

## COMPARISON OF REPRODUCTIVE PERFORMANCE UNDER DIFFERENT BREEDING CONDITIONS IN AWASSI EWES

WISAM KHAMEES<sup>1</sup>; AHMED ALI ADHAB<sup>2</sup> AND HMOOD AJEEL<sup>1</sup>

<sup>1</sup> Ministry of Agriculture, Iraq

<sup>2</sup> Department of Biology, College of Education, Al Iraqia University

**Received:** 4 July 2024; **Accepted:** 18 August 2024

---

### ABSTRACT

This study was designed to evaluate the reproductive performances of Awassi ewes under different breeding conditions. This experiment was carried out at three sites: a ruminant research station (F1), a sheep breeder's field, a flock from the research station (private sector) (F2), and a flock from a sheep breeder (private sector) in Bardiya, west of Baquba/Diyala Governorate (F3) between 1/7/2019 and 1/5/2020. Each flock included 25 mature pluriparous ewes. The data including lambing rate, litter size at birth, percentage of twinning, litter size at weaning, and ewes' and lambs' mortality rate, as well as the sterility percentage, were recorded at each location and compared between the flocks. The results revealed that the lambing rate was the highest in F1 (96%), while it was the lowest in F2 (84%) and the difference was significant ( $P \leq 0.05$ ). There were non-significant differences in lambing rates between F2 and F3. Litter size at lambing in F1 was significantly ( $P \leq 0.05$ ) higher than that recorded in F2 and F3, where the litter sizes were 1.26, 1.10, and 1.15 births/ewe per flock in F1, F2, and F3 respectively. Similarly, the twinning rate in F1 was significantly higher than that recorded in F2 and F3. There were non-significant differences in the twinning rate between F2 and F3. The percentage of twins in the F1, F2, and F3 were 26.31%, 10.52%, and 15.78% respectively. The lambing rate in F1 was significantly ( $P \leq 0.01$ ) higher than that recorded in F2 and F3. There were non-significant differences in the litter size at weaning between F1 and F3 (1.05, 1.00, respectively), while both had litter sizes at weaning were larger than F2 ( $P \leq 0.05$ , 0.89). The percentage of lambs' mortality was non-significant among the included flocks. There were significant differences ( $P \leq 0.05$ ) in the ewes' mortality between the F and F3, with the lowest lamb mortality recorded in F3 (13.63%). It can be concluded that reproductive performance in Awassi ewes is highly dependent on flocks' breeding condition and that must be optimal to improve the reproductive performance in this breed.

**Keywords:** Awassi ewes, lambing rate, litter size, twinning rate, Mortality rate, breeding conditions.

---

### INTRODUCTION

Sheep are among the most significant pillars of livestock in terms of the pressing need for its products for human consumption,

making the livestock sector one of the most important agricultural sectors in Iraq. A significant portion of agricultural production is derived from this sector. Iraqi sheep are not very productive, since they are typically raised on poor pastures with little vegetation cover and have to travel long distances in search of grazing (Al-Kass *et al.*, 1993). According to the Arab Organization for

---

Corresponding author: Ahmed Ali Adhab  
E-mail address: [ahmed.a.adhab@aliraqia.edu.iq](mailto:ahmed.a.adhab@aliraqia.edu.iq)  
Present address: Department of Biology, Al-Iraqia University, College of Education

Development and Agriculture (2001), sheep are a vital resource for the production of red meat, milk, wool, and hides. They also provide farmers with an additional source of income during periods of drought and crop shortages (Arora *et al.*, 2016). There are three methods used for raising sheep: grazing is the oldest and most common approach, and farmers still use it today to raise sheep by depending solely on natural resources. With this approach, his livestock do not receive supplementary feeding even though there is a drought in a particular year. The breeder gathers the flock in fenced areas, sorts the flock, and ewes that are not suitable for milking or shearing are culled out. These are the only seasonal operations; the daily field operations are not dependent upon them. According to Kochewad *et al.* (2017), there is no genetic or environmental improvement in this system, and the financial return and invested capital are both very low.

The second, and most popular, method for raising sheep is called a semi-intensive system. In this system, the breeder monitors his animals daily and provides dry and concentrated fodder when there is insufficient green fodder. Seasonal field operations are also conducted in large quantities prior to breeding and during the last stages of pregnancy, similar to intensive systems (Alkaas *et al.*, 1993; Kochewad *et al.*, 2017).

Regarding the third breeding method, it is an intense system in which the sheep are housed in pens made of cement or even older structures, depending on the availability of material resources. A permanent supply of drinking water is also required. Direct sunlight and adequate ventilation are also requirements for the building; grazing animals are not permitted in this arrangement. To get the highest return through the best possible use of all these inputs, more material inputs, more techniques, and more organizational inputs must be employed in the manufacturing process (Alkass *et al.*, 1993). According to Kochewad *et al.* (2017), although this system requires high investment requirement, it also has a high productivity.

To our knowledge, there are scarce works in Iraq on the breeding system and its effects on the reproductive performance in Awassi ewes, so the aim of the current work was to compare breeding conditions on some reproductive parameters in Awassi ewes.

## MATERIALS AND METHODS

### *Animals and breeding condition*

A total of 75 apparently healthy and pluriparous Awassi ewes aged 3-6 years were included in the experiment. The ewes were present in three flocks as follows: The first flock (F1, n=25 ewes), animals were at the research station, Ruminant Research Station, Ministry of Agriculture, located in the Akarkouf area 25 km west of Baghdad, and they were raised in a semi-intensive system. The second flock (F2, n=25 ewes), sheep were in the research station (Baghdad or Abu Ghraib) and raised by a farmer in the Abu Ghraib area (grazing system). The third flock (F3, n=25 ewes), ewes were raised by a farmer in the Bardiya area, west of Baquba (grazing system). The experimental period was from 1/7/2019 to 1/5/2020. From history, all ewes in the three flocks were free from any reproductive problems, such as abortion, repeat breeder or anestrus.

### *Study parameters:*

The following parameters were calculated in ewes

1. Fertility (%) =  $(\text{Number of lambing ewes} / \text{The number of ewes exposed to rams}) \times 100$
2. Fertilization (%) =  $(\text{Lambing ewes} + \text{Aborted} / \text{The number of ewes exposed to rams}) \times 100$
3. Litter size =  $(\text{The number of born lambs} / \text{The number of lambing ewes})$
4. Twins % =  $(\text{The number of ewes that give twins} / \text{Lambing ewes}) \times 100$
5. The percentage of lambing: the number of births born to the number of ewes exposed to the ram during the mating season  $\times 100$
6. Lamb mortality % =  $(\text{Number of dead lambs} / \text{Total number of lambs}) \times 100$
7. Ewe mortality % =  $(\text{Number of dead ewes} / \text{Total number of ewes}) \times 100$
8. Sterility % =  $(\text{Sterile ewes} / \text{The number of ewes exposed to rams}) \times 100$

**Statistical analysis:**

The statistical program (SAS, 2010) was used to study the flock effect. A (10) polynomial test was used to compare the differences between the averages. Data were analyzed using the following mathematical model:

$$Y_{ij} = \mu + F_i + e_{ij},$$

where  $Y_{ij}$  is the observing value  $j$  of the breeding condition  $i$ .  $\mu$ : the general mean of the studied traits.  $F_i$ : the effect of the breeding condition.  $e_{ij}$ : the normally distributed random error with a mean equal to zero and a variance of  $\delta^2e$  (Duncan, 1955).

**RESULTS**

As the results presented in table (1), it was found that all flocks showed similar fertilization and fertility rates ( $P \geq 0.05$ ,  $76 \pm$

0.12). ~~Where~~—There were non-significant differences in fertility and fertilization between the included flocks.

**Table 1:** Fertility and fertilization rates percentages in the three flocks (mean  $\pm$  SE)

Flock	Fertility (%)	Fertilization (%)
F1	76 $\pm$ 0.12	76 $\pm$ 0.12
F2	76 $\pm$ 0.12	76 $\pm$ 0.12
F3	76 $\pm$ 0.12	76 $\pm$ 0.12
<b>Significance</b>	NS	NS

It was noticed that the lambing rate was the highest in F1 (96%), while it was the lowest in F2 (84%) and the difference was significant ( $P \leq 0.05$ ). There were non-significant differences in lambing rate between F2 and F3 (Table 2).

**Table 2:** Lambing rate in the three flocks (mean  $\pm$  SE)

Flock	Number of ewes	Number of lambs	Percentage of birth %	Sig.
F1	25	24	96 $\pm$ 0.58 <sup>a</sup>	
F2	25	21	84 $\pm$ 1.72 <sup>b</sup>	*
F3	25	22	88 $\pm$ 2.39 <sup>ab</sup>	

\* Different superscripts within the same column means significant difference ( $P \leq 0.05$ ).

The results revealed that litter size at lambing in F1 was significantly ( $P \leq 0.05$ ) higher than that recorded in F2 and F3, where the litter sizes were 1.26, 1.10, and 1.15 births/ewe per flock in F1, F2, and F3 respectively. There were non-significant differences in the litter size at weaning between F1 and F3 (1.05, 1.00, respectively), while both had litter size at weaning were larger than F2 ( $P \leq 0.05$ , 0.89) (Table 3).

**Table 3:** Litter sizes at lambing and weaning in three flocks (mean  $\pm$  SE).

Flock	Litter size at lambing	Litter size at weaning
F1	1.26 $\pm$ 0.11 <sup>a</sup>	1.05 $\pm$ 0.04 <sup>a</sup>
F2	1.10 $\pm$ 0.07 <sup>b</sup>	0.89 $\pm$ 0.05 <sup>b</sup>
F3	1.15 $\pm$ 0.07 <sup>b</sup>	1.00 $\pm$ 0.00 <sup>a</sup>
<b>Significance</b>	*	*

\* Different superscripts within the same column means significant difference ( $P \leq 0.05$ ).

It was noticed that the twinning rate in F1 was significantly higher than that recorded in F2 and F3. There were non-significant differences in the twinning rate between F2 and F3. The percentage of twins in the F1, F2, and F3 were 26.31, 10.52%, and 15.78 respectively (Table 4).

**Table 4:** Twinning rate of three flocks included in the experiment (mean  $\pm$  SE)

Flock	Ewes gave births	Ewes gave twins	Percentage %	Significant
F1	19	5	26.31 $\pm$ 1.47 <sup>a</sup>	**
F2	19	2	10.52 $\pm$ 0.74 <sup>b</sup>	
F3	19	3	15.78 1.02 $\pm$ <sup>b</sup>	

\* Different superscripts within the same column mean significant difference ( $P \leq 0.01$ ).

The percentage of lambs' mortality was the highest in F2 (19.04%), while in F1 was 16.66% and in F3 was 13.63% and the differences were non-significant ( $P \geq 0.05$ ) (Table 5).

**Table 5:** Percentage of lambs' mortality in the three flocks included in the study (mean  $\pm$  SE)

Flock	Num. lambs	Num. lambs lost	Percentage %	Significant
F1	24	4	16.66 $\pm$ 0.71	NS
F2	21	4	19.04 $\pm$ 1.05	
F3	22	3	13.63 $\pm$ 0.85	

The highest percentage of ewes' mortality in F1 was 8% and only one ewe was lost in F2. The cause of the deaths of these ewes was their abstinence from feeding after birth.

While in F3, none of the ewes were lost during the period of the experiment (Table 6).

**Table 6:** The ewes' mortality rate in the three flocks included in the study (mean $\pm$  SE)

Flock	Ewes number	Number of lost ewes	Percentage	Significant
F1	25	2	8.00 $\pm$ 0.63 <sup>b</sup>	*
F2	25	1	4.00 $\pm$ 0.30 <sup>ab</sup>	
F3	25	0	0.00 $\pm$ 0.00 <sup>a</sup>	

\* Different superscripts within the same column mean significant difference ( $P \leq 0.05$ ).

It was noticed that there were no significant differences between the three flocks in the percentage of ewes that showed sterility,

where the percentage of sterile ewes was 24% for all flocks (Table 7).

**Table 7:** Percentage ewes showed sterility in the flocks included in the study (means $\pm$ SE).

Flock	Num. ewes	Sterile ewes	Percentage	Significant
F1	25	6	24 $\pm$ 1.37	NS
F2	25	6	24 $\pm$ 1.37	
F3	25	6	24 $\pm$ 1.37	

## DISCUSSION

The current work evaluated the reproductive performance in three flocks of Awassi ewes under different breeding conditions. The results obtained from this study indicated that there were no significant differences between the three flocks in the fertility rate and

fertilization. The obtained results were comparable to those recorded previously (Sultana *et al.*, 2011; Adhab, 2014 and Adhab *et al.*, 2015), where the recorded fertility rates were 76.92% and 75.70%, respectively, where the recorded fertilizing and fertility rates in the current study were 76%. While Abadulkareem *et al.* (2014) recorded a

fertility rate of 92.45% on local Awassi sheep; while AL-Sharify and Altaei, (2020) recorded a fertility rate of 88.10% on Awassi sheep; this higher percentage could be attributed to environmental and administrative conditions.

The obtained results of litter size at lambing in the current work were close to those reported by Ishaq and Ajeel (2013), who found that the fertility rate recorded at birth reached 1.17 for local Awassi ewes and 1.23 for Turkish Awassi ewes. At weaning, the lowest litter size was recorded in F2 (0.89), and there were no significant differences in the litter size between F1 and F3 at weaning, which was close to what was found by Ishaq and Ajeel (2013), and the litter size was lower than that recorded before by Adhab *et al.* (2015) and Adhab (2014) where a higher litter size was found in the improved flock at the research enhancer and grazing flock.

There were non-significant differences in lambing rate between F2 and F3. These results agreed with those recorded before (Erol *et al.*, 2020), where they found that in the Karakul sheep breed in Turkey, the lambing rate was 95.8%. However, our findings disagreed with those recorded by Adhab (2014), and the reason for this discrepancy was due to the increase in the percentage of twins.

The results of the twinning rate recorded in the current study not agreed with that recorded by Ishaq and Ajeel (2013), who scored a lower rate of twins, which amounted to 14.8% in the local Awassi sheep in the research station flock. This result was also higher than that found by Adhab (2014), who recorded a lower percentage of twins in the flock of the research station for the improved and the unimproved flocks. As for the flock of the breeder, the flock taken from the research station, and a flock taken from a farmer, the result was less than what Adhab *et al.* (2015) and Adhab (2014) found when the breeder's flock recorded the percentage of twins at 25.00%. The reason may be due to the greater weights of ewes in F1 were noticed at mating

time and the selection that occurs in the stations and the breeder did not perform this.

The percentage of lambs' mortality was the highest in the F2, and the differences between the flocks were non-significant. The reason may be due to the poor health of the lambs, and the differences between the three flocks did not reach the level of significance. This result was consistent with the findings of Metawi *et al.* (1999), where they found the mortality rate in the semi-intensive system was 17.4%, and also agreed with what was found in Adhab *et al.* (2015 and Adhab (2014), as they found the mortality rate of the lambs in the research station reached 11.76% for the improved flock and 20.00% for the unimproved flock, while a lower mortality rate was recorded in the grazing system (9.52), and I also agreed with what Doko Allou *et al.* (2013) indicated that the breeding and management systems affect reducing the mortality of lambs and that the difference in the mortality rate of lambs between different breeding systems may return due to several reasons, including management factors such as the method of grazing and diseases that affect ewes before and during parturition, the health status of the lambs at birth, and genetic factors such as the litter size

The ewes' mortality percentage recorded in the current study agreed with that noticed before by Adhab (2014) who found that the number of lost ewes in the flocks of the improved and unimproved research station reached 7.50, 5.00%, while the breeder's flock did not record any deaths in his experience.

It was noticed in the current study that there were no significant differences between the three flocks in the percentage of ewes that showed sterility, where it was comparable to that recorded before by Salman *et al.* (2009), who recorded a lower rate of sterile ewes in the domestic Awassi ewes as 20, 4.5, 10, and 5% according to body condition: low without supplementary feed, low with supplementary feed, high without supplementary feed, and high with supplementary feed, respectively.

(Mansor *et al.*, 2015) recorded a higher percentage of sterile ewes, reaching 42.9% for local Awassi ewes, and (13) also recorded a higher percentage of sterile ewes, reaching 37.5% in Awassi sheep.

## CONCLUSION

It could be concluded that reproductive performance in Awassi ewes is highly dependent on flocks' breeding conditions and that conditions during breeding must be optimal and under specialized observation to improve the reproductive performance in this breed.

## REFERENCES

- Abadulkareem, T. A., S., M., Eidan., L., A., Al-Maliki. (2014):* Reproductive Performance of Iraqi Awassi Ewes Owned by Sheep Owners and Extension Farms in Response to Flushing and Estrus Synchronization Regimes. *The Iraqi Journal of Agricultural Science*, 45(3) (Special Issues):328–334.
- Adhab A.A. (2014):* Effect of different breeding systems of Awassi flocks on productive and reproductive performance. Ph. D. thesis. University of Baghdad.
- Adhab, A.A.; Al-Jalili, Z.F. and Sadeq, A.T. (2015):* Effect of the management system on Awassi sheep production. *Diyala J. Agric. Sci.*, (2): 38–48.
- Al-Kass, J.E. and Al-Jalili, Z.F. and Aziz, D.I. (1993):* National Library. University of Baghdad. Al-Khazrji, W. J., and Al-Samari, W.A., Ajil. H. M. (2014): Effect of some genetic and hereditary factors on the fertility and growth characteristics of Awassi sheep. *Iraqi Journal of Agricultural Sciences*. 45 (3) 263-268. *The Iraqi J. of Agric. Sci.* 45(3) (Special Issue): 263-268.
- Al-Sharify, M.A.H. and Altaei, H.M.A. (2020):* Factors Affecting Litter size and Fertility Traits for Local Awassi Sheep and Iranian Karakul and Their Crosses. *Plant Archives*, 20(2), 4126-4130.
- Arab Organization for Development and Agriculture (2001):* Arab agricultural policies in the 1990s/RRepublic of Iraq. Annual Report: Khartoum, Sudan.
- Arora, R.; Kulkarni, V.S.; Jain, A. and Yadav, D.K. (2016):* Yalaga sheep: A microsatellite-based genetic profile. *Indian Journal of Animal Sciences* 86: 1155–1158.
- Doko Allou, S.; Farougou, S. and Hountondji, F. (2013):* Impact of prophylactic measures and the use of local food resources on the viability and growth of pre-weaning lambs in Djougou, in the northern region of Benin, *Journal of Animal & Plant Sciences*. 19(3), 2933-2940.
- Duncan, C.B. (1955):* Multiple range and multiple "F" tests. *Biometrics*. 11: 1-12.
- Erol, H.C.; Özbeyaz, C. and Ünal, N. (2020):* Investigating various performance traits of Karakul sheep. *Ankara Üniv Vet Fak Derg*, 67, 113–120, DOI: 10.33988/auvfd.491960.
- Ishaq, M.A. and Ajeel, H.M. (2013):* Reproductive characteristics of local and Turkish Awassi sheep under semi-intensive breeding conditions (Iraqi J. Agric. Sci., 2013, Vol. 44(5): 615-623.
- Kochewad, SA.; Meena, IR.; Kumara, S.; Kumar, Y. and Meena, IK. (2017):* Sheep Breeding Systems and their Productive Performances –A Review. *Trends in Biosciences* 10(9), 1716-1719.
- Mansor, A.R.; Al-Saigh, M.N. and Khalaf, S. Sh. (2015):* The impact of melatonin injections on reproductive performance in Iraqi domestic ewes. *Anbar Journal of Agricultural Sciences*. 13 (1), 174–183.
- Metawi, H.R.; Kandil, H.M. and El Shaer, H.M. (1999):* Sheep productivity under extensive and semi-intensive production systems in Egypt. *Cheam Options Mediterraneennes*. pp: 239-243.

Salman, A.D.; Ibrahim, H.K.; Al-Khalisy, A.F. and Ibrahim, R.A. (2009): Effect of body condition and supplementary feeding on the reproductive performance of Awassi ewes. Iraqi J. of Vet. Medicine 33(2): 138–145. SAS, (2010).  
SAS (2010): Users Guide: Statistics (Versioned). SAS Inst. Inc. Cary. NC, USA, Ver. 9.1.

Sultana, N.; Hasan, M.N.; Iqbal, A.; Ershaduzzaman, M.; Talukdar, M.A.I. and Dey, S. (2011): Effect of Intensive and Semi-Intensive Feeding Systems on Productive and Reproductive Performances of Native Sheep. Journal of Scientific Research. 2011, Vol. 3 Issue 3, p693-698. <https://doi.org/10.3329/jsr.v3i3.7129>

## مقارنة الأداء التناسلي تحت ظروف تربية مختلفة في النعاج العواسية

وسام خميس ، أحمد عذاب ، حمود عجيل

Email: ahmed.a.adhab@aliraqia.edu.iq

Assiut University web-site: [www.aun.edu.eg](http://www.aun.edu.eg)

صممت هذه الدراسة لتقييم الأداء التناسلي تحت ظروف تربية مختلفة في النعاج العواسية. أجريت هذه التجربة في ثلاثة مواقع: محطة أبحاث المجترات (F1) من حقل مربي الأغنام، وقطيع من محطة الأبحاث (قطاع خاص) (F2)، وقطيع لدى مربي الأغنام (قطاع خاص) في بردية غرب بعقوبة/محافظة ديالى (F3) خلال الفترة من ٢٠١٩/٧/١ إلى ٢٠٢٠/٥/١. ضم كل قطيع ٢٥ نعجة ناضجة متعددة الولادات. تم تسجيل البيانات بما في ذلك معدل الولادة وحجم الحملان عند الولادة ونسبة التوائم وحجم الحملان عند الفطام ومعدل نفوق النعاج والحملان وكذلك نسبة العقم في كل موقع ومقارنة القطعان مع بعضها البعض. أظهرت النتائج أن معدل الولادة كان أعلى في المجموعة الأولى (F1) (٩٦٪)، بينما كان أدنى في F2 (٨٤٪) وكان الفرق معنويًا ( $P \leq 0.05$ ). كانت هناك فروق غير معنوية في معدل الولادة بين F2 و F3 كان حجم الحملان عند الولادة في F1 أعلى بشكل ملحوظ ( $P \leq 0.05$ ) من ذلك المسجل في F2 و F3، حيث كانت أحجام الحملان ١,٢٦ و ١,١٠ و ١,١٥ ولادة / نعجة لكل قطيع في F1 و F2 و F3 على التوالي. وبالمثل، كان معدل التوائم في F1 أعلى بشكل ملحوظ من ذلك المسجل في F2 و F3. كانت هناك فروق غير معنوية في معدل التوائم بين F2 و F3 كانت نسبة التوائم في F1 و F2 هي 26.31٪ و ١٠.٥٢٪ و ١٥.٧٨٪ على التوالي. كان معدل الولادة في F1 أعلى بشكل ملحوظ ( $P \leq 0.01$ ) من ذلك المسجل في F2 و F3. كانت هناك فروق غير معنوية في حجم الحملان عند الفطام بين F1 و F3 (١,٠٥، ١,٠٠، ١,٠٠ على التوالي)، في حين كان حجم الحملان في كل منهما عند الفطام أكبر من ٠,٨٩ في F2 ( $P \leq 0.05$ ). كانت نسبة نفوق الحملان غير معنوية في القطعان المشمولة. كانت هناك فروق معنوية ( $P \leq 0.05$ ) في نفوق النعاج بين F3 و F2، حيث سجلت أقل نسبة نفوق حملان F3 (13.63٪). يمكن الاستنتاج أن الأداء التناسلي في نعاج العواس يعتمد بشكل كبير على حالة تربية القطعان والتي يجب أن تكون مثالية لتحسين الأداء التناسلي في هذه السلالة.