DOI: 10.12731/2658-6649-2025-17-6-2-1541 EDN: RDIXOH
UDC 636.08

Original article

REPRODUCTIVE QUALITIES OF BOARS IN THE ASSESSMENT OF ADAPTIVE CAPABILITIES WHEN USING INTRODUCTORY CROSSBREEDING OF DIFFERENT VARIANTS

N.A. Garskaya, S.N. Tresnitsky, A.A. Rudenko, G.A. Zelenkova, A.Yu. Kochetkova

Abstract

Background. The article deals with the study of the reproductive performance of breeding boars of Poltava meat breed when using different variants of introductory crossbreeding. At the same time, the objectives of using introductory crossbreeding determine the dynamics of changes.

By introductory crossing in the breed new genotypes were created with Finnish Landrace pigs (in order to improve productive qualities) and fast-ripening meat pigs (in order to increase the adaptive capacity of animals to natural and climatic conditions of the farm). To conduct research we formed four groups according to the principle of pair-analogs: Group I – boars descendants of introductory crossbreeding, with a share of blood of the fast-ripening meat breed 25%, Group II – boars descendants of introductory crossbreeding, with a share of blood of the Finnish Landrace breed 25%, Group III – boars descendants of introductory crossbreeding, with a share of blood of the fast-ripening meat breed 50%, Group IV – boars descendants of introductory crossbreeding, with a share of blood of the Finnish Landrace breed 50%. We evaluated boar development indicators (live weight, body length, age at 100 kg live weight, thickness of the bailiffs follower) and indicators characterizing reproductive capacity (number of inseminated and farrowed breeding sows, fertilizing capacity of the boar, multiple fertility of farrowed breeding sows, weight of one piglet at weaning at 45 days).

Infusion of Finnish Landrace blood in order to improve meat qualities leads in boars of Poltava meat breed to a violation of adaptive capabilities, manifested in an increase in the age of achieving a live weight of 100 kg and a decrease in reproductive performance, not actively involved in the selection process. Increasing the level of bloodlines of breeding boars up to 50% for Finnish Landrace breed is not reasonable in these natural and climatic conditions and will require additional costs to improve efficiency.

The infusion of blood of the soon-to-be ripe meat breed to boars of Poltava meat breed with the purpose of improvement of adaptive qualities leads to strengthening of adaptive properties of the organism, by means of increase of protective capabilities and increase of reproductive indicators.

Purpose. The aim of the study is to investigate reproductive qualities of boars in the evaluation of adaptive capabilities when using introductory crossbreeding of different variants

Materials and methods. The data of 40 breeding boars-producers of Poltava meat breed, belonging to genetic groups with the infusion of blood of Finnish Landrace and soon-breeding meat breed, were used in the work. All animals belonged to the elite and first classes. The age of the animals was 24 months.

We evaluated boar development indicators (live weight, body length, age at 100 kg live weight, thickness of the rump) and indicators characterizing reproductive capacity (number of inseminated and farrowed sows, fertilizing capacity of the boar, multiple fertility of farrowed sows, weight of one piglet at weaning at 45 days, weight of one piglet at weaning at 45 days).

Results. As a result of the study it was found that in boars of Poltava meat breed of all examined groups the obtained average values of live weight and body length did not differ significantly from each other.

The study revealed that the use of introductory crossbreeding using 25% bloodlines for the two improving breeds did not cause significant changes in the average number of sows inseminated and interviewed. Increasing the proportion of bloodlines up to 50% resulted in multidirectional significant differences depending on the breeds used. Thus, the use of Finnish Landrace breed decreased the value of both studied indicators by 20.96 head (64.6%) ($p \leq 0.05$) and 15.77 head (66.4%) ($p \leq 0.05$), respectively.

When the proportion of bloodlines of the fast-ripening meat breed increased from 25% to 50%, boars showed a significant increase in the number of farrowing sows by 9.85 head or 41.5% ($p \leq 0.05$). This group also showed the highest value of fertilizing ability of boars. The difference amounted to 13.49% ($p \leq 0.05$) compared to the group with lower bloodlines. No significant differences were found in groups with Finnish Landrace blood for this indicator.

Conclusion. The infusion of the blood of the fast-ripening meat breed in order to increase the adaptive qualities of the Poltava meat breed and increasing the share of its bloodline up to 50% led to a reliable increase in reproductive indicators (the number of inseminated sows, the number of farrowing sows, the fertilizing ability of the boar), not related to the primary in the breeding process, but determining, among other things, the efficiency of the pig breeding industry.

In the indicators of development, the use of blood of the early maturing meat breed was reflected in the indicator of the thickness of the speck. We found a significant increase in fat thickness with increasing bloodlines of the fast-ripening beef breed. Earlier studies have clearly shown that increased fat thickness can have a favorable effect on reproductive performance. Our study also demonstrated a significant effect of rump thickness on the fertilizing ability of boars. Taking into account that an increase in the thickness of the rump can be considered as an increase in the protective properties of the skin, it gives us the opportunity to talk about the increase in the protective and adaptive (adaptive) capabilities of the organism in this case.

Keywords: genotype; breeding boars; reproductive performance; Poltava meat breed

For citation. Garskaya, N. A., Tresnitsky, S. N., Rudenko, A. A., Zelenkova, G. A., & Kochetkova, A. Yu. (2025). Reproductive qualities of boars in the assessment of adaptive capabilities when using introductory crossbreeding of different variants. *Siberian Journal of Life Sciences and Agriculture*, *17*(6-2), 165-182. https://doi.org/10.12731/2658-6649-2025-17-6-2-1541

Научная статья

РЕПРОДУКТИВНЫЕ КАЧЕСТВА ХРЯКОВ В ОЦЕНКЕ АДАПТАЦИОННЫХ ВОЗМОЖНОСТЕЙ ПРИ ИСПОЛЬЗОВАНИИ ВВОДНОГО СКРЕЩИВАНИЯ РАЗЛИЧНЫХ ВАРИАНТОВ

Н.А. Гарская, С.Н. Тресницкий, А.А. Руденко, Г.А. Зеленкова, А.Ю. Кочеткова

Аннотация

Обоснование. В статье рассмотрены вопросы изучения репродуктивных показателей у племенных хряков полтавской мясной породы при использовании различных вариантов вводного скрещивания. При этом, цели использования вводного скрещивания, определяют динамику изменений.

Путём вводного скрещивания в породе были созданы новые генотипы со свиньями породы финский ландрас (с целью улучшения продуктивных ка-

честв) и скороспелая мясная (с целью повышения адаптационных возможностей животных к природно-климатическим условиям хозяйства). Для проведения исследований нами по принципу пар-аналогов были сформированы четыре группы: I группа – хряки-потомки вводного скрещивания, с долей крови скороспелой мясной породы 25%, II группа – хряки-потомки вводного скрещивания, с долей крови породы финский ландрас 25%, III группа – хряки-потомки вводного скрещивания, с долей крови скороспелой мясной породы 50%, IV группа – хряки-потомки вводного скрещивания, с долей крови породы финский ландрас 50%. Мы оценивали показатели развития хряков (живая масса, длина туловища, возраст достижения живой массы 100 кг, толщина шпика) и показатели, характеризующие репродуктивные возможности (количество осеменённых и опоросившихся свиноматок, оплодотворяющую возможность хряка, многоплодие опоросившихся свиноматок, масса одного поросёнка при отъёме в 45 дней, масса одного поросёнка при отъёме в 45 дней).

Прилитие крови финского ландраса с целью улучшения мясных качеств приводит у хряков полтавской мясной породы к нарушению адаптивных возможностей, проявляющихся в увеличении возраста достижения живой массы 100 кг и снижению репродуктивных показателей, активно не вовлечённых в селекционный процесс. Увеличение уровня кровности племенных хряков до 50% по породе финский ландрас не целесообразно в данных природно-климатических условиях и будет требовать дополнительных затрат для повышения эффективности.

Прилитие крови скороспелой мясной породы хрякам полтавской мясной породы с целью улучшения адаптивных качеств приводит к усилению адаптационных свойств организма, путём повышения защитных возможностей и повышению репродуктивных показателей.

Цель. Цель исследования – изучить репродуктивные качества хряков в оценке адаптационных возможностей при использовании вводного скрещивания различных вариантов

Материалы и методы. В работе использованы данные 40 племенных хряков-производителей полтавской мясной породы, принадлежащих к генетическим группам с прилитием крови финского ландраса и скороспелой мясной породы. Все животные относились к классам элита и первый. Возраст животных составил 24 месяца.

Мы оценивали показатели развития хряков (живая масса, длина туловища, возраст достижения живой массы 100 кг, толщина шпика) и показатели, характеризующие репродуктивные возможности (количество осеменённых и опоросившихся свиноматок, оплодотворяющую возможность хряка, многоплодие опоросившихся свиноматок, масса одного поросёнка при отъёме в 45 дней, масса одного поросёнка при отъёме в 45 дней).

Результаты. В результате проведённого исследования было установлено, что у хряков полтавской мясной породы всех обследованных групп полученные средние значения показателей живой массы и длины туловища достоверно друг от друга не отличались.

Исследование выявило, что применение вводного скрещивания при использовании 25% кровности по двум улучшающим породам не вызывало достоверных изменений по среднему установленному количеству осеменённых и опросившихся свиноматок. Увеличение доли кровности до 50% приводило к разнонаправленным достоверным отличиям в зависимости от использованных пород. Так, использование породы финский ландрас снижало значение обоих изученных показателей на 20,96 голов (64,6%) ($p \leq 0,05$) и 15,77 голов (66,4%) ($p \leq 0,05$) соответственно.

При увеличении доли кровности по скороспелой мясной породе с 25% до 50% у хряков наблюдался достоверный рост количества опоросившихся свиноматок на 9,85 голов или 41,5% ($p \leq 0,05$). В этой группе также было отмечено наивысшее значение оплодотворяющей способности хряков. Разница составила 13,49% ($p \leq 0,05$) в сравнении с группой с меньшей долей кровности. Достоверных отличий в группах с кровью финского ландраса по данному показателю выявлено не было.

Заключение. Прилитие крови скороспелой мясной породы с целью повышения адаптивных качеств полтавской мясной породы и увеличение доли её кровности до 50% привело к достоверному увеличению репродуктивных показателей (количество осеменённых свиноматок, количество опоросившихся свиноматок, оплодотворяющая способность хряка), не относящихся к первичным в селекционном процессе, но определяющих в том числе эффективность отрасли свиноводства.

В показателях развития использование крови скороспелой мясной породы нашло отражение в показателе толщины шпика. Нами было установлено достоверное повышение толщины шпика при увеличении кровности по скороспелой мясной породе. Более ранние исследования ясно показали, что увеличение толщины шпика может благоприятно отразиться на репродуктивных качествах. Наше исследование также продемонстрировало достоверное влияние толщины шпика оплодотворяющую способность хряка. Учитывая, что увеличение толщины шпика можно рассматривать как повышение защитных свойств кожи, это даёт нам возможность говорить о повышении в данном случае защитных и приспособительных (адаптивных) возможностей организма.

Ключевые слова: генотип; племенные хряки; репродуктивные показатели; полтавская мясная порода

Для цитирования. Гарская, Н. А., Тресницкий, С. Н., Руденко, А. А., Зеленкова, Г. А., & Кочеткова, А. Ю. (2025). Репродуктивные качества хряков в оценке адаптационных возможностей при использовании вводного скрещивания различных вариантов. *Siberian Journal of Life Sciences and Agriculture*, *17*(6-2), 165-182. https://doi.org/10.12731/2658-6649-2025-17-6-2-1541

Introduction

In pig breeding, industry viability and profit depend on the flow of animals in the production chain, which starts with the reproductive efficiency of the breeding herd [1]. Paternal factors are known to be able to modulate many critical characteristics of the reproductive process [2]. Boars, as well as their semen, are an important component of the pig herd, strongly influencing production efficiency and profitability [3; 4]. Boars make an integral contribution to the genetic potential of pig farms and pig production, and their role in this is undoubtedly key. Therefore, understanding and improving the reproductive performance of boars is essential to maintain high quality pork production and to adapt to ever-changing market demands [5].

A number of researchers have emphasized the importance of the environmental conditions encountered by the father during spermatogenesis as critical determinants of offspring outcome [6; 7]. In the literature, this phenomenon is known as paternal programming, a phenomenon in which the father's environment during spermatogenesis can have effects that not only affect sperm but also influence offspring outcome [8].

Although the genetic selection currently used in pig production is aimed at making pigs as homogeneous as possible, each living organism reacts differently to different environmental conditions and changes [9]. This implies the development of an appropriate strategy to manage the genotype x environment interaction [10].

Genotype-environment interactions imply that different genotypes may respond differently to environmental changes, affecting performance in different environments. Consequently, the breeding value of an animal depending on environmental conditions reflects the heterogeneous effects of genetic background in different environments [11]. In pigs, genotype x environment interaction exists [12; 13]. It has also been found that some animal traits, such as reproductive traits, may be more sensitive to various environmental factors than other traits [14].

At present, due to the distribution in different regions of the world with diverse ecological and climatic conditions of a limited number of highly productive breeds created in Europe and North America, considerable attention is paid to the study of mechanisms of adaptation of farm animals to unfavorable environmental conditions [15].

According to Abdu Niyas et al. (2015) [16], the term "adaptation" refers to morphological, anatomical, physiological and biochemical characteristics of an animal that combine to promote the animal's well-being and facilitate its survival in a particular environment.

Based on the opinion of F. Phocas et al. (2016) [17], crossbreeding can provide some immediate benefits in terms of improving certain traits that allow animals to adapt well to local environmental conditions. Crossbreeding, as a method of animal breeding, is fundamental to modern pig production [18].

Thus, given the importance of using different crossbreeding variants in pig production and the role of boar producers in this process, it is probably necessary to determine the reproductive potential of individual breeds and breed groups of pigs in specific natural and technological breeding conditions to assess the potential for the realization of reproductive success or loss mechanisms.

The *aim* of this work is to study the effect of different variants of introductory crossbreeding of breeding boars of Poltava meat breed on reproductive performance.

Materials and methods

The data of 40 breeding boars-producers of Poltava meat breed, belonging to genetic groups with the infusion of blood of Finnish Landrace and soon-breeding meat breed, were used in the work. All animals belonged to the elite and first classes. The age of the animals was 24 months.

The Poltava meat breed of pigs belongs to the group of breeds of meat direction of productivity. By introductory crossing in the breed were created new genotypes with pigs of Finnish Landrace breed (in order to improve productive qualities) and fast-ripening meat breed (in order to increase the adaptive capacity of animals to natural and climatic conditions of the farm). To conduct research we formed four groups according to the principle of pair-analogs: Group I – boars descendants of introductory crossbreeding, with a share of blood of the fast-ripening meat breed 25%, Group II – boars descendants of introductory crossbreeding, with a share of blood of the Finnish Landrace breed 25%, Group III – boars descendants of introductory crossbreeding, with a share of blood of the fast-ripening meat breed 50%, Group IV – boars descendants of introductory crossbreeding, with a share of blood of the Finnish Landrace breed 50%. Data on genotype were taken from breeding and zootechnical records. All animals were bred under traditional conditions and kept on the same farm with the same staff.

Boars of all genetic groups received the same diet composition under the same conditions. The rations of animals used in the experiment were formulated in such a way as to meet the required norms taking into account age and live weight. Feeding type was concentrate with the use of self-produced fodder. The animals were kept free-range.

We evaluated boar development indicators (live weight, body length, age at 100 kg live weight, thickness of the rump) and indicators characterizing reproductive capacity (number of inseminated and farrowed sows, fertilizing capacity of the boar, multiple fertility of farrowed sows, weight of one piglet at weaning at 45 days, weight of one piglet at weaning at 45 days).

The obtained results of the study were processed biometrically using the package of applied computer programs "Statistika-10".

Results

In order to determine the possibility of predicting the indicators that determine the reproductive traits of breeding boars, we initially studied the effect of different variants of introductory crossbreeding on animal development indicators in this study. The obtained results of boars of Poltava meat breed of different genotypes are shown in Table 1.

As a result of the study it was found that in boars of Poltava meat breed of all examined groups the obtained average values of live weight and body length did not differ significantly from each other.

The infusion of Finnish Landrace blood in breeding boars caused an increase in the age of reaching a live weight of 100 kg. Thus, the increase in the animals' blood share from 25% to 50% led to a reliable increase in the index by 3.55 days or 1.8% ($p \leq 0.05$). In comparison with the group-analog of 50% blood on the breed, the meat index of boars with Finnish Ladras blood was also significantly higher by 6.67 days or 3.3% ($p \leq 0.05$).

With the increase in the proportion of blood from 25% to 50%, the thickness of the rump increased significantly by 0.45 mm or 1.9% ($p \leq 0.05$). No significant change in this indicator was observed in boars with Finnish Landrace blood. At the same time, groups with different breed variants, but the same proportion of blood, also did not differ significantly from each other in terms of the thickness of the rump.

Table 1.

Development indicators of boars of Poltava meat breed of different genotypes, (M±m)

Indicator	Boars with the blood of the early maturing meat breed of 25% bloodlines (I group) (n=12)	Boars with Finnish Landrace blood of 25% bloodlines (II group) (n=10)	Boars with 50% blood of fast-growing beef breed (III group) (n=13)	Boars with Finnish Landrace blood of 50% bloodlines (IV group) (n=5)
Live mass, kg	297.5±0.7	296.1±1.44	290.89±3.33	296.5±2.22
Lim (R)	294-300 (6)	293-306 (13)	291-325 (34)	293-303 (10)
Cv,%	0.98	1.54	4.03	1.49
Body length, sm	183.75±0,46	183.1±0,41	183.84±0.71	183.25±0.95
Lim (R)	182-186 (4)	182-186 (4)	181-189 (8)	182-186 (4)
Cv,%	0.88	0.7	1.4	1.03
Age when reaching 100 kg of live mass, days	199.75±0,77	202.2±0.99	199.08±1.32	205.75±0.25•*
Lim (R)	194-204 (10)	199-206 (7)	189-205 (16)	205-206 (1)
Cv,%	1.49	1.54	2.4	0.2
Speck thickness, mm	23,17±0,11	23.4±0.16	23.62±0.14 *	23.75±0.25
Lim (R)	23-24 (1)	23-24 (1)	23-24 (1)	23-24 (1)
Cv,%	1.68	2.21	2.14	2.1

Here and further: * – probability of difference between groups with bloodlines of 25% and 50 % $p \leq 0.05$;

• – probability of difference between groups with the same bloodlines $p \leq 0.05$.

Very low values characterizing the variability of developmental indices are noteworthy. Low variability values may indicate a strong selection pressure when breeding for these traits. Within the groups, the variability of traits was the highest in boars with blood of the fast-ripening meat breed with a blood share of 50%, as evidenced by the established range of variability of traits and the coefficient of variation.

The data obtained when analyzing reproductive performance of breeding boars of Poltava meat breed of different variants of introductory crossbreeding are shown in Table 2.

Table 2.

Indicators of reproductive qualities of boars of Poltava meat breed of different genotypes, (M±m)

Indicator	Boars with the blood of the early maturing meat breed of 25% blood-lines (I group) (n=12)	Boars with Finnish Landrace blood of 25% bloodlines (II group) (n=10)	Boars with 50% blood of fast-growing beef breed (III group) (n=13)	Boars with Finnish Landrace blood of 50% bloodlines (IV group) (n=5)
Inseminated sows, animals	22.75±2.65	22.3±3.61	32.46±4.45	11.5±3.88•
Lim (R)	3-36 (33)	6-38 (32)	11-60 (49)	6-23 (17)
Cv,%	40.43	51.17	49.41	67.57
Sows farrowed, animals	13.92±1.69	14.3±2.28	23.77±3.05*	8.0±2.97•
Lim (R)	5-23 (18)	3-24 (21)	10-42 (32)	3-16 (13)
Cv,%	42.17	50.42	46.23	74.25
Fertility of the boar, %	62.78±4.66	65.07±5.05	76.27±2.69*	68.44±12.77
Lim (R)	34.48-90.9 (56.42)	37.5-100 (62.5)	64.29-90.9 (26.61)	37.5-100 (62.5)
Cv,%	25.72	24.56	12.7	37.34
Multiple fertility of farrowing sows, animals	11.14±0.12	11.09±0.13	10.91±0.01	11.08±0.23
Lim (R)	10.4-11.7 (1.3)	10.7-11.9 (1.2)	10.3-11.4 (1.1)	10.7-11.7 (1,0)
Cv,%	3.83	3.69	3.14	4.06
Nest weight at weaning at 45 days of age, kg	119.83±1.37	125.2±3.9	120.46±2.7	130.85±8.5
Lim (R)	112-126 (14)	105-142 (37)	105-133 (28)	105-142 (37)
Cv,%	3.96	9.84	8.09	13.07
Weight of one piglet at weaning at 45 days of age, kg	12.03±0.09	12.66±0.54	12.14±0.32	13.68±1.15
Lim (R)	11.6-12.6 (1)	10.3-15.5 (2.2)	10.5-14.1 (36)	10.3-15.5 (5.2)
Cv,%	2.66	13.59	9.55	16.89

The study revealed that the use of introductory crossbreeding using 25% bloodlines for the two improving breeds did not cause significant changes in the average number of sows inseminated and interviewed. Increasing the proportion of bloodlines up to 50% resulted in multidirectional significant differences depending on the breeds used. Thus, the use of Finnish Landrace breed decreased the value of both studied indicators by 20.96 head (64.6%) ($p \le 0.05$) and 15.77 head (66.4%) ($p \le 0.05$), respectively.

When the proportion of bloodlines of the fast-ripening meat breed increased from 25% to 50%, boars showed a significant increase in the number of farrowing sows by 9.85 head or 41.5% ($p \le 0.05$). This group also showed the highest value of fertilizing ability of boars. The difference amounted to 13.49% ($p \le 0.05$) compared to the group with lower bloodlines. No significant differences were found in groups with Finnish Landrace blood for this indicator.

We did not observe a significant effect of boar genotype on the mean values of multiple births of farrowing sows, nest weight at weaning at 45 days of age, and weight of one piglet at weaning at 45 days of age, as no significant difference was observed in these values among groups with different variants of introductory crossbreeding.

It was found that the average number of sows inseminated and polled was not homogeneous and showed the highest genetic diversity (based on Cv and Lim values) among all reproductive parameters considered. The multiple fertility of farrowing sows was characterized by the lowest level of variation.

It should also be noted that boars with Finnish Landrace blood have the highest values of trait variability in reproductive parameters.

During the correlation analysis we noted reliable interrelations between the development and reproduction indicators in boars of Poltava meat breed of different variants of introductory crossbreeding. Thus, the thickness of the boars' fat had a significant effect on their fertilizing ability ($r=0.37$ at $p \le 0.05$), the age of reaching a live weight of 100 kg was significantly correlated with the number of inseminated sows ($r=-0.62$ at $p \le 0.001$) and the number of farrowed sows ($r=-0.59$ at $p \le 0.001$).

Discussion

Boars have a critical influence on the progress of adoption in pig genetics and reproduction. Numerous studies indicate that both boar-dependent and boar-independent factors influence performance. However, the reproductive traits of the animals depend strictly on the effects of their interactions. [19]. At the same time, there is no doubt that the genotype of breeding boars is a factor determining their reproductive performance and longevity [20].

The presented results indicate that different variants of introductory crossbreeding used in the farm have an impact on reproductive performance, which in turn is interrelated with developmental performance. We have previously obtained similar results in a study of sows [21].

Conducting studies of the influence of the used breed in variants of introductory crossbreeding, we found that the infusion of blood of Finnish Landrace breed did not lead to improvement of boars' development indicators, but, on the contrary, significantly increased in these natural-climatic and economic conditions the indicator of the age of reaching the live weight of 100 kg, which can be considered as a strain of adaptation and adaptive mechanisms of the animal organism. At the same time, the established low values of variability of the trait indicate that among these individuals it is practically impossible to select animals with the optimal period of reaching the live weight of 100 kg, especially with an increased value of blood. The established negative correlation of this indicator of development with reproductive indicators gives grounds to confirm the deterioration of reproductive indicators as a violation of adaptive capabilities when carrying out breeding measures to improve productivity.

The data of our study indicate that the increase in meat qualities of Poltava beef boars using different variants of Finnish Landrace bloodlines leads to deterioration of some reproductive parameters and to an increase in their variability (especially with a blood share of 50%). "Instability" of adaptation mechanisms in animals of this group was also manifested by high variability of reproductive indicators, which can be considered as an increased response of the organism to the 'load of the environment'.

The infusion of the blood of the fast-ripening meat breed in order to increase the adaptive qualities of the Poltava meat breed and increasing the share of its bloodline up to 50% led to a reliable increase in reproductive indicators (the number of inseminated sows, the number of farrowing sows, the fertilizing ability of the boar), not related to the primary in the breeding process, but determining, among other things, the efficiency of the pig breeding industry.

In the indicators of development, the use of blood of the early maturing meat breed was reflected in the indicator of the thickness of the speck. We found a significant increase in fat thickness with increasing bloodlines of the fast-ripening beef breed. Earlier studies have clearly shown that increased fat thickness can have a favorable effect on reproductive performance [22]. Our study also demonstrated a significant effect of rump thickness on the fertilizing ability of boars. Taking into account that an increase in the thickness of the rump can be considered as an increase in the protective properties of the skin, it gives us the opportunity to talk about the increase in the protective and adaptive (adaptive) capabilities of the organism in this case.

In addition, the observed lower values of variability of parameters in boars with blood of the fast-maturing meat breed may indicate their greater stability in these breeding conditions.

Conclusion

The analysis of the use of breeding boars in combination with different genotypes, studied in this study, can be of great importance for the optimal direction of breeding work not only with the Poltava meat breed, but also with the fast-ripening meat breed and Finnish Landrace breed. We have established that the use of different variants of introductory crossbreeding in breeding boars of Poltava meat breed with the use of blood of soon-to-be-matured meat breed and Finnish Landrace breed leads to changes in reproductive indicators, interrelated with developmental indicators and may reflect the processes of adaptation of animals. The purposes of using introductory crossbreeding, in this case, determine the dynamics of changes.

Infusion of Finnish Landrace blood in order to improve meat qualities leads in boars of Poltava meat breed to a violation of adaptive capabilities, manifested in an increase in the age of achieving a live weight of 100 kg and a decrease in reproductive performance, not actively involved in the selection process. Increasing the level of bloodlines of breeding boars up to 50% for Finnish Landrace breed is not reasonable in these natural and climatic conditions and will require additional costs to improve efficiency.

The infusion of blood of the soon-ripening meat breed to boars of the Poltava meat breed with the purpose of improvement of adaptive qualities leads to strengthening of adaptive properties of an organism, by means of increase of protective possibilities and increase of reproductive indicators

Conflict of interest information. The authors declare that they have no conflict of interest.

References / Список литературы

1. Knox, R. V. (2024). Swine fertility in a changing climate. *Animal Reproduction Science*, *269*, 107537. https://doi.org/10.1016/j.anireprosci.2024.107537

2. Mateo-Otero, Y. (2024). Integrating metabolomics into reproduction: Sperm metabolism and fertility enhancement in pigs. *Animal Reproduction Science*, *269*, 107539. https://doi.org/10.1016/j.anireprosci.2024.107539
3. Gonzalez-Peña, D., Knox, R. V., Pettigrew, J., & Rodriguez-Zas, S. L. (2014). Impact of pig insemination technique and semen preparation on profitability. *Journal of Animal Science*, *92*(1), 72–84. https://doi.org/10.2527/jas.2013-6836
4. Ngo, C. B., Morrell, J. M., & Tummaruk, P. (2025). Boar semen microbiome: Insights and potential implications. *Animal Reproduction Science*, *272*, 107647. https://doi.org/10.1016/j.anireprosci.2024.107647. EDN: https://elibrary.ru/UVEYYG
5. Hensel, B., Henneberg, S., Kleve-Feld, M., Jung, M., & Schulze, M. (2024). Selection and direct biomarkers of reproductive capacity of breeding boars. *Animal Reproduction Science*, *269*, 107490. https://doi.org/10.1016/j.anireprosci.2024.107490
6. Chan, J. C., Morgan, C. P., Leu, N. A., Shetty, A., Cisse, Y. M., Nugent, B. M., Morrison, K. E., Jasarevic, E., Huang, W., Kanyuch, N., Rodgers, A. B., Bhanu, N. V., Berger, D. S., Garcia, B. A., Ament, S., Kane, M., Epperson, C. N., & Bale, T. L. (2020). Reproductive tract extracellular vesicles are sufficient to transmit intergenerational stress and program neurodevelopment. *Nature Communications*, *11*, 1499. https://doi.org/10.1038/s41467-020-15305-w. EDN: https://elibrary.ru/YIPLAS
7. Lismer, A., & Kimmins, S. (2023). Emerging evidence that the mammalian sperm epigenome serves as a template for embryo development. *Nature Communications*, *14*, 2142. https://doi.org/10.1038/s41467-023-37820-2. EDN: https://elibrary.ru/BQNKIS
8. Dahlen, C. R., Ramírez-Zamudio, G. D., Bochantin-Winders, K. A., Hurlbert, J. L., Crouse, M. S., McLean, K. J., Diniz, W. J. S., Amat, S., Snider, A. P., Caton, J. S., & Reynolds, L. P. (2024). International Symposium on Ruminant Physiology: Paternal nutrient supply: Impacts on physiological and whole animal outcomes in offspring. *Journal of Dairy Science*, *20*. https://doi.org/10.3168/jds.2024-25800
9. Berckmans, D. (2017). General introduction to precision livestock farming. *Animal Frontiers*, *7*, 6–11. https://doi.org/10.2527/af.2017.0102
10. FAO. (2010). *The State of the World's Animal Genetic Resources in Food and Agriculture*. Moscow: VIZH RAAS. (Translated from English: FAO, 2007. *The State of the World's Animal Genetic Resources for Food and Agriculture*, edited by B. Rischkowsky & D. Pilling, Rome.)
11. Callegaro, S., Tiezzi, F., Fabbri, M. C., Biffani, S., & Bozzi, R. (2024). Evaluating genotype by environment interaction for growth traits in Limousine cattle. *Animal*, *18*(11), 101344. https://doi.org/10.1016/j.animal.2024.101344. EDN: https://elibrary.ru/LYWOIQ

12. Brandt, H., Werner, D. N., Baulain, U., Brade, W., & Weissmann, F. (2 Newton). Genotype-environment interactions for growth and carcass traits in different pig breeds kept under conventional and organic production systems. *Animal*, *4*(4), 535–544. https://doi.org/10.1017/S1751731109991509
13. Knap, P. W., & Su, G. (2008). Genotype by environment interaction for litter size in pigs as quantified by reaction norms analysis. *Animal*, *2*(12), 1742–1747. https://doi.org/10.1017/S1751731108003145
14. Rose, G., Mulder, H. A., Greeff, J. C., Thompson, A. N., van der Werf, J. H. J., & van Arendonk, J. A. M. (2024). Examining across year genotype by environment interactions for production and reproduction traits in Merino sheep. *Small Ruminant Research*, *238*, 107325. https://doi.org/10.1016/j.smallrumres.2024.107325. EDN: https://elibrary.ru/KAQIWC
15. Canario, L., Mignon-Grasteau, S., Dupont-Nivet, M., & Phocas, F. (2013). Genetics of behavioural adaptation of livestock to farming conditions. *Animal*, *7*(3), 357–377. https://doi.org/10.1017/S1751731112001978
16. Abdul Niyas, A., Chaidanya, K., Shaji, S., Sejian, V., Bhatta, R., Bagath, M., Rao, G. S. L. H. V. P., & Girish, V. (2015). Adaptation of livestock to environmental challenges. *Journal of Veterinary Science and Medical Diagnosis*, *4*(3). https://doi.org/10.4172/2325-9590.1000162
17. Phocas, F., Belloc, C., Bidanel, J., Delaby, L., Dourmad, J. Y., Dumont, B., Ezanno, P., Fortun-Lamothe, L., Foucras, G., Frappat, B., González-García, E., Hazard, D., Larzul, C., Lubac, S., Mignon-Grasteau, S., Moreno, C. R., Tixier-Boichard, M., & Brochard, M. (2016). Review: Towards the agroecological management of ruminants, pigs and poultry through the development of sustainable breeding programmes. II. Breeding strategies. *Animal*, *10*(11), 1760–1769. https://doi.org/10.1017/S1751731116001051
18. Thutwa, K., Chabo, R., Nsoso, S. J., Mareko, M., Kgwatalala, P. M., & Owusu-Sekyere, E. (2020). Indigenous Tswana pig production characteristics and management practices in southern districts of Botswana. *Tropical Animal Health and Production*, *52*(2), 517–524. https://doi.org/10.1007/s11250-019-02037-3. EDN: https://elibrary.ru/WPLLGE
19. Knecht, D., Jankowska-Mąkosa, A., & Duziński, K. (2017). The effect of age, interval collection and season on selected semen parameters and prediction of AI boars productivity. *Livestock Science*, *201*, 13–21. https://doi.org/10.1016/j.livsci.2017.04.013
20. Knecht, D., Jankowska-Mąkosa, A., & Duziński, K. (2017). Boar genotype as a factor shaping age-related changes in semen parameters and reproduction longevity simulations. *Theriogenology*, *98*, 50–56. https://doi.org/10.1016/j.theriogenology.2017.04.050

21. Garskaya, N., Peretyatko, L., Pozyabin, S., Tresnitskiy, S., & Tresnitskiy, A. (2022). Influence of heat stress on the reproduction rates of sows of the Poltava meat breed, depending on the genotype. *BIO Web of Conferences. International Scientific and Practical Conference "Sustainable Development of Traditional and Organic Agriculture in the Concept of Green Economy" (SDGE 2021)*, *42*, 01026. https://doi.org/10.1051/bioconf/20224201026
22. Arsenakis, I., Appeltant, R., Sarrazin, S., Rijsselaere, T., Van Soom, A., & Maes, D. (2017). Relationship between semen quality and meat quality traits in Belgian Piétrain boars. *Livestock Science*, *205*, 36–42. https://doi.org/10.1016/j.livsci.2017.09.009

AUTHOR CONTRIBUTIONS

The authors contributed equally to this article.

ВКЛАД АВТОРОВ

Все авторы сделали эквивалентный вклад в подготовку статьи для публикации.

DATA ABOUT THE AUTHORS

Natalia A. Garskaya, Associate Professor of Laboratory Diagnostics, Anatomy and Physiology Department
Lugansk State Pedagogical University
2, Oboronnaya Str., Lugansk, 291011, Russian Federation
Natalya_G@bk.ru
ORCID: https://orcid.org/0000-0001-5350-8770

Sergey N. Tresnitsky, Head of the Department of Biology and General Pathology
Don State Technical University
1, Gagarin Sq., Rostov-on-Don, 344000, Russian Federation
Tresnitskiydonstu@yandex.ru
ORCID: https://orcid.org/0000-0001-9641-5363

Andrey A. Rudenko, Professor of the Department of Veterinary Medicine
Russian Biotechnological University (ROSBIOTECH)
11, Volokolamskoye Highway, Moscow, 125080, Russian Federation
vetrudek@yandex.ru
ORCID: https://orcid.org/0000-0002-6434-3497

Galina A. Zelenkova, Docent of the Department of Biology and General Pathology
Don State Technical University
1, Gagarin Sq., Rostov-on-Don, 344000, Russian Federation
galinazelenkova2025@gmail.com
ORCID: https://orcid.org/0000-0002-8562-4423

Anastasia Yu. Kochetkova, Docent of the Department of Biology and General Pathology
Don State Technical University
1, Gagarin Sq., Rostov-on-Don, 344000, Russian Federation
lastik61@yandex.ru
ORCID: https://orcid.org/0009-0005-7888-7160

ДАННЫЕ ОБ АВТОРАХ

Гарская Наталья Александровна, доцент кафедры лабораторной диагностики, анатомии и физиологии
Луганский государственный педагогический университет
ул. Оборонная, 2, г. Луганск, 291011, Российская Федерация
Natalya_G@bk.ru

Тресницкий Сергей Николаевич, заведующий кафедрой «Биология и общая патология»
Федеральное государственное бюджетное образовательное учреждение высшего образования «Донской государственный технический университет»
пл. Гагарина, 1, г. Ростов-на-Дону, 344000, Российская Федерация
Tresnitskiydonstu@yandex.ru

Руденко Андрей Анатольевич, профессор кафедры «Ветеринарная медицина»
Российский биотехнологический университет (РОСБИОТЕХ)
Волоколамское шоссе, 11, г. Москва, 125080, Российская Федерация
vetrudek@yandex.ru

Зеленкова Галина Александровна, доцент кафедры «Биология и общая патология»
Федеральное государственное бюджетное образовательное учреждение высшего образования «Донской государственный технический университет»

пл. Гагарина, 1, г. Ростов-на-Дону, 344000, Российская Федерация
galinazelenkova2025@gmail.com

Кочеткова Анастасия Юрьевна, доцент кафедры «Биология и общая патология»
Федеральное государственное бюджетное образовательное учреждение высшего образования «Донской государственный технический университет»
пл. Гагарина, 1, г. Ростов-на-Дону, 344000, Российская Федерация
lastik61@yandex.ru

Поступила 05.07.2025 — Received 05.07.2025
После рецензирования 20.08.2025 — Revised 20.08.2025
Принята 26.08.2025 — Accepted 26.08.2025