Sheep productivity in relation to coarse fiber in new-born lambs of different genotypes

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Abstract. The presence of coarse fiber in newborn animals indicates the viability and high productivity of animals in adulthood, therefore, when breeding meat-wool sheep of the Jalghin merino breed, flocks of lambs should be formed according to the amount of coarse fiber at birth. It was found that in all groups, animals born with coarse fiber at all age periods had superiority in live weight over animals born without coarse fiber. In group I of the fine line, 72.5% were born without coarse fiber, and 27.5% with coarse fiber. In group III of the strong line, 13.6% were born without coarse fiber of lambs, 86.4% with coarse fiber. In the second group of the medium line, there was practically the same ratio of without and with coarse fiber lambs and amounted to 48.7% and 51.3%, respectively. It was found that, at birth and at 4 months of age, in terms of live weight, rams with coarse fiber, regardless of their linearity, outnumbered their peers. At 14 months of age, the superiority of animals of group III in live weight in general over their peers in groups I and II was 8.8% (P<0.001) and 5.4% (P<0.001). In turn, the rams of the III group that were born with coarse fiber had a significant superiority over the coarse-fibered peers of the I and II groups by 5.6% (P<0.001) and 2.8% (P<0.001). The same tendency was noted for the rams that were born without coarse fiber, animals of the III group (strong) had a significant superiority over their peers (fine and medium).

1. Introduction
Sheep breeding is a valuable industry in terms of the diversity of obtaining products and raw materials from it for light industry. Products that contain sheep's wool in their composition are distinguished by their environmental friendliness, low thermal conductivity, and the porous structure of the inner part of the hair allows it to absorb and release moisture up to 30% of its own weight into the external environment. Therefore, at present, the main task of scientists and specialists of agricultural enterprises is not only to achieve profitability of the sheep breeding industry, but also to preserve high-quality wool, which cannot be achieved without purposeful, systematic selection. The intensification of the breeding process leads to an improvement in the production technology, and the subsequent productivity of animals is associated with the origin and phenotypic features, in our case, which is the coarse fiber at birth.
Scientists are conducting targeted selection to achieve high productivity of animals, since in most farms the level of productivity and, especially, the quality of wool does not meet modern requirements [5].

Many scientists of sheep breeders say that coarse fiber at birth is interconnected with the strength of the constitution, the level of wool productivity, and also associate it with survival. Coarse fibers are fibers that are longer, coarser and less crimped [6–10].

It has been established that when coarse fiber is manifested in hybridized australized sheep, it is noted that the animals have better conformation, differences in growth and development are revealed, and a relationship with the viability of lambs and survival is noted. [11].

When developing a method for predicting wool and meat productivity, the relationship was determined between the coarseness of the skin at birth in rams of the Taurian type of the Askanian fine-wool breed with their productive qualities in adulthood [12].

The possibility of early determination of high productivity by the girth of the pastern and the presence of a coarse fiber at birth in sheep of the Altai breed has been established [13].

Therefore, the study of productivity in sheep of different linear belonging of the Jalghin merino breed, depending on the amount of coarse fiber at birth, is relevant.

2. Objects and research methods
The experimental part of the research was carried out in the agricultural production cooperative “Breeding Plant after Second Five-Year Plan” of the Ipatovsky district of the Stavropol Region on rams of the Jalghin merino breed of different lines: “fine”, “medium”, “strong” according to the experiment scheme presented in table 1.

| Group | Mating options | number of animals | number of animals |
|-------|----------------|------------------|------------------|
|       | rams-producers | ewes             |                  |
| I     | fine           | 3                | 67               |
| II    | medium         | 3                | 67               |
| III   | strong         | 3                | 67               |

3. Results and discussions
As it is known, coarse fiber hairs are produced by primary follicles, less often by secondary. In our case, we associate a greater amount of coarse fiber in lambs in group III with a greater number of primary follicles and a stronger constitution.

The amount of coarse fiber in newborn lambs is shown in table 2.

| Group   | Without coarse fiber | With coarse fiber | |
|---------|----------------------|------------------|%
| I (fine)| 29                   | 12               | 72.5 |
| II (medium)| 19               | 20               | 48.7 |
| III (strong)| 6                | 38               | 13.6 |

Studies have shown that in group I of the fine line, there were more lambs without coarse fiber and amounted to 72.5%, and with coarse fiber in the same group, respectively – 27.5%. In group III of the strong line, the opposite picture was observed, without the coarse fiber of lambs it was 13.6%, with the coarse fiber 86.4%. In the second group of the medium line, there was practically the same ratio without coarse fiber and coarse-fiber lambs and amounted to 48.7% and 51.3%, respectively. The data obtained
show that with an increase in wool fiber in groups from the fine line to the strong line, the number of coarse-fibered lambs increases.

Table 3 shows the live weight of young sheep with different amount of coarse fiber from birth to 14 months of age.

Analysis of the table shows that in terms of live weight, rams born with coarse fiber, regardless of their linearity, outnumbered their peers. The highest live weight at birth was in animals of group III, on average 4.3 kg, which exceeded the average indicators of peers in groups I and II by 5.1% and 1.4%. This indicator is associated with the high live weight of mothers in group III.

As for the results in terms of coarse fiber, the lambs of the medium line, which had coarse fiber at birth, had the highest live weight of 4.49 kg, which is 5.6% and 3.5% higher than their coarse-fibered peers in groups I and III.

In this case, we associate high indicators of live weight at birth in group II medium with the better adaptability of coarse-fibered lambs to local environmental conditions.

At 4 months of age, rams of all groups born with coarse fiber had superiority over those without coarse fiber, regardless of their linearity.

| Group | detected animals | Number of animals at birth, heads | Live weight at birth, kg | Number of animals at 4 months, heads | Live weight at 4 months, kg | Live weight at 14 months, kg |
|-------|------------------|----------------------------------|-------------------------|-------------------------------------|---------------------------|---------------------------|
| I (fine) | Without coarse fiber | 29 | 4.03±0.09 | 26 | 23.20±0.13 | 68.09±0.21 |
|       | With coarse fiber | 12 | 4.25±0.15 | 11 | 25.40±0.22 | 71.31±0.27 |
|       | Group average | 41 | 4.09±0.09 | 37 | 23.85±0.16 | 69.06±0.29 |
| II (medium) | Without coarse fiber | 19 | 3.97±0.11 | 17 | 23.47±0.65 | 69.41±0.40 |
|       | With coarse fiber | 20 | 4.49±0.15 | 19 | 25.53±0.31 | 73.21±0.41 |
|       | Group average | 39 | 4.24±0.10 | 36 | 24.56±0.49 | 71.31±0.40 |
| III (strong) | Without coarse fiber | 6 | 4.10±0.27 | 5 | 23.66±0.53 | 73.57±0.35 |
|       | With coarse fiber | 38 | 4.34±0.06 | 36 | 25.70±0.36 | 75.27±0.18 |
|       | Group average | 44 | 4.30±0.13 | 41 | 25.45±0.40 | 75.17±0.21 |

But it should be noted that animals of group III had the highest live weight on average 25.45 kg and exceeded the average indicators of peers in groups I and II by 5.1% (P <0.001) and 1.4%. Animals born without coarse fiber at 4 months of age, regardless of linearity, had an insignificant difference in live weight between themselves (P> 0.05), but animals of group III of the strong line had some superiority. A similar picture at 4 months of age was observed among animals with coarse fiber at birth.

It was also noted, despite the fact that animals of group I at 4 months of age had on average the lowest live weight in comparison with other groups, the live weight of rams in this group born with coarse fiber was 7.4% higher than that of animals of group III that were born without coarse fiber (P <0.001).

Consequently, coarse-fibered lambs in live weight had a significant superiority over their peers born without coarse fiber. And the animals of the III group in terms of the average live weight at 4 months of age had a significant difference over their peers in the studied groups due to the higher percentage of coarse fiber.
At the age of 14 months, the influence of the genotype had a noticeable difference in live weight among the coarse-fibered and normal groups of animals. The superiority of animals in group III in terms of live weight in general over their peers in groups I and II was 8.8% (P < 0.001) and 5.4% (P < 0.001). In turn, the rams of the III group that were born with coarse fiber had a significant superiority over the coarse-fibered peers of the I and II groups by 5.6% (P < 0.001) and 2.8% (P < 0.001). The same tendency was noted for the rams that were born without coarse fiber, animals of the III group (strong) had a significant superiority over their peers (fine and medium).

Of great importance in increasing the wool productivity of sheep with equal other quality indicators of wool is its length, which is not the same in fine-wool sheep of different genotypes, different areas of productivity. Therefore, we studied the growth of wool in rams of different genotypes from birth to 6 months of age, the results of which are presented in table 4.

Table 4. The length of the ram's wool by growing periods.

| Group   | Detected animals | Number of animals at birth, heads | Wool gain in 4 months of life | Wool gain in 2 months (age 6 months) |
|---------|------------------|----------------------------------|------------------------------|-------------------------------------|
| I (fine)| Without coarse fiber | 26                               | 4.25±0.11                    | 2.15±0.12                           |
|         | With coarse fiber  | 11                               | 4.26±0.16                    | 2.17±0.18                           |
|         | Group average     | 37                               | 4.25±0.09                    | 2.16±0.10                           |
| II (medium) | Without coarse fiber | 17                              | 4.47±0.21                    | 2.31±0.14                           |
|          | With coarse fiber  | 19                               | 4.50±0.17                    | 2.44±0.16                           |
|          | Group average     | 36                               | 4.49±0.13                    | 2.38±0.11                           |
| III (strong) | Without coarse fiber | 5                                | 4.51±0.11                    | 2.97±0.14                           |
|          | With coarse fiber  | 36                               | 4.60±0.19                    | 3.12±0.14                           |
|          | Group average     | 41                               | 4.59±0.10                    | 3.10±0.12                           |

The analysis of table 4 shows that the growth of wool in young fine-wool sheep ranged from 1.07 to 1.29 cm per month. After shearing wool grows faster than the rest of the time. This is due to improved skin respiration and increased metabolism. The air regime also affects the growth of wool, which is confirmed by the high efficiency of keeping sheep in the open air, both in summer and in winter. The positive role of pastures is due not only to full-fledged feeding, but also to lighting conditions (insolation, temperature, etc.) other than in the case of stall keeping.

As a result of our studies, we have established a pattern within the line of animals: the rams that were born with coarse fiber had superiority over their peers in terms of hair growth in all age periods.

The highest growth in wool was observed in experimental animals from birth to 4 months of age, with fluctuations in groups from 4.25 cm in group I (fine) in lambs without coarse fiber to 4.60 cm in coarse-fibered lambs in group III (strong).

Before weaning from their mothers, the longest hair was characteristic of both types of rams of the III group, which outperformed their peers of the I and II groups by 6.1% and 0.9% (P > 0.05) and 8.0% and 2.2% (P > 0.05), respectively.

On average, per month, the growth of wool in rams without coarse fiber varied - from 1.06 to 1.13 cm, in coarse-fibered rams on the side – from 1.07 to 1.15 cm.

The growth of wool on the side of rams from 4 to 6 months of age (2 months) ranged from 2.15 to 2.97 cm in the group without coarse fiber, and from 2.17 to 3.12 cm in coarse-fibered rams. The growth per month was from 1.08 to 1.49 cm in the animals without coarse fiber, and in coarse-fibered lambs - from 1.09 to 1.56 cm. The animals of the III group of both types were distinguished by the best growth of wool in comparison with the rams of the I and II groups. The difference in favor of the former was 38.1% (P < 0.001) and 28.6% (P < 0.01) and 43.8% (P < 0.001) and 27.9% (P < 0.01), respectively.
4. Conclusion
Thus, lambs of the III group of the strong line with different types of wool by the age of 14 months have a significant superiority in live weight and the best growth of wool over their peers. It is associated with the influence of the animals’ genotype.

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