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EFFECT OF PROCESSED HORSE EYE BEAN (*MUCUNA URENS* L.) ON THE HORMONAL MILIEU OF MALE RATS

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ABSTRACT

Purpose: To investigate the effect of processed horse eye bean (*Mucuna urens* L.), a soup thickener on serum level of some sex hormones: testosterone, follicle stimulating hormone (FSH), luteinizing hormone/interstitial cell stimulating hormone (LH/ICSH), estradiol and prolactin in male rats.

Methods: Twenty male albino rats of 12 weeks old with similar body weights were assigned to four groups of 6 rats each and treatment with processed horse eye bean at 0, 100, 200 and 300 mg/kg body weight respectively daily for 8 weeks. Blood samples collected through cardiac puncture were assayed for levels of hormones.

Results: There were dose-dependent effects of the processed horse eye bean on the serum concentration of the hormones. The treatment significantly reduced the levels of testosterone and FSH in the serum while it significantly increased the levels of estradiol, LH/ICSH and prolactin.

Conclusions: Processed horse eye bean had strong capability to disrupt hormonal functions. Hence, its indiscriminate use as soup thickener could increase the risk of infertility in males.

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INTRODUCTION

In the Eastern and South-Eastern parts of Nigeria, horse eye bean (*Mucuna urens* L.), a soup thickener is widely and frequently consumed in soup and stew, there are reports that the seeds affect the consistency of semen and motility of sperm cells (Udoh and Ekpenyong, 2001).

Mucuna urens is often cracked and removed from the seed coats soaked in water and then boiled (Osei-Bonsu *et al.*, 1995; Elitta and Carsky, 2003), roasted or fermented to remove most of the toxic substances, which have been implicated in poisoning (Osei-Bonsu *et al.*, 1995). Some food scientists have reached a consensus that mucuna beans does not seem to pose a danger to humans, if proper cooking takes place prior to eating (Ravindran and Ravindran, 1988; Infante *et al.*, 1990; Osei-Bonsu *et al.*, 1995; Siddhuraju *et al.*, 1996).

Horse eye bean are reported to be rich sources of potassium, magnesium, calcium, iron, proteins and amino acids (Olaboro, 1993), as well as containing 5-hydroxytryptamine, mucunine, mucunadine proteins, carbohydrates, tannins and phytates (Udoh and Ekpenyong, 2001).

Udoh and Ekpenyong (2001) also reported the degeneration of sperm in testicular tubules, collapse of the villi in prostrate gland and reduction of secretion in the prostrate gland and seminal vesicles of male guinea-

pigs treated with seeds of horse eye bean. While Amin *et al.* (1996) have observed mucuna beans to increase sexual activity, testosterone levels, leading to deposition of protein in the muscles and increased muscle mass and strength in rats.

Plants with high alkaloid content have been reported to be responsible for increase in serum concentration of estradiol and prolactin, which are capable of inhibiting gonadotrophic action of the testes and subsequently the fertility of male animals (McGarvey *et al.*, 2001; Weber *et al.*, 2001; Pastuszewska *et al.*, 2006). Reductions in levels of testosterone and follicle stimulating hormone (FSH) were responsible for suppressed spermatogenic activities, infertility and reproductive toxicity (Greenspan and Stawler, 1997; Gelain *et al.*, 2005).

This study set out to further explore the effect of processed horse eye bean on the levels of the following reproductive hormones: testosterone, follicle stimulating hormone (FSH), luteinizing hormone/interstitial cell stimulating hormone (LH/ICSH), estradiol and prolactin; in male rats as a model.

MATERIALS AND METHODS

Plant material

Mature dry seeds of horse eye bean (*Mucuna urens* L.) were cracked and soaked in water overnight with various water changes, after which the seed coats were removed and the endosperm was boiled in fresh water for 30-40 minutes according to (Osei-Bonsu *et al.*, 1995; Elitta and Carsky,

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2003). The water was discarded and the endosperm chopped into tiny pieces and sun-dried, then pulverized into the processed horse eye bean for the study.

Animals

Twenty four healthy and sexually mature male albino rats of 12 weeks old were obtained from the Animal House of Department of Zoology and Environmental Biology, University of Calabar, Calabar, Nigeria for this study. The rats were divided into four groups with six rats per group and housed in conventional wire mesh cages under standard

while differences in means were separated using least significant difference (LSD) according to Obi (2002).

RESULTS

General Observation

General observations showed that all the rats in the study looked healthy and there was a general increase in body weights of all rats in both treatment and control groups during the treatment period. The increases in body weights of the rats indicated that processed horse eye bean had no adverse effect on growth and body weight of the rats.

Table 1 Effect of processed horse eye bean on the level of hormones in male rats

Hormone	<i>Mucuna urens</i> (mg/kg BW)			
	0(Control)	100	200	300
Testosterone (ng/ml)	4.40 ^d ± 0.19	3.90 ^c ± 0.22	3.30 ^b ± 0.21	3.00 ^a ± 0.13
Estradiol (pg/ml)	0.10 ^a ± 0.03	0.75 ^b ± 0.15	0.91 ^c ± 0.01	1.21 ^d ± 0.09
Prolactin (ng/ml)	14.10 ^a ± 0.08	14.10 ^a ± 0.35	16.90 ^b ± 0.55	20.30 ^b ± 0.20
FSH (mIU/ml)	1.30 ^d ± 0.13	1.10 ^c ± 0.13	0.70 ^b ± 0.08	0.30 ^a ± 0.14
LH/ICSH (mIU/ml)	10.70 ^a ± 0.98	20.80 ^b ± 0.20	22.10 ^b ± 0.08	26.40 ^c ± 0.76

^{abcd} [Values across the table with similar superscript are not significantly different at 5% based on ANOVA]

12hours darkness cycle). They were allowed free access to water and commercial feed throughout the period of the experiment. Generally, the study was conducted in accordance with the recommendation from the declarations of Helsinki on guiding principles in care and use of animals.

Experimental procedure

Four experimental groups of five male albino rats each with similar body weights were constituted in a Completely Randomized Design (CRD). The rats were administered with processed horse eye bean at 100, 200 and 300 mg/kg body weight respectively daily for 8 weeks. The treatments (processed horse eye bean) were mixed with about 10-30% of the daily feed consumption and given in the morning, to ensure the consumption of the daily treatment dose (Ekaluo *et al.*, 2009). At the end of the treatment period the rats were sacrificed under chloroform anaesthesia and the blood samples were obtained through cardiac puncture.

Hormonal Assay

Blood samples collected through cardiac puncture were allowed to clot then centrifuged at 2500 rpm for 10min using Wisperfuge model 1384 centrifuge (Tamson, Holland) at 10-25°C to obtain the serum. Serum samples were assayed for levels of testosterone, follicle stimulating hormone (FSH), lutenizing hormone/interstitial cell stimulating hormone (LH/ICSH), estradiol and prolactin using the Microwell (solid phase) enzyme linked immunoassay (ELISA) technique utilizing the competitive binding principle; with analytical grade reagents from Synttron Bioresearch Inc., USA (Ekaluo *et al.*, 2010).

Statistical Analysis

Data from the levels of testosterone, follicle stimulating hormone (FSH), lutenizing hormone/interstitial cell stimulating hormone (LH/ICSH), estradiol and prolactin in the serum were subjected to the analyses of variance (ANOVA)

Serum Hormone Levels

Table 1 shows that processed horse eye bean had significant (P<0.05) reduction effects on the level of testosterone and FSH in the serum at all treatment (100, 200 and 300 mg/kg BW) levels when compared with the control. On the other hand the processed horse eye bean had significant (P<0.05) increasing effect on the level of estradiol in the serum at all treatment levels, while for LH/ICSH and prolactin there were significant (P<0.05) effects from 200 mg/kg BW respectively. There was a dose-dependent effect of the processed horse eye bean on the level of the hormones as shown on Fig. 1.

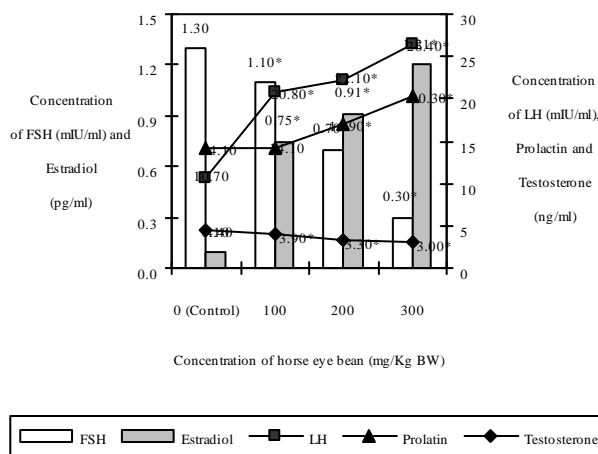


Fig. 1 Effect of crude extract of horse eye bean (*Mucuna urens*) on hormonal profile of male rats.

Discussion

The male rats treated with processed horse eye bean showed a dose-dependent effect on the serum concentration of the hormones. The treatment significantly reduced the levels of

testosterone and FSH in the serum which agrees with the report of Kasturi *et al.* (1988), which suggested a possible antiandrogenic property and attributed the reduction to the effects of the treatment on the number of leydig cells which is responsible for the manufacturing of testosterone. The significant increase in the levels of estradiol, LH/ICSH and prolactin can be ascribed to the high alkaloid content of the treatment (McGarvey *et al.*, 2001; Weber *et al.*, 2001; Pastuszewska *et al.*, 2006) and this is capable of inhibiting gonadotrophic action of the testes and subsequently the fertility of the male animals. This study shows that processed horse eye bean had strong capability to disrupt hormonal functions. Hence, its indiscriminate use as soup thickener could increase the risk of infertility in males.

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