EVALUATION OF ANALGESIC AND ANTI-INFLAMMATORY ACTIVITY OF CRINUM LATIFOLIUM LEAVES ON ALBINO MICE

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ABSTRACT
In present study, the dried leaves of Crinum latifolium were selected for preliminary phytochemical investigation and pharmacological evaluation for its analgesic and anti-inflammatory activity. The dried leaves were subjected to extraction with alcoholic/aqueous solvents. Then extract were subjected to qualitative chemical test for identification of phytoconstituents. As a model of chronic inflammation, cotton pellet induced granuloma in rats was utilized in the present study. As a model of acute inflammation, acetic acid induced writhing test and formalin test were utilized in the present study. In conclusion, the results of the present study demonstrated that aqueous extract of Crinum latifolium produced dose related acute anti-inflammatory activity (Carrageenan, dextran, histamine and formalin), chronic anti-inflammatory activity (Cotton pellet) and analgesic activity (Acetic acid and formalin). These studies have shown that the aqueous extract of Crinum latifolium contains some active ingredients with the potential of being good anti-inflammatory and analgesic agents.

KEYWORDS: Phytoconstituents, chronic inflammation, acute inflammation.

INTRODUCTION
For thousands of years plant and their derivatives are being used for treatment of pain. During the last two decades, traditional systems of medicine and medicinal plant research have
become topics of global interest and importance. Many studies have been carried out in search of suitable plant drugs for the management of pain. There is great demand in developing and industrially developed countries to use alternative approaches to treat pain such as plant-based medicines, due to their cheaper rates and less or no side effects in comparison of synthetic drugs respectively. The plant drugs are frequently considered to be less toxic when compared to synthetic drugs. In the traditional system of Indian medicine various plant extracts are used for treating pain conditions. Synthetic drug can produce serious side effects and in addition, they are not suitable for use during pregnancy.

Thorough literature survey provoked us to undertake the study involving standardization of crude drugs, extraction, phytochemical investigation, anti-inflammatory and analgesic of screening of compound. This kind of detailed scientific study has not been documented up till now on *Crinum latifolium*.

**MATERIALS AND METHODS**

*Crinum latifolium* leaves were collected from local area Alwar, Rajasthan and leaves of plant were collected from the natural habitats. Chloroform, Ethyl acetate, Diethylamine, Toluene, Formic acid, Acetic acid, Acetone, Ethanol and other chemical and solvents were of analytical grade/IP/equivalent grade and procured from laboratory.

**Extraction procedure**

**Aqueous extraction**

Dried leaves (200 gm) of *C.latifolium* were used for the preparation of the extract. Leaves were collected, calyx and pedicle were removed. Leaves were soaked in distilled water and were kept overnight. The next day, leaves were boiled and extract was filtered through a sterile muslin cloth to obtain the water extract. Freshly prepared extract was lyophilized to obtain a dry powder. This sticky powder was dissolved in water and the semisolid extract was used for phytochemical investigation. For animal study this extract will be fed orally to animals by intragastric tube at different doses.

**Alcoholic extract**

Dried leaves of *Crinum latifolium* were used for the alcoholic extract. Leaves were collected, calyx and pedicle were removed. Leaves were soaked in distilled water and were kept for 7 days. After 7 days extract was filtered and used for phytochemical investigation.
Evaluation of Anti-Inflammatory Activity

Drug dose
The doses considered for the experiment on rat for the anti-inflammatory and analgesic experiments were carried out in two different doses of 200 and 400 mg/kg body weight.

Preparation of test drug and standard drug
Test drug (Aqueous extract of *Crinum latifolium*) and standard drug (Indomethacin) were prepared as a suspension in distilled water using mortar and pestle.

Animal grouping
The animals were divided into four groups for anti-inflammatory and analgesic studies. Each group consisted of six animals of either sex. The groups were:
Group I: Negative control - Distilled water
Group II: Test drug- Aqueous extract of *Crinum latifolium*- 200 mg/kg bodyweight (CLA-200)
Group III: Test drug- Aqueous extract of *Crinum latifolium*- 400 mg/kg bodyweight (CLA-400)
Group IV: Positive control- Standard drug indomethacin- 2.5 mg/kg bodyweight (Indo-2.5)

Carrageenan induced rat paw edema
Acute inflammation was produced by sub plantar injection of 0.1 ml of 1% carrageenan in normal saline in the hind paw of rats 1 h after the administration of the test drug as well as positive and negative controls. The paw volume was measured at 1 h, 2 h and 3 h after carrageenan injection, using plethysmograph.

Dextran induced rat paw edema
The animals were treated in a manner similar to that of carrageenan induced paw edema model. 0.1 ml 1% dextran was used for the study. Paw volume was measured as mentioned in carrageenan induced paw edema model at 1 h, 2 h and 3 h.

Histamine induced rat paw edema
In this model paw edema of a rat was induced by subplantar injection of 0.1ml of 1% freshly prepared histamine in normal saline and the paw oedema was measured as mentioned in carrageenan induced paw edema model. The paw volume was measured at 0.5 h, 1 h, 2 h and 3 h.
Formalin induced paw edema
The test drug was administered once daily for seven consecutive days to all the groups. On seventh day, initial paw volume was measured before drug administration. After 1 h of drug administration, paw edema of the rat was induced by sub plantar injection of 0.1 ml of 3% formalin solution in normal saline. Paw volumes were measured at 3 h, 24 h and 48 h after formalin injection as described earlier in carrageenan model.

Cotton pellet induced granuloma in rats
Cotton pellet induced granuloma formation in rats was performed for chronic anti-inflammatory study. This model represents the exudative and proliferative phases of inflammation. The cotton pellets weighing 100 mg were made by rolling of cotton piece and sterilizing by autoclaving. The rats were anaesthetized with ether; dorsum was shaved clear and swabbed with 70%(v/v) alcohol. Midline incision of 1 cm was made in the intra scapular region. A small tunnel was made on either side of the incision with the help of a small blunt forceps. Sterile cotton pellet (100 mg) was implanted in each tunnel. Air was removed from the tunnel and then incision was closed with sutures. The test drugs were administered for 7 consecutive days starting from the day of implantation. The rats were sacrificed on the 8th day, cotton pellets were removed and cleaned of extraneous tissue and dried by placing them in a hot air oven overnight at 80°C and then weighed. The difference between the initial weight and the final weight of the pellet after drying was taken as the granuloma tissue weight. The results were expressed as mg granulation tissue formed per 100 g body weight.

Evaluation of Analgesic Activity
Analgesic study was determined in two different models.

Acetic acid induced writhing in mice
Intraperitoneal injection of diluted solution of acetic acid is a well–established animal model for tonic visceral pain in rodents. Swiss albino mice were used for acetic acid induced writhing test. Mice were divided in to four groups. Test drug or standard drug or distilled water was administered orally, 1 h prior to the injection of acetic acid. Writhing was induced by administrating of 3% aqueous solution of acetic acid (10ml/kg body weight) intraperitoneally. Immediately after the acetic acid injection, each animal was placed in a transparent observation cage and the number of writhes per rat was counted for 30 min. Writhing movement is accepted as contraction of the abdominal muscles accompanied by stretching of hind limbs. The percentage inhibition was calculated using the following ratio:
[(Control mean - treated mean)/control mean] X 100

**Formalin induced paw licking response in rats**

The effect of aqueous extract of *Crinum latifolium* upon formalin induced paw licking response was evaluated. The procedure is same as that followed for formalin induced hind paw edema, which is mentioned above. After the injection of formalin, the animals were kept under observation for half an hour. The amount of time spent licking the injected paw was noted, and was considered to be indicative of pain. The time taken for the onset of paw licking was initially measured. The first of the nociceptive responses normally peaked 5 min after formalin injection and the second phase 15-30 min after formalin injection, representing the neurogenic and inflammatory pain. Therefore, the frequency of paw licking was measured in five intervals at 0-5 min., 6-10 min., 11-15 min., 16-20 min. and 21-30 min.

**RESULT AND DISCUSSION**

The results of screening of anti-inflammatory activity of *Crinum latifolium* in carrageenan induced rat paw edema. *Crinum latifolium* was selected for further pharmacological studies. Carrageenan-induced edema has been commonly used as an experimental animal model for acute inflammation and is believed to be biphasic. The early phase (1-2 h) of the carrageenan model is mainly mediated by histamine, serotonin and increased synthesis of prostaglandins in the damaged tissue surroundings. The late phase (3 h) is associated with neutrophil originated free radicals, such as hydrogen peroxide, superoxide and hydroxyl radicals, as well as prostaglandin release.

The results of anti-inflammatory activity of aqueous extract of *Crinum latifolium* in carrageenan induced paw edema is shown in Table 1. CLA-200 group showed potent anti-inflammatory activity at 1 h (71.47%), 2 h(45.25%,) and 3 h (39.06%). CLA-400 group showed significant decrease in paw volume at 1 h (72.97%), 2 h (68.45%) and 3 h (49.08%). Indomethacin group showed significant decrease in paw volume at 1 h (67.45%), 2 h (66.53%) and 3 h (72.61%, P≤0.01). CLA-200 showed more anti-inflammatory activity than reference drug indomethacin at 1 h, while CLA-400 group showed more anti-inflammatory activity than reference drug indomethacin at 1 h and 2 h.

Thus, it can be concluded that aqueous extract of *Crinum latifolium* has potent anti-inflammatory activity in carrageenan induced rat paw edema in early phase (1 h) and also in later phase (3 h).
It is well established that carrageenan and dextran induce rat paw oedema by different mechanisms. Dextran is a polysaccharide of high molecular weight that induces anaphylactic reaction after injection in rat’s extremities, which is characterized by extravasation and oedema formation, as a consequence of liberation of histamine and serotonin from mast cells.

The results of anti-inflammatory activity of aqueous extract of *Crinum latifolium* in dextran induced paw edema is shown in Table 2. CLA-200 group and CLA-400 group showed significant anti-inflammatory activity in dextran induced paw edema model when compared with the control group. CLA-400 group showed significant decrease in paw volume at 1 h (32.26%), 2 h (55.64%) and 3 h (79.31%). Indomethacin group showed significant decrease in paw volume at 1 h (49.39%), 2 h (38.85%) and 3 h (65.61%). Aqueous extract of *Crinum latifolium* showed anti-inflammatory activity in dose dependant manner. The results tend to suggest that the anti-inflammatory activity of the aqueous extract of *Crinum latifolium* is possibly backed by its antihistamine or anti-serotonin activity.

The histamine is a basic amine related with inflammatory and allergic process causing, among several effects, both vasodilatation and increase of vascular permeability. The results of anti-inflammatory activity of aqueous extract of *Crinum latifolium* in histamine induced paw edema is shown in Table 3. Anti-inflammatory activity of CLA-200 and CLA-400 groups was statistically significant at 1 h, 2 h and 3 h compared with the control group. CLA-400 group showed significant decrease in paw volume at 1 h (26.16%) and highly significant at 2 h (42.72%) and 3 h (46.42%). Reference drug indomethacin group showed highly significant decrease in paw volume at 1 h (57.08%), 2 h (66.45%) and 3 h (66.34%) as compared with the control group. Thus CLA-200 and CLA-400 groups did not show higher anti-inflammatory activity than reference drug indomethacin group.

The results of anti-inflammatory activity of aqueous extract of *Crinum latifolium* formalin induced paw edema is shown in Table 4. It is well known that inhibition of formalin induced paw edema in rats is one of the most suitable test procedures to screen anti-arthritic and anti-inflammatory agents as it closely resembles human arthritis. Thus formalin-induced paw edema is a model used for the evaluation of an agent with antiproliferative activity. Injection of formalin subcutaneously into hind paw of rats produces localized inflammation. The administration of CLA-200, CLA-400 and indomethacin daily for 7 days successfully inhibited edema induced by formalin (Table 7.4). CLA-200 group showed decrease in paw volume at 3 h (40.79%), 24 h (34.98%) and 48 h (35.96%). CLA-400 group showed decrease
in paw volume at 3 h (42.96%), 24 h (36.50%) and at 48 h (39.67%). Indomethacin group showed decrease in paw volume at 3 h (30.98%), 24 h (42.64%) and 48 h (21.67%). CLA-200 and CLA-400 groups showed almost similar anti-inflammatory activity at 3 h, 24 h and 48 h. Thus, from the results, it can be concluded, that aqueous extract of *Crinum latifolium* has higher anti-inflammatory activity in formalin induced paw edema test. CLA showed significant decrease in paw volume till 48 h with both doses, which suggests its long duration of action.

Cotton pellet granuloma test is a chronic inflammation model commonly used to evaluate the anti-proliferative activities of drugs. Tissue granulation, one of the distinctive features of chronic inflammation, which is composed of marked infiltration macrophages and neovascularization, was induced by subcutaneous implantation of biomaterials. The implanted material induces a host’s inflammatory response and modulates the release of inflammatory mediators which finally leads to tissue proliferation and granular formation.

The results of anti-inflammatory activity of aqueous extract of *Crinum latifolium* in cotton pellet induced granuloma is shown in Table 5. In the present study, CLA-200 and CLA-400 groups showed dose dependent activity and markedly inhibited granuloma formation surrounding the pellets compared with the control group. CLA-200 group showed significant decrease in granuloma formation with 24.01% while CLA-400 group showed significant decrease in granuloma formation with 28.68% which was almost near to the reference drug indomethacin (33.97%) group. Thus, the results showed that aqueous extract of *Crinum latifolium* potent anti-inflammatory activity in chronic inflammatory model.

Aqueous extract of *Crinum latifolium* used to distinguish between the central and peripheral analgesic action by acetic acid induced writhing response in mice. This method is not only simple and reliable but also affords rapid evaluation of peripheral type of analgesic action. In this test the animals react with characteristic stretching behavior, which is called writhing. The writhing response of the mouse to an intraperitoneal injection of noxious chemical is used to screen for both peripherally and centrally acting analgesic activities. Intraperitoneal injection of diluted solutions of acetic acid is a well-established animal model for tonic visceral pain in rodents. Intraperitoneal injection of acetic acid induces a stereotypic response pattern in the form of abdominal contractions (lengthwise stretches of the torso with a concomitant concave arching of the back) that may persist beyond 6 h after the
administration, although most contractions occur within 30 min of the application of the irritant.

The results of analgesic activity of aqueous extract of *Crinum latifolium* in acetic acid induced writhing test is shown in Table 6. CLA-200 and CLA-400 groups showed 31% and 35% inhibition significantly in abdominal writhes produced by acetic acid respectively as compared with the control group. Thus, CLA-200 and CLA-400 groups produced a significant and dose dependent inhibition of analgesic effect produced by acetic acid. Indomethacin group showed significant inhibition with 46% as compared with the control group. This probably means that the extract is able to reduce the receptor sensitivity to the acetic acid induced pain in a dose dependent manner.

The formalin test is a valid and reliable model of nociception, and it is sensitive to various classes of analgesic drugs. The formalin test may be more useful as model of pain in which the first phase seems to be due to direct chemical activation on nociceptive afferent fibers, whereas the second phase is dependent of peripheral inflammation and changes in central processing.

The results of analgesic activity of aqueous extract of *Crinum latifolium* in formalin induced paw licking are shown in Table 7. The onset time of paw licking was measured after formalin injection. CLA-200 and CLA-400 showed 7.29% and 21.53% increase in onset time respectively, while indomethacin group showed 25% increase in onset time as compared with the control group. Onset time of paw licking response of CLA-400 group was almost the same as that of the indomethacin group. CLA-400 and indomethacin groups showed statistically significant increase in paw licking response.

After formalin injection, the frequency of paw licking was measured 5 min, 10 min, 15 min, 20 min and 30 min. CLA-400 group showed 38% decrease in frequency between 0-5 min, 80.83% between 6-10 min, 54.13% between 11-15 min, 14.24% between 16-20 min and 13.93% between 21-30 min. Indomethacin group showed 28.01% decrease in frequency between 0-5 min, 72.98% between 6-10 min, 48.62% between 1115 min, 5.66% between 16-20 min and 11.32% between 21-30 min. Statistically significant decrease in frequency between 0-5 min was seen in CLA-400 group and indomethacin group. Statistically significant decrease in frequency between 6-10 min was seen in CLA-400 group and indomethacin group.
Table 1: Anti-inflammatory activity of aqueous extract of *Crinum latifolium* in carrageenan induced paw edema.

<table>
<thead>
<tr>
<th>Groups</th>
<th>After 1h</th>
<th>After 2h</th>
<th>After 3h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Increase in Paw volume (%)</td>
<td>% Changes</td>
<td>Increase in Paw volume (%)</td>
</tr>
<tr>
<td>Control</td>
<td>67.63 ± 1.87</td>
<td>-</td>
<td>51.24 ± 4.18</td>
</tr>
<tr>
<td>CLA-200</td>
<td>46.03 ± 4.85*</td>
<td>31.93</td>
<td>23.61 ± 2.30**</td>
</tr>
<tr>
<td>CLA-400</td>
<td>45.82 ± 2.96**</td>
<td>32.21</td>
<td>22.53 ± 2.50***</td>
</tr>
<tr>
<td>Indo-2.5</td>
<td>34.28 ± 2.53***</td>
<td>49.30</td>
<td>31.32 ± 3.44*</td>
</tr>
</tbody>
</table>

n=6, *p<0.05- significant, **p<0.01-more significant v/s control, SEM= standard error mean, SD = standard deviation, n= number of animals

CLA 200- *Crinum latifolium* aqueous extract 200mg/kg b.wt, CLA 400- *Crinum latifolium* aqueous extract 400mg/kg b.wt, Indo-2.5- Indomethacine 2.5 mg/kg b.wt.

![Graph showing anti-inflammatory activity of Crinum latifolium](image)

Fig. 1: Anti-inflammatory activity of aqueous extract of *Crinum latifolium* in carrageenan induced paw edema.

Table 2: Anti-inflammatory activity of aqueous extract of *Crinum latifolium* in dextran induced paw edema.

<table>
<thead>
<tr>
<th>Groups</th>
<th>After 1h</th>
<th>After 2h</th>
<th>After 3h</th>
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<td></td>
<td>Increase in Paw volume (%)</td>
<td>% Changes</td>
<td>Increase in Paw volume (%)</td>
</tr>
<tr>
<td>Control</td>
<td>67.70 ± 1.87</td>
<td>-</td>
<td>51.20 ± 4.28</td>
</tr>
<tr>
<td>CLA-200</td>
<td>46.13 ± 4.85*</td>
<td>31.95</td>
<td>23.70 ± 3.30**</td>
</tr>
<tr>
<td>CLA-400</td>
<td>45.82 ± 3.96**</td>
<td>32.26</td>
<td>22.85 ± 1.50***</td>
</tr>
<tr>
<td>Indo-2.5</td>
<td>34.22 ± 2.53***</td>
<td>49.38</td>
<td>31.40 ± 3.41*</td>
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</table>
n=6, *p<0.05- significant, **p<0.01-more significant v/s control, SEM= standard error mean, SD = standard deviation, n= number of animals

CLA 200- *Crinum latifolium* aqueous extract 200mg/kg b.wt, CLA 400- *Crinum latifolium* aqueous extract 400mg/kg b.wt, Indo-2.5- Indomethacine 2.5 mg/kg b.wt.

![Graph showing anti-inflammatory activity](image)

**Fig 2:** Anti-inflammatory activity of aqueous extract of *Crinum latifolium* in dextran induced paw edema.

**Table 3:** Anti-inflammatory activity of aqueous extract of *Crinum latifolium* in histamine induced paw edema.

<table>
<thead>
<tr>
<th>Groups</th>
<th>After 1h</th>
<th>% Changes</th>
<th>After 2h</th>
<th>% Changes</th>
<th>After 3h</th>
<th>% Changes</th>
</tr>
</thead>
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<tr>
<td></td>
<td>Increase in Paw volume (%)</td>
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<td>Increase in Paw volume (%)</td>
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<td>Increase in Paw volume (%)</td>
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<tr>
<td>Control</td>
<td>58.42 ± 2.15</td>
<td>-</td>
<td>45.253 ± 1.76</td>
<td>-</td>
<td>35.92 ± 2.52</td>
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</tr>
<tr>
<td>CLA-200</td>
<td>43.24 ± 1.48**</td>
<td>25.99</td>
<td>28.72 ± 3.53*</td>
<td>36.41</td>
<td>21.85 ± 1.30*</td>
<td>39.27</td>
</tr>
<tr>
<td>CLA-400</td>
<td>43.14 ± 3.46**</td>
<td>26.16</td>
<td>25.92 ± 1.62***</td>
<td>42.74</td>
<td>19.28 ± 1.11***</td>
<td>46.42</td>
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<tr>
<td>Indo-2.5</td>
<td>25.07 ± 3.72***</td>
<td>57.08</td>
<td>15.19 ± 2.84***</td>
<td>66.45</td>
<td>12.15 ± 1.20***</td>
<td>66.34</td>
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</table>

n=6, *p<0.05- significant, **p<0.01-more significant v/s control, SEM= standard error mean, SD = standard deviation, n= number of animals

CLA 200- *Crinum latifolium* aqueous extract 200mg/kg b.wt, CLA 400- *Crinum latifolium* aqueous extract 400mg/kg b.wt, Indo-2.5- Indomethacine 2.5 mg/kg b.wt.
Fig 3: Anti-inflammatory activity of aqueous extract of *Crinum latifolium* in histamine induced paw edema.

Table 4: Anti-inflammatory activity of aqueous extract of *Crinum latifolium* in formalin induced paw edema.

<table>
<thead>
<tr>
<th>Groups</th>
<th>After 1h Increase in Paw volume (%)</th>
<th>% Changes</th>
<th>After 2h Increase in Paw volume (%)</th>
<th>% Changes</th>
<th>After 3h Increase in Paw volume (%)</th>
<th>% Changes</th>
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<tbody>
<tr>
<td>Control</td>
<td>53.03 ± 4.98</td>
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<td>54.03 ± 4.98</td>
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<td>38.57 ± 4.23</td>
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<tr>
<td>CLA-200</td>
<td>31.40 ± 3.76*</td>
<td>40.79</td>
<td>35.13 ± 2.12*</td>
<td>34.98</td>
<td>24.70 ± 4.31</td>
<td>35.96</td>
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<tr>
<td>CLA-400</td>
<td>30.25 ± 4.76*</td>
<td>42.96</td>
<td>34.31 ± 3.45*</td>
<td>36.50</td>
<td>23.27 ± 4.71</td>
<td>39.67</td>
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<tr>
<td>Indo-2.5</td>
<td>36.60 ± 3.73*</td>
<td>30.98</td>
<td>30.99 ± 2.52**</td>
<td>42.64</td>
<td>30.21 ± 3.89</td>
<td>21.67</td>
</tr>
</tbody>
</table>

n=6, *p<0.05- significant, **p<0.01-more significant v/s control, SEM= standard error mean, SD = standard deviation,  n= number of animals

CLA 200- *Crinum latifolium* aqueous extract 200mg/kg b.wt, CLA 400- *Crinum latifolium* aqueous extract 400mg/kg b.wt, Indo-2.5- Indomethacine 2.5 mg/kg b.wt.
Fig 4: Anti-inflammatory activity of aqueous extract of *Crinum latifolium* in formalin induced paw edema.

Table: 5 Anti-inflammatory activity of aqueous extract of *Crinum latifolium* in cotton pellet induced granuloma formation.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Pellet weight g/100g Body weight</th>
<th>% Change</th>
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<tbody>
<tr>
<td>Control</td>
<td>0.155 ± 0.012</td>
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<tr>
<td>CLA-200</td>
<td>0.119 ± 0.016*</td>
<td>24.30</td>
</tr>
<tr>
<td>CLA-400</td>
<td>0.112 ± 0.010*</td>
<td>28.66</td>
</tr>
<tr>
<td>Indo-2.5</td>
<td>0.104 ± 0.006**</td>
<td>33.76</td>
</tr>
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</table>

n=6, *p<0.05- significant, **p<0.01-more significant v/s control, SEM= standard error mean, SD = standard deviation, n= number of animals

CLA 200- *Crinum latifolium* aqueous extract 200mg/kg b.wt, CLA 400- *Crinum latifolium* aqueous extract 400mg/kg b.wt, Indo-2.5- Indomethacine 2.5 mg/kg b.wt.

Fig 5: Anti-inflammatory activity of aqueous extract of *Crinum latifolium* in cotton pellet induced granuloma formation.
Table 6: Analgesic activity of aqueous extract of *Crinum latifolium* in acetic acid writhing test in Swiss albino mice.

<table>
<thead>
<tr>
<th>Group</th>
<th>Onset time (Sec.)</th>
<th>% Change</th>
<th>Frequency</th>
<th>% Change</th>
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<tr>
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<td>CLA-200</td>
<td>226 ±52**</td>
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</tr>
<tr>
<td>CLA-400</td>
<td>246 ± 52**</td>
<td>743</td>
<td>54 ± 5*</td>
<td>35</td>
</tr>
<tr>
<td>Indo-2.5</td>
<td>490 ± 51***</td>
<td>1593</td>
<td>45 ± 8**</td>
<td>46</td>
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</table>

n=6, *p<0.05- significant, **p<0.01-more significant v/s control, SEM= standard error mean, SD = standard deviation, n= number of animals

CLA 200- *Crinum latifolium* aqueous extract 200mg/kg b.wt, CLA 400- *Crinum latifolium* aqueous extract 400mg/kg b.wt, Indo-2.5- Indomethacine 2.5 mg/kg b.wt.

Fig 6: Analgesic activity of aqueous extract of *Crinum latifolium* in acetic acid writhing test in Swiss albino.
Table 7: Analgesic activity of aqueous extract of *Crinum latifolium* in formalin induced paw licking test in rats.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Onset time (Sec)</th>
<th>% Changes</th>
<th>5 Min</th>
<th>10 Min</th>
<th>15 Min</th>
<th>20 Min</th>
<th>30 Min</th>
<th>Increase in Paw volume (%)</th>
<th>% Changes</th>
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<tr>
<td>Control</td>
<td>48.05 ± 3.13</td>
<td>-</td>
<td>16.60 ± 1.25</td>
<td>-</td>
<td>4.33 ± 0.56</td>
<td>-</td>
<td>6.17 ± 1.58</td>
<td>-</td>
<td>5.83 ± 0.91</td>
</tr>
<tr>
<td>CLA-200</td>
<td>51.30 ± 4.19</td>
<td>7.29</td>
<td>14.35 ± 1.36</td>
<td>14.04</td>
<td>2.65 ± 0.61</td>
<td>38.34</td>
<td>2.33 ± 0.92</td>
<td>62.24</td>
<td>5.67 ± 1.46</td>
</tr>
<tr>
<td>CLA-400</td>
<td>58.33 ± 2.56*</td>
<td>21.53</td>
<td>10.35 ± 2.13*</td>
<td>38</td>
<td>0.83 ± 0.42**</td>
<td>80.83</td>
<td>2.83 ± 1.18</td>
<td>54.13</td>
<td>5 ± 0.65</td>
</tr>
<tr>
<td>Indo-2.5</td>
<td>60 ± 1.14*</td>
<td>25.01</td>
<td>12.04 ± 1.34*</td>
<td>28.01</td>
<td>1.15 ± 0.78*</td>
<td>72.98</td>
<td>3.17 ± 0.97</td>
<td>48.62</td>
<td>5.50 ± 1.48</td>
</tr>
</tbody>
</table>

CLA 200- *Crinum latifolium* aqueous extract 200mg/kg b.wt, CLA 400- *Crinum latifolium* aqueous extract 400mg/kg b.wt, Indo-2.5- Indomethicine 2.5 mg/kg b.wt.

![Graph showing analgesic activity](image_url)

**Fig 7:** Analgesic activity of aqueous extract of *Crinum latifolium* in formalin induced paw licking test in rats.
CONCLUSION

The results of the present study demonstrated that aqueous extract of *Crinum latifolium* in produced dose related acute anti-inflammatory activity (Carrageenan, dextran, histamine and formalin), chronic anti-inflammatory activity (Cotton pellet) and analgesic activity (Acetic acid and formalin). These studies have shown that the aqueous extract of *Crinum latifolium* contains some active ingredients with the potential of being good anti-inflammatory and analgesic agents. There is a need for detailed investigation of the mechanism of action of aqueous extract of *Crinum latifolium* based on which a possible therapy can be visualized.

ACKNOWLEDGEMENTS

Authors are profusely thankful to Alwar Pharmacy College, Alwar (Raj.), India staff for their constant and perennial support.

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