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PERFORMANCE TEST RESULTS ANALYSIS OF CROSSBRED GILTS PRODUCED IN THE BYDGOSZCZ BREEDING REGION

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ABSTRACT

The aim of this study was to analyse the results of performance test of crossbred gilts of Polish Large White and Polish Landrace breed conducted in years 2009–2013 in the Bydgoszcz Breeding Region. They came from two crossing variants (sows breed at first position): [PLW×PL] and [PL×PLW]. Crossbred gilts [PL×PLW] in all analysed years (except for 2001) had higher daily gain of body weight standardised on 180th day than [PLW×PL] animals. From 2009 till 2013 the growth rate of tested crossbred gilts, i.e. [PLW×PL] and [PL×PLW] increased by 10 and 8 g, respectively. Within the span of 5 years (2009–2013) an improvement of breeding value of animals determined as selection index value, which increased by 7 points in [PLW×PL] gilts and by 4 points in [PL×PLW] pigs. This proves the effective improvement of growth and slaughter performance of crossbred gilts coming from the Bydgoszcz Breeding Region within the space of years 2009–2013, being maternal component used in breeding and commercial crossing, which should be monitored in following years.

Key words: crossbred gilts, performance test, growth rate, selection index

INTRODUCTION

The Bydgoszcz Breeding Region is located in Kujawy-Pomorze Province and has a leading position in Poland in pig production and young boars and gilts being produced here impact on the level of usefulness of this animal species in the country. It should be emphasized that most breeding sows in 2011 were kept in Kujawy Pomorze Province and their number – 3574 amounted 26.3% of the domestic population [Blicharski and Hammermeister 2013]. The production efficiency of breeding and mass population of pigs depends on i.e. breeding value of paternal and maternal components used in breeding and commercial crossing. In domestic pig crossing programs it is assumed that maternal components are following breeds: Polish Large White (PLW), Polish Landrace (PL), Pulawska, Zlotnicka White, Zlotnicka Spotted and two-breed crossbreds came from two-way (reciprocal) crossing of PLW and PL breeds [Różycki 1995, 1998, Michalska 1996, Buczyński et al. 1999, Nowachowicz et al. 2003, Michalska et al. 2006 a, 2006 b]. Gilts of mentioned above breeds and crossbreds are performance tested determining the breeding value in terms of growth and slaughter performance [Różycki 1999, 2003, 2004]. Its results are one of the main criteria in the selection work in the choosing of animals for breeding and producing herds [Buczyński et al. 1999, Różycki, 1998, 1999, 2003]. The results of performance test of gilts of particular breeds and crossbreds breed in different regions of the country are diversed and change in time [Buczyński et al. 2001, Nowachowicz et al. 2003, 2010, 2012, Michalska et al. 2006 a, 2015, Eckert and Żak 2010, 2011, 2012, Eckert et al. 2013, 2014].

The aim of presented paper was analysis of the performance test results in crossbred gilts of Polish Large White and Polish Landrace, thus [PLW×PL] and [PL×PLW] conducted in years 2009–2013 in the Bydgoszcz Breeding Region.

MATERIAL AND METHODS

The research covered 52,024 two-breed crossbred gilts performance tested in years 2009–2013 with accordance to the actual methodology [Eckert et al. 2014]. Animals were produced in the Bydgoszcz Breeding Region covering Kujawy-Pomorze Province. They came from two

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crossing variants of breeds Polish Large White (PLW) and Polish Landrace (PL): [PLW×PL] and [PL×PLW], where the sows breed was given at first position. Gilts were fed and housed in accordance approved standards.

The performance test selection index providing the breeding value in terms of growth and slaughter traits was estimated on the basis of following formula [Eckert et al. 2014]:

$$I = 0.1556X_1 + 3.1023X_2 - 167.8359$$

where:

X_1 – daily gain of body weight standardised on 180th day of life,

X_2 – percentage body meat content standardised on 180th day of life.

Two-factor analysis of variance was used including crossing variant and years (2009–2013) assumed as groups 1–5 in which performance test was done. Statistical program Statistica 8.0 PL [2008] was used in calculations.

Table 1 presents the number of tested crossbred gilts in particular years and in a total summary of years 2009––2013.

RESULTS AND DISCUSSION

Table 2 gives the age of tested animals. Gilts from [PLW×PL] crossing variant in analysed 5 years were performance tested at age from 171 days (2009) till 174 days (in years 2010, 2011, 2012) and in a total results summary from years 2009–2013 their average age was 173 days. Crossbred [PL×PLW] gilts were performance tested at age from 175 days (2009 and 2012) till 177 days (2011) and the average value for total results summary from 5 tested years (2009–2013) amounted 176 days. In all analysed years [PL×PLW] crossbred gilts had significantly ($P \leq 0.01$) older age by 4 days in 2009, 2 days in 2010, 3 days in 2011, 1 day in 2012 and 4 days in 2013, respectively regarding to [PLW×PL] pigs. According to the average values from 5 tested years (2009–2013) crossbred gilts came from [PL×PLW] crossing variant were older by 5 days from animals representing [PLW×PL] crossing variant. It should be noted that age on performance test day both [PLW×PL] and [PL×PLW] crossbred gilts was in limits appointed by the methodology which assumes that pigs should be performance tested at age 150––210 days [Eckert and Żak 2010, 2011, 2012; Eckert et al. 2013, 2014].

Table 3 gives body weight of tested crossbred gilts on performance test day, which may be related to their age. In particular analysed years [PL×PLW] crossbred gilts had significantly ($P \leq 0.01$) higher body weight on performance test day comparing to [PLW×PL] animals. The differences between tested groups of crossbred gilts amounted at this range 4 kg in 2009, 3 kg in 2010, 2 kg in 2011, 1 kg in 2012, 4 kg in 2013 and 3 kg in a total results summary from 5 years (2009–2013). It should be noted that similar trends were also in age on performance test day (Table 2). One supposes, that higher body weight of gilts came from [PL×PLW] crossing variant thus [PLW×PL] crossbreds was the consequence that [PL×PLW] animals were performance tested in older age (by 1–4 days). Tested gilts had high significant and significant differences regarding to the age and body weight between particular years when performance test was done.

The daily gain of body weight standardised on 180th day of animals life is an objective indicator of the intensity of the growth of pigs. The results regarding to above mentioned trait are presented in Table 4. The daily gain of body weight standardised on 180th day of life of [PLW×PL] and [PL×PLW] crossbred gilts in 2009 shaped averagely at the level of 603 g and in 2013 amounted 612 g, so increased by 9 g. In all analysed years except 2011 and in total results summary from years 2009–2013 [PL×PLW] crossbred gilts had higher weight gain by 5 g in 2009, 8 g in 2010, 2 g in 2012 and 3 g in 2013 and in total results summary from 5 years (2009–2013) from pigs representing [PLW×PL] crossing variant. The results in this range were statistically high significant and significant. In year 2011 the results in both groups were different and similar because crossbreds [PLW×PL] had only slightly higher (by 1 g) growth rate from [PLW×PL] animals. Daily gain of body weight of examined gilts both [PLW×PL] and [PL×PLW] has improved from 2009 till 2013, because increased by 10 and 8 g, respectively.

In the research of Nowachowicz et al. [2012] otherwise than in the present study [PLW×PL] crossbred gilts

Table 1. The number of tested crossbred gilts in particular years and in a total summary of years 2009–2013

Tabela 1. Liczba ocenianych loszek mieszańców w poszczególnych latach i w łącznym zestawieniu lat 2009–2013

Crossing variant Wariant krzyżowania	Year – Rok					Total Razem
	2009	2010	2011	2012	2013	
PLW × PL – wbp × pbz	7786	7326	6994	9758	6690	38,554
PL × PLW – pbz × wbp	3454	2733	2596	2418	2269	13,470
Total – Razem	11,240	10,059	9590	12,176	8959	52,024

Table 2. Age on performance test day (days)

Tabela 2. Wiek w dniu oceny przyżyciowej (dni)

Year, Group Rok, Grupa	Crossing variant Wariant krzyżowania			Interaction – Interakcja	Significance of differences between tested years assumed as groups 1–5 Istotność różnic między badanymi latami przyjętymi jako grupy 1–5			
					PLW × PL – wbp × pbz		PL × PLW – pbz × wbp	
	PLW × PL wbp × pbz	PL × PLW pbz × wbp	average średnio		P ≤ 0.05	P ≤ 0.01	P ≤ 0.05	P ≤ 0.01
2009, 1	171A ±14	175B ±15	172 ±15		4	2, 5	–	2, 3, 4, 5
2010, 2	174A ±15	176B ±16	175 ±15		–	1, 3, 4, 5	–	1, 3, 4, 5
2011, 3	174A ±15	177B ±16	175 ±15		4	2, 5	5	1, 2, 4
2012, 4	174A ±15	175B ±14	174 ±15	xx	1,3	2, 5	–	1, 2, 3
2013, 5	172A ±15	176B ±15	173 ±15		–	1, 2, 3, 4	3	1, 2
Mean 2009–2013 Średnia 2009–2013	173A ±15	176B ±15	174 ±15					

Means in rows marked by different letters differ significantly; capital letters – P ≤ 0.01, small letters – P ≤ 0.05.
Średnie w rzędach oznaczone różnymi literami istotnie różnią się od siebie; duże litery – P ≤ 0,01, małe litery – P ≤ 0,05.
xx – interactions significance at P ≤ 0.01.
xx – istotność interakcji przy P ≤ 0,01.

Table 3. Body weight on performance test day (kg)

Tabela 3. Masa ciała w dniu oceny przyżyciowej (kg)

Year, Group Rok, Grupa	Crossing variant Wariant krzyżowania			Interaction – Interakcja	Significance of differences between tested years assumed as groups 1–5 Istotność różnic między badanymi latami przyjętymi jako grupy 1–5			
					PLW × PL – wbp × pbz		PL × PLW – pbz × wbp	
	PLW × PL wbp × pbz	PL × PLW pbz × wbp	average średnio		P ≤ 0.05	P ≤ 0.01	P ≤ 0.05	P ≤ 0.01
2009, 1	99A ±10	103B ±10	100 ±10		–	2, 3, 4, 5	–	2, 3, 4
2010, 2	101A ±10	104B ±10	102 ±10		–	1, 3, 4, 5	–	2, 3, 4, 5
2011, 3	102A ±10	104B ±11	102 ±10		–	1, 2, 4	–	1, 2, 5
2012, 4	103A ±9	104B ±9	103 ±9	xx	5	1, 2, 3	–	1, 2, 5
2013, 5	102A ±9	106B ±10	103 ±10		4	1, 2	–	2, 3, 4
Mean 2009–2013 Średnia 2009–2013	101A ±10	104B ±10	102 ±10					

Means in rows marked by different letters differ significantly; capital letters – P ≤ 0.01, small letters – P ≤ 0.05.
Średnie w rzędach oznaczone różnymi literami istotnie różnią się od siebie; duże litery – P ≤ 0,01, małe litery – P ≤ 0,05.
xx – interactions significance at P ≤ 0.01.
xx – istotność interakcji przy P ≤ 0,01.

had higher growth rate than [PL×PLW] animals. Only in one year of the study (2008) [PL×PLW] crossbreds had significantly higher growth rate than [PLW×PL] pigs. In Polish Large White and Polish Landrace gilts and F_1 crossbreds performance tested in 2009 in the country daily gain of body weight standardised on 180th day of life amounted 642, 648 and 629 g, respectively and in 2013 shaped on the level: 653, 651 and 635 g, respectively [Eckert and Żak 2010, Eckert et al. 2014]. Crossbred gilts [PLW×PL] and [PL×PLW] produced in the Bydgoszcz Breeding Region in 2009 had growth rate amounting 601 and 606 g, thus obtained worse result from the country average value for crossbreds, and in 2013 had daily gain of body weight at the level 611 and 614 g, respectively and had worse result by 24 g [PLW×PL] and 21 g [PL×PLW] from the country average value for crossbreds [Eckert and Żak 2010, Eckert et al. 2014]. The growth rate of particular breeds and lines and crossbreds of pigs breed in Poland and in particular regions of the country is different and changes within the space of years [Michalska 1996, Czarnecki et al. 1999 a, b, Różycki 1999, Milewska and Falkowski 2001]. Buczyński et al. [1999] indicate significant differences between the breeds of pigs regarding to kind and mutual relation of deposi-

Table 4. Daily gain of body weight standardized on 180th day of life (g)

Tabela 4. Przyrost dobowy masy ciała standaryzowany na 180. dzień życia (g)

Year, Group Rok, Grupa	Crossing variant Wariant krzyżowania			Interaction – Interakcja	Significance of differences between tested years assumed as groups 1–5 Istotność różnic między badanymi latami przyjętymi jako grupy 1–5			
					PLW × PL – wbp × pbz		PL × PLW – pbz × wbp	
	PLW × PL wbp × pbz	PL × PLW pbz × wbp	average średnio		P ≤ 0.05	P ≤ 0.01	P ≤ 0.05	P ≤ 0.01
2009, 1	601A ±57	606B ±59	603 ±58		3	2, 4, 5	–	2, 4, 5
2010, 2	593A ±55	601B ±55	595 ±55		–	1, 3, 4, 5	–	1, 3, 4, 5
2011, 3	599 ±58	598 ±53	599 ±57		1	2, 4, 5	–	2, 4, 5
2012, 4	607 ±55	609 ±52	607 ±54	xx	–	1, 2, 3, 5	–	1, 2, 3, 5
2013, 5	611a ±51	614b ±59	612 ±50		–	1, 2, 3, 4	–	1, 2, 3, 4
Mean 2009–2013 Średnia 2009–2013	602A ±56	605B ±55	603 ±55					

Means in rows marked by different letters differ significantly; capital letters – P ≤ 0.01, small letters – P ≤ 0.05.
Średnie w rzędach oznaczone różnymi literami istotnie różnią się od siebie; duże litery – P ≤ 0,01, małe litery – P ≤ 0,05.
xx – interactions significance at P ≤ 0.01.
xx – istotność interakcji przy P ≤ 0,01.

ted tissues during the growth of animals. The results of research of many authors i.e. [Fandrejewski 1992, 1997, Cameron and Curran 1995 a, 1995 b, Fuller et al. 1995] confirm that the intense improvement of pigs in direction to increase the daily gains of body weight resulted in increase of body protein deposition and in consequence to increase the meat content of animals. However, the results of some authors [Kanis 1988, Kapelański et al. 1999, 2002, Milewska and Grudniewska 1999, Urbańczyk et al. 1999, Michalska and Nowachowicz 2000, Koczanowski et al. 2001, Milewska and Falkowski 2001, Michalska et al. 2003] may show the unfavourable impact of high growth rate on slaughter value of pigs because follow the decrease of fat content and increase of meat content. Buczyński et al. [2001] regard that forcing too high growth rate may contribute to lower the profitability of pig production.

The results regarding fat content (determined on the base of standardised backfat thickness in P_2 and P_4 points and meat content (characterised on the base traits such as standardised height of loin eye in P_4 point and body meat content) of examined crossbred gilts were published in other paper [Michalska et al. 2015]. Percentage body meat content standardised on 180 days of life is estimated on performance test day on the base of ultrasonic backfat thickness measurements in P_2 and P_4 points and the height of loin eye in P_4 point standardised on 110 kg of body weight [Eckert et al. 2014]. The results of own research [Michalska et al. 2015] indicate that in analysed years (2009–2013) the meat content of examined groups of crossbred gilts was similar and amounted averagely 58.3% [PLW×PL] and 58.2% [PL×PLW]. From 2009 till 2013 the body meat content of crossbred gilts increased by 1.6% [PLW×PL] and 1.1% [PL×PLW], respectively.

The selection index is the most important parameter of performance test of pigs defining the own performance of young boars and gilts. The base to estimate selection index being the end result of performance test is daily gain of body weight and the percentage body meat content. Using in the breeding work selection index allows effective genetic improvement of animals.

Table 5 gives the selection index results, thus the most important traits of performance test. The performance test selection index of all examined crossbred gilts coming from two crossing variants, i.e. [PLW×PL] and [PL×PLW] in year 2009 shaped averagely at the level of 105 points and in 2013 amounted 110 points, thus increased by 5 points, averagely. In years 2009 and 2010 [PL×PLW] crossbred gilts obtained significantly ($P \leq 0.01$) higher performance test selection index value by 2 and 1 point, respectively compared to animals coming from [PLW×PL] crossing variant. The different results were obtained in years 2011 and 2013 because [PL×PLW] gilts had a little lower (by 1 point) statistically not confirmed selection index value than [PLW×PL] animals. In 2012 selection index shaped at identical level in both examined groups of crossbred gilts (109 points). In a total results summary from years 2009–2013 between examined crossing variants of crossbred gilts significant diversity was observed regarding to the analyzed trait and the selection index value in [PLW×PL] gilts shaped at the level of 106 points and in [PL×PLW] crossbreds amounted 107 points. Within the space of five analyzed years, i.e. 2009–2013 an improvement of body meat content occurred defined as selection index me-

Table 5. Performance test selection index (points)

Tabela 5. Indeks selekcyjny oceny przyżyciowej (pkt)

Year, Group Rok, Grupa	Crossing variant Wariant krzyżowania			Interaction – Interakcja	Significance of differences between tested years assumed as groups 1–5 Istotność różnic między badanymi latami przyjętymi jako grupy 1–5			
					PLW × PL – wbp × pbz		PL × PLW – pbz × wbp	
	PLW × PL wbp × pbz	PL × PLW pbz × wbp	average średnio		P ≤ 0.05	P ≤ 0.01	P ≤ 0.05	P ≤ 0.01
2009, 1	104A ±10	106B ±10	105 ±10		–	2, 3, 4, 5	–	2, 3, 4, 5
2010, 2	104A ±10	105B ±10	104 ±10		–	1, 3, 4, 5	–	1, 3, 4, 5
2011, 3	106 ±10	105 ±9	105 ±10		–	1, 2, 4, 5	–	1, 2, 4, 5
2012, 4	109 ±9	109 ±9	109 ±9	xx	–	1, 2, 3, 5	–	1, 2, 3, 5
2013, 5	111 ±9	110 ±8	110 ±9		–	1, 2, 3, 4	–	1, 2, 3, 4
Mean 2009–2013 Średnia 2009–2013	106A ±10	107B ±10	107 ±10					

Means in rows marked by different letters differ significantly; capital letters – P ≤ 0.01, small letters – P ≤ 0.05.
Średnie w rzędach oznaczone różnymi literami istotnie różnią się od siebie; duże litery – P ≤ 0,01, małe litery – P ≤ 0,05.
xx – interactions significance at P ≤ 0.01.
xx – istotność interakcji przy P ≤ 0,01.

asure amounted 7 points in [PLW×PL] gilts and 4 points in [PL×PLW] crossbreds. It was stated that crossbred gilts tested in the Bydgoszcz Breeding Region in 2009 obtained worse result (104 points in PLW×PL and 106 points in PL×PLW) of selection index regarding to crossbred pigs performance tested in the whole country – 109 points [Eckert and Żak 2010]. Similar trends were in 2013 because the selection index value of crossbred gilts tested in analyzed region in relation to the average value in Poland (113 points) was lower in examined animals and amounted 111 points in [PLW×PL] gilts and 110 points in [PL×PLW] crossbreds. The selection index variance analysis of examined crossbred gilts showed statistically high significant differences between particular years of performance test in examined groups of pigs. Nowachowicz et al. [2012] observed that in years 2004–2007 and in a total results summary from years 2004–2008 [PLW×PL] crossbred gilts had higher performance test selection index value compared to animals from [PL×PLW] crossing variant]. Only in 2008 [PL×PLW] gilts had statistically high significant higher performance test selection index from [PLW×PL] animals.

It should be paid a particular attention, that in the presented paper between two tested experimental factors, i.e. genotype of tested animals and the years of crossbred gilts performance test occurred in the case of analysed traits statistically high significant interactions (Tables 2–5). Confirmed statistically high significant interactions show a mutual strong influence of examined factors, thus pigs genotype and time when animals were performance tested. It confirms the merit of analysis of growth and slaughter value of pigs performance tested in the Bydgoszcz Breeding Region in analysed years taking into account these factors.

CONCLUSIONS

Summarizing obtained results it should be stated that [PL×PLW] crossbred gilts in all analyzed years (except the result from year 2011) had higher daily gain of body weight standardised on 180th day of life than [PLW×PL] animals. The growth rate of tested crossbred gilts, i.e. [PLW×PL] and [PL×PLW] improved from 2009 till 2013, because increased by 10 and 8 g. Within the space of five examined years (2009–2013) an improvement of animals breeding value occurred defined as selection index measure which increased by 7 points in [PLW×PL] gilts and by 4 points in [PL×PLW] animals. It shows an efficient improvement in range of this trait of crossbred gilts coming from the Bydgoszcz Breeding Region within the space of years 2009–2013, being the maternal component used in breeding and in commercial crossing which should be monitored in following years.

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ANALIZA WYNIKÓW OCENY PRZYŻYCIOWEJ LOSZEK MIESZAŃCÓW WYPRODUKOWANYCH W BYDGOSKIM OKRĘGU HODOWLANYM

STRESZCZENIE

Celem prezentowanej pracy była analiza wyników oceny przyżyciowej loszek mieszańców ras wielkiej białej polskiej i polskiej białej zwisłouchej, przeprowadzonej w latach 2009–2013 w bydgoskim okręgu hodowlanym. Pochodziły one z dwóch wariantów krzyżowania (w których rasę lochy podano w pierwszej pozycji): [wbp×pbz] i [pbz×wbp]. Loszki mieszańce [pbz×wbp] we wszystkich analizowanych latach (z wyjątkiem wyniku z roku 2011) odznaczały się wyższymi przyrostami dobowymi masy ciała standaryzowanymi na 180. dzień życia aniżeli zwierzęta [wbp×pbz]. Od 2009 do 2013 roku tempo wzrostu badanych loszek mieszańców, tj. [wbp×pbz] i [pbz×wbp] uległo zwiększeniu odpowiednio o 10 i 8 g. Na przestrzeni pięciu badanych lat (2009–2013) nastąpiła poprawa wartości hodowlanej zwierząt określanej miarą indeksu selekcyjnego, który wzrósł o 7 pkt. u loszek [wbp×pbz] oraz o 4 pkt. u świń [pbz×wbp]. Świadczy to o skutecznym doskonaleniu cech użytkowości tucznej i rzeźnej loszek mieszańców pochodzących z bydgoskiego okręgu hodowlanego na przestrzeni lat 2009–2013, będących komponentem matecznym wykorzystywanym w rozrodzie i w krzyżowaniu towarowym, które w kolejnych latach powinno być nadal monitorowane.

Słowa kluczowe: loszki mieszańce, ocena przyżyciowa, tempo wzrostu, indeks selekcyjny