

## LIVE WEIGHT AND INTENSITY OF GROWTH OF LAMBS FROM LACAUNE BREED RAISED IN BULGARIA

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### Abstract

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The study was conducted with 45 lambs from the breed Lacaune which were offspring of sheep imported from France and inseminated at 9-10 months of age. The live weight and intensity of growth of the lambs from birth up to 90 days of age were controlled. A very good live weight of the lambs was observed – an average 4.516 kg at birth, 15.933 kg at weaning and 26.178 kg at 90 days of age, as well as a slight superiority of male over female lambs at all three ages. The single lambs at all studied ages had a higher live weight, than twin lambs – with 0.760 kg at birth, with 3.13 kg at weaning, and with 3.36 kg at 90 days of age. The factor “type of birth” had a reliable influence on the live weight of lambs at different ages, and that influence was relatively higher on the live weight at weaning. The results from the conducted exterior measurements of the lambs confirmed the realized very high intensity of growth during the suckling period. The wither height was an average 46.64 cm, the body length - 72.89 cm, and the chest circumference - 62.16 cm. For all three indicators the differences between the average values of the male and female lambs were minimal, and between single and twin lambs – significantly higher and reliable. The obtained phenotypic correlations between the traits, which determine the intensity of growth of lambs, were positive - with average to high level of significance.

*Key words:* Lacaune, lambs growth, daily gain, body measurements

### Introduction

The live weight and intensity of growth of lambs from specialized dairy breeds have very high significance, because of their direct relation to the amount of milk yielded from sheep during the suckling period. With regard to this, the control of live weight and some exterior measurements (such as body length and chest circumference) of lambs at an early age at specific periods of time, can very accurately characterize the intensity of growth. Some authors (Otoikhian, 2008; Abdel-Moneim, 2009) attempted to determine a relation between different exterior measurements and the live mass of the animals with regard to their use to predict the weight of the carcass.

Using the live mass as the criteria for determining the intensity of growth, the researches made by a number of au-

thors had shown that the sex of the lambs and the type of birth had a significant influence on that trait. Ivanova and Rajcheva (2009) determined that for the Pleven Blackhead sheep, male lambs were born with a higher live mass than female ones. According to Abbas et al. (2010) development of the skeleton of the two genders was the reason male lambs being heavier than female at all ages. The higher live weight of male lambs at all ages was due to the higher average daily growth (Macit et al., 2002; El-Toum, 2005; Kumar et al., 2008).

According to Idris et al. (2010) the type of birth had a reliably higher influence on the live mass compared to the sex of the animals. Regardless of breed, single lambs had a higher live mass than twin lambs not only at birth but also afterwards. The reason for that according to Klewies et al. (2002); Idris et al. (2010) was the competition between twin lambs

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during the suckling period. Vuchkov and Dimov (2008) reported that the sex, type of birth, marketing year and flock had statistically proven effects on the live weight at birth, at 30 and at 60 days of age.

The exterior measurements of the lambs, such as body length and chest circumference are in direct correlation with the live mass and intensity of growth. Philips et al. (2002) found that male lambs weaned at 60 days of age, not only reached higher live mass during the test period, but had greater body length, chest circumference and wither height in comparison to female lambs. Koritiaki et al. (2013) found no reliable differences at birth and at weaning at 70 days of age in the height and body length of male and female lambs, but according to the type of birth the differences found between single and twin lambs were reliable.

The aim of the present study was to examine the live weight and intensity of growth of lambs from the breed Lacaune, with regard to their use for future selection work.

## Materials and methods

In order to achieve that aim we used a total of 45 lambs which were offspring of sheep, imported from France and mated at 9-10 months of age. The first five weeks after lambing, the lambs stayed with their mothers, and in addition to the suckled milk, after the first week they were supplemented with granulated beginner's mix containing 18% crude protein, lucerne and meadow hay. After weaning up to 90 days

of age they were fed freely with the same feed (beginner's mix and hay).

In order to determine the intensity of growth of the lambs the following traits and indicators were monitored:

- Live weight at birth (kg);
- Live weight at weaning (kg);
- Live weight at 90 days of age (kg);
- Daily gain during the suckling period (absolute and average daily gain), (kg);
- Daily gain from birth up to 90 days of age (absolute and average daily gain), (kg);
- Exterior measurements of the lambs at weaning (withers height; body length; chest circumference), (cm).

For the main statistical processing, the analysis of the variants of individual traits and the calculation of the phenotypic correlations between them we used respective modules of the software package Statistica for Windows 2010.

## Results and Discussion

The data from Table 1 shows that the lambs – offspring of the studied sheep, had a very good live weight at birth – an average 4.516 kg, and the individual animals varied from 2.8 to 6.2 kg. While the difference in the average values for this trait between male and female lambs was relatively small (0.209 kg) and unreliable, the difference between male single and twin lambs was 0.984 kg and highly reliable ( $p < 0.001$ ), and between female single and twin lambs – 0.444 kg, but

**Table 1**  
**Live weight of the lambs at birth, at weaning and at 90 days of age**

Type of birth / Sex	N	Live weight at birth, kg		Live weight at weaning, kg			Live weight at 90 days, kg		
		x	± Sx	C	days	x	± Sx	C	x
1. Male lambs	26	4.604 ± 0.142	15.75	36.5	16.135 ± 0.402	12.72	26.442 ± 0.763	14.72	
- Single	15	5.020 ± 0.132	10.19	36.8	17.500 ± 0.335	7.40	28.467 ± 0.872	11.87	
- Twins	11	4.036 ± 0.174	14.33	36.2	14.273 ± 0.378	8.77	23.682 ± 0.818	11.46	
2. Female lambs	19	4.395 ± 0.166	16.45	37.6	15.658 ± 0.453	12.60	25.816 ± 0.531	8.97	
- Single	11	4.582 ± 0.262	18.95	37.3	16.818 ± 0.417	8.22	26.409 ± 0.786	9.87	
- Twins	8	4.138 ± 0.131	8.94	38.0	14.063 ± 0.530	10.66	25.000 ± 0.590	6.68	
Total	45	4.516 ± 0.108	16.03	37.0	15.933 ± 0.300	12.62	26.178 ± 0.492	12.61	

mathematically not proven. The difference in the average live weight at birth between male and female single lambs was 0.438 kg, and between male and female twin lambs – 0.102 kg, however both were unreliable.

These results allow us to believe that the type of birth had a higher influence on the live weight of lambs at birth, in comparison to the sex. Idris et al. (2010) reached the same conclusions.

All lambs from the breed Lacaune, in France, are traditionally weaned at 5 weeks of age, regardless of their purpose (for breeding or fattening). The results received in our conditions showed that the average live weight of the studied lambs at weaning (37 days of age) was an average 15.933 kg – 16.135 kg for male and 15.658 kg for female lambs, respectively. The difference between the sexes (0.477 kg) for this trait was unreliable.

The data showed that the difference in the average values between male single and twin lambs at weaning was 3.227 kg, and between female single and twin lambs – 2.755 kg, both differences were highly reliable ( $p < 0.001$ ). The difference in the average values between male and female single lambs was 0.682 kg, and between male and female twin lambs – 0.209 kg, however, as with the live weight at birth, these two differences were unreliable.

The average live weight at 90 days of age for male lambs was 26.442 kg, and for female – 25.816 kg. It was noticeable that for male lambs the variation according to this trait, both for single and twin lambs was significantly higher than in comparison with female lambs. The marked reliable difference between male single and twin lambs at birth and at weaning continued at this age and had reached nearly 5 kg. For female lambs the difference between single and twin lambs in comparison with the one marked at weaning had decreased to 1.409 kg and was unreliable. This showed that

female twin lambs had overcome more easily the stress after weaning and their comparative performance with single lambs was significantly more successful in comparison to the one of male twin lambs.

The intensity of growth of lambs during the suckling period, shown on Table 2 through the absolute and average daily gain, directly corresponds with the data from Table 1. The results showed that during that period the lambs had a very high intensity of growth, and as a result they had realized an average 11.418 kg absolute gain and 0.309 kg average daily gain. The received values can be explained with the high milk yield and the composition of the suckled milk, as well as with the supplementary feeding of the lambs after the first week with high quality beginner's mix and hay. Both for the absolute and the average daily gain the differences in the average values of male and female lambs were not significant, respectively 0.268 kg for the first and 0.015 kg – for the second trait.

Significantly higher and more reliable ( $p < 0.001$ ) were the differences in the average values between single and twin lambs – for the absolute, as well as the average daily gain, respectively 2.244 and 0.058 kg for male and 2,311 and 0,067 kg for female lambs.

The studied lambs had realized an average 21.662 kg absolute gain from birth to 90 days of age (Table 3). This indicates that for that period their live weight had increased almost five times.

Analogically to the received results during the suckling period, for the absolute, as well as for the average daily gain the differences in the average values between male and female lambs were not significant – respectively 0.417 kg for the first and 0.008 kg for the second trait. The difference in the average values between single and twin lambs for the absolute gain was respectively 3.802 kg for male and only 0.964 kg – for female lambs. It was noticeable that female twins

**Table 2**  
**Growth of lambs during suckling period**

Type of birth / Sex	N	Gain, kg		Average daily gain, kg/day	
		x ± Sx	C	x ± Sx	C
1. Male lambs	26	11.531 ± 0.330	14.61	0.316 ± 0.009	13.97
- Single	15	12.480 ± 0.319	9.90	0.340 ± 0.010	10.84
- Twins	11	10.236 ± 0.401	12.98	0.282 ± 0.009	10.44
2. Female lambs	19	11.263 ± 0.373	14.45	0.301 ± 0.011	15.78
- Single	11	12.236 ± 0.275	7.47	0.329 ± 0.008	7.96
- Twins	8	9.925 ± 0.511	14.56	0.262 ± 0.015	16.21
Total	45	11.418 ± 0.246	14.43	0.309 ± 0.007	14.89

had an absolute gain that was with 1.218 kg higher than that of male ones. However this difference was unreliable. Relatively low and almost not significant were the differences between the groups of single and twin lambs whose average daily gain differed with 0.041 kg for the male and with only 0.012 kg for the female lambs.

Table 4 shows the results from the conducted exterior measurements of the lambs after weaning. The received values, supported by those for the gained live weight (from the table) showed that during the suckling period, the studied animals had realized a very good growth. The average values for all three indicators, which give us information about the proportions of the body were respectively – 46.64 cm for wither height, 72.89 cm for body length and 62.16 cm for chest circumference. While the differences in the average values between male and female lambs for all three indicators were around 1 cm, the differences between single and twin lambs, for the male, as well as for the female lambs were

significantly higher and mathematically proven with a varying degree of reliability. The indicated differences in the average values between male single and twin lambs were – 1.67 cm for wither height, 4.52 cm for body length and 4.25 cm for chest circumference, and between female single and twin lambs, respectively – 2.52, 3.73 and 2.38 cm. Noticeable was that the variation for all three of the studied measurements was very low and moved in very narrow limits between the different groups.

All phenotypic correlations between the traits, which determine the intensity of growth of the lambs (Table 5), were positive, with average to high level of significance and reliability.

The correlation between live weight at birth and weaning was 0.636, and between live weight at birth and at 90 days of age – 0.602. Significantly higher was the correlation between live weight at weaning and at 90 days of age – 0.755 and it was highly reliable ( $p < 0.001$ ).

**Table 3**  
**Growth of lambs up to 90 days of age**

Type of birth / Sex	N	Gain, kg		Average daily gain, kg/day	
		x ± Sx	C	x ± Sx	C
1. Male lambs	26	21.838 ± 0.688	16.06	0.247 ± 0.008	15.82
- Single	15	23.447 ± 0.802	13.25	0.264 ± 0.009	13.45
- Twins	11	19.645 ± 0.856	14.45	0.223 ± 0.009	13.83
2. Female lambs	19	21.421 ± 0.442	8.99	0.239 ± 0.005	8.75
- Single	11	21.827 ± 0.645	9.80	0.244 ± 0.007	9.48
- Twins	8	20.863 ± 0.545	7.39	0.232 ± 0.006	6.81
Total	45	21.662 ± 0.436	13.50	0.243 ± 0.005	13.58

**Table 4**  
**Body measurements of the lambs at weaning**

Type of birth / Sex	N	Wither height		Body length		Chest circumference	
		x ± Sx	C	x ± Sx	C	x ± Sx	C
1. Male lambs	26	46.96 ± 0.374	4.06	73.42 ± 0.717	4.98	62.27 ± 0.672	5.50
- Single	15	47.67 ± 0.465	3.78	75.33 ± 0.838	4.31	64.07 ± 0.831	5.02
- Twins	11	46.00 ± 0.505	3.64	70.82 ± 0.724	3.39	59.82 ± 0.553	3.07
2. Female lambs	19	46.21 ± 0.469	4.42	72.16 ± 0.944	5.70	62.00 ± 0.621	4.37
-Single	11	47.27 ± 0.589	4.13	73.73 ± 1.335	6.01	63.00 ± 0.842	4.43
- Twins	8	44.75 ± 0.366	2.31	70.00 ± 0.886	3.58	60.62 ± 0.706	3.29
Total	45	46.64 ± 0.295	4.24	72.89 ± 0.576	5.30	62.16 ± 0.464	5.01

While the correlations between live weight at birth and average daily gain of lambs during the suckling period and up to 90 days of age had average level of significance (respectively 0.374 and 0.456), the ones between the live weight at weaning and the average daily gain during the indicated two periods, had much higher level of significance. The phenotypic correlations with the highest level of significance were those between the average daily gain of the lambs during the suckling period and the live weight at weaning (0.910) and between the average daily gain up to 90 days of age and the live weight at that age (0.976).

The correlations between the live weight of the lambs and the exterior measurements had average level of significance – from 0.483 to 0.587. These correlations were significantly higher with the live weight at weaning (the age at which these measurements were made) respectively - 0.608 with wither height, 0.650 body length and 0.788 chest circumference. With average to high level of sig-

nificance were the correlations between the exterior measurements and the live weight at 90 days of age (0.468 – 0.706).

The phenotypic correlations between the different exterior measurements were: 0.506 between the wither height and the body length; 0.489 between the wither height and the chest circumference; and 0.476 between the body length and the circumference.

The model presented on Table 6 for recording the influence of live weight at mating, the type of birth and sex of the lamb on the live weight of lambs at different ages is highly reliable. The results showed that the factor “type of birth” had a reliable influence on the live weight of lambs at different ages, and that influence was relatively greater on the live weight at weaning. There was no reliable influence determined for the factor “sex of the lamb”, and the factor “live weight at mating” showed a reliable influence only on the live weight of the lambs at 90 days of age.

**Table 5**  
Phenotypic correlations between some traits n = 45

TRAITS	LWB	LWW	LW90	ADG-1	ADG-2	WH	BL	ChC
1. Live weight at birth (LWB)								
2. Live weight at weaning (LWW)	0.636***							
3. Live weight at 90 days (LW90)	0.602***	0.755***						
4. Average daily gain during suckling period (ADG-1)	0.374*	0.910***	0.620***					
5. Average daily gain up to 90 days of age (ADG-2)	0.456***	0.699***	0.976***	0.649***				
7. Wither height (WH)	0.483***	0.608***	0.547***	0.551***	0.520***			
8. Body length (BL)	0.587***	0.650***	0.468**	0.495***	0.377*	0.506***		
9. Chest circumference (ChC)	0.543***	0.788***	0.706***	0.691***	0.662***	0.489***	0.476***	

**Table 6**  
Analysis of variances for the influence of body weight at mating, type of birth and sex of the lambs on the body weight of lambs at different ages

Sources of variation	Degree of freedom df	Live weight at birth (kg)	Live weight at weaning (kg)	Live weight at 90 days (kg)
		F p	F p	F p
Total for the model	42	3.837 **	7.975 ***	5.109 ***
Live weight at mating	4	1.710	1.025	3.073 *
Type of birth	1	5.721 *	22.436 ***	4.447 *
Sex of the lamb	1	0.228	0.5372	0.661

\*P < 0.05

\*\*P < 0.01

\*\*\*P < 0.001

The influence of the type of birth on the live weight of the lambs at different ages is presented clearly on Fig. 1. The results showed that single lambs at all studied ages had a higher live weight than twin lambs, respectively - with 0.760 kg at birth, with 3.13 kg at weaning and with 3.36 kg at 90 days of age.

The influence of the live weight of the mothers at mating is reflected on Fig. 2. A tendency towards increased live

weight of the lambs at birth, at weaning and at 90 days of age was observed with the increase of the live weight of the mother ewes at mating - up to 47 – 50 kg. For the mother ewes from this class the highest average values of the live weight of lambs at all ages were registered - 5.029 kg at birth, 17.786 kg at weaning and 29.071 kg at 90 days of age. This allows us to recommend that ewe lambs from the breed Lacaune in Bulgaria should be mated when they reach 47 – 50 kg.

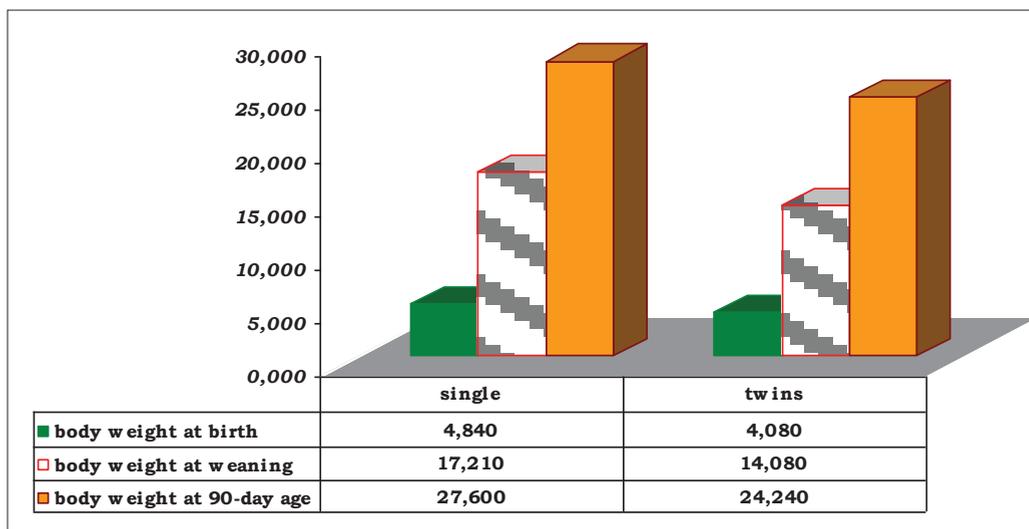


Fig. 1. Influence of the type of birth on live weight of lambs at different ages (kg)

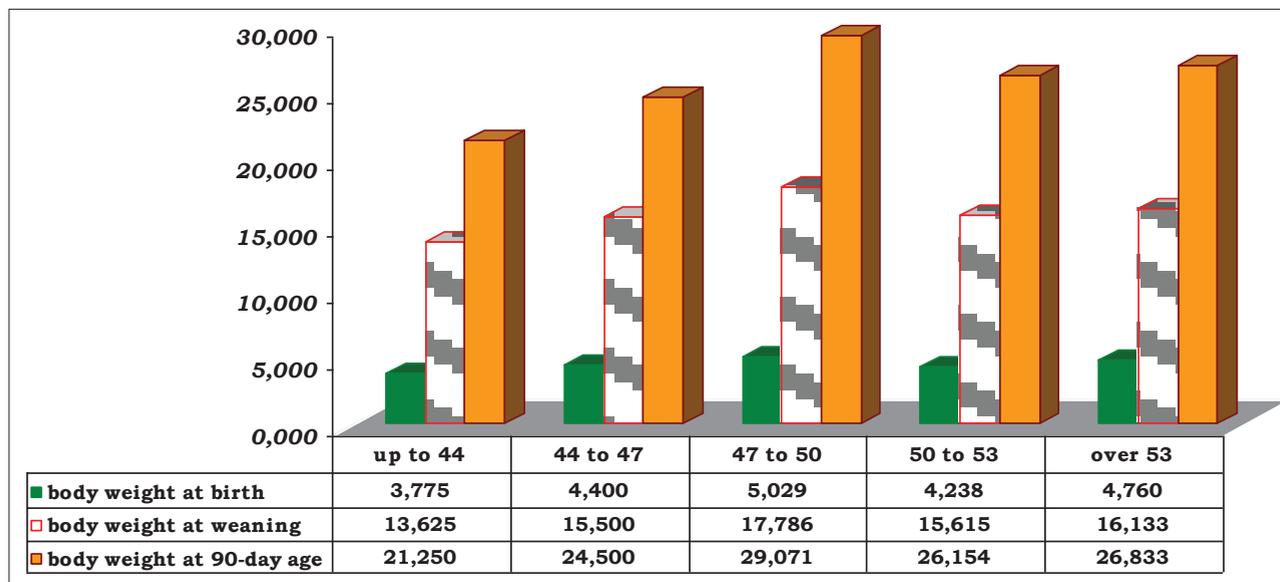


Fig. 2. Influence of the live weight at mating on the live weight of lambs at different ages (kg)

## Conclusions

It was found that: a) the live weight of the studied lambs was very good – an average 4.516 kg at birth, 15.933 kg at weaning and 26.178 kg at 90 days of age; b) the superiority of male over female lambs at all three ages is not significant; c) the single lambs at all controlled ages have a higher live weight than twin lambs: with 0.760 kg at birth; with 3.13 kg at weaning; and with 3.36 kg at 90 days of age. The factor type of birth has a reliable influence on the live weight of the lambs at different ages, and that influence is relatively higher on the live weight at weaning; d) the exterior measurements of the lambs confirmed that the studied animals have a very high intensity of growth during the suckling period. The average wither height was 46.64 cm, the body length – 72.89 cm, and the chest circumference – 62.16 cm. For all three indicators the differences between the average values of the male and female lambs are minimal, and between single and twin lambs – significantly higher and reliable; e) all phenotypic correlations between the traits, which determine the intensity of growth of the lambs, are positive – with average to high level of significance and highly reliable.

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