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GROWTH INTENSITY OF LAMBS WITH A DIFFERENT SEX AND TYPE OF BIRTH FROM THE COPPER-RED SHUMEN BREED

Genoveva STAYKOVA[1*], Margarit ILIEV[2], Todor TSONEV[3]

[1]Agricultural Institute - Shumen, 3 Simeon Veliki Blvd, 9700, Shumen, Agricultural Academy, Sofia, Bulgaria
[2]Institute of Agriculture - Karnobat, 1 Industrialna Str., 8400, Karnobat, Agricultural Academy, Sofia, Bulgaria
[3]Research Center for Agriculture - Targovishte, 91 Kyustendzha Str., 7700, Targovishte, Agricultural Academy, Sofia, Bulgaria

Corresponding author email: staikova666@abv.bg

Abstract

The aim of the research was to study the growth intensity of lambs of different sexes and types of birth from the Copper-Red Shumen sheep breed. Subject of the research were 30 lambs born during the 2024 lambing season. Four (4) groups of lambs were formed, equalized according to the method of analogues by type of birth (singles, twins), gender (male, female) and age. Live weight was recorded at birth, 10 days, 30 days, 70 days and 90 days. It has been established that the Copper-Red Shumen sheep breed is characterized by a good growth intensity of lambs until weaning. The average live weight at birth for both sexes was close in values, after which female lambs reached an average of 21.171 kg and male lambs – 25.120 kg at 90 days. The average daily gain of lambs ranged from 0.162 kg to 0.203 kg for females by periods and from 0.184 kg to 0.253 kg for male lambs. Female lambs had the highest gain in the period 30-70 days, and male lambs during the 70-90 days. The results indicate that the Copper-Red Shumen breed has good potential for the production of quality lamb meat.

Key words*: Copper-Red Shumen sheep breed, live weight, average daily gain, sex, type of birth.*

INTRODUCTION

Sheep of the Copper-Red Shumen breed are typical representatives of the autochthonous Bulgarian breeds, a product of national selection with a centuries-old history. The animals are reared under extensive conditions using traditional, environmentally friendly technology, mainly in the North-Eastern region of Bulgaria. Local breeds are a valuable part of the national gene pool and, as locally adapted, are a unique source of genes for improving the health and sustainability of modern cultural breeds and populations. The preservation of genetic resources in sheep breeding and their rational use are topics developed by our scientists in this field (Aleksieva, 1987; Aleksieva et al., 1995; Genkovski, 2002; Panajotov et al., 2003; Hinkovski et al., 1984). The Copper-Red Shumen breed, like most local sheep, has a combined purpose - for meat, milk and wool. This breed is not highly productive, but it produces ecologically clean and high-quality products with specific taste qualities. The local Copper-Red Shumen sheep is the subject of scientific interest in the works of Ganchev (1926), Nakev (1977), Boykovski (2003), Staykova (2005), Hristova (2013).

Lambs from the Copper-Red breed were an expensive and sought-after commodity in the markets of Constantinople before the Liberation (Hlebarov, 1940). Vuchkov (2020) points out the good potential of our local sheep breeds for the production of quality meat. Slavova & Staykova, (2021) found that the largest relative share of income in the various productive areas of sheep breeding in our country comes from the sale of animals for meat. Jawasreh et. al. (2018) studied the dynamics of live weight and growth to weaning of Awassi lambs in Jordan. In extensive farms with local breeds, the growth intensity of the offspring and the ability to create growth are particularly important. The sale of lamb meat is a major income and provides a chance for sustainable development, which ensures the

economic survival of farms in Bulgaria. The production of high-quality lamb and sheep meat with unique taste is an important advantage of autochthonous breeds of sheep in the conditions of market competition with specialized introduced meat-producing breeds. The sale of lambs immediately after weaning is a traditional practice in the aboriginal direction. There is not enough information in the scientific literature on the weight development of lambs of the Copper-Red Shumen breed until weaning. The results of such analyses are necessary for the implementation of state policy in the sector in accordance with the European directives for the protection of biological diversity.

The aim of this research was to analyse the growth intensity of lambs with different type of birth and sex from the Copper-Red Shumen breed.

MATERIALS AND METHODS

An experiment was conducted to track the weight development of lambs of the Copper-Red Shumen breed in the period up to weaning. Subject of the study were 15 female and 15 male lambs born during the 2024 lambing campaign in a herd of purebred Copper-Red sheep under selection control. Four groups of lambs were formed, equalized by the method of analogues by type of birth (singles, twins), sex (male, female) and age. The live weight trait was recorded at birth /within 24 hours/, at 10 days, at 30 days, at 70 days and at 90 days. Live weight was measured in the morning with an accuracy of 0.1 kg. The exact age at weaning in days was recorded, then it was equated to 90 days, for the purpose of data comparability. A total of 150 measurements of the live weight of the lambs were made, based on which the average daily gain by periods was calculated for both sexes and for different types of birth. The lambs have constant access to drinking water and salt for licking. The animals have free access to a concentrated starter mixture with 18% crude protein, alfalfa hay and straw. Feeding and adaptation to different types of feed in the period until weaning is without quantitative restrictions. The data were processed using the method of variation statistics with the software MINITAB 16. The significance of the differences between the levels of the factor were established based on the distribution degree measured by Student.

RESULTS AND DISCUSSIONS

The data in Table 1 show that female lambs of the Copper-Red Shumen breed of sheep were born with an average live weight of 4.347 kg, at 10 days they weighed an average of 5.937 kg, at 30 days - 9.349 kg, at 70 days - 17.463 kg and at 90 days - 21.171 kg. The results show that single female lambs achieved a 14.04% to 18.32% higher average live weight by age than lambs born as twins during the study period. The weight of female twins was significantly lower in the period from 30 days to weaning ($P< 0.01$, $P< 0.05$). Single lambs show a 19.39% higher absolute gain during the study period ($P<0.05$). The dynamics of the variance indicates a higher variation in the studied trait in lambs born as twins, the coefficients of variation range from 16.72% to 20.20%. In the oldest literary sources, Ganchev (1926) reported a lower average live weight at birth of lambs of the Copper-Red Shumen breed (2,900 kg), but the average weights at 70 and 90 days (17.375 kg and 21.675 kg) were very close to our results. Staykova (2005) established an average live weight at 90 days of female Copper-Red lambs (21.244 kg) very close to our results. These comparisons show that the Copper-Red Shumen breed of sheep has sustainably preserved its main characteristics over the years and has been preserved for the national gene pool in its authentic form. Results of a similar study were also published by Slavova et al., (2018), finding a lower average live weight at birth, but higher at subsequent ages up to 70 days for female lambs of the Thracian fine-fleece breed, compared to our study. Iliev et al. (2022) found that female lambs of the Karnobat local breed are born with a lower average live weight and by the end of the first month are lighter than the Copper-Red ones. However, at 70 and 90 days they show higher values for this trait. The variation in weight is greatest at birth and at 10 days of age, after which a downward trend in the variance follows (Iliev et al., 2022). Todorov et al. (2023) published lower values for the average live weight of Karakachan female lambs at

birth, at 10, at 30 and at 70 days, compared to our study. The same authors show lower birth weight for the Middle Rhodope female lambs, but at the next three ages they surpass the Copper-Red in terms of their own productivity. At 30 days, the Middle Rhodope female lambs weigh 32.73% more than the Copper-Red breed (Todorov et al., 2023).

Table 1. Live weight of female lambs from the Copper-Red Shumen breed from birth up to weaning

Trait	Female lambs - total n = 15			Female lambs - singles n = 10			Female lambs - twins n = 5		
	x	Sx	CV%	x	Sx	CV%	x	Sx	CV%
Live weight – birth, kg	4.347	0.161	14.36	4.560	0.141	9.76	3.920	0.340	19.38
Live weight – 10 days, kg	5.937	0.254	16.54	6.250	0.276	13.99	5.310	0.428	18.04
Live weight – 30 days, kg	9.349	0.409	16.95	9.866*	0.502	16.09	8.316*	0.473	16.72
Live weight – 70 days, kg	17.463	0.780	17.30	18.590*	0.816	13.88	15.210*	1.002	17.94
Live weight – 90 days, kg	21.171	0.997	18.25	22.550**	1.004	14.54	18.420**	1.060	20.20
Total gain for the whole period, kg	16.825	0.911	20.98	17.987*	0.994	17.47	14.500*	1.050	23.12

*** – P< 0.001; ** – P< 0.01; * – P< 0.05

Female Copper-Red lambs showed an average daily gain until weaning of: 0.162 kg, 0.171 kg, 0.203 kg and 0.185 kg by periods, and for the entire study period - an average of 0.187 kg per day (Table 2). The highest gain was shown by female offspring in the period from 30 to 70 days (0.203 kg) with statistical certainty of the differences between the average gain of singles and twins (P< 0.05). The results show that single female lambs achieve from 17.13% to 21.10% higher gain at different ages, compared to twins. Significantly lower average daily gain was given by twins from 30 to 70 days and average daily gain for the entire period (P<0.05). The coefficients of variation are highest in lambs with different types of birth for the period up to 10 days and reach 42.74% in female twins. Characteristic for both types of birth is the gradual decrease in variability up to 70 days and again an increase in variability by the end of the study period. This is the period in which the maternal effect gradually decreases and the offspring demonstrate their own growth abilities. It was found that in terms of the total average daily gain for the entire study period, female lambs born as twins at the end of the study are characterized by 19.05% lower total gain (P< 0.05) compared to singles. Iliev (2002) published similar values for daily gain of the Karnobat fine-fleece breed until weaning, an average of 0.208 kg. Ivanova & Raycheva (2009) found higher than our results for average daily gain of female lambs of the Pleven Blackhead sheep breed up to 30 days - 0.249 kg, until weaning - 0.287 kg and a total average gain for the period of 0.268 kg. Tzonev (2014) provides data on a higher average daily gain until weaning for female lambs of the Northeastern Bulgarian fine-fleece breed of sheep compared to the Copper-Red lambs. Twins in the same study demonstrated a 3.6% higher gain than singles in the total period until weaning (Tzonev, 2014). Slavova et al. (2018) also found higher average daily gain of female lambs of the Thracian fine-fleece breed up to 70 days compared to our study. The average gain values of female Copper-Red lambs found are lower than the data published by Iliev et al. (2022) for the growth of the Karnobat local breed of sheep up to weaning. Todorov et al. (2023) obtained similar results regarding average daily gain of Karakachan female lambs, but higher values for the gain of the Middle Rhodope lambs up to 70 days. Staykova et al. (2023) found the highest average daily gain for the period 30-70 days in Karnobat fine-fleece lambs of both sexes and in both types of birth.

Table 2. Average daily gain of female lambs from the Copper-Red Shumen breed up to weaning

Trait	Female lambs – total, n = 15			Female lambs – singles, n = 10			Female lambs – twins, n = 5		
	x	Sx	CV%	x	Sx	CV%	x	Sx	CV%
Gain – birth-10 days, kg	0.162	0.017	39.79	0.173	0.021	38.52	0.139	0.027	42.74
Gain – 10-30 days, kg	0.171	0.013	28.48	0.181	0.016	28.52	0.150	0.017	25.88
Gain – 30-70 days, kg	0.203	0.012	22.62	0.218*	0.012	16.71	0.172*	0.023	29.80
Gain – 70-90 days, kg	0.185	0.013	27.62	0.198	0.015	23.11	0.161	0.026	35.85
Total average daily gain for period, kg	0.187	0.010	20.98	0.200*	0.011	17.47	0.161*	0.017	23.12

*** – P< 0.001; ** – P< 0.01; * – P< 0.05

The average live weight values of male lambs of the Copper-Red Shumen breed at the same ages were: 4.341 kg, 6.301 kg, 9.974 kg, 20.070 kg and 25.120 kg, respectively (Table 3). The results show that lambs of both sexes are born with approximately the same weight, but in the process of growth and development, male offspring show more intensive growth and give 19.07% higher absolute gain than females for the entire period until weaning. Single male lambs achieve from 13.64% to 16.79% higher average live weight by age than lambs born as twins during the study period. The weight of male twins at birth and at the end of the 90-day period is significantly lower (P<0.05). Single lambs showed 13.64% higher absolute gain for the study period. The dynamics of the variance showed a higher variation in the studied trait in lambs born as twins, the coefficients of variation ranged from 20.95% to 29.81%. Tzonev (2014) found very similar results to ours for live weight of single male lambs of the Northeastern Bulgarian fine-fleece breed up to 70 days. Twins of the Copper-Red Shumen breed are born with a slightly higher average weight, but then show about 12% lower average live weight than fine-fleece lambs born as twins. Iliev et al. (2017) found lower live weight at birth and at 10 days and close to ours at 30 days in male lambs of the Karnobat local sheep, but higher average daily gain for the period of our study. Vuchkov (2020) reports a 26.878 kg average live weight of Karakachan male lambs at 90 days, which is slightly higher than our results. According to Todorov et al. (2023) male Karakachan lambs have a lower average weight at birth, by 10 days they catch up with Copper-Red lambs, but then they lag behind in weight development again and are weaned at a lower live weight. The Middle Rhodope male lambs are born with a slightly lower weight than the Copper-Reds, at 10 days they are equal to our study, at 30 days they are 23% superior to the Copper-Reds and at 70 days they are again slightly lower than our results (Todorov et al., 2023). Vuchkov & Encheva (2023) give lower average live weight values for Karakachan male lambs of both types of birth up to 90 days, but higher than our results for male lambs of the Duben breed up to weaning.

Table 3. Live weight of male lambs from the Copper-Red Shumen breed from birth up to weaning

Trait	Male lambs - total n = 15			Male lambs - singles n = 10			Male lambs - twins n = 5		
	x	Sx	CV%	x	Sx	CV%	x	Sx	CV%
Live weight – birth, kg	4.341	0.231	20.69	4.586 *	0.273	18.84	3.820 *	0.358	20.95
Live weight – 10 days, kg	6.301	0.381	23.40	6.675	0.448	21.20	5.554	0.641	25.80
Live weight – 30 days, kg	9.974	0.650	25.23	10.522	0.757	22.76	8.880	1.180	29.81
Live weight – 70 days, kg	20.070	1.070	20.66	21.250	1.250	18.54	17.700	1.720	21.71
Live weight – 90 days, kg	25.120	1.280	19.79	26.360 *	1.460	17.50	22.630 *	1.320	22.96
Total gain for the whole period, kg	20.790	1.110	20.76	21.780	1.310	18.98	18.810	1.970	23.42

*** – P< 0.001; ** – P< 0.01; * – P< 0.05

Male lambs of the Copper-Red Shumen breed showed an average daily gain until weaning of: 0.198 kg, 0.184 kg, 0.252 kg and 0.253 kg by periods, and for the entire study period – an average of 0.231 kg per day (Table 4). Compared to female offspring, the average daily gain for the period was 19.05% higher. Male offspring showed the highest growth in the period from 70 to 90 days (0.253 kg). The results show that single male lambs achieved 13.54% to 17.62% higher growth at different ages, compared to twins. Twins showed a significantly lower average daily gain from 30 to 70 days and a total average daily gain for the entire period ($P<0.05$). The coefficients of variation are highest in lambs with different types of birth for the period from 10 to 30 days and reach 44.68% in male twins. Characteristically, in both types of birth, the highest variability is up to 30 days, after which it decreases and its increase is observed towards the end of the period, especially in twins. During this period, individuals rely more on their own potential for creating growth, regardless of the mothers' milk yield. It was found that in terms of the total average daily gain for the entire studied period, male lambs born as twins at the end of the study are characterized by 13.64% lower total gain ($P<0.05$). Copper-Red male lambs show lower average daily gain until weaning, compared to lambs from the North East Bulgarian fine-fleece breed (Tzonev, 2014). The same author found that twin lambs give higher average daily gain after the first month, which indicates the realization of the compensatory abilities for growth intensity during multiparity of the fine-fleece breed. Todorov et al. (2023) published data on lower average daily gain by periods for Karakachan and Middle Rhodope male lambs up to 70 days compared to our results. Vuchkov & Encheva (2023) found similar data on average growth of male Karakachan lambs up to 90 days and 29% higher average daily gain for Duben male lambs from birth to weaning, compared to the Copper-Red Shumen breed of sheep.

Table 4. Average daily gain of male lambs from the Copper-Red Shumen sheep breed up to weaning

Trait	Male lambs - total n = 15			Male lambs - singles n = 10			Male lambs - twins n = 5		
	x	Sx	CV%	x	Sx	CV%	x	Sx	CV%
Gain – birth-10 days, kg	0.198	0.022	43.13	0.210	0.029	43.98	0.173	0.032	41.58
Gain – 10-30 days, kg	0.184	0.016	33.92	0.192	0.018	30.00	0.166	0.033	44.68
Gain – 30-70 days, kg	0.252	0.012	18.92	0.268*	0.015	17.66	0.221*	0.014	14.68
Gain – 70-90 days, kg	0.253	0.016	24.05	0.256	0.016	19.35	0.246	0.038	34.79
Total average daily gain for period, kg	0.231	0.013	20.76	0.242*	0.015	18.98	0.209*	0.022	23.42

*** – P<0.001; ** – P<0.01; * – P<0.05

CONCLUSIONS

The Copper-Red Shumen sheep breed is characterized by good growth intensity of the lambs until weaning. A similar average live weight at birth of both sexes has been established, after which the female lambs reached an average of 21.171 kg, and the male lambs 25.120 kg respectively at 90 days.

The average daily gain of the lambs of the Copper-Red Shumen breed ranges from 0.162 kg to 0.203 kg for the females by periods and from 0.184 kg to 0.253 kg for the male lambs. The highest gain is achieved by the female lambs in the period 30 - 70 days, and the male lambs from 70 to 90 days.

The results show that the Copper-Red Shumen breed has a good potential for producing quality lamb meat. This advantage and balanced nutrition of the sheep, especially of the mothers with twins, are prerequisites for sustainable development of the farm.

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