



The effects of soybean's hydroalcoholic extract on sexual hormones in female mice

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ABSTRACT

Soybean (*Glycine max*) from leguminosae family has many medicinal properties. Current study was carried out to evaluate the effects of soybean's hydroalcoholic extract on sexual hormones in mice. Forty mice were randomly divided into five groups including control, placebo and three experimental groups. Cloprostenol was injected and three days later progesterone was injected to synchronize sexual cycles of samples. Hydroalcoholic extract was injected in 50 mg/kg, 100 mg/kg and 200 mg/kg doses intraperitoneal for twenty days every other day. At the end of period, blood samples were taken and LH, FSH, estradiol and progesterone hormones were measured using ELISA method. According to results, all doses of the extract reduced LH, FSH and estrogen hormones and increased progesterone significantly ($p < 0.05$). Probably, soybean extract can affect sexual hormones and hypothalamus-pituitary axis by phytoestrogens. Therefore, this plant can affect reproduction system of female mice.

Keywords: soybean, female reproduction system, LH, FSH, estrogen, progesterone

INTRODUCTION

Since the mid-twentieth century, chemical drugs were replaced with herbal drugs because of their obvious side effects [1]. People think that medicinal plants are not dangerous at all and use them frequently. Therefore, Informing people from probable dangerous effects of these drugs is necessary [2].

Soybean is a useful and important plant which is used in industry, milk production, oil production and human nutrition. This plant is cultivated in moderate warm regions. It is an annual herbaceous plant with 30-80 cm height [3].

Soybean is rich of phytoestrogen, protein, Vitamins A, B, C, D, E, K, oligosaccharides, choline, niacin, lecithin, pantothenic acid, phenolic acid, riboflavin, Omega3, a little beta carotene, minerals such as copper, manganese, molybdenum, phosphorus, potassium and necessary amino acids for human. Thus, it is an important source of nourishing matters for human [4].

Wood (2006) reported that high use of soybean in maturity time reduced probability of breast cancer. Also, soybean as an herbal estrogen source is useful for reducing the incidence of menopause such as hot flashes, anxiety, insomnia and changing moods and is effective for healthy breast tissues and endometrial organs [5]. Isoflavone of soybean has estrogenic, anti androgenic activities which can prevent or reduce prostate cancer [6]. According to a long time study on Makao monkeys for three years after menopause, isoflavone of soybean did not reduce the bones destruction, but as it was expected, replaced estrogen increased minerals of bones and its density [7].

Studies on rodents showed that subcutaneous injection of isoflavones before birth reduced spermatogenesis and the number of sperms in maturity [8]. Adams (1995) reported that phytoestrogen consumption led to changes in estrous cycle, changes in sexual behaviors of female sex and reduction in fertility chance. In ruminants, irregular intervals

between estrous cycle false estrous, anestrus, increased libido in females and reduces the number of ovulatory were observed. Exposure to a combination of isoflavones which had more Daidzein and daidzein before birth caused early maturity in female mice and irregularities in the estrous cycle (e.g. prolongation of it) in adults [9].

Current study was carried out to investigate the effects of three doses of soybean's hydroalcoholic extract on sexual hormones of mice.

EXPERIMENTAL SECTION

Forty female mice from Balb/C race and 30 ± 5 g weight range were selected. Samples were kept for one month (similar place, temperature, photoperiod, water and food) to adapt to environment. After that, mice were divided into five groups with eight mice in each group. Groups were: control, placebo (0.3cc injection of physiological serum), and 50, 100 and 200 mg/kg of soybean extract.

Prior to extract injections, 0.5 microgram of cloprostenol was injected interperitoneal and three days later 3 microgram of progesterone was injected subcutaneously to synchronize sexual cycles of samples. One day later, extract injection was started in peritoneum for twenty days every other day. At the end of injections period, blood samples were taken using guillotine method. Serum was separated using centrifuge machine and LH, FSH, estrogen, and progesterone were measured using Elisa test.

Obtained data were analyzed using SPSS program, one way analysis of variance and Duncan test.

RESULTS AND DISCUSSION

Estrogen amounts

Estrogen amounts (pg/ml) of experimental groups were decreased significantly ($p < 0.05$).

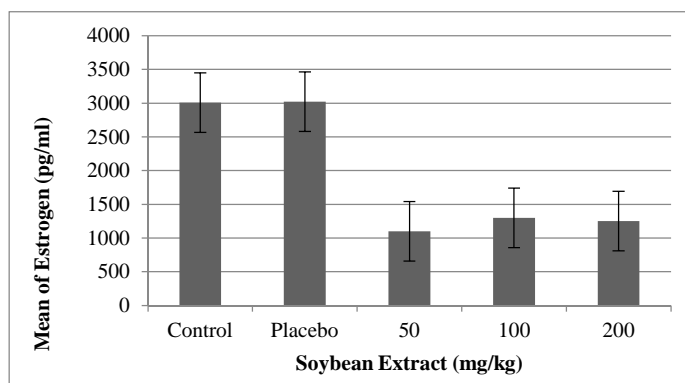


Figure 1. Estrogen amount in all treatment groups

Progesterone amount

The amount of progesterone hormone (ng/ml) was increased in all three experimental groups significantly ($p < 0.05$).

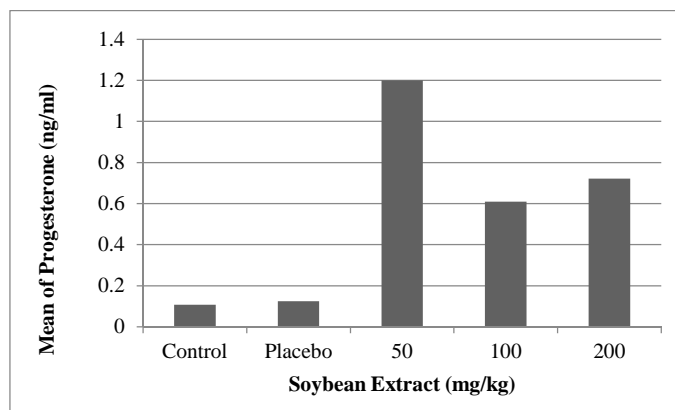


Figure 2. Progesterone amount in all treatment groups

FSH amount

FSH hormone (pg/ml) was reduced significantly in all experimental groups in proportion to control group ($p < 0.05$).

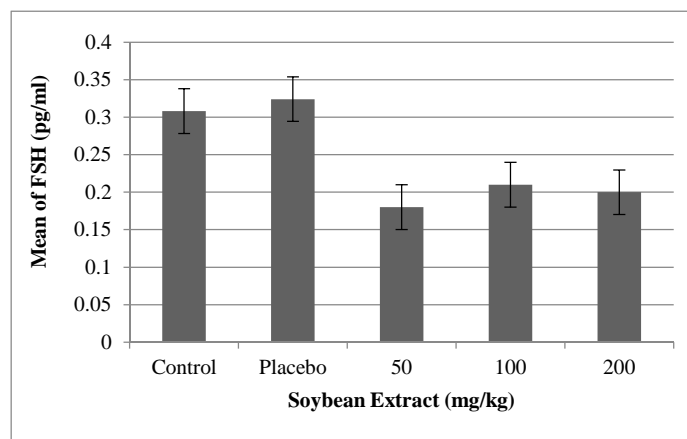


Figure 3. FSH amount in all treatment groups

LH amount

The amount of LH hormone (mIU/ml) showed significant reduction in all extract groups in proportion to control group ($p < 0.05$).

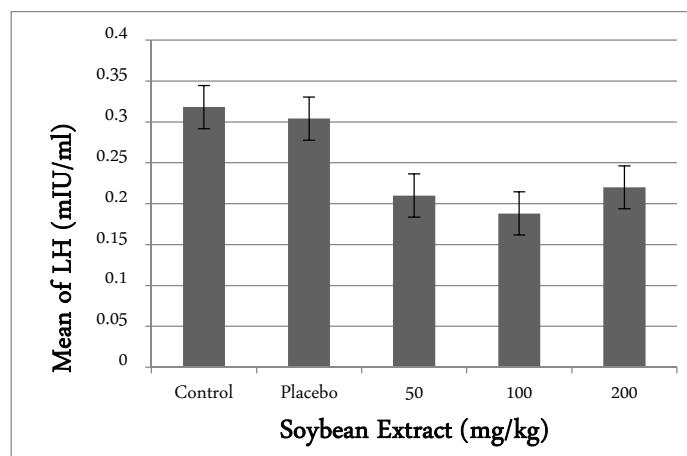


Figure 4. LH amount in all treatment groups

In view of previous reports about the effects of soybean on reproduction system performance [9], current study was carried out to investigate the effects of soybean's hydroalcoholic extract on sexual hormones of laboratory mice. According to results, all doses of the extract reduced the estrogen amount significantly. Probably, reduction in serum estradiol amount reflects high capacity of isoflavone in binding to estrogen receptors and prohibiting actions of internal estrogen. Results of this study are similar to other studies [5]. Progesterone was increased significantly by all extract doses. Lissin et al. (2000) in a study on humans reported that progesterone level was decreased for 45% over a period of sexual cycle by using 36 ounces of soybean milk (including 113-207 mg/day of isoflavone)[10].

FSH and LH hormones were reduced significantly by all doses of the extract. Cassidy et al. (1994) and also Duncan et al. (1999) reported that adding soybean protein to diet (45-60 mg of isoflavone per day) suppressed LH and FSH secretion significantly. Ahsannia (2011) reported significant decrease of LH by using soybean extract. Also, Khan et al. (2004) showed that phytosterols reduced gonadotropins including LH directly and enforced their adjusting effect. These are in agreement with results of current study [11].

By comparing the results of various studies, it can be said that lower doses of isoflavones may act as agonists of estrogen in the hypothalamus and pituitary, but high doses do not. More studies are necessary to determine if gonadotropins are mediators of the effects of soybean's isoflavones on ovarian steroids. On the other hand, soybean's isoflavones may directly inhibit the ovarian steroids synthesizer enzymes directly [12].

Probably, increase in progesterone amount in this study has reduced pituitary action via negative feedback mechanism and therefore reduced LH hormone. Also, low estrogen amounts have strong effects on controlling FSH and LH by negative feedback which is increased in presence of progesterone. It seems that those negative feedbacks affect front pituitary and also hypothalamus directly and reduce GnRH secretion. On the other hand, inhibin which is secreted with sexual steroid hormones by corpus luteum granulosa cells, in females, like males, has controlling effect on secretion of follicle stimulating hormone and somewhat lutein hormone [8].

CONCLUSION

Probably, soybean extract can affect sexual hormones and hypothalamus-pituitary axis by phytoestrogens. Therefore, this plant can affect reproduction system of female mice. It seems that soybean extract causes changes in the production of the female sex cells by affect HPG axis.

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REFERENCES

- [1] Bingham, S. A., Atkinson, C. and Coward, A. *British Journal of Nutrition*, **1998**, 79(05), 393-406
- [2] Weggemans, R. M. and Trautwein, E. A. *European Journal of Clinical Nutrition*, **2003**, 57(8), 940-946.
- [3] Wu, A. H., Wan, P., Hankin, J., Tseng, C. C., Mimi, C. Y., and Pike, M. C. *Asian-Americans. Carcinogenesis*, **2012**, 23(9), 1491-1496.
- [4] Evans BAJ, Riffiths GK and Morton MS. *J. Endocrinol*, **1995**, 147: 295-302.
- [5] Wood, C. E., Register, T. C. and Cline, J. M. *Carcinogenesis*, **2006**, 28(4), 801-808.
- [6] Messina, M. J. *Nutrition reviews*, **2003**, 61(4), 117-131.
- [7] Register, T. C., Jayo, M. J. and Anthony, M. S. *The Journal of Clinical Endocrinology & Metabolism*, **2003**, 88(9), 4362-4370.
- [8] Atanassova, N., McKinnell, C. and Turner, K. J., *Endocrinology*, **2000**, 141(10), 3898-3907.
- [9] Adams, N. R. *Journal of animal science*, **1995**, 73(5), 1509-1515.
- [10] Lissin, L. W. and Cooke, J. P. *Journal of the American College of Cardiology*, **2000**, 35(6), 1403-1410.
- [11] Cassidy, A., Bingham, S. and Setchell, K. D. *The American journal of clinical nutrition*, **1994**, 60(3), 333-340.
- [12] Kumar, N. B., Cantor, A., Allen, K. and Riccardi, D. *The Prostate*, **2004**, 59(2), 141-147.