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THE INFLUENCE OF KOLANUT (*COLA NITIDA*) ON EXPLORATORY BEHAVIOUR IN RATS

R.R. Ettarh[1], S.A. Okoosi[1] and M.U. Eteng[2]

[1]Department of Human Physiology, Ahmadu Bello University, Zaria, Nigeria
[2]Department of Biochemistry, University of Calabar, Calabar, Nigeria

ABSTRACT

*The effect of oral administration of an aqueous extract of kolanut (*Cola nitida*) on exploration of a Y-maze was investigated in rats. The number of entries made into all the arms of the maze and the frequency of rearing following administration of the extract was determined over 20 min, and repeated 24 h later without administration of the extract. Both the extract (400 and 800 mg/kg) and caffeine (15 mg/kg) caused significant increases in the number of entries, but reduced the frequency of rearing. The extract did not significantly reduce the number of entries after 24 h. It is suggested that kolanut stimulates exploratory locomotor activity due to its caffeine content, but does not enhance habituation.*

INTRODUCTION

Kolanut *Cola nitida* L. (Sterculiaceae) is very widely consumed in various parts of West Africa (Brouk, 1975). In most parts of Nigeria it is chewed as a stimulant and for its inhibitory effects on fatigue and hunger. It is also used in the manufacture of non-alcoholic beverages (Tyler et al., 1981). Despite the widespread use of this nut, very little has been done to investigate its psychopharmacological effects. Caffeine accounts for not less than 2% of the composition of kolanut (Greden, 1979). Studies have shown that caffeine increases locomotor activity (Berkowitz et al., 1970; Thithapandha et al., 1972), enhances exploratory behaviour, and improves memory and learning (Flood et al., 1978). The present study has been carried out to investigate the effects of an aqueous extract of kolanut on exploratory behaviour in rats.

Keywords: Cola nitida, Y-maze, exploratory behaviour.

Address correspondence to: R. Ettarh, Department of Physiology, College of Medical Sciences, University of Calabar, Calabar, Nigeria. E-mail: rettarh@unical.anpa.net.ng.

MATERIALS AND METHODS

Extract Preparation

Fresh nuts were collected at Zaria, Nigeria and identified and authenticated at the Herbarium, Department of Biological Sciences, Ahmadu Bello University, Zaria, Nigeria. Voucher specimens were also deposited at the unit.

Fifty grams of the nut were pulverized and soaked for 2 h in 100 ml of distilled water. This was filtered and the residue was discarded. The filtrate was evaporated to dryness in an aeration oven at 60 °C. Appropriate doses of the dried extract were suspended in 1 ml of distilled water for oral administration to the animals.

The Maze

The maze had an equilateral triangular centre with each arm beginning from each side of the triangle and extending radially away from the centre, forming a Y shape. Each arm had a floor, two sides and a closed extreme end. The other end of the arm at the centre was open to allow for movement from one arm into another. The three arms were made as similar as possible to prevent preference on the part of the animal when introduced into the maze (Shillito, 1967).

The maze was made entirely of wood, and each arm was 62 cm long, and 12.5 cm wide. The height of the walls were 21 cm from the floor of the maze. The maze stood on the floor and was lit by a 60 W lamp hanging at a distance of 1.5 m directly above its centre.

Table 1. Effect of kolanut and caffeine on total number of entries into the arms of the maze.

Treatment	Day 1	Day 2
Control	16.5 ± 1.95	10.8 ± 2.07*
Kolanut extract (400 mg/kg)	23.8 ± 1.72*	20.5 ± 2.10
Kolanut extract (800 mg/kg)	27.0 ± 2.13*	24.2 ± 2.06
Caffeine (15 mg/kg)	30.2 ± 4.88*	19.0 ± 2.62**

Values are means ± SE, n = 6
*($P < 0.05$) vs control (day 1)
**($P < 0.05$) vs caffeine (day 1)

Table 2. Effect of kolanut and caffeine on total number of rears.

Treatment	Day 1	Day 2
Control	96.7 ± 4.07	75.8 ± 3.86**
Kolanut extract (400 mg/kg)	56.5 ± 5.74*	44.2 ± 3.78#
Kolanut extract (800 mg/kg)	45.8 ± 4.37*	30.3 ± 1.66
Caffeine (15 mg/kg)	20.5 ± 2.11*	16.5 ± 1.47

Values are means ± SE, n = 6
*($P < 0.001$) and **($P < 0.05$) vs control (day 1)
($P < 0.05$) vs kolanut extract (400 mg/kg) (day 1)

Exploratory Activity

Male Wistar rats (100–150 g) were randomly divided into groups each of 6 animals and were allowed five days for conditioning. Rat chow and tap water were provided *ad libitum* except during the period of observation in the Y-maze. Two groups of animals were administered the kolanut extract (400 and 800 mg/kg), and a third group received caffeine (15 mg/kg, Sigma, UK) orally. The last group served as control and was given the vehicle (1 ml of distilled water).

On the first day of the experiments, the animals were taken to the laboratory, weighed and administered the drug. The drugs were given 30 min before the rats were placed in the Y-maze. Each rat was put in the centre of the maze and observed through a window for 20 min. During this time, the number of entries into each arm of the maze, and the number of rears were recorded. The animal was returned to the cage and the procedure was repeated 24 h later, but without administration of the drug.

Statistical Analysis

All results are expressed as mean ± SE. Differences between means were tested for significance by Student's *t*-test (paired and unpaired).

RESULTS

The effects of caffeine and an aqueous extract of kolanut on the total number of entries made into the arms of the Y-maze are shown in Table 1. There was a reduction in the number of entries on the second day compared with the first day in all the groups, but this was not significant in the groups administered the kolanut extract. Both caffeine and the extract caused significant increases in the number of entries on the day of administration.

All the groups showed reductions in the frequency of rearing on the second day, but these were significant only in control animals and those administered the low dose of the extract (400 mg/kg) (Table 2). The number of rears on both days were significantly higher in the control group than in those administered caffeine or the kolanut extract (Table 2).

DISCUSSION

The results of the present study demonstrate that kolanut causes an increase in locomotor exploratory activity. The increase in the number of entries made by the rats into the arms of the maze following administration of the extract (400 and 800 mg/kg) is probably

due to the presence of caffeine in kolanut (Brouk, 1975). A stimulant effect of caffeine on locomotor activity at doses as low as 1–2 mg/kg in mice has been reported (Natsuno & Inada, 1972; Waldeck, 1975). Based on the estimated caffeine content of the extract, these reports agree with the results obtained in this study. The significant decline in locomotor exploratory activity on the second day following the administration of caffeine indicates the occurrence of habituation. This response is indicative of retention and transfer of some experience from the first day. Shillito (1967) suggests that the decrease in movement observed on the second day can be taken to demonstrate that learning has taken place. The rats given the extract did not show significant habituation. These results confirm the effect of caffeine on habituation (Holloway & Thor, 1983), and also suggests that kolanut does not enhance memory and learning as strongly as caffeine. This difference may be due to the presence of other constituents in kolanut which might disrupt the habituation response induced by caffeine. The significant reduction in the number of rears seen with both the extract and caffeine indicates that caffeine may preferentially stimulate exploratory activity of certain types. Other studies of the actions of the constituents of kolanut may further explain the mechanisms underlying its effects.

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