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The Effectiveness of Aqueous Extract of Ginger on Some Sex Hormones and Biochemical Parameters in Female Laboratory Mice (*Mus Musculus L.*)

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Abstract:

Objective: Ginger is a flowering tropical plant that commonly used as a spice and flavoring having various pharmacological properties, several phytochemical compounds which has biological activity. The main bioactive compound in ginger is gingerol, have a powerful anti-inflammatory effect will greatly affect on fertility. Also, it has an effective role in many laboratory experiments to study the physiological activities of ginger extract on these functions. **Aim:** This study aimed to investigate the effects of ginger extract on some sex hormones like estrogen, progesterone, follicle-stimulating hormone (FSH) and luteinizing hormone (LH) in female mice, also its effect on total protein, albumin and globulin

Methods: Thirty adult female mice of (*Mus Musculus L.*) weight (22-24g) were derived into three groups one control and two treated. Ginger water extract be ready to prepare with affecting doses according to experimental test on mice (3.5 and 7 mg body weight/mice). The concentration of serum female sex hormones (FSH, LH, progesterone and estrogen) were measured.

Results: Ginger water extract caused a significant increase in the level of estrogen in both doses and significant increase in the level of FSH and LH in high dose only ($P<0.01$). While progesterone level show no significant changes. On the other hand, the serum total protein, albumin and globulin shows a significant increase only in total protein and globulin levels ($P<0.01$) in turn albumin level show no significant changes in comparison to control.

Conclusion: The results of this study, ginger extract could increase the level of female sex hormones (estrogen, FSH and LH) and conceder as adjunctive natural therapy for improvement of female sex hormones as well as lead to increase in total protein and globulin level which is essential for boosting the immunity.

Keywords: Aqueous extract of ginger; Sex hormones; Biochemical parameters; ginger.

1 Introduction

Female sex hormones imbalances are common but should not be considered normal that may lead to disorders in ovulation which about counting percent 30-40% of all fertility disorder causes in women (Mehrdad Modaresi, et al 2010. Aliaa, et al 2021). The prevent and treat them is the first mostly seriously matters that numerous researchers have recently focused on. The long- term administration of drugs that used to correct hormonal disorders may be causes many side effects on the body of female and the proficient will believe that it should be direct effect to the patient by use a herbal medication as a remedy to lower these side effects (Shewita & Taha2018). Ginger (*Zingiber officinale*) family Zingiberaceae consider a herbaceous plant perennial from southeastern of Asia, or its aromatic pungent rhizome (stem underground) used as a spice, flavor, sauces, curry dishes, confections, pickles, food, breads, and in medicine treatment of various diseases like cardiovascular, pulmonary, gastrointestinal, and sexual disorders (Ogbuewu, et al 2014, Al-Katib, et al 2009). Also, it has been listed in document of the US FDA and (GRAS), "Generally Recognized as Safe" where a dose of powder ginger (0.5-1.0 g) was ingested for (2-3 times) from three months to more than two years didn't cause any side effects (Bloch, and Thomson, 1995). The sex hormones are involved in health general and insufficient levels are linked with a broad range of disorders such as diabetes, infertility, bone loss and osteoporosis (Karakas, et al 2018, Hsia, et al 2007). Furthermore, ginger has various pharmacological properties, several phytochemical compounds which have biological activity and can affect many blood biochemical parameters such as total protein (Jamel, et al 2010). Proteins are important building blocks of all cells and tissues and are necessary for body's growth, development, and health (Vivian, et al 2015). Albumin proteins keep fluid from leaking out of the blood vessels while globulin proteins play an important role in the immune system (Matsuda, et al 2009). In addition, ginger mentioned as agent of detoxification to bromobenzene and alcohol abuse (El-Sharaky, et al 2009, Shati, and Elsaid, 2009). Also, use for anticancer effect in hepatic cell (Habib, et al 2008). The target of this search is to investigate the effectiveness of water ginger extract on female sex hormones as well as on the level of blood total protein, albumin and globulin in adult female mice.

2 Materials and Methods

2.1 Preparation the extractor of ginger

In market of Basrah, the dry's rhizome of *Zingiber officinale* was brought. As much as (50 g) of crude ginger was boiling in container have (350 ml) of water for (25) minuet, the dried cool extract finally was resolved in distill water. Then it will be ready to prepare the affecting doses according to experimental test on mice as below (3.5 and 7 mg ginger extract/ body weight/mice).

Animals: Thirty adult female mice (*Mus Musculus* L.) were brought from the animal house in biology department, with weight was (22-24 g) were divided into three groups one as control and the other two as treated group. Within a 12 h light and 12 h dark cycle, they were storage for 28 days at room temperature ($22\pm3^{\circ}\text{C}$) in standard diet and water.

Project of experiment: 0.1 ml in every dose of aqueous *Zingiber officinale* extract (3.5 and 7 mg ginger extract/ body weight/mice) were injected intraperitoneal (IP) for four weeks, while a control group received the same injected dose of distill water at the same time. Blood samples was taken from the heart and kept in a special tube to clot formation for some biochemical tests and sex hormones after animals were butcher at the end of last dose.

2.2 Analyses of sex hormones and some biochemical test

The clot of blood samples was detached by centrifuge for (25 min at 3000 rpm) after 28 days to have a serum for measurement of the parameters. The serum total protein and albumin by using a kit from Biolab company (France) according to (Dmaous,1981, Doumas, et al 1971). While the value of globulin for every sample was gotten by deducting the albumin value from the identical total protein value. (A/G) ratio test measures by division the level of albumin to globulin grade. The concentration of serum sex hormone LH, FSH, estrogen and progesterone were measured by the (Enzyme Linked Fluorescent Assay) ELFA technique using the modern VIDAS automated quantitative test procedures analyzing the sexual hormones as described by (Anckaert. et al 2002, Haakola, et al 1997, Haavisto, et al 1995).

2.3 Statistical test

The SPSS version (16) statistical program was used to have the data analytical and descriptive statistics. The mean, standard deviation (\pm SD), minimum and maximum values for all parameters were determined. A highly significant difference is a P value less than 0.01.

3 Results and Discussion

The blood samples serum shows in (Table 1) FSH, LH significantly excess in high dose, while estrogen clarified raises in both doses significantly. Whilst progesterone in treated (1 and 2) groups had no affected reach to significant value.

Total protein and globulin in table (2) have a statistically differences in (3.5, 7 mg aqueous extract of ginger) compared to the control group ($p < 0.01$). Whereas, albumin and (A/G) ratio significantly not reached in statistic for both doses at the same level of values.

Table 1: Aqueous extract of ginger effect on some sex hormones in female mice (N= 10)

Parameters	Control Distal water	Treated 1 (3.5 mg) ginger extract/mice	Treated 2 (7 mg) ginger extract/mice
FSH ng/mL	32.18 \pm 0.51	35.42 \pm 1.81	*41.77 \pm 4.28
LH ng/mL	5.2 \pm 2.73	7.96 \pm 0.59	*10.37 \pm 2.25
Estrogen pg/mL	118.5 \pm 3.32	*131.92 \pm 1.83	*145.42 \pm 0.88
Progesterone ng/mL	4.69 \pm 1.64	4.51 \pm 4.84	5.11 \pm 3.67
P value	(p<0.01)	(p<0.01)	(p<0.01)

* Significant increase

Table (2): Aqueous extract of ginger effect on (total protein, albumin and globulin) in female mice (N= 10)

Parameters	Control Distal water	Treated 1 (3.5 mg) ginger extract/mice	Treated 2 (7 mg) ginger extract/mice
Total Protein (g/dl)	11.13 \pm 3.18	*15.78 \pm 3.98	*18.14 \pm 7.49
Albumin (g/dl)	8.82 \pm 0.28	9.03 \pm 0.63	9.89 \pm 1.21
Globulin (g/dl)	2.31 \pm 7.65	*6.75 \pm 6.42	*8.25 \pm 4.63
(A/G) ratio	3.81 \pm 1.44	1.33 \pm 0.63	1.19 \pm 2.12
P value	(p<0.01)	(p<0.01)	(p<0.01)

* Significant increase

Discussion:

There was a significant increase of estrogen level in both doses (3.5 and 7mg body weight/mice), also there was a significant increase of FSH and LH level but in high dose, the progesterone level in the treated groups had no significant changes compared to control group as illustrated in (Table 1). These results is confirmed by prior studies will be suggest that ginger extractor contains inactive ingredient antioxidants that have effect on the regulation of gonadotropin production like gingerols and shogaols which block production of arachidonic acids by interpose with lipooxygenase, pathways cyclooxygenase and that way lead to prevent production of prostaglandin (Hosseini & Jahandideh 2015, Solmaz, 2020, Harrison, et al 2011). Furthermore, survey about ginger extract had shown that it have anti androgenic effects such as, polyphenolic compounds and flavonoids with their specify physiological and pharmacological effects could rebalanced any disorders in sex hormones (Montazeri, et al 2018, Andi, et al 2021). Moreover, ginger have the ability to increase

glutathione level which act as anti-oxidant and hydrogen donors to free radicals to prevent oxidative stress which is a trigger for oocyte damage and infertility as well as lead to increase estrogen hormone levels (Amanda, et al 2017, Loucks, and Thuma, 2003). The ginger extractor considered as assistant therapy to amelioration of gonadotropin hormones levels and for ovarian follicles growth and maintenance (Oni, 2018). In present study the treatment of ginger extract caused a significant increase in total protein and globulin levels in both doses while albumin show no significant changes in treated groups in comparison to control group as illustrated in (Table 2). These results are in agreement with previous studies that revealed that ginger had a preservation effect on liver cells and the functional capacity of hepatocytes which are the site where proteins synthesized being improved (Sattar and Jamal, 2013, 29. Saira, et al 2018). The possible explanation was the administration of ginger extract may cause stabilization in hepatocytes membrane and protect the liver against deleterious

agents (Muthusamy, and Sankar, 2015). Also can help the liver to maintain its normal functions by

4 Conclusions

According to results of this study, consumption of ginger could increase the serum levels of estrogen, FSH, LH therefor, conceder as a herbal medicine have additional benefit and efficacious properties in balancing female sex hormones without any side effects. Furthermore, there was an increase in the level of total protein and globulin which is essential for boosting the immunity.

Recommendations:

More studies about this herb and other traditional uses for effective on other organ for importance to increase knowledge in future research.

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Ethics Approval and Consent to Participate:

Permission and fundamental approvals were obtained from biology house official to use mice to complete the experiment.

Funding:

The researchers did not receive any financial to support the completion of this research.

Competing Interests:

During the experiment, there was no conflict of interest.

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