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EFFECT D-ASPARTIC AMINO ACID INJECTION ON SEX CELLS IN SHAMI GOATS

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Abstract:

This study was conducted with the aim of showing the effect of injecting D-Aspartic acid on characteristics of spermatogonia, for Period 15/7/2021 until 15/10/2021 in the animal farm/ Ruminant hall of Animal Production Department /College of Agriculture / University of Diyala. This study include 12 male of Shami goat aged (1-1.3) years, with an average weight (35-38) kg, were divided randomly to four equal groups (3/ male / group): the first was a control group (without injection)(T1),while the second (T2), third (T3) and fourth (T4) groups were injected intramuscular with D- Aspartic Acid in concentration 125, 250 and 375 mg /48 hour . The animals were slaughtered after the end of the experiment. The number of spermatogonia cells, Sertoli cells and the number of Leydig cells,germ cell layer, seminiferous tubule diameter and Seminiferous lumen of the tubule were measured. The results showed that the injection of D- Aspartic Acid led significant increase ($p<0.05$) in the number of Sertoli cells, Leydig cells, inside the seminiferous tubule, as T4 and T3 were superior on T1, and there were no significant differences between T2, T3 and T4. There was also significant effect ($p<0.05$) for injection in the number of Leydig cells, spermatogonia cells. so T3 and T4 were superior on T1, and T2 was superior on T1. The number of Spermatogonia cells also outperformed the T3 and T4 transaction on T1 and T2 transaction .

The results showed that the was a significant effect ($P<0.05$) for Aspartic acid injection in the thickness of germ layer, as T4 was superior on rest treatments, while T3 was superior on T1and T2. Also T4 was superior on T1 and T2 in the seminiferous tubule diameter, as T3 was superior on T1 in the thickness of the seminiferous tubule lumen, T4 was superior on the rest treatments and T3 was superior on T1 and T2

Keywords: Sex Cells – D-Aspartic Acid - Shami Goat

*** The research is a part of master's thesis for the first researcher.**

INTRODUCTION

Livestock in Iraq occupies a prominent place in the national economic structure, especially the agricultural economy, because its products of red and white meat, milk and eggs are the main source of animal protein which is necessary for human food (Al-Qass and Faiq,1982). Goats are animals that are raised for multiple purposes, as they produce meat and milk in conditions that other farm animals cannot produce with the same efficiency (Mlambo and Mapiye,2015). Goat's milk is characterize by its medical properties and has recently gained importance in human health because it is easily digestible and close to the components of mother's milk, so the demand for it and its dairy products is expected to increase in the coming years (Elbehri, 2015). The chemical composition of goat meat varies according to the breed(Bakar et al,2011). The shami or Damascus goat) is one of the important breeds of goats that originated in the Levant (Al-Qass et al., 1993). Its importance is due to its high efficiency in the production of milk and meat, with a high percentage of twins reaching to 75% in the mating season (Harba, 2020). In order to male reproductive process to continue with a high efficiency, the hormonal relationship must be maintained at high levels represented by the melatonin hormone, which is secreted from the pineal gland, GnRH hormone from the hypothalamus, SSH and ICSH from the pituitary gland, and testosterone from the testis, as they have an important role in the perpetuation and functioning of the sexual glands and the sperm formation and perpetuation of sexual behavior (Darbandi et al,2018). Since the Shami goat breed is one of the seasonal breeds in Iraq (Tallak, 2019), The dimensions of the testicle increase during the reproductive season and decrease during the season of sexual inactivity (Ahmed et al,2016)many studies

have been conducted for the purpose of improving the seminal fluid quality of Shami goats male during the period of sexual inactivity through treatment with some hormones such as GnRH, hCG, Kisspeptin (Al-Amri, 2015) and luteinizing hormone. eCG (Al-Mahdawi, 2019) and eCG and hCG (Abdel Manhal, 2021) or treatment with vitamins such as vitamin C (Ishaq et al.,2005) or treatment with amino acids such as tryptophan (Mahdi, 2021).

D-Aspartic acid is an amino acid that is found in the nervous tissue and endocrine gland of both vertebrates and invertebrates (D'Aniello et al., 1998) and in high levels in the testicles (Di Fiore et al., 2014). It has an important role in the synthesis and secretion of endocrine hormones such as GnRH, SSH and ICSH. It regulates testosterone secretion (D'Aniello et al., 2000a) and spermatogenesis (Di Fiore et al., 2016). Most recent studies have been limited to testing the role of D-Aspartic acid in stimulating the secretion of GnRH, LH, FSH and testosterone in several animals, We believe that there is no study dealing with the role of D-Aspartic acid in improving the seminal fluid characteristics of Shami goats male during the period of sexual inactivity, therefore, this study was conducted to find out the effect of injecting different concentrations of D-Aspartic acid in the fertility of Shami goats by measuring its effect on testicle tissue sections.

MATERIALS AND WORKING METHODS

This study was conducted in the field of the College of Agriculture / University of Diyala, 12 sexually mature Shami goats were used in this experiment, their ages ranged between (1-1.3) years and weights ranged between (35-38) kg. For the purpose of studying the effect of amino acid injection on spermatogonia. The animals were divided into 12 male Shami goats with four treatments:-

The first treatment, T1: the control treatment

The second treatment T2: injection of D-Aspartic acid at a dose of 125 mg

The third treatment T3: injection of D-Aspartic acid at a dose of 250 mg

Fourth treatment T4: injection of D-Aspartic acid at a dose of 375 mg

The animals were slaughtered after the end of the experiment, the testes were taken and placed in a box containing a physiological solution Nacl (0.9%)Automatic microtome tissue section was taken from the testes with 36 samples, 3-5 mm in size. The samples were placed in small containers containing 10% formalin. Samples were cut in a Histo-Line Laboratories device, at a thickness of 6 µm, stained, placed on slides and prepared for reading. The reading was carried out by the Ocular Micrometer of the light microscope with a magnification of 400 × 2.5 and the number of spermatogonia cells inside the seminiferous tubule near the membrane below the Sertoli cells and measurement of the thickness of the germ cell layer, seminiferous tubule diameter, the number of Sertoli cells, and the number of Leydig cells (Luna, 1968). SAS program (2010) were used analyzed of Data. Duncan multiple range test were used to compare the significant difference means (Duncan, 1955).

RESULTS AND DISCUSSION

The effect of D-Aspartic amino acid injection on sex cells in the testes of male Shami bucks.

Table 1 showed there were significant differences ($p<0.05$) for injection of Aspartic acid on the number of Sertoli cells inside the seminiferous tubule, as T4 and T3 were superior on T1 (25.26±1.85, 30.00±2.64, 34.00±1.52,36.00±2.08) respectively, and there were no significant differences between T2, T3 and T4. There was also significant effect ($p<0.05$) for injection in the number of Leydig cells, so T3 and T4 were superior on T1 (10.00 ± 0.56, 13.00 ± 0.57, 14.66 ± 0.33, 15.00 ± 0.57), respectively, and T2 was superior on T1. The number of Spermatogonia cells also outperformed the T3 and T4 transaction on T1 and T2 transaction (73.00±1.15 ,76.33±2.72 ,86.00±2.30 ,88.66±4.09) respectively.

Table 1: The effect of D-Aspartic amino acid injection on sex cells in the testes of male Shami bucks (mean± SE).

Treatment	Sertoli cells	Leydig cells	Spermatogonia
T_1	25.66±1.85 b	10.00±0.57 c	73.00 ±1.15 b
T_2	30.00±2.64 ab	13.00 ±0.57 b	76.33± 2.72 b
T_3	34.00±1.52 a	14.66 ± 0.33 ab	86.00 ± 2.30 a
T_4	36.00±2.08 a	15.00± 0.57 a	88.66± 4.09 a

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

The reason of increasing number of Sertoli, Spermatogenic, and Leydig cells may be due to rise in testosterone hormone, which works to complete the growth of Spermatogenic cells within the seminiferous tubule (Al-Qamati,2005), while increasing in Leydig cells number may be due to Aspartic acid injection, which directly activates the Leydig cells (Rastogi et al., 2011). Also, Aspartic acid is present in these cells and an increase in its concentration led to an increase in its activity and number (Sakai et al., 2005 ; Raucci and Di Fiore, 2009).

The effect of D-Aspartic amino acid injection on sex cells in the testes of male Shami bucks

Table 2 showed there were significant differences($p<0.05$) for Aspartic acid injection in the thickness of germ layer, as T4 was superior on rest treatments, while T3 was superior on T1and T2 (41.66) ± 0.88, 44.66±0.88, 51.00±0.57 and 56.00±2.08) respectively. Also T4 was superior on T1 and T2 in the seminiferous tubule diameter (145.00±2.88, 160.00±15.27, 190.00±5.77 and 193.33±8.81) respectively, as T3 was superior on T1 in the thickness of the seminiferous tubule lumen, T4 was superior on the rest treatments and T3 was superior on T1 and T2 (48.33± 1.66, 42.66 ± 1.45, 37.66 ± 1.45 and 32.66±1.45) respectively.

Table 2: The effect of D-Aspartic amino acid injection on sex cells in the testes of male Shami bucks (mean± SE).

Treatment	Germ cell layer	Seminiferous tubule diameter	Seminiferous lumen of the tubule
T_1	**41.66 ±0.88** c	**145.00±2.88** c	**48.33 ±** 1.66 d
T_2	**44.66 ±0.88** c	**160.00±15.27 bc**	**42.66 ± 1.45** c
T_3	**51.00±0.57 b**	**190.00±5.77 ab**	**37.66±1.45 b**
T_4	**56.00±2.08 a**	**193.33±8.81 a**	**32.66±1.45 a**

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

The increasing in germ layer and seminiferous tubule diameter may be due to Aspartic acid injection, which increased testosterone hormone and testosterone hormone works on growth of Spermatogenic cells in seminiferous tubule (Al-Qamati, 2005), which led to dilation of seminiferous tubules diameter. Injection of Aspartic acid also led to an increase in the secretion of SSH (Sticker et al., 2001), which led to an increase in the germ layer and dilation of the seminiferous tubule (Petersen and Soder, 2006).

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REFERENCES

1. Abd Manhal.,M. F .2021. Effect the injection of hCG and eCG hormone and cooling period on semen quality in Shami bucks. Master Thesis. College of Agriculture.University Of Diyala.
2. Ahmed, A. S., Hobi, A. A.-K. A. ., & G. , H. A. . (2016). effct of season on testicular and epididymal measurements of local black bucks . *Diyala Agricultural Sciences Journal*, *8*(1), 60–64.
3. AL-amire, M.H. M .2015. Effect of Kisspeption, GnRH and hCG treatment on reproductive performance of male and female Cypriot goats outside the reproductive season. Phd thesis. College of Agriculture -University of Baghdad.
4. Al-Qamati, Ahmed almajdub . 2005. Endocrine glands and their hormones. Faculty of Agriculture - Fatih University
5. Alkass, J. I and Faeq, S. A.1982.Goat production. Mosul University Press, Republic of Iraq.
6. Alkass, J. I, Zuhair F. A and Deputy ,I. A. 1993. The basics of the production of the sheep of the goat. faculty of Agriculture. Baghdad University. The Republic of Iraq
7. Al-Mahdawi ,H. H. S.2019. effect of injection of different leveals of equine chorionic onadotropin (eCG) on semen qualities in Shami goats . Master Thesis. College of Agriculture.University Of Diyala.
8. Bakar, I. A., Saleh, H. H., & Alkass, J. I. (2011). the effect of breed and feeding regimen on the chemical composition , color and lipid stability and cholesterol content in meat and kidney fat of local goats . *Diyala Agricultural Sciences Journal*, *3*(2), 1–11
9. D' Aniello, A., Di Fiore, M. M., Fisher, G. H., Milone, A., Seleni, A., D'Aniello, S., ... and Ingrosso, D. 2000a. Occurrence of D-aspartic acid and N-methyl-D-aspartic acid in rat neuroendocrine tissues and their role in the modulation of luteinizing hormone and growth hormone release. *The FASEB Journal*, *14*(5), 699-714.
10. D'Aniello, A., Di Fiore, M. M., D'Aniello, G., Colin, F. E., Lewis, G., and Setchell, B. P. 1998. Secretion of D-aspartic acid by the rat testis and its role in endocrinology of the testis and spermatogenesis. *FEBS letters*, *436*(1), 23-27 .

11. Darbandi, M., Darbandi, S., Agarwal, A., Sengupta, P.,Durairajanayagam, D., Henkel, R., and Sadeghi, M. R. 2018. Reactive oxygen species and male reproductive hormones. *Reproductive Biology and Endocrinology*, *16*(1), 1-14.
12. Di Fiore, M. M., Santillo, A., and Baccari, G. C. 2014. Current knowledge of d-aspartate in glandular tissues. *Amino Acids*, *46*(8), 1805-1818.
13. Di Fiore, M. M., Santillo, A., Falvo, S., Longobardi, S., and Chieffi Baccari, G. 2016. Molecular mechanisms elicited by D-aspartate in Leydig cells and spermatogonia. *International journal of molecular sciences*, *17*(7), 1127.
14. Duncan, D. B. 1955. Multiple range and multiple F tests. *Biometrics*, *11*(1), 1-42
15. Elbehri, A. 2015. Climate change and food systems: global assessments and implications for food security and trade. Food and Agriculture Organization of the United Nations (FAO).
16. Harba ,H. W.2020. Effect of Using Some Hormonal Programs in the Reproductive Efficiency in Shami Goats. Master Thesis . College of Veterinary Medicine. University of Hama.
17. Ishaq,M. A . Talal A. A., Muhammad T. A., and Farahan A. M. A.2005. The effect of the genetic group and the treatment of vitamin C in some of the characteristics of the semen of goats. *Iraqi Journal of Agricultural Science*, *36*(3)
18. Mahdi,M. M..2021. Effect of tryptophan amino acid injection on some Repoduction characteristics of Shami bucks in July,August,Septemper and October months . Master Thesis. College of Agriculture.University Of Diyala.
19. Mlambo, V., and Mapiye, C. 2015. Towards household food and nutrition security in semi-arid areas: What role for condensed tannin-rich ruminant feedstuffs?. *Food Research International*, *76*, 953-961.
20. Raucci, F., and Di Fiore, M. M. 2009. The reproductive activity in the testis of Podarcis s. sicula involves D-aspartic acid: a study on c-kit receptor protein, tyrosine kinase activity and PCNA protein during annual sexual cycle. *General and comparative endocrinology*, *161*(3), 373-383.
21. Talak ,R. T..2019. study the effect of autumn and spring seasons on reproductive system activity of shami bucks in iraq . Master Thesis. College of Agriculture.University Of Diyala.
22. Luna, L. G. 1968. Manual of histological staining methods of the Armed Forces Institute of Pathology. 3rd ed. New York. McGraw Hill Bock Company. PP. 38- 76. https://agris.fao.org/agris-search/search.do?recordID=US20130045 9165
23. Rastogi, R. K., Pinelli, C., Polese, G., D'Aniello, B., and Chieffi-Baccari, G. 2011. Hormones and reproductive cycles in anuran amphibians. In *Hormones and Reproduction of Vertebrates* (pp. 171-186). Academic Press.
24. Sakai, K., Homma, H., Lee, J. A., Fukushima, T., Santa, T., Tashiro, K., ... and Imai, K. 1998. Localization ofd-aspartic acid in elongate spermatids in rat testis. *Archives of Biochemistry and Biophysics*, *351*(1), 96-105.
25. Sticker, L. S., Thompson Jr, D. L., and Gentry, L. R. 2001. Pituitary hormone and insulin responses to infusion of amino acids and N-methyl-D, L-aspartate in horses. *Journal of animal science*, *79*(3), 735-744.
26. Petersen, C. and O. Soder . 2006. The sertoli cell--a hormonal target and 'super' nurse for germ cells that determines testicular size. Horm. Res. 66(4): 153-161.