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Anti-nociceptive activity of *Mundulea sericea* leaves

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Abstract

Objective: To study the analgesic activity of leaves of *Mundulea sericea*. Methods: Methanolic extract (30 mg/kg and 70 mg/kg) of *Mundulea sericea* (Leguminosae, subfamily Papilionaceae) was investigated for analgesic activity using acetic acid-induced writhing and tail immersion method. The extract was studied for its effect on pentobarbitone-induced sleep and on gross behavior. Results: Methanolic extract (30 mg/kg and 70 mg/kg) significantly increased latency to flick tail in tail immersion test and reduced the number of writhings induced by acetic acid. The extract increased the duration of pentobarbitone-induced sleep. No adverse effects were observed upto a dose of 200 mg/kg of the extract. Conclusion: Leaves of *Mundulea sericea* possess central as well as peripheral analgesic activity.

Key words: *Mundulea sericea,* analgesic, tail immersion, writhing.

1. Introduction

Mundulea sericea (Leguminosae, subfamily Papilionaceae) is a stout erect shrub, 3.0-4.5m high, it is found in dry forests and rocky hills of West and South India. It possesses insecticidal and piscicidal properties [1]. Its bark contains a toxic glycoside, a non-alkaloidal thermostable principle with a marked central nervous system depressant action. Ethanolic extract of fruits and leaves of *M. sericea* are active against gram positive bacteria and *M. tuberculosis* [2]. The seeds are used in southern and western India as fish poison [3]. Literature survey indicated scanty reports on the pharmacological studies of *M. sericea*. During our preliminary pharmacological screening of methanolic extract of *M. sericea,* an analgesic activity was observed. This prompted us to investigate the analgesic activity of *M. sericea.*

2. Materials and methods

2.1 Preparation of extract

Shade dried leaves of *M. sericea* were collected from Sinnar taluka of Nashik and authenticated. 500 g of dried leaves were powdered and defatted with petroleum ether (60-80°C) using Soxhlet's apparatus. The marc was then subjected to extraction using methanol. The solvent was concentrated under reduced pressure, evaporated to dryness. This gave a yield of 1.3% w/w.

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Prelimnary phytochemical screening were carried out using standard procedures. [4]

2.2 Animals

Swiss albino mice (20-25 g) were obtained from National Toxicology Centre, Pune. Animals were housed into groups of five at an ambient temp of 25±1°C. Animals had free access to food (Hindustan Lever, India) and water. Animals were deprived of food but not water 4 h before the experiment. The Institutional Animal Ethical Committee approved the protocol of this study.

2.3 Drugs and Chemicals

Pentobarbitone (40 mg/kg, i.p), Pentazocine (17.5 mg/kg,i.p), Acetyl salicylic acid(ASA) (100mg/kg, p.o) were used in the study. The drugs were dissolved in the water for injection before administration. The methanol extract of *M. sericea* was suspended in PEG-400 (just sufficient to dissolve) and administered intraperitoneally.

2.4 Tail immersion method

Mice of either sex were used. They were divided into 5 groups (n=6) and treated either with vehicle, methanolic extract of *M.sericea* (10,30,70 mg/kg) and Pentazocine (17.5 mg/kg). The tip of the mouse's tail was immersed in hot water maintained at 55 ± 0.5°C. The time taken by the mouse to withdraw the tail from hot water was noted as reaction time. The animals that showed responses upto 30 seconds were included in the study and the experiment was terminated at 30 sec to avoid damage to the tail [5].

2.4.1 Acetic acid induced writhing method

Mice were divided into 5 groups (n=6). Group 1 received vehicle, groups 2, 3 and 4 received extract (10, 30 and 70 mg/kg) respectively while group 5 received ASA (100mg/kg,p.o). This method involved injection of freshly prepared solution of 0.7% acetic acid (10 ml/kg, i.p).The number of writhing in the following 20 min were noted [6]. Percentage protection against writhing was taken as index of analgesia, and it was calculated as:

$$\frac{\text{No of writhing in control animals - No of writhing in treated animals X 100}}{\text{No of writhing in control animals.}}$$

2.4.2 Pentobarbitone potentiation

Female mice were divided into 3 groups (n=6). The animals received the extract (30 mg/kg and 70 mg/kg) or vehicle 30 min prior to pentobarbitone (40 mg/kg i.p.). The onset and duration of sleep were measured. Sleeping time was measured as the interval between the loss and recovery of righting reflex [7].

2.5 Effect on gross behaviour

Mice of either sex were divided into 4 groups (n=6). They were administered the extract at a dose of 50, 100, and 200 mg /kg and observed for gross behavioral changes. Animals were observed for activity, grooming, convulsions, sedation, and hypothermia for 4 h after administration of extract.

2.6 Statistical analysis

All values are shown as mean ± SEM. The results were statistically analyzed using one way analysis of variance followed by Dunnett's test. $P < 0.05$ was considered significant.

3. Result and discussion

The preliminary phytochemical screening of methanolic extract of *Mundulea Sericea* showed the presence of saponins and triterpenes. In the tail immersion method, the methanolic extract (30 and 70 mg/kg) showed a significant increase in the latency to tail flick at 15, 30, 60 and 90 min (Table 1).The extract also caused a significant inhibition of acetic acid - induced writhing in mice by 26.45%, 56.45% and 72.06% at doses of 10, 30 and 70

Table 1
Effect of methanolic extract of M. sericea on latency to flick tail in mice.

Treatment	Reaction time (sec)					
	0 min	15 min	30 min	60 min	90 min	120 min
Vehicle	2.0 ± 0.25	2.16 ± 0.30	2.33 ± 0.21	2.0 ± 0.25	2.0 ± 0.0	2.16 ± 0.30
M. sericea (10 mg/kg)	2.0 ± 0.36	3.66 ± 0.21	2.33 ± 0.33	2.16 ± 0.30	2 ± 0.25	2 ± 0.25
M. sericea (30 mg/kg)	2.66 ± 0.21	12 ± 0.68*	8.83 ± 0.41*	6.66 ± 0.33*	4.5 ± 0.34*	3.33 ± 0.21*
M. sericea (70 mg/kg)	2.66± 0.21	20.33 ± 0.84*	10.83 ± 0.6*	6.66 ± 0.66*	3.66 ± 0.33*	2.16 ± 0.16
Pentazocine (17.5mg/kg)	2.33 ± 0.21	5 ± 0.365*	7.83 ± 0.47*	8.5 ± 0.43*	6.16 ± 0.30*	3.83 ± 0.30*
F	1.67	190.64	71.28	45.88	39.13	15.33

n = 6, *P < 0.05 (ANOVA followed by Dunnett's test) compared with vehicle

mg/kg respectively when compared to control. ASA caused a 83.35% inhibition in the study (Table 2).

The extract also potentiated the duration of pentobarbitone-induced sleep (Table 3). In the study of the extract on gross behaviour the extract was found to be safe and no adverse effects were observed at a dose as high as 200 mg/kg but the animals were observed to be sedated.

Table 2.
Effect of methanolic extract of *M. sericea* on acetic acid - induced writhing in mice.

Treatment	Number of writhings	% inhibition
Vehicle	31.00 ± 1.06	--
M. sericea (10 mg/kg)	22.83 ± 0.94*	26.45
M. sericea (30 mg/kg)	13.50 ± 0.99*	56.45
M. sericea (70 mg/kg)	8.66 ± 0.71*	72.06
ASA (100mg/kg)	5.16 ± 0.70*	83.35
F	140.77	

n = 6, *P < 0.05 (ANOVA followed by Dunnet's test) compared with vehicle

In the present study, the methanolic extract of *Mundulea sericea* leaves has shown analgesic activity. The extract increases the latency to tail flick in tail immersion method. It also inhibits acetic acid-induced writhing in a dose dependent manner. Acetic acid induced writhing is a sensitive method of screening anti-nociceptive effects of compounds. It causes an increase in concentration of PGE_2 and $PGF_2\alpha$ in the peritoneal fluid (8, 9).

The extract may therefore act via inhibition of prostaglandin synthesis. In addition to the above effects the methanolic extract of *Mundulea sericea* leaves has potentiated pentobarbitone-induced sleep. Thus it can be concluded that leaves of *Mundulea sericea* contains bioactive component(s) possessing anti-nociceptive properties that possess central as well as peripheral analgesic activities.

This could be due to the effect of one or more combination of bioactive components in the plant. Further studies shall aim at isolating, characterizing and purifying compounds in this plant with potential bioactive properties.

Table 3.
Effect of methanolic extract of *M. sericea* on pentobarbitone - induced sleep in mice.

Treatment	Duration of sleep (min)
Vehicle	66.67 ± 8.47
M. sericea (30 mg /kg)	97.5 ± 8.36
M. sericea (70 mg /kg)	141 ± 12.33*
F	14.25

n = 6, *P< 0.05 (ANOVA followed by Dunnett's test) compared with vehicle.

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