



## The Effect of Some Environmental Factors on birth weight in Anatolian Merino Sheep

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### ABSTRACT

In this study, the data of 1510 lambs born in a private sheep farm in Eregli district of Konya in 2018-2019 were evaluated. Birth type, birth times, birth weight and lamb sex were investigated in this study. 892 of the lambs were born in 2018 and 618 of them were born in 2019. A total of 1510 lambs were born. 699 of them were born as single, 761 of them as twins and 50 of them as triplets. The total number of sheep was 1096. 681 of the lambs were male and 829 were female. Of the environmental factors affecting birth weight, while the effect of the year was statistically insignificant ( $p < 0.05$ ), the effect of season, type of birth and sex was significant ( $p < 0.01$ ). Lambs born in spring have more live weight than those born in other seasons. The live weight of male lambs was higher than that of females, however the weight of single born lambs was higher than that of twins and triplets.

### 1. Introduction

Akkaraman breed is a sheep breed which is raised in Central Anatolia and nearby regions. It is the highest number among domestic sheep breeds. It has been adapted to bad weather, thirst, hunger and regional conditions. Meat yield and quality can be increased by improving feeding and maintenance conditions. Annual wool yields are 2.2 kg and annual milk yields are 50-60 kg. Their tails are large and weigh up to 4-6 kg. Twinning rates are around 20% (Anonymous 2009).

German mutton merino is one of the main race used for crossbreeding of native breeds in Turkey. The Turkish merino, Anatolian merino, Konya merino, and Malya breeds were obtained by crossbreeding the German mutton merino with Kivırcık and Akkaraman.

The bodies of the Anatolian merino mated with Akkaraman sheep and German mutton merino are covered with white fleece. Anatolian merino sheep have approximately 75-80% of German Mutton Merino genotype with 20-25% of Akkaraman genotype. The body is large. Head length and width is medium, lips are thick, ears are horizontal and wide, the neck is short

and thick, the body is large, deep and long, thighs are full and fleshy, legs are long and strong. Its fleece is thin and consists of homogeneous fiber. Males and females are usually hornless. It is superior to Akkaraman race in terms of wool quality, growth, and fertility. It has a lean, thin, long tail structure, and twin birth rate is between 30-40%. Live body weight is 50-55 kg in adult sheep, milk yield is 70 to 90 liters per sheep, lactation period is 120 days, greasy fleece yield is about 3.0-3.5 kg (Anonymous 2009)

Factors such as birth type, birth weight, sex and dam age, nutritional status of mothers during pregnancy and after birth are effective on the growth characteristics of lambs except for their breed features. Birth weight is an important criterion for the profitability of enterprises. It greatly affects the survival of lambs. Lamb deaths increase with birth weight decreases. The average birth weight of lambs varies between 3-5 kg. There are many factors affecting birth weight such as feeding, birth type, dam age and race (Yılmaz and Akmaz 2000, Odabaşoğlu 1990, Yılmaz 2006, Karakuş and Aşkın 2007, Ceyhan et al. 2013, Sezenler, et al. 2013, Ürüşan and Emsen., 2010). If birth weight is above or below the race's average, it can cause different problems. In particular, it can be said that if the birth weight is below the average, it increases the mor-

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tality rate in lambs. In lambs with birth weight less than 1.7 kg, the death rate is about 94%. On the other hand, the mortality rate is 8.1% in those with an average birth weight of 3.4 kg (MAUD and DUFFELL, 1977). By increasing the birth weight, the viability can be improved to a certain limit. The likelihood of growing slowly in the first 4-6 weeks in lambs with low birth weight is very high. In other words, the effect of birth weight on lamb growth is very important until weaning. However, this effect may decrease after weaning. Another negative effect; carcass fat ratio of lambs slaughtered at a certain weight is higher in low birth weight lambs than high birth weight lambs. Lambs should be slaughtered at a lower weight if an excess fat deposition is not desired. The effect of sex, which is one of the environmental factors affecting birth weight, is higher in the mortality rate of male lambs than female lambs. Therefore, the ratio of females in reared lambs is 2-3% greater. The effect of the birth type; Because of the limited and undernourished mothers, the mortality rate of single lambs is lower than that of multiple lambs. Mortality is higher in multiple births due to low birth weight (Koyuncu and Duymaz, 2017).

The aim of this study is to investigate the effects of some environmental factors on the birth weight of Anatolian merino sheep.

## 2. Materials and Methods

The material of this study consists of 1510 Anatolian Merino lambs born in 2018-2019 in a private sheep farm in Eregli district of Konya. Live weights of lambs were weighed and recorded after birth. At the same time, the sex of the lambs, birth types (singles, twins), birth year and seasons were recorded. 892 of the lambs were born in 2018 and 618 of them were born in 2019. A total of 1510 lambs were born, 699 of them were born in singles, and 761 in twins and 50 in triplets. The total number of sheep is 1096. 681 of the lambs were male and 829 were female.

At birth, lambs were weighed with 5 g precision scales and birth weights were recorded. Lamb sex, birth type and birth seasons are the other factors that were recorded. The distribution of sex, singleton, twin and triplet rates, distribution of births by year and season, birth type and sex distributions by years and seasons were calculated. In addition, the amounts of the factors affecting the birth weight were also calculated.

In the study, variance analysis was performed according to the least squares method using JUMP 7 statistical package program. As a result of the analysis of variance, OEF test (LSD test) was used to compare the sub-groups of the factors that were statistically significant among the factors examined on the birth weight (Anonymous, 2002).

## 3. Results and Discussion

Information on the birth years, birth seasons, lamb sex and birth types of Anatolian merino lambs are given in Table 1. As it can be seen from the table, 59.1% of the total 1510 lambs were born in 2018 and 40.9% were born in 2019. The distribution of born lambs according to the seasons was in spring, summer, autumn and winter seasons 11.5%, 16.4%, 28.5%, and 43.6%, respectively. The highest birth rate was in winter.

42.8% of the births of male lambs took place in 2018 and 48.2% of the births in 2019. 61.4% of female lambs were born in 2018 and 38.6% of them were born in 2019. The distribution of sex according to the seasons was as follows. 5.7% of male lambs were born in spring, 18.4% in summer, 28.5% in autumn and 47.4% in winter. Likewise, the highest birth rates of male lambs occurred in winter. The distribution of female lambs to seasons was 16.3% in spring, 14.7% in summer, 28.5% in autumn and 40.5% in winter. Like male lambs, the highest birth rates of female lambs occurred in winter. In 2018, the birth rate of single births was 51.2% and 48.8% in 2019. 65.8% of twins were born in 2018 and 34.2% were born in 2019. The birth rate of triplet lambs was 66% in 2018 and the birth rate in 2019 was 34%. In the distribution of birth type in seasons, 11.2% of singles were born in spring, 14.3% in summer, 23.4% in autumn and 51.1% in winter. The single birth rate is highest in winter. 11.7% of the twins were born in spring, 19.3% in summer, 32% in autumn and 37% in winter. Twin birth rate was also highest in winter. While 14% of the triplets lambs were born in spring, 46% in autumn and 40% in winter, triplets birth did not occur in summer. The highest triplet rate occurred in the autumn season. Of the total 1510 lambs, 63.8% were born as singles, 34.7% as twins and 1.5% as triplets. The sex distribution of the lambs was 45.1% male and 54.9% female.

Table 1

Descriptive statistics of birth year, birth season, birth type and lamb sex in Anatolian merino sheep

	Birth Year		Birth Season									
	2018		2019		Spring		Summer		Autumn		Winter	
	N	%	N	%	N	%	N	%	N	%	N	%
Lambs born	892	59.1	618	40.9	174	11.5	247	16.4	430	28.5	659	43.6
Sex												
Male	383	56.2	298	43.8	39	5.7	125	18.4	194	28.5	323	47.4
Female	509	61.4	320	38.6	135	16.3	122	14.7	236	28.5	336	40.5
Birth Type												
Single	358	51.2	341	48.8	78	11.2	100	14.3	164	23.4	357	51.1
Twin	501	65.8	260	34.2	89	11.7	147	19.3	243	32	282	37
Triplet	33	66	17	34	7	14	-	-	23	46	20	40
Birth Type						Sex						
Single		Twin		Triplet		Male		Female				
N	%	N	%	N	%	N	%	N	%	N	%	
Lambs born	699	63.8	380.5	34.7	16.6	1.5	681	45.1	829	54.9		

Karabacak et al. (2015) determined in their study on Anatolian merino sheep that the single birth rate was 64.41%, the twin birth rate was 35.59%, 51.03% of the lambs were female and 48.97% were male. While singleton and twin birth rates determined by Karabacak et al. (2015) are similar to this study, the rate of female lambs is lower and the proportion of male lambs is higher. Karabacak and Zülkadir (2014) found in their study on Anatolian merino sheep the twin birth rate as 19.78%, singleton birth rate as 80.22%, and the sex distributions of female lambs as 54.54% and male lambs as 45.46%. The rate of twins obtained in this study is higher than the rate of twins stated by Karabacak and Zülkadir (2014), whereas the sex ratio has similar values. Zülkadir and Karabacak (2013) stated the sex distribution of Akkaraman lambs

as 57.50% male, 42.50% female, and the Awassi lambs sex distribution as 42.11% male and 57.89% female. The rate of males found by Zülkadir and Karabacak (2013) for Akkaraman is higher than that of this study and the proportion of females is lower. The rate of males determined for Awassi is lower than this study and the proportion of females is higher. Karakuş and Aşkın (2007) found the birth type in Anatolian merino as 56.14% singleton, 36.84% twin, and 7.02% triplets. The reported single birth rate is lower than the rate obtained in this study, and the twin rate is similar and the triplet rate is higher.

Table 2 shows the results of the variance analysis calculated according to the least squares mean method of birth weight, year, season, sex, and type of birth.

Table 2

The least squares variance analysis results of the examined effective factors on birth weight

	DF	SOS	MS	F
General	1509	691.98	---	
Years Between	1	0.42	0.42	1.14
Between the Sexes	1	6.26	6.26	16.92
Between Birth Types	2	120.54	60.27	162.89
Between the seasons	3	8.21	2.74	7.41
Error	1502	556.55	0.37	

The least square mean of the factors affecting birth weight are given in Table 3. While the effect of year factor was not statistically significant ( $P > 0.05$ ), the effects of sex, birth type and season factors were statistically significant ( $P < 0.01$ ). The mean birth weight of lambs born in 2018 was 4.59 kg and the mean birth weight of lambs born in 2019 was 4.49 kg. Mean birth weight of lambs born in spring, summer, autumn and

winter season was 4.59 kg, 4.37 kg, 4.33 kg, and 4.40 kg, respectively. The birth weight was highest in the spring season. The mean birth weight of male lambs was 4.59 kg and the mean birth weight of female lambs was 4.46 kg. The effect of birth type on birth weight was also statistically significant ( $P < 0.01$ ). The mean birth weights of singles, twins, and triplets were 4.59 kg, 4.07 kg and 3.62 kg, respectively.

Table 3

The least squares mean (LSM) and standard error (SE) values of affecting factors birth weight

	Birth Weight	P-value
Year	$\bar{X} \pm S_{\bar{x}}$	
2018	4.59+0.055	0.287
2019	4.49+0.113	
Season		0.001
Spring	4.59+0.055 <sup>A</sup>	
Summer	4.37+0.046 <sup>B</sup>	
Autumn	4.33+0.039 <sup>B</sup>	
Winter	4.40+0.098 <sup>AB</sup>	
Sex		0.001
Male	4.59+0.055 <sup>A</sup>	
Female	4.46+0.050 <sup>B</sup>	
Birth Type		0.001
Single	4.59+0.055 <sup>A</sup>	
Twin	4.07+0.055 <sup>B</sup>	
Triplet	3.62+0.109 <sup>C</sup>	

Yılmaz and Akmaz (2000) stated in their study carried out to investigate the effect of the season on the growth characteristics of lambs that seasons had an effect on the growth of lambs in all periods except the birth, and the birth type and sex had a statistically significant effect on live weight in the first and second month. This report of Yılmaz and Akmaz is not similar to the results of current study. Odabaşoğlu (1990) found in their study with the aim of investigating the effects of sex on the growth of Anatolian Merino lambs that the effect of sex on the 15th and 30th days was insignificant, but significant at  $P < 0.05$  level on the 45th day and  $P < 0.01$  in the other periods. In contrast to Odabaşoğlu (1990)'s report, the effect of sex on birth weight is statistically significant in current study. Yılmaz (2006) determined that the effect of birth type, sex, and breed on the birth weights of Akkaraman breed and crossbred lambs was statistically significant. The results of current study are consistent with the declaration of Yılmaz. Ceyhan, et al. (2013) remarked that birth type and dam age were effective on the birth weight of lambs, but sex was not effective. While the effect of birth type found by Ceyhan et al. (2013) on birth weight was parallel to the results of current study, but the effect of sex on birth weight was not similar. Sezenler et al. (2013) expressed that the effect of sex, year and type of birth was important on the birth weight of Karacabey merino lambs. The results of Sezenler et al. (2013) reports are similar to current study except for the year factor. Ürüsan and Emsen (2010) stated that the effect of breed and season is significant on the birth weight of lambs in Tushin, Awassi, Morkaraman and their crossbreed with Romanov. In this study, the effect of the season on birth weight is similar to the results found by Ürüsan and Emsen (2010). Foster et al. (1988) stated that lamb birth weights may increase in spring and summer periods, during which the environmental temperature increases and environmental conditions of the birth improve. In this study, birth weight of lambs born in spring season is similar to that of Foster et al. (Year).

As a result, 59.1% of total 1510 lambs were born in 2018 and 40.9% of them in 2019. The highest birth rate was 43.6% in winter and the lowest birth rate was 11.5% in spring. While 42.8% of males were born in 2018, 48.2% were born in 2019, 61.4% of females were born in 2018 and 38.6% in 2019. The highest rate of male births was in winter with 47.4%, while the lowest birth rate was 5.7% in spring. The highest birth rates of females occurred in winter with 40.5% and the lowest rate was 14.7% in summer. 51.1% of singles, 37% of twins and 40% of triplets were born in winter. The rate of single births was 63.8%, twin births were 34.7% and triplet births were 1.5%. The distribution of sex in born lambs was 45.1% male and 54.9% female. While the effect of the year on the birth weight of the lambs was statistically insignificant, the effect of season, birth type and sex were statistically significant ( $P < 0.01$ ). The birth weight of lambs born in spring season is higher than those born in other seasons, the birth weight of male lambs is higher than that of females, and the birth weight of singles is higher than that of twins and triplets.

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