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EFFECT OF SOYBEAN (*GLYCINE MAX* L.) ON THE HORMONAL MILIEU OF MALE RATS

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ABSTRACT

Effect of soybean (*Glycine max*) 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 was investigated. Twenty male albino rats of 12 weeks old with similar body weights were assigned to four groups of 5 rats each and treatment with soybean meal at 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. There were dose-dependent effects of the soybean meal 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. The results show that soybean (*Glycine max*) had strong capability to disrupt hormonal functions. Hence, its indiscriminate use could increase the risk of infertility in males.

INTRODUCTION

Soybean is consumed as fried beans, soybean cake, soy milk, soy flour and soy oil, as well as in many other forms; either solely or in combination with other food products by human beings and as animal feed.

Isoflavones found in soy products are also reported to have protective effects on prostate cancer (Bylund *et al*., 2000; Kato *et al*., 2000; Mentor-Marcel *et al*., 2001; Castle and Thrasher, 2002). Animal studies suggest that soy protein and isoflavones may prevent cardiovascular disease by multiple mechanisms (Carusi, 2000). It could also be used in the treatment postmenopausal symptoms, such as hot flashes, vaginal dryness and mood changes while protecting women from osteoporosis and heart diseases (Anderson *et al*., 1998; Carusi, 2000).

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 gonadothrophic 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 soybean 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.

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MATERIALS AND METHODS

Plant material

Soybean meal was obtained from Livestock Farm, University of Calabar, Calabar, Nigeria. It was sun-dried for two days, and then pulverized for the study.

Animals

Twenty 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 five rats per group and housed in conventional wire mesh cages under standard laboratory conditions (temperature 25-30^{0}C, 12hours light and 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 soybean meal at 100, 200 and 300 mg/kg body weight respectively daily for 8 weeks. The soybean meal was 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), before the remaining feed was

given. 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^{0}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 Syntron 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) while differences in means were separated using least significant difference (LSD) according to Obi (2002).

RESULTS

General Observations

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 soybean meal had no adverse effect on growth and body weight of the rats.

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.

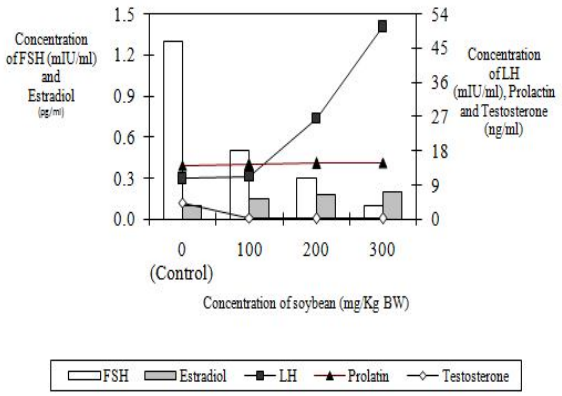

Fig. 1 Effect of soybean meal hormonal profile of male rats.

DISCUSSION

The male rats treated with soybean meal 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 an earlier 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. Greenspan and Stawler (1997) and Gelain *et al.* (2005), also agreed that reductions in levels of testosterone and FSH were responsible for suppressed spermatogenic activities, infertility and reproductive toxicity in male animals.

The significant increase in the levels of estradiol, LH/ICSH and prolactin can be ascribed to the high alkaloid content of Pastuszewska et *al*., 2006) and this is capable of inhibiting gonadothrophic action of the testes and subsequently the fertility of the male animals. This study shows that soybean meal has strong capability to disrupt hormonal functions. Hence, the indiscriminate consumption of soy products could increase the risk of infertility in males.

Table 1 Effect of soybean meal on the level of hormones in male rats

Hormone	*Mucuna urens* (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]

References

Anderson, J.J.; Ambrose, W.W. & Garner, S.C. (1998). Biphasic effects of genistein on bone tissues in the ovariectomized, lactating rat model. *Proceedings of Society in Experimental Biology and Medicine, 217*: 345-350. Carusi, E. (2000). Primary care update. *Obstetrics and Gynecology, 7*: 253-259. Castle, E.P. & Thrasher,

J.B. (2002). The role of soya estrogens in prostate cancer. *British Journal of Cancer, 29*: 71-81.

Bylund, A.; Zhang, J.Z.; Bergh, A.; Damber, J.E.; Widmark, A.; Johanson, A.; Adlercrentz, H.; Aman, P.; Shepherd, M.J. & Hallmans, G. (2000). Ryebean and soya protein delay growth and increase apoptosis of human LNCaP prostrate adenocarcinomal in nude mice. *Prostate, 37*: 36-43.

Ekaluo, U.B.; Ikpeme, E.V. & Udokpoh, A.E. (2009). Sperm head abnormality and mutagenic effects of aspirin, paracetamol and caffeine containing analgesics in rats. *The Internet Journal of Toxicology*, 7(1).

Ekaluo, U.B.; Ikpeme, E.V.; Udensi, O.; Markson, A.A.; Madunagu, B.E.; Omosun, G. and Umana, E.J. (2010). Effect of aqueous leaf extract of neem on the hormonal milieu of male rats. *International Journal of Current Research,* 4: 1-3.

Gelain, D.P.; Casali, E.A. and Dal-Pizzol, F. (2005). Effect of follicle stimulating hormone and vitamin A upon purinergic secretion by rat sertoli cells. *Molecular Cell Biochemistry 278*: 185-195.

Greenspan, F.S. and Stawler, G.J. (1997). *Basic and clinical endocrinology*. New York: McGraw Hill.

Kasturi, M; Manivannan, B; Ahamed, R.N; Shaikh P.D; Pathan, K.M. (1988). Changes in epididymal structure and function of albino rat treated with *Azadirachta indica* leaves. *Journal of Ethnopharmacology 23*: 53-9.

Kato, K.; Takahashi, S.; Cui, L.; Toda, T.; Suzuki, S.; Fatakuchi, M.; Suguira, S. & Shirai, T. (2000). Suppressive effects of dietary genistein and daidzin on rat prostrate carcinogenesis. *Japanese Journal of Cancer Research, 91*: 786-791.

McGarvey, C.; Cates, P.A.; Brooks, A.; Swanson, I.A.; Milligan, S.R.; Coen, C.W. and O'byrne, K.T. (2001). Phytoestrogens and gonadotropin releasing hormone pulse generator activity and pituitary luitenizing hormone release in the rat. *Endocrinology 142*: 1202-1208.

Mentor-Marcel, R.; Lamartiniera, C.A.; Eltoum, I.E.; Greenberg, N.M. & Elgavish, A. (2001). Genisteinin the diet reduces the incidence of poorly differentiated prostatic adenocarcinomal in transgenic mice. *Cancer Research, 61*: 6777-6782.

Obi, G.N. (2004). Efficacy of neem extracts in control of bean weevil *C. maculates*. *Journal of Entomology 23*: 112-115.

Pastuszewska, B.; Taciak, P.; Ochtabiniska, A.; Tusnio, A.; Misztal, T.; Romanowicz, K. and Morawski, A. (2006). Nutritional value and physiological effects of soya-free diets fed to rats during growth and reproduction. *Journal of Animal Physiology and Animal Nutrition 10*: 1439-1496.

Weber, K.S.; Setchell, K.D.; Stocco, D.M. and Lephart, E.D. (2001). Dietary soy-phytoestrogen decrease testosterone levels and prostate weight without altering LH, prostate 5 alpha-reductase or testicular steroidogenic acute regulatory peptide levels in adult male Sprague-Dawley rats. *Journal of Endocrinology 170*: 591-9

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