Application of biological engineering methods to improve the productivity of Tuvan short-fat-tailed sheep

Raisa Irgit[1], Chechena Sambu-Hoo[2], Songukchu Mongush[2], Bair Ludu[2], Chechek Lopsan[2]
[1]Tuva State University, Kyzyl, Russia, scopush@gmail.com
[2]Tuva Scientific Research Institute of Agriculture, Kyzyl, Russia

ABSTRACT

This article presents the results of many years of research on the use of semi-coarse-wool breeds to improve Tuvan short-fat-tailed sheep. On the basis of the assessment of biochemical and biomechanical parameters of experimental animals, the schemes of interbreed crossing are proposed. A comparative analysis of the data on the exterior and productive indicators of hybrid offspring of different generations, their adaptability to natural-climatic and forage conditions was carried out. The calculation of productivity indices showed the validity of the proposed bioengineering approach to improve economically useful characteristics of sheep.

Key words: biological engineering, Tuvan sheep, crossing, productivity.

1. INTRODUCTION

Tuvinian short-fat-tailed breed is one of the most numerous coarse-wooled sheep breeds in Russia. It was created by folk selection for many centuries, and as an independent one was approved in 1993. Tuvan sheep are excellently adapted to the sharply continental climate, year-round grazing, unpretentious to feed, mobile, able to use snow instead of water, rapidly accumulate fat at favorable times, which is an adaptive property developed in steppe and mountain pastures [4].

The first scientific research on the crossing of local sheep with semi-coarse-wooled rams was carried out at the Tuva Agricultural Experimental Station, when in 1969 rams of the Saraja semi-coarse-wool breed were brought to the republic in order to create a semi-coarse-wool direction of sheep breeding in the southern zone. As A.M. Rogozhnikov writes, "taking into account the needs of the national economy in semi-coarse wool of white and light gray color, SibNIPTIZH has been working since 1968 to create a new type of semi-coarse-wool sheep of meat, wool and fur coat direction, well adapted in semi-desert areas with year-round pasture content in the south of the Tuva ASSR ".

Experimental research on the crossing of Saradzha rams with local coarse-wooled and fine-wooled-coarse-wooled hybrid queens was carried out by SibNIPTIZh employees V.I.Korotkov and A.M. Rogozhnikov from 1970 to 1973 in the conditions of the Ak-Erik collective farm in the southern dry steppe zone of the republic [9, 11, 12].

The Sarajin breed among fat-tailed sheep is considered the best in terms of wool productivity. The coat is semi-coarse, white, with low sheen, contains a lot of fluff and almost no dead hair. Fleece of a braided structure, length of braids 12-19 cm, fluff - 8 cm. The annual cut of wool from rams is 3.7-4.5 kg, from queens 3.0-3.5 kg. Fertility is 102-108 lambs from 100 queens. The live weight of rams is on average 65 kg with fluctuations from 42 to 95 depending on the grazing conditions, queens - 44-58 kg, at birth in rams - 5.3, in daisies - 5 kg, with beating, respectively - 31.7 and 29 , 2 kg [2, 7].

According to A.M. Rogozhnikov. (1974), in Tuvan queens the live weight ranged from 29 to 50 in the spring and from 39 to 63 in the fall, in rams - from 50 to 89 kg, the wool of the queens was cut 1.5-1.7, in rams - 2.3-2, 5 kg, the wool is coarse, in 80% of the runes the presence of dead hair and a large amount of thin fluff was noted, the length of the braid is 12-14, the down zone is 6-8 cm, the average fineness of the awn and dead hair is 115.7, down is 18.5 , transitional hair - 37.8 microns, the ratio of fibers of different types: down - 83.9, transitional hair - 6.7, awn - 9.4%. The mass of rams at birth is 4.21 kg, and that of rams is 4.13.

During the experiment, hybrids of the first and second generation were obtained. The authors have established a positive effect of crossing: the live weight of the crossbred half-bred offspring increased, the wool was cut, the output of young animals to the cut. Adult crossbred rams of the 1st generation surpassed the Tuvan ones in live weight by 10.9, uterus - by 1.4, of the 2nd generation - by 4.3 and 1.3 kg, in terms of wool shearing - by 1.47 and 1.49 kg, respectively. In the wool of the 1st generation hybrids, the proportion of fluff was higher by 0.3, transitional hair - by 4.8, awn - less by 5.1%, fluff and transitional hair were thicker by 1.4 and 3.2 μm, respectively, and awn thinner by 55.5 microns, plait and downy zones were longer by 2.1 and 3.7 cm, respectively, dead hair was absent in 90% of animals. The slaughter yield

in hybrids at 8.5 months was 1.3% higher, at 18 months - 0.2% lower. A negative phenomenon was the presence of a large number of crossbreeds with solid black color and piebald.

As noted by SS Mongush, crossing of Tuvan sheep with Saraja rams yielded positive results, however, deep absorption reduced the viability of young animals in the winter tebenevka, especially high-blooded hybrids [15].

2. MATERIALS AND METHODS

In 1987-1990 work was carried out on crossing Tuvan sheep with rams of the Altai fat-tailed breed with semi-coarse wool. The Alai breed was bred in Kyrgyzstan, it is characterized by a well-defined meat-sucking productivity, a strong constitution and a well-developed skeleton. Live weight of queens is 58-62 kg, of rams - 96-105 kg, lambs for chopping at the age of 4-5 months weigh 30-35 kg. When slaughtered from 5-6-month-old lambs, carcasses weighing 16.2 kg are obtained. The breed has a high meat content (6.1). The wool of Alai sheep is heterogeneous, white in color, shiny, braided structure. It contains 56.7% of down, 13.7% of transitional hair and 29.6% of awn. Dead and dry hair is rare.

The average length of the plait ranges from 17-30 cm, down - 8-12 cm. Cut the wool from the queens 2.5-3.0 kg, from rams - 4.5-5.5 kg with a yield of 65-70% pure fiber ... Fertility is 105-106 lambs per 100 queens. A feature of the Alai breed is the absence of natural molting in most sheep, which is characteristic of other breeds of fat-tailed sheep [2, 3].

The Alai rams used in this crossing, in comparison with the Tuvan ones, had a live weight higher by 13.0 kg, a wool cut by 1.45 kg, and a wool length by 6.0 cm

Alai-Tuvan hybrids of the 1st generation surpassed the purebred Tuvan ones both in live weight and in productivity. The difference in favor of hybrids increased with age and was 0.9 kg at birth and 9.0 kg at 1.5 years. She cut wool at 4 months. was higher by 0.23 kg, at 1.5 years - by 0.61 kg, wool length by 3.0 and 5.0 cm, respectively. 1.5-year-olds in carcass weight had an advantage of 3.2 kg, for slaughter yield - 2.1%. In terms of the yield of washed wool, the hybrids were inferior to the Tuvan ones with a difference of 2.0%.

3. RESULTS AND DISCUSSION

The summary table 1 shows the indicators of the Saradzha-Tuva and Alai-Tuva hybrid young animals.

Table 1: Indicators of crossbred young animals when using semi-coarse wool breeds on local queens of the southern zone

Improver breed	Rams		1st generation mixes							
	live weight, kg	sheared wool, kg	live weight, kg						sheared wool (1-1.5 years), kg	
			at birth		at weaning		1.5 years			
			rams	ewes	rams	ewes	rams	ewes	rams	ewes
Saradzhinskaya	85,1	3,79	4,33	4,10	28,4	27,8	56,6	39,8	2,83	2,68
Alayskaya	78,0	3,90	4,4	4,1	29,5	26,0	63,0	52,0	1,86	1,25

A comparative analysis shows that Alai-Tuvan hybrids in live weight had an advantage over Saraja-Tuvan ones in all periods, but they were inferior in wool shearing at 1.5 years: rams by 0.97, uterus - by 1.43 kg.

In these crosses, the Tuvan sheep passed on to the crossbred offspring a high adaptability to natural, climatic and forage conditions.

Scientific and production experience in crossing purebred Saradzha and cross-bred Saradzha-Tuva rams with fine-wool-coarse-wool cross-breed queens with fine, semi-fine and semi-coarse wool to create an array of

Table 2: Indicators of complex three-breed crossbreeds from purebred Saradzha (group I) and Saradzha-Tuvan crossbred (group II) rams

| Group | Sheared wool at one year of age, kg | | Wool length, cm | | Fiber thickness, microns | | |
| | original | washed fiber | plait | fluff zone | fluff | transitional hair | spine |

semi-coarse-wool sheep in the southern zone was carried out in the second half of the 1370s [8]. In the experiments Mongush S.S. (1979) three-breed hybrid lambs had a high live weight equal to 3.7-3.8 in the young and 4.0 4.1 in the rams, when they were cut from their mothers they reached a weight of 28.5-29.7 kg, which was 63.3 -68.5% of the mass of the original fine-wool-coarse-haired queens. Semi-coarse wool of high quality was found in 92.9% of crossbreeds from purebred Saradzha rams and 76.2% of crossbreeds from Saraja-Tuvan hybrid rams of the first generation.

			The ratio of fiber types,%					
I	2,03	1,31	17,3	9,5	19,5	41,0	65,0	7
II	3,8	1,21	17,0	9,3	18,5	42,0	68,2	5
			fluff	transitional hair	spine			

Along with the improvement in wool performance, three-breed crossbreeds were characterized by good meat qualities. So, after the autumn feeding without feeding, 8.5-month-old windbills produced carcasses weighing 16.5

kg, the slaughter yield was 47%. At the same time, the best indicators were obtained from the queens with semi-coarse wool [14, 15].

Summing up, the author states that when crossing fine-wooled-coarse-wooled queens with purebred and crossbred rams of the Saraja breed, the business output of lambs (which was one of the main problems of the fine-wooled direction in Tuva) increases significantly, and the productivity of offspring increases [14].

As a result of the use of the Saraja and Alai semi-coarse-haired fat-tailed breeds in the southern semi-desert zone of Tuva, an array of semi-coarse wool was created.

Since 2003, the Tuva Scientific Research Institute of Agriculture has been working on the creation of the desired type of hybrid semi-coarse-wool sheep of the meat-wool direction using hybrid Saraja-Tuvan rams on hybrid semi-coarse-wool and Tuvan coarse-haired queens. Studies have shown the superiority of the offspring obtained from crossbred semi-coarse-haired queens: in live weight - 1.0-3.7%, in wool shearing - 8.0-11.3%, in carcass weight - 7.8%, slaughter yield - 4 , 2%. In the wool of these crosses there is more fluff, transitional hair and thin awn, dead hair is almost absent [11].

In the high-mountainous part of the western zone of the republic, to increase the live weight and improve the quality of the wool of Tuvan sheep, the Bayad semi-coarse-wool sheep were used [4, 5]. Scientific and production experience was carried out in the state unitary enterprise "Malchyn" of Mongun-Taiginsky region from 1994 to 2003.

Bayad sheep were distinguished by their large size. Their live weight was 5.5% higher than that of Tuvans, and the wool sheared in washed fiber was 7.1% higher. The diameter of the down fibers of Bayad sheep corresponded to the 60th quality of fineness, against the 70th in Tuvans, which determined a more equalized wool structure.

The half-bred hybrid rams of the desired type obtained from the crossing had superiority over the purebred Tuvan ones and were used to obtain ¼-blooded cross-breed offspring.

Table 3: Productivity and quality of sheep wool

Index	Bayadski	½ bayadsko-tuvinskiye	Tuvinian
Live weight, kg	69,4	66,5	65,8
Sheared wool, kg: not washed washed	2,31 1,5	2,30 1,5	2,08 1,4
Washed wool yield,%	64,9	65,2	67,3
Awn length, cm	20,8	20,5	20,2

Down length, cm	8,8	9,0	8,2
The ratio of the down zone to the length of the plait,%	42,3	43,9	40,6
Wool thickness, microns: fluff transitional hair spine	23,0±0,6 50,0±1,4 60,2±2,1	22,7±0,9 50,4±1 65,2±1,9	19,2±0,8 51,4±1,9 73,0±2,4

The down of half-bred rams was 9.7% longer, the ratio of the down zone to the length of the plait was 3.3% larger, and the awn was thinner by 7.8 microns.

One of the important indicators that have a direct relationship with economically useful traits and the level of productivity is the growth and development of young animals. Lambs obtained from the crossing of Tuvan short-fat-tailed queens with Bayad rams and half-bred crossbreds, in terms of live weight at all age periods of growth and development exceeded the purebred Tuvan peers. In half-bred rams, this difference was most significant at the age of 12, 15 months and reached 2.3 and 3.1 kg, or 8 and 10.7% (P> 0.99). 1/4-blood rams, starting from 6 months of age, in live weight significantly exceeded the control ones by 2.4; 3.3 and 3.3 kg (P> 0.99). In terms of bright spots, the differences between 1 / 2- and 1/4-blood crosses and the control group were highly significant in all periods of growth, the difference between crossbred animals was insignificant.

In the period from birth to weaning, hybrid lambs in gross growth were ahead of purebred Tuvan peers: half-bred rams - by 7.4, bright - by 8.3%, 1/4 blood - by 6.7 and 5.7%, respectively (P > 0.99).

During the period of growth from six to twelve months, the absolute gains in live weight in hybrids were greater with an average difference: for 1/2-blood rams - 0.8 (9.4%), 1/4-blood - 0.9 kg (10.6%) (P> 0.95), in girls 1/2-blooded - 1.0 (12.2%), 1/4-blooded - 2.5 kg (30.5%) (P = 0.95).

For the entire period of cultivation, from 1/2-blooded hybrid rams received 84.0 g, from 1/4-blooded - 83.9, and from local - 77.8 g of growth. A similar pattern was observed for the bright group.

Thus, when crossed with the Bayad breed, Tuvan sheep give offspring with a higher live weight, growth rate, better productivity and higher wool quality in both the first and second generations [6, 7].

The crossing of Tuvan sheep with the Bayad breed under the conditions of the southern steppe zone of Tuva was used to create the steppe type of the Tuvan short-fat-tailed breed. According to Orus-ool, the use of Bayad rams in crossing with Tuvan sheep of the steppe zone already in the first generation made it possible to obtain crossbred animals with a high live weight and early meat maturity [16].

In the Tuvan short-fat-tailed breed, two types are now distinguished, created using the Bayad breed: mountain and steppe. The mountain type was created in the western mountain-steppe zone of the republic, the steppe - in the southern dry-steppe zone. Therefore, their creation is based on an ecological factor that defines them as ecological intra-breed types. Both types were approved in 2010.

Sheep of the new types are superior to the original local Tuvan ones in all the main breeding characteristics. So, the live weight of mountain-type bright birds is 7.3 kg higher, steppe sheep - by 0.6, repair rams - by 2.55 and 18.7, respectively, ewes - by 2.28 and 20.1, steppe-type rams - by 19.3 kg. In terms of wool shearing, the superiority was respectively: 0.24 and 0.39; 0.15 & 0.54; 0.62 and 0.70; 0.10 and 0.60. Slaughter yield of young mountain type at the age of 20 months was higher by 5.48, steppe - by 5.85%.

Due to the difference in breeding zones in terms of natural-climatic and forage conditions, the types themselves also differ among themselves.
Sheep of the steppe type in live weight surpass their peers of the mountain type by 25.26 kg, uterus - by 16.85, rams 1.5 years old - by 15.2, bright - by 9.5 kg. In terms of wool shearing, the difference depending on age and gender ranged from 0.20 to 0.37 kg. By carcass weight, young animals at the age of 8 months. surpasses by 4.3 kg, at the age of 20 months. - by 7.7 kg, in slaughter yield - by 4.24 and 2.86%, respectively [1].

4. CONCLUSION

Thus, semi-coarse wool breeds had a decisive influence on the development of sheep breeding in Tuva. Due to a number of positive qualities, such as high plasticity in various breeding conditions, good maternal instinct, effective use of pastures, good feeding qualities, adaptation to harsh environmental conditions, Tuvan sheep are now known outside the republic, they are actively purchased and raised by agricultural enterprises and farmers of nearby territories. They were brought to the Republic of Buryatia, Krasnoyarsk Territory, and the Republic of Khakassia.

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