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## The realization of black-and-white cattle's productive potential.

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### ABSTRACT

The studies were conducted in a herd of black-and-white cattle of OJSC "Timiryazevskoe" of the Ulyanovsk Research Institute. The objects of research were thoroughbred animals of the black and white breed and crossbreeds of different pedigree, obtained from their crossing with sires of the Holstein breed. In accordance with the purpose and objectives, 7 groups of cows and 3 groups of uncastrated bull calves were formed, taking account of the age, body weight and pedigree of the black and white and Holstein breeds. Meat quality of bull-calves was studied by means of the slaughter at the Ulyanovsk meat-packing plant (3 heads from each group) after 24 hours of fasting with the method recommended by All Russian Institute of Livestock breeding. The conducted researches have revealed that with the crossbreeding increase in the Holstein breed up to 75% also raises their milk production. With age, the superiority of milk production in crossbreeds over black-and-white counterparts becomes much greater: in favor of crossbred F1 - by 367 kg (8.2%), F2 - by 437 kg (9.8%), F3 - by 454 kg (10 , 2%). It was found that during the period from the birth to 18 months, the average daily live weight gain for a group of thoroughbred bulls of the black and white breed was 788 g, and for groups of crossed bulls on the basis of the Holstein breed F1 and F2 824 and 812 g, or more than for thoroughbred peers, by 39 and 27 grams (4.5 and 3.0%). Thus, the double addition of genetic material of the Holstein breed to the black and white breed when creating the Volga type of the new breed created makes it possible to significantly increase the milk productivity of the crossbred animals, without worsening the meat production potential of black and white cattle.

**Keywords:** black-and-white breed, holstein breed, crossing, pedigree, daily weight gain, slaughter yield

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## INTRODUCTION

A program to develop a new domestic breed on the basis of crossing the black and white and Holstein cattle breeds is being implemented in the Russian Federation, which envisages the creation of the Moscow, Leningrad, Volga and Siberian zonal types. Each of the zonal types is created according to its program taking into account the specific conditions of the zone [1-5]. In accordance with the approved program, the animals of the created types must have a pronounced dairy type of constitution, be well adapted to long-term operation on large highly mechanized farms, have resistance to diseases, have a strong backbone, well-developed limbs with strong hoofs and horns and an udder providing fitness for double machine milking. The currently used Holstein breed for the breeding of a new black and white breed of cattle is characterized by a high dairy productivity, early maturity and ease of handling. At the same time, it is known that it has satisfactory meat qualities, which are characteristic of highly specialized dairy breeds. As I.M. Dunin, K.K. Adjibekov, E.K. Borozdin [2-3] point out when slaughtering cattle of this breed, a high yield of bones in the carcass is observed, fat deposition is predominantly on the internal organs, to a lesser extent in the form of "watering" and a minor deposition of intermuscular and internal fat. Therefore, it is important that in the process of breeding the Volga type of the created black and white breed of livestock using the Holstein gene pool, its fattening and meat qualities should not be allowed to be inferior.

## OBJECTS AND METHODS OF RESEARCH

Studies were conducted in the herd of black and white breed of livestock of OJSC Timiryazevskoye. The objects of research were purebred animals of black and white breed and crossbred animals of different pedigree, obtained from their crossing with bulls-sires of the Holstein breed. Bulls-sires of the Holstein breed belonged to the genealogical lines of M. Chieftain 95679, R. Sovering 198998, S.T. Rokit 252803, U. Aisial 0933122. Simultaneously, the intra-breed resources of the black and white breed were used, belonging to the lines of Poseidon 239, Nico 31652, Oreshka 1, A. Adema 30587, Eduard 31646. The materials of zootechnical and pedigree recording, cattle evaluation, catalogs of bulls-sires were used in the work. In accordance with the purpose and objectives, 7 groups of cows and 3 groups of uncastrated bull calves were formed, taking into account the age, body weight and pedigree of the black and white and Holstein breeds. Control over the growth of bull-calves was carried out by monthly individual weighing and calculation of average daily weight gain. Milk productivity of cows was determined by the results of control milking, the content of milk fat – with the help of the device "Milk-tester". Meat quality of bulls was studied by means of the slaughter at the Ulyanovsk meat-packing plant (3 heads from each group) after 24 hours of fasting with the method recommended by All Russian Institute of Livestock breeding. The feeding diets of animals were made up in accordance with the rations recommended by the All Union Academy of Agricultural Sciences [6]. Conditions in which animals were kept corresponded to zootechnical requirements. Statistical processing of research materials was carried out according to the methodology offered by E.K. Merkurieva [7] on a personal computer using Microsoft Excel.

## RESULTS OF THE RESEARCH

The conducted studies have shown that with the growth of pedigree in crossbred animals on the basis of the Holstein breed up to 75%, their milk production also increases. So, if the crossbred animals with pedigree of 50% (F1) in the breed to be improved exceeded the purebred animals in the milk yield for the first lactation by 160 kg (3.9%), this difference in favor of crossbred cows with pedigree of 75% (F2) already amounted to 358 kg (8.8%). Crossbred cows with pedigree of 87.5% (F3) did not differ from purebred black-and-white counterparts by yield, being less productive by only 83 kg. With age, the milk yield superiority of crossbred cows over black-and-white peers becomes much greater: in favor of crossbred cows F1 - by 367 kg (8.2%), F2 - by 437 kg (9.8%), F3 - by 454 kg (10.2%) (Table 1). The mass fraction of the milk fat of crossbred cows for the first lactation was higher by 0.07 ... 0.11% compared to purebred peers, and by 0.04 ... 0.11% at the highest. In the milk fat content, the crossbred cows of all the groups had a significant advantage over the black-and-white peers. This difference in favor of crossbred cows for the first lactation was 0.7 ... 17.6 kg (0.5 ... 12.1%), and for the highest - 5.8 ... 21.7 kg. Exceptions were only crossbred cows with pedigree of 62.5%, in which the amount of milk fat was less than in black and white cows, by 6.9 kg. In the zone of the Middle Volga region, experimental studies to find out how the process of inheriting characteristics from the Holstein breed is reflected on black-and-white cattle in its meat potential have been clearly insufficient. In this connection,

we set the task of studying the meat productivity of the crossbred bull-calves of the first (F1) and second (F2) generations in comparison with purebred.

**Table 1: Milk productivity of purebred and crossbred cows of the black and white breed**

Genotype	Indicator			
	n	Milk yield, kg	fat content, %	milk fat, kg
First lactation				
Black and white	17	4077±256	3,55±0,03	144,7±9,5
3/4 BW + 1/4 H	15	4350±276	3,62±0,04	157,5±8,0
5/8 BW + 3/8 H	16	4119±223	3,65±0,04	150,3±8,4
1/2 BW + 1/2 H	79	4237±97	3,53±0,02	149,5±4,6
3/8 BW + 5/8 H	21	4051±185	3,63±0,02	147,0±7,5
1/4 BW + 3/4 H	39	4435±174	3,66±0,04	162,3±6,1
1/8 BW + 7/8 H	19	3994±242	3,64±0,06	145,4±10,3
On average in all crossbreds (X B3B.)	206	4250	3,59	152,6
Highest lactation				
Black and white	16	4455±261	3,51±0,09	156,4±10,3
3/4 BW + 1/4 H	14	4514±264	3,65±0,04	164,7±9,8
5/8 BW + 3/8 H	14	4433±272	3,66±0,07	162,2±9,5
1/2 BW + 1/2 H	60	4822±82	3,57±0,02	172,1±6,4
3/8 BW + 5/8 H	19	4142±175	3,61±0,03	149,5±7,3
1/4 BW + 3/4 H	25	4892±146	3,64±0,04	178,1±7,5
1/8 BW + 7/8 H	16	4909±270	3,55±0,07	174,3±11,2
On average in all crossbreds (X B3B.)	164	4732	3,60	170,3

Growing and fattening of bull-calves were carried out according to the developed schemes and feeding norms, taking into account the planned live weight gains.

The level and type of feeding of animals was identical. Newborn bulls 10 ... 12 days were kept in the dispensary, then they were kept in group cages for 8 ... 10 heads in each. In the cowshed, bull-calves were kept loose, in winter - indoors, in summer - on the walking ground. For one bull-calf for the period of growing and fattening (0 ... 18 months), 3368.4 feed units and 315.2 kg of digestible protein were used. In calculation on one feed unit of the diet there was 93.6 g of digestible protein.

Age changes in the live weight of purebred and crossbred bulls from the birth to 18 months are shown in Table 2. The study of the dynamic pattern of weight gain in animals showed that the first-generation crossbred bulls at birth had an average live weight of 0.8 kg more, and the second generation - at 0, 4 kg less than purebred bulls of the black and white breed. The F1 crossbred bulls in all age periods exceeded by the live weight of purebred peers by 4.9 ... 20.7 kg, or by 3.7 ... 4.3%, however, the intergenotypic difference was only reliable in the 12-18 month period (P < 0.05). A similar regularity is observed in the dynamic pattern of the live weight of bull calves F2. Inferior to purebred peers in live weight at birth, in other age periods they had superiority over them by 1.4 ... 13.3 kg (0.8 ... 3.4%) with an unreliable difference.

**Table 2: Dynamic pattern of live body weight and daily weight gain in bulls of various genotypes**

Indicator	Genotype		
	black and white	1/2 bw+1/2bwh	1/4bw+1/4bwh
Live bodyweight, kg			
Number of animals	10	12	12
At birth	32,4±0,65	33,2±0,71	32,0±0,77
3 months	101,6±1,8	106,±2,0	104,3±1,7
6 months	174,7±3,4	181,3±4,1	176,1±4,2

9 months	256,3±4,5	267,4±4,6	260,3±5,3
12 months	324,5±5,1	343,4±5,3	335,9±4,8
15 months	396,2±6,4	416,9±5,8	409,5±5,6
18 months	464,0±6,8	484,1±6,3	476,7±5,9
Daily weight gain, g			
0-3 months	760±32	805±21	794±24
3-6 months	803±24	822±19	789±28
6-9 months	896±29	964±30	925±19
9-12 months	749±31	835±26	831±26
12-15 months	788±27	807±24	808±18
15-18 months	745±34	738±27	738±25
For the experiment period	788±22	824±23	812±20

It was found that during the period from the birth to 18 months, the average daily live weight gain for a group of purebred bulls of the black and white breed was 788 g, and for groups of crossbred bulls on the basis of the Holstein breed of F1 and F2 824 and 812 g, or more than in purebred peers by 39 and 27 grams (4.5 and 3.0%). The most intensive growth of bull-calves was observed in the period of 6 ... 12 months. The daily weight gain of crossbred bull-calves in this age period reached 808 ... 946 g versus 749 ... 896 g in purebred black-and-white ones. The bulls of all the groups at 12 months of age in live weight exceeded the standard requirements of the first class of the black and white breed by 10.0 ... 16.4%, and in 18 months - by 13.1 ... 18.1%.

The results of the slaughter showed that in the weight of the hot carcass the bulls of the first generation had superiority over purebred peers by 9.9 kg (4.0%), and in the second generation by 2.6 kg (1.1%) (Table 3). With the increase in pedigree of the Holstein breed, the advantage of crossbred bulls in the slaughter weight is reduced over black and white bulls from 9.3 to 1.8 kg, there is a tendency to reduce both the yield of the carcass and the slaughter yield. With the increase in genetic features of the Holstein breed, the advantage of crossbred bulls over black-and white bulls in the slaughter weight is reduced from 9.3 to 1.8 kg, there is a tendency to reduce both the yield of the carcass and the slaughter yield.

**Table 3: The slaughter results of bulls of various genotypes**

Indicator	Genotype		
	black and white	1/2bw + 1/2bwh	1/4bw + 3/4bwh
Live bodyweight, kg	458,1±0,65	473,5±6,4	470,3±5,8
Pre-slaughter weight, kg	439,8±6,0	454,2±5,7	448,5±5,1
Weight of the hot carcass, kg	245,4±4,3	255,3±5,2	248,0±4,7
Carcass yield, %	55,8	56,2	55,3
Weight of internal fat, kg	8,6±0,48	8,0±0,39	7,8±0,40
Internal fat yield, %	1,96	1,76	1,74
Slaughter weight, kg	254,0±3,8	263,3±4,2	255,8±3,9
Slaughter yield, %	57,8	58,0	57,0

With the increase in pedigree of the Holstein breed, an advantage of the crossbred bulls in the slaughter mass is reduced over the black and white bulls from 9.3 to 1.8 kg, there is a tendency to reduce both the yield of the carcass and the slaughter yield. If in semi-pedigree crossbred bull-calves these figures were slightly better (0.2 ... 0.4%) compared to thoroughbred, then the crosses of the second generation, on the contrary, were inferior to them in the carcass yield and slaughter yield by 0.5% and 0.8% . However, the differences in all cases were unreliable.

### CONCLUSIONS

Consequently, the double addition of Holstein's genetic material to the black and white breed when creating the Volga type of the new breed created makes it possible to significantly increase the milk productivity of the crossed cows without worsening the meat productivity potential of black and white cattle.



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