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Growth and Development of Lambs of the Akzhaik Sheep Depending on Selection

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Abstract

The study was performed in the western region of Kazakhstan with the Akzhaik meat-and-wool sheep with crossbred wool. This article presents the results of the studies of growth and development of the Akzhaik sheep lambs up to 8 months of age obtained from various selection options. The aim was to obtain preliminary information for future studies that would provide a scientific basis for ways of increasing production of sheep breeding due to a more complete use of the genetic potential of the breed. Encouraging results were obtained in terms of growth and development of lambs that can be implemented for production of high quality meat.

Keywords

Akzhaik meat-and-wool crossbred sheep; Selection options; Dynamics of growth and development

Introduction

In Kazakhstan, one of the most promising meat-and-wool breeds of sheep with crossbred wool is the Akzhaik meat and wool breed that was tested in 1996 in the Western region of the Republic. According to Terentyev [1], a distinctive feature of breeding this species is the fact that only crossbred animals were used for the breed-forming process: fine, semi-fine, and coarse wool ewes and rams of the Lincoln and Romney Marsh breeds, with 1/4-3/4 strain of these breeds with subsequent breeding of desirable type "in itself". Sheep feature high meat and wool productivity: live weight of rams is 94-137 kg, that of ewes – 55 to 70 kg, shearing of scoured wool is 4.8-6.1 kg and 2.5-3.1 kg, respectively, crossbred wool is 12-18 cm long, fineness is of quality 58-50 (50-46 in rams) with large wavy crimps, white with luster shine.

Since 1996, when the breed had been tested, purposeful work was undertaken in order to create a new intrabreed commercial meat type of sheep of the Akzhaik meat and wool breed. Groups of animals that differ in meat qualities with regard to market requirements and are adapted to the sharply continental climate were formed. Many years of scientists' work came to success, and in 2013 a patent was granted for the intrabreed commercial meat type. Animals of the intrabreed commercial meat type exceed the standard in terms of live weight by 4.8-20.0%; in terms of shearing of original wool by 13.1-24.2%, in terms of shearing of scoured wool by 13.6-33.3% and in terms of length by 4.5-18.4%.

Formation of animal productiveness is mainly influenced by the nature of their growth and development, according to Razoznaev [2] and Yerokhin *et al.* [3].

Growth is understood as an increase in live body weight, morphologically based on cell division and changing their number with increasing size and increasing the weight of extracellular structures. This development constitutes a differentiation, i.e., qualitative amplification of cell structure and its functions. According to Novikov [4] and Yerokhin *et al.* [5], growth and development are two sides of the same complex process occurring in the animal unit.

References [6-9] note that studying growth is based on the fact that animal development depends to a greater extent on body weight.

Live weight is mainly an important factor in characterizing animal's meat productivity. It can be regarded as a summarizing indicator of growth and development, according to Kosilov *et al.* [10]. It is not only a generic but also a breed indicator, largely due to heredity, which is manifested at all stages of ontogeny, according to Yuldashbaev *et al.* [11].

Live weight at different age has different biological and economic value. Live weight is the most available and characteristic indicator for determining maturity rate in animals.

Within the same breed, precocity and meat production rate can be measured always in the dynamics of the body weight. In meat and wool sheep breeding, consideration of this indicator and regularity of its changing over periods of growth from the very birth was considered to be very important by Chamuha; Traisov and Terentyev; Hamiruev *et al.* [12-14].

The size of newborn lambing is an important indicator, which characterizes not only lamb development during prenatal period, as noted in Adrakhmanov *et al.*; Bayzhumasheva *et al.* [15,16], but its subsequent viability and development as well.

References [17,18] noted that the dynamics of body weight is due to several factors such as genotype, year of birth, lamb gender, ewe age, ewe body weight during the breeding season, and ewes keeping and feeding.

Methods

The study was conducted during the period from November 2013 to December 2014 in a farm for Akzhaik meat and wool sheep breeding of the West Kazakhstan Agricultural University named after

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Zhangir-Khan. The essence of the experiment was the comparing of growth and development of lambs obtained by homogeneous and heterogeneous selection:

- the first group was represented by the Akzhaik meat and wool rams of meat type ($n = 3$) with nonlinear Akzhaik meat and wool ewes ($n = 100$);
- the second group was represented by the Akzhaik meat and wool rams of meat type ($n = 3$) with Akzhaik meat and wool ewes of meat type ($n = 100$); and
- the third group was represented by nonlinear meat and wool rams ($n = 3$) with nonlinear Akzhaik meat and wool ewes ($n = 100$).

Weight growth was studied by weighing experimental lambs at birth and at the age of 4.5 and 8 months before morning feeding.

Lambs growth rate can be judged more objectively by the absolute growth rate and the absolute weight gain, which are indicators of young animals' growth rate, and, therefore, of their precocity. These indicators were calculated by formulas proposed in Krasota *et al.* [19].

Results and Discussion

Age-related changes in body weight of meat and wool lambs are shown in Table 1.

As shown in Table 1, lambs were characterized by satisfactory body weight at birth and later on in all periods of weighing; the influence of parental couples on growth and development of the offspring shows especially the influence of the father. Both in the first and in the second group, where fathers were tupping rams of meat type, their influence on the growth and development of the offspring can be seen.

Thus, the offspring of the second group, where both parents were animals of meat type, surpassed their counterparts in both the first and the third group, which is in line with the data of Panin *et al.* [20] that found that with the increasing live body weight of ewes, the weight of the offspring also increases.

In selection options with tupping rams of meat type, influence of fathers is observed. The offspring of meat and wool rams of meat type was more numerous in I and II selection groups.

Featuring higher body weight at birth, rams and ewes in the first and the second groups are still superior as compared to the offspring in the third group from nonlinear animals in the age of 4.5 and 8 months.

So, rams in the first group exceeded their counterparts in the third group at birth by 0.3 kg, or 2.3%, in the second group by 0.4 kg, or 9.7%.

Age	Groups					
	I-meat × nonlinear		II-meat × meat		III-nonlinear × nonlinear	
	n	M ± m	n	M ± m	n	M ± m
Rams						
At birth	42	4.4 ± 0.07	45	4.5 ± 0.08	41	4.1 ± 0.08
4.5 months	38	32.7 ± 0.24	41	34.0 ± 0.21	37	31.3 ± 0.17
8 months	35	37.2 ± 0.51	37	38.7 ± 0.47	34	35.5 ± 0.39
Ewes						
At birth	47	4.1 ± 0.05	46	4.2 ± 0.06	43	4.0 ± 0.05
4.5 months	42	27.8 ± 0.19	43	28.1 ± 0.28	39	27.2 ± 0.21
8 months	38	31.3 ± 0.42	39	31.8 ± 0.37	35	30.4 ± 0.44

Table 1: Dynamics of lambs' live body weight (kg)

Groups	Growth	Periods			
		From birth to weaning (126 days)		From weaning to 8 months (100 days)	
		Rams	Ewes	Rams	Ewes
I-meat type of ram × nonlinear ewes	Absolute (kg)	28.3	23.7	45	35
	Absolute growth rate (g)	225	204	45	35
II-meat type of ram × meat type of ewes	Absolute (kg)	29.5	23.9	47	37
	Absolute growth rate (g)	234	209	47	37
III-nonlinear ram × nonlinear ewes	Absolute (kg)	27.2	23.2	42	32
	Absolute growth rate (g)	215	192	42	32

Table 2: Absolute growth and absolute growth rate of the experimental lambs

Accordingly, the first and the second groups of rams at the moment of weaning exceeded the third one by 1.4 kg and 2.7 kg, and in the age of 8 months by 1.7 kg and 3.2 kg, respectively.

Some better results were observed in the second group, where large rams and ewes were used, i.e., in case of homogeneous selection.

Absolute growth and absolute growth rate of the experimental lambs are shown in Table 2.

Absolute growth from the birth to weaning in all groups of rams ranged between 27.2 and 29.5 kg, with the best results reported in the first two groups, where meat type tupping rams were used.

Thereafter, from weaning to 8 months of age, the absolute growth rates sharply reduce. This is caused by weaning from mothers, i.e., by deprivation of mother's milk and deterioration of feeding conditions.

One of the indicators of growth intensity in lambs is the absolute growth rate of live weight. The highest absolute growth rates from birth to weaning were observed in lambs from selections with larger meat type animals. So, at the age of weaning, rams of selection (second group) "meat × meat" had the absolute growth rate equal to 234 g, rams of the first group (meat × nonlinear) – 225 g, which was higher than in the third group by 8.8 kg.

A similar pattern was observed with ewes. The first and the second groups exceeded the third group by 0.5 kg and 0.7 kg, respectively.

Lambs grow most intensively during the preweaning period. In the subsequent periods, the absolute growth rate significantly reduces. If the absolute growth rate from the birth to weaning amounted to 215-234 g, from weaning to 8 months, they ranged between 32 and 47 grams – by groups of rams – 42 to 47 g, ewes – 32 to 37 g.

Conclusions

The detected changes in growth rate by periods can, evidently, be explained by the influence of hereditary factors.

Thus, our experiment showed that the use of larger animals (of meat type) for parents makes it possible to obtain larger offspring.

Materials of the research were obtained within the framework of the program "Improving genetic potential of sheep (fine, semi-fine, and meat-and-lard type) and goats", state registration number 0112 RK 03038 for the event: "Development of effective methods of sheep and goats breeding and reproduction with improving existing and creating new breeds, types and lines" and will be further used in breeding of meat and wool crossbred sheep.

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