Reproductive Ability and Milk Production of Ewes with Different Variants of Linear Selection

E N Chernobai, N A Rezun and N A Agarkova
Stavropol State Agrarian University, 12 Zootechnicheskiy per., Stavropol, Stavropol Territory, Russian Federation

E-mail: bay973@mail.ru

Abstract. This article studied the reproductive capacity and milk production of ewes with various combinations of lines. It was found that the highest fecundity was possessed by animals of the III group from the interline selection of rams of the ME-50 line and ewes of the AC-30 line and amounted to 139.6%, which is higher than that of their peers of the I, II and IV groups by 4.2; 9.8 and 4.8 abs. percent. With intralinear selection, the animals of group I (line ME-50) were the best in this indicator, compared with animals of group II (line AC-30) by 5.6 abs. percent. The best safety of lambs before weaning (4.5 months) was observed in animals of group IV obtained from interline selection of rams of the AC-30 line and ewes of the ME-50 line and amounted to 93.5%, which is 1.2% higher than in their peers in groups I, II and III; 1.7 and 1.0 abs. percent. The highest milkiness of ewes with intraline selection, both for little rams and for young ewes, was in animals of group I (line ME-50), which surpassed in milkiness their peers of group II (line AC-30) reliably for little rams by 18.3% (P < 0.001), and for young ewes by 3.1% (P> 0.05). The superiority in milkiness of animals of group III over their peers of group I was 6.8% in little rams (P <0.001), and in young ewes – by 5.6% (P <0.01).

1. Introduction
The reproductive characteristics of sheep depend on hereditary factors, conditions of feeding and maintenance, individual characteristics of the organism, age, physiological state of animals, etc. The high fertility of animals ensures more effective selection, taking into account the rapid change of generations and repair of the herd, which contributes to an increase in the productivity of animals, hence economy and profitability of the industry [2, 14].

The reproductive functions of sheep are mainly determined by the origin or breed, physiological state, age. It is impossible not to take into account feeding and maintenance, on which the health of the mother, her fatness or those conditions, in which ewes come into heat better and with artificial insemination, fertilization of the egg, takes place [12].

Fertility is an important indicator in the reproduction of the herd, therefore, knowledge of this issue allows the breeder to properly organize work with the herd. Thus, with pure-bred breeding of the Edilbaevskaya breed, 17.9% more lambs are obtained per 100 ewes that have been clung to in comparison with ewes of the Soviet Merino breed inseminated by stud rams of the Edilbaevskaya breed [4].

In order to obtain the maximum number and viable offspring, ewes of the Romanov breed should be inseminated with Texel sheep. Fertility is higher in comparison with peers from purebred breeding of the Romanov breed by 11.0% [7].
Breeding work in sheep breeding should be aimed not only at improving the productive wool and meat qualities, but also at increasing fertility, which depends on hereditary and paratypical factors. The high fertility of ewes leads to a higher level of profitability, since the costs of producing young lamb are reduced.

Currently, breeders of sheep breeding organizations pay special attention to the fertility of ewes, which determines both the quantitative and qualitative increase in production. Therefore, the study of this indicator in sheep of the Russian Meat Merino breed of different lines, as well as with their various combinations in the conditions of the eastern zone of the Stavropol Territory, is of great theoretical and practical importance.

2. Research methods
In our experiment, 2 groups were formed from the intralinear pairing of the ME-50 and AC-30 lines, and the next 3 and 4 groups from the reciprocal pairing of the same lines (table 1).

Table 1. Scheme of the experiment.

| Group | Mating option | Stud rams breed, line | Ewes breed, line | Number of heads |
|-------|---------------|-----------------------|------------------|----------------|
| I     | PMM (line ME-50) | PMM (line ME-50)     | 50               |
| II    | PMM (line AC-30) | PMM (line AC-30)     | 50               |
| III   | PMM (line ME-50) | PMM (line AC-30)     | 50               |
| IV    | PMM (line AC-30) | PMM (line ME-50)     | 50               |

The ewes of the two main lines of the farm business, according to productive characteristics, differ in the features characteristic of each line:
– line ME-50 – animals with high live weight and medium fineness of wool;
– line AC-30 – animals of average live weight, thick-haired, with super-thin wool.

The reproductive abilities of ewes of the Russian Meat Merino breed of different linear combinations and origins are presented in table 2.

Table 2. Reproductive abilities of ewes.

| Indicator                        | Group            |
|----------------------------------|------------------|
|                                  | I    | II    | III   | IV    |
| Inseminated ewes, head           | 50   | 50    | 50    | 50    |
| Lambed-out ewes, head            | 48   | 47    | 48    | 46    |
| Ewes remained barren, head       | 2    | 3     | 2     | 4     |
| Fertility, %                     | 96.0 | 94.0  | 96.0  | 92.0  |
| Received lambs, head             | 65   | 61    | 67    | 62    |
| incl. little rams                | 31   | 32    | 30    | 29    |
| Young ewes                       | 34   | 29    | 37    | 33    |
| Fertility per 100 lambed ewes, % | 135.4| 129.8 | 139.6 | 134.8 |
| Preservation of lambs for weaning, head | 60 | 56 | 62 | 58 |
| Safety of lambs, %               | 92.3 | 91.8 | 92.5 | 93.5 |
| Lambs received for weaning per 100 inseminated ewes, % | 120.0 | 112.0 | 124.0 | 116.0 |

An analysis of the reproductive capacity of ewes of different lines and their combinations shows that fertilization was higher with intralinear selection, on average this indicator was 95%, with interlinear
selection it was slightly lower – 94%. The highest mortality rate was observed in group I from intralinear selection of the ME-50 line and in group III when mating rams of the ME-50 line and ewes of the AC-30 line and amounted to 96%.

The fertility of ewes was determined according to GOST 25955-83 – Agricultural breeding animals. Methods for determining the parameters of the productivity of sheep, according to the number of lambs obtained per 100 lambed ewes. It was noted that fertility with interlinear selection was on average higher than with intralinear selection and amounted to 137.2%, which is 4.6 abs. percent. The highest fertility was in animals of the III group from the interline selection of rams of the ME-50 line and ewes of the AC-30 line and amounted to 139.6%, which is 4.2% higher than in their peers of the I, II and IV groups; 9.8 and 4.8 abs. percent. With intralinear selection, animals of group I (line ME-50) were the best in this indicator, compared with animals of group II (line AC-30) by 5.6 abs. percent.

With interlinear selection, the safety of lambs to weaning was 93.0%, which is higher compared to the intralinear selection by 0.9 abs. percent. Comparing the groups of animals in terms of safety, we note that the highest safety (93.5%) had the animals of group IV, obtained from the interline selection of rams of the AC-30 line and ewes and ewes of the ME-50 line, which is 1.2% higher than those of their peers in groups I, II and III by 1.2, 1.7 and 1.0 abs. percent. With intralinear selection, the animals of the ME-50 line were the best in terms of survival, as compared to the animals of the AC-30 line by 0.5 abs. percent.

The best indicator in terms of the number of lambs to weaning per 100 inseminated ewes was observed in animals from interline selection on average 120%, compared with peers from intralinear selection higher by 4.0 abs. percent. Both with intralinear selection according to this indicator, the superiority was in the animals of group I (line ME-50) over their peers of group II (line AC-30), and with interlinear selection – animals of group III exceeded their peers of group IV by 8.0 abs. percent.

The results obtained from the intralinear selection of the first two groups are confirmed by the research results of A.V. Borodin (2013). The indicators of fertility of ewes and the safety of lambs to weaning were higher in animals of the line with a higher live weight and coarser wool [1].

A.A. Shuymanova et al. (2010) note that sheep of the meat-wool type, which were distinguished by a coarser wool fiber, compared to their wool-meat peers, had an advantage in lambs safety from birth to weaning by 4.3%, in fertility and fertility by 6.1 and 3.8 abs.%, by live weight at birth and in subsequent periods [9].

It is known that the growth and development of the resulting young in the first months of life depends not only on the genotype and origin of animals, but also on the milk production of ewes. The milk production of ewes was determined according to GOST 25955-83, according to the difference in the live weight of a lamb at 30 days and at birth and by multiplying by a factor of 5, because it is considered that 5 kg of milk is spent on an increase in 1 kg of live weight.

It should be noted that the milk production of ewes affects not only the growth and development of the lamb, but also its viability, especially in the first days of life. Therefore, a sufficient amount of milk received by a lamb after birth helps to more fully reveal the genetic capabilities of the body in specific conditions of detention [8].

The high milk production of ewes contributes to the economic growth of the industry as a whole, since in the first two weeks of life the lamb feeds only on mother's milk, and if the mother has enough milk, then the development and safety of young animals depends on this. Therefore, breeders pay attention to this trait, which can be used as one of the methods to increase the productivity of the herd.

It is also known that the milk productivity of ewes, some of which have little rams, and others have young ewes, is not the same. Young ewes spend more milk per 1 kg of live weight gain than little rams, which use mother's milk much more efficiently. Consequently, the ewes, which gave birth to little rams, will have a higher milk yield compared to ewes with young ewes [10, 11, 13].

The results of milk production of ewes by groups are presented in table 3.

The average milk yield of ewes with intralinear breeding for little rams was 37.5 kg, for young ewes – 24.6 kg, for interline selection, respectively – 41.5 and 25.8 kg, which is higher, respectively, for little rams by 10.7 (P <0.001), and for young ewes by 4.9% (P <0.05).
Table 3. Milk production of ewes, taking into account the intensity of growth of the offspring, kg.

| Lamb sex       | Group   | Live weight of lambs at birth, kg | Live weight of lambs at the age of 30 days, kg | Milk production of ewes, kg |
|----------------|---------|---------------------------------|-----------------------------------------------|----------------------------|
|                | I       | II                              | III                                           | IV                         |
| Little rams    | 4.41±0.08| 4.38±0.07                       | 4.39±0.07                                     | 4.40±0.08                  |
| Young ewes     | 4.03±0.06| 3.95±0.07                       | 3.93±0.06                                     | 3.95±0.05                  |
| Little rams    | 12.54±0.15| 11.25±0.12                      | 13.07±0.17                                    | 12.33±0.12                 |
| Young ewes     | 9.03±0.13| 8.80±0.12                       | 9.21±0.13                                     | 8.97±0.11                  |
| For little rams| 40.65±0.46| 34.35±0.42                      | 43.40±0.40                                    | 39.65±0.48                 |
| For young ewes | 25.00±0.37| 24.25±0.34                      | 26.40±0.32                                    | 25.10±0.36                 |

The highest milkiness of ewes with intraline selection, both in little rams and in young ewes, was in animals of group I (line ME-50), which exceeded in milkiness their peers of group II (line AC-30), reliably in little rams by 18.3% (P <0.001), in young ewes by 3.1% (P > 0.05). With interline selection with high milkiness, ewes of the III group are observed, inseminated with the semen of rams of the ME-50 line (♂ line ME-50 × ♀ line AC-30), which significantly exceeded their peers of group IV (♂ line AC-30 × ♀ line ME-50) for little rams – by 9.5% (P <0.001), for young ewes – by 5.2% (P <0.01). The superiority in milkiness of animals of group III over their peers of group I was 6.8% in little rams (P <0.001), and in young ewes – by 5.6% (P <0.01).

3. Conclusion
Thus, when crossing the lines, the ME-50 line appears on the paternal side, and the AC-30 line on the maternal side which helps to improve the fertility of ewes, the safety of lambs and an increase in milk production in ewes.

The research results obtained on the milk production of ewes are confirmed by the article by V.A. Moroz, N.A. Agarkova, E.N. Chernobay (2018). They argue that crossing lines allows you to get high production in ewes. Moroz, N.A. Agarkova, E.N. Chernobay (2018). They argue that crossing lines allows you to get high production in ewes. In his studies A.S. Krivko (2014) argues that crossing allows to increase the reproductive capacity and milk production of ewes, and in our case, crossing lines increases the fertility and milk production of ewes [5].

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