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The impact of Sesamum indicum oil on the heamatological parametrers on albino mice

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Abstract--The current study was conducted to find out the effect of sesame oil on white female rats by studying some biochemical parameters that included vitamin D, parathyroid hormone and calcium ion. The study included 35 animals divided into two main groups divided into groups, each group included 5 animals dosed with different doses 0.5'0.8' 1 ml. The period of dosing was for a month between one day and one day. After the end of the experiment, the animals were sacrificed and the serum was obtained. A significant increase in the volume of vitamin D (13.21 ± 0.312 , 16.01 ± 0.51 , 19.51 ± 0.78) (ng/dl) respectively compared with control group (9.739 ± 0.096) (ng/dl) and a decrease in parathyroid hormone (0.101 ± 0.001 , 0.086 ± 0.002 , 0.074 ± 0.002) (ng/dl) respectively compared with control group (0.112 ± 0.002) (ng/dl), which caused an increase in calcium ion (9.85 ± 0.206 , 10.948 ± 0.178 , 12.62 ± 0.158) mg/dL respectively compared with control group (8.7 ± 0.063) mg/dL, was shown. The second group dosed for two months, and the period of dosing was more effective in Significant increase and decrease in these criteria, The results showed the effect of sesame oil depends on the quantity of the dose, as the effect was at the highest dose of 1 ml, as well as the period vitamin D (13.385 ± 0.657 , 15.849 ± 0.999), PTH (0.097 ± 0.002 , 0.090 ± 0.003) and calcium ion (10.095 ± 0.317 , 10.964 ± 0.351).

Keywords--- heamatological, Sesamum indicum oil, albino mice.

Introduction

Sesame (*Sesamum indicum* L.) is one of the most significant oil seed crops, with seeds and edible oil considered as a traditional healthful dietary element due of the high levels of protein and antioxidants (Sharma *et al.*, 2021). Sesamin,

sesamol, and sesaminolignan fractions are found in sesame oil and are known to contribute to its oxidative stability and antioxidative activity (Wan *et al.*, 2015). Parathyroid hormone is produced in the parathyroid glands in response to hypocalcemia stimulating bone resorption. A stimulating role in bone formation has also been established through the synthesis of IGF 1 and TGF β . This dual effect of resorption and formation is explained by the fact that the continuous supply of PTH stimulates bone resorption through the synthesis of RANKL on the part of the osteoblastic cells, while at intermittent doses, it would stimulate the formation of bone, associated with an increase of the growth factors and with a decrease in the apoptosis of osteoblasts (Lombardi *et al.*, 2020; Leung, 2021).

PTH is released when calcium blood levels fall below approximately 8.8 mg/dL (in adults). It acts in an indirect fashion by binding to PTH receptors on osteoblasts, and those cells respond by releasing factors noted previously to recruit and activate osteoclasts to resorb bone thereby increasing blood calcium levels (Cardoso, 2020; Kusumi *et al.*, 2021).

Vitamin D is either synthesized in the skin or ingested in the diet and is transported to the liver, where it is hydroxylated in the 25 position to yield 25-hydroxyvitamin D, which is the main storage form of vitamin D and the vitamin D metabolite to be measured to assess vitamin D nutrition. 25-Hydroxyvitamin D is further hydroxylated by the enzyme 1- α -hydroxylase in the kidney, to yield 1,25-dihydroxyvitamin D, which is the active form of vitamin D, the major endocrine form of vitamin D, and this metabolite is responsible for the effects of vitamin D on calcium and phosphorus metabolism, bone health, and the regulation of parathyroid function (Abboud *et al.*, 2017).

Calcium is the most abundant mineral in the body, and it plays a key role in the health of bones and teeth, constriction and relaxation of blood vessels, transmission of nerve impulses, and other functions. Calcium is of great importance in the prevention of osteoporosis (Pravina *et al.*, 2013). Almost all the calcium in the human body is stored in the bones and teeth, where it supports their structure and gives them hardness. Calcium also helps blood vessels in the movement of blood inside the body, and plays a role in the secretion of many hormones and enzymes in the body. The level of calcium in the blood is regulated mainly by two hormones: parathyroid hormone and calcitonin (Glenske *et al.*, 2018).

Material and Methods

The experimental animals

40 adult female rats (*Rattus norvegicus*) weighing (125-250 g) of 6-7 weeks old were used in the present study. Animals were housed in the animal house of the Biology Department, College of Science, Kufa University, Iraq. Experiments were achieved for two months November and December -2021. Animals were housed in plastic cage bedded with wooden chips. During the experimental period four animals were kept in each box and they were housed under standard laboratory conditions (12h light: 12h dark photoperiod (LD) at 22 ± 2 C°

and relative humidity 45-55% (Merriman *et al.*, 2012). Animals were fed on standard rat pellet and tap water. The standard pellet contains wheat 66.6%, soya 25.6%, and sun flower oil 4.4%, lime stone 1.5%, salt 0.63%, methionine 0.158%, choline chloride 0.062% and trace elements 0.05% (Oudah *et al.*, 2019).

The experimental design

35 animals were taken and placed in 2 main groups, one control, and the remaining groups were dosed with three different doses (0.5-0.8-1) ml of *Sesamum indicum* oil the experimental design for animals after Period of time the animals were sacrificed collect blood to obtained serum for hematological study.

Blood samples

3-4 mL of blood were drawn from each animal in the experimental groups, by heart puncture method. Using 60 gauge syringes, the sample was transferred into clean tube, left at room temperature for 15 minutes for clotting, centrifuged at 3000 rpm for 15 minutes, and then serum was separated and kept in a clean tube in the refrigerator at (-20C°) until the time of assay.

Results

Sesame oil

Biochemical parameters

Effect of interactions of oral administration of different concentrations of Sesame oil on vitamin D3, parathyroid hormone and calcium ion in female rats

The results revealed a significant increase ($p < 0.05$) in Vitamin D after oral administration with 0.5, 0.8, and 1 ml/kg/day of sesame oil (13.21±0.312, 16.01±0.51, 19.51±0.78) (ng/dl) respectively compared with control group (9.739±0.096) (ng/dl). And decrease ($p < 0.05$) in PTH after oral administration with 0.5, 0.8, and 1 mg/kg/day of sesame oil (0.101±0.001, 0.086±0.002, 0.074±0.002) (ng/dl) respectively compared with control group (0.112±0.002) (ng/dl) and increase ($p < 0.05$) in calcium after oral administration with 0.5, 0.8, and 1 mg/kg/day of sesame oil (9.85±0.206, 10.948±0.178, 12.62±0.158) mg/dL respectively compared with control group (8.7±0.063) mg/dL, as show in (table 1).

Table (1)

Effect of interaction of oral administration of different concentrations of sesame oil vitamin D3, parathyroid hormone and calcium ion in female rats

Sesame oil mg/kg/day	Vit. D3 (ng/dl) (Mean± S.E)	PTH (ng/dl) (Mean± S.E)	Ca ⁺ mg/dL (Mean± S.E)
Control	9.739±0.096 (D)	0.112±0.002 (A)	8.7±0.063 (D)
0.5	13.21±0.312 (C)	0.101±0.001 (B)	9.85±0.206 (C)
0.8	16.01±0.51 (B)	0.086±0.002 (C)	10.948±0.178 (B)
1	19.51±0.78 (A)	0.074±0.002 (D)	12.62±0.158 (A)

*The different letters in each column refers to significant differences ($P < 0.05$) between means while similar letters refer to non-significant differences between means.

Effect of interactions of oral administration periods of Sesame oil on vitamin D3, parathyroid hormone and calcium ion in female rats

Table (2)

Effect of interactions of different oral administration periods of sesame oil on vitamin D3, parathyroid hormone and calcium ion in female rats

Day	Vit. D3 (ng/dl) (Mean± S.E)	PTH (ng/dl) (Mean± S.E)	Ca ⁺ mg/dL (Mean± S.E)
30	13.385±0. 657 (B)	0. 097± 0. 002 (A)	10.095±0. 317 (B)
60	15.849±0. 999 (A)	0.090± 0. 003 (B)	10.964±0. 351 (A)

*The different letters in each column refers to significant differences ($P < 0.05$) between means while similar letters refer to non-significant differences between means.

Interactions between different concentrations and periods of oral administration of Sesame oil on vitamin D3, parathyroid hormone and calcium ion in female rats

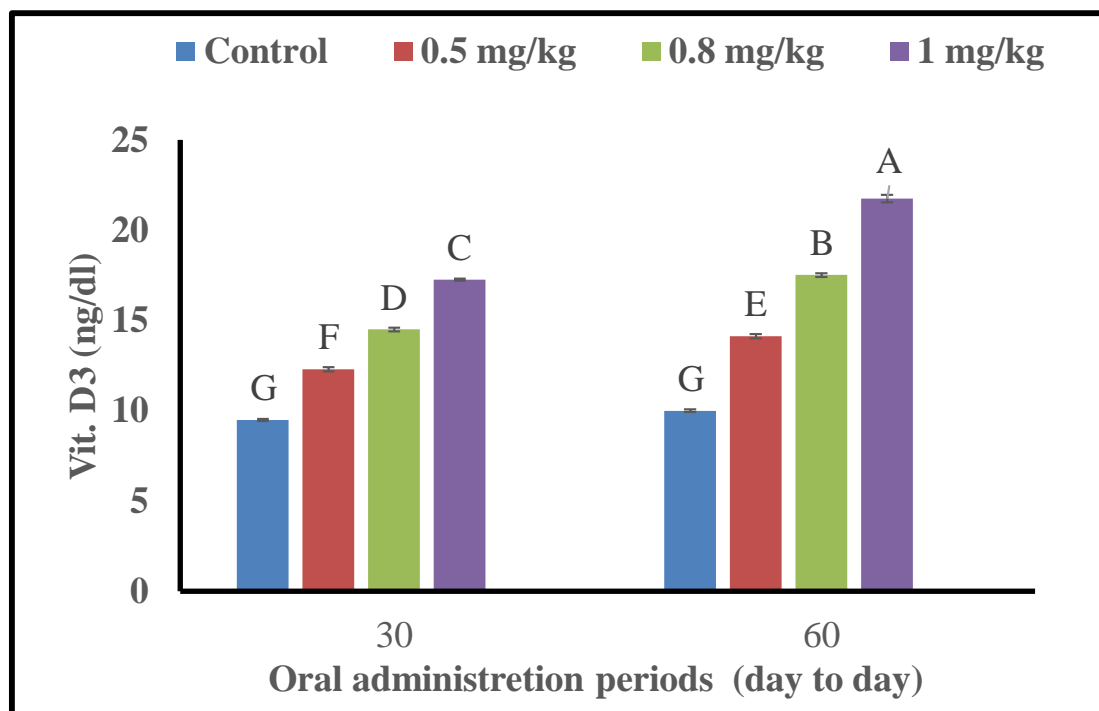


Figure (1): Interaction between different concentrations and period of oral administration of sesame oil on vitamin D3 (ng/dl) in female rats.

*The different letters refers to significant differences ($P < 0.05$) between means while similar letters refers to non-significant differences between means.

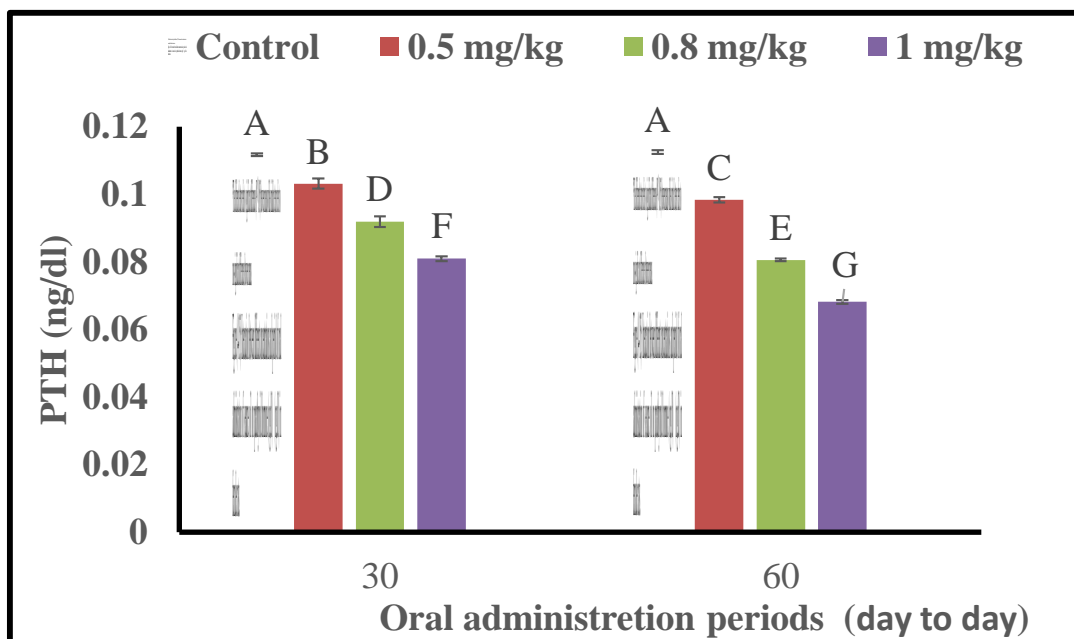


Figure (3): Interaction between different concentrations and period of oral administration of sesame oil on parathyroid hormone (ng/dl) (ng/dl) in female rats.

*The different letters refers to significant differences ($P < 0.05$) between means while similar letters refers to non-significant differences between means.

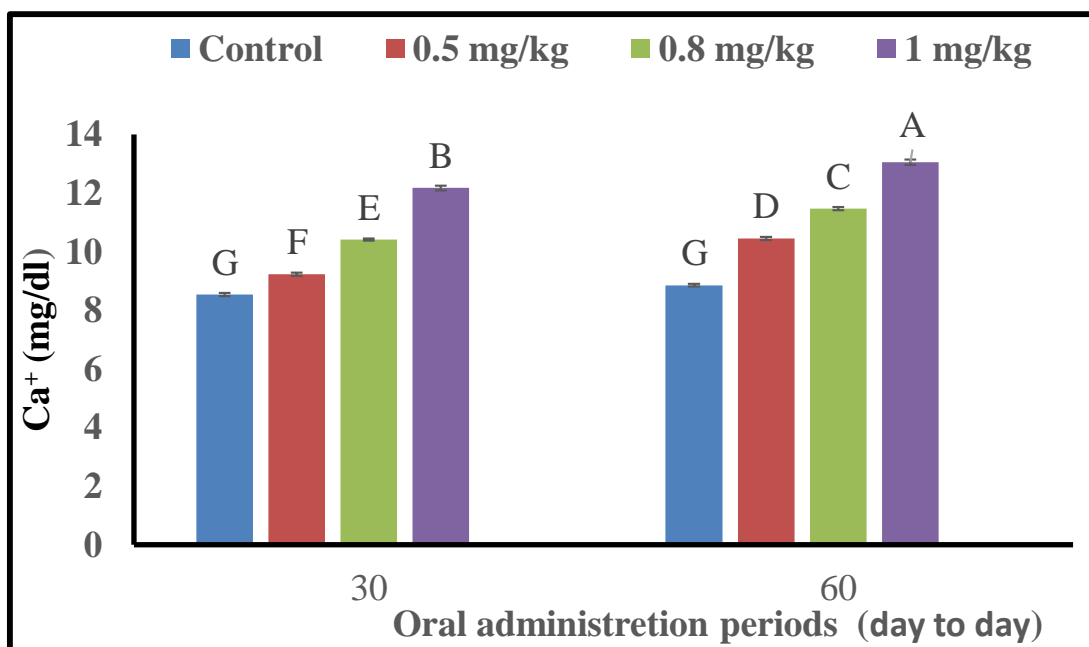


Figure (3): Interaction between different concentrations and period of oral administration of sesame oil on Ca^+ (mg/dl) in female rats.

*The different letters refers to significant differences ($P < 0.05$) between means while similar letters refers to non-significant differences between means.

Active vitamin D sterols (calcitriol and its analogs) lower PTH levels, but also promote intestinal calcium and phosphate absorption. Vitamin D has a critical role in the regulation of calcium and phosphate metabolism by effects on the intestine, bone and the kidneys. Breaking it down to a simple concept, an adequate vitamin D status is required to maintain normal calcium and phosphate levels and prevents secondary hyperparathyroidism. (Pilz *et al.*, 2019).

Studies show that the consumption of vitamin D alone is not effective in preventing bone fractures in the elderly (Reid and Bolland, 2020), but the use of this vitamin with calcium has a positive effect on BMD and reduces the risk of falls and bone fractures (Gil and Mesa, 2018). Although vitamin D and calcium intake can prevent hip fractures or other types of fracture, consideration should be given to the use of these supplements in patients with heart, kidney, and gastrointestinal diseases, because supplements such as calcitriol (the active form of vitamin D) are associated with an increased risk of hypercalcemia (Aslam *et al.*, 2019).

This increase is due to the presence of lignin component sesamin, sesamol and small amount of sesamol (Pusadkar *et al.*, 2015). Our study agree with (Lee *et al.*, 2005) that the reason for the high calcium is a compound sesamol. Also a glycoprotein (osteocalcin) in osteoid binds extracellular Ca^{2+} ions, leading to a high local concentration (Hasegawa, T;018). The enzyme alkaline phosphatase, which is abundant in osteoblasts, increases local Ca^{2+} concentration (Hoshi and Ozawa, 2001).

PTH effects are present in the bones, kidneys, and small intestines. As serum calcium levels drop, the secretion of PTH by the parathyroid gland increases. Increased calcium levels in the serum serve as a negative-feedback loop signaling the parathyroid glands to stop the release of PTH (Wongdee *et al.*, 2019). The mechanism of PTH in the body is intricate, and the clinical ramifications of irregularities are significant. The understanding of PTH is of paramount relevance and importance (Khan and Sharma, 2018).

PTH raises calcium levels by releasing calcium from the bones and increasing the amount of calcium absorbed from the small intestine. When calcium levels in the blood are too high, the parathyroid glands produce less PTH (Bhattarai *et al.*, 2020).

Calcium is the most common mineral of the body and is primarily stored in the skeleton (González-Vázquez *et al.*, 2014). Calcium homeostasis is tightly regulated by PTH and calcitonin, which regulate calcium serum levels by stimulating (PTH) or inhibiting (calcitonin) bone resorption mediated by osteoclasts. During bone remodeling, bone resorbing osteoclasts can create local concentrations of extracellular calcium ions up to 40 mM (Tang *et al.*, 2021). These microenvironmental increases are known to inhibit resorption activity of osteoclasts and to stimulate proliferation and differentiation of mesenchymal stromal cells and osteoblasts (Glenske *et al.*, 2018). During the 1980s,

extracellular calcium was shown to activate an extracellular G-protein-coupled receptor, termed the calcium sensor receptor (CaSR) (Leach *et al.*, 2020). The CaSR is expressed in cells of the hematopoietic lineage, such as in monocytes, osteoclasts and in cells of the mesenchymal lineage (Zhong *et al.*, 2021). Regarding the high responsiveness of bone cells to extracellular calcium, elevated levels of calcium enhance proliferation chemotaxis and osteogenic differentiation of bone marrow-derived mesenchymal stromal cells in a dose-dependent manner by activating the CaSR (Shanbhag *et al.*, 2020). Downstream, the intracellular pathway induces phosphorylation of extracellular signal-regulated protein kinases 1 and 2 (ERK 1/2) (Jones-Tabah *et al.*, 2021) which are part of the mitogen-activated protein kinase (MAPK) signaling pathway, playing an important role in regulating cell proliferation in various mammalian cells (Guo *et al.*, 2020).

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