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The Effect of Bitter Kola (Garcinia Kola) on Open Field Test

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The open field test is a common measure of exploring behaviour and general activity in both mice and rat. This study was carried out to investigate the open field movement effect of administration of Bitter kola (Garcinia kola) extract on wistar rats. Fifteen adult wistar rats were purchased, weighed and divided into three groups of five per group. They were allowed access to rat feed and water ad-libitum for two weeks period of acclimatization. Different dosages of Garcinia kola extract were administered to group two (200mg/kg body weight) and group three (300mg/kg body weight) respectively, while group one (control group) received clean water and rat feed. The study lasted for four weeks (28 days). A dose dependent response was observed. Open field movement test was determined using open field apparatus and light-dark transition box.Results indicate that high dose and prolonged duration of administration of the extract decreased food intake, increased defecation and urination, reduces body weight and increase sexual drive compared to the control. An increasedanxiety and decreased exploratory activity was observed.

Key Words: Garcinia Kola, Open Field Test, Locomotion Activity

INTRODUCTION

Open field test (OFT) is an experiment used to assay general locomotion activity levels and anxiety in rodents in scientific research.[1]Itis a commonly used qualitative and quantitative measure of general locomotion activity and willingness to explore in rodents.[2]The open field test provides simultaneous measures of locomotion, exploration and anxiety. The number of line crosses and the frequency of rearing are used as measures of locomotors activity and a high frequency of these behaviours indicates increased locomotion.[3]

Bitter kola also known as Garcinia kola is a tropical flowering plant found in western and central Africa and it produces brown, nut-like seeds. It has been used in African culture for centuries for both traditional and medicinal purposes.Garcinia kola is called kola bitter, bitter kola, false or male kola. They are commonly called "Agbilu" in Igbo land, "Namijimgoro"inHausa and "Orogbo" in Yoruba land of Nigeria.[4] It is also commonly called "Akan" in Izon and Urhobo land.Its chemical constituent includesFlavinoids, Xantheries and Benzophenones.[5]Garcinia kolabelongs to the family of Guttiferae and is found mainly in the tropical rain forest region of central and West Africa.[6] It is predominant in rainforest belt of Southern Nigeria.[7]You can identify bitter kola as nut with brownish outer cover while the inner part is yellow in colour. Bitter kola contains a juicy substance which is assumed to be the active ingredient. Garcinia kola has shown anti-inflammatory, anti-parasitic, anti-microbial and anti-viral properties.[8]Garciniakola has a general anecdotal effect in folk medicine Africa.[9]Garcinia kola may be acting as antioxidant to either inhibit or slow down the progression of symptomatic knee osteoarthritis(KOA). It is also known to relief pain.Bitter kola is believed to have aphrodisiac properties.[9]It is also used as an antidote for venomous stings and bites, and in the treatment of diarrhoea and dysentery.[4]The aim of this study is therefore to investigate the open field effect of garcinia kola on wistar rat.

MATERIALS AND METHODS

Fresh Garcinia kola seeds were purchased and identified by the Pharmacology department Delta State University Abraka. The outer coat of each bitter kola seed were remove, washed and the seeds cut into pieces and air-dried. The dried seeds were ground to fine powder and extraction done using 70% alcohol in a soxhlet extraction. The yield was concentrated by evaporation in a water bath and dried to solid form. 2.0g of the extract was measured out and dissolved in 100ml of distilled water to give 20mg/ml.[10]The solution was refrigerated until required for use.Fifteen adult wistar rats weighing between 150-250g were divided into three groups of five rats per group after two weeks period of acclimatization. Group one (control) group receivedrat feed with clean drinking water daily. Group

two received rat feed and clean drinking water freely with Garcinia kola extract (200mg/kg body weight) orally once daily for four weeks. Group three received rat feed and clean drinking water freely with Garcinia kola extract (300mg/kg body weight) orally once daily for four weeks.

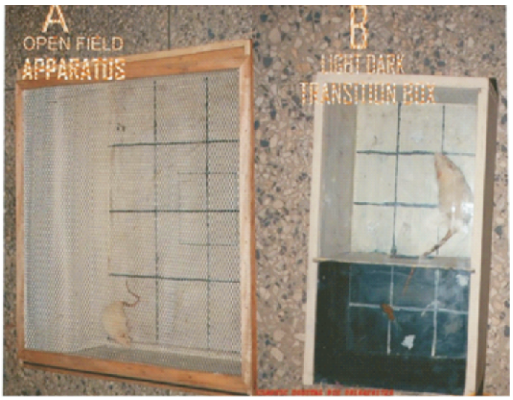


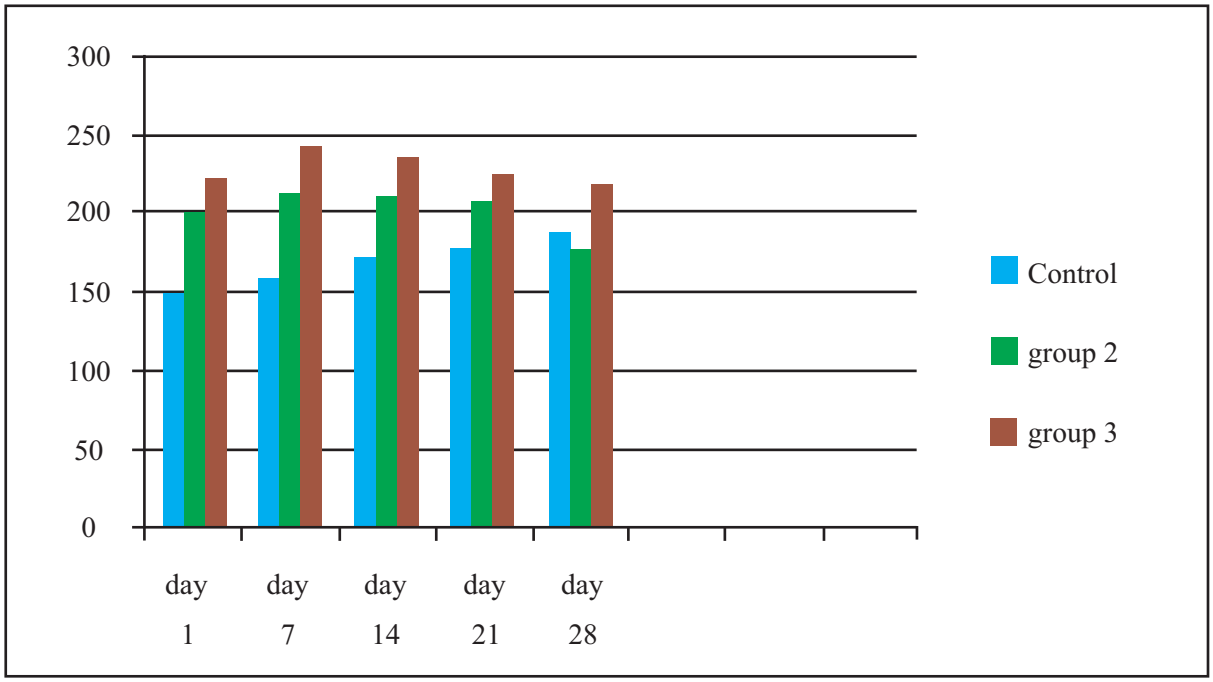
Figure 1: Showing wistar rat displaying in the open field apparatus (A) and (B) showing wistar rat displaying in the light-dark transition box

The open field apparatus was constructed of white plywood and measured 72 x 72 cm with 36cm walls. One of the walls was clear Plexiglas, so rats could be visible in the apparatus. Blue lines were drawn on the floor with a marker and were visible through the clear Plexiglas floor.The lines divided the floor into sixteen 18 x 18 cm squares. A central square (18 cm x 18 cm) was drawn in the middle of the open field.[11]The central square is used because some rats have high locomotor activity and cross the lines of the test chamber many times during a test session.[12] Rats were placed into the centre or one of the four corners of the open field and allowed to explore the apparatus for 5 minutes. After the 5 minute test, rats were returned in their home home cages and the open field was cleaned with 70 % ethyl alcohol and permitted to dry between tests. To assess the process of habituation to the novelty of the arena, rats were exposed to the apparatus for 5 minutes on 2 consecutive days. The behaviour scored[11] included:

1. Line Crossing: Frequency with which the rat crossed one of the grid lines with all four paws.
2. Centre Square Entries: Frequency with which the rat crossed one of the red lines with all four paws into the central square.
3. Centre Square Duration: Duration of time the rat spent in the central square.
4. Rearing: Frequency with which the rat stood on their hind legs in the maze.
5. Stretch Attend Postures: Frequency with which the animal demonstrated forward elongation of the head and shoulders followed by retraction to the original position.
6. Grooming: Duration of time the animal spent licking or scratching itself while stationary.
7. Freezing: Duration with which the rat was completely stationary.
8. Urination: number of puddles or streaks of urine.
9. Number of fecal boli produced.

Table 1: Mean and standard deviation of body weight

GROUP	N	First week	Second week	Third week	Fourth week
Group 1 (control)	5	[illegible]	159.00± 9.43	172.00± 9.68	178.00± 9.27
Group 2	5	200.00± 4.45	205.00± 4.86	210.00± 4.79	208.33± 4.40
Group 3	5	222.00± 9.68	243.75± 10.45	236.25± 10.20	225.00± 9.60



Graph 1: showing changes in average body weight during administration of Garcinia kola extract.
Table 1 and graph 1 shows there was a marked increase in body weight from the first to the third week of administration and decrease in the fourth week of administration for animals in group two while for animals in group three there was a marked decrease in body weight from second to fourth week when compared to the control group. Values were subjected to statistical analysis using one way analysis of variance, weight decrease was not significant in group two but significant in group three ($p < 0.05$).

Table 2: Physical observation of ratsin group two during administration of Garcinia kola

	First week	Second week	Third week	Fourth week
Food Intake	Normal	Increase	Increase	Increase
Water Intake	Normal	Increase	Increase	Increase
Defecation/Urination	Normal	Normal	Increase	Increase
Rearing/Grooming	Positive	Positive	Positive	Positive
Sexual Drive	Nil	Nil	Increase	Increase
Body Weight	Increase	Increase	Increase	Decrease

Table 3: Physical observation of rats in group three during four weeks of administration of Garcinia kola extract

	First week	Second week	Third week	Fourth week
Food Intake	Increase	Increase	Decrease	Decrease
Water Intake	Increase	Increase	Decrease	Decrease
Defecation/Urination	Increase	Increase	Increase	Increase
Rearing/Grooming	Positive	Positive	Positive	Positive
Sexual Drive	Increase	Increase	Increase	Increase
Body Weight	Increase	Decrease	Decrease	Decrease

There was an increase in food and water intake in group two during the second to the fourth week of administration when compared to the control group. In group three food and water intake increased in the first and second week and decreased in the third and fourth week of administration when compared to the control group. There was also marked increase in sexual excitation in both groups two and three when compared to the control.

Table 4: Open field apparatus/light-dark (L/D) transition box test.

Group	Exploratory	Anxiety	Line Crossing	L/D box
Control	High	Low	All lines(16)	More in light box
Group 2	Low	High	About 10 - 12 lines	Both in light and dark box
Group 3	Lower	Higher	About 6 - 10 lines	More in dark box

Exploratory and Anxiety

There was mild decrease of exploration and mild increase of anxiety in group two compared to the control and marked decrease of exploration and increase of anxiety in group three compared to the control group.

DISCUSSION

In order to assess the effect of the consumption of Bitter kola (Garcinia kola) extract on the open field movement behaviour in adult wistar rats, the open field apparatus and the light- dark transition box (L/D) were employed. This method is in line with Podhorna and Brown who used the open field apparatus to assess the measures of locomotion, exploration and anxiety of animals in a novel environment[13]. Prut and Belzungused open field test to assess anxiety by including additional measures of defecation, time spent in the centre of the field and the first few minutes of activity[14]. The locomotors behaviours assessed in this study included line crossing, rearing, grooming and frequency of light-dark transition in the light-dark transition box. The frequency of line crossing for group two and group three are significantly different when compared to the control group.Also the frequency of rearing and grooming behaviour for both group two and three are lower compared to the control. The decrease locomotors activity following the different dosage of the Garcinia kola extract is due to the little caffeine content in the Garcinia kola. This is in consonance with the reports of Odebunmi,who stated that bitter kola contains caffeine[15]. The depressive state is likely to lead to a decrease in locomotors and exploratory behaviour as shown by the results of this study. Also there is reduced rearing and grooming behaviour. Since the amount of caffeine consumed was not increased to maintain its stimulant action, it is conceivable that the wistar rats were mildly depressed after consumption of different dosage of the Garcinia kola extract as shown by the decrease in locomotion. There is mild frequency of stretch attend postures. This is in line with Blanchard et al., who stated that stretch attend postures are risk assessment behaviours which indicate that the animals is hesitant to move from its present location to a new position and thus a high frequency of these postures indicates a higher level of anxiety[16]. Prolonged and higher dose consumption decreased food intake and body weight. This is in consonance with Olayinkawho reported that bitter kola promoted weight loss; it seems to suppress hunger and boosted serotonin levels in the brain[17]. The results also showed prolonged consumption of Garcinia kola increase defecation and urination. This is in consonance with Odebunmi et al., who reported that bitter kola is also rich in theobromine[15]. The results also showed increased sexual behaviour[18]. This study is in consonance with the report of Olayinka and Odebunmi et al., who stated that bitter kola is also believed to be an Aphrodisiac (an agent that stimulates sexual excitement)[15,17]

In conclusion the present study shows that Garcinia kola has effect at various dosages on the open field movement activities in wistar rats. Its consumption caused mild decrease in locomotors activities. Furthermore, high dosages and prolonged consumption of bitter kola decreased food intake and body weight by its suppressant to hunger. Also high dosages of consumption caused increased sexual drive behaviour. If these results are applicable to man, Garcinia kola with prolonged consumption could be used to suppressed hunger and reduce body weight in obese persons which is a major problem to much individual, also prolonged consumption could be used to increase sexual drive in persons with poor sexual performance.

It can be used to cure impotence since it increases blood flow to the genital area in men which hardening of the arteries leads to penile erection. Garcinia kola contain Theobromine which have the effect of diuretic and its ability to dilate blood vessels, it can therefore be used to treat high blood pressure and edema.

REFERENCES

1. Denenberg VH. Open field behaviour in the Rat (Experimental approaches to the study of emotional behaviour) 1969; 852-859.
2. Stanford SC. 'The open field test: Reinventing the wheel'. Journal of psychopharmacology 2007; 21 (2): 134.
3. Walsh RN and Cummins RA. The Open-Field Test: a critical review. Psycho. Bull. 1976; 83 (3): 482-504. Pub. Med. 17582919 MGl
4. Aluka. Entry for Garcinia kola Heckel (Guttiferae). The useful plants of West Tropical Africa, Burlill, H. M. 1985; vol. 2.
5. Heckel E and Schlagdenhauffen F. Some African kola, in their botanical, chemical and therapeutical aspects. Pharmacy 1884; 56: 81-177.
6. Uko OJ, Usman A and Ataja AM. Some biological activities of Garcinia kola in growing rats. VerterinarskiArhiv, 2001; 71: 287-297.

7. Agada PO and Braide VB. Effect of dietary Garcinia kola seed on selected serum electrolytes and trace metals in male albino rats. Nigerian journal, physiol sci., 2009; 24: 53-57
8. Olajide OA. Investigation of the effect of selected medicinal plants on experimental thrombosis. 1999; 13 (3): 231-232.
9. Adaramoye OA, Farombi EO, Adeyemi EO & Emerole GO. Comparative study on the antioxidant properties of flavonoids of Garcinia kola seeds. Journal. Med. Sci. 2005; 21 (3): 331-339.
10. Akantah et al., Effects of Garcinia kola seed extract on ovulation, oestrous cycle and fetal development in cyclic female Sprague-dawley rats. Nigerian Journal of physiological sciences. 2005; 20(1-2): 58-62.
11. Brown RE, Corey SC, Moore AK. Differences in measures of exploration and fear in MHC-congenic C57BL/6J and B6-H-2K mice. *Behavior Genetics*, 1999; 26: 263-271.
12. Carrey N, McFadyen MP, Brown RE. Effects of chronic methylphenidate administration on the locomotor and exploratory behaviour of prepubertal mice. *Journal of Child and Adolescent Psychopharmacology*, 2000; 10: 277-286.
13. Podhorna J and Brown RE. Stain differences in activity and emotionality do not account for differences in learning and memory performance between C57BL/6 and DBA/2 mice. Genes Brain Behav. 2002; 1(2): 96-110. Pubmed 12884980 mGl.
14. Prut LJ and Belzung C. The open field as a paradigm to measure the effects of drugs on anxiety like behaviour: a review. European Journal of pharmacology 2003; 463 (1-3): 3-33.
15. Odebunmi EO, Oluwaniyi OO, Awolola GV, Adedeji OD. Wonders of bitter kola proximate and nutritional composition of bitter kola. African journal of biotechnology. 2009; 8(2): 301-310.
16. Blanchard DC, Griebel G, Blanchard RJ. Mouse defensive behaviors: Pharmacological and behavioral assays for anxiety and panic. *Neuroscience and Biobehavioral Reviews*, 2001; 25: 205-218.
17. Olayinka OA. Effect of Garcinia kola against arthritis symptoms. Journal of Orthopedics surgery and research. 2008.