

The Effects of Fenugreek (*Trigonella Foenum-Graecum*), Sesame (*Sesamum Indicum*) and Domperidone on Weights and Some Hormones of Lactating White Female Rats

Israa Hashim Ali¹, Munif Saob Ahmed², Aziz Khaled Hamid³

¹College of Education for Girls, Tikrit University, Tikrit, Iraq

Email: israahashim3030@gmail.com

²College of Education for Pure Sciences, Tikrit University, Tikrit, Iraq

³College of Science, Tikrit University, Tikrit, Iraq

Abstract

This study was designed to investigate the effect of fenugreek, sesame and domperidone on the mammary glands of pregnant white rats (*Rattus norvegicus*) in different concentrations.

The results of calculating mothers' weights show that there is an increase in the period of dosing and lactation as a result of the mothers being dosed with the materials used for the experiment compared with the control group and for all study groups. In the third week, all groups recorded an increase in the first week after dosing with the control group, but the increase in the experimental groups was greater than the control group which was clear according to the results obtained.

As for the weights, the weights were close after birth between the control group and the experiment groups, but after one week of breastfeeding, a weight difference was observed between the experimental groups and the control group. In the second week, the difference was clear as the increase was higher than in the first week between the control group and the experimental groups and in the week The third difference was clearer, as the increase was higher than the first week and the second week of lactation between the control group and the experimental groups, and the domperidone-dosed group had a higher weight than the rest of the groups which was 27.30 g.

The results of measuring the levels of serum hormones for lactating females showed that there were significant ($p < 0.05$) differences between the different study groups compared with the control group in the case of hormones (prolactin, estrogen and dopamine) for the domperidone-dosed group, as well as the two groups dosed with fenugreek and domperidone and the dosed sesame and domperidone as for the two dosed groups Fenugreek and the sesame dose did not show any significant differences compared to all the other measured hormones, while there were no significant changes or differences ($p > 0.05$) in the case of hormones (progesterone, FSH and LH).

Keywords: hormones, domperidone, fenugreek.

1. Introduction

Fenugreek is suggested to have uterine growth and change and stimulating benefits for lactation due to the presence of steroids such as saponins in the seeds which may be related to a similar stimulating effect of oxytocin or similar compounds on the uterine ducts and mammary glands as fenugreek has been shown to have a growth stimulating effect. [1].

The extracts are those related to milk secretion by their effect on the growth and development of the mammary glands. It was also found that the fenugreek acts as a galactagogue, a factor that stimulates milk production and ductal secretion in the mammary glands of lactating women by giving it to nursing mothers regularly to increase milk production [2].

The growth of the mammary glands is associated with the hormonal control of the reproductive hormones, as progesterone synergizes with estrogen, prolactin and growth hormone to complete the alveolar lobule growth that becomes mature at the beginning of lactation. By the synergistic action of insulin with prolactin [3].

The prolactin receptors in the milk secreting tissue increase

with an increase in milk production under the influence of elevated estrogen levels. Prolactin causes the formation of milk droplets and their secretion into the ducts after birth. The effect of prolactin also includes an increase in mRNA in developing cells [4].

It is found that the fenugreek may contain phytoestrogen, and this substance is very effective in increasing breast milk production. In addition, fenugreek seeds contain a very high level of milk-producing vitamins and may contain strong properties in improving blood circulation and blood flow to the mother's breast, thus increasing the milk flow to the infant [3].

Sesame seeds increase the expression of estrogen receptors in the uterus and have the ability to reduce the growth of breast tumors and increase the number of blood cells by stimulating the bone marrow to the presence of vitamin B12. It is also important in increasing the number and movement of sperm and increasing fertility [5].

The husks of sesame seeds are one of the richest of the three main groups of seeds that have been classified as sources of phytoestrogen. The husks contain a compound (ENL) Enterolactone odol, which is converted by the natural intestinal flora to phytoestrogen and are the factors responsible for estrogenic activity [6]. But in other

research it is found that sesame does not affect the levels of estrone, estradiol and FSH in serum [7].

Domperidone raises the levels of prolactin in females and males, but the increase in females is four times compared to males, especially in high doses (100 micrograms / ml) and more. As for low doses, it is ineffective in stimulating the secretion of prolactin. As for other hormones, it causes a decrease in the levels of the hormones GnRH, TRH and LH Carter et al. [8] and it also leads to a decrease in the sexual activity of female and male rats due to its effect on sex hormones and its inhibitory action on the pituitary gland in releasing these hormones when the rats are treated with treatment for 30 days or more and causes interruption of estrus [9]. Dopamine leads to an increase in the concentration of prolactin in the plasma which acts on the ovary directly to stimulate the expression of gonadotropin receptors, thus increasing the release of FSH and LH McCue [10]. The corpus luteum by stimulating the growth of follicles [10].

2. Materials and Work Methods

The experiment was conducted in the laboratories of the College of Education and the Medical Rehabilitation Hospital in Tikrit, to show the effect of fenugreek, sesame and domperidone on lactating females of laboratory white rats *Rattus norvegicus*. The plants used in the experiment were obtained from the Herbal Medicine Department of the Technical Affairs Department of the Ministry of Health and used the fenugreek as a natural oil prepared from ground fenugreek seeds. As for sesame, it was used as a feed by grinding it and mixing it with brown flour at a ratio of 10-1%.

The drug used, domperidone, was obtained from local pharmacies in the form of hard disks of 2 mg, called Motilium, manufactured by the Portuguese company Janssen pharmaceutica NV, where it was crushed and dissolved in distilled water. Fenugreek was used as an oral dose of 0.5 ml / day in oil form [11, 12]. As for sesame, it was used at a weight of 1 g/day [5] and domperidone was used as an oral dose of 2 mg/day [13] 120 female rats were used in the experiment, which were divided into groups of 10 rats for each group as follows:-

- 1 -The first group (control): included 20 lactating females.
- 2 -The second group: included 20 lactating females who dosed fenugreek oil 0.5 ml.
- 3 -The third group: included 20 lactating females, they dosed 1 gm of sesame.
- 4 -The fourth group: included 20 lactating females who dosed 2 mg of domperidone.
- 5 -The fifth group: included 20 lactating females who dosed fenugreek and domperidone.
- 6- The sixth group: included 20 lactating females who were dosed with sesame and domperidone.

All mothers and newborns were weighed using a 500g Table Balance / Japan sensitive micro scale.

As for the hormone assays, prolactin, estrogen and dopamine were measured using the Enzyme Linked Immuno Sorbent Assay (ELISA) using an ELISA Reader type (Bio Tek of American origin) and Kits for the mentioned hormones manufactured by the American company Accu Bind for the hormones prolactin and estrogen and

progesterone and LH, FSH and the American company CUSABIO for the hormone dopamine.

3. Results and Discussion

The results of calculating the mothers' weights during the period of dosing indicate that there is an increase in the period of dosing and lactation as a result of the mothers being dosed with the materials used for the experiment compared with the control group and for all study groups. And 37.95 gm in the third week, where all groups recorded an increase in the first week after dosing with the control group, but the increase in the experimental groups was greater than the control group, which was clear from the results obtained.

The highest increase was in the second week of dosing, as the increase was in the dosed group, fenugreek and domperidone, followed by the dosed group, Sesame and Domperidone, in contrast to the control group, sesame, and domperidone, where the increase in the second week was less than the other weeks of dosing.

Also, in the third week of dosing, an increase in maternal weights was recorded, especially the group dosed with fenugreek, but it was less than the second week for the group dosed with fenugreek and the group dosed with fenugreek and domperidone, and the group with sesame and domperidone as well. As for the group dosed with sesame, the increase was in a week

The third was higher than the first and second weeks of dosing and the domperidone-dosed group. The increase in the first and third weeks was equal as shown in Table (1).

Table (1) shows the average weight of mothers after each week for a period of three weeks until weaning				
Week 3	Week 2	Week 1	At birth	Weight /gram Group
35.33	35.29	35.27	35.14	Control
37.95	37.13	35.98	35.21	Fenugreek
36.79	36.20	35.97	35.52	Sesame
37.62	37.04	36.67	36.09	Domperidone
36.37	35.89	35.08	34.42	Domperidone and fenugreek
36.38	35.91	35.12	34.83	Domperidone and sesame

The effect of the materials used in the experiment on the weights of the infants throughout the breastfeeding period was also observed, as the weights were close after birth between the control group and the experiment groups, but after one week of breastfeeding, a weight difference is observed between the experiment groups and the control group, as there is an increase in the weight of infants for the experiment groups and the group is the dosed mothers of cyclamen and domperidone had a higher weight which is 10.24 g. In the second week, the difference is clear, as the increase is higher than in the first week between the control group and the experimental groups, and the dosed group whose mothers domperidone is higher in weight which is 16.12 g.

In the third week, the difference is clearer, as the increase was higher than the first week and the second week of lactation between the control group and the experimental groups, and the domperidone-dosed group had a higher weight than the rest of the groups which is

27.30 gm (Table 2).

Table (2) shows the average weight of infants at birth and after each week for three weeks until weaning				
Wee k3	Week 2	Week 1	At birth	Weight /gram Groups
24.44	14.36	9.75	7.25	Control
25.71	15.26	10.13	7.22	Fenugreek
25.68	15.24	10.14	7.24	Sesame
27.30	16.12	10.22	7.25	Domperidone
27.23	16.9	10.24	7.24	Domperidone and fenugreek
27.26	16.11	10.22	7.24	Domperidone and sesame

The results of measuring the levels of serum hormones for lactating females showed that there are significant ($p < 0.05$) differences between the different study groups compared with the control group in the case of hormones (prolactin, estrogen and dopamine). As for the two groups dosed with fenugreek and the dose with sesame, this statement does not apply to them because it does not show any significant differences compared to all other measured hormones, while no significant changes or differences ($p > 0.05$) appeared in the case of hormones (progesterone, FSH and LH) for the groups dosed with domperidone, fenugreek and domperidone. Sesame and Domperidone

In the case of the progesterone hormone, there are no significant differences between the dosed groups and the control group. There is only a small difference in the decimals. It is not considered a significant difference and does not affect the result, but in the case of FSH, no significant differences were observed between the dosed groups and the control group, as there is a difference Simple in the value or level is not considered significant, in the case of luteinizing hormone the same result also appeared as there were no significant differences between the study groups.

In the case of estrogen, there were significant differences between the study groups. The group dosed with fenugreek and the group dosed with sesame did not show any significant differences between them and the control group, but the domperidone dosed group, the domperidone dosed group, and the group dosed sesame

and domperidone showed significant differences between them and the control group and also between them and the other two groups. The dosed fenugreek and the sesame-dosed group increased, the levels of this hormone increased in the domperidone-dosed groups. Circuit and domperidone and the group dosed with sesame and domperidone, and the difference is clear between them and the control group and the two groups dosed with herbal diuretics. Among the group Hungary Domperidone and the group dosed with fenugreek and domperidone compared with the group dosed with Sesame and Domperidone as the levels of the hormone increased more than the group dosed with Sesame and Domperidone, the hormone dopamine groups showed significant differences compared to each other. Significant, while we find clear significant differences in the domperidone dosed group, the fenugreek and domperidone dosed group, and the sesame and domperidone dosed group when compared with the control group and the other two herbal diuretics dosed groups.

Table (3) Average levels of hormones in lactating females for the different study groups (modified M + S.E standard error).						
Domperidone	prolactin	Estrogen	LH	FSH	Progesterone	Hormone Groups
23.41 ± 6.08 a	6.986 ± 1.921 c	6.992 ± 3.3 b	3.092 ± 0.73 7 a	7.018 ± 1.31 5 a	1.54 ± 0.583 a	Control
24.62 ± 7.25 a	6.747 ± 1.814 c	5.275 ± 2.744 b	3.093 ± 0.72 5 a	6.979 ± 1.26 8 a	1.5645 ± 0.4289 a	Fenugreek
24.48 ± 7.36 a	6.761 ± 2.039 c	6.21 ± 2.485 b	2.986 ± 0.69 6 a	6.972 ± 1.139 a	1.6870 ± 0.46 a	Sesame
7.739 ± 2.042 b	10.756 ± 4.288 a	10.121 ± 1.098 a	3.571 ± 0.17 4 a	6.577 ± 1.35 5 a	1.5735 ± 0.3803 a	Domperidone
7.739 ± 2.043 b	10.170 ± 4.56 a	10.243 ± 1.259 a	3.175 ± 0.72 6 a	6.931 ± 1.31 7 a	1.435 ± 0.4171 a	Fenugreek and Domperidone
7.739 ± 2.043 b	8.750 ± 4.54 b	9.936 ± 1.277 a	3.150 ± 0.83 4 a	6.901 ± 1.24 5 a	1.514 ± 0.4319 a	Sesame and Domperidone
The different letters denote the significance Significance level $p < 0.05$						

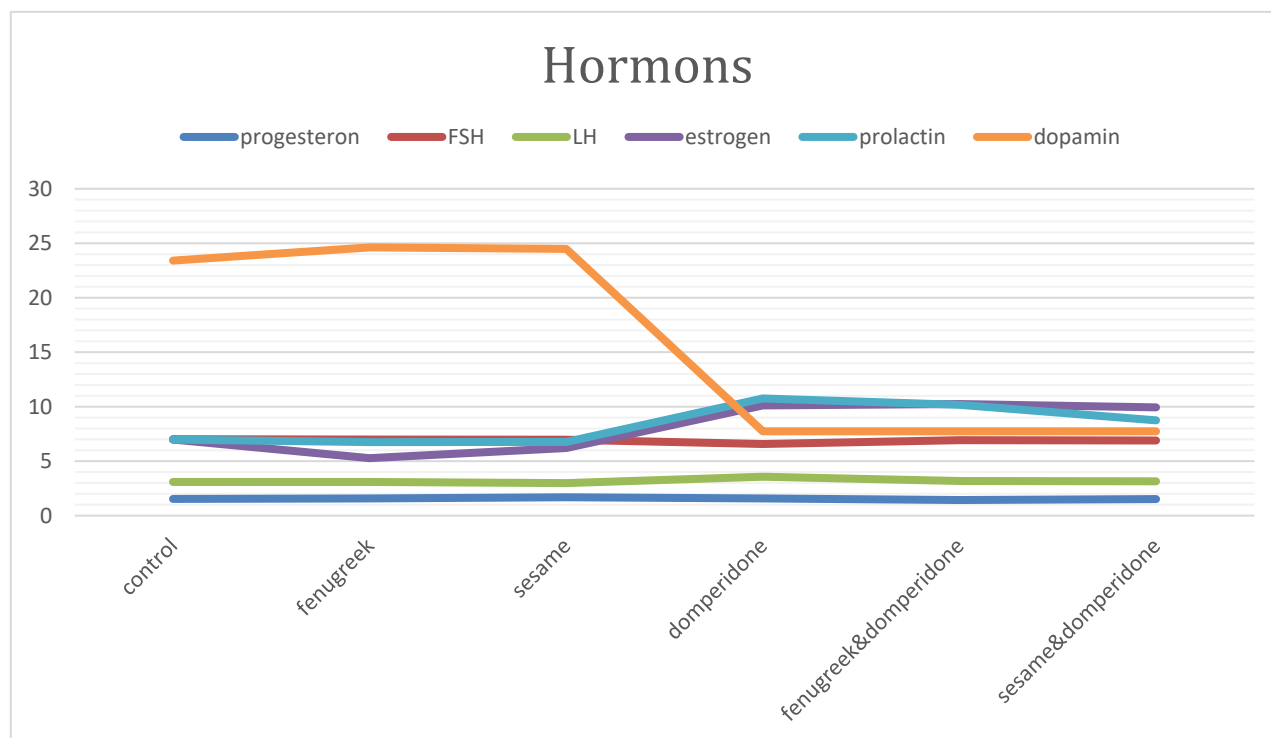


Figure (1) A diagram of the effect of the materials used in the study on hormone levels in lactating females

It is noticeable in the results of the current study of the weights of nursing mothers and infants that the highest weight of nursing mothers in the case of using fenugreek and of course this herb is known for its role in weight gain since ancient times due to its nutritional importance and also its action in stimulating the conversion of the basic building blocks of known nutrients into fats that are stored in the body. An increase in infant weights and also the highest weight recorded in the newborns of the domperidone-dosed group, which proves the increase in the nutritional value of milk.

These results are in agreement with [Wu et al. \[14\]](#) and with [Agiang et al. \[15\]](#) an increase in the weight of lactating women when consuming sesame, and it was found [\[16, 17\]](#) that lactating women increased their weight when they regularly consumed herbal tea containing fenugreek during the lactation period.

As for (Romagnoli and Majolino, 2008), it was found that an increase in the weights of infant dogs and cats was found when their mothers dosed domperidone during the lactation period.

It agrees with [Osadchy et al. \[13\]](#), who observed an increase in the weight of infants of mothers who were given a daily dose of 10 mg/day of domperidone, and this confirms that domperidone leads to more milk supply from the mammary glands due to its effect on the pituitary gland and stimulating it to secrete the prolactin-stimulating hormone. Mammary glands increase milk production and inhibit the release of dopamine that reduces the secretion of prolactin from the pituitary gland by binding to its receptors.

The results of a study conducted by (Alalawi et al, 2012) to show the effect of fenugreek oil on the mammary glands do not agree with the results of the current study, where only a slight increase in the proportions of infant weights during the breastfeeding period was recorded. It is larger [\[18\]](#). As for our experience, it is throughout the

lactation period, which give better results, and the increase in the size and weight of infants is evident in the treated groups than the control group.

It also does not agree with [Agiang et al. \[15\]](#) that infant weights increased very slightly in rats when mothers were given sesame oil during lactation.

But it agrees with [Sharma et al. \[5\]](#), who confirmed through the results of his study the increase in the weight of infants for mothers fed sesame throughout the lactation period, as supplying the developing infant's body with the necessary nutrients of proteins, carbohydrates and fats, in addition to the vitamins and minerals available in foodstuffs promotes optimal and faster growth of the infant's body.

The results of the experiment also agree with the results of [Ozalkaya et al. \[16\]](#) in terms of infant weight gain after mothers drank herbal tea containing fenugreek during the lactation period, and since the herbal groups regulate the expression of receptors in the mammary glands of the hormone prolactin, which leads to an increase in milk secretion.

The results of the hormone tests showed that there were no changes in the levels of the hormones progesterone, FSH, and LH in all study groups. In contrast, there were changes in the levels of the hormones estrogen, prolactin, and dopamine in the groups dosed with domperidone and domperidone with herbal diuretics.

Our results do not agree with [Reeder et al. \[19\]](#) an increase in the level of the hormone prolactin and estrogen in nursing mothers as a result of taking doses of fenugreek in the form of herbal capsules for the effect of the fenugreek on the cells of the pituitary gland and stimulating them to secrete more prolactin hormone, so its level in the blood.

It also does not agree with (Abdualjabar et al, 2013), which obtained an increase in the levels of the hormone prolactin, estrogen and progesterone in the serum of

lactating rats fed sweet cumin seeds during the lactation period for the same previous reason.

It does not agree with the results of Mohanty et al. [20] which recorded in its results an increase in the level of the hormone prolactin and a decrease in the level of the hormone dopamine because it is dosed with a number of diuretics, including fenugreek, where he confirmed that the diuretics work to inhibit dopamine receptors, thus increasing the secretion of prolactin and thus the development of the mammary glands and an increase milk production.

But it agrees with Liu et al. [21], who noted that there is no increase in the level of the hormone prolactin and estrogen when taking fenugreek during lactation, but rather the effect of herbal diuretics on the receptors of the hormone prolactin in the cells of the secretory mammary glands, as these herbs lead to an increase in the structural processes of proteins in The cells, including the membrane prolactin receptors, increase the stimulatory effect of prolactin on the secretory cells, and as a result, the secretion of milk from these glands increases.

The results agree with Ozalkaya et al. [16] that the level of the hormone prolactin and dopamine decreased during lactation with an increase in the amount of milk secreted in nursing mothers who drink herbal tea containing fenugreek during the lactation period and without any side effects because herbal diuretics generally do not affect the secreting cells. The hormone prolactin is in the pituitary gland, but it affects the receptors of this hormone in the milk-secreting cells in the mammary glands, which are stimulated by the hormone prolactin.

It agrees with Wang [7], where its results showed that the levels of estrogen, follicle stimulating and prolactin hormones did not change in rats as a result of feeding on sesame during lactation. On the prolactin receptors in secretory vesicle cells in the mammary gland.

It also agrees with Wu et al. [14], who observed no changes in the level of estrogen and other sex hormones in lactating mothers fed a specific amount of sesame for each day of lactation.

Also, our results do not agree with Agiang et al. [15] who found an increase in the level of prolactin, estrogen and gonadotropins in lactating female rats dosed with sesame oil during the lactation period for its effect on the prolactin-secreting pituitary gland.

And they do not agree with Carter et al. [8], who obtained results confirming a decrease in gonadotropin hormones and estrogen as a result of domperidone administration to nursing mothers.

Also, they do not agree with Vanzeler et al. [9] which states that domperidone lowers the levels of gonadotropin hormones and estrogen in the dosed rats, as our results showed no change in the levels of gonadotropin hormones compared to the control group. However, our results agree with McCue [10] an increase in prolactin levels and a decrease in dopamine levels as a result of the inhibitory effect of domperidone in its association with dopamine receptors in pituitary cells, which increases the expression of gonadotropins, thus increasing levels of estrogen hormones and decreasing dopamine reduces or cancels its inhibitory effect. On the

center responsible for the secretion of the hormone prolactin, which allows to increase the secretion of this hormone and thus increase its level in the blood plasma. It also agrees with (Ghattas and Derbala, 2019) in terms of the effect of domperidone in increasing the levels of both estrogen and prolactin in dosed mares during the lactation period for the same previous reason.

We also noted from the previously mentioned results an increase in estrogen with almost no significant changes in progesterone and gonadotropins despite a decrease in the level of dopamine, a hormone that inhibits the secretion of gonadotropins in the pituitary gland, whose levels are supposed to rise in the blood serum. The hormones stimulate the follicular cells in the ovary and increase the secretion of estrogen that prepares the endometrium for the growth of the endometrium in the first phase of the sexual cycle, but what is noticeable is a very slight decrease in the level of FSH and a very small rise in the level of LH, and this may be due to the high level of estrogen itself. It has an inhibitory effect on the FSH hormone, as it leads to a decrease in its secretion with a high secretion of the ovulatory hormone OIH. It seems that the absence of a noticeable rise in the level of the hormone LH is due to the lack of ovulation yet at this stage, which leads to the formation of the luteal body that secretes the hormone progesterone, which explains the lack of a change in progesterone level also occurred in groups dosed with domperidone.

References

1. Shim SH, Lee EJ, Kim JS, Kang SS, Ha H, Lee HY, Kim C, Lee JH, Son KH. Rat growth-hormone release stimulators from fenugreek seeds. *Chemistry & biodiversity*. 2008;5(9):1753-61. <https://doi.org/10.1002/cbdv.200890164>
2. Hennighausen L, Robinson GW. Information networks in the mammary gland. *Nature Reviews Molecular Cell Biology*. 2005;6(9):715-25. <https://doi.org/10.1038/nrm1714>
3. Basch E, Ulbricht C, Kuo G, Szapary P, Smith M. Therapeutic applications of fenugreek. *Altern Med Rev*. 2003;8(1):20-7. Available from: <https://pubmed.ncbi.nlm.nih.gov/12611558/>
4. Raju J, Bird RP. Alleviation of hepatic steatosis accompanied by modulation of plasma and liver TNF- α levels by *Trigonella foenum graecum* (fenugreek) seeds in Zucker obese (fa/fa) rats. *International Journal of Obesity*. 2006;30(8):1298-307. <https://doi.org/10.1038/sj.ijo.0803254>
5. Sharma R, Jain N, Rani D, Kantwa S. *Sesamum indicum* before and during pregnancy: a review. *International Journal of Research and Development in Pharmacy & Life Sciences*. 2015;4(5):1750-9. Available from: <https://ubipayroll.com/IJRDP/index.php/ijrdp>
6. Kurzer MS, Xu X. Dietary phytoestrogens. *Annual review of nutrition*. 1997;17:353. Available from: <https://www.proquest.com/openview/e0e5d1f9547037c129aa2f115db18005/1?pq-origsite=gscholar&cbl=49287>
7. Wang L-Q. Mammalian phytoestrogens: enterodiol and enterolactone. *Journal of Chromatography B*. 2002;777(1):289-309. <https://doi.org/10.1016/S1570->

[0232\(02\)00281-7](#)

8. Carter D, Pennington J, Whitehead S. In-vivo and in-vitro effects of domperidone on the release of prolactin and LH in male and female rats. *Reproduction*. 1982;64(1):191-7. <https://doi.org/10.1530/jrf.0.0640191>
9. Vanzeler M, Felicio LF, Nasello A. Effects of chronic domperidone treatment on rat conditioned avoidance behavior. *Brazilian Journal of Medical and Biological Research= Revista Brasileira de Pesquisas Medicas e Biologicas*. 1990;23(9):865-8. <https://europepmc.org/article/med/2101329>
10. McCue PM. Management of seasonal anestrus: Hormone therapy. *Equine Reproductive Procedures*. 2014;146-8. <https://doi.org/10.1002/9781118904398.ch46>
11. Aliawy AS, Hassan BJ, Taher JK. Effect of *Trigonella foenum-graecum* linn oil on prolactin hormone and mammary gland in laboratory mice. *Thi-Qar University Journal for Agricultural Researches*. 2014;3(1). Available from: <https://www.iasj.net/iasj/article/94743>
12. Khaleel ZI, Mohammed ZH, AL-Samarraie MQ. Histological Effect of the Alcoholic Extract of *Nerium Oleander* in the Heart and Brain in Mice and its Effect on the Lymphocytes (In Vitro). *Indian Journal of Public Health*. 2019;10(8):2363. <https://www.researchgate.net/publication/336065329>
13. Osadchy A, Moretti ME, Koren G. Effect of domperidone on insufficient lactation in puerperal women: a systematic review and meta-analysis of randomized controlled trials. *Obstetrics and Gynecology International*. 2012;2012. <https://doi.org/10.1155/2012/642893>
14. Wu W-H, Kang Y-P, Wang N-H, Jou H-J, Wang T-A. Sesame ingestion affects sex hormones, antioxidant status, and blood lipids in postmenopausal women. *The Journal of nutrition*. 2006;136(5):1270-5. <https://doi.org/10.1093/jn/136.5.1270>
15. Agiang MA, Matthew OJ, Atangwho IJ, Ebong PE. Effect of some traditional edible oils on sex hormones of albino Wistar rats. *African Journal of Biochemistry Research*. 2015;9(3):40-6. <https://doi.org/10.5897/AJBR2015.0815>
16. Ozalkaya E, Aslandođdu Z, Özkoral A, Topcuođlu S, Karatekin G. Effect of a galactagogue herbal tea on breast milk production and prolactin secretion by mothers of preterm babies. *Nigerian journal of clinical practice*. 2018;21(1):38-42. Available from: <https://www.ajol.info/index.php/njcp/article/view/166424>
17. Mustafa MA, AL-Samarraie MQ. Secondary menopause and its relationship to hormonal levels among women at Salah Al-Din Hospital. *European Journal of Molecular & Clinical Medicine*. 2020;7(09):96-104. Available from: https://ejmcm.com/article_1425_4f0147c80fc7c6a98a7fac162637f371.pdf
18. Bishop ML, Fody EP, Schoeff LE. Clinical chemistry, Principles, procedures, correlation. Quality assurance. 2005;3(4). Available from: https://www.just.edu.jo/CoursesAndLabs/Biochemistry%20Hospital%20Laboratory%20Practice_LM474/LM474.pdf
19. Reeder C, Legrand A, O'Connor-Von SK. The effect of fenugreek on milk production and prolactin levels in mothers of preterm infants. *Clinical Lactation*. 2013;4(4):159-65. <https://doi.org/10.1891/2158-0782.4.4.159>
20. Mohanty I, Senapati M, Jena D, Behera P. Ethnoveterinary importance of herbal galactagogues-a review. *Veterinary World*. 2014;7(5). Available from: <https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.644.1183&rep=rep1&type=pdf>
21. Liu H, Hua Y, Luo H, Shen Z, Tao X, Zhu X. An herbal galactagogue mixture increases milk production and aquaporin protein expression in the mammary glands of lactating rats. *Evidence-Based Complementary and Alternative Medicine*. 2015;2015. <https://doi.org/10.1155/2015/760585>