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Effect of Chronic Admnistration of Ficus *Thonningii* on Depression and Motor Coordination in CD-1 Mice.

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Abstract: *The effect of ficus thonningii depression and motor coordination was investigated using 30 Adult Swiss mice weighing between 18 -21g, were divided into 3 groups containing 10 mice per group. Before the neurobehavioral parameters were assessed, the LD50, phytochemical screenings of the plant were determined. Group 1(control),received normal rat feed while, group 2(low dose)were administered with ficus thoninngii extract at a dose of 15mg/kg, and group 3 being the high dose were administered with ficus thoninngii extract at a dose of 30mg/kg, this administration lasted for 21 days. All animals were allowed clean drinking water. Beam walking apparatus was used to assess motor coordination while the forced swim test was used for depression. The results showed that the low and high dose administered ficus thonningii showed better motor coordination when compared to the control because the distance covered and the latency of fall was significantly longer compared to control (P<0.05).Similarly, the frequency of foot slip was significantly low in the low and high dose group compared to control (P<0.05).Forced swim test showed on significant difference among the groups.Therefore,chronic administration of the ficus thonningii improves motor coordination but does not affect depression.*

Keywords: *ficus thonnngii, beam walking, force swim, depression, motor coordination, mice*

1. Introduction

F. thonningii is a well-known ornamental tree that is also used in improving agroforestry systems. Its leaves are used as fodder and its bark is used for making bark cloth. Like many woody trees, (Orwa et al., 2009). *Ficus thonningii* is extensively used by ethnomedical practitioners for treating various ailments and all part of this plant are medicinally useful, the latex-rich leaves are preferred because latex has been traditionally associated with potency (Ahur et al., 2010). Macerations of fresh *F. thonningii* leaves, taken orally, have been used by traditional healers for treating diarrhoea, gonorrhoea and diabetes mellitus (Njoronge and Kibunga, 2007. Leaf extracts are also used for treating bronchitis and urinary tract infections (Cousins and Huffman, 2002; Bah et al., 2006). In Nigeria, a maceration of the leaves is used for treating stomach pains,gastric ulcers and other stomach conditions in animals (Nwude and Ibrahim, 1980). The leaves can also be used for treating liver disorders and disease conditions associated with jaundice (Ahur et al., 2010). Other medicinal uses of the leaves reported include treatment of bone movement disorders, ringworm,etc (Moshi et al., 2009; Alawa et al., 2002). *It* contains various biologically active compounds such as alkaloids, terpenoids, flavonoids, tannins and essential (Ndukwe et al., 2007 ; Usman et al., 2010; Greenham et al., 2007) . Studies have shown that the bark of the plant is important in local medicine and has been used in the treatment of cold, sore throat, dysentery, constipation, nose bleed, stimulation of lactation etc. Little or no studies have been recorded on the effect of*ficus thionningii* on neurobehavioral despair and motor coordination. Therefore, there is the need to find out the effect of this plant on motor coordination and depression using CD-1 mice as experimental animals.

2. Materials and Methods

Animals

Thirty adult CD-1mice were bought from the Department of veterinary Medicine University of Agriculture, Umudike, and Abia State and was then transported to Department of Physiology, Abia state university, Uturu. The mice weighing between 18-21g were kept in the animal house of the Department of Physiology, Abia State University Uturu and were housed in groups of 3 (control, low dose and high dose) in plastic cages, maintained under standard dark-light cycle. Food and water were available ad libitum. All rules applying to animal safety and care were observed. Acclimatization lasted for 14 days.

Experimental design

Animals were identified using identity cards attached to each group containing 10 mice each among the three groups. Group 1 which is the control, received normal rat chow while Group 2 and Group 3 which are the low and high dose groups were administered 15mg/kg and 30Mg/kg via cannula daily for a period of 21days. However, the lethal dose (LD_{50}) of *the F.thonningii* was determined prior to administration using the method proposed by lorke(1983).

Experimental protocols for motor coordination

The mice were carried to the test room in their home cages. The mouse was removed from its home cage and placed at one end of the balance beam. After the mouse has secured its grip on the beam, the trial begins. The maximum length of the trial is five minutes. The mouse is tested under white light, during the dark phase. The beam is cleaned with 70% ethanol and permitted to dry between each trial. The following behavioral parameters were measured,

Distance travelled: The number of line crosses.

Foot Slips: Number of times one of the mouse's back feet slips from the beam

Number of turns: Frequency that the animal reversed direction

Latency to fall: Time at which the animal fell off of the beam. If a fall occurred the animal was not placed back on the beam but was returned to the home cage. The trial was not repeated.

Beam walking apparatus

Experimental protocols to test for depression

A 2L glass cylinder was filled with water at room temperature (approximately 25 ± 2° C). The cylinder is 19-cm tall, 10-cm in diameter and filled to 13-cm (the 1600-mL point) with tap water and allowed to sit overnight to achieve room temperature (Roy et al., 2007).

Mice should not be able to touch the bottom of the cylinder with their tails, as this may alter their behavior. Mice are picked up from their home cages in a plastic container with holes in the bottom to let out water, and are individually dropped (placed in, head downward, trying to ensure that the mouse's head does not go underwater) into the glass cylinder and observed for immobility for one 6-min trial. Immobility is defined as the cessation of all movements except those necessary to stay afloat, such as paddling lightly with one. A stopwatch was used to record immobility.

Test set up forced swim test

Statistical analysis

Data Obtained from the experiments were statistically analyzed using Microsoft excel, with factorial ANOVA/T-test in the statistics programme start view version for Windows or Mac. A Post-hoc comparison was also done using the student ± Newman-keuls design. Values were represented as Mean ± SEM and a "P" value less than 0.05, was considered as significant.

3. RESULTS

Behaviors scored during beam walking

Frequency of turn

The frequency of turns for the low and high dose administered *ficus thonningii* were 35.82±7.04 and 38.64±3.31/5mins was significantly higher (P<0.05) compared to control which was 22.37±4.82. Fig 1**Foot slip**

The frequency of foot slips in the low and high dose groups were 3.21±1.02 and 2.53±0.32/5mins was significantly lower (P<0.05) compared to control which was 6.38±1.14/5mins respectively. Fig 2.

Distance covered

The distance covered by the low and high dose groups of mice were 42.69±2.99 and 58.80±7.46/6mins which as significantly higher (P<0.05) compared to the control group which was 25.50±8.34/6mins.Fig 3.

Latency of fall

The latency of fall of the different experimental groups are as follows: 8.04 ± 7.08; 12.25 ± 1.12 and 16.20 ± 0.02 seconds for mice fed control, low and high dose diets respectively. The latency of fall was longer for the low and high dose groups of mice compared to control at p<0.05. (Figure 4).

Behaviors scored in the forced swim test

Float latency

The float latency for the low and high dose groups were 103.49±5.20 and 104.02±2.60seconds which was significantly different compared to the control which was 100.62±8.80seconds.See fig 5.

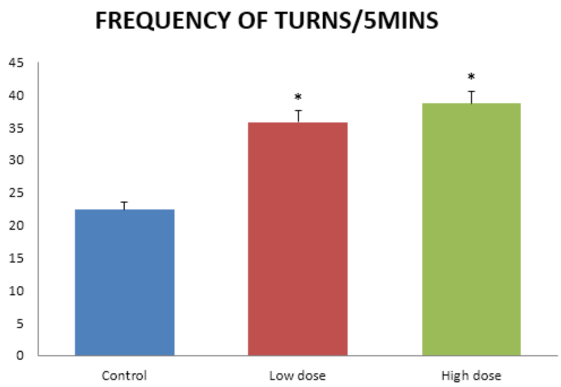

Fig1. *frequency of turns in the beam walking test among the experimental groups within 5mins.Values are expressed as the mean, standard error of mean(±),n=10;*

**P<0.05 compared to control.*

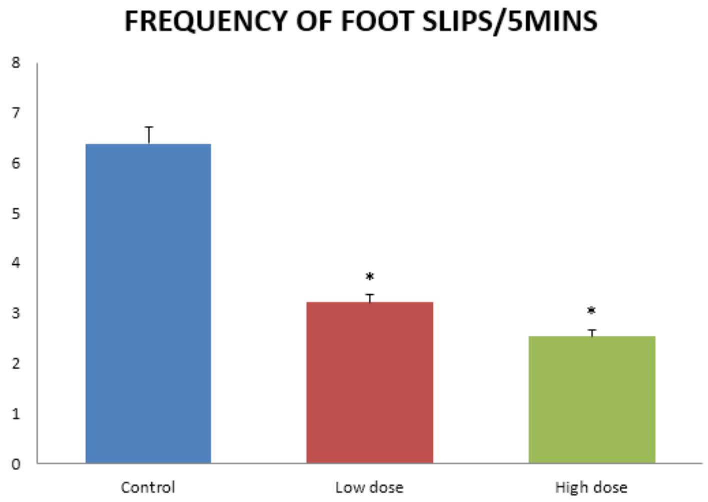

Fig2. *frequency of foot slips in the beam walking test within 5minutes among the experimental groups. Values are expressed as the mean, standard error of mean (±), n=10;*

**P<0.05 compared to control.*

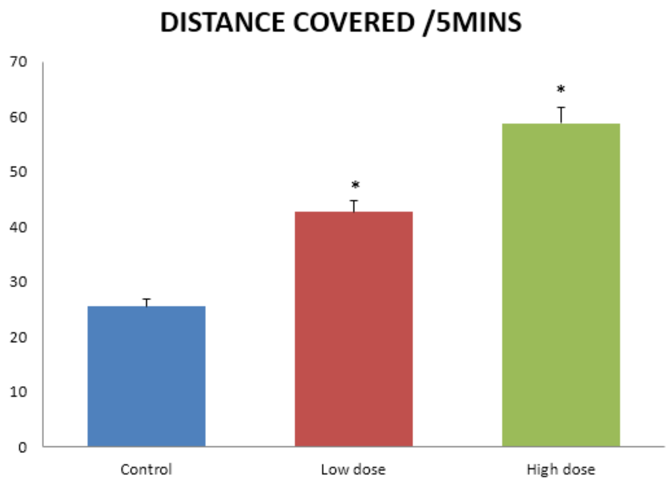

Fig3. *distance covered in the beam walking test within 5minutes among the experimental groups. Values are expressed as the mean, standard error of mean (±), n=10;*

**P<0.05 compared to control.*

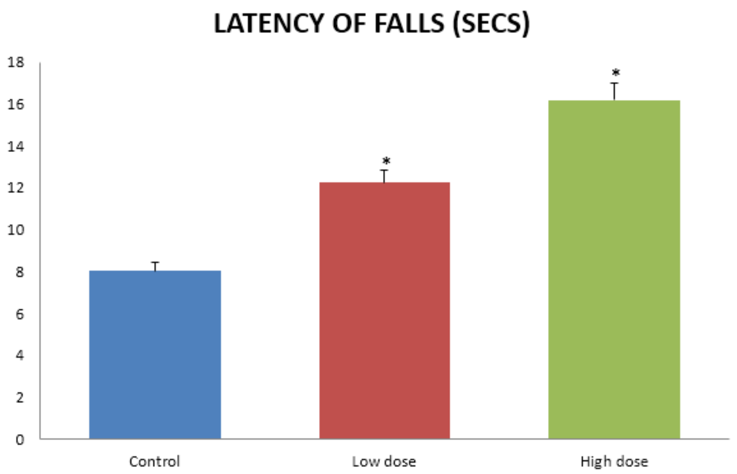

Fig4. *latency of falls in the beam walking test among the experimental groups. Values are expressed as the mean, standard error of mean (±), n=10;*

**p<0.05 compared to control.*

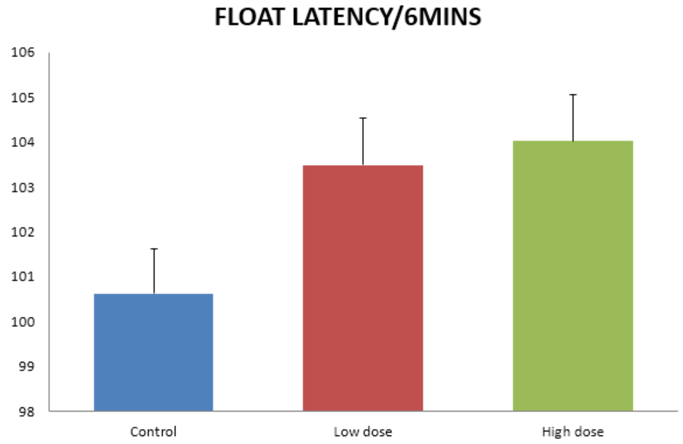

Fig5. *float latency in the forced swim test within 6 minutes among the different experimental groups. Values are expressed as the mean, standard error of mean (±), n=10;*

**P<0.05 compared to control.*

4. Discussion

Beam walking is a test for motor coordination and balance (Hyde *et al*., 2001; Easton et al., 1998; Hymson *et al*., 1982 ;). The task involved the ability of the mice to learn to maneuver their way and stay on the beam balance for as long as possible. The results in beam walking showed that the frequency of turn was significantly higher in the low and high dose groups of mice compared to the control. The distance covered group showed better motor coordination in the treated groups compared to control. During the foot slip test, the low and high dose groups of mice showed fewer foot slips when compared to the control. This indicates a high level of manoeuvrability in the beam, thus indicating better motor coordination and therefore the better the motor learning ability.). The latency of fall in the groups of mice treated with the low and high dose was significantly longer when compared to their control for the period of training on the beam apparatus. This means that the animals in the test groups learned better to stay on the beam compared to their control.Therefore,chronic administration of ficus thonningii may have a stimulating effect on the cerebellum which is involved in learning adjustments that make motor coordination easier when a given task is performed over and over(Ganong et al.,2010) .

The force swim test in mice was developed to test rodents for immobility because it was discovered that rodents became immobile after an initial swimming activity in an inescapable situation. The duration of immobility is considered a measure of despair or depression. The force swim test showed no significant difference in the three experimental groups when compared. The results obtained showed that the mice in the different experimental groups showed equal level of depression when the duration of their immobility was considered.

5. Conclusion

Chronic administration of the leaves of ficus thonningii improves motor coordination but does not affect depression. If these results are applied in humans, then the leaves of this plant could be used in the control and management of ataxia, the animal model of Parkinson’s disease.

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