Effect of chronic consumption of ibie leave (Mucuna flagellipes) on locomotor behaviour in CD-1 mice

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ABSTRACT

The aim of the study is to investigate the effect of chronic consumption of Ibie leaf (Mucuna flagellipes) on locomotor behavior and thus discover the potential of this underutilized plant in managing locomotor disorders. The open field was used to study locomotor behaviors in 25 Swiss white mice weighing 18 to 22 g. The mice were grouped into two groups consisting of 9 mice each. Group 1 which served as the control group received normal rat chow (20 g) and clean drinking water, while group 2, which serve as the test group received (20 g w/w) Ibie leaf diet. Each mouse was tested in the open field arena for 5 min and behaviors scored. ANOVA and post-hoc t-test were employed for statistical analysis and P<0.05, were accepted as significant. The results showed that the frequency of line crosses and rearing were statistically lower (P< 0.01) in the M. flagellipes diet group as compared to the control. Therefore, chronic consumption of Ibie (M. flagellipes) diet reduced locomotor behaviour in mice.

Keywords: Mucuna flagellipes, open field maze, locomotor, mice.

INTRODUCTION

Mucuna flagellipes commonly known as ‘Ibie or agbara’ in the Igbo part of eastern Nigeria, belongs to the family Fabaceae. It is found in the woodlands of tropical areas of the country (Hutchison and Dalziel, 1973). The flowers are creamy white or yellowish while the leaves are greenish with leaflets which are broadly oval (Hutchison and Dalziel, 1973). The Mucuna plant possesses useful phytochemicals of high medicinal values to humans (Sridhar and Bhat, 2007). The seeds are good source of food for some ethnic groups in Asia and Africa (Iyai and Egharevba, 1998; Adebowale and Lawal, 2003; Afolabi et al., 1985; Diallo et al., 2002; Emenalom et al., 2004).

It is a common practice by the eastern people of Nigeria to squeeze the leaves of Ibie (M. flagellipes) in water and take it orally in order to boost the blood level and to cure other ailments. Therefore, this study is designed to investigate the effects of chronic consumption of the Ibie leaf on locomotor behavior. The date obtained could show the potentials of this underutilized plant in medicinal purpose such as in the management and treatment of locomotor disorders.

MATERIALS AND METHODS

Animals

Twenty-five (25) Swiss mice were bought from the Michael Okpara University of Agriculture, Umuahia, Abia State, Nigeria, weighing between 18 and 22 g for the study. The animals had access to food and clean drinking water and were fed ad libitum and kept in well ventilated room under room temperature (25 ± 1°C), humidity (85 ± 4%) and 12/12 h light/dark cycle and allowed two weeks for acclimatization to the research environment before the experiments. The mice were housed singly in metabolic cages where food and water intake were monitored. They were randomly assigned into two groups, group A and B of 9 mice each. Group A was the control, while groups B were the test group. Animals in group A received normal rat...
chow, while animals in group B received the Ibie diet for a period of 30 days.

**Experimental procedure**

The open field test was used to access locomotor behaviour. The floor of a square plastic board (72 × 72) with plastic side of 30 cm high was divided into 16 squares. A central square (18 × 18 cm) was drawn at the middle of the open field. The central square has sufficient space surrounding it to give meaning to the central location as being distinct from the outer locations. The mice were individually placed in the corner of the open field maze and allowed to explore the area freely. The activity level was expressed as the total number of squares crossed and the rearing frequency during a 5-min testing period. The maze was cleaned with 70% ethyl alcohol and permitted to dry between trials. Mice were placed back into the colony room while cleaning the apparatus in bright light conditions.

**Statistical analysis**

All results were shown as mean ± SEM. Differences between means of the two groups were compared using Student’s *t* test or the Mann-Whitney *u* test, depending on whether the data were normally distributed. SPSS for Windows 11.5 software was used for statistical analysis. In all cases, significance level was set at *P*<0.05.

**RESULTS AND DISCUSSION**

**Behaviors scored in the open field maze (OPM)**

**Line crossing**

Figure 1 compares the frequency of line crosses between the two groups of mice for locomotor behavior. The number of lines crossed by the mice were 35.80± 4.97 (control) and 19.60± 1.32/5 min (ibie leaf). The results shows that the frequency of line crosses of the Ibie leaf fed mice was statistically lower (*P*<0.01) as compared to control.

**Rearing frequency**

The frequency of rearing in the open field for control mice and Ibie leaf was 3.00 ± 0.70 and 0.60 ± 0.04/5 min (ibie leaf) respectively. The graph in Figure 2 shows that the frequency of rearing in the test group when compared was significantly different at (*P*<0.01) as compared to control.

**Centre square duration**

Figure 3 compares the centre square duration which is a measure of locomotion in the two experimental groups. The values are: 0.60 ± 0.00 (control) and 0.00 ± 0.00 (ibie leaf). The duration of centre square was not significantly different as compared to the control.

**Frequency of SAP**

Figure 4 shows the frequency of Stretch Attend Posture (SAP) between the two experimental groups. The values are: 0.80 ± 0.37/5 min (control) and 2.20 ± 0.48 (ibie leaf). The frequency of SAP of the group of fed Ibie leaf was statistically higher (*p*<0.05) as compared to control.

**Freezing duration**

The freezing duration between the mice administered 5-Hydroxytryptophan and control are: 41.80 ± 6.35 s and 25.00 ± 3.91 s. The duration of freezing for the group of mice fed Ibie leaf was significantly lower (0.05) as compared to control (Figure 5).
Rearing frequency (5 min)

**Figure 2:** Comparison of rearing frequency in the open field maze in the control and Ibie leaf treated groups. Values are mean ± SEM and n = 9. *p<0.01 vs. control.

Center square duration (s)

**Figure 3:** Comparison of centre square duration in the open field maze in the control and Ibie leaf treated groups. Values are mean ± SEM and n = 9. NS = Not significant.

Stretch attend posture (5 min)

**Figure 4:** Comparison of Stretch Attend Posture (SAP) in the open field maze in the control and Ibie leaf treated groups. Values are mean ± SEM and n = 9. *p < 0.05 vs. control.
The open field arena was used as an assay to access locomotor, exploratory and even anxiety related behavior in animals (Walsh and Cummin, 1976). The frequencies of line crosses and rearing were the direct indices used in measuring locomotors behavior even though the centre square entries, centre duration, freezing duration and frequency of stretch attend posture are also other behavioral indices used in measuring locomotor behavior.

The results of our research work showed that the frequencies of line crosses and rearing were significantly lower in the mice treated with the Ibie leaves when compared to the control, indicating a decrease in the locomotor behavior in the mice fed the *Mucuna flagellipes*. Similarly, the stretch attend posture was also significantly higher for the test group as compared to the control. The duration of centre square entry did not differ compared to control while the duration of freezing was lower for the test group as compared to the control.

Locomotion is been controlled by the central pattern generator of the spinal cord. Increase in dopamine level directly or indirectly result in hyper locomotion. Therefore, increase in dopamine level may probably be the reason for the hyperthermia of the brain and this has been known to be in correlation with increased locomotion (Brown and Kiyathin, 2003, Brown et al., 2004, Mesembe et al., 2008, and Kiyathin, 2005). Our study revealed that Ibie leaves may have inhibitory effect on the motor cortex such as the cerebellum, thus, decreasing locomotor activity in the experimental animals.

**Conclusion**

The results of this study indicate that *M. flagellipes* leaves decreased locomotor/exploratory behavior in mice.

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