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Research Article

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Mucuna Flagellipes Chronic Diet Consumption Improves Exploratory Behaviour and Body Weight in Mice

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Abstract

The use of Mucunaflagellipes in recent time has been on the increase as a result of its speculated therapeutic effect mostly on the protein level of the body. And owing to the fact that there are no detailed reports on Mucunaflagellipes on its effect on neurobehavioral parameters, this work is therefore intended to investigate the possible effects of this herb on the exploratory behavior and body weight in Swiss white mice. Twenty (20) mice of mixed sex were randomly divided in to two groups of ten mice each. Group 1 served as the control, while group 2 received the Mucunaflagellipes diet. The feeding lasted for 31 days. The open field maze task was used to assess exploratory behavior. All mice were allowed free access to clean drinking water. Daily food intake, water intake and body weight change were measured. Data were analyzed using the statistical tools (one way ANOVA and student t-test).The results showed that the Mucunaflagellipes diet fed mice had significantly increased ($p<0.01$; $p<0.05$) line crossings, close arm duration and stretch attend posture (SAP) compared to control. There was an increase in food intake and water intake ($p<0.001$ and $p<0.01$) compared to control. However, the body weight change was statistically higher but not significant when compared to the control group. Therefore, consumption of Mucunaflagellipes improves exploratory behavior and body weight in mice. These may be has a result of an unknown phytochemical compound present in Mucunaflagellipes.

Keywords: *Mucunaflagellipes*, Exploration, Body weight, Open field Maze, Mice

Introduction

The system of use of plants for food and drug dates back to the early man on earth [1]. The use of natural products with therapeutic properties for chronic and acute diseases is as ancient as human civilization [2, 3] and, for a long time, mineral, plant and animal products were the main sources of drugs [4].

Mucunaflagellipes which is commonly called cow itch and locally called *Ibie*, There are abundance of macro elements like calcium, magnesium and iron [5,6]. The pod hairs have been used in India to treat snakebite while in West Africa; it is the stem that is used for treating of snakebite [7-9]. Their stems have been reported to also improve sexual potency [8,10]. Its pods have also been used to deworm patients [11]. The use of *Mucunaflagellipes* in recent time has been on the increase as a result of its speculated therapeutic effect mostly on the protein level of the body [12]. And owing to the fact that there are no detailed reports on *Mucunaflagellipes* on its effect on neurobehavioral parameters, this work is therefore intended to investigate the possible effects of this herb on the exploratory behavior of Swiss white mice. The findings on the Swiss white mice can be extrapolated to humans with a fair measure of accuracy. Also, Based on the established fact that the demand of *Mucuna* is on the increase in the international market, its therapeutic significance elevated and the demand for enhancing neuro-cognitive performance are on the increase which can be seen in the rate at which students consume memory enhancing drugs like Nicotine, Caffeine and Amphetamine. Therefore this study is timely and justifiable as it will not only separate myth from fact alone, but also increase the demand for this plant, for the treatment and management of exploratory disorders.

Materials and Methods

Preparation and storage of experimental diet

Dried leaves of *Mucunaflagellipes* was obtained from a local market in Umuahia, Abia State, Nigeria and pulverized with manual blender to obtain a fine powder. The powder was then kept in a dry and air tight container from which the *Mucunaflagellipes* were prepared.30% of the *Mucunaflagellipes* diet was prepared by mixing 3g of *Mucunaflagellipes* and 7g of the rat fed. Approval for the use of the leave was authenticated in the Herbarium unit of the Department of Biological Sciences, Faculty of life Sciences, Abia State, Nigeria.

Experimental animals

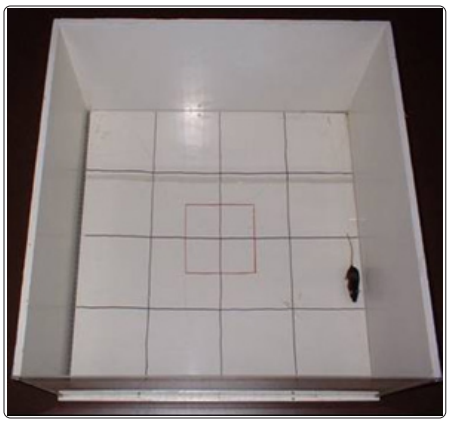
Experimental animals(mice) weighing between 20-21g were obtained from the animal house of the Department of Human Physiology,

Faculty of Medicine, Abia State University and housed in a new wired cages in the same animal house were the mice acclimatized for two weeks. Prior to the commencement of the experiments. The mice were housed under standard laboratory condition, light and dark cycles of 12hrs and were provided standard rodent pellet diet and water ad *libitum*. The mice were categorized into control and treated groups. The treated group was administered, in addition to feed and water for a period of four weeks.

Experimental Design: Twenty mice were assigned into two groups of ten mice per group. Group 1 served as the control, while the second group which is group 2 received the *Mucunaflagellipes* diet. The animals were placed on their respective diets for 31 days with their body weight assessed every 3 days. Approval of the animal was obtained from the college Ethical committee of the Faculty of Basic Medical Sciences, Abia State University, Uturu. In accordance with the accepted principles for laboratory animal use and care.

Assessment of exploratory behavior

The open field (OF) test, which provides simultaneous measures of locomotion, exploration and anxiety, was used for this study [13]. The open field apparatus is constructed from white plywood with a 72 x 72 cm floor and 36 cm walls. One of the walls is made of clear Plexiglas, so that mice could be visible in the apparatus. Blue lines are drawn on the floor with a marker and are visible through the clear Plexiglas floor. The lines divide the floor into sixteen 18 x 18 cm squares. A central square (18 cm x 18 cm) is drawn in the middle of the open field [14]. The central square has sufficient space surrounding it to give meaning to the central location as being distinct from the outer locations [15].



The open field apparatus Procedure

Mice were carried to the test room in their home cages and tested one at a time for 5-minutes each. Each mouse was scooped up in a small plastic container from their home cage and placed at the centre square of the open field, then allowed to explore the apparatus for 5-minutes. After the 5-minute test, each of the mice was scooped up from the open field with the plastic container and returned to their home cages. The number of urinations and defecations for each mouse was counted and recorded before the open field is cleaned with 70 % ethyl alcohol and permitted to dry between trials. This was to eliminate olfactory stimuli.

The behaviors scored, included [14]:

1. Line Crossing: frequency with which the mice crossed one of the grid lines with all four paws.
2. Centre Square Entries: frequency with which the mice crossed one of the red lines with all four paws into the central square.
3. Centre Square Duration: amount of time the mice spent in the central square.
4. Stretch Attend Postures: Frequency with which the animal demonstrated forward elongation of the head and shoulders.

Statistical analysis

All data obtained were analyzed by one way analysis of variance followed by post hoc student's t-test using the SPSS computer program. Results are presented as mean ± SEM and p value less than 0.05 was considered statistically significant.

Results

Effect of *Mucunaflagellipes* on exploratory behavior in mice

Line crossing

line crossing is a form of exploratory behavior. In the 30% w/w *Mucunaflagellipes* diet fed mice, the number of line crosses was 38.80±4.98/5mins, which was significantly higher($p<0.01$) compared to control which was 19.62/5mins.(figure 1).

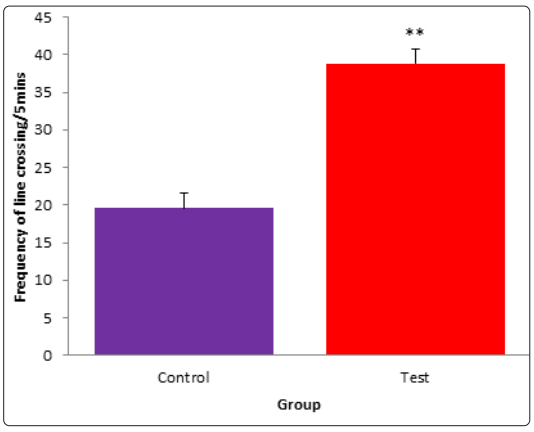


Figure 1: Effect of *Mucanaflagellipes* on line crossing in the open field maze among the experimental groups
****-Significant at p<0.01compared to control.**

Rearing frequency

The frequency of rearing in the 30% w/w *Mucunaflagellipes* diet group was 34.6±2.70/5mins and it was significantly higher ($p<0.01$) compared to control which was 7.55±3.00/5mins.See figure 2.

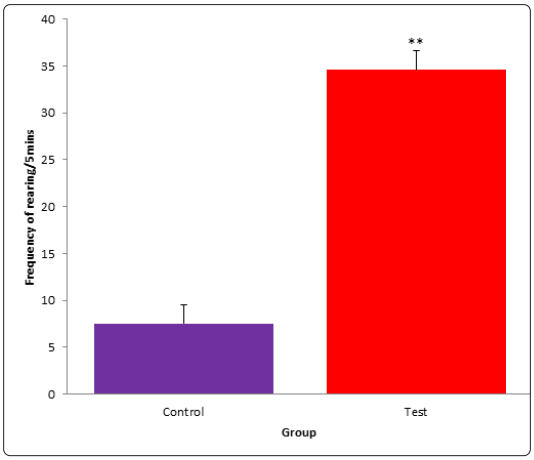


Figure 2: Effect of *Mucunaflagellipes* on rearing in the open field maze among the experimental groups.
****-Significant at p<0.01 compared to control.**

Centre square duration

The duration of time spent in the centre square the 30% w/w *Mucunaflagellipes* diet group was 94.40±3.75/Seconds; which was significantly higher($p<0.01$)compared to control which was51.22±3.46/Seconds. See figure 3

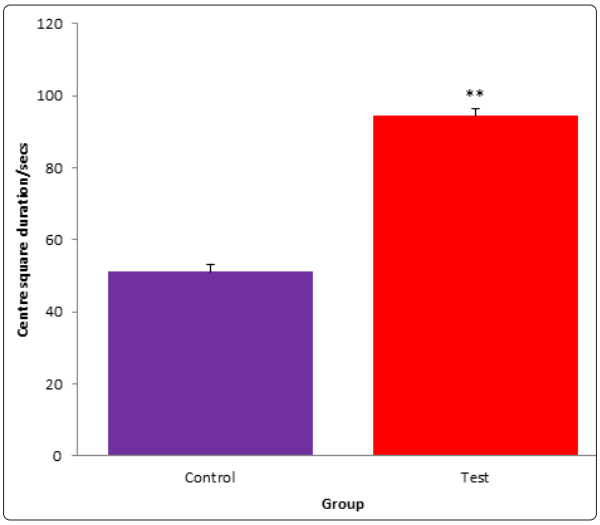


Figure 3: Effect of *Mucunaflagellipes* on centre square duration in the open field maze among the experimental groups.
****-Significant at p<0.01 compared to control.**

Stretch attend posture

The SAP activity in the test mice fed with 20% w/w *Mucunaflagellipes* diet was 2.40± 0.59/5mins;which was significantly higher($p<0.05$) compared to the control group which was 0.80±0.36/5mins.See figure 4.

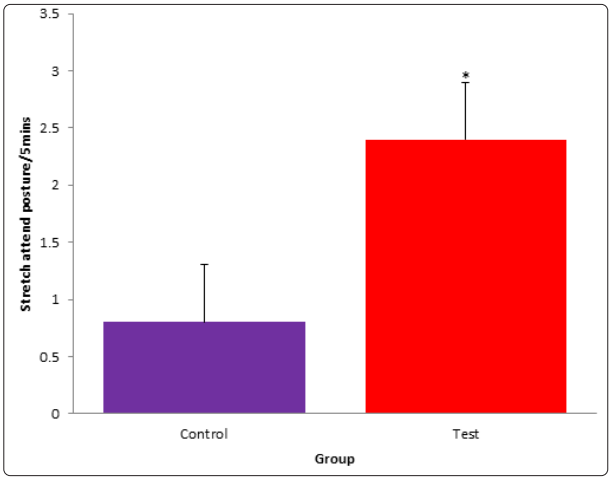


Figure 4: Effect of *Mucunaflagellipes* on stretch attend posture in the open field maze among the experimental groups.
***-Significant at p<0.01 compared to control.**

Effect of *Mucunaflagellipes* on body weight in mice

The body weight change for the 30% *Mucunaflagellipes* diet group was 26.4±1.07g, which was statistically higher but not significant, when compared to the control group which was 25.80±1.87g.See figure 5.

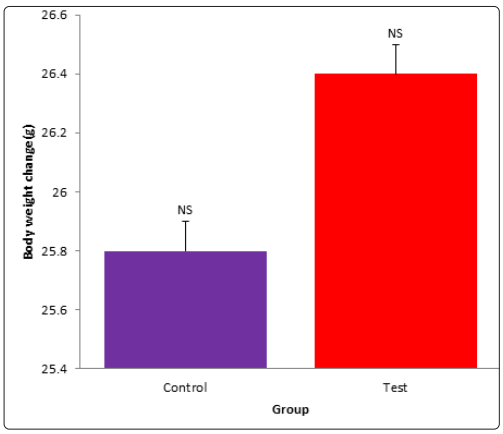


Figure 5: Effect of *Mucunaflagellipes* on body weight change among the experimental group.
NS- Not significantly different.

Food intake

The food intake for the 30% *Mucunaflagellipes* diet group was 48.30±1.63g which was significantly higher ($p<0.001$) compared to the control group which was 30.50±11.86g.See figure 6.

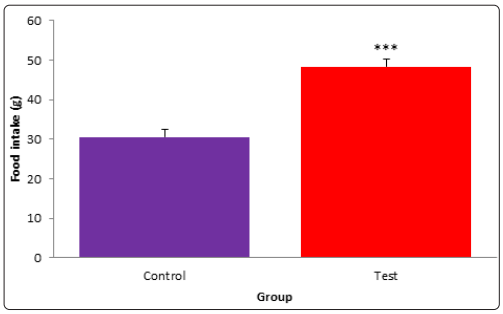


Figure 6: Effect of *Mucunaflagellipes* on food intake among the experimental group.
*****-Significant at p<0.001 compared to control.**

Water intake

The water intake in the 30% *Mucunaflagellipes* group was 46.00±11.69mls which was significantly higher ($p<0.01$) compared to the control which was 27.70±16.43mls.See figure 7.

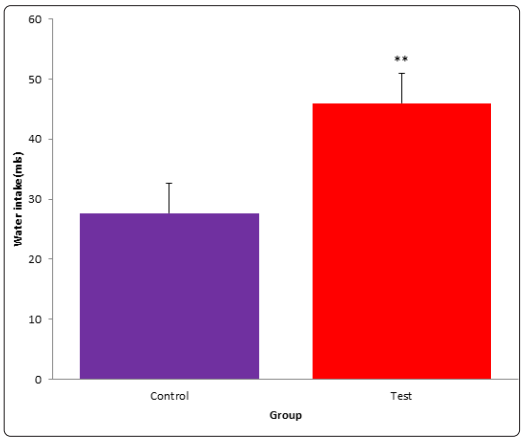


Figure 7: Effect of *Mucunaflagellipes* on water intake among the experimental groups.
****-Significant at p<0.01 compared to control.**

Discussion

Centre square duration, walling, line crossing and rearing are usually used as measures of exploration and anxiety, the greater the frequency of these measures, the greater the exploratory behavior. In this study, the 30% of *Mucunaflagellipes* diet group had a higher exploratory activities compared to the control as seen in the line crosses, rearing and centre square duration. The centre square duration is measures of exploratory behavior and anxiety, with higher frequency of these activities, indicating higher exploratory behavior and lower anxiety level [13]. In this study, the 30% *Mucunaflagellipes* diet group had higher exploratory behavior as when compared to the control group. Exploration as well as locomotion activation results from brain activation which in turn manifest as excitation of the central neurons and eventually leads to an increasein cerebral metabolism. It has been reported that exploratory activation that occur naturally, such as (rearing, grooming, etc) and inhibition like rest and sleep may differ in its underlying mechanisms for similar behaviors induced by drugs [16]. Pharmacological increase in dopamine either directly or indirectly by dopamine agonists result in higher exploratory/ locomotor activity [17].Therefore, increased dopamine which may be a reason for brain hyperthermia has been known to correlate with increased exploration [18-20].

The mean daily food intake for the *Mucunaflagelipes* diet group was significantly higher compared to control. Food and water intake is controlled by the lateral hypothalamic nucleus and the ventromedial hypothalamic nucleus [21]. The lateral hypothalamic nucleus is the hunger centre and so, when stimulated the animal eats and drinks voraciously. On the other hand, ventromedial hypothalamic nucleus is the satiety centre and so, when stimulated the animal stops feeding. It is possible therefore, that the 30% *Mucunaflagellipes* diet may have a stimulatory effect on the lateral hypothalamic nucleus thus causing hunger, thereby increasing food intake. Similarly, the mean water intake was also significantly different between the test groups and the control group. Water intake is controlled by the Osmoreceptors or 'thirst' receptors in the hypothalamus [22]. It is likely that certain unknown chemical constituents in *Mucunaflagellipes* may be responsible for the stimulation of the thirst centre thus increasing thirst. The mean body weight change was statistically higher in the *Mucunaflagellipes* diet group but not significant when compared with the control. This may be attributed to the increase in food and water intake observed in the mice fed with *Mucunaflagellipes* diet.

Conclusion

Our study revealed that *Mucunaflagellipes* improves exploration and body weight in mice. These effects may be due to the total constituent of *Mucunaflagellipes*.

Conflict of interest: The authors declare no conflict of interest.

References

1. Miller LG (1998) Herbal medicine: selected or potentiating herb interaction. Archives of internal medicine 158: 2200-2211.
2. Borris RP (1996) Natural product research. J. Ethnopharmacol 51: 29-38.
3. Dureja H, Kaushik D, Kumar V (2003) Developmentats in nutraceuticals. Indian J.Pharmacol 35: 363-372.
4. A depasquale (1984) Pharmacognosy: the oldest modern Science. J. Ethnopharmacol, 11: 1-16.
5. Rajaman N, JonardhamanK (1991) The botanical composition and nutritional potential of the tribal pulse, Mucunagigants (wild) DC plant food for human. Nutrition 5: 45-51.
6. Sexena P (2001) Records of Aphis craccirora Koch (He nipteraaphidae) on medicinal crop. Mucunapuriens L. Chh. Athisgarh (India).Insect environment 7: 24-25.
7. Weiner BA (1984) Cognitive (attribution)-emotion-action model of motivation behavior: Analysis of judgments of help-giving. Journal of Personality and Social Psychology 32: 186-200.
8. Siddhuragu PK, Vijiayakumari, Jonardiam K (1996) Chemical composition and protein quality of little known legumes velvet (LDC). Journal of Agricultural and food chemistry 44: 2636-2641.
9. Houghton J (1994) Flora of West Africa 1: 10-15.
10. Thompson W (1978) Medicine from the earl company Maiden head, United Kingdom.McGraw-Hill book.1.
11. FaridahHanum I, Van der Maesenh J (1996) Prosea handbooks No 1, auxiliary plants pros seal Bogor, Wagering. Netherlands 16-17.
12. Farooqui IS, Jebb SA, Landmack E, Cheetham CH, Prentice AM, et al. (1999) Effect of recombinant Leptin therapy in child with congenital Leptin deficiency, Engl J Med 341: 879-884.
13. Walsh RN, Cummins RA (1976) The open field test: a critical review. Psychological Bulletin 83: 482-504.
14. Brown R E, Corey S C, Moore A K (1999) Differences in measures of exploration and fear in MHC-congenic C57BL/6J and B6-H-2K mice. Behavior Genetics 29: 263-271.
15. Carrey NR, Mcfayden MP, Brown RE (2000) Effects of chronic methylphenidate administration on locomotor and exploratory behaviour of Prepubertal mice. Journal of Child and Adolescent Psychopharmacology 10: 277-286.
16. Brown PL, Bae D, Kiyatkin E A (2007) Relationship between locomotor activation and alteration n Brain temperature during selective blockade and stimulation of dopamine transmission. Neuroscience145: 335-345.
17. Wise RA, Bozarth MA (1987) A Psychomotor stimulant theory of addiction. Psychological Review 94: 469-492.
18. Brown PL, Kiyathin EA (2003) Brain hyperthermia is induced by methamphetamine and exacerbated by social interaction, J. Neurosci 23: 3924-3929.
19. Brown PL, Wise RA, Kiyathin EA (2004) Brain hyperthermia induced by MDMA (ecstacy): modulation by environmental conditions, Eur .J 20: 51-58.
20. Kiyathin EA (2005).Brain hyperthermia as physiological and pathological phenomena. Brain Res Rev 50: 27-56.
21. Osim EE (2008) Neurophysiology. Calabar. University of Calabar Press. 24-27.
22. Guyton AC, Hall JE (2006) The nervous system. Textbook of Medical Physiology. London: Saunders Company. 675-701.

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