

## Effect of Dietary on Live Weight and Testicular Development in Ouled Djellal Ram Lambs During the Prepubertal Period in Western Algeria

Zineddine Esma\* and Bereksi Reguig Karima

Département de Biologie/Université UDL de Sidi-Bel-Abbès, Algérie

### Abstract

The aim of our study was to investigate the effect of the feeding level on the testicular and body weight growth of Ouled Djellal ram lambs. The study lasted 3 months (15 March to 15 June 2015) from post-weaning until prepubertal period at the Technical Institute Farms (ITELV) Lamtar of Sidi-bel-Abbes (Western Algeria). Twenty Ouled Djellal lambs of 3-4 months of age were weighed and allotted into two equal groups of Low (n=10) or High (n=10) nutrition plane. Each group received, in addition to a basal diet, 200 g and 400 g head<sup>-1</sup>day<sup>-1</sup> respectively. Monthly measurements of live weight and testicular volume of lambs were recorded. During the trial, the High group showed a significant greater live weight compared to the low group. Whereas, the testicular growth was a gradual and linear increase according to the two groups (low and high) without significant differences. However, all measurements of testis, live weight and age were positively correlated with one another at both low and high groups during the trial. It was concluded that postweaning nutrition management had a strong influence on lamb live weight, which in turn was related to testicular growth and prepubertal period in Ouled Djellal ram lambs. The strategy focussed feeding is necessary to optimise weight and testicular growth of ram lambs replacements. Also, the nutrition management may be a useful tool to maximize productivity in flocks.

**Keywords:** Live weight; Ouled Djellal lambs; Nutrition; Prepubertal period; Testicular volume; Weaning

### Introduction

In Algeria, sheep breeding represents 81.6% of the total domestic animal production (with 26.88 millions head) and mutton provides more than 56% of the national red meat production [1]. The Ouled Djellal is the main native sheep breed. It is adapted to steppe conditions and has exceptional qualities for red meat and wool production [1]. Recognition of the reproductive characteristics of a sheep breed is an essential starting point towards improving its productivity [2]. Characterization of puberty and early sexual development is a valuable tool for selection within the males of a breed [3]. In fertility studies in livestock there is a tendency to focus more on the female side with much less emphasis on the male side [2]. However, male fertility is as important as that of the female [4,5].

In general, sexual development of ram lamb appears to be more closely associated with body growth than with chronological age [6]. Dyrmondsson [7] concluded that body weight was a better criterion for the attainment of puberty than the chronological age alone. A review by Toe et al. suggested that measures of testicular size have received considerable attention as possible selection criteria for improving fertility in sheep, primarily because of their high heritable and their favourable to neutral association with female reproduction. The purpose of this investigation was to evaluate the effect of level of dietary on onset of prepubertal period and also to research its linkage with testicular and body weight growth of Ouled Djellal ram lambs.

### Materials and Methods

The present study was conducted at the Technical Institute Farms (ITELV) Lamtar of Sidi-bel-Abbes (Western Algeria). This farm is located in Lamtar (25 km on the road to Tlemcen), at an altitude of 560 m (average minimum temperature 10.38°C, average maximum temperature 25.22°C, annual rainfall 372 mm). Twenty Ouled Djellal lambs of 3-4 months old were used. The lambs were weaned at 100 ± 10 days of age and then housed in a sheepfold under natural condition. They were weighed and allotted into two equal groups of Low (n=10) or High (n=10) nutrition plane. Each group received, in addition to a basal diet (good quality pasture) 200 g and 400 g of concentrate

feed containing barley (50%), corn (10%), wheat bran (37.5%) and vitamin mineral compound (2.5%) by head<sup>-1</sup>day<sup>-1</sup> respectively. Lambs concentrate feed contained also 92.36% dry matter which it composed of: 72.68% carbohydrates, 15% proteins, 2% lipids, 1% calcium, 0.55% phosphorus and vitamins (A: 500000 UI, D3: 75000 UI, E: 1000 UI). Hay and water were provided *ad libitum*. At the date of 15<sup>th</sup> March the lambs were identified by numerated loops in the ear. Body weight and testicular volume of lambs were measured monthly for 3 months (15 April-15 June 2015). The volume of testis was calculated as reported by Marson et al. [8]. The length and wide of each testis were measured with a calliper after forcing it against the scrotum.

Volume Testicular (cm<sup>3</sup>) =  $W^2 \times L \times \pi/6$  (with W: testicular width and L: testicular length)

All statistical analyses were carried out using the Stat View program (version 5; 1998 France SAS Institute Inc.). Data were analyzed using the "Student t test" (with a 5% significance level). Correlations between measurements were obtained by means on the Pearson correlation test.

### Results and Discussion

The average means and standard deviations of live weights for different age periods are shown in Table 1. Live weights increased continuously at different average ages respectively 20.22 ± 2.11 kg at 102 ± 11.86 days to 23.57 ± 1.95 kg at 133 ± 11.86 days and 26.55 ± 2.59 kg at 163 ± 11.86 days (significant difference : p<0.0001). Results in the present study indicated that the average lamb live weights of the two groups (Low and High) tend to increase throughout during

\*Corresponding author: Zineddine Esma, Médecin Vétérinaire and Maître Assistante A, Département de Biologie/Université UDL de Sidi-Bel-Abbès, Algérie, Tel: 796898491; E-mail: [zineddinevet@gmail.com](mailto:zineddinevet@gmail.com)

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the trail. The means live weights of lambs on diet 1 were significantly higher than those for animals on the diet 2 ( $18.65 \pm 1.02$  vs  $21.80 \pm 1.70$  kg : significant difference with  $p=0.001$ ), ( $22.15 \pm 0.94$  vs  $25.00 \pm 1.63$  kg : significant difference  $p=0.0018$ ), and ( $24.30 \pm 0.71$  vs  $28.80 \pm 1.56$  kg: very significant difference with  $p<0.0001$ ). However, increasing the concentrate component of feed intake indicates an apparent influence on weight gain which it mentioned with the findings 3.15 kg, 2.85 kg and 4.5 kg respectively between the lambs of lower and higher groups.

Our values were superior to comparable compared with results reported by Titaouine [9] which has advanced average of  $16.92 \pm 1.22$  kg, and  $22.56 \pm 1.50$  kg respectively for 90 days and 120 days in Appearance lambs Ouled high Djellal the level the cradle region of this breed of sheep (Wilaya of Biskra) although Yilmaz and Altin [10] have advanced an average of 19.71 kg at 100 days of age in lambs from Chios cross breed Kivircik  $\times$  F1 in Turkey.

Our results were also higher than those estimated by some Algerian authors who recorded 15.79 alive means weight of  $\pm 2.15$  kg and  $18.85 \pm 3.05$  kg at 60 days and 120 days respectively in race lambs Rembi in Tiaret (western Algeria) [11] and by Dekhili and Mahnane [12] who found an average weight of lambs of  $17.80 \pm 0.42$  kg at 90 days in the race Ouled Djellal in Setif (eastern Algeria). As for the level of the Mediterranean basin, for example, in Tunisia, averages 15 to 20 kg at the age of 3 months to 3.5 months at the Ghezala farm and 18-23 Kg at 3.5 months of age in farm Fretissa at the same breed of sheep called the Sicilo- Sarde [13] while Chafri and Mahouachi [14] found an average of 14.2 kg at 24 weeks or 6 months of age in lambs D'man race receiving a high diet. In Morocco, Elfadili [15] reported an average of  $17.24 \pm 0.35$  kg at 90 days in the local race Beni Guil. However, our results were lower than those recorded by Boussena et al. [16] who obtained 22.07 average weight of  $\pm 0.94$  kg, and  $25.82 \pm 1.17$  kg, respectively, at 90 days and 120 days in breed lambs Ouled Djellal late weaned at an average age of  $122.65 \pm 1.18$  kg and housed at the demonstration farm of the technical institute farms Ain M'lila (North - East Algeria) while Lamrani et al. [17] who noted an average live weight of  $31.09 \pm 0.98$  kg) at 6 months of age in lambs of the same race at the Guelma region (North - East Algeria).

In general, the significant increase in live weight may be explained by the dietary transition that suffered the lamb during the weaning period wick the milk food was replacing by the solid food and he received a high level of concentrate energy. It will allow to transform

the monogastric to a ruminant (development of other gastric pouches and increasing the efficiency of the digestive tract).

Our results differ significantly more or less compared to those obtained by other authors because there are several factors influencing the weight of lambs in the post- weaning period (weaning age : early or late weaning), genotype (breeds) factors related to the mother (maternal age, parity, maternal qualities, level of milk production ... etc.), type of birth (single or double), diet (food transition, quantity and quality concentrated and distributed availability and forage type offered including individual intake capacity of the lamb) and the type of farming (intensive, semi- intensive or extensive depending on the type of production).

Table 2 summarize the development of testicular volumes of Ouled Djellal ram lambs during the present trial. Our results revealed that a gradual and linear increase in testicular volume from 3 to 6 months at different average age periods in the two groups (High and Low) wick it recorded the values :  $34.76 \pm 6.31$  cm<sup>3</sup> to  $102 \pm 11.86$  days and  $41.38 \pm 6.60$  cm<sup>3</sup>  $133 \pm 11.86$  days while  $53.12 \pm 10.87$  cm<sup>3</sup> is estimated at  $163 \pm 11.86$  days (highly significant difference with  $p<0.0001$ ). This finding is in agreement with that observed by Attal et al. who report that testicular growth is initially slow during the period of infancy, is accelerating between 3 and 12 months in the establishment of spermatogenesis in the Normande cattle breed males.

A gradual and linear increase in testicular volume was observed from two to six months of age for both of the lower and higher groups with the findings were  $33.11 \pm 4.56$  vs  $36.41 \pm 7.56$  cm<sup>3</sup>: no significant difference with  $p=0.23$ ), ( $39.04 \pm 5.45$  vs  $43.71 \pm 7.09$  cm<sup>3</sup> : no significant difference with  $p=0.12$ ) and ( $48.54 \pm 12.00$  vs  $57.69 \pm 7.67$  cm<sup>3</sup> : no significant difference with  $p=0.06$ ), although the beginning of the experiment, a slight gap was gradually observed  $3.29$  cm<sup>3</sup>,  $4.67$  cm<sup>3</sup> to reach the threshold of  $9.14$  cm<sup>3</sup> until the end of the study period (6<sup>th</sup> month corresponding to the pre-pubertal age).

Lambs having larger testis produce more sperm later [18,19]. However, scrotal circumference is considered the best indicator of sexual development in males [20] and differs by breeds [21].

Our results were lower than those reported by Kahal [22] who advanced the following values :  $37.62 \pm 4.52$  cm<sup>3</sup>,  $47.39 \pm 5.01$  cm<sup>3</sup>,

Groups	Effective	(102 days)	(133 days)	(163 days)
Group Lower	n=10	$18.65 \pm 1.02^a$	$22.15 \pm 0.94^a$	$24.30 \pm 0.71^a$
Group Higher	n=10	$21.80 \pm 1.70^b$	$25.00 \pm 1.63^b$	$28.80 \pm 1.56^b$
AM $\pm$ SD*	n=20	$20.22 \pm 2.11^a$	$23.57 \pm 1.95^b$	$26.55 \pm 2.59^{ab}$

Total average mean and standard deviation

a,b: Values with different letters in the same column are significantly different ( $p<0.05$ )

$\alpha,\beta,\omega$ : Values with different superscripts in the same row are significantly different ( $p<0.0001$ )

**Table 1:** Changes in live weight (kg) in Ouled Djellalram lambs according to the average age.

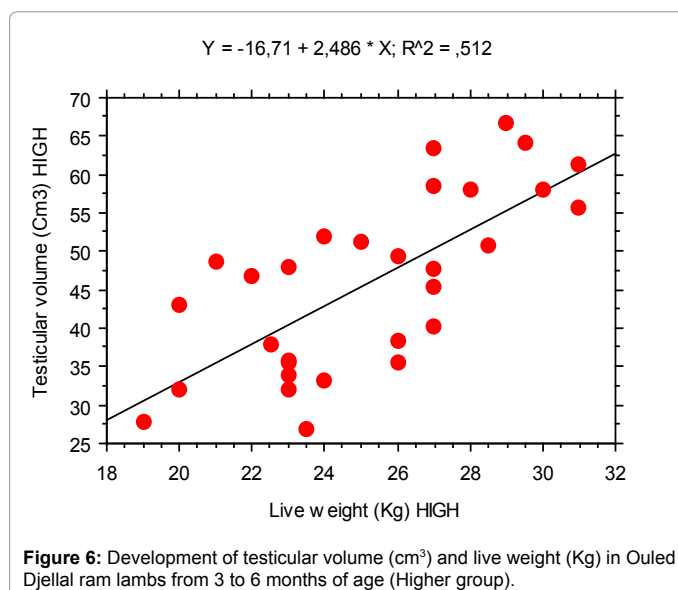
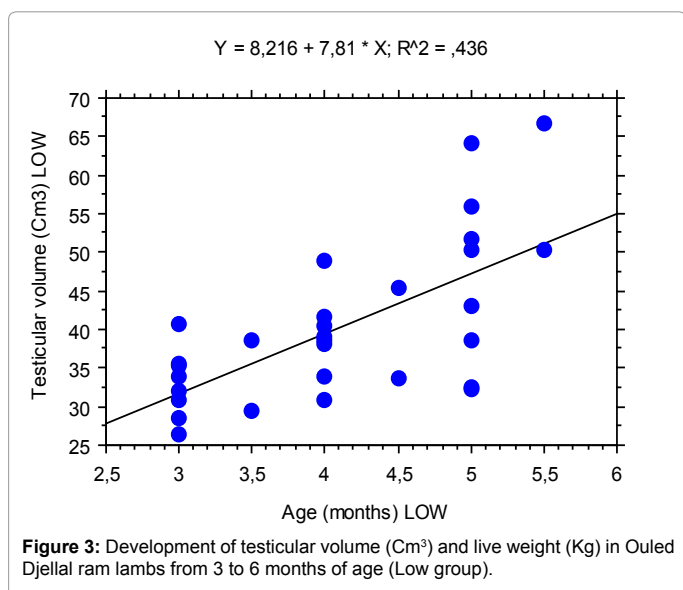
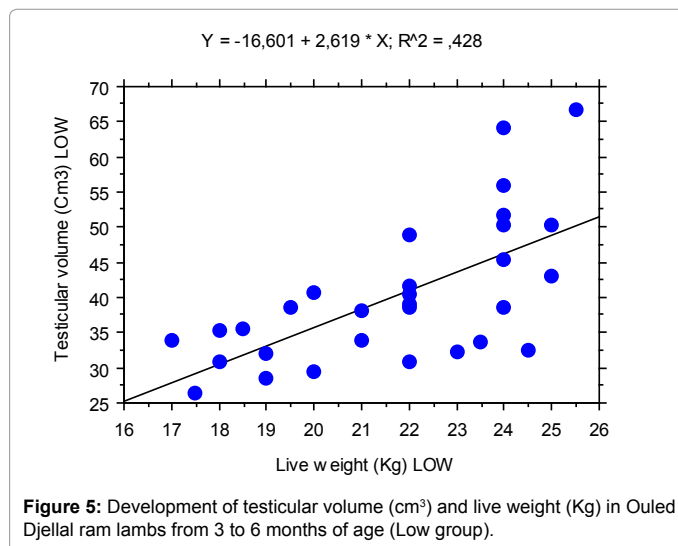
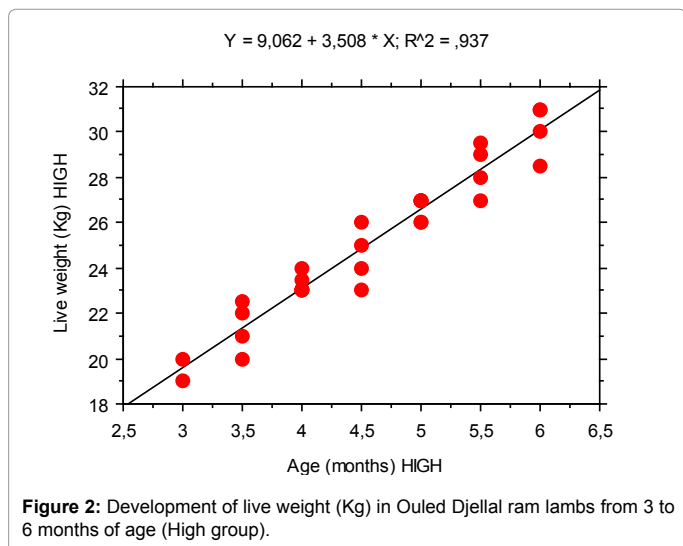
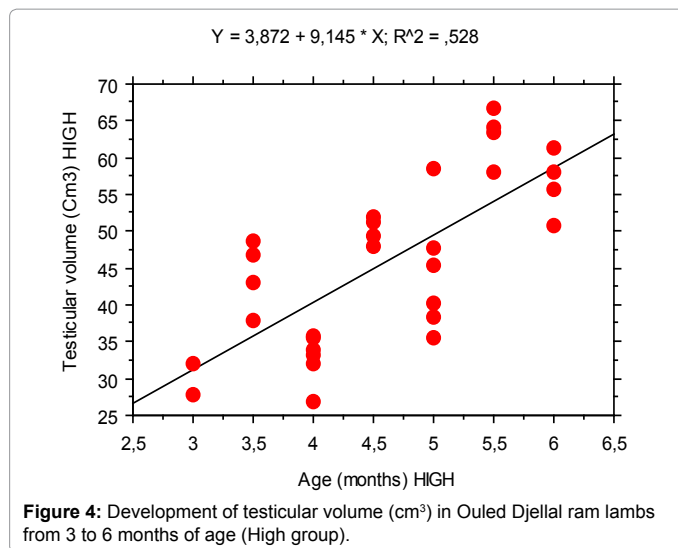
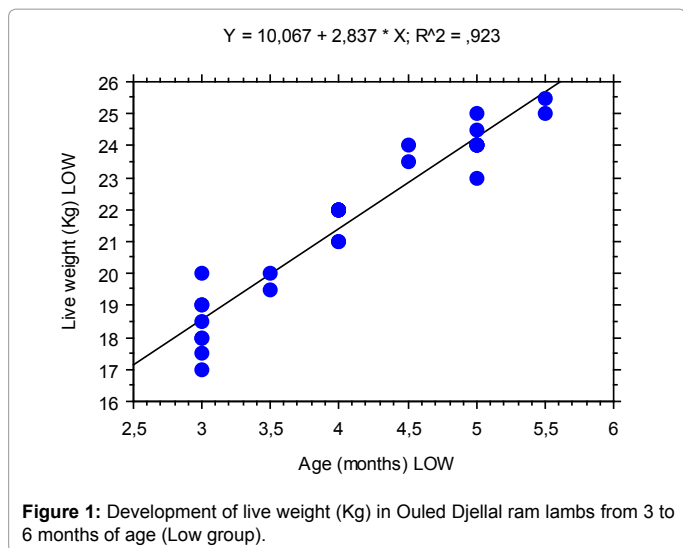
Testicular Volume (cm <sup>3</sup> )	Effective	(102 days)	(133 days)	(163 days)
Group Lower	n=10	$33.11 \pm 4.56$	$39.04 \pm 5.45$	$48.54 \pm 12.00$
Group Higher	n=10	$36.41 \pm 7.56$	$43.71 \pm 7.09$	$57.69 \pm 7.67$
AM $\pm$ SD*	n=20	$34.76 \pm 6.31^a$	$41.38 \pm 6.60^b$	$53.12 \pm 10.87^{ab}$

\*Total average mean and standard deviation

The values in the same column are not significantly different ( $p>0.05$ ).

$\alpha, \beta, \omega$ : values with different superscripts in the same row are significantly different ( $p<0.0001$ ).

**Table 2:** Changes in testicular volume in Ouled Djellal ram lambs according to the average age.



62.79 ± 6.98 cm<sup>3</sup> to 3 months, respectively, 4 months and 5 months of age in Ouled Djellal ram lambs keeping at the experimental station of EL- Meniaa and receiving two levels of dietary supplementation based on barley (250 g or 500 g/head/day). While Koyuncu et al. [23] reported an average testicular volume (measured by immersing the testicles in a graduated container of water) of 87.57 ± 5.92 cm<sup>3</sup>, and 157.49 ± 5.98 cm<sup>3</sup> to 2 months and 6 months of age respectively in Turkey Kivircik ram lambs (farming system intensive and weaning at 60 days) [24,25].

Our results differ significantly from those reported by other authors as lambs in experiment were receiving different diets related to the types of forage offered and the quality and quantity of concentrate supplementation consumed. Furthermore, methods of measurement of testicular volume differs from one practitioner to another (calipers, orchidometer, graduated with water container .... etc.). The differences among all the studies in the literature may be due to breed, age, season and feeding strategies and other environmental/management practices [26-29].

### Correlations between different parameters (age, live weight and testicular volume)

Live weight of Ouled Djellal ram lambs were positively correlated with the age according both of the two groups (High: R=0.96 and Low: R=0.96). Our results were similar to those reported by Elmaz et al. [2] which showed strong correlation between age and weight (R=0.89) [30,31] (Figures 1 and 2).

Testicular volume of Ouled Djellal ram lambs were positively correlated with the age according both of the two groups (Higher : R=0.72 and Lower : R=0.66) [32]. Our findings were in agreement with those reported by Elmaz et al. [2] which showed strong correlation between age and weight (R=0.83) [33,34] (Figures 3-6).

Regression equation presented in Figure 6 describe the relationship with body weight and testicular volume of ram lambs of both the two groups (High : R=0.65 and Low : R=0.71). In agreement with Chafri et al. [24] reported that scrotal circumference is strongly correlated with live weight of lambs D'man race with a coefficient of R=0.95) and Elmaz et al. [2] which showed strong correlation (R=0.86) between body weight and testicular volume. These results also corroborated those of Toure and Meyer [25]. The trend of testicular and body growth noticed in this study was similar also to that described by Mahouachi and et al. [26] in Dman lambs and Courot Richetin [27] in Ile-de-France ram lambs [35-38].

### Conclusions

Depending on the results of the present study it was possibly to confirm the effect of a high level and adequate diet on weight and testicular growth in Ouled Djellal ram lambs from the early age just after weaning until the prepubertal age of six months. Moreover, a close relationship was found between the different parameters live weight, testicular volume and age of the animals throughout the period of the experiment. Therefore, the nutrition management during the crucial period of development may be a useful tool to maximize productivity in flocks and it can be considered to reduce the costs of keeping surplus ram lambs.

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