

# Indian Journal of Animal Production and Management

## Year 2026, Volume-42, Issue-1 (Jan-Mar)



## Influence of Date Molasses and Honey on Reproductive Performance and Hormone Levels in Male Rabbits (Bucks)

Ihsan Ali Habeeb<sup>1</sup>, Mosa Fadiel Abbas<sup>1</sup>, Hyder Jaber Mathboob ALBuhusseini<sup>2</sup>, Mohammed R. Abduljaleel<sup>1\*</sup>

<sup>1</sup> Department of Surgery and Obstetrics, College of Veterinary Medicine, University of Basrah, Basrah, Iraq

<sup>2</sup> Department of Surgery and Obstetrics, College of Veterinary Medicine University of Al-Muthanna, Iraq.

### ARTICLE INFO

Received: 5 February 2026

Accepted: 18 March 2026

**Key word:** Rabbits, FSH, Date Molasses, Honey, Luteinizing Hormones

doi: 10.48165/ijapm.2026.42.1.18

### ABSTRACT

**Background:** The increased curiosity in natural nutraceuticals has led to the investigations into the effects of dietary supplements on animal reproductive performance.

**Objective:** The study aimed to determine the impact of consuming honey and date molasses on reproductive hormone levels, blood glucose and testicular histopathology in male New Zealand White rabbits.

**Methods:** 15 male rabbits were selected at random and divided into three groups (n=5 rabbits each) as follows: the control group (G1), date molasses group (G2, 1 g/kg), and honey group (G3, 1 g/kg), which were administered orally over 45 days. We analyzed the follicle-stimulating hormone, luteinizing hormone, testosterone and blood sugar levels at 0, 15, 30 and 45 days. The testicular tissues were tested by using histological examination following the experiment.

**Findings:** The results showed significant increases ( $P < 0.05$ ) in the levels of follicle-stimulating hormone, luteinizing hormone, and testosterone in G2 and G3 as compared to G1 and the strongest hormonal response was observed in the honey group. G2 and G3 significantly elevated the level of blood glucose but the levels were normal. G1 showed a normal testicular architecture, G2 showed moderate degenerative alterations and G3 showed modest changes with retained spermatogenesis via histopathological examination.

**Conclusions:** Honey and date molasses of honey enhanced reproductive hormone profiles but honey had better results in stimulating hormonal activity and maintaining healthier testicular tissues. These findings justify the use of honey as a safe and effective dietary supplement to boost male procreation in rabbits.

### Introduction

Natural food supplements have aroused much interest in the enhancement of reproductive functioning in animals. Dates

molasses and honey have also found their way as preferred foods in enhancing hormonal and reproductive functioning of male rabbits (bucks). A very good enterprise to get the necessary carbohydrates to the body is date molasses that is

\*corresponding authoremail : Mohammed.resen@uobasrah.edu.iq

made out of dates and is an excellent source of minerals (iron, potassium, and calcium), antioxidants. They are required to provide energy and spermic production as well as protection against oxidative stress (Al-Farsi and Lee, 2008; Hegazi *et al.*, 2022). Recently, it was discovered that date molasses can be used to enhance reproductive health since it improves semen quality and the fertility rates (El-Aziz *et al.*, 2023). Honey is made by bees and is characterized by the complicated combination of vitamins, minerals, enzymes, carbohydrates, and antioxidants. Definite improvements in the sperm quality and the levels of reproductive hormones have been demonstrated in several animal species, especially rabbits (Nasr and Al-Khalifa, 2012; Mardani *et al.*, 2021). Bioactive compounds in honey which can potentially alleviate oxidative stress to a large extent and improve reproductive health include flavonoids and phenolic acids (Khan *et al.*, 2023). Also, honey has been reported to increase the reproductive success of male rabbits through enhancing testosterone levels and libido (Tartibian and Maleki, 2012). The increasing population of men who are infertile is a large concern to the society and the economy, and we should make some effort to improve reproductive performance (Boivin *et al.*, 2007). According to research, some of the factors that could lead to male reproductive issues include lack of proper nutrition and oxidative stress (Plas *et al.*, 2000; Petrelli and Mantovani, 2002). Their potential is rather high, as it was possible to use honey and date molasses as natural nutraceuticals to enhance the reproductive performance of male rabbits. The present study focuses on the effects of adding date molasses and honey to the diets of the male rabbits on their reproductive abilities and the amount of the hormones in their bodies. The concept is that these natural materials will enhance the quality of sperms, libido, and make bucks more fertile in general. This research will aim at explaining the impacts that might result in more sustainable farming practices and hence augmenting efficiency of producing rabbits and food security.

## Materials And Methods

### Ethical statement

The current study was carried out according to a rule and the guidelines of the animal care and use committee / College of the Veterinary Medicine, University of Basrah (The approval number: 99/37/2025).

### Experimental Study

This study was undertaken at Basrah University's College of Veterinary Medicine, specifically within the Department of Surgery and Obstetrics. The study was approved by the Ethics Committee of the University of Basrah's College of Veterinary Medicine (BCVM) and was conducted in

accordance with its animal welfare guidelines. There were 15 New Zealand White (NZW) rabbits used, all between the ages of 6 and 12 months and weighing between 2000g and 2500g. The experiment lasted for 60 days. For the first two weeks, the rabbits were kept in conventional cages by themselves and under the same circumstances for hygiene and management. During this time, the rabbits underwent screening and deworming with Ivermectin (Ivomec 1%, 0.2 mg/kg SC; India) to eliminate endo and ectoparasites. (Ibrahim *et al.*, 2025)

The rabbits were put into three groups at random. Group G1 (n=5) was the control group and did not get any supplements. Group G2 (n=5) got 1g/kg of date molasses every day by mouth, and Group G3 (n=5) got 1g/kg of honey every day by mouth through a syringe in the morning (Anyakudo *et al.*, 2015). At four different times (0, 15, 30, and 45 days), blood tests were done on each group to check for follicle-stimulating hormone (FSH), luteinizing hormone (LH), and testosterone levels, as well as blood sugar levels.

### Blood Collection

At the correct times, 3 ml of blood were taken from each rabbit's from the marginal ear vein of the bucks. The serum was separated from the collected blood through centrifugation at 5000 rpm for 15 minutes and subsequently stored at -20 °C until analysis.

### Hormonal Assay

The concentrations of testosterone, LH, and FSH in the serum obtained from cardiac blood samples were measured using enzyme immunoassay methods with commercially available ELISA kits (Cosmo Bio Co., USA Inc.). All hormone assays were conducted uniformly across groups to minimize inter- and intra-assay variations that could influence results.

### Testicular Extraction and Histology

All subjects underwent surgical castration (orchidectomy) under mild general anesthesia induced by a combination of Medetomidine (1 mg/kg) and Ketamine (100 mg/ml), administered intramuscularly at dosages of 0.25 mg/kg and 13 mg/kg, respectively (Orr *et al.*, 2005; Jassim *et al.*, 2023; Abduljaleel *et al.*, 2025). Following surgery, testicular tissues were collected and processed at the Histopathology Laboratory in the Department of Pathology at Basrah University. The tissues were initially washed in running tap water, followed by dehydration through a graded series of ethanol (70%, 80%, 90%, and 100%), and then cleared in xylene. Tissue samples were infiltrated with molten paraffin wax at 58°C, embedded in wax, and sectioned to a thickness of 5µm using a rotary microtome (Semi-automated Rotary Microtome Wetzlar, Germany). The histological sections

were stained with Hematoxylin and Eosin (H & E) for examination (Chan, 2014; Mohsin et al., 2025).

## Statistical Analysis

Data were analysed statistically using one-way ANOVA followed by Student-Newman-Keuls multiple range tests, with significance determined at  $P < 0.05$  (Field, 2006).

## Results

The present research examined the impact of a honey and date molasses diet on male reproductive function in male rabbits, measuring hormone levels and blood glucose levels. The findings indicated a significant elevation ( $P < 0.05$ ) in the hormone FSH levels in the second group (G2) at 30 and 45 days compared to the 15 and 0-day intervals within the same

group, as well as a significant increase ( $P < 0.05$ ) in the same hormone relative to the control group (G1) during the 30 and 45-day periods. Also, the results showed that the hormone FSH levels were significantly higher ( $P < 0.05$ ) in the third group (G3) at 15, 30, and 45 days compared to the baseline (0 days) in the same group. Also, when compared to the control group (G1), there was a significant rise ( $P < 0.05$ ) in the hormone at the 15, 30, and 45-day marks. In the second group (G2), there is a significant increase ( $P < 0.05$ ) in LH hormone at 15, 30, and 45 days compared to day 0 within the same group. There is also a considerable increase ( $P < 0.05$ ) in LH hormone at 15, 30, and 45 days compared to the control group. Furthermore, the LH hormone in the third group (G3) exhibited a substantial rise ( $P < 0.05$ ) at 15, 30, and 45 days compared to day 0 between the same group and the control group. A considerable rise ( $P < 0.05$ ) in testosterone levels was seen in the second group (G2) and third group (G3) at 30 and 45 days compared to days 0 and 15 among the same groups and the control group (Table 1).

**Table 1: Effect of date molasses and honey on hormone (FSH, LH and testosterone) in male rabbits**

Groups		Time after treatment/days			
		0	15	30	45
FSH mIU/ ml	G1	0.23± 0.09 a	0.27± 0.33 a	0.31± 0.05 a	0.35± 0.18 a
	G2	0.29± 0.11 a	0.40± 0.35 a	0.51± 1.22 b	0.68± 1.32 ab
	G3	0.25± 0.16 a	0.52± 0.41b	0.65± 1.39 b	0.74± 1.45 ab
LH mIU/ ml	G1	0.08± 0.023 a	0.09± 0.11 a	0.10± 1.06 a	0.12± 1.09 a
	G2	0.07± 0.25 a	0.18± 0.52 b	0.53± 0.88 b	0.87± 1.22 ab
	G3	0.08± 0.60 a	0.34± 0.24 b	0.67± 1.62 b	0.88± 1.53 ab
Testosterone ng / dl	G1	2.21± 0.13 a	2.35± 0.23 a	2.38± 0.16 a	2.40± 0.19 a
	G2	2.25± 0.24 a	2.6± 0.16 a	3.8± 0.77 b	4.4± 1.11 ab
	G3	2.27± 0.17 a	2.8± 0.18 a	4.2± 0.78 b	5.4± 1.27 ab

Conversely, the blood glucose levels exhibited a substantial rise ( $P < 0.05$ ) in groups G2 and G3 at 15, 30, and 45 days compared to the control group G1 and day 0 of the same

groups; nonetheless, the blood glucose levels remained within the normal range for the experimental animals (Table 2).

**Table 2: Effect of date molasses and honey on blood glucose in male rabbits**

Groups		Time after treatment/days			
		0	15	30	45
Glucose measurement	G1	70± 0.25 a	76± 0.27 a	77± 0.44 a	68± 0.48 a
	G2	72± 0.24 a	120± 0.48 b	130± 0.88 ab	150± 1.02 ab
	G3	75± 0.53 a	135± 0.49 b	140± 0.76 ab	155± 1.18 ab

The histological examination findings, after laboratory analysis of the samples, indicated no histopathological alterations in the testes of male rabbits in the control group (G1), with normal seminiferous tubules seen (Figure 1). The second group (G2) treated with molasses exhibited haemorrhage in the interstitial tissue, congested and dilated

blood vessels, subcapsular oedema, thickened capsules, and vacuolated epithelium of the seminiferous tubules (figures 2 and 3). Additionally, the histological alterations seen in the third group (G3) treated with honey included minor vacuolation, little haemorrhage in the interstitial tissue, congested blood vessels, and normal spermatogenesis

(figures 4 and 5).

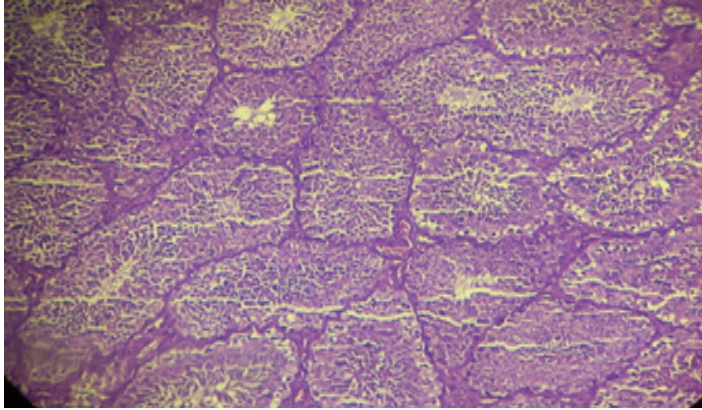


Figure (1): Histopathological section of control male rabbit testis group (G1), showing normal seminiferous tubules (H&E stain 10x).

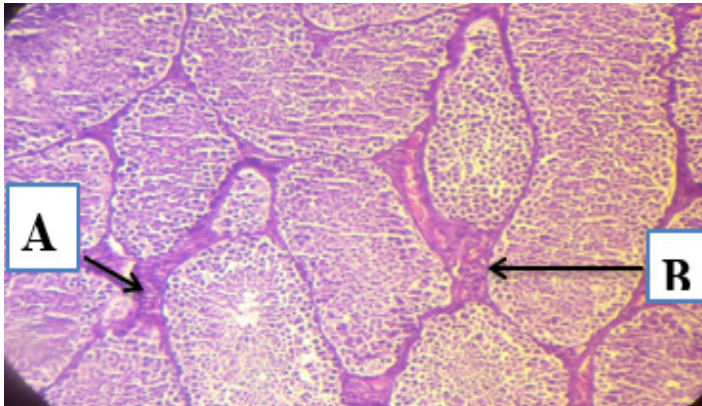


Figure (2): Histopathological section of testis group (G2) treated with date molasses, shows haemorrhage in interstitial tissue (A), congested and dilated blood vessels (B) (H&E stain 10x).

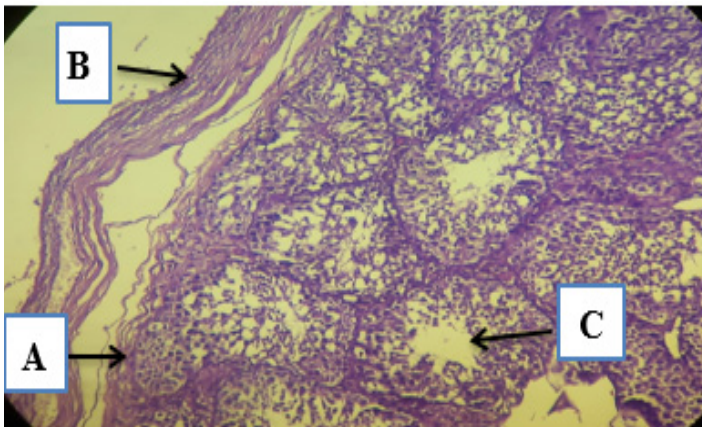


Figure (3): Histopathological section of testis group (G2) treated with date molasses, shows subcapsular oedema (A), thickness in capsules (B), vacuolated epithelium of the seminiferous tubules (C) (H&E stain 10x).

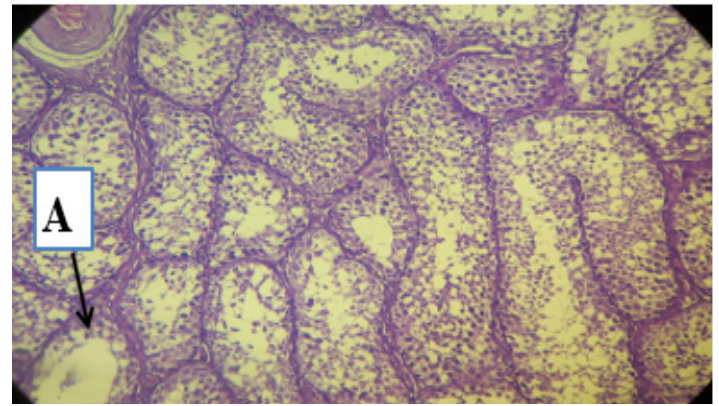


Figure (4): Histopathological section of testis group (G3) treated with honey, showing mild vacuolation (A) (H&E stain 10x).

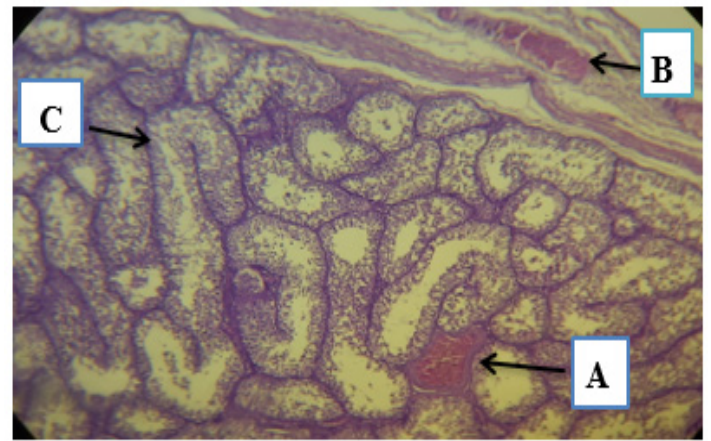


Figure (5): Histopathological section of testis group (G3) treated with honey, shows mild haemorrhage in interstitial tissue (A), congested blood vessels (B), normal spermatogenesis (C) (H&E stain 10x).

## Discussion

This study investigated the effects of dietary supplementation with date molasses and honey on the reproductive hormonal profile, blood glucose levels, and testicular histopathology in male New Zealand White rabbits. The results corroborate the concept that natural nutraceuticals, including honey and date molasses, may influence reproductive hormone levels and testicular function, with honey demonstrating superior effects relative to molasses.

The significant increase in the levels of FSH observed in both the treatment groups (G2 and G3) beyond day 15, especially days 30 and 45, points to increased stimulation of the hypothalamic-pituitary-gonadal axis. FSH has a role in spermatogenesis in which it triggers Sertoli cells within the seminiferous tubules. The fact that the higher FSH levels in G2 and G3 compared with the control group (G1) is related to previous studies that indicate the potential of some natural

products rich in antioxidants and some trace nutrients to enhance endocrine activity and testicular development (Nasr and Al-Khalifa, 2012; Hegazi et al., 2022). Luteinizing hormone (LH) levels increased significantly in both treated groups after administration of the supplements at all times. This implies that Leydig cells were more active and produced more testosterone. This finding is important because the testosterone production that is induced by LH is required to promote the development and upkeep of male secondary sexual traits and sperm development. It is the consistency of this reaction in both groups, especially G3 (honey) that brings out the importance of bioactive compounds in honey in the stimulation of reproductive hormones (Tartibian and Maleki, 2012). The amount of testosterone on the days 30 and 45 that increases significantly in both G2 and G3 and slightly in honey demonstrates that these supplements do improve the reproductive health of men. Testosterone plays a very important role in libido, spermatogenesis, and testicular tissue maintenance. The results indicate that regular honey or molasses intake can improve androgen synthesis and reproduction that other research studies have already proven (Mardani et al., 2021; El-Aziz et al., 2023). In conjunction with the changes in hormones, the level of blood glucose in the two treatment groups showed significant statistical increase at days 15, 30 and 45 compared to their baseline and the control group. However, the levels were still in the physiological range of rabbits, which indicated that carbohydrate concentration in honey and molasses augmented the accessibility to energy without hyperglycemia. This might have helped increase metabolic needs associated with increased reproductive activity. The impact of these supplements on tissues was explained by the histopathology. The standard testicular architecture was observed in control group (G1), however, G2 (date molasses) exhibited numerous pathological changes such as subcapsular oedema, haemorrhage, thickened capsule, congested arteries and vacuolated seminiferous epithelium. Such findings were consistent with the reports of other studies (Salman et al., 2013). These changes could reflect the dose-related or compound-specific development of cytotoxicity connected to the concentrated molasses possibly through excessive sugar fermentation or metabolic products. G3 (honey), on the contrary, showed few changes in histology, with small interstitial haemorrhage and vacuolation predominantly, but spermatogenesis was largely intact. This proves that honey is more harmonious and biocompatible on testicular tissue. The results indicate that honey and molasses are equally useful in raising reproductive hormone levels but honey supplementation is more beneficial in maintenance of testicular integrity and normal spermatogenic activity. This can be attributed to the synergetic antioxidant, anti-inflammatory and metabolic benefits of bioactive compounds of honey, e.g., flavonoid, phenolic acids and enzymes.

## Conclusions and Recommendations

The proposed research demonstrates the possible benefits of honey and date molasses as natural dietary interventions in improving male reproductive performance. Honey, specifically, exhibited better hormonal and histological performances hence it is a better candidate to be applied in the future in breeding of rabbits and fertility of livestock. Nevertheless, the negative histological outcomes of molasses should be evaluated by doing additional research on the ideal dosage and safety in the long term. The following research ought to investigate alternative dosages, prolonged therapy and fertility results like mating achievement and offspring sustainability to comprehend the practicality of the results in animal production networks.

## Novelty Statement

Our novelty is entitled (Study the Effect of Date Molasses and Honey on the Hormone and Reproductive Activities of Male Rabbits (Buck)). But the studies of these stimulants, and male reproductive system stimulants are limited; not many researchers are attaching their attention to their use.

## Author's Contributions

All authors equally contributed

## Conflict of interest

There is no conflict of interest.

## References

- Abduljaleel, M. R., Abdulrazaq, A. W., Jassim, M. M., Abbas, M. F., Alfaris, A. A., Naeem, R. M., Ibrahim A.A, Mohammed Saleh W.M, Alrashid I.M, and Alrafas H.R. (2025). Understanding the synergistic impact of atropine with xylazine and ketamine on recovery time, heart rate and respiratory rate in male rabbits.. *Assiut Veterinary Medical Journal*, 71(187), 237-246. DOI: <https://www.doi.org/10.21608/avmj.2025.341413.1505>
- Al-Farsi, M. A., & Lee, C. Y. (2008). Nutritional and functional properties of dates: A review. *Critical Reviews in Food Science and Nutrition*, 48(10), 877–887. <https://doi.org/10.1080/10408390701724264>
- Anyakudo, M. M. C., Balogun, A. J., & Adeniyi, M. O. (2015). Ben-

- eficial effects of honey-based diet on glycemic control and reproductive potential in diabetic rats. *World Journal of Nutrition and Health*, 3(2), 41–46. <https://doi.org/10.12691/jnh-3-2-3>.
- Boivin, J., Bunting, L., Collins, J. A., & Nygren, K. G. (2007). International estimates of infertility prevalence and treatment-seeking: Potential need and demand for infertility medical care. *Human Reproduction*, 22(6), 1506–1512. <https://doi.org/10.1093/humrep/dem046>
- Chan, J. K. (2014). The wonderful colours of the hematoxylin-eosin stain in diagnostic surgical pathology. *International Journal of Surgical Pathology*, 22(1), 12–32. <https://doi.org/10.1177/1066896913517939>
- El-Aziz, A. A., El-Sayed, M. A., & Kamel, H. (2023). The impact of date molasses supplementation on rabbit reproductive performance. *Animal Science Journal*, 94(2), e13805. <https://doi.org/10.1111/asj.13805>.
- Field, A. (2006). *Discovering statistics using SPSS* (2nd ed.). Sage.
- Hegazi, M. M., Khedher, N. B., & Rjiba, M. (2022). The role of antioxidants in improving fertility and reproductive performance in male rabbits. *Veterinary Research Communication*, 46(1), 1–10. <https://doi.org/10.1007/s11259-021-09827-2>.
- Ibrahim AA, Naeem RM, Abduljaleel MR, Jassim MM, Abdulrazaq AW, Khaleefah IA, Hashim AM (2025). Effect of platelet-rich fibrin (PRF) from different sources on avulsion wound healing in a rabbit model. *J. Anim. Health Prod.* 13(4): 1244-1251. <https://dx.doi.org/10.17582/journal.jahp/2025/13.4.1244.1251>
- Jassim MM, Abduljaleel MR, Abdulkareem ZB, Sanad NH, Alrashid IMH (2023). Study the effect of the magnetic field on the healing of bone fracture after implant avian bone in femoral bone in rabbits. *Adv. Anim. Vet. Sci.*, 11(11):1779-1784. <https://dx.doi.org/10.17582/journal.aavs/2023/11.11.1779.1784>
- Khan, M. I., Ullah, N., & Bafakeeh, O. T. (2023). Protective effects of honey on oxidative stress in male reproductive health: A review. *Journal of Apicultural Research*, 62(1), 13–22. <https://doi.org/10.1080/00218839.2022.2100833>.
- Mardani, K., Ranjbar, A., & Khosravi, S. (2021). The effect of honey on reproductive hormones and sperm quality in male rabbits. *Journal of Animal Physiology and Animal Nutrition*, 105(3), 445–453. <https://doi.org/10.1111/jpn.13466>.
- Mohsin TA, Abduljaleel MR, Radhi AJ, Abbas MF, Alrashid IMH, Khudhair ZW (2025). Histopathological effects of streptomycin treatment on macrophages in lymph nodes, spleen, liver and kidneys of rats. *Adv. Anim. Vet. Sci.* 13(6): 1337-1345. <https://dx.doi.org/10.17582/journal.aavs/2025/13.6.1337.1345>
- Nasr, M. A., & Al-Khalifa, H. S. (2012). Effect of honey on the semen quality of male rabbits. *Saudi Journal of Biological Sciences*, 19(3), 329–333. <https://doi.org/10.1016/j.sjbs.2012.03.004>.
- Orr, H. E., Roughan, J. V., & Flecknell, P. A. (2005). Assessment of ketamine and medetomidine anaesthesia in rabbits. *Veterinary Anaesthesia and Analgesia*, 32(5), 271–275. <https://doi.org/10.1111/j.1467-2995.2005.00205.x>.
- Petrelli, G., & Mantovani, A. (2002). Environmental risk factors and male fertility and reproduction. *Contraception*, 65(4), 297–300. [https://doi.org/10.1016/S0010-7824\(02\)00288-7](https://doi.org/10.1016/S0010-7824(02)00288-7).
- Plas, E., Berger, P., Hermann, M., & Pflüger, H. (2000). Effects of ageing on male fertility. *Experimental Gerontology*, 35(5), 543–551. [https://doi.org/10.1016/S0531-5565\(00\)00121-7](https://doi.org/10.1016/S0531-5565(00)00121-7).
- Salman, T. M., Alagbonsi, I. A., & Olayaki, L. A. (2013). Honey increases sperm count in male albino rats by enhancing testosterone production. *Biokemistri*, 25(2), 39–44. <https://www.ajol.info/index.php/biokem/article/view/94978>
- Tartibian, B., & Maleki, B. H. (2012). The effects of honey supplementation on seminal plasma cytokines, oxidative stress biomarkers, and antioxidants during 8 weeks of intensive cycling training. *Journal of Andrology*, 33(3), 449–461. <https://doi.org/10.2164/jandrol.111.013292>.