The composition and properties of cow milk of “Sibiryachka” breed depending on the method of keeping them

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Abstract. The article presents materials on the composition and properties of milk of cows of breed “Sibiryachka”, depending on the method of their keeping. With a higher milk yield, cows of a new Siberian breed with tie-up keeping (5504 kg) have a good composition of its main components (fat - 3.74%, protein - 3.27%). Cows with loose keeping (5310 kg) have the highest milk content of dry matter (12.71%), SOMO (9.03%), lactose (4.91%) and casein (2.69%). The level of milk yield does not remain constant, but changes during the lactation period. The highest milk yield in cows of all groups was in the second month of lactation, then gradually decreased in different groups unequally. The research results indicate that during the lactation period, not only the percentage of fat in cow's milk changes, but also its absolute amount. In the composition of milk fat, changes occur in the morphological state of its fat phase, that is, the number of fat globules increases from the first month of lactation (from 2.1 to 3.5 billion / ml in the first group and from 2.5 to 3.9 billion / ml in the second group) to the last, the diameter changes in the opposite direction.

1. Introduction
The current state of the country's dairy cattle breeding requires accelerating the processes of intensification of the industry, which have been outlined in recent years. The improvement of the productive qualities of cattle of those breeds that most closely meet the requirements of intensive technologies is of particular importance for this. First of all, this refers to a new domestic breed “Sibiryachka”, characterized by a higher level of productivity than animals of many other genotypes. In the Irkutsk region, as well as nationwide, about 95% of cows are kept on farms with traditional technology of tie-up keeping, as well as with loose keeping and milking cows in milking parlors [7].

Both tie-up and loose keeping are used at Zheleznodorozhnik breeding plant of the Irkutsk Region. During the lactation period, a scientific and economic experiment was conducted to study the effectiveness of tie-up and loose cows keeping methods. To achieve this goal, we determined the degree of influence of the keeping methods on the formation of milk productivity and quality indicators of milk.

2. Conditions, materials and methods
The studies were carried out in the period from 2017 to 2018 on cows of breed “Sibiryachka” at “Zheleznodorozhnik Ltd.” of the Irkutsk Region. For the experiment, two groups of first-calf cows
were formed with 50 head in each according to the principle of analogs, selected taking into account the day of lactation, current productivity, live weight, fatness, age. Sampling of milk was carried out in accordance with GOST 26809-86 "Milk and dairy products. Acceptance rules, sampling methods, preparation of samples for analysis".

Milk productivity of cows was determined by individual accounting of milk produced by means of control milkings [1,5]. The first group (I) was on loose keeping, the second (II) – on tie-up keeping. The experiment began on the 10th day of lactation and continued until the end of the first lactation. Feeding the animals was the same both in structure and overall nutrition rations level. Qualitative indicators of milk in experimental cows were determined on the basis of generally accepted methods: fat content — by the standard acid method; the diameter of fat globules and their number - according to the method of N. V. Barabanshchikov; total amount of proteins - by the Kjeldahl method; casein and whey proteins in milk - by the refractometric method (GOST 25179-90); the dry matter content in milk and the dry skim milk residue (SOMO) were calculated by the Fleishman formula simplified by Farrington and Uule [1,3,6].

3. Results and discussion
As a result of the studies, it seems possible to characterize the cows in terms of milk yield and the composition of the main components in milk, depending on the method of their content (Table 1).

The cows of group II turned out to be the best in milk yield and milk fat yield. In terms of fat content in milk, cows of group II are by 0.02% higher than cows of group I.

The dry matter and SOMO content in milk is higher in cows of group I. But in absolute yield of these components of milk, cows of group I are inferior to cows of group II.

A higher percentage of lactose was found in milk of cows of group I, and low in milk of cows of group II.

The percentage of protein in milk is the same in both groups. The highest casein content in milk is in cows of group I, and the lowest - in cows of group II. Albumin and globulin in milk are higher in cows of group II.

Table 1. Milk yield and milk composition of cow milk, depending on the method of their keeping (M ± m).

| Indicator                  | Group  |  |  |
|----------------------------|--------+---+---|
| Yield, kg                  | I      | 5310±127 | 5504±154 |
| Fat content, %, %          | II     | 3,72±0,09 | 3,74±0,09 |
| The yield of milk fat, kg  | I      | 197,5 | 205,8 |
| Dry matter content, %      | II     | 12,71±0,121 | 12,68±0,108 |
| Dry matter yield, kg       | I      | 674,9 | 697,0 |
| SOMO content, %            | II     | 9,03±0,050 | 8,99±0,038 |
| SOMO yield, kg             | I      | 479,4 | 494,8 |
| Lactose content, %         | II     | 4,91±0,052 | 4,87±0,061 |
| Lactose yield, kg          | I      | 260,7 | 268,0 |
| Protein content, %         | II     | 3,27±0,048 | 3,27±0,054 |
| Protein yield, kg          | I      | 173,6 | 179,9 |
| Casein content, %          | II     | 2,69±0,050 | 2,66±0,049 |
| Casein yield, kg           | I      | 142,8 | 146,4 |
| Albumin content, %         | II     | 0,367±0,012 | 0,385±0,014 |
| Albumin yield, kg          | I      | 19,5 | 21,2 |
| Globulin content, %        | II     | 0,208±0,006 | 0,232±0,003 |
Thus, with a higher milk yield, cows of group II have a good content of main components (fat, protein). Cows of group I have a high content of dry matter, SOMO, lactose and casein. But since the milk yield is lower, then in terms of the gross content of these components they are inferior to the cows of group II.

The level of milk yield does not remain constant, but changes during the lactation period (Fig. 1). The highest milk yield in cows of both groups was in the second month of lactation, then gradually decreased, unequally in different groups.

![Figure 1. Change in milk yield during lactation in cows, depending on the method of their keeping, kg.](image1)

Within all the studied groups of animals, no regular changes in the coefficient of variation of the average data of milk yield during the lactation period were found. Apparently, this is due to the fact that the animals in each group were of the same age, and the feeding was the same. Therefore, the coefficient of variation of milk yield in various groups throughout the entire period of lactation fluctuates slightly.

The lowest fat content in milk was in the first month with a gradual increase during lactation (Fig. 2). This trend continued during the period of maximum milk yields. Cows of group II have a high percentage of fat per lactation (3.74-0.09), but the fluctuations in the months of lactation are quite significant, as evidenced by the average error.

![Figure 2. Variability of milk fat in cows, depending on the method of their keeping during lactation.](image2)
The highest amount of milk fat was obtained from cows of all groups in the second month of lactation, that is, during the period of maximum milk yield, the lowest - at the end of lactation. The degree of decline in different groups is not the same. A more uniform decrease in this indicator was observed in cows of group II.

Cows, depending on the method of their keeping also had different protein content in milk, while its fluctuations in months of lactation were also not the same. In cows of group II, this indicator was higher than in group I. The most constant percentage of protein in milk from the third to the eighth month of lactation was obtained in this group of cows.

4. Conclusions

In recent years, the level of consumption of dairy products in Russia has been growing at a faster rate than the increase in milk production. Dairy products demand is mainly satisfied by foreign companies. Thus, one of the strategic tasks for Russia is the creation of new breeds of cattle and milk production, depending on the method of their keeping.

With higher milk yield, cows of a new breed “Sibiryachka” of group II have a good content of main components (fat, protein). Cows of group I have the highest content of solid, SOMO, lactose and case in milk. But since the milk yield is lower, then in terms of the gross content of these components they are inferior to the cows of group II. The level of milk yield does not remain constant, but changes during the lactation period. The highest milk yield in cows of all groups was in the second month of lactation, then gradually decreased in different groups unequally.

The research results indicate that during the lactation period, not only the percentage of fat in the milk of cows changes, but also its absolute amount. In the composition of milk fat, changes in the morphological state of its fat phase occur, that is, the number of fat globules increases from the first month of lactation to the last, while their diameter changes - in the opposite direction. The largest fat globules are in milk of the first month of lactation, then their diameter decreases to the last month.

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