Full Length Research Paper

Anxiolytic activity of an aqueous extract of *Alchornea cordifolia* (Euphorbiaceae) leaves

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*Alchornea cordifolia*, a half way growing shrub from Africa is very valued by traditional doctors in treating numerous ailments including psychical and nervous troubles. The aim of our study was to investigate the anxiolytic activity of *A. cordifolia* leaves by estimating the effect of an aqueous extract of this plant upon the spontaneous movements and the exploratory behaviour of laboratory mouse. Study of spontaneous movements (moving, straightening-up, activity duration) was done using an activemeter. To assess the exploratory behaviour, a hole-board test was used. The results showed that all spontaneous movements as rapid moving, rapid straightening-up as well as activity duration of mouse decreased after administration of *A. cordifolia* in the dose of 2500 mg/kg body weight, p.o. A reduction of exploratory behavior in *A. cordifolia* 2500 mg/kg body weight p.o-treated mice could also be noticed. Thus, the present findings suggest that *A. cordifolia* might be a potential candidate for use as an anxiolytic drug in the treatment of neuro-psychical troubles.

Key words: *Alchornea cordifolia*, anxiolytic activity, spontaneous movement, hole-board test, mouse.

INTRODUCTION

In African countries, about 80% of the population depends on traditional medicine for their treatment, because it is readily available and affordable economic-wise. *Alchornea cordifolia* (Euphorbiaceae) is a shrub or small tree spreading from Senegal to Kenya and Tanzania and throughout Central Africa to Angola is highly valued by traditional doctors. In addition to its sedative and anti-spasmodic activities, it is also used to treat a variety of respiratory problems, genital-urinary problems, wounds, pain, and many others uses. The leaves are also taken to treat psychical and nervous troubles (Adjanohoun and Ake, 1979). The scientific importance given to this plant by many researchers has helped to highlight several properties it possess: antibacterial (Ajao et al., 1985; Lamikanra, 1990; Lamikanra et al., 1999; Sutton et al., 2000; Tona et al., 2000), anti-malarial (Banzouzi et al, 2002), anti-inflammatory (Manga et al., 2004; Osadebe and Okoye, 2003; Mavar-Manga et al., 2008), antispasmodics (Ogumbamila and Samuelsson, 1990), antioxidant (Nia et al., 2005), and anti-diarrhea (Agbor et al., 2004). However, very few studies have been conducted on the activity of this plant on the central nervous system. The aim of this study was to investigate the anxiolytic activity that *A. cordifolia* leaves possess by...
measuring its effects on behavior and exploratory activity of mice.

MATERIALS AND METHODS

Plant

Fresh and matured leaves of A. cordifolia (Schum. and Thonn.) Müll. Arg. (Euphorbiaceae) were collected in Abidjan along the old Bingerville road and verified by a botanist expert (Professor Ake Assi, Department of Botany, University of Abidjan).

Animal

White mouse of Mus musculus race, of either sexes, weighing between 20 and 27 g were used. They were fasted 18 h before the experiment with water ad libitum. Five homogenous weight set of 6 mice were set up.

Preparation of lyophilized aqueous extract

Shade dried leaves were crushed in a Ritscher grinder (SM 100 serial from Germany) and 50 g of the obtained powder was then macerated for 48 h at 25°C in a glass balloon containing 500 ml of distilled-water. The obtained aqueous extract was then filtered and freeze-dried with a Telstar Grydos-80 labeled freeze-drier. The freeze-dried product was kept in a glass flask at a 4°C temperature.

Chemical substance used

Chlorpromazine (LARGACTIL ®) Laboratory EurekaSanté was used as reference standard.

The study of spontaneous movements in activemeter

The method of Pérez et al. (1998) was used for the study of spontaneous movement. The activemeter AM 1051 operates by using infrared light ray to detect movement. There are two sets of light ray, placed in two separate and independent matrices, one above and one below. The lower ray is used to detect the normal movement and the upper ray to detect if the animal rises. The sensor operates by detecting the number of times that the ray changes from "obstructive" to "non-obstructive" and vice versa. In this way more spontaneous movements can be recorded like rapid movements, rapid straightening up, and duration of all spontaneous movements. Five (5) uniform batches of six (6) mice were formed. One batch served as controls lot and received saline (10 ml/kg body weight), another batch received chlorpromazine (2 mg/kg body weight), reference chemical substance used in this study. The other three batches each received different doses of our extract (625, 1250 and 2500 mg/kg body weight). The mice were placed one after the other in the Activity Monitor AM1051, 30 min after treatment and rapid movements, rapid straightening up, and duration of all spontaneous movements are recorded for a period of 5 min. The operation was repeated three times at intervals of 30 min.

The study of exploratory activity of mice

The method of Boissier and Simon (1967) was used for the study of exploratory activity of mice. A hole board with holes measuring 40 cm by 2.2 cm thickness and with 16 equidistant holes, 3 cm in diameter fitted with infrared transmitters and receptors. These transmitters and receivers are incorporated in miniature into walls of each hole and around the board. The board is connected to a counter which automatically detects the exploratory movements of mice. Out of the five lots, one lot was used as control and received normal saline solution (10 ml/kg body weight), another batch received reference chemical substance, that is, chlorpromazine (2 mg/kg body weight), the other three batches were administered each an increasing dose of the extract (625, 1250 and 2500 mg/kg p.o). The mice were placed one after the other in the middle of the board after 30 min of treatment and the number of holes explored within 5 min was recorded. The procedure was repeated every 30 min for 90 min. The average number of holes explored was calculated.

Statistical test

The comparison of these means was performed using Student’s t test. The difference between two averages is considered significant if the calculated t is greater than or equal to t theoretical risk α = 5%.

RESULTS

The differences recorded in activities with the extract at dose 625 and 1250 mg/kg body weight is not significantly different from each other, which will not present the results obtained with the dose of 625 mg/kg body weight.

Spontaneous movements

These spontaneous movements were represented by the number of rapid movements (Figure 3) and the number of rapid straightening up (Figure 2). The duration of all spontaneous movements is as shown in Figure 1. Overall, we noted that the mean obtained for the control lot were higher than all other lots. There was a significant decrease in mean and duration of spontaneous movements of mice at 2500 mg/kg body weight of extract as compared to the control from 30 to 90 min, but still higher than the mean obtained with lot receiving chlorpromazine.

The exploratory activity

The number of holes explored in 5 min by different groups of mice is shown in Figure 4. Herein, it was noted that the mean of the control group was higher than all other lots. From 30 to 90 min, the number of explorative activities decreases. There was a significant decrease in explorative activities of mice receiving the extract at 2500 mg/kg body weight dose as compared to the control, but remain superior as compared to the mean obtained with mice receiving chlorpromazine.
**DISCUSSION**

*Alchornea cordifolia* is used in Africa traditional medicine in the treatment of various neurological and psychiatric disorders. This study is meant to highlight the importance and efficiency of traditional medicine by revealing the anxiolytic activity of *A. cordifolia* leaves. Spontaneous movements and exploratory behaviour of mice were the measures used to assess the central nervous system depression of *A. cordifolia*. The study of spontaneous movements in mice (rapid movements, rapid straightening up, duration of all spontaneous movements) using the activity meter is used to measure exploration and voluntary locomotion in a new environment and in a limited space. Spontaneous movements’ particularly rapid straightening up reflect an excitement of the nervous
system in mice. The decrease in spontaneous movements is the result of a decrease in the excitability of the central nervous system or central depressant effect (Mansur et al., 1971; Morais et al., 1998). In this study, all spontaneous movement in mice, rapid movement (Figure 3) rapid straightening up (Figure 2) and the duration of activity (Figure 1) were reduced as a result of A. cordifolia extract administration at a dose of 2500 mg/kg body weight. These effects are similar to those of chlorpromazine, a psycholeptic agent depressing the central nervous system.

This molecule is used in the treatment of agitation and aggression in the acute or chronic psychotic states. Thus A. cordifolia could possess central nervous system depression activity. The hole board test provides a simple method to measure the response of an animal to an unfamiliar environment and is widely used to assess emotionality, anxiety and/or response to stress in animals (Takeda et al., 1998) showed that the exploration of holes by the mouse reflect changes in the emotional state of the animals. Thus, the hole board test is a measure of exploratory behavior of animal, and substance that reduces
this behavior is responsible for the anxiolytic activity (File and Wardill, 1975; Pellow et al., 1985). The ability of exploration can be seen as a sign of anxiety (Crawley, 1985) although it is difficult to dissociate from locomotive activity. Our results may reflect anxiolytic activity of *A. cordifolia* as a reduction was observed in the exploratory behavior of mice treated with the extract at 2500 mg/kg body weight similar to that observed with chlorpromazine. This fact reinforces the hypothesis of anxiolytic activity described earlier by reducing spontaneous movements measured in the actimeter. Many neurotransmitters influence spontaneous movements in mice.

These include the gamma-aminobutyric acid (GABA), opioids, dopamine receptors (Walting and Keith, 1998). *A. cordifolia* could interact with these mediators. GABA-A is the main mediator of anxiety in the central nervous system. In addition to anxiety, it is involved in other physiological functions related to behavior, and various psychological and neurological disorders such as epilepsy, depression, Parkinson's syndrome and Alzheimer's disease.

The anxiolytic properties of *A. cordifolia* observed in this study could be explained by an interaction with the metabolism of GABA-A. This hypothesis could be in agreement with the results of Pedersen et al. (2009). In fact they explained that *A. cordifolia* has an affinity for the benzodiazepine binding site on GABA-A receptors without activating or inhibitory activity demonstrated on these receptors.

Several phytochemical constituents have proved to be inhibitors of spontaneous movement in mice. These are flavonoids, which have also shown an affinity for the benzodiazepine receptor (Pedersen et al., 2008) and saponins (Wagner et al., 1985; Dubois et al., 1986). Knowing that *A. cordifolia* contains in its leaves saponins (Adjanohoun, 1994) and flavonoids (Manga et al., 2004), the anxiolytic activity observed in this study could be partly due to these phytochemical constituents.

*A. cordifolia* leaves could therefore have a depressing effect on the central nervous system which justifies its uses in traditional medicine in the treatment of neuropsychiatric disorders.

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**REFERENCES**


