VOLUME 1 ISSUE 3

ISSN: 2230-4818

JOURNAL OF SCIENTIFIC & INNOVATIVE RESEARCH

ORIGINAL RESEARCH ARTICLE

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

Ashok Kumar *[1], Surendra Gaur[1], K Jha[1], Kuldeep Sharma[1]

1. College of Pharmacy, Teerthanker Mahaveer University, Moradabad-244001

ABSTRACT

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 Carrageenan induced paw edema.

Keywords: Sesbania grandiflora, Acacia nilotica, Carrageenan, Inflammation, Diclofenac.

INTRODUCTION

Medicinal plants constitute a source of raw materials for both traditional systemsof medicine (e.g. Ayurvedic, Chinese, Unani, Homeopathy, and Siddha) and modern medicine. Nowadays, plant materials are employed throughout the industrialized and developing world as home remedies, over-the-counter drugs, and ingredients for the pharmaceutical industry.[1] Sesbania grandiflora and Acacia nilotica is one of such medicinal plant which is used in different illness conditions.

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.[2] Inflammation is characterized in acute phase by increased blood flow and vascular permeability along with the accumulation of fluid,

Address for correspondence:
Ashok Kumar*
College of Pharmacy, Teerthanker Mahaveer University, Moradabad-244001
E-mail: ashuandyou@gmail.com

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.[3]

2. MATERIALS AND METHODS

2.1. Collection of Plant material-

The leaves of *Sesbania grandiflora* were collected near Kanichikudi temple, Samalpatti to Oothngrai main road, Krishnagiri district, Tamil Nadu state in the month of October and were 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 was 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 powered 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 30º to 35º 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 ± 2) ºC in hygienic condition under natural light and dark schedule and were fed on standard laboratory diet. Food and water were given ad libitium. 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 Carrageenan induced paw edema in rats:

Anti-inflammatory activity[4-10]

Principle

This model is based on the principle of release of various inflammatory mediators by carrageenan. Edema formation due to carrageenan in the rat paw is biphasic event. The initial phase is attributed to the release of histamine and serotonin. The second phase of edema is due to the release of prostaglandins, protease and lysosome. Subcutaneous injection of carrageenan into the raw paw produces inflammation resulting from plasma extravasation, all due to the metabolism of arachidonic acid. The first phase begins immediately after the injection of carrageenan and diminished in two hours. The second phase begins at the end of first phase and remains through third hour up to five hours.

Procedure

Preparation of carrageenan 2% solution

2 gm of carrageenan powder was weighed and volume was adjusted upto 100ml by the 0.9% saline solution.

Carrageenan induced paw edema model was used to determine of anti-inflammatory activity. The rats were divided into six groups. All the groups were fasted overnight. Group-I serves as control, group-II serves as standard and group- III, IV, V and VI were considerd as test groups. Control group is treated with 1ml distilled water, standard receive Diclofenac Sodium (50mg/kg) and test group is treated with methanolic extracts of *Sesbania grandiflora* and *Acacia nilotica* at dose of 200 and 400 mg/kg. 60 min after the oral administration of test sample or dosing vehicle each rat was injected with freshly prepared 0.1 ml of 2%(w/v) suspension of carrageenan in physiological saline (0.9% saline solution) into sub-plantar region of the right hind paw of rat.[11] The paw volume was measured immediately before injection and after 1, 2, 3, 4 hours than after 5 hours. The difference in footpad thickness was measured by using plethysmometer.[12]

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:

Percentage of inhibition (%) = 100 × (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.[13]

Group	Treatments
	Carrageenan induced paw edema
Control	Distilled water
Standard	Diclofenac sodium
Treated I	Methanolic extract of *Sesbania grandiflora* (200mg/kg, p.o.)
Treated II	Methanolic extract of *Sesbania grandiflora* (400mg/kg, p.o)
Treated I	Methanolic extract of *Acacia nilotica (200mg/kg, p.o.)*
Treated II	Methanolic extract of *Acacia nilotica* (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 ± Standard Error Mean (SEM) for six rats in each group and $P<0.05$ were considered significant.

3. RESULTS AND DISCUSSION

Antiinflammatory activity of the test extract was measured against acute paw eddema induced by 1 % carrageenan in saline. The methanol extract of the leaves and bark of *Sesbania grandiflora* and *Acacia nilotica* respectively were evaluated for anti-inflammatory activity using the carrageenan induced paw edema model at the dose levels of 200 and 400 mg/kg body weight, whereas diclofenac sodium at a dose level of 50 mg/kg was used as positive reference standard and the results were shown below:

Table no 1: edema diameter in cm at different time intervals.

Treatment groups	Change of paw edema volume (cm) Mean±SEM					
	0 hr	1 hr	2 hr	3 hr	4 hr	5 hr
Control	0.058± 0.008	0.1± 0.012	0.125± 0.017	0.183± 0.016	0.208± 0.015	0.216± 0.021
Standard (50 mg/kg)	0.058± 0.008	0.091± 0.008	0.108± 0.008	0.125± 0.011**	0.083± 0.010***	0.075± 0.011***
SG1 (200 mg/kg)	0.058±0. 008	0.1± 0.012	0.116± 0.010	0.125± 0.011**	0.133± 0.016**	0.116± 0.021**
SG2 (400 mg/kg)	0.066±0. 010	0.091± 0.015	0.108± 0.008	0.116± 0.010**	0.116± 0.010***	0.1± 0.012***
AN1 (200 mg/kg)	0.058±0. 008	0.091±0.00 8	0.116± 0.010	0.133± 0.010*	0.15± 0.012*	0.133± 0.021*
AN2 (400 mg/kg)	0.066±0. 010	0.083± 0.010	0.108± 0.015	0.133± 0.010*	0.141± 0.018*	0.124± 0.016*

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.

Table no 2: Percentage inhibition of oedema by methanolic leaves extract of *S. grandiflora* and bark of *A. nilotica* at different time intervals.

	Percentage inhibition					
Groups	0 hrs	1 hrs	2 hrs	3 hrs	4 hrs	5 hrs
Standard (15 mg/kg)	0	9%	13.6%	31.80%	59.95%	65.38%
***S.grandiflora* (200 mg/kg)**	0	0	6.64%	31.80%	36.00%	46.16%
***S.grandiflora* (400 mg/kg)**	0	9%	13.36%	36.33%	43.97%	53.85%
***A.nilotica* (200 mg/kg)**	0	9%	6.64%	27.27%	27.98%	38.48%
***A.nilotica* (400 mg/kg)**	0	5%	13.36%	27.27%	27.98%	42.45%

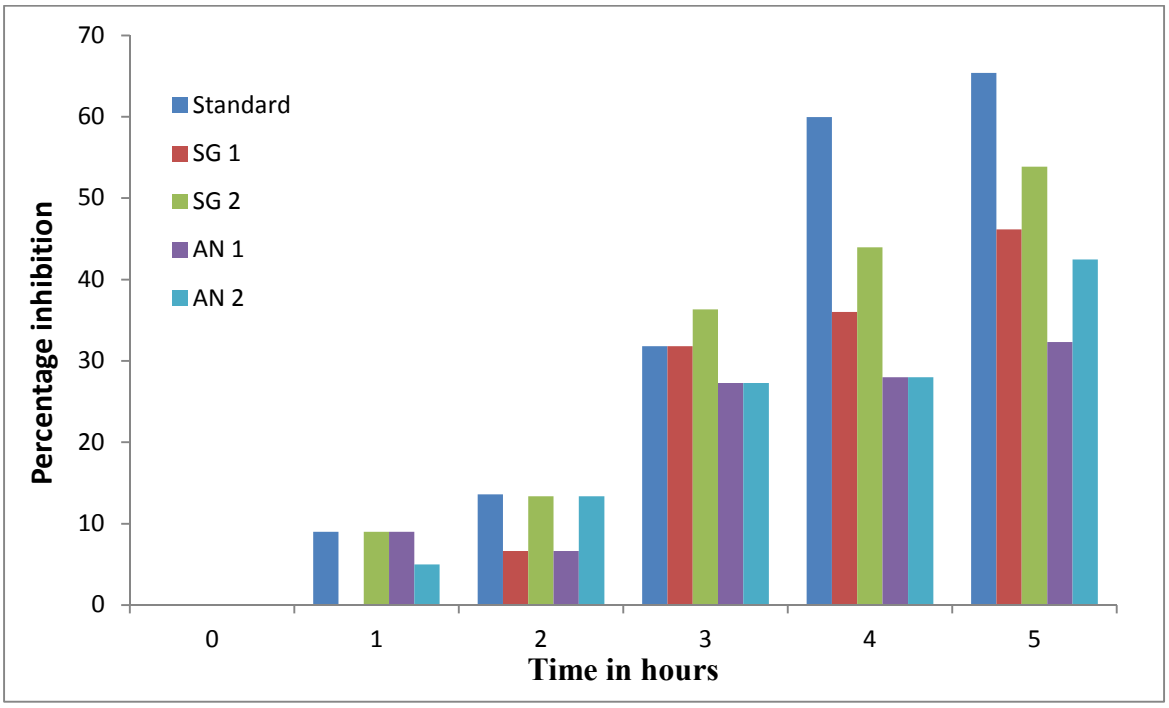

Fig no. 1: Percentage inhibition of methanolic extract of leaves of *S. Grandiflora* and bark of *A. nilotica* on carrageenan induced paw oedema

Carrageenan induced inflammation is a biphasic phenomenon. The first phase of edema is attributed to release of histamine and 5-Hydroxy trptamine, plateau phase is maintained by kinin like substance and second acceleration phase of swelling is attributed to prostaglandin like substance. The knowledge of these mediators involved in different phase is important of interpreting mode of drug action. The above Table no 1 and Table no. 2 result of acute inflammation model indicate that the methanolic extract of leaves of *S. grandiflora* at dose level of 400 mg/kg showed reduction in paw edema volume. There is a significant reduction in paw edema volume when compared with control and *A.nilotica* at 3rd, 4th and 5th hour observation 36.33 %, 43.97 % and 53.85 % respectively. The activity may be due to their content of tannins, flavanoids, alkaloids, glycosides and carbohydrates.[7]

CONCLUSION

The obtained result showed that the extract at high dose showed 53.85% inhibition in carrageenan induced paw oedema whereas, *Acacia nilotica* bark extract showed that the extract at high dose exhibited only 42.45% inhibition in carrageenan 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.*

ACKNOWLEDGMENTS

The authors are thankful to Director College of Pharmacy and authority of Teerthanker Mahaveer University, Moradabad, India for providing the facility to carry out the research work.

REFERENCES

1. Bandaranayake W.M., “quality control, screening, toxicity and regulation of herbal drugs”, modern phytyomedicines, 2006, pp 25-55

2. Harshmohan "Text Book of Pathology", Jaypee brothers medical publishers, 2010, 6th edition, pp 134-137, 550, 591-593

3. Feghali C. A., et al "Cytokines in acute and chronic inflammation", Frontiers in Bioscience, Vol- 2, 1997, pp 12-26

4. Santosh S. bhujbal, et al,"Anti-inflammatory activities of an isolatd flavanoid fraction from Celosia argentea Linn." Journal of medical plant research, 2008, Vol. 2, issue 3, pp. 52-54.

5. Anupam A. Suralkar,et al, "In vivo animal models for evaluation of anti-inflammatory activity" pharmainfo.net; latest review, 2008, Vol. 6; issue 2

6. Rehman hussain, et al, "Dose-dependent anti-inflammatory effect of silymarin in experimental animal model of chronic inflammation" African journal of pharmacy and pharmacology, 2009, Vol. 3, issue 5, pp. 242-247.

7. You- seong jeong, et al, "Effect of different concentration of formalin on paw edema and pain behaviors in rats" J Korean med sci; 2002; vol. 17; pp. 81-85.

8. Dashputre N.L.,et al, "Evaluation of anti-ulcer activity of methanolic extract of Abutilon indicum Linn. Leaves in experimental rats" International journal of pharmaceutical sciences and Drug research, 2011; Vol.3 ; issue 2; pp. 97-100.

9. Gupta J K, et al, "Evaluation of anti-ulcer activity of Leucas lavandylifolia on mucosal lesion in rat", Asian journal of pharmaceutical and clinical research, 2010 vol. 3, issue 2, pp.118-120.

10. Ranju Pal, et al, "Antioxidant and free radical scavenging activity of ethanolic extract of the root of Morinda citrifolia" African journal of pharmacy and pharmacology; 2012, vol. 6; issue 5; pp. 278-282.

11. Kumar V., Robbins S.L., "Robbins Basic Pathology", Saunders/Elsevier, 2007, 8th edition, pp 31,37, 38, 39, 45, 47, 594

12. Lemerond T., "Inflammation: the wonder spice solution", Better Nutrition

Magazine, vol- 5, 2008, pp 1-32

13. Badarinath A.V., et al, "A review on in-vitro Antioxidant methods: Comparisons, Correlations and considerations", International Journal of PharmTech Research, 2010, Vol 2, issue 2, pp 1276-1285