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Research Article

## Formulation and evaluation of Emulgel containing *Coriandrum sativum* seeds oil for Anti-inflammatory activity

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### ABSTRACT

The present work deals with the formulation and evaluation of anti-inflammatory activity containing *Coriandrum sativum* seeds oil. The major component of *Coriandrum sativum* seed oil is linalool (60-70%) and this linalool content is suitable for anti-inflammatory activity. Our main purpose is to treat inflammation at faster rate with minimum side effects. During formulation and development of any new dosage form the foremost common perplexity featured from hydrophobic behavior of medication that ultimately results in poor water solubility and bioavailability issues. Such types of problems are overcome by incorporating *Coriandrum sativum* seeds oil emulsion into gel base as 1:1 proportion to obtain an emulgel. Emulsion was prepared by using  $3^2$  factorial design in which peppermint oil and span 20 were selected as two factors. The emulgel was prepared by incorporating optimized batch of emulsion (F9 batch) into gel base as 1:1 proportion and evaluated for their physical examination, pH, viscosity, extrudability, swelling index, drug content, *In-vitro* diffusion study, *In-vivo* anti-inflammatory study and stability study.

**Keywords:** Anti-inflammatory activity, *Coriandrum sativum*, Emulgel, Linalool, O/W type emulsion.

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### INTRODUCTION

Topical drug administration is simplest and best route of restricted drug delivery anywhere within the body by routes as ophthalmic, rectal, vaginal and skin.<sup>1</sup> Topical drug delivery is defined as the localized application of formulation within the body through ophthalmic, rectal, nasal, vaginal and skin with the approach to extend its bioavailability and reduction in side effects.<sup>2</sup> Emulgels are the combination of emulsions and gels.<sup>3</sup> Emulsion, either of oil in water or water in oil type, which are gelled by mixing with a gelling agent.<sup>4</sup> Emulgel acts as dual control of drug release from the formulation, due to presence of both aqueous and non-aqueous phase.<sup>5</sup> Emulgels are preparations widely used for delivery of drug through skin. Its function in dermatology is realized mainly due to the advantages such as easy incorporation of hydrophobic drugs, thixotropy, greaseless, easily spreadable, easy removable, emollient, non-staining, water-soluble, biocompatibility with greater shelf life and pleasant appearance.<sup>6</sup>

Gel formulations typically show higher drug release than ointments and creams. In spite of many advantages of

emulsions and gels a major disadvantage is their inability to delivery of hydrophobic drugs and instability during storage respectively. Such types of problems are overcome by using emulsion based approach that is emulgel preparations and thereby hydrophobic drug is successfully incorporated and enjoy the unique property of gels.<sup>7</sup> Major active constituents of *Coriandrum sativum* are essential oils and fatty oil. The major component of which is Linalool (60-70%) and other minor active constituents present in essential oil are citronellol, borneol, geraniol,  $\alpha$ -pinene, camphor,  $\gamma$ -terpinene, limonene, p-cymene, and geraniol acetate, furan, pyridine, pyrazine, thiazole, neochlidilide, coriandrin, phtlides, isocoumarins, dihydrocoriandrin, coriandronA-E, flavonoids, digustilide phenolic acids and sterols.<sup>8</sup> Out of this all constituents Linalool possesses strong anti-inflammatory activity and could thus be applied for the treatment of inflammatory diseases.<sup>9</sup>

### MATERIALS AND METHODS

#### Materials:

*Coriandrum sativum* seeds were purchased from Waghdole ayurvedics, Satara. Carbopol 940, Carbopol 934, Span 20,

Tween 20, Triethanolamine, Peppermint oil were purchased from Research lab fine chem industries, Mumbai. Methyl paraben, Propyl paraben were purchased from Loba chemie Pvt.ltd, Mumbai. Light liquid paraffin, Propylene glycol, Linalool, Sodium sulphate were purchased from S.D lab chem. Mumbai.

#### Extraction of *Coriandrum sativum* seeds oil:

The dried *Coriandrum sativum* seeds were coarsely powdered and volatile oil was extracted through hydrodistillation by using Clavenger apparatus with a flow

rate of 4 ml/min at the temperature of 90<sup>o</sup> C for 4 hrs. The resulting oil water mixture obtained in receiver was extracted using diethyl ether as solvent (v/v) and dried over sodium sulphate (anhydrous). The organic layer was concentrated at 20<sup>o</sup> C for further studies.<sup>10</sup> The *Coriandrum sativum* seeds oil was analyzed for organoleptic properties namely colour, odour, taste. The *Coriandrum sativum* seeds oil was identified by Thin Layer Chromatography, Ultraviolet Spectroscopy, Infrared Spectroscopy, Differential Scanning Calorimetry Methods.<sup>11</sup>

#### Preparation and evaluation of all batches (F1-F9) of emulsion

Table 1: Design summary

| Factor | Name           | Coded level |        |      | Actual level |        |      | Response |      |
|--------|----------------|-------------|--------|------|--------------|--------|------|----------|------|
|        |                | Low         | Medium | High | Low          | Medium | High |          |      |
| A      | Peppermint oil | -1          | 0      | +1   | 1.05         | 1.57   | 2.1  | % PY     | % EE |
| B      | Span 20        | -1          | 0      | +1   | 1.4          | 2.1    | 2.8  |          |      |

Table 2: Formulation table of (F1-F9) batches of emulsion

| Batches<br>Ingredients            | F1    | F2    | F3    | F4    | F5    | F6    | F7    | F8    | F9    |
|-----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Coriandrum sativum seeds oil (ml) | 2.5   | 2.5   | 2.5   | 2.5   | 2.5   | 2.5   | 2.5   | 2.5   | 2.5   |
| Light liquid paraffin (ml)        | 4.37  | 4.37  | 4.37  | 4.37  | 4.37  | 4.37  | 4.37  | 4.37  | 4.37  |
| Peppermint oil (ml)               | 1.05  | 1.05  | 1.05  | 1.57  | 1.57  | 1.57  | 2.1   | 2.1   | 2.1   |
| Span 20 (ml)                      | 1.4   | 2.1   | 2.8   | 1.4   | 2.1   | 2.8   | 1.4   | 2.1   | 2.8   |
| Tween 20 (ml)                     | 1.4   | 1.4   | 1.4   | 1.4   | 1.4   | 1.4   | 1.4   | 1.4   | 1.4   |
| Methyl paraben (g)                | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 |
| Propyl paraben (g)                | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  |
| Propylene glycol (ml)             | 5     | 5     | 5     | 5     | 5     | 5     | 5     | 5     | 5     |
| Distilled water q.s (ml)          | 50    | 50    | 50    | 50    | 50    | 50    | 50    | 50    | 50    |

The oil phase of the emulsion was prepared by dissolving span 20 in light liquid paraffin and peppermint oil, also *Coriandrum sativum* seeds oil was mixed in oil phase. While the aqueous phase of emulsion was prepared by dissolving tween 20 in distilled water. Methyl paraben and propyl paraben were dissolved in propylene glycol and mixed with aqueous phase. Both the oily and aqueous phases were separately heated to 70<sup>o</sup> to 80<sup>o</sup>C, then the oily phase was added to the aqueous phase with continuous stirring until it was cooled to room temperature. The emulsion was obtained, which is stored in well closed air tight container.<sup>12</sup> All the batches of emulsion (F1-F9) were evaluated for microscopic observation, pH, electrical conductivity, viscosity, dilution test, % transmittance measurement, % production yield and entrapment efficiency. Zeta potential of optimized batch of emulsion was measured by using zeta sizer at 25<sup>o</sup> C.<sup>13,14</sup>

#### Preparation of gel:

The composition of the gels was as per (Table 3). The quantity of carbopol 940, carbopol 934 were weighed and mixed homogenously with distilled water at 65–70<sup>o</sup>C using magnetic stirrer, stirring speed is 1000±200 RPM for 10 min to form smooth dispersion. The preparation is allowed to stand, permitting entrapped air to separate. Then the pH was adjusted to 6–6.5 using triethanolamine.<sup>15</sup>

Table 3: Composition of gel

| Sr.No. | Ingredients               | Quantity |
|--------|---------------------------|----------|
| 1      | Carbopol 940 (gm)         | 0.5      |
| 2      | Carbopol 934 (gm)         | 0.25     |
| 3      | Triethanolamine (ml)      | q.s      |
| 4      | Distilled water (ml) q.s. | 50       |

#### Preparation of emulgel:

The optimized emulsion (batch F9) was incorporated into the gel base in 1:1 ratio under continuous mixing using mechanical stirrer (RQT-127/ Remi) at 5000-6000 rpm for about 10-20 minutes to obtained emulgel.

#### Evaluation of emulgel containing emulsion (of optimized batch F9) of *Coriandrum sativum* seeds oil:<sup>16</sup>

##### 1. Physical Examination:

The color of the formulation was checked against white and black background. The consistency of emulgel was checked by applying on skin. The odor of emulgel was checked by mixing it in water and by smelling it.

## 2. pH

1% solution of emulgel were prepared and subjected to measure pH by the digital pH meter.

## 3. Drug - excipient compatibility study:

FTIR spectra of the *Coriandrum sativum* seeds oil and other excipients like carbopol 940, carbopol 934 was compared with spectra of prepared emulgel formulation.

## 4. Viscosity

The rheological property of emulgel sample was determined by using Brookfield viscometer.

## 5. Spreadability

A lower glass slide was fixed on this block. An excess of prepared emulgel (about 1gm) under study was placed on this ground slide. The emulgel formulation was then sandwiched between this slide and another glass slide having the dimension of fixed ground slide and provided with a hook. A weight of 100 g was placed on the top of the two slides for 5 min to expel air and to provide a uniform film of the gel between the slides. Excess of the emulgel was scrapped off from the edges. The upper slide was then subjected to a pull of 20 g weight with the help of a string attached to the hook and the time (in seconds) required by the upper slide to cover a distance of 6.5 cm was noted. A shorter interval indicates better spreadability.

Spreadability (S) was calculated as follow:

$$S = M.L/t$$

## 6. Extrudability:

The emulgel formulations were filled in standard capped collapsible aluminium tubes and sealed by crimping to the end. The weights of the tubes were recorded. The tubes were placed between two glass slides and were clamped. 50 g was placed over the slides and then the cap was removed. The amount of the extruded emulgel was collected and weighed. The percent of the extruded emulgel was calculated as follow:

$$\text{Extrudability} = \frac{\text{Applied weight to extrude emulgel from tube (in gms)}}{\text{Area (in cm}^2\text{)}}$$

## 7. Globule size and its distribution in emulgel:

Globule size and distribution was determined by using optical microscope. A 1 gm sample was dissolved in purified water and agitated to get homogeneous dispersion. Sample was observed under optical microscope and mean globule diameter and distribution was obtained.

## 8. Drug content:

Drug content in emulgel was measured by dissolving 1 gm of emulgel in 100 ml of solvent (a mixture of ethanol and phosphate buffer pH 6.8(60:40). After filter this solution to obtain clear solution and subjected to spectrophotometric analysis after suitable dilution.

## 9. In vitro drug diffusion study:

Release of the *Coriandrum sativum* seeds oil from emulgel formulation was measured through standard cellophane membrane using a Franz diffusion cell. Prior to study, cellophane membrane was soaked in diffusion medium for overnight, and then placed on the support screen of the diffusion cell assembly. Ethanolic phosphate buffer (60:40) at pH 6.8 was used as the receptor medium and 1 g of the gel was placed on the donor side. At predetermined time intervals, 2ml of sample was withdrawn from the receptor

compartment and replaced with same volume of ethanolic phosphate buffer (60:40) at pH 6.8. The aliquots were analyzed by UV spectrophotometer at 538 nm. Cumulative amount of drug diffused (CADD) was calculated as follow:

$$\% \text{ CADD} = \frac{[\text{Concentration } (\mu\text{g/ml}) \times \text{Volume of diffusion medium} \times \text{Dilution factor}]}{1000}$$

## 10. In-vitro Anti-inflammatory activity:<sup>17</sup>

All the procedures related with animal experiment were carried out in accordance with committee for purpose of experiments on animal's guidelines (CPSCEA). The study was reviewed and approved by Institutional Ethics Committee (Protocol number: SCOP /IAEC/98/18-19), Satara College of Pharmacy, Satara, Maharashtra, India.

Animals were divided into 3 groups in each group containing 6 animals. 1% suspension of carrageenan in saline was prepared 1 hr before each experiment and injected into the plantar side of the right hind paw of the rat. A emulgel containing *Coriandrum sativum* seeds oil was applied to the plantar surface of the hind paw by gentle rubbing with the index finger. Rats of the control groups were received the plain emulgel base and emulgel of standard drug was applied in the same way. Paw volume was measured immediately after carrageenan injection and at 1, 2, 3 and 4 hrs intervals by using plethysmometer. The size of edema was expressed as the increase in paw volume after carrageenan injection. % Inhibition of edema was calculated as follow:

$$\% \text{ Inhibition of edema} = \left[ \frac{C - T}{C} \right] \times 100$$

## 11. Stability study:<sup>18</sup>

Emulgel was packed in aluminum collapsible tubes (5 gm) and subjected to stability studies at 5°C, 25°C/60%RH, 30°C/65% RH and 40°C/75% RH for a period of 3 months. Samples are withdrawn at each month as per ICH guidelines and analyzed for the physical appearance, pH, drug content, drug release profile etc.

## RESULT AND DISCUSSION

The dried seeds of *Coriandrum sativum* were collected from Waghdole ayurvedics, Satara. Authentication of *Coriandrum sativum* seeds was done from department of botany, YCIS satara and it was confirmed that the procured after were of *Coriandrum sativum*. Oil was obtained in sufficient quantity from the seeds of *Coriandrum sativum* through hydrodistillation method by using clavenger type apparatus. Characterization of *Coriandrum sativum* seeds oil was found to be colourless to pale yellow colour, characteristic odour and spicy taste. Rf value of *Coriandrum sativum* seeds oil was found to be  $0.766 \pm 0.0057$  and compared with standard linalool was found to be  $0.776 \pm 0.0057$ . The  $\lambda$  max value of *Coriandrum sativum* seeds oil was found to be 538 nm in 95% methanol using UV- spectrophotometer. This was in well compliance with the  $\lambda$  max value of linalool in literature.

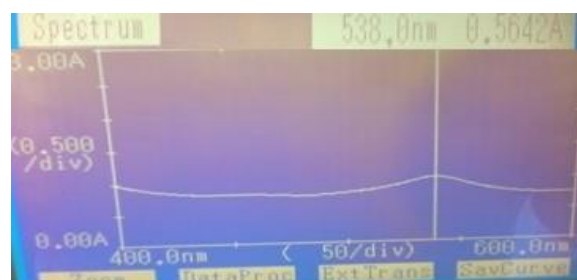


Figure 1: UV spectrum of *Coriandrum sativum* seeds oil in 95% methanol

The DSC thermogram displayed endothermic peak at 195<sup>0</sup>-199<sup>0</sup>C, which expresses boiling of *Coriandrum sativum* seeds oil.

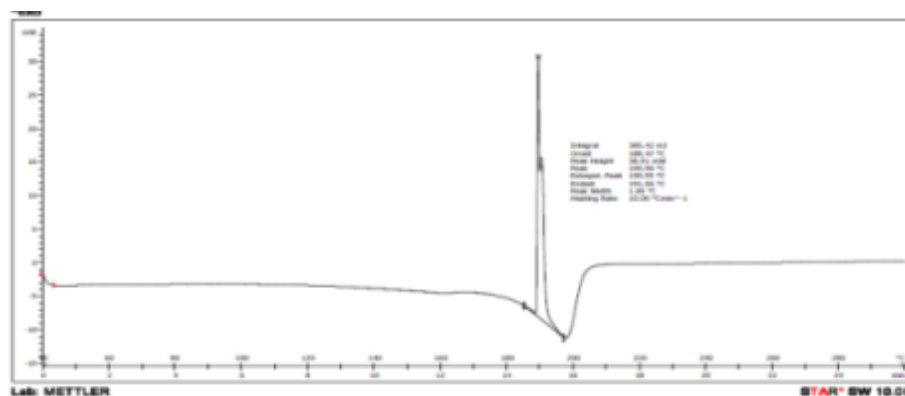


Figure 2: DSC Thermogram of *Coriandrum sativum* seeds oil.

The IR of *Coriandrum sativum* seeds oil (Figure 3) showed the presence of functional groups which are present in Linalool (Figure 3) so, it indicated that Linalool is present in *Coriandrum sativum* seeds oil.

Table 4: FTIR spectrum of *Coriandrum sativum* seeds oil and Linalool

| Wave number (cm <sup>-1</sup> )     |          | Functional groups |
|-------------------------------------|----------|-------------------|
| <i>Coriandrum sativum</i> seeds oil | Linalool |                   |
| 3415.32                             | 3430.41  | O-H               |
| 3083                                | 3087     | C=C-H             |
| 2926.96                             | 2925.60  | C-C-H             |
| 1635                                | 1721.71  | C=O               |
| 1112.73                             | 1113.99  | C=C               |

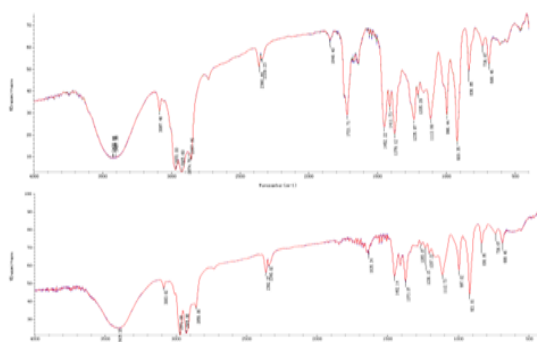


Figure 3: FTIR spectrum of *Coriandrum sativum* seeds oil and Linalool

The microscopic observation of all the batches of emulsion were examined and photographed by using an optical microscope. The observed emulsions were found to be in oil in water type. The pH of all batches (F1-F9) was found to be in the range of 5.04 ± 0.005 to 5.82 ± 0.005. The electrical conductivity of all batches (F1-F9) was found to be in the range of 140.6 ± 0.125 to 186.2 ± 0.126 µs. The viscosity of all batches (F1-F9) was found to be in the range of 414.23

cps to 660.46 cps. The % transmittance of all batches (F1-F9) was found to be in the range of 72.34 ± 0.1850 to 96.66 ± 0.1860 %. The % production yield of all batches (F1-F9) was found to be in the range of 49 % to 93 %. The entrapment efficiency of all batches (F1-F9) was found to be in the range of 48 % to 87 %. The zeta potential of optimised emulsion formulation (F9 batch ) was found to be 21.66 mv(Figure 4) which indicated the formulation is stable.

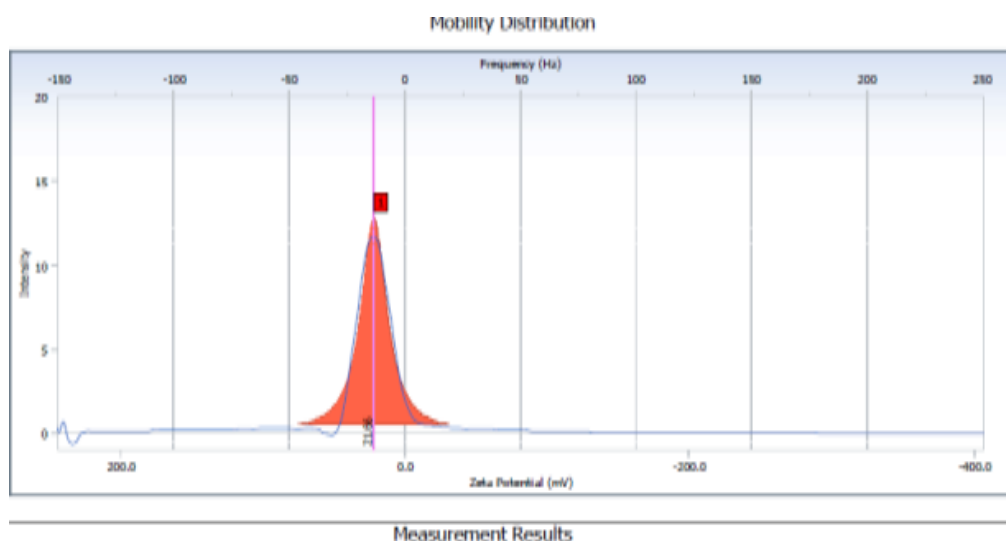


Figure 4: Zeta potential of emulsion



### Data analysis of formulations:

A  $3^2$  full factorial design was selected and the 2 factors were evaluated at 3 levels. The amount of peppermint oil (A) and span 20 (B) were selected as independent variables and the dependent variables were % production yield, and % entrapment efficiency. The data obtained was treated using Stat-Ease Design Expert software. The data clearly indicates that production yield and entrapment efficiency were strongly dependent on the selected independent variables.

### ANOVA for Quadratic model

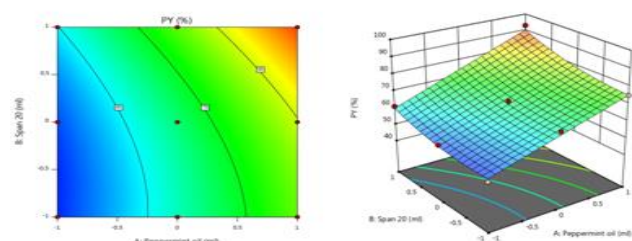


Figure 5: Contour plot and Response 3D surface plot for % production yield of peppermint oil and span 20

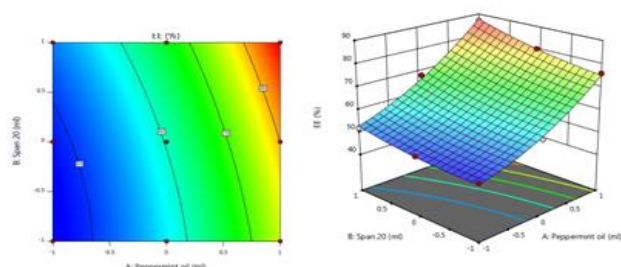


Figure 6: Contour plot and Response 3D surface plot for % entrapment efficiency of peppermint oil and span 20

Final equation in term of coded factors for % PY and % EE

$$\% \text{ PY} = + 60.00 + 13.66 + 6.0000 + 1.50000 + 0.0000 + 3.0000$$

$$\% \text{ EE} = +60.33 + 15.67 + 4.50 + 1.75 + 4.00 + 1.50$$

The amount of % production yield from the (F1-F9) batches of emulsion varied from 49% to 93%. From the P-value 0.0184, it can be concluded that peppermint oil and span 20 have the prominent effect ( $P < 0.05$ ) on the production yield. Positive sign of peppermint oil in regression equation indicates that the response value increases as the number of factors increases. The amount of % entrapment efficiency from the (F1-F9) batches of emulsion varied from 48 % to 87%. From the P-value 0.0010, it can be concluded that peppermint oil and span 20 have the prominent effect ( $P < 0.05$ ) on the entrapment efficiency. Positive sign of peppermint oil in regression equation indicates that the response value increases as the number of factors increases.

### Evaluation of emulgel containing emulsion of optimized (batch F9) of *Coriandrum sativum* seeds oil:

#### 1. Physical examination:

The prepared emulgel containing emulsions (of optimized batch F9) of *Coriandrum sativum* seeds oil was inspected visually for their color white, consistency good, and odour aromatic.

#### 2. Determination of pH:

pH of prepared emulgel was found to be  $5.54 \pm 0.004$ , which compliance with skin pH range 4.5 to 6.5.

#### 3. Drug excipient compatibility study:

An FTIR spectrum of formulation shows significant peaks of *Coriandrum sativum* seeds oil; indicating no interaction between *Coriandrum sativum* seeds oil and excipients (Figure 7).

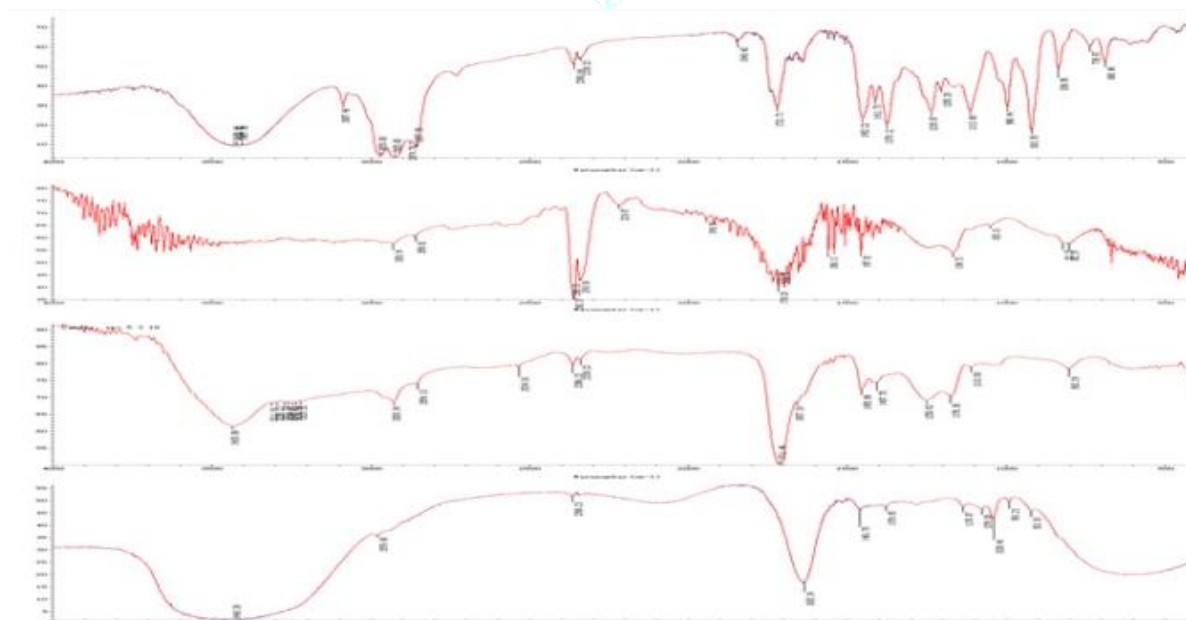


Figure 7: FT-IR of *Coriandrum sativum* seeds oil, Carbopol 940, Carbopol 934 and Prepared emulgel formulation

Table 5: FT-IR of *Coriandrum sativum* seeds oil, Carbopol 940, Carbopol 934 and prepared emulgel formulation

| Coriandrum sativum seeds oil    |                   | Carbopol 940                    |                               | Carbopol 934                    |                     | Prepared emulgel formulation    |                     |
|---------------------------------|-------------------|---------------------------------|-------------------------------|---------------------------------|---------------------|---------------------------------|---------------------|
| Wave number (cm <sup>-1</sup> ) | Functional groups | Wave number (cm <sup>-1</sup> ) | Functional groups             | Wave number (cm <sup>-1</sup> ) | Functional groups   | Wave number (cm <sup>-1</sup> ) | Functional groups   |
| 3415.32                         | O-H               | 2929.34                         | O-H                           | 3435.89                         | O-H                 | 3440.39                         | O-H                 |
| 3083                            | C=C-H             | 2859.92                         | 1 <sup>o</sup> C-H stretching | 1711.46                         | C=O stretching      | 2979.48                         | C-C-H               |
| 2926.96                         | C-C-H             | 1718.26                         | C=O                           | 1176.36                         | C-C                 | 1635.34                         | C=O                 |
| 1635                            | C=O               | 1166.72                         | C-O stretching                | 802.24                          | N-H rocking stretch | 1135.87                         | C=C                 |
| 1112.73                         | C=C               | -                               | -                             | 532.51                          | C-Br stretching     | 921.81                          | N-H rocking stretch |

**Viscosity:**

Viscosity was found to be 2781 cps. Viscosity was increased with increase in emulsifier concentration.

**Spreadability:**

The spreadability of emulgel was found to be 30.33 ± 0.471 gm.cm/sec. Spreadability of emulgel was increased due to presence of propylene glycol as a humectant.

**Extrudability:**

The extrudability of emulgel was found to be 84%. The prepared formulation was required less force to extrude material from tube, hence emulgel showed good extrudability.

**Globule size and its distribution in emulgel:**

The average globule size in emulgel was found to be 1 $\mu$ . About 70-80% of globules were having size range 1 to 2  $\mu$ . It was concluded that the emulsion was uniformly distributed throughout gel base and formed homogenous emulgel.

**Drug content:**

% Drug content of emulgel formulation was found to be 95.67 ± 0.0057 %, which is within the pharmacopieal limits.

**In vitro drug diffusion study:**

At the end of 7 hr, the total amount of drug release from the formulation was found to be 92.9 ± 1.1030 so, it showed better % CADD from emulgel formulation (Table 6 and Figure 8).

Table 6: % CADD of emulgel

| Time (hr) | % CADD Average ± SD |
|-----------|---------------------|
| 1         | 28.67 ± 0.51219     |
| 2         | 48.98 ± 0.50758     |
| 3         | 68.96 ± 0.40305     |
| 4         | 82.86 ± 0.42426     |
| 5         | 85.42 ± 0.62225     |
| 6         | 91.85 ± 0.41012     |
| 7         | 92.9 ± 1.103086     |

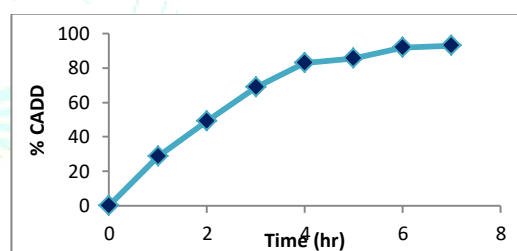


Figure 8: In vitro drug diffusion study of emulgel

**In-vivo Anti-inflammatory activity:**

The anti-inflammatory activity of the formulation (test) was compared with marketed (mobilene) i.e., standard group. The % inhibitions of standard and test group were 46.97 % and 32.14. Data reported above as the mean ± SEM and were analyzed statistically by means of Two way analysis of variance (ANOVA) values of p<0.05= \*, p<0.01=\*\*, p<0.001\*\*\* are regarded as significant and values indicated in bracket are of % inhibition of edema. (Table 7) In this (Figure 9), emulgel containing *Coriandrum sativum* seeds oil give significant result of % inhibition of paw volume at 3<sup>rd</sup> and 4<sup>th</sup> hr.

Table 7: Mean Paw Edema Volume and Percentage Inhibition of the Edema in the Albino Rats

| Time(hr) | Group I Control | Group II Std                    | Group III Test                  |
|----------|-----------------|---------------------------------|---------------------------------|
| 0        | 0.855 ± 0.3064  | 0.640 ± 0.00577*<br>(25.14%)    | 0.755 ± 0.0042*<br>(12.28%)     |
| 1        | 1.04 ± 0.2929   | 0.7133 ± 0.01145*<br>(31.44%)   | 0.871 ± 0.14314*<br>(16.25%)    |
| 2        | 1.326 ± 0.0280  | 0.825 ± 0.07126***<br>(37.78%)  | 1.058 ± 0.01376*<br>(20.21%)    |
| 3        | 1.506 ± 0.0186  | 0.7096 ± 0.16571***<br>(39.17%) | 1.140 ± 0.057734***<br>(24.30%) |
| 4        | 1.82 ± 0.0089   | 0.965 ± 0.02247***<br>(46.97%)  | 1.235 ± 0.005627***<br>(32.14%) |

Values are expressed as mean ± S.D for six animals in each group, brackets values indicated as % inhibition of edema.

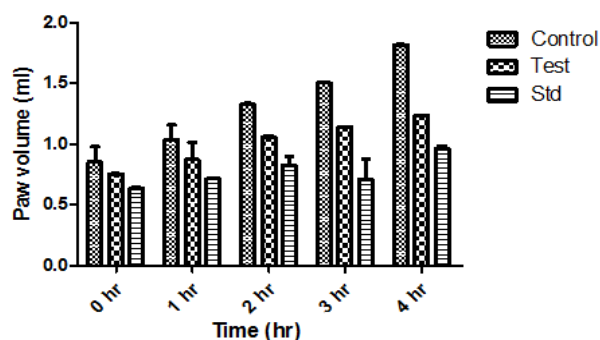


Figure 9: ANOVA for anti-inflammatory activity of albino wistar rat

Table 8: Stability test of emulgel

| Parameters             | Initial        | 1 Month                 | 2 Month                 | 3 Month                 |
|------------------------|----------------|-------------------------|-------------------------|-------------------------|
| Appearance             | White colour   | No change in appearance | No change in appearance | No change in appearance |
| pH                     | 5.54 ± 0.004   | 5.54 ± 0.004            | 5.54 ± 0.004            | 5.54 ± 0.004            |
| Drug content           | 95.67 ± 0.0057 | 95.67 ± 0.0057          | 95.66 ± 0.0057          | 95.66 ± 0.0057          |
| Drug diffusion at 7 hr | 92.9 ± 1.103   | 92.9 ± 1.103            | 92.9 ± 1.103            | 92.8 ± 1.103086         |

Stability study of prepared emulgel formulation was performed as per ICH guideline. It can be observed that the emulgel formulation showed no major alteration in relation to the appearance, pH, drug content and in vitro drug release study. From (Table 8) it can be concluded that the prepared emulgel formulation was found to be stable upon storage for 3 months.

## CONCLUSION

In the coming years, topical drug delivery will be used extensively to impart better patient compliance. Since emulgel is helpful in enhancing spreadability, viscosity, adhesion and extrusion, this novel drug delivery become popular. Furthermore, they will become a solution for loading hydrophobic drugs in water soluble gel bases for the long term stability. Similarly in the study, topical emulgel of *Coriandrum sativum* seeds oil was formulated and subjected to physicochemical studies i.e. appearance, rheological studies, spreadability, extrudability and *In vitro* release studies. *In vitro* release of the tests formulation was performed to determine drug release from emulgel rate and duration of drug release. From the *in vitro* studies, formulation showed maximum release of  $92.9 \pm 1.103$  in 7 hrs. Carrageenan induced paw edema test revealed anti-inflammatory activity. Prepared emulgel containing *Coriandrum sativum* seeds oil showed significant result of anti-inflammatory activity. So emulgel containing *Coriandrum sativum* seeds oil can be used as an anti-inflammatory agent for topical drug delivery.

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## CONFLICT OF INTEREST: None

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