COMPARISON OF MEAT QUALITY AS DIFFERENT LINE OF BERKSHIRE

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Abstract— **Total of 448 pigs divided by 5 line groups were slaughtered and analyzed the meat quality. pH_{45min} values were higher (p<0.05) in the line 1~4 groups, however, pH_{24hr} values were lower (p<0.05) in the line 1 and 3 groups than the other groups. Moisture contents were higher (p<0.05) in the line 5 group and the intramuscular fat contents were higher (p<0.05) than the other groups. Water-holding capacity was higher (p<0.05) for the line 3 group and Warner-Bratzler shear force (WBS) values were higher for the line 4 group than the other line groups. In CIE color, L^* values were 51.59 for the line 5 group and it was higher than the other line groups. There were not significantly different in a values and b^* values among the 5 line groups. Therefore, the line 5 groups were selected as the growth type and the line 4 group was selected as the meat type of Korean Berkshire line that produced pork higher (p<0.05) in pH, and lower (p<0.05) in a value of L^*, drip loss and WBS.**
Index Terms— **Berkshire, pH, water-holding capacity, shear force, meat color, meat quality.**

I. INTRODUCTION

Meat consumption pattern is depended on the cultural experience and eating habit. In most western countries, pork was consumed as the processed meat type whereas it was consumed as the fresh meat type in Korea. This is supported with the production rate (%) of processed meat based on pork production. In 2006, the production rate of domestic processed meat was 15% and this is relatively low when compared to that of Japan (30%) and Europe (70%). Appearance is very important criteria because they consume it as fresh. Korean consumers prefer light red coloured and marbled pork without drip (Cho et al., 2007). Van der Wal et al. (1997) reported that the factors affecting meat quality are water holding capacity, meat color, textural firmness, postmortem pH. Generally, black or brown-colored pigs had higher intramuscular fat and better meat quality among pork breed, especially for Berkshire breed. There were 28,000 heads of sow in Japan, and they were marketed with the additional price of 50% more than the original price (Suzuki *et al*., 2003). The objective of this study was to compare the meat quality and yield properties of Berkshire and to provide the fundamental information for screening the Berkshire line.

II. MATERIALS AND METHODS

The pigs were collected from 8 farms and they were divided by 5 groups depending on the genetic line The carcass weight, backfat thickness of the experimental animals (Berkshire 448) are shown in Table 1. The animals were slaughtered at the local slaughterhouse and postmortem pH_{45min} and pH_{24hr} were measured using pH meter (pH*K21, NWK-Binär GmbH Co., Germany). The carcasses were chilled for 18hrs and obtained *longissimus dorsi* from the left side and transported to NIAS for analyzing the meat quality after 2 days of storage at 2℃. The moisture, protein, fat and collagen contents were analyzed using the Foodscan (Food scan^{TM} 78810, Foss Co., Denmark). Meat color was determined by Loin muscles were exposed to bloom for 30 min and determined by Chromameter(CR-400, Minolta Co., Japan)로 CIE(Commision Internationale de Leclairage) L^*, a^*, b^* vlaues with 9 replicaton. The standard was used with Y=92.40, x=0.3136, y=0.3196 for white tile. Water-holding capacity(WHC) was measured by Laakkonen et al.(1970) as modified by Park et al.(2001). Drip loss (%) was measured by the weight difference between before and after storage of loin at 4℃ for 24hr. Warner-Braztler shear force (WBS) measurements were 1.27 cm circular core to determine sheared by cooked steaks (2.5 cm thick). Eight cores (Φ13㎜) were made for each sample, and peak force determined using a Instron (model 5543, Instron crop., USA) with a load cell 50 kg and cross head speed 150 mm/min.

III. RESULTS AND DISCUSSION

In chemical composition, loins obtained from different line were significantly higher in intramuscular fat contents for line 4 (3.07%) than those of line 5 (2.32%) (p<0.05) (Table 2). While the protein contents were significantly higher for line 5 (24.18%) than the other lines (p<0.05). The collagen contents were not signficantly different among different lines in the range of 0.87%- 0.91%. Table 3 showed that the postmortem pH_{45min} of line 5 were 6.08 and it was higher than 5.94 for line 1 and 5.96 for line 3. Line 2 and line 3 had no signficant difference in pH_{45min}. pH_{24hr} of line 1 and line

5 were significantly lower in lines 2, 3, and 4 ($p<0.05$). In meat color, L values were not significantly different among 5 lines in the range of 48.05-48.98 ($p>0.05$), line 5 had higher values than the other lines. This reuslt was consistent that high rate of pH drop resulted in pale pork color (Honikel, 1987) and the lower pH_{24hr} caused the lower L values (Park et al, 2002). Table 4 showed that WHC was significantly higher in line 3 (58.36%) and followed by line 4 (57.84%), line 2 (57.13%), line 1 (56.93%) and line 5 (55.62) ($p<0.05$). Line 5 had significantly higher drip loss (6.33%) than the other lines showed in the range of 4.69% to 5.17% ($p<0.05$). Cooking loss (%) was lower in line 1 whereas it was higher in line 5 than the other lines ($p<0.05$). Results from WHC, drip loss and cooking low of different lines showed that pork had higher pH_{24hr} had higher WHC and low drip loss and cooking loss. Therefore, postmortem pH had significantly related with meat quality. WBS values of line 5 were 3.30 kg, and followed by line 1 (3.20 kg), line 2 (2.99 kg), line 3 (3.03kg) and line 4 (2.84kg) ($p<0.05$).

IV. CONCLUSION

The line 4 was meat type which had higher intramuscular fat and pH, and lower meat color (L value), drip loss, WBS values. The llne 5 was growth type which would be useful for production of Korean Berkshire line.

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Table 1. Carcass weight and backfat thickness by the Berkshire lines* of animals used in the experiment

Items	Line 1	Line 2	Line 3	Line 4	Line 5
Heads of animals	61	221	71	79	16
Carcass weight(kg)	87.33±5.66	86.01±6.16	84.87±6.26	86.59±5.04	87.56±4.70
Backfat thickness(mm)	26.33^{a}±6.45	25.15^{ab}±4.92	25.01^{ab}±5.13	25.00^{ab}±4.76	23.81^{b}±5.96

[a-b] Means having different letters in the same row are significantly different ($p<0.05$).

*Line 1~5; Pure line among pig farm

Table 2. Chemical compositions (%) of loin muscles from 5 groups of different Berkshire lines*.

Items	Line 1	Line 2	Line 3	Line 4	Line 5
Fat	2.62^{ab}±1.21	2.78^{ab}±1.20	2.75^{ab}±1.20	3.07^{a}±1.09	2.32^{b}±1.24
Protein	23.87^{b}±0.66	23.79^{b}±0.70	23.77^{b}±0.65	23.75^{b}±0.70	24.18^{a}±0.71
Moisture	75.62^{ab}±0.98	75.56^{ab}±0.83	75.68^{ab}±0.89	75.31^{b}±0.81	75.75^{a}±0.76
Collagen	0.91±0.11	0.89±0.13	0.91±0.12	0.89±0.14	0.87±0.11

$^{a-b}$ Means having different letters in the same row are significantly different (p<0.05).
*Line 1~5; Pure line among pig farm

Table 3. pH and meat color properties of loin muscles from 5 groups of different Berkshire lines*.

Items		Line 1	Line 2	Line 3	Line 4	Line 5
pH_{45min}		5.94^{b}±0.26	5.99^{ab}±0.26	5.96^{b}±0.24	6.00^{ab}±0.32	6.08^{a}±0.20
pH_{24hr}		5.69^{b}±0.18	5.78^{a}±0.18	5.80^{a}±0.20	5.80^{a}±0.21	5.65^{b}±0.16
Meat color (CIE)	L^*	48.81^{b}±3.48	48.45^{b}±2.75	48.05^{b}±2.98	48.98^{b}±3.29	51.59^{a}±2.81
	a^*	5.89±1.29	6.13±1.12	6.10±1.08	6.34±1.02	6.07±0.78
	b^*	2.424±1.12	2.66±0.97	2.67±0.99	2.89±0.99	2.73±1.12
Chroma		6.68^{ab}±1.56	6.84^{a}±1.30	6.84^{a}±1.27	6.99^{a}±1.24	5.89^{b}±0.68
Hue		23.89^{a}±8.40	24.24^{a}±8.56	23.92^{a}±5.26	24.24^{a}±6.00	18.48^{b}±2.08

$^{a-b}$ Means having different letters in the same row are significantly different (p<0.05).
*Line 1~5; Pure line among pig farm

Table 4. Water holding capacity (WHC), drip loss, cooking loss and Warner-Bratzler shear force (WBS) of loin muscles by 5 groups of different Berkshire lines*.

Items	Line 1	Line 2	Line 3	Line 4	Line 5
WHC (%)	56.93^{b}±2.54	57.13^{b}±2.28	58.36^{a}±2.57	57.84^{ab}±2.53	55.62^{c}±1.37
Drip loss (%)	5.17^{b}±1.86	4.69^{b}±2.09	4.70^{b}±1.85	4.92^{b}±2.34	6.33^{a}±1.98
Cooking loss (%)	26.93^{b}±3.52	27.55^{ab}±3.23	27.95^{ab}±2.93	27.83^{ab}±2.88	28.99^{a}±2.34
WBS (kg)	3.20^{a}±0.59	2.99^{ab}±0.71	3.03^{ab}±0.77	2.84^{b}±0.68	3.30^{a}±0.68

$^{a-c}$ Means having different letters in the same row are significantly different (p<0.05).
*Line 1~5; Pure line among pig farm