

FORMULATION AND EVALUATION OF *MIMOSA PUDICA* GELVIVEK KUMAR R\* AND SATISH KUMAR<sup>1</sup>\* Dept of Pharmacognosy, <sup>1</sup> Dept of Pharmacology, Government College of Pharmacy, Bangalore India. 560027

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## ABSTRACT

The present study was aimed to prepared and characterize gel formulations of *mimosa pudica* using different polymers as gelling agents in various concentrations and also to evaluate antiinflammatory activity of gel. For the study, polymers such as carbopol 940 (0.2-1.0%w/v), carboxy methyl cellulose (3.5%w/v), hydroxy propyl methyl cellulose (0.5-1.0%w/v) were selected for preparation of different gel formulations. The prepared gels were evaluated for drug content, physical appearance, pH, extrudability, spreadability, skin irritation to observe toxicity or side effects and also for anti inflammatory activity. It was inferred from the results that gel formulation prepared by carbopol 940 in the range 0.2-0.6%w/v, drug concentration 1.5 w/w were found to be best formulations among the prepared batches. The prepared gels were evaluated for anti inflammatory activity in wistar rat model and carbopol 940 formulation of *Mimosa pudica* gel shown significant inhibition in carrageenan induced paw oedema.

**Keywords:** *Mimosa pudica*, Carbopol 940, Carboxymethylcellulose, Hydroxy propyl methyl cellulose, Anti-inflammatory.

## INTRODUCTION

Topical application of gels at pathological sites offer great advantage in a faster release of drug directly to site of action, independent of water solubility of the drug as compared to creams and ointments<sup>1,2,3,4</sup>. *Mimosa pudica* (mimosae) commonly known as the "shyplant" is phytochemically rich in steroids, alkaloids, tannins, triterpenes, flavanoids and cardiac glycosylflavones<sup>5</sup>. Traditionally the plant is used in treatment of hydrocele, dysentery, anthelmintic, diuretic<sup>6</sup>, hyperglycemic<sup>7</sup>, convulsant<sup>8</sup>, analgesic anti inflammatory<sup>10</sup> and substantial neutralization of snake proteins like hyaluronidase and protease<sup>9</sup>. Since the plant is used traditionally for inflammation it became worthwhile to evaluate its antiinflammatory activities in rats. The present investigation involves the preparation of three gel formulations of *mimosa pudica* (aqueous extract) followed by the evaluation for drug content, physical appearance, pH, extrudability, spreadability and also for antiinflammatory activity.

## MATERIALS AND METHODS

## Plant collection and identification

Fresh plant of *mimosa pudica* were collected from medicinal plants garden Government College of Pharmacy, Bangalore and authenticated by botanist Dr. Jawahar Raveendran FRLHT, Bangalore.

## Preparation of plant extract

About 1.5 kg fresh plant was collected in bulk, washed under running tap water to remove adhering dust, dried under shade and powdered. The aqueous extract was prepared using water by simple maceration technique at room temperature 22-24 °C and filtered. The filtrate was evaporated to dryness.

## Animals

Healthy adult wistar albino rats weighing about 200-250g were used for the study. Housed individually in polypropylene cages, maintained under standard conditions (12h light and 12h dark cycle,

25±2°C, 40-60% humidity), the animals were feed with standard rat pellets diet (Venkateshwara Enterprises Bangalore) and water ad libitum. The study was approved by institutional animal ethical committee of Government college of Pharmacy, Bangalore (GCP/IAEC/02/2009-10)

## Preparation of gels

Carbopol 940 gel<sup>11</sup>

*Mimosa pudica* gel prepared using carbopol 940 labeled as A. Accurately weighed quantity of carbopol 940 was dispersed in water with constant stirring using mechanical stirrer at 1200 rpm for 30 min. Then carbopol was dispersed, the drug solution was prepared in propylene glycol and preservatives were added and mixed well. The pH was then adjusted to neutral (pH-7) using triethanolamine and stirred slowly till a clear gel was obtained.

Hydroxy Propyl Methyl Cellulose (HPMC) gel<sup>13</sup>

*Mimosa pudica* gel prepared using HPMC labeled as B. Accurately weighed quantity of aqueous extract was transferred to a beaker and dissolved in PEG into which preservatives were added. HPMC was made to disperse in distilled water and this was heated up to 80°-90°C with stirring and it was allowed to cool. The drug and PEG solution of the drug were added and stirred vigorously was mixed in cold condition and added water to make up the volume and stirred well to get a uniform gel.

Sodium Carboxy Methylcellulose gel<sup>11</sup>

*Mimosa pudica* gel prepared using sodium CMC labeled as C. Accurately weighed quantity of Sodium Carboxy Methylcellulose was dispersed in 1/4 th of water with constant stirring using a mechanical stirrer at 2000 rpm for 30 min. The drug solution in propylene glycol and preservatives were added and mixed well with remaining water to get a homogenous gel.

Composition of gel formulation given in Table 1:

Table 1: Composition of *mimosa pudica* gel formulations

| Batch | Aq. Ext of<br><i>mimosa<br/>pudica</i> | Carbopol<br>940<br>gms | Hpmc<br>gms | Sodium<br>Cmc<br>gms | PEG<br>ml | Methyl<br>Paraben<br>gm | Propyl<br>Paraben<br>gm | Triethanolamine | Distilled<br>water |
|-------|--|------------------------|-------------|----------------------|-----------|-------------------------|-------------------------|-----------------|--------------------|
| A     | 1.5                                    | 0.5                    | --          | --                   | 35        | 0.15                    | 0.3                     | Q.S             | Q.S                |
| B     | 1.5                                    | --                     | 1.0         | --                   | 35        | 0.15                    | 0.3                     | --              | Q.S                |
| C     | 1.5                                    | --                     | --          | 2.0                  | 25        | 0.15                    | 0.3                     | --              | Q.S                |

**Evaluation of gel formulations<sup>14</sup>**

Prepared gels formulations were evaluated for drug content, physical appearance, pH, extrudability, spreadability.

**Drug content analysis<sup>15</sup>**

*Mimosa pudica* aqueous extract is soluble in ethanol 3.33g of gel containing approximately 5% w/w of drug is taken (50mg). Drug was extracted using 2 times (25ml) of ethanol the contents were filtered into a 50 ml volumetric flask and the volume was made to 50ml using ethanol. From this 1ml of ethanol extract was pipetted into a 50 ml volumetric flask and the volume was made using ethanol. The uv absorbance of the resulting solution was measured at 276nm (Table 2).

**Physical observation<sup>16</sup>**

Transparency and Homogeneity<sup>17</sup> (Table 2).

**pH measurement<sup>15</sup>**

pH measurement of the gel was carried out of the formulation was measured by using a digital pH meter, dipping the glass electrode completely into the gel system (Table 2).

**Extrudability<sup>15</sup>**

The formulations were filled taken into collapsible metal tubes after the gels were set in the container. The extrudability of formulation was determined (Table 2).

**Spreadability<sup>18</sup>**

Two glass slides of standard dimensions were selected. The gel formulation whose spreadability had to be determined was placed over one of the slide. The other slide was placed on top of the gel in such a way that the gel was sandwiched between the two slides across a length of 6 cms along the slide (Table 2).

Spreadability =  $M \cdot L / T$

$M = \text{wt tied to upper slide} = 33.13\text{gms}$

$L = \text{length of glass slide} = 6\text{cms}$

$T = \text{time taken in sec.}$

**Antiinflammatory screening<sup>19,20,21,22,23</sup>**

Albino rats weighing between 200-250g were taken and divided into four groups containing six animals each group. The anti inflammatory activity was carried out by local application of *Mimosa pudica* gel formulation by to the carrageenan-induced paw oedema in to wistar rat model of either sex and the oedema was measured by using mercury displacement technique. Rat The paw oedema can be directly compared with the change in height of the mercury column produced by the control and test group of animals. The gels were applied half an hour before injecting carrageenan to the plantar surface of the hind paw by gently rubbing fifty times with index finger and paw volume was measured by dipping in mercury. The 0.1ml of 1% v/w of carrageenan was injected into the subplantar surface and paw volume was again measured at the end of 0h, 1h, 2h, 3h, 4h, 5h and 24h after application. Control group rats received only the gel base without drug by same mode of application. The percentage inhibition of oedema was calculated.

**%inhibition =  $\frac{V_c - V_t}{V_c} \times 100$** 

$V_c = \text{Avg paw volume in control group.}$

$V_t = \text{Avg paw volume in drug treated group.}$

**Statistics**

All values are expressed as mean  $\pm$  SEM. Statistical significance of the difference was assessed by Student's *t*-test. *P* values lower than 0.05 were considered significant.

**RESULTS AND DISCUSSION**

Table 2 shows the results of drug content analysis, transparency and homogeneity, pH, extrudability, spreadability carried out on gels pH of all formulation lies in between 6.9-7.2, which is compatible to normal pH range of skin. Evaluation of drug content data showed uniform distribution of drug in gel formulation.

**Table 2: Reading of drug content, physical appearance, pH, extrudability, spreadability of gel**

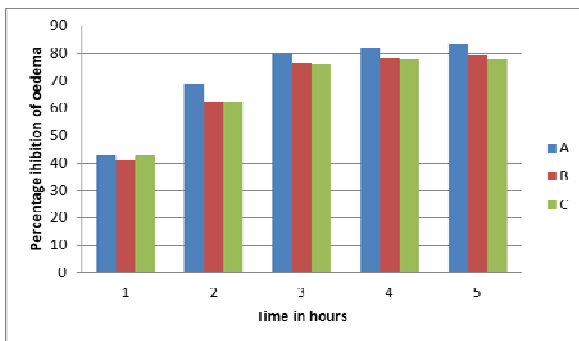
| Formulations | Net content mcg/gm | Drug content % | Physical observation              | pH  | Extrudability | Spreadability gm.cm/sec |
|--------------|--------------------|----------------|-----------------------------------|-----|---------------|-------------------------|
| A            | 50,241             | 100.51         | Transparent non greasy homogenous | 7.2 | EXCELLENT     | 8.28                    |
| B            | 50,256             | 96.37          | Opaque non greasy homogenous      | 6.9 | EXCELLENT     | 7.95                    |
| C            | 50,186             | 97.87          | Opaque Non greasy Homogenous      | 7.1 | EXCELLENT     | 7.64                    |

Carrageenan induce edema is a biphasic response. The aqueous extract of *Mimosa pudica* gels shows significant inhibition in carrageenan induced paw oedema.

**Table 3: Anti-inflammatory activity of different gel formulations**

| Group | Treatment | Time in hours | Mean oedema volume (Height equivalent) $\pm$ S.E.M. | % Reduction of oedema |
|-------|-----------|---------------|---|-----------------------|
| 1     | Control   | 1             | 0.184 $\pm$ 0.010                                   | --                    |
|       |           | 2             | 0.386 $\pm$ 0.027                                   | --                    |
|       |           | 3             | 0.461 $\pm$ 0.022                                   | --                    |
|       |           | 4             | 0.473 $\pm$ 0.019                                   | --                    |
|       |           | 5             | 0.454 $\pm$ 0.016                                   | --                    |
| 2     | A         | 1             | 0.105 $\pm$ 0.010 a                                 | 42.93                 |
|       |           | 2             | 0.121 $\pm$ 0.010                                   | 68.65                 |
|       |           | 3             | 0.091 $\pm$ 0.010                                   | 80.16                 |
|       |           | 4             | 0.087 $\pm$ 0.011                                   | 81.60                 |
|       |           | 5             | 0.076 $\pm$ 0.010                                   | 83.25                 |
| 3     | B         | 1             | 0.109 $\pm$ 0.013 b                                 | 40.76                 |
|       |           | 2             | 0.149 $\pm$ 0.010                                   | 62.39                 |
|       |           | 3             | 0.108 $\pm$ 0.013                                   | 76.52                 |
|       |           | 4             | 0.102 $\pm$ 0.011                                   | 78.43                 |
|       |           | 5             | 0.093 $\pm$ 0.010                                   | 79.51                 |
| 4     | C         | 1             | 0.105 $\pm$ 0.013 c                                 | 42.93                 |
|       |           | 2             | 0.149 $\pm$ 0.011                                   | 62.39                 |
|       |           | 3             | 0.105 $\pm$ 0.010                                   | 76.19                 |
|       |           | 4             | 0.098 $\pm$ 0.011                                   | 77.84                 |
|       |           | 5             | 0.090 $\pm$ 0.013                                   | 78.08                 |

Values are in nMean  $\pm$  SEM;  $P^a < 0.05$ ,  $P^b < 0.01$ ,  $P^c < 0.01$  versus control group.



### CONCLUSIONS

Formulation A with 0.5% carbopol 940 was the best formulation, having good invitro activity; the formulated gels were evaluated for gross visual appearance, pH, and extrudability, spreadability drug content and antiinflammatory. And also lesser side effects can be expected from this formulation as the drug is natural ingredient. We can conclude that industrial manufacturing of this product can be taken up after conducting clinical trials on human volunteers.

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