



Formulation and Evaluation of Analgesic Gel for Toothache

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Abstract

Toothache is a common problem occurring in the human population throughout the world frequently. The World Health Organization (WHO) recommended the reduction of toothache as one of the priority issues in the global oral health promotion agenda. The different tooth formulation were prepared and evaluated for Colour, Clogging, Homogeneity, Texture, Washability, Extrudability (g), pH, Viscosity (cps) and antimicrobial activity. It was observed that the freshly prepared formulations were light brown. The Clogging was found absent in all formulations and having good homogeneity, texture was found in all formulations F1, F2, F3, F4, F5 and F6 respectively. In conclusion, F4 formulation has desired viscosity because of its higher polymer content and it is able to remain on mucous surface long enough to release its active ingredient.

Key-Words: Toothache, Gel, Analgesic

Introduction

Toothache is defined as an orofacial pain originated from a dental element and/or adjacent structures in consequence of several diseases or conditions, such as dental caries, periodontal disease, trauma, occlusal dysfunction, and abscess. The causative factors behind toothache include tooth decay or fracture, abscessed tooth, or infected gums. Over 750 species of bacteria inhabit the oral cavity and a number of these are implicated in oral diseases including toothache. [1]

Gels are an intermediate state of matter containing both liquid and solid components. Gel is a two-component, cross linked three-dimensional network consisting of structural materials interspersed by an adequate but proportionally large amount of liquid to form an infinite rigid network structure which immobilizes the liquid continuous phase within. The structural materials that form the gel network can be composed of inorganic particles or organic macromolecules, primarily polymers. [2]

The aim of present work is to formulate gel containing *Acemella oleracea*, clove oil, camphor oil, which are reported separately to analgesic and gives a soothing effect. But in the present formulation the quantity of *Acemella oleracea*, clove oil and camphor oil both are used. Where clove oil has both analgesic and antiseptic properties and camphor oil has cooling effects and sooth inflammation. Thus the formulation is capable of providing quick onset action. The gel can acts as better tool for safer and effective cure of toothache.

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Material and Method

Collection of plant material

The plant has been selected on the basis of its availability and folk use. Leaves of *Acemella oleracea* were collected from local area of Bhopal in the month of November, 2020.

Preparation of tooth gel

For different gels, the concentrated *Acemella oleracea* extract, Clove oil, Camphor oil as the active ingredient and carbomer 934, SCMC and HPMC K4M were used as gelling polymers. Table 1 demonstrates each formulation and their contents.[3]

Table 1: Composition of gel formulations with different polymers

Ingredient (g)	F1	F2	F3	F4	F5	F6
<i>Acemella oleracea</i> Extract	0.5	0.5	0.5	0.5	0.5	0.5
Clove oil	0.1	0.1	0.1	0.1	0.1	0.1
Camphor oil	0.1	0.1	0.1	0.1	0.1	0.1
Carbomer 934	0.5	1.0	1.5	0.5	0.75	1.0
Sodium CMC	-	-	-	3	3	3
HPMC K4M	3	2	1	-	-	-
PEG 400	5	10	15	5	10	15
Potassium Sorbate	0.1	0.1	0.1	0.1	0.1	0.1
Triethanolamin	qs	qs	qs	qs	Qs	qs
Purified water to	100	100	100	100	100	100

Evaluation of herbal gel [4-6]

Appearance and consistency

The physical appearance was visually checked for the texture of herbal gel formulations and observations may be like stated in Table.

Extrudability determination of formulations

The herbal gel formulations were filled into collapsible metal tubes or aluminium collapsible tubes. The tubes were pressed to extrude the material and the extrudability of the formulation was checked.

Determination of pH

The pH of the herbal gels was determined by using digital pH meter. 1gm of gel was dissolved in 25 ml of distilled water and the electrode was then dipped in to formulation until constant reading was obtained. And constant reading was noted. The measurements of pH of each formulation were replicated two times.

Antimicrobial activity of herbal tooth gel

Sterilization of Instruments and glassware's

At first, all instruments which were used in laboratory were made sterile, all glassware's

like Erlenmeyer flask, graduated cylinders, stirring rods, beakers, test tubes, petri dishes, inoculating loops, that were used in the assay were placed in an autoclave at 121°C under 15 psi pressure for 25 min by using Autoclave and followed aseptic technique method.

Preparation of nutrient agar media (NAM)

Nutrient agar media was prepared for growing of bacteria inside the laboratory. The standard size (100mm× 15mm) petri dishes as required for whole experiment. For preparation of NAM, 13 gram NAM powder was mixed with 1000 ml of distilled water and stirred to obtain homogenized mixture. After which, NAM mixture was placed in Autoclave under 15 psi pressure, at 121°C for 25 min for sterilization of media. After that poured the culture media into petri dishes at ratio of 20 ml/dish and was left half covered on the table to let the agar cool down and solidify at room temperature.

Antimicrobial activity [7]

Antimicrobial activity of the herbal tooth gel obtained from leaves of *Acemella oleracea* extract was determined, using the agar well

diffusion assay method as described by Holder and Boyce. The plates were prepared in triplicates and were incubated at 37°C. The antimicrobial activity was taken on the basis of diameter of zone of inhibition, which was measured after 2 days of incubation and the mean of three readings is presented. The herbal tooth gel and the standard fluconazole were dissolved in distilled water.

Statistical analysis: Each experiment has three replicates and three determinations were conducted. Means of variable and standard deviation were recorded.

Results and Discussion

It was observed that the freshly prepared formulations were light brown Table 7.6. The Clogging was found absent in all formulations and having good homogeneity, texture was found in all formulations F1, F2, F3, F4, F5 and F6 respectively.

Formulations were applied on the skin and then ease and extent of washing with water were checked manually. All the formulations exhibited good washability and left no traces over the skin on washing with water due to non-greasy properties. The all the prepared gel formulation were found good washability and extrudability

was found 175±4g, 182±2g, 195±5g, 176±2g, 162±6g and 165±4g for F1, F2, F3, F4, F5, and F6 formulation respectively.

It was found to be in the range of 5.8±0.1 to 6.8±0.1, the pH of prepared formulation was found to be similar to the oral cavity pH 6.8. The Results of pH of all formulation were found to be 5.8±0.1, 5.9±0.2, 6.2±0.1, 6.8±0.1, 6.1±0.2 and 5.9±0.1 for formulation F1, F2, F3, F4, F5, and F6 respectively.

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In the above formulations the viscosity of different sample of gel were determined and found that there is increase in viscosity. The formulation HG5 has good viscosity. The viscosity of formulations F1, F2, F3, F4, F5, and F6 was found to be 3250±15, 3045±20, 2950±32, 2565±15, 2474±22 and 2315±13.

Table 2: Psycho rheological Characteristics

Formulation	Colour	Clogging	Homogeneity	Texture
F1	Light Brown	Absent	Good	Smooth
F2	Light Brown	Absent	Good	Smooth
F3	Light Brown	Absent	Good	Smooth
F4	Light Brown	Absent	Good	Smooth
F5	Light Brown	Absent	Good	Smooth
F6	Light Brown	Absent	Good	Smooth

Table 2: Results of washability and extrudability

Formulation	Washability	Extrudability (g)	pH	Viscosity (cps)
F1	Good	175±4	5.8±0.1	3250±15
F2	Good	182±2	5.9±0.2	3045±20
F3	Good	195±5	6.2±0.1	2950±32
F4	Good	176±2	6.8±0.1	2565±15
F5	Good	162±6	6.1±0.2	2474±22
F6	Good	165±4	5.9±0.1	2315±13

Results of the experiment are being concluded in the, which clearly shows the antimicrobial activity of herbal tooth gel against oral pathogens, *S. mutans*, *E. faecalis* and *S. sanguinis* used in present work. The herbal tooth gel obtained from

Acemella oleracea used to suitably dilute upto the concentrations of 100, 50 and 25 milligram per ml and applied on to the test organism using Agar well diffusion method.

Table 3: Antimicrobial activity of herbal tooth gel formulation (F4) against selected microbes

S/No.	Oral pathogens	MTCC No./ATCC No.	Zone of inhibition (mm)		
			100mg/ml	50 mg/ml	25mg/ml
1.	<i>S. mutans</i>	MTCC 890	14±0.5	13±0.57	10±0.74
2.	<i>E. faecalis</i>	MTCC 439	9±0.86	8±0.74	6±0.47
3.	<i>S. sanguinis</i>	ATCC 10556	11±0.57	10±0.47	8±0.94

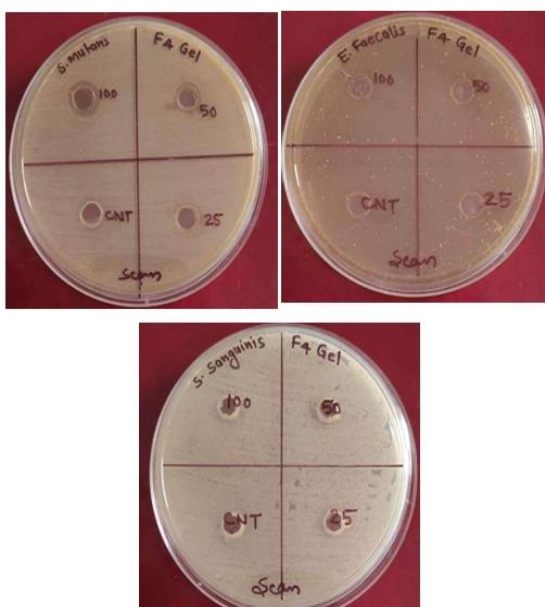


Figure 1: Photoplates of antimicrobial activity of herbal tooth gel formulation(F4) against selected microbes

Conclusion

F4 formulation has desired viscosity because of its higher polymer content and it is able to remain on mucous surface long enough to release its active ingredient. So because of uniformity, proper appearance, stability and acceptable viscosity F4 formulation was chosen as the superior formulation.

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