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Effects of Sex and Breed on Meat Quality and Sensory Properties in Three-way Crossbred Pigs Sired by Duroc or by a Synthetic Breed Based on a Korean Native Breed

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Abstract This study was conducted to determine the effects of breed and sex on meat quality and sensory properties of the loin in three-way crossbred pigs: Landrace×Yorkshire×Duroc (LYD) and Landrace×Yorkshire×Woori (LYW) black pig synthesized by Korean native breed. Carcass traits did not differ by breed. Carcass weight and backfat thickness were higher in castrates than in gilts ($p<0.01$). LYW showed significant high values in fat content, cooking loss, and water-holding capacity (WHC) than LYD ($p<0.05$). Redness and yellowness of the meat were higher in LYW than in LYD ($p<0.01$). Further, LYW had lower pH and shear force than LYD ($p<0.001$). Significant high scores in color and flavor were obtained in LYW or gilts compared to LYD or castrates by sensory panel, respectively ($p<0.05$). However, other sensory traits did not differ by breed or sex. Capric acid (C10:0) was higher in LYD than LYW ($p<0.001$). However, stearic acid (C18:0) and saturated fatty acid (SFA) contents were higher in LYW than LYD ($p<0.05$). Eicosenoic acid (C20:2) and the n6/n3 ratio were higher in gilts than in castrates, whereas SFA content was higher in castrates than in gilts. These results suggest that certain physicochemical qualities of meat and sensory properties are improved in LYW compared to LYD. This study could provide basic data on meat quality of crossbred pigs with Woori black pig as a terminal sire.

Keywords three-way crossbred, Korean native pig, Woori black pig, sensory property, meat quality

Introduction

Pork meat quality is an economically important trait (Sosnicki et al., 2003). South Korean consumers prefer high-quality pork with high marbling and redness. Currently, most of the pork is produced from Landrace×Yorkshire×Duroc (LYD) crossbred pigs owing to their economic benefits such as high litter size, growth trait, and meat quality (Hong et al., 2001; Jin et al., 2005). Furthermore, Duroc has been widely used as a sire

to improve average daily gain weight and meat quality (Latorre et al., 2003). Consequently, the use of Duroc boars as terminal sires is high (76%) in the artificial insemination center of South Korea (Sa et al., 2015). While Korean native pigs are more suitable for roasting because of the high redness, tenderness, and higher intramuscular fat content of their meat, there has been a significant decrease in their use because of their low growth rate and reproduction performance, and high backfat thickness (Kim et al., 2002). However, since the Nagoya Protocol has established obligations for its contracting parties to implement strategies related to access to genetic resources, benefit-sharing, and compliance, the conservation and utilization of indigenous genetic resources have become more important (Oh, 2013). Therefore, many countries have tried to improve the low economic traits of native pigs by breeding them with other breeds. In Spain, Iberian×Duroc crosses are popularly used to improve slaughter weight and meat yield (Ramírez and Cava, 2007). Thai native pigs have been increasingly crossed with European commercial breeds for improving economically important traits (Glinoubol et al., 2015).

The National Institute of Animal Science in Korea has developed a new synthetic breed of pig, the Woori black pig, using a Korean native pig and Duroc to improve the low economic traits of Korean native pigs. Woori black pig was registered as a new breed in the Food and Agriculture Organization Domestic Animal Diversity-Information System in 2015. The present study aimed to investigate the effect of crossbreeding on carcass traits and meat quality using LYD and Landrace×Yorkshire×Woori black pig (LYW).

Materials and Methods

Sample preparation

The present study evaluated a total of 59 offspring from the three-way crossbreeding systems, LYD (n=29) and LYW (n=30). The pigs were maintained according to the guidelines approved by the National Institute of Animal Science. The carcasses were cooled in a chilling room for 24 h and graded. Samples of meat were prepared by method modified partly of Lim et al. (2014). Subsequently, the *longissimus dorsi* (LD) muscle was sampled from the left side of the carcasses and was ribbed between the 13th rib and the first lumbar vertebra. The samples were vacuum-packed and transported to the laboratory, where they were frozen at -20°C until further analyses. The frozen samples were cut into sub-samples. The sub-samples were vacuum-packed in oxygen-impermeable polyethylene bags and stored at -20°C until further analyses.

Measurement of pH

Three grams of sample was homogenized in 27 mL of distilled water for 60 s using a homogenizer (Polytron PT 10-35GT, Kinematica AG, Switzerland). The pH of the sample was determined using a pH electrode (Orion 2 Star, Thermo Scientific, USA). The electrode was calibrated with standard buffers of pH 4.01 and 7.00, and equilibrated at 25°C .

Determination of moisture and total lipid contents

Moisture content of the samples was determined by a slightly modified method of the Association of Official Agricultural Chemists (AOAC, 2000). Three grams of meat sample was placed in an aluminum moisture dish and dried in a hot-air oven at 104°C for 24 h. The moisture content was calculated from the dry weight of the sample and determined in triplicate for each sample. Lipids were extracted from 5 g meat samples using Folch solution containing chloroform/methanol (2:1, v/v; Folch et al., 1957). The total lipid separated was stored at -70°C before analysis of fatty acids.

Determination of cooking loss, Warner-Bratzler shear force, and water-holding capacity

Cooking loss, Warner-Bratzler shear force (WBSF) and water-holding capacity (WHC) were tested according to method of Lim et al. (2014). Briefly, a sample block of approximately 3 cm in height was placed in a polyethylene bag. The package was weighted and heated in a water bath at 80°C for 30 min and cooled at room temperature for 30 min. Cooking loss (%) was calculated as the weight loss of the meat after cooking. The WBSF was measured in the cooked samples (4×3×2.5 cm) after chilling. Each chilled sample was cut into six replicate core samples of 1.3 cm diameter, and WBSF was measured using an Instron Universal Testing Machine (Model 4400, Instron, USA). The WHC was determined by procedure of Kristensen and Purslow (2001). The 5 g sample was centrifuged and then weighted before and after centrifugation to obtain water loss in meat. Difference of the sample weights was calculated as this equation: $WHC (\%) = [1 - (\text{moisture content extracted by centrifugation} / \text{moisture content in original meat})] \times 100$.

Determination of meat color

Meat color was measured after blooming for 30 min at room temperature using a Minolta Chroma meter (CR-410, Minolta, Japan). The color coordinates were set to lightness (L^*), redness (a^*), and yellowness (b^*). The color values were obtained using an average value from three repeated measurements taken at different locations on the surface of the meat. The chroma meter was standardized using a white calibration plate ($L^*=89.2$, $a^*=0.921$, and $b^*=0.783$).

Analysis of fatty acids

Total fat was extracted according to the method of Folch et al. (1957) for free fatty acid analysis. After thawing, the lipids in 5 g of LD muscle sample were extracted in a mixture of chloroform/methanol (2:1) with butylated hydroxytoluene. Fatty acid methyl esters (FAMES) were allowed to form using potassium hydroxide solution in methanol, and were extracted with water and hexane. The top hexane layer containing the FAMES was dehydrated using anhydrous sodium sulfate. The extracted and dehydrated hexane was transferred to a vial for analysis. Separation and quantification of the FAMES were conducted using a gas chromatography (Agilent 7890N, Agilent Technologies, Korea) with a flame ionization detector and capillary column (30 m, 0.32 mm i.d., 0.25 μm ; Omega wax 320, Supelco, USA). Injection volume of sample was 1 μL into split inlet with 100:1 of split ratio. As carrier gas, high pure nitrogen was used and flow rate was 1 ml/min. Oven temperature was initially held at 180°C for 5 minutes, and then increased at 2.5°C/min to 200°C and hold for 25 minutes. Injector and detector temperatures were 250°C and 260°C, respectively. Fatty acids, saturated fatty acid (SFA), mono-unsaturated fatty acid (MUFA), poly-unsaturated fatty acid (PUFA), PUFA/SFA and n-6/n-3 were expressed as a percentage on identified total fatty acids.

Sensory evaluation

The meat sample was heated to an internal temperature of 75°C using gas burner. Samples of meat (2×3×1.5 cm) were placed in a coded white dish and given drinking water. Semi-trained panelists have a 9 point pleasure scale (1, deeply dislike; 5, moderately liked; 9, deeply liked). The sensory parameters tested were color, odor, taste, texture and overall acceptability. All samples were labeled with random three-digit numbers and presented to panelists in random order. For sensory evaluation, panelists were asked to subjectively rating the color, odor, taste, texture and overall acceptability of the samples.

Statistical analyses

Data are reported as the mean±standard deviation. The data were analyzed using SAS 9.4 (2003). A two-way analysis of

variance (ANOVA) (breed, sex) with (breed×sex) interaction was conducted. Means between two groups were compared using the *t*-test. Duncan's multiple range test was applied to compare the mean values of the breed. Differences were considered significant at $p<0.05$.

Results and Discussion

Carcass characteristics

The carcass characteristics of crossbred pigs with either Duroc or Korean native pig as the terminal sire are shown in Table 1. The live weight, market weight day, carcass weight, and backfat thickness were not different between LYD and LYW pigs. Carcass weight and backfat thickness were higher in castrates than in gilts ($p<0.01$). Only live weight showed a breed×sex interaction effect by cross line between breed and sex in interaction plot ($p<0.05$).

Native breed pigs are used for producing commercially optimal crossbreeds because of consumer preferences (García-Gudiño et al., 2013; Kim et al., 2014; Ramírez and Cava, 2007). However, carcass traits of the crossbred pigs can be reduced because of the low growth rate of the native breed. Choi et al. (2005) reported that Korean native pigs of 210–270 days old presented lower live and carcass weights (76 and 55 kg, respectively) than 180-day-old commercial pigs (L, Y, D, and LYD; 93.5–103.1 kg and 72.2–77.57 kg, respectively). According to Cho et al. (2007a), the average weight of 280-day-old Korean native castrates and gilts was 74.7 and 75.5 kg, respectively. Therefore, Korean researchers have tried to improve the growth rate of Korean native pigs; the results showed that the live weight, carcass weight, and backfat thickness of 254-day-old Korean native castrates were 102.3 kg, 71.3 kg, and 2.72 mm, respectively (Kim et al., 2013a). Comparably, crossbred gilts (DKD×DK) reached a live weight of 104.7 kg and a carcass weight of 80.91 kg at the age of 190 days, which are similar to those of pure Duroc (Kim et al., 2014). These results are similar to the findings of the present study, in which we observed no differences in carcass traits between LYD and LYW. However, the carcass weight and backfat thickness were influenced by sex in this study. The results of the present study were in agreement with the findings of Kim et al. (2013a), who reported that castrates have a higher carcass weight, yield, and backfat thickness than gilts. These results can be indicated to control carcass traits by the sex rather than the breed in the pigs. Therefore, woori black pigs might be to have possibility as sire in domestic swine farms on behalf of Duroc.

Physicochemical qualities of meat

Table 2 presents the physicochemical traits of the loin in crossbred pigs using either Duroc or Korean native pig as the

Table 1. Carcass characteristics between loin of crossbred pigs sired either Duroc or synthetic breed based on Korean native breed

Items	Breed ¹⁾		Sex		Significance		
	LYD	LYW	Castrate	Gilt	Breed	Sex	Breed×Sex
Live weight (kg)	120.2±8.17 ²⁾	117.4±10.41	120.5±10.05	117.0±8.51	ns	ns	*
Market weight (day)	162.3±1.3	162.5±1.0	162.2±1.14	162.6±1.21	ns	ns	ns
Carcass weight (kg)	96.38±6.95	93.10±8.34	97.37±8.21	91.97±6.39	ns	**	ns
Carcass backfat thickness (mm)	29.03±5.78	28.60±5.13	31.23±5.32	26.31±4.34	ns	***	ns

¹⁾ LYD, Landrace×Yorkshire×Duroc; LYW, Landrace×Yorkshire×Woori black pig based on Korean native breed.

²⁾ Values are mean±standard error.

* $p<0.05$, ** $p<0.01$, *** $p<0.001$.

ns, not significant.

terminal sire. Moisture content ranged from 72.88% to 73.01% and was not influenced by breed or sex. These values were within the ranges reported previously from Korean native pig (Kim et al., 2013a) and cross bred pig with Korean native breed (Kim et al., 2014). However, other studies (Lim et al., 2014; Oh et al., 2008) reported lower moisture contents, ranging from 69.01 to 63.74%. This variation might be attributed to the age and breed of the pigs. In the present study, LYD and LYW pigs were killed and sampled at an age of approximately 160 days. However, Lim et al. (2014) and Oh et al. (2008) used synthetic pigs LB (L×Berkshire (B)), YB, and YL that were slaughtered at the age of 90 days. Indeed, older pigs reportedly show greater moisture content than younger pigs (Virgili et al., 2003). Kim et al. (2000) reported differences in moisture content among the breeds D, L, B, and Tamworth (Kim et al., 2000), whereas Korean native pigs had a moisture content similar to that of BB and YBB (Kim et al., 2008). Furthermore, Iberian×D pigs showed no effect of sex on moisture content (Ramírez and Cava, 2007). Therefore, the fact that we did not observe a difference in moisture content might be attributed to crossbreeding way, rather than breed or sex.

LYW showed a higher fat content than LYD ($p<0.01$) in the present study; however, fat content did not differ by sex (Table 2). Similarly, crossbreeds of Korean native pigs and Korean native pigs had higher fat content than LYD and other commercial breeds, such as LL, DD, and YY (Kim et al., 2014; Choi et al., 2005). Findings of previous studies are similar to the results of the present study, that is, fat content of LYW is increased (4.38%) compared with that of LYD (3.30%). Further, fat content is negatively correlated with shear force (Hodgson et al., 1991). Accordingly, in the present study, LYW presented lower shear force (3.08 kg/cm²) than LYD (3.93 kg/cm²) ($p<0.001$, Table 2). This observation is in agreement with the findings of a previous study, where the shear force of the meat of half-Chinese native pigs (D×LiangShan) was lower than that of DLY (Luo et al., 2017).

In the present study, cooking loss was greater in LYW (13.9%) than in LYD (12.48%, $p<0.01$), and lower in the castrates (12.6%) than in the gilts (13.9%, $p<0.05$, Table 2). However, it did not show an interaction effect of breed and sex (Table 2). These results are similar to the findings of previous studies. Kim et al. (2013a) reported lower cooking loss in castrates (26.8%) than in gilts (22.5%) of Korean native pigs. Magowan et al. (2011) reported that boars show high cooking loss as compared with gilts (28.7 vs. 27.8%). Although the present study and previous studies showed the effect of breed and sex

Table 2. Physicochemical traits between loins of crossbred pigs sired either Duroc or synthetic breed based on Korean native breed

Items ¹⁾	Breed ²⁾		Sex		Significance		
	LYD	LYW	Castrate	Gilt	Breed	Sex	Breed×Sex
Moisture (%)	72.88±0.90 ³⁾	73.01±1.73	72.94±1.46	72.95±1.30	ns	ns	ns
Fat (%)	3.30±1.14	4.38±2.05	3.95±1.62	3.73±1.87	*	ns	ns
Shear force (kg/cm ²)	3.93±0.90	3.08±0.78	3.37±0.99	3.62±0.88	***	ns	ns
Cooking loss (%)	12.48±1.94	13.90±1.98	12.60±1.82	13.93±2.15	**	*	ns
WHC (%)	74.51±4.58	78.12±6.20	75.14±5.53	77.60±5.73	*	ns	*
pH	5.57±0.11	5.41±0.08	5.49±0.12	5.48±0.12	***	ns	ns
Meat color							
Lightness	46.89±1.86	46.53±1.50	47.06±1.60	46.34±1.72	ns	ns	ns
Redness	14.69±1.06	15.37±0.64	15.06±0.80	15.01±1.06	**	ns	ns
Yellowness	6.63±0.94	7.45±0.67	6.99±1.02	7.09±0.78	***	ns	ns

¹⁾ WHC, water holding capacity.

²⁾ LYD, Landrace×Yorkshire×Duroc; LYW, Landrace×Yorkshire×Woori black pig based on Korean native breed.

³⁾ Values are mean±standard error.

* $p<0.05$, ** $p<0.01$, *** $p<0.001$.

ns, not significant.

on cooking loss in meat, some studies have reported the contrary. Oh et al. (2008) reported no difference in cooking loss among LYD (32.5%), YB (31.0%), and LB (31.9%). Four pig breeds (Norwegian L, Pietrain from Austria and Belgium, and Tempo) showed no difference (27.7–28.6%) in cooking loss (Magowan et al., 2011). Similarly, in a crossbreed using Spain native pigs, cooking loss was not influenced by both breed and sex (Franco et al., 2014). These variations could be caused by various factors. Magowan et al. (2011) reported that heavier pigs compared with lighter showed lower cooking loss (27.5 vs. 29.0%) than lighter pigs at finish weight. According to Madzimure et al. (2017), different cooking loss may be attributed by cooking processes such as heating temperature and time. However, in the present study, the live weight was comparable to between breed or between sexes. Furthermore, the values of cooking loss in the present study were substantially lower than those reported in previous studies. This might be attributed to differences in the cooking process.

In the present study, LYW showed higher WHC and lower pH than LYD, whereas these traits did not differ with sex ($p < 0.05$, Table 2). An interaction between breed and sex was observed in WHC. According to the review of Huff-Lonergan and Lonergan (2005), WHC is one of the important meat properties and is influenced by multiple factors. Particularly, a rapid decrease in pH or very low pH decreases the WHC. However, in the present study, an inverse tendency was observed. Generally, the loin, as a skeletal muscle, consists of various types of muscle fibers, which are classified as MyHC type I, IIa, and IIb (Peter et al., 1972). Korean native pigs have higher type I muscle fiber and lower drip loss than Landrace pigs (Park et al., 2007). Drip loss and moisture content were positively correlated with type IIb muscle fiber in a Korean native crossbreed (Kim et al., 2013b). In addition, a correlation coefficient of 0.33 for type I muscle fiber with pH has been reported (Kim et al., 2013b). These previous findings indicate that muscle fiber composition can affect the WHC and pH in meat. Therefore, the opposite tendency observed in the present study might be due to a difference in the muscle composition. Further studies are necessary to determine muscle fiber types of crossbreeds with Korean native pigs.

Although the lightness of loin was not affected by breed and sex in the present study, redness and yellowness were greater in LYW than LYD ($p < 0.01$, Table 2). However, none of the color traits were affected by sex and by an interaction between breed and sex. These findings were in agreement with those in previous studies. Kim et al. (2014) reported higher redness in pigs crossbred with Korean native than in those crossbred with Duroc. Similarly, the meat of LYD showed lower redness and higher yellowness than the meat of Korean native pigs (Choi et al., 2005; Kim et al., 2008).

Fatty acid composition in loin

Capric acid (C10:0) content in the loin of LYD was higher than that in the loin of LYW (Table 3, $p < 0.001$). However, LYW showed higher stearic acid (C18:0) content than LYD ($p < 0.001$). Eicosenoic acid (C20:2) content was higher in the gilts than in the castrates ($p < 0.01$). Further, LYW and castrates exhibited higher SFA than LYD and gilts ($p < 0.01$ and $p < 0.05$, respectively). Other fatty acids were not affected by breed and sex, or their interaction.

The fatty acid composition of pork meat is influenced by the breed (Kim et al., 2008). In the present study, stearic acid was higher in LYW (13.0%) than in LYD (11.9%). This observation is comparable to findings in native crossbreeds or pure native breeds compared with crossbred pigs in previous studies (Franco et al., 2014; Kim et al., 2014). Furthermore, sensory properties are influenced by the fatty acid profile of pork (Cho et al., 2007b), and the percentage of SFA reportedly is positively correlated with sensory property (Cameron and Enser, 1991). In the present study, LYW had statistically significantly higher SFA percentage (39.4 vs. 38.4%), color (5.9 vs. 5.6), and flavor (5.9 vs. 5.5) than LYD. This is consistent with the findings of earlier studies. However, in the present study, the effect of sex on the sensory properties and fatty acid composition was in discord with the results of former studies. These studies suggested that compared with boars, gilts have

Table 3. Fatty acid compositions between loins of crossbred pigs sired either Duroc or synthetic breed based on Korean native breed

Items ¹⁾ (%)	Breed ²⁾		Sex		Significance		
	LYD	LYW	Castrate	Gilt	Breed	Sex	Breed×Sex
C10:0	0.14±0.01 ³⁾	0.10±0.01	0.12±0.02	0.12±0.02	***	ns	ns
C12:0	0.10±0.02	0.09±0.01	0.09±0.01	0.09±0.01	ns	ns	ns
C14:0	1.40±0.20	1.38±0.11	1.40±0.11	1.38±0.19	ns	ns	ns
C16:0	24.70±1.35	25.10±1.05	25.26±1.02	24.53±1.29	ns	ns	ns
C16:1	3.08±0.42	3.04±0.37	3.15±0.37	2.97±0.41	ns	ns	ns
C18:0	11.85±1.37	12.99±0.93	12.46±1.15	12.40±1.45	***	ns	ns
C18:1	44.52±1.65	43.85±1.91	44.29±1.15	44.06±2.08	ns	ns	ns
C18:1-trans	0.23±0.06	0.25±0.04	0.24±0.04	0.25±0.06	ns	ns	ns
C18:2	7.95±1.61	7.51±1.56	7.35±1.28	8.13±1.80	ns	ns	ns
C18:3	0.63±0.09	0.65±0.06	0.65±0.08	0.63±0.06	ns	ns	ns
C20:2	0.25±0.05	0.25±0.03	0.24±0.03	0.27±0.04	ns	**	ns
C20:3	0.23±0.06	0.22±0.07	0.21±0.06	0.24±0.08	ns	ns	ns
C20:4	1.61±0.53	1.51±0.60	1.46±0.49	1.66±0.63	ns	ns	ns
C24:1	0.25±0.07	0.23±0.07	0.23±0.06	0.26±0.09	ns	ns	ns
SFA	38.40±1.57	39.44±1.49	39.38±1.47	38.47±1.64	**	*	ns
MUFA	47.93±1.75	47.77±1.61	47.91±1.38	47.78±1.95	ns	ns	ns
PUFA	10.39±1.71	10.17±2.20	9.83±1.81	10.74±2.04	ns	ns	ns
n-6/n-3	12.89±3.33	11.59±3.01	11.45±2.50	13.04±3.70	ns	*	ns

¹⁾ SFA, saturated fatty acid; MUFA, monounsaturated fatty acid; PUFA, polyunsaturated fatty acid.

²⁾ LYD, Landrace×Yorkshire×Duroc; LYW, Landrace×Yorkshire×Woori black pig based on Korean native breed.

³⁾ Values are mean±standard error.

* $p<0.05$, ** $p<0.01$, *** $p<0.001$.

ns, not significant.

improved eating quality, which was indicated by an increase in MUFA and a decrease in PUFA contents (Cho et al., 2007b).

Sensory properties

Sensory evaluation of pork loins from crossbred pigs with Duroc or Korean native pigs as the terminal sire are presented in Table 4. The results revealed that LYW (5.89) and gilts (5.88) showed higher color index than LYD (5.56) and castrates (5.58), respectively ($p<0.05$, Table 4). Similarly, flavor of LYW was higher than that of LYD ($p<0.05$). Furthermore, the flavor of gilts was higher than that of castrates ($p<0.01$). There was no difference in meat tenderness and juiciness between the breeds or sexes. However, these traits tended to be slightly higher in LYW and gilts, and so was the overall appreciation of the meat. None of the sensory properties were affected by an interaction between breed and sex.

Sensory evaluation is an index of consumer preference. Meat color is a very important criterion that influences its acceptability by consumers (Seideman et al., 1984). Generally, meat from female pigs is superior to that of male pigs in terms of flavor, juiciness, and tenderness (Cho et al., 2007b). Furthermore, pork meat flavor and aftertaste are affected by the breed (Magowan et al., 2011). Overall, the sensory properties of LYW were better than those of LYD in the present study. This suggests that the utilization of Woori black pig as the terminal sire might possibly help in meeting consumer acceptability with respect to pork.

Conclusion

This study showed differences in certain meat qualities and sensory traits in three-way crossbred pigs with either Duroc or

Table 4. Sensory evaluation between loins of crossbred pigs sired either Duroc or synthetic breed based on Korean native breed

Items	Breed ¹⁾		Sex		Significance		
	LYD	LYW	Castrate	Gilt	Breed	Sex	Breed×Sex
Color	5.56±0.48 ²⁾	5.89±0.44	5.58±0.37	5.88±0.55	*	*	ns
Flavor	5.52±0.62	5.96±0.74	5.46±0.54	6.04±0.75	*	**	ns
Tenderness	5.74±1.12	6.23±1.69	5.94±1.65	6.03±1.22	ns	ns	ns
Juiciness	5.53±1.08	5.94±1.06	5.55±0.86	5.93±1.26	ns	ns	ns
Overall liking	5.64±1.19	6.01±1.08	5.62±0.95	6.04±1.30	ns	ns	ns

¹⁾ LYD, Landrace×Yorkshire×Duroc; LYW, Landrace×Yorkshire×Woori black pig based on Korean native breed.

²⁾ 1, deeply dislike; 5, moderately liked; 9, deeply liked. Values are mean±standard error.

* $p < 0.05$, ** $p < 0.01$.

ns, not significant.

Woori black pig (synthetic breed with Korean native pigs) as the terminal sire. For instance, the loin of LYW had superior meat qualities, including high fat content, WHC, and redness, and relative high sensory traits. Furthermore, LYW did not differ in carcass characteristics. Therefore, Korean native pigs have strong potential for use as the terminal sire to produce meat that meets consumer preferences in Korea.

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