

EVALUATION OF MEAT AND FAT CONTENT OF CROSSBRED GILTS OBTAINED FROM MULTIDIRECTIONAL CROSSING OF POLISH LARGE WHITE AND POLISH LANDRACE BREEDS OBTAINED IN THE BREEDING AREA OF KUJAWY-POMORZE REGION

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Abstract. The aim of research was the analysis of meat and fat content in two groups of crossbred gilts (52.024 individuals) produced in The Kujawy-Pomorze Breeding Region in years 2009–2013 and performance tested according to obligatory methodology. Gilts came from two crossing variants of Polish Large White (PLW) and Polish Landrace (PL) breeds: [PLW × PL] and [PL × PLW], where the sow's breed was given at first position and boar's breed at second position. It should be noticed that in analysed years, fat content measured as backfat thickness in P₂ and P₄ points decreased and the height of loin eye and meat content increased in both groups of crossbred gilts i.e. [PLW × PL] and [PL × PLW]. Efficient improvement in range of meat and fat content of crossbred gilts [PLW × PL] and [PL × PLW] produced in The Kujawy-Pomorze Breeding Region and being the component used in breeding and commercial crossing of pigs is still recommended and should be monitored in the following years.

Key words: crossbred gilts, performance test, meat content, fat content

INTRODUCTION

We noticed among the modern domestic consumers increasingly growing demand for lean meat and its products with a low share of fat [Grześkowiak 1999,

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Migdał et al. 2004]. An increase of meat content and decrease of fat content is still one of main targets in rearing and breeding of pigs in Poland, including the Kujawy-Pomorze Breeding Region. Suitable evaluation methods are used and their results are applied in the selection [Różycki 1994, 1998, 1999, Milewska and Grudniewska 1999, Milewska and Falkowski 2001]. Currently, breeding work aims to, inter alia, increase the meat content and decrease the fat content in pigs of Polish Large White and Polish Landrace breeds and their crossbreds. However, it is essential on an ongoing basis to monitor and analyse the results because an excessive increase in the productivity of animals can cause abnormalities and changes in the homeostasis of genetic relationships between traits [Falkenberg et al. 1989].

The efficiency of meat production by massive pig population is conditioned by many factors. It depends also on the meat content of the maternal component used in commercial crossing. It is required from the maternal components to be characterized by a very high level of breeding performance traits, good growth rate and proper use of the fodder, at least the average meat content and easy adaptation to local environmental conditions and high resistance to disease and stress [Różycki 1994, 1995, Dawidek 1995, Kapelański 1997, Różycki 1997, 1998].

In the national crossing programs of pigs, the following breeds belong to the maternal components: Polish Large White (PLW), Polish Landrace (PL), Pulawska, Zlotnicka White and Zlotnicka Spotted and two-breed crossbreds created from the multidirectional crossing of breeds PLW and PL [Różycki 1995, 1998, Michalska 1996, Buczyński et al. 1999, Nowachowicz et al. 2003, Michalska et al. 2006a, 2006b, Eckert and Žak 2010, 2011, 2012, Eckert et al. 2013, 2014]. The gilts of above mentioned breeds and crossbreds are performance tested and the results are one of the main criteria in the selection work and in selection of animals for breeding and producing herds [Różycki 1995, 1998, 2003, Nowachowicz et al. 2003].

The aim of the presented paper was analysis of meat and fat content of two groups of crossbred gilts created from crossing Polish Large White × Polish Landrace breeds that is [PLW × PL] and [PL × PLW] produced in The Kujawy-Pomorze Breeding Region in years 2009–2013, which are an important maternal component in fatteners production programs that use the heterosis effect.

MATERIAL AND METHODS

The results concerning meat and fat content of 52,024 two-breed crossbred gilts performance tested in years 2009–2013 according to obligatory methodology were analysed [Eckert et al. 2014]. Animals were produced in the area of The Kujawy-Pomorze Breeding Region covering Kujawy-Pomorze province. The gilts

came from two crossing variants of breeds: Polish Large White (PLW) and Polish Landrace (PL): [PLW × PL] and [PL × PLW], where the sow's breed was given at the first position and boar's breed at the second position. The number, which is closely related to the pig breeding structure in Poland and in The Kujawy-Pomorze Breeding Region, of tested crossbred gilts, which come from the analyses crossing variants, was presented in Table 1.

The backfat thickness measurements at P₂ and P₄ points and the height of loin eye at P₄ point were made by PIGLOG 105 apparatus on live animals. To improve the accuracy of assessment and to eliminate the differences resulted from the measurements on animals with different body weight, the backfat thickness and the height of loin eye are standardised on 110 kg of body weight. The particular measurements standardization was made according to obligatory formulas [Eckert and Szyndler-Nędzka 2014]:

$$P_{2st} = \frac{15.15084P_2}{0.112345Z + 2.79289}$$

$$P_{4st} = \frac{14.32432P_4}{0.100311Z + 3.29011}$$

$$P_4M_{st} = \frac{47.556226P_4M}{0.1392866Z + 32.2347}$$

where:

P_{2st} – backfat thickness measured at P₂ point standardised on 110 kg of body weight,

P_{4st} – backfat thickness measured at P₄ point standardised on 110 kg of body weight,

P₄M_{st} – height of loin eye standardised on 110 kg of body weight,

Z – body weight on the test day.

On the base of standardised measurements of backfat thickness and loin muscle, the percentage of meat content was calculated according to the formula [Eckert and Szyndler-Nędzka 2014]:

$$MB(\%) = -0.4776P_{2st} - 0.4593P_{4st} + 0.3486P_4M_{st} + 48.9829$$

To eliminate the differences resulted from the measurements on animals of different age, the percentage of meat content was standardised at the age of 180 days according to the formula [Eckert and Szyndler-Nędzka 2014]:

$$X_2 = \frac{53.564M}{-0.0004W^2 + 0.0621W + 55.346}$$

where:

X_2 – percentage of meat content standardised on age of 180 days of life,

M – percentage of meat content estimated on the test day on the basis of backfat thickness and loin muscle measurements standardised on 110 kg of body weight (M_B or M_P),

W – age of an animal on the test day.

Two-way ANOVA was used. Analysed factors were the pig crossing variant, i.e. $PLW \times PL$ (group 1) and $PL \times PLW$ (group 2) and the year when animals were performance tested. Statistica 8.0 PL computer program was used for statistical calculations [Statistica 2008].

RESULTS AND DISCUSSION

Analysed animal material was very numerous and concerned in total over 52 thousands crossbred gilts performance tested in years 2009–2013 according to the obligatory methodology (Table 1). Among tested groups of animals, more numerous were crossbred gilts coming from $[PLW \times PL]$ crossing variant – 38.554 pcs representing 74.1% comparing to $[PL \times PLW]$ pigs – 13.470 pcs, whose share was 25.9%.

Table 1. Number of crossbred gilts, individuals

Tabela 1. Liczebność loszek mieszańców, osobniki

Year Rok	Group – Grupa		Total Łącznie
	PLW x PL wbp x pbz 1	PL x PLW pbz x wbp 2	
2009	7786	3454	11240
2010	7326	2733	10059
2011	6994	2596	9590
2012	9758	2418	12176
2013	6690	2269	8959
Total – Łącznie	38554	13470	52024

The data presented in Table 2 shows that standardised backfat thickness in P_2 point on 110 kg of body weight of $[PLW \times PL]$ and $[PL \times PLW]$ crossbred

gilts in year 2009 shaped at the level of 10.8 mm and in year 2013 amounted to 9.8 mm on average, and therefore decreased. In years 2009, 2011, 2012 and 2013 [PLW × PL] crossbred gilts had significantly ($P \leq 0.01$) thinner backfat layer measured at P₂ point comparing to animals coming from [PL × PLW] crossing variant. In 2010, significant differences were not observed in this matter between tested groups of crossbred gilts. Regarding the results from 2009 and 2013, it should be noticed that backfat thickness at P₂ point decreased amounting to 1.2 mm in [PLW × PL] pigs and 1.1 mm in [PL × PLW] gilts.

Table 2. Standardised backfat thickness at P₂ point on 110 kg of body weight, mm

Tabela 2. Standardyzowana grubość słoniny w punkcie P₂ na 110 kg masy ciała, mm

Year Rok	Group – Grupa		On average Średnio	Significance of differences between tested years assumed as 1–5 groups ($P \leq 0.01$) Istotność różnic pomiędzy badanymi latami przyjętymi jako grupy 1–5 ($P \leq 0.01$)	
	PLW × PL wbp × pbz	PL × PLW pbz × wbp		PLW × PL wbp × pbz	PL × PLW pbz × wbp
	1	2		1	2
2009 (1)	10.9 ^A ± 1.6	11.1 ^B ± 1.6	10.8 ± 1.7	2, 3, 4, 5	2, 3, 4, 5
2010 (2)	10.5 ± 1.7	10.5 ± 1.8	10.5 ± 1.7	1, 3, 4, 5	1, 3, 4, 5
2011 (3)	10.2 ^A ± 1.7	10.3 ^B ± 1.7	10.2 ± 1.7	1, 2, 4, 5	1, 2, 4, 5
2012 (4)	9.9 ^A ± 1.7	10.0 ^B ± 1.7	9.9 ± 1.7	1, 2, 3, 5	1, 2, 3
2013 (5)	9.7 ^A ± 1.6	10.0 ^B ± 1.6	9.8 ± 1.6	1, 2, 3, 4	1, 2, 3
Average 2009–2013 Średnia 2009–2013	10.4 ^A ± 1.8	10.5 ^B ± 1.7	10.4 ± 1.8		

Means in rows marked by different capital letters (A, B) differ significantly each other ($P \leq 0.01$).

Średnie w rzędach oznaczone różnymi dużymi literami (A, B) różnią się istotnie od siebie ($P \leq 0.01$).

Statistically high significant interaction between tested factors (crossing variant, year of test) was observed.

Pomiędzy badanymi czynnikami (wariant krzyżowania, rok oceny) stwierdzono statystycznie wysoko istotną interakcję.

Different trends than in the case of backfat thickness at P₂ point concerned the standardised backfat thickness at P₄ point on 110 kg of body weight of tested crossbred gilts (Table 3). [PL × PLW] crossbred gilts performance tested in all analysed years had thinner backfat measured at P₄ point from pigs from [PLW × PL] crossing variant. The differences regarding the tested trait were confirmed as statistically highly significant. Analysing the results from years 2009 and 2013, it should be noticed that a small decrease of fat content occurred (by 0.5 mm) at P₄ point in [PLW × PL] crossbred gilts. In gilts coming from [PL × PLW] crossing variant, the value of analysed trait decreased at this time by a smaller value 0.2 mm. More favourable results, as in the present study, with regard to fat content of [PL × PLW] gilts comparing to the animals coming from [PLW × PL] crossing variant were also indicated in another own research [Nowachowicz et al. 2003, Nowachowicz and Michalska 2004, Nowachowicz et al. 2009], where pigs

were performance tested in years 1995–2004 according to the previous methodology.

Table 3. Standardised backfat thickness at P₄ point on 110 kg of body weight, mm

Tabela 3. Standaryzowana grubość słoniny w punkcie P₄ (mm) na 110 kg masy ciała, mm

Year Rok	Group – Grupa		On average Średnio	Significance of differences between tested years assumed as 1–5 groups ($P \leq 0.01$) Istotność różnic pomiędzy badanymi latami przyjętymi jako grupy 1–5 ($P \leq 0,01$)	
	PLW × PL	PL × PLW		PLW × PL	PL × PLW
	wbp × pbz 1	pbz × wbp 2		wbp × pbz 1	pbz × wbp 2
2009 (1)	11.1 ^A ±1.7	10.7 ^B ±1.6	11.0 ±1.6	2, 3, 4, 5	2, 3, 4, 5
2010 (2)	11.3 ^A ±1.5	11.1 ^B ±1.5	11.3 ±1.5	1, 3, 4, 5	1, 3, 4, 5
2011 (3)	11.2 ^A ±1.5	10.8 ^B ±1.5	11.1 ±1.5	1, 2, 4, 5	1, 2, 4, 5
2012 (4)	10.9 ^A ±1.4	10.6 ^B ±1.5	10.8 ±1.4	1, 2, 3, 5	1, 2, 3, 5
2013 (5)	10.6 ^A ±1.3	10.5 ^B ±1.3	10.5 ±1.3	1, 2, 3, 4	1, 2, 3, 4
Average 2009–2013 Średnia 2009–2013	11.2 ^A ±1.5	10.9 ^B ±1.5	11.1 ±1.5		

Means in rows marked by different capital letters (A, B) differ significantly each other ($P \leq 0.01$).

Średnie w rzędach oznaczone różnymi dużymi literami (A, B) różnią się istotnie od siebie ($P \leq 0,01$).

Statistically high significant interaction between tested factors (crossing variant, year of test) was observed.

Pomiędzy badanymi czynnikami (wariant krzyżowania, rok oceny) stwierdzono statystycznie wysoko istotną interakcję.

The statistical analysis showed highly significant diversity in range of standardised backfat thickness at P₂ and P₄ points between tested years, when the performance test of crossbred gilts was done (Tables 2 and 3).

Table 4 presents the results of standardised height of loin eye at P₄ point on 110 kg of body weight in years 2009–2013, which shaped for all tested crossbreds at the level of 56.0 mm on average. Crossbred gilts performance tested in all analysed years coming from [PLW × PL] crossing variant had more favourable results when it comes to this trait than [PL × PLW] pigs and differences between them were confirmed as statistically highly significant. From 2009 to 2013, standardised height of loin eye at P₄ point on 110 kg of body weight increased in [PLW × PL] crossbred gilts by 1.8 mm and in pigs from [PL × PLW] crossing variant by 1.7 mm. In tested groups of gilts, significant diversity ($P \leq 0.01$) occurred regarding the standardised height of loin eye between particular years when performance test was done – Table 4.

Table 5 presents the results of standardised body meat content on 180th day of life of two tested groups of crossbred gilts, which depends on the backfat thickness at P₂ and P₄ points and the height of loin eye at P₄ point. In the analysed years (2009–2013), the meat content amounted to 58.3% in [PLW × PL] crossbred gilts and to 58.2% in [PL × PLW] pigs on average; and thus it was similar

Table 4. Standardised height of loin eye at P₄ point on 110 kg of body weight, mm

Tabela 4. Standaryzowana wysokość oka połędwicy (mm) na 110 kg masy ciała, mm

Year Rok	Group – Grupa		On average Średnio	Significance of differences between tested years assumed as 1–5 groups ($P \leq 0.01$) Istotność różnic pomiędzy badanymi latami przyjętymi jako grupy 1–5 ($P \leq 0,01$)	
	PLW × PL	PL × PLW		PLW × PL	PL × PLW
	wbp × pbz	pbz × wbp		wbp × pbz	pbz × wbp
	1	2		1	2
2009 (1)	56.0 ^A ± 3.7	54.9 ^B ± 3.7	55.6 ± 3.8	2, 3, 4, 5	2, 3, 5
2010 (2)	55.8 ^A ± 3.9	54.6 ^B ± 4.0	55.5 ± 3.9	1, 3, 5	1, 4, 5
2011 (3)	55.9 ^A ± 4.0	54.7 ^B ± 3.4	55.6 ± 3.9	1, 2, 4, 5	1, 4, 5
2012 (4)	55.5 ^A ± 5.0	55.1 ^B ± 4.8	55.4 ± 5.0	1, 3, 5	2, 3, 5
2013 (5)	57.8 ^A ± 4.2	56.6 ^B ± 3.5	57.5 ± 4.1	1, 2, 3, 4	1, 2, 3, 4
Average 2009–2013 Średnia 2009–2013	56.2 ^A ± 4.3	55.3 ^B ± 3.9	56.0 ± 4.2		

Means in rows marked by different capital letters (A, B) differ significantly each other ($P \leq 0.01$).

Średnie w rzędach oznaczone różnymi dużymi literami (A, B) różnią się istotnie od siebie ($P \leq 0,01$).

Statistically high significant interaction between tested factors (crossing variant, year of test) was observed.

Pomiędzy badanymi czynnikami (wariant krzyżowania, rok oceny) stwierdzono statystycznie wysoko istotną interakcję.

and statistically not diversified. The differences regarding this trait between tested groups of crossbred gilts were relatively small; and thus amounting to 0.3% in 2009, 0.1% in 2010 and 0.2% in 2013; however, they were statistically highly significant. Standardised body meat content on 180th day of life of [PLW × PL] gilts was a little lower comparing to [PL × PLW] animals performance tested in 2009 and a bit higher in remaining years. It should be noticed that meat content of both [PLW × PL] and [PL × PLW] gilts improved from 2009 to 2013 by 1.6 and 1.1%, respectively. In research of Nowachowicz and Michalska [2004] and Nowachowicz et al. [2009], it was observed that [PL × PLW] crossbred gilts had better results of body meat content. When it comes to gilts of Polish Large White and Polish Landrace breeds and F1 crossbreds performance tested in Poland in 2009, standardised body meat content on 180th day of life amounted to 58.3; 57.8 and 57.7%, respectively, and in 2013 shaped at the level of 59.3; 58.8 and 58.7%, respectively [Eckert and Żak 2010, Eckert et al. 2014]. Crossbred gilts [PLW × PL] and [PL × PLW] produced in The Kujawy-Pomorze Breeding Region in 2009 had 57.5 and 57.8% of meat content and so obtained similar result to the country-average results for crossbreds, and in year 2013 had the meat content of 59.1 and 58.9%, respectively and had a better result by 0.4% [PLW × PL] and 0.2% [PL × PLW] from the country-average results for crossbreds [Eckert and Żak 2010, Eckert et al. 2014]. In the research of Nowachowicz et al. [2010], performance tested gilts [PLW × PL] in 2004–2008 similarly as in the presented study (years 2010, 2011, 2012, 2013) had higher meat content than

[PL × PLW] pigs. According to Nowachowicz et al. [2010], within the period of 5 tested years (2004–2008), an improvement of this important trait occurred by 1.4% [PLW × PL] and 1.2% [PL × PLW]. The data given in Table 5 shows that in tested groups of crossbred gilts coming from The Kujawy-Pomorze Breeding Region statistically significant diversity ($P \leq 0.01$) of the body meat content was observed among particular years when performance test was done.

Table 5. Standardised body meat content on 180th day of life, %

Tabela 5. Standaryzowana zawartość mięsa w ciele na 180 dzień życia, %

Year Rok	Group – Grupa		On average Średnio	Significance of differences between tested years assumed as 1–5 groups ($P \leq 0.01$) Istotność różnic pomiędzy badanymi latami przyjętymi jako grupy 1–5 ($P \leq 0,01$)	
	PLW × PL wbp × pbz	PL × PLW pbz × wbp		PLW × PL wbp × pbz	PL × PLW pbz × wbp
	1	2		1	2
2009 (1)	57.5 ^A ± 1.6	57.8 ^B ± 1.8	57.6 ± 1.7	2, 3, 4, 5	2, 3, 4, 5
2010 (2)	57.8 ^A ± 1.9	57.7 ^B ± 2.1	57.8 ± 1.9	1, 3, 4, 5	1, 3, 4, 5
2011 (3)	58.1 ± 1.8	58.0 ± 2.0	58.1 ± 1.9	1, 2, 4, 5	1, 2, 4, 5
2012 (4)	58.7 ± 1.7	58.6 ± 1.9	58.7 ± 1.7	1, 2, 3, 5	1, 2, 3, 5
2013 (5)	59.1 ^A ± 1.8	58.9 ^B ± 2.0	59.0 ± 1.9	1, 2, 3, 4	1, 2, 3, 4
Average 2009–2013 Średnia 2009–2013	58.3 ± 1.8	58.2 ± 2.0	58.3 ± 1.9		

Means in rows marked by different capital letters (A, B) differ significantly each other ($P \leq 0.01$).

Średnie w rzędach oznaczone różnymi dużymi literami (A, B) różnią się istotnie od siebie ($P \leq 0.01$).

Statistically high significant interaction between tested factors (crossing variant, year of test) was observed.

Pomiędzy badanymi czynnikami (wariant krzyżowania, rok oceny) stwierdzono statystycznie wysoko istotną interakcję.

It should be noticed that between two tested factors, i.e. crossing variant and the year of conducted performance test regarding to all tested traits, statistically highly significant differences were observed, which shows their strong mutual interaction.

CONCLUSIONS

Summarizing, it should be stated that tested [PLW × PL] crossbred gilts had thinner backfat measured at P₂ point (except year 2010 when the result was the same) and thicker backfat at P₄ point and more favourable result of the height of loin eye and also a bit higher meat content (except the result from year 2009) comparing to animals from [PL × PLW] crossing variant. It should be emphasized that in the analysed years, from 2009 till 2013, fat content measured as backfat thickness at P₂ and P₄ point decreased, the height of loin eye increased and meat content in both groups of crossbred gilts i.e. [PLW and PL] and [PL and PLW]

increased. An efficient improvement in the area of meat and fat content of crossbred gilts coming from two crossing variants, i.e. [PLW × PL] and [PL × PLW] produced in The Kujawy-Pomorze Breeding Region being the component used in breeding and commercial crossing is still advisable and should be monitored in following years.

REFERENCES

- Buczyński, J.T., Panek, A., Szulc, K., Fajfer, E., Luciński, P. (1999). Porównanie wyników oceny przyżyciowej loszek różnych ras [Comparison of performance of gilts of different breeds]. *Rocz. Nauk. Zootech., Supl. 3*, 87–95 [in Polish].
- Dawidek, J. (1995). Stan i perspektywy prac hodowlanych nad poprawą mięsności świń [Status and prospects of breeding on improving the meat content of pigs]. *Zesz. Nauk. Prz. Hod.*, 20, 17–30 [in Polish].
- Eckert, R., Szyndler-Nędza, M. (2014). Ocena przyżyciowa młodych knurów (w:) Stan hodowli i wyniki oceny świń w 2013 [Results of performance tested boars (in:) Report on pig breeding in Poland in 2013]. *IZ Kraków, XXXII*, 19–33 [in Polish].
- Eckert, R., Żak, G. (2010). Ocena przyżyciowa loszek (w:) Stan hodowli i wyniki oceny świń w 2009 [Results of performance tested gilts (in:) Report on pig breeding in Poland in 2009]. *IZ Kraków, XXVIII*, 35–47 [in Polish].
- Eckert, R., Żak, G. (2011). Ocena przyżyciowa loszek (w:) Stan hodowli i wyniki oceny świń w 2010 [Results of performance tested gilts (in:) Report on pig breeding in Poland in 2010]. *IZ Kraków, XXIX*, 34–44 [in Polish].
- Eckert, R., Żak, G. (2012). Ocena przyżyciowa loszek (w:) Stan hodowli i wyniki oceny świń w 2011 [Results of performance tested gilts (in:) Report on pig breeding in Poland in 2011]. *IZ Kraków, XXX*, 35–48 [in Polish].
- Eckert, R., Żak, G., Bereta, A. (2013). Ocena przyżyciowa loszek (w:) Stan hodowli i wyniki oceny świń w 2012 [Results of performance tested gilts (in:) Report on pig breeding in Poland in 2012]. *IZ Kraków, XXXI*, 35–48 [in Polish].
- Eckert, R., Żak, G., Bereta, A. (2014). Ocena przyżyciowa loszek (w:) Stan hodowli i wyniki oceny świń w 2013 [Results of performance tested gilts (in:) Report on pig breeding in Poland in 2013]. *IZ Kraków, XXXII*, 34–47 [in Polish].
- Falkenberg, H., Hammer, H., Ritter, E. (1989). Genetische und phänotypische Beziehungen zwischen Merkmalen der Mast- und Ansatzleistung von Ebern in zentralen Aufzuchtstationen, der Besamungseignung dieser Tiere sowie der Wurfleistung ihrer Schwestern. *Arch. Tier.*, 32(2), 163–172.
- Grześkowiak, E. (1999). Technologiczna i konsumpcyjna przydatność mięsa krzyżówek towarowych świń polskich ras białych z udziałem knurów ras hampshire i duroc [Technological and consumer usefulness of meat from cross breeding of Polish-White with participation of boars of Hampshire and Duroc breeds]. *AR, Szczecin, Rozprawy 190* [in Polish].
- Kapelański, W. (1997). Rasy świń i ich praktyczne wykorzystanie (w:) *Produkcja żywca wieprzowego. ODR Minikowo, 2–7*.

- Michalska, G. (1996). Efekt heterozji w zakresie cech użytkowości rozplodowej, tucznej i rzeźnej w krzyżowaniu dwurasowym prostym świń belgijskiej zwislouchej z wielką białą polską i duroc [Heterosis effects for reproductive performance, growth performance and carcass traits in two-breed reciprocal crosses of Belgian Landrace with Polish Large White and Duroc pigs]. ATR, Bydgoszcz, Rozprawy 76 [in Polish].
- Michalska, G., Nowachowicz, J., Chojnacki, Z. (2006a). Body muscling in performance-tested gilts of different breeds from the Bydgoszcz Breeding Area. Anim. Sci. Pap. Rep., Vol. 24, Suppl. 2, 213–221.
- Michalska, G., Nowachowicz, J., Chojnacki, Z. (2006b). The analysis of performance test results of Polish Landrace pigs from Bydgoszcz breeding area. Anim. Sci. Pap. Rep., Vol. 24, Suppl. 1, 57–63.
- Migdał, W., Paściak, P., Gardzińska, A., Barowicz, T., Pieszka, M., Wojtysiak, D. (2004). Wpływ czynników genetycznych i środowiskowych na jakość wieprzowiny [Effect of genetic and environmental factors on the quality of porcine meat – a review]. Pr. Mater. Zootech., Zesz. Spec., 15, 103–117 [in Polish].
- Milewska, W., Grudniewska, B. (1999). Zależność między przyrostami dziennymi a zawartością mięsa u knurków ocenianych metodą przyżyciową [The relationship between daily growth and meat content in young boars performance tested]. Międz. Konf. Nauk. „Aktualne problemy w produkcji trzody chlewnej” [Int. Sci. Conf. “Current problems in pig production”]. Olsztyn, 6 maja 1999, Wyd. ART, Olsztyn, 97 [in Polish].
- Milewska, W., Falkowski, J. (2001). Analiza wyników oceny przyżyciowej knurków czystorasowych i mieszańców F1 pochodzących z chlewni rejonu OSHZ w Olsztynie w latach 1995–1998 [Analysis of results alive assessment in boars breeds and F1 on the territory of Regional Breeding Station in Olsztyn in the years 1995–1998]. Zesz. Nauk. AR, Wrocław, 405, 181–188 [in Polish].
- Nowachowicz, J., Michalska, G. (2004). Umięśnienie i otłuszczenie loszek mieszańców w zależności od ich tempa wzrostu [Meat and fat content of crossbred gilts depending on their growth rate]. Zesz. Nauk. ATR Bydgoszcz, Zootech., 34, 79–85 [in Polish].
- Nowachowicz, J., Michalska, G., Bucek, T., Wasilewski, P.D. (2009). Meat and content of crossbred gilts born and kept in Poland in Bydgoszcz breeding region in years 1995–2004. JCEA, Vol. 10, No. 4, 367–374.
- Nowachowicz, J., Michalska, G., Bucek T., Wasilewski, P.D. (2010). Meat and fat content of crossbred gilts came from reciprocal crossing of Polish Large White and Polish Landrace breeds. “Pig Meat. Modern trends in meat production”. Polskie Towarzystwo Technologów Żywności, Oddział Małopolski, 69–75.
- Nowachowicz, J., Michalska, G., Chojnacki, Z., Wasilewski, P.D., Bucek, T. (2003). Analiza wyników oceny przyżyciowej loszek produkowanych w bydgoskim okręgu hodowlanym [The analysis of the results of performance tested gilts produced in Bydgoszcz breeding area]. Zesz. Nauk. Prz. Hod., 68(2), 25–32 [in Polish].
- Różycki, M. (1994). Hodowla i produkcja świń w Polsce [Breeding and production of pigs in Poland]. Mat. Konf. Nauk. „Współczesne zasady żywienia świń”. PAN, Jabłonna, 30–31 maja 1994, 8–17 [in Polish].
- Różycki, M. (1995). Praca hodowlana nad doskonaleniem cech użytkowych krajowego pogłowia świń [Breeding work on the improvement of the functional traits of the domestic pig population]. Prz. Hod., 2, 1-7 [in Polish].

- Różycki, M. (1997). Stan i perspektywy rozwoju hodowli i produkcji trzody chlewnej w Polsce [Status and prospects of development of breeding and production of pigs in Poland]. Międz. Konf. Nauk. „Aktualne problemy w produkcji trzody chlewnej” [Int. Sci. Conf. “Current problems in pig production”]. Olsztyn, 7 maja 1997, 16–29.
- Różycki, M. (1998). Metody oceny wartości hodowlanej (w:) Hodowla i użytkowanie świń [Evaluation methods of breeding value] Ed. B. Grudniewska. Wyd. ART, Olsztyn, 489–504 [in Polish].
- Różycki, M. (1999). Doskonalenie mięsności ras świń hodowanych w Polsce [Improvement of meat content of pig breeds reared in Poland]. Rocz. Nauk. Zootech., Supl. 3, 55–63 [in Polish].
- Różycki, M. (2003). Selected traits of Polish pedigree pig-progress in the carcass meat deposition and meat quality. Anim. Sci. Pap. Rep., Vol. 21, Suppl. 1, 163–171.
- Statistica, ARSL, 8.0 PL. (2008). StatSoft Polska.

OCENA UMIEŚNIENIA I OTŁUSZCZENIA U LOSZEK MIESZAŃCÓW UZYSKANYCH Z WIELOKIERUNKOWEGO KRZYŻOWANIA RAS WIELKIEJ BIAŁEJ POLSKIEJ I POLSKIEJ BIAŁEJ ZWISŁOCHEJ UZYSKANYCH W OKRĘGU HODOWLANYM REGIONU KUJAWSKO-POMORSKIEGO

Streszczenie. W pracy przedstawiono analizę umięśnienia i otłuszczenia dwóch grup loszek mieszańców (52.024 osob.) wyprodukowanych w bydgoskim okręgu hodowlanym w latach 2009–2013 i ocenionych przyżyciowo zgodnie z obowiązującą metodyką. Loszki pochodziły z dwóch wariantów krzyżowania ras wielkiej białej polskiej (wbp) i polskiej białej zwisłoczej (pbz): [wbp × pbz] i [pbz × wbp], w których rasę lochy podano w pierwszej pozycji a knura w drugiej. Należy podkreślić, że w analizowanych latach, miało miejsce zmniejszenie otłuszczenia mierzonego grubością słoniny w punktach P₂ i P₄, zwiększenie wysokości oka połędwicy oraz polepszenie mięsności u obu grup loszek mieszańców, tj. [wbp × pbz] i [pbz × wbp]. Skuteczne doskonalenie w zakresie umięśnienia oraz otłuszczenia loszek mieszańców [wbp × pbz] i [pbz × wbp] produkowanych w kujawsko-pomorskim okręgu hodowlanym będących komponentem wykorzystywanym w rozrodzie i w krzyżowaniu towarowym jest nadal wskazane i powinno być monitorowane w kolejnych latach.

Słowa kluczowe: loszki mieszańce, ocena przyżyciowa, umięśnienie, otłuszczenie

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