Anti-Inflammatory Effects of *Aerva Javanica* (Burm.f.) Schult. against Carrageenan Induced Paw Oedema in Albino Rats

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Abstract - The anti-inflammatory effects of ethanolic crude extracts of *Aerva javanica* whole plant were investigated in carrageenan induced paw oedema in rats. Albino Rats were classified into four groups, each of 5. Group 1 received carrageenan (2 ml/kg) at sub-plantar region and served as negative control, group 2 received indomethacin (10 mg/kg) intraperitoneally and served as standard reference (positive control), group 3 received crude ethanolic extract intraperitoneally at 250 mg/kg, group 4 received crude ethanolic extract intraperitoneally at 500 mg/kg. The oedema was induced in the four groups using carrageenan (2 ml/kg) at sub-plantar region. The oedema was quantified by measuring the hind paw thickness immediately before sub-plantar injection and at 1, 2 and 3 Hours. Administration of ethanolic extract (250 mg/kg and 500 mg/kg) significantly reduced the oedema thickness in a time and dose dependent manner. The inhibition percentage of inflammation was 48.30% and 85.22% at dose of 250 and 500 mg/kg at 3th hour respectively. The ethanolic extract at dose of 500 mg/kg shows a potent activity to be nearly the same comparable to inhibition produced by indomethacin (reference drug) at the last hour of following up. The present study concluded that *Aerva javanica* extract display remarkable anti-inflammatory activity and recommended for the possible use as anti-inflammatory remedy.

Index Items: anti-inflammatory, *Aerva javanica*, Albino Rats

I. INTRODUCTION

The plant kingdom is known to provide a rich source of botanical anti-inflammatories [1]. A number of medicinal plants have been used to treat inflammations in man and animals [1]. Numerous natural products have been tested as various therapeutics [2]. Acute inflammation is a rapid, short – lived and characterized by accumulation of fluid, plasma proteins and the leukocytes which release a large number of soluble mediators which modulate and maintain the inflammation [3]. Carrageenan induced rat paw oedema has been used for assessment of the anti-inflammatory activity of many plant extracts and essential oils [4-6].

The *Aerva javanica* plant locally called Ras Elshaieb, is a member of the Amaranthaceae family, has been used in traditional medicine in many parts of the world. In Sudan, the plant used in North Kordofan Province for treating ulcers, wounds, abdominal pain and as anti-plasmodial. The root is used as chew stick. In White Nile province, the plant used against snake bites, breast cancer and rheumatism. The present study aimed to investigate the anti-inflammatory effects of *Aerva javanica* extract in carrageenan induced rat paw oedema model.

II. MATERIALS AND METHODS

*Plant material*

*Aerva javanica* plant was obtained from Nile river banks (November, 2012) in Khartoum, Sudan. The plant dried under sun-rays. The plant was classified (authenticated) by the
taxonomist Dr. Haider AbdelGader and voucher specimen was kept in the Department of Pharmacology and Toxicology at the Medicinal and Aromatic Plants Research Institute (MAPRI) – National Center for Researches (Khartoum).

**Preparation of extract**
The plant dried under sun-rays, after complete dryness removed for extraction. Specific weight of the plant sample (500 gram) was soaked in 2500 ml of 80% ethanol for about 3 days with daily filtration and evaporation of the solvent under reduced pressure using rotary evaporator apparatus. Final extract residues allowed to air in petri-dishes till complete dryness [7], and the percentage yield was found to be about 24.042% w/w ethanolic extract.

All drugs used were of the highest commercially available purity. Indomethacin, carrageenan and normal saline were purchased from Sigma – Aldrich, Germany.

**Experimental design**
The method used was carried out according to Winter [8] Carrageenan-induced paw oedema in rats has been used for assessment of the anti-inflammatory activity of many plant extracts. Twenty Albino rats were housed within the Animal house of the Medicinal and Aromatic Plant Research Institute, National Center for Research, Khartoum, with feed and water provided ad libitum. The rats were allotted into four groups each of 5 rats.

Group 1: received the vehicle sterile lambda carrageenan suspension in saline (2 ml/kg) at sub-plantar region and served as negative control.

Group 2: received indomethacin (10 mg/kg) intraperitoneally, and served as standard reference and act as positive control.

Group 3: received the crude ethanolic extract intraperitoneally at 250 mg/kg.

Group 4: received the crude ethanolic extract intraperitoneally at 500 mg/kg.

One hour following the previously mentioned treatments, paw swelling was induced by sub-plantar injection of 0.1 ml of 1% w/v carrageenan in normal saline into the right hind paw of all groups. The oedema was quantified by measuring the hind paw thickness (mm) immediately before sub-plantar injection, and at 1, 2 and 3 hours with a micrometer screw gauge. The increase with linear diameter of the right hind paw paws were taken as an indication of the paw oedema.

The percentage inhibition of the inflammation was calculated from the formula described by [4].

\[
\text{Percent inhibition} = \frac{D_0 - D_T}{D_0} \times 100
\]

Where \( D_0 \) is the average inflammation (hind paw oedema) of the control group of rats at a given time.

Dt is the average inflammation of the drug treated (that is, reference indomethacin or extracts) in rats.

**Statistical analysis**
Mann-Whitney test was used, each cell shows the mean, P-value and percentage respectively.

### III. RESULTS AND DISCUSSION

The results of the effects of *Aerva javanica* plant extracts and indomethacin on oedema in carrageenan model are summarized in Table 1.

<table>
<thead>
<tr>
<th></th>
<th>Control negative (Carrageenan) 2 ml/kg B.Wt</th>
<th>Control positive (Indomethacin) 10 mg/kg B.Wt</th>
<th>Aerva javanica 250 mg/kg</th>
<th>Aerva javanica 500 mg/kg</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hour 1</strong></td>
<td>1.95 ± 0.48</td>
<td>1.16 ± 0.37 (40.51 %)</td>
<td>1.92 ± 0.44 (1.54 %)</td>
<td>0.86 ± 0.25 (55.89 %)</td>
</tr>
<tr>
<td><strong>Hour 2</strong></td>
<td>1.89 ± 0.44</td>
<td>0.47 ± 0.24 (75.13 %)</td>
<td>1.66 ± 0.44 (12.17 %)</td>
<td>0.57 ± 0.09 (69.84 %)</td>
</tr>
<tr>
<td><strong>Hour 3</strong></td>
<td>1.76 ± 0.42 (mm)</td>
<td>0.10 ± 0.06 (94.32 %)</td>
<td>0.91 ± 0.42 (mm)</td>
<td>0.26 ± 0.10 (mm)</td>
</tr>
</tbody>
</table>

Data expressed as mean ± SD, percentage and P-value. [*] means there is significant difference (\( P \leq 0.05 \)) between control positive and the plant extract of the specified time [9].

The crude ethanolic extract of *Aerva javanica*
of which express biological activities as flavonoids, steroids, alkaloids and saponins. Several classes of secondary metabolites such as indomethacin (control positive) produced significant inhibition ($P \leq 0.05$) in rat paw oedema of 48.3% and 85.22% at 3 hours post treatment respectively (Table 1).

The two doses significantly inhibited or decreased oedema in a time and dose dependent manner and the maximum inhibition percentage were recorded with the dose of 500 mg/kg as 85.22%, which is near comparable to the inhibition produced by the reference drug indomethacin at the end of the follow up period.

The present study was conducted to investigate the possible anti-inflammatory effects of *Aerva javanica* extract in carrageenan model. Paw swelling is one of the major factors in assessing the degree of inflammation and efficacy of the tested drugs [10–11]. The crude ethanolic extract of *Aerva javanica* at two dose levels were investigated for their anti-inflammatory activity. The current study results might be considered as first report for the anti-inflammatory activity by both dose levels of ethanolic extract of *Aerva javanica* whole plant. Phytochemical screening of the medicinal plants showed good anti-inflammatory activity as it may contain secondary metabolites like alkaloids and flavonoids. These classes of plant, which possesses secondary metabolites, are considered the sources of chemicals, which are responsible for wide therapeutic activities of several plants [12]. Phytochemical investigation on *Aerva javanica* yielded several classes of secondary metabolites such as flavonoids, steroids, alkaloids and saponins, many of which express biological activities [13].

Previous several studies reported that the *Aerva javanica* plant contained tannins, these compounds are known to be potent cyclooxygenase-1 (COX-1) inhibitors, through their binding nature with proteins [14–16]. Since the carrageenan-induced inflammation model is a significant predictive test for anti-inflammatory agent acting by the mediators of acute inflammation [17]. The extract may have exhibited its anti-inflammatory actions by means of either inhibiting the synthesis, release or action of inflammatory mediators such as histamine, serotonin and prostaglandins. Non-steroidal anti-inflammatory drugs (NSAIDs) such as indomethacin act by the reduction of sensitization of pain receptors caused by prostaglandins at the inflammation site [18].

The different triterpenoids, polyphenolics and other chemical constituents of the plant extract may be involved in the observed anti-inflammatory effects of the plant extract and may be having actions similar to NSAIDs. It should be noted that the anti-inflammatory activities of many plants have been attributed to their high sterol/triterpene [19].

**IV. CONCLUSION**

The present study concluded that *Aerva javanica* possessed potent anti-inflammatory activity at 500 mg/kg.

The present study recommended the possible use of *Aerva javanica* as a remedy for treatment of inflammation. Further studies are needed to investigate the phytochemicals/responsible for the anti-inflammatory effect and toxicological studies are needed to evaluate the safety of the plant constituents in the different animal species.

**REFERENCES**


