

Analysis of the live weight of Thracian merino lambs depending on the lambing season and type of birth

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Citation: Slavova, S., & Slavova, P. (2022). Analysis of the live weight of Thracian merino lambs depending on the lambing season and type of birth. *Zhivotnovadni Nauki*, 59(4), 3-9 (Bg).

Abstract

The aim of the present study was to establish the effect of lambing season and birth type on the weight development of Thracian merino lambs. Research was conducted at the experimental farm of the Agricultural Institute – Stara Zagora. Ewes of the Thracian merino breed were divided into 2 groups: group I /experimental/ – 102 ewes mated in anestrus season /April–May/ after application of vaginal tampons for estrous synchronization and hormonal treatment for inducing superovulation; group II /control/ – 123 ewes mated in the estrus season /July–August/, without being hormonally treated. Progeny was divided respectively into 2 groups: group I – lambs of hormonally treated ewes and group II – lambs of untreated ewes. The live weight of male and female lambs at birth, 10, 30, 70 days and at weaning, and of ewe lambs at 9 months of age were investigated, and the influence of season and type of birth on the level of the trait was established. Data were processed using program STATISTICA for Windows. It was found that the factors season and type of birth affected to a different extent the live weight of lambs from birth to weaning (and at 9 months for the females). The effect of season was weak and marked no definite tendency, while the birth type gave a significant advantage to singles over twins. Therefore, it could be summarized that the weight development of lambs was not so strongly influenced by the season as by the type of birth of lambs.

Key words: Thracian merino ewes, live weight, prolificacy, lambing season, type of birth

Introduction

Development of appropriate breeding programs for sheep aims to accelerate genetic progress for economically significant productive traits to ensure sustainable farm development (Ugarte, 2007; Yavarifard et al., 2015). Precise genetic selection and successful organization of selection activities are a prerequisite for improving the quality of the breeding process and increasing the volume of lamb production.

Reproductive efficiency is crucial for increasing productivity level, and hence sales revenues and overall profitability (Hanford et al., 2003). The intensification of reproductive process

through application of various schemes for estrous synchronization and inducing of superovulation creates conditions for mating of female animals in both estrus and anestrus season. In this way, breeders could manage the sex-cycling activity in sheep (Yadi et al., 2011; Osama et al., 2010; Ralchev et al., 2008; Dimova, 2019; Slavova et al., 2012) and provide almost year-round lamb meat for consumption.

Live weight of lambs and growth intensity are important breeding traits that have economic dimensions. Birth weight affects not only growth and development, but also the viability and mortality rate of progeny (Morris et al., 2000; Cloete et al., 2001). As the earliest measurable, this trait

is essential for predicting live weights of lambs at older ages, due to its positive genetic correlation with them (Mellado et al., 2016). Growth intensity directly affects live weight at weaning, and hence lamb revenue, which forms a large share of farm income (Mousa, 2013; Shiotsuki et al., 2014).

In turn, both traits depend on many factors, some genetic and some environmental. Of non-genetic factors, interest to researchers have been the season, sex and type of birth of lambs, as well as the live weight and age of the ewes (Petrovic et al., 2011, 2015; Yavarifard et al., 2015).

The relationship between live weight of lambs of different breeds and environmental factors have been the subject of a number of studies (Fisher, 2004; Notter et al., 2005; Benyi et al., 2006; Yimaz et al., 2007; Rosov and Gootwine, 2013; Petrovic et al., 2015). In Bulgaria, Ivanova and Raycheva (2017 a), Stoychev et al. (2015) and Iliiev et al. (2020) have been working in this field in recent years.

The aim of the present study was to determine the effect of season and birth type on the live weight of Thracian merino lambs.

Material and methods

The study was conducted in the flock of Thracian merino breed, raised at the Experimental farm of the Agricultural Institute – Stara Zagora, Bulgaria. Ewes were divided into 2 groups as follows: group I /experimental/ – 102 ewes mated in anestrus season /April–May/ after application of vaginal tampons for synchronization of estrus and hormonal treatment for inducing

superovulation; II group /control/ – 123 ewes mated in the estral season /July–August/, without being hormonally treated. Production performance of ewes was reported – live weight and wool yield before mating, and fecundity /number of lambs born per ewe/ after lambing. The progeny was also divided into two groups – of treated and untreated ewes, respectively. Live weight was measured at birth, at 10, 30, and 70 days and at weaning, and at 9 months /for females only/, depending on the season and birth type. Weaning of lambs took place around 60th day after birth. The influence of season /autumn or winter/ and type of birth /single or twins/ on the weight development of lambs was established and analyzed. Feeding and rearing of both groups were equal during the study period. Data were obtained from the performance records of the flock and processed with the program STATISTICA for Windows.

Results and discussion

Productive characteristics of the ewes are shown in Table 1. Live weight and wool yield had similar values for both groups. Some differences were found in prolificacy, which was due to the reproductive intensification applied to the experimental group. A major difference was found for the number of lambs born per ewe, which was expected, given the specifics of the trait.

Iliiev et al. (2018) calculated a close value for prolificacy – 135.40%, applying a standard mating procedure in the flock of Karnobat merino breed. Iliiev and Staykova (2019) reported for 58.05 kg live weight and 6.930 kg wool produc-

Table 1. Production performance of ewes in the flock

Productive traits	I group /experimental/ N = 102		II group /control/ N = 123	
	x ± Sx	C%	x ± Sx	C%
Live weight, kg	57.62 ± 0.382	14.35	58.280 ± 0.431	13.29
Wool yield, kg	6.58 ± 0.951	18.44	6.686 ± 0.110	19.85
Prolificacy, %	157.84 ± 0.064	35.28	132.520 ± 0.051	36.42

tion per ewe for the same flock. Stancheva et al. (2020 a) and Stancheva et al. (2020 b) established 1.114 lambs and 9.902 kg wool per ewe for the Northeast Bulgarian merino breed.

Live weight of male lambs depending on the season and type of birth is presented in Table 2. Male single lambs born in the autumn had a higher live weight at all ages than lambs born in the winter. The established differences were as follows: 4.27% at birth, 8.78% at 10 days, 17.83% at 30 days and 17.71% at 70 days of age, and 4.45% at weaning. Only at the age of 10, 30 and 70 days differences were significant ($p < 0.05$; $p < 0.01$; $p < 0.001$). The coefficient of variation C was calculated the highest for the value of the trait at birth, and the lowest at 70 days of age for both groups, as it is more pronounced for the winter lambing group. Male twin lambs born in the autumn had a lower live weight at all studied ages than lambs born in the winter, as only the difference at weaning /19.13%/ was significant ($p < 0.001$).

Unlike the season, the type of birth had a distinct effect on male lambs' weight. Singles had a

higher live weight than twins at all ages – from birth to weaning. Such trend was observed for both groups. The difference between singles and twins in group I was 29.14% at birth, 37.38% at 30 days of age and 26% at weaning. They were statistically proven with high degree of significance ($p < 0.001$). For the male progeny of group II the highest difference between singles and twins was reported for the live weight at birth – 19.49%. Differences were proven with medium /at birth, at 30 days of age and at weaning/ and high /at 10 days of age/ degree of significance.

Female single lambs born in the autumn showed a lower value of the trait at birth, at 10 days and at weaning, and a higher value at 30, 70 days of age and at 9 months compared to those born in the winter (Table 3). The differences were small and not significant – the highest at the age of 70 days – 7.67% and the lowest at the age of 30 days – 0.7%. No particular tendency was observed for the influence of season on the live weight of female singles in both groups. The coefficient of variation of the trait was most es-

Table 2. Live weight of male lambs depending on the season and type of birth

Live weight	Autumn lambing /I group/			Winter lambing /II group/			Significance		
	n	$\bar{x} \pm \bar{S}_x$	C%	n	$\bar{x} \pm \bar{S}_x$	C	a	b	b1
Singles									
at birth	26	3.931 ± 0.199^b	25.85	40	3.770 ± 0.159^{b1}	26.66		***	**
at 10 days	26	6.973 ± 0.195^{ab}	14.27	40	6.410 ± 0.157^{ab1}	15.54	*	***	***
at 30 days	26	13.516 ± 0.336^{ab}	12.43	40	11.470 ± 0.318^{ab1}	17.52	***	***	**
at weaning	8	25.250 ± 1.206^b	13.51	40	24.175 ± 0.620^{b1}	16.23		***	**
at 70 days	8	27.750 ± 0.977^{ab}	9.96	40	23.575 ± 0.485^a	13.00	**	***	
Twins									
at birth	55	3.044 ± 0.056^b	13.73	20	3.155 ± 0.097^{b1}	13.82		***	**
at 10 days	55	5.487 ± 0.107^{ab}	14.43	20	5.595 ± 0.148^{ab1}	11.87	*	***	***
at 30 days	55	9.838 ± 0.225^{ab}	16.96	20	10.080 ± 0.333^{ab1}	14.75	***	***	**
at weaning	25	20.040 ± 0.474^b	11.83	20	23.875 ± 0.573^{b1}	10.74		***	**
at 70 days	25	20.920 ± 0.695^{ab}	16.61	20	21.375 ± 0.614^a	12.85	**	***	

a – according to the season of lambing

b – according to the type of birth for the autumn lambing

b1 – according to the type of birth during the winter lambing

Significance: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Table 3. Live weight of female lambs depending on the season and type of birth

Live weight	Autumn lambing /I group/			Winter lambing /II group/			Significance		
	n	$\bar{x} \pm \bar{S}_x$	C%	n	$\bar{x} \pm \bar{S}_x$	C	a	b	b1
Singles									
at birth	22	3.350 ± 0.181 ^b	25.37	63	3.590 ± 0.110 ^{b1}	24.37		***	***
at 10 days	22	5.991 ± 0.265 ^b	20.73	63	6.400 ± 0.169 ^{b1}	20.95		*	***
at 30 days	22	11.714 ± 0.360 ^b	14.41	63	11.630 ± 0.306 ^{b1}	20.91		***	***
at weaning	8	22.750 ± 1.250	15.54	63	23.984 ± 0.552 ^{b1}	18.27			***
at 70 days	8	23.500 ± 1.763	21.22	63	21.825 ± 0.346 ^{b1}	12.57			**
at 9 months	3	49.333 ± 4.055	14.24	43	47.581 ± 0.859 ^{b1}	11.84			**
Twins									
at birth	58	2.991 ± 0.072 ^b	18.39	40	2.908 ± 0.082 ^{b1}	17.92		***	***
at 10 days	58	5.345 ± 0.114 ^b	16.28	40	5.433 ± 0.097 ^{b1}	11.28		*	***
at 30 days	58	9.590 ± 0.218 ^b	17.35	40	9.483 ± 0.210 ^{b1}	13.98		***	***
at weaning	22	21.091 ± 0.501	11.13	40	22.225 ± 0.383 ^{b1}	10.90			***
at 70 days	22	20.318 ± 0.796	18.38	40	19.388 ± 0.395 ^{b1}	12.88			**
at 9 months	11	49.455 ± 1.423 ^a	9.54	21	43.714 ± 0.876 ^{ab1}	9.18	**		**

a – according to the season of lambing

b – according to the type of birth for the autumn lambing

b1 – according to the type of birth during the winter lambing

Significance: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

essential for the birth weight – 25.37% and 24.37%, respectively.

As in singles, in female twins no specific trend was again established for the live weight depending on the season. Lambs born in the autumn were higher at birth, at the age of 30 and 70 days and at 9 months, and at the other ages it was on the contrary. The difference between groups was small and insignificant, except for the live weight at 9 months – 13% higher for the experimental group and with a medium degree of significance ($p < 0.01$).

The advantage of singles in weight was again established when comparing the level of the trait in female lambs of group I. It has been demonstrated with a high degree of significance for birth weight and live weight at 30 days of age and with a low degree of significance at 10 days of age. For female lambs, born in the winter /group II/, a higher live weight was proven with

a high and medium degree of significance at all ages for the singles.

A number of authors have found a strong dependence of birth weight on the lambing season in different breeds (Yilmaz et al., 2007; Rosov and Gootwine, 2013; Benyi et al., 2006). Petrovic et al. (2011) and Mellado et al. (2016) established that lambs born in spring and summer had a higher birth and weaning weight than those born in the autumn and winter. Such difference may be due to nutrition and in particular to the effect of pasture grass and the natural environment, as well as to the care of animals during the production cycle and especially during pregnancy. In Bulgaria, Ivanova and Raycheva (2017 a) indicated a higher live weight in lambs born in December compared to those born in January and February in a sheep flock of Bulgarian dairy synthetic population.

The results obtained in our study did not confirm such a dependence. The season of lambing had significantly affected only the live weight of single male lambs at 10, 30 and 70 days of birth and that of twins at weaning, but its effect varied according to the type of birth. In female lambs, the level of the trait was significantly influenced only in animals at 9 months of age, and was higher for those born in the autumn.

Analyzing the influence of birth type, it was found that single lambs have a higher live weight than twins, regardless of sex and season of birth. The advantage of single lambs in live weight was confirmed also by Ivanova and Raicheva (2017 b) for Ile de France lambs.

Petrovic et al. (2015) established that single lambs received by crossing Pirot x Württemberg breeds were 0.79 kg ($p < 0.05$) heavier at birth ($p < 0.01$) and 0.94 kg ($p < 0.05$) heavier at weaning than twins. The results were similar for single and twin lambs when crossing Sjenica x Württemberg breeds – the weight of the singles was 0.60 kg higher at birth and 1.62 kg higher at weaning compared to twins, with significant differences ($p < 0.01$).

Baneh and Hafezian (2009) reported that the type of birth was important for the body weight of the lambs until weaning. The weight of singles of all ages, as well as their average daily gain, were higher than of twins, due to competition between twins for ewe milk during the suckling period, which led to the less milk intake. Kalantar (2003) and Dixit et al. (2001) also observed higher body weight of single lambs at weaning, while Shahroudi et al. (2003) and Matika et al. (2003) argued that the type of birth had no particular effect on the live weight of lambs.

Our study showed that early mating of ewes did not have a negative impact on the weight development of the progeny, as the seasonal factor had a weak effect on the studied trait. It was mathematically proven only for the live weight of single male lambs at 10, 30 and 70 days of age, for male twins at weaning/as its influence was different according to the type of birth/, and for female twins at 9 months. On the other hand, the type of birth showed priority to single over twin lambs, which has been confirmed by a number of researchers.

Conclusions

Within the current study it was established that the factors season and type of birth affected to a different extent the live weight of lambs from birth to weaning (and 9 months for the females). The effect of the season was weak and indefinite in terms of direction, while the birth type gave a significant advantage to single over twin lambs. The results obtained can be a basis for the hypothesis that if a lamb market is provided at the end of the year, it will be possible to perform early mating of ewes without affecting in a negative way the weight development of the progeny and quantity of production, and hence farm revenues. However, further studies are needed focused on the economic effect of mating female animals in anestrus season and the sale of lambs outside the standard season.

Acknowledgement

This research is published with the financial support of the Ministry of Education and Science on the basis of contract No. КП06-МНФ/14 with the Scientific Research Fund.

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