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V G Dvalishvili and V D Milchevsky

L.K. Ernst Federal Science Center for Animal Husbandry, 60, Dubrovitsy str., Podolsk Municipal District, Moscow Region, 142132, Russia

E-mail: dvalivig@mail.ru

Abstract. It is shown, that uncontrolled mass crossing of sheep with homogeneous wool led to a sharp deterioration in the quality of wool and the appearance in herds of a large number of fine-wool-coarse-wool hybrids not suitable for breeding. The experience of work on the restoration of fine-fleece and semi-fine fleece herds from such crosses is reported. The research on the dynamics of productivity and quantitative useful traits during the transformation of hybrid sheep into Tsigai is presented. The correlation dependence between the quantitative traits and the coefficients of heritability of the quantitative traits of Tsigai and crossbred sheep, as well as the variability of the quantitative traits of these sheep are shown. With the absorption of Tsigai by rams of fine-coarse-wool hybrids for one and a half intervals between generations, it is possible to increase the proportion of half-fine wool in a flock of sheep by 3-4 times.

1. Introduction

The direction of selective breeding in Russian sheep raising has radically changed in recent years. Wool has depreciated, it has become unprofitable, and the motivation to improve its quality and shearing and, in general, to breed for this unprofitable product at the moment, has been lost. Such a simple, rather primitive, consideration has become widespread that sheep products can and should be made competitive only by increasing meat productivity, turning unprofitable wool sheep into profitable meat sheep, or at least using hybrids for meat, which, by some definition, will certainly be heavier due to heterosis [1, 2, 3, 4]. Sheep breeds with homogeneous wool, which constituted the majority of the entire livestock of our country, began to be massively crossed with meat-wool breed, especially mutton-wool breed.

Of course, crossing is a powerful method for improving animals with a thoroughly calculated breeding business in all details, which in our conditions is extremely rare, as evidenced by long-term experience of the authors of this article. In our actual conditions, when crossing with, as it were, meatier, more fine-fleeced and semi-fine-fleeced breeds, the result was the registration of several new, quickly made selection achievements - breeds and types [5, 6]. The true result of these achievements will become known when the “new” types become commercial herds and are in production. It should be noted that such work has already been carried out in the country for many times [7].

Early maturing, meat, mainly semi-fine-fleece breeds and their crosses have been bred in different varieties for more than a century in the country. There are specialized breeding herds of these breeds. The question is whether the herds that have propagated from the sheep brought from Europe differ greatly from the primordially domestic ones, whether they solve the meat problem in sheep breeding. Comparison of the sheep of the best breeding farms of Stavropol, Altai, Askanian, Tsigai breeds with the same best herds of the North Caucasian breed, which were once administratively in one association of breeding farms shows that they are notable for the worst vitality. But, one way or another, their wool is homogeneous. A new result of crosses with coarse-haired breeds (meat-feeding, fat-tailed, etc., also,

as it were, meatier than sheep with homogeneous wool) is more dismal. This trend of crossing all dams with fat-tailed rams has led to the fact that, in pursuit of an increase in the cutoff of one or two kilograms of growth, the herds began to receive crossbred sheep for replacement, which are unsuitable for wool production, and do not give the expected increments in future generations. Thus, sheep breeding with homogeneous wool began to disappear very rapidly. This is proved by the view that you see, driving through the center of sheep breeding in Russia - from the Sea of Azov to the Caspian Sea- instead of fine-fleeced flocks, there are only mixed flocks, and even those are several times less. This is the most visible cul-de-sac in sheep breeding today. Obviously, one way or another, sooner or later, it will be necessary to renew domestic sheep breeding with homogeneous wool [8]. In the future it will be seen in what reasonable amount it will have to be done and what qualities, apart from, of course, meatiness, to improve. Surely the most important of these qualities will be vitality. It should be noted that our sheep breeders have the long-standing historically grandiose experience of transforming coarse-wool sheep breeding into fine-wool sheep breeding [9, 10]. Closer to our days is the experience and example of the transformation of a large crossbred, low productive degenerating massif into a millionth massif of animals with homogeneous wool with a simultaneous increase in wool and meat productivity [11, 12]. It is to such marketable herds that we are approaching or have already approached in the zones where they were bred to the trend for spontaneous crossing of sheep with homogeneous wool, some of which just need to be returned to homogeneous ones. The purpose of the work is to show the results of productivity studies in the ingestion of fine-fleece-coarse-wool hybrids of different types of Tsigai sheep, combined with the need to improve their vitality.

2. Materials and methods

The feeding conditions during studies with animals corresponded to the detailed feeding norms of meat-wool and wool sheep breeds [13, 14]. Primary materials are taken for a detailed presentation of one of the stages of a very successful large-scale breeding work in sheep breeding. The primary individual data on the sheep of our report date back to the time when the Tsigai sheep were used for a number of years in the dry areas specialized in sheep breeding, as a devouring breed in herds with large livestock. For this, Tsigai rams of the old type from Rostov region and the Crimea, as well as Preazov type from Azov region were taken. In the process of crossing, 3-4 generations of hybrids accumulated, mainly with a homogeneous semi-thin wool, which were used as an experimental material. To determine the degree of approximation of these sheep in terms of the main types of products to Tsigai, it was necessary to carry out appraisals and serious studies of wool using materials obtained in typical economic conditions of dry steppes and semi-deserts. Therefore, when conducting research, it was important to create favorable feeding conditions for the experimental young sheep of different crossing options.

3. Results

Primary research materials are taken for a more detailed presentation of one of the stages of a very successful large-scale breeding work in sheep breeding.

Comparison of the basic physical properties of the wool of the hybrids with the wool of purebred Tsigai sheep showed that by the 3rd generation this wool differs little from the wool of the old type of Tsigai sheep (Table 1).

Table 1. Physical properties of wool of purebred and crossbred sheep

Indicator	Mixes 3-4 generations			Purebreds of the old type			Purebred Azov type		
	Dams	Gimmers	Yearling rams	Dams	Gimmers	Yearling rams	Dams	Gimmers	Yearling rams
Number of animals	12	26	31	10	10	10	10	10	10
Strength of wool fibers, cN / Tex	9.0 ±0.34	8.5 ±0.15	8.2 ±0.21	8.8 ±0.31	8.6 ±0.21	8.7 ±0.22	8.9 ±0.15	8.5 ±0.20	8.8 ±0.21

Length of fibers in a staple, cm	8.5 ±0.24	9.1 ±0.34	9.7 ±0.22	8.5 ±0.23	9.3 ±0.25	8.7 ±0.24	13.3 ±0.27	15.0 ±0.30	14.5 ±0.36
Straightened fiber length (true), cm	12.9 ±0.29	12.6 ±0.38	12.8 ±0.34	12.9 ±0.27	12.4 ±0.31	12.2 ±0.32	17.3 ±0.29	18.7 ±0.32	17.5 ±0.33
Fiber thickness in the middle zone, microns	26 ±0.92	24 ±0.81	26,3 ±1.60	33 ±0.89	24 ±0.90	27 ±0.95	38 ±0.86	34 ±0.88	34 ±0.84

From the data in Table 1, we see that the differences in the thickness of the wool of the dams are associated, first of all, with the feeding conditions. The samples of wool of the Azov sheep were taken from the herds of the artificial insemination station and the breeding plant, where animal feeding was close to the recommended norms. The differences in wool length between crossbred and Azov sheep are significant. Prior year studies have proven that fiber length is not related to feeding conditions and can only be changed by selection. In this regard, the predominant use of old-type rams with long wool was introduced, which is why the Azov type rams were imported, as their long wool is genetically determined.

Some judgment about the degree of absorption of hybrids by Tsigai rams can be made by analyzing the correlations (r_{xy}) between the quantitative traits that have developed in purebred and crossbred herds (Table 2). In all cases, the correlations are either close to zero or positive, which indicates the possibility of using similar selection methods in different herds and zones, if it is necessary to create a single direction of the breeding process on a breed scale. Interestingly, the degree of herd selection is inversely related to the magnitude of the correlations between the traits. Obviously, the possibilities of selection by a single trait in a selected high-yielding herd are somewhat lower than in a hybrid, low-yielding herd. This means there is a prospect to somewhat accelerate the rate of conversion of hybrids into sheep with homogeneous wool in the current spoiled by short-sighted crossing with coarse-wool rams.

Table 2. Correlation between quantitative traits Tsigai and cross-breed sheep (yearling ewe)

Trait pair	Mixes 3-4 generations		Purebred Tsigai			
			Old type		Priazov type	
	Animals	r_{xy}	Animals	r_{xy}	Animals	r_{xy}
Cut – body weight	876	0.45	120	0.22	660	0.04
Cut – staple length	577	0.60	120	0.10	781	0.06
body weight – staple length	576	0.19	120	0.15	806	-0.04

To assess selection possibilities, it is important to know how each trait is distributed in the herd. The universal statistical indicator of such a distribution is the standard deviation (σ). From the data in Table 3 it can be seen that the value of square deviations in a purebred herd is not much higher than in a crossbred herd. Therefore, the possibilities of ranking animals in both herds differ insufficiently.

The coefficients of variation (C_v) show that in both herds the greatest variability is in terms of shear cut, the smallest variability is in terms of live weight. This is also an indicator of the statistical similarity of the herd in terms of phenotype.

Table 3. Variability of quantitative traits of Tsigai and crossbred sheep

Indicator	Class of animals	Purebred Priazov type			Mixes 3-4 generations		
		animals	σ	C_v, %	animals	σ	C_v, %
Cut, kg	Gimmers	911	0.98	15.4	512	0.52	23.7
	Dams	807	0.91	16.5	515	0.62	18.3
Body weight, kg	Gimmers	911	5.32	10.2	512	3.68	10.8
	Dams	807	4.76	10.9	515	3.50	8.8
Staple length, cm	Gimmers	911	1.91	14.2	512	1.46	15.8
	Dams	807	1.87	14.0	515	1.05	14.5

Some idea of the inheritance of quantitative traits can be given by comparing the coefficients of heritability (h^2). These coefficients are presented in Table 4. Data analysis suggests that in a cross-breed herd, if it is necessary to quickly change an individual trait, more progress can be made when selecting according to length, in the old type - when selecting according to cut and body weight, and in Priazov type - according to body weight.

Table 4. Coefficients of heritability of quantitative traits of Tsigai purebred and crossbred sheep

Indicator	Mixes 3-4 generations		Purebred old type		Purebred Priazov type	
	animals	h^2	animals	h^2	animals	h^2
Cut	13	0.02	120	0.4	304	0.1
Body weight	68	0.3	120	0.5	150	0.3
Staple length, cm	84	0.4	120	0.1	668	0.04

Our research has shown that the ingestion of fine-wool hybrids by Tsigai rams guarantees an increase in the number of semi-fine wool sheep. Thus, the share of fine wool sold by the experimental farm with a hybrid livestock converted to Tsigai in seven years, that is, over one and a half generation intervals, decreased from 58% to 16%. The pace, as we see, is very encouraging for the success of such work in the current conditions in the restoration of flocks of sheep with homogeneous wool.

4. Conclusion

When studying the productivity of quantitative traits of the phenotype of purebred Tsigai sheep and fine-wool-coarse-wool hybrids when consumed by Tsigai rams, a general phenotypic similarity was found between the third-generation hybrid sheep and purebred Tsigai sheep - in a commercial hybrid herd, as well as in well-selected purebred breeds, there are no negative coefficients correlations between useful traits, which indicates the possibility of creating a single direction of the breeding process on a breed scale. In terms of the main physical properties of wool (strength, length, thickness), hybrid sheep differ little from purebred Tsigai sheep of the old type. With the absorption of Tsigai by rams of fine-wool-coarse-wool hybrids for one and a half intervals between generations, it is possible to increase the proportion of half-fine wool in a flock of sheep by 3-4 times.

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