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MANIFESTATION OF THE HETEROSIS EFFECT IN SOWS UNDER THE DIFFERENT BREED COMBINATIONS

Abstract

The aim of the research was to assess the manifestation of the heterosis effect in sows under the different breed combinations. The research was conducted on the basis of the pig farm of the private enterprise "Skrypnyk V.O." in Lozova district of Kharkiv region. Two control groups (the Poltava Meat and Welsh sows) were formed for insemination with boars of the same breeds in purebred breeding (groups I and II, respectively). Two subsequent groups were formed for reciprocal crossing of Welsh and the Poltava Meat breeds (groups III and IV, respectively). Two experimental groups were also formed by direct combinations of Welsh and the Poltava Meat with boars of the Large White breed (groups V and VI, respectively). The main indexes of reproductive ability of sows were taken into account, on the basis of which the level of manifestation of the heterosis effect was calculated. The highest values of the manifestation of the heterosis effect (general type) in terms of the number of piglets at birth were observed for the combination of the Poltava Meat sows with boars of the Large White and Welsh breeds. In terms of the number of live piglets, the highest values of the manifestation of the general heterosis effect were obtained for the combinations of the Poltava Meat sows with boars of the Large White (11.04%) and the Poltava Meat sows with boars of the Welsh breed (9.82%). In terms of the specific and hypothetical types of manifestation of the heterosis effect, in all cases there was an advantage for the direct combination. Regarding the level of manifestation of the total manifestation of the heterosis effect according to different indexes of reproductive ability of sows for the combination of Welsh and the Poltava Meat breeds, higher values were obtained for the number of piglets at birth (both total and live) and the weight of the litter at weaning. When assessing the reciprocal effect, positive values were obtained for all evaluated indexes, which indicates the presence of a parental effect in reciprocal combinations of Welsh and the Poltava Meat pigs. The assessment of the degree of phenotypic dominance indicates the obtained different types of dominance for different indexes and combinations, which confirms the complex mechanisms of formation of the heterosis effect.

Key words: *pig breeding, reproductive ability, sows, heterosis effect, domestic selection, reciprocal crosses*

Introduction. Modern pig breeding is based on two interrelated components – pedigree and commercial. The pedigree pig breeding ensures further progress in improving the main pig breeds, while commercial production is aimed at revealing the genetic potential of animals and obtaining the maximum level of productivity. At the same time, by combining different breeds, types and lines of pigs, an additional effect is obtained. Today, various systems of industrial crossing and hybridization are used in domestic pig breeding to obtain the effect of heterosis [1-4]. The advantages of hybridization through the use of the heterosis effect are well proven both by scientific experiments and by effectiveness in practice [5-6].

Analysis of recent research and publications. The breeding work carried out with different breeds of pigs involves the targeted improvement of individual productive traits, which, accordingly, determines the place of a particular breed for further use in various systems of industrial crossing and breed-line hybridization. An important element in choosing the best variant of breed-line hybridization using specific breeds is the combinatory ability and the efficiency of individual combination variants [7]. It should be taken into account that the majority of commercial production is based on

the traditional scheme of combining breeds with obtaining three-breed final hybrids of the ultra-meat direction of productivity from the combination of two-breed sows (the Large White × Landrace) with boars of specialized meat breeds, types and lines - Duroc, Pietren, Maxter, etc. [8-10].

At the same time, there are still a number of breeds that are also characterized by a high level of genetic potential, but are almost not used in industrial pig breeding. These breeds include domestic ones – the Poltava Meat, the Red White-belted, etc. In addition, individual combinations were studied at one time, as is known in the scientific literature [11-14].

Therefore, the study of the manifestation of the heterosis effect in sows under the different breed combinations is relevant and timely.

Goal: to evaluate the manifestation of the heterosis effect in sows under the different breed combinations.

Materials and research methods. The research was conducted on the basis of the pig farm of the private enterprise "Skrypnyk V.O." in Lozova district of Kharkiv region according to the general principles of conducting research [13]. In order to assess the reproductive ability of sows of the Poltava Meat and Welsh breeds in different combinations, the obtained experimental data were analyzed according to the general research scheme (Table 1).

Two control groups (sows of the Poltava Meat and Welsh breeds) were formed for insemination with boars of the same breeds in purebred breeding (groups I and II, respectively). The next two groups (experimental) were formed for reciprocal crossing of Welsh and the Poltava Meat breeds (groups III and IV, respectively). Two experimental groups were also formed by direct combinations of Welsh and the Poltava Meat sows with boars of the Large White breed (groups V and VI, respectively).

Table 1

The scheme of researches

Group of animals	Group assignment	Breed combination			
		Sows		Boars	
		breed	n, heads	breed	n, heads
I	control	PM	15	PM	3
II	control	W	15	W	3
III	experiment	W	15	PM	3
IV	experiment	PM	15	W	3
V	experiment	W	15	LW	3
VI	experiment	PM	15	LW	3

Taking into account the percentage of fertile sows available on the farm, a larger number of sows were selected for research, with subsequent formation of groups from the first 15 heads with confirmed pregnancy on the 28th day after insemination using an ultrasonic device for diagnosing sow pregnancy. All sows were artificially inseminated in one period, had a standardized ration of appropriate feed according to

physiological periods. All feed was fed in dry form with free access to water. Sows were housed individually in different physiological periods with compliance with appropriate temperature regimes, etc. The main indexes of the reproductive ability of sows were taken into account - the total number of piglets at birth, including live ones, survival at weaning, litter weight at weaning and average weight of one piglet at weaning. The results of the studies were processed by the method of variational statistics [14], using computer technology and the application software packages MS Excel 2016 and Statistica 10 (10.0.1011) (StatSoft Inc., USA). Based on the absolute indexes, the level of manifestation of the heterosis effect was calculated according to Tsereniuk O.M., 2018 [15].

Presentation of the main research material. The following results were obtained when determining the manifestation of the heterosis effect on the reproductive ability of sows under the different combinations (Tables 2-3).

Table 2

The effect of heterosis on the number of piglets at birth from sows of different combinations

Combination	Index							
	EG by number of piglets at birth				EG by number of live piglets at birth			
	$\bar{x}$	max	min	Δ max - min	$\bar{x}$	max	min	Δ max - min
General								
WxPM	3.27	33.18	-22.90	56.07	7.89	34.21	-13.16	47.37
PMxW	12.14	38.73	-4.62	43.35	9.82	28.83	1.23	27.61
WxLW	4.67	54.21	-22.90	77.10	8.42	50.00	-13.16	63.16
PMxLW	12.72	47.40	-13.29	60.69	11.04	38.04	-7.98	46.01
Specific								
WxPM	27.75	64.74	-4.62	69.36	25.77	56.44	1.23	55.21
PMxW	-9.35	12.15	-22.90	35.05	-5.79	10.53	-13.16	23.68
Hypothetical								
WxPM	14.21	47.29	-14.73	62.02	16.15	44.48	-6.52	50.99
PMxW	0.26	2403	-14.73	38.76	1.42	18.98	-6.52	25.50

Table 3

The effect of heterosis on indexes at weaning of piglets from sows of different combinations

Combination	Index							
	EG by litter weight at weaning				EG by average weight of one piglet at weaning			
	$\bar{x}$	max	min	Δ max – min	$\bar{x}$	max	min	Δ max - min
General								
WxPM	8.95	19.76	-9.27	29.03	0.87	20.52	-12.35	32.87

PMxW	8.26	26.62	-2.60	29.22	0.17	9.49	-11.81	21.29
WxLW	13.23	31.85	1.61	30.24	1.14	13.30	-18.59	31.89
PMxLW	13.08	26.62	1.58	25.05	1.91	9.61	-2.99	12.60
Specific								
WxPM	25.32	37.76	4.36	33.40	2.08	21.96	-11.30	33.26
PMxW	-5.89	10.08	-15.32	25.40	-1.01	8.20	-12.85	21.04
Hypothetical								
WxPM	16.57	28.13	-2.93	31.06	1.47	21.24	-11.83	33.06
PMxW	0.69	17,77	-9.40	27.18	-0.42	8.84	-12.33	21.17

The highest values of the heterosis effect (general type) in terms of the number of piglets at birth were observed for the combination of the Poltava Meat sows with boars of the Large White and Welsh breeds. At the same time, the maximum values (EG max) for individual animals were obtained for the combination of Welsh sows with the Large White boars. At the same time, for this combination, minimum values (EG min) were also obtained for individual animals. If the total number of piglets at birth is more indicative of the potential productivity of sows with optimization of housing conditions, feeding, etc., then the index of the number of live piglets is closer to the practical realization of the productive potential of animals. According to this index, the highest values of the manifestation of the general heterosis effect were obtained in combinations of the Poltava Meat sows with the Large White boars (11.04%) and the Poltava Meat sows with Welsh boars (9.82%).

Regarding the maximum values (EG max) and minimum values (EG min) for individual animals in terms of the number of live piglets at birth, similar results were obtained for the combination of Welsh breed sows with the Large White boars as for the total number of piglets at birth.

According to the specific and hypothetical types of manifestation of the heterosis effect, in all cases there was an advantage for direct combination.

The manifestation of the heterosis effect in reciprocal combinations of the Welsh and the Poltava Meat breeds was also determined (Table 4).

Higher values of the heterosis effect manifestation for all evaluated indexes occurred in the combination of Welsh sows with the Poltava Meat boars. It was this combination of breeds that was characterized by a higher share of manifestation in the total heterosis effect. Regarding the level of manifestation of the total manifestation of the heterosis effect by different indexes of the reproductive ability of sows for the combination of Welsh and the Poltava meat breeds, higher values were obtained for the number of piglets at birth (both total and live) and the weight of the litter at weaning. The level of manifestation of the total heterosis effect by the average weight of one piglet at weaning was insignificant.

Table 4

The heterosis effect in reciprocal combinations of Welsh and the Poltava Meat breeds

Index	EG_{Σ}	EG direct (WxPM)	Share EG direct %	EG reverse (PMxW)	Share EG reverse, %
Number of piglets at birth	7.24	7.11	98.20	0.13	1.80
Number of live piglets at birth	8.78	8.07	91.91	0.71	8.09
Litter weight at weaning	8.63	8.28	95.94	0.35	4.06
Average weight of one piglet at weaning	0.53	0.74	-	-0.21	-

When assessing the reciprocal effect (Table 5), positive values were obtained for all evaluated indexes, which indicates the presence of a parental effect in reciprocal combinations of Welsh and the Poltava Meat pigs.

Table **5.**

The reciprocal effect and degree of phenotypic dominance under the combinations of Welsh and the Poltava Meat breeds

Index	Number of piglets at birth	Number of live piglets at birth	Litter weight at weaning	Average weight of one piglet at weaning
r	0.659	0.963	1.136	1.596
h_p (WxPM)	5.294	0.593	75.758	-161.352
h_p PMxW)	3.494	-1.141	63.491	-161.490

The assessment of the degree of phenotypic dominance indicates the different types of dominance obtained for different indexes and combinations. Thus, despite the fact that the total number of piglets at birth had a positive overdominance for both combinations, the number of live piglets at birth for the direct combination was positive dominance, and for the reverse combination - negative overdominance. There was a positive overdominance in the weight of the litter at weaning for both combinations, and a negative overdominance in the average weight of one piglet at weaning for both combinations.

Conclusions and prospects for further research. As a result of the evaluation of the manifestation of the heterosis effect, the highest values in terms of the number of piglets at birth were observed for the combination of the Poltava Meat sows with boars of the Large White and Welsh breeds. A higher level of manifestation of the heterosis effect was obtained when using the Large White breed of pigs as the parental form.

According to specific and hypothetical types of manifestation of the heterosis effect, in all cases there was an advantage for the direct combination of the Welsh and the Poltava Meat breeds of pigs. At the same time, the assessment of the reciprocal effect

indicates the presence of a parental effect. Analysis of the results of determining the degree of phenotypic dominance confirms the complex mechanisms of formation of the heterosis effect, since different types of dominance were obtained for different indexes and combinations.

References

1. Grishina, L., Onyshchenko, A., & Krasnoshchok, O. (2022). Proiav efektu heterozysu za produktyvnymy oznakamy svynei [Manifestation of the effect of heterosis on the productive characters of pigs]. *Scientific Progress & Innovations*, (4), P.78–85. https://doi.org/10.31210/visnyk2022.04.09 [in Ukrainian].
2. Tsereniuk, O. M., Akimov, O. V., Bobrytska, O. M., Khokhlov, A. M., Susol, R. L., Miroshnykova, O. S., Martyniuk, I. M., Palii, A. P., Palii, A. P., & Chalyi, O. I. (2020). Pidvyshchennia henetychnoho potentsialu produktyvnosti v svynarstvi Ukrainy [Increasing the genetic potential of productivity in the Ukrainian pig industry]. Kharkiv: FOP Brovin O. V. [in Ukrainian].
3. Tsereniuk, O. M., Hryshyna, L. P., & Peretiatko, L. H. (2022). Analiz pleminnoi bazy svynarstva Ukrainy [Analysis of the breeding base of the Ukrainian pig industry*]. Svynarstvo* [Pig Breeding]. Poltava, 77–78, 72–82 [in Ukrainian].
4. Kremez, M. I., Povod, M. H., Zhelizniak, I. M., Shostia, H. M., Shpyrna, I. H., & Karunna, T. I. (2024). Produktyvni yakosti svynomatok velykoi biloi ta landras porid anhliiskoho pokhodzhennia za chystoporodnoho rozvedennia ta skhreshchuvannia i poiav riznykh form heterozysu pry poiednanni tsykh porid [Productive qualities of sows of the great white and landrace breeds of english origin during purebred breeding and crossing and the appearance of various forms of heterosis when combining these breeds]. *Visnyk Sumskoho natsionalnoho ahrarnoho universytetu. Seriia: Tvarynnytstvo* [Bulletin of Sumy National Agrarian University. The Series: Livestock*]*. Sumy, 3, 39–50 [in Ukrainian] https://doi.org/10.32782/bsnau.lvst.2024.3
5. Povod, M. H., Mykhalko, O. H., & Kremez M. I. (2022). Vidtvoriuvalni yakosti svynomatok materynskykh ta batkivskoi linii [Reproductive qualities of sows of maternal and paternal lines in the conditions of a breeding breeder]. *Visnyk Sumskoho natsionalnoho ahrarnoho universytetu. Seriia: Tvarynnytstvo* [Bulletin of Sumy National Agrarian University. The Series: Livestock]. Sumy, 4(47), 133–137 [in Ukrainian]. https://doi.org/10.32845/bsnau.lvst.2021.4.22
6. Liu, Z., Deng, Y., Li, Q., Liu, B., Xia, Y., Du, Y. & He, N., 2012. Research of the incubation and hybridization instrument with vibration for nanoparticles. *J Nanosci Nanotechnol*., 12(11), 48–52. https://doi.org/10.1166/jnn.2012.6623. PMID: 23421229.
7. Pelykh, N. L., & Kolesnikova, K. Yu. (2021). Hibrydyzatsiia u promyslovomu svynarstvi [Hybridization in industrial pig farming]. *Tavriiskyi naukovyi visnyk. Seriia: S.-h. nauky* [Taurida Scientific Herald. Series: Rural Sciences]. Kherson, 122, 269–275 [in Ukrainian]. https://doi.org/10.32851/2226-0099.2021.122.40
8. Vashchenko, O. V. (2017). Ekonomichna efektyvnist vykorystannia heterozysu za promyslovoho skhreshchuvanni svynei [Economic efficiency of heterosis use in

industrial crossbreeding of pigs]. *Tekhnolohiia vyrobnytstva ta pererobky produktsii tvarynnytstva* [Technology of production and processing of livestock products]. Bila Tserkva, 1(134), 32–37 [in Ukrainian].
9. Susol, R. L., Harmatiuk, K. V., & Khalak, V. I. (2018). Optymizatsiia systemy rozvedennia i hodivli svynei miasnoho napriamku produktyvnosti v umovakh pivdnia Ukrainy [Optimisation of the system of breeding and feeding of meat pigs in the south of Ukraine]. *Zernovi kultury* [Cereal crops]. Dnipro, 2(12), 353–359 [in Ukrainian].
10. Koroban, M. P., & Lykhach, V. Ya. (2023). Vidhodivelni yakosti molodniaku svynei suchasnykh henotypiv za riznykh vahovykh kondytsii v umovakh promyslovoi tekhnolohii [Fattening qualities of young pigs of modern genotypes at different weight conditions under industrial technology]. *Podilian Bulletin: agriculture, engineering, economics, agricultural sciences*, 41, 26–32 [in Ukrainian]. https://doi.org/10.37406/2706-9052-2023-4.4
11. Povod, M. H., & Khramkova, O. M. (2017). Vidhodivelna produktyvnist hibrydnohomolodniaku svynei vitchyznianoho ta zarubizhnoho pokhodzhennia [Fattening performance of hybrid young pigs of domestic and foreign origin]. *Bulletin of Sumy National Agrarian University. The series: Livestok,* 7(33), 226–232 [in Ukrainian].
12. Pundyk, V. P. & Tesak, H. V. (2022). Monitorynh naiavnoho poholivia svynei u lisostepovii zoni zakhidnoho rehionu ta rozroblennia systemy mizhporodnoho skhreshchuvannia [Monitoring of the existing pig population in the Forest-Steppe zone of the Western region and development of an interbreeding system]. *Peredhirne ta hirske zemlerobstvo i tvarynnytstvo* [Foothill and mountain agriculture and stockbreeding], 72(1), 145–160 [in Ukrainian]. https://doi.org/10.32636/01308521.2022-(72)-1-10
13. Pundyk, V. P., Vovk, S. O., Ferents, L. V., & Dmytrotsa, A. I. (2024). Produktyvnist chystoporodnykh i pomisnykh svynomatok pry poiednanni z knuramy riznoho pokhodzhennia [Productivity of purebreed and crossbreed sows when mating with boars of different origin]. *Peredhirne ta hirske zemlerobstvo i tvarynnytstvo* [Foothill and mountain agriculture and stockbreeding], 76(2), 144–151 [in Ukrainian]. https://doi.org/10.32636/01308521.2024-(76)-2-14
14. Birta, H. O., Burhu, Yu. H., Floka, L. V., Horiachova, O. O., Rachynska, Z. P., & Hnitii, N. V. (2021). *Svynarstvo* [Pig Breeding]. Poltava [in Ukrainian].
15. Ibatullin, I. I., Zhukorskyi, O. M., & Bashchenko, M. I. (2017). Methodology and organisation of scientific research in animal husbandry [Metodolohiia ta orhanizatsiia naukovykh doslidzhen u tvarynnytstvi]. Kyiv: Ahrarna nauka [in Ukrainian].
16. Baranovskyi, D. Y., Khokhlov, A. M., & Hetmanets, O. M. (2017). Biometrics in MS Excel [Byometryia v MS Excel]. Kharkov: FLP Brovyn A. V. [in Ukrainian].
17. Tsereniuk, O. M. (2018). Metodolohiia vyznachennia efektu heterozysu v svynarstvi [Methodology for determining the effect of heterosis in pig production]. *Naukovo-tekhnichnyi biuleten Instytutu tvarynnytstva NAAN* [Scientific and technical

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ПРОЯВ ЕФЕКТУ ГЕТЕРОЗИСУ У СВИНОМАТОК ЗА РІЗНИХ ПОРІДНИХ ПОЄДНАНЬ MANIFESTATION OF THE HETEROSIS EFFECT IN SOWS UNDER THE DIFFERENT BREED COMBINATIONS

Анотація

Метою проведених досліджень була оцінка прояву ефекту гетерозису у свиноматок за різних порідних поєднань. Дослідження були проведені на базі свинарської товарної ферми ФОП «Скрипник В.О.» Лозівського району Харківської обл. Було сформовано дві контрольних групи (свиноматки полтавської м'ясної та уельської порід) для осіменіння кнурами тих же порід за чистопорідного розведення (група I та II відповідно). Дві наступні групи були сформовані для проведення реципрокного схрещування уельської та полтавської м'ясної порід (група III та IV відповідно). Також були сформовані дві дослідні групи за прямих поєднань уельської та полтавської м'ясної з кнурами великої білої породи (група V та VI відповідно). Враховувались основні показники відтворної здатності свиноматок, На основі яких розраховувався рівень прояву ефекту гетерозису.

Найбільші значення прояву ефекту гетерозису (загальний тип) за показником числа поросят при народженні відмічені за поєднання маток полтавської м'ясної з кнурами великої білої та уельської порід. За показником числа живих поросят більші значення прояву загального ефекту гетерозису було отримано за поєднань маток полтавської м'ясної з кнурами великої білої (11,04 %) та маток полтавської м'ясної з кнурами породи уельс (9,82%). За специфічним та гіпотетичним типами прояву ефекту гетерозису у всіх випадках була наявна перевага за прямого поєднання.Стосовно рівня прояву сумарного прояву ефекту гетерозису за різними показниками відтворної здатності свиноматок за поєднання уельської та полтавської м'ясної порід більші значення були отримані за числом поросят при народженні (як всього так і живих) та масі гнізда при відлученні.

За оцінки реципрокного ефекту, по всіх оцінених показниках були отримані позитивні значення що вказує на наявність батьківського ефекту за реципрокних поєднань свиней порід уельс та полтавська м'ясна. Оцінка ступеня фенотипового домінування вказує на отримані різні типи домінування за різних показників та поєднань, що підтверджує складні механізми формування ефекту гетерозису.

Ключові слова: *свинарство, відтворювальна здатність, свиноматки, ефект гетерозису, вітчизняна селекція, реципрокні схрещування.*

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