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The Russian Heavy Draft Milk Type Mares Characteristics.

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ABSTRACT

The scientists of Mari State University have been engaged in the Russian heavy draft milk type mares breeding for more than 30 years in the Republic of Mari El. Mares' milk yield has reached 4007-5235 kg for 210 days of lactation during the period under discussion. Mares' milk fat ratio ranged from 1.6% to 2.0%, while the milking ability index reached 591.5-696.0 kg. Morphological mares' udder characteristics have been studied. Interdependence of mare's udder shape and udder measurements with milking ability has been stated. Milk mares' traits have become less massive and slightly more angular for this period. It means that milk traits started to appear along with the lines of milk cattle little by little. Positive correlation between milk yield, mares' height at withers and mares' body length varied from + 0.01 to +0.47. Positive correlation between milk yield and mares' live weight made +0.24. Correlations between body measurements and mare's udder has not been stated. It has been assumed that inbreeding type of dairy animals is being formed on the basis of the Russian Heavy Draft.

Keywords: Dairy horse-breeding; correlation; milkiness index; milk type.

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INTRODUCTION

Dairy horse-breeding in the central regions of the Russian Federation is a prospective direction in the industry. Productive horse-breeding is the fastest growing sector of horse-breeding [6]. According to M. Mironenko, Ministry of Health and Care Service of the Russian Soviet Federated Socialist Republic recognized natural kumis as a remedy even at the end of 60th in the last century. The demand in kumis for medical institutions of the Russian Federation was 6.8 thousand tons at that time. Its annual production was only 2.3 thousand tons [4].

Not only kumis but also heat-treated mares' milk hit the trading networks. As it has been proved nowadays mare's milk is the best raw material for baby food production [1]. The chemical composition of mare's milk resembles female milk more than other agricultural animals' milk. So, the protein lactoferrin is considered a major factor of a newborn baby nonspecific immunity as breast milk is the main power source [7]. The share of lactoferrin in mare's milk in comparison with cow milk makes more than 1% [8]. Lactoperoxidase is the primary ferment in mare's milk, which inactivates non-indigenous microorganisms by means of bacteriostatic activity [9].

According to S. A. Veremeenko and others, mares' milk daily requirement is about 100 tons or 36.5 thousand tons per year in Russia [2]. According to V. V. Kalashnikov, there will be increase in the dairy horse breeding from the current 12 thousand to 17 thousand heads up to 2020 [3].

The development of dairy cattle breeding should be based on a profound knowledge of the biological basis of mares' milking ability as well as on the efficient technological solutions for their products. The effective selection of milking mares for milk production is still constrained by weak development of methodological and theoretical issues of breeding work in the dairy breeding.

Further development of the dairy cattle breeding makes it necessary to extend the selection list that comprises traditional features with new ones, for example, mares' udder technological parameters, mares' conformation peculiarities, correlating with their high milking ability which will greatly improve the animals' selection efficiency according to the set of traits [10].

The scientists of Mari State University have been engaged in the Russian heavy draft milk type mares breeding for more than 30 years. It was proved that the mares' milking increases their milking abilities. Correlation of milking ability with the types of higher nervous activity and mare's udder capacity has been defined. It was stated that high milk yield was typical for the Russian heavy draft milk type mares.

9 families numbering from 8 to 37 heads of the Russian heavy draft milk type mares have been formed in the Republic of Mari El. Leaders of the families dairy products ranged from 4007 to 5235 kg of milk in 210 days of lactation. Fat in mares' milk ranged from 1.6% to 2.0%, while milkiness index was 591.5-696.0 kg.

In mares, according to observations Campitelli et al., Noted a wide variability of fruiting period [12]. Milking ability of the Russian heavy draft milk type mares depended on the duration of the prenatal period of ontogenesis and service period. The technology of intensive mares' rearing has been developed. It made it possible to impregnate the Russian heavy draft milk type mares at the age of 1.5-2.0 years, but not at the age of 3 years [6].

Morphological mares' udder characteristics have been studied. Interdependence of mare's udder shape and udder measurements with milking ability has been stated. It has been singled out that linear selection increases milk yield while stabilization was more suitable for udder shape and teat selection. Family and within-family selection is better to be applied in mares breeding on the basis of reproductive qualities. As it was stated at the same time the existing technology of obtaining mares' milk reduced selection events effect significantly [5].

Inbred mare Russian draft breed mare outbred significantly superior ($P < 0,01$) on average, and the highest milk production per 210 days of lactation. Variability in milk production in inbred mares was also higher than outbred. Similar results were obtained in studies of cattle Parland S. [11].

The improved technology of obtaining mares' milk has been developed. It made it possible to increase mares' milk yield during lactation by 65.8% as well as to get up to more than 2.49 times of commercial milk from one milking mare during the year [5].

The Russian heavy draft milk type mares have been used only lately. So there are no clear selection criteria based on dairy mares' habit selection. Studies on the Russian heavy draft high-milk mares' exterior have not been carried on. Therefore, our research was aimed at identifying the Russian heavy draft milk type mares. The following points had to be solved:

- to trace dependence of mares' exterior on their milking ability
- to find correlation between mares' live-weight and their milkiness
- to understand the interrelation of parameters and mares' udder shape with their conformation and milking ability.

In 2013-2015 the studies were conducted at the kumis stud farm of the joint-stock company Plemzavod "Semyonovsky", located in the village of Yakimovo, Medvedevsky district of the Mari El Republic. The annual average horses' number made 350-370 heads, including 120-150 mares. The Russian heavy draft exterior-conformation peculiarities were studied by means of measuring tools and scales. Four key measurements were taken into consideration: height at withers, oblique body length, chest girth, metacarpal girth. Animals' conformation indices have been calculated on the basis of measurements.

Mares' milk yield was calculated on the basis of data obtained from the process of control milkings, held 2-3 times a month. Milking ability was determined for total lactation and for 210 days of lactation. The first control milking during the second month of lactation (or the first month of mares' milking) determined mares' milking. Milk yield per lactation was summarized with milk foal used during the lactation and this amount was defined as the estimated milk yield per lactation. The average mares' milking ability for all lactations was determined by summing the amount of milk per any lactation and dividing this sum by the number of lactations. Milkiness index was determined by the method that is common in animal industry. Data obtained from 463 Russian heavy drafts were used in our research.

The mares involved in the research, belonged to "elite" type. The Russian heavy draft mares were characterized by the sound constitution, heavysset, harmonious conformation. They had a harmonious, dry, small head; short well-muscled neck; long, sometimes slightly soft back; wide, long, well-muscled croup; well-built strong legs. Table 1 reveals changes in mares' measurements that were indicated in the process of milking ability selection.

Table 1 – Changes in the Russian heavy draft mares' measurements on the basis of generations

Years	Body measurements, sm				Conformation indices			
	the height at the withers	oblique body length	chest girth	metacarpus girth	format	mass	blockiness	Bone
1984	149.40	156.70	202.70	20.50	104.80	135.70	129.50	13.10
2000	151.90	162.00	194.00	20.60	106.60	127.70	119.70	13.50
2011	150.50	159.30	199.20	21.10	105.80	132.40	125.10	14.00
2011 in % by 1984	100.74	101.66	98.27	102.93	100.95	97.57	96.60	106.87

The results of the intensive selection on milking ability of the Russian heavy draft milk mares were the following: oblique length of the body increased by 1.66%, the chest girth decreased by 1.73% and metacarpus has increased almost by 3%. Mass and blockiness indices have decreased, but the bone index has increased. These changes were quite predictable. The following peculiarities are typical for the dairy horse-breeding: lack

of substantial load on the horse’s muscular system. As the lungs should not be quite developed mares’ chest girth reduces.

Milk mare’s traits have become less massive and slightly more angular for this period. It means that milk traits started to appear along with the lines of milk cattle little by little. The metacarpus increase testified to the increase in conformation, which was also the case for animals of the dairy type. Intensive milking ability involves a large removal of calcium from the body with milk yield, therefore, the bone system, which is the main battery of calcium, develops. That is why, the higher milking ability is, the better animal’s backbone develops.

Table 2 reveals the dependence of exterior on the milk yield of the Russian heavy draft milk mares Russian in 2013-2015.

Table 2 – Change in body measurements of the Russian heavy draft milk mares with different milk ability

Mares’ groups on milking ability	Head numbers	The average milk yield per lactation,kg	Body measurements, sm				Conformation indices			
			the height at the withers	oblique body length	chest girth	metacarpus girth	format	mass	blockiness	bone
<1999	4	1586.9	148.50	152.50	193.25	20.0	102.67	130.26	126.96	13.46
2000 - 2999	16	2466.0	149.75	159.31	195.69	20.7	106.37	130.66	122.87	13.86
3000 - 3999	16	3314,6	152.25	163.44	202.81	21.0	107.36	133.27	124.12	13.80
>4000	2	4181.6	151.50	165.50	199.50	20.5	109.22	131.63	120.49	13.52

The Russian heavy draft milk mares showed the increase in milk ability from 2000 kg to 4000 kg of milk per an average lactation when all measurements increased. The indices have increased accordingly, except animals’ bone index.

Correlation ratio for milk yield and body measurements of the Russian heavy draft milk mares with different milking ability have been calculated. (table 3).

Table 3 – Correlation ratio of the body measurements for the Russian heavy draft milk mares with milk yield per an average lactation

Mares’ groups on milking ability	Head numbers	The average milk yield per lactation,kg	Body measurements, sm				Conformation indices			
			the height at the withers	oblique body length	chest girth	metacarpus girth	format	mass	blockiness	bone
<1999	4	1586.9	+0.47	+0.44	-0.46	+0.66	+0.28	-0.55	-0.72	+0.72
2000 - 2999	16	2466.0	+0.15	+0.21	-0.08	-0.35	+0.18	-0.21	-0.36	-0.54
3000 - 3999	16	3314.6	+0.04	+0.01	-0.28	-0.66	-0.02	-0.26	-0.32	-0.65

The Russian heavy draft milk mares showed positive milk yield dependence on height at withers and body length. In the course of time correlation in mares' milking ability dropped dramatically to zero because of aging. The correlation with milk yield was low and negative in case of conformation indices.

The correlation ratio for the Russian heavy draft mares on the basis of live weight-productivity relationship was positive but low +0.24. Milkiness index has been calculated for the Russian heavy draft mares. It was equal to 574 kg. The leaders of the Russian heavy draft mares showed average milkiness index equal to 678 kg.

No significant dependence between the body measurement and the Russian heavy draft mares' udder measurements has been revealed in different animal groups on milking ability. Thus one can come to the conclusion that selection on the mares' udder measurements and on the animals' exterior should be carried out separately.

CONCLUSIONS

1. The chest girth decreased and metacarpus girth increased in the course of long-term selection on the Russian heavy draft milk mares' milking ability. Mass and blockiness indices decreased while bone index increased.
2. There is positive correlation varying from moderate to low values between the Russian heavy draft mares' milk yield, height at withers and body length.
3. The Russian heavy draft mares' correlation ratio between milking ability and live weight was + 0.24.
4. The Russian heavy draft mares' milkiness index was equal to 574 kg, while the leaders' Russian heavy draft mares' milkiness index was equal to 678 kg.
5. No significant dependence between the body measurement and the Russian heavy draft mares' udder measurements has been revealed. Selection on the mares' udder measurements and on the animals' exterior should be carried out separately.

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