

PERFORMANCE TEST OF YOUNG CROSSBRED BOARS FROM THE BYDGOSZCZ BREEDING REGION IN POLAND

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Abstract

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The aim of presented research was performance test analysis of young crossbred boars came from 6 crossing variants conducted in years 2009 and 2010 in Poland, in The Bydgoszcz Breeding Region. The research covered the performance test results of 1911 young crossbred boars conducted with accordance to obligatory modified methodology. The animals came from the following crossing variants (sows breed given in the first position): Hampshire x Duroc (H x D), Hampshire x Pietrain (H x P), Duroc x Hampshire (D x H), Duroc x Pietrain (D x P), Pietrain x Hampshire (P x H) and Pietrain x Duroc (P x D). Duroc x Hampshire young crossbred boars had the highest growth rate, the thinnest backfat, the highest height of loin eye and the highest selection index value. The highest meat content in 2009 had animals of Pietrain x Duroc and Hampshire x Pietrain, and in 2010 Duroc x Hampshire pigs. Analysing the results from years 2009 and 2010 it was observed that the increase of performance test selection index value occurred in crossbreds of Hampshire x Duroc, Hampshire x Pietrain and Pietrain x Duroc (by 4, 4 and 2 points, respectively). In case of the remaining groups of pigs deterioration (by 1-2 points) of performance test selection index has been observed or there was no change.

Key words: young crossbred boars, performance test, growth rate, meat content

Introduction

Crossbred boars are becoming increasingly important in modern pig crossing programs, both in Poland and in other countries. Results of many studies (Czarnecki et al., 1999a, b; Michalska et al., 2004; Milewska 2007; Milewska and Falkowski, 2001; Nowachowicz et al., 2009; Różycki, 1995) indicate their suitability for commercial crossing. Crossbred boars compared with pure breed animals are characterized by earlier puberty, heavier testicles weight, higher volume of better quality semen, greater suitability for breeding because of the increased libido and better efficacy of mating and the possibility of their prolonged use (Czarnecki et al., 1999a; Fent et al., 1980; Kapelański, 1995; Knap, 1987; Koczanowski et al., 2001; Michalska, 1996; Michalska et al., 2004, 2010; Michalski and Polańska, 1983; Milewska, 2007; Milewska and Falkowski, 2001; Neely and Robison, 1983; Nowachowicz, 2004; Nowachowicz et al., 2009; Rak et al., 1993; Różycki, 1995).

Performance test results are one of the main criteria in the selection work over the pigs in the selection of animals for breeding and production herds (Różycki, 2003). Performance test plays a special role in the conducted selection, especially male individuals, because of their breeding value depends largely on the productivity of breeding and mass herds. Therefore, it would be advisable, to know not only the properties of boars of particular pig breeds and lines, but also variants of their crossing (Czarnecki, 1999a, b; Eckert and Szyndler-Nędza, 2010, 2011; Michalska, 1996; Michalska and Nowachowicz, 2000, 2002; Michalska et al., 1998, 2000; Różycki, 1995, 1997; Różycki et al., 1980, 1986). Among the paternal components of pigs performance tested in our country, including Bydgoszcz Breeding Region in recent years next to the boars of following breeds such as: Hampshire, Duroc, Pietrain and Synthetic Line 990 there are also two-breed crossbred young boars came from their reciprocal crossing (Eckert and Szyndler-Nędza, 2010, 2011). In the national literature there is a lack of the results regard-

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ing the young crossbred boar's performance test. In annually published by the Institute of Animal Production in Balice PIB register "Status of breeding and evaluation results of pigs" is given only the total results of performance test of all crossbreds. However, the results of young crossbred boars came from specified pigs crossing variants are not given.

The aim of presented study was the analysis of young crossbred boars performance test came from 6 crossing variants, carried out in years 2009 and 2010 in Poland in The Bydgoszcz Breeding Region.

Material and Methods

The statistical analysis covered the results of performance test of 1911 young crossbred boars produced in Poland, in The Bydgoszcz Breeding Region in years 2009 and 2010 according to obligatory modified methodology, which in calculations of the selection index takes into account daily gain of body weight standardized on 180th day and percentage body meat content (Eckert and Szyndler-Nędza, 2011).

Young boars came from the following crossing variants (sows bred in first position): Hampshire x Duroc (H x D), Hampshire x Pietrain (H x P), Duroc x Hampshire (D x H), Duroc x Pietrain (D x P), Pietrain x Hampshire (P x H) and Pietrain x Duroc (P x D).

The performance test selection index formula was as follows (Eckert and Szyndler-Nędza, 2011):

for paternal lines: $I_o = 0.1364 X_1 + 4.7820X_2 - 275.5944$, where: X_1 – daily gain standardized on 180 days of life,

X_2 – percentage meat content estimated on the base of standardized backfat thickness and loin muscle measurements on 110 kg, then standardized on 180th day of life.

The results were statistically elaborated using one-way ANOVA variance analysis. Calculations were made using computer program Statistica 8.0 PL (2008).

Results

The number of young crossbred boars in 6 tested groups, performance test results, including growth and slaughter traits and the selection index value were presented in Tables 1 and 2. Among animals performance tested in The Bydgoszcz Breeding Region the most numerous were Duroc x Pietrain crossbreds (in 2009 - 534 pcs., in 2010 - 490 pcs.), then Pietrain x Duroc crossbreds (in 2009 - 139 pcs., in 2010 - 287 pcs.). Among the remaining crossbred groups the next in terms of the number were animals of Pietrain x Hampshire (in 2009 – 91 pcs., in 2010 - 137 pcs.), Hampshire x Pietrain (in 2009 - 87 pcs., in 2010 - 50 pcs.) and Hampshire x Duroc (in 2009 - 51 pcs.). The smallest group in 2009 were Duroc x Hampshire (17 pcs.) in 2010 – young boars of Duroc x Hampshire (15 pcs.) and Hampshire x Duroc (13 pcs.).

The youngest on performance test day in analyzed years (2009 and 2010) were young crossbred boars Duroc x Hamp-

Table 1
Performance test results of young crossbred boars in year 2009

Trait	Group							Significance of differences		
	H x D	H x P	D x H	D x P	P x H	P x D	Total	P≤0.01	P≤0.05	
	1	2	3	4	5	6				
Number, pcs	51	87	17	534	91	139	919			
Age on the test day, days	\bar{x}	174	177	160	170	170	181	172	3-1,2,4,5,6	1-6
	s	10	15	6	16	13	15	15	6-4,5	2-4,5
Body weight on the test day, kg	\bar{x}	122	124	129	120	102	120	119	1-,3,5; 3-4,5,6	2-3
	s	11	12	9	13	10	14	14	5-2,4,6	
Daily gain of body weight standardized on 180 th day, g	\bar{x}	724	716	864	736	625	666	714	1,2-3,5; 3-4,5,6	6-1,2
	s	107	121	47	128	64	109	125	4-5,6	
Average backfat thickness, mm	\bar{x}	9.4	9.6	8.7	8.8	8.8	9.0	9.0	2-3,4,5	1-3,4,5
	s	1.4	1.6	0.6	1.4	0.8	1.3	1.4		2-6
Standardized height of loin eye, mm	\bar{x}	57.5	58.7	58.8	57.4	57.9	57.3	57.6	-	-
	s	2.6	4.3	2.1	4.2	1.6	4.0	3.9		
Standardized body meat content, %	\bar{x}	60.4	61.1	60.6	60.5	59.5	61.2	60.6	5-2,3,4,6	1-5,6
	s	1.3	1.8	0.5	2.1	1.1	1.6	1.9		
Performance test selection index, points	\bar{x}	112	114	132	115	94	109	112	1,2-3,5; 3-4,5,6	-
	s	19	20	8	17	11	16	18	5-4,6	

shire, 160 and 167 days, respectively. The oldest were pigs of Pietrain x Duroc, both in 2009 and 2010 (181 and 180 days, respectively) and the differences between them and the remaining groups were generally statistically significant (Tables 1 and 2).

The heaviest body weight on the test day in examined years (2009 and 2010) had Duroc x Hampshire crossbreds, 129 and 127 kg, respectively. The differences between them and the remaining groups of animals were verified in the most cases as statistically high significant (Tables 1 and 2). Next regarding to the analyzed trait in 2009 were young boars of Hampshire x Pietrain (124 kg), Hampshire x Duroc (122 kg), Duroc x Pietrain, Pietrain x Duroc (120 kg) and Pietrain x Hampshire (102 kg). In 2010 the young boars order in range of this trait was similar and shaped as follows: Hampshire x Duroc (123 kg), Hampshire x Pietrain (120 kg), Duroc x Pietrain, Pietrain x Duroc (119 kg) and Pietrain x Hampshire (106 kg). Both in 2009 and 2010 Pietrain x Hampshire young crossbred boars had statistically significant ($P \leq 0.01$) lower body weight on the performance test day compared to the remaining tested groups of pigs.

Daily gain of body weight standardized on 180th day of life of young crossbred boars coming from all analyzed groups was in 2009 714 g and in 2010 689 g, averagely. The highest growth rate in both tested years (2009 and 2010) had Duroc x Hampshire pigs (864 and 795 g, respectively) - Tables 1 and 2. Differences in daily gain of body weight in 2009 between above mentioned the best group (Duroc x Hampshire) and

the remaining crossbreds were (in grams): 128 (D x P), 140 (H x D), 148 (H x P), 198 (P x D) and 239 (P x H), respectively. However, in 2010 between the same crossbreds (Duroc x Hampshire) and other groups of animals were lower and shaped as follows: 64 (H x P), 78 (D x P), 86 (H x D), 123 (P x D) and 196 (P x H) and were statistically high significant.

Backfat thickness of performance tested young crossbred boars in 2009 amounted averagely 9.0 mm, and in 2010 – 8.7 mm. The thinnest backfat in 2009 had individuals of Duroc x Hampshire, Duroc x Pietrain, Pietrain x Hampshire, Pietrain x Duroc (8.7; 8.8; 8.8; 9.0 mm respectively) and in 2010 Duroc x Hampshire, Pietrain x Duroc, Duroc x Pietrain and Pietrain x Hampshire (8.5; 8.6; 8.7 and 8.7 mm, respectively). The thickest layer of subcutaneous fat in 2009 had crossbreds of Hampshire x Pietrain (9.6 mm) and Hampshire x Duroc (9.4 mm) - $P \leq 0.01$ and $P \leq 0.05$ (Tables 1 and 2), however in 2010 – pigs of Hampshire x Duroc and Hampshire x Pietrain (9.3 mm).

Standardized height of loin eye of young crossbred boars measured in P_4 point regarding to the results from analyzed years (2009 and 2010) shaped at the average level of 57.6 and 58.1 mm, respectively. The highest height of loin eye in 2009 had young boars of Duroc x Hampshire (58.8 mm), and in 2010 animals of Hampshire x Pietrain and Duroc x Hampshire (61.4 mm). The lowest height of loin eye in 2009 had pigs of Pietrain x Duroc (57.3 mm), and in 2010 crossbreds of Pietrain x Hampshire (57.3 mm) - Tables 1 and 2.

Body meat content is an important parameter affecting a production and economic results of pigs. Therefore, it is

Table 2
Performance test results of young crossbred boars in year 2010

Trait	Group							Significance of differences		
	H x D 1	H x P 2	D x H 3	D x P 4	P x H 5	P x D 6	Total	$P \leq 0.01$	$P \leq 0.05$	
Number, pcs	13	50	15	490	137	287	992			
Age on the test day, days	\bar{x}	177	171	167	172	179	180	175	3-1,5,6	2-5,6 4-6
	s	21	12	8	14	14	17	15		
Body weight on the test day, kg	\bar{x}	123	120	127	119	106	119	117	5-1,2,3,4,6	3-4,6
	s	13	10	6	12	10	14	13		
Daily gain of body weight standardized on 180 th day, g	\bar{x}	709	731	795	717	599	672	689	1,2-3,5; 3-4,5,6 5-4,6	6-2,4
	s	69	87	66	89	60	101	98		
Average backfat thickness, mm	\bar{x}	9.3	9.3	8.5	8.7	8.7	8.6	8.7	-	-
	s	0.8	1.2	0.8	1.7	2.0	1.3	1.6		
Standardized height of loin eye, mm	\bar{x}	59.3	61.4	61.4	58.3	57.3	57.5	58.1	2,3-4,5,6	1-2,3
	s	1.5	3.4	1.4	4.5	2.5	4.2	4.2		
Standardized body meat content, %	\bar{x}	61.6	61.5	62.2	61.0	60.2	61.7	61.1	5-1,2,3,6	-
	s	2.5	1.9	1.1	2.3	1.4	2.1	2.1		
Performance test selection index, points	\bar{x}	116	118	130	114	94	111	111	1,2-3,5; 3-4,5,6 5-4,6	-
	s	9	13	9	15	11	17	17		

one of the most important indicators taken into account during the selection of the animals. The average standardized body meat content of all tested young crossbred boar's performance tested in The Bydgoszcz Breeding Region in 2009 amounted 60.6% and in 2010 was higher by 0.5% and shaped at the level 61.1%. The highest body meat content in 2009 had crossbreds of Pietrain x Duroc – 61.2 %, however in 2010 – young boars of Duroc x Hampshire (62.2%). The next in the test conducted in 2009 were young boars of Hampshire x Pietrain (61.1%), Duroc x Hampshire (60.6%), Duroc x Pietrain (60.5%), Hampshire x Duroc (60.4%) and in 2010 pigs of Pietrain x Duroc (61.7%), Hampshire x Duroc (61.6%), Hampshire x Pietrain (61.5%), Duroc x Pietrain (61.0%). However, young crossbred boars of Pietrain x Hampshire performance tested in years 2009 and 2010 had the lowest meat content amounted 59.5 and 60.2%, respectively and the differences in this range between them and pigs from remaining crossing variants (except young boars of Duroc x Pietrain performance tested in 2010) were statistically high significant (Tables 1 and 2).

The most important performance test parameter of pigs is the selection index, which determines the own usability of animals. The average selection index value of all tested young boars in 2009 shaped at the level 112 points, however in 2010 amounted 111 points, thus decreased insignificantly (by 1.0 points). On the base of the results given in Tables 1 and 2 it should be stated that in years 2009 and 2010 among 6 groups of young crossbred boars coming from The Bydgoszcz Breeding Region the highest performance test selection index value had the less numerous Duroc x Hampshire crossbreds (132 and 130 points), and the differences between this group of animals and the remaining were confirmed at the $P \leq 0.01$ significance level. The next in term of this trait in 2009 were young boars of: Duroc x Pietrain (115 pts), Hampshire x Pietrain (114 pts), Hampshire x Duroc (112 pts), Pietrain x Duroc (109 pts) and Pietrain x Hampshire (94 pts), however in 2010 were crossbreds of: Hampshire x Pietrain (118 pts), Hampshire x Duroc (116 pts), Duroc x Pietrain (114 pts) Pietrain x Duroc (111 pts) and Pietrain x Hampshire (94 pts). The differences of analyzed trait expressed in points in 2009 between the best 3rd group (Duroc x Hampshire) and the remaining crossbreds of pigs amounted from 17 (D x P, group 4) up to 38 (P x H, group 5). Also, in year 2010 similar trends were observed, because the differences between Duroc x Hampshire young boars and the remaining groups of animals amounted from 12 (H x P, group 2) up to 36 (P x H, group 5). Comparing the results from 2009 and 2010 it should be noted that the performance test selection index of pigs Duroc x Hampshire and Duroc x Pietrain decreased by 2 and 1 point, respectively. As regards young

crossbred boars of Hampshire x Duroc, Hampshire x Pietrain and Pietrain x Duroc increased by 4, 4 and 2 points. In Pietrain x Hampshire crossbreds, which obtained the worst performance test selection index value there were no changes in its value in the studied years (Tables 1 and 2).

Discussion

The results of Grudniewska and Milewska (2000), Michalska et al. (1998), Milewska and Falkowski (2001) and Milewska and Grudniewska (1999) indicate that the animals of Duroc breed had higher daily gains of body weight compared to Hampshire and Pietrain pigs. In another studies (Bucek, 2009; Chojnacki, 2004; Michalska, 2001; Michalska and Nowachowicz, 2000, 2002; Michalska et al., 2000) regarding pigs performance tested in The Bydgoszcz Breeding Region in years 1995-2000 and 2001-2006 Duroc young boars and crossbreds with this breed also had the highest growth rate. Milewska and Falkowski (2001) observed unlike in the present study, that among performance tested young crossbred boars coming from OSHZ in Olsztyn the highest daily gain of body weight had P x D group. Similarly, Eckert and Žak (1999) proved higher growth rate of young crossbred boars P x D compared to P x H animals amounting 646 and 626 g, respectively. In another studies Eckert and Žak (2002) report that regarding to the daily gain of body weight the heterosis effect was higher in pigs coming from ♀Duroc x ♂Pietrain crossing variant than ♀Pietrain x ♂Duroc and shaped in young boars and gilts at a level of 3.37 and 2.18%, respectively. In the research of Bucek (2009), regarding young boars performance test results in The Bydgoszcz Breeding Region in years 2001-2004, among 9 two-breed crossbreds the best results in range of analyzed trait had the animals coming from three crossing variants: BL x D (644 g), P x H (648 g) and P x D (639 g). Average daily gain of body weight of tested crossbreds coming from The Bydgoszcz Breeding Region in 2009 (714 g) and 2010 (689 g) was comparable to the average value of all young crossbred boars performance tested in whole country amounted in 2009 - 708 g and in 2010 - 686 g, respectively (Eckert and Szyndler-Nędzka, 2010, 2011). In the study of Michalska et al. (2010) among 6 tested crossing variants groups, young crossbred boars Hampshire x Pietrain (H x P) had the most favourable results regarding to daily gain of body weight standardized on 180th day of life, consequently, the results in this regard shaped differently than in the presented publication. On the other hand, Nowachowicz et al. (2009) showed that the highest growth rate among F_1 young crossbred boars performance tested in The Bydgoszcz Breeding Region had Pietrain x Hampshire (637 g) animals.

In the previous own research (Michalska et al., 2010) among 6 two-breeds crossing variants the highest meat content had Hampshire x Pietrain group, however in other research (Michalska et al., 1997) regarding to the performance test of 11 young crossbred boars the highest meat content had Pietrain x Hampshire individuals. Animals of Pietrain breed, due to its outstanding meat content, are used in crossbreeding programs applied in many European countries (Arent et al., 1988; Czarnecki et al., 1999a, b; Michalska et al., 1998, 2010; Milewska and Falkowski, 2001; Rak et al., 1993).

Milewska and Falkowski (2001) observed that among tested young crossbred boars the highest selection index value had Pietrain x Duroc and Pietrain x Hampshire animals, what is consistent with the results in presented paper. In the research of Eckert and Żak (1999) statistically high significant differences in selection index were proved between F₁ crossbreds Pietrain sow x Duroc boar (126 points) comparing to crossbreds Pietrain sow x Duroc boar (123 points), what indicates that Pietrain sows crossed with Duroc boars produce more valuable young crossbred boars comparing to the animals coming from Pietrain sows and Hampshire boars. Chojnacki (2004) showed otherwise as in the present work, that among young crossbred boars produced in The Bydgoszcz Breeding Region in years 1995-2000 and examined under the old methodology of performance test, the best results of selection index had pigs came from Pietrain x Hampshire crossing variant (127 points). In the research of Michalska et al. (2010) otherwise than in the present research it was proved that the most favourable result of performance test selection index among examined 6 crossing variants had Hampshire x Pietrain young crossbred boars.

Conclusions

Summarizing obtained results of research it should be noted that among young crossbred boars performance tested in The Bydgoszcz Breeding Region in years 2009 and 2010 Duroc x Pietrain pigs had the highest growth rate, the thinnest backfat, the highest height of loin eye and the highest selection index value. The highest meat content in 2009 had young boars of Pietrain x Duroc and Hampshire x Pietrain, and in 2010 Duroc x Hampshire pigs. Analyzing the results from years 2009 and 2010 it was observed that the increase of performance test selection index value occurred in crossbreds of Hampshire x Duroc, Hampshire x Pietrain and Pietrain x Duroc (by 4, 4 and 2 points, respectively). In case of the remaining groups of pigs deterioration (by 1-2 points) of performance test selection index has been observed or there was no change.

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