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Full Length Research Paper

Influence of cross-breeding of native breed sows of Zlotnicka spotted with boars of Duroc and polish large white (PLW) breeds on the slaughter value fatteners

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The aim of this study was the estimation of the cross-breeding influence of Zlotnicka spotted sows with boars of polish large white and Duroc breeds on carcass traits of fatteners. 50 pigs were divided into four groups: Zlotnicka spotted (ZS), Zlotnicka spotted x polish large white (ZS x PLW), Zlotnicka spotted x Duroc (ZS x D) and Zlotnicka spotted x (Zlotnicka spotted x D). Obtained results confirm the results of previous studies. It was found that animals of the native breed ZS were characterized by small height of the loin 'eye' (52.20mm), low meatiness (43.99%) and considerable backfat thickness (4.22 cm). The analysis of the cross-breeding influence on the value of slaughter traits, was confirmed by significant higher thickness and surface of the loin 'eye' in crossbred fatteners (ZS x PLW, ZS x D, ZS x (ZS x D) in comparison with purebred fatteners ZS. The highest meatiness (48%) and lowest backfat thickness (3.61cm) were observed in fatteners from group ZS x PLW. With regards to these traits, this group differed significantly from group ZS x (ZS x D). Crossbred fatteners ZS x PLW and also ZS x D had significantly higher share of meat cuts in comparison with purebred fatteners ZS and crossbred fatteners ZS x (ZS x D). However, with regards to share of fat cuts, crossbred animals ZS x PLW and ZS X D showed the significant lower capacity of these joints than groups ZS and ZS x (ZS x D). Obtained results show that crossbreeding of sows of the breed ZS with boars PLW and also D influenced significantly the value of some important slaughter traits and animals from these cross-breeding can be used for the purpose of improving economic effects of the goods production.

Key words: Pigs, Zlotnicka spotted, crossbreds, slaughter value.

INTRODUCTION

It has been observed that carcass traits of swine breeds reared for meat usually have some faults, which makes them unsuitable for traditional culinary processes and aims. Therefore, the meat industry in many countries and also in Poland increases the interest of native races of the unique genetic value which at proper feeding, provide the raw material particularly useful to the production of raw-ripen products. In Poland, native pigs belong to the following breeds: Zlotnicka spotted (ZS), Zlotnicka White and Pulawska breeds. Many European countries take special care of their own old races of pigs (Salvatori, 2008; Szulc, 2009). Carcasses of these pigs have the thick backfat and meat is prized for its organoleptic traits. Carcasses of these pigs are also the raw material to the production of the raw-ripen ham. In Pie Noir du Pays Basque, the old race is prized for the production of the Basque ham (Szulc, 2010). In Spain, the native race Iberico is highly valued for the production of dry-cured hams and loins. In this country, 2.6 millions of Iberian

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Abbreviations: PLW, Polish large white; **ZS,** Zlotnicka spotted; **D,** Duroc.

Table 1. Proximate composition of diets.

Item	Diet		
	Starter	Grower	Finisher
Dry matter (%)	90.29	90.28	90.56
Energy (MJ/kg)	13.46	12.63	12.46
Crude protein (%)	16.26	17.31	14.79
Digestible energy (%)	13.65	14.65	12.65
Crude fibre (%)	3.45	4.16	3.90
Crude fat (%)	3.58	1.95	2.01
Ash (%)	4.73	4.98	4.77
Ca (%)	0.81	0.79	0.77
P (%)	0.67	0.62	0.61
Lysine (%)	1.11	0.99	0.79

hams are produced annually and the production of these dry-cured hams is nowadays the known mark in many countries (Serrano et al., 2008).

As it was reported by Buczyński et al. (2001), Grześkowiak et al. (2006), Strzelecki et al. (2006), and Buczyński et al. (2005), traditional Polish breeds are good and thus are quite popular because of their meat quality and quantity but one of the major disadvantages of these breeds is their low meat content (44 to 46%) comparatively, which is significantly lower in comparison with modern breeds and from here is not favoured by many commercial meat processors. It was reported by Buczyński et al. (1996), Grześkowiak et al. (2006), Strzelecki et al. (2006), Michalska and Chojnacki (2005) and also Nowachowicz (2005) that the crossbreeding project was initiated with ZS swine with breeds having the better meat content.

Buczyński et al. (2001) and Nowachowicz (2005) reported that Pietrain was the breed chosen for such crossbreeding projects. Using the race Pietrain, there was observed increase of meatiness. However, it also led to the deterioration of qualitative traits of the meat. It also led to the need of initiating the project, in which qualitative traits can be improved besides the meat quantity as whole.

MATERIALS AND METHODS

The study was conducted in Jaworowo near Gniezno (17˚36 E, 52˚32 N), with both purebred and crossbred swines of ZS, Duroc (ZS x D) and polish large white (ZS x PLW). Races Duroc and also PLW were chosen with regards to the good quality of the meat. In Poland, both are used widely as components for cross-breeding. Animals were divided into four experimental groups with equal numbers of sows and boars. All animals were tattooed and ear-marked. Experimental animals having the average weight of 20 kg were selected and the experiment ended when animals reached the slaughter weight of about 120 kg (113.0 to 123.6 kg). The experiment was divided into starter (20 to 30 kg), grower (30 to 80 kg) and finisher (over 80 kg) rations. The approximate composition of the diets is shown in Table 1. The rations in all the three stages were similar for all three genotypes. Fatteners were kept in collective coops with 35 animals on the plate bedding. Animals were fed *ad libitum* using the collective feeding and there was the stable approach to water all the time.

After obtaining the final fattening, animals were transported from the farm to the slaughter-house located in the distance of about 50 km. Animals rested for about 2 h prior to slaughtering. Fatteners were stunned before slaughter. The carcasses were weighed with having the precision of 100 g electronic scales typical in polish slaughter-houses 30 min after slaughter and the meat content was estimated the with the help of the optical-needle apparatus CGM made by the Sydel firm (in France). The backfat thickness was also measured in 5 points on the lying right half-carcass (accurate to 0.1 cm); 1) in the thickest point over the shoulder; 2) on the back - between the last thoracic vertebra and the first lumbar vertebra; 2, 3, 4) in three points over the lumbar loin (on the cross I, II, III): for example under the beginning, middle and end of the section of gluteus medius muscle (Borzuta, 1998). Later, half-carcasses were cooled down using the mono-gradual system to about 4°C. After the 24 h cycle of cooling down, carcasses were transported to the factory in Bieganów on the distance of about 30 km where they were cut down into fundamental cuts according to the method given in the Polish norm (PN-86-A/82002). Cuts were weighted with the scales having the precision of ± 1 g. Obtained results were analysed statistically using STATISTICA 6.0 by calculating arithmetic means and the standard deviation. One-way analysis of variance was conducted and significance of differences between genetic groups was identified with the Tukey's test (Stanisz, 1998).

RESULTS AND DISCUSSION

The studied fatteners had weak traits of the slaughter value (Tables 2, 3 and 4). The observed slaughter productivity oscillated from 73.33 to 78.54% and was approximate to the results obtained earlier by other authors (Kapelański et al. 2006; Wajda and Meller, 1996; Kapelański and Rak 1999). The meat content in the pig carcass of the race Zlotnicka spotted was estimated as low. In our studies, it amounted to 43.99% and the lowest meat content was found in crossbreds ZS x ZS/ D while the highest one was in crossbreds ZS x PLW ($P \leq 0.05$).

Kapelański et al. (2006) obtained the average meatiness as 44.69% but in turn, Szulc et al. (2006)

Table 2. Formation of slaughter traits of fatteners taking into consideration the genetic group.

Trait	Genetic group			
	ZS	ZS x PLW	ZS x D	ZS x (ZS x D)
Slaughter weight (kg)	114.00[a] ±11.05	113.10[a]±5.97	113.00[a]±8.03	123.60[b]±7.90
Hot carcass weight (kg)	88.92±6.29	87.26±5.76	88.57±5.46	90.57±6.08
Slaughter productivity (%)	78.25±5.39	77.24±4.93	78.54±4.60	73.33±5.06
High of the loin 'eye' (mm)	52.20[a]±6.25	61.89[b]±11.61	60.10[b]±7.55	61.00[b]±6.88
Loin 'eye' area (cm^2)	29.61[a]±5.46	35.97[b]±5.61	35.24[b]±4.77	36.63[b]±7.05
Meat content (%)	43.99±5.54	48.00[a]±3.47	45.02±3.61	42.47[b]±3.41

[a, b]Means along the same row with different superscripts are significant (P≤0.05). Values are mean± SD.

Table 3. Formation of the backfat thickness in fatteners taking into consideration the genetic group.

Trait	Genetic group			
	ZS	ZS x PLW	ZS x D	ZS x (ZS x D)
Backfat thickness over shoulder (cm)	5.42±0.86	4.70[a]±0.77	5.35±0.49	6.08[b]±0.75
Backfat thickness on the back (cm)	3.13±0.95	2.72[a]±0.46	2.87±0.51	3.29[b]±0.70
Backfat thickness on the cross I (cm)	4.40[b]±0.94	3.61[a]±0.38	3.88±0.70	4.45[b]±0.64
Backfat thickness on the cross II (cm)	3.63±0.97	3.04[a]±0.45	3.20±0.66	3.92[b]±0.62
Backfat thickness on the cross III (cm)	4.54±1.26	3.96[a]±0.51	4.00±0.70	4.82[b]±0.63
Backfat thickness from five measurements (cm)	4.22±0.93	3.61[a]±0.36	3.86±0.58	4.51[b]±0.57

[a, b]Means along the same row with different superscripts are significant (P≤ 0.05). Values are mean± SD.

Table 4. Productivity of cuts in analysed carcasses.

Trait	Genetic group			
	ZS	ZS x PLW	ZS x D	ZS x (ZS x D)
Pork-chop (%)	8.08[a]±0.79	9.01[b]±0.72	9.00[b]±0.66	8.02[a]±0.69
Ham with shank (%)	25.38[a]±1.32	26.14[b]±1.47	26.49[b]±1.31	25.34[a]±1.23
Neck (%)	6.12±0.78	5.99±0.53	5.77±0.64	5.95±0.61
Shoulder with shank (%)	13.30±0.96	13.48±1.24	13.68±0.74	13.08±1.17
Sum of four meaty cuts down (%)	52.88[a]*	54.62[b]	54.94[b]	52.39[a]
Belly with bone (%)	9.92±1.38	9.65±1.48	9.24±3.16	10.56±1.21
Backfat with skin (%)	13.71[a]±2.57	11.92[b]±1.53	12.35[b]±2.37	15.10[a]±1.83
Dewlap (%)	4.84±0.58	4.55±0.53	4.31±0.89	4.68±0.77
Grain (%)	2.19±0.77	2.36±0.86	2.84±1.03	2.55±0.72
Sum of four fat cuts	30.66[a]*	28.48[b]	28.74[b]	32.89[a]

[a, b]means along the same row with different superscripts are significant (P≤ 0.01). Values are mean± SD ; *values are expressed as mean.

noted the meat content as 47%. Similar results were obtained by Grześkowiak et al. (2007). In the experiment, on cross-breeding of the Zlotnicka White race with race PLW conducted by Strzelecki et al. (2006), they obtained similar effects as in this work and for example meatiness increased from 46.4 to 49.7%. The increase of the surface of the loin 'eye' was observed from 36 to 42 cm^2 but the medium backfat thickness decreased from 4.1 to 3.1 cm. In this work, it was noticed that the surface of the loin 'eye' was small and was about 30 cm^2. It confirms the results of earlier research (Kapelański and Rak, 1999; Grześkowiak et al., 2007). Height of the loin 'eye' was higher significantly in crossbreeds groups than in purebred groups ZS. The backfat in Zlotnicka pigs was rather thick and the mean from five measurements was 4.22 cm. In other studies, it was noticed that the thinner backfat was 3.3 cm as was given by Kapelański and Rak (1999), 3.2 cm by Grześkowiak et al. (2009) and 2.4 cm by Kapelański et al. (2006). The highest mean of the backfat thickness in the five points was found in group ZS x Z/D, and the lowest one was in group ZS x PLW. Between groups, significant difference was found in the

backfat thickness in all the measured points.

Higher productivity of pork-chop than for ham was found in crossbreeds ZS x PLW and ZS x D lacked significant differences in the productivity of shoulder and neck. The share of four cuts (pork-chop, ham, shoulder, neck) in these groups were found on the average from 54.6 to 54.9% and was bigger; about 2% in comparison with the remaining groups. Grześkowiak et al. (2006) showed the increase of the share of the pork-chop, neck and shoulder in crossbreds ZS x PLW. Improvement of the slaughter value in crossbreds with Duroc in comparison with purebred fatteners, was observed for race Cinta Sense. In crossbreds, the productivity of four cuts increased from about 54 to about 68% (Franci et al., 2003). Studies were conducted on native races in other European countries pointing to the worse muscularity, bigger backfat thickness and lower share of ham, shoulder blade and pork-chop in comparison with Duroc (Serrano et al., 2008).

It should be also noted that fattening of native pigs in Italy and in Spain had body mass of about 140 to 150 kg; about 40 kg higher than that in Poland. It resulted from the destiny of this raw material to the production of raw-ripen manufacturers. In Poland, possibilities of using native pigs and their crossbreds to such production, particularly in the light of the obtained result in this work should be considered.

Conclusion

Analyzing the influence of cross-breeding on the results of the slaughter utility, showed that animals of all crossbred groups had significant bigger thickness and surface of the loin ‘eye’ in comparison with purebred fatteners. Fatteners from group ZS x PLW, had the highest meatiness which was on the average 48%. The lowest meatiness was found in animals from groups ZS x (ZS x D) and the difference among these groups was statistically significant.

The thinnest backfat was observed in fatteners from group ZS x PLW (3.61 cm) while the thickest (4.51 cm) was in animals from group ZS x (ZS x D). Difference was found among these groups, which proved significant bigger share of four meaty cuts in comparison with purebred fatteners ZS and also crossbreds ZS x (ZS x D). In turn, with regards to share of fat cuts, crossbred animals ZS x PLW and ZS x D showed the lower content of these cuts (P≤0.05) than groups ZS and ZS x (ZS x D).

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