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Research Article

ANALGESIC POTENTIAL OF THE ROOTS OF *MEMECYLON UMBELLATUM* (Burm)

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ABSTRACT

The ethanol extract of *Memecylon umbellatum* roots (EMUR) was investigated for analgesic activity for its central and peripheral analgesic activity in tail-flick, hot plate and acetic acid induced writhing models respectively. The EMUR at a dose of 100, 200, 400 mg/kg body weight showed significant and dose dependent analgesic activity in all animal models. The plant extract (EMUR) showed more prominent peripheral effect than the Central effect. The analgesic activity may be attributed to the presence of flavonoides and other phenolic compounds. The findings further suggest that the plant is good candidate for further investigation in other models of inflammations.

KEYWORDS: *Memecylon umbellatum*, tail-flick, hot plate, writhing model.

INTRODUCTION

Memecylon umbellatum (Melastomataceae) is a shrub or a small tree. It is commonly known as 'Anjani' / 'Iron wood tree', found distributed in the coastal region of Deccan Peninsula, eastern part of India and Andaman islands[1-2]. Traditionally plant is used in the treatment of skin disorders; stomach disorders and snake bite[3]. The phytoconstitutents of the aerial parts include β-amyrin, sitosterol, oleanolic acid, ursolic acid and umbelactone[4]. Various pharmacological activities like antidiabetic[5] antiviral[6] and wound healing activity[7] have been reported. The present study was undertaken to screen the analgesic activity of the roots of *Memecylon umbellatum.*

MATERIALS AND METHODS

Plant material

M. umbellatum roots were collected from Mangalore, Karnataka, India during August -2006. The plant was authenticated by Prof. Gopal Krishna Bhatt, Department of Botany, Poornaprajna College, Udupi, Karnataka, India. A voucher specimen (No. 102 a) was deposited in NGSM Institute of Pharmaceutical Sciences, Paneer, Deralakatte, Mangalore, India.

Preparation of the ethanol extract

The roots were collected and dried under the shade. The dried roots were powdered (7 kg) and soaked in ethanol (95%) and kept aside for four days. After four days the ethanol layer was decanted off. The process was repeated for four times. The solvent from total extract was distilled off and concentrate was evaporated on a water bath to syrupy consistency, evaporated to dryness (900 g) and stored in desiccators for further use.

Animals

Male Albino wistar rats weighing between 150-200g and mice weighing between 20-30g were obtained from KSHEMA, Deralakatte, Mangalore, Karnataka, India, and maintained under standard conditions. Animals were housed in standard cages with controlled temperature (23 ± 3.0° C) and a 12 h

light /dark cycle with free access to food (Hindustan Lever Co. Bombay, India) and water *ad libitum*. The Principles of Laboratory Animals Care (NIH publication no. 85-23) guidelines and procedures were used in this study[8]. The study was permitted by the Institutional Animal Ethical committee with (Reg. no. KSHEMA/ACE/050/2007) and all efforts were made to minimize animal sufferings and to reduce the number of animals.

Acute toxicity study was performed for ethanol extract according to the acute toxic classic method (as per OECD guidelines). For the assessment of analgesic activity, multiple dose levels of 100, 200, 400 mg/kg body weight were taken.

Analgesic Screening Models

Tail-flick method

Tail-flick model was used for the assessment of analgesic activity, as per the method described by D' Amour and Smith[9] using analgesiometer. Each animal was placed in a restrainer, before treatment to find out the basal reaction time by keeping distal one-third portion of the animal tail. Animals were selected based on basal reaction time and divided into five groups of 6 animals each group.

Group I Animals received 0.6 % w/v sodium CMC orally and served as control group.

Group II Animals received standard drug Pentazocin (5 mg/kg body weight, s.c.).

Group III, IV and V Animals received 100, 200, 400 mg/kg body weight of EMUR respectively.

The reaction time was recorded once in every 30 minutes for 2 hrs for all five animal groups and the average values of reaction time found out after each time interval were tabulated and compared with the pretest value by analysis of significance.

Hot plate method

The study was performed using Eddy's hot plate model. Animals were individually placed on a hot plate maintained at a constant temperature (55°C) and the reaction of animals, such as paw licking or jumping and withdrawal of the paws response was taken as end point. The method originally described by Eddy and Leimbach (1953) has been modified by several investigators. In this method male albino mice weighing between 25-30 g body weights were selected for the study. The animals were selected and divided into five groups of 6 animals in each group[10].

Group I Animals received 0.6 % w/v sodium CMC orally and serve as control group.

Group II Animals were administered with standard drug pentazocin (5 mg/kg body weight, s.c.).

Group III, IV and V Animals received 100, 200, 400 mg/kg body weight of EMUR respectively.

The reaction time was recorded before and at 30, 60, 120, 180 min. after the test drug administration.

Acetic acid induced writhing method

Pain is produced by injection of acetic acid into peritoneal cavity of mice. The animals react with characteristic movements such as extension of hind limb, abdominal constriction and trunk twisting movement, which is called writhing. The test was carried out using the technique of Koster et al[11]. In this method male albino mice weighing between 25-30 g body weights were selected for the study. The animals were divided into 5 groups of 6 animals in each group.

Group I: Animals received 0.6 % w/v sodium CMC orally and serve as control group.

Group II: Animals were administered with standard drug Aspirin (150 mg/kg body weight p.o.)

Group III, IV and V: Animals received 100, 200, 400 mg/kg body weight of EMUR respectively.

After 30 min of drug administration 1ml/100g body weight of 0.6% v/v acetic acid solution was injected intraparetonially to all the groups of animals to induce writhing. The number of writhing occurring between 0 and 30 min after the acetic acid injection was recorded and the percentage inhibition was calculated by using the formula. The response of extract treated group was compared with the control. Aspirin (150 mg/kg body weight p.o.) was used as standard drug.

$$\text{Percentage inhibition} = \left(1 - \frac{R_t}{R_c}\right) \times 100$$

R_t = mean reaction time in treated group; R_c = mean reaction time in control group.

Statistical analysis

The data were expressed as Mean ± SEM and analyzed by using one way analysis of variance (ANOVA), followed by post hoc Sheffe's test using SPSS computer software version 10. The values were considered significant when $p < 0.05$.

RESULTS AND DISCUSSION

The present study was carried out to evaluate the analgesic activity of EMUR in different models of pain. The analgesic activity of EMUR was investigated for its central and peripheral analgesic activity in tail-flick, hot plate and acetic acid induced writhing models respectively. The EMUR showed significant and dose dependent analgesic activity in all animal models.

Tail-Flick Method: Animals treated with 100, 200, 400mg/kg body weight EMUR showed significant increase in the tail flick latency compared to control. The tail flick latency at a dose of 400mg/kg body weight EMUR (maximum dose) was found to be 7.35sec after 90 min of drug treatment whereas the standard drug pentazocin showed the tail flick latency 8.25 sec **(Table-1) (Figure-1).** The activity was also found to be dose dependent.

Hot plate method: Animals treated with 100, 200, 400mg/kg body weight EMUR showed significant and dose dependent analgesic activity in thermal stimulated pain (hot plate test) in mice. The reaction time at a dose of 400mg/kg body weight EMUR (maximum dose) was found to be 8.13 sec after 90 min of drug treatment whereas the standard drug Pentazocin showed the tail flick latency 9.91 sec. **(Table-2) (Figure-2).**

Acetic Acid Induced Writhing Method: Pretreatment of mice with EMUR at a dose of 100, 200, 400 mg/kg body weight exhibited a significant and dose dependent reduction in writhing induced by acetic acid. The EMUR at a dose of 400mg/kg body weight (maximum dose) showed 55.36 percentage inhibition whereas the standard drug Aspirin (150 mg/kg, p.o.) showed 71.74 percentage inhibition in acetic acid writhing. However it exhibited a dose dependent analgesic activity in writhing model **(Table3) (Figure-3).** The writhing assay is a useful and reliable test for the rapid evaluation of peripheral type of analgesic action. Acetic acid induced pain is due to the liberation of various substances like serotonin, histamine, PGs, bradykinin and substance and the involvement of local peritoneal receptors, which are also postulated to be partly involved in the abdominal constriction (writhing).The result showed that the EMUR significantly inhibited the acetic acid induced writhings and the abdominal constriction is related to the sensitization of nociceptive receptors to prostaglandins. Therefore the analgesic effect of EMUR may be due to the inhibition of synthesis or action of prostaglandins. The result also showed that the plant is good candidate for further investigation in other models of inflammations. A number of flavonoides have been reported to produce analgesic activity. Hence the analgesic activity may be attributed to the presence of flavonoides and other phenolic compounds.

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Table 1: Effect of EMUR on Tail-flick latency in rats

Treatment	Dose mg/kg	Tail-flick latency in sec (mean ± SEM) at time (min)				
		0 min	30 min	60 min	90 min	120 min
Control	---	2.31 ± 0.15	2.43 ± 0.16	2.41 ± 0.23	2.32 ± 0.13	2.44 ± 0.13
Pentazocin	5	2.52 ± 0.22	4.96 ± 0.22**	7.54 ± 0.53**	8.25 ± 0.21**	7.23 ± 0.71**
Ethanol extract	100	2.56 ± 0.19	2.88 ± 0.23	3.78 ± 0.33*	4.99 ± 0.27**	3.12 ± 0.08
Ethanol extract	200	2.32 ± 0.17	3.70 ± 0.29**	4.30 ± 0.41**	6.11± 0.21**	4.21 ± 0.28**
Ethanol extract	400	2.51 ± 0.16	3.85 ± 0.21**	5.73 ± 0.19**	7.35 ± 0.31**	5.32 ± 0.26**

All the values are expressed as mean ± SEM (n=6)
** P<0.01, * P< 0.05 significant compared to control

Table 2: Effect of EMUR on thermal stimulated pain (Hot plate test) in mice

Treatment	Dose mg/kg	Reaction time in sec (mean ± SEM) at time (min)				
		0 min	30 min	60 min	90 min	120 min
Control	---	3.32 ± 0.15	3.43 ± 0.16	3.41 ± 0.23	3.32 ± 0.13	3.44 ± 0.13
Pentazocin	5	3.52 ± 0.22	5.92 ± 0.22**	8.64 ± 0.53**	9.91 ± 0.21**	9.13 ± 0.71**
Ethanol extract	100	3.56 ± 0.19	3.77 ± 0.23	4.13 ± 0.33*	4.88 ± 0.27**	4.13 ± 0.08
Ethanol extract	200	3.32 ± 0.17	3.98 ± 0.29**	4.89 ± 0.41**	6.71± 0.21**	6.33 ± 0.28**
Ethanol extract	400	3.51 ± 0.16	4.65 ± 0.21**	6.78 ± 0.19**	8.13 ± 0.31**	7.14 ± 0.26**

All the values are expressed as mean ± SEM (n=6)
** P<0.01, * P< 0.05 significant compared to control

Table 3: Effect of EMUR on Acetic acid induced writhing in mice

Treatment	Dose mg/kg, p.o.	Number of writhing mean ±SEM	% Inhibition
Control	---	85.50 ± 0.95	--
Aspirin	150	24.16 ± 1.47**	71.74
Ethanol extract	100	71.16 ± 0.87**	16.77
Ethanol extract	200	50.66 ± 1.30**	40.74
Ethanol extract	400	38.16 ± 1.04**	55.36

All the values are expressed as mean ± SEM (n=6);
** P<0.01, significant compared to control

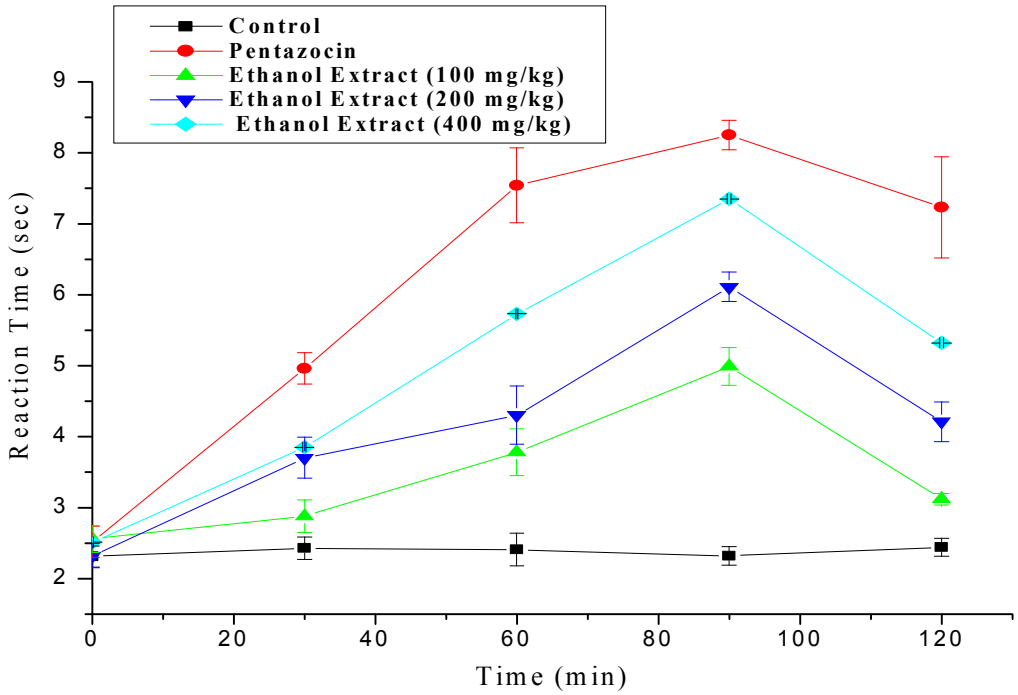

Figure 1: Effect of EMUR on tail-flick latency in rats

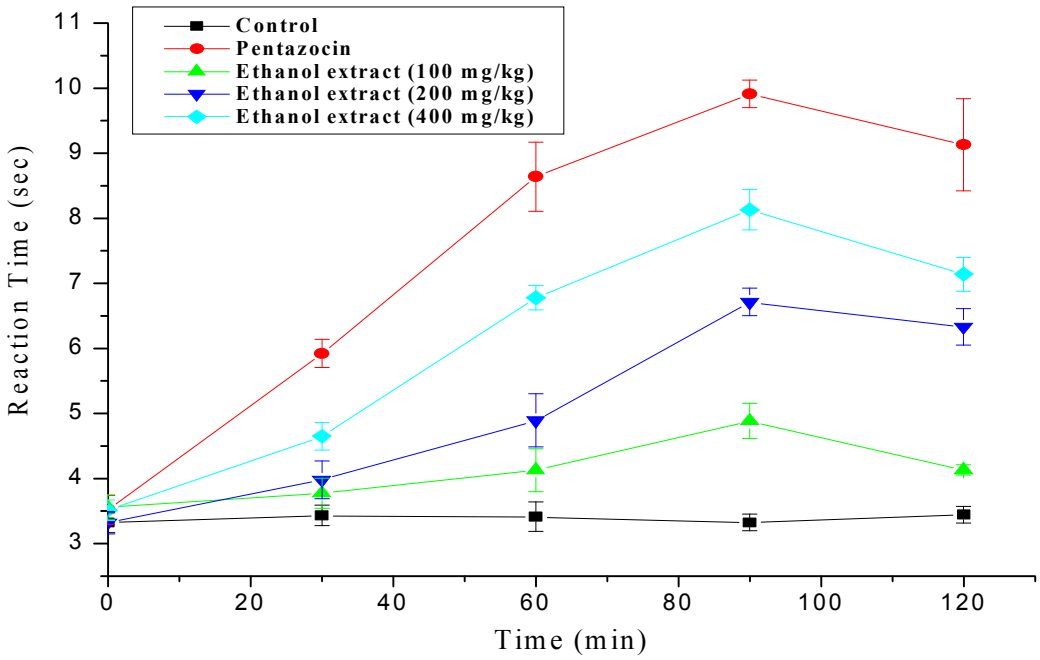

Figure 2: Effect of EMUR on Thermal stimulated pain (hot plate test) in mice

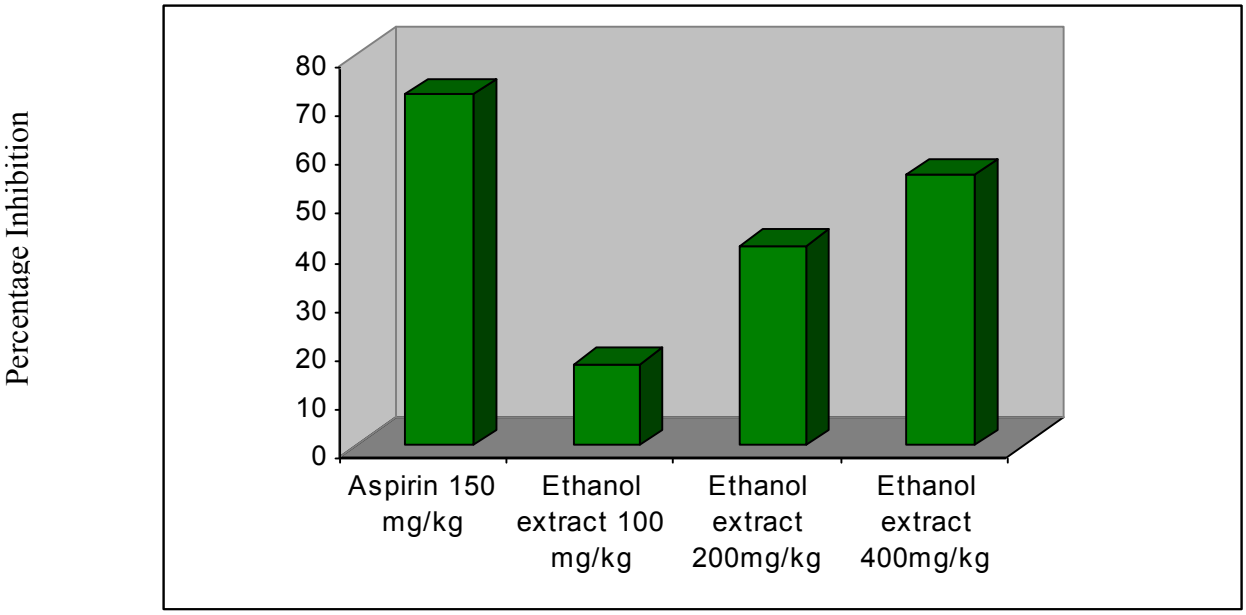

Figure 3: Effect of EMUR on acetic acid induced writhes in mice.

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