Dairy productivity of cows - daughters of bull producers

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Abstract. In the Sverdlovsk region, in herds of Holstein black-and-white cattle of the Ural type, up to 98% of cows are descended from bull producers of foreign selection. Assessment of the influence of a bull producer on the productive qualities of daughters is relevant and of practical importance, especially in conditions of increased blood in the Holstein breed. The daughters of the breeding bull Gavano had the highest indicators in terms of milk production, the daughters of the breeding bull Das were in second place. It should be noted that the milk yield for 305 days of lactation in all studied animals was within the range of 6583 (daughter of bull Cassio) - 8106 kg (daughter of bull Gavano) kg, which indicates a high potential for productivity in the cows of this herd. The superiority of the daughters of bull Gavano in milk yield ranged from 445 to 1523 kg or 5.5 - 18.8% and was reliable in favor of the former (P≤0.05 - P≤0.01). The highest rates for fat mass fraction in milk were found in the daughters of bull De-Su. 4.0 and 4.01% of fat was in milk of cows-daughters of the Sayan, Mers and Cassio bulls. In terms of protein mass fraction in milk, cows differed from bull De-Su for the worse. In the milk of cows-daughters of other bull producers the protein mass fraction was in the range of 3.13-3.17%. The yield of milk fat and milk protein was more influenced by milk yield in 305 days of lactation. Most of the nutrients were obtained from the milk of the cows-daughters of bull Gavano. The daughters of bull Cassio were in second place, only slightly inferior to them were the daughters of bulls Das and De-Su. Less nutrients were obtained with milk from the daughters of bull Cassio. All cows had a dairy production direction, as evidenced by a high milk yield ratio from 1186 to 1432 kg of milk per 100 kg of live weight of a cow. The farm uses daughter cows from Holstein bull producers with a high genetic potential for productivity.

1. Introduction
Sustainable supply of the population with high-quality food products, including milk, is the main necessity in ensuring the health of the nation and food security of any country [1-7]. Increasing the production of high-quality livestock products (milk and dairy products) is one of the most important tasks in the development of animal husbandry all over the world, which is becoming increasingly
important both with the growth of the population of our planet, in particular our country, and to meet the human needs for food. In this regard, the development of this industry is given great national economic importance [7-14]. An increase in the productivity of cows is inseparably associated with an improvement in the quality of milk, which has a significant impact on the quality of finished dairy products [15-25]. All over the world, dairy cattle are used to obtain milk, including such related ones as black-and-white, Holstein, Dutch, which differ in economically useful qualities depending on the climatic and ecological-forage conditions of the breeding zone, and the gene pool of breed resources [26-27]. However, since these are related breeds in herds of dairy cattle, bull producers of the Holstein breed of foreign selection are widely used. In the Sverdlovsk region, in herds of Holstein black-and-white cattle of the Ural type, up to 98% of cows are descended from bull producers of foreign selection [28-30]. Assessment of the influence of a bull producer on the productive qualities of daughters is relevant and of practical importance, especially in conditions of increased blood in the Holstein breed. The aim of the research was to assess the influence of a bull producer on the productive qualities of cows-daughters.

2. Materials and method
The study included all cows that completed the first lactation of breeding bulls (Das, Sayan, De-Su, Gavano, Tuareg, Mers, Cassio, Bentley), having more than 15 daughters from a breeding farm for breeding Holstein black-and-white cattle of the Ural type of the Sverdlovsk region. They were divided into 8 groups depending on their affiliation with the breeding bull: group 1 consists of the daughters of bull Das; group 2 of the daughters of bull Sayan; group 3 of the daughters of bull De-Su, group 4 of the daughters of bull Gavano; group 5 of the daughters of bull Tuareg; group 6 of the daughters of bull Mers, group 7 of the daughters of bull Cassio and group 8 of the daughters of bull Bentley. The data of zootechnical and breeding registration of the Selex program base were used. The milkiness coefficient, the amount of milk fat and milk protein per lactation were calculated.

3. Results
The agricultural enterprise is engaged in breeding highly productive, Holsteinized black-and-white cattle of the Ural type. Over the past seven years, daughters of 70 breeding bulls have been and continue to be used in the herd.

We studied and analyzed data on the indicators of milk production of daughters of Holstein bull producers used on the farm for the first lactation in order to assess the effect of the producer on the productive qualities of daughters (figure 1).

The daughters of the breeding bull Gavano had the highest indicators in terms of milk production, the daughters of the breeding bull Das were in second place. It should be noted that the milk yield for 305 days of lactation in all studied animals was within the range of 6583 (daughter of bull Cassio) - 8106 (daughter of bull Gavano) kg, which indicates a high potential for productivity in the cows of this herd. The superiority of the daughters of bull Gavano in milk yield ranged from 445 to 1523 kg or 5.5 - 18.8% and was reliable in favor of the former (P≤0.05 - P≤0.01).

Milk productivity is assessed by both quantitative and qualitative indicators. In our case, these are fat mass fraction and protein mass fraction in milk. The daughters of the assessed producers had different values for fat and protein content in milk (figure 2).
The nutritional and biological value of milk as a food product depends on the quality indicators of milk. The highest indicators for fat mass fraction in milk were found in the daughters of the De-Su bull. 4.0 and 4.01% of fat was in milk of cows-daughters of the Sayan, Mers and Cassio bulls. In terms of protein mass fraction in milk, the cows differed for the worse from bull De-Su. In the milk of cows-daughters of other bull producers, the protein mass fraction in milk was in the range of 3.13-3.17%.

Differences in milk yield per lactation and milk quality had an impact on the yield of nutrients, namely milk fat and protein (figure 3).

The yield of milk fat and milk protein was more influenced by milk yield in 305 days of lactation. The figure clearly shows that most of the nutrients were obtained from the milk of the cows-daughters of Gavano, in second place were the daughters of the Sayan bull, the daughters of the Das and De-Su bulls were very slightly inferior to them. Less nutrients were obtained with milk from the daughters of the bull Cassio, due to the lower milk yield per lactation.
Figure 3. The release of nutrients from the milk of cows-daughters, kg.

The farm uses a system of intensive rearing of replacement young animals, its insemination is carried out at 14-15 months of age with a live weight of 365-380 kg. We tracked the change in live weight in heifers at the first insemination and after the first calving. The data are presented in figure 4.

Figure 4. The release of nutrients from the milk of cows-daughters, kg.

The figure clearly shows that the daughters of bulls did not have a significant difference in live weight at the first insemination, but they differed in live weight at the first calving. It ranged from 2 to 30 kg or 0.3 - 5.3%. This, to some extent, influenced the milk production ratio, which can be used to judge the direction of cow’s productivity (figure 5).
All cows had a dairy productivity direction, as evidenced by a high milk yield ratio from 1186 to 1432 kg of milk per 100 kg of live weight of a cow. Thus, a general conclusion can be made about the high genetic potential of daughters from Holstein bull producers used on the farm.

4. Discussion
The daughters of the breeding bull Havano had the highest indicators in terms of milk production, the daughters of the breeding bull Das were in second place. The milk yield for 305 days of lactation in all studied animals was in the range of 6583 - 8106 kg, which indicates a fairly high productivity potential in the cows of this herd. Similar studies were conducted by V S Mymrin, O G Loretts, I V Tkachenko, V F Gridin, S L Gridina, O I Leshonok.

5. Conclusion
In general, breeding work in the herd is carried out at a fairly high level. Breeding stock in terms of milk productivity is relatively uniform and leveled, which contributes to the intensification of production and an increase in milk production at complexes with industrial production technology. The daughters of all assessed bull producers have high performance indicators.

References
[1] Ashan S et al. 2020 Functional exploration of bioactive moieties of fermented and non-fermented soy milk with reference to nutritional attributes J Microbiol Biotech Food Sci 10(1) 145-9 doi 10.15414/jmbfs.2020.10.1.145-149
[2] Ahsan S et al. 2020 Safety assessment of milk and indigenous milk products from different areas of Faisalabad J Microbiol Biotech Food Sci 9(6) 1197-203 DOI: 10.15414/jmbfs.2020.9.6.1197-1203
[3] Akhmetova S, Suleimenova M and Rebezov M 2019 Mechanism of an improvement of business processes management system for food production: case of meat products enterprise Entrepreneurship and sustainability issues 7(2) 1015-35 Doi 10.9770/jesi.2019.7.2(16)
[4] Morozova L et al. 2020 Improving the physiological and biochemical status of high-yielding cows through complete feeding International Journal of Pharmaceutical Research 1 2181-90 https://doi.org/10.31838/ijpr/2020.SP1.319
[5] Zinina O et al. 2020 Functional and technological indicators of fermented minced meat IOP
Zinina O et al. 2020 Sensory, physical and chemical characteristics of fermented minced meat IOP Conf. Ser.: Earth Environ. Sci. 548 082010 doi: 10.1088/1755-1315/548/8/082010

Rebezov M et al. 2020 Improvement of Laboratory Services When using Sample Preparation in Microwave System International Journal of Current Research and Review 12(16) 29-33 doi 10.31782/IJCRRR.2020.12167

Gorelik O et al. 2019 Effect of bio-preparation on physiological status of dry cows International Journal of Innovative Technology and Exploring Engineering 8(7) 559-62

Gorelik O et al. 2019 The state of nonspecific resistance of calves during the preweaning period International Journal of Agricultural and Veterinary Research https://doi.org/10.31838/ijrpr/2019.11.01.133

Gorelik O et al. 2017 Study of chemical and mineral composition of new sour milk bio-product with sapropel powder Annual Research & Review in Biology 18(4) 1-5 DOI: 10.9734/ARRRB/2017/36937

Gorelik O et al. 2020 Studying the biochemical composition of the blood of cows fed with immune corrector biopreparation AIP Conference Proceedings 2207 020012 https://doi.org/10.1063/5.0000317

Belookov A et al. 2019 Using of EM-technology (effective microorganism) for increasing the productivity of calves International Journal of Engineering and Advanced Technology 8(4) 1058

Khaziakhmetov F et al. 2018 Effect Of Probiotics On Calves, Weaned Pigs And Lamb Growth Research journal of pharmaceutical biological and chemical sciences 9(3) 866-70

Khaziakhmetov F, Khabirov A, Rebezov M, Basharov A, Ziangulov I and Okuskanova E 2018 Influence of probiotics "Stimix Zoostim" on the microflora of faeces, hematological indicators and intensivity of growth of calves of the dairy period International Journal of Veterinary Science 7(4) 178

Smolnikova F, Moldabayeva Z, Klychkova M, Gorelik O, Khaybrakhmanov R, Mironova I, Kalimullin A and Latypova G 2019 Sour milk production technology and its nutritive value International Journal of Innovative Technology and Exploring Engineering 8(7) 670-2

Chernopolskaya N, Gavrilo N, Rebezov M, Harlap S, Nigmatyanov A, Peshcherov G, Bychkova T, Vlasova K and Karapetyan I 2019 Biotechnology of specialized fermented product for elderly nutrition International Journal of Pharmaceutical Research 11(1) 545-50 DOI 10.35940/ijrte.B3158.078219

Chernopolskaya N, Gavrilo N, Rebezov M, Dolmatova I, Zaitseva T, Somova Y, Babaeva M, Ponomarev E and Voskanyan O 2019 Biotechnology of specialized product for sports nutrition International Journal of Engineering and Advanced Technology 8(4) 40-5 DOI: 10.35940/ijrte.B3158.078219

Gavrilo N, Chernopolskaya N, Molyboga E, Shipkova K, Dolmatova I, Demidova V, Rebezov M, Kuznetsova E and Ponomareva L 2019 Biotechnology application in production of specialized dairy products using probiotic cultures immobilization International Journal of Innovative Technology and Exploring Engineering 8(6) 642-8

Gavrilo N, Chernopolskaya N, Rebezov M, Shchetinina E, Suyazova I, Safronov S, Ivanova V and Sultanova E 2020 Development of specialized food products for nutrition of sportsmen Journal of Critical Reviews 7(4) 233-6 DOI 10.31838/jcr.07.04.43

Gavrilo N, Chernopolskaya N, Rebezov M, Moisejkina D, Dolmatova I, Mironova I, Peshcherov G, Gorelik O and Derkho M 2019 Advanced Biotechnology of Specialized Fermented Milk Products International Journal of Recent Technology and Engineering 8(2) 2718-22 DOI 10.35940/ijrte.B3158.078219

Temerbayeva M et al. 2018 Development of Yoghurt from Combination of Goat and Cow Milk Annual Research & Review in Biology 23(6) 1-7 DOI 10.9734/arrb/2018/38800

Temerbayeva M et al. 2018 Technology of Sour Milk Product For Elderly Nutrition Research
[23] Serikova A et al. 2018 Development Of Technology Of Fermented Milk Drink With Immune Stimulating Properties Research Journal of Pharmaceutical Biological and Chemical Sciences (RJPBCS) 9(4) 495-500 WOSUID WOS 000438848100062

[24] Smolnikova F et al. 2018 Nutritive Value Of Curd Product Enriched With Wheat Germ Research Journal of Pharmaceutical Biological and Chemical Sciences (RJPBCS) 9(3) 1003-8 WOSUID WOS 000438847100131

[25] Kuramshina N, Rebezov M, Kuramshin E, Tretyak L, Topuria G, Kulikov D, Evtushenko A, Harlap S and Okuskhanova E 2019 Heavy metals content in meat and milk of Orenburg region of Russia International Journal of Pharmaceutical Research 11(1) 1301-5 DOI: 10.21668/health.risk/2019.2.04.eng

[26] Skvortsov E, Bykova O, Mymrin V, Skvortsova E, Neverova O, Nabokov V and Kosilov V 2018 Determination of the applicability of robotics in animal husbandry The Turkish Online Journal of Design Art and Communication 8(S-MRCHSPCL) 291-9

[27] Mymrin V and Loretts O 2019 Contemporary trends in the formation of economically-beneficial qualities in productive animals Digital agriculture - development strategy Proceedings of the International Scientific and Practical Conference (ISPC 2019) Advances in Intelligent Systems Research 511-4

[28] Gridina S, Gridin V and Leshonok O 2018 Characterization of high-producing cows by their immunogenetic status Advances in Engineering Research 253-6

[29] Chechenikhina O, Loretts O, Bykova O, Shatskikh E, Gridin V and Topuriya L 2018 Productive qualities of cattle in dependence on genetic and paratypic factors International Journal of Advanced Biotechnology and Research 9(1) 587-93

[30] Tkachenko I, Gridin V and Gridina S 2016 Results of researches federal state scientific institution “Ural research institute for agri-culture” on identification of interrelation efficiency cows of the ural type with the immune status Yekaterinburg 85-90