Research Article

Formulation and Evaluation of Herbal Gel Containing Extract of *Cedrus deodara*

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ABSTRACT
The present research has been undertaken with the aim to formulate and evaluate the herbal gel containing *Cedrus Deodara* extract. The gel formulation was designed using ethanol extract of *Cedrus Deodara* and evaluated for various parameters. The gel was formulated using accurately weighted amount of extract along with other additives, poured into the fixed amount of hydrated Carbopol dispersion with constant stirring. The herbal gel formulations prepared were subjected to preliminary evaluation such as pH, Spreadability, Drug content uniformity, Viscosity and *In vitro* diffusion study. The parameters were found to be satisfactory. The spectral analysis was also performed to check compatibility and drug integrity throughout the process. The results of study reveal great acceptability of Gel-formulation of *Cedrus Deodara* since evaluation parameters lies in range.

Keywords: Cedrus Deodaraextract, Formulation, Herbal Gel, Extract.

INTRODUCTION

Herbal medicine is a major component in all traditional medicine and a common element in Ayurvedic medicine. Topical gel preparations are intended for skin application or to certain mucosal surfaces for local action or percutaneous penetration of medicament. Gels are typically semi-solid formulations having a liquid phase that has been thickened with other components. The liquid phase allows free diffusion of molecules through the polymers scaffold and hence release should be equivalent to that from a simple solution[1].

C. deodara (**Figure 1**) is an evergreen conifer tree reaching up to 85 m in height with almost rough black, furrowed bark and spreading branches, shoots dimorphic, leaves 2-5,-5-8 cm needle like triquetrous, sharp, pointed, flowers usually monoecious, but some trees or branches habitually bear flowers of one sex[2]. It comprises four species *Cedrus deodara*, *Cedrus libani, Cedrus brevifolia and Cedrus atlantica*[3,4]. They were also found to have potent antimicrobial properties[5-7].

Fig. 1: Plant of *Cedrus deodara*

MATERIAL AND METHOD

The plant material was collected locally, identified and grinded to coarse powder for further extraction. Other chemicals were procured from S.D. Fine chemicals. Other reagents and solvents used were of analytical grade.

Preparation of extracts

Powdered *Cedrus deodara* defatted with petroleum ether and extracted from ethanol.

The coarse powder was extracted by continuous hot percolation using Soxhlet apparatus, until the extract is clear of any traces if present. Successive extraction is done with solvent of least polarity to most polar solvent ethanol. The potent ethanol extract was used for herbal gel formulation.

Preparation of herbal gel

The required quantity of Carbopol was slowly sprinkled into weighed amount of purified water with constant stirring to get the uniform dispersion and then kept overnight for hydration. The accurately weighted amounts of dried extract along with other additives were poured into the fixed amount of hydrated Carbopol dispersion with constant stirring[8]. The composition of herbal gel prepared from ethanolic extract of *Cedrus Deodara*is tabulated in **Table 1**.

Table 1: Composition of various gel formulations

S. No.	Formulation	INGREDIENTS					
		Carbopol (g)	Polyethylene (g)	Triethanol Amine (g)	Plant Extract (%)	Sodium Sulphite (g)	Water up to (ml)
1	G1	0.25	5	1	2	0.1	100
2	G2	0.5	5	1	2	0.1	
3	G3	0.75	5	1	2	0.1	
4	G4	1.00	5	1	2	0.1	

EVALUATION OF HERBAL GEL

pH

The pH of gel formulations were determined by using digital pH meter. 2.5gm of gel was accurately weighed and dispersed in 25ml of distilled water and stored for two hours .The measurement of pH of formulation was carried out in triplicate **(Table 2)**.

Viscosity

Viscosities of gels were determined using Brookfield viscometer. Gels were tested for their rheological characteristics at 250C using Brookfield viscometer. The measurement was made over the whole range of speed settings from 10 rpm- 100 rpm with 30 seconds between 2 successive speeds and then in a descending orders **(Table 2)**.

Spreadability

Spreadability is a term expressed to denote the extent of area to which the gel readily spreads on application to skin or affected part. Spreadability (S) is calculated by using the formula:

S=ml/t

Where, m = weight tide to upper slide
l = length moved on the glass slide
t = time taken to separate the slides completely from each other

Drug content uniformity

About 1 gm of gel was accurately weighed and transferred to 100ml volumetric flask to which about 70ml of methanol was added. After mixing, the volume was made up to 100ml with methanol. The content was filtered using filter paper. A quantity of 1ml was pipette out from the filtrate and suitably diluted with methanol. Then the extract was estimated spectrophotometrically by using Shimadzu UV/VIS spectrophotometer-1700[9].

Extrudability

Extrudability is the force required to exude material out of tube; determining the consistency of preparation. The extrudability was calculated using the following formula
Extrudability = Applied weight to extrude gel from tube (gm) / Area (cm^2)

Table 2: Results of evaluation parameters of various gel formulations

S. No.	Formulation	PARAMETERS				
		pH	Viscosity (cps)	Spreadability	Drug Content (%)	Extrudability (%)
1	G1	6.9	1652	28.60	62.4	76.8
2	G2	6.8	1544	31.20	82.4	81.5
3	G3	7.1	1530	28.12	84.5	83.2
4	G4	7.0	1688	30.92	79.2	75.5

***In vitro* diffusion study**

Cellophane membrane was used for this study. In modified Franz diffusion cell, 2gm of gel was placed in donor compartment of cell. The entire surface of membrane was in contact with the receptor compartment containing 60ml of phosphate buffer pH 6.8. The receptor compartment was continuously

stirred (100rpm) using a magnetic stirrer with temperature maintained at normal body temperature ie. 37±1^{0}C. The study was carried out for 8hr. with the interval of 0.5, 1, 2, 3,4, 5 & 6 hrs. The surface area available for diffusion was calculated. The sample was withdrawn at predetermined time interval and same volume was replaced with fresh phosphate buffer. The absorbance of withdrawn sample was measured. The experiment was carried out in triplicate[10].

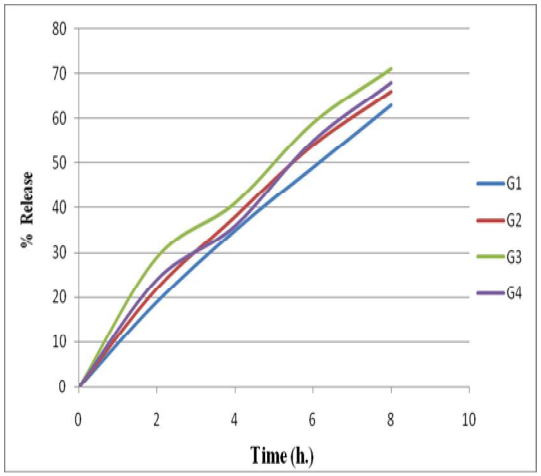

Fig. 2: Results of diffusion studies (% Release Vs Time)

Drug (Extract) Polymer Compatibility Studies

The interaction studies were carried out to ascertain any kind of chemical interaction of extract with the excipients used in the preparation of gel formulations. Fourier-transform infrared spectra were obtained by using a spectrophotometer. Scans were obtained at a resolution of 4 cm^{-1}, from 4000 to 400 cm^{-1}.

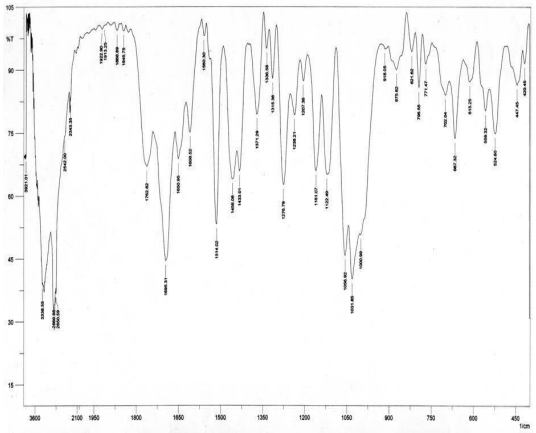

Fig. 3: IR Spectrum of Formulation (G3)

RESULTS AND DISCUSSION

The prepared gel formulations were evaluated for various pharmaceutical parameters and results were mentioned in **Table 2**. From the results it is clearly evident that all the gel formulations showed good gelling property and homogeneity. The pH of all the formulations was in the range compatible with normal pH range of the skin. The drug content released was also found to be moderate releases drug with in optimum range of time period (**Figure 2**). The rheological behaviors of the gel formulations were studied with Brookfield viscometer. The results indicated the viscosity of gel formulations was consistent. A comparative study of viscosity and Spreadability showed that with increase in viscosity of the formulation, the Spreadability decreased and *vice versa*. The FT-IR spectra of gel formulations did not show the presence of any additional peaks for new functional groups. The major peaks of the drug remained unchanged in the mixture were observed in FT-IR spectra, the formulation (**G3**) reveals all essential peaks of extract which confirm no drug excipient interaction as shown in **Figure 3**.

CONCLUSION

This research work was carried out to develop a new topical herbal gel formulation for topical application. The prepared herbal gel was further evaluated for pH, Viscosity and extrudability, Spreadability, Drug content uniformity, *In-vitro* diffusion study, and Drug Polymer Compatibility Studies. The gel formulation **G3** was found to have all the desirable properties. However, *In vivo* models are required for further studies to evaluate the potential of the herbal gel formulation and then it can be useful for the clinical applications.

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