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Growth Performance of Blackhead Pleven Lambs during the Suckling Period

Research Article

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ABSTRACT

The aim of the present study was to analyze the live weight, body length, and chest perimeter in Blackhead Pleven lambs at an early age with a view to their future use as prognostic indicators of growth performance. The study was conducted with 46 lambs. It found out that at birth and weaning the singletons had higher live weight and higher average daily weight gain in comparison with the twins (P<0.01). Body length and chest perimeter at birth were higher in the singletons lambs (P<0.01). The type of birth influenced significantly (P<0.01) on the live weight (η2=26.85%), live weight (η2=21.39%) and the chest perimeter (η2=27.08%) of the lambs at birth. At 26 days of age i.e. at weaning, only the live weight was influenced by the birth type (η2=27.53%, P<0.01). The chest perimeter of lambs at weaning was not influenced by the body length at birth and at weaning. There was a moderate to strong phenotypic correlation among the other studied parameters.

KEY WORDS chest perimeter, lambs, live weight.

INTRODUCTION

The growth of animals is directly related to morphological and physiological changes of the organism. Some parameters as live weight, body length, and chest perimeter are used to evaluate the intensity of growth in young animals. Kadlečík and Kasarda (2007) outlined that growth is a process accompanied by changes in the weight and body size of animals, hence these are two processes occurring in the organism which determine the concept of development. Brown *et al.* (1973) noted that body measurements served to determine the growth rate and feed conversion by animals. Growth usually defined as the increase in size or live weight at a given age is one of the important selection criteria for improvement of lamb production (Afolayan *et al.* 2006). Linear body measurements taken on live animals have been widely used in research work as a simple means of recording certain aspect of animal growth and shape (Salako, 2006; Alphonsus *et al.* 2010). Linear measurement can be used in assessing growth rate, weight, feed utilization and carcass characteristic, for tracing the relationship between production performance, visual appraisal and body measurements (Fourie *et al.* 2002).

The live weight is a parameter of growth performance of lambs from all production types. In Blackhead Pleven lambs, Savov (1948) reported that females are born with higher live weight than males. The study of Ivanova and Raicheva (2009) shows that over the years the team on this indicator has not stopped to water and male lambs are born with a higher live weight than females.

The gender and birth type have a substantial effect on live body weight. According to Abbas *et al.* (2010), the gender is the cause for males being heavier than females at all ages in the course of skeletal development. Higher live

body weight of male lambs is outlined by El-Toum (2005) and Kumar *et al.* (2008), and in the view of Macit *et al.* (2002) could be attributed to the higher average daily weight gain.

The type of birth has a significantly influence on the live weight compared to the sex of animals (Idris *et al.* 2010). According to Klewies *et al.* (2002); Idris *et al.* (2010), regardless of the breed, lambs born as singletons are heavier than twins both at birth and after that, by reason of the lack of competition during the suckling period (Klewies *et al.* 2002; Idris *et al.* 2010).

Vuchkov and Dimov (2008) outlined that the gender, the birth type, production year and the herd are factors influencing statistically significantly the weight at birth and at 30 and 60 days of age.

Exterior measurements (body length and chest perimeter) are directly related to body weight and growth intensity. Philips *et al.* (2002) reported that male lambs weaned at 60 days of age not only attain higher liver weight at the end of an 86-day experimental period but also exhibited statistically significantly higher body length, chest perimeter ($P<0.05$) and body height ($P<0.01$) than females. Koritiaki *et al.* (2013) did not observe considerable differences at birth and at weaning (70 days of age) in body height and length between the genders, but with respect to birth type, differences were substantially smaller in male lambs.

The aim of the present study was to analyze the live weight, body length and chest perimeter in Blackhead Pleven lambs at an early age with a view to their future use as prognostic indicators of growth performance.

MATERIALS AND METHODS

To fulfill the study's aim, the growth performance of 46 early weaned lambs from the Blackhead Pleven breed was monitored at the Institute of Forage Crops, Pleven in 2010. The lambs were born during January with an age difference of 5 days.

The lambs were weaned at 26 days of age at average live weight of 11.080 kg. After the 6th day of age, lambs were allowed creep feeding (Alcock, 2006), i.e. free access to pelleted protein concentrate, pea hay and water.

For monitoring of growth intensity from birth to weaning the each 7 days to weaning was determined body weight, body length and chest. The body weight was determined with electronic balance, and body length and chest perimeter with a measuring tape.

The body length was measured from the anterior point of the scapulohumeral joint to the root of the tail, and chest perimeter was measured just behind the shoulder blade. The correlation among the traits was calculated by means of Pearson's analysis and the power of factors (η^2) on studied traits was determined by analysis of variance using Statistica for windows software (Statistica, 2006). The significance of between-group differences was calculated by the t-test at ($P<0.05$) and ($P<0.01$) levels.

RESULTS AND DISCUSSION

During the study period, male lambs had a higher liver weight than females although the gender differences in weights at birth and at weaning were insignificant (Table 1). Idris *et al.* (2010) reported that in Sudan, female lambs were born with lower live weight as compared to males ($P<0.05$), but after the first week of life females were superior to males with regard to this parameter ($P<0.05$). This disagrees with the studies of Vuchkov and Dimov (2008) in White Maritsa lambs. The obtained coefficients of variation indicated that the possibility for large-scale selection for live weight at birth would have a positive impact on the herd (Table 1). At birth and at weaning (26 days of age), male lambs had a body length which was insignificantly higher than that of females by 1.06 cm and 3.93 cm respectively ($P>0.05$, Table 1). During the study period, the body length in male lambs increased by 27.9% from birth to weaning, while that of females only by 21.1%.

At weaning, chest perimeter of male lambs increased by 15.78 cm (37.9%) as compared to the perimeter at birth. For the same period, the chest perimeter of female lambs increased by 13.35 cm (33.1%). As gender was concerned, the chest perimeter of males was by 1.4 cm higher on the average than that of females. At weaning, the average difference was already 3.83 cm, but differences were not statistically significant ($P>0.05$, Table 1).

The measurement of exterior traits (body length and chest perimeter) demonstrated high coefficient of variation at weaning, which was characteristic for the growth and development of lambs during the suckling period (Table 1). At birth, male lambs had insignificantly higher compactness index; this advantage at weaning was in favour of females, although not statistically significant ($P>0.05$, Table 1).

Singletons are born heavier than twins by 19.4% ($P<0.05$, Table 2). This benefit was preserved also at weaning when the difference of 25.3% was statistically significant at ($P<0.05$). These results are not compatible with data reported by Sava *et al.* (2011) in Tigaia lambs, in which the insignificantly higher body weight by 28 and 90 days of age was in favour of twins. Rajab *et al.* (1992) indicated that twin lambs were born with lower live weight than singletons due to the limited space in the uterus during the pregnancy and the delivery of fewer nutrients from the dam to the fetuses during the embryonic life. At weaning, singletons exhibited higher average daily weight gain by 39.6% than twins ($P<0.05$, Table 2), due to the lack of competition during the suckling period (Rajab *et al.* 1992).

Table 1 Influence of gender on the growth

Indicators	Gender of the lamb				P-value
	Male (n=23)		Female (n=23)		
	(Mean±SE)	C	(Mean±SE)	C	
Live weight, kg					
At birth	5.017±0.176	16.84	4.594±0.208	21.71	NS
At weaning	11.035±0.675	29.33	10.499±0.575	26.27	NS
Gain	0.231±0.021	43.36	0.227±0.013	27.92	NS
Body length, cm					
At birth	39.01±0.723	8.88	37.95±1.044	13.19	NS
At weaning	49.88±2.468	23.73	45.95±2.080	21.71	NS
Chest perimeter, cm					
At birth	41.67±0.609	7.01	40.27±0.634	7.55	NS
At weaning	57.45±2.841	23.72	53.62±2.369	21.19	NS
Compactness index					
At birth	107.01±1.104	4.94	106.91±1.595	7.15	NS
At weaning	115.27±0.959	3.99	116.84±0.713	2.93	NS

* (P<0.05).
n: number of animals.
NS: non significant.
SE: standard error.
C: coefficient of variation.

Table 2 Influence of birth type on the growth

Indicators	Birth type				P-value
	Single (n=21)		Twins (n=25)		
	(Mean±SE)	C	(Mean±SE)	C	
Live weight, kg					
At birth	5.394±0.224	19.22	4.349±0.109	12.53	*
At weaning	12.485±0.703	25.80	9.324±0.364	19.53	*
Gain	0.273±0.019	31.96	0.165±0.015	30.87	*
Body length, cm					
At birth	40.65±1.004	11.31	36.66±0.610	8.32	*
At weaning	51.15±2.297	26.23	45.20±1.554	17.19	*
Chest perimeter, cm					
At birth	42.73±0.672	7.21	39.48±0.415	5.25	*
At weaning	58.21±3.385	26.65	53.29±1.828	17.15	*
Compactness index					
At birth	105.73±1.528	6.62	108.07±1.198	5.54	NS
At weaning	113.75±0.760	3.06	117.99±0.711	3.01	*

* (P<0.05).
n: number of animals.
NS: non significant.
SE: standard error.
C: coefficient of variation.

The coefficients of variation at birth and weaning were lower in twins while higher for singletons. The amount and quality of dam's milk could also influence the weight gain of lambs. This is supported by the study of Hrouz and Šubrt (2007) proving that during the suckling period, the growth intensity depended on the amount and quality of milk protein. At birth, the body length was statistically significantly higher in singletons *vs*. twins by 3.99 cm (P<0.05, Table 2). At weaning, singletons preserve their superiority with respect to the analyzed trait and the difference attained 5.95 cm (P<0.05). During the experimental period, body length of singletons increased by 25.8%, *vs*. 23.3% in twins (Table 2).

At birth, Singleton lambs had a chest perimeter greater by 3.25 cm than twins at the background of a relatively low coefficient of variation (P<0.05, Table 2).

At weaning, the difference in chest perimeters between both birth types attained 4.92 cm in favour of Singletons (P<0.05). It was established that during the period of the study, the chest perimeter of singleton lambs increased by 15.48 cm (36.2%) while of twins by 13.81 cm (35.0%, Table 2).

Comparing the growth performance of singleton and twin lambs, there was a strong correlation at weaning indicative for the amount and quality of suckled milk during the preweaning period (Table 2).

The performed analysis of variance (Table 3) showed that the greatest share of the total variance was that of the birth type, which influenced significantly (P<0.01) the live weight (η^2=26.85%), the body length (η^2=21.39%) and the chest perimeter (η^2=27.08%) at birth.

The gender of lambs, and gender × birth type were factors with relatively low shares of the total variance with statistically insignificant differences (Table 3). At 26 days of age i.e. at weaning, only the live weight was influenced by the birth type (η^2=27.53%, P<0.01), while none of the other studied traits had a substantial effect on the growth performance of animals (Table 3). The analysis of the repeatability and phenotypic correlations between the studied traits showed that the chest perimeter at weaning was not influenced by the body length at birth and at weaning. There was a moderate to strong relationship among the other studied parameters (Table 4).

Behzadi *et al*. (2007), stated that phenotypic correlations between various stages of body development in Kermani sheep were positive.

Table 3 Analysis of variance and the extent of influence of factors

Indicators	Source of variance					
	Sex of lamb		Type of birth		Sex × type	
	MS	η^2	MS	η^2	MS	η^2
Live weight						
at birth	0.955^{ns}	2.48	10.353**	26.85	0.050^{ns}	0.13
at weaning	0.531^{ns}	0.13	109.219**	27.53	11.78^{ns}	2.97
Body length						
at birth	1.88^{ns}	0.23	175.50**	21.39	27.35^{ns}	3.33
at weaning	138.0^{ns}	2.56	332.2^{ns}	6.15	123.1^{ns}	2.28
Chest perimeter						
at birth	11.59^{ns}	2.88	108.90**	27.08	0.80^{ns}	0.20
at weaning	143.40^{ns}	2.03	217.70^{ns}	3.08	150.4^{ns}	2.13

** (P<0.01).
MS: variance.
NS: non significant.
η^2: power of factor's impact, percent.

Table 4 Repeatability and phenotypic correlations between the studied traits

Parameters	LWB	LWW	BLB	BLW	CPB
Live weight at birth (LWB)	-	-	-	-	-
Live weight at weaning (LWW)	0.866**	-	-	-	-
Body length at birth (BLB)	0.702**	0.655**	-	-	-
Body length at weaning (BLW)	0.694**	0.683**	0.839**	-	-
Chest perimeter at birth (CPB)	0.565**	0.635**	0.495**	0.441**	-
Chest perimeter at weaning (CPW)	0.325*	0.467**	0.286	0.151	0.884**

* (P<0.05) and ** (P<0.01).

CONCLUSION

At birth and at weaning, singleton lambs had a higher body weight and higher average daily weight gain as compared to twins. The body length and the chest perimeter at birth were greater in singletons and statistically significantly lower for twin lambs. The birth type was a factor with statistically significant effect on live body weight (η^2=26.85%), body length (η^2=21.39%) and chest perimeter (η^2=27.08%) of lambs at birth. The chest perimeter of lambs at weaning was not influenced by the body length at birth and at weaning. There was a moderate to strong phenotypic correlation among the other studied parameters.

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