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INFLUENCE OF GENETIC FACTORS ON THE PRODUCTIVITY OF COWS

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The research was carried out in the herd of the State enterprise experimental farm "Khristinivske" on cows of Ukrainian Red-and-White dairy and Holstein breeds, taking into account the conditional blood rate for improving Holstein. Breeding work ensured a gradual increase in the dairy production of the herd. The biological regularity of cows to increase dairy productivity with age has been implemented. According to the first-calf cows, a trend of curvilinear increase in productivity with an increase in the conditional share of heredity for the Holstein breed was noted. In cross-breed comparisons, a statistically significant excess of Holstein heifers milk yield over such cows of Ukrainian Red-and-White dairy breed (404 ± 158.0 kg, td = 2.57, P < 0.02), which is leveled before the third lactation, was found. A statistically significant effect of linear affiliation (on average 8.3%) and paternal origin (13.1%) on the variability of individual traits of live weight, dairy production and reproductive ability of cows was established. The influence of the father in the studied herd is 1.58 times more significant than that of linear affiliation. A significant level of differentiation of the groups of cows of different lines, sibling groups and half sisters by father by milk for the first lactation was revealed. Based on the totality of assessments of the improving effect and phenotypic consolidation, the most desirable for further use in the herd are the prepotent improvers Tumpi ET Red Tl 112367468 and Mitchell Red 402213, and the most undesirable are the prepotent detergents Inhibitor ET Red 402151 and Jopi Red Tv Tl 114386090.

Keywords: **genetic factors, Ukrainian Red-and-White dairy breed, Holstein breed, dairy productivity, live weight, reproductive ability**

ВПЛИВ ГЕНЕТИЧНИХ ЧИННИКІВ НА ПРОДУКТИВНІСТЬ КОРІВ

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Дослідження проведено в стаді ДП ДГ "Христинівське" на коровах української червоно-рябої молочної та голштинської порід з урахуванням умовної кровності за поліпшувальною голштинською. Селекційна робота забезпечила поступове зростання молочної продуктивності стада. Реалізовано біологічну закономірність корів до збільшення молочної продуктивності з віком. За надоєм первісток відмічено тенденцію до криволінійного підвищення продуктивності зі зростанням умовної частки спадковості за голштинською породою. За міжпорідного порівняння встановлено статистично значуще перевищення надою голштинських первісток над таким корів української червоно-рябої молочної породи (404 ± 158,0 кг, t_d = 2,57, P < 0,02), яке до третьої лактації нівелюється. Встановлено статистично значущий вплив лінійної належності (у середньому 8,3%) і походження за батьком (13,1%) на мінливість окремих ознак живої маси, молочної продуктивності та відтворювальної здатності корів. Вплив батька у досліджуваному стаді в 1,58 рази істотніший за такий лінійної належності. Виявлено істотний рівень диференціації груп корів різних ліній, споріднених груп і напівсестер за батьком за надоєм за першу лактацію. За поєднанням оцінок поліпшувального

ефекту і фенотипової консолідованості найбільш бажаним для подальшого використання у стаді є препотентні поліпшувачі Тумпі Ет Ред Тл 112367468 і Мішель Ред 402213, а найбільш небажаними – препотентні погіршувачі Інгібітор Ет Ред 402151 і Джупі Ред Тв Тл 114386090.
Ключові слова: **генетичні чинники, українська червоно-ряба молочна порода, голштинська порода, молочна продуктивність, жива маса, відтворювальна здатність**

ВЛИЯНИЕ ГЕНЕТИЧЕСКИХ ФАКТОРОВ НА ПРОДУКТИВНОСТЬ КОРОВ

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Исследования проведены в стаде ГП ОХ "Христиновское" на коровах украинской красно-пёстрой молочной и голштинской пород с учётом условной кровности по улучшающей голштинской. Селекционная работа обеспечила постепенный рост молочной продуктивности стада. Реализована биологическая закономерность увеличения молочной продуктивности коров с возрастом. По надою первотёлок отмечена тенденция криволинейного повышения продуктивности с возрастанием условной доли наследственности голштинской породы. При межпородном сравнении установлено статистически значимое превышение надоя голштинских первотёлок над таким коров украинской красно-пёстрой молочной породы (404 ± 158,0 кг, t_d = 2,57, P < 0,02), которое до третьей лактации нивелируется. Установлено статистически значимое влияние линейной принадлежности (в среднем 8,3%) и происхождения по отцу (13,1%) на изменчивость отдельных признаков живой массы, молочной продуктивности и воспроизводительной способности коров. Влияние отца в исследуемом стаде в 1,58 раза более существенное, чем линейной принадлежности животных. Определили существенный уровень дифференциации групп коров разных линий, родственных групп и полусестёр по отцу по надою за первую лактацию. По совокупности оценок улучшающего эффекта и фенотипической консолидированности наиболее желательными для дальнейшего использования в стаде являются препотентные улучшатели Тумпи Ет Ред Тл 112367468 и Мишель Ред 402213, а наиболее нежелательными – препотентные ухудшатели Ингибитор Ет Ред 402151 и Джупи Ред Тв Тл 114386090.
Ключевые слова: **генетические факторы, украинская красно-пёстрая молочная порода, голштинская порода, молочная продуктивность, живая масса, воспроизводительная способность**

Introduction. The Ukrainian Red-and-White dairy breed of cattle remains one of the main (second by livestock and third by dairy productivity) in the controlled part of the dairy cattle population in Ukraine [2, 5–7, 17]. The prospective breeding program for 2020 [14, 17] provides for genetic improvement of herds for the use of boogers of enhancers of both domestic and foreign breeding. Considering the desire of livestock owners to fix the stock of Holstein breed bulls with higher breeding index by breeding stock, the contingent share of hereditary breeding succession increased from 75–82.5% in 2003 to 92.5% and above 2015, which together with the increase milking often leads to a decrease in fat and protein content in milk and reproductive capacity [17]. Of the other (in addition to conditional blood) genetic factors note a marked effect on the phenotypic variability of economically beneficial traits of parental origin (inheritance) and linear affiliation [3, 4, 8, 18, 19].

Formation and manifestation of traits (genotype implementation) occurs under the essential influence of specific environmental conditions. Therefore, the phenotype of the animal is only the norm of the genotype response to specific paratypic growing and retention conditions [13]. In view of the above, it is proposed to carry out periodic breeding and genetic monitoring in factory flocks and breeds [2, 8, 11, 12, 15, 20, 21]. The system of complex analysis consists in the assessment of individual development and manifestation of economically useful features of cows and heifers of different breeds, intraspecific types, conditional blood counts for improving breeds, lines, families, groups

of half-sisters by paternal, total intra, intergroup and relative variability, variability genetic and environmental factors, the degree of phenotypic consolidation of breeding groups of different levels of intrathoracic hierarchy and their compatibility [12]. In modern world breeding practice, the dynamics of population-genetic parameters in the interaction "genotype – environment" is determined depend-ing on the breed [22, 23, 31, 34], country or geographical region of breeding [16, 25, 30–32], tem-perature load [24, 26], organic animal husbandry [28, 29], voluntary milking technology [33], produc-tivity level [27] and other factors.

In the process of improving dairy breeds, considerable attention is paid to improving the ability to feed, the ability to maintain and milk, the quality of milk, the life expectancy of animals, economic maturity, and so on. However, dairy productivity remains the main breeding ground for dairy cattle. It is known about the significant influence of paratypic factors on qualitative and quantitative signs of milk productivity [3, 8, 19–21]. Under such conditions, genetic improvement of the dairy cattle array can be expected with the successful selection of the fruit enhancers desired.

The purpose of this study was to evaluate the influence of genotypic factors on the economic usefulness of dairy cattle.

Materials and methods. The study was conducted on the basis of primary breeding records in the herd of Ukrainian Red-and-White dairy breed of the State Enterprise experienced farm "Hristinovske" of the Institute of animal breeding and genetics nd. a. M.V.Zubets of National Academy of Agrarian Science. Based on the materials of the SUMS ORSEC electronic information database on 2017, using the interface developed by us (O. O. Bokov, Yu. P. Polupan), an observation matrix was formed in "*.sta" format, which contained data on 448 variables of 1540 cows, 912 of which had dated milk production information for the first lactation with calving during 1999–2017.

Given the methodological incorrectness of comparing the productivity of cows of different breeding groups under conditions of probably different levels of their cultivation and feeding in chronologically distant years [3, 8], the average yield of first-calf cows herds by years of first calving was calculated to substantiate the accounting period (table 1).

1. Dynamics of dairy productivity of the first-calf cow by years of the first calving

Group by year calving	Considered animals	Milk yield for 305 days		Fat content in milk,%	
		x ± S.E.	σ	*x ± S.E.*	σ
1999	4	2571 ± 301.6	603.2	3.38 ± 0.083	0.167
2000	2	2918 ± 255.0	360.6	3.34 ± 0.188	0.265
2001	7	4290 ± 410.9	1087.4	3.41 ± 0.010	0.026
2002	10	5211 ± 291.2	920.8	3.78 ± 0.029	0.090
2003	4	5227 ± 259.2	518.4	3.79 ± 0.022	0.043
2004	26	5715 ± 176.7	900.7	3.86 ± 0.014	0.074
2005	10	4149 ± 242.2	766.0	3.74 ± 0.017	0.052
2006	23	4880 ± 212.4	1018.7	3.66 ± 0.015	0.072
2007	26	4450 ± 209.9	1070.4	3.81 ± 0.057	0.286
2008	118	4826 ± 73.9	802.5	3.77 ± 0.009	0.095
2009	85	5199 ± 121.3	1118.7	3.89 ± 0.120	0.267
2010	62	7009 ± 151.4	1192.6	3.96 ± 0.057	0.289
2011	61	5865 ± 154.1	1203.3	3.95 ± 0.060	0.403
2012	92	6552 ± 102.6	984.4	3.81 ± 0.019	0.128
2013	95	5938 ± 116.3	1133.2	4.02 ± 0.112	0.623
2014	98	5959 ± 102.1	1010.6	3.86 ± 0.061	0.563
2015	98	7106 ± 112.9	1117.7	3.79 ± 0.078	0.708
2016	90	6466 ± 108.7	1031.6	3.87 ± 0.055	0.502
At the average	911	5994 ± 44.4	1339.5	3.83 ± 0.017	0.435

The average milk yield for 305 days of lactation of the first-calf cow herds in the last 18 years has ranged from 2571 kg in 1999 calving to 7106 kg in 2015. The fat content of milk ranged from 3.34% (2000) to 4.02% (2013). In general, the curvilinear increase in milk yields of the first-calf cow in the analyzed years reaches more than 4500 kg or almost 2.8 times. In such circumstances, it is

considered methodically incorrect to determine the force of influence of factors and to compare group averages, given the likely different level of rearing and feeding of animals of different genetic groups in chronologically different years.

Due to the revealed chronological dynamics of the average productivity of first-calf cows in the formed database, a sufficiently homogeneous cluster of first-calf cows of 2010–2016 calves was isolated with a total livestock of 596 cows. During this period, the yield level for the years ranged from 5865–7106 kg with a limit of 1241 kg. The weighted arithmetic mean of the yield of first-calf cows in these years was 6412 kg. To determine the level of deviation of individual variants from the average level over this period, the normalized deviation was calculated. It ranged from 0.62 in animals in 2015 to -0.45 in 2011 in calving years. Comparisons of different breeding groups of animals on economically useful traits during the specified period were considered methodically correct.

The experimental animals that were calved during the control period are the daughters of 31 boogies, belonging mainly to 12 lines and related groups and related to two (Ukrainian Red-and-White dairy and Holstein) breeds.

The calculations were performed by the methods of mathematical statistics by means of the software package "STATISTICA-12.0" on the PC [1]. The degree of consolidation of different groups of animals by 305 days of first lactation was determined by our proposed coefficients [10] using the standard deviation (K1) and the coefficient of variability (K2). The influence of the studied genetic and paratypic factors was calculated by one-way ANOVA as a ratio of factorial and total variance [9].

Research results. An analysis of age-related dynamics of dairy productivity revealed the regular growth of milk yields in the herd from the first to the third lactation (table 2). The milk yield of full-grown cows has increased by almost 400 kg compared to first-calf cows. During the studied period, milk yield and fat content for the first lactation of a cow of the herd exceed the standards of the Ukrainian Red-and-White dairy breed established by the instruction for boning.

2. Productivity for 305 days of lactation of cows of different breeds and conditional blood

Index		A group of cows by breed and conditional blood						Total of the herd
		Ukrainian Red-and-White dairy					Holstein	
		together	including Holstein blood, %					
			to 75	75–87.5	87.5–93.7	93.8–96		
The first lactation								
Counted cows		519	10	325	50	117	77	596
Milk yield, kg		6360 ± 50.5	6305 ± 292.3	6257 ± 61.3	6498 ± 152.9	6632 ± 110.7	6764 ± 149.7	6412 ± 48.3
Content in milk, %	fat	3.87 ± 0.027	4.20 ± 0.246	3.86 ± 0.034	3.91 ± 0.071	3.81 ± 0.059	3.89 ± 0.078	3.87 ± 0.026
	protein	2.98 ± 0.021	3.16 ± 0.150	2.96 ± 0.026	2.97 ± 0.070	3.05 ± 0.042	3.04 ± 0.046	2.99 ± 0.019
The second lactation								
Counted cows		298	4	202	32	56	35	333
Milk yield, kg		6640 ± 69.1	7035 ± 353.2	6607 ± 84.2	6801 ± 180.4	6652 ± 179.1	6930 ± 246.4	6670 ± 67.1
Content in milk, %	fat	3.79 ± 0.033	3.96 ± 0.066	3.77 ± 0.042	3.83 ± 0.084	3.87 ± 0.069	3.81 ± 0.118	3.79 ± 0.032
	protein	2.96 ± 0.024	3.06 ± 0.058	2.97 ± 0.030	3.04 ± 0.100	2.90 ± 0.042	2.91 ± 0.068	2.95 ± 0.023
Third lactation								
Counted cows		176	3	112	24	37	15	191
Milk yield, kg		6824 ± 101.7	7167 ± 143.2	6851 ± 131.8	6582 ± 253.3	6872 ± 209.9	6644 ± 306.5	6810 ± 95.7
Content in milk, %	fat	3.73 ± 0.045	3.91 ± 0.149	3.67 ± 0.057	3.86 ± 0.131	3.80 ± 0.094	3.75 ± 0.288	3.73 ± 0.045
	protein	2.96 ± 0.029	3.00 ± 0.222	2.93 ± 0.038	2.97 ± 0.070	3.04 ± 0.067	2.92 ± 0.060	2.96 ± 0.028

In State enterprise experienced farm “Hristinovske” the individual attachment of the captives by the mother stock is carried out taking into account the share of heredity by the Holstein breed. For the first-calf cow, there was a tendency for a curvilinear increase in productivity with an increase in the conditional share of heredity in the Holstein breed (table 2). Between the high-blooded milk yields (93.8–96%, approaching relatively purebreds in the breed of improvement) and cows with a relative hardness of 75–87.5%, the advantage of the former reaches 375 ± 126.5 kg ($t_d = 2.96$, $P < 0.01$). For the second and third lactation, the intergroup difference in yield is almost offset.

In the cross-sectional comparison, a statistically significant excess of milk yield of Holstein first-calf cows over such cows of Ukrainian Red-and-White dairy breed was found (404 ± 158.0 kg, $t_d = 2.57$, $P < 0.02$). In the second lactation, this difference is reduced to an unreliable level, and in the third lactation Holstein cows are even slightly inferior to the peers of the Ukrainian Red-and-White dairy breed. The predominance of Holstein cows on milk yield during the first lactation may be due to higher growth rate and earlier sexual and economic maturation of heifers. First-timers demonstrate the realization of the genetic potential of the breed, however, with age, the influence of environmental factors leads to the elimination of intergenerational differences in productivity. In old-age cows, this advantage is offset. Concerning the qualitative indicators of milk, probable unidirectional patterns of intergroup differentiation of cows of different breeds and conditional blood were not revealed.

Other genetic factors have investigated the differentiation of cow groups of different linear lineages and parental origin (half-sisters). For the analysis of intergroup differentiation by the milking of first-calf cows, the cows of the eight most numerous herds in the herd and related groups with dated productivity of more than 10 animals were selected. It was found (table 3) that cows of the Astronaut 1458744 line had the highest milk yields (7% higher than the average of the herd) for the first lactation. The average expectation for the flock was 3–4% higher than the first-calf cows of the Cavalier 1620273 and Hanover 1629391 lines. Lower than average dairy productivity is characterized by the first-calf cow of the lineages and related groups of Enhancer 343514, Improver 333471 and Chief 1427381. In many cases, the intergroup difference reaches a statistically significant level (up to $P < 0.01$).

3. Average milk yield of the first-calf cows of different lines

Line, a related group	Considered animals	*x ± S.E., кg*	C.V., %
R. Citation 267150	119	6514.7 ± 112.47	18.83
Chief 1427381	123	6338.6 ± 100.14	17.52
Hanover 1629391	102	6611.0 ± 103.74	15.85
Improver 333471	79	6269.8 ± 141.12	20.00
Enhancer 343514	62	6225.5 ± 147.12	18.61
Cavalier 1620273	28	6708.2 ± 193.11	15.23
Starbuck 352790	28	6482.2 ± 225.89	18.44
Astronaut 1458744	11	6884.4 ± 471.44	15.86
At average over the accounting period	585	6408.2 ± 48.55	18.40

Even more significant was the differentiation on milk yield for the 305 days of the first lactation of groups of half-sisters by father (table 4). The predominance of the best in this indicator of the daughters of the sire Soloist 7959 of the Ukrainian Red-and-White dairy breed over the peers of the sire Inhibitor 402151 of the Holstein breed reaches 1050 ± 491.6 kg or 17.4% ($P < 0.05$). The performance of the daughters of the bulls Mitchell Red 402213 and Tumpi Et Red Tl 112367468 was also significantly higher than the mean. The deteriorating yields of the first-calf cows in the studied herd were Holstein bulls Inhibitor Et Red 402151, Jopi Red Tv Tl 114386090, and sire Ukrainian Red-and-White dairy breed May 5573.

4. Characteristic of the half-sisters groups of the father by milk yields of first-calf cows

Father	Considered animals	*x ± S.E., kg*	*S.D., kg*	*C.V., %*	K_1	K_2
Soloist 7959	10	7096 ± 465. 8	1472.9	20.8	-0.254	-0.133
Mitchell Red 402213	13	7033 ± 323.8	1167.6	16.6	0.006	0.094
Tumpi Et Red Tl 112367468	13	7006 ± 305.9	1103.0	15.7	0.061	0.141
Benaro Et Red Tl 359855968	94	6657 ±107.5	1042.5	15.7	0.112	0.146
Konbeo Red Tv Tl 579810507	26	6612 ± 195.1	995.0	15.1	0.153	0.179
Diplomat Et Red 401497	118	6528 ± 112.6	1222.9	18.7	-0.041	-0.022
Roman Red Tv Tl 660886883	19	6465 ± 317.5	1383.9	21.4	-0.178	-0.168
May 5573	76	6226 ± 140.6	1225.9	19.7	-0.044	-0.074
Jopi Red Tv Tl 114386090	91	6240 ± 112.7	1075.3	17.2	0.084	0.060
Inhibitor Et Red 402151	47	6046 ± 157.1	1077.2	17.8	0.083	0.028

Estimates of the degree of phenotypic consolidation by both methods impersonal were bulls Solist 7959, Roman Et Red TV TL 660886883, May 5573 and Diplomat Et Red 401497.

A noticeable narrowing of the phenotypic variability in daughters' daughters was found in the relatively pre-present congeners of Konbeo Red Tv Tl 579810507, Benaro Et Red Tv 359855968, Tumpi Et Red Tl 112367468, Jopi Red Tv Tl 11438602, Inhibitor Et Red 402151 and Mitchell Red 402213.

Therefore, in combination with estimates of enhancing effect and phenotypic consolidation, prepotent enhancers of Tumpi Et Red Tl 112367468 and Mitchell Red 402213, and the most undesirable ones are prepotent aggravating Inhibitor Et Red 402151 and Jopi Red Tv Tl 114386090.

An analysis of variance confirmed the presence of the influence of the genetic factors studied on the overall phenotypic variability of not only dairy productivity but also other economically beneficial traits of cows of the herd of the State Enterprise experienced farm "Hristinovske" (table 5).

5. The influence of genetic factors on the phenotypic variability of economically beneficial traits of cows

Sign				The influence of the organized factor:			
				line, a related group		father	
				$\eta^2_x \pm S.E., \%$	P	$\eta^2_x \pm S.E., \%$	P
Number of degrees of freedom:		factorial		13		31	
		general		571		553	
Live weight in age:	months:	6		9.5 ± 5.14	0.027	11.4 ± 8.15	0.080
		12		11.1 ± 5.03	0.007	11.7 ± 7.48	0.041
		18		10.7 ± 4.53	0.005	16.8 ± 6.84	< 0.001
	calving:	1		9.8 ± 3.24	< 0.001	21.6 ± 6.79	< 0.001
		2		14.4 ± 4.47	< 0.001	16.5 ± 7.31	< 0.001
		3		9.3 ± 8.02	0.245	17.8 ± 13.51	0.084
For 305 days lactation:	first	milk yield		4.0 ± 2.27	0.034	9.2 ± 5.56	0.005
		content in milk:	fat	3.1 ± 3.34	0.493	7.2 ± 7.73	0.466
			protein	7.6 ± 3.71	0.014	11.0 ± 7.65	0.048
	second:	milk yield		2.8 ± 3.78	0.696	7.3 ± 8.18	0.530
		content in milk:	fat	3.1 ± 4.42	0.707	8.7 ± 10.20	0.556
			protein	14.0 ± 4.65	< 0.001	17.0 ± 10.73	0.014
	third:	milk yield		8.1 ± 6.74	0.223	17.6 ± 12.76	0.046
		content in milk:	fat	7.5 ± 8.48	0.500	18.4 ± 16.10	0.162
			protein	7.8 ± 8.41	0.448	14.0 ± 16.20	0.484
Age of first calving				11.7 ± 1.86	< 0.001	17.2 ± 4.78	< 0.001
The length of time between the calving:		1 i 2		5.8 ± 2.68	0.008	12.5 ± 6.39	< 0.001
		2 i 3		7.1 ± 4.63	0.082	11.7 ± 10.06	0.163
		3 i 4		11.2 ± 8.17	0.128	15.6 ± 15.73	0.310

Belonging to a lineage or related group has a relatively low but significant effect on the phenotypic variability of milk yield and protein content of first-calf cow milk. By protein content, the influence of the specified genetic factor prolongs (even doubles) to the second lactation. The effect of linear affiliation on the live weight of heifers and cows after the first two calves, the age of the first calving and the length of time between the first two calves were statistically significant.

The influence of parental origin (inheritance) in most cases exceeds that of linear affiliation. From the signs of dairy productivity, the influence of the father on the variability of milk yield for the first and third milk and the protein content in milk for the first and second lactation was significant. At the third level of statistical significance, a significant effect of paternal origin was found on the phenotypic variability of age of first calving, duration of period between first and second calving, live weight of calves at one and a half years, and cows after the first two calves. There was no statistically significant influence of the father (as well as linear affiliation) on the fat content of cows' milk.

At average, the influence of parental origin on the traits studied is 13.1% versus 8.3% for lineage or related group affiliation. That is, the influence of the father in the studied herd is 1.58 times more significant than such linear affiliation. This corresponds to the regularities revealed in our previous studies in other herds and confirms the theoretical expectation of the highest influence at the

basic level of the intrabreed system hierarchical structure [3, 4, 11, 12]. Therefore, when selecting the fetuses, their linear identity should be taken into account with the unconditional priority of the breeding value of the bulls for posterity.

Conclusions. In the process of breeding work, there is a positive trend in the productivity growth of dairy cattle in the State Enterprise experienced farm "Hristinovske". The biological regularity of cows to increase dairy productivity with age is realized.

For the first-calf cows, there was a tendency for curvilinear productivity increase with an increase in the conditional share of heredity in the Holstein breed. In the interspecific comparison, a statistically significant excess of the Holstein milk yields over such cows of the Ukrainian Red-and-White dairy breed (404 ± 158.0 kg, $t_d = 2.57$, $P < 0.02$) was established, which is leveled by the third lactation.

A statistically significant influence of linear affiliation (on average 8.3%) and parental origin (13.1%) on the variability of individual signs of live weight, milk production and reproductive capacity of cows was established. The influence of the parent in the study herd is 1.58 times more significant than such linear membership.

A significant level of differentiation of groups of cows of different lines, related groups and half-sisters by father for milk yield for the first lactation was revealed. Combining estimates of the enhancing effect and phenotypic consolidation, the most desirable for further use in the herd are the prepotent enhancers Tumpi Et Red Tl 112367468 and Mitchell Red 402213, and the most undesirable are the pretentious aggravating Inhibitors ET Red 403860 and Jopi Red Tv Tl 114386090.

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