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INCREASMENT OF PRODUCTIVITY OF FIRST-CALF COWS BY PERFORMING UDDER MASSAGE

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ABSTRACT

The paper presents research materials on the use of heifers udder massage and the subsequent milk productivity of first-calf cows. Studies have shown that for first-calf cows (Commercial dairy farm No. 1, vil. Kezdur), they were given manual udder massage. Milk yield for 305 days of lactation averaged 5111.6±41.80 kg; the content of the mass fraction of fat in milk 3.59±0.05%; the content of the mass fraction of protein 3.19±0.01%. In first-calf cows (Commercial dairy farm No. 3, vil. Pazhman), that were given mechanical udder massage. Milk yield for 305 days of lactation averaged 5272.6±262.13 kg; the content of the mass fraction of fat in milk 3.55±0.04 %; the content of the mass fraction of protein 3.18±0.01 %. In first-calf cows (Commercial dairy farm No. 2, vil. Klyuchevskaya), that were not given udder massage. Milk yield for 305 days of lactation on average for the study group was 4794.6±87.30 kg; the content of the mass fraction of fat in milk 3.52±0.18 %; the content of the mass fraction 3.18±0.02 %. In first-calf cows (Commercial dairy farm No. 4, vil. Kamyshevo), which also were not given udder massage. Milk yield for 305 days of lactation of the studied cows averaged 4858.8±71.02 kg; the content of the mass fraction of fat in milk 3.48±0.18 %; the content of the mass fraction of protein 3.18±0.03 %.

Disciplinary: Agricultural Science, Biological Science, Dairy Science.

1. INTRODUCTION

Preparation of heifers for calving is aimed at developing a set of positive conditioned reflexes for

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milking and keeping so that cows do not have negative reactions to new conditions. Replenishment a herd with heifers on dairy farms has significant advantages compared to putting first-calves in the herd if they were calved and lactated on another farm with different production technology. These advantages are as follows: when replenishing a herd with no more than 7 months of pregnancy, the animals have time to adapt to the accepted industrial technology before calving; preparation for calving, calving, and distribution of first calves in the maternity department and the production sector ensure that they develop a certain stereotype for the mode and multiplicity of milking, housing conditions and other elements of technology. These studies were conducted by many authors who presented their works in scientific publications (Lapotko, 2019; Vorobyova and Chukavin, 2017; Vorobyova and Perevozchikov, 2017; Isupova, 2018; Kislyakova, et al., 2016; Kislyakova et al., 2017; Kislyakova and Khokhryakov, 2017; Lyubimov et al., 2017; Lyubimov et al., 2017; Martynova and Yastrebova, 2016; Martynova et al., 2016; Rodionov, et al., 2017; Strekozov et al., 2013; Strekozov, 2006; Faizrakhmanov et al., 2007; Yastrebova and Martynova, 2016; Lyubimov et al., 2019; Kudrin et al., 2019a; 2019b; Kudrin et al., 2019c).

The purpose of the research was to study the effectiveness of udder massage at farms. The following tasks were set for the research: to study the organization and carrying out of udder massage of heifers, to analyze quantitative and qualitative indicators of milk productivity of first-calf cows.

2. MATERIALS AND METHODS OF RESEARCH

The research was conducted at Oshmes LLC of the Kez district of the Udmurt Republic. The object of research was four cowsheds, where they kept milk cows and heifers. The analysis of technological processes for the husbandry of cows on dairy farms is carried out. Heifers are kept with cows in a single unit on a leash and groups of different milkmaids. To study the results of the massage to heifers, we selected five first-calf cows from each farm. The difference in the calving of the selected first-calf cows was 20 days.

3. RESEARCH RESULTS

3.1 COMMERCIAL DAIRY FARM (CDF) NO. 1: KEZDUR

The commercial dairy farm "Kezdur" (CDF No. 1) contains 78 milk cows, two machine milking operators work there, the load on one operator was 39 milk cows, and the operators work with three milking machines. The technology of keeping cows is tie-up housing, the floors are made of sand-polymer tiles. Stall sizes: width 1.2 m, length 1.8 m. Wood sawdust is used as a bedding material on this farm at the rate of 15 kg per cow. The slope of the floor in the direction of the manure channel on which the metal grid is 1.5 %, which corresponds to the normative indicators. Manure is removed from the room twice a day by a scraper conveyor of the TCH-160 brand.

Cows feeding is organized from a feed Table made of concrete. Inside, the feed is distributed manually, in winter the cows are fed with a feed mixture, and in summer the cows are sent to grass. For best digestibility, the feed cutting length is 25 mm. For drinking, level drinkers are used - one for two cows, working on the principle of communicating vessels.

Two-time milking of cows is carried out by two-stroke milking machines with the АДМ-100 milking system. Accounting for cow milk is performed for each group of cows separately, using the УПУМ-1 counter. Milk is piped to the "Arctic 2000" cooling tank for further cooling and storage.

Lighting in the housing is provided through side windows, doors, and incandescent lamps. Ventilation in the room is carried out through side windows, doors, and exhaust shafts.

3.2 CDF NO. 2: KLYUCHEVSKAYA

The commercial dairy farm No. 2 "Klyuchevskaya" contains 108 milking cows, two machine milking operators work there, the load on one operator is 54 heads, they work with three milking machines. Stall sizes: width 1.2 m, length 1.8 m. Wood sawdust is used as a bedding material on this farm at the rate of 10 kg per cow. The slope of the floor in the direction of the manure channel on which the metal grid is 1.5 %, which corresponds to the normative indicators. Manure is removed from the premises twice a day by a TCH-160 scraper conveyor.

Cows feeding is organized from a feed Table made of concrete. Inside, the feed is distributed manually, in winter the cows are fed with a feed mixture, and in summer the cows are sent to grass. For best digestibility, the feed cutting length is 25 mm. For drinking, level drinkers are used - one for two cows, working on the principle of communicating vessels.

Two-time milking of cows is carried out by two-stroke milking machines with the АДМ-100 milking system. Accounting for cow milk is performed for each group of cows separately, using the УПУМ-1 counter. Milk is piped to the "Arctic 2000" cooling tank for further cooling and storage. Lighting in the housing is provided through side windows, doors, and incandescent lamps. Ventilation in the room is carried out through side windows, doors, and exhaust shafts.

3.3 CDF NO. 3: PAZHMAN

The commercial dairy farm No. 3 "Pazhman" contains 70 milking cows, two machine milking operators work there, the load on one operator is 35 cows, and they work on three milking machines. The technology of keeping cows is tie-up housing. The floor in the stalls is made of wooden planks. Stall size: width 1.2 m, length 1.8 m. Wood sawdust is used as a bedding material on this farm at the rate of 10 kg per cow. The slope of the floor in the direction of the manure channel on which the metal grid is 1.5 %. Manure is removed from the premises twice a day by a TCH-160 scraper conveyor into a cart and taken to the field.

Cows feeding is organized from the feed Table. The feed is distributed manually, cows are fed with feed mixture in winter, and cows spend more time on pasture in summer. The feed cutting length is 25 mm for best uniformity and best digestibility. Level drinkers are used for drinking working on the principle of communicating vessels, designed for two cows. Two-time milking of cows is carried out by two-stroke milking machines with the АДМ-100 milking system. Milk accounting is performed for each group separately using the УПУМ-1 counter. Milk is piped to the "Arctic 2000" closed type cooling tank for further cooling and storage.

Natural lighting through windows, doors, and artificial incandescent lamp lighting. Ventilation in the room is carried out through side windows, doors, and exhaust shafts.

3.4 CDF NO. 4: KLYUCHEVSKOE

The commercial dairy farm No. 4 "Klyuchevskoe" contains 208 milking cows, four machine milking operators work there, the load on one operator is 52 heads, and they work on three milking machines. The technology of keeping cows is tie-up housing, the floors in the stalls are made of wooden boards: width 1.2 m, length 1.8 m. Wood sawdust is used as a bedding material on this farm at the rate of 10 kg per cow. The slope of the floor in the direction of the manure channel on which the metal grid is 1.5 %. Manure is removed from the premises twice a day by a TCH-160 scraper

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conveyor.

Cows feeding is organized from the feed Table. The feed is distributed by the АМК-9 feeding machine, in winter the cows are fed with feed mixture, in summer the cows are sent to pastures and additionally fed with hay. Milking is performed twice a day in the stalls by two-stroke milking machines, АДМ-200 milking unit. Milk accounting is performed for each group separately using the УПУМ-1 counter. After milking, the milk is piped to the Arctic 3500 closed-type cooling tank for further cooling and storage.

Lighting is provided through windows, doors, and incandescent lamps. Ventilation in the room is carried out through side windows, doors, and exhaust shafts.

There are four typical silage pits with a capacity of 1000 t per each for storing feed-in "Oshmes" LLC. The type of feeding on the farm is silage feeding. Silage makes up 80 % of the diet structure in the winter-stall period and in the summer more than 85 % - green feed.

3.5 METHODS OF HEIFERS TRAINING TO THE CALVING

The farm uses different methods of heifers training to the calving. Thus, CDF No. 1 (Kezdur) for heifers training to the calving apply manual massage of the udder, the CDF No. 3 (Pazhman) use mechanical massage, and at two other farms of CDF No. 2 (Klyuchevskaya) and CDF No. 4 (Kamyshevo) - udder massage of heifers is not carried out.

Massage of the udder of the heifers in the farm (manual and mechanical) begins from the day they are placed in the group to the milkmaid (2-3 months before calving) and is carried out at the places of future milking. Manual massage is performed 2 times a day – in the morning and in the evening in the same hours as cows milking. The duration of the massage is 4-5 minutes. The udder massage mode is as follows:

- in the 1st week, the udder and nipples are massaged for 2 minutes superficially and with light circular movements (dry massage);
- in the 2nd week, for 3 minutes, massage of each half of the udder is performed separately with rubbing and lightly nipples sipping;
- in the 3rd week, for 4 minutes, a deep massage of the udder of each half is performed separately with both hands from the top down with nipples rubbing and stretching;
- in the 4th week, the same deep massage is performed, paying more attention to the front lobes of the udder. Massage of each half of the udder is carried out not only from the top-down but also from the bottom up. The duration of the massage is 4 minutes.

For the entire second month, continuous deep massage of each half of the udder is performed separately, and then each udder lobe is massaged with circular movements of the palm and fingers from top to bottom and from bottom to top.

They finish the udder massage a month before calving, it depends on the condition of the cow's udder, so that the cow does not have a colostral milk flux before calving.

Mechanical massage is performed using pneumatic massagers of the АПМ-Ф-1 brand operating from a vacuum line. Heifers are trained to the massage device for 3-5 days, increasing the duration of training from 1 to 5 minutes. Pneumomassage begins 2-3 months before calving, it is performed one time a day and is completed a month before calving.

The analysis of quantitative and qualitative indicators of milk productivity of the studied first-calf cows after manual udder massage was carried out (Table 1). The results of the research showed that the milk yield for 100 days of lactation was in the range from 2023 to 2103 kg of milk, on average 2068.6±34.33 kg; the content of the mass fraction of fat in milk was in the range from 3.24 to

3.35 %, on average 3.30±0.05 %; the content of the mass fraction of protein in milk ranges from 3.05 to 3.19 %, on average 3.11±0.05 %.

Table 1: Quantitative and qualitative indicators of milk productivity of first-calf cows after manual udder massage (CDF No. 1 Kezdur)

No.	Cow No., name	Milk yield for 100 days of lactation, kg	FMF, %	PMF, %	Milk yield for 305 days of lactation, kg	FMF, %	PMF, %	% for 100 days of lactation
1	Kedzurka 1245	2045	3.31	3.10	5098	3.64	3.19	40.1
2	Mimosa1230	2103	3.26	3.10	5162	3.58	3.19	40.7
3	Vesnushka1247	2023	3.24	3.10	5058	3.64	3.18	40.0
4	Ayva1301	2098	3.35	3.05	5145	3.58	3.18	40.8
5	Vernaya1220	2074	3.35	3.19	5095	3.51	3.19	40.7
Average		2068.6±34.33	3.30±0.05	3.11±0.05	5111.6±41.80	3.59±0.05	3.19±0.01	40.46±0.38

Milk yield for 305 days of lactation of the studied cows was in the range from 5058-5162 kg, on average for the study group 5111.6±41.80 kg; the content of the mass fraction of fat in milk was in the range 3.51-3.64 %, on average 3.59±0.05 %; the content of the mass fraction of protein was in the range 3.18-3.19%, on average 3.19±0.01 %. For all the studied first-calf cows in the group: the milk yield for 100 days of lactation exceeds 40.0% of the milk yield for lactation and is within the established norms (up to 40-45%), which indicates the effectiveness of the massage, see Table 1.

The analysis of quantitative and qualitative indicators of milk productivity of the studied first-calf cows after mechanical udder massage is presented in Table 2. The results of the research showed that the milk yield for 100 days of lactation was between 1993-2190 kg of milk, with an average of 2064.6±80.62 kg; the content of the mass fraction of fat in milk was between 3.21-3.32%, with an average of 3.27±0.05 %; the content of the mass fraction of protein was between 3.02 and 3.10 %, with an average of 3.06±0.04 %.

Milk yield for 305 days of lactation of the studied cows was in the range 5032-5600 kg, on average for the study group 5272.6±262.13 kg; the content of the mass fraction of fat in milk was in the range from 3.51-3.59%, on average 3.55±0.04 %; the content of the mass fraction of protein was in the range from 3.16-3.19%, on average 3.18±0.01 %. In this group, only one cow's milk yield for 100 days of lactation exceeds 40.0 % of the milk yield for lactation and amounted to 41.5 %, while for other cows it was in the range from 36.3-39.7%, on average 39.2%.

Table 2: Quantitative and qualitative indicators of milk productivity of first-calf cows after mechanical udder massage (CDF No. 3 Pazhman)

No.	Cow No., Name	Milk yield for 100 days of lactation, kg	FMF, %	PMF, %	Milk yield for 305 days of lactation, kg	FMF, %	PMF, %	% for 100 days of lactation
1.	Krasnaya1246	2056	3.32	3.02	5178	3.59	3.17	39.7
2	Prima1226	2087	3.32	3.10	5032	3.58	3.19	41.5
3	Ket1228	1993	3.21	3.02	5052	3.52	3.18	39.4
4	Fira1231	1997	3.23	3.09	5501	3.51	3.19	36.3
5	Zayka1239	2190	3.29	3.06	5600	3.53	3.16	39.1
Average		2064.60±80.62	3.27±0.05	3.06±0.04	5272.60±262.13	3.55±0.04	3.18±0.01	39.2±1.87

Also, we analyzed quantitative and qualitative indicators of milk productivity of first-calf cows without udder massage in two units (Table 3). The results of the research showed that the milk yield

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for 100 days of lactation at CDF No. 2 was between 1625-2009 kg of milk, on average 1799.2±146.90 kg; the content of the mass fraction of fat in milk was between 3.12-3.30 %, on average 3.19±0.07 %; the content of the mass fraction of protein was between 2.09-3.20%, on average 2.87±0.44 %. Milk yield for 305 days of lactation of the studied cows was in the range from 4665 to 4900 kg, on average for the study group 4794.6±87.30 kg; the content of the mass fraction of fat in milk was in the range from 3.20-3.63 %, on average 3.52±0.18 %; the content of the mass fraction of protein was in the range 3.15-3.22 %, on average 3.18±0.02%. In this group, only one cow's milk yield for 100 days of lactation exceeds 40% of the milk yield for lactation and amounted to 42.2 %, while for other cows it was in the range 34.8-37.7%, on average 37.5%.

Table 3: Quantitative and qualitative indicators of milk productivity of first-calf cows without udder massage (CDF No. 2 Klyuchevskaya)

No.	Cow No., name	Milk yield for 100 days of lactation, kg	FMF, %	PMF, %	Milk yield for 305 days of lactation, kg	FMF, %	PMF, %	% for 100 days of lactation
1.	Bulana1225	1702	3.20	3.01	4820	3.60	3.18	35.3
2	Avatarka 1267	1625	3.12	3.20	4665	3.63	3.18	34.8
3	Lyubka1256	1848	3.13	3.06	4900	3.59	3.22	37.7
4	Angara1234	1812	3.21	2.09	4825	3.20	3.15	37.6
5	Vasilisa1236	2009	3.30	3.00	4763	3.60	3.19	42.2
	Average	1799.2±146.9	3.19±0.07	2.87±0.44	4794.6±87.3	3.52±0.18	3.18±0.02	37.5±2.92

Table 4, milk yield for 100 days of lactation of first-calf cows, which also did not have udder massage at CDF No. 4, ranged 1524-1790 kg of milk, on average 1653.4±123.86 kg; the content of the mass fraction of fat in milk was in the range from 3.21-3.31 %, on average 3.25±0.04 %; the content of the mass fraction of protein in the range from 3.05-3.18 %, on average 3.11±0.05 % (Table 4). Milk yield for 305 days of lactation of the studied cows was in the range 4785-4956 kg, on average for the study group 4858.8±71.02 kg; the content of the mass fraction of fat in milk was in the range from 3.23-3.64 %, on average 3.48±0.18%; the content of the mass fraction of protein was in the range from 3.14-3.21 %, on average 3.18±0.03 %. In this group, no cow's milk yield for 100 days of lactation exceeded 40.0% of the milk yield for lactation and was in the range 31.8-36.6%, on average 34.0 %.

Table 4: Quantitative and qualitative indicators of milk productivity of first-calf cows without udder massage (CDF No. 4 (Kamyshevo)

No.	Cow No., Name	Milk yield for 100 days of lactation, kg	FMF, %	PMF, %	Milk yield for 305 days of lactation, kg	FMF, %	PMF, %	% for 100 days of lactation
1.	Marusya1241	1532	3.31	3.12	4800	3.64	3.14	31.9
2	Milaya1269	1524	3.25	3.11	4785	3.63	3.14	31.8
3	Dunya1291	1759	3.25	3.10	4852	3.54	3.19	36.3
4	Neveska1264	1662	3.25	3.18	4901	3.36	3.21	33.9
5	Munyo1233	1790	3.21	3.05	4956	3.23	3.20	36.1
Average		1653.40±123.86	3.25±0.04	3.11±0.05	4858.8±71.02	3.48±0.18	3.18±0.03	34.0±2.17

4. CONCLUSION

Thus, it was found that for first-calf cows (CDF No. 1, vol. Kezdur), that were given manual udder massage, milk yield per 100 days of lactation averaged 2068.6±34.33 kg; the content of the mass fraction of fat in milk is 3.30±0.05%; the content of the mass fraction of protein in milk is

3.11±0.05%. Milk yield for 305 days of lactation averaged 5111.6±41.80 kg; the content of the mass fraction of fat in milk 3.59±0.05 %; the content of the mass fraction of protein 3.19±0.01 %. Milk yield for 100 days of lactation was 40.46 % of the milk yield for lactation and it is within the established norms (up to 40-45 %). In first-calf cows (Commercial dairy farm No. 3, vol. Pazhman), that were given mechanical udder massage, milk yield for 100 days of lactation averaged 2064.6±80.62 kg; the content of the mass fraction of fat in milk 3.27±0.05 %; the content of the mass fraction of protein 3.06±0.04 %. Milk yield for 305 days of lactation averaged 5272.6±262.13 kg; the content of the mass fraction of fat in milk 3.55±0.04 %; the content of the mass fraction of protein - 3.18±0.01 %. In this group, only one cow's milk yield for 100 days of lactation exceeds 40.0 % of the milk yield for lactation and amounted to 41.5 %, on average 39.2 %. In first-calf cows (Commercial dairy farm No. 2, vol. Klyuchevskaya), that were not given udder massage, the milk yield for 100 days of lactation averaged 1799.2±146.90 kg; the content of the mass fraction of fat in milk 3.19±0.07 %; the content of the mass fraction of protein 2.87±0.44 %. Milk yield for 305 days of lactation on average for the study group was 4794.6±87.30 kg; the content of the mass fraction of fat in milk 3.52±0.18 %; the content of the mass fraction 3.18±0.02 %. In this group, only one cow's milk yield for 100 days of lactation exceeds 40.0 % of the milk yield for lactation and amounted to 42.2 %, on average 37.5 %. In first-calf cows (Commercial dairy farm No. 4, vol. Kamyshevo), which also were not given udder massage, the milk yield averages 1653.4±123.86 kg; the content of the mass fraction of fat in milk was 3.25±0.04 %; the content of the mass fraction of protein was 3.11±0.05 %. Milk yield for 305 days of lactation of the studied cows averaged 4858.8±71.02 kg; the content of the mass fraction of fat in milk 3.48±0.18 %; the content of the mass fraction of protein 3.18±0.03 %. In this group, no cow's milk yield for 100 days of lactation exceeded 40.0 % of the milk yield for lactation and it was in the range from 31.8-36.6 %, on average 34.0 %.

According to the results of the research, the farm is recommended to organize the preparation of heifers for calving at CDF No. 2 and CDF No. 4. To prepare the heifers for calving and to distribute the first-calf cows, it is necessary to allocate a separate room for their maintenance and provide a separate milkmaid.

5. DATA AND MATERIAL AVAILABILITY

Information regarding this study is available by contacting the corresponding author.

6. REFERENCES

Faizrakhmanov, D.I., Nurtdinov, M.G., Khairullin, A.N., Khazipov N.N., et al. (2007). Organization of dairy cattle breeding based on technological innovations. *city of Kazan: Study guide*. 90-118.

Isupova, Yu.V. (2018). Influence of origin on the reproductive and productive qualities of first-calf cows. *Production of breeding products (material) in the areas of domestic livestock breeding based on accelerated selection: materials of International Research-to-Practice Conference city of Izhevsk*, 118-128.

Kislyakova, E.M., Abasheva, A.A., Achkasova, E.V. (2016). Use of a feed additive based on natural local raw materials in cows feeding. *Actual problems of intensive development of animal husbandry: a collection of proceedings. – the city of Gorki: UEBSACA*. Ed. 19, In 1 part - 4.2, 78-83.

*Corresponding author (A.B. Spiridonov) Email: anbs88@bk.ru Volume 11 No.10 ISSN 2228-9860 eISSN 1906-9642 CODEN: ITJEA8 Paper ID:11A10U http://TUENGR.COM/V11A/11A10U.pdf DOI: 10.14456/ITJEMAST.2020.204

Kislyakova, E.M., Achkasova, E.V., Abasheva, A.A. (2017). Dairy productivity of black-and-white cows when feeding energy and protein supplements from local natural raw materials. *Science-based technologies for intensification of agricultural production: materials of International Research-to-Practice Conference, February 14-17, 2017 - city of Izhevsk: FSBEI HE IzhSACA*, 3, 55-58.

Kislyakova, E.M., and Khokhryakov, G.A. (2017). Prospects of the use of preservatives in silage in the conditions of the Udmurt Republic. *The innovative potential of agricultural science of the XXI century: contribution of young research scientists: materials of All-Russian Research-to-Practice Conference – the city of Izhevsk: FSBEI HE IzhSACA,* 101-104.

Kudrin, M.R., Berezkina, G.Y., Shklyaev, A.L., Shuvalova, L.A., Deryushev, I.A. (2019a). Post-mortem indices of the black-and-white breed. *IOP Conference Series: Earth and Environmental Science* (7), 072034. p. 315

Kudrin, M.R., Izhboldina, S.N., Shklyaev, K.L., Nikolaev, V.A., Selezneva, N.V. (2019b). Beef production of black-and-white breed depending on the degree of fattening. *IOP Conference Series: Earth and Environmental Science* (7), 072028. p. 315

Kudrin, M.R., Krasnova, O.A., Koshchaev, A.G., Olga V. Koshchaeva, O.V., Ulimbashev, M.B., Konik, N.V., Shabunin, S.V. (2019c). Biological Processing of Renewable Raw Materials Resources about the Environmental and Technological Criteria. *Journal of Ecological Engineering.* 20(11), 58-66, DOI: 10.12911/22998993/113192.

Lapotko, A.I. (2019). Secrets of milk rivers. Practical guide. Volume 1: "Feed and feeding". *M.: "Our youth" LLC "OFFSET Printing House" LLC*. 536 p.

Lyubimov, A., Martynova, E., Isupova, Y., Yastrebova E. (2019). Milk producing ability and reproductive qualities of the daughters of stud bulls whose semen was obtained using different methods. *Digital agriculture – development strategy Proceedings of the International Scientific and Practical Conference*, 258-261.

Lyubimov, A.I., Vorobyova, S.L., Chukavin, A.S. (2017). The relationship of physiological characteristics with the productive longevity of black-and-white cows in different ways of keeping. *Scientific notes of the Kazan State Academy of Veterinary Medicine n.a. N.E. Bauman*, 232(4), 99-105.

Lyubimov, A.I., Yudin, V.M., Chukavin, A.S. (2017). The influence of the birth season on the duration of the economic use of black-and-white cows. *Scientific and personnel support of agricultural enterprises for food import substitution: materials of All-Russian Research-to-Practice Conference, February 16-19, 2016 – the city of Izhevsk: FSBEI HE Izhevsk SACA* 111-115.

Martynova, E.N., and Yastrebova, E.A. (2016). Floor covering in cowsheds as one of the factors affecting the behavioral responses of animals. *Veterinary, animal science, and biotechnology*, 8, 27-32.

Martynova, E.N., Azimova, G.V., Sukhova, V.S., Isupova, Yu.V. (2016). *Bulletin of the Izhevsk SACA.* 3(48), 38-44.

Rodionov, G.V., Kostomakhin, N.M., Tabakova, L.P. (2017). Breeding: textbook. *City of Saint-Petersburg: Lan*. 488 p.

Strekozov, N.I. (2006). Condition and prospects of development of cattle breeding in Russia. *Scientific heritage of P.N. Kuleshov and modern development of zootechnical science and practice of animal husbandry: materials of the International Scientific-to-Practice Conference dedicated to the 150th anniversary of the birth of Professor Kuleshov P.N., October 26-29, 2004. M.,* 28-42.

Strekozov, N.I., Amerkhanov, Kh.A, Pervov, N.G. (2013). Dairy cattle breeding in Russia. *Moscow*, 616p.

Vorobyova, S.L., and Chukavin, A.S. (2017). The effect of genotypical factors on the duration of economic use of cows of the black-and-white breed in the Udmurt Republic. *Scientific notes of the Kazan State Academy of Veterinary Medicine n.a. N.E. Bauman*, 232(4), 154-159.

Vorobyova, S.L., and Perevozchikov, A.V. (2017). Grain molasses as a means of filling the deficit of sugars in cattle diet. *Science-based technologies for intensification of agricultural production: materials of International Research-to-Practice Conference, February 14-17, 2017 city of Izhevsk: FGBEU HE IzhSACA*, 3, 34-37.

Yastrebova, E.A., and Martynova, E.N. (2016). Keeping cattle in light-weight barns. *Scientific and personnel support of agricultural enterprises for food import substitution: materials of All-Russian Research-to-Practice Conference, February 16-19, 2016 – the city of Izhevsk: FSBEI HE Izhevsk SACA*, 2, 115-118

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