ANTI-INFLAMMATORY ACTIVITY OF ETHANOLIC AND AQUEOUS EXTRACTS OF *ALTERNANTHERA SESSILIS* LINN.

Sahithi B, Rajani G. P. [*], Sowjanya K, Deepak Gupta.

Department of Pharmacology, KLE University's College of Pharmacy, Bangalore-560010, Karnataka, India.

***Corresponding Author:**

G. P. Rajani,
Associate Professor,
Department of Pharmacology,
KLE University's College of Pharmacy,
Mobile No.: 91-9448856162
E-mail: bmruvce@yahoo.co.in

Summary

The present study was performed to evaluate the anti-inflammatory activity of ethanolic and aqueous extracts of *Alternanthera sessilis* Linn. at doses of 200 and 400mg/kg body weight using carrageenan induced rat paw edema model. Maximum inhibition of edema was produced at 3rd h. Maximum inhibition of edema was produced by ASE400 (64.29±7.14) followed by Indomethacin and ASA400 (57.14±4.24 and 57.14±8.24). This finding showed that *Alternanthera sessilis* can be a potential source of anti-inflammatory activity.

Key words: *Alternanthera sessilis,* Anti-inflammatory activity, carrageenan induced rat paw edema.

Introduction

Inflammation is a physiologic series of response generated by the host in response to infection or other insults. It is the local reaction of the living body to an injury of vascularised tissues.[1] The word inflammation is derived from the Latin word *inflammare* meaning to burn.[2]

Alternanthera sessilis Linn., Family: Amaranthaceae, (vernacular names[3,4]: English: Sessile joy weed, Sanskrit: Matsyaaksha, Matsyagandha, Kannada: Honagone soppu, Telugu: Ponnaganti kura, Hindi: Gudari sag) is widespread throughout the warmer parts of India, Ceylon and all warm countries.[5] In India it is found throughout hotter parts, ascending an altitude of 1200m in the Himalayas and even cultivated as a pot-herb.[6] It is a weed and occurs in both wet lands and uplands and can grow on a variety of soil types. The plant spreads by seeds, which are wind and water dispersed and by rooting at stem nodes. It is a weed of rice throughout tropical regions and of other cereal crops, sugarcane and bananas. Although it is a weed, it has many utilities.[7]

It has been used in Indian traditional system of medicine since a long time in diseases due to vitiated blood, skin diseases and ulcers. The herb is used in folklore as galactogogue, cholagogue, abortifacient and febrifuge. In some parts of Bihar, the plant is used for hazy vision, night blindness, diarrhoea, dysentery and post-natal complaints. The poultice of pounded fresh material is reported to be used for sprains, burns, eczema, carbuncle, erysipelas and acute conjunctivitis. It is applied externally on acne and pimples. Previous phytochemical studies have reported the isolation of flavonols, triterpenoids, steroids and tannins; β-sitosterol, stigmasterol, campesterol, lupeol being few of its important constituents.[8] The herb has been reported to have antipyretic[8], hepatoprotective[9], antiulcer[10], antibacterial[11], hematinic[12], diuretic[13] activities. Taking into consideration the folklore uses and the active constituents present, the present study aims at pharmacological evaluation of ethanolic and aqueous extracts of *Alternanthera sessilis* (L) for anti-inflammatory activity.

Materials and methods

Plant material: Fresh aerial parts of *Alternanthera sessilis* were collected in July 2010 and the plant was authenticated by Dr. Shiddamallayya N from Regional Research Institute (Ay.) (Central Council of Research in Ayurveda and Sidha, Dept of AYUSH, Ministry of Health and Family Welfare, Govt. Of India, New Delhi), Government Central Pharmacy, Annexe, Ashoka Pillar, Jayanagar, Bangalore-560 011.

Preparation of extract: Fresh aerial parts (leaves, flowers, stem) of *Alternanthera sessilis* Linn. were procured, shade dried, coarsely powdered and was successively Soxhlet extracted with petroleum ether, chloroform and 90% ethanol. The aqueous extract was prepared using the same marc by the process of maceration. The extracts obtained were concentrated under reduced pressure to yield ethanolic extracts (7.7%) and aqueous extracts (9.9%).

Animals: albino Wistar rats were purchased from M/s Venkateshawara Traders, Bangalore-560 010 and were maintained under standard animal house conditions in animal house of KLE University's College of Pharmacy, Bangalore. Experimental protocol was approved by Institutional animal ethics committee (IAEC) of KLE University's College of Pharmacy, Bangalore.

Acute toxicity study [14]: Acute toxicity studies for ethanolic and aqueous extracts were conducted as per OECD guidelines 425 to determine the safe dose using female albino Wistar rats weighing 150-200g. No sign and symptoms of toxicity were observed during the observations which was done continuously for the first 4h and then observed up to 24h for mortality. The extracts were safe up to a dose of 2000mg/kg b.w. The biological evaluation was carried out at doses of 200 and 400mg/kg b.w.

Preliminary phytochemical screening [15]:

The ethanolic and aqueous extracts of *Alternanthera sessilis* Linn. were subjected to preliminary phytochemical screening.

Anti-inflammatory activity: Anti-inflammatory activity was determined by Carrageenan induced rat paw edema model.

Carrageenan induced inflammation[16]:

Animals in the range of 150-200g were divided into VI groups of 6 animals each. Group I served as control, animals of Groups II to VI received Indomethacin at the dose of 10mg/kg b.w., aqueous and ethanolic extracts (200mg/kg b.w. and 400mg/kg b.w) of *Alternanthera sessilis* respectively.

After 1h of drug administration, 0.1ml carrageenan (1% suspension) was injected into the sub-plantar region of the right hind paw of each rat. The paw volumes were measured at 0, 1, 2, 3, 4, 5, 6h intervals with the help of plethysmometer. The percentage decrease in paw volume was determined using the formula:

(Control reading-Test reading)/Control reading×100.

Statistical analysis: The interpretation of the results was done after subjecting the data obtained from various studies to statistical analysis which included one way ANOVA followed by post test Tukey.

Results

Carrageenan induced paw edema:

The anti-inflammatory activity of ethanolic and aqueous extracts and Indomethacin started from 1st h and continued up to 6th h. The percentage inhibition of edema produced during 1st h by ethanolic and aqueous extracts was comparable to that of standard. Maximum inhibition of edema was produced at 3rd h. Maximum inhibition of edema was produced by ASE400 (64.29±7.14) followed by Indomethacin and ASA400 (57.14±4.24 and 57.14±8.24). At 4th h, the percentage inhibition of edema produced by ASE400 was comparable to that of Indomethacin. In the 5th h, Indomethacin produced maximum inhibition of edema (55.56±0) followed by ASE400 and ASA400 (44.44±8.12 and 44.44±8.12). (Table 1)

Table 1: Anti-inflammatory activity of aqueous and ethanolic extracts of *Alternanthera sessilis* on carrageenan induced paw edema in albino Wistar rats

Treatment	Dose (kg^{-1})	Percentage inhibition of edema at various time intervals					
		1h	2h	3h	4h	5h	6h
Indomethacin	**10**	60±0	54.55± 5.09	57.14± 4.24	54.55± 5.09	55.56± 0	37.5± 4.27
ASA	**200**	30±10	27.27±0	21.43± 7.14	27.27± 0	33.33± 6.83	12.5± 5.25
ASA	**400**	50±10	36.36± 9.09	57.14± 8.24	45.45± 10.5	44.44± 8.12	50±0
ASE	**200**	40± 11.55	36.36± 9.09	28.57± 6.24	36.36± 9.09	22.22± 7.24	12.5± 5.25
ASE	**400**	50±10	45.45± 10.5	64.29± 7.14	54.55± 9.09	44.44± 8.12	50±0

n=6, values are mean±SEM, where ASA and ASE indicates *Alternanthera sessilis* aqueous and ethanolic extracts respectively.

Discussion

Inflammation is the reaction of a tissue and its microcirculation to a pathogenic insult. By this mechanism the host localizes and eliminates metabolically altered cells, foreign particles, microorganisms or antigens.[17] Mediators of inflammation include histamine, bradykinin, prostaglandins, Leukotrienes, platelet activating factor, interleukin-1, Thromboxane A_2 and prostacyclin.[18]

Carrageenan induced paw edema is an *in-vivo* model of inflammation, it has been frequently used to assess the anti-inflammatory activity of steroidal and non-steroidal drugs involving inhibition of several chemical mediators such as histamine, serotonin, bradykinin and prostaglandins.[19] The results of the present study reveals the anti-inflammatory activity of *Alternanthera sessilis* on acute phase of inflammation induced by carrageenan.[20] The acute inflammatory responses induced by carrageenan administration involves three phases of chemical mediator release in an orderly sequence. For the first 1.5h an intial phase takes place with the release of histamine and serotonin and for the subsequent 1.5-2.5h a second phase is mediated by bradykinin. The third and final phase occurs between 2.5 and 6h and is presumably mediated by prostaglandins (PGs).[21] Besides, in the carrageenan-induced rat paw edema model, the production of prostanoids has been through the serum expression of COX-2 by a positive feedback mechanism. Therefore, it is suggested that the mechanism of action of *Alternanthera sessilis* may be related to the prostaglandin synthesis inhibition, as described for the anti-inflammatory mechanism of Indomethacin in the inhibition of the inflammatory process induced by carrageenan.[20]

Conclusion

Alternanthera sessilis produced good anti-inflammatory activity. It can be considered to be used in therapeutics for treating inflammation as it has shown promising anti-inflammatory activity.

Acknowledgement

The authors are thankful to Dr. B. G. Desai, Principal, KLE University's College of Pharmacy for providing facilities to carry out this work.

References

1. Kumar V, Abbas AK, Fausto N. Robbins and Cotran Pathologic basis of disease. 7th ed. New Delhi: Saunders, 2004:47-86.
2. Dheodhare SG. General pathology and pathology of systems, 6th ed. Mumbai: Popular Prakashan, 2002:337-340.
3. Gayathri BM, Balasuriya K, Panduka GS, et al. Toxicological studies of the water extract of green leafy vegetable Sessile joy weed (*Alternanthera sessilis*). Curr Sci 2006;91:1517-1520.
4. Sharma PC, Yelne MB, Dennis TJ. Database on medicinal plants used in Ayurveda. Vol. 4. New Delhi: Central Council for Research in Ayurveda and Siddha, 2002:396-403.
5. Kirtikar KR, Basu BD. Indian medicinal plants. Vol. 3. 2nd ed. Dehradun: Bishen singh mahendra pal singh, 1980:2069-2070.
6. Chadha YR. The wealth of India, A Dictionary of Indian Raw Materials and Industrial Products. Vol 1:A. New Delhi: NSCAIR,CSIR, 2003:206-207.
7. Singh A, Kandasamy T, Odhav B. *In vitro* propagation of *Alternanthera sessilis* (sessile joy weed), a famine food plant. Afr J Biotechnol 2009;8(21):5691-5695.
8. Nayak P, Nayak S, Kar DM, et al. Pharmacological evaluation of ethanolic extracts of the plant *Alternanthera sessilis* against temperature regulation. Journal of Pharmacy Research 2010;3(6):1381-1383.
9. Lin SC, Lin YH , Shyuu SJ, et al. Hepatoprotective effects of Taiwan folk medicine: *Alternanthera sessilis* on liver damage induced by various hepatotoxins. Phytother Res 1994;8(7):391-398.
10. Purkayastha J, Nath SC. Biological activities of ethnomedicinal claims of some plant species of Assam. Indian journal of traditional knowledge 2006;5(2):229-236.
11. Sahu BR, Chakrabarty A. Screening of antibacterial activity of various extractives of seeds of *Cassia tora* and *Alternanthera sessilis*. Asian J Chem 1994;6(3):687-689.

12. Arollado EC, Osi MO. Hematinic activity of *Alternanthera sessilis* (L.) R. BR. (AMARANTHACEAE) in mice and rats. E-International Scientific Research Journal 2010;2(2):110-117.
13. Roy A, Saraf S. Diuretic activity of *Alternanthera sessilis* R.Br. Ex D.C. an ethnomedicine of Chhattisgarh (India). Biosci. Biotechnol. Res. Asia. 2008;5(1):369-372.
14. OECD guidelines for the testing of chemicals (Acute oral toxicity- up and down procedure). Adopted 23rd march 2006. [cited 2008 jun 20]; Available from:URL:www.oecd.org.
15. Kokate CK, Purohit AP, Gokhale SB. Pharmacognosy. 24th ed. Pune: Nirali Prakashan, 2003:149-153.
16. Geetha M, Saluja AK, Shankar MB, et al. Analgesic and anti-inflammatory activity of *Couroupita guianensis* aubl. J Nat Rem 2004;4(1):52-55.
17. Rubin E, Gorstein F, Rubin R, et al. Pathology:Clinico pathologic Foundation of Medicine. 4th ed. Philadelphia: Lippincott Williams and Wilkins, 2009:40-52.
18. Vane J, Botting R. Inflammation and the mechanism of action of anti-inflammatory drugs. Faseb J 1987;1:89-96.
19. Arrigoni-Blank MF, Dmitrieva EG, Franzotti EM, et al. Anti-inflammatory and analgesic activity of *Peperomia pellucid* (L.) HBK (Piperaceae). J Ethnopharmacol 2004;91:215-218.
20. Lu TC, Ko YZ, Huang HW, et al. Analgesic and anti-inflammatory activities of aqueous extract from *Glycine tomentella* root in mice. J Ethnopharmacol 2007;113:142-148.
21. Zhang G, Huang X, Wang H, et al. Anti-inflammatory and analgesic effects of the ethanolic extract of *Rosa multiflora* Thunb. Hips. J Ethnopharmacol 2008;118:290-294.