

EFFECT OF AQUEOUS FRUIT EXTRACT OF *XYLOPIA AETHIOPICA* ON REPRODUCTIVE HORMONES IN MALE GUINEA PIGS

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ABSTRACT

The effect of aqueous fruit extract of *xylopia aethiopica* on reproductive hormones in male guinea pigs was investigated using 60 mature male guinea pigs which were randomly divided into 5 groups of 12 animals each. Daily oral doses of 2.5mg/kg, 5mg/kg, 10mg/kg and 20mg/kg of extract were administered to each of the animals in the four treatment groups respectively, while the control group received equal volume of distilled water only. Blood from 6 animals in each group were analysed for leuteinising hormone (LH), follicle stimulating hormone (FSH) and Testosterone on the 8th and 15th days of the experiment by classical ELISA method, using Human kits. The result shows a dose dependent significant ($p < 0.05$) decrease in the plasma levels of LH, FSH and Testosterone for both the 7 days and 14 days treatment groups respectively. Also, a time dependent significant ($p < 0.05$) decrease was observed for both LH and FSH at all treatment doses. This suggests that the use of *xylopia aethiopica* fruits by human males may have both dose and time dependent adverse effects on the reproductive hormones, and therefore on their reproductive capacity.

KEY WORDS: *xylopia aethiopica*, reproductive hormones, infertility

INTRODUCTION

Globally, there is an increasing concern about declining reproductive ability. Travison *et al.* (2007), had reported on an age-independent, secular decline in circulating testosterone concentrations in men. Studies show that exposure to environmental and workplace pollution, and exposure to heat, pesticides and other chemicals (Inhorn and Buss, 1994; Srinivasa *et al.*, 2005), cultural and social factors (Leke, *et al.* 1993), as well as some plant extracts (Chakraborty and Pakrashi 1991) have been implicated in this decline.

Xylopia aethiopica (Dunal) A. Rich (Annonaceae), is a tall tree bearing small and twisted bean-pod shaped fruits in clusters, and variously called African Pepper, Negro pepper (in English). It is widely cultivated in West Africa, Central Africa and Southern Africa. Its fruit extracts have wide ethnomedicinal uses such as tonic to encourage female fertility, for ease of childbirth and as a woman remedy after child birth (Burkill, 1985), as spice used to prepare local soups in West Africa (Acquaye *et al.* 2002), to add flavour to palm wine (Burkill, 1985); for relief of pains in the ribs, chest, lumbargo, neuralgia and in treatment of boils and skin eruptions (Acquaye *et al.* 2002); for increasing menstrual flow and was accordingly deemed to have abortifacient properties (Burkill, 1985, Nwafor and Gwotmut, 2006), and for treatment of malaria (Etkin, 1997).

Although *Xylopia aethiopica* has wide ethnomedicinal and social acceptance and uses, especially in Nigeria, there is no report on its physiological effects on hormonal parameters such as testosterone, follicle stimulating hormone and leutenizing hormone. Therefore, this study was done to

establish scientific data on the effectiveness of *Xylopia aethiopica* as fertility regulating agent by its effects on the hormonal parameters of male guinea pigs

MATERIALS AND METHODS

Animal models: A total of 60 mature male guinea pigs bred in the animal house of the department of Human Physiology, University of Port Harcourt were obtained for the study. The animals weighed between 400-600g. They were randomly divided into five groups (A, B, C, D and E) of 12 animals each. Each group was housed in a separate partition in a cage. Group A was the Control, while groups B, C, D, and E were the Test groups. The animals were provided daily with fresh leaves of elephant grass which they fed ad libitum, and allowed to acclimatize for 7 days before commencement of the experiment.

Plant material: Dried fruits of *Xylopia aethiopica* bought from Choba market in Port Harcourt, Nigeria were identified and authenticated at the department of Forestry, Faculty of Agriculture, University of Port Harcourt. Voucher specimen was maintained at the Herbarium.

Preparation of extract: The fruits were washed, oven dried at a temperature of 40°C for 24 hours and then ground to coarse powder. The powder (850g) was macerated in 2litres of distilled water and allowed to stand for 48hours with frequent stirring. After filtration with a whatman No 1 filter paper, the solvent was evaporated in a rotary evaporator at a temperature of 40-45°C. The resultant dry extract weighing 38g (4.47% yield) was preserved in a refrigerator at 4°C.

Treatment protocol: Using sterile 1ml syringes, 2ml of

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extract solution containing the test doses of extract 2.5mg/kg, 5.0mg/kg, 10mg/kg, and 20mg/kg were daily orally administered to each animal in groups B, C, D, and E respectively, while the control group daily orally received a corresponding volume of only distilled water. Six (6) animals from each group were sacrificed on the eighth (8th) and fifteenth (15th) days of the experiment, after being treated with the extract for 7 days and 14 days duration respectively. 3ml of whole blood was collected from each animal into lithium heparinised sample bottles for hormone analysis.

Hormone analysis: The blood samples were analyzed for Luteinizing hormone (LH), Follicle stimulating hormone (FSH), and testosterone by classical ELISA method, using Human kits (Human, Germany).

Statistical analysis: A statistical analysis of the result was done using computer SPSS soft ware. The results were expressed as mean \pm SD. The means were compared using the students t-test and one way analysis of variance (ANOVA). Significant values were determined at $p < 0.05$ level of confidence.

RESULTS

The results for the hormone analyses are shown in table 1. There was a dose dependent significant ($p < 0.05$) decrease in the plasma levels of LH, FSH and Testosterone for both the 7 days and 14 days treatment groups respectively, when compared with their corresponding control groups. Also, a time dependent significant ($p < 0.05$) decrease was observed for both LH and FSH (Table 1) at all treatment doses.

Table 1: Changes in plasma concentrations of LH, FSH and Testosterone according to the dose and duration of administration of extract (Mean \pm SD).

Dose (mg/kg/day)	Leuteinising Hormone (mIU/ml)		Follicle Stimulating Hormone (mIU/ml)		Testosterone (ng/ml)	
	8 th day	15 th day	8 th day	15 th day	8 th day	15 th day
Control	5.95 \pm 0.30	5.65 \pm 1.20†	6.60 \pm 0.52	6.75 \pm 0.30†	6.50 \pm 1.33	6.10 \pm 1.10†
2.5	0.53 \pm 0.20*	0.20 \pm 0.00*‡	0.68 \pm 0.50*	0.20 \pm 0.10*‡	0.93 \pm 0.20*	1.08 \pm 0.60*†
5.0	0.30 \pm 0.20*	0.15 \pm 0.10*‡	0.33 \pm 0.20*	0.13 \pm 0.10*‡	0.83 \pm 0.60*	1.03 \pm 0.70*†
10.0	0.28 \pm 0.10*	0.15 \pm 0.10*‡	0.18 \pm 0.10*	0.13 \pm 0.10*‡	0.60 \pm 0.10*	0.55 \pm 0.40*†
20.0	0.18 \pm 0.10*	0.13 \pm 0.10*‡	0.15 \pm 0.10*	0.10 \pm 0.00*‡	0.35 \pm 0.20*	0.40 \pm 0.20*†

*Significant at $p < 0.05$ compared to control. ‡Significant at $p < 0.05$ compared to 8th day treatment. †Not statistically significant compared to 8th day treatment.

DISCUSSION

In this study, a significant reduction in LH, FSH and Testosterone was observed, consistent with reports from previous studies where some plant extracts were observed to lower plasma concentration of LH and testosterone (Chakraborty and Pakrashi 1991, Mali et al 2002). The male reproductive hormones, LH and FSH are synthesised and secreted by the gonadotropic cells in the anterior pituitary glands, while LH stimulates the interstitial cells of Leydig in the testes to secrete Testosterone. Therefore, the observed reduction in plasma concentration of LH and FSH following 7 days and 14 days periods of treatment and at doses of 2.5mg/kg, 5mg/kg, 10mg/kg and 20mg/kg respectively suggests that the extract may have inhibitory effect on the gonadotropic cells in the anterior pituitary gland which may be attributed to calcium antagonistic mechanisms in the gonadotropic cells (Somova et al, 2001). Also, the reduction in testosterone concentration may be secondary to the reduced secretion of Leuteinising hormone by the anterior pituitary gland. We conclude that the aqueous fruit extract of *Xylopi aethiopica* has a dose and time dependent adverse effect on the reproductive hormones in male guinea pigs, suggesting that it may have similar effects in male humans and therefore on their reproductive capacity.

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