Characteristics of variability of the main breeding characteristics of the Salsk sheep

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Abstract. The article defined indicators of variability of productive qualities of sheep of the Salsk breed of different age groups. In the studies, high indicators of variability in folding, living weight, wool trimming in all sex and age groups were obtained. In terms of density, length of wool, average coefficient of variability was observed, and the lowest indicators were established in terms of wool tone.

1. Introduction
Improvement of farm animals is carried out on the basis of selection, as one of the main elements of selection, which is possible due to the variability of economically useful traits used in the selection process [1]. Variability is a biologically programmed quality of a living organism. It is a complex multifactorial process of interaction between the organism and the external environment or combined structural structures within the organism, depending on a number of reasons for various reasons. Therefore, the discovery of the essence of variability, as well as the establishment of the laws to which it obeys, allows effective methods of formation [2, 3]. Mastering this method is desirable for the breeder, as it allows to accelerate the achievement of the desired productivity of farm animals, and, consequently, to solve the problem of food security. Therefore, the subject of the article is relevant and is of scientific and practical interest.

2. Materials and methods
Experimental studies were carried out in the population of sheep of the Salsk breed of the “Belozernoye” breeding plant in the Rostov region. The number of evaluated animals varied from 40 heads for groups of adult and 12-month-old rams, up to 200 heads for groups of ewes and bright sheep. In the course of scientific and economic experience based on appraisal, a comprehensive assessment of runes and determination of the yield of pure wool, accounting during the shearing period, we assessed the breeding and genetic parameters of the herd, the coefficients of variation (Cv), asymmetry and excess of breeding
traits (cut, length, fineness, live weight, folding and density of wool) for the indicated groups of animals.

3. Results and discussion
The index of folding or skin reserve, assessed by the number and size of folds on the neck, as well as the wrinkles of the skin on the trunk, and expressed in points on a certain scale, had a coefficient of variation (Cv) from 6.1 to 13.5%. For wool density, this indicator in the estimated age and sex groups varied from 6.1 to 11.6%; coat length - from 6.9 to 10.6; live weight - from 5 to 12 and physical shearing of wool from 5 to 16%. The lowest indicators of variability in the experimental groups were found in coat fineness: their level was only 4 to 7%.

It should be noted that the standard deviation (σ) and the coefficient of variation, as the most frequently used biometric indicators, do not fully reflect the variability of characters. The definition of the values of asymmetry and kurtosis, which characterize the features of distribution and the efficiency of selection [4, 5, 6, 7], allows to make a more complete idea of the variability of economically useful features.

Among the empirical distributions, asymmetry (As) and excess (Ex) are quite common. One can notice asymmetry and kurtosis by the nature of the frequency distribution in the classes of the variational series [8]. Graphically, asymmetry is expressed as a skewed variation curve, the vertex of which can be to the left or to the right of the distribution center. In the first case, the asymmetry is called right-sided or positive, and in the second, left-sided or negative. With right-sided asymmetry, its flat side is to the right, with left-sided - to the left of the center of distribution [9, 10, 11].

Along with asymmetric distributions, there are peaked and flat-topped distributions. The peakedness of the distribution curve is caused by excessive accumulation of frequencies in the central classes of the variation series, as a result of which the top of the variation curve turns out to be strongly raised up. In such cases, one speaks of a positive excess of the distribution.

The presence of a plus sign in the excess coefficient indicates that the excess is positive, that is, there is a sharpness. With negative excess, the range of variation narrows and the values of Xmin and Xmax do not reach the boundaries of -3 σ ... + 3 σ. The reasons causing the negative phenomenon of excess - flat-topped and bimodal - are the same as in asymmetry.

The results of the studies on the analysis of indicators of the diversity of selection characteristics of selection are shown in tables 1-6.

**Table 1. Folding Diversity Indicators (X₁).**

| Age and gender groups | N  | Cv,% | As   | Ex  |
|-----------------------|----|------|------|-----|
| Main rams             | 40 | 13.5 | -2.08| 5.81|
| Repair rams           | 40 | 10.3 | -3.18| 11.1|
| Yarki                 | 200| 6.1  | -2.67| 8.11|
| Ewes                  | 200| 7.5  | -3.7 | 16.6|

Based on the data obtained, it can be concluded that the highest coefficient of variability of skin folding was established in the group of main rams Cv = 13.5% and repair rams Cv = 10.3%. In other groups, the diversity indicator is low.

Negative (right) asymmetry in all groups indicates the ongoing qualitative shifts in the studied group of individuals in the direction desirable for selection [12]. The proportion of individuals with the desired folding in the population is significant, and therefore, according to this trait, one should adhere to the chosen direction of selection, which will allow the herd to be typed according to the analyzed trait.
The rates of kurtosis are high. For example, in the group of ewes, it was 16.6, for replacement rams - 11.1. It is also obvious that among the animals of these groups there are a large number of individuals with the values of this trait close to the average.

Studies assessing the diversity of wool density, determined by the number of hairs growing per unit area of the skin, are presented in Table 2.

Table 2. Wool density diversity indicators (Xs).

| Age and gender groups | N  | Cv%, | As   | Ex  |
|-----------------------|----|------|------|-----|
| Main rams             | 40 | 6.1  | -2.85| 9.1 |
| Repair rams           | 40 | 9.5  | -1.04| 2.08|
| Yarki                 | 200| 11.6 | 0.382| 0.108|
| Ewes                  | 200| 7.9  | -1.66| 3.75|

Coefficients of variability of wool density range from 6.1 to 1.6%, which indicates a low diversity of the breeding trait.

Analyzing the variety of wool density in the studied groups, it can be noted that this characteristic is similar to the fold of the skin. The asymmetry coefficient in the group of main rams was -2.85. The variation series has a negative type of asymmetry (right). This argument is confirmed by the high rate of kurtosis in the same group - Ex = 9.1. In the other age and sex groups, the level of this indicator is lower and it is 2.08 in replacement rams, 0.108 in bright sheep and 3.75 in ewes. A slight positive asymmetry is observed only in the bright group.

The length of the coat, as the length of the staple from the base of the skin to its top, is characterized by low variability in all groups of animals. The coefficient of variation ranges from 6.9 to 10.6% (table 3).

Table 3. Wool Length Diversity Indicators (Xs).

| Age and gender groups | N  | Cv,% | As   | Ex  |
|-----------------------|----|------|------|-----|
| Main rams             | 40 | 10.6 | 1.84 | 6.06|
| Repair rams           | 40 | 9.4  | -0.884| 3.69|
| Yarki                 | 200| 9.0  | 0.327| 1.97|
| Ewes                  | 200| 8.9  | -0.332| 2.59|

Analyzing the variety of wool length, it can be noted that the coefficient of asymmetry in the group of main rams and bright sheep has a positive value. In the other groups, although it is negative, its values are not high, from -0.332 to -0.884. The asymmetry in the main rams is significant, positive +1.84. The accumulation of frequencies occurs on the left side of the row due to the fact that there are individuals in the group that have high average coat lengths. Here we can assume the high efficiency of direct selection.

The kurtosis indicator ranges from 1.97 to 6.06.
There is insignificant variety in coat fineness (Cv from 3.8 to 7.2%). Negative asymmetry was noted in the group of replacement rams -1.21, as well as ewes -1.16. An insignificant positive asymmetry of 0.37 was found in the group of main rams. This indicates a greater number of individuals with a fineness of 22.5 microns and less. The amount of kurtosis is insignificant in the group of main rams (1.94), and bright (1.44). In the group of repair and rearing rams, the indicator has average values of 3.78 and 4.99.

The degree of diversity of such a trait as live weight is of particular interest, since it has a tangible effect on both meat and wool productivity.

The variability in this indicator is characterized by low values. In the group of main rams, the coefficient of variation was 12%, for repair rams - 13.5%. For the rest of the groups, low variability is observed.

The coefficient of asymmetry in live weight in purebred rams approaches zero and indicates that the variation series has a distribution close to normal. An insignificant indicator of asymmetry with a negative sign was found in ewes. The kurtosis index in the bright group was 6.66. In the remaining groups, the kurtosis indicator is insignificant.

The coefficient of variability according to the physical cut of wool (table 6) has a high value in the group of bright 16%. He has an average level of importance in the group of replacement rams 12.6% and 11.6%. Major rams have a low rate of variability among the assessed groups of sheep.
According to the shearing of the wool in the group of salo sheep, the coefficient of asymmetry tending to zero is observed, and this indicates that the variation series has a normal type of distribution. In bright, it is significant 1.15. This suggests that the accumulation of frequencies occurs on the left side of the distribution series.

The indicators of kurtosis are low, in the group 5.1 is bright, in the rest - from 1.75 to 2.82.

4. Conclusions
There is a genetic cause of asymmetry, due to the interaction of allelic and non-allelic active genes. It is known that quantitative traits are inherited polygenically [13]. In the absence of dominance, epistasis and other means of interaction of non-allelic genes, the action of additive, i.e. unambiguous or similar in strength of action on a trait, genes, determines an intermediate type of inheritance, their normal distribution. If, in the process of the formation of a trait, there is an interaction of genes, in which some active genes suppress or limit the activity of others, then the intermediate type of inheritance of the trait will not be observed and the distribution curve of such a trait will be asymmetric. Another reason for the appearance of asymmetry is the modifying conditions of the external environment in which the organism develops and quantitative signs are formed.

Each of the named reasons affects the trait not in isolation, but, as a rule, in total, therefore, without rigorous statistical and genetic analysis, it is impossible to identify a specific reason causing the deviation of the empirical distribution from the normal curve.

Thus, the analysis of variation curves for the presence of asymmetry and excess reinforces us in the conclusions about the nature of the variability of the initial studied material, its homogeneity in a given population and about the features of the distribution, which either refers to the normal type, or to deviating types of distribution - asymmetric or excessive. This was pointed out by E K Merkuriev (1970) and these patterns were used by us in a detailed assessment of the variability of the main breeding traits in the population of Salsk sheep that emerged at the beginning of the 21st century.

Based on the studies carried out to analyze the variability of the selected traits, the following conclusions can be drawn.

Comparatively high indicators of variability (Cv) are observed in folding, live weight, wool cut in all age and sex groups. The coefficient of variability in terms of density and length of wool is slightly lower, and the lowest values are set in terms of wool fineness. Thus, direct selection for folding, live weight and shearing will be the most effective. It will be difficult to achieve dramatic changes in wool fineness in a herd given the current genetic situation.

Assessing the indicators of asymmetry and kurtosis, we can note the following points. In terms of folding, density, length and fineness of wool, we found right-sided asymmetry, which indicates a high selection efficiency. A slight negative asymmetry coefficient was observed for live weight and wool cut.

In all age and sex groups, significant excess manifestations were established, which indicates that the accumulation of frequencies is observed in the central classes of the variation series.

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