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Research Article

ANTI-INFLAMMATORY ACTIVITY OF METHANOLIC EXTRACT OF PLANT *SIDA CORDATA* IN CARRAGEENAN-INDUCED PAW EDEMA IN RATS

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ABSTRACT

Since ancient times in India several medicinal plants are in use for clinical practices. Inflammation is a process through which the body's white blood cells and the things they make protect body from infection from outside invaders, such as bacteria and viruses. Currently many of the plant's species have been reported effective as an Anti-inflammatory, but only a few of them have been investigated. Currently many drugs are available to control the inflammation but has several adverse effects. The plant *Sida Cordata* was reported to have several activities such as Antioxidant, Analgesic, Antidepressant, Antihyperglycemic, Hepatoprotective Antibacterial, Antitumor, Antifungal, Antiulcer, Antitussive, Anti-inflammatory, Anti-malarial, in ayurvedic system of medicine. This study was undertaken to investigate the anti-inflammatory activity of Methanolic extract of *Sida Cordata*. The methanolic extract of *Sida Cordata* used for treatment of Carrageenan-induced Rat paw Oedema model with the predefined dose as reported. The experimental groups with higher dose of methanolic extract (200 mg/kg) exhibited a significant anti-inflammatory effect after 2 hr. ($p<0.01$); based on the observation, the activity was favorable, which is nearly equal to that of the standard drug Indomethacin (10 mg/kg). The methanol extract (200 mg/kg) shows the maximum percentage of inhibition of inflammation 27.06 %. The standard drug indomethacin shows 33 % inhibition.

Keywords: *Sida Cordata*, Carrageenan-induced, Anti-inflammatory

INTRODUCTION

Numerous plants are normally used in India for the treatment of several diseases known as Ayurvedic system of medicine. Homeopathic, Siddha, Naturopathy, Unani like alternative medicine systems also comprise various products obtained from plants. Currently the thousands of plant species employed in clinical practices directly as a plant parts like roots, stem, bark, leaves, flowers, fruits, seeds & whole plants or their various extract used in various dosage forms of medicines. The single plant may be used alone or with other plant combination for better results. In the clinical treatment's clear ancient references for utilization of plants are given. [1.2]

Ayurvedic medicine is the use of herbs for their medicinal and therapeutic or medicinal value. According to the world health organization (WHO), herbal medicine refers to health practices, approaches knowledge and beliefs incorporating plant, animal, and mineral based medicine, spiritual therapies, manual technique and exercises applied singularly or in combination to treat, diagnose and prevent illnesses or to maintain well-being. [3,4]

Although many drugs are available to control the Inflammation but has several adverse effects. [5,6,7]

Sida Cordata is highly reputed plant in ayurvedic system of medicine for the treatment of several ailments.[8] This study was undertaken to investigate the anti-inflammatory activity of methanolic extract of *Sida Cordata*.

MATERIAL AND METHODS

Plant Collection

The whole plant *Sida Cordata* (Burm. F.) Borss. was collected in the month of December from Tirupati hills, A.P., India. The plant material was taxonomically identified, confirmed and authenticated by Dr. K. Madhava Chetty, Assistant Professor, Department of Botany, Sri Venkateswara University, Tirupati-517502, A.P., India.

Preparation of Extract

The plant was dried under shade with occasional shifting and then powdered with a mechanical grinder and stored in an airtight container.

The dried coarse powder of *Sida Cordata* (Burm. F.) Borss. extracted (at 65^0c) in Soxhlet apparatus for 72 hrs. by using the 4 liter of Methanol solvent. The extract is then filtered through Whatman filter paper 45# and concentrated by evaporation till dry powder.

Phytochemical Analysis

Phytochemical screening of the crude leaf extract was carried out employing standard procedures and tests, to reveal the presence of chemical constituents such as alkaloids, flavonoids, tannins, terpenes, saponins, anthraquinones, reducing sugars, cardiac glycosides among others. [8, 9]

Anti-Inflammatory Activity

Test Animals

Wister albino rats weighing between 150-200 gm were used in this study. The animals were placed at random and allocated to treatment group in propylene cages with paddy husk as bedding. Animals were housed at a temperature of 24˚C and relative humidity 30-70%. A 12:12 dark: light cycle. All the animals were allowed to free asses to the water and feed with standard commercial pellet rat chew. All the experimental procedure and protocols used in this study were reviewed by Institutional Animal Ethics Committee (IAEC), proposal number NCP/IAEC/NO: 15/2011-12 and were in accordant with guidelines of the IAEC.

Chemicals

1. 0.5% CMC w/v.p.o.
2. Carrageenan.

Drugs

1. Methanol extract of *Sida Cordata* (Burm. F.) Borss.
2. Indomethacin.

Carrageenan-Induced Paw Edema In Rats

For this experiment, the male rats (120-150g) were divided into five groups (n=6). The first group received (0.5% CMC w/v.p.o.) and served as normal control, while the second group received (0.5% CMC w/v p.o.) and served as negative control, the third group received Indomethacin (10mg/kg p.o) and served as standard. The fourth and fifth groups were treated with the methanol extract of *Sida Cordata* (Burm. F.) Borss. (100 and 200 mg/ kg p.o.) respectively. Acute inflammation was produced by the sub plantar administration of 0.1 ml of 1% Carrageenan (in 0.5% CMC w/v) in the right hind paw of the rats. The paw thickness was measured at 0 min, 30 min, 1hr, 2hr and 4hr after Carrageenan injection by using digital Vernier caliper. The animals were pretreated with the drug 1 hour before the administration of Carrageenan.

The percent inhibition of inflammation was calculated using the formula;

$$\% \text{ inhibition} = 100(1-Vt/Vc),$$

Where Vc represents Oedema size in negative control and Vt the Oedema size in the group treated with the tested compounds or Indomethacin. [9,10,11,12,13]

Statistical Analysis

The collected data were subjected to appropriate statistical test including one-way ANOVA, followed by an appropriate Dunnett's t-test, P-value of less than 0.05, 0.01 and 0.001were considered as less significant, significant and more significant respectively. The analysis was carried out using graph pad prism software.

RESULTS AND DISCUSSIONS

The plant *Sida Cordata* (Burm. F.) Borss. Belonging to the family of Malvaceae was selected for the phytochemical and biological activities. The plant was collected in the month of December 2011 from Tirupati hills, A.P., India, and authenticated by the botanist for confirmation. Methanol extract was subjected to phytochemical analysis. Results were shown the presence of the Flavonoids, Tannins, Sterols, Tri-terpenoids, Alkaloids and Glycosides. The anti-inflammatory activity of methanolic extract of *Sida Cordata* (Burm. F.) Borss. and isolated compound was compared with that of standard drug, and it shows the significant anti-inflammatory activity in dose dependent manner as shown in Table 1 and the percentage of inhibition of inflammation is shown in Table 2.

Table 1: Acute Anti-Inflammatory activity of the test compound in the Carrageenan-induced Rat paw Oedema model

	Initial	0 min	30 min	60 min	120 min	240 min
Normal control	2.635 ± 0.1509	2.6583 ± 0.1488	2.4733 ± 0.1453	2.635 ±0.1509	2.634 ±0.1509	2.636 ±0.1506
Negative control	2.6216 ±0.0614	4.0533 ±0.0599	4.11 ±0.0552	4.125 ±0.0563	4.305 ±0.1411	4.075 ±0.0218
Indomethacin (10mg/kg p.o.)	2.77 ±0.1358	4.0433 ±0.0599	3.8216 ±0.0715	3.71 ±0.0675	3.2866** ±0.0404	2.73** ±0.0424
T1 (100 mg/kg p.o. extract)	2.685 ±0.1241	4.065 ±0.0763	4.06 ±0.0706	3.9716 ±0.0564	3.6883* ±0.0498	3.2166* ±0.0622
T2 (200 mg/kg p.o. extract)	2.7466 ±0.1148	4.0483 ±0.0766	3.9933 ±0.0789	3.9366 ±0.0737	3.4966** ±0.0793	2.9666** ±0.0414

Data represents mean ± S.D. (n=6). *p< 0.05 Significant as compared to Negative control. **p< 0.01 Significant as compared to Negative control. ***p< 0.001 Significant as compared to Negative control. ns: non-significant compared to normal control.

Table 2: Percent of inhibition of Oedema formation at time compared to negative control

	30 min	60 min	120 min	240 min
Indomethacin (10mg/kg p.o.)	7.1%	10.06%	23.66%	33%
T1 (100 mg/kg p.o. extract)	1.22%	3.72%	14.44%	18.61%
T2 (200 mg/kg p.o. extract)	2.84%	4.57%	18.78%	27.06%

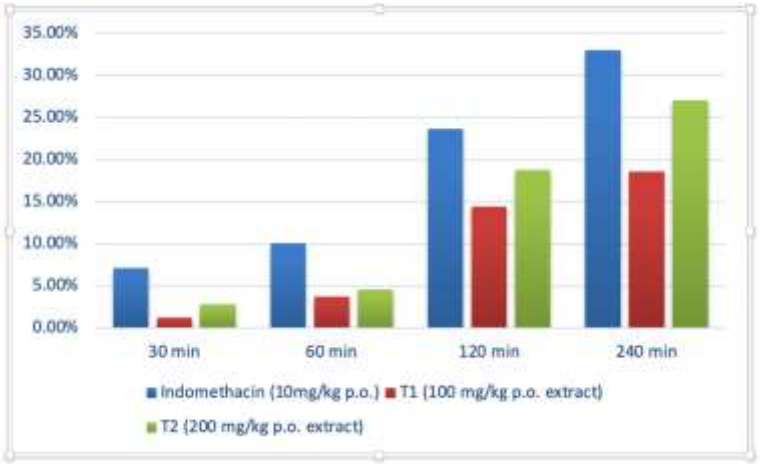

Figure 1: Percent of inhibition of Oedema formation at time compared to negative control

The experimental groups with higher dose of methanolic extract (200 mg/kg) exhibited a significant anti-inflammatory effect after 2 hr. ($p<0.01$); based on the above observation, the activity was favorable, which is nearly equal to that of the standard drug Indomethacin (10 mg/kg). The methanol extract (200 mg/kg) shows the maximum percentage of inhibition of inflammation 27.06 %. The standard drug indomethacin shows 33 % inhibition. Therefore, this medicinal plant can be considered effective and alternative treatment for the inflammation[14].

CONCLUSION

From the results obtained it is seen that the methanolic extract of the plant S*ida Cordata* (Burm.F.) Borss. possess the potential anti-inflammatory activity. Therefore, this medicinal plant is effective and alternative treatment for the inflammation.
Apart from the above, further isolation, pharmacological and biochemical investigations will clearly elucidate the mechanism for such an effect and will be helpful in projecting this plant as a therapeutic target.

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