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RELATIONSHIP BETWEEN BIRTH WEIGHT AND BODY GROWTH CHARACTERISTICS OF LAMBS

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Abstract: Research was carried out in population of R2 generation Pirot pramenka x Pirot improved sheep during period of three years. Lambs were divided into three groups: I from 2.5 kg to 3.5 kg; II from 3.6 kg to 4.5 kg; III from 4.6 kg to 5.5 kg. Weight of lambs was controlled at birth, with 30, 60 and 90 days of age. Average body weight at birth of the tested lambs was 3.35 kg in the first group, 4.30 kg in the second group and 5.06 kg in the third group. At 30 days of age, the body weight of the lambs was 10.19 kg in the first group, 11.39 kg in the second and 12.49 kg in the third group. All these differences in body weight of lambs at birth were statistically highly significant (P□ 0.01). With 60 days of age, average body weight was 16.48 kg in the first group, 19.01 kg in the second and 20.49 kg in the third group. Differences between groups of lambs at this age were statistically very significant (P□0.01).On the end of experiment at 90 days of lambs age, we have found the following values of the body weight of lambs: 26.35 kg in the first group, when the second 30.49 kg and 28.93 kg in the third group. Differences between groups of lambs at this age were statistically very significant (P□0.01). At the age of 90 days maximum weight of the body was in the second group of lambs, or a group which body weight at birth occupied the mean of the population. Correlations between body weights of lambs vary from weak to mid-sized values. The highest values of correlation coefficients were found between body weight at birth and weight of lambs at 30 days of age.

Key words: lamb, birth weight, body growth, correlations

Introduction

Body weight of lambs at birth has an important role in achieving a good sheep production. In recent years, genetic improvement program for sheep in

Serbia have been primarily directed towards the improvement of growth and carcass traits (*Petrović et al., 2011*). An understanding of the factors which influence the development and growth of lambs will permit changes in the breeding and management schemes to minimize influences, which reduce production efficiency (*Bermejo et al., 2010).*

In addition to the number of lambs which is obtained by sheep, body weight of lambs at birth plays an important role as an initial power factor for the later development of the young organism (*Petrović et al., 2009; Riggio et al., 2008*). Body weight at birth also affect the vitality and mortality of lambs during development (*Morris et al., 2000; Cloete et al., 2001; Berhane and Arendonk, 2006; Vatankhah and Taleb, 2009*).

Information on factors influencing birth weight is of interest to farmers as well as the animal breeders (*Zapasnikiene, 2002; Caro Petrović et al., 2013*).

The objective of the present study was to estimate the effect of birth weight of crossbred lambs on growth during fattening period of 90 days.

Material and methods

Investigations were carried out in the area of Stara Planina. Material for research crossbreds R_2 generation of Pirot Pramenka x Pirot improved sheep. The experiment was conducted in the three-year period with 300 lambs of both sexes (50 female and 50 male). All lambs were kept in the same conditions, fed ad libitum hay and concentrates-18% of protein, and sucked two times a day. Depending on body weight at birth, lambs were divided into three groups: I from 2.5 kg to 3.5 kg; II from 3.6 kg to 4.5 kg; III from 4.6 kg to 5.5 kg. The body weight of lambs was controlled at birth, with 30, 60 and 90 days of age. Data analysis was performed using the statistical software SPSS 20 (2012). Procedures were used, one-way ANOVA, Pearson's correlations and the Dependent t-test (called the Paired-Samples T test).

Results and discussion

The research results are presented in tables 1-5. From table 1 we see that the average body weight at birth of the tested lambs was 3.35 kg in the first group, 4.30 kg in the second group and 5.06 kg in the third group.

Table 1. Descriptive statistics of lambs groups body weight from birth to weaning

Group	Age	Min	Max	Mean	Std. Error
I	1	2.70	3.50	3.3564	.01908
II		4.00	4.50	4.3071	.01728
III		4.80	5.50	5.0600	.01123
I	30	8.60	11.80	10.1911	.07466
II		10.00	13.40	11.3907	.07743
III		10.40	15.00	12.4914	.09551
I	60	14.15	18.70	16.4839	.09511
II		15.30	23.60	19.0143	.14509
III		16.50	24.60	20.4911	.15645
I	90	22.00	33.40	26.3566	.24581
II		24.60	34.80	30.4986	.23807
III		25.00	40.00	28.9336	.16205

From Table 2, we can notice that the difference in body weight of lambs between the first and the second group was 0.95kg, between the first and third groups of 1.70 kg, and the second and third groups of 0.75 kg. All these differences in body weight of lambs at birth were statistically highly significant (P □ 0.01). At 30 days of age, the body weight of the lambs (Table 1) was 10.19 kg in the first group, 11.39 kg in the second and 12.49 kg in the third group. The existing differences in the body weight of lambs in are shown in table 2, and were as follows: Differences between the first and the second group was 1.19 kg, between the first and third groups 2.30 kg, and the second and third groups 1.10 kg. All these differences in body weight of lambs at birth were statistically highly significant (P□ 0.01).

At the end of the second month with 60 days of age, average body weight (Table 1) was 16.48 kg in the first group, 19.01 kg in the second and 20.49 kg in the third group. Differences between groups of lambs at this age (table 2) were statistically very significant (P□0.01).

Table 2. Paired samples test of lambs groups body weight from birth to weaning

Pair of groups	Age	Paired Differences					t	Sig.
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference			
					Lower	Upper		
I- II	1	-.95071	.32018	.02706	-1.00422	-.89721	-35.133	.000
I - III		-1.70357	.25850	.02185	-1.74677	-1.66038	-77.977	.000
II- III		-.75286	.26128	.02208	-.79652	-.70920	-34.094	.000
I- II	30	-1.19964	1.38724	.11724	-1.43145	-.96783	-10.232	.000
I - III		-2.30036	1.65726	.14006	-2.57729	-2.02343	-16.424	.000
II- III		-1.10071	1.46737	.12402	-1.34591	-.85551	-8.876	.000
I- II	60	-2.53036	2.05492	.17367	-2.87374	-2.18698	-14.570	.000
I - III		-4.00721	2.19495	.18551	-4.37400	-3.64043	-21.601	.000
II- III		-1.47686	3.06654	.25917	-1.98928	-.96443	-5.698	.000
I- II	90	-4.14200	4.54922	.38448	-4.90218	-3.38182	-10.773	.000
I - III		-2.57700	3.72146	.31452	-3.19886	-1.95514	-8.193	.000
II- III		1.56500	3.34356	.28258	1.00628	2.12372	5.538	.000

Of particular importance are the results that we got on the end of experiment at 90 days of lambs age. We have found the following values of the body weight of lambs: 26.35 kg in the first group, while the second 30.49 kg and 28.93 kg in the third group. Differences between groups of lambs at this age were statistically very significant (P□0.01).

We can view (Table 1) that at the age of 90 days maximum weight of the body was in the second group of lambs, or a group which body weight at birth occupied the mean of the study population. On this occasion, confirming the biological principle that the vitality and adaptability of living organisms most pronounced in individuals who are in the morphological findings related in the middle of all the possible variants (*Petrović et al., 2011*). To similar findings in terms of the importance of body weight at birth on growth and vitality came from other authors (*Muir et al., 2000; Morris et al.,* 2003; Thompson et al., 2004). A different results found by *Hanford et al., (2003*) which stated that lambs with heavier birth weights have heavier weaning weights.

Table 3. Correlation between body weights of lambs in first group

Age of lambs					
		1	30	60	90
1	r	1	.176*	.020	.028
	Sig.		.037	.816	.742
30	r	.176*	1	-.048	.103
	Sig.	.037		.575	.225
60	r	.020	-.048	1	-.022
	Sig.	.816	.575		.798
90	r	.028	.103	-.022	1
	Sig.	.742	.225	.798	
*. Correlation is significant at the 0.05 level (2-tailed).					
**. Correlation is significant at the 0.01 level (2-tailed).					

According to the research of *London and Weniger (1995*) higher body weight of lambs at birth affects the higher birth weight of lambs at 60 days of age, while *Greenwood et al. (2002*) stated that, the low birth weight lambs are less mature than high birth weight lambs in aspects of metabolic and endocrine development, which may enhance their capacity for growth.

Correlation between body weights of lambs from birth to weaning may give a clearer picture of physical development of lambs. In tables 3, 4 and 5 are given the values of obtained correlation coefficients and their significance.

Table 4. Correlation between body weights of lambs in second group

Age of lambs					
		1	30	60	90
1	r	1	.389**	.262**	-.133
	Sig.		.000	.002	.117
30	r	.389**	1	-.066	-.310**
	Sig.	.000		.438	.000
60	r	.262**	-.066	1	.344**
	Sig.	.002	.438		.000
90	r	-.133	-.310**	.344**	1
	Sig.	.117	.000	.000	
*. Correlation is significant at the 0.05 level (2-tailed).					
**. Correlation is significant at the 0.01 level (2-tailed).					

From Table 3 we can observe that the lambs of the first group have significant correlation (P<0.05) only between the body weight of lambs at birth and the age of 30 days.

In other groups of lambs correlation coefficients have intermediate intensity values, a significance was determined between weight of the lambs at birth and 30 days and birth and 60 days (P<0.01), as well as the body weight of lambs between the 30 and 60 days, respectively, and 90 to 60 days (P <0.01).

Table 5. Correlation between body weights of lambs in third group

Age of lam lambs					
		1	30	60	90
1	r	1	.342**	.052	-.014
	Sig.		.000	.545	.868
30	r	.342**	1	.405**	.177*
	Sig.	.000		.000	.036
60	r	.052	.405**	1	.216*
	Sig.	.545	.000		.010
90	r	-.014	.177*	.216*	1
	Sig.	.868	.036	.010	
*. Correlation is significant at the 0.05 level (2-tailed).					
**. Correlation is significant at the 0.01 level (2-tailed).					

Correlations between body weights of lambs in third group vary from weak to mid-sized values. Statistical significance (P<0.01) was found between body weight at birth and 30 days, weight of the 30 days and weight at 60 days, and between body weight at 30 days and 90 days of age (P<0.05). The research results we obtained in the third group of lambs show that there is a correlation between body weight at the age of 60 and 90 days (P<0.05).

The highest values of correlation coefficients of the body weight of lambs, as indicated by all three tables, were found between body weight at birth and weight of lambs at 30 days of age. This could be interpreted as a benefit greater weight at birth, in other words, the higher body weight of lambs at birth gives greater potential force for growth in the first month, in contrast to lambs with less weight and thus less power of growth (*Petrović et al., 2013*).

In the literature there are various research results related to this subject. *Sawalha et al. (2007*) reported a weak genetic correlation (0.21) between lamb viability and birth weight. *Hanford et al. (2003)* reported that correlation between birth weight and weaning weight was moderate for the Columbia breed. Birth weight and weaning weight were highly correlated on the direct and maternal genetic levels (*Cloete et al., 2003*). The association between body weight of lambs

at weaning and weight gain during the previous period ages have studied by many authors. *Ghafouri-Kesbi et al. (2011*) reported a positive correlation and secondary qualities of body weight of lambs. *Matika et al. (2001*) found that genetic correlations between birth weight and other weights up to 18 months were high (0.75-0.85) whilst the relationship between weaning, 12 month and 18 month weight was close to unity. *Fogarty (1995*) reported lower correlations between birth weight and later weights.

Conclusion

The research results influence of body weight of lambs at birth on the subsequent development of body weight showed the following. Higher body weight at the end of the experimental period-at the age of 90 days were the lambs' second groups. These are the lambs whose body weight at birth had the population average. This is a very important conclusion for science and farmers, as information that in selection should not force direction of getting lambs with high body weight at birth. Specifically, all variants of the left and right of the average population are less desirable, which means that it confirms the old wisdom of man "middle is gold."

Povezanost između mase tela pri rođenju i karakteristika porasta jagnjadi

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Rezime

Istraživanja su sprovedena u populaciji R_2 generacije Pirotska pramenka x Pirotska oplemenjena ovca tokom perioda od tri godine. Jagnjad su bila podeljeni u tri grupe: I od 2,5 kg do 3,5 kg; II od 3,6 kg do 4,5 kg; III od 4,6 kg do 5,5 kg. Masa jagnjadi je kontrolisana na rođenju, sa 30, 60 i 90 dana starosti. Prosečna telesna težina na rođenju testiranih jagnjadi bila je 3,35 kg u prvoj grupi, 4,30 kg u drugoj grupi i 5,06 kg u trećoj grupi . Sa 30 dana starosti ,telesna masa jagnjadi bila je 10,19 kg u prvoj grupi, 11,39 kg udrugoj i 12,49 kg u trećoj grupi. Sve ove razlike u telesnoj masi jagnjadi na rođenju su visoko statistički značajne (P□0,01). Sa 60 dana starosti, prosečna telesna masa je bila 16,48 kg u prvoj grupi, 19,01 kg udrugoj i 20,49 kg u trećoj grupi. Razlike između grupa jagnjadi u ovom uzrastu

su statistički vrlo značajne (P□0,01). Na kraju eksperimenta sa 90 dana starosti, pronašli smo sledeće vrednosti telesne mase jagnjadi: 26.35 kg u prvoj grupi, 30,49 kg u drugoj grupi i 28,93 kg u trećoj grupi. Razlike između grupa jagnjadi u ovom uzrastu su statistički vrlo značajne (P□0,01). U uzrastu od 90 dana maksimalna masa tela je registrovana u drugoj grupi jagnjadi, ili grupi čija telesna masa na rođenju zauzima srednju vrednost populacije. Korelacija između telesne mase jagnjadi variraju od slabe do srednje vrednosti. Najveće vrednosti koeficijenata korelacije su pronađene između telesne mase na rođenju i mase jagnjadi sa 30 dana starosti.

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