

ACUTE ANTI-INFLAMMATORY EVALUATION OF *NYCTANTHES ARBORTRISTIS* LEAF EXTRACTS IN RATS

Rajarshi Roy¹, Nirankush Paul¹, Sanjib Bhattacharya^{2*}, J. N. Pandey¹, Moulisha Biswas¹

¹Bengal Institute of Pharmaceutical Sciences, Kalyani, Nadia 741235, West Bengal, India

²Bengal School of Technology (A College of Pharmacy), Delhi Road, Sugandha, Hooghly
712102, West Bengal, India

*For correspondence: E-mail: sakkwai@yahoo.com

Summary

Nyctanthes arbortristis L. (Oleaceae), commonly known as *Sefali* or *Siuli* in Bengali, is a shrub or small tree native to India and grown throughout the Indian subcontinent. The present study assessed the petroleum ether, chloroform and methanol extracts of *N. arbortristis* leaf for their acute anti-inflammatory potential by carrageenan induced paw oedema in Wistar albino rats. All of the test extracts exhibited significant anti-inflammatory activity. The methanol extract was found to be the most potent followed by the chloroform and petroleum ether extracts. The present preliminary study demonstrated marked acute anti-inflammatory activity of *N. arbortristis* leaf in Wistar rats.

Key words: *Nyctanthes arbortristis*, anti-inflammatory, oedema, leaf.

Introduction

Nyctanthes arbortristis L. (Oleaceae), commonly known as *Sefali* or *Siuli* in Bengali, is indigenous to India and grown throughout the Indian subcontinent. It is an erect shrub or small tree bearing white flowers of pleasant fragrance. Its flowers are used for worship in Hindu temples and made into garlands. Different parts of this plant have been traditionally used by rural and tribal people of India from the prehistoric time not only for curing various ailments but for other purposes also as evident from the literature survey. The plant is used as an antiphlogestic agent, anodynes and as remedy of hiccups and several other disease conditions.

Previous authors have reported several pharmacological properties of this plant (1, 2). However, the comparative anti-inflammatory assessment of petroleum ether, chloroform and methanol extracts from *N. arbortristis* leaf is still not reported. Therefore, in the present investigation we attempted these studies on the leaf extracts of *N. arbortristis* grown in India.

Materials and methods

Plant material: The mature leaves of *Nyctanthes arbortristis* L. (Oleaceae), were collected during October 2011 from North 24 Pargana district of West Bengal, India. The plant material was taxonomically identified at the Central National Herbarium, Botanical Survey of India, Howrah, West Bengal, India. The voucher specimen [CNH/93/2011/Tech II/589] was maintained in our research laboratory for future reference. The plant material was shade-dried with occasional shifting and then powdered with mechanical grinder, passing through sieve no. 40, and stored in an air-tight container.

Preparation of plant extracts: The dried powdered plant material was defatted with petroleum ether (60-80°C), the percentage extractive value was 1.81 % w/w. The defatted powdered material thus obtained was further extracted successively with chloroform and methanol for 72 h. The solvent was distilled off in reduced pressure and resulting semisolid mass was vacuum dried to yield the dry extracts and the percentage extractive values were accordingly 6.20 % w/w and 13.92 % w/w respectively. The preliminary phytochemical analysis was performed for all three extracts to identify the phytoconstituents present in the extracts (3).

Drugs and chemicals: λ -Carrageenan (type IV) was obtained from S. D. Fine Chemicals Ltd., Bombay; indomethacin was from Recon, Bangalore, India. All other chemicals and reagents were of analytical grade obtained commercially.

Experimental animals: Studies were carried out using adult male Wistar albino rats of weighing 150-180 g. The animals were grouped in polyacrylic cages (38 cm \times 23 cm \times 10 cm) with not more than four animals per cage and maintained under standard laboratory conditions (temperature 25 ± 2 °C, dark and light cycle 14/10 h). They were allowed free access to standard dry pellet diet (Hindustan Lever, Kolkata, India) and water *ad libitum*. The rats were acclimatized to laboratory condition for 10 days before commencement of experiment. All experimental methods were reviewed and approved by the Institutional Animal Ethical Committee.

Evaluation of anti-inflammatory activity

Carrageenan-induced rat paw oedema: The rats were divided into five groups ($n = 6$). The first group (which served as control) received normal saline (3 ml/kg body wt., p.o.). The second, third and fourth groups received the petroleum ether, chloroform and methanol extracts (200 mg/kg body wt., p.o., each) respectively. The fourth group (which served as reference) received indomethacin (10 mg/kg body wt., p.o.). After 30 minutes, acute inflammation was produced by the sub-plantar administration of 0.1 ml of 1 % (w/v) of freshly prepared suspension of carrageenan in the right hind paw of each rat. The paw volume was measured at 0 hour and at each hour up to 4 hours after carrageenan injection by using plethysmometer (Ugo Basile, Italy).

The difference between the two readings was taken as the volume of oedema and the percentage of inhibition was calculated by using the following formula (4, 5).

$$(\text{Control mean} - \text{Treated mean} / \text{Control mean}) \times 100 \%$$

Statistical analysis: The values were expressed as mean \pm standard error of mean (SEM). Statistical significance was analyzed by Student's *t* test. Values of $p < 0.001$ were considered as statistically significant.

Results and discussion

Preliminary phytochemical studies on *N. arbortristis* leaf extracts showed the presence of triterpenoids and steroids in the petroleum ether extract; triterpenoids in the chloroform extract; and steroids, glycosides and carbohydrates in the methanol extract.

Anti-inflammatory activity of *N. arbortristis* leaf extract was evaluated against carrageenan induced acute paw oedema in Wistar albino rats and the results are summarized in Table 1. The methanol extract was found to be the most potent followed by the chloroform extract and petroleum ether extract after 4 hours of treatment, whereas the reference drug indomethacin was found to be the most potent when compared with the saline control group.

The present study establishes the significant anti-inflammatory activity of *N. arbortristis* leaf against the experimentally induced acute inflammation in rodents. Carrageenan-induced paw oedema has been commonly used as an experimental animal model for acute inflammation and it is believed to be a biphasic response. The early phase (1 - 2 h) of the carrageenan model is mainly mediated by histamine and serotonin (5-HT). The late phase (2 - 4 h) is mediated by bradykinin, leukotrienes, polymorphonuclear cells and prostaglandins produced by tissue macrophages (6, 7). All the test extracts produced significant ($p < 0.001$) inhibition of carrageenan-induced rat paw oedema after a period of 4 h.

Based on the results obtained from the present preliminary investigation, it can be inferred that all the test extracts from *N. arbortristis* leaf possessed remarkable acute anti-inflammatory property in the Wistar albino rats. The present preliminary study confirms marked anti-inflammatory activity of *N. arbortristis* leaf which may be due to presence of multitude of constituents as revealed by its phytochemical profile.

Acknowledgement

The authors are thankful to the authority of Bengal Institute of Pharmaceutical Sciences Kalyani, Nadia 741235, West Bengal, India for necessary facilities for the present study.

Table 1. Effect of *N. arbortristis* leaf extracts on carrageenan induced rat paw oedema.

Treatments	1 h	2 h	3 h	4 h	% Inhibition
Normal control	0.73±0.08	1.40±0.57	1.80±0.57	1.66±0.08	-
Indomethacin (10 mg/kg)	0.20±0.05*	0.50±0.05*	0.36±0.03*	0.23±0.03*	86.14
Pet ether extract (200 mg/kg)	0.36±0.07*	0.61±0.05*	0.45±0.06*	0.37±0.04*	77.71
CHCl ₃ extract (200 mg/kg)	0.31±0.06*	0.54±0.06*	0.42±0.03*	0.32±0.07*	80.72
MeOH extract (200 mg/kg)	0.26±0.05*	0.47±0.04*	0.33±0.03*	0.26±0.03*	84.33

Values are mean ± SEM (n = 6). **p* < 0.001 when compared to normal control.

References

1. Sasmal D, Das S, Basu SP. Phytoconstituents and therapeutic potential of *Nyctanthes arbortristis* Linn. *Pharmacognosy Reviews* 2007; 1 (2): 344-349.
2. Jain R, Mittal M. A review on pharmacological and chemical documentation of *Nyctanthes arbor-tristis* Linn. (Harsingar). *Asian Journal of Traditional Medicines* 2011; 6 (5): 188-202.
3. Kokate CK (1994): Practical Pharmacognosy. 4th Edition. New Delhi. Vallabh Prakashan. pp. 107-112.
4. Winter CA, Risley EA, Nuss, GW. Carrageenan-induced oedema in hind paws of the rats as assay for antiinflammatory drugs. *Experimental Biology and Medicine* 1962; 111: 544-547.
5. Bhattacharya S, Haldar PK, Zaman MK. Anti-inflammatory and *in vitro* antioxidant property of *Zanthoxylum nitidum* root. *Current Trends in Biotechnology and Pharmacy* 2010; 4: 774-783.
6. Brito ARMS, Antonio MA. Oral anti-inflammatory and antiulcerogenic activities of a hydroalcoholic extract and partitioned fractions of *Turnera ulmifolia* (Turneraceae). *Journal of Ethnopharmacology* 1998; 61: 215-228.
7. Biswas M., Biswas K., Ghosh A.K., Haldar P.K. A Pentacyclic triterpenoid possessing analgesic and anti-inflammatory activities from the fruits of *Dregea volubilis*. *Oriental Pharmacy and Experimental Medicine* 2009; 9: 315-319.