



Journal Homepage: - [www.journalijar.com](http://www.journalijar.com)

## INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI: 10.21474/IJAR01/10487

DOI URL: <http://dx.doi.org/10.21474/IJAR01/10487>



### RESEARCH ARTICLE

#### IMPROVING BREEDING AND PRODUCTIVE QUALITIES OF AYRSHIRE CATTLE IN THE CONDITIONS OF THE REPUBLIC OF MARI EL OF THE RUSSIAN FEDERATION

Lyudmila V. Holodova, Alexey L. Rozhentsov and Evgeny V. Mikhalev  
Mari State University, Lenin Square 1, Yoshkar-Ola City, 424000.

#### Manuscript Info

##### Manuscript History

Received: 10 December 2019

Final Accepted: 12 January 2020

Published: February 2020

##### Key words:-

Breeding And Productive Qualities,  
Cattle, Genetic Potential

#### Abstract

In modern conditions of development of dairy cattle breeding in the Russian Federation, the problem of qualitatively improving existing breeds and animal populations is coming to the fore. Ayrshire cattle bred in the republic are purebred and have an genetics elite class. The herd is relatively young - the average age of cows is 2.5 calving. Milking of first-calf heifers amounted to 6583 kg of milk, full-age cows - 7000 kg. Milking of first-calf heifers amounted to 6583 kg of milk, full-age cows - 7000 kg. The average milk fat content in the herd is 4.1%, and the milk protein content is 3.12%. Analysis of the milk productivity of cows, depending on the linear affiliation, showed that the animals of O.R. Lightning 120135 had the highest level of productivity (milk yield - 7315 kg, milk fat content - 4.14%, milk protein - 3.15%). Research has shown that have a high genetic potential, their parental index for milk yield was 8364 kg, in the mass fraction of fat - 4.41%, protein - 3.23%. Thus, Ayrshire cattle in the republic are characterized by excellent productive qualities and high genetic potential. Further improvement of livestock will be carried out on the basis of purebred breeding methods. When selecting cows for the breeding core, the breeding traits will be: milk yield, mass fraction of fat and protein in milk, reproductive abilities, exterior, milk flow rate. In the selection of Ayrshire cattle, an individual, corrective selection will be applied, which improves milk production and body type.

Copy Right, IJAR, 2020.. All rights reserved.

#### Introduction:-

In modern conditions of development of dairy cattle breeding in the Russian Federation, the problem of qualitatively improving existing breeds and animal populations is highlighted, solving this problem to a large extent ensures high profitability of livestock production.

The main way to solve the problem should be the use of animals with high genetic potential. For this, it is necessary to create animal populations that would make it possible not only to increase productivity quantitatively, but also to solve the problem of milk quality if possible. In this regard, the Ayrshire breed, which is currently quite widespread in our country, deserves attention<sup>1,2,3</sup>. It is generally recognized that the Ayrshire breed is one of the most breeding in the range of economically useful and technological features of dairy breeds<sup>4,5,6</sup>. Breeding of these animals shows that even in contrasting conditions of keeping, they persistently retain the valuable qualities of the breed. Practical

**Corresponding Author:- Lyudmila V. Holodova**

Address:- Mari State University, Lenin Square 1, Yoshkar-Ola City, 424000.

experience shows that the animals of this breed must be constantly improved, using various breeding systems, taking into account production requirements, the characteristics of the gene pool, breeding conditions<sup>7,8,9,10</sup>.

This research is devoted to improving the breeding and productive qualities of Ayrshire cattle in the conditions of the Mari El Republic.

### **Materials and Methods:-**

Research have been done on the basis of ZAO «Mariyskoye» of the Republic of Mari El.

The purpose of the work is to improve the productive and breeding qualities of Ayrshire cattle in the Republic of Mari El.

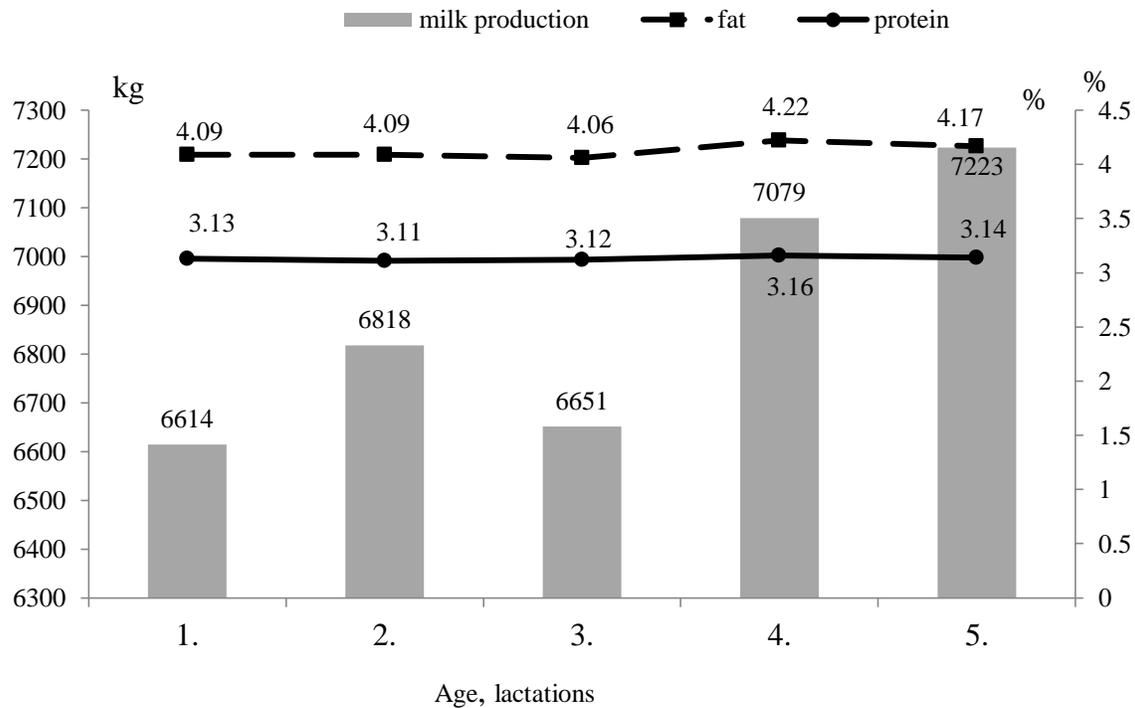
#### **To achieve this goal it was necessary to solve the following problems:**

1. study the breeding qualities of Ayrshire cows
2. analyze the level of milk productivity of Ayrshire cows in age dynamics and depending on linear affiliation.
3. The object of the research was 83 Ayrshire cows.
4. For research has been defined milk yield of cows (milk yield for 305 days, the mass fraction of fat and protein).
5. The genetic potential of livestock was assessed by the productivity of the ancestors of cows (mothers, mothers of fathers) according to the average milk yield per 305 days of lactation, the mass fraction of fat and protein.
6. The data obtained as a result of the studies were statistically processed on a PC using the Microsoft Excel program.

### **Results and Discussion:-**

In breeding farms, breeding is carried out in order to improve the existing breeds, increase their productivity, and expand the reproduction of the herd for obtaining and raising high-quality breeding animals. ZAO «Mariyskoye» is a Ayrshire breed cattle breeding farm. All Ayrshire cattle bred on the farm are purebred and have the highest class – «elite-record». The herd on the farm is relatively young. The average age of cows is 2.5 calving. Milking of first-calf heifers amounted to 6583 kg of milk, and for full-aged cows - 7000 kg. An important feature of Ayrshire cows is the high fat content in milk. Thus, analyzing the content of the mass fraction of fat in milk of cows, we can state the fact that on average in a herd this indicator was equal to 4.1%. The milk protein of Ayrshire cows is highly technological, and high-quality cheeses are obtained from milk. According to this indicator, the cows ZAO «Mariyskoye» are not high enough - only 3.12%. The record of Ayrshire breed in CJSC «Mariyskoye» in milk productivity belongs to cows No. 1558 and No. 1481. Their milk yield in 305 days of 2 lactation amounted to 11902 kg and 9270 kg of milk with a fat content of 4.3% and 4.1%, respectively. They were obtained from the bulls of Ring 3988 and Rembrandt 369. In addition, the bull Rembrandt 369 passed high dairy milk to his daughters. His daughter - cow No. 1486, the mass fraction of fat in milk was 4.7%. The largest number of record cows - 11 animals lactating in the herd, were born by the daughters of Venius bull 5165. The milk yield of cows for 305 days of 1 lactation exceeded the requirements of the standard of the 1st class Ayrshire breed by 2182.1 kg (67.1%), 2 lactations - by 2399, 1 kg (68.5%).

Analyzing the age-related dynamics of the milk production of cows, it was found that from the first to fifth lactation, the milk yield of cows increases, while the mass fraction of fat and protein in milk increases. So, cows of the fifth lactation had the highest milk yield - 7223 kg, while the mass fraction of fat was 4.17%, and protein - 3.14% (Fig).



**Fig 1:-** Milk productivity of cows in age dynamics.

One of the most important factors determining the value of livestock is the genetic potential of animals, which is determined by the productivity of maternal ancestors. For a more complete assessment of the potential of animals for all indicators of female ancestors, we calculated the parental index of cows, which shows the degree of possible transmission to the offspring of the level of milk productivity, i.e., the pressure of the ancestor genotype on the milk productivity of the offspring. As shown by studies of cow herds, have a high genetic potential, their parental index for milk yield was 8364 kg, in the mass fraction of fat - 4.41%, protein - 3.23%. Realization of the genetic potential of cows under farm conditions was 80.8% for milk yield, 93% for fat mass fraction, and 96.6% for protein.

The population of Ayrshire cattle on the farm is characterized by relatively high heritability ratios (0.4 by milk yield, 0.2 by mass fraction of fat; 0.48 by mass fraction of protein).

Currently Ayrshire cattle, bred on the farm, refers to 6 lines: O.R. Lightning120135, S.B. Commander 174233, R. Urho Herrant 13093, Juttero Romeo 15710, Dick 768 and Sniperum 63640.

Analysis of the milk productivity of cows, depending on linear affiliation, showed that the highest milk yield was found in animals belonging to the O.R. Lightning120135, from each cow of this line an average of 305 days of lactation was infused 7315 kg of milk. In cows belonging to the line of SB Commander 174233, milk yield was significantly lower by 743 kg ( $P \leq 0.01$ ). The coefficient of variation in milk yield, reflecting the degree of variability of this trait in Ayrshire cows, was low and varied from 3.3 (Yuttero Romeo line 15710) to 8.5% (R. Urho Erranta 13093). On this basis, the herd is homogeneous and selection on it will be difficult.

The most fat-dairy and protein-milk cows also belonged to the line of O.R. Lightning120135. In this line, the mass fraction of milk fat (MFF) in the average was 4.14%, and protein (MFP) was 3.15%. The coefficient of variation for these two characteristics is very low, the variation in MFF is from 0.7 to 2.4%, for the MFP from 0.3 to 0.9% (table).

**Table 1:-** Milk productivity of cows, depending on linear affiliation.

Line	N	Milk production, kg			Fat, %			Protein, %		
		M	M	Cv,%	M	M	Cv,%	M	M	Cv,%
R. Urho Herrant 13093	12	6479	318,3	8,5	4,04	0,04	1,7	3,10	0,020	0,9

Juttero Romeo 15710	7	6753	109,9	3,3	4,05	0,05	2,4	3,10	0,010	0,6
S.B. Commander 174233	27	6572	106,5	7,6	4,10	0,02	1,8	3,12	0,004	0,6
O.R. Lightning120135	8	7315	255,3	7,8	4,14	0,01	0,7	3,15	0,004	0,3
Dick 768	10	7051	225,3	7,8	4,07	0,03	2,1	3,12	0,005	0,4

Selection work with Ayrshire cattle in the farm is aimed at increasing milk yield and increasing the mass fraction of fat and protein in milk. Further improvement of Ayrshire cattle in ZAO «Mariyskoye» will be carried out on the basis of purebred breeding methods. The selection of Ayrshire cattle will be carried out with animals of six genealogical lines: O.R. Lightning120135, S.B. Commander 174233, R. Urho Errant 13093, Juttero Romeo 15710, Dika 768, Sniperum 63640. Both intraline and interline breeding will be applied. The most important elements of breeding of Ayrshire cattle are the development of the system and the organization of selection.

When selecting cows, the breeding characteristics are: milk yield, mass fraction of fat and protein, reproductive abilities, exterior, milk flow rate. Cows of the breeding core should not have any defects. Breeding core should be animal milk yield is not lower than the average for the herd, ie 6800 kg. We have allocated 46 animals to the breeding core, which is 55% of the total stock of broodstock. The milk yield of the cows of the breeding core is 7319 kg with a mass fraction of fat - 4.13%, protein - 3.14%. Entering heifers into the main herd will be possible if their milk yield is not lower than 85% of the average for the herd, and the milk yield is not less than 1.6 - 1.8 kg / min, the fat and protein content in milk is at the level of the breed standard.

First, animals are evaluated and the best of them are selected for the breeding core, then work is carried out to select the best pairs of them. The main task for the near future will be not only increasing the genetic potential for productivity, but also its implementation. This task can be accomplished through the selection of high-value bulls that are superior in their productive qualities to the genotypes obtained in the herd of ZAO «Mariyskoye».

As before, an individual, corrective selection will be applied in the farm when working with Ayrsky cattle, which will improve milk production and body type. For this purpose, bioproducts of such producers as: Jelyca Oblique7407843 (line of Errant 13093), Glen Malcolm Zachary 7534892 (line of S.B.Commandor 393145) and Du Petit Bois Anime 108572401 (line of O.R. Lightningwill be used for insemination of breeding stock) 120135). These bulls are not only distinguished by the high milk productivity of their maternal ancestors, but they also improve their physique, udder shape, and reproductive qualities in their offspring.

The planned measures will increase the milk production of the Ayrshire livestock in the Republic of Mari El and improve its breeding qualities.

### Conclusion:-

Thus, we can conclude that the breeding stock of Ayrshire cattle on the farm is purebred, upscale, characterized by excellent productive qualities and high genetic potential. Further improvement of Ayrshire cattle will be carried out on the basis of purebred breeding methods using animals of six genealogical lines: Lichting 120135, S.B. Commander 174233, R. Urho Errant 13093, Juttero Romeo 15710, Dika 768, Sniperum 63640. When selecting cows for the breeding core, the selection features will be: milk yield, mass fraction of fat and protein in milk, reproductive abilities, exterior, milk flow rate. When carrying out pedigree work with Ayrshire cattle, an individual, corrective selection will be applied that improves milk production and body type. For this purpose, biological products of such bulls as: Jelyca Oblique7407843, Glen Malcolm Zachary 7534892 and Du Petit Bois Anime 108572401 will be used for insemination of the breeding stock, as these manufacturers are not only of high genetic potential, but also improve their physique, shape udders, reproductive qualities.

### References:-

1. Bebe B.O., J. Udo, H.M., Rowlands G.J. and Thorpe W. (2003): Smallholder dairy systems in the Kenya highlands: breed preferences and breeding practices. *Livestock Production Sci.*, 82(2-3):117-127.
2. Cole J.B. and Null D.J. (2009): Genetic evaluation of lactation persistency for five breeds of dairy cattle. *J. Dairy Sci.*, 92(5): 2248-2258.
3. Cooper T.A., Wiggans G. R., Null D. J., Hutchison J. L. and Cole J. (2014): Genomic evaluation, breed identification, and discovery of a haplotype affecting fertility. for Ayrshire dairy cattle. *J. Dairy Sci.*, 97(6): 3878-3882.

4. Hare E., Norman H.D. and Wright J.R. (2006): Survival Rates and Productive Herd Life of Dairy Cattle in the United States. *J. Dairy Sci.*, 89(9):3713-3720.
5. Loker S., Miglior F., Bohmanova J., Jamrozik J. and Schaeffer L. (2009): Phenotypic analysis of pregnancy effect on milk, fat, and protein yields of Canadian Ayrshire, Jersey, Brown Swiss, and Guernsey breeds. *J. Dairy Sci.*, 92(3):1300-1312.
6. Lopez-Villalobos N., Garrick D.J., Holmes, Blair C.W. and Spelman R.J. (2000): Effects of Selection and Crossbreeding Strategies on Industry Profit in the New Zealand Dairy Industry. *J. Dairy Sci.*, 83(1):164-172.
7. Rincon E.J., Schermerhorn E.C., Mc Dowell R.E. and Mc Daniel B.T. (1982): Estimation of Genetic Effects on Milk Yield and Constituent Traits in Crossbred Dairy Cattle. *J. Dairy Sci.*, 65(5): 848-856.
8. Sewalem A., Kistemaker G.J., Ducrocq V. and Van Doormaal B.J. (2005): Genetic Analysis of Herd Life in Canadian Dairy Cattle on a Lactation Basis Using a Weibull Proportional Hazards Model. *J. Dairy Sci.*, 88(1):368-375.
9. Sewalem A., Kistemaker G.J., Miglior F. and Van Doormaal B.J. (2006): Analysis of Inbreeding and Its Relationship with Functional Longevity in Canadian Dairy Cattle. *J. Dairy Sci.*, 89(6): 2210-2216.
10. Wiggans G.R., Misztal I. and Van Vleck L.D. (1988): Animal Model Evaluation of Ayrshire Milk Yield with All Lactations, Herd-Sire Interaction, and Groups Based on Unknown Parents. *J. Dairy Sci.*, 71(2):115-125.