-	1gm	-
Guava	-	5mL	-	5mL	-	1gm
Carbopol 934	0.3gm	0.3gm	0.3gm	0.3gm	0.3gm	0.3gm
Sodium benzoate	0.5gm	0.5gm	0.5gm	0.5gm	0.5gm	0.5gm
Methyl paraben	0.18gm	0.18gm	0.18gm	0.18gm	0.18gm	0.18gm
Triethanolamine	q.s	q.s	q.s	q.s	q.s	q.s
Distilled water	q.s	q.s	q.s	q.s	q.s	q.s
Saccharine	0.5gm	0.5gm	0.5gm	0.5gm	0.5gm	0.5gm
PEG	15mL	15mL	15mL	15mL	15mL	15mL



Figure 1: Guava and Pomegranate Herbal Gels

Table 2: Evaluation parameters of all the formulations.

Evaluation parameters	Formulations					
	F1	F2	F3	F4	F5	F6
Physical appearance	Viscous	Viscous	Viscous	Viscous	Viscous	Viscous
colour	Cream	Cream	Brown	Brown	Brown	Brown
pH	6.7±0.8	6.8±0.9	6.9±0.7	7.4±0.6	6.2±0.8	6.3±0.6
Homogeneity	Good	Good	Good	Good	Good	Good
Spreadability (gm.cm/sec)	5.50 ± 0.1	5.40±0.1	5.60 ± 0.8	5.9±0.7	5.15±0.7	5.45±0.7
Viscosity (Pa·S)	3.011 ± 0.003	3.2 ± 0.004	3.091 ± 0.005	3.05 ± 0.005	3.091 ± 0.002	3.08 ± 0.005
Extrudability	Good	Good	Good	Good	Good	Good
Gelling Strength (Sec)	38±0.78	42±0.76	38±0.78	42±0.76	40±0.78	40±0.78

DISCUSSION

Periodontitis is the inflammation of gums and supporting tissues of the teeth. It is one of the most common human diseases. Periodontitis is caused by certain *Bacteria* and local inflammation is triggered by those *Bacteria*. The treatment methods are dental root planning and scaling, NSAIDs, antibiotics, and antiseptics. Pomegranate & guava is a natural and nontoxic beehive product that prevents disease progression. These contains flavonoids and polyphenols that have antimicrobial, anti-inflammatory, and antioxidant activity. It can help with dental root and scaling which is very effective in treatment of periodontal disease. From the above mention results in Table 1, it is clearly shows that all the prepared gel formulations having good homogeneity and gelling property.

The pH of all gel formulations was in the range compatible with normal pH range of the skin. The rheological behavior was studied with remoter ranging between 3.011 to 3.9Pa.S. This indicates that formulated gel was neither too thick, nor too thin. The study of spreadability shows that with increasing the viscosity of formulation spreadability decreases and vice versa. The gelling strength of all the batches was found in the suitable range. All the prepared gels are having good appearance, good stability and good effective in nature.

CONCLUSION

With the data presented in this study, it was concluded that all the prepared gels are having good in appearance, good stability and good effective and herbal gel formulation possess significant, therapeutically efficacious, suitable vehicle for drug delivery in low cost but definitely with high potential. Developed new

herbal gel formulations are suitable for periodontic treatment.

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