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STUDY OF SOME REPRODUCTIVE PARAMETERS AND SEXUAL BEHAVIOR IN AWASSI RAMS: A REVIEW

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ABSTRACT

Reproductive efficiency represented by sexual desire, semen quality, testicular dimensions, and level of sex hormones are among the main components of ram fertility, which affect the fertility and productivity of the herd. Since the development of the testicles is related to reproductive activity and the ability to fertilize, so measuring the dimensions of the testicles is important in evaluating the reproductive capacity of rams. In addition, the concentration of testosterone is reflected in most of the characteristics of male sexual behavior, as it is positively and significantly correlated with ejaculate volume, mass motility, and sperm concentration. The high level of testosterone hormone in the blood plasma during reproductive season leads to an increase in male sexual desire and an improvement in the quality of semen through direct influence in the process of sperm formation and the volume ejaculate, density and vitality of semen. In addition to reproductive traits are also affected by age, body weight, season and herd management, as well as the impact of the environmental conditions, which are temperature, humidity, level of nutrition, quantity and quality, and length of the photoperiod, which is one of the most important factors affecting the reproductive performance of rams.

INTRODUCTION

The reproductive efficiency of sheep, which is related to the fertility of rams, is one of the most important factors affecting the productive performance of the herd, and the sexual behavior of rams is an indication of their ability to fertilize the largest possible number of ewes (Abdul Wahid and Yunus, 1995 and Shihab *et al.*, 2021). Also, rams with high semen quality will lead to an increase in the fecundity of the herd (Saacke *et al.*, 1994). The motility, vitality, and concentration of the sperm are among the most important qualitative characteristics of semen, as it is related to fertility (Taha *et al.*, 2012). The productive performance and reproductive activity of rams is affected by the surrounding environmental conditions such as type of feeding, breeding system, care and season (Al-Zaidan *et al.*, 2022), which is reflected in the measurements dimensions of the testes and the composition and vitality of the sperm (Gorner, 1997). Several studies have indicated a positive relationship between testicular measurements and the reproductive efficiency of rams. So through testicular measurements, can be selected breeding rams because there is a positive

relationship between some testis measurements and each of the semen quality and sperm formation process (Curtis and Amann, 2000). The concentration of testosterone varies with seasons, which is affected by the reproductive activity of rams (Land, 1973), and the level of this hormone in blood is affected by breed, age, and length of time rams are exposing to ewes in estrus (Schanbacher and Lunstra, 1976). Excluding rams with low sexual desire and weak ability to fertilize at an early stage will reduce the costs of care and feeding in sheep flocks. Therefore, the current study aims to review some of the available sources on some reproductive performance traits represented by semen characteristics, testicular dimensions and sexual behavior in Awassi rams and to focus on the most important traits that lead to raising the level of fertility and improving the reproductive efficiency of these rams.

REVIEW OF LITERATURE

Semen characteristics:

1-Volume:

Semen ejaculate volume is affected by age, season, frequency of collection, and testicular size. Semen volume rises with increased concentration of testosterone and spermatogenic stimulating hormone (SSH) during the reproductive season, as they activate the Sertoli cells that support and nourish the sperm (Sarkar *et al.*, 2008). The increase in ejaculate volume occurs mainly due to the increase in seminal plasma produced by the accessory glands (Gündoğan, 2007,and Al-Obaedi *et al.*, 2017) noted that the highest volume of semen in Awassi rams aged 2-4 years was 4.6 ml in July and the lowest volume was 0.5 ml in February. Al-Hassan *et al.* (2017) found that the average ejaculate volume was 1.38 and 1.39 ml in Turkish and local Awassi rams aged 4-5 years respectively, and Ibrahim (2019) mentioned that the volume of ejaculate in Awassi rams aged 2-3 years was 1.52 ml during winter. Also Zaher *et al.* (2020) indicated that the highest volume of semen in Awassi rams aged 3-5 years in the UAE was 1.45 ml during the autumn season and the lowest volume was 0.97 ml during the spring season. Shihab *et al.* (2021) observed that the semen volume in Awassi rams at the age of 9-12-month-old was 1.98 ml. Ibrahim *et al.* (2022) noted that the volume of semen in Awassi rams aged 1.5-2 years was 1.69 ml. Table (1) shows the results of a number of studies that it indicated the volume of semen in Awassi rams.

2-Consistency:

When the sperm concentration is high, the consistency of ram's semen is creamy, and if the sperm concentration is low, the consistency of the semen is watery (Sorensen, 1979, Youngquist and Threlfall, 2007). Malejane *et al.* (2014) indicated that the semen is more intense during autumn, which is the natural reproductive season. Table (1) indicates that the consistency of the semen in Awassi rams ranges between 0.73-3.7 degrees. Ahmed and Ibrahem (2011) noted that the consistency of the semen in Awassi rams was 1.65, 0.88 and 1.19 during the summer, winter and spring seasons, respectively. Taha *et al.* (2012) reported that the variation in semen consistency may be due to several reasons, including genetic factors, environmental conditions, and method of collection and they noted that the consistency of semen of Awassi rams at the age of 12-17 months was 2.36 degrees. Ahmed *et al.* (2012) indicated that the semen consistency of Awassi rams aged 8-10 months ranged

between 0.73 and 1.91 during February and June month respectively. The semen consistency of 2-3-year-old Awassi rams during winter was 1.82 (Ibrahim, 2019).

3-Mass motility:

Sperm motility is a preliminary assessment of semen (Gimenes and Rodning, 2007). Aziz and Hmoud (2011) indicated that the mass motility of sperm rises in the reproductive season and decreases outside the reproductive season. It is clear from Table (1) that the mass motility of the sperm in Awassi rams ranged between 2-4 degrees or 32.70-92% in several studies. Ahmed *et al.* (2012) observed that the mass motility of sperm in Awassi rams at the age of 8-10 months ranged between 32.70-65.83% during February and August month, respectively. While Taha *et al.* (2012) found that the mass motility of sperm in Awassi rams was 3.19 degrees. Sultan (2013) explained that the mass motility of sperm ranged between (2.69-3.23) for Awassi rams at 32 months old. Ali (2014) also found that the mass motility of sperm in the semen of Awassi rams aged 2-3 years was 92%. Mahdi *et al.* (2016) indicated that the mass motility of sperm in Turkish Awassi rams aged 2-3 years ranged between 75-80%. Al-Obaedi *et al.* (2017) showed that the highest percentage of mass motility of sperm in the semen of Awassi rams aged 2-4 years was 4.0 and 3.8 degrees during the months of April and May, and the lowest percentage was 2.2 and 2.0 during the months of November and July, respectively. Khalil (2018) reported that the mass motility of sperm in the semen of Awassi rams aged 13-12 months was 70.83% and 67.50% during the autumn and winter seasons, respectively. Shihab *et al.* (2021) reported that the mass motility of sperm in the semen of Awassi rams aged of 9-12 months was 4.23. Moreover, Ibrahim *et al.* (2022) showed that the mass motility of sperm in the semen in Awassi rams aged of 1.5-2 years amounted to 3.54.

4-Individual motility:

The individual motility of the sperm is important for the fertilization process in males, which is affected by season and age (Javed *et al.*, 2020). Aziz and Hmoud (2011) indicated that the individual motility of the sperm in the semen of Awassi rams was 90.66%. In a study by Mahdi *et al.* (2016) on Turkish Awassi rams aged 2-2.5 years, the individual motility of the sperm ranged between 70-75%. Sultan (2013) showed that the individual motility of sperm in the semen of Awassi rams aged of 32 months ranged between 42.80% and 48.60%, and the individual motility of sperm in Awassi rams at the age of 1.5 years and weight of 45.5 kg was 62.00% (Hassan, 2013). Al-Obaedi *et al.* (2017) showed in their study on the same breed that the highest percentage of individual motility of sperm in the semen of Awassi rams aged 2-4 years was 0.85% in May month and the lowest was 0.29% in February. Khalil (2018) reported that the individual motility of sperm in the semen of Awassi rams aged 12–13 months was 75% and 71.22% during the autumn and winter seasons, respectively. Ibrahim (2019) observed in his study on Awassi rams aged 2-3 years that the individual motility of sperm during the winter, it reached 75.01%. Shihab *et al.* (2021) found that the individual motility of sperm in the semen of Awassi rams aged of 9-12 months was 84.95. Ibrahim *et al.* (2022) found that the individual motility of sperm in the semen of Awassi rams was 70.97%. Table (1) shows the individual motility of sperm in the semen of Awassi rams, which ranged in the several studies between 0.29% and 92.5%.

5-Sperm concentration:

Ahmed *et al.* (2012) observed that the sperm concentration in the semen of Awassi rams aged 10-8 months ranged between 0.429-2.00×10^9/ml during the months of February and June, respectively. Ibrahim *et al.* (2016) found that the sperm concentration in the semen of Turkish Awassi rams aged 11-13 months was 3.48, 4.02 and 4.37×10^9/ ml for low, medium and high weight, respectively, and the sperm concentration in Turkish and local Awassi rams aged 4-5 years was 2.15 and 1.99×10^9/ml, respectively (Al-Hassan *et al.*, 2017). Al-Obaedi *et al.* (2017) indicated that the highest sperm concentration was 1.61×10^9 /ml in May and the lowest was 0.6×10^9 /ml in July. Khalil (2018) reported that the sperm concentration in the semen of Awassi rams aged 13-12 months was 3.53 and 4.16×10^9 /ml during the autumn and winter seasons, respectively. Ibrahim (2019) mentioned that the sperm concentration in the semen of Awassi rams aged 2-3 years during winter month was 3.9800×10^9 sperm/ml . Shihab *et al.* (2021) showed that the semen concentration of Awassi rams aged of 9-12 months was 2.10×10^9 /ml . Ibrahim *et al.* (2022) found that the concentration of sperm in the semen of Awassi rams was 2.55×10^9 /ml . Table (1) shows the sperm concentration in the semen of Awassi rams in the several studies.

6- live sperm:

The percentage of alive sperm is affected by Photoperiod, season and temperature in addition to age and the collection process (Hussain *et al.*, 2012). Table (1) indicates the percentage of alive sperm in the semen of Awassi rams that was conducted by some Researchers, in a study on Awassi rams at the age of 2-1.5 years, Aziz and Hmoud (2011) noted that the percentage of alive sperm in the semen ranged between 52-96%, with a rate of 86.9%. Taha *et al.* (2012) reported that the percentage of alive sperm for one-year-old Awassi rams was 60.52%. Sultan (2013) found that the percentage of alive sperm in the semen of 32-month-old Awassi rams ranged between 56.20-63.60%, while Ali (2014) noted that the percentage of live sperm in the semen of Awassi rams at the age of 2 years amounted to 93.3%. Al-Hassan *et al.* (2017) indicated that the percentage of live sperm in Turkish and local Awassi rams aged 4-5 years was 76.93% and 74.06%, respectively. The percentage of alive sperm in the semen of Awassi rams aged 2-3 years during the winter month was 82.89% (Ibrahim, 2019), and Zaher *et al.* (2020) reported that the percentage of alive sperm in the semen of Awassi rams aged 3-5 years was 71.83, 71 .67, 70.92 and 68.17% during the autumn, winter, spring and summer seasons, respectively. Shihab *et al*. (2021) observed that the percentage of alive sperm in the semen of Awassi rams at the age of 9-12 months was 84.95. Like that Ibrahim *et al.* (2022) noted that the percentage of live sperm in the semen of Awassi rams was 83.55.

7-Dead sperm:

Al-Rubaie *et al.* (2011b) observed a decrease in the number of dead sperm during the reproductive season autumn and the beginning of winter. In a study by Kashef Al-Getaa (2012) on 11.5-month-old Awassi rams, the researcher found a significant increase in the percentage of dead sperm during the month of August, reaching 37.01% compared to 7.81% in November. Ahmed *et al.* (2012) reported that the percentage of dead sperm in the semen of Awassi rams aged 8-10 months ranged between 20.79 and 53.42% during the months of March and July, respectively. The percentage of dead sperm in the semen of Awassi rams aged 1.5 years 20.94%

(Hassan, 2013). Ibrahim *et al*. (2016) explained that the percentage of dead sperm in the semen of Turkish Awassi rams was 11.62, 9.52 and 9.28% for low, medium and high weight, respectively. Al-Obaedi *et al.* (2017) mentioned that the highest and lowest percentage of dead sperm in the semen of Awassi rams aged 2-4 years was during the months of September and June, and it amounted to 28 and 5%, respectively. Khalil (2018) noted that the percentage of dead sperm in the semen of Awassi rams aged 13-12 months reached 1.00 and 4.00% during the autumn and winter seasons, respectively. Shehab *et al*. (2021) indicated that the percentage of dead sperm in the semen of Awassi rams aged 9-12 months was 10.07%. Ibrahim *et al.* (2022) found that the percentage of dead sperm in the semen of Awassi rams was 17.53%. Table (1) shows the percentage of dead sperm in the semen of Awassi rams, which was reached by a number of researchers.

8-Abnormal sperm:

Sperm abnormalities are divided into two major categories called primary and secondary abnormalities. Primary abnormalities are caused by a failure during the formation of the sperm cell in the testes,secondary abnormalities occur as the sperm travel through the epididymis (Sharma *et al.*, 2013), and that abnormally distorted sperms are without functional efficiency and therefore reduce the chances of fertilization or may prevent it (Overstreet and Katz, 1987). Hamidi *et al.* (2012) observed that the percentage of abnormal sperms in the semen of Awassi rams in Iran was 7.2% and 4.4% outside and inside the reproductive season, respectively. Ahmed *et al.* (2012) indicated that the percentage of abnormal sperms of Awassi rams aged 8-10 months ranged between 3.41 and 5.66% during the months of December and May, respectively. Taha *et al.* (2012) mentioned that the percentage of abnormal sperms for Awassi rams aged one year was 1.99%, while the percentage of abnormal sperms in rams of the same breed at the age of 2-3 years was 2.5% (Ali, 2014). Bashawat (2015) reported that the percentage of abnormal sperms in the semen of Awassi rams aged 3 years was 3.7% and 2.3% outside and within the reproductive season, respectively. Al-Obaedi *et al.* (2017) showed that the highest percentage of abnormal sperms was 16% in February and the lowest percentage was 4 % in august and September in 2- 4 years rams old. In Turkish Awassi rams aged 11-13 months the percentage of abnormal sperm was 1.45, 3.28 and 1.12% for low, medium and high weight, respectively (Ibrahim *et al.*, 2016). Khalil (2018) showed that abnormal sperms in the semen of Awassi rams aged 12-13 months amounted to 2.00 and 1.21% during the autumn and winter seasons, respectively. Shihab *et al*. (2021) reported that the percentage of abnormal sperm in the semen of Awassi rams aged 9-12 months was 2.49%. Whereas Ibrahim *et al.* (2022) observed that the percentage of abnormal sperm in the semen of Awassi rams was 8.24. Table (1) indicates the percentage of abnormal sperms in the semen of Awassi rams, which were found in the several studies.

Testicle dimensions:

1-Scrotal circumference:

Several researchers have studied the testicular dimensions and their effect on rams' fertility and their relationship to sperm production, and they have clarified the possibility of relying on testicular dimensions, especially the scrotal circumference,

to predict the fertility of rams (Al-Hassan, 2009). Dorostghoal *et al.* (2009) noted that the scrotal circumference in Iranian Awassi rams aged 3-4 years was 26.35, 24.12 and 22.63 cm during December, February and June, respectively. Al-Khashab (2011) in study on Awassi rams aged 1.5-2 years noticed that the highest value of the scrotal circumference was 31.71 cm in the summer season, followed by the values of 31.23 and 30.46 cm in the spring and autumn seasons, respectively, while the lowest value was 29.94 cm in the winter season and there was a significant difference between the summer and winter seasons. Ibrahim *et al.* (2016) showed that the scrotal circumference in Turkish Awassi rams aged 11-13 months was 27.70, 28.40 and 30.35 cm for low, medium and high weight, respectively. Study on Awassi ram lambs aged 12-13 month, Khalil (2018) found that the scrotal circumference was 28.46 and 29.17 cm during the autumn and winter seasons, respectively. While the scrotal circumference in Awassi rams aged 3-5 years in the United Arab Emirates- UAE was 34.8 and 34.9 cm during the summer and autumn seasons, and it was significantly higher compared to the value in winter and spring seasons (32.6 and 32.9 cm), respectively Zaher *et al*. (2020). Table (2) shows the scrotal circumference in Awassi rams that were reached in several studies.

2-Testicular length:

In a study by Al-Rubaie *et al.* (2011a) on sexually mature Awassi rams aged 7-12 months, the average testicular length reached 75.61 mm during the autumn season and was superior compared to the rest of the other seasons. While the testes length in Awassi rams aged 11.5 months was 7.66 and 7.45 cm during the months of October and November, respectively, and it was significantly less than 6.03 and 6.72 cm during August and September month, respectively (Kshef Al-Getaa, 2012). Ahmed (2016) reported that the length of the testicle ranged between 79.39 and 68.94 mm during the months of October and March, respectively. Khalil (2018) also indicated that the length of the right and left testicles of Awassi rams aged of 12-13 months was 13.38, 13.25 and 14.00, 13.71 cm during the autumn and winter seasons, respectively. The average length of the testicles of Awassi rams aged 3-5 years in the UAE was 13.00, 12.87, 12.90 and 12.95 cm during the autumn, winter, spring and summer seasons, respectively (Zaher *et al.*, 2020). Table (2) shows the testicular length in Awassi rams that were reached in several studies.

3-Testicular width:

Al-Rubaie *et al.* (2011a) showed in their study on sexually mature Awassi rams aged 7-12 months that the maximum testicular width reached 52.63 mm during the autumn season and was significantly superior compared to the rest of other seasons. Kshef Al-Getaa (2012) noted that the testicular width in Awassi rams was significantly higher at 4.07 and 4.20 cm during October and November, respectively, and the lowest was 3.58 and 3.60 cm during July and August, respectively. Ahmed (2016) also indicated that the highest testicular width of Awassi rams was 55.51 mm in October and it was significantly differ than the lowest 49.91 mm in March. Ibrahim *et al.* (2016) found that the diameter of the right and left testicles of Turkish Awassi rams aged 11-13 months was 63.69, 64.07, 67.71, 67.95, 71.17, 71.33 mm for low, medium and high body weight, respectively. Table (2) shows the testis width in Awassi rams that were recorded in the several studies.

4-Testicular volume:

Al-Khashab (2011) in study on Awassi rams aged 1.5-2 years, showed a significant superiority in the testicle size in summer and spring seasons, which amounted to 613.33 and 567.67 cm^3, respectively, compared to the autumn and winter seasons, which amounted to 466.67 and 491.67 cm^3, respectively. Al-Rubaie *et al.* (2011a) observed in their study on sexually mature Awassi rams that the testicular volume reached 138.04 cm^3 during the autumn season, which was significantly superior compared to other seasons. Ahmed (2016) stated that the testicular size in Awassi rams aged 1-2 years ranged between 98.37 and 136.92 cm^3 during March and October month, respectively, and it was significant. The testicle size in Awassi rams aged 3-5 years ranged between 661.63 and 670.39 cm^3 during winter and summer, respectively (Zaher *et al.*, 2020). Table (2) shows the size of the testis in Awassi rams.

Testosterone concentration:

The level of the testosterone hormone is a good indicator of the quality of semen, as there is a positive and highly significant correlation coefficient between the level of the hormone and volume of ejaculate, mass motility and Sperm concentration (Kishk, 2008). Ahmed *et al.* (2012) observed that the serum testosterone level of Awassi rams aged 8-10 months was 38.74 and 51.54 nmol/L during January and August, respectively. Al-Hassan (2013) found that the concentration of testosterone in the blood of 4-year-old Awassi rams was 7.10 ng/ml, and he showed that the best concentration of testosterone in autumn and spring seasons was 7.08 and 7.04 ng/ml, respectively, and the high level of the hormone was reversed during the autumn season on most of the characteristics of sexual behavior of rams, which were the best in this season. Sultan (2013) explained that the level of testosterone in the blood serum of Awassi rams aged 32 months was 4.51, 4.28 and 5.15 pg / ml during December, January and February months, respectively and the increase in the level of the hormone during the February was attributed to the improvement of pasture plants in this month compared to December and January. The level of testosterone in low, medium and high weight Turkish Awassi rams was 0.81, 0.96 and 0.92 ng/mmol, respectively (Ibrahim *et al.*, 2016). In a study by Khalil (2018) on Awassi rams aged 12-13 months, serum testosterone levels were 0.86 and 0.74 ng/mol during autumn and winter, respectively. Also Baker *et al.* (2019) also noted that the level of testosterone in blood serum of Awassi rams aged 15-16 months was 0.8, 1.33 and 2.23 mIU/ml during the three months of the study, respectively. Table (4) shows the concentration of testosterone in the blood of rams Awassi.

Libido test:

Libido is a ram's desire to mate. It is regulated by the release of testosterone, produced by specialized cells in the testes. Some breeds of rams show libido almost continuously once they reach puberty. In other breeds, there is a marked decline in libido during the non-breeding season. Al-Khashab (2011) in study to test the sexual desire of Awassi rams aged 1.5-2 years noticed that the lowest time for first jump was 12.21 seconds in the summer season and it differed significantly from the values of the time for first jump 15.21 and 17.25 seconds in winter and spring seasons, respectively, while they did not Significantly different from the period of 14.30 seconds in the autumn season. Al-Hassan (2013) showed through the sexual desire test for Awassi rams at the age of 4 years for a period of 20 minutes that the average

number of sniffing, kicking, jumping trial and jumping without serving, and number of breeding were 8.04, 2.46, 4.88, 16.23 and 0.94, respectively. The time for first jump and first breeding was 28.08 and 4.92 minutes, respectively. Hamad *et al.* (2015) found that the response time for the first leap and the first coitus for Awassi rams aged 2.5 years was 3.34 and 4.52 minutes, respectively, and the leaps number was 18 and one coitus during 20 minutes. Ibrahim *et al.* (2016) indicated that the stimulation time for Awassi rams aged 11-13 months was 25.59, 32.59 and 20.59 seconds for low, medium and high weight rams, respectively, and indicated that the improvement in stimulation time for high weight treatment is due to the high level of testosterone in the blood plasma, which causes an increase in male sexual desire and causes an improvement in the quality of semen through the direct effect of this hormone on the process of spermatogenesis (Weinbauer and Nieschlag, 1991). Al-Hassan *et al.* (2017) showed that the time for the first jump of the Turkish and local Awassi rams was 5.67 and 7.42 seconds, respectively, and the number of jumps during the non-breeding season was 18.67 and 18.92 jumps. The time for the first coitus was 2.87 and 2.63 minutes, the number of jumps for the first breeding was 8.85 and 8.06, and the number of breeding is 1.43 and 1.27 for the Turkish and local Awassi rams, respectively. Table (3) shows some characteristics of the sexual desire of Awassi rams.

Table (1): Some traits of Awassi rams semen.

Source and year	Age	volume/ml	Consistency	Mass motility	Individual motility	concentration $\times 10^9$/ml	% Live sperm	%Dead sperm	%Abnormal sperm
Ahmed and Ibrahem (2011)	8-10 mo.		0.88-1.65						
Aziz and Hmoud (2011)	1.5-2 yr.	0.93		92.32%	90.66%	0.83-199	52-96		
Shamoon *et al.* (2011)	2-3 yr.	1.95	2.25		31.56	2.2	69.78	30.22	3.25
Al-Dulaimi and Hobi (2011)	2-4 yr.	0.61		77.03	76.16	3.68		10.65	4.84
Naoman (2012)	2.5-4	1.2		89.0	88.0	1.79	88.76		
Ahmed *et al.*(2012)	8-10 mo.	0.52-1.58	0.73-1.91	32.70-65.83%	34.37-70.30%	0.42-2.00	46.58-79.21	20.79-53.42	3.41-5.66
Taha *et al.*(2012)	12-17 mo.	1.01	2.36	3.19	57.54%	1.85	60.52		1.99
Hassan and Fahad (2012)	2.5-3 yr.	0.53-1.12			33-41%				
Sultan (2013)	32 mo.	1.45-1.64		2.69-3.23	42.80-48.60%	1.62-2.24	56.20-63.60		2.47-3.46
Hassan (2013)	1.5 yr.				62.00			20.94	23.65
Ali (2014)	2-3 yr.	1.43		92%	92.5%	1.79	93.3		2.5
Bashawat (2015)	3							12.4-16.7	2.3-3.7
Mahdi *et al.*(2015)	2-2.5 yr.	0.56-0.70		75-80%	70-75%	6.21-6.68			3.5-3.9
Ibrahim *et al.*(2016)	11-13 mo.	0.61-0.92	3.00	69.17-75.33%	72-76%	3.48-4.37		9.28-11.62	1.12-3.28

Al-Hassan *et al.* (2017)	4-5 yr.	1.38-1.39	3.08-3.40	3.36-3.60	63.34-71.13%	1.99-2.15	74.06-76.93		1.10-1.23
Al-Obedi *et al.*(2017)	2-4 yr.	0.5-4.6	1.3-3.7	2.0-4.0	0.29-0.85%	0.6-1.61		5-28	4-16
Khalil (2018)	12-13 mo.	0.76-0.89	3.00	67.50-70.83%	71.22-75.0%	3.53-4.16		4.00-10.00	1.21-2.00
Ibrahim (2019)	2-3 yr.	1.52	1.82	3.47	75.01	3.9800	82.89	17.21	7.22
Zaher *et al.* (2020)	3-5 yr.	0.97-1.45			61.92-64.33%		68.17-71.83		
Shihab *et al.* (2021)	9-12 mo.	1.98	2.94	4.23	84.95	2.10	89.93	10.07	2.49
Ibrahim *et al.*(2022)	1.5-2 yr.	1.69	2.01	3.54	70.97	2.55	83.55	17.53	8.24

Table (2): Testicle dimensions of Awassi rams.

Source and year	Age	Scrotal circumference /cm	Testicular length /cm	Testicular width /cm	Testicular volume /cm^3
Al-Khashab (2011)	1.5-2 yr.	29.94-31.71			466.67-613.33
Al-Rubaie *et al.* (2011a)	7-12 mo.		6.87-7.56	4.93-5.26	100.94-138.04
Kshef Al-Getaa (2012)	11.5 mo.		6.03-7.45	3.58-4.20	
Sultan (2014)	35 mo.		14.35-15.10	6.76-7.39	
Ibrahim *et al.* (2016)	11-13 mo.	27.70-30.35	12.88-14.45	6.36-7.13	
Ahmed (2016)	1-2 yr.		6.89-7.93	4.99-5.55	98.37-136.92
Khalil (2018)	12-13 mo.	28.46-29.17	13.25-14.00		
Zaher *et al.* (2020)	3-5 yr.	32.6-34.9	12.87-13.00	8.3	661.63-670-39

Table (3): The concentration of testosterone in the blood serum of Awassi rams.

Source and year	Age	Concentration
Shamoon *et al.* (2011)	2-3 yr.	0.88 ng/ml
Ahmed *et al.*(2012)	8-10 mn.	38.74-51.54 nmol/L
Naoman (2012)	2.5-4 yr.	2.1 (ng)
Al-Hassan (2013)	4 yr.	7.10 ng/ml
Sultan (2013)	32 mn.	4.51-5.15 pg/ml
Ibrahim *et al.* (2016)	11-13 mn.	0.81-0.96 ng/mmol
Khalil (2018)	12-13 mn.	0.74-0.86 ng/mol
Baker *et al.*(2019)	15-16 mn.	0.8-2.23 mIU/ml

Table (4): Traits of sexual desire of Awassi rams.

Source and year	Age	Time for first jump/ sec.	Number of jumps	Time for first breeding/ mit.	Number of jumps for first breeding	Number of breeding	**S**niffing	Kicking	Jump Trial
Al-Hassan (2013)	4 yr.	28.08	16.23	4.92		0.94	8.04	2.46	4.88
Hamad *et al.*(2015)	2.5 yr.	3.34 min	18	4.52		1.00			
Al-Hassan et al.(2017)	*4-5 yr.*	*5.67-7.42*	*18.67-18.92*	*2.63-2.87*	*8.06-8.85*	*1.27-1.43*			

CONCLUSION

It is concluded from this study that there is variation in semen characteristics, testicular dimensions and testosterone level. This discrepancy can be invested in selecting the best rams for breeding and spreading their genetic structures among the herds. The reproductive activity of rams is affected by the surrounding environmental conditions such as nutrition, care and reproductive season, as well as the influence of genetic factors.

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CONFLICTS OF INTEREST

The researchers support that this work does not conflict with the interests of others.

دراسة بعض المقاييس التناسلية والسلوك الجنسي في الكباش العواسية: مراجعة

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الخلاصة

تعد الكفاءة التناسلية المتمثلة بالرغبة الجنسية ونوعية السائل المنوي وأبعاد الخصية ومستوى الهرمونات الجنسية من بين المكونات الرئيسية لخصوبة الكباش التي تؤثر على خصوبة القطيع وإنتاجيته. ونظراً لارتباط تطور الخصيتين مع النشاط التناسلي والقدرة على الإخصاب، لذلك يعد قياس أبعاد الخصيتين ذات أهمية في تقييم القدرة التناسلية للكباش. بالإضافة إلى ذلك ينعكس تركيز هرمون التستستيرون على معظم صفات السلوك الجنسي للذكور، حيث يرتبط بشكل موجب ومعنوي مع حجم القذفة والحركة الجماعية وتركيز النطف. يؤدي ارتفاع مستوى هرمون التستوستيرون في بلازما الدم خلال الموسم التناسلي إلى زيادة الرغبة الجنسية لدى الذكور وتحسين نوعية السائل المنوي من خلال التأثير المباشر في عملية تكوين النطف وزيادة حجم القذفة وكثافة وحيوية السائل المنوي. بالإضافة إلى ذلك فإن الصفات التناسلية تتأثر أيضًا بالعمر ووزن الجسم والموسم وإدارة

القطيع فضلاً عن تأثير الظروف البيئية المحيطة بالحيوان والمتمثلة بدرجة الحرارة والرطوبة ومستوى التغذية كماً ونوعاً وطول فترة الإضاءة والتي تعد من أهم العوامل المؤثرة في الأداء التناسلي للكباش.

REFERENCES

Abdul Wahid, S., & Yunus, J. M. (1995). Level of testosterone in blood plasma of selected rams. *Asian-Australasian Journal of Animal Sciences*, *8*(6), 583-585. https://doi.org/10.5713/ajas.1995.583

Ahmed, A. S. (2016). Effect of month on testicular and epididymis weight and biometrics of Awassi rams. *Al-Anbar Journal of Veterinary Sciences, 9*(2), 104-108. https://www.iasj.net/iasj/download/1d13f27a1ca1f082

Ahmed, N. N., Al-Mteoty, M. S. & Al-Masri, N. A. (2012). Effect of months on some physiological and biochemical characters of blood and semen in Awassi rams. *Mesopotamia Journal of Agriculture, 40*(3), 153-165. http://dx.doi.org/10.33899/magrj.2012.54820

Ahmed, N. N. & Ibrahem M. S. (2011). Effect of seasonally–induced thyroid gland disorders on some physiological and biochemical characters of blood and semen of Awassi rams. *Mesopotamia Journal of Agriculture, 39*(1), 83-94. http://dx.doi.org/10.33899/magrj.2011.28082

Al-Dulaimi, A. Y. & Hobi A. A. (2011). The effect of oral administration of vitamin. E and selenium on semen quality and viability for awassi rams. *Anbar Journal of Agricultural Sciences*, *9*(1), 149-161. https://www.iasj.net/iasj/download/78ca5557e412d36e

Al-Hassan, F. H. A. (2009). *Study of Some Reproductive Traits and Estimate The Genetic Parameters For Body Weight and Testes Dimensions For Rams and Puberty of Awassi and Hamadani Sheep*. Ph. D. Dissertation, College of Agriculture and Forestry, University of Mosul, Iraq. https://2u.pw/Py0G7

Al-Hassan, F. H. A. (2013). Effect of seasonal variations on sexual behavior of Awassi and Hamadani rams. *Euphrates Journal of Agriculture Science, 5(*1),65-75. https://www.iasj.net/iasj/download/b5edcb961108bd0f

Al-Hassan, F. H. A., M. N. Abdullah, N. Y. Abbo & G. I. Abdullah (2017). Study of oxytocin injection effect on some semen traits and libido in Turkish and local Awassi rams. *Mesopotamia Journal of Agriculture, 45*(4), 151-158. http://dx.doi.org/10.33899/magrj.2017.161377

Ali, A. J. (2014). Effect of Ivermectin on semen parameters and levels of Alanine aminotransferase (ALT) and Aspartate aminotransferase (AST) enzymes in seminal plasma of Iraqi Awassi rams. *Al-Qadisiyah Journal of Veterinary Medicine Sciences, 13*(1), 115-119. https://doi.org/10.29079/vol13iss1art290

Al-Khashab, A. T. M. (2011). *Using Some Hormonal Treatments on Reproductive Performance of Awassi Sheep*. Ph. D. Dissertation, College of Agriculture and Forestry, University of Mosul, Iraq. https://2u.pw/7SK7V

Al-Obaedi, H. J., Albiaty, N. M. H., Kareem, F., Jassim, J. M., Al-Hakim A. M. & Al-Naeb A. Y. (2017). Study the effect of temperature variation on some semen characteristics of Awassi rams in Iraq. *Iraq Journal of Agriculture Research, 22*(4), 15-22.

https://www.iasj.net/iasj/download/aa82022e48fde8cc

Al-Rubaie, H. M., Al-Dulaimi, M. K. & Al-Anbari N. N., (2011b). The effect of seasonal variation occurring in testes and epididymis histological in Awassi rams. *Journal of Kerbala University*, *9*(2), 61-68. https://www.iasj.net/iasj/download/e1e3c7cbc529792a

Al-Rubaie, H. M., Al-Dulaimi, M. K. & Al-Anbari, N. N. (2011a). Effect of seasonal variation in testis and epididymis of Awassi rams. *Journal of Kerbala University*, *9*(2),213-219. https://www.iasj.net/iasj/download/dd3b30aba7e4441b

Al-Zaidan, O. A., Al-Kurjia, O. A., & Sabeh, H. M. (2022). Effect of weight at fattening on carcass traits of Awassi lambs. *Mesopotamia Journal of Agriculture*, *50*(2), 1-7. https://10.0.132.107/magrj.202

Aziz, D. M., & Hmoud, S. M. (2011). Effects of seasons of the year and breeding season on semen parameters in Awassi Rams. *Al-Anbar Journal of Veterinary Sciences*, *4*(2), 85-96. https://www.iasj.net/iasj/ download/ 56159f3502cf03b9

Baker, A. G., Alssadi, S. A. A. & Mohammad, A. K. (2019). Study the effect of adding selenium and vitamin E in some reproductive hormones of Awassi rams. *Journal of Kirkuk University for agricultural Sciences, International Scientific Conference for Agricultural Sciences. Special Issue*: 231-236. https://www.iasj.net/iasj/download/febab305e85acd16

Bashawat, M. A. (2015). *Effect Of Low-Density Lipoproteins (LDL) Extracted From Egg Yolk And Proline On Indicators Of Frozen Semen And Its Fertilization Ability In Awassi Sheep.* Ph.D Dissertation, Faculty of Agriculture - Damascus University, Syria. https://2u.pw/luKPZ

Curtis, S. K. & Amann, R. P. (2000). Testicular development and establishment of spermatogenesis in holstein bulls. *Journal of Animal Sciences*, *53*(6), 1645-1657. https://doi.org/10.2527/jas1982.5361645x

Dorostghoal, M.1., Majd, N. E. & Nejad, S. G. (2009). Stereological study of Arabian ram testis during different seasons. *Iranian Journal of Veterinary Research, Shiraz University*, *10*(4).360-366. https://2u.pw/2nQ0b

Gimenes, D & Rodning,S. (2007). Reproductive Management of Sheep and Goats.www.aces.edn. https://2u.pw/hx7We

Gorner, O.L. (1997). Ancillary tests of bull semen quality. *Bull infertility*, *13*: 313-330. https://doi.org/10.1016/S0749-0720(15)30344-3

Gündoğan, M. (2007). Seasonal variation in serum testosterone, T3 and andrological parameters of two Turkish sheep breeds. *Small Ruminant Research, 67*: (2-3), 312-316. https://doi.org/10.1016/j.smallrumres.2005.11.005

Hamad, Z. I., Mahdi, A.S., & Mohammed, A. H. (2015). Effects of two dose of pomegranate peels powder on some physiological characteristic and libido in the Iraqi Awassi rams. *Kufa Journal For Veterinary Medical Sciences*, *6*(2), 1-7. https://www.iasj.net/iasj/download/4c9613a61028b76a

Hamidi, A., Mamoei, M., Mirzadeh, K., Tabatabaei, S., & Roshanfekr, H. (2012). Seasonal variations in semen characteristics in Arabic rams. *Pakistan veterinary journal*, *32*(1), 41-44. http://www.pvj.com.pk/pdf-files /321/41-44.pdf

Hassan, W. M. & Fahad K. K. (2012). Study of some physicochemical properties of semen in protected rams in the southern marshes Iraq (Chebayish). *Dhi Qar University Scientific Journal. 7*(2), 1-6. https://www.iasj.net/iasj/download/033dc5167bceb839

Hassan, W. M. (2013). Effect of ginger rhizome extract additives to Awassi rams ration on the weights and sperms quality. *Jornal of Al-Muthanna for Agricultural Sciences, 2*(20), 187-195. https://www.iasj.net/iasj/download/b7dac75d4fb63b71

Hussain, S .O., Al-Zubaid, S. F. A. & Al-Dujaily, S. S. (2012). Study the effect of seasonal months on buck semen using modified Tris solution for sperm motility following cryostorage. *Euphrates Journal of Agriculture Science, 4* (4), 13-23. https://www.iasj.net/iasj/download/4d98adab03956be1

Ibrahim, A. G., Khalil, R. I. & Alani, A. A. (2016). Study of the effect of body weight on some reproductive characteristics in Awassi rams. *Diyala Agricultural Sciences Journal, 8*(2), 6-15. http://www.agriculmag.uodiyala.edu.iq/

Ibrahim, M. S., (2019). Effect of use fenugreek seeds (Trigonella foenum-graecum) on some semen characteristics of Awassi rams in winter season. *Mesopotamia Journal of Agriculture, 47*(1), 42-48. http://dx. doi. org/10.33899/magrj.2019.161235

Ibrahim, M. S., Aziz, D. M., & Alkhashab, A. T. (2022). The effect of some antioxidant on the physical and biochemical characteristic of semen in Awassi rams. *Euphrates Journal of Agriculture Science-14* (1): 106-117. https://www.iasj.net/iasj/download/fa20654cfd41042d

Javed, M. T., Ahmad., N. Saleem., G. Sadia., H. Manzoor, F. & Dilbar, G. H. (2020). Effect of age and season on semen characteristics of Buffalo Bull –A Review. *Journal of Innove Science,*4(1), 65-82. https://2u.pw/Y1r3d

Kashef Al-Ghetaa, H. F. K. (2012). Effect of environmental high temperature on the reproductive activity of Awassi ram lambs. *Iraqi Journal of Veterinary Medicine, 36*(2): 244-253. https://doi.org/10.30539/iraqijvm.v36i2.502

Khalil, R. I. (2018). Effect of autumn and winter seasons on seminal traits and testicular measurements of Awassi ram lambs. *Diyala Journal of Agricultural Sciences, 10*(2), 1-11. http://www.agriculmag.uodiyala.edu.iq/

Kishk, W. H. (2008). Interrelationship between ram plasma testosterone level and some semen characteristics. *Slovak journal of animal science, 41* (2), 67-71. file:///C:/Users/fox/Downloads/Kishk-1.pdf

Land, R. B. (1973). The expression of female sex-limited characters in the male. *Nature*, 241(5386), 208-209. https://doi.org/10.1038/241208a0

Mahdi, A. S., Alani, A. A., & Aljashaami, S. A. (2016). The effect of different intensities of magnetically treated water on some physical and chemical semen characteristics of Turkish-Awassi rams in Iraq. *Kufa Journal for Agricultural Sciences, 8(4), 217-237.* https://www.iasj.net/iasj/download/a817d2544bd00a96

Malejane, C.M., Greyling, J. P. C. & Raito, M. B. (2014). Seasonal variation in semen quality of Dorper rams using different collection techniques. *South African Journal of Animal Science, 44*(1), 26-32.

http://dx.doi.org/10.4314/sajas.v44i1.4

Naoman, U. D. (2012). Effect of Ivermectin on semen characteristics of Iraqi Awassi ram. *Al-Anbar J. Vet. Sci*, *5*(2), 129-133. https://www.iasj.net/iasj/download/73447a79061426d2

Overstreet, J.W. & Katz, D.F. (1987). Semen analysis :The urologicalclinics of north America :*Male infertility* .14:441. https://pubmed.ncbi.nlm.nih.gov/3617266/

Saacke, R, G, S, Nader and R, L, Nebel (1994). Relationship of semen quality to sperm transport, fertilization and embryo quality in ruminants. *Theriogenology*, *41*(1), 45-50. https://doi.org/10.1016/S0093-691X(05)80047-0

Sarkar, M., Borah, B. D., Bandopadhayay, S., Meyer, H. H. D., & Prakash, B. S. (2009). Season of the year influences semen output and concentrations of testosterone in circulation of yaks (Poephagus grunniens L.). *Animal reproduction science*, *115*(1-4), 300-305. https://doi.org/10.1016/j.anireprosci.2008.12.012

Schanbacher, B. D. & Lunstra, D. D. (1976). Seasonal changes in sexual activity and serum levels of LH and testosterone in Finish Landrace and Suffolk rams. *Journal of animal science*, *43*(3), 644-650. https://doi.org/10.2527/jas1976.433644x

Shamoon, S. A., Al-Mallah, O. D. M. & TAEIB, M. A. M. (2011). Effect of adding sunflower seeds to the ration components on semen characteristics and some blood parameters in Awassi rams. *Mesopotamia Journal of Agriculture*, *39*(1), 113-121. http://dx.doi.org/10.33899/magrj.2011.28040

Sharma, R. K., Goyal, A. K., & Bhat, R. A. (2013). Antifertility activity of plants extracts on female reproduction: A review. *Int. J. Pharm. Biol. Sci*, *3*(3), 493-514. http://www.ijpbsonline.com/

Shihab, S. L., Mohammed, O. D., & Ahmed, F. H. (2021). Study of semen characteristics at sexual maturity in Awassi lambs fed on low degradable sunflower meal and seeds. *Mesopotamia Journal of Agriculture*, *49*(2), 9-18. http://dx.doi.org/10.33899/magrj.2021.130161.1130

Sorensen, A .M (1979). Animal Reproductive. Mc Graw-Hill book company. https://2u.pw/bqph9

Sultan, K. H. (2013). Effect of grazing and vitamin a injection in semen characters and sexual hormones concentration of awassi rams. *Tikrit Journal for Agricultural Sciences*, *13*(3), 73-80. https://www.iasj.net/iasj/download/d4da1303a33d5992

Sultan, K. H. (2014). Effect of using different management systems for feeding on testis dimensions and sexual behavior in Awassi rams. *Iraqi Journal of Veterinary Sciences*, *28*(1), 7-13. http://dx.doi.org/10.33899/ijvs.2014.89335

Taha, M. B., Ali, N. M. & Ahmed, F. H. (2012). Study of some semen traits in Awassi and Hamadani. *Mesopotamia Journal of Agriculture, 40*(3): 10-19. https://2u.pw/lEIvA

Weinbauer, G. F. & Nieschlag, E. (1991). Peptide and steroid regulation of spermatogenesis in primates. *Annals of the New York Academy of Sciences. (367)*, 107-121. https://doi.org/10.1111/j.1749-6632.1991.tb27304.x

Youngquist, R. S & Threlfall, W. R. (2007). Large Animal Theriogenology .Saunders an important of Elsevier Inc. https://2u.pw/Lavga

Zaher, H. A., Alawaash, S. A. & Swelum, A. A. (2020). Effects of season and breed on the reproductive performance of sheep. *Journal of Animal Reproduction and Biotechnology*, *35*(2), 149-154. https://doi.org/10.12750/JARB.35.2.149