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THE IMPACT OF SOME FACTORS ON MILK PRODUCTION OF BLACK SPOTTED COWS IN THE PIEDMONT ZONE OF NORTH CAUCASUS

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Abstract:

Only 60% of the genetic capacity of milk cattle is presently used in Russia, therefore the purpose of this research is to study some factors affecting the quantitative and qualitative indicators of Black Spotted cow milk in the piedmont zone of North Caucasus. The study was carried out from 2013 to 2016. The materials of 112 Holstein breed cows with different blood were analyzed in the course of studying the genotype impact on the milk productivity. To see the impact of service we studied 120 cows with different lactations, dry periods and carving interval on the milk productivity. The values for 108 cows with different lactations were examined to see the connection between the productive longevity of cows and high producing qualities. The first group includes the animals with the conception at the age of 18-19 months; the second group comprises of the cows with the conception at the age of 20-21 months, and the cows in the third group were conceived at the age of 22-23 months. The impact of fatness among the milk cows on their milk productivity and the quality of milk organize 4 groups of second conception animals and older on the basis of analogy with 22 cows per group on average. The first group consisted of the animals with the fatness score of 2.0-2.5; the second group included the animals with 2.6-3.0 scores; the third one – 3.1-3.5 scores and the fourth one – 3.6-4.0 scores.

With moderate feeding and treatment conditions blood correlation in crossing Black Spotted cows with Holstein seed bulls is justifiable by ½ and ¾. Usage rate for the milk cows depends on the duration of service, dry periods and carving interval. Preliminary periods become longer with the lactation and milk production, but the milk production intensity and the number of calves decrease for the period of cow household usage. The age of 18-19 months for the first conception is the most economically profitable. Crossing the Black Spotted cows with Holstein seed bulls positively impacts on the technological qualities of cows' udders. Higher values of milk yield and long usage could be observed among the cows with their fatness of 3.6-4.0 scores, i.e. 4584 kg. The cows with 3.6-4.0-score fatness had the longest working life.

Key words: *Holstein breed, Black Spotted breed, blood, milk production, fatness.*

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INTRODUCTION:

Dairy cattle breeding occupies the leading place in agriculture with its main purpose to increase the yield with high quantity of milk [1, 2, 3, 4]. The world gene pool is used to improve the genetic resources of the national cattle breeds [5, 6, 7, 8, 9, 10]. Modern milk cattle breeding is characterized with intensive nature with high genetic capacity, and the livestock farmers must reveal this capacity [11, 12, 13].

An academician Amerkhanova Kh.A. notes that presently only 60 % of the genetic capacity of the milk cattle is used [14]. To uncover the capacity it is important to know in what ways these features are determined by the genetic and phenotypical factors [15]. Hence, the analysis of the genetic and paratypic factors influence on the quantitative and qualitative milk indicators is relevant.

The efficiency of selection depends on the impact degree of genetic and paratypical factors on the changeability of this or that feature. Yield of the milk cattle depends, to a large extent, on the paratypic factors and is determined by the genetic factors by 25 %, while the milk composition is mainly connected with the genetic factors [16]. Phenotypical diversity of the features among the cattle is determined with a complex mixture of heredity and life conditions [17, 18, 19, 20, 21, 22, 23, 24, 25, 26].

The purpose of the studies is to examine some factors which impact the quantitative and qualitative milk indicators for the Black Spotted cows bred in the piedmont zone of North Caucasus.

MATERIAL AND METHODS OF RESEARCH:

The studies were carried out from 2013 to 2016 on the basis of the materials of livestock and breeding records in "Osetiya" livestock farm in Prigorodnyi district of the Republic of North Ossetia-Alania for the Black Spotted cows and crossbreeds with different share of blood from Holstein breed. Housing conditions and feeding for the experimental cows were similar and in accordance with the technology typical for the agriculture. The materials for 112 cows of different blood share with the Holstein breed were studied to analyze the genotype impact on milk production and milk quality.

The primary livestock documents were used to study the impact of service, dry and calving periods on the milk production. The following indicators were analyzed: the duration of the dry period (from cessation to calving); the duration of service-period (time from the calving to productive insemination); the duration of the calving interval, as well as the impact of these indicators on the milk yield capacity of cows. All in all, 120 cows with different lactations were analyzed.

To study the connection between the cow longevity and the reproductive qualities we examined the following parameters: milk yield capacity of Black Spotted cows depending on the age of first calving; impact of the cows' reproductive functions on the duration of their economic use. The values of 180 cows with different lactations were processed. For the purpose of this research the cows were classified into 3 groups depending on their age at first calving. The first group includes the animals with the calving at 18-19 months; the second group – at 20-21 months and the third group – at 22-23 months. The animals were selected on the basis of the livestock and breeding records.

The animals of the second calving and older were classified into 4 groups with on average 22 heads in each group based on the milk cow fatness impact on their milk yield and quality on the principle of analogues. The first group consisted of animals with the body condition score of 2.0-2.5 points; the second – 2.6-3.0; the third – 3.1-3.5, and the fourth – 3.6-4.0 points. Body condition score assessing methodology proposed by All-Russian Institute of Animal Husbandry (VIZh) [27] was used. Animals were classified by a 5-point scale (with the graduation interval of 0.5 points) where 1 point corresponded to exhaustion, while 5 points corresponded to excessive obesity. The assessed parameters of milk production included milk production, fat, protein, quantity of milk fat and lifetime milk production of cows under study. The obtained materials were biometrically processed with the methodology of E. K. Merkureva [28].

The results of research and their discussion:

The main purpose of crossing the Black Spotted and Holstein cows is to increase the milk production and to create new types of milk cows. The key indicators characterizing the economically useful features of milk cows are the milk yield level and the composition of milk.

The analysis of the results in using the Holsteins in Black Spotted livestock in the piedmont zone of North Caucasus shows that the blood degree by Holstein breed significantly impacts the milk production (Table 1).

Table 1. Milk Production of Black Spotted Cows of Different Genotypes for 305 Lactation Days

Indicator	Blood share by Holstein breed				
	Black Spot-ted B/S	1/4	1/2	3/4	7/8
I lactation					
Milk production, kg	3255±76	3932±128	3874±102	3853±68	3828±99
II lactation					
Milk production, kg	3769±92	4198±234	4324±101	4375±99	4232±121
III lactation and older					
Milk production, kg	3946±87	4241±255	4658±114	4539±94	4309±119
On average by III lactation, kg	3656±81	4124±206	4285±106	4256±87	4123±113

Table 1 shows that cross-bred cows with different blood share prevailed the Black Spotted ones in lactation by 305 days. Black Spotted cows had 3255 kg of milk for the I lactation, while cross-bred ones had from 3828 to 3932 kg of milk. The difference in milk yield was from 598 to 677 kg and was reliable (P< 0.001).

As the cows get older, the advantage of cross-bred ones over the purebred cows in milk yields remained. For the II lactation it was from 429 to 606 kg, for the III – from 295 to 712 kg.

The cross-bred cows with 1/2 - 3/4 share of Holstein breed blood gave high yield, except the cows of the I lactation. Cross-bred cows with 7/8 share of Holstein blood had practically no advantage over the animals with less share of upgrading breed blood. Both cross-bred and purebred Black Spotted cows had the highest yields mainly in the III lactation and older, which can be considered as satisfactory.

The content of fat and protein in milk per lactation is an important indicator of milk production capacity. Data given in Table 2 show that in the herb under analysis the content of fat and protein in cross-bred cows' milk significantly increased in crossing the Black Spotted cows with Holstein ones, which is the result of selection of bulls with ancestors with high fat content both from father's and mother's sides.

For the purebred Black Spotted cows the fat content in milk for different lactations fluctuated from 3.62 to 3.71 % (Table 2). The blood of Holstein breed contributed into the increase of this indicator, and the fluctuations were from 3.85 to 3.95 % depending on blood share. This means that in this herb the fat content in milk did not decrease, as is often the case for the cross breeds, but rather increased, which promoted the significant growth in milk fat production per lactation.

Table 2. The Content of Fat and Protein in Milk of Black Spotted Cows With Different Genotypes

Indicator	Blood share by Holstein breed				
	Black Spotted B/S	1/4	1/2	3/4	7/8
I lactation					
Fact, %	3.62±0.03	3.85±0.06	3.88±0.04	3.88±0.02	3.95±0.04
Amount of milk fat, kg	117.8±2.6	151.4±8.7	150.3±3.5	141.7±5.3	151.2±3.8
II lactation					
Fact, %	3.67±0.02	3.86±0.08	3.90±0.06	3.90±0.02	3.92±0.03
Amount of milk fat, kg	138.3±3.1	162.0±4.2	168.6±6.6	170.6±3.8	165.9±5.3
III lactation and older					
Fact, %	3.71±0.03	3.89±0.06	3.85±0.04	3.94±0.03	3.89±0.04
Amount of milk fat, kg	146.4±4.7	164.9±4.5	179.3±5.8	178.8±3.3	167.6±5.1

Black Spotted cows gave 117.8 kg of milk fat per the I lactation and 146.4 at the maximum milk yield at the III lactation. Cross-bred cows with ¾ blood share gave the minimum 141.7 kg of milk fat per I lactation. 1/4 and 7/8 blood share animals had the highest milk fat yield for the I lactation (151.4 and 151.2 kg), for ¾ blood share cows the same indicator was 170 kg for the II lactation and for half blood share it comprised 179.3 kg for the III lactation.
The obtained data led us to conclude that adding Holstein breed blood to the Black Spotted cows reliably increase the milk yield with the increase of fat and protein in milk. It should be noted here that the cows with half and ¾ blood share had the maximum growth in milk yield in comparison with Black Spotted cows. Further increase of Holstein blood in cross-bred cows did not result in significant increase in milk yield production; hence, there is no need to increase the Holstein blood share. High blood share cross-bred cows with the same or lower milk yield tend to have weakened body type and low period of economic use, which is supported by a number of researchers [29, 30, 31, 32].

Animal suitability for machine milking is one of the requirements to the cows in the context of intensive technology application in milk production. This task is currently solved in two ways – upgrading of milking machine sets and purposeful cow selection in udder quality with normal mammal gland.
The experiments showed that Holstein blood share increase in cross-bred cows improves the morphological and functional properties of the udder.

The udder of purebred Black Spotted cows is larger, mainly round and cup-shaped. Holstein blood share increase resulted in greater number of cows with cup-shaped udder. The number of cows with cup-shaped udder grew from 56 to 83%.

Milk flow rate is one of the most important indicators to assess a cow. It depends on yield level, stability of lactation curve, lactation duration, anatomic physiological features of an udder, breed and other factors.

Cows with fast and easy milk flow are more suitable for machine milking, more resistant to mastitis and, hence, more profitable for households.

Table 3 illustrates the indicators of milk flow rate for the Black Spotted cows with different genotype by Holstein breed.

Table 3. The Indicators of Milk Flow Rate for Cows with Different Genotypes

Blood share by Holstein breed	Daily yield, кг	Udder index, %	Milking time, min	Milk flow rate, kg/min
Black Spotted B/S	12.9±0.32	42.3±0.61	7.37±0.44	1.52±0.06
1/4	13.9±0.42	43.9±0.82	7.94±0.23	1.75±0.03
1/2	15.3±0.74	44.1±0.58	8.22±0.34	1.86±0.02
3/4	14.9±0.66	44.9±0.17	7.88±0.42	1.89±0.03
7/8	14.1±0.28	43.1±0.23	8.19±0.23	1.72±0.04

Udder index is defined by the ratio of forequarters' milk production to the overall yield and is expressed in percentage.

Milk flow rate is defined by dividing a daily yield value by the corresponding milking time, the rate expressed in kg/min with the accuracy up to 0.1.

The research showed that daily milk production for cross-bred cows is more than the one for the purebred cows, besides, the table 3 states that milk yield for the cows with ½ and ¾ Holstein blood share is higher with the difference of 2.0 – 2.4 kg respectively.

Many researchers note that milking time is a derivative value depending on the milk flow rate, yield amount, smoothness of udder, design of milking machines and other factors. The obtained data show that Holstein blood share increase lengthens the cow milking which can be explained by significant difference in the amount of daily milk production.

Besides, it should be noted that milk flow rate is higher for the cross-bred cows, with these indicators significantly higher for 1/2 and ¾ blood share cows. The difference was 0.34 – 0.37 kg/min. As for the udder index value, the advantage of this group of animals over the purebred ones was 1.8 – 2.6 %.

Thus, the findings let us conclude that Holstein blood share increase to a certain level for the Black Spotted cows improve the morphophysiological properties of an udder.

Many scientists both in Russia and abroad indicate that in terms of physiology 45-60 days is reasonably dry.

Only a small number of studied cows from "Os-setiya" livestock farm in Prigorodnyi district have the dry period close to the standard one. For example, only 42 cows out of 120 ones of the second lactation have the dry period of 41 - 60 days. This comprises 34.9 % of the second lactation cows, while it is only 31.4 % for the cows of the third lactation and older.

A very long dry period – more than 60 days – is typical for a significant amount of the cows in the studied herb.

It is known that both too short and too long dry periods can negatively impact the milk yield capacity.

The data from Table 4 make an impression that long dry period can increase the milk yield capacity. In reality early cessation or self-cessation can significantly reduce their yearly milk production.

Table 4. The Impact of Dry Period on Cows' Milk Yield Capacity

Indicator		Dry period in days						Total
		to 40	41-50	51-60	61-70	71-90	more than 90	
2 lactation	Number of cows	12	16	26	14	24	28	120
	%	10	13.3	21.6	11.7	20.0	23.4	100
	Milk yield, kg	4570±140	4669±164	4743±609	4586±504	4784±308	4551±113	-
	% from standard dry period	97.3	90.0	100	94.3	101.5	93.0	-
3 lactation and older	Number of cows	12	14	36	18	14	28	122
	%	9.8	11.4	30.0	14.6	11.4	22.8	100
	Milk yield, kg	4934±294	5268±197	5211±206	4952±550	5040±164	5053±102	-
	% from standard dry period	91.4	101.8	100	91.9	94.7	95.0	-

At the same time, it should be noted that a group of the second lactation cows is characterized by slight dependence of milk yield on the dry period duration. For example, average milk yield per lactation of a cow with a dry period of 51 - 60 days is 4743 kg, while it is 4784 kg for the cows with the dry period of 71 - 90 days. These data show that the cows with a long dry period (from 71 to 90) gave a bit more milk than the cows with the preferable duration of dry period. For example, the cows with the dry period of up to 40 days give on average 4570 kg of milk, while the cows with the dry period of 61 - 90 days give 4784 kg of milk.

Hence, the data illustrate that if the first-calf heifer is not appropriately prepared for the lactation, they have early cessation – in 7.5-8 months, and obviously their dry period is from 60 to 90 days, and the milk yield is lower. However, in normal conditions the dry period of 51-60 days for them can give 4745 kg of milk, i.e. the milk yield is the same for the dry period of 71-90 days. Therefore, a long dry period is not economically justified.

A group of cows of the third lactation and older gives high milk yield per lactation with dry period of 41-50 and 51-60 days – 5268 kg and 5211 kg, respectively. The same is true for the dry periods of 71-90 days and more than 90 days – 5040 kg and 5053 kg, respectively. However, despite high milk yield the dry periods of 70-90 days and more are not economically justified since the yearly milk yields decrease by 258-359 kg in comparison with a preferable dry period.

The duration of service-period is one more important indicator of milk yield capacity. The studies gave us the following findings. A cow herb in "Osetiya" livestock farm in Prigorodnyi district has a wide amplitude of fluctuation in service-period: from 50 to 120 days and more. If we take this indicator as the basis to classify the cows with no regard to lactation age, then we arrive at the following conclusion: with a dry period of up to 50 days the conception rate is good – 11.2-21.7 %; with a 51-75-day dry period it is 16.7-26.6 %; with a 76-95-day dry period it is 10.1-20.0 %; with a 96-120-day dry period it is 12.4-13.3 %; more than 120 days of dry period give 27.8-42.7 % conception rate.

Table 5 shows that a great number of cows – 45.9 % are best conceived in 90 days after the calving, therefore, these cows become unjoined in the next calendar year. Unless these cows are rejected, their lactation duration increases by the number of days corresponding to the days of service –period, and obviously these cows give more milk per lactation in comparison with the cows with a preferable service-period. For example, the milk yield per first lactation with 96-120-day service period appeared to be more by 490 kg in comparison with the cows with up to 50-day service period.

A group cows of the second lactation gave the highest milk yield among the animals with the service-period of more than 120 days – 5368 kg, while the cows with a less 50-day service period provided 4844 kg of milk. Approximately the same results were given by a group of the third lactation cows and older, i.e. the cows with a service period of more than 120 days give the highest milk yield – 5528 kg.

Table 5. The Dependence of Milk Production on Cows' Service-period

Indicator		Service –period duration in days					Total
		up to 50	51-75	76-95	96-120	more than 120	
1 lactation	Number of cows	12	24	18	12	24	90
	%	13.3	26.6	18.9	13.3	27.8	100
	Lactation period, days	277±7.2	280±4.9	297±5.1	332±3.2	314±2.8	-
	Yield per lactation, kg	4315±316	4441±363	4388±322	4805±170	4669±162	-
	Yield per one lactation day, kg	15.5	15.9	14.8	14.4	14.8	-
2 lactation	Number of cows	26	20	24	16	34	120
	%	21.7	16.7	20.0	13.3	28.3	100
	Lactation period, days	271±14.2	291±7.0	290±5.4	316±4.6	329±9.4	-
	Yield per lactation, kg	4844±228	5097±168	5048±191	5252±209	5368±114	-
	Yield per one lactation day, kg	17.8	17.5	17.4	16.6	16.3	-
ıacta-tion	Number of cows	10	20	10	12	38	90
	%	11.2	23.6	10.1	12.4	42.7	100

	Lactation period, days	286±7.4	292±6.2	297±5.0	311±8.9	324±9.1	-
	Yield per lactation, kg	5181±131	5393±122	5398±126	5489±204	5528±231	-
	Yield per one lactation day, kg	18.1	18.4	18.2	17.6	17.0	-

The given data illustrate that the longer the service-period is, the more milk is given per lactation. However, the reverse is true in case of economic use of cows, i.e. the increase in a service-period up to 75 days raises an average milk yield per one day of lactation, while with the service-period of more than 75 days the milk yield per one lactation day starts to decrease. For example, the yield per one lactation day for the cows with a 51-75-day service-period equals 15.9 kg, while it is 14.4 kg for the cows with a service-period of 96-120 days.

This regularity typical for the first lactation animals can be observed in the groups of the cows of the second, the third and older lactations, i.e. here the cows with the service-periods of up to 50 days and 51-75 days gave the highest milk yields – 17.8 and 17.5 kg, respectively, and the cows with the service-periods of 96-120 days and more than 120 days gave the lowest milk yields – 16.6 and 16.3 kg, respectively. In a group of third lactation cows and older the heist milk yields per one lactation day are typical for the cows with the service-period of 51-75 days – 18.4 kg and 76-95 days – 18.2 kg.

Considering the fact that the first lactation cows with a standard service-period are used longer than the cows with a long service-period, and the animals of the second and older lactation in these groups do not show any significant changes in daily milk production, then we can conclude that a long service-period decreases the milk yield and the number of calves in a period of using these animals.

It is known that a 365-day period is considered to be the most appropriate duration for the calving interval. The number of studied cows with this parameter is low, i.e. only 27 cows out of 85 cows have a calving interval of 365 days; for 28 animals the carving interval is from 366 to 400 days, and the rest cows have the calving internal of more than 400 days (401-450 days).

Table 6. The Impact of a Carving Interval on Cows' Milk Production

Indicator		Carving interval, days		
		Up to 365	366-400 average 383	401-450 average 425
1 lactation	Number of cows	58	36	13
	%	54.2	33.6	12.2
	Milk yield, kg	4821±162	4913±118	5262±103
	Daily yield, kg	17.7	17.1	16.9
2 lactation	Number of cows	8	20	30
	%	13.7	34.5	51.7
	Milk yield, kg	5509±234	5269±195	5809±117
	Daily yield, kg	18.0	17.3	17.0
3 lactation and older	Number of cows	14	28	48
	%	15.5	31.2	53.3
	Milk yield, kg	5680±251	5757±174	5480±192
	Daily yield, kg	17.9	17.5	16.4

The data of the research (Table 6) clearly illustrate the increase in the calving interval results in the growth of milk yield per complete lactation per cow. For example, in a group of cows of the first lactation the animals with a 401-450-day calving interval give the highest yield – 5262 kg. Along with that, an average milk production for cows with the carving interval of up to 365 days was 4821 kg, i.e. less by 441 kg. The yields are likely to grow with a longer carving interval.

However, our studies show the reverse trend, i.e. yields per one lactation day fall with longer carving interval. For example, daily milk yield for the first lactation cows with an up to 365-day carving interval was 17.7 kg, while daily yield for the cows with a

more than 401-450-day carving interval was 16.9 kg. The same is true for the groups of cows of second, third and older lactations. Thus, the assessment of cow usage efficiency should include the duration of carving interval. Above mentioned data considered we can say that a short carving period of 365 days is the most economically justifiable for milk production. Therefore, economic, organizational activities and stock breeding in dairy breeding should reasonably be based on shortening the carving interval. However, one should also remember that a group of third lactation cows and older does not have a lot of animals with the appropriate carving interval – 15.5%. At the same time, 53.3% of animals have the carving period of 401-450 days. Here we can conclude that "Osetiya" livestock farm does not follow technological techniques of intensive usage of cows, which negatively impacts the implementation of all genetic capacity of the animals in this herb.

The longer the period of a cow household usage is, the higher it has its working life, it brings more calves, thus, their economic efficiency is higher. Long working life of the animals at the farms is one of the main indicators of efficient farm management. However, the results of the research show that in the context of industrial technology of milk production the intensification of diary breeding is accompanied with a significant reduction in household usage period of breeding stock. In these conditions the animals do not live to the age (V-VI lactation) of the maximum genetic productivity. The period of cow usage depends on different genetic and paratypical factors. A significant importance is attached to the improvement of the animals' reproductive functions, among other factors influencing the long working life of cows [33, 34].

Table 7 gives the data on the productivity of Black Spotted cows with regard to their age of the first conception.

The analysis of the data shows that the cows being conceived at the age of 22-23 months appeared to be the most productive in milk in the first two lactations. Their yields in the first lactation were higher by 127-453 kg than the yield from the cows of other groups. As for the second lactation the difference was 34-306 kg, while for the third lactation the cows with the conception at the age of 20-21 months had the advantage over the other groups.

Fat content in cows' milk did not show any significant difference, while the opposite is true for the milk fat among the same groups: the first lactation showed the difference of 5.5 – 17.8 kg; for the second lactation the difference was 2.1-12.1 kg. For the third lactation the advantage of the second group over the peers from the 1 and 3 groups was 1.6-5.4 kg, respectively.

Table 7. Cows' Productivity with Regard to the Age of the First Conception

Group	First conception age, months	Yield per 365 days of lactation, kg	Fat content, %	Amount of milk fat, kg
I lactation				
I	18- 19	3628±105.3	3.66±0.08	132.8
II	20-21	3954±164.2	3.67±0.06	145.1
III	22-23	4081±169.3	3.69±0.06	150.6
II lactation				
I	18- 19	3957±274.1	3.67±0.05	145.2
II	20-21	4229±194.7	3.67±0.02	155.2
III	22-23	4263±95.3	3.69±0.03	157.3
III lactation				
I	18- 19	4544±155.1	3.70±0.03	168.1
II	20-21	4677±184.3	3.71±0.03	173.5
III	22-23	4636±115.8	3.71±0.06	171.9

Table 8 provides the data in studying the impact of the first conception age of heifers on their working life.

The table shows that the heifers being conceived at the age of 18-19 months had longer working life. The period of productive longevity in this group was 5.3 lactations, which is by 1.1 and 1.7 lactation more that in the second and the third groups, respectively. The heifers conceived at the age of 22-23 months appeared to have the shortest productive period. The cows of this group in milk productivity were among the best. Their average milk yield per 3.6 lactations was 4593.3 kg of milk. They had an advantage over the animals conceived at the age of 18-19 and 20-21 months by 307- 717 kg ($P< 0.001$), respectively.

Table 8. The Impact of Heifers' First Conception Age on Their Working Life

First conception age (months)	Group	Working life (lactations)	Average yield, kg	Life yield, kg
18- 19	I	5.3±0.7	4043.0±147.3	21427.9±1845.2
20-21	II	4.2±0.5	4286.6±126.4	18146.4±2337.1
22-23	III	3.6±0.5	4326.6±132.7	15575.7±2024.8
Average		4.3±0.3	4218.7±204.2	18383.3±1778.6

However, it should be noted that life milk yield is the main economic indicator of efficient animal breeding. The value of the life yield is determined by two factors: duration of a cow's productive period and average milk yield per lactation. It is known that the value of cows' life yield depends on the working life. Table 2 illustrates that life yield of the cows conceived at the age of 22-23 months appeared to be the lowest due to a short working life. It was 15575.7 kg, which is less by 2570.7 – 5852.2 kg in comparison with the cows conceived at the age of 18-21 months.

Early replacement of cows reduces their average productivity per year of their usage by approximately 150-250 kg, while the maximum productivity of the milk cows is shown in 4-8 lactations. Besides, costs on heifer breeding together with the cow usage during 4 lactations are two times higher than in case of cow usage during 8 lactations.

Thus, the given data on milk yield capacity and duration of cow usage with their conception in earlier period of life (18-19 months) prove the economic reasonableness of this treatment. Later the first conception time reduces the milk production capacity and longevity of cows.

For the first conception a great attention is paid to the live weight of heifers since it is a fundamental feature. Live weight characterizes the growth rate and is an indicator of adequate development and readiness of young animals for their efficient usage. Later this can be seen in the longevity, milk yield capacity, body habitus and exterior characteristics.

The results of the research show that the heifers being conceived at the age of 22-23 months had more live weight. The differences were by 12 kg in comparison with the heifers from the second group and by 25 kg in comparison with the heifers conceived at the age of 18-19 months (Table 9).

Table 9. Milk Production Capacity and Indicators of Reproductive Ability for Black Spotted Cows

Indicator	First conception age, months		
	18-19	20-21	22-23
Number of cows	7	18	23
Live weight, kg	409±9.8	422±8.1	434±11.4
Conception, times	1.4±0.1	1.8±0.2	1.7±0.3
Average yield, kg	4043.0±147.3	4286.6±126.4	4326.6±132.7
Service-period, days	69±4.2	74±3.4	103±1.8
Dry period, days	69±11.2	83±9.8	82±7.5
Carving interval, days	374±4.6	398±11.2	406±8.4
CRA	0.97	0.91	0.89
Calves per 100 cows, %	79.5	74.8	69.5

Table 9 illustrates that an average duration of service-period in the herb under study is within 69-103 days, which exceeds the standard norms. These values are especially large for the cows with the conception at the age of 22-23 months. This, in its turn, results in the increase of carving interval from 374 to 406 days and to the decrease of CRA (from 0.97 to 0.89) (CRA – coefficient of reproductive ability is defined as the correlation between the calendar year yield to the duration of carving interval). Hence, this leads to a low number of calves per 100 cows (from 79.5 to 69.5 %).

The duration of the dry period being a period providing a better preparation of cows for the next lactation period, thus, for the next conception plays a particular role in high yield values. A 45-65-day dry period is considered to be the most appropriate one.

In our research the dry period was 60-80 days long.

The key reason for this long dry period is the difficulty in cessation of the high-producing cows which give 10-12 kg of milk per day by that period of time.

The introduction of 20-month heifers into a herb is found to be accompanied with a low conception rate. The heifers at early conception are easily conceived, after carving their udders are better developed since their overall development continues.

The production of quality milk and dairy products depends on high genetic potential of dairy cattle, its complete feeding, contemporary technologies of animal exploitation in farms, and the advanced technologies of milk processing.

The milk production of cows depends on their breed characteristics, feeding and handling conditions. It increases with milk yield; one of the main factors being the abundant feeding in winter and summer periods. Proper organization of feeding the cows is of great economic importance. Cows must be fed continuously so as to make full use of their productive capacities.

The milk productivity of cows decreases with a lack of energy in the diet declining especially rapidly when it is unbalanced in protein. Milk yields reduce even more essentially with a simultaneous deficit of energy and protein in the diet. Complete feed assumes the presence of 100-110 g of digestible protein per one fodder unit of the diet [35].

In "Ossetia" livestock farm, the rations for dairy cows do not differ from diets of nonmilking cows in terms of feed composition. Per 100 kg of live weight, dairy cows are fed 1.5-2.5 kg of fibrous feed and 4.0-5.0 kg of silage. The diet of cows includes draff in the rate of 30 kg per head. Concentrates are normalized depending on the level of milk production: 150-250 g of concentrate is used per 1 kg of milk.

Body condition score is an in vivo method for determining the physiological status of dairy cows. The animal fatness changes during lactation and the interlactation periods, its dynamics affects the reproductive ability of cows, the nature of the lactation activities, milk composition, metabolic diseases, and duration of economic use.

Body condition score is a useful tool in determining the balance of animals' diets and modes of exploitation. Milk production depending on the quantitative assessment of the fatness of cows was also studied (Table 10).

Таблица 10. The Milk Productivity of Black Spotted Breed Cows Depending on Fatness

Fatness of cows (on a 5 point scale)	Average milk yield per lactation, kg	Duration of use in lactations	Life milk yield, kg
2.0-2.5	3678±83	2.4±0.21	8849±278
2.6-3.0	3852±111	3.1±0.31	11981±413
3.1-3.5	4108±97	3.7±0.24	15214±829
3.6-4.0	4584±85	4.1±0.28	18794.4±942

It is known that in the first three months after calving the cow acutely suffers from a lack of metabolic energy since the increase in milk yield is well ahead of the amount of consumed feed, and the cow is forced to use the internal reserves of the body for milk production. From this point of view, the more fat deposits are there, the higher metabolic energy reserves are, the greater the body capabilities are. The results of the research showed that the increase of body fatness of Black Spotted cows up to 4.0 points was accompanied by an increase in milk production. Thus, milk production of the cows with fatness of 3.6-4.0 points was 906, 732 and 476 kg higher than that in animals of the other groups, 19.8%, 15.9% and 10.4%, respectively. It should be noted that in the "Osetiya" livestock farm, no animals were identified among the Black Spotted cows with fatness above 4.0 points. This suggests that cows of this breed were selected especially for intensive milk production and high milk yields per lactation. This does not allow the animal to make nutrients and metabolic energy reserves in the body at the expense of excessive fat deposits in the subcutaneous tissue and the omentum.

Besides, it should be noted that the productive longevity of the studied cows was also increased with increasing fatness of animals to 4.0 points. As it is obvious from Table 10, the lowest productive longevity was noted in the cows, whose fatness was 2.0-2.5 points and amounted to 2.4 lactation periods, while the highest productive longevity was in the cows with fatness of 3.6-4.0 points and amounted to 4.1 lactation periods. Accordingly, they were superior to the animals with lower fatness in terms of lifetime milk

production. For the period of their use, these animals gave 18794.4 kg of milk that is 19-46% higher than the lifetime milk production of lower fatness cows in other groups, i.e. with low fatness.

CONCLUSION:

1. With moderate feeding and treatment conditions it is justifiable to ½ and ¾ blood correlation in crossing Black Spotted cows with Holstein seed bulls.
2. Usage rate for the milk cows depends on the duration of service, dry periods and carving interval. Preliminary periods become longer with the lactation and milk yield, but the milk production intensity and the number of calves decrease for the period of cow household usage.
3. The age of 18-19 months for the first conception is the most economically profitable since it increases the life milk yields.
4. Crossing the Black Spotted cows with Holstein seed bulls positively impacts the technological qualities of cows' udders for the industry technology.
5. Higher values of milk yield and long usage could be observed among the cows with their fatness of 3.6-4.0 scores, i.e. 4584 kg. The cows with 3.6-4.0-score fatness had the longest working life. This supports the statement that intensive and efficient milk production in the industrial farms and complexes presupposes the cows to have enough nutrient and exchange energy capacity to provide the steady lactation and long period of productive usage.

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