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Determination of dairy performance in OuledDjallal Ewes by studying the Average Daily Gain (ADG) of Lambs

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Abstract
This study aims to study the local conditions of extensive or semi-intensive breeding and the study of the growth of lambs and ewes from birth to the 10th, 30th and 70th days. To achieve this goal, we relied on several criteria such as age, weight, Average Daily Gain, Milk production with sex, age and breeding system factors. This study shows that the growth of lambs is dependent on the ingestion of milk in quantity and quality during the first weeks of the lambs' life. The ability of ewes with double litters to produce more milk than those with single litters has been clearly demonstrated. The breeding system and pre-partum supplementation have very important effects on milk production (quantity and quality of milk) and on the weight of lambs at birth. The study of lamb growth shows the classic results of a higher Average Daily Gain (ADG) in males than in females as well as in singles than in doubles. Whatever the type of breeding "extensive or semi-intensive", at the 10th, 15th, 30th, 70th day male lambs are heavier than females and lambs from ewes that receive food supplements have a faster growth than lambs in the extensive system. Our result shows that there is a significant relationship between the start of lambs, that is to say the variation in weight during colostrum intake, and subsequent growth (ADG10-30), and between the breeding system and milk performance, and between the milk performance of ewes and the growth of lambs. In conclusion, the level of feeding is one of the breeding factors that affects milk production in dairy sheep, daily growth pre-partum and post-partum supplementation and that GMQ is higher in males than in females and in singles than in doubles

Keywords: Ewes, Lambs, GMQ, Weight, Colostrum, Milk.

Introduction

Nutrition is one of the most important management elements that the farmer must be concerned with (Faye and Alary 2001). Ewes that are fed well-balanced rations are more fertile, they are easier to milk and they wean more lambs that grow faster (Kenyon and Corner-Thomas 2022). Not only do well-fed ewes wean more lambs per year, but they are

healthier and more resistant to infections and diseases than those that suffer from nutritional stress (Asín et al. 2021). If we aim for profitability of breeding, the management of the nutrition of the ewe flock must be the primary concern. The study that we wish to carry out consists of the assessment of the milk performance of the "OuledDjallel" sheep mothers and their impact on the growth of the lambs. This study aims to study the local conditions of extensive or semi-intensive breeding and the study of the growth of lambs from birth until the 10th, 30th and 70th days.

Materials and method

Period and localisation of study

Our study was carried out in northeastern Algeria at the El Merahna experimental station (El Merahna is a commune in the wilaya of Souk Ahras in Algeria, located on the RN 81, approximately 25 km southeast of Souk Ahras and approximately 20 km west of the Tunisian border). From September 2022 to the end of May 2023.

Composition of the studied farms

To show the influence of feeding or the farming system on the milk performance of the "OuledDjallal breed" sheep mothers and their impacts on the growth of the lambs, 58 healthy ewes (aged between 2 and 5 years) were studied with these 80 lambs in two types of farming (table 1) "E 1: extensive and E2: semi-intensive" by indirect milk control (ADG).

Table 1. Composition of the farms studied

Number / Breeding system	**Ewes**	**Lambs**	**Females**	**Males**	**singles**	**Doubles**
E1 extensive	27	35	16	19	20	15
E2 semi intensive	31	45	22	23	14	31

The lambing period took place in the spring between March and April; the lambs remained under their mothers throughout the experimental period. The lambs were fed exclusively on milk during the first month of their lives. In semi-intensive farms, after lambing, the lactating ewes received a dietary supplement of "good quality hay with concentrated feed (300 g/day/head) combined with grazing when possible. Salt licks were made available to the animals to compensate for mineral requirements and water was distributed manually in buckets", on the other hand in the extensive system the females received no food intake other than grazing regardless of the season.

Milk production estimation

Milk production of ewes was estimated on days 7, 15, 21 and 30 of lactation. Milk production estimation was performed by the weighing before and after suckling (WPS) method (Snowder and Glimp 1991; Benson et al. 1999; Ünal et al. 2007; Benchohra et al. 2014).

Average Daily Gain (ADG)

Two weighings were carried out per lamb in order to calculate the weights at 10 and 30 days of age, as well as the average daily gain between 10 and 30 days (ADG 10 – 30). The method used is based on weighings carried out on lambs born during lambing "after identification of the lambs and their mothers". A lamb must weigh: on the day of birth (0 day), on the 10th day, on the 30th day, and subsequently on the 70th day. The formulas used to calculate the average daily gains are:

- $ADG_{0-30} = (W30 – WN) / 30$.
- $ADG_{10-30} = (W30 – W10) / 20$.
- $ADG_{30-70} = (W70 – W30) / 40$.

Weight Age Type 30 (WAT 30)

In January 2001, the ADG 10-30 was replaced for all breeding animals evaluated in milk value by the PAT 30 (Weight Age Type 30 days). The ADG 0-30 was calculated between a reference weight and the PAT 30 estimated with the single weighing carried out around 30 days. The PAT 30 and ADG 0-30 were provided to breeders instead of the GMQ 10-30. The WAT 30 as well as the ADG 0-30 used for indexing is close to a weaned lamb weight because it integrates, in addition to the growth of the lamb, its birth weight, i.e. its fetal growth.The average daily gain (ADG) expressed in g of live weight/day, reflects the rate of increase in weight as a function of time.

Statistical study

The results are expressed as mean ± SE. An analysis of variance was used followed by the multiple comparison test "Newman–Keuls" ($\alpha = 5\%$) to determine the effect of the breeding system on the dairy performance of ewes and using the statistical analysis software SPSS (Statistical Packages for Social Sciences, 135 Version 19).

Results and Discussion

Lamb weight

The results of lamb weight are illustrated in Table 2. In our study; the weight of lambs in semi-intensive extensive breeding was higher than the values recorded in lambs of Sardi breed (3.0 to 3.6 kg), Timahdite (3.2 to 3.6 kg), BéniGuil (2.7 to 3.3 kg); but close to the value recorded for lambs of Hamra breed 3 to 4 kg (Boujenane 1999). In the D'men breed, the birth weight is 2.5 kg (Poore and Fowden 2003) and 1.7 to 2.9 kg (Boujenane 1999); in the Rembi breed, it is 2 to 3.5 kg (Benia et al. 2022) and 2.5 kg according to Khelifi (1999), 3.89 kg (Chikhi and Boujenane 2003). According to Gbangboche et al. (2015); at birth, a difference of 1 and 2.5 kg in weight is observed depending on the sex of the lamb. During our study, male lambs are heavier at birth than females for both types of breeding. Several studies (Adeleye 1984; Otesile 1993; Afolayan et al. 2006), showed that under the same breeding conditions, males are born heavier than females. Depending on the birth mode, it was noted that lambs born as twins are significantly ($p<0.01$) lighter than singles, in extensive breeding. The same observations were reported by previous studies (Armbruster et al. 1991a; Bonfoh et al. 1996; Yapi-Gnaore et al. 1997). For the weight of lambs on the 10th day and the 30th day; The two weighings of lambs (on the 10th day and the 30th day) are used to estimate the genetic potential of ewes and rams on the criterion of milk value (Dudouet 2003). From the 30th to the 70th day, females have a fairly high GMQ than males. Boujaâd lambs presented a very high GMQ 30-70 of 200 g/d in females and 190 g/d in males (Chikhi and Boujenane 2003). This weight is higher than the values recorded in lambs of the Sardi breed (10 vs 7.1 kg), Timahdite (9.4 vs 7.4 kg); but close to the value recorded in lambs of the Hamra breed (11.59 vs 8.90) kg (Suliman et al. 2021).

Table 2. Average weight of lambs (kg) according to age and sex of lambs.

	W n		**W 10ème d**		**W 30ème d**		**W 70ème d**	
	E I	E II	E I	E II	E I	E II	E I	E II
W of lambs	3.92±0.83	5.13±0.13	5.11±0.98	6.31±0.32	7.36±0.08	9.38±0.43	10.37±0.83	14.10±0.57
Double bornlambs	3,20 ±0.22	4,55±0.80	4,30±0.42	5,39±0.08	6,43±0.48	8,43±0.76	8,78±0.82	13,17±049
Single bornlambs	4,54±0.93	6,11±0.45	5,96±0.89	7,83±0.42	8,08±0.42	11,04±0.65	11,83±0.77	15,50±0.69
Males	4,64±0.87	6,27±0.45	6,06±0.66	7,93±0.54	8,22±0.46	11,18±0.22	12,19±0.99	15,79±0.32
Females	3,17±0.26	5,70±0.92	5,60±0.68	6,56±0.32	7,57±0.65	10,68±0.15	10,50±0.09	14,60±0.68

The average daily gain (ADG) of lambs

The results of GMQ of lambs are illustrated in Table 3. The GMQ values recorded in the two types of breeding conform to the values indicated by Gbangboche et al. (2005); which indicates that the average daily weight gains are generally between 50 and 150 g in the month following birth (Boujenane and Chami 1997). The weight evolution and the growth rate from birth to the 10th day of age in males is significantly ($p < 0.05$) higher than that of females. From the 10th to the 30th day after birth, males have a higher GMQ than females. This difference is remarkable but not significant ($p>0.05$). On the other hand, Boujaâd lambs, females have a higher GMQ than males (219) g/day in females and (207) g/day in males (Chikhi and Boujenane 2003). Single lambs showed a weight gain from birth to the 10th day higher than that of twin lambs. The first effect of an increase in prolificacy is a progressive reduction in the weight of lambs at birth (Toleba et al. 2001). It is obvious that the insufficiency of the milk supply of duplicates delays their growth (Gbangboche et al. 2005). According to Peyraud, the increase in the ADG of lambs is due to pre-partum and especially post-partum supplementation (Peyraud 1995). The effect of pre-partum energy and protein supplementation on milk production can be significant in conditions of significant nutritional stress, if for example, the ewes are returned after lambing to poor pasture (Bedhiaf et al. 2001). Daily growth during the first weeks is the direct result of milk consumption by the lamb (Laville et al. 2002). Indeed, the mother's milk production can be the limiting factor in litter growth, the reduction in the growth rate of individuals depends largely on daily weight-growth (Villette and Theriez 1981). Favorable breeding conditions, good dairy ewes well fed in the sheepfold, the weaning weight depends closely on the birth weight (Theriez 1991). Gbangboche et al. indicated that average daily weight gains are generally between 50 and 150 g the month following birth (Gbangboche et al. 2005).

Table 3. ADG (g) according to age and sex of lambs

	ADG 0-10 d		**ADG 0-30 d**		**ADG 10-30 d**		**ADG 30-70 d**	
	E I	E II	E I	E II	E I	E II	E I	E II
ADG of lambs	131.25±13.53	153.5±11,43	117.5±15,29	155.75±10,78	172±15,67	250.75±13,86	81.85±18,1	117.75±12,85
ADG of lambs born double	110±16.93	093±7.62	108±14.85	129±18.64	162±18.98	194±16.23	059±6.46	119±14.95
ADG of lambs born single	143±7.06	143±6.62	123±8.98	200±6.53	177±3.32	300±8.95	094±6.29	120±10.98
ADG of males	143±8.58	206±3.98	126±8.87	128±5.36	179±7.62	260±5.35	099±6.58	134±6.69
ADG of females	129±4.20	172±6.68	113±6.06	166±6.53	170±8.46	249±8.37	073±9.40	098±10.39

Milk production

Ewe feeding is undoubtedly one of the key factors in the success of sheep farming (Faye and Alary 2001). According to Patout , the variation in milk production within and between breeds is very large, it depends on the effect of pre-partum and post-partum supplementation [29]. According to Treacher and Caja (2022) feeding has an effect on the quantity of colostrum and milk but not on their quality. During the first three weeks of life, the growth of lambs is dependent on the ingestion of milk in quantity and quality (Sardinha et al. 2020). According to our results, the milk production of the mother can be a limiting factor in the growth of the litter, the reduction in the growth rate of individuals depends largely on their demand which are confirmed by the results of Villette and Aurousseau (1981).

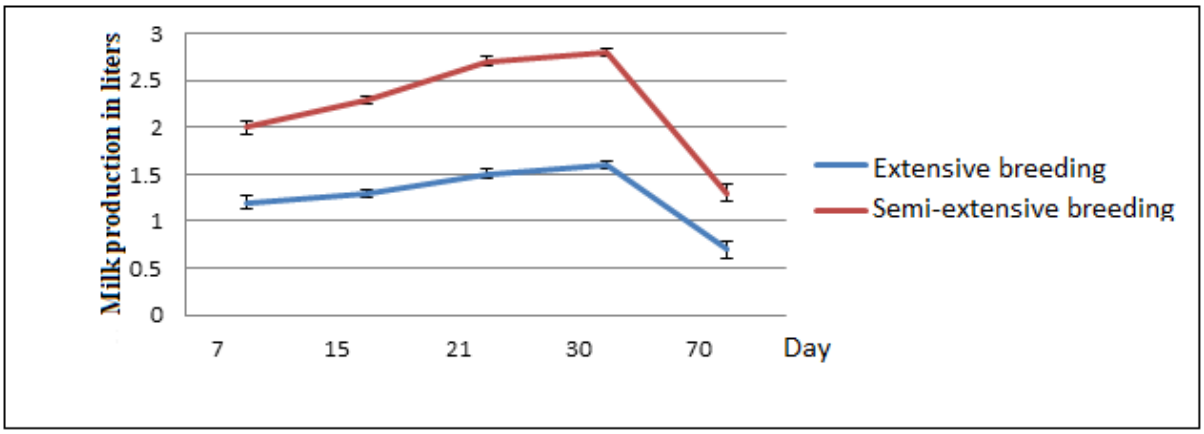

Figure 1. Curve of Daily milk production

Conclusion

Feeding level is one of the husbandry factors that affect milk production in dairy ewes. This variability may depend on nutrition, lactation stage and age. Milk production and growth of lambs depend on the effect of pre- and post-partum supplementation. The study of lamb growth shows the classic results of a higher ADG in males than in females and in singles than in doubles. Daily growth during the first weeks is the direct result of milk consumption by the lamb.

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