Evaluation of Anti-Inflammatory, Analgesic and Antipyretic Effect of Mangifera indica Leaf Extract on Fever-Induced Albino Rats (Wistar)

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Abstract: This study was designed to evaluate the anti-inflammatory, analgesic and antipyretic effects of Mangifera indica leaf extract. The effects of the leaf extract on anti-inflammatory response using fresh egg albumin-induced paw edema model, analgesic activity of the extract using hot plate model to induce pain and anti-pyretic activity using Baker’s yeast fever induction model were examined. The research work was carried out using rats weighing between 150-210 g. These rats were divided into five (5) groups of 5 animals each; Group 1 served as the control group. Other groups were administered at a dosage of 100, 200 and 400 mg/kg, respectively. The extract (at the dose various dosages and in a time dependent manner) significantly (p<0.05) decreased the paw oedema induced by fresh egg-albumin in rats. This result supports the use of Mangifera indica leaf extract for the management of inflammatory disorders. Phytochemical analysis of the extract composition demonstrated the presence of alkaloids, anthraquinones, reducing sugars, flavonoids, glycosides, saponins, cardiac glycosides, steroids and tannins.

Key words: Analgesic, anti-inflammatory, anti-pyretic, edema, fever, Mangifera indica leaf

INTRODUCTION

Mangifera indica L. (Aracardiaceae) is one of the most important topical plants marketed in the world (Ross, 1999) it is a large tree that grows in tropical and subtropical region whose fruits are widely appreciated by the population there are many traditional, medicinal uses for the leaves, bark, roots of mangifera Indica throughout the globe (Ross, 1999). This plant was listed in TRAMIL program of applied research of popular medicine in caribbean) as an agent for the treatment of diarrhea, fever, gastritis and ulcers (Robineau and Soejarto, 1996).

Phytochemical research from different parts of mangifera Indica has demonstrated the presence of phenolic constituents, tritepenes, flavonoids, Phytosterols and polyenols. The leaves of mangifera Indica yields an essential oil containing humulene, elemene, ocmene, linalool, nerol and many others (Anjaneyulu et al., 1994). This species is purported to possess numerous therapeutic uses including antiamoebic (Tona et al., 2000), anti-inflammatory, analgesic (Garrido et al., 2001), anti-diabetic, anti-hyperglycemic (Aderibigbe et al., 2001, 1999), inmunostimulant (Makare et al., 2001), antidiaorrhea dylipidemic (Anila and Vijayaralachmi, 2002), anti bacterial (Bairy et al., 2002) anti-helminthic, antiallergic (Garcia et al., 2003a, b) and Spasmoletic application (Sairam et al., 2003). Due to huge dependence on this herb in the amelioration of various ailments such as fever and pain predominantly in Africa, scientific evaluation of the claims to ascertain its potent curative properties in inflammation, pyrexia and pain formed the core objectives of this study.

Plant: Mangifera indica leaves were collected from Elele in Rivers State and identified by Mr. A.O. Ozioko of the Department of Botany, university of Nigeria, Nsukka.

Plant extraction: The fresh leaves of Mangifera indica were air dried under atmospheric pressure (25+15°C) for two weeks and grinded using a crestow milling machine. The extract was subjected to cold maceration. This extract was prepared according to standard methods. The solution was then filtered using fitter paper.

Animal preparation: All animals were obtained from the animal house, faculty of Biological science, University of Nigeria Nsukka. Albino wistar rats weighing 150-215 g the animal were housed in wooden cages for at least two
weeks in the animal room of the physiology department, Madonna University prior to investigation. They were kept in the animal house, department of physiology, Madonna University, Elele campus and allowed to acclimatize for 4 weeks.

The rats were fed daily with food and water ad libitum was supplied throughout the period of acclimatization. Their cages were kept clean.

The acute toxicity test which is the lethal dose for the extract, according to the method of (Lorke, 1983) has been previously found to be 365 mg/kg on rats (Loomis and Hayes, 1996).

METHODOLOGY AND PROCEDURE

The research study was carried out in the animal research laboratory of the department of human Physiology, College of Health Sciences, Madonna University, Elele town, near Port Harcourt, Rivers State, Nigeria, in August, 2010.

Anti-inflammatory activity: Acute inflammation was produced by injecting a fresh egg albumin into the plantar surface of rat hind paw according to a modified method of Winter et al. (1962). The leaf extract (100, 200 and 400 mg/kg, respectively) was administered 30 min before the fresh egg albumin injection. The paw volume was measured at 30, 60 and 90 min, respectively using the Archimedes principle and the difference in paw volume at 0 h were taken as a measure of oedema.

Analgesic activity: In determining the analgesic activity of the extract the writhing test was carried out according to the modified method of Yaksh et al. (1976). The hot plate was made red hot; the animals were given the extract 30 min before each animal was placed into the hot plate and the first writhing was observed from the period of placing the animal on the hot plate to the time of writhing. This method was repeated for every 30 min for 3 consecutive times.

Antipyretic activity: The antipyretic activity of the leaf extract of Mangifera indica in rats which were made hyperpyretic by injecting suspension of baker’s yeast was investigated by a combination of methods described by Chatterjee et al. (1983) and kesersky et al. (1973) pyrexia was induced in albino rats each, by subcutaneous injection of 50% dried baker’s yeast suspension. Initial rectal temperature was recorded. After 18 h animal that showed a slight increase in rectal temperature were selected. The extract was administered to the rats (100, 200 and 400 mg/kg, respectively). The rectal temperature was measured by Ellab thermostat at intervals of 30 min for 3 consecutive times after the extract administration.

Phytochemical screening: The phytochemical analysis of the Mangifera indica leaf extract has been reported to contain alkaloids, saponins, anthroquinones, steroids, tannins, flavonoids, reducing sugars and cardiac glycosides (Doughari and Mamzara, 2008).

Group of animals for the experiment: Twenty (25) rats divided into Five (5) groups of five (5) rats per group were used in the study. Group 1 served as the control group and they was given distilled water. Group 2 was given the leaf extract. Group 3 was given Aspirin. Group 4 was given the extract these 5 groups were kept in separate cages and fed with same quantity of grower’s mash.

Weight assessment: The weight of each rat was monitored daily as an index of the physical status of the animals. At the end of the test, the animals were sacrificed by administering overdose of thiopental.

Statistical analysis: Statistical analysis was performed using the Statistical Package for Social Sciences (SPSS Version15.0). the results were analyzed using the One-Way Analysis of Variance (ANOVA) with a statistically significant difference at p<0.05. Turkey’s Multiple Comparison was used to test for statistically significant differences between control and experimental groups. The results are presented as mean+Standard Error of Mean.

RESULTS AND DISCUSSION

All doses used in this study were adjudged to be within the safety range (365 mg/kg). The Table 1, 2 and 3 showed the results for the anti-inflammatory, analgesic and antipyretic effects of Mangifera indica leaf extract.

The observation in Table 1 showed that the plant extract (at 400 mg/kg b.w) caused a significant (p<0.05) suppression of nociceptive response. The extract is a better option than Aspirin in this effect. In the present study the leaf extract of Mangifera indica exerted its analgesic activity by inhibition of some inflammatory response as analgesic could be due to inhibition of sensory receptor stimulation or due to anti inflammatory action (Dubuisson and Dennis, 1977).

In Table 2, the extract at a dose of 400 mg/kg produced an inhibition in the paw edema as well as the extract at 200 mg/kg. Like the standard anti-inflammatory drug Aspirin the inhibition was at the later phase (2 h) of paw volume increase. The paw edema model is a standard method used for evaluation of anti-inflammatory activity of anti-inflammatory agents including several mediators of inflammation such as prostaglandins, serotonin, histamine and bradykinin (Vinegar et al., 1987; Winter et al., 1962; Dananukar et al., 2000).
Table 1: Effect of *Mangifera indica* leaf extract on analgesic response induced by hot plate

<table>
<thead>
<tr>
<th>Groups</th>
<th>Dosage</th>
<th>30 min</th>
<th>60 min</th>
<th>90 min</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>-</td>
<td>2.25±0.25</td>
<td>4.50±0.50</td>
<td>3.75±0.25</td>
</tr>
<tr>
<td>Group 2</td>
<td>100 mg/kg</td>
<td>4.50±0.28*</td>
<td>8.25±0.25*</td>
<td>8.50±0.25*</td>
</tr>
<tr>
<td>Group 3</td>
<td>200 mg/kg</td>
<td>5.50±0.28*</td>
<td>8.25±0.25*</td>
<td>10.25±0.25*</td>
</tr>
<tr>
<td>Group 4</td>
<td>Aspirin</td>
<td>4.00±0.41*</td>
<td>6.75±0.75*</td>
<td>8.00±0.82*</td>
</tr>
<tr>
<td>Group 5</td>
<td>400 mg/kg</td>
<td>5.00±0.00*</td>
<td>11.75±0.63*</td>
<td>13.75±0.75*</td>
</tr>
</tbody>
</table>

Each value represents mean±SEM; *: p<0.05 compared with the control group

Table 2: Effect of *Mangifera indica* leaf extract on egg albumin-induced paw rat paw oedema

<table>
<thead>
<tr>
<th>Groups</th>
<th>Dosage</th>
<th>30 min</th>
<th>60 min</th>
<th>90 min</th>
<th>120 min</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>-</td>
<td>2.00±0.20</td>
<td>1.75±0.14</td>
<td>1.88±0.24</td>
<td>1.25±0.30</td>
</tr>
<tr>
<td>Group 2</td>
<td>100 mg/kg</td>
<td>1.63±0.13</td>
<td>1.25±0.14*</td>
<td>1.13±0.13*</td>
<td>1.00±0.14*</td>
</tr>
<tr>
<td>Group 3</td>
<td>200 mg/kg</td>
<td>1.75±0.25</td>
<td>1.38±0.24</td>
<td>1.00±0.13*</td>
<td>1.00±0.00*</td>
</tr>
<tr>
<td>Group 4</td>
<td>Aspirin</td>
<td>2.00±0.20</td>
<td>1.63±0.13*</td>
<td>1.38±0.13*</td>
<td>1.00±0.20*</td>
</tr>
<tr>
<td>Group 5</td>
<td>400 mg/kg</td>
<td>2.13±0.13</td>
<td>1.63±0.13*</td>
<td>1.13±0.13*</td>
<td>1.00±0.00*</td>
</tr>
</tbody>
</table>

Each value represents mean±SEM; *: p<0.05 compared with the control group

In Table 3, the evaluation of the antipyretic effect of *Mangifera indica* leaf extract (at 100, 200 and 400 mg/kg, respectively), profoundly revealed that the extract (at 100 mg/kg) decreased the temperature elevation (not dose dependent) induced experimentally with yeast. The yeast-induced fever is a well-established model for assessing antipyretic effect and it has been used in a number of studies (Kesersky et al., 1973; Chatterjee et al., 1983; Lakshman et al., 2006). The effect the antipyretic agent had was the lowering of raised body temperature. Generally antipyretic activity is exerted by inhibition of prostaglandin synthesis via cyclo-oxygenase activity (Vane, 1987). The present study showed that the leaf extract of *Mangifera indica* has a fairly good antipyretic effect.

**CONCLUSION**

In conclusion the leaf extract of *Mangifera indica* exerted anti-inflammatory, analgesic and partially antipyretic activities. This finding showed justification for the use of the plant extract in the management of anti-inflammatory and nociceptive conditions.

**REFERENCES**


