

Short communication

Effects of Aqueous Extract of Kola Nut (*Cola Nitida Rubra*) on Reproductive Hormones in Rats

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Summary: Our previous study suggests that aqueous extract of kola nut had effect on reproductive hormones in male rats. This study evaluates the effects of kola nut extract on plasma level of testosterone and luteinizing hormones in male rats. 30 adult male rats were used. These were divided into three groups: group A served as control and it received water only, group B and C received kola nut extract only (8mg/kg body weight), C served as recovery group. All the groups were treated for four weeks. The C which served as recovery group was allowed to recover for another four weeks at the end of the extract administration period. The plasma level of testosterone was significantly increased ($p < 0.05$) while that of luteinizing hormone was significantly decreased ($p < 0.05$) when compared with control animals. The recovery group showed values that were insignificantly lowered but a bit closer to those of the control animals. This showed that the rats were able to recover to some extent after the extract administration.

Keywords: Kola nut, Testosterone, Luteinizing hormone, Rat.

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INTRODUCTION

Kola nuts are the seed pods of various evergreen trees that are native to Africa. In West Africa and Sudan, are popular masticatory (Russel, 1955). They are important in various social and religious customs and may also be used to counteract hunger and thirst. In Nigeria for instance the rate of consumption of kola nut especially by students is very high as a principal stimulant to keep awake and withstand fatigue (Purgesleve, 1977).

Somorin (1973) reported that caffeine, theobromine and theophylline found in kola nut are xanthine stimulants. Ogotuga (1975), suggested that caffeine content of kola nut could be as high as 7% and is often considered to be the agent responsible for the physiological or clinical effect of kola nut in man and other mammals (Chukwu *et al.*, 2006). Caffeine was first isolated from green coffee beans in 1820. It was later found in tea mate and kola nuts. Caffeine (1,3,7-trimethylxanthine) is a psychoactive drug, a methylated xanthine that naturally occurs in many foods beverages consumed daily in nearly all countries. Coffee, tea, carbonated beverages and cocoa (Burker & Williams, 1979) are the main sources of caffeine. Moreover, various pharmaceutical products contain caffeine in combination with other drugs (Rall, 1980). Caffeine and some of its metabolites have been suggested as

risk factors in birth defect (Jacobson *et al.*, 1981), heart disease (Heyden *et al.*, 1978) and pancreatic cancer.

The popularity of caffeine is due to its stimulant action. Since it occurs naturally in more than 60 plant species, people may have consumed it as long as Paleolithic period.

Epidemiological studies have been advocated as the best approach to exploring any link between caffeine and reproductive outcome (Olsen, 1991). Caffeine has been implicated as a risk factor for delayed conception (Wilcox *et al.*, 1988; Williams *et al.*, 1990; Hatch and Bracken, 1993; Staton and Gray 1995; Bolumar *et al.*, 1997; Jensen *et al.*, 1998). In a cohort of 104 healthy women who attempted to become pregnant for 3 months, the high caffeine consumers (i.e. 1 cup of brewed coffee/day) were significantly less likely to become pregnant in each cycle [fecundity ratio: 0.53, 95% confidence interval (CI): 0.35, 0.79] than the lower caffeine consumers (i.e. <1 cup of coffee/day), while adjusting for age, frequency of intercourse, age at menarche, smoking, and a woman's prenatal exposure to her mothers' smoking (Wilcox *et al.*, 1988).

Caffeine consumption has also been implicated as a risk factor for spontaneous abortions (Srisuphan and Bracken, 1986; Fenster *et al.*, 1991; Armstrong *et al.*, 1992; Infante-Rivard *et al.*, 1993).

There is a relationship between caffeine and birth weight; a combined analysis of mean birth weight from 22 studies resulted in a significant decrease in birthweight of nearly 43 g among newborns of the heaviest-caffeine-consuming mothers (Santos *et al.*, 1998).

In 5476 subjects from an infertility clinic, coffee consumption was associated with increases in sperm concentration, abnormal forms, and motility. The combination of coffee drinking with smoking diminished sperm motility and increased the percentage of dead sperm (Marshburn *et al.*, 1989). Considering the potentials of caffeine, and the fact that kola nuts are consumed in large quantities by natives of Africa, especially the Hausas in the northern part of Nigeria where its consumption has become a die-hard habit among men and women, this study is therefore designed to investigate its probable effects on reproductive functions using male rats.

MATERIALS AND METHODS

Aqueous extraction: 8kg of *Cola nitida* were pulverized with an electric blender, the pulverized product was placed inside the Soxhlet apparatus into which water was added. The soxhlet apparatus was then set up and left for 72 hours.

The extracted solution was taken to the oven for concentration to dryness at a regulated temperature of 40⁰ and left for 6 days. With this a powdery product was obtained, from which aqueous extract of 8mg/kg body weight was prepared.

Animals: Adult male rats weighing between 150-250g obtained from the animal house of the College of Medicine, University of Lagos, Nigeria were used. They were housed in cages at room temperature (23⁰-27⁰C) with free access to rat cubes (Animal Feeds Nig- Limited, Lagos, Nigeria). 30 male rats were used for this study consisting of 3 groups of 10 rats each as follows:

Group 1, served as control and were treated with water only.

Group 2, were administered *Cola nitida* extract 8mg/kg body weight for a period of four weeks.

Group 3, served as recovery group, were administered *Cola nitida* extract 8mg/kg body weight for a period of four weeks, after which the rats were allowed another period of four weeks to recover. The recovery group is the one with which evaluation of how the rats recovered from the effect of kola nut were carried out, after the period of kola extract administration.

The administration was done orally for a period of four weeks by means of an oral cannula.

Blood collection: Blood collection was done at the end of the experiment. It was obtained via the orbital sinus, punctured by capillary tubes from test, recovery and control groups for hormonal level determination. The hormones were measured using radioimmunoassay method.

Materials: Capillary tubes, heparinized bottles, centrifuge.

RESULTS

Results of hormonal test: There was a significant increase ($p < 0.05$) in plasma level of testosterone (Table 1), but a significant decrease ($p < 0.05$) in plasma level of luteinizing hormone (Table 1) of rats treated with *Cola nitida* extract only when compared with control rats.

Table 1: Effect of *Cola nitida* extract on plasma level of testosterone and luteinizing (LH) hormone

	Testosterone (ng)	LH (miu)
Control	6.83±0.27	16.27±0.84
Cola nitida	7.4±0.1*	6.4±1.83*
Recovery	6.67±0.24	15.97±0.84

* = $p < 0.05$, Student's *t*-test. All treated groups were statistically compared to control group

DISCUSSION

The result of this study shows that *Cola nitida* extract significantly reduced plasma level of luteinizing hormone but significantly increased plasma testosterone level.

The reduced plasma LH level reported in this study is in agreement with findings of Benie and Thieulant (2004), where it was reported that *Cola nitida* extract exerted an inhibitory effect on LH release of rat's pituitary cells, however our findings on plasma level of testosterone was in agreement with Leehayward (2009), that caffeine increases plasma level of testosterone. But contrary to the findings of Rebecca and Elizabeth (1996), who reported that bioavailable testosterone was negatively and independently associated with caffeine intake, while estrone was positively associated with high levels of caffeine consumption in post-menopausal women. Sex hormone-binding globulin was positively associated with caffeine intake, replicating findings of London et al. (1991). Sex hormone-binding globulin is the major carrier of steroid hormones in the circulation

and an important moderator of bioavailable hormone levels.

The active chemical constituents of all the species of kola nut include: caffeine, glucoside, theobromine and kolatin which are stimulants (Russel 1955). It has been found that most of the physiological actions of kola are due to caffeine (Eijnatten, 1973) because the effect of the kola nut extract is similar to that of caffeine which occurs abundantly in kola nut.

The quantity of methylxanthines present in the kola nut was not determined in this study however, Somorin (1973) found that cola *accuminata* contained 0.161g caffeine per 100g powdered kola nut.

This increased plasma level of testosterone, suggests the increment in the size of testis observed in our previous study (Adisa et al 2010). Testosterone being the male reproductive hormone could cause an increase in the size of testis and other male reproductive structures. However the mechanism by which the cola nitida brings about an increase in plasma testosterone level in rats as reported in this study need to be investigated in further studies.

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