

Analgesic activity of *Polyalthia longifolia* leaf extracts in mice

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ABSTRACT

Polyalthia longifolia (Sonn.) Thwaites (Annonaceae), commonly known as Debdaru in Bengali, is an evergreen tall tree indigenous to India and planted as ornamental tree. The present study assessed the three different solvent extracts of *P. longifolia* leaf for their analgesic potential by acetic acid induced writhing experiment in Swiss albino mice. All the test extracts exhibited significant analgesic activity. The methanol extract was found to be the most potent followed by the ethyl acetate and benzene extracts respectively. The present preliminary study demonstrated marked analgesic activity of *P. longifolia* leaf in Swiss mice.

Keywords: Analgesic, *Polyalthia longifolia*, writhing, leaf.

INTRODUCTION

Traditional medicine worldwide is being re-evaluated by extensive experimental research on different plant species and their therapeutically active principles. The major merits of traditional or herbal medicine seem to be their perceived efficacy, low incidence of serious adverse effects and comparatively low cost.

Polyalthia longifolia (Sonn.) Thwaites (Annonaceae), commonly known as *Deodar* in Hindi and *Debdaru* in Bengali, is a tall, evergreen, ornamental tree indigenous to India and found throughout the countries of the Indian subcontinent. It is planted throughout India as an ornamental tree. Traditionally the plant has been used in India for several medicinal purposes. Various parts of *P. longifolia* are used in treatment of fever, skin diseases, mouth ulcers, hypertension, helminthiasis, gonorrhea, uterine ailments, leucorrhoea and menorrhagia. [1-4] Several phytochemical and pharmacological investigations are reported on this plant mainly on its stem bark and seeds. However, literature survey revealed that reports on the experimental studies on its leaf are

comparatively less. In the present study, therefore, we have aimed to evaluate analgesic activity of three solvent extracts from *P. longifolia* leaf in Swiss albino mice.

MATERIALS AND METHODS

Plant material: The mature leaves of *Polyalthia longifolia* (Sonn.) Thwaites (Annonaceae), were collected during November 2013 from Nadia, West Bengal, India. The plant material was taxonomically authenticated at the Central National Herbarium, Botanical Survey of India, Howrah, West Bengal, India. The voucher specimen [CNH/I-I/(85)/2010/Tech.II/353] had already been maintained in our research laboratory for reference. Just after collection, the plant material (leaf) 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 material was separately (350 g in each case) extracted with benzene, ethyl acetate and methanol for 72 h in a cone-shaped percolator. The solvent was distilled off in reduced pressure and resulting semisolid mass was vacuum dried using rotary flash evaporator to yield a solid residue and the percentage extractive values were accordingly 5.97, 9.70 and 14.18% w/w respectively. The preliminary phytochemical analysis

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was performed for all three extracts to identify the phytoconstituents present in the extracts. [5]

Chemicals: Acetyl salicylic acid (aspirin) and glacial acetic acid from Sigma-Aldrich Chemical Corp. (St. Louis, MO, USA). All other chemicals and reagents were of analytical grade obtained commercially.

Experimental animals: Adult male albino mice of Swiss strain weighing 20 ± 2 g were procured from registered breeders (Rita Ghosh & Co., Kolkata, India) and maintained under standard laboratory conditions (temperature $25 \pm 2^\circ\text{C}$ with 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 mice were acclimatized to laboratory condition for 10 days before commencement of the experiment. All experimental procedures were reviewed and approved by the Institutional Animal Ethics Committee.

Analgesic evaluation: acetic acid-induced writhing test: Swiss albino mice were divided into five groups ($n = 6$). Group I received acetic acid (1% v/v, 10 ml/kg b.w., i.p.) and writhing reflex was noted for the period of 15 minutes. Group II received aspirin (100 mg/kg b.w., p.o.) Groups III, IV and V received the benzene, ethyl acetate and methanol extracts at the doses of 120 mg/kg b.w., p.o. respectively. Thirty minutes after aspirin and extracts administration, group II to V received acetic acid (1% v/v, 10 ml/kg b.w., i.p.) and writhing reflex was noted for the period of 15 min. [6, 7] The mean writhing scores in each group were calculated and expressed the percentage of protection using the following formula:-

$$\left(\frac{\text{Control mean} - \text{Treated mean}}{\text{Control mean}} \right) \times 100 \%$$

Statistical analysis: The data are represented as mean \pm standard error of mean (SEM). Degree of significance was assessed by Student's 't' test.

RESULTS AND DISCUSSION

Preliminary phytochemical studies on three test extracts showed the presence of triterpenoids, steroids and saponins in the benzene extract;

triterpenoids, steroids and carbohydrates in the ethyl acetate extract; and triterpenoids, steroids, phenolic compounds, condensed tannins, carbohydrates and saponins in the methanol extract.

The analgesic efficacy of *P. longifolia* leaf extracts was evaluated by acetic acid induced writhing method in mice to assess peripheral (non-narcotic) type of analgesic activity. Acetic acid induced writhing is chemically induced nociception by intraperitoneal injection of dilute acetic acid solution to mice. The chemical agents can produce nociceptive reactions in mice. Intra-peritoneal injection of phenyl para quinone, bradykinin or dilute acetic acid (1-3% v/v) produces pain reaction that is characterized as writhing response. Constriction of abdomen, turning of trunk (twist) and extension of hind limbs (at least one) are considered as writhing reaction to chemically induced pain. [8, 9]

Acetic acid induced writhing test is known as a visceral pain model nociception. Several mediators like kinins, acetylcholine, substance P, calcitonin-gene-related peptide and prostaglandins (PG) take part in visceral pain model nociception and transmission of the nociception from the viscera. In this test both central and peripheral analgesics are detected. Analgesics of narcotic (central) e. g. morphine, pentazocin, pethidine etc and non-narcotic (peripheral) type, e. g. aspirin, ibuprofen, indomethacin etc can inhibit the writhing response in mice. [10-11]

Based on the results obtained from the present study, it can be inferred that all the test extracts had effective peripheral analgesic actions. The methanol extract was found to be the most potent followed by the ethyl acetate and benzene extracts respectively (Table 1). Therefore, the present preliminary study confirms marked analgesic activity of *P. longifolia* leaf.

Table 1: Analgesic effect of *P. longifolia* leaf extracts on acetic acid induced writhing in mice.

| Treatments | Dose | Number of writhes | % Protection |
|-------------------------------------|-----------|-------------------|--------------|
| Acetic acid (1% v/v) | 10 ml/kg | 52.83 ±1.400 | -- |
| Acetic acid + Aspirin | 100 mg/kg | 17.26 ±1.606* | 67.32 |
| Acetic acid + Benzene extract | 120 mg/kg | 21.31 ±1.661* | 59.66 |
| Acetic acid + Ethyl acetate extract | 120 mg/kg | 19.85±1.872* | 62.43 |
| Acetic acid + Methanol extract | 120 mg/kg | 18.16±1.291* | 65.63 |

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

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