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PRODUCTIVITY AND BIOLOGICAL FEATURES OF PIGS OF DOMESTIC AND CANADIAN BREEDING

Abstract. In the conditions of large pig breeding complexes in the raw material base of Smolmyaso OJSC and Pavlovskaya Sloboda Meat Processing Plant OJSC, in the period of 2010-2015, research and production experience was conducted to study the productivity and biological features of domestic and western breeding pigs. Experimental young stock from 2 months age till reaching the live weight of 100 kg was kept in the control growing. The conditions of keeping, feeding and slaughter of young pigs were identical. When young pigs reached 95-105 kg in live weight, they were evaluated by their own productivity and slaughter indices.

In the process of research, it was found that among the domestic and Canadian young stock, the highest precocity and growth rate was characterized by three-breed hybrid young stock, obtained by crossing hybrid sows with Duroc boars. The results of the control slaughter showed that among the domestic and Canadian young stock, the best slaughter indices were characterized by the three-breed hybrid young.

It was established that the three-breed cross young pigs of the Canadian breeding reached the pre-slaughter live weight 22 days earlier compared to the domestic one, the average daily weight gain was 134.1 g higher, the slaughter yield was 2.3% higher. Thus, the three-breed commercial young stock of Canadian breeding reliably surpasses the pigs of domestic breeding.

The calculation of the economic efficiency of growing young pigs shows that the additional income from the sale of 1 head of Canadian breeding is 1.5 thousand rubles (23 US dollars) compared with the domestic breeding.

Based on the research results, it was recommended that pig farms engaged in breeding and growing domestic pigs, should strengthen breeding to improve the fattening and meat qualities of pigs. To obtain commercial young pigs with high fattening and meat qualities, it is recommended to use Canadian pigs more extensively.

Keywords: young pigs, domestic breeding, Canadian breeding, growth rate, average daily gains, slaughter weight, slaughter yield.

Introduction. Currently, animal husbandry is one of the most important sectors of the agro-industrial complex of the Russian Federation and plays a significant role in the country's food supply. Pig breeding, as the most intensive and efficient livestock industry, makes a substantial contribution to providing the population of the country with meat and meat products. At the moment, the pig breeding is developing dynamically, which means that the production of pork sustainably develops.As before, the growth rate of pork production goes ahead of the increase in livestock population, which indicates the intensification of the industry due to the implementation of progressive methods of pig breeding, the involvement of highly productive breeds in the production and widespread use of hybridization and crossing, and the improvement of fattening technology and pig breeding [1-3].

According to the National Union of pig breeders, for the last 5 years from 2014 to 2018, pork production increased from 2816 thous. t to 3733 thous. t. or by 24.6%. The main growth in pork production was received due to the increase in the production of agricultural enterprises. During this period, the import of pork dropped from 427 thous. t to 80 thous. t or 5.3 times [4]. The pork production figures show that the pig breeding successfully executes the program of import substitution.

A significant portion of pork is produced in the large industrial complexes with the use of intensive technologies of growing and fattening animals. However, as indicated by Yu.V. Tatulov and co-authors [5, 6], instability of dimensional and weight standards of pigs, no stress resistance lead to a decrease in quality and appearance of meat defects, complicating its industrial processing. In this regard, there is an ongoing search for breeds, lines and types of pigs that are able to show high productive quality in large pig-breeding complexes [7-10].

Currently, the domestic pig farms to form tribal flocks often use imported pigs from abroad and, in particular, from Canada. These pigs are characterized by high productive qualities [12-17].

But so far the lifetime productivity and biological features of Canadian breeding pigs in large farms are poorly studied.

Therefore, the conduct of a comparative assessment of productivity and biological features of domestic and Canadian pigs in the conditions of large pig farms is very urgent.

Theaimoftheresearch is a determination of biological and productive features in pigs of domestic and the Canadian breeding grown in the conditions of the pig farms.

To achieve this aim, the following objectives were traced:

- to assess the own productivity of young pigs of domestic breeding;
- to assess the own productivity of young pigs of the Canadian breeding;
- to determine the slaughter parameters of the tested young stock;
- to calculate the economic efficiency of pork production when using domestic and Canadian pigs.

Arrangement and methods of the research. The control growing of experimental young pigs and slaughterwere carried out in the raw material zone of Smolmya so OJSC and Pavlovskaya Sloboda Meat Processing Plant OJSC of the Moscow Region during 2010-2015.

To conduct a research and production experiment, two experimental groups were formed with 3 subgroups of the most common pig breeds and breedcombinations. The first group consists of yelts from parents of domestic breeding, in the second - from Canada breeding. The sequence of the experiment is shown in scheme.

In all experiments, identical methods of housing and feeding, as well as transportation and pre-slaughter preparation and slaughter of animals were applied. Pigs were fed according to the norms and diets of feeding at the animal farms [18].

Formation of the experimental groups	
Domestic breeding: 1.1. Large whitexLarge white 1.2. Large whitex Landrace 1.3. (Large whitexLandrace) xDuroc	Canadian breeding: 2.1. Yorkshire 2.2. Yorkshire xLandrace 2.3. (Yorkshire xLandrace) xDuroc
Test indicators	
Atcontrolgrowing	At slaughter
Pre-slaughter live weight, kg Age of reaching 100 kg mass, days Average daily weight gain, g	Carcass weight, kg Mass of internal fat, kg Deadweight, kg Slaughter yield, %
Calculation of economic efficiency.	

Scheme of the experiment performance

Lifetime productivity of experimental young stock was assessed according to standard methods for control growing according to indicators covering the animals' productivity - age of attaining live weight in days and average daily gain in grams [19].

Slaughter indicators were determined in accordance with the "Methodological l recommendations by the V.I. Lenin Academy of Agricultural Sciences on the assessment of meat productivity, meat quality and subcutaneous fat of pigs" [19].

Evaluation of the economic efficiency of growing experimental young pigs was determined by mapping live weight during realization and the costs of growing young pigs in monetary terms. The level of profitability was calculated as the ratio of profit to prime cost,%.

Biometric processing of the obtained data was performed according to A.M. Gataulin's methodological guidelines on the design of measurement results using the Microsoft Excel, the accuracy of the difference was taken at the reliability threshold of B1 = 0.95 (significance level $P \leq 0.05$). At the level of difference $P \geq 0.05$, the difference is not statistically significant [20]. As a control group, young pigs of 1.1 and 2.1 subgroups were used.

Research results and discussion. Lifetime assessment of young pigs in their own productivity allows to evaluate animals according to phenotype. The results of table 1 show that among domestic breeding pigs, pre-slaughter mass ranged from 99.3 kg (subgroup 1.1) to 102.3 kg (subgroup 1.3), which indicates slight deflections in this indicator.

In the three-breed cross young stock of domestic breeding from 1.3 subgroup, the age of reaching 100 kg of live weight was 178 days, which is less compared to gilts from 1.1 and 1.2 subgroups by 8 ($P \leq 0.05$) and 4 days respectively. The highest gains in live weight were obtained from gilts of 1.3 subgroup - 694.0 g, which is higher than in 1.1 and 1.2 subgroups by 52.0 g or 7.5% ($P \leq 0.01$) and 21.9 g - 3.2%, respectively.

Consequently, among young stock of domestic breeding, the highest early ripeness and growth rate were for the three-crossbred stock, received by crossing crossbred sows with duroc boars.

Analysis of the data in Table 1 demonstrates that among young Canadian breeding pigs, the smallest age to reach 100 kg of weight was obtained from gilts of 2.3 group — 156 days, which is less compared to the young pigs from 2.1 and 2.2 subgroups by 6 ($P \leq 0.05$) and 2 days respectively. The highest average daily gains of live weight among young Canadian breeding were obtained from gilts of 2.3 subgroup - 828.1 g, which is higher than in yelts from 2.1 and 2.2 subgroups by 54.1 g or 6.5% ($P \leq 0.001$) and by 43.6 g - 5.3% ($P \leq 0.01$) respectively.

On the basis of the research results, it can be concluded that of young pigs of Canadian breeding, the highest early ripeness and growth rate were for three-crossbreed young pigs from 2.3 subgroup.

Comparing with young domestic breeding pigs from 1.1, 1.2 and 1.3 subgroups, pigs of Canadian breeding from 2.1, 2.2 and 2.3 subgroups reached live weight 24 and 22 days earlier at ($P \leq 0.001$)

Table 1 – Lifetime productivity of experimental young pigs ($X \pm m_x$; n=20)

Group	Combination	Pre-slaughter live weight, kg	Age of reaching 100 kg mass, days	Average daily weight gain, g
1. Domesticbreeding				
1.1	Largewhite	99.3±1.1	186±3	642.0±12.0
1.2	Largewhitex Landrace	101.2±0.9	182±2	672.1±13.4
1.3	Large whitex Landracex Duroc	102.3±1.0	178±2*	694.0±14.2**
2. Canadian breeding				
2.1	Yorkshirex Yorkshire	99.0±1.0	162±2.0	774.0±5.9
2.2	Yorkshirex Landrace	99.5±1.0	158±2.0	784.6±10.6**
2.3	Yorkshirex Landracex Duroc	102.0±1.1	156±2.0*	828.1±13.9***

Note. *$P \leq 0.05$; **$P \leq 0.01$; ***$P \leq 0.001$. Hereinafter, a dominance of young experimental subgroups over the control groups (1.1 and 2.1 subgroups) is indicated.

respectively. In young stock of Canadian breeding from subgroups 2.1, 2.2 and 2.3 compared to subgroups 1.1, 1.2 and 1.3 of domestic breeding, the average daily weight gain was higher by 132.0 g or 15.9%, 112.5 g - 14.3% and 134.1 g - 16.2% respectively with (P≤0.001).

Therefore, young Canadian breeding pigs significantly exceeded young stock of domestic breeding in average daily live weight gain.

The main indicator characterizing the meat productivity of pigs is the slaughter yield. The results of table 2 show that among young pigs of domestic breeding, the highest carcass mass was obtained from gilt of 1.3 subgroup - 69.6 kg, which is higher than in animals from 1.1 and 1.2 subgroups by 5.5 kg or 7.9% (P≤0.01) and by 2.5 kg - 3.6%. The biggest mass of internal fat was obtained from young pigs of 1.1 subgroup - 3.2 kg, and the smallest - from gilt of 1.3 subgroup - 3.0 kg.

A higher slaughter yield was received from young pigs of 1.3 subgroup - 71.0%, which is higher compared to 1.1 and 1.2 subgroups by 3.2% (P≤0.05) and 1.6%, respectively.

The slaughter results show that among the young domestic breeding pigs, the best slaughter indicators were shown by three-crossbred young stock.

Among young pigs of Canadian breeding, the highest carcass weight was obtained from 2.3 subgroup - 73.2 kg, which is higher compared to 2.1 and 2.2 subgroups by 4.6% (P≤0.05) and 2.9% respectively. The highest mass of internal fat was obtained from pigs of 2.1 subgroup - 1.8 kg, and the lowest - from young stock of 2.1 subgroup - 1.6 kg.The highest results in slaughter yield were obtained from young pigs of 2.3 subgroup - 73.3%, which is higher compared to 2.1 and 2.2 subgroups of animals by 2.3% (P≤0.05) and 1.2% respectively. So, the best slaughter rates among young pigs of Canadian breeding were obtained from three-breed crossbred young pigs of 2.3 subgroup.

Slaughter yield of young stock of Canadian breeding from 2.1, 2.2 and 2.3 subgroups compared to the young Canadian breeding of 1.1, 1.2 and 1.3 subgroups was higher by 3.2% (P≤0.05), 2.7% and 2.3% respectively.

Table 2 – Slaughter indicators of young pigs($X \pm m_x$; n=10)

Group	Pre-slaughter live weight, kg	Carcass weight, kg	Mass of internal fat, kg	Deadweight, kg	Slaughter yield, %
1. Domestic breeding					
1.1	99.3±1.1	64.1±1.3	3.2±0.1	67.3±1.4	67.8±1.2
1.2	101.2±0.9	67.1±1.0	3.1±0.1	70.2±1.5	69.4±0.9
1.3	102.3±1.0	69.6±1.1**	3.0±0.1	72.6±1.2**	71.0±0.7*
2. Canadian breeding					
2.1	99.0±1.0	68.6±1.8	1.8±0.1	70.4±1.9	71.0±1.0
2.2	99.5±1.0	70.3±1.6	1.7±0.1	72.0±1.7	72.1±0.9
2.3	102.0±1.1	73.2±1.1*	1.6±0.1	74.8±1.1*	73.3±0.6*

Research results demonstrate that Canadian breeding is characterized by higher slaughter indicators. This certifies deeper and more effective breeding by fattening and meat qualities in pigs of Canadian breeding.

Conclusion. As a result of the research and production experiment, the biological features and productivity of domestic and Canadian breeding pigs were studied and it was established that:

- among domestic breeding young stock, the highest early ripeness and growth rate were for three-breed crossbred young pigs, obtained by crossing crossbred sows with Duroc boars;
- among Canadian breeding pigs, the highest precocity and growth rates were shown by three-breed crossbred stock obtained by mating of crossbred sows with Duroc boars;
- among the domestic breeding young pigs, the best slaughter indicators were shown by three-breed crossbred young stock;

- the best slaughter indicators among young pigs of Canadian breeding were for three-crossbred young stock;

- it was found that in comparison with the domestic breeding pigs, the three-breed crossbred young pigs reached the pre-slaughter live weight 22 days earlier; their average daily weight gains were higher by 134.1 g, and the slaughter yield was 2.3% higher. Thus, the three-breed commercial young stock of the Canadian breeding reliably surpasses the crossbred domestic breeding pigs.;

- a calculation of the economic efficiency of growing young pigs shows that the additional income from a realization of 1 pig of Canadian breeding, compared to domestic breeding, is 1.5 thousand rubles ($ 23).

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КАНАДА ЖӘНЕ ОТАНДЫҚ СЕЛЕКЦИЯДАН ШЫҚҚАН ШОШҚАЛАРДЫҢ БИОЛОГИЯЛЫҚ ЖӘНЕ ӨНІМДІЛІК ЕРЕКШЕЛІКТЕРІ

Аннотация. 2010-2015 жылдар аралығында шошқа өсірудің ірі кешендері жағдайында, шикізат аймағы ААҚ «Смолмясо» және ААҚ «Павловская Слобода» ет комбинатында зерттеумен өндірістік тәжірибе отандық және батыс селекциясы арқылы өсірілген шошқалардың өнімділігі мен биологиялық ерекшеліктерін зерттеу үшін жүргізілді. Тәжірибелік 2 айлық жас 100 кг тірі салмақ жинау үшін бақылау жағдайында өсірілді. Жас шошқалардың өсіру жағдайы үй, азықтандыру және сою шарттары бірдей болды. Жас шошқаның 95-105 кг тірі салмақ жинағаннан кейін олардың өнімділігі мен таза ет салмағының бағалауын өткіздік.

Зерттеу үрдісінде жас отандық және канадалық шошқалардың арасында ең жоғары өнімділік пен өсім қарқыны Дюрок тұқымының шошқасы мен будан шошқалармен будандастырылған үш тұқымдық жастармен сипатталды.

Бақылау сойысының нәтижелері жасотандық және канадалық шошқа арасында ең жақсы союыс көрсеткіш көрсеткен үштұқымдық будан жастары шошқалары.

Үштұқымдық будан жастары канадылық селекцияның отандық шошқадан ерекшелігі сойғанға дейін тірі салмағын 22 күнге ерте жинайды, орташа тірі салмақ жинау 134,1 г, сойыс шығысы 2,3% ға жоғары. Сондықтан, үш тұқымдық канадалық селекциядан шыққан тауарлық жас шошқалар отандық шошқалардан жоғары болып есептелді.

Жас өсірілген шошқалардың экономикалық тиімділігін есептеу Канаданың 1 басын сатудан түскен қосымша табыс отандық іріктеумен салыстырғанда 1,5 мың рубльді (23 АҚШ доллары) құрайды.

Зерттеу нәтижелері бойынша шошқа фермалары шошқа өсіру және шошқа етін өсірумен айналысады, шошқалардың бордақылау және ет сапасын арттыру үшін өсіруді күшейтеді. Бұрынғы бордақылау және ет сапасы жоғары сатылатын жас шошқаларды алу үшін канадалық шошқа шошқаларын кеңінен пайдалану ұсынылады.

Түйін сөздер: жас шошқа, отандық іріктеу, канадалық іріктеу, өсу қарқыны, күнделікті орташа өсу, сойыс салмағы, сойысшығысы.

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ПРОДУКТИВНОСТЬ И БИОЛОГИЧЕСКИЕ ОСОБЕННОСТИ СВИНЕЙ ОТЕЧЕСТВЕННОЙ И КАНАДСКОЙ СЕЛЕКЦИИ

Аннотация. В условиях крупных свиноводческих комплексов в сырьевой зоне ОАО «Смолмясо» и ОАО «Мясокомбинат «Павловская Слобода» в течение 2010-2015 гг. был проведен научно-производственный опыт по изучению продуктивности и биологических особенностей свиней отечественной и западной селекции. Подопытный молодняк с 2-мес. возраста до достижения живой массы 100 кг содержался в условиях контрольного выращивания. Условия содержания, кормления и убоя молодняка свиней были идентичны. При достижении молодняком свиней живой массы в 95-105 кг провели оценку по собственной продуктивности и убойным показателям.

В процессе исследований было установлено, что среди молодняка отечественной и канадской селекций наиболее высокой скороспелостью и скоростью роста характеризовался трехпородный помесный молодняк, полученный при скрещивании помесных свиноматок с хряками породы дюрок. Результаты контрольного убоя показали, что среди молодняка отечественной и канадской селекций лучшими убойными показателями характеризовался трехпородный помесный молодняк.

Установлено, что трехпородный помесный молодняк канадской селекции по сравнению с отечественным достигал предубойной живой массы на 22 суток раньше, среднесуточные приросты живой массы были выше на 134,1 г, убойный выход был выше на 2,3%. Таким образом, трехпородный товарный молодняк канадской селекции по продуктивности достоверно превосходит свиней отечественной селекции.

Расчет экономической эффективности выращивания молодняка свиней показывает, что дополнительный доход от реализации 1 головы канадской селекции по сравнению с отечественной селекцией составляет 1,5 тыс. руб (23 доллара США).

На основе полученных результатов исследований было рекомендовано свинокомплексам, занимающихся разведением и выращиванием свиней отечественной селекции, усилить селекцию на повышение откормочных и мясных качеств свиней. Для получения товарного молодняка свиней с высокими откормочными и мясными качествами рекомендуется шире использовать свиней канадской селекции.

Ключевые слова: молодняк свиней, отечественная селекция, канадская селекция, скорость роста, среднесуточные приросты, убойная масса, убойный выход.

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