

# Pure breeding of the Kazakh white-headed cattle by lines as the main method of improving the hereditary qualities

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## Abstract.

The paper underlines that in the specialized meat cattle breeding of Kazakhstan, the largest share belongs to the Kazakh white-headed breed, which constitutes the base for increasing the production of high-quality organic beef.

The issues of breed and grade structure, the genealogical structure of the animals of the Kazakh white-headed breed have been described. Pedigree and productive indicators of stud animals and related groups have been shown. Modern characteristics of intrabreed types, including the West Kazakhstan zonal type of the Kazakh white-headed breed have been given. The main productivity traits have been interpreted with the breeding and genetic parameters. The age dynamics of the bred characteristics of animals of various stud lines have been shown. It has been found that among the stud lines, the largest share by the number of animals is taken by the animals of stud lines Maylan 13851, Baikal 442K, and Landysh 7879. Recommendations have been given for the efficient use of structural elements of the Kazakh white-headed breed.

**Keywords:** Meat cattle, the Kazakh white-headed, breed, stud line, genealogy, live weight, milkproducing ability, breeding, genetic parameters.

## INTRODUCTION

Increasing the production of high-quality beef is one of the most important and difficult tasks of agrarian science and practice, resolving which requires increased efficiency of using available breeding resources of beef cattle.

The relevance of increasing meat production in the shortest possible time and therefore intensification of specialized meat cattle breeding is dictated by the need to expand the meat export potential of the country in order to ensure its food safety.

Meat cattle breeding of Kazakhstan is based mainly on breeding the animals of the Kazakh white-headed breed; thus, its improvement largely depends on the volume of high-quality beef production.

Highly productive stud lines and types of animals have been created in the breed, which are well adapted to the environmental conditions. At the same time, in the modern conditions, the breed should meet certain requirements aimed mainly at improving the meat qualities of the animals. The need for increasing production of high-quality beef is primarily dictated by the requirements of the external market. In this aspect, improving the genetic processes in the population extends the real possibility of intensifying the breeding process and allows developing new science-based programs of improving the stud and productive qualities of meat animals.

In improving cattle of the Kazakh white-headed breed, the main method of improving the hereditary qualities today is the purebred breeding by stud lines.

The importance of the method of breeding by lines is in the fact that it allows fast fixation and development of the desired traits, which are characteristic of individual animals, in many descendants. This requirement primarily arises when a new breed or a new stud type of cattle appears.

N.A. Kravchenko [1] believed that due to the difficulty of simultaneous breeding by a set of the most important traits, the lines had to be differentiated by productivity.

A. I. Ovsyannikov [2] argued that formation breeds started with breeding individual lines.

F. F. Eisner, E. N. Dorotyuk [3] noted that breeding by lines was the main breeding method of improving herds and breeds of animals in the program of large-scale breeding.

A. M. Belousov [4] notes that the debates about whether lines are required appear to be largely artificial, as their absence deprives them of the ability to monitor and control the genealogy of individual herds, and breeds in general.

M. A. Makaev, et al. [5, 6, 7, 8, 9] note that the progress of breeds and their efficient use for production are based on

continuous improvement of their structural units, the main role among which is played by stud lines.

Separation of a breed into lines helps maintain optimal heterogeneity, allowing the use of nonadditive effect in detecting the specific combining ability in interline crosses.

Therefore, an important issue in breeding the Kazakh white-headed breed is the deep and comprehensive analysis of the genealogical structure of certain populations at the leading farms for breeding this breed, development of the methods of creating lines (genotypes) and types, improving assessment of producers by the quality of their off springs.

## MATERIALS AND METHODS

The research was performed at the Aisulu farm household, Plemzavod Chapayevsky LLP, Hafiz farm household, and Dongelek farm household.

The technology of keeping and feeding animals at all farms was identical and typical for specialized beef cattle breeding. The animals were kept loose in lightened premises on deep nonreplaceable straw bedding. The premises adjoined the loafing yard. The premises were joined with the loafing yard, where a mound was formed for the animals' rest.

In the winter, feeding on hay and concentrated feeds occurred indoors, on clear days, during the daytime—in the loafing yard from the self-feeding hopper and longitudinal feeders.

For watering, group ATK-4 type autodrinking devices with electric water heating were used: in summer, animals were grazing at the pasture.

To determine the characteristics related to the weight growth and development of the young animals, at the end of each month before the feeding, individual weighing was made, and the live weight of adult cattle was determined at the age of 3, 4, and 5 years of age, and older.

The milkproducing ability of cows was determined by the live weight of calves at the age of 6 months.

The breeding qualities were assessed by the results of valuation and the zootechnical and pedigree accounting documents.

## RESULTS

The object of the research included the breeding herds of the Kazakh white-headed breed of the leading farms in Western Kazakhstan: the Aisulu farm household, Hafiz farm household, PlemzavodChapayevsky LLP, farm household Dongelec, the animals of which had been represented by stud lines widely

spread in many herds in our country and CIS — Landysh 9879, Cactus 7969, Salem 12747, Maylan 13851, Baikal 442, Veteran 7880, Vyun 712, Vostok 7632, Copperton 150 K, as well as relative groups - Comerton 63118, Churchill C-60, Marsian C-12.

It should be noted that the majority of agricultural companies in Western Kazakhstan are specialized farms for breeding meat cattle, and therefore, the modern state and the prospects of the meat cattle breeding development in the region are mainly determined by the development of these farms.

Most stud herds of the Kazakh white-headed breed at the farms of Western Kazakhstan and a number of farms in other regions of the country are based on the use of genetic material of the breeding plants that were leaders in the past: Ankatinsky (currently Aisulu farm household) and Chapayevsky (currently PlemzavodChapayevsky LLP).

All above-mentioned stud lines are structural elements of the known intrabreed types of the Kazakh white-headed breed "Ankatinsky enlarged" and "Shagataysky hornless".

These intrabreed types form the basis of population "West Kazakhstan Zonal Type" of the Kazakh white-headed breed (Patent No. 110 for achievement inbreeding dated 29.06.2010).

The Western type includes stud lines Vyun 712K, AZKB-104, Veteran 7880 KB-4, Baikal 442K, AZKB-102, Vostok 7632K, AZKB-98, Landysh 9879, AZKB-91, Cactus 7969, AZKB-69 (KB-2), Salem 12747, Copperton 150K, Maylan 13851. Beef cattle of the new zonal type of the Kazakh white-headed breed features excellent adaptability to the conditions of sharply continental climate of the dry steppe and semi-desert zone, which allows keeping and growing it in both open and semi-open premises.

One of the leading farms, the herd of which has a significant effect on the genealogical composition of the Kazakh white-headed breed, is the Aisulu farm household (former Ankatinsky stud farm). Here many highly productive genealogical lines started.

The herd structure is currently represented by the animals of stud lines Landysh 9879, Cactus 7969, Salem 12747, Maylan 13851, the number of which is shown in Table 1. Table 1 shows that the herd of the Aisulu farm household is represented mostly by mature cows, the share of which reaches 95.8 %, with the largest share of the animals taken by stud lines Maylan 13851 — 39.8 %, and Landysh 9879 — 34.9%. The rest of the stud lines are represented by youngsters.

The genealogical structure of the herd at PlemzavodChapayevsky LLP was created with the participation of descendants of hornless bulls Vyun 712K, Vostok 7632K, Baikal 442K, and Copperton 150K. The greatest share in the herd belongs to the stud stock of lines from Baikal 442K — 35.3%, and the relative group from Comerton 63118 — 28.2 %. The herd, in general, is evenly represented by cows of all analyzed ages.

The genealogical structure of the herd of cows at the Hafiz farm household has been formed by the descendants from stud lines and relative groups of two well-known intrabreed types of the Kazakh white-headed breed: "Ankatinsky enlarged" and "Shagataysky hornless". In the structure of the herd from this farm, most livestock is the breeding stock of stud lines from Cactus 7969 — 31.1%, and Landysh9879 — 31.1 %; in recent years, the number of relative group of MarsianC-12 has increased.

The genealogical structure of the herd at the Dongelek farm household is characterized by higher heterogeneity and is also represented by descendants of the stud lines from two intrabreed types of the Kazakh white-headed breed of West Kazakhstan breeding. The age composition of the herd is characterized by a uniform distribution with some prevalence of mature cows in the structure. The greatest number of cows is represented by stud lines from Landysh9879 — 35.3 %, and Cactus 7969 — 22.1 %. It is noteworthy that among heifers, 11.6 % are taken by the animals of promising and well-known herds of the Kazakh white-headed breed of our country of relative groups from MarsianC-12 and Churchill C-60.

Table 1. The number of cattle of the Kazakh white-headed breed

No.	Founder's nickname	Age, years			Total
		3	4	5 and older	
Aisulu farm household					
1	Landysh 9879	1	-	98	99
2	Cactus 7969	-	-	46	46
3	Salem 12747	-	-	26	26
4	Maylan 13851	-	11	102	113
	Total	1	11	272	284
PlemzavodChapayevsky LLP					
1	Baikal 442K	25	23	66	114
2	Veteran 7880K	2	5	19	26
3	Vostok 7632K	37	16	30	83
4	Comerton 63118	15	41	35	91
5	Copperton	1	-	8	9
	Total	80	85	158	323
Hafiz farm household					
1	Cactus 7969	-	5	61	66
2	Landysh 9879	-	20	46	66
3	Churchill C-60	9	1	8	18
4	Salem 12747	7	-	15	22
5	Marsian C-12	3	9	28	40
	Total	19	35	158	212
Dongelek farm household					
1	Comerton 63118	-	-	23	23
2	Vostok 7632K	-	-	11	11
3	Baikal 442K	-	-	3	3
4	Marsian C-12	6	6	34	46
5	Landysh 9879	49	3	36	88
6	Cactus 7969	-	53	2	55
7	Churchill C-60	23	-	-	23
	Total	78	62	109	249

Table 2. Characteristics of mature cows of the stud lines of the Kazakh white-headed breed

No.	Founder's nickname	n	Productivity					
			Live weight, kg			Milkproducing ability by the live weight of 6-month-old calves, kg		
			X±Sx	δ	Cv	X±Sx	δ	Cv
Aisulu farm household								
1	Landysh 9879	98	562.0±0.37	36.25	6.0	186.0±0.40	19.43	10.0
2	Cactus 7969	46	595.0±1.20	54.39	9.0	188.0±0.80	20.80	11.0
3	Salem 12747	26	556.0±1.27	31.82	5.0	187.1±1.52	28.36	11.0
4	Maylan 13851	102	560.2±39.38	39.78	7.0	188.3±0.44	20.64	10.0
PlemzavodChapayevsky LLP								
1	Baikal 442K	66	520.1±0.87	56.87	10.0	184.2±0.25	3.15	2.0
2	Veteran 7880K	19	519.3±3.06	55.15	10.0	185.0±1.46	7.32	3.0
3	Vostok 7632K	30	528.0±1.28	37.17	7.0	182.0±3.70	22.21	12.0
4	Comerton 63118	35	519.1±1.38	47.06	9.0	179.0±0.18	3.98	2.0
5	Copperton	8	509.0±5.19	41.30	8.0	178.0±1.21	4.87	20.0
Hafiz farm household								
1	Cactus 7969	61	524.0±0.38	23.02	4.0	181.0±0.26	6.29	3.0
2	Landysh 9879	46	529.1±0.65	29.42	5.0	182.0±0.28	5.89	3.0
3	Churchill C-60	8	533.0±4.20	29.46	5.0	185.0±2.29	6.87	3.0
4	Salem 12747	15	531.0±2.20	30.85	5.0	176.1±1.95	7.82	4.0
5	Marsian C-12	28	521.0±1.06	28.74	5.0	185.0±0.97	11.65	6.0
Dongelek farm household								
1	Comerton 63118	23	518.7±8.40	39.40	7.6	201.0±3.40	11.81	5.87
2	Vostok 7632K	11	510.0±11.0	34.8	6.8	203.0±2.43	6.42	3.16
3	Baikal 442K	3	539.3±12.6	12.65	4.0	-	-	-
4	Marsian C-12	34	513.0±8.77	51.87	10.11	207.0±1.57	6.07	2.93
5	Landysh 9879	36	526.4±6.83	41.57	7.9	203.0±0.78	9.3	4.5
6	Cactus 7969*	53	510.0±6.07	45.45	8.9	200.0±0.4	6.4	3.2
7	Churchill C-60**	23	478.7±11.98	56.21	18.74	-	-	-

Note: \*Age of cows — 4 years;

\*\*Age of cows — 3 years.

The main indicators of productivity and exterior valuation of cows in the analyzed genealogical lines are shown in Table 2, from which it follows that mature cows of most farms by their live weight exceed the requirements of the standard of the breed, and the live weight of the cows at the Aisulu farm household exceeds the norms of the standard for the elite and the elite-record classes on the average by 15.5 kg and 25 kg, respectively. It is known that the genetic abilities of the herd are determined by the presence of outstanding animals. In the herds of the analyzed farms, on the average, over 35 cows have record live weight (600 to 700 kg), which is an objective indicator of the genetic structure of the herd.

At the same time, studying the coefficients of cows' live weight variation shows its low range, which to some extent characterizes the homogeneity state of the herds and narrowing of the genetic diversity by this trait.

It should be noted that in the recent years, selection of genetically valuable animals with better genotypic characteristics and their intentional improvement allowed achieving better milk producing ability and exterior valuation. Thus, by the exterior valuation, the cows of all stud lines exceeded the requirements of the elite-record class. They featured high milk producing ability, which at the age of 6 months in all stud lines ensured the average live weight of calves of 187.3 kg, of heifers — 176.8 kg.

The highest coefficient of variation of the live weight was noted in the descendants of a relative group from Churchill C-60, and by the milk yield coefficient, the cows of all stud lines at the Aisulu farm household were characterized by the fairly high interval of variability, which was within 26. All these indicated the possibility of further improvement of these traits in the herd breeding.

## CONCLUSION

The research has shown that the genealogical structure of herds of the Kazakh white-headed breed is characterized by relatively high diversity, and the genetic resources of the Western Kazakhstan breed with a scientifically substantiated system of breeding can become a reliable factor for the enrichment of the gene pool of the Kazakh white-headed breed in whole.

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