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Research Article

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The effect of *Allium sativum* extract on pituitary-gonad axis in heat-stressed female mice

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ABSTRACT

Heat stress is one of the most important environmental pressures especially in tropics which reduce sexual performance by affecting whole vital system. Garlic () as an effective pharmaceutical plant has been proposed for increasing resistance against stress. Current research was carried out to study the effects of garlic hydroalcoholic extract on reproductive hormones in female mice under heat stress. Fifty female mice were studied in five groups and ten replications. Experimental treatments were control group (normal situation without receiving extract),0, 200, 400, and 800 mg/kg of body weight of extract for thirty days in term of 4 hours daily heat stress. Blood samples were taken at the end of experiment period and estrogen, progesterone, FSH and LH hormones were measured. Obtained data were analyzed using SPSS program. Heat stress reduced all sexual hormones significantly ($p<0.05$) in zero group but FSH and LH amount were increased by 400 and 800 mg/kg doses. Estrogen and progesterone amounts were increased significantly in 200, 400, and 800 mg/kg groups and were about control group. Considering the results, extract can be effective under heat stress and neutralize negative effects of stress by affecting pituitary - gonadal axis and ovarian secretion.

Keywords: Garlic extract, Sexual hormones, Heat stress, Mice.

INTRODUCTION

Production is the base of generation survival in all organisms. Medicinal plants play important roles in curing diseases and have fewer side effects than chemical drugs.

Heat stress is a complex of external factors (temperature, humidity, radiation and wind speed) which increases body temperature. This stress is one of the most important concerns in tropics, which reduces vital functions [1]and increases cholesterol level especially in warm seasons.

Garlic (*Allium sativum*) is a bulbous plant. The corm is the most important part of plant for medicinal use[2]. Allicin and Ajueinare the most important compounds of this plant. Allicin causes the smell and also medicinal properties of garlic. It also has antibiotic properties and prohibits cholesterol aggregation. Garlic has also alliinase, peroxidase, glucose, sucrose, selenium, zinc, cysteine, glutamine, isoleucine, thiamin, vitamin B1, vitamin B2, and 60% water [2].Many studies have been conducted about effects of garlic on immune stem of various animals. Researchers have been observed that garlic in human and animals reduced cholesterol, triglyceride of serum, and cholesterol of yolk [3].

Studies on human models showed that regular consumption of garlic powder (300 g/day) protected endothelial cells from oxidative damages. Also, 800 mg/day dose for 12 weeks was useful for peripheral artery occlusion patients, and reduced plasma viscosity significantly. Studies on rats showed that long-term consumption of garlic protected the heart from laboratory ischemic injury and oxidative stress induced by a single dose adriamycine[4].

Considering the role of this plant in reducing stress in traditional medicine, this study was carried out to investigate the effects of garlic hydroalcoholic extract on changes due to heat stress in sexual hormones of female mice.

EXPERIMENTAL SECTION

Fifty little laboratory mice from Balb/C race were used in this study. Animals were weighed and were placed in cages according to weight average (10 mice in each cage).Samples had free access to food and kept in normal situation for 15 days for adaptation to nest. The temperature was between 19 and 25 C.

Treatments were control and four doses of extract (0, 200, 400, 800 mg/kg)in drinking water.

Mice were kept under 4 hours of heat stress (30-36℃) every day for 30 days. 10 mice were selected randomly from each group at the end of experiment and their blood samples were taken to evaluate sexual hormones. For estrus synchronization, 0.5 microgram of cloprostenol was injected in peritoneum at first. Three days later, 3 microgram of progesterone was injected under skin of samples and samples became synchronized. One day after injection of progesterone, the extract feeding was started.

Obtained data were analyzed using SPSS (18) program.

RESULTS AND DISCUSSION

Data analysis of hormones showed significant reduction in hormones of zero group ($p<0.05$) whereas FSH and LH amount of 400 and 800 mg/kg groups showed significant increase in proportion to zero group (Fig:1).

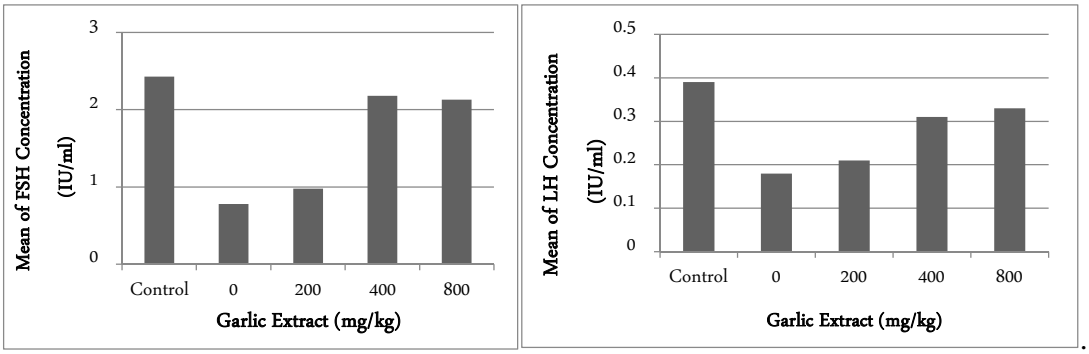

Figure1: LH and FSH amounts in studied groups

The concentrations of ovary hormones (estrogen and progesterone) was increased in 200, 400, and 800 mg/kg groups in proportion to zero groups and were about control group, so that there were not significant differences between mentioned group and control (Fig:2)

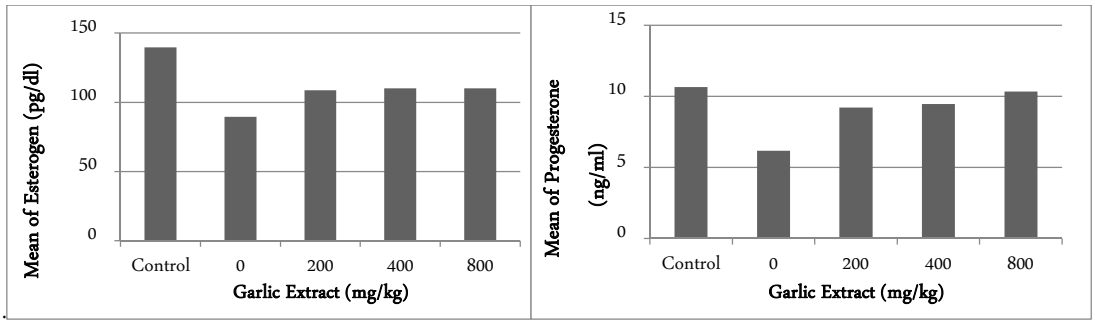

Figure2: Estrogen and progesterone amounts in studied groups

Undesirable environmental situation at the time of reproduction leads to many serious problems for generation survival. Physiological stresses due to heat stress are really important in decreasing female fertility capacity by affecting the pituitary - gonadal axis and period. Stressful factors like intensive heat and environmental pressures have negative effects on reproduction ratio. The harmful effects of heat stress on reproduction processes are the

weakening of the signs of estrus[4], reducing the secretion of LH before ovulation, decreased luteal progesterone secretion, disorder off ollicular growth, reduced fetal grow than d increasing lack of estrus[5].

The main rout of controlling sexual acts is Hypothalamic-pituitary-gonadal axis (HPG) which regulates these acts in human and other animals by feedback control. Hypothalamus stimulates front pituitary by secreting releasing hormones (GnRH) and causes secretion of FSH and LH gonadotropins. Granulosa cells of follicle are in charge of estrogen ovarian production [6]. Therefore, female reproduction system acts as a coherent system and very environmental factor can affect this performance.

Ovulation is one of the important processes of reproduction and disruptions in it lead to infertility. To prevent disruptions, many chemical drugs have been made which have numerous side effects. Herbal drugs have less side effects than herbal ones. Heat stress reduces antioxidant capacity damages [7]. In a study about garlic effects on female reproduction system [8], the extract increased the secretion of estrogen and progesterone. In present study also, garlic extract showed significant effect on estrogen concentration. Considering the obtained results we can conclude that estrogen increasing is mostly depend on the number of follicles and stradioles released from mature follicles. Yet, FSH increasing in 400 and 800 mg/kg groups can be important factor in estrogen increasing.

Progesterone activity increased significantly in 200, 400 and 800 mg/kg group and this increase was closely tied to LH concentration. Medicinal properties and antibiotic properties of garlic are because of allicin which traps free radicals and controls lipid peroxidation, placket aggregation and fibrinolysis stimulation and reduces fats [9].Some researchers reported increase in progesterone amount. Volfrosan reported that long time heat stress reduced progesterone [10]. Reduction in progesterone amount in current study is in agreement with mentioned reports and it seems that garlic extract in 200, 400, and 800 mg/kg concentration could compensate this reduction.

CONCLUSION

Results of present study showed that garlic is able to reduce negative effects of heat stress by affecting reproduction activities via changing pituitary-gonadal axis.

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