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THE INCREASING OF MILK PRODUCTIVITY OF YAROSLAVL BREED CATTLE DUE TO THE INCREASING GENETIC POTENTIAL UNDER VARIOUS KEEPING TECHNOLOGIES

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ABSTRACT

Milk is widely used as a food product in processed and unprocessed form or as raw materials for dairy and food industries. So indicators of dairy efficiency of cows have a direct influence on a profit of agricultural producers. The estimation of the indicators of milk production of cows with different level of thorough-bredness of the Holstein breed depending on keeping technology was conducted in the article. For statistical data in determining the strength of influence of factors procedure we used the procedure of generalized linear models – GLM in the complex «MATLAB 2000» to determine the strength of influence of factors for statistical processing. Breeding strategies for improving the genetic potential of the cows of the Yaroslavl breed Holstein -Yaroslavl hybrids used on the farms with technologies widely used in Russia was developed in the article. Our studies allow identifying components providing a significant effect on milk production of cattle. The most informative and productive factors were: yield of the first lactation, live weight of the first lactation, the level of thorough-bredness.

Keywords: Cattle, the realization of genetic potential, milk productivity

INTRODUCTION

The intensification of production is considered to be main direction of development of animal husbandry in Russia. It is based on modern scientific achievements and advanced technologies. These factors provide high productivity, sustainability, competitiveness, production and effective implementation of the genetic potential of animals **(Furaeva, 2012).** The implementation of created high genetic potential of milk productivity of cows is one of the main problems in livestock caused by several factors. Keeping, feeding and milking animals determine the level of the productivity and life expectancy of animals by 70 - 80% **(Kutrovskij, 2010).** Russian farmers have received ample opportunity to use modern technologies and content exploitation of cattle producers from different countries presented by: «Westfalia» (Germany), «DeLaval» (Sweden), «SAC» (Denmark) and STP «Femax» (Russia). These technologies do not have objective data on the comparative evaluation. Purchasing equipment, management is guided only by subjective evaluation, cost, terms of payment and technical services. After modernization of livestock complexes manufacturers need a set of measures which aim is genetic improvement of cattle herds. One of the elements of the solution of the problem is to optimize the implementation of the genetic potential of productive cattle performance with the use of various keeping technologies. Therefore, the aim of our research was the improvement of controlling methods of the selection process to improve productive performance of cows on the basis of the realization of the genetic potential with the use of various keeping technologies.

MATERIAL AND METHODS

Research objects - pure-bred cows of the Yaroslavl breed and crossbreed cows of the Holstein- Yaroslavl breed having different thorough-bredness of the Holstein breed, in the amount of 6230 cows, 4776 of them are leavers.
Material is prepared on the basis of the «Information database of the Yaroslavl cattle breed » (№ of the state registration is 2013620064), data of the program ARMZS (up to 2009 year) and ARMS -W (№ of the state registration is 2009613920 from 22.07.2009 year), information software module «PAVKA».
Farms of the Yaroslavl region with different keeping technology were selected for study: LLC breeding plant «Rodina» (Loose - boxed keeping of cows and equipment of «Westfalia» company), Joint Stock Company, breeding farm named after Dzerzhinsky (captive keeping with the use of installations of «DeLaval» company), JSC «Tatischevskoe» (loose - boxed keeping with the use of high-tech equipment which LLC NPP «Femax» offers as an alternative to imported equipment).
The security of feeds of dairy herd annually was at the same level and under the control of the Yaroslavl Research Institute of Livestock and fodder production during study period. Diets were balanced on essential nutrients.
The effects of the lines and leader groups, bulls, mothers of the cows and the influence of the crossing level were considered in the evaluation of the impact of genetic factors. Such factors as the effect of the year of the first calving, age and live weight at first calving and milk yield in the first lactation were taken in the complex of paratypic factors. Maximum lactation milk yield, duration of cow use on the farm and life yield were considered as controlled productive indicators. We determined the realization of the genetic potential estimated on controlling grounds by Kuznetsovsky algorithm, 1983 **(Malyukova, 2012).** For statistical data in determining the strength of influence of factors procedure we used the procedure of generalized linear models - GLM in the complex «MATLAB 2000» to determine the strength of influence of factors for statistical processing.

RESULTS AND DISCUSSION

The analysis of the dependence of the term «yield of maximum lactation» of the factor «line» showed that only loose keeping of cows and the equipment of «Femax» company provided highly realized genetic potential to lines Vis Back Aydeala 933122 , 252803 Silin Traigune Rokita 252803 and Volniy – YAYA-4370 . Captive keeping of cows and installation «Delaval» provided the realization of the genetic potential of the maximum milk yield close to a 100% lines Vis Back Aydeala 933122 and 198998 Reflection Sovering. Loose - boxed content of cows of «Westfalia» company equipment provided the realization of the genetic potential of this indicator higher than 100 % animals belong to the lines of Murat – YAYA-4388 and Gillette- YAYA-4574.
The indicator «life yield» correlates positively with the indicator «economic use» - at the level of +0.45...+0.58. Therefore, an assessment of the realization of genetic superior of lines of life yield performed with the reference to the assessment of the previous feature. According to our data the cows of the lines:

Gillette YAYA–4574, Marta YAYA-2456 and Dobriy-4627 have maximum life yield. These lines tend to increase the duration of the economic use. The decrease in the duration of the economic use is observed between the animals belong to the lines of the Holstein breed (except line Montvik Chieftain 95679 in the conditions of breeding farm breeding named after Dzerzhinsky). This trend is characterized by a decrease of lifetime yield. The effect of the interaction of the factors was 31.2***, the influence of factor «line» was 29.1*** technology – 27.2*** unorganized factors – 12.5**.

Table 1 The Results of the application of various technologies in the context of thorough-bredness of the Holstein breed

Thorough-bredness on the Holstein breed	Technology of the keeping cows / Index	Loose - boxed keeping of cows and equipment of «Westfalia»	Captive keeping with the use of installations of «DeLaval» company	Loose - boxed keeping of cows and equipment of «Femax»
0…5	the number of cows	396	783	417
	yield of maximum lactation	6090,7	5073,6	4912,3
	genetic superiority, %	88,2	89,2	79,6
5,1…12,5	the number of cows	---	88	23
	yield of maximum lactation	---	5470,7	5004,6
	genetic superiority, %	---	98,5	85,9
12,6…25,0	the number of cows	25	159	39
	yield of maximum lactation	6444,7	5353,5	5945,2
	genetic superiority, %	95,3	96,3	102,4
25,1…37,5	the number of cows	77	172	201
	yield of maximum lactation	5407,1	4992,8	5477,7
	genetic superiority, %	79,5	89,5	93,4
37,6…50,0	the number of cows	371	494	307
	yield of maximum lactation	6569,1	5517,8	5975,5
	genetic superiority, %	96,7	99,3	103,6
50,1…75,0	the number of cows	590	1432	337
	yield of maximum lactation	7132,5	5872,9	6541,8
	genetic superiority, %	107,7	109,9	116,9
75,1 and more	the number of cows	717	486	129
	yield of maximum lactation	7071,7	5697,6	7044,2
	genetic superiority, %	107,1	103,0	123,7

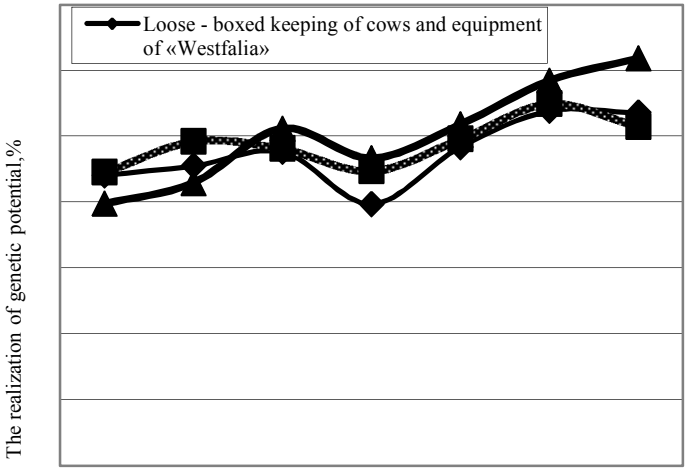

Figure 1 The characteristic of the dependence of the indicator «yield of maximum lactation» on the factor «thorough-bredness on the Holstein breed»

It is shown from the findings (figure 1, table 1) that with the increasing of thorough-bredness on the Holstein breed the implementation rate of the genetic potential of the yield of maximum lactation for all considered technologies is gradually increasing. Exception is the limit of thorough-bredness from 25 to 37.5%. There is a slight decline and its genetic superiority in this limit. Maximum rate «for the maximum yield of lactation» and genetic superiority on this indicator differ the animals with thorough-bredness more than 76% on the Holstein breed in loose-boxed keeping in JSC «Tatischevskoe» with the using of high-tech equipment of «Femax» company.

The power of influence of factors: «thorough-bredness», «technology» on the yield of maximum lactation is determined through covariance analysis realized in the software package «MATLAB 2000». «When the effect of the interaction force is 16.3*, the power of influence of factors: «thorough-bredness» is 27.3**, technology – 31.2***, unorganized factors – 25.2**.

Nonlinear dependence is clearly observed in characterizing the relationship between the duration of the economic use and live weight at first calving. In all sample the correlation coefficient of the «duration of economic use * live weight» was -0. 13 to the optimum point (441 ... 450 kg) -0.33 , 0.41, from the optimum point +0.41. Consequently, the achievement of the optimum live weight at first calving (respectively at the first insemination) can provide an increase in the duration of the economic use of animals up to ten days per kg of live weight increase.

The characteristics depending on «lifelong yield * live weight at first calving» are mostly close to the estimates «the duration of economic use o * live weight» (identical optimal point and growth trend). However, they were treated in the form of multiple correlations (except the effect of «the duration of economic use»). The correlation coefficient between live weight and duration of the economic use (except the effect of life milk yield) was 0.31**. Between live weight and life yield (except the duration of economic use) - 0.09 **. Between the yield and the life duration of economic use (except live weight) +0.47***.

The evaluation of the impact showed that the interaction effect was 26,8 ***, the power of factor influence «live weight at first calving» was 24,4 ***, technology – 26,3**, unorganized factors – 22,5*.

The regression line of the impact factor «milk yield of the first lactation» of the indicator «life milk yield» has a curvilinear characteristic. From the boundary point of selection pressure (for cattle, in which import technology equipment of keeping is used, the point is 3000...3500 kg, with the technology, which can replace import equipment, the level of milking is 4001...4500 kg of milk) the characteristic of the regression line on the trend of «reduction – increase» applied to technology does not differ. Phenotypic correlation coefficients between milk yield in the first lactation and life milk yield were +0.36*** in LLC breeding farm «Rodina» and in JSC breeding farm named after Dzerzhinsky - +0.38. The lack in differences between correlations confirms the conclusions made earlier. Additional analysis of the strength of the influence of factors detected maximum influence of the unorganized factors – 52.3***, interaction effect is on the second place – 24.1 **, the power of the influence of the factor «the first lactation milk yield» was 15.9*, technology – 7.7*.

Our studies allow to identify components providing a significant effect on milk production of cattle. The most informative and productive factors were: yield of the first lactation, live weight of the first lactation, the level of thorough-bredness. Therefore, in breeding of animals we recommend to use a linear model considering thorough-bredness, live weight at first calving and milk yield of the first lactation to consider such indicators as productive longevity , lifetime milk yield and milk yield of the maximum lactation for selection of firstTcalf heifers.

CONCLUSION

1. We recommend to use the lines with the implementation of the genetic potential 106 % or more to improve the efficiency of selection indexes of milk productivity

-for loose-boxed keeping of animals with the equipment of «Westfalia» company - this is line Murat YAYA - 4388 , Mars - YAYA 4319 and Siling Traydzhun Rokita 25280;

- for loose-boxed keeping of animals with the equipment LLC NPP «Femax» company
Loose - boxed keeping of the equipment NPP «Femax» - lines - Murat YAYA 4388, Gillete - YAYA 4574 and Montvik Chieftain 95679;
-for captive keeping with the use of installations of «DeLaval» company - line Vis Back Ideal 933122 and Volniy YAYA-4370.
2. For all marked technologies in our work- line Vis Back, Ideal 933122 and Volniy - YAYA 4370.
2. For loose keeping with «Westfalia» and «Femax» equipment we recommend the use of animals having thorough-bredness from 50,1 to 75,0 % of the Holstein breed, for captive keeping with the use of installations of «DeLaval» - 75 % or more.

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