BioGecko Vol 12 Issue 03 2023

ISSN NO: 2230-5807

Effect of the amino acid L-Tyrosine on some semen characteristics of Afghani goats

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Abstract
This study was conducted in the field of ruminants in the Department of Animal Production / College of Agriculture / University of Diyala. The animals were healthy, and male Afghan goats were continuously trained for two weeks (initial stage) to collect semen using artificial vagina, with microscopic examinations of the required characteristics of the semen to be ready for collection. semen during the study period. The field experiment period lasted from 10/6/2022 to 10/9/2022 (for a period of three months), after which the animals were slaughtered and testes were collected to take the required measurements in the experiment. In this study, 16 sexually mature Afghan goats were used, their ages ranged between 1-1.5 years, and their weights ranged between (35-40) kilograms. The study animals were randomly divided into four groups with four repetitions for each group. The difference in male weights ranged between 1.5-2.5 kg in one group. The first group was left without a dose (control group), while the other three groups were given different concentrations of the amino acid tyrosine (L-Tyrosin) every 48 hours: the second group was given 50 mg of tyrosine/kg body weight. The third group was given 75 mg of tyrosine / kg of body weight and the fourth group was given 100 mg of tyrosine / kg of body weight. The animals were trained to collect semen for 15 days a day as an induction and activation period. before the exams start. At the end of each month, semen was collected, microscopic examinations, and semen physical characteristics were collected at the end of each month to measure forward movement, mass movement, and unilateral sperm concentration. On the other hand, live sperm and seminal sperm were measured. Dead and abnormal sperm required in the study. The results showed that the dose of the amino acid tyrosine led to a significant ($p < 0.05$) increase in collective sperm motility, individual sperm motility, sperm concentration, percentage of live sperm, percentage of dead sperm, and percentage of dead sperm. The percentage of abnormal sperms in the fourth group compared to the first and second addition groups in addition to the control treatment. As for the effect, we recommend the possibility of administering doses of tyrosine acid to male Afghan goats outside the breeding season to stimulate them sexually.
***The research is part of a master's thesis for the first researcher.**

***Key words: semen characteristics - tyrosine acid - Afghan goats.**

Introduction

Goats are one of the oldest and most important domestic animals in the world, and they are an important part of human culture. The necessary source of human food is animal protein. Goats are versatile animals with a diversified production. At present, there are more than 300 breeds of domesticated goats in the world. , which provided primary sources of meat, milk, and fiber (Clark and Mora García, 2017; Alvites et al., 2021). In addition, dairy goats provide other benefits to owners, including hides and dung for farming (Miller and Lu, 2019). Goat's milk differs from cow's milk in its high digestibility, diverse alkalinity, and therapeutic use in human nutrition. Goat's milk also contains smaller fat globules(Dinkissa. A. F. and U. G. Girgo. 2022), distinct protein polymorphism, and shows better digestibility than cow's milk. Goat's milk contains more short-chain and medium-chain fatty acids, which give the ability to produce energy more often in the growth stage, and goat's milk so far accounts for more than 1.6% of global milk production (FAOSTAT, 2018).
Amino acids are organic compounds consisting of two groups, one of which is an amino group (-NH2) and the other a carboxylic group (-C) intertwined with each other, and they are the basic building

ISSN NO: 2230-5807

block for building proteins and peptides, and amino acids are linked by peptide bonds (Davydova et al., 2022). In addition to the formation of proteins, amino acids have multiple uses such as the production of biomass, and the formation of energy (Vettore et al., 2020; Lieu et al., 2020) and semen contains an abundant amount of amino acids that have a major role in the reproduction process (Deng et al., 2020). Dietary supplementation with amino acids improves sperm qualityand thus increases their specialized capacity (Dong et al., 2016).

Tyrosine is a non-essential amino acid that the body can adequately manufacture and not necessarily obtain from the daily diet (Cassata, 2021). The chemical formula for tyrosine is $C_9H_{11}NO_3$ (Litwack, 2018), and it is one of the twenty standard amino acids used by cells to synthesize proteins, and it is a non-essential amino acid with a polar side group (Kavitha et al., 2020). L-Tyrosine (Tyr) is an essential aromatic amino acid that is essential for biosynthesis (proteins) in all organisms, and can be synthesized in bacteria, fungi, and plants, but not in animals (Timoneda et al., 2018). Tyrosine is an important precursor for thyroid hormones, dopamine, adrenaline, and others, which is used to establish and maintain a balanced diet (Banderet and Lieberma, 1989). Alonso et al. (1982) reported that the release of GnRH stimulates the anterior pituitary gland to secrete FSH (a secretory hormone responsible for the release of follicle-stimulating hormone) and LH (a luteinizing-stimulating hormone), which have a role and control in spermatogenesis (Hafez, 1993). And according to what was suggested by Abu El-Hamd and Sayah (2015) that enhancing the secretion of sex hormones works to improve growth and reproductive performance. Therefore, this study was conducted to find out the effect of dosing different levels of L-Tyrosin on semen characteristics of Afghan goats during the summer by studying: - It is to improve the fertility of Afghan goats by injecting different concentrations of the amino acid tyrosine during the summer.

Materials and methods

This study was conducted in the field of the College of Agriculture / University of Diyala / and in this experiment 16 sexually mature male Afghani goats were used / their ages ranged between (1.2-1.5) years and their weights ranged between (35-40) kg. For the purpose of studying the effect of doses of different levels of amino acids on the characteristics of the semen of Afghan goats at the height of summer, where the animals were dosed with tyrosine acid and the semen of male goats was collected by means of the artificial vagina of goats at the end of each month from each animal in the presence of a female in a state of estrus, where it was injected Of estradiol in an amount of (2.5) mg 36 hours before it was presented to male goats.

The animals were divided into 16 Afghan goats with four treatments:

T1: control treatment.The first treatment,

The second treatment, T2: L-tyrosine was given at a dose of 50 mg.

The third treatment, T3: L-Tyrosine, at a dose of 75 mg.

The fourth treatment, T4: L-tyrosine, at a dose of 100 mg.

Collective sperm motility was assessed according to Bloom (1946), and individual sperm motility was estimated according to Chemineau et al. (1991), sperm concentration was calculated using an erythrocyte count slide. A dilution solution of 0.9% NaCl, 0.01% mercury chloride, and 2 g/L eosin dye (dissolved in water) was prepared for sperm characterization under a microscope, so that the percentage of Dilution 1/200, live and dead sperm based on Chemineau et al. (1991), and deformed sperm were counted according to the method of Chemineau et al. (1991) The CRD statistical software was used in the statistical analysis of trial data by design.

$Y_{ijk} = \mu + a_i + e_{ijk}$

Y_{ijk} = display the k value of the transaction.

μ = overall mean of the experiment

a_i = main effect of L-Tyrosine acid

e_{ijk} = value of the experimental error of the observation, which is normally and randomly distributed independently with mean equal to zero and variance σ^2.

Significant differences between means were compared using Duncan's multiple test (Duncan, 1955).

Results and Discussion

The effect ofL-Tyrosine amino acid dose on individual and Mass activity and concentration of sperm.

Table 1 showed the effect of an amino acid dose: L-tyrosine on the collective motility of sperm. There were significant effects ($p < 0.01$), where T4 and T3 outperformed T1 and T2 (56.08±1.19, 72.08±1.13, 79.91±1.76, 86.75±1.22), respectively. A significant effect was also found ($p < 0.01$) for dose [in single action where T4 was superior to T1 and T2 (56.16±1.09,72.08±1.13,80.00±1.080,86.91±0.91)% respectively and T3 and T2 were superior to T1. There was a significant effect of dose in concentration ($p < 0.01$) where T4 outperformed T3, then T2, and finally T1 (1.68 ± 0.17, 3.59 ± 0.13, 4.38 ± 0.16, 4.94 ± 0.23) × 10^9 respectively.

Table 1: Effect of the amino acid L-tyrosine dose on individual activity, mass, and sperm concentration (mean ± SE).

Treatment	Individual movement %	Mass activity %	Spermatozoa concentration (ml ×109)
T1	1.09±56.16 d	1.19±56.08 d	0.17±1.68 d
T2	1.13±72.08 c	1.13±72.08 c	0.13±3.59 c
T3	1.080±80.00 b	1.76±79.91 b	0.16±4.38 b
T4	0.91±86.91 a	1.22±86.75 a	0.23 ±4.94 a

Different letters in column indicate significant differences (a, b, c: P≤0.05)

Perhaps the reason for the increase in the rate of mass movement in the third and fourth transactions is due to the amino acid tyrosine, which increased testosterone (Mohamed et al. 2012) Table (12) and when testosterone rises, the secretions of the accessory glands will increase from energy sources such as fructose (Cevik et al., 2007), which We reflect positively on collective locomotion (Sullivan and Mieusse, 2016) and this finding is in agreement with what Ali (2005), Al Mahdawi (2019), Al Dulaimi and Al Hibi (2022) found on male Shami goats(Talak,2019).

Perhaps the reason for the increase in individual movement is attributed to tyrosine acid, which works on the synthesis of catecholamines (adrenaline, noradrenaline and dopamine) that affects the hypothalamus gland in secreting GnRH, which activates the action of the hormones ICSH and SSH from the pituitary, which are important in the process of sperm production, and testosterone from Leydeck cells (Donmez. et al., 2004), which works to regulate epididymal metabolism, activities, and secretions of some proteins that affect sperm maturation in the epididymis and increase its progressive motility, which is reflected in increased individual motility (Sullivan and Mieusse, 2016). This result agreed with what Mahmoud et al. (2020) found in males. New Zealand rabbits and Hamd and Sayah (2015) in Friesian calves.(Ishaq,Muhammad and Ali,2015)

The reason for the significant increase in sperm concentration may be attributed to the effect of tyrosine acid, which works on the secretion of ICSH and SSH (Abu El-Hamd and Sayah, 2015), which act on Lydek cells to produce testosterone and sperm production (spermatogenesis), which leads to sperm concentration (Allan et al. 2010). This result is consistent with what It was found by Abu El-Hamd and Shamiah (2010)and (Khalil,2018).

Effect of L-Tyrosine on the percentage of live, dead and abnormal sperm.

Table 2 showed the effect of L-Tyrosine doses on the percentage of live sperm, with a ratio of (P≤0.01), where T3 and T4 treatment outperformed T1 and T2 (67.71 ± 1.43, 83.56 ± 1.89, 88.67 ± 0.60, 93.42 ± 0.71) . T2 outperformed T1, and there was a high significant effect (P≤0.01) in dead sperm, T4 and T3 outperformed T1 and T2, and T2 outperformed T1 with the lowest percentage of dead sperm. , 17.16 ± 1.2, 11.33 ± 0.60, 6.58 ± 0.71) there were significant dose effects on the percentage of abnormal sperm (P≤0.01), with T4 outperforming T1, T2, T3 and T2 having the lowest percentage of abnormal sperm (18.83 ± 0.86). , 13.80 ± 0.71, 10.54 ± 0.90, and 8.16 ± 0.69%, respectively

Table 2: Effect of L-Tyrosine Histidine Dosing on the Percentage of Live, Dead and Abnormal Sperm (mean ± SE).

Treatment	abnormal spermatozoa%	Dead spermatozoa%	Live spermatozoa %
T1	0.86±18.83 d	1.66±32.29 d	1.43±67.71 d
T2	0.71±13.80 c	1.21±17.16 c	1.21±82.84 c
T3	0.90±10.54 b	0.60±11.33 b	0.60±88.67 b
T4	0.69±8.16 a	0.71±6.58 a	0.71±93.42 a

Different letters in column indicate significant differences (a, b, c: P≤0.05)

The reason for the increase in the percentage of live sperm in the third and fourth treatments and its decrease in the first and second treatments may be attributed to the increase in the numbers of Sertoli cells, which lead to an increase in sperm vitality as a result of the dose of the amino acid tyrosine (Singh et al., 1995). Tyrosine also works to increase testosterone from Lydec cells, which It works to stimulate the sperm and increase its vitality (Mahmoud et al., 2020), and the results agreed with Ali (2005) and Al-Mahdawi (2019).

The reason for the increase in dead sperm in the first and second treatment may be attributed to the decrease in testosterone as shown in Table 12, and the decrease of this percentage in the third and fourth treatment as a result of the effect of the amino acid tyrosine, which leads to an increase in testosterone (Abu El-Hamd and Sayah, 2015).

The reason for the decrease in the percentage of abnormal sperm may be attributed to the dose of the amino acid tyrosine, which works to raise testosterone (DeSantiago et al., 2018), which improves semen quality in terms of sperm motility and decreases sperm abnormalities (Mahmoud et al., 2020). Thus, increased secretion The accessory glands and epididymis were accompanied by an increase in spermatogenesis (Aziz, 2015), which preserves the shape of normal sperms, raises their percentage, and reduces the percentage of abnormal sperms (Manhal, 2021).(Ahmed,2016)

Acknowledgments

We extend our gratitude and sincere thanks to the Department of Animal Production and the Deanship of the College of Agriculture at Diyala University for their help and facilitating things for us to implement this experiment.

ISSN NO: 2230-5807

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