

## COMPARATIVE CHARACTERISTICS OF DOMESTIC BEEF CATTLE BREEDS AND THEIR INITIAL GENOTYPES BY ECONOMICAL VALUABLE TRAITS

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*Comparative characteristics of domestic beef cattle breeds with their original forms (breeds participated in creating) by performance indicators (live weight, 210-day weaning weight of calves), population size and growth intensity of young animals at different ages were carried out. It has been established that Volyn and Polessian Beef cattle predominated over their original forms in population size, but Ukrainian Beef breed was inferior to them. Analysis of performance indicators has shown advantage of Volyn and Ukrainian Beef cows by live weight and 210-day weaning weight of calves over the breeds of England (Hereford, Aberdeen-Angus), Simmental, Ukrainian Grey, but they were inferior to the breeds of France (Limousine, Charolais).*

**Key words:** breed, beef cattle-breeding, live weight, 210-day weaning weight of calves, growth intensity, reproductive ability

### ПОРІВНЯЛЬНА ХАРАКТЕРИСТИКА ВІТЧИЗНЯНИХ М'ЯСНИХ ПОРІД ВЕЛИКОЇ РОГАТОЇ ХУДОБИ ТА ЇХ ВИХІДНИХ ГЕНОТИПІВ ЗА ГОСПОДАРСЬКИ КОРИСНИМИ ОЗНАКАМИ

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*Проведена порівняльна характеристика вітчизняних порід великої рогатої худоби м'ясного напрямку продуктивності з їх вихідними формами (породи, які приймали участь в процесі створення) за показниками продуктивності (живою масою, молочністю), чисельністю поголів'я, а також інтенсивністю росту молодяку у різні вікові періоди. Встановлено, що волинська та поліська м'ясні породи переважають за чисельністю свої вихідні форми, а українська м'ясна поступається їм. Характеристика показників продуктивності волинської та української м'ясних порід показала, що вони мають перевагу за живою масою і молочністю над англійськими породами (геррефорд, абердин-ангус), симентальською, сірою українською, але поступаються породам Франції (лімузин, шароле).*

**Ключові слова:** порода, м'ясне скотарство, жива маса, молочність, інтенсивність росту, відтворна здатність

### СРАВНИТЕЛЬНАЯ ХАРАКТЕРИСТИКА ОТЕЧЕСТВЕННЫХ МЯСНЫХ ПОРОД КРУПНОГО РОГАТОГО СКОТА И ИХ ИСХОДНЫХ ГЕНОТИПОВ ЗА ХОЗЯЙСТВЕННО ПОЛЕЗНЫМИ ПРИЗНАКАМИ

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*Проведена сравнительная характеристика отечественных пород крупного рогатого скота мясного направления продуктивности с их исходными формами (породы принимавших участие в процессе создания) по показателям производительности (живой массе, молочностью), численности поголовья, а также интенсивности роста молодняка в разные возрастные периоды. Установлено, что волынская и полесская мясные породы преобладают по численности свои выходные формы, а украинская мясная уступает им. Характеристика показателей производительности волынской и украинской мясных пород показала, что они имеют преимущество по живой массе и молочностью над английскими породами (геррефорд, абердин-ангус), симментальской, серой украинской, но уступают породам Франции (лимузин, шароле).*

**Ключевые слова:** порода, мясное скотоводство, живая масса, молочность, интенсивность роста, воспроизводство

**Introduction.** Since the 70s of the last century it has been working to create beef cattle of Ukraine. In the early stages it was imported foreign breeds, conducted further analysis of crosses domestic dairy and dual-purpose breeds with breeds of France, England and Italy to find successful combinations. The first achievement of painstaking work of scientists and breeders was Ukrainian Beef breed (created by: Charolais, Ukrainian Grey, Simmental, Chianina) which was approved in 1993, than Volyn Beef (on the basis of Aberdeen-Angus, Limousine, Hereford, Polish Red, Black-and-White breeds). Polessian Beef breed was approved 5 years later (combined genotype of Ukrainian Beef and Znamensk type), Southern Beef (Red Steppe, Hereford, Santa Gertrude, Charolais, Zebu, Shorthorn) and Znamensk interbreed type of Polessian Beef (Aberdeen-Angus, Charolais, Simmental, Red Steppe) –12 years later, Kovel interbreed type of Volyn Beef breed –15 years later (Volyn Beef, Aberdeen-Angus and Limousine breeds). All the Ukrainian beef breeds were created by a complex reproductive crossbreeding, they have their breed standards, target requirements and plan of further selection and breeding, well adapted to the specific climatic zones, where there are natural meadows and pastures.

The research aim was to compare the domestic breeds of Ukraine with genotypes participated in their creation by performance indicators [1-3,5,7].

**Material and methods.** Comparative characteristics and analysis were carried out basing on the data of annual cattle valuation of 92 breeding farms for 2013 including 23 farms for breeding Aberdeen-Angus breed, 21 – Volyn Beef, 13 – Polessian Beef, 6 – Southern Beef, 2 – Ukrainian Beef, 8 – Simmental, 2 – Ukrainian Grey, 6 – Charolais, 5 – Limousine, 1 – Hereford, 4 – Kovel interbreed type and 2 – Znamensk interbreed type. Population size, its age structure, distribution of cows and bulls by the age and live weight, cow's performance as a 210-day weaning weight of calves, reproductive ability, growth intensity of young animals at the age of weaning, 8, 12, 15, 18 months were used in the analysis.

**Results.** Development of competitive beef cattle-breeding requires a systematic study of the field with emphasis on population size, its structure, performance and reproductive ability of domestic and foreign breeds for further selection and breeding. In Ukraine the domestic breeds (68.4 %) and the world's best ones participated in their creation were the main array of beef cattle (table 1). Volyn Beef cattle were the most numerous population, which was 31,0 % in the general structure, and was 3 % greater than the total population of initial breeds (Aberdeen-Angus – 25,1 %, Hereford – 0,4 %, Limousine – 2,5 %). Polessian and Southern Beef breeds were 14,2 % and 8,3 % respectively in the general array. Ukrainian Beef (1,4 %) and autochthonous Ukrainian Grey (1,6 %) breeds reached critical level.

Effective development is impossible without planning of livestock population. Equally important in this case is rational structure of a herd. V. I. Kostenko, J. Z. Siratsky, Y. D. Ruban et al. [4] proposed scientifically based standards for group proportion of animals in a herd of breeding farm, where number of cows should be 50–55 %, heifers – 15–18 %, heifers younger than a year old – 20–25 %. The analysis of gender and age structure of the studied beef populations indicates for some variation in a group proportion of beef breeds. It is noted that the proportion of females is more than 55 % was only in the breeds with small population size (Ukrainian Grey and Ukrainian Beef) whereas the smallest share of cows was in Southern Beef breed (33,3 %).

### 1. Population size of the beef breeds

Breeds	Population size	Observed cows	Observed bulls	Age group of	
				heifers	young bulls
<b>Volyn Beef</b>	9631	4162	96	3926	1447
Aberdeen-Angus	9445	4288	97	3464	1596
Hereford	133	54	-	35	44
Limousine	931	362	18	368	183
<b>Ukrainian Beef</b>	527	366	17	124	20
Simmental	3347	1405	21	1084	837
Ukrainian Grey	607	351	12	189	55
Charolais	1346	572	24	489	261
<b>Southern Beef</b>	3110	1035	49	1124	902
<b>Polessian Beef</b>	5383	2435	55	1945	948
<b>Znamensk interbreed type</b>	921	348	4	450	239
<b>Kovel interbreed type</b>	2185	946	12	851	376

Analyzing age structure of breeding females (table 2) should emphasize lack of heifers in herd structure of Volyn Beef, Hereford, Ukrainian Beef breeds and Kovel interbreed type. All the observed breeds had a large proportion of cows older than 8 years old except Limousine (18,5 %), Southern Beef (16,8 %) and Polessian Beef (16,6 %). These values in populations of Znamensk and Kovel interbreed types were 43,1 and 37,1 % respectively. In 2013 the breeding farms used 398 bulls for own reproduction, of which almost half (52 % – 207 bulls) were young animals at the ages of 2 and 3 years.

### 2. Distribution of observed cows and bulls by age

Breeds	Cows at the age of						Bulls at the age of		
	2 years	3 years	4 years	5 years	6-7 years	8 years and older	2-3 years	4-5 years	6 years and older
<b>Volyn Beef</b>	-	652	536	649	918	1407	48	33	12
Aberdeen-Angus	295	698	690	681	751	1152	60	32	4
Hereford	-	15	12	10	3	14	-	-	-
Limousine	3	82	92	76	42	67	9	7	2
<b>Ukrainian Beef</b>		68	70	88	54	86	9	8	-
Simmental	96	157	201	225	275	451	5	12	4
Ukrainian Grey	23	54	5	91	70	108	7	5	-
Charolais	53	105	101	65	97	151	12	12	-
<b>Southern Beef</b>	52	205	221	172	211	174	29	13	6
<b>Polessian Beef</b>	50	480	542	443	449	391	20	13	20
<b>Znamensk interbreed type</b>	23	45	20	42	68	150	3	1	-
<b>Kovel interbreed type</b>	-	93	164	132	206	351	5	5	2

However, a streamlining gender and age structure is not sufficient for effective management of beef cattle-breeding. Importance has organization of selection and breeding work for improving pedigree and productive qualities of animals. Milk production is one of the most important selection criteria for evaluating quality of breeding cows as it determines largely survival of calves and their weaning weight [6]. Comparing cow's performance of breeds, it is noteworthy that the larger breeds were characterized by higher its rates (table 3). The Ukrainian Beef cows among the domestic breeds were characterized by the highest milk production (a 210-day weaning weight of calves) and dominated over Simmental (17 kg greater on average) and Ukrainian Grey (35 kg). But the Ukrainian Beef cows were slightly inferior (3 kg less on average) compared with the Charolais

cows. Value of performance of the Volyn Beef cows was intermediate compared with the initial genotypes and its advantage over the cows of Aberdeen-Angus and Hereford breeds was within 11-16 kg, with a minimum value after the third calving and maximum one for average. However, there was a negative value (10–14 kg less) compared with the Limousine cows. The structural formations of Volyn and Polessian Beef breeds are Kovel and Znamensk interbreed types respectively; their cows dominated slightly these breeds by milk performance (a 210-day weaning weight of calves).

### 3. Cow's performance as a 210-day weaning weight of calves

Breeds	after calving I		after calving II		after calving III		Average	
	n	M	n	M	n	M	n	M
<b>Volyn Beef</b>	354	206	347	211	1959	218	2660	215
Aberdeen-Angus	448	193	493	200	1759	207	2700	203
Hereford	11	193	2	197	21	207	34	199
Limousine	33	216	49	225	98	230	180	226
<b>Ukrainian Beef</b>	60	219	60	235	176	228	296	224
Simmental	115	202	131	209	547	218	793	211
Ukrainian Grey	52	179	9	204	153	194	214	189
Charolais	52	224	57	229	181	232	290	230
<b>Southern Beef</b>	82	200	165	208	371	215	618	208
<b>Polessian Beef</b>	224	195	360	207	1205	224	1789	214
<b>Znamensk interbreed type</b>	50	202	11	210	172	217	233	213
<b>Kovel interbreed type</b>	52	214	64	222	292	223	408	221

Live weight is one of the main indicators of beef performance and an important feature of breeding values. Live weight of the Volyn Beef cows, most of which are concentrated in Western Polessya complied with the requirements of the highest class of valuation (table 4). So, 3-, 4- and 5-years old Volyn Beef cows dominated same age animals of Aberdeen-Angus (31, 50, 46 kg greater) and Hereford (37, 9, 49 kg greater). Polessian Beef breed was created in Polissya of Ukraine. Live weight of the Polessian Beef cows was from 9 to 11 kg less compared with the cows of Znamensk interbreed type and was from 35 to 42 kg less compared with the Ukrainian Beef cows. It is noteworthy that the highest value of live weight among domestic breeds was in Ukrainian Beef cows which are common in the Forest-Steppe zone. Live weight of bulls varies widely depending on the breeds, but it should be noted live weight of 2-years-old bulls was more than 700 kg in Volyn Beef, Ukrainian Grey, Charolais breeds; live weight of 3-years old bulls was more than 800 kg in Charolais, Polessian Beef breed and Kovel interbreed type; live weight of 4-years old bulls was more than 900 kg in Polessian Beef breed and Kovel interbreed type; live weight of 5-years old bulls and older was more than 1,000 kg in Simmental and Charolais breeds.

The main requirement of beef cattle is a high rate of animal's growth at different age periods. Thus, live weight of the Ukrainian Beef young bulls was equal to the Charolais same age animals, but the Charolais 12-months-old bulls were 34 kg greater than the Ukrainian Beef same age animals, and the bulls at the age of 18 months were 14 kg greater (table 5). Live weight of the Polessian Beef young bulls was 18 kg greater at the age of 18 months and 35 kg greater at the ages of 12, 15 months compared with the animals of Znamensk interbreed type. Live weight of the Ukrainian Beef remount heifers at the age of 12 months was equal to the Charolais same age animals; at the age of 8 months they were 20 kg greater than the Charolais ones.

An equally important part of beef cattle-breeding is reproductive ability of breeding females. Calving interval varied from 343 days (Aberdeen-Angus) to 394.2 days (Charolais) among general of the investigated breeds. Calving interval was more than 400 days in the cows of Simmental (411), Southern Beef (400) and Znamensk interbreed type (408). Age at first calving of investigated heifers ranged from 22.4 months (Ukrainian Grey) to 31 months (Znamensk interbreed type). The calving course proceeded well in the observed cows, it was fine in 15 680 cows, 302 of cows needed help, and there were registered 128 abortions and 717 stillborns. The most stillborns were in Volyn, Polessian, Southern Beef, Simmental, Aberdeen-Angus, Charolais and Limousine breeds.

4. Live weight of beef cows and bulls, kg

Breeds	Cows at the age of						Bulls at the age of											
	3 years		4 years		5 years		average		2 years		3 years		4 years		5 years		average	
	n	M	n	M	n	M	n	M	n	M	n	M	n	M	n	M	n	M
<b>Volyn Beef</b>	652	468	536	527	2974	570	4162	545	28	707	19	807	15	934	34	967	96	834
Aberdeen-Angus	398	437	690	477	2584	524	3972	494	34	582	20	700	19	763	24	808	97	678
Hereford	15	431	12	518	27	521	54	502	-	-	-	-	-	-	-	-	-	-
Limousine	82	460	92	547	185	597	359	551	8	634	2	721	4	858	5	931	19	830
<b>Ukrainian Beef</b>	68	516	70	562	228	599	366	570	7	650	-	-	-	-	5	1070	12	825
Simmental	157	481	201	514	951	554	1309	532	1	630	5	634	5	817	10	1005	21	774
Ukrainian Grey	54	461	5	494	269	532	328	500	1	750	6	766	-	-	5	854	12	773
Charolais	105	513	101	580	313	598	519	577	6	708	10	952	6	931	2	1037	24	924
<b>Southern Beef</b>	205	462	221	479	557	525	983	498	11	616	19	749	10	861	9	896	49	759
<b>Polesian Beef</b>	480	481	542	521	1283	557	2305	527	8	669	14	874	5	902	28	956	55	842
<b>Znamensk interbreed type</b>	68	472	19	530	261	568	348	534	1	652	2	792	1	864			4	775
<b>Kovel interbreed type</b>	93	481	164	543	689	585	946	560	3	753	2	823	1	942	6	987	12	805

5. Distribution of young animals of beef breeds by live weight

Breed	Live weight of animals, kg											
	at birth		at weaning		at the age of 8 months		at the age of 12 months		at the age of 15 months		at the age of 18 months old	
	n	M	n	M	n	M	n	M	n	M	n	M
<b>Heifers</b>												
<b>Volyn Beef</b>	301	30	440	207	659	224	288	314	721	363	443	397
Aberdeen-Angus	571	27	359	187	820	210	383	276	699	324	849	370
Hereford	-	-	5	175	-	-	-	-	2	328	10	361
Limousine	91	29	62	205	27	223	21	304	81	345	31	402
<b>Ukrainian Beef</b>	-	-	-	-	58	261	69	318	15	390	38	449
Simmental	516	33	349	205	344	223	411	304	431	343	375	389
Ukrainian Grey	-	-	8	229	66	194	45	275	7	351	40	356
Charolais	200	38	67	217	58	241	63	318	110	436	155	451
<b>Southern Beef</b>	238	30	137	183	185	208	234	222	288	270	271	369
<b>Polessian Beef</b>	350	32	368	213	324	230	363	300	314	344	355	396
<b>Znamensk interbreed type</b>	134	25	111	202	106	216	42	300	171	330	211	382
<b>Kovel interbreed type</b>	3	28	92	215	164	227	55	304	127	358	225	398
<b>Young bulls</b>												
<b>Volyn Beef</b>	171	36	155	212	283	241	37	360	51	438	13	506
Aberdeen-Angus	442	29,6	271	201	254	225	126	322	82	371	71	428
Hereford	-	-	8	190	1	219	-	-	2	385	-	-
Limousine	51	34	46	224	15	246	46	351	40	420	2	530
<b>Ukrainian Beef</b>	-	-	-	-	51	266	15	392	-	-	7	568
Simmental	367	37	198	214	206	238	166	347	143	416	19	487
Ukrainian Grey	-	-	-	-	57	228	44	383	1	415	9	483
Charolais	188	45	39	237	41	266	28	358	35	457	6	582
<b>Southern Beef</b>	264	33	153	207	201	240	193	306	135	384	7	459
<b>Polessian Beef</b>	227	34	205	227	228	254	108	355	59	432	21	525
<b>Znamensk interbreed type</b>	150	30	96	209	101	237	70	320	66	397	-	-

**Conclusions.** Comparative characteristics of domestic beef cattle breeds and ones participated in their creating have shown that population size of some domestic breeds (Ukrainian Beef, Ukrainian Grey) reached a critical level. It makes sense for the majority of the studied populations are to optimize gender and age structure. Analysis of performance indicators has showed that live weight of the observed cows and bulls complied with the requirements of valuation and the Volyn Beef cows meet the requirements of the highest class of valuation. The Ukrainian Beef cows among the domestic breeds were characterized by the highest milk production (a 210-day weaning weight of calves) and live weight. Volyn and Ukrainian Beef cows by live weight and 210-day weaning weight of calves predominated over the Hereford and Aberdeen-Angus cows, but they were inferior to the Limousine and Charolais cows.

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