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### Comparing of anti-inflammatory activity of *Sesbania grandiflora* and *Acacia nilotica* on Formalin induced paw edema in rats

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**Abstract:** Inflammation is defined as the local response of living mammalian tissues to injury due to any agent. It is a body defence reaction in order to eliminate or limit the spread of injurious agent, followed by removal of the necroses cells and tissues. Objective of present study is to compare the ant-inflammatory activities of methanolic extracts of *Sesbania grandiflora* leaves and *Acacia nilotica* bark. We hypothesized that methanolic extracts of *Sesbania grandiflora* leaves and *Acacia nilotica* bark may benefit in diseases of cell injury and pain. *Sesbania grandiflora* leaves and *Acacia nilotica* bark extract, exhibited anti-inflammatory activity when subjected to the tests like Formaline induced paw edema.

**Keywords:** *Sesbania grandiflora*, *Acacia nilotica*, Formaline, Inflammation, Dexamethasone

**Introduction:** Medicinal plants employed throughout the industrialized and developing world as home remedies, over-the-counter drugs, and ingredients for the pharmaceutical industry.<sup>1</sup> *Sesbania grandiflora* and *Acacia nilotica* is one of

such medicinal plant which is used in different illness conditions.

The survival of all organisms requires that they eliminate foreign invaders, such as infectious pathogens, & damaged tissues. These functions are mediated by a complex host response called inflammation.

Inflammation is defined as the local response of living mammalian tissues to injury due to any agent. It is a body defence reaction in order to eliminate or limit the spread of injurious agent, followed by removal of the necroses cells and tissues.<sup>2</sup> Inflammation is characterized in acute phase by increased blood flow and vascular permeability along with the accumulation of fluid, leukocytes and inflammatory mediators such as cytokines. In the sub acute/chronic phase it is characterized by the development of specific humoral and cellular immune responses to pathogens present at the site of tissue injury.<sup>3</sup>

## 2. Materials and Methods:

### 2.1. Collection of Plant material-

The leaves of *Sesbania grandiflora* were collected near Kanichikudi temple, Samalpatti to Oothnrai main road, Krishnagiri district, Tamil Nadu state in the month of October and was authenticated by Dr. K. Ravikumar, Assistant Director, Foundation of revitalisation of Local Health Traditions, Bangalore and were deposited in the department of pharmacology, Teerthanker Mahaveer University for future reference.

The bark of *Acacia nilotica* was collected in the month of October near Thiruvadhigai Anaicut, panruti Taluk, cuddalore district, Tamil Nadu state and was authenticated by Dr. K. Ravikumar, Assistant Director, Foundation of revitalisation of Local Health Traditions, Bangalore and were deposited in the department of pharmacology, Teerthanker Mahaveer University for future reference.

### 2.2 Preparation of plant extracts-

The freshly collected leaves and bark of *Sesbania grandiflora* and *Acacia nilotica* respectively were dried in shade under the control conditions and powdered. The powdered leaves and bark of the plants (500g) were extracted in solvents with increasing polarity from petroleum ether, chloroform, ethyl acetate, methanol and water for 24 hours with each solvent, by successive extraction method (Soxhlet apparatus) at a temperature of 30° to 35° C. The extracts were concentrated by evaporating the solvent on water bath until it got reduced to a semisolid mass obtain methanolic extract of *Sesbania grandiflora* and *Acacia nilotica* plants.

### 2.3 Maintenance of animals and approval of protocol-

30 Wistar albino rats of either sex weighing between 200 and 400 g were used in this study. These rats were procured from the Central Animal House Facility, Teerthanker Mahaveer University, Moradabad. They were housed in well ventilated stainless-steel cages at room temperature ( $24 \pm 2$ ) °C in hygienic condition under natural light and dark schedule and were fed on standard laboratory diet. Food and water were given ad libitum. Permission for the use of animal and animal protocol was obtained from the Institutional Animal Ethical Committee (IAEC) of Committee for the Purpose of Control and Supervision of Experiments on Animals (Reg. No. 1205/c/08/CPCSEA, Dated:-21/4/2008).

### 2.4 Formalin induced paw edema in rats:

#### Anti-inflammatory activity<sup>4-10</sup>

##### Principle

This model was based upon the ability of test drug to inhibit the edema produced in the hind paw of the rat after injection of formalin. The nociceptive effect of formalin is biphasic, an early neurogenic component followed by a later tissue-mediated

response. In the first phase there is release of histamine, 5-HT and kinin, while the second phase is related to the release of prostaglandin.<sup>1</sup>

##### Preparation of 2% formalin solution

Firstly 0.9% saline solution was made and then 98 ml of this saline is mixed with 2ml of formaldehyde solution and adjust the volume up to 100ml to get the 2% formalin solution.

##### Procedure

The rats were divided into six groups. All the groups are fasted overnight. Group-I serves as control, group-II serves as standard and group-III, IV and V considered as test groups. Control group is treated with 1ml distilled water, Standard receives Dexamethasone (0.5mg/kg) and test group is treated with methanolic extracts of *Sesbania grandiflora* and *Acacia nilotica* at a dose of 400 mg/kg. This dose is given one hour before the formalin injection and ones daily for 7 days. Paw edema was produced in the right hind paw of rats by injecting 0.1 ml of 2% formalin in 0.9% NaCl subcutaneously in the planter surface near the central region of planter aponeurosis. The percentages of inhibition of increased circumferential length of hind paw edema of rats in both the control and drug- treated groups were

compared by using formula:  $\{(C - T) \div C\} \times 100$  where T and C stands for test and control respectively.

Progress of local inflammatory exudative lesion was assessed by measuring the circumferential length one hour before formalin injection and 3 hours, 6 hours, once daily for 7 consecutive days after injection of formalin. The mean increase in the circumferential length of the hind paw edema was taken for calculation.

In the present study, taking measurement of mean increase in the circumferential length of rat's hind paw edema respectively assessed inflammation.

The ability of anti-inflammatory drug to suppress paw inflammation was expressed as a percentage of inhibition of paw edema and this percentage can be calculated according to the following equation:

$$\text{Percentage of inhibition (\%)} = 100 \times (1 - x/y)$$

Where X= mean increase in paw volume, thickness or weight of treated rats and Y= mean increase in paw volume, thickness of control rats.<sup>13</sup>

Group	Treatments
Control	Distilled water
Standard	Diclofenac sodium
Treated I	Methanolic extract of <i>Sesbania grandiflora</i> (200mg/kg, p.o.)
Treated II	Methanolic extract of <i>Sesbania grandiflora</i> (400mg/kg, p.o.)
Treated I	Methanolic extract of <i>Acacia nilotica</i> (200mg/kg, p.o.)
Treated II	Methanolic extract of <i>Acacia nilotica</i> (400mg/kg, p.o.)

### 2.5 Statistical analysis-

The statistical significance was assessed using one-way analysis of variance (ANOVA) followed by Bonferroni Multiple Comparisons Test by using Graph Pad InStat (File version 3.0.10.0). The values were expressed as mean  $\pm$  Standard Error Mean (SEM) for six rats in each group and P<0.05 were considered significant.

### 3. Results and Discussion:

Anti-inflammatory activity of the test extract was measured against chronic paw edema induced by formalin. The methanolic extracts of the whole parts of *S. grandiflora* and *A. nilotica* was evaluated for anti-inflammatory activity using the formaldehyde-induced rat paw oedema model at dose of 400 mg/kg body weight

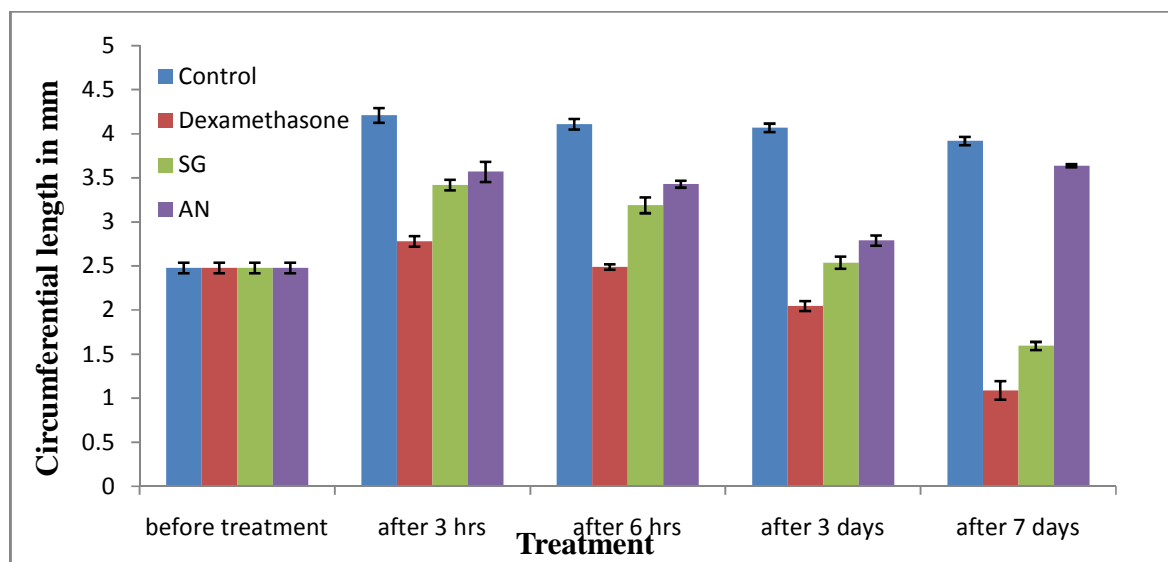
where as Dexamethasone at a dose of 0.5 mg/kg was used as a positive reference standard and the results were as been shown

in Table no 1, Table no. 2, Fig no. 1 and Fig no 2

**Table no 1:** Effect of *Sesbania grandiflora*, *Acacia nilotica* and dexamethasone on circumferential length of the hind paw edema

Groups	Treatment	Circumferential length (cm) of hind paw edema				
		Before treatment	At 3 hrs	At 6 hrs	3 days	7 days
I	Control	2.48± 0.0600	4.21± 0.0833	4.11± 0.0600	4.07± 0.0473	3.92± 0.0471
II	Dexamethasone	2.48± 0.0600	2.78± 0.0600**	2.49± 0.0318***	2.048± 0.0557***	1.09± 0.1057***
III	<i>S. grandiflora</i> (400 mg/kg)	2.48± 0.0600	3.42± 0.0600**	3.19± 0.0895**	2.54± 0.0700**	1.595± 0.0458**
IV	<i>A. nilotica</i> (400 mg/kg)	2.48± 0.0600	3.57± 0.114*	3.43± 0.0387*	2.79± 0.0572**	1.71± 0.0164**

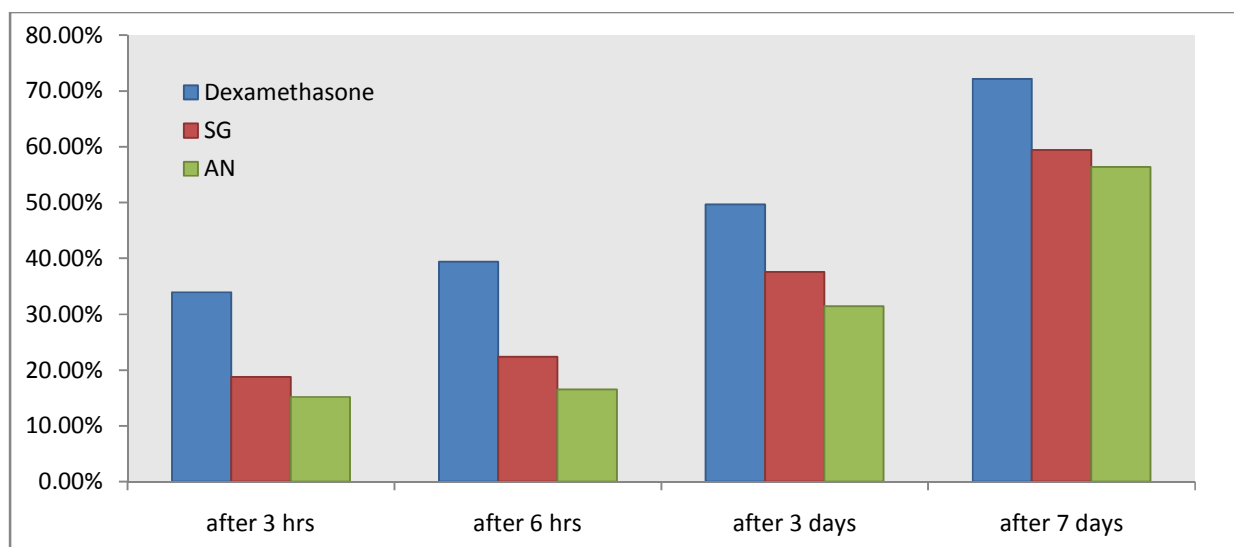
Anti-inflammatory effect of methanolic extracts of *S. grandiflora* and *A. nilotica* in carrageenan induced paw edema. All the values are shown as mean ± Sem n = 6, \*p < 0.05, \*\* p < 0.01, \*\*\* p < 0.001 vs control. # p < 0.05,## p < 0.01, ### p < 0.001 vs standard.



**Fig no 1:** Graph representing mean increase in circumferential length of paw at different time duration

**Table no. 2:** % Inhibition of hind paw edema by *S. grandiflora*, *A. Nilotica* and dexamethasone after different time duration

Group	After 3 hrs	After 6 hrs	On 3 <sup>rd</sup> day	On 7 <sup>th</sup> day
Dexamethasone	33.96%	39.41%	49.68%	72.19%
<i>S. grandiflora</i>	18.76%	22.38%	37.59%	59.43%
<i>A. nilotica</i>	15.20%	16.54%	31.44%	56.37%

**Fig no. 2:** Graph shows the % inhibition of *Sesbania grandiflora*, *Acacia nilotica* and dexamethasone treated groups at different time duration**Conclusion:**

The obtained result showed that the extract at high dose showed 59.43% inhibition for Formalin induced paw oedema, whereas, *Acacia nilotica* bark extract showed that the extract at high dose exhibited only 56.37% for formalin induced paw edema. These investigations showed that leaves of *Sesbania grandiflora* and bark of *Acacia*

*nilotica* methanolic extract possessed anti-inflammatory, but *Sesbania grandiflora* elicited better results for all the activities than *Acacia nilotica*.

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