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FORMULATION AND EVALUATION OF HERBAL EMULGEL USING C*ARDIOSPERMUM HALICACABUM* LEAF EXTRACT FOR ANTI ARTHRITIC ACTIVITY

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Abstract

Aim: The aim of the present study is to formulate and evaluate a natural emulgel using *Cardiospermum halicacabum* leaf extract and investigate its anti arthritic activity.

Methods: Emulgel is one of the recent technologies in novel drug delivery system suitable for hydrophobic drugs. It is used topically having characteristic of dual control release, i.e. an emulsion as well as gel. Sodium carboxy methyl cellulose is used as the gelling agent to prepare the emulgel formulation. Ethanolic extract of *Cardiospermum halicacabum* was used to exhibit the antiarthritic potential.

Result: Ethanolic extract of *Cardiospermum halicacabum* were subjected to physiochemical evaluation. The prepared emulgel possess good spreadability, viscosity, consistency.

Conclusion: Herbal medicines are easily available, cheaper, time tested and considered safer than synthetic drugs. Mainly hydrophobic drugs can be used to develop emulgel because it contains gel base both oil and aqueous. Thus, emulgel proves to be an effective formulation for the delivery of hydrophobic drugs in water soluble bases.

Keywords: Anti arthritic activity, *Cardiospermum halicacabum*, Emulgel, Extract, gel, herbal.

Introduction

Herbal medicines are easily available, cheaper, time tested and considered safer than the synthetic drugs. Emulgel is one of the recent technologies in Novel Drug Delivery System. It is used topically having characteristic of dual control release. That is an emulsion as well as gel. Gels are relatively newer class of the dosage forms. It consists of large amount of hydro alcoholic liquid in colloidal solid particles. It has a higher aqueous component that permits greater dissolution rate of the drug and it also undergo easy migration of the drug compared to ointment or cream base[1]. A gel is

a colloid which is immobilized by surface tension between it and a macromolecular network of fibers built from a small amount of a gelating substance present. Among various advantages of the gels, a major limitation is in the delivery of the hydrophobic drugs. So to overcome this limitation, an emulsion based approach is being used. Hydrophobic therapeutic moiety can be successfully incorporated and delivered through gels. *Cardiospermum halicacabum*, is commonly known as "Balloon wine" or "Love in a Puff". It is a climbing plant widely distributed in tropical and subtropical regions of Africa and Asia. When gels and emulsion are used in combined form, the dosage form is referred as emulgel. Emulgels have several favorable properties such as thixotropic, greaseless, easily spreadable, easily removable, emollient, water soluble, longer shelf life, transparent etc[2]. Advantages of the emulgel are its better stability, better loading capacity, avoid first pass metabolism. The present study was conducted to formulate *Cardiospermum halicacabum* herbal emulgel containing sodium carboxyl methyl cellulose as the gelling agent.

Materials and Methods

Sodium carboxyl methyl cellulose, Liquid Paraffin, Tween 80, Span 80, Propylene glycol, Alcohol, Distilled water

Formulation of Emulgel

Sodium carboxy methyl cellulose was used as a gelling agent for preparing the emulgel. Oil phase was prepared by mixing span 80 in liquid paraffin while aqueous phase was prepared with tween 80 in purified water. Both aqueous and oil phase was heated separately in the water bath at 70˚C. In a separate beaker, propyl paraben was added to propylene glycol and ethanolic extract of *Cardiospermum halicacabum* was dissolved in ethanol. Then, the mixture of propyl paraben in propylene glycol and the extract of *Cardiospermum halicacabum* in ethanol was added and mixed with the heated aqueous solution. The oil phase was then added to the aqueous phase at room temperature with continuous stirring. The formed emulsion was mixed with the gelling agent in the ratio (1:1) to form the emulgel[3-6] (Table 1).

Table 1: Composition of the Emulgel.

S.NO	INGREDIENTS	QUANTITY (100ml)
1.	*Cardiospermum halicacabum* extract	1g
2.	Sodium carboxy methyl cellulose	0.1g
3.	Light liquid paraffin	0.4ml
4.	Tween 80	0.1ml

5.	Span 80	0.05ml
6.	Alcohol	1ml
7.	Propylene glycol	0.5ml
8.	Distilled water	Q.S to 100 ml

Evaluation of Emulgel[7-10]

Physical examination

The emulgel was prepared and evaluated for its colour, appearance, consistency. The parameter was evaluated visually (Table 2).

Table 2: Evaluation of Emulgel.

Parameter	**Observations**
Colour	White
Appearance	Clear and Transparent
pH	6.7±0.1*
Consistency	Good
Viscosity	0.017 cps ± 0.004*
Spreadability	14.2 cm ± 0.23*
Drug content	93% ± 0.12*

*Each Value represents mean ± SD, n=3

pH: The pH of the emulgel was measured using pH meter (Table 2).

Rheological studies

The viscosity of 1% emulgel was determined using Ostwald's viscometer (Table 2).

Spreadability

Spreadability is expressed in terms of time in seconds. The spreading value depends on the bioavailability efficiency of an emulgel formulation. 1 gm of sample was placed over a slide and another slide was placed on top of the emulgel. 100

gm of weight was then placed upon the upper slide. The weight was removed after 30 minutes and the diameter of the emulgel was measured (Table 2).

$$S = M.L / T$$

Where

M = weight of the upper slide

L = length of glass slide

T = time taken to separate the slides

Drug content determination

1g of the formulation of the drug was taken in a 50ml volumetric flask. Drug was diluted with ethanol. It was shaken to dissolve completely. The solution was then filtered through the whatman filter paper. From this fitrate, 0.1ml was pipetted out and diluted to 10ml with ethanol. The content of the drug was estimated using UV spectrophotometer at a wavelength of 204nm (Table 2).

Drug Content = (Concentration x Dilution factor x Volume taken) x Conversion Factor

***In vitro* drug release**

In vitro studies were carried out using Franz diffusion cell. 10ml of pH 6.8 phosphate buffer was used as the diffusion medium and this was maintained at 37 $^{\circ}$ C on a magnetic stirrer. 1ml of the sample was collected at an interval of 30 minutes for 2 hours until drug gets completely released. After every sample withdrawal, fresh medium is replaced in to the receptor compartment. Then the collected sample was analyzed by UV Visible spectrophotometer at 204nm (Table-3) [11].

Table 3: *In vitro* Drug diffusion study.

S.No	Time(Minutes)	Percentage Drug Release
1.	30	44.98 ±0.056*
2.	60	53.45 ±0.017*
3.	90	64.414 ±0.086*
4.	120	93.204 ±0.15*

*Each Value represents mean ± SD, n=3

Anti arthritic activity

0.5ml of test solution, test control solution, product control solution, standard solution was prepared. Various concentration (100,250,500 and 750µg/ml) of test drug and standard drug of diclofenac sodium (10,50,100,200,400,800 and 1000µg/ml) were prepared. 1N HCL was used to adjust the pH to 6.3 for all above the solution . The sample was incubated at 37°C for 20 minutes and the temperature was too increased to 57°C for 3 minutes. After cooling, 2.5 ml of the phosphate buffer was added to the above solution.

The absorbance was measured at 204nm. The control represents 100% protein denaturation[12] (Table 4). The percentage inhibition of protein denaturation can be calculated as

$$\frac{100-(\text{Optical Density of test control}-\text{Optical Density of product control})}{\text{Optical Density of test solution}} \times 100$$

Table 4: *Invitro* Anti arthritic activity of *Cardiospermum halicacabum* leaf extract.

S.No.	Concentration (µg/Ml)	Percentage Inhibition	
		Cardiospermum halicacabum	**Diclofenac sodium**
1.	10	21.221 ±0.056*	22.17 ±0.017*
2.	50	40.357 ±0.018*	42.116 ±0.059*
3..	100	57.256 ±0.089*	53.886 ±0.058*
4.	200	65.891 ±0.064*	61.276 ±0.046*
5.	400	72.131 ±0.036*	67.43 ±0.061*
6.	800	76.090 ±0.095*	75.905 ±0.082*
7.	1000	88.129 ±0.057*	89.39 ±0.072*

*Each Value represents mean ± SD, n=3.

Results and Discussion

Physical appearance:

The emulgel formulation was evaluated for its colour and appearance. The physical appearance of the emulgel formulation was found to be whitish, clear and transparent.

PH determination

The pH of the emulgel formulation was in the range of 6.7.

Spreadability studies

The spreadability of the emulgel was found to be 14.2 cm.

Rheological studies

The viscosity of the emulgel was found to be 0.017cp using Ostwald's viscometer.

Drug content determination:

The drug content of the emulgel formulation was found to be 93%.

In vitro drug release: The invitro drug release of the emulgel formulation was characterized for drug diffusion study using Franz diffusion cell and the result was found to be 93.20% at 2 hours.

Conclusion

The prepared emulgel was found to have better spreadability, viscosity, consistency, ph and organoleptic properties. The emulgel was evaluated for its anti arthritic activity by protien denaturation method and was found to have comparable result with that of the standard diclofenac sodium gel. The emulgel also possess better drug diffusion which was studied using franz diffusion cell. Thus, we can conclude that the prepared emulgel can be used as an effective formulation in the treatment of arthritic pain with all the advantages of using a natural drug than a synthetic drug.

Fig 1: *In vitro* Drug diffusion study.

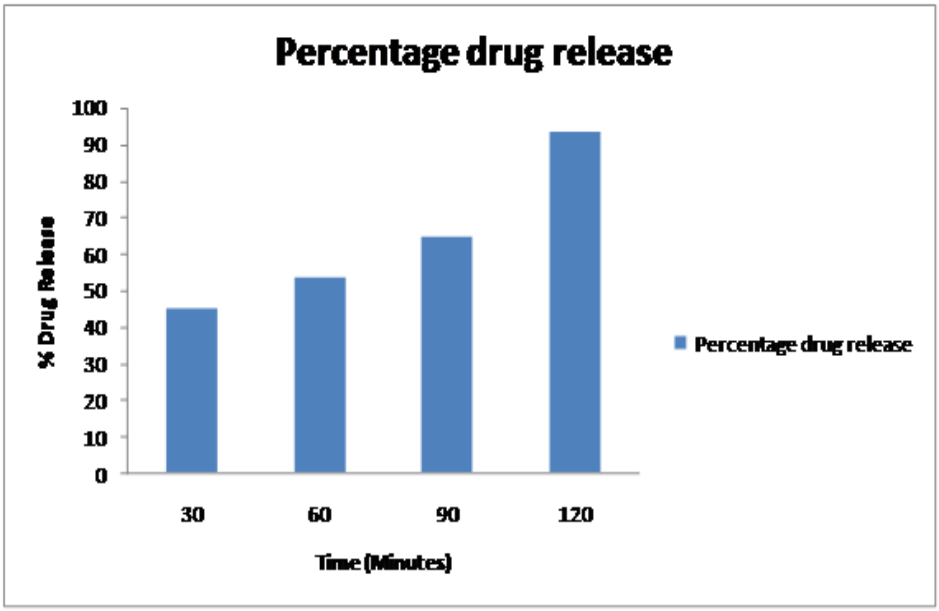
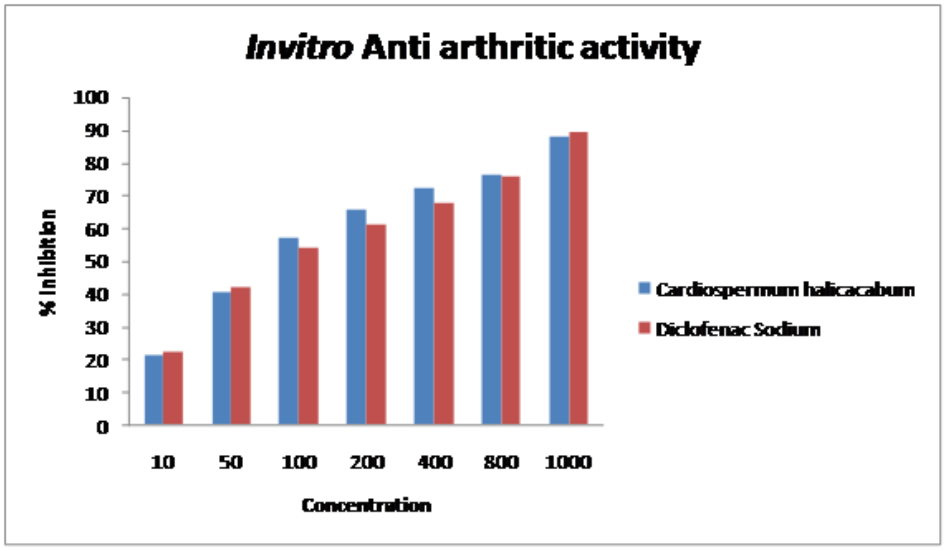


Fig 2: *Invitro* Anti arthritic activity of *Cardiospermum halicacabum* leaf extract.



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