The effectiveness of crossing Red steppe cattle with Anglers in order to increase the meat productivity of crossbreeds

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Abstract. The article highlights the results of scientific experience in studying the meat productivity of cross-breeding red steppe bulls with genotypes ½, ¾ and 7/8 in Angler breed in comparison with pure-bred red steppe bulls. In the course of a complex of scientific research and chemical analyzes, it was found that thanks to the use of Angler breed, it is possible to obtain highly productive young cattle that are superior in quantitative and qualitative indicators of productivity to pure-bred red steppe cattle.

1. Introduction

Ways to improve the red steppe cattle Providing the country's population with high-quality meat is the most important component of Russia's food security strategy. Today, this indicator of the Doctrine of Food Security is 100% fulfilled due to the growth in industrial production of poultry meat and pork. The volume of beef production is not so large that it requires the search for new intensive methods of raising cattle in the current economic conditions. The problems of intensification of beef production cannot be solved without fundamentally new methods of selection and rational breeding of animals. The statistics on the production of meat of the main species in Russia according to the data of the Center for Agroanalytics FSBI shows a steady growth in production in the short term (figure 1).

Figure 1. Production of the main types of meat in the Russian Federation, million tons.
At the same time, however, it is necessary to intensify the activity of cattle-breeding enterprises to intensify the production of primarily beef. To increase the volume of its production, scientifically based breeding work should be aimed at improving and enhancing the most promising genetic qualities of animals of various breeds. In this study, we will study the effectiveness of the absorptive interbreeding of red steppe cattle with Anglers while improving the forage base and conditions of keeping livestock [1, 2].

It is known that the process of crossbreeding in animal husbandry is accompanied by the recombination of hereditary traits of the original breeds and the discovery of hidden reserves of hereditary variation. This is precisely the main source of hereditary factors of transformation and improvement of breeds [3, 4].

In recent years, the main sources of beef in our country are overrepair young stock and culled cows from dairy and combined herds. One of the promising domestic combined breeds is the red steppe. Red steppe cattle occupies a significant place in numbers in the Russian Federation and in the Volgograd region in particular (figure 2). This breed is better than many other dairy and combined breeds adapted to the specific climatic conditions of the southern regions of Russia.

Figure 2. Red steppe cow.

In the process of implementing the program for improving animals of Russian livestock breeds, many agricultural enterprises have chosen the most optimal way, as the absorption crossing of local cows with improving bulls of more highly productive combined breeds [3]. In this regard, such a breed as Angler breed is of great interest, its cattle stands out among other red breeds in that it is characterized by relatively high milk and meat productivity [5, 6]. This breed is very often used to improve milk productivity, however, the effectiveness of its use to increase and improve meat productivity in the agroecological conditions of the south of Russia, in particular the Volgograd region, has not been studied enough. Therefore, this circumstance determined the purpose of our research.

2. Materials and methods
The purpose of the research was to find out how the absorption of purebred red steppe cows with Angler bulls affects the improvement of meat productivity. The object of the study was a purebred red steppe and crossbred young growth with a genotype of ½, ¾, 7/8 blood type in Angler breed. The studies were carried out according to the "Methods of scientific research in animal husbandry". Experimental work on this topic was carried out in the conditions of PZK them. Lenin, located in the Surovikinsky district of the Volgograd region. For the purpose of setting up a scientific experiment, 4 groups of bull calves at the age of 10 months were selected: 1) I experimental group - represented by purebred animals of the red steppe breed; 2) experimental II - cross-breeding bulls ½ blood, obtained as a result of crossing cows...
of the red steppe breed with bulls-producers of Angler breed; Experimental III - cross-breed animals blood, obtained as a result of crossing cows ½ blood with purebred Angler bulls; Experimental IV - cross-breeding bulls of 7/8 blood, obtained as a result of crossing cows ¾ blood with Angler bulls.

The conditions of the experimental young animals were the same. Gobies were in special rooms prepared for them, intended for feeding, drinking and resting. The room equipped with an adjustable microclimate system was divided into sections.

The diets of feeding the studied animals were compiled in accordance with the nutritional value of the feed and were periodically adjusted during the experiment based on the age of the animals. The feeds included: cereal hay, corn silage, mixed fodder, molasses feed, common salt, mixed grass hay, green sorghum mass. Nutrient rations were balanced using the developed premixes. Animals had free access to water.

The duration of the research experience was 8 months. Control slaughter was carried out in a specially equipped slaughterhouse. The results of a scientific experiment were systematized and processed using hardware and the Microsoft Office software package, as well as using the statistical program Statistica 6.0 (Stat Soft Inc., USA).

3. Results
Ontogenesis studies in the scientific experiment are demonstrated by the example of the dynamics of live weight of experimental animals (table 1).

| Age, months | Group          |
|-------------|----------------|
|             | I experienced  | II experienced | III experienced | IV experienced |
| 10          | 266.4±1.13     | 266.8±1.99     | 285.1±3.49      | 308.6±4.77     |
| 12          | 312.1±2.41     | 314.1±1.91     | 335.9±4.07      | 359.1±6.79     |
| 15          | 378.0±2.69     | 385.0±2.80     | 412.4±3.41      | 433.6±7.53     |
| 18          | 448.0±5.27     | 466.8±2.70     | 499.6±3.15      | 522.1±8.72     |

At 10 months of age, the superiority of young animals of the III and IV experimental group over peers of the I experimental group was 18.7 kg or 6.56% and 42.2 kg or 13.68%; from the II experimental group - 18.3 kg or 6.42% and 41.8% or 13.55%; at the age of 12 months, the weight was 23.8 kg or 7.09% and 47.0 kg or 13.09%; 21.8 kg or 6.49% and 45.0 kg or 12.53%; at the age of 15 months - 34.4 kg or 8.34% and 55.6 kg or 12.82%; 27.4 kg or 6.64% and 48.6 kg or 11.21%, respectively.

At the final stage of the scientific experiment, the emerging dynamics was continued. All this allows us to conclude that an increase in the blood level of the Angler breed in cross-breeding animals leads to an increase in live weight and the manifestation of more constitutional traits of this breed in posterity.

However, in order to establish a more complete picture of the meat productivity of experimental young animals, we performed a control slaughter of animals with 3 heads from each group (table 2).

| Indicator                        | Group          |
|----------------------------------|----------------|
| Live weight in the farm, kg      | I experienced  | II experienced | III experienced | IV experienced |
| Pre-slaughter weight, kg         | 448.0±1.15     | 466.9±6.05     | 499.6±3.06      | 522.0±20.30    |
| Weight loss, kg                  | 424.0±1.00     | 439.9±5.66     | 471.6±2.64      | 493.3±18.96    |
| Carcass weight, kg               | 24.0±0.58      | 27.0±0.58      | 28.0±0.50       | 28.7±1.20      |
| Carcass output, %                | 527.7±0.53     | 239.6±2.87     | 266.9±1.46      | 279.0±10.68    |
| Fat weight, kg                   | 53.7           | 54.5           | 56.6            | 56.6           |
| Fat output, %                    | 8.8±0.12       | 9.1±0.06       | 10.7±0.12       | 11.0±0.53      |
| Slaughter weight, kg             | 236.5±0.64     | 248.7±2.91     | 277.6±1.56      | 290.0±11.14    |
| Killer exit, %                   | 55.8           | 56.5           | 58.9            | 58.8           |
As can be seen from the data in table 2, gobies with a blood content of ¾ and 7/8 in the Angler breed had high meat qualities. According to the data presented, we see that the animals from the third and fourth groups exceeded their peers from the first experimental group in the following qualitative indicators, as the slaughter weight - by 47.6 kg or 10.09% and 69.3 kg or 14.04%, of the second experimental group - by 31.7 kg or 6.71% and 53.3 kg or 10.81%; in terms of carcass weight, superiority was as follows - by 39.2 kg or 14.67% and 51.3 kg or 18.38%; 27.3 kg or 10.23% and 39.4 kg or 14.13%; in terms of slaughter mass exceeded - by 41.1 kg or 14.79% and 53.5 kg or 18.45%; 28.9 kg or 10.41% and 41.3 kg or 14.25%, respectively.

The data obtained confirm our conclusions that crosses with genotypes ¾ and 7/8 in the Angler breed were superior to analogues from the I and II experimental groups in live weight at 18 months of age.

The nutritional value and taste of the resulting meat raw materials primarily depend on the ratio of muscle mass, adipose, bone tissue and the volume of these parameters. To this end, the study conducted a morphological analysis of the carcasses of experimental animals. The results of this analysis are presented in the table 3.

Table 3. The morphological composition of the carcasses of experimental gobies (n = 3).

| Indicator                  | Group                          | I experienced | II experienced | III experienced | IV experienced |
|----------------------------|-------------------------------|---------------|----------------|-----------------|----------------|
| Carcass weight, kg         |                               | 227.7±0.53    | 239.6±2.87     | 266.9±1.46      | 279.0±10.68    |
| The mass of the pulp, kg   |                               | 179.5±0.58    | 189.8±0.72     | 214.6±1.11      | 224.0±9.54     |
| The output of pulp, %      |                               | 78.8          | 79.2           | 80.4            | 80.3           |
| Bone mass, kg              |                               | 41.1±0.23     | 42.8±2.58      | 44.5±1.01       | 47.0±1.62      |
| Output of bones, %         |                               | 18.1          | 17.8           | 16.7            | 16.8           |
| Tendon mass, kg            |                               | 7.1±0.03      | 7.0±0.17       | 7.8±0.38        | 8.0±0.25       |
| The output of tendons, %   |                               | 3.1           | 3.0            | 2.9             | 2.9            |
| Meat index, %              |                               | 53.7          | 54.5           | 56.6            | 54.2           |
| Nutritional value, units.  |                               | 4.36          | 4.47           | 4.83            | 4.77           |

In the process of studying the composition of the obtained carcasses of calves, we found that the animals of the third and fourth experimental groups exceeded their peers from the first and second experimental groups in the following parameters: by carcass pulp - by 35.1 kg or 16.36% and 44.5 kg or 19.87%; 24.8 kg or 11.56% and 34.2 kg or 15.27%, respectively. The maximum yield of flesh, meatiness index and consumer qualities were obtained from gobies with genotype ¾ in Angler breed. The results of the chemical analysis of the average meat sample, presented in table 4, indicate that, in general, meat obtained from animals of all four groups was characterized by physiological maturity (table 4).

Table 4. The chemical composition of the average sample of pulp obtained from experimental gobies, %.

| Indicator  | Group                 | I experienced | II experienced | III experienced | IV experienced |
|------------|-----------------------|---------------|----------------|-----------------|----------------|
| Moisture, %|                       | 68.33±0.17    | 67.92±0.23     | 67.72±0.10      | 66.93±0.21     |
| Dry matter |                       | 31.67±0.18    | 32.08±0.20     | 32.28±0.12      | 33.07±0.24     |
| including fat, % |         | 10.81±0.06    | 12.72±0.04     | 12.88±0.08      | 13.20±0.06     |
| protein   |                       | 19.96±0.04    | 18.45±0.03     | 18.45±0.14      | 18.94±0.04     |
| ash, %     |                       | 0.89±0.16     | 0.91±0.21      | 0.94±0.10       | 0.92±0.25      |

As can be seen from table 4, the crossbred gobies of the III and IV experimental groups exceeded their peers from the I and II experimental groups in the dry matter content in the average pulp sample by 0.61 and 1.40% and 0.20 and 0.99%; fat - by 2.07 and 2.39 and 0.16 and 0.48%, respectively. However, the average sample of the pulp of purebred red steppe gobies from the experimental group I
was richer in protein compared to analogues from the II, III and IV experimental groups by 1.51, 1.51 and 1.02%, respectively.

4. Conclusion
As a result of a scientific experiment, it was found that absorbing interbreeding of animals allows to maximize the excellent qualities of individual breeds and achieve greater yield of meat raw materials, ceteris paribus.

A number of domestic scientists [2, 3, 7] note that in order to conduct effective breeding and breeding work with red steppe cattle, it is necessary to actively breed with improving breeds. Thus, many researchers note that through the use of such improving breeds as Angler, Hereford, Ayrshire, and others, it is possible to obtain highly productive young cattle that are superior in quantitative and qualitative indicators of productivity to purebred red steppe cattle [8]. Based on the foregoing, our results are consistent with earlier publications and supplement them with new information on changes in productivity and improvement of animals of the red steppe breed. Thanks to the use of the seed of bulls of the Angler breed to improve red steppe cattle, highly productive cross-breed descendants with a live weight of 466.8 to 522.1 kg at 18 months of age were obtained; slaughter weight - 248.7-290.0 kg and slaughter yield - 56.5-58.8%; pulp mass - 189.8-224.0 kg and pulp yield - 79.2-80.3%. The meat index in crossbreeds with genotype ¾ for Anglers reached 56.6%, and the nutritional value of pulp was 4.83 units. The effectiveness of the use of Angler bulls-producers was confirmed in improving productivity and improving the red steppe cattle.

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