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Enhancing libido and semen characteristics in rams via fenugreek seed supplementation

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Abstract

This study was carried out at the experimental fields of the Department of Animal Production, College of Agriculture and Forestry, University of Mosul, during the period from 15 November to 15 February (the non-breeding season). Fifteen Awassi rams aged 2-3 years were randomly allocated into three equal groups (5 rams per group). The rams were fed three rations formulated to contain comparable crude protein and metabolizable energy but differing in the level of crushed fenugreek seed inclusion (0, 5 and 10% for the first, second and third groups, respectively). The results revealed a significant effect ($P \leq 0.05$) of crushed fenugreek seed supplementation on sperm concentration per ejaculate, the time to first mount, the time to first service and the number of services. No significant effects ($P > 0.05$) were detected on semen pH, the number of mounts without service, or the number of mounts to the first service, compared with the control group. In conclusion, the dietary inclusion of crushed fenugreek seeds at 5 and 10% improved libido and some semen characteristics of Awassi rams, with the 10% level being the most effective. Fenugreek seeds may therefore be considered a promising natural feed supplement for enhancing the reproductive performance of Awassi rams in Iraq, particularly outside the breeding season.

Keywords: Fenugreek seeds, semen, libido, Awassi rams, breeding season

Introduction

At present, many plants and herbs, including fenugreek, occupy a distinguished position in the pharmaceutical, industrial and agricultural fields (Alu'datt *et al.*, 2024) ^[6]. Fenugreek is cultivated in southern Europe, the Mediterranean basin and West Asia, the latter being its native range, and 17-18 species of fenugreek occur naturally in Iraq (Alu'datt *et al.*, 2024; Akbaş *et al.*, 2022) ^[6, 1]. Fenugreek (*Trigonella foenum-graecum*) is a winter leguminous plant (Ibrahim *et al.*, 2022) ^[12] that is widely used for medicinal purposes and in the management of hyperglycaemia and hypercholesterolaemia (Tak *et al.*, 2024) ^[24], as well as in improving the flavour and properties of food, being a rich source of carbohydrates, iron, biotin and vitamin C (Alu'datt *et al.*, 2024) ^[6].

As a traditional food and pharmaceutical ingredient, fenugreek is valued for its content of the amino acid lysine, phytic acid, steroidal saponins, lipids and proteins that contribute to the biosynthesis of testosterone (Shawky *et al.*, 2024) ^[21]. Animal nutrition is one of the key factors governing sperm production and the secretion of sex hormones by the testis; the effects of nutritional deficiency can be reversed in mature animals but are less readily corrected in young animals owing to permanent damage to the germinal epithelium (Ngcobo *et al.*, 2023; Zhang *et al.*, 2023) ^[17, 26]. Previous studies have indicated that fenugreek seeds play a substantial role in improving male reproductive performance (Sankhwar *et al.*, 2023) ^[20]. The effects of several medicinal plants on libido have been investigated, including their effects in male goats (Pascal *et al.*, 2023) ^[18]. Given the scarcity of research addressing the effect of fenugreek seeds on libido in rams, it has become necessary to conduct further work to determine the effect of fenugreek seed administration on libido and on some semen characteristics in Awassi rams.

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Materials and Methods

Ethical approval

Experiments was carried out in the Animal Unit, Faculty of Agriculture and Forestry, Department of Animal Production, University of Mosul, Iraq. Experiments followed the guidelines of the Institutional Animal Ethics Committee.as per their document No. UM.VET.2023.163 dated November 1, 2023.

Animals

Fifteen Awassi rams aged 2-3 years were randomly allocated into three groups (5 rams per group) and fed three rations of comparable protein and energy levels that differed in the inclusion rate of crushed fenugreek seeds (0, 5 and 10% for the first, second and third groups, respectively) for a period of seventy-five days. Each group was housed in a pen measuring $6 \times 3 \text{ m}^2$ equipped with dedicated feeders and waterers, and was offered concentrate feed at 1.250 kg/head/day in addition to roughage (straw). The protein and energy contents of the rations were calculated according to Saleh and Al-Saadi (2022) ^[19], and the chemical composition of the feedstuffs was derived from standard feed composition tables. Veterinary care was provided in accordance with the farm health program.

Semen was collected using a battery-operated electro-ejaculator (Fourie *et al.*, 2004) ^[11] powered by two 6-volt batteries, by inserting the electrode into the rectum of the ram and applying electrical stimulation every 5-10 seconds until ejaculation occurred; the ejaculate was collected in a graduated tube. After collection, all samples were placed in a

water bath at 37 °C and semen evaluations were performed. Sperm concentration per ejaculate was calculated as the number of sperm per mL multiplied by the ejaculate volume, and sperm concentration per mL was determined as described by Al-Khashab *et al.* (2024) ^[4] using a haemocytometer, with sperm counted according to the equation reported by Smith and Mayer (1955) ^[23]. The pH was measured directly using a digital pH meter (Hanna Instruments, Italy).

Libido was assessed in the 15 Awassi rams (aged 2-3 years) at a frequency of one test per month, conducted in the morning. Each ram was individually exposed to three ewes in a separate pen ($4 \times 5 \text{ m}$) that had been artificially brought into oestrus by intramuscular injection of oestrogen (Oestradiol Benzoate, 2 mg/ampoule, Iranian-made). The ewes received the hormone intramuscularly in two doses over three days at 0.5 cm^3 per dose; on the following day, the ram under test was introduced for 20 minutes and its sexual behaviour was monitored from outside the pen according to Nechifor *et al.* (2024) ^[16]. The following parameters were recorded: time to first mount (s), number of mounts without service, time to first service (s), number of mounts per service and number of services.

Statistical analysis

Was performed using a Completely Randomized Design (CRD) according to the mathematical model: $Y_{ij} = \mu + \tau_i + e_{ij}$. Differences among means were tested using Duncan's Multiple Range Test (Duncan, 1955) ^[10], and analyses were carried out using the SAS statistical software package (Anonymous, 2000) ^[7].

Table 1: Composition and proportions of the rations used in the experiment

Ingredient	Group 1 (%)	Group 2 (%)	Group 3 (%)
Crushed fenugreek seeds	0	5	10
Black barley	60	59	50
Wheat bran	30	28	35
Soybean meal	8	6	3
Limestone	1	1	1
Common salt	1	1	1
Total	100	100	100
Crude protein (%)	14.79	14.81	14.94
Metabolizable energy (kcal/kg)	2572	2601	2572

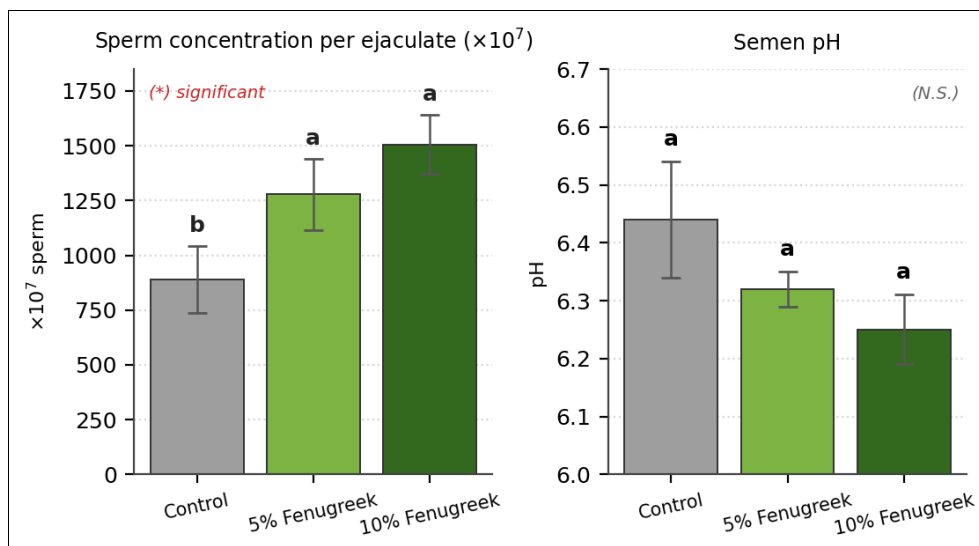
Calculated from standard feed chemical composition tables.

Results and Discussion

Figure 1 shows a significant effect ($P \leq 0.05$) of treatment on sperm concentration per ejaculate, with higher concentrations recorded in the second and third treatment groups (1277.77×10^7 and 1505.24×10^7 , respectively) compared with the control group (889.45×10^7). Fenugreek seeds act to raise the concentration of follicle-stimulating hormone (FSH), which stimulates the Sertoli cells (Wang *et al.*, 2022) ^[25]; this hormone promotes the development and maturation of spermatogonial precursor cells in adult animals (Bhattacharya *et al.*, 2023) ^[8]. The increase in sperm concentration may also be attributed to the elevated testosterone concentration resulting from reduced damage to the organelles of the Leydig

cells in the testis, which in turn enhances sperm production (Al-Shammari *et al.*, 2024) ^[5]. The seminiferous tubules contain successive stages of spermatogenesis, and fenugreek seeds promote sperm abundance within the central lumen of the seminiferous tubule and maintain the activity of the Leydig cell nuclei (Ibrahim and Al-Mallah, 2025) ^[13].

Figure 1 also indicates no significant effect ($P > 0.05$) of treatment on semen pH, although pH decreased numerically with increasing fenugreek seed inclusion in the second and third treatments compared with the control group. This numerical decrease in semen pH with increasing sperm concentration is attributable to the higher metabolic activity of the spermatozoa and the resulting production of lactic acid.



Means bearing different superscript letters within a column differ significantly at $P \leq 0.05$. (*) significant; N.S. = not significant.

Fig 1: Effect of fenugreek seeds on some semen characteristics (means $\pm$ standard error)

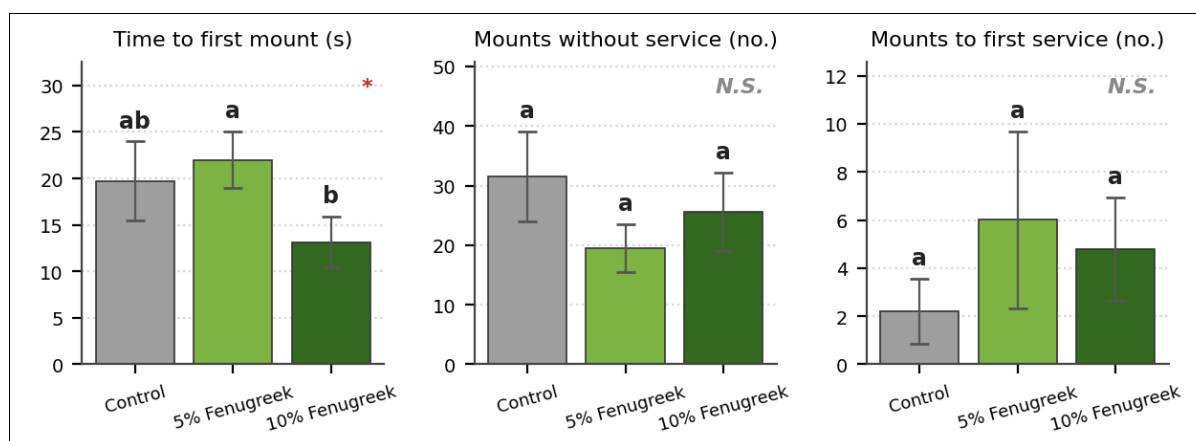
Figure 2 shows a significant effect ($P \leq 0.05$) of treatment on the time to first mount. The third group (10% fenugreek seeds) recorded the shortest time to first mount (13.14 s), which is a desirable trait in rams and is attributable to the effect of fenugreek seeds; this value was lower than that of the second group (5% fenugreek seeds) and the control group. This was observed despite the fact that the libido test was conducted outside the breeding season, twice during the final period of the experiment (January). The overall mean for this trait was 18.31 s, reflecting an improvement in the libido of rams treated with fenugreek seeds outside the breeding season.

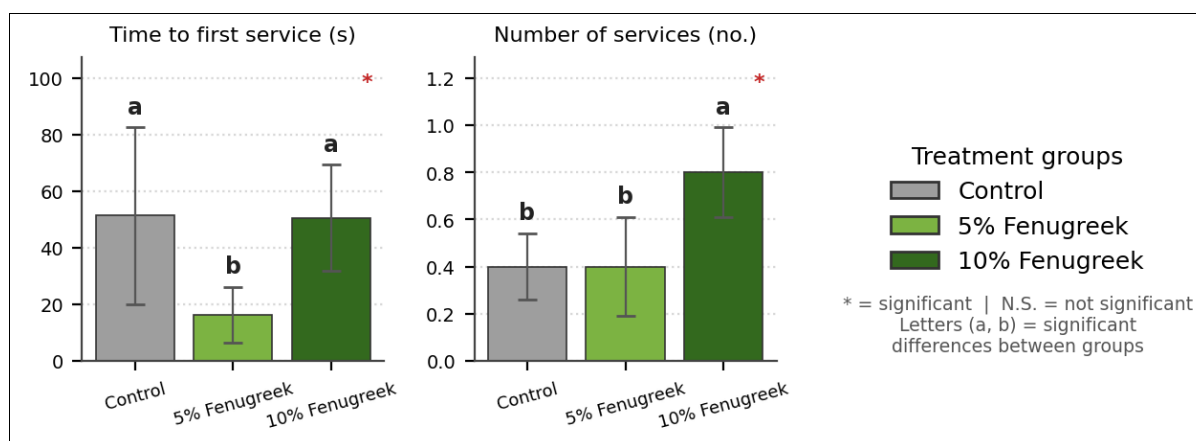
Figure 2 further shows no significant effect ($P > 0.05$) of treatment on the number of mounts without service across the three groups, nor on the number of mounts to first service. However, a significant effect was observed on the time to first service, which was best in the second treatment group (5% fenugreek seeds) at 16.2 s, compared with the control group (51.31 s) and the third group (50.6 s). A significant effect ($P \leq 0.05$) of treatment was also recorded on the number of services, with the third group being superior (0.8) compared with the control and second groups. Al-Jawari *et al.* (2022) reported a wide range in the serving ability of rams, ranging from zero to six services per ram, indicating considerable variation in serving ability among rams. The ability to serve is an indicator of a successful libido test and of mating capacity (Nechifor *et al.*, 2022) [15]. Libido is influenced by numerous factors, including the level of sex hormones in rams and goats

(Ngcobo *et al.*, 2023) [17].

The improvement in some libido traits in the two fenugreek-treated groups (5 and 10%) may be attributed to the role of fenugreek seeds in the biosynthesis of steroid hormones (Sankhwar *et al.*, 2023) [20] and to the increase in the concentrations of testosterone, follicle-stimulating hormone and luteinizing hormone (LH) induced by fenugreek seeds (Skrzypiec-Spring *et al.*, 2024) [22]. In males, LH is referred to as Interstitial Cell Stimulating Hormone (ICSH), which plays an important role in the formation of adenosine monophosphate in Leydig cells and subsequently in the increased synthesis of cholesterol, the principal precursor of testosterone. Testosterone is important for increasing ejaculate volume and activating the accessory sex glands in males (Dawood, 2025) [9], and it also influences the sexual behaviour of rams (Al-Jumaili and Shamoun, 2023) [3]. There is a strong correlation between testosterone concentration and sperm concentration on the one hand and libido on the other (Pascal *et al.*, 2023; Mocé *et al.*, 2022) [18, 14].

It can therefore be concluded that fenugreek seeds exert a positive effect on some semen characteristics and on the libido of rams. Feeding Awassi rams fenugreek seeds at a level of 10% is recommended, particularly during the serving season, owing to their effect on hormonal activity and spermatogenesis and their contribution to enhanced reproductive efficiency through improvements in semen characteristics and certain libido traits.





Means bearing different superscript letters within a column differ significantly at $P \leq 0.05$. (*) significant; N.S. = not significant.

Fig 2: Effect of fenugreek seeds on some libido characteristics (means $\pm$ standard error)

Conclusion

This study concluded that adding crushed fenugreek seeds to the ration of Awassi rams at levels of 5% and 10% outside the breeding season resulted in a significant improvement in sperm concentration per ejaculate and in some libido traits, most notably a reduction in the time to first mount and an increase in the number of services, with the 10% treatment being superior for most of the traits studied. Accordingly, the use of crushed fenugreek seeds can be recommended as a natural feed additive to improve the reproductive efficiency of Awassi rams outside the breeding season.

Conflict of Interest

The author declares that there is no conflict of interest related to the publication of this research.

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