

Productivity of Simmentals Livestock of Austrian Breeding in Climatic Conditions of the Karachay- Cherkess Republic



Valery Kulintsev, Muhamed Shakhmurzov, Anatoly Shevkhezhev, Vladimir Pogodaev, Dagir Smakuev

Abstract: The aim of the work was to establish the adaptive abilities and milk productivity of Simmental cows of Austrian origin in the conditions of the Karachay-Cherkess Republic. Research and production experience was held at Hammer Company LLC, Prikubansky District, Karachay-Cherkess Republic, in which 400 head Simmental heifers were brought from Austria. For the experiment, 40 cows of Schwyz and Simmental breeds were selected. Schwyz cows were included in the experiment (control group I), as well adapted to the conditions of Karachay-Cherkessia, and Simmental cows constituted the second experimental group. Among Simmental cows with a bath-like form of the udder, it was 12.5%, while in Swiss peers - 2.5%, with a bowl-shaped form - 60.0%, and in peers - 47.5%, Schwyz cows were in the lead - 50%, for Simmental - 27.5%. There were no significant differences between the groups of experimental cows in hemoglobin, erythrocyte, and leukocyte counts. On average, the hemoglobin level in the rocks was within the normal range and was 109.8-110.1g / l, the content of erythrocytes was 7.2-7.4x10¹² / l, and leukocytes were 9.9-10.2x10⁹ / l. The heart rate and respiration rate in adapting Simmental cows were slightly higher than in their peers of the Swiss breed and were 71.8-73.5; 24.7-26.8 times per minute and 70.5-71.0; 23.4-24.2 times per minute, respectively. The highest milk production in the second lactation was distinguished by Simmental cows, their milk yield was 4455 kg of milk, which is 958 kg or 27.4% higher than the Swiss peers. The fat content of milk in Simmental cows was at the level of 3.84%, protein 3.32%. The superiority of Simmental cows over Swiss peers in terms of fat and protein content in milk was 0.11% and 0.15%, respectively. Simmental cows in the new climatic conditions provided an increase in milk productivity, which indicates good lability of the organism in the new geographical area.

Keywords: Simmental breed, Schwyz breed, adaptation, milk yield, leukocyte formula.

I. INTRODUCTION

One of the priorities of modern animal husbandry is to

increase the production of high-quality products to ensure the full nutrition of the population of Russia. The production of competitive products in dairy cattle breeding involves the breeding of breeds adapted to specific climatic conditions, characterized by high productivity with high payment for food products. Under these conditions, the use of the gene pool of the best breeds in the world is of particular interest [1, 4]. Violations of the state of adaptation are manifested with a drop in productive qualities, reproductive abilities, and a decrease in the growth and development of animals. Economic and biological indicators provide an opportunity to study the health of cows, to identify shortcomings when they are moved to other climatic zones [5].

In the last decade, this problem has been approached by importing large quantities of imported cattle, in particular, Simmental heifers from Austria are imported, which combine high milk and meat productivity, have good health, and are able to adapt to conditions Karachay -Cherkess Republic [2, 3]. In this regard, the study of economic and biological characteristics, as well as the identification of their adaptive capacity and ability to acclimatize in this natural climatic zone is relevant. The purpose of the research was to comprehensively determine the adaptive abilities and milk productivity of Simmental cows of Austrian origin in the conditions of the Karachay-Cherkess Republic.

II. MATERIALS AND METHODS

Research and production experience was held at Hammer Company LLC of the Karachay-Cherkess Republic, in which 400 heads of Simmental heifers were brought from Austria.

For the experiment, 40 cows of Schwyz and Simmental breeds were selected. It should be noted that of the combined breeds of the planned for the Karachay-Cherkess Republic is Schwycka. The cows of the Swiss breed were included in the experiment (control group I) as well adapted to the conditions of Karachay-Cherkessia, and the Simmental cows constituted the second experimental group.

The study of adaptation and productive features of Simmental cattle was carried out by comparing imported cows from Austria with similar animals of Swiss breed

To characterize the linear growth in the third month of the first and second lactations, the main measurements were taken from 15 animals from each group: height at withers, height at the back, height at the sacrum, slanting body length, lateral length of the backside, chest girth, chest depth, width at the back, the width of the sciatic hills, the circumference of the metacarpus.

Revised Manuscript Received on October 30, 2019.

* Correspondence Author

Valery Kulintsev*, North Caucasian Federal Scientific Agrarian Center, Stavropol, Russia. Email: kulincev@gmail.com

Muhamed Shakhmurzov, Kabardino-Balkarian State Agrarian University, Nalchik, Russia. Email: shakh@gmail.com

Anatoly Shevkhezhev, North Caucasus Federal Scientific Agrarian Center, Mikhailovsk, Russia. Email: Shevkhezhev@gmail.com

Vladimir Pogodaev, his/her department, Name of the affiliated College or University/Industry, City, Country. Email: Pogodaev@gmail.com

Dagir Smakuev, North-Caucasian State University of Humanities and Technology, Cherkessk, Russia. Email: Smakuev@gmail.com

© The Authors. Published by Blue Eyes Intelligence Engineering and Sciences Publication (BEIESP). This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>)

Based on the above measurements, body indexes were calculated:

Clinical indicators (pulse, temperature, and respiration) in experimental animals were studied with a phonendoscope, thermometer, and counting of chest movements per minute.

Biochemical parameters of blood serum were determined by the following methods: protein - by the refractometric method, reserve alkalinity - by Nevodov, calcium - by De Ward, phosphorus - by the calorimetric method by Briggs.

The natural resistance of experimental animals was determined by hematological studies: the leukocyte formula was calculated and the blood elements involved in the protective function of the organism were counted.

The dynamics of the milk productivity of cows (milk yield, milk fat content) were studied according to the results of control milkings. The chemical composition of milk from experimental cows was determined on the "Milko - Scan" and chemical methods.

The research results are processed by the method of variation statistics.

III. RESULTS AND DISCUSSIONS

In the visual assessment of the mammary gland among cows in the experimental groups, Simmental animals received the highest score (4.4 points), while in Swiss peers this indicator was 4.2 points.

The udder of the cow population studied is quite voluminous, tightly attached, with evenly developed quarters, conveniently located nipples and well-defined subcutaneous and abdominal veins.

The best indicators were characterized by animals of the Simmental breed. Thus, among Simmental cows with a bath-like form of the udder was 12.5%, while in Swiss peers - 2.5%, with a bowl-shaped form - 60.0%, and in peers - 47.5%, by the presence of a rounded udder Schwyz breed - 50%, among Simmentals - 27.5%.

The results of measurements of the udder and nipples indicate that for the main udder measurements in experimental groups of animals the difference is not significant. Thus, the animals of the Simmental breed had superiority over the Swiss peers in the circumference of the udder by 1.3 cm, in the rear udder depth - 1.1 cm, in the depth of the front parts of the udder - 0.6 cm and in the rear shares in 0.7 cm.

With the desired cylindrical nipple shape, more Simmental cows were. In animals of the experimental groups, the nipples were optimal in length - 6.3 - 6.4 cm and diameter - 2.3 - 2.4 cm, the front ones were slightly longer than the rear ones. At the same time, no significant difference was found between groups of cows: in length, diameter of nipples and distance between them.

Thus, the shape of the udder and nipples, as well as their size in cows of experimental groups, are suitable for machine milking.

The functional properties of the udder of experimental cows are presented in Table I.

Table- I: Functional properties of the udder of cows.

Indicators	Group	
	I Schwycka	II Simmental
Daily milk yield, kg	11,5± 0,63	14,6± 0,90
Udder index,%	42,6± 0,51	44,7± 0,87
Milk flow rate, kg / min	1,56± 0,04	1,79± 0,07

In our studies, it was found that the daily milk yield of Simmental cows was 3.1 kg higher compared with the Swiss peers, the udder index was 2.1 times higher, and the milk yield rate was 0.23 kg / min.

It is known that interior indicators are important for assessing the level of animal productivity, the state of their natural resistance and the productive qualities of cows. Improving the adaptive capacity of animals to adverse environmental factors is of practical importance. Each organism is already adapted for existence in certain conditions. Deviation from these conditions causes an adaptation reaction in it, which is similar to the response to brief effects and passes along evolutionary established paths.

Studies on the hematological parameters of experimental animals were conducted on the 4th month of the second lactation (Table II).

Table- II: Hematological indicators of experimental animals

Indicators	Group	
	I Schwycka	II Simmental
Hemoglobin, g / l	110,1±0,42	109,8±0,51
Erythrocytes, x 10 ¹² / l	7,4±0,23	7,2±0,31
Leukocytes, x 10 ⁹ / l	10,2±0,49	9,9±0,50
Total protein, g / l	78,6±2,01	79,3±2,31
Total calcium, mmol / l	2,4±0,14	2,1±0,17
Inorganic phosphorus, mmol / l	1,7±0,11	1,7±0,12
Reserve alkalinity, vol. % CO	50,4±2,45	48,8±2,50

On average, the hemoglobin level in the rocks was within the normal range and amounted to 109.8–110.1 g / l, the erythrocyte content was 7.2–7.4x10¹² / l, and the leukocyte count was 9.9–10.2x10⁹ / l. The blood levels of total protein, calcium, phosphorus and reserve alkalinity of animals of all studied groups were also within acceptable limits. All this testifies to a high degree of physiological homeostasis, that is, the Simmentals have shown the ability to withstand the fluctuating environmental conditions through the adaptive response of the organism. Our research has established that leukocyte formula indicators in animals in experimental groups were within the physiological norm (Table III).

Table- III: Indicators of leukocyte blood count of cows, depending on lactation

Indicators	Group			
	I Schwycka		II Simmental	
	1 lactation	2 lactation	1 lactation	2 lactation
Leukocyte count, 10 ⁹ /l	10,9±0,16	10,2±0,12	10,0±0,09	9,9±0,14
Leukocyte formula,%	0,98± 0,07	1,02±0,09	1,01±0,12	0,96±0,09
eosinophils	5,7±0,24	6,8±0,34	5,5±0,20	6,7±0,36
lymphocytes	52,2±1,13	50,1±1,08	54,7±1,43	51,5±1,38
monocytes	2,3±0,28	2,6±0,34	2,0±0,15	2,7±0,43
stab neutrophils	2,6±0,22	2,8±0,31	2,5±0,19	2,7±0,30
segmented neutrophils	36,2±1,27	36,7±1,29	34,3±1,25	35,4±1,26

However, it should be noted that the superiority of cows of the Swiss breed over Simmentals in the number of band and segmented neutrophils, which are important for the blood-forming organs in the implementation of the bactericidal and antiviral activity of the animal organism, should be noted.



Thus, the study of the protective properties of the organism in experimental cows showed their good natural resistance.

The results of our research have shown that with age, there is a slight decrease in body temperature in cows in the experimental groups. Thus, in animals of the Schwyz breed, it decreased by 0.7 ° C to the second lactation, and in Simmental cows - by 0.4 ° C.

The heart rate and respiration rate in the adaptive Simmental cows were slightly higher than the peers of the Swiss breed and amounted to 71.8-73.5; 24.7-26.8 times per minute and 70.5-71.0; 23.4-24.2 times per minute, respectively. It should also be noted that the heart rate and respiration rate with age (in the second lactation) in the cows of the experimental groups somewhat decreased.

It should be noted that there is a tendency towards an increase in clinical and physiological indicators (heart rate and respiration rate) in Simmental cows, which means that they have increased pulmonary ventilation in order to prevent overheating of the body in a new natural and climatic zone. The live weight of the Schwyz cows at the first hotel was homogeneous and low, with an average of 421 kg. The live weight of Simmental cows in the first hotel was 484 kg (Table IV)

Table- IV: Characteristics of the reproductive function of cows

Indicators	Group	
	I Schwycka	II Simmental
Age I calving, months	28,2±1,43	29,8±1,97
Live weight at the first hotel, kg	421±3,34	484±4,25
Service period, days:		
1st lactation	98,5±12,61	80,8±7,56
2nd lactation	87,2±8,63	75,9±6,55
Inter-hotel period, days:		
1st lactation	379,5±14,87	368,1±10,23
2nd lactation	374,8±12,14	366,7±9,89
Duration of pregnancy, days:		
1st lactation	282,4±2,45	286,7±3,13
2nd lactation	284,6±1,89	285,2±1,46
FAC:		
1st lactation	0,96±0,02	0,99±0,04
2nd lactation	0,97±0,06	0,99±0,05

The indicator of the duration of the service period in cows of the Swiss breed in the first lactation exceeds the permissible norms (no more than 90 days), which indicates an unsatisfactory state of reproduction. In Simmental cows, these indices corresponded to the physiological norm and were 75.9 - 87.2 days for two lactations.

Simmental cows were characterized by the shortest period between the separate periods, therefore the coefficient of reproductive ability approached unity (0.99). The coefficient of reproductive function in cows of the Swiss breed for the studied lactation was 0.96-0.97).

Thus, the introduced animals of the Simmental breed of Austrian origin in the conditions of Karachay-Cherkessia are characterized by a high reproductive function.

The highest milk production in the second lactation was distinguished by Simmental cows, their milk yield was 4455 kg of milk, which is 958 kg or 27.4% higher than Swiss peers (Table V). In the organoleptic evaluation, the taste and smell of milk were normal, the consistency of the milk was homogeneous without sediment and flakes, the color of the milk of both groups did not have differences.

Table- V: Milk productivity and physico-chemical indicators of milk of cows of simmentalsky and shvitsky breeds

Indicators	Group	
	I Schwycka	II Simmental
Drink per lactation (kg)	3497±2,28	4455±3,93

Fat content (%)	3,73±0,09	3,84±0,12
Protein content (%)	3,17±0,07	3,32±0,14
Acidity (° T)	18,03±0,15	17,96±0,17
Density (kg / m3)	1028,4±11,8	1028,6±11,3
SOMO (%)	8,51±0,03	8,83±0,07
Dry matter (%)	12,24±0,16	12,67±0,18
Ash content (%)	0,88±0,05	0,86±0,04
Phosphorus content (mg /%)	98,2±0,02	98,7±0,01
Calcium content (mg /%)	125,3±0,04	126,1±0,05
Rennet coagulation (min)	32,3±0,21	28,5±0,18

The fat content of milk in Simmental cows was at the level of 3.84%, protein 3.32%. The superiority of Simmental cows over Swiss peers in terms of fat and protein content was 0.11% and 0.15%, respectively.

In terms of the acidity and density of milk, there were no particular differences between the breeds.

The content of dry skim milk residue (SOMO) in Simmental cows was higher by 0.32% than in Swiss peers.

The lowest indicator of the diameter of the fat globules was in animals of the Schwyz breed - 2.66 microns, in Simmental cows this indicator was 3.18 microns.

IV. CONCLUSION

The adaptation of imported Simmental cattle to new natural and climatic conditions is fairly calm and stable, which determines the manifestation of the genetic capabilities of their body, manifested by high milk productivity and high quality milk.

REFERENCES

- R. M. Mudarisov, V. G. Semenov, I. N. Khakimov, A. A. Sharipov, Milk productivity of Holstein cows of European breeds in the climatic conditions of the Republic of Bashkortostan. *Modern aspects of the development of agriculture in the South-West region of Kazakhstan: materials of the International scientific-practical conference*. 2018, pp. 285–289.
- V. A. Pogodaev, A. F. Shevkhuzhev, A. I. Dubrovin, S. N. Kartashov, Chemical and amino acid composition of alpine and subalpine meadows in the mountainous zone of the North Caucasus. *News of the North Caucasus State Humanitarian-Technological Academy*. 2011, 1, pp. 44–47.
- A. F. Shevkhuzhev, V. A. Pogodaev, D. R. Smakuev, The productivity of bulls of the Simmental breed of various types during mining and distant keeping. *Actual issues of the development of domestic beef cattle in modern conditions: materials of the international scientific-practical conference (in the light of the signing of the treaty on the creation of the Eurasian Economic Union)*. Shouted 2014, pp. 221–229.
- A. F. Shevkhuzhev, D. R. Smakuev, Milk productivity and milk quality of Simmental cattle when feeding the drug Biotol Platinum. *Zootekhn.* 2009, 12, pp. 16–19.
- V. A. Pogodaev, A. N. Arilov, A. I. Petenko, A. A. Soldatov, T. I. Pakhomova, Influence of the immune modulation drug "PIM" on the cows' metabolism and calves growth rates born from them. *RJPBCS*. 2018, 9(4), pp. 755–759.

AUTHORS PROFILE



Valery Kulintsev, Director of North Caucasian Federal Scientific Agrarian Center, Doctor of Agricultural Sciences, Chairman of North Caucasus Federal Scientific Agrarian Center.



Muhamed Shakhmurzov Head of the Veterinary Directorate of the Kabardino-Balkarian Republic, Chief State Veterinary Inspector of the Kabardino-Balkarian Republic.



Anatoly Shevkhuzhev, Professor, Doctor of Agricultural Sciences of Agricultural Sciences, North Caucasus Federal Scientific Agrarian Center.



Vladimir Pogodaev Doctor of Biological Sciences, Professor of North Caucasus Federal Scientific Agrarian Center



Dagir Smakuev 3North-Caucasian State University of Humanities and Technology