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INCREASING PRODUCTIVITY OF YOUNG SIMMENTAL CATTLE ON THE BASIS OF INTENSIVE TECHNOLOGY IN UZBEKISTAN

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ABSTRACT

The paper considers the impact of intensive cultivation of Simmental breed heifers on growth, development, reproductive ability and milk productivity by increasing the level of feeding by 20-30%. These researches showed that intensive breeding of experimental heifers allowed bringing the live weight at the age of 15.6 months to 391.4 kg and fruitful insemination, reducing the reception of litter for 50 days, increasing the milk productivity by 11.8% and at the age of 25-26 months transferring them to the main herd.

Keywords: heifers, first-calf cows, feeding level, live weight, growth, development, reproduction, milk productivity, economic efficiency, profitability

INTRODUCTION

Today, the global demand for livestock products - meat, meat products, milk and dairy products is increasing day by day. In this connection in Switzerland, USA, Germany and EU countries, where cattle breeding industry is developed, it is necessary to increase number of cattle, increase productivity, improve reproduction of cattle, improve keeping, feeding and directed rearing of young animals is one of the most important tasks.

Among zoned breeds of dual productivity cattle in the world there is an increasing amount of work on development of systematic methods of increasing the number of Simmental cattle and getting quality products from them. With the acceleration of milk production the requirements to qualitative indicators of cattle will increase and there will be a need to create highly productive herds. For this purpose, dairy herds and farms should be completed with cows close to each other in live weight and productivity, having high natural resistance of organism. The formation of such traits in cows depends mainly on how young females are reared from birth to lactation. It should be noted that the level of feeding depends on the biological characteristics of the growing animal and its breeding purpose.

In recent years, the country has taken a wide range of measures to meet the needs of the population in high-quality and safe food. Therefore, it is important to study the biological characteristics and adaptation of imported young Simmental breeds, to study the peculiarities of their productivity, to expand its scientific aspects, to transfer cattle to scientifically grounded and economically profitable ration, to transfer heifers early to the main herd, through their intensive breeding, to extend the terms of cows use, increase their productivity and quality of dairy products.

The purpose of the study was to determine the effect under local conditions of intensive breeding technology on the complete diet on the growth, development and milk productivity of Simmental cows and their progeny.

MATERIAL AND RESEARCH METHODOLOGY

The research was conducted in 2017-2019 on the cattle farm of UP "Sardoba" AK "Uzbekistan Temir Yullari", in Mirzaabad district of Syrdarya region. As an object of the study, the progeny of purebred Simmental cows imported from Germany were chosen. During the research the conditions of feeding, nutrition and chemical composition and eating capacity of forages, live weight of the experimental heifers, exterior, body measurements, relative and absolute growth rates, clinical and haemotological parameters of the animals, fertility, forage payback, economical efficiency of the research and the results obtained in the course of the research were studied biometrically processed.

Research Results

During the dairy period the calves of the experimental and control groups were additionally given mineral premixes in mixture with mixed fodder in the ration, besides milk. While preparing the mixed mixed fodders, they were weighed on the basis of 10 days and all animals were fed the same during the year (Table 1)

Table 1 Consumption of feed by calves up to 180 days of age for the dairy period, kg (average per head)

Озуқалар	Назорат	Тажриба
Whole milk	405	540
Alfalfa hay	198	249
Corn silage	300	378
Corn grain	100	120
Wheat grain	68	104
Common salt	2,35	2,65
Monocalcium phosphate	2,8	2,8
Diet contains		
Exchange energy, MJ	5124,5	6654,9
Feed units	426,2	553,5
Dry matter	414,2	561,8
Digestible protein	51,6	67,4
Fiberglass	78,0	98,3
sugar	9,1	11,7
starch	95,2	126
Fat	28,4	37
Ca	4,4	5,6
P	1,6	2,1

Over the 180-day study period, on average, the experimental group consumed 6654.9 MJ of metabolizable energy, 553.5 kg.k.u. nutrients, 561.8 kg of dry matter, 72.4 kg of digestible protein, 98.3 kg of fiber, 11.7 kg of sugar, 126 kg of fiber. starch, 37 fat, calcium 5.6 kg, phosphorus 2.1 kg, carotene 20.0 g, salt 2.65 kg, BMC 1.1 kg, and in the control group - metabolic energy 5124.5 MJ, feed unit 426.2 kg, dry matter 414, 2 kg, digestible protein 51.6 kg, fiber 78 kg, sugar 9.1 kg, starch 95.2 kg, fat 28.4 kg, calcium 4.4 kg, phosphorus 1.6 kg,

carotene 16.1 g, table salt 2.65 kg, BMQ 1.1 kg. As shown in Table 1, there were differences in the structure of the diet between the control and experimental groups of calves up to 6 months of age.

In the total structure of the diet skimmed milk was 24.3% more in the experimental group or 5.9% more than in the control group. In the composition of the diet concentrates in the experimental group were 3.4% more than in the control group, roughage by 2.4%, succulent forage by 1.9%. At this stage, great attention was paid to milk feeding during the first 3 months of life. Good milk feeding in the first 3 months has a positive effect on subsequent growth and productivity.

Table 2 Feeding technology of experimental heifers up to 15-18 months of age, average per head, kg

Feed	Feed	Exchange energy, MJ	EKU Feed	stern units	dry material	digestible protein
Hay (alfalfa)	135	904,5	90,45	63,45	120.05	13,64
Hay haylage	550	2255	225,6	159,5	247,5	21.45
Silage (Corn)	555	1276,5	127,65	99,9	138,75	7,77
Corn bran	31	396,8	39,68	35,65	26,35	2,23
Barley bran	60	708	70,8	63,6	53,4	3,78
Wheat bran	65	578,5	57,85	46,15	55,25	6.31
Total	-	6119,3	611,93	468,25	633,3	55,18

The total feed intake in the diets of feeding experimental heifers up to 15-18 months of age is shown in Table 2.

Table 3 Dynamics of growth of live weight of experimental calves, kg (n-15)

Age , months.	Control group		Experimental group	
	Live weight, kg	Average daily gain, g	Live weight, kg	Average daily gain, g
At birth	31 , 9 ± 0,29	-	30,8 ± 0,24	-
3	90,5 ± 0 , 51	651,1 ± 3,0	103,1 ± 0,68	803,3 ± 4,93
6	153,7 ± 0,51	702,2 ± 3,09	175,5 ± 0,80	804,4 ± 3,18
9	211,5 ± 0,44	642,2 ± 2,10	251,3 ± 0,52	842,2 ± 3,93
12	269,0 ± 0,78	638,9 ± 4,80	320,2 ± 0,40	765,6 ± 1,70
15	325,1 ± 1,16	623,3 ± 8,50	389,7 ± 1,04	772,2 ± 7,20
18	378,9 ± 1,36	597,8 ± 9,11	-	-
at fertilization	360,2 ± 1,16	623,5 ± 12,10	391,4 ± 1,04	774,6 ± 7,30

The feeding technology for the age period from 18 months to 24 years is designed the same for both experimental control and experimental heifers. During the 180-day heifer rearing period the diet of both groups of heifers was the same, with the developed feeding technology averaging

14415 MJ of exchangeable energy 1441.5 kg of energy feed unit, 1099.45 kg of feed unit, dry matter 1499.8 kg, digestible protein 131.3 kg, Ca 16.03 kg, P 4.68 kg. To enrich the diet with minerals, 35 g of table salt and 40 g of monocalcium phosphate were added to the diet of both groups.

Heifers of the experimental group were characterized by high live weight during all growth periods (Table 3). At 3 months of age, compared with the control group, there was an average difference of 13.4 kg or 14.9%, 22.6 kg or 3.8% at 6 months of age, 40.6 kg or 19.2% at 9 months of age, 12 at one month of age was 52.0 kg or 19.4%, at 450 days of age was 65.4 kg or 20.2%. (R≥0,999).

From birth to 90 days of age experimental heifers spent 221.5 kg of feed units, which is 29.9% more than in the control group. Per 1 kg of live weight gain in experimental heifers up to 90 days of age, the experimental group consumed 5.2 % more nutrients in comorbid units than the control group (Table 4).

Table 4 Feed recoupment indexes

Growth period, months	Absolute growth, kg		Total consumption, in feed units		Feed consumption per 1 kg live weight, k.unit	
	control	experienc	control	experienc	control	experienc
0-3	58,6	72,3	170,10	221,5	2,90	3.06
3-6	63,2	72,4	255,10	332,2	4.04	4,59
6-9	57,8	75,8	401,15	509,38	6,94	6,72
9-12	57,5	68,9	457,96	569,5	7,96	8,27
12-15	56,1	69,5	505.10	626,92	9,00	9,02
15-18	53,8	66,4	578,95	447,3	10,76	6,74
Total	347	425,3	2368,36	2706,8	6,83	6,36
On the day of inseminati on	328,3	360,6	2303.08	2205.3	7,02	6.12

During the period of growth of test heifers up to the age of 3-6 months, 332.2 kg of fodder units were spent per heifer of the experimental group, which is 30.2% more than that of their coevals. At the age of 6-9 months, Group II heifers consumed an average of 509.38 kg of fodder units, that is, 117.23 kg of fodder units more than their counterparts in Group I and an average of 6.72 kg of fodder units per 1 kg of live weight, while their counterparts consumed 6.78 kg of fodder units. By 9 months of age, 75.8 kg of live weight gain was obtained from group II test heifers, which was 18 kg or 23.75% (P>0.999) more than the group I coevals.

By the 9-12 month growth period, heifers in group II had consumed 569.5 kg of fodder, which is 124.55 kg more than in group I. During this period, 68.9 kg of live weight were obtained from heifers in group II, which was 11.9 kg or 16.5% (P>0.999) more than their counterparts, or 8.27

kg of fodder units per 1 kg of live weight, compared with their group I by 0.53 kg fodder units or 6.85% more.

At the age of 15-18 months, heifers in group II consumed an average of 447.3 kg of feed units, which is 7.0 kg more than in group I. During this period, an average of 6.74 kg of feed per 1 kg of live weight was expended, which was 1.44 kg less than in group I (P>0.999).

Group II heifers, from birth to the day of fertilization, consumed 6.12 kg of digestible protein per 1 kg of live weight gain. According to this indicator, 3.7% less fodder units were consumed than that of their peers. During the experiment, 425.3 kg of body weight was obtained from Group II heifers, which was 78.3 kg or 18.4% more than that of Group I (P > 0.999).

Table 5 Body mass indexes of control group heifers, %

Indexes	Age, months					
	3	6	9	12	15	18
Stretchiness	102,7	109,5	112,4	110,6	111,02	116,6
Long leg	59,2	54,7	52,8	50,9	53,98	50,4
Knobbiness	105,7	105,3	109,2	110,4	111,3	112,1
Pectoral	54,8	56,3	57,3	56,9	59,42	59,2
Overgrown	105	104,4	103,7	101,6	104,38	101,4
Bonesiness	15,3	14	13,9	14,7	15,2	15,2

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Table 6 Body mass indexes of experimental group heifers, %

Indexes	Age, months					
	3	6	9	12	15	18
Stretchiness	105,8	111,7	114,3	118,3	112,83	105,8
Long leg	54,8	54,3	52,4	50,4	50,43	54,8
Knobbiness	108	108,4	111,5	111,3	111,6	108
Pectoral	59	58	58,6	59,3	61,7	59
Overgrown	108,8	105,8	104,1	102,6	101,9	108,8
Bonesiness	14,9	15	15	15,2	15,1	14,9

Increasing the feeding rate of heifers in the experimental group allowed the animal's body size to increase in height and width during the whole period of growth (Tables 5,6).

The control group of Simmental heifers had the following indices from birth to 6 months of age: long leggedness index 54.6%, extension index 105.33%, breast index 56.3%, outgrowth index 106.1%. The experimental group had the following indices: long leggedness index 54.30%, extension index 92.2%, breast index 57.96%, outgrowth index 105.78%. Later on, with the age of heifers, the differences in individual traits changed significantly as a result of adaptation to the natural climate and an increase in feeding norms by 20-30%.

The body mass indices of the experimental Simmental heifers of the control group at the age of 15 months were 53.98% for the long leg index, 111.02% for the extension index, 59.42% for the chest index and 104.38% for the overgrowth index. While the heifers of the experimental group had an average long leg index of 50.43%, a stretching index of 112.83%, a breast index of 61.7%, an overgrowth index of 101.7%.

Thus, the results of the experiments allow us to conclude that the experimental group of Simmental breed had specific constitutional features in body measurements of heifers as a result of increasing the diet of heifers by 20-30% in nutrition.

During the study, the age at first hunt of the control and experimental groups was 12.9 days (R>0.99) less than that of the experimental group heifers, and the live weight was 18 kg less (R>0.999) (Table 7). The experimental group, where the level of feeding was increased by 20-30%, was artificially inseminated 50 days earlier than heifers of the control group, i.e. than their counterparts kept on the farm's diet. The average live weight of inseminated heifers of the experimental group was 33.9 kg more and for the first calving 50.4 days earlier than that of their counterparts of the control group.

Table 7 Indexes of reproductive ability of heifers, (n -15)

Indicators Group	Group	
	Control	Experimental
Age of the first heat, days	241,3	228,4
Live weight at the first hunt, kg	197,2	215,2
Age at fertilization, days	519	469
Average weight at fertilization, kg	360,2	394,1
Gestation period, days	282,7	282,3
Age at first calving, days	801,7	751,3
Average live weight after calving, kg	510,8	593,9
Service period, days	70,0±2,1	65,0±1,77
Fertilization rate, %	73,3	80,0
Insemination index	1,27	1,20
Receiving litter, %	81,3	82,6

According to Table 7, the average postpartum live weight of Simmental cows in the experimental group was 593.9 ± 2.9 kg, which was 83.1 kg or 16% more than in the control group (P>0.999), and the service period was reduced to 5 days. Thus the research shows that under conditions of hot climate in Syrdarya region the increase of feeding level by 20-30% in young Simmental breeds irrespective of time of year provides high growth rate and ensures high milk productivity in first 100 days of lactation.

Cows with bowl-shaped udders had a slight advantage in relative udder size. The experimental group of cows was superior to the control group according to the main indices of body measure. The data obtained confirm that there is a direct correlation between the preparation of heifers for lactation (Table 8).

Analysis of the tabulated data shows that evaluation of udder animals by their morphological signs and functional characteristics makes it possible to determine their suitability for machine

milking. While studying the udder measurements in 2-3 months of lactation it was established that the maximum number of cows with the cup-shaped udder in the experimental group was 12 cows (80,0%), in the control group - 11 cows (73,3%), with the cup-shaped udder - 20 cows, round udder - 20 % and 26,7% respectively. Goat udder cows, which were considered inappropriate, were not found in any group. The maximum milk yield per lactation in the first heifers of the experimental group with bowl-shaped udders was 24.1 kg on the day of control milking, while in the animals of the control group 19.6 kg (R > 0,95).

There were no recurrent, statistically stable differences between the groups when analyzing the qualitative composition of cow's milk.

Table 8 Relationship between udder size of the experimental cows and their milk yield, cm X ± Sx

Groups	Number of cows	During lactationamount of milk, kg	During the lactation period Average daily amount of milk,kg	Udder size			
				Width	Length	Girth	Depth
Bowl-shaped							
experiment	12	4344 ± 133,6	14,24±0,49	27,2 ± 0,49	36,6 ± 0,76	118,2 ± 1,47	27,8 ± 0,55
control	11	3850 ± 121,7	12,66±0,37	24,8 ± 0,57	30,2 ± 0,84	107,7 ± 1,52	25,7 ± 0,61
Round							
experiment	3	4092 ± 141,2	13,42±0,31	25,1 ± 0,54	28,2 ± 0,81	108,4 ± 1,54	25,2 ± 0,62
control	4	3590 ± 131,6	11,77±0,29	23,2 ± 0,41	25,1 ± 0,71	105,1 ± 1,48	24,1 ± 0,63
Mean							
experiment	15	4218 ± 137,3	13,83±0,47	26,8 ± 0,51	34,9 ± 0,79	116,2 ± 1,51	27,3 ± 0,59
control	15	3720,3±126,7	12,20±0,34	24,4 ± 0,48	29,7 ± 0,81	106,8 ± 1,50	25,2 ± 0,61

However, the cows of the experimental group had an advantage over the control group in milk fatness by 0.03%, in milk protein by 0.04%, in milk fatness by 0.16 kg.

The results of our studies clearly showed that intensive rearing up to the age of fertilization, preparation for calving, milk yield estimation of the first cows in the first 100 days of lactation increased the cows' milk yield by 11,8% (Table 9). The feed consumption per unit of production shows that the best results were achieved as a result of intensive breeding.

Table 9 Indicators of milk productivity of experimental cows (average per head)

Indicators	Group	
	Control	Experienced
In the first 100 days of lactation, kg	2090 ± 29,7	2370 ± 39,7
In 305 days of lactation, kg	3720,2 ± 47,7	4218,6 ± 54,8
Average daily milk yield, (100 days), kg	20,9 ± 0,55	23,7 ± 0,49
Milk contains:		
Milk fat,%	3,79 ± 0,02	3,82 ± 0,02
Protein in milk, %	3,31 ± 0,01	3,35 ± 0,01
Fat yield, kg	7 9 , 21 ± 1,31	90,53 ± 1,43
Milk protein, kg	69,18 ± 1,27	79,4 ± 1,47
4% milk, kg	1980,3 ± 42,5	2263,4 ± 47,5
Dry matter , %	12,35	12,51

When estimating the economic efficiency of the research (Table 10) we took into account such indices as growth and development of Simmental heifers under intensive technological conditions, live weight gain and absolute growth dynamics, feeding and preservation of the litter obtained, feed consumption up to the age of 6 months, feeding from the age of 6 months up to the first insemination.

Table 10 Economic efficiency of the research (per 1 head)

Parameters	Groups	
	Control	Experienced
Efficient insemination, days	516	468
Live weight, kg	360,2	391,4
Age at first calving, days	801,7	751,3
Live weight at first calving, kg	478,9	563,1
100-day milk yield, kg	2090	2370
Absolute live weight gain, kg	447	532,3
Selling price of 1 kg of milk, sum	4000	4000
Selling price of 1 kg live weight, soum	42000	42000
Income from realization of production:	27134	31836,6
Milk, thousand soum	8360	9480
Living weight, thousand sum	18774	22356,6
Expenses:	22853,02	26176,32
For milk, sum	7252,3	7584
For live weight gain, sum	15600,72	18592,32
Cost of 1 kg of milk, sum	3470	3200
Cost of 1 kg of live weight, sum	34900,9	34928,27
Fodder consumption from birth to first calving, in nutritional units	4937,5	4655,5
Income, thousand sum	4280,98	5660,28
Level of profitability, %	18,7	21,6

As can be seen from the table, the productivity of cattle in the experimental group of intensive rearing was high. In particular, 19.1% growth in absolute live weight was obtained from them. As a result of early calving from lactating cows of the experimental group received 280 kg more milk than in the control group

The difference in profitability can be explained by the fact that, firstly, the cost of rearing and housing animals up to their first calving in different technologies was different; secondly, the production of experimental animals began at the age of 25 months and was higher than that of the control group, i.e. 1.7 months earlier. The greatest economic efficiency was achieved as a result of increasing the nutritional value of feed, improving the technology of housing and rearing, as well as the fertilization of heifers at a relatively earlier age.

DISCUSSION OF RESEARCH RESULTS

The scientific significance of the results of the study lies in the fact that feeding the progeny heifers of purebred Simmental cows imported from Germany on a balanced diet from early age to calving, with an increase in the total piety by 20-30% of the diet leads to an increase in their

live weight, early sexual maturity, early fertilization and transfer of heifers to the main herd of cows than at the recommended dates.

The practical significance of the study lies in the fact that increasing the level of feeding the heifers at different initial stages of growth and development contributes to the growth of live weight to 380-400 kg at 15-16 months old heifers, which enables early fertilization and formation of a herd of highly productive cows from 24-25 months old heifers that allows their early transfer to the main herd and extends the terms of economic use of the cows.

CONCLUSIONS

The results of the research allowed us to draw the following conclusions:

1 Using the intensive technology of producing heifers from birth to lactation at the increased level of feeding by 20-30% in a hot climate compared to the control group has led to a more intensive set of live weight. Heifers in the experimental group had a live weight of 389.7 kg at the age of 15.6 months, which was 31.2 kg or 7.97% higher than that of the control group. There is a difference in the level of reliability of live weight (R> 0.999).

2. Increasing the level of feeding of the experimental heifers contributed to an increase in live weight, bodyweight and productivity indicators. Increasing the level of feeding of heifers in the experimental group by 20-30% resulted in the decrease of feed expenses: in the period of growth and development 6.12 feed units were spent per 1 kg of live weight gain, and 0.84 feed units were spent to produce 1 kg of milk during the period of parturition.

3. Heifers of the experimental group spent 14.1 kg of fodder units less when growing to the age of first insemination compared with the control group. The average daily gain was 151.1 g or 24.2% more than that of the control group heifers and averaged 774.6 g.

4. Intensive breeding of heifers improved reproductive performance. Thus, heifers of the experimental group showed sexual maturity at the age of 15.6 months and heifers of the control group at the age of 17.3 months. The heifers of the experimental group were inseminated 50 days earlier than the control heifers and 50,4 days earlier the litter was received and the service-period was reduced by 5 days. The live weight of first-calf cows at the age of 25 months was 563.1 kg in the experimental group, which was 84.2 kg or 17.6% more than in the control group.

5. Preparation of heifers for calving by pneumomassage of udder helped to improve morphological and functional indicators of udder. Detection of the udder shape in 2-3 months of lactation showed that the number of cows in the experimental group with bowl-shaped udder were 12 (80,0%), 3 cows with rounded udder shape (20%), the control group had 11 (73,3%) and 4 (26,7%) heads, respectively.

6. Breeding heifers at the increased level of feeding by 20-30% contributed to improving the milk productivity of the heifers of the experimental group. In the period of milking (the first 100 days of lactation) milk was 280.0 kg (11.8%) more than in the control group.

7. Increasing the level of heifer feeding had a positive impact on the economic indicators of breeding. In the experimental group, the profitability of growing heifers was 21.6% and the cost of milk production was reduced by 270.0 soums. On the average from one heifer of experimental group there was received profit 5660,2 thousand soums on the head, that is on 1379,3 thousand soums more, than in control group.

CONFIRMATION OF CONCLUSIONS

The research results were presented at the production meetings of the livestock farm LLC "Sardoba" of Mirzaabad district of Syrdarya region, discussed at the meetings of the Scientific Council of the Research Institute of Livestock and Poultry Production, State Committee for Veterinary and Livestock Development (2017-2019), as well as at 3 international and 1 national scientific conferences.

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