Research Paper

Afr. J. Traditional,
Complementary and Alternative Medicines
www.africanethnomedicines.net

ISSN 0189-6016©2009

ANALGESIC AND ANTIPYRETIC EFFECTS OF *SANSEVIERIA TRIFASCIATA* LEAVES

Anbu Jeba Sunilson J , Jayaraj P, Varatharajan R , John Thomas, Jisha James, Muthappan M .

School of Pharmacy, Masterskill University College of Health Sciences, Batu 9, 43200 Cheras, Selangor, Malaysia.
Email: anbujsunil@yahoo.co.in,jayarajmpharm@yahoo.com,varadharajeen@yahoo.co.in, thomasjohnthomas@yahoo.com, jishajohnsonu@yahoo.com shankara1@hotmail.com.

Abstract

The ethanol and water extracts of *Sansevieria trifasciata* leaves showed dose-dependent and significant ($P < 0.05$) increase in pain threshold in tail-immersion test. Moreover, both the extracts (100 – 200 mg/kg) exhibited a dose-dependent inhibition of writhing and also showed a significant ($P < 0.001$) inhibition of both phases of the formalin pain test. The ethanol extract (200 mg/kg) significantly ($P < 0.01$) reversed yeast-induced fever. Preliminary phytochemical screening of the extracts showed the presence of alkaloids, flavonoids, saponins, glycosides, terpenoids, tannins, proteins and carbohydrates.

Keywords: *Sansevieria trifasciata ,* Analgesic activity, Antipyretic activity.

Introduction

Sansevieria trifasciata (Ruscaceae) is commonly known as snake plant or mother in-law's tongue,an evergreen herbaceous perennial plant found throughout Malaysia (Anonymous., 2005) and has been traditionally used by Orang Asli in Perak, Malaysia for the treatment of ear pain, swellings, boils and fever. We found no relevant literature substantiating the uses indicated. Phytochemical screening of the plant has shown the presence of carbohydrates, saponins, glycosides (Yoshihrio et al., 1996), steroids (Yoshihrio et al., 1997) in the leaves since no data are till now reported on the claimed activities. The purpose of the present study was to evaluate the analgesic effect of the ethanolic and water extracts using different acute and chronic models of pain in mice and rats and also to evaluate their antipyretic effects in brewer's yeast-induced pyrexia in rats.

Experimental

Plant

Fresh leaves of the *S. trifasciata* (Ruscaceae), collected from Air Puteh, Johor Baharu, Malaysia in the month of November 2007,were authenticated by Dr. Adzhar, Department of Botany, Science university of Malayasia, Penang, Malaysia. A voucher specimen (No. MSCNH/A-3(11), 2007) was deposited in our departmental herbarium.

Air-dried, powdered leaves were soxhlet extracted with ethanol (EtOH) and water. The extracts evaporated in *vacuum gave* EtOH and water extracts (yields 5.7 %, and 27.6 % w/w, respectively).

Moreover, the extracts were subjected to preliminary phytochemical screening for the detection of various plant constituents (Trease and Evans, 2002).

Animals

Swiss mice (18–20 g) and Wistar rats (150–200 g) of either sex kept at the Laboratory Animal House of Masterskill University College of Health Sciences, Cheras, Malaysia were used. The animals were housed under standard environmental conditions and had free access to standard pellet diet and water *ad libitum.*

Acute toxicity studies

The method described by (Lorke., 1983) was employed in the determination of the LD_{50}. Mice were separated into two sets of five groups of animals, each consisting of five male and female mice (*N*=5). They were fasted overnight and then were administered with the EtOH and water extracts orally at the following doses; 1, 10, 100, 1000, and 2000 mg/kg. Animals were observed for 24 hr after treatment and the final LD_{50} value was calculated as the square root of the product of the lowest lethal dose and highest non-lethal dose

Mouse writhing assay

The method of (Koster et al., 1959) was used. The EtOH and water extracts (100–200 mg/kg, oral) and acetylsalicylic acid (100 mg/kg, s.c.) was administered to mice 60 and 30 mins respectively, before intraperitoneal injection of acetic acid (0.6%, v/v in saline, 10 ml/kg). 10% v/v propylene glycol was used as the control. The number of writhes was counted for 15 min.

Tail-immersion test

Mice were divided into six groups each containing five animals. The lower 5 cm portion of the tail was immersed in a beaker of water maintained at 55 ± 0.5 °C (Janssen et al., 1963). The time in seconds for tail withdrawal from the water was taken as the reaction time, with a cut-off time of immersion set at 10 seconds. The reaction time was measured 1 hr before and 1 hr after oral administration of EtOH and water extracts (100–200 mg/kg) or 10% v/v propylene glycol (10 ml/kg). Morphine (10 mg/kg) was administered subcutaneously, 30 mins before the test.

Formalin test

The method used was similar to that described previously by Shibata et al. (1989). Twenty micro liters of 1% v/v formalin was injected subcutaneously into the right hind paw of mice. The time in seconds spent in licking and biting responses of the injected paw was taken as an indicator of pain response. Responses were measured for 5 mins after formalin injection (first phase) and 15–30 mins after formalin injection (second phase). The EtOH and water extracts (100–200 mg/kg, oral) and acetylsalicylic acid (100 mg/kg, s.c.) were administered 60 and 30 mins, respectively, before formalin injection. Control animals received 10% v/v propylene glycol (10 ml/kg).

Antipyretic activity

Antipyretic activity of drug was measured by slightly modifying the method described by Adams et al. (1968). Rats were fasted overnight with water *ad libitum* before the experiments. Pyrexia was induced by subcutaneously injecting 20% w/v brewer's yeast suspension (10 ml/kg) into the animal's dorsum region. Nineteen hrs after the injection, the rectal temperature of each rat was measured using a thermometer. Only rats that showed an increase in temperature of at least 0.7 °C were employed for the experiments. The EtOH and water extracts (100–200 mg/kg) and 10% v/v propylene glycol solution (10 ml/kg) was administered orally and the temperature was measured at 0, 1, 2 and 3 hrs after drug administration.

Statistical analysis

All data were expressed as mean ± S.D. and analyzed statistically by using Student's t-test and paired t-test. A difference was considered significant at P<0.05.

Results and discussion

Acute toxicity studies

The LD_{50} in mice for the EtOH and water extracts was estimated to be 1513.5 ± 21.5, 1426 ± 43.6 mg/kg, p.o. respectively. During observation the animals exhibited decreased mobility, respiratory distress (gasping) with eventual immobility but without convulsions or loss of righting reflex prior to death.

Analgesic effects

In the mouse writhing assay, EtOH and water extracts caused a significant and dose-dependent inhibition of the control writhes (Table 1). The inhibition produced by the highest dose (200 mg/kg) of the extracts was significantly (P < 0.01) lower than that by acetylsalicylic acid (100 mg/kg).The effect of EtOH and water extracts on tail-immersion tests are shown in (Table 2). These extracts showed a dose-dependent inhibition of pain with the EtOH extract being more active than the water extract. There was a significant, dose-dependent inhibition of both phases of the formalin-induced pain response in mice, with a more potent effect on the second than the first phase (Table 3).

Table 1: Effects of *S. trifasciata* leaves EtOH and water extracts on acetic acid-induced writhing in mice

Groups	***Dose (mg/kg)***	***No. of writhes z (× 15min)***
Control	----	38.4 ± 0. 81
EtOH extract	100	27.5 ± 0.43 [b]
EtOH extract	200	24.8 ± 0.65 [b]
Water extract	100	33.5 ± 0.62
Water extract	200	28.4 ± 0.74[b]
Acetylsalicylic acid	100	12.7 ± 0.71[a]

Values are expressed as mean ± S.D. [a]*P* < 0.01, [b]*P* < 0.05 Significantly different from control. Student's *t*-test. *N=6.*

Table 2: Effects of *S. trifasciata* leaves EtOH and water extracts on tail-immersion test in mice

Groups	***Dose (mg/kg)***	***Reaction time (s)***
Control	----	1.8 ± 0.62
EtOH extract	100	3.6 ± 0.41[a]
EtOH extract	200	4.9 ± 0.53[b]
Water extract	100	3.1 ± 0.68
Water extract	200	3.8 ± 0.56[a]
Morphine	10	7.3 ± 0.85[b]

Values are mean ± S.D. [a]*P* < 0.01, [b]*P* < 0.001; Significantly different from control; Paired *t*-test. *N=6.*

Table 3: Effects of *S. trifasciata* leaves EtOH and water extracts on formalin-induced pain in mice

Groups	***Dose (mg/kg)***	***0-5 min***	***15-30 min***
Control	----	90.08 ± 4.61	85.61 ± 3.36
EtOH extract	100	68.32 ± 3.02[a]	32.63 ± 2.18[b]
EtOH extract	200	64.15 ± 3.69[b]	24.3 ± 1.86[b]
Water extract	100	83.61 ± 2.71	47.65 ± 2.64[b]
Water extract	200	69.30 ± 2.69[a]	38.91 ± 2.11[b]
Morphine	10	56.74 ± 3.33[b]	11.48 ± 1.21[b]

Values are mean ± S.D. [a]$P < 0.01$, [b]$P < 0.001$; Significantly different from control; Paired *t*-test. *N=6.*

Antipyretic effects

The water extract of *S. trifasciata* did not show significant effect on pyrexia induced by yeast while the EtOH extract (200 mg/kg) significantly (P < 0.01) reversed yeast-induced fever (Table 4).

Table 4: Effects of the *S. trifasciata* leaves EtOH and water extracts on brewer's yeast-induced pyrexia in rats

Groups	***Dose (mg/kg)***	***Average rectal temperature (^{o}C)***			
		0 h	**1 h**	**2 h**	**3 h**
Control	----	31.06 ± 0.42	35.58 ± 0.51	37.20 ± 0.38	39.18 ± 0.51
EtOH extract	100	30.81 ± 0.38	36.21 ± 0.64	37.06 ± 0.26	38.65 ± 0.31
EtOH extract	200	30.31 ± 0.26	35.16 ± 0.19[a]	36.83 ± 0.62[b]	37.08 ± 0.41[b]
Water extract	100	32.28 ± 0.81	37.08 ± 0.84	38.14 ± 0.94	39.78 ± 0.18
Water extract	200	32.05 ± 0.36	36.32 ± 0.58	37.30 ± 0.71	38.61 ± 0.36
Morphine	10	30.50 ± 0.16[b]	34.39 ± 0.51[b]	34.61 ± 0.62[b]	33.68 ± 0.21[b]

Values are mean ± S.D. [a]$P < 0.05$, [b]$P < 0.01$; Significantly different from control; Paired *t*-test. *N=6.*

Discussion

Several tests (acute and chronic) were employed in evaluating the analgesic effect of the EtOH and water extracts of *S. trifasciata*. It is necessary to apply tests which differ with respect to stimulus quality, intensity and duration, to elucidate the analgesic properties of a substance using behavioral nociceptive tests (Tjolsen et al., 1992). The results obtained indicate that the extracts possess a moderate dose-dependent analgesic effect on the various pain models used. A potent inhibitory effect was exerted by both the extracts on the mouse writhing assay (a test useful for evaluating mild analgesic non-steroidal anti-inflammatory agents). This suggests that the analgesic effect of the extract may be peripherally mediated. The extracts also had a significant effect in the tail-immersion test. Centrally acting analgesic drugs elevate pain threshold of animals towards heat and pressure. The effect of the extract on this pain models indicates that it might be centrally acting. The extracts inhibited both phases of the formalin-induced pain with a more potent effect on the second than the first phase. The formalin pain test is useful for evaluating the mechanism of pain and analgesia. Drugs which act centrally, such as narcotic analgesics, inhibits both phases of pain in this model peripherally acting drugs, such as acetylsalicylic acid or indomethacin, only inhibit the late phase (Santos et al., 1994). The water extract of *S. trifasciata* did not show any significant effect on brewer's yeast-induced fever in rat; however EtOH extract (200 mg/kg) significantly reversed yeast-induced pyrexia. The results obtained in this study indicate that the extracts

possess mild analgesic properties. This seems to provide a rationale for the use of this plant in fever and inflammatory disorders.

Acknowledgements

We are grateful to Dr. Dato' Dr. Proom Promwichit, Deputy Vice-chancellor, Research and Innovations & Dato' Edmund Santhara, CEO, Masterskill University College of Health Sciences, Malaysia, for encouragement and support.

References

1. Adams,SS., Hebborn,P., Nicholson,JS. (1968). Some aspects of the pharmacology of Ibufenac, a non-steroidal anti-inflammatory agent. J. Pharm Pharmacol.**20**:305
2. Anonymous (2005). Snake plant, mother- in law's tongue, *Sansevieria trifasciata* **.** Online availablefromURLhttp://www.desert-tropicals.com/Plants/ Agavaceae/Sansevieria_trifasciata.html. (accessed on 10.12.2007)
3. Janssen,PAJ., Niemegeers,CJE., Dony,JGH. (1963). The inhibitory effect of fentanyl and other morphine-like analgesic on the warm water induced tail withdrawal reflex in rats. Arzneim-Forsch Drug Res. **6**: 502-507.
4. Koster, R.,Anderson, M., De Beer ,EJ .(1959). Acetic acid for analgesic screening. Fed. Proc. **18**: 418-420.
5. Lorke, D. (1983). A new approach to practical acute toxicity testing. Arch. Toxico. **54**:275.
6. Santos,ARS.,Filho,VC.,Niero.R.,Viana ,AM.,Moreno, FN.,Campos, MM.,Yunes, RA.,Calixto, JB. (1994). Analgesic effects of callus culture extracts from selected species of Phyllantus in mice. J. Pharm. Pharmacol. **46**: 755–759.
7. Shibata, M., Ohkubo, T.,Takahashi, H. ,Inoki, R. (1989). Modified formalin test: Characteristic biphasic response. Pain. **38**:347–352.
8. Tjolsen, A., Berge, OG.,Hunskaar,S.,Rosland,JH.,Hole, K.(1992). The formalin test: an evaluation of the method. Pain **51**, pp. 5–17.
9. Trease, G.,Evans SM. (2002). pharmacognosy. 15th edition. Bailer Tindal, London.pp.23-67.
10. Yoshihrio, M.,Toshihiro, I., Minpei, K.,Yutaka, S .(1996). Steroidal Saponins from *Sansevieria trifasciata.* Phytochemistry. **43**:1325-1331.
11. Yoshihrio, M.,Toshihiro,I. Minpei, K., Yutaka, S. (1997). Pregnane glycosides from *Sansevieria trifasciata.* Phytochemistry. **44**:107-111.