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STUDY OF THE GROWTH TRAITS RELATIONSHIP OF LAMBS IN THE POSTNATAL DEVELOPMENT

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Abstract

CARO PETROVIC, V., Z. Z. ILIC, A. TENEVA, M. P. PETROVIC, Z. L. J. SPASIC, M. M. PETROVIC and D. RUZIC MUSLIC, 2013. Study of the growth traits relationship of lambs in the postnatal development. *Bulg. J. Agric. Sci.,* 19: 801-805

Data from the Pirot improved sheep were use to estimate postnatal development and growth traits relationship of lambs from birth to weaning. The experiment included 360 lambs, divided into three groups (I, II, III). Lamb traits included BW at birth and approximately 30d, 60d and 90d (weaning). Lambs managed under conditions typical of the area. Male lambs in-group I had a total gain of 22.97 kg (0.255 kg/d), in group II 25.97 kg (0.286 kg/d) (P<0.01). Lambs in-group III the total gain was 24.64 kg (0.274 kg/d), which was lower than lambs of group II (P>0.05). On the other side, III group of lambs had a higher gain than the I group (P<0.01). Development of female lambs in the postnatal period was slightly weaker. Lambs of I group, from birth to weaning had a total gain of 21.27 kg, (0.236 kg/d), II group was 23.32 kg (0.259 kg/d). The difference was statistically very significant (P<0.01). Lambs of group III had a total gain of 23.54 kg (0.261kg/d) and higher growth rate then lambs of group II, but not significant (P>0.05). From the other side, the difference in comparison with the groups III and I was very significant (P<0.01). Correlations between BWB and BW30, 60, 90 are ranged from low to moderate among the respective traits and ranged between positive from 0.001 to 0.365 and negative from -0.005 to -0.279. Can conclude that the selection should direct towards producing lambs with intermediate birth weight.

Key words: lamb, body weight, post natal development, correlation

Introduction

Sheep production in most European countries is oriented towards the production of lamb meat. Therefore, the research focused on development issues, greater gain and body weight of lambs of particular importance. Growth usually defined as the increase in size or body weight at a given age is one of the important selection criteria for the improvement of sheep (Lewis et al., 2002; Afolayan et al., 2006). Knowledge of factors affecting variation in birth weight is especially important given the relationship of birth weight to neonatal and adult health (Gardner et al., 2007). The weight of lambs affected by many genetic and non genetic factors (Ligdaa et al., 2000; Ghafouri et al., 2008; Krejcova et al., 2008; Thiruvenkadan et al., 2008; Petrovic et al., 2011; Ruzic-Muslic et al., 2011). The issue of body weight of lambs is always current, so in terms of marketing, and in terms of selection of sheep (Bromley et al., 2000; Ronny et al., 2001; Hanford et al., 2003). Progressive sheep producers use selection as a tool to improve flock profitability by increasing lamb crop value and reducing production costs. Traits of economic importance typically include lamb growth, and genetic parameter estimates for these traits have been derived for many breeds (Nasholm, 2004; Van Vleck et al., 2003; Safari et al., 2005; Borg, 2007; Gamasaee et al., 2010; Kum et al., 2010).There is an increasing interest in improving productivity through increasing the number of lambs weaned per ewe and increasing lamb growth rates (Muir et al., 2000; Morris et al., 2003). Studied the correlation between daily gain of a genotype in one environment (e.g., automated facilities) and daily gain

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of the genotype in another environment (e.g., feedlot conditions) (Van Vleck et al., 2000). The relationship between birth weight and mortality is also very important factor in growing sheep. It is likely that changes in management practices (improved nutrition, heavier ewes, and selection for easy care lambing) may have contributed to the reduced mortality rates in the heavier lambs (Thompson et al., 2004). We have seen that in the literature there are a lot of research on the linkage growth of lambs and relationship with genetic and non-genetic factors. Unfortunately, little attention addressed to the connection between body weight of lambs at birth and their weaning weight. To effectively define the selection criteria, it is important to know the following: what is the weight of lambs at birth, gives the best results at weaning. The aim of this study was to examine the association between body weights of lambs at birth with the dynamics of body development to weaning.

Material and Methods

Trials conducted in a population of Pirot improved sheep. The experiment included 360 lambs, divided into three groups (I, II, III). Each group observed was consisted of 120 lambs were divided into two subgroups (60 male and 60 female). Groups formed according to body weight of lambs at birth (BWB) as follows: 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. All lambs had the same housing conditions, nutrition and care. This means that the first 10 days was keep with their mothers and suckling *ad libitum*. From the eleventh day to the weaning at 90 days (BW90), all lambs separated from their mothers in special boxes. Contact with their mothers had only two times for 30 minutes daily morning and evening, when they sucked. In addition to milk, lambs throughout the period of experiment received alfalfa hay and concentrate mixture containing 18% digestible crude protein. Control of body weight is carried out with 30 days (BW30), 60 days (BW60), 90 days (BW90). SPSS (2007) package program was used to analyze the data by using the following procedures: One-way ANOVA, Pearson's correlations and the Dependent t-test (called the Paired-Samples T-test).

Results and Discussion

For the whole period of testing male lambs in group I had realized a total gain of 22.97 kg, or 0.255 kg/d. Group II lambs from birth to weaning, had total gain of 25.97 kg (0.286 kg/d), which is 3.0 kg or 0.031 kg/d higher than in the I group. This difference, as shown in Table 4, was statistically very significant (P<0.01). In the same period of investigation, the total gain of lambs in group III was 24.64 kg with a daily gain of 0.274 kg. The results shows that the lambs of group III had a lower growth rate of 1.33 kg or 0.014 kg/d then lambs of group II, but this difference (Table 4) was not statistically significant (P>0.05). On the other side, III group of lambs had a higher gain than the I group of lambs for 1.67 kg, or 0.019 kg/d), and the difference was statistically very significant (P<0.01).

Based on the results in Table 1, we can conclude that the lambs of group II whose body weight at birth was the nearest to the average-overall mean of population showed the best production results in the development of body weight up to weaning. Biological potential for growth in the II group of lambs came to the fore in the third month of body development.

Development of female lambs in the postnatal period was slightly weaker than the trend of male lambs. Female lambs of I group, from birth to weaning had a total gain of 21.27 kg, or 0.236 kg/d. II group of lambs from birth to weaning had total gain of 23.32 kg (0.259 kg/d), which is 2.05 kg or 0.023 kg/d higher than in the I group. The difference was statistically very significant (P<0.01). The female lambs of group III had a total gain of 23.54 kg and daily gain of 0.261kg. The results shows that the lambs of III group had a higher growth rate for 0.22 kg or 0.002 kg/d then lambs of group II, but not significant (P>0.05), and 2.27 kg or 0.025 kg/d then lambs of group I which was statistically very significant (P<0.01). We can see that lambs with higher birth weight had a higher weaning weight. Our study has similarity with Hanford et

Table 1
The trend of body weight of male lambs from birth to weaning

Traits	Group					
	I		II		III	
	Mean	S. E.	Mean	S. E.	Mean	S. E.
BWB	3.36	±0.04	4.31	±0.03	5.07	±0.03
BW30	10.09	±0.15	11.41	±0.15	12.54	±0.20
BW60	19.02	±0.34	22.06	±0.39	20.46	±0.37
BW90	26.33	±0.50	30.28	±0.53	29.74	±0.55

al. (2003) which stated that producing lambs with heavier birth weights will tend to produce lambs with heavier weaning weights. Greenwood et al. (1998) found that average daily gain tended to be greater in the high birth-weight lambs given *ad libitum* access to feed owing to slower growth by the small newborns during the immediate postpartum period. Many genetic, maternal and environmental factors are involved in the development of the body of lambs. London and Weniger (1995) state that there is the dual advantage of higher birth weight of lambs and higher postpartum weight of their dams, with the benefit of the maternal effect that supported optimal postnatal development lambs, resulted in higher body-weight gain at 60 days of age. Interestingly in our studies "that", the heavier lambs of both sexes during the first month had a higher daily gain. The explanation for this can found in research of Greenwood et al. (2002) who stated that, at birth, low-birth-weight lambs are less mature than high-birth-weight lambs in aspects of metabolic and endocrine development, which may enhance their capacity to utilize amino acids for energy production and to support gluconeogenesis during the immediate postpartum period. Being small at birth also resulted in elevated plasma insulin concentrations when adequate nutriment to support moderate or rapid growth provided postpartum, although it remains elucidated whether this more chronic effect persists in the longer term (Table 2).

The correlations among the body weight of lambs in the postnatal period are summarized in Table 3. It is evident that all the correlations ranged from low to moderate among the respective traits and ranged between positive from 0.001 to 0.365 and negative from -0.005 to -0.279.

Cloete et al. (2008) reported a low negative genetic correlation between birth weight and lamb survival. In previous research of Cloete et al. (2003) also stated that birth weight and weaning weight were highly correlated on the direct and maternal genetic levels. Sawalha et al. (2007) described a weak genetic correlation (0.21) between lamb viability and birth weight. Highest correlation in our study found between BWB-BW30 in male lambs (0.365) and in female lambs

Table 2
The trend of body weight of female lambs from birth to weaning

Traits	Group					
	I		II		III	
	Mean	S. E.	Mean	S. E.	Mean	S. E.
BWB	3.26	±0.05	4.14	±0.08	5.06	±0.05
BW30	9.07	±0.16	11.01	±0.18	12.12	±0.22
BW60	15.71	±0.27	17.97	±0.26	18.79	±0.21
BW90	24.53	±0.44	27.46	±0.43	28.6	±0.23

Table 3
Correlation between body weight of lambs in the post natal period

Pair	Group I		Group II		Group III	
	r_{xy}		r_{xy}		r_{xy}	
	Male	Female	Male	Female	Male	Female
BWB- BW30	0.075	-0.075	0.141	-0.104	0.365	0.309
BWB- BW60	0.102	0.224	0.279	-0.279	0.052	-0.144
BWB- BW90	-0.137	0.181	0.001	-0.005	-0.201	0.151

Table 4
Significance level of differences in body weight of lambs

Pair	Male	Female	Pair	Male	Female
BWBI- BWBII	**	**	BW60I- BW60II	**	**
BWBI- BWBIII	**	**	BW60I- BW60III	*	**
BWBII- BWBIII	**	**	BW60II- BW60III	*	*
BW30I- BW30II	**	**	BW90I- BW90II	**	**
BW30I- BW30III	**	**	BW90I- BW90III	**	**
BW30II- BW30III	**	**	BW90II- BW90III	ns	ns

(0.309) of group III. Genetic correlation between birth weight and weaning weight was moderate (0.56) for the Columbia breed (Hanford et al., 2002). Most weak correlations were found between the BWB-BW90 in male lambs (0.001) and female lambs (-0.005) of group II. Generally, it can be seen that there is no strong correlation between BWB and postnatal development of lambs. However, lambs born with greater weight have a higher proportion to total growth. On the other hand, lambs whose body weight around the population average have better vitality and a greater chance of survival, as evidenced by many studies. In the literature, there are different results. Motika 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 genetic (0.07-0.32) and phenotypic correlations between birth weight and later weights. Positive direct and maternal genetic correlations between birth weight and weaning weight were consistent with those reported by Duguma et al. (2002). It seems that because the relationship between lamb survival and birth weight is complicated and difficult to explain due to the non-linear relationship that exists between these two traits. This relationship suggest that it would be better to direct selection towards the production of lambs with intermediate birth weights, as the extreme to both sides-too low or too heavy birth weights, will decrease survival and successful production of lambs.

Conclusions

Based on these results, we conclude that lambs whose birth weight was closest to the average of the total population, showed the best production results in the development of body weight in the postnatal period. Heavier lambs of both sexes had a higher daily gain, but biological potential for growth is particularly prominent in the third month of development. The correlations between corresponding traits were low to moderate ranging from positive to negative values. Lambs whose weight is around the average mean, have better vitality and a greater chance of survival, as evidenced by many other studies. Due to the influence of various environmental factors on the development of the body in the postnatal period, the selection should be directed towards producing lambs with intermediate birth weight, because the extremes on both sides have a smaller contribution to successful sheep production.

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