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Effects of the methanol leaf extract of *Sansevieria liberica* on the central nervous system in mice

Umukoro S [1]*, Ashorobi R. B [2]

1. Department of Pharmacology and Therapeutics, University of Ibadan, Nigeria.

2. Department of Pharmacology, College of Medicine, University of Lagos, Nigeria.

Abstract

Objective: To investigate the effects of the methanol leaf extract of *Sansevieria liberica* (SL) on the Central Nervous System (CNS) in mice. Materials and methods: The spectrum of activities studied, includes the effects of SL on hexobarbital-induced sleeping time, on picrotoxin-induced convulsions and on pains produced by acetic acid and by noxious heat. Results: The extract was found to exhibits sedative effect, as it prolongs hexobarbital-induced sleeping time in mice. SL was also found to possess analgesic property, as it reduced the pain episodes produced by acetic acid and by noxious heat in mice. However, the extract did not demonstrate anticonvulsant property, as it failed to prevent convulsions and could not delay significantly the onset of seizures in picrotoxin-treated animals. Conclusion: The results of the study suggest that the leaf extract of *Sanseviera liberica* contained phytochemically active ingredients with CNS depressant and analgesic effects.

Keywords: *Sansevieria liberica*, sedative, anticonvulsant, analgesic.

1. Introduction

Herbal products are extensively used globally, as alternative to orthodox medicines and in Africa, upto 80% of the population depends on herbs [1-2]. The increased patronage of folk medical practitioners, by most of the Nigerian populace, is related to the ever-increasing cost of orthodox medicines and easy accessibility of plant materials [3-4].

Sanseviera liberica is an erect herb, with several stiff edged elliptical leaves, arising from a rhizome. The leaves are broad, marked with dark and light green bands. The fruits are red in colour and are one seeded. The plant is well distributed within the tropical regions of the world. The extract of the plant is reputed as an herbal remedy for central nervous system disorders, especially convulsions [5-6]. The plant is also prescribed as a remedy for diarrhoea, abdominal pains and in promoting wounds healing [7]. In spite of extensive

* Corresponding author
Email: umusolo@yahoo.com

searching, it was not possible to find any reports on the pharmacological effects of the plant. In this study, we decided to investigate the effect of the methanol leaf extract of SL on the central nervous system in mice.

2. Materials and methods

2.1 Laboratory animals

Swiss albino mice (18-20g) of either sex used in the study were purchased from the Laboratory Animals center, College of Medicine, University of Lagos, Nigeria. They were kept in a well-ventilated environment with free access to food and water *ad libitum*. The study was conducted in the Department of Pharmacology, College of Medicine, University of Lagos and the ethical guidelines for the handling of experimental animals were followed.

2.2 Plant material

The leaves of *Sanseviera liberica* were purchased from Mushin market, Lagos and identified by Prof. J. D. Olowokudejo of the Department of Botany and Microbiology, University of Lagos, Nigeria.

2.3 Extraction procedure

The dried leaves of *Sanseviera liberica* were ground into fine powder using blender and 520 g of the powdered material was subjected to methanol extraction in a Soxhlet apparatus according to the method previously described [8]. The solution was evaporated to dryness using water bath. The yield of the extract was 12.85 % with reference to the powdered leaves.

2.4 Phytochemical screening

The extract was screened for the presence of active principles according to the method previously described [9].

2.5 Acute toxicity study

The animals (6 mice/group) were given i.p injection of the extract in a dose-range of 0.5-2.0 g/kg. The animals were observed for symptoms of toxicity and the number of death was recorded within 24hrs of treatment [10].

2.6 Hexobarbital-induced sleeping time

The animals were divided into 4 groups of 6 each. The first 3 groups were treated with the extract (50-200 mg/kg, i.p) whilst the fourth group which served as control was given saline (10 ml/kg, i.p). Thirty minutes later, each animal received i.p dose of hexobarbital (75 mg/kg) and the duration of sleep was recorded as the interval between the loss and regain of righting reflex.

2.7 Tail flick Test

The animals (6/group) were given the extract (50-200 mg/kg, i.p) or saline (10 ml/kg, i.p) 30 minutes before the tail of each mouse was immersed in water maintained at 55°C. The time (s) taken for each animal to withdraw the tail from the water was measured [11]. The cut-off time of 15 s was imposed to avoid tissue damage.

2.8 Acetic acid–induced mouse writhing test

Acetic acid-induced abdominal constriction in mice was carried out according to the method described by Koster *et al*., [12]. Mice (6 per group) were treated with the extract (50-200 mg/kg, i.p) or saline (10 ml/kg, i.p) 30 minutes before induction of nociception with 0.60% acetic acid (i.p). Total writhes were recorded for 30 minutes duration.

2.9 Anticonvulsant test

The animals were divided into 4 groups of 6 mice. Group one received saline (10 ml/kg, i.p) and the second, third and the fourth groups received i.p doses of 50, 100 and 200 mg/kg of the extract respectively. Thirty minutes later, each animal was given picrotoxin (10 mg/kg, i.p) and the onset of convulsions as well as mortality was recorded within 30 min after picrotoxin injection.

Table 1. Effect of methanol leaf extract of *Sanseviera liberica* on hexobarbital induced sleeping time in mice

Drug	Dose mg/kg	Sleeping time (Minutes)
Hexobarbital- control	75	9.46 ± 4.34
S. liberica	50	11.00 ± 2.67
S. liberica	100	15.06 ± 5.40*
S. liberica	200	19.30 ± 1.8*

Each value represents the mean ± SEM for 6 animals per group. *P < 0.05 compared to hexobarbital-control group (ANOVA).

Table 2. Effects of methanol leaf extract of *Sanseviera liberica* on tail withdrawal latency in mice

Drug	Dose (mg/kg)	Tail withdrawal latency (s)
Saline	-	2.46 ± 0.21
S. liberica	25	6.10 ± 0.12*
S. liberica	50	8.32 ± 0.14*
S. liberica	100	10.54 ± 0.06*

Each value represents the mean ± SEM for 6 animals per group. *P < 0.05 compared to saline-control group (ANOVA).

Table 3. Effect of methanol leaf extract of *Sanseviera liberica* on acetic acid-induced abdominal writhing in mice

Drug	Dose (mg/kg)	Number of writhes
Saline	-	86.56 ± 2.61
S. liberica	50	38.43 ± 1.42*
S. liberica	100	27.81 ± 2.14*
S. liberica	200	21.64 ± 1.46*

Each value represents the mean ± SEM for 6 animals per group. *P < 0.05 compared to saline-control group (ANOVA).

2.10 Data analysis

Data obtained from this study were expressed as mean ± SEM. Statistical analysis was performed using ANOVA. P-values less than 0.05 were considered statistically significant.

3. Results

3.1 Phytochemical test

Phytochemical screening revealed the presence of phenols, flavonoids, alkaloids and glycosides in the leaf extract of SL.

3.2 Acute toxicity study

The extract was found to produce 40, 80 and 100% mortality when administered intraperitonally in doses of 0.5, 1.0 and 2.0g/kg respectively. However, no death was observed at lower doses.

3.3 Sedative property

The extract was found to exhibit sedative property, as shown by its effects on the general behavior of the animals and on hexobarbital-induced sleeping time in mice. The extract reduced spontaneous motor activity and response to touch but it did not caused immobility or loss of righting reflex in mice at the tested doses. The extract (50-200 mg/kg, i.p) produced a dose-dependent potentiation of hexobarbital-induced sleeping time in mice. However, the duration of sleep in animals pretreated with the extract at a dose of 50 mg/kg, was not significantly different from that produced by hexobarbital alone (Table 1).

Table 4. Effect of methanol leaf extract of *Sanseviera liberica* on picrotoxin-induced convulsions in mice

Sample	Dose (mg/kg)	Onset of seizures (s)	Duration of seizures (s)	Mortality (%)
Saline	-	5.10 ± 1.20	3.20 ± 0.06	100
S. liberica	50	6.20 ± 1.24	3.0 ± 0.10	100
S. liberica	100	6.50 ± 0.73	2.91 ± 0.23	100
S. liberica	200	7.10 ± 0.86	2.64 ± 0.31	80

Each value represents the mean ± SEM for 6 animals per group. *P < 0.05 compared to saline-control group (ANOVA).

3.4 Analgesic property

The extract (50-200 mg/kg, i.p) was found to exhibits analgesic property as shown in Table 2 and 3. As shown in table 2, the extract in a dose range of 50-200 mg/kg significantly prolonged the response of the animals to noxious heat in a dose-related manner. In a similar manner, SL was found to reduce the frequency of abdominal constrictions induced by acetic acid in mice (Table 3).

3.5 Anticonvulsant effect

The extract at the tested i.p doses of 50, 100 and 200 mg/kg did not modify the convulsive actions of picrotoxin (10 mg/kg, i.p) in mice. The extract could not prevent convulsions, as all the animals convulsed with 80% mortality at the maximum dose used in the study (Table 4). The extract did not prolong the onset of seizures and also failed to shorten the duration of convulsions in picrotoxin-treated mice in a significant manner (Table 4).

4. Discussion

The extract was found to exhibits sedative effect, as shown by its ability to prolong hexobarbital-induced sleeping time. SL was also found to possess analgesic property, as it reduced the pain episodes produced by acetic acid and by noxious heat in mice. However, the extract did not demonstrate anticonvulsant property, as it failed to prevent convulsions and could not delay significantly the onset of seizures in picrotoxin-treated animals.

It is well known that drugs with sedative properties, prolonged the time of sleep produced by barbiturates [13]. The prolongation of barbiturate-induced sleeping time still enjoys a wide popularity, as a laboratory animal paradigm for the assessment of sedative property of a novel compound [13-14]. Studies have shown that the potentiation of barbiturate hypnosis is an index for CNS depression [14-15]. It may be suggested that the ability of the extract to prolong hexobarbitone-induced sleeping time, indicates that it possesses CNS depressant property.

The anticonvulsant activity of a compound is generally assessed by its ability to prevent convulsions, to delay the onset of seizures or death and also to shorten the duration of convulsions in laboratory animals [16-18]. In this study, the extract did not significantly modify any of these effects of picrotoxin, a well-known antagonist of gamma-amniobutyric acid receptor chloride ion complex [19-20].

The acetic acid mouse writhing is a widely used animal model for routine screening of compounds with peripheral analgesic actions [21-22]. Whilst the hot plate or tail immersion model of pains, is generally used to detect centrally acting analgesics [22, 23]. It is generally accepted that the peripherally acting analgesics, are active against pain produced by acetic acid, but lacked the ability to raise the pain threshold to noxious heat, a condition in which the centrally acting analgesic drugs, are known to be effective [21-23]. The ability of the extract to reduce the pain episodes produced by acetic acid and by noxious heat, may suggests that SL possess both peripheral and central analgesic property.

In conclusion, the results of the study suggest that the leaf extract of *Sanseviera liberica* contained phytochemically active ingredients with CNS depressant and analgesic activities.

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