Lactation Characteristics of Red Steppe and Simmenthal Cows in Yakutia

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Abstract. This article considers the comparison of the lactation characteristics of local and imported cow breeds. The winter rations of milk cows contain 9.4 EFU of fodder and 1139 g of digestible proteins, which is 89.9 and 107% of the feeding reference values. The rations comprise 36% of bulk feed, 24% of succulent feed, and 40% of concentrated feed. The proportion of sugar and proteins is 0.43, which means that the content of carbohydrates in the diet is insufficient. The authors established that the research cows had different lactation curve levels even if they had the same housing conditions and diets. For both groups, lactation curves were at the highest during the summer with 5-6 months of lactation and when animals were in the open grazing. The lactation curve of the dairy breed beings to drop rapidly since the 6th month of lactation, and the lactation curve of the local Simmenthal cows reduces more smoothly. The lactation persistency coefficient for the Red Steppe breed equaled 66.5%. Local Simmenthal cows had the highest lactation productivity of 89.7%.

1. Introduction

The Republic of Sakha (Yakutia) is located in the risk farming and ranching zone. The limiting factors for the development of agricultural production include very low air temperatures in winter (January average of 31-45°C), short frost-free period (67-76 days), a small amount of precipitation (250-300 mm), and prolonged winters (220-250 days) [14].

The best conditions for milk yield increase in Yakutia occur during the three summer months when animals consume enough green grass. High milk yields are obtained for 2-2.5 months during open grazing in midsummer, and then milk productivity of cows rapidly reduces. The lowest milk yields can be observed between September and November.

The lactation curve is an important indicator of milk productivity of cows that visualize the herd average milk yield dynamics throughout the lactation period.

Milk productivity and lactation curve uniformity depend significantly on the breed of animals and their productivity levels [1,5], as well as the proper system of rationed biologically healthy feeding and housing conditions that help implement the genetic potential of animals [7].

The analysis of lactation curves provides an opportunity to study some physiological features of lactation and general patterns of this process. Under specific conditions, the analysis of lactation curves provides additional information on the potential milk productivity capacities of specific animals and the impact of feeding, housing, and maintenance conditions for cows [6].
On many farms, milk yields are significantly lower than possible. This can be explained by the insufficient availability of nutrients to animals due to the low quality of bulk feeds [8].

2. Results and discussion
The historic development of ranching in Yakutia shows that its harsh environment and climate require a special approach to stock breeding and selection. This is connected to the long winter housing period of eight months [4].

According to the pedigree data of the imported Red Steppe cow stock, the average milk yield for this breed is 4000-6000 kg per one lactation. In Yakutia, this figure was reduced to 2700-3000 kg on average. This means that local environmental conditions (climate and management practices) do not comply with the biological characteristics of the imported breed [3,13]. Insufficient nutrition and feed type during the winter housing period do not facilitate the complete fulfillment of the high genetic potential of the dairy cattle. As we can see from Table 1, the diet of milk cows is not balanced in terms of nutrients and has an insufficient amount of carbohydrates, as well as metabolic energy, crude fibers, and carotene.

Table 1. The daily ration of lactating cows*.

| Indicator          | kg  | EFU | ME in MJ | Weigt, kr | DP, g | CFB, g | CF, g | Sugar, g | Ca, g | P, g | Caroten e, mg |
|--------------------|-----|-----|----------|-----------|-------|--------|-------|----------|-------|------|---------------|
| Reference          | -   | 11.5| 115      | 13.2      | 1060  | 3650   | 290   | 760      | 65    | 45   | 410            |
| Hay                | 8   | 3.36| 54.8     | 6.85      | 440   | 2104   | 200   | 160      | 57.6  | 17.6 | 120            |
| Haylage            | 5   | 1.45| 0.99     | 2.25      | 115   | 785    | 50    | 115      | 24.5  | 6.5  | 125            |
| Silage             | 5   | 0.75| 8.9      | 1.25      | 80    | 430    | 65    | 15       | 10.5  | 3    | 75             |
| Mixed fodder       | 4   | 3.84| 38.76    | 3.4       | 504   | 164    |       | 203.6    | 21.2  | 34.8 | -              |
| Total              | -   | 9.4 | 103.4    | 13.75     | 1139  | 3483   | 315   | 493.6    | 113.8 | 61.9 | 320            |
| ± of the reference value | -   | -2.1| -11.55   | +0.55     | +79   | -167   | +25   | -266.4   | +56.2 | +16.9 | -90            |
| Availability, %    | -   | 81.7| 89.9     | 104       | 107   | 95     | 108   | 64.8     | 173   | 137 | 78             |

Note: * EFU – energetic feed unit, ME – metabolic energy, DP – digestible protein, CFB – crude fibers, CF – crude fat.

It is well-known that high-producing animals have a higher relative increase in milk yields during the second and the third months of lactation, after which the yields are decreasing [9,10,12]. When evaluating cows, it is also necessary to consider such valuable individual qualities as the capability of maintaining high milk yields over the lactation period and the differences between the yields at different moments. Animals that have a more stable lactation and milk yields over most of the lactation period are considered the most valuable [11].

The data on the milk productivity of cows are shown in Table 2. According to A.S. Yemelyanov [2], Group 1 falls within the 3rd type: high but unstable and rapidly decreasing lactation, and Group 2 belongs to the 4th type: stable and low lactation.
Table 2. Milk productivity of cows during lactation.

| Breed      | n | Indicator | Lactation months | Milk yield per lactation kg |
|------------|---|-----------|------------------|----------------------------|
| Red Steppe | 15| Milk yield per one month, kg | I  II  III  IV  V  VI  VII  VIII  IX  X |
|            |   | % of the milk yield per one lactation | 22 9.5 11.6 13.7 15.0 14.3 11.5 9.1 4.5 3.2 |
|            |   | % of the milk yield for the previous month | 713 121. 118. 109. 95.2 80.7 79.4 49.3 72.3 |
|            |   | Daily average milk yield, kg | 7.4 9.9 12.0 14.3 15.6 14.8 12.0 9.5 4.7 3.4 |
| Simmental  | 15| Milk yield per one month, kg | 128 183 194 238 294 335 320 248 201 149 |
|            |   | % of the milk yield per one lactation | 5.5 7.9 8.4 10.3 12.8 14.6 13.9 10.8 8.7 6.5 |
|            |   | % of the milk yield for the previous month | 142 106. 122. 123. 113. 95.5 77.5 81.0 74.1 |
|            |   | Daily average milk yield, kg | 4.2 6.1 6.4 7.9 9.2 11.1 10.6 8.2 6.7 4.9 |

The figure shows the lactation curves based on the daily average milk yield values. Both of the groups had the highest lactation levels in summer, during the 5-6th months of lactation when the animals were grazing in the open, with the maximum yield of 468 kg for the Red Steppe cow and 335 kg for the Simmental cow.

The figure also shows that the lactation curve of the Red Steppe milk cow begins to drop rapidly since the 6th month of lactation, while the lactation curve of the local Simmental cow is reducing smoothly because this breed is better adapted to the local climate, as well as the feeding and management practices. We can assume that the Simmental cow has a better disposition for milk yield increase and productivity maintenance. We must note that the local Simmental cow was created by fifty years of upgrading Yakutian cows and Simmental breeders. Local home-bred animals have a fraction of Yakutian cow genetics, and they adapted well to the climate conditions and management practices over time and truly became a local breed that has relatively high breeding and productivity characteristics. Their low productivity and small size are a result of adaptation to the harsh feeding conditions, climate, and management practices of the Far North [13].
Dairy farming practices put great stress on the stable milk production by every cow during the lactation period. The authors determined the lactation persistency coefficient reflecting the stability of milk yields over the lactation months. The lactation persistency coefficient for the Red Steppe breed equaled 66.5%. Local Simmenthal cows had the highest lactation productivity of 89.7%.

3. Conclusions
The highest milk yields were produced by the cows in question during open grazing in summer. The lactation curve of the Red Steppe milk cow begins to drop rapidly since the 6th month of lactation, while the lactation curve of the local Simmenthal cows reduced smoothly. Local Simmenthal cows also have a more stable lactation.

4. References
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Figure 1. Cow lactation curves.
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