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ANTIOXIDANT EFFECT OF GINGER ON THE PITUITARY-GONADAL AXIS HORMONES RECOVERED FROM THE DEVASTATING EFFECTS OF THE HERBICIDE GLYPHOSATE IN FEMALE RATS

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ABSTRACT

Roundup is Glyphosate brand, the family of Phosphonic acid (isopropyl amine salt) and is used for after the preparation is highly toxic and can be absorbed through the skin. It also stated that in ancient medicine, Ginger as an anti-inflammatory herb is introduced. But so far hasn't been made any study in association with the antioxidant effect of this plant on destructive effects of Glyphosate on changes in sex hormones that the main objective of the present study.

56 adult female Wistar rats were selected and divided into 7 groups of 8, Group C without receiving any medication. Group S that received saline solution. Group Z100 100mg/kg B.W zingiber, group Z400 400 mg / kg B.W zingiber , group G100 100mg/kg B.W glyphosate, group GZ100 100mg/kg B.W glyphosate with zingiber 100mg/kg B.W and group GZ400 100mg/kg B.W glyphosate with 400 mg / kg B.W zingiber intraperitoneally received. At the end of the 21 day period, the rats were bled from the hormonal changes of LH, FSH, estrogen and progesterone was measured.

The results show that the concentration of the hormones LH, FSH, Estrogen and Progesterone in group S, Z100 is not a significant difference compared to control. The hormones in Z400 have significantly increased compared to controls ($P < 0.05$). In G100, with the effect of poison damage of glyphosate on Pituitary-gonadal axis causes all

hormones are reduced significantly. In GZ100 and GZ400 groups that received toxin glyphosate with zingiber, somewhat improved glyphosate toxin degradation.

Glyphosate with the production of reactive oxygen species and alkylating properties causes decreasing the effects of sex hormones. Zingiber also with an anti-inflammatory and antioxidant properties in a dose dependent manner, reduce the damaging effects of glyphosate.

Keywords: Antioxidants, Ginger, Glyphosate, Sex Hormones, Rats

INTRODUCTION

Ginger scientifically known as *Zingiber Officinale* that is containing compounds such as 3.2% protein, 0.9% fat, 2.1% minerals, 4.2% fiber and 3.2% carbohydrate. Ginger contains the minerals calcium, iron and phosphorus. It also contains vitamins such as niacin, vitamin C and E, thiamin and riboflavin are **[1-2]**. Ginger is also the most therapeutic value due to its combination of spices (ginger and Shogaol); they cause the pungent and caustic taste. According to chemical composition of this plant, Potassium oxalate is indicated. In addition, it contains Zenjron and some fat pitches called Gingerin. In fresh rhizome of Ginger, Gingerols have been identified as the major active components that 6 - Gingerol, (5-hydroxy-1 - 4 - hydroxyl-3 - methoxyphenyl), is the most abundant component in Gingerols series. Powdered rhizome contains 3-6 percent fat, oil, 9% protein, 60-70% carbohydrates, 3 to 8 percent crude fiber, about 8% ash, 9-12% water, 2-3% of volatile oils. The volatile oils in ginger rhizomes are: Camphene, d-beta - Flandren, curcumin, sifrol, Terpineol, Terfan, Borneol, Geraniol, limonene, linalool, alpha - Zingiberen (30-70%), beta - sesquiterpene Flandren (15-20%), beta - Bisabolene (10-15%). Ginger powder (Shogaol) is a product of hydrate bulk spicy taste of ginger and ginger makes caustic **[3-4]**. Glyphosate with the formulation of liquid and colorless is used as unselected toxin (public) and systemic to control all annual and perennial weeds (leaves and thin leaved) in gardens and arable land and non-agricultural as the liquid soluble in water (% 41SL) can be formulated. Roundup after preparation is highly toxic and can be absorbed through the skin. Due to the unique characteristics and its low price, has led to a common

herbicide in the world **[5]**. Glyphosate is an organophosphate, Colorless and its boiling point 187 ° C and its half-life in animals is 12 hours. Effects of organophosphorus compounds are both acute and chronic that stimulates the parasympathetic nervous system **[6]** and the incidence of some diseases, including cancer. This toxin is absorbed through the respiratory tract, skin, and gastrointestinal **[7]**. Infertility is defined as not being pregnant without contraceptive method after one year sex. Basically, the term infertility (Strile) and refers to the couples not only to women or men **[8]**. The causes of infertility in women include: 1. Ovulation disorders. 2. Factors tube. 3. Endometriosis is when endometrial tissue from its original position (the womb) is removed and placed in the pelvic area. 4. Problems with the cervix **[8]**. The most common cause of female infertility or lack of ovulation an egg is not released which secretion of gonadotropin hormones and might not be ovarian tissue injury **[9]**. According to the above adverse effects on the reproductive system toxin glyphosate and antioxidant properties of ginger on different body systems, the aim of the present study the antioxidant effect of ginger on the pituitary-gonadal axis hormones recovered from the damaging effects of toxins glyphosate in rats.

METHODOLOGY

This study has been carried out experimentally and completely random. All animal experiments in this study comply with the Code of Conduct has been developed. 56 adult female Wistar rats weighing 180 ± 10 g and 75 days provide from implantation animals of Islamic Azad University of Jahrom branch and in laboratory conditions at 22 ± 2°C and 12 h light and 12 h dark cycle were maintained. Rats' standard rodent diets (pellete) were used. Glass bottles of water as it were. The rats eating the food and drinks were free.

Ginger Extracts Preparation Method

For extraction, the first electric grinding powder and ginger to help in a soxhlet extraction. In this way, for every 10 grams of ginger powder, 200 ml of the solvent containing ethanol and water was added to the cast act and soxhlet extraction was performed. And the solvent was removed from the extract to rotavapor device. End to saline as solvent, the doses required were obtained from glyphosate and ginger.

Samples (saline solution, zingiber extract and glyphosate) with 0.2ml insulin syringe volume were injected intraperitoneally at 9 am each day.

56 rats were divided randomly into 7 groups as follows:

Group C: Were maintained on normal without any medication.

Group S: Rats in this group recevied saline solution as solvent of glyphosate and zingiber extract.

Group Z100: Rats in this group recevied zingiber extract 100mg/kg B.W.

Group Z400: Rats in this group recevied zingiber extract 400mg/kg B.W.

Group G100: Rats in this group recevied glyphosate 100mg/kg B.W.

Group GZ100: Rats in this group recevied glyphosate 100mg/kg B.W with zingiber extract 100mg/kg B.W.

Group GZ400: Rats in this group recevied glyphosate 100mg/kg B.W with zingiber extract 400mg/kg B.W.

By the end of the period of 21 days, the rats were anesthetized, blood samples were taken by syringe from the heart, and after separation of serum hormone concentrations of LH, FSH, estrogen and progesterone were measured by ELISA in the laboratory of Jahrom University of Medical Sciences. One-way ANOVA for comparison between treatments (ANOVA) followed by t-test and Duncan test was used for multiple comparisons between groups. ($P<0.05$) level was considered significant. Data analysis and statistical testing was performed using SPSS, version 17.

RESULTS

Concentrations of LH in groups G100, GZ100 and GZ400 than group C showed a significant decrease. GZ100 and GZ400 group also showed a significant increase was observed in the G100 group ($P <0.05$).

Concentrations of FSH in group C than group showed a significant reduction in G100. The group Z400 significant increase was observed in the C group. GZ400 group compared to the G100 was a significant increase ($P <0.05$).

In Z100 and Z400 groups estrogen levels were significantly increased compared to C group. G100 in a significant reduction in estrogen levels than group C was observed. Groups GZ100 and GZ400 is a significant increase compared to the G100 group ($P <0.05$).

The results of the hormone progesterone in Z400 group were significantly increase

compared to C group. In the G100 group also showed a significant decrease compared to the C group. GZ100 and GZ400 group compared to the G100 is a significant increase (P <0.05).

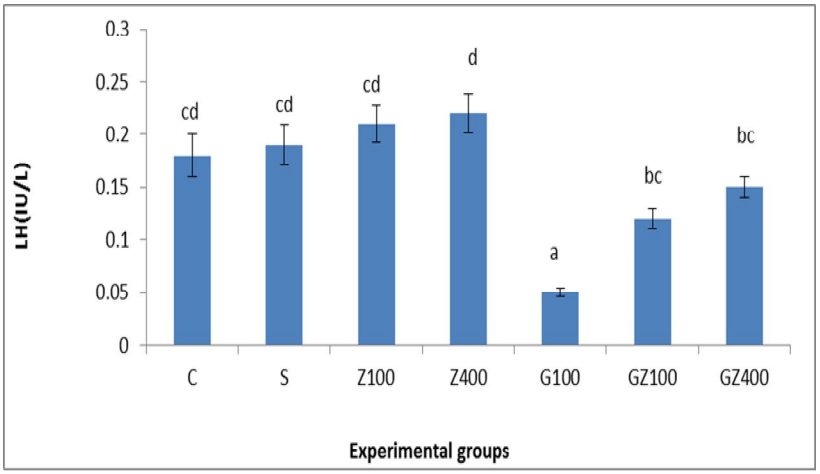

Figure 1: Effect of Glyphosate and *Zingiber officinal* Extract on LH. The Culmnes that have at Least One Common Letter, Have not Significant Different From Each Other at the Level of P<0.05

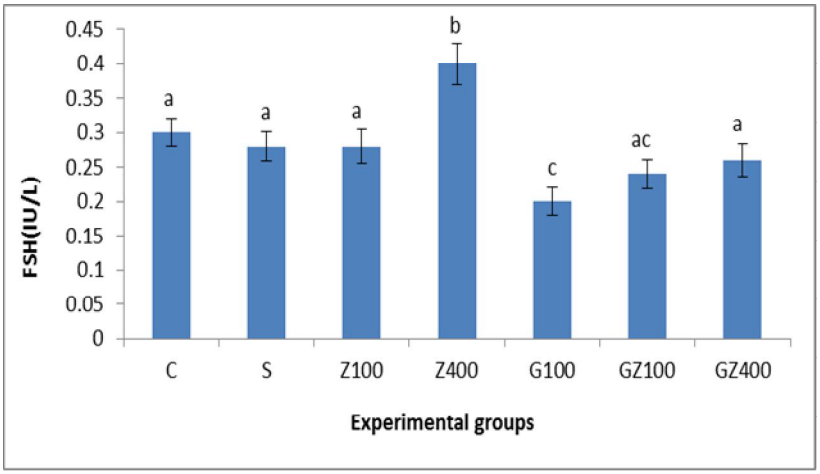

Figure 2: Effect of Glyphosate and *Zingiber officinal* Extract on FSH. The Culmnes that Have at Least one Common Letter, Have not Significant Different From Each Other at the Level of P<0.05

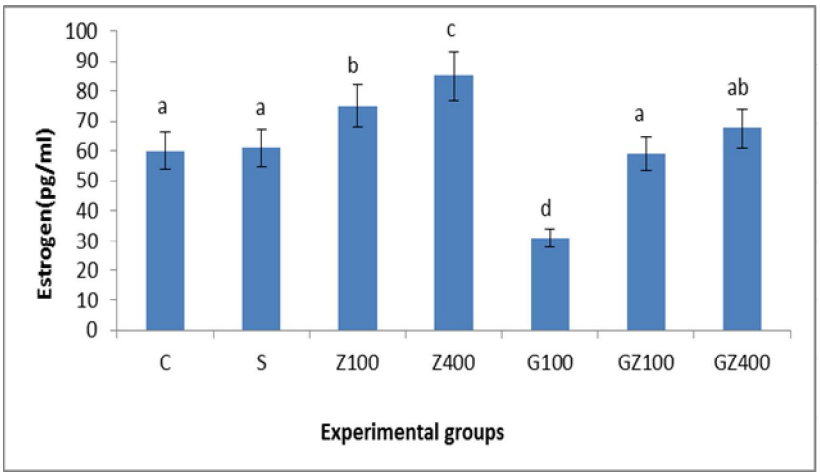

Figure 3: Effect of Glyphosate and *Zingiber officinal* Extract on Estrogen. The Culmnes That Have at Least One Common Letter, Have not Significant Different From Each Other at the Level of P<0.05

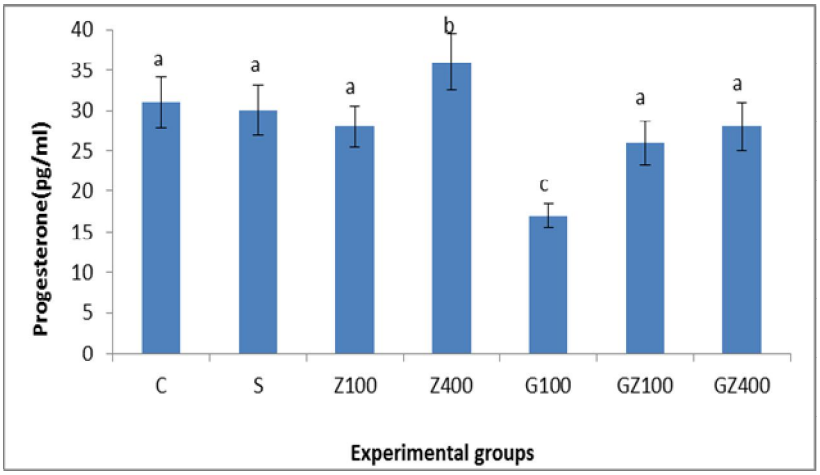

Figure 4: Effect of Glyphosate and *Zingiber officinal* Extract on Progesterone. The Culmnes That Have at Least One Common Letter, Have Not Significant Different From Each Other at the Level of P<0.05

DISCUSSION

In the present study it was observed that the concentration of sex hormones LH, FSH, estrogen and progesterone in group G100 had a significant reduction than group C. According to research, exposure glyphosate caused by endocrine dysfunction and also reduces the synthesized mRNA. Researchers stated that glyphosate progesterone synthesis in mouse cells disrupts steroid genesis and protein and disrupts the Star protein **[12]**. Star protein is essential for adrenal steroidogenesis in and Star protein expression and may potentially interfere with carbohydrate metabolism, immune system function, water balance, and also affect fertility, It also may affect

reproduction in humans and other mammals, birds and amphibians are also affected **[12]**. Glyphosate previously reported that non-toxic concentrations of the enzyme aromatase, which is responsible for estrogen synthesis is affected **[11]**. Glyphosate can cause endocrine disorders through inhibition of aromatase in mammals and these effects can cause abnormal development of the fetus during pregnancy, low birth weight, premature birth and miscarriage **[13-14]**. Overall, a significant decrease in concentrations of sex hormones in reproductive activity causes reproductive disorders in individuals who are exposed to chemicals **[15]**. The research has shown that chemicals affect ovarian disturbances in estrogen and progesterone levels are raised. It was also reported that damage to the ovaries, progesterone and estrogen levels are reduced. Estrogen and progesterone naturally affect fertility and ovulation and LH and FSH secretion of these two hormones is influenced by the pituitary **[16]**. So we can conclude stating that the ovarian tissue is affected by the hormones estrogen and progesterone can interfere. Studies show that oxidative stress plays an important role in the pathogenesis of various diseases such as cancer, diabetes, cardiovascular disease, Parkinson's disease, schizophrenia, atherosclerosis, lung disease and cataracts **[17]**. Studies so far have shown that the production of reactive oxygen species and oxidative stress glyphosate in human lymphocytes **[19-18]** in human skin cells **[21-20]**, Bovine lymphocytes **[18]**, Great American Pig **[22]**, pregnant rats and their fetuses **[23]**, rat liver cells **[24]**. Thus, a decrease in hormones can also cause other reactive oxygen species and oxidative stress is created. Ginger is also one of the herbs in the history of medical science in particular, is inflammation **[26]**. Despite numerous reports of anti-tumor effects of the plant, the more marked this effect occurs through the mechanism of reducing inflammation **[25]**. Anti-inflammatory effects of this plant are in line with several reports have shown that the active components of the plant such as ginger, shogaol and curcumin inhibited the production of prostaglandins and nitric oxide as well as the ability and IL are involved in inflammation **[27]**. In addition to over 40 different antioxidant compounds in ginger have been identified **[28- 29]**. The antioxidant properties

reduce the effects of free radicals in the body material manufacturer. In the present study, the groups that receiving ginger significant increase in the concentration of LH, FSH, estrogen and progesterone, this represents the observed anti-inflammatory and antioxidant properties of the this extract. In groups Z400 and Z100 that have received only ginger extracts hormone concentrations are increased. That indicating the positive effects of the extract. In the groups that received the same extraction and glyphosate hormone secretion improvement was observed as a significant increase in serum FSH and progesterone GZ400 group compared to the G100 has received glyphosate toxin was observed. The GZ100 in the hormones estrogen and progesterone concentrations were significantly increased compared to that of G100. What is certain is that the groups that had received a higher dose of the extract is determined hormone secretion improvement in the use of higher doses of the extract was more effective.

CONCLUSIONS

According to the above subjects, glyphosate poison with several mechanisms, including the production of reactive oxygen species and protein dysfunction star causes impaired secretion of female sex hormones. Ginger extracts with antioxidant and anti-inflammatory properties of their sex hormones were improved. The use of higher doses of the extract is recommended in order to better efficacy.

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