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Formulation and Evaluation of Herbal Gel Containing Peel Extract of Pomogranate for Periodontitis

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A B S T R A C T
Periodontitis disease is a group of illness located in the gums and dental support structures and produced by certain bacteria i.e. *Actinobacillus*. Studies have suggested that *Punica granatum* is used for the treatment of microbial infections especially in dental diseases. *Punica granatum* is an ancient, unique plant belongs to family *lythraceae* consists chemical constituents like ellagic acid, ellagitannins, punicic acid, flavonoids, anthocyanins, anthocyanidines and estrogenic flavonols & flavonols. The rind of pomegranate consists of flavonoids and the extract was prepared by cold maceration process and was used as active ingredient to prepare medicated gels for the treatment of Periodontitis. 10 formulations i.e. F1 to F10 were prepared by incorporating 1 % extract and with different gelling agents at different concentrations like Sodium alginate, Guar gum, Sodium carboxy methyl cellulose, Methyl cellulose and Hydroxy propyl methyl cellulose. The prepared gels were evaluated for parameters like Appearance, spreadability, consistency, Ph & stability studies. The prepared gels showed good physical appearance and good stability condition hence we conclude our work that gels can be prepared successfully and used for the treatment of periodontitis and further optimization studies are to be done for the commercial success of the medicated gels of pomegranate rind extract.

Keywords: cardiovascular, diseases, Angiotensin II, olmesartan, telmisartan, hypertension.

A R T I C L E I N F O

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1. Introduction

Periodontal diseases range from simple gum inflammation to serious disease those results in major damage to the soft tissue and bone that support the teeth. In the worst cases, teeth are lost [1]. Gels are an excellent formulation for several routes of administration. They are useful as liquid formulations in oral, topical, vaginal, and rectal administration. Gels can be clear formulations when all of the particles completely dissolve in the dispersing medium. But this doesn't occur in all gels, and some are, therefore, turbid. Clear gels are preferred by patients. Gels are made using substances (called gelling agents) that undergo a high degree of cross-linking or association when hydrated and dispersed in the dispersing medium, or when dissolved in the dispersing medium [2]. Several studies on Pomegranate shown its antibacterial actions and hence an attempt was made to formulate gels using pomegranate peel aqueous extract and to evaluate the prepared gel for the desired parameters.

2. Material and methods

Materials: The peel of *Punica granatum* was collected from the fruits which were purchased from the local market of Ananthapuramu. Peel was cutted into pieces, dried and powdered for the maceration. All other chemicals used were purchased fron SD fine chemicals, Mumbai.

Methods:

Extraction: The dried peel powder of *P.granatum* was boiled in distilled water for 15-20 min, kept in room temp overnight and filtered the filtrate was evaporated to dryness in hot air oven and store in refrigerator the condensed extracts were used for preliminary screening of phytochemicals [3].

Phytochemical Screening of the Extract:

The extract of P.granatum was studied for the presence of different phytochemicals like Steroids, Triterpenoids, Glycosides, Alkaloids, Saponins, Flavonoids, Tannins, Proteins and Amino acids [4].

Formulation of Gels:

By using various ingredients ten different formulations were prepared and evaluated [Table 1]. Gels were prepared by dispersing the polymers like sodium alginate, guar gum, sodium carboxy methyl cellulose, methyl cellulose, hydroxypropyl methyl cellulose at different concentrations in water by continuous stirring for a period of 2 hours. The drug was dissolved in water and the solution was added gently to above polymer dispersion under continuous stirring. The mixture was stirred gently until homogeneous gel was formed [5].

Evaluation of Gels: The prepared gels were evaluated for the parametes like

pH: pH of the formulated gel was measured using digital pH meter.

Viscosity: Viscosity pf the gels was measured using Brookfield viscometer.

Spreadability:

Spread ability of periodontal gel was determined by laboratory fabricated apparatus that has two glass slides containing lower slide fixed to a wooden plate and the upper one attached to a balance by a hook. One gram of gel was placed on lower slide and weight was applied to the upper slide. On applying weight, the upper slide moved linearly in the direction of applied weight and the time required for complete displacement of the upper slide was recorded. Using the weight required for displacement, spread ability was calculated by using Equation [6].

$$S = m \times l/t \text{ (gram cm/sec)}$$

S is spreadability, m is the weight tied to the upper slide, l is the length of the glass slide, and t is the time taken for complete displacement of upper slide.

Organoleptic Properties:

Organoleptic evaluation of the gels involves observing of the gels for the properties like color, odor and clarity.

Figure 1: Gel formulations

Syringeability:

It was carried out by filling 1 g of periodontal sol in a plastic syringe (Dispo Van) of 1 mL fill capacity, bearing 22 gauge needles. The filled syringe was stored in a refrigerator at 4°C to maintain the formulations in ″sol;′ state. Gentle force was applied manually by pressing the injector so that sol can eject out from the syringe. The ease of ejection was assessed qualitatively [7].

Stability Studies:

The formulated gels were filled in the collapsible tubes and stored at different temperature condition viz. 25°C± 2°C/60% RH± 5%RH, 30°C± 2°C/65% RH± 5%RH, 40°C±2°C/75% RH± 5%RH for a period of three months and evaluated for all parametes [8].

3. Results and Discussion

The formulated gels were evaluated were different parameters and found good result. All gels were in reddish brown color and acceptable odor. The values of pH were within the range of neutral pH. The viscosity of the prepared gels was in the range of 1956 – 48542 cps. The results of the syringe ability study indicate that all the gel formulations were syringe able and were in the range of 91-96%. The Spread ability was found to be in the range of 6.82-7.25 cm (Table 2). After 3 months of storage at different temperature conditions a slight change in the parameters was observed which indicates a good stability of the formulated gels (Table 3).

Table 1: Formulation of Gels

Ingredients	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
Pomegranate extract	1	1	1	1	1	1	1	1	1	1
Sodium Alginate	1	2	-	-	-	-	-	-	-	-
Guar Gum	-	-	1	2	-	-	-	-	-	-
Sodium CMC	-	-	-	-	1	2				
Methyl Cellulose	-	-	-	-	-	-	1	2	-	-
HPMC	-	-	-	-	-	-	-	-	3	4
Methyl Paraben	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Propyl Paraben	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Water	100	100	100	100	100	100	100	100	100	100

Table 2: Results of Evaluation of Gels

Formulation	Appearance	pH	Viscosity	Spreadability	Syringeability
F1	Reddish Brown	6.12 ± 0.98	46552	6.82 ± 0.08	91.23 ± 0.86
F2	Reddish Brown	6.25 ± 1.08	46892	6.86 ± 0.06	95.25 ± 1.08
F3	Reddish Brown	6.56 ± 1.25	47854	7.02 ± 0.12	91.85 ± 0.98
F4	Reddish Brown	6.35 ± 1.12	48235	7.25 ± 0.23	94.89 ± 1.36
F5	Reddish Brown	6.89 ± 0.96	46582	6.96 ± 0.09	92.56 ± 1.39
F6	Reddish Brown	6.68 ± 1.16	41956	6.98 ± 0.20	95.65 ± 0.56
F7	Reddish Brown	6.54 ± 1.25	47145	7.02 ± 0.18	92.56 ± 0.86
F8	Reddish Brown	6.12 ± 1.26	42262	7.25 ± 0.12	94.36 ± 1.02
F9	Reddish Brown	6.25 ± 1.14	48542	7.14 ± 0.09	92.35 ± 0.99
F10	Reddish Brown	6.46 ± 1.18	47558	6.96 ± 0.12	96.58 ± 1.23

Table 3: Results of Stability studies

Formulation	Storage Temp	pH	Viscosity (cps)	Spreadability (cms)	Syringeability (%)
F1	4°c ± 2°c	6.26 ± 1.08	46885	6.52 ± 0.12	91.85 ± 0.86
	25°c ± 2°c	6.12 ± 0.98	46259	6.82 ± 0.18	92.45 ± 0.98
	37°c ± 2°c	6.56 ± 1.12	47589	6.25 ± 0.25	93.25 ± 0.88
F2	4°c ± 2°c	6.65 ± 0.89	46847	6.48 ± 0.09	91.89 ± 1.06
	25°c ± 2°c	6.45 ± 1.12	46489	6.89 ± 0.13	91.96 ± 1.23
	37°c ± 2°c	6.85 ± 1.26	47847	6.95 ± 0.11	92.23 ± 1.58
F3	4°c ± 2°c	6.16 ± 1.25	48285	7.12 ± 0.14	94.25 ± 1.21
	25°c ± 2°c	6.26 ± 1.58	47568	7.25 ± 0.18	95.48 ± 1.15
	37°c ± 2°c	6.75 ± 1.28	47584	7.29 ± 0.21	95.43 ± 1.25
F4	4°c ± 2°c	6.42 ± 1.06	46854	7.02 ± 0.19	94.65 ± 1.21
	25°c ± 2°c	6.62 ± 1.29	46548	7.12 ± 0.25	94.98 ± 1.25
	37°c ± 2°c	6.38 ± 0.98	46956	6.95 ± 0.15	94.63 ± 1.23
F5	4°c ± 2°c	6.26 ± 1.58	48249	6.98 ± 0.09	92.46 ± 1.21
	25°c ± 2°c	6.86 ± 1.19	48143	7.06 ± 0.09	92.65 ± 1.32
	37°c ± 2°c	6.62 ± 1.23	47949	7.16 ± 0.09	92.48 ± 1.26
F6	4°c ± 2°c	6.25 ± 0.98	46482	6.98 ± 0.21	94.45 ± 0.95
	25°c ± 2°c	6.89 ± 1.26	45489	7.18 ± 0.08	95.25 ± 1.05
	37°c ± 2°c	6.35 ± 1.16	46754	7.25 ± 0.20	95.63 ± 0.89
F7	4°c ± 2°c	6.45 ± 1.48	46682	6.89 ± 0.22	92.56 ± 0.86

	25°c ± 2°c	6.85 ± 1.58	46478	6.45 ± 0.20	91.59 ± 0.96
	37°c ± 2°c	6.49 ± 1.24	46456	6.82 ± 0.18	92.98 ± 0.98
F8	4°c ± 2°c	6.59 ± 1.16	47545	7.15 ± 0.19	93.36 ± 1.14
	25°c ± 2°c	6.24 ± 1.09	48142	7.09 ± 0.21	93.48 ± 1.24
	37°c ± 2°c	6.46 ± 1.25	48245	7.14 ± 0.15	93.68 ± 1.15
F9	4°c ± 2°c	6.53 ± 1.28	48542	7.28 ± 0.19	92.58 ± 0.98
	25°c ± 2°c	6.25 ± 1.14	47842	7.45 ± 0.12	92.46 ± 1.09
	37°c ± 2°c	6.58 ± 1.24	45942	7.06 ± 0.21	92.89 ± 1.02
F10	4°c ± 2°c	6.13 ± 1.42	47145	6.94 ± 0.12	96.58 ± 1.05
	25°c ± 2°c	6.38 ± 1.28	46949	7.14 ± 0.19	95.89 ± 1.15
	37°c ± 2°c	6.02 ± 1.08	47256	7.25 ± 0.25	95.83 ± 1.21

4. Conclusion

Present study was aimed to formulate ten different gel formulations of dried peel extract by using *punica granatum*. These gels were formulated by different gelling agents with mucoadhesive property for the treatment of Periodontitis .We found acceptable properties for the gels and stability studies of gels also found acceptable properties. These gels were formulated with the naturally available pomegranate fruit and we found good results for the gels and further Optimization Studies are required on this study to find the useful benefits of pomegranate oral gel. Thus we conclude that the formulated gels can be used as an effective treatment for treating dental infections.

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