PS1.04 Does piglet birth weight affect carcass composition and meat quality?

Does piglet birth weight affect carcass composition and meat quality? 149.00

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Abstract—An analysis was conducted to determine if piglet birth weight (BW) has an effect on subsequent carcass growth rate, composition, and meat quality. Data from 464 litters (consisting of 3,450 pigs) were used in the analysis. All litters were derived from 2 dam lines and a single sire line (a total of 43 different sires). The data were from six farrowing groups of pigs from the same sow farm and cross-fostering was very intensive within these farrowing groups. Data were collected for determination of growth rates (carcass), carcass composition, and meat quality. Hot carcass weight and lifetime average daily carcass gain (hot carcass weight/age) increased as BW increased particularly in pigs weighing less than 1.588 kg (BW quadratic, P < 0.0001). Backfat depth decreased (BW linear, P < 0.0002) and loin depth increased (BW quadratic, P < 0.002) as BW increased resulting in higher lean % as BW increased (BW linear, P < 0.0001). Ham, belly, loin, and boneless loin weights when adjusted to a constant age at harvest all increased as BW increased (BW quadratic, P < 0.03). Objective loin color measurements of Minolta L* (darker) and b* (less yellow) improved as BW increased (BW linear, P < 0.0001), but Minolta a* was not affected (P > 0.05) by BW. Subjective loin color (Japanese color score), loin pH, loin drip loss, and loin firmness also were not affected (P > 0.05) by BW. Loin marbling decreased as BW increased (P < 0.05). These data clearly indicate that piglet BW has an effect on carcass composition and some aspects of meat quality.

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Index Terms— birth weight, carcass composition, meat quality, pork.

I. INTRODUCTION

Modern swine production continues to place a heavy emphasis on increased litter size because the perception is more pigs born equals more profits. However, research has indicated that as litter size is increased, birth weight (BW) is decreased [1,2] and subsequently post-natal growth performance and survivability is poorer in low BW pigs [3]. Much of the research addressing BW effects on subsequent performance has been conducted with relatively small sample sizes (< 100 pigs) and has grouped pigs in categories for analysis (i.e. low, medium, heavy BW). These small sample sizes and trial designs may not allow complete expression/detection of differences due to BW, particularly for carcass composition and pork quality traits. The purpose of this research was to determine the effects of BW on growth, carcass composition, and pork quality in a large-scale commercial production system.

II. MATERIALS AND METHODS

An analysis was conducted on a dataset from 464 litters to determine the effect BW has on subsequent performance. All pigs in this trial were sired by boars (n=43) from a synthetic Duroc sire line and were individually weighed within 24-hr of birth. Two different dam lines were used and the average parity was 3.67 with a range of 1 to 9. Data were collected for determination of pig growth rates, carcass composition, and meat quality. The data were from six farrowing groups of pigs from the same sow farm and cross-fostering was very intensive within these farrowing groups. Diets were formulated to meet PIC's nutrient recommendations for PIC commercial pigs and PayLeanTM was not fed. A total of 3,450 pigs were harvested at a commercial processing plant. On the day of slaughter, hot carcass weight (head-off, feet-on) was recorded for each carcass, and backfat and loin depth data were measured using an optical grading probe. Lifetime average daily carcass gain (LTADCG) was the measure of growth rate in the trial and it was calculated by dividing the hot carcass weight of each pig by its age at harvest. Percentage lean was calculated using the following equation: [58.86 - (0.61 x backfat, mm) + (0.12 x loin depth, mm)]. Carcasses were fabricated the following day at approximately 24 h post-mortem. During fabrication, hams, bellies, and loins were collected from the left side of each carcass for determination of primal weight. Each left side primal weight was multiplied by 2 to estimate total weight for each primal. Hams were not trimmed or skinned prior to weighing. Bellies were skinned and squared prior to weighing. Loins were skinned and fat was trimmed to 0.32 cm. After obtaining a bone-in loin weight, loins were boned to obtain a boneless loin weight (center-cut loin with belly strap-off). Boneless loins were then assessed for pork quality attributes. Two 2.54 cm chops were removed from the sirloin end of the center-cut boneless loin. The first chop removed was allowed to bloom for approximately 5 min and then assessed for loin color and marbling. Objective color was assessed using a Minolta CR-400 colorimeter. Minolta measurements were taken using the C illuminant in the CIE L*a*b* color space. Subjective color was assessed using a Japanese color block with a scoring range of 1 (light) to 6 (dark) [4]. Subjective marbling scores were assessed using the guidelines of the NPPC [5]. Drip loss was assessed on the 2nd chop removed from the loin. A 2.54 cm diameter core was taken from the chop and drip loss was determined using the drip tube method [6]. Loin firmness was assessed on the sirloin end of the intact loin using a 3-point scale (1=soft and 3=firm) scoring system [5]. Ultimate pH also was determined in the sirloin end of the center cut loin. The pH was determined using a Hanna pH meter (Model #98160; Hanna Instruments® USA, Woonsocket, RI 02895) fitted with a glass tip pH probe (Model #FC201B; Hanna Instruments® USA, Woonsocket, RI 02895).

Data were analyzed using the MIXED procedure of SAS® (SAS Inst., Cary, NC). Hot carcass weight and LTADCG were analyzed with farrowing group as the random effect. All other measurements, except pH, were analyzed with slaughter date within farrowing group as the random effect. Farrowing group and slaughter date were used as random effects for analysis of pH data. Dam line and gender were fixed effects in the model for all traits. Linear and quadratic functions of BW were used as covariates for all variables. If the quadratic function of BW was not significant (P > 0.05) then the quadratic covariate was removed from the model. Age of the pigs was included in the model as a covariate for all traits except LTADCG and hot carcass weight. If the age covariate was not significant (P > 0.05), then it was removed from the model. Least square means were estimated in 0.23 kg increments from 0.454 to 2.041 kg of BW using the ESTIMATE function of SAS. Table 1 contains sources of variation for the models used and associated significance levels.

Table 1. Statistical Model Sources of Variation and Significance Levels

	Fixed Effects		Covariates		
Effect	Dam line	Gender	Birth weight linear	Birth weight quadratic	Age
Lifetime average daily carcass gain [a]	0.004	0.0001	0.0001	0.0001	-
Hot carcass weight [a]	0.64	0.0001	0.0001	0.0001	-
10^{th} rib backfat [a]	0.01	0.0001	0.0002	-[d]	0.0001
Loin depth [a]	0.0001	0.0014	0.0002	0.002	0.0001
% Lean [a]	0.0001	0.0001	0.0001	-	0.0001
Ham weight [a]	0.08	0.69	0.0001	0.006	0.0001
Belly weight [a]	0.007	0.0001	0.003	0.03	0.0001
Loin weight [a]	0.0001	0.11	0.0001	0.0001	0.0001
Boneless loin weight [a]	0.0001	0.0001	0.0001	0.0001	0.0001
L* [b]	0.0008	0.0001	0.0001	-	0.006
a* [b]	0.65	0.18	0.16	-	-
b* [b]	0.008	0.0001	0.0001	-	0.0001
Japanese color score [b]	0.09	0.004	0.35	-	-
pH [c]	0.38	0.29	0.43	-	0.0001
Drip loss, % [b]	0.04	0.004	0.24	-	-
Subjective marbling [b]	0.40	0.0001	0.0001	-	-
Subjective firmness [b]	0.0001	0.03	0.06	-	-

[a] Random effect included breed group.
[b] Random effect included slaughter date(breed group).
[c] Random effects included breed group and slaughter date.
[d] Effect was omitted from statistical model.

III. RESULTS AND DISCUSSION

As expected, BW decreased as litter size increased. Hot carcass weight and LTADCG increased as BW increased and the rate of increase was greater in pigs with BW less than 1.588 kg (BW quadratic, P < 0.0001; Table 2).

Table 2. Least Square Mean Estimates by Birth Weight for Carcass Traits and Pork Quality

	Birth Weight, kg							
Trait	0.454	0.680	0.907	1.134	1.361	1.588	1.814	2.041
LTADCG, g/d [i]	431 ± 9^{a}	458 ± 9^{b}	476 ± 9^{c}	494 ± 9^{d}	508 ± 9^{e}	522 ± 9^{f}	526 ± 9^{g}	531 ± 9^{h}
Hot carcass weight, kg	81.5 ± 1.6^{a}	84.3 ± 1.4^{b}	86.6 ± 1.3^{c}	88.5 ± 1.3^{d}	89.9 ± 1.3^{e}	91.0 ± 1.3^{f}	91.7 ± 1.3^{g}	91.9 ± 1.3^{g}
10^{th} rib backfat, mm [j]	18.3 ± 0.5^{a}	18.1 ± 0.5^{b}	17.9 ± 0.5^{c}	17.8 ± 0.5^{d}	17.6 ± 0.5^{e}	17.5 ± 0.5^{f}	17.3 ± 0.5^{g}	17.2 ± 0.5^{h}
Loin depth, mm [j]	54.9 ± 1.0^{a}	56.1 ± 0.8^{b}	57.0 ± 0.7^{c}	57.8 ± 0.7^{d}	58.3 ± 0.7^{e}	58.6 ± 0.7^{f}	58.7 ± 0.7^{f}	58.6 ± 0.7^{ef}
% Lean [j]	54.6 ± 0.3^{a}	54.7 ± 0.3^{b}	54.8 ± 0.3^{c}	55.0 ± 0.3^{d}	55.1 ± 0.3^{e}	55.2 ± 0.3^{f}	55.3 ± 0.3^{g}	55.5 ± 0.3^{h}
Ham weight, kg [j]	18.9 ± 0.4^{a}	19.7 ± 0.3^{b}	20.4 ± 0.2^{c}	21.0 ± 0.2^{d}	21.5 ± 0.2^{e}	22.0 ± 0.2^{f}	22.4 ± 0.2^{g}	22.6 ± 0.2^{h}
Belly weight, kg [j]	9.5 ± 0.4^{a}	9.8 ± 0.4^{b}	10.1 ± 0.4^{c}	10.3 ± 0.4^{d}	10.5 ± 0.4^{e}	10.6 ± 0.4^{f}	10.7 ± 0.4^{g}	10.8 ± 0.4^{fg}
Loin weight, kg [j]	18.1 ± 0.3^{a}	18.9 ± 0.2^{b}	19.5 ± 0.2^{c}	20.1 ± 0.2^{d}	20.6 ± 0.2^{e}	21.0 ± 0.2^{f}	21.3 ± 0.2^{g}	21.5 ± 0.2^{h}
Boneless loin weight, kg [j]	5.8 ± 0.1^{a}	6.1 ± 0.1^{b}	6.4 ± 0.1^{c}	6.7 ± 0.1^{d}	6.8 ± 0.1^{e}	7.0 ± 0.1^{f}	7.1 ± 0.1^{g}	7.2 ± 0.1^{h}
L* [j]	46.0 ± 0.3^{a}	45.8 ± 0.3^{b}	45.6 ± 0.3^{c}	45.4 ± 0.3^{d}	45.2 ± 0.3^{e}	45.0 ± 0.3^{f}	44.8 ± 0.3^{g}	44.6 ± 0.3^{h}
a*	5.7 ± 0.1^{a}	5.6 ± 0.1^{a}	5.6 ± 0.1^{a}	5.6 ± 0.1^{a}	5.6 ± 0.1^{a}	5.6 ± 0.1^{a}	5.5 ± 0.1^{a}	5.5 ± 0.1^{a}
b* [j]	0.4 ± 0.3^{a}	0.3 ± 0.3^{b}	0.2 ± 0.3^{c}	0.1 ± 0.3^{d}	0.0 ± 0.3^{e}	-0.1 ± 0.3^{f}	-0.2 ± 0.3^{g}	-0.3 ± 0.3^{h}
Japanese color score [k]	3.26 ± 0.04^{a}	3.27 ± 0.03^{a}	3.27 ± 0.03^{a}	3.28 ± 0.03^{a}	3.28 ± 0.03^{a}	3.29 ± 0.03^{a}	3.29 ± 0.03^{a}	3.30 ± 0.03^{a}
pH [j]	5.77 ± 0.03^{a}	5.77 ± 0.03^{a}	5.77 ± 0.03^{a}	5.77±0.03^{a}	5.78 ± 0.03^{a}	5.78 ± 0.03^{a}	5.78 ± 0.03^{a}	5.78 ± 0.03^{a}
Drip loss, %	2.56 ± 0.28^{a}	2.53 ± 0.27^{a}	2.50 ± 0.27^{a}	2.48 ± 0.26^{a}	2.45 ± 0.26^{a}	2.43 ± 0.26^{a}	2.40 ± 0.26^{a}	2.37 ± 0.26^{a}
Subjective marbling [l]	3.30 ± 0.06^{a}	3.15 ± 0.05^{b}	3.00 ± 0.05^{c}	2.84 ± 0.04^{d}	2.69 ± 0.04^{e}	2.54 ± 0.04^{f}	2.39 ± 0.04^{g}	2.24 ± 0.05^{h}
Subjective firmness [l]	2.20 ± 0.03^{a}	2.19 ± 0.03^{a}	2.18 ± 0.03^{a}	2.17 ± 0.02^{a}	2.16 ± 0.02^{a}	2.15 ± 0.02^{a}	2.14 ± 0.02^{a}	2.13 ± 0.03^{a}

[a-h] Means with different superscripts are significantly different from one another (P < 0.05).
[i] LTADCG = lifetime average daily carcass gain.
[j] Age was used as a covariate to correct to a common days of age (175 days). The covariate was significant (P < 0.006).
[k] Japanese color score was determined with a color block with a scoring range of 1 (light) to 6 (dark)[4].
[l] Scored using NPPC [5] standards.

Backfat depth decreased (BW linear, P < 0.0002) and loin depth increased (BW quadratic, P < 0.002) as BW increased resulting in higher lean % as BW increased (BW linear, P < 0.0001; Table 2).

The rate of increase loin depth was greater in pigs with BW less than 1.588 kg. Ham, belly, loin, and boneless loin weights when adjusted to a constant age at harvest all increased as BW increased (BW quadratic, P < 0.03; Table 2) and for the most part, the rate of increase in these primal weights was greater in pigs with BW less than 1.588 kg. Objective loin color measurements of Minolta L* (darker) and b* (less yellow) improved (BW linear, P < 0.0001) as BW increased, but Minolta a* was not affected (P > 0.05) by BW. Subjective loin color (Japanese color score), loin pH, loin drip loss, and loin firmness also were not affected (P > 0.05) by BW. Loin marbling decreased as

BW increased (BW linear, $P < 0.0001$; Table 2). This analysis clearly indicates that piglets with lighter BW have poorer subsequent carcass composition and some quality traits also may be affected. Rehfeldt and Kuhn [3] conducted a review of literature addressing the consequences of BW on growth and carcass composition. They stated that pigs with low BW have poorer growth performance and decreased lean percentage which agrees with our results. They also concluded the number of muscle fibers formed prenatally is correlated with BW. Thus, these light BW pigs are predestined to poorer performance prior to birth. Foxcroft [2] indicated that once these low BW pigs are "programmed" prenatally, it is very unlikely that compensatory growth can occur after birth. These results are in agreement from the standpoint that even an aggressive cross-fostering did not alleviate the effects of low BW. Research has also been conducted to determine if pre-natal sow nutrition could influence muscle fiber development which would subsequently increase BW. Rehfeldt and Kuhn [3] indicated that altering pre-natal sow nutrition was not very effective in increasing muscle fiber formation or BW. Similarly, Foxcroft [2] concluded that if intrauterine growth retardation (result of increased litter size) does limit the number of muscle fibers, nutritional strategies may not alleviate these problems.

IV. CONCLUSION

Clearly, as the swine industry continues genetic selection for larger litter sizes, we must determine ways to minimize light BW pigs. Foxcroft [2] suggests that we should select for BW in addition to litter size in order to identify females which do not illicit prenatal effects (i.e. reduced muscle fibers) that have a negative influence on post-natal growth and carcass traits. Furthermore, we need to collect more data in order to develop economic models that can determine if production throughput of larger litter sizes (with lower BW) is economically more desirable than improved robustness and growth performance observed with smaller litter sizes (with higher BW).

REFERENCES

[1] Bérard, J., Kreuzer, M., & Bee, G. (2008). Effect of litter size and birth weight on growth, carcass and pork quality, and their relationship to postmortem proteolysis. Journal of Animal Science, 86, 2357-2368.

[2] Foxcroft, G. R., Dixon, W. T., Novak, S., Putman, C. T., Town, S. C., & Vinsky, M.D.A. (2006). The biological basis for prenatal programming of postnatal performance in pigs. Journal of Animal Science, 84(E. Suppl.), E105-E112.

[3] Rehfeldt, C., & Kuhn, G. (2006). Consequences of birth weight for postnatal growth performance and carcass quality in pigs as related to myogenesis. Journal of Animal Science, 84(E. Suppl.), E113-E123.

[4] Nakai, H., Saito, F., Ikeda, T., Ando, S., & Komatsu, A. (1975). Standard models of pork-colour. (pp 69-74) In Bulletin Number 29, National Institute of Animal Industry, Chiba, Japan.

[5] NPPC (2000). Pork Composition and Quality Assessment Procedures. National Pork Producers Council, Des Moines, IA

[6] Rasmussen, A. J., & Andersson, M. (1996). New Method for Determination of drip loss in pork muscles. In Proceedings 42nd International Congress of Meat Science and Technology (pp. 286-287), 1-6 September 1996, Lillehammer, Norway.

PS1.05a Influences of carcass weight on histochemical characteristics and meat quality of crossbred (Korean native black pig£øLandrace) pigs 159.00

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Abstract-Influences of carcass weight on muscle fiber characteristics and pork quality traits were investigated with 40 crossbred (Korean native black pig and Landrace) F2 pigs. Four carcass groups were categorized by carcass weight (A: 70~79kg, B: 80~89kg, C: 90~99kg, D: 100~109kg), and quality traits and histochemical characteristics of Longissmus dorsi muscle were investigated. There were significant differences in muscle fiber characteristics between carcass groups. The fiber number of type IIB was significantly higher while those of type I and IIA were lower in group D. Results suggested that composition of type IIB was increased with increasing of carcass weight, but those of type I and IIA were decreased. Also a clear difference in quality traits was observed among groups. Especially, fat content, sarcomere length, L* value and drip loss were significantly increased whereas moisture content and Warner-Bratzler shear force (WBSF) were decreased with increasing of carcass weight. Consequently, inverse correlations between type I, IIA and IIB for carcass weight and quality traits were observed. When composition of type IIB had a positive correlation with carcass weight and quality traits including fat %, L* value and drip loss and a negative correlation with moisture % and WBSF, those of type I and IIA showed the converse. These results suggested that marbling and tenderness of pork loin could be increased with increasing of carcass weight because of high proportion of muscle fiber type IIB, but lightness and drip loss also could be increased.

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Index Terms; Korean native black pig, crosbreed pig, muscle fiber type, pork quality

I. INTRODUCTION

Skeletal muscle is composed of different fiber types, which is affected by various factors, such as sex, age, muscle type, breed and hormones [1]. Also, there is a large individual variation in meat quality and quantity both within and between animals of the same breed, sex, age and environment. The Korean native black pig (KNP) is the typical breed, which has a high redness and intramuscular fat content compared with commercial breed. However, KNP shows a slower growth rate and lighter carcass weight than commercial pig breed. Regardless of crossing in pig production is aimed to improve the quantity and quality of the meat, there are little reports concerning the effects of crossing and muscle fiber characteristics on pork quality of crossbred (KNP Landrace) pigs. Therefore, in the present study, muscle fiber characteristics of crossbred (KNP Landrace) F2 pigs categorized by carcass weight were investigated, and its influence on pork quality traits was also investigated.

II. MATERIALS AND METHODS

Forty carcasses of crossbred (KNP Landrace) F2 pigs representing four carcass weight groups (A:70~79kg, B:80~89kg, C:90~99kg, D:100~109kg) were selected at a commercial pork plant after slaughtering immediately. Carcass weight, backfat thickness and loin-eye area were measured at the 4-5th thoracic vertebra. Muscle samples of about 5 g were taken at the adjacent to the 5th thoracic vertebra for histochemical analysis within 1h postmortem. Myosin ATPase activity [2] was detected after acid (pH 4.63) and alkaline (pH 10.70) preincubation for classification of muscle fiber types (type I, IIA and IIB) (Fig. 1), and analyzed histochemical characteristics such as fiber number composition, fiber area composition and fiber diameter. Samples of M. Longissimus dorsi (LD) were also taken from the left side of the carcass adjacent to the 5th thoracic vertebra for meat quality traits analysis at 24h postmortem. The ultimate pH (pHu) and meat color (CIE L*a*b*) were determined using pH-meter (MP230, Mettler Toledo, Switzerland) and Chromameter (CR-300, Minolta Co., Japan), respectively. Fat and moisture contents were measured by AOAC [3]. Drip loss was determined as the weight loss during suspension of about 30 g over 24 hrs, and Warner-Bratzler shear force (WBSF) were determined using an Instron Universal Testing Machine (Model Series ¥¸, Instron Co., USA) with a Warner-Bratzler shearing device. Sarcomere length was determined by a laser diffraction method.

III. RESULTS AND DISCUSSION

Carcass characteristics and meat quality traits were significantly different between four carcass groups (Table 1).

Loin-eye area, backfat thickness and fat content were significantly increased with increasing of carcass weight ($p<0.05$). Also, L* value and drip loss were significantly increased with increasing of carcass weight ($p<0.05$), although pHu did not differ between groups. Sarcomere length was increased and WBSF was decreased with increasing of carcass weight. As expected, fiber number composition, fiber area composition and fiber diameter are significantly different between four groups (Table 2).

The fiber number composition of type IIB fibers was significantly increased whereas those of type I and IIA fibers were significantly decreased with increasing of carcass weight ($p<0.05$). Fiber area compositions of type I and IIA in group A and B were significantly higher than those in group C and D ($p<0.05$). Group A and B had lower composition of type IIB compared to group C and D ($p<0.05$). Result also showed that fiber diameter of type I and IIB were higher in group D, whereas that of type IIA was lower in group D ($p<0.05$). These results suggest that pork loins from higher carcass weight has higher proportion of type IIB, thus the proportion of type I and IIB fibers decrease. There were significant correlation between histochemical characteristics and pork quality traits (Table 3). Especially, carcass weight had a positive correlation with fiber number and area composition of type IIB and a negative correlation with those of type I and IIA ($p<0.05$). Moreover, fat content showed a positive correlation with fiber number ($r=0.44$) and fiber diameter ($r=0.53$). This confirms the finding of Fiedler et al. [4] who reported that fat content was positively correlated with type IIB (fast-twitch fiber), and imply that marbling of pork loin may be increased with increasing of carcass weight because of high proportion of type IIB in muscle. Moisture content had a positive correlation with fiber number of type I and IIA, and a negative correlation with that of type IIB ($p<0.05$).When composition of type I and IIA had a negative correlation with L* value and drip loss, that of type IIB showed the converse. This was similar with Ryu & Kim [5] that increasing composition of type IIB and decreasing composition of type I and IIA were related to increases in drip loss and lightness. However, our result of a* value was not agree with Ruusunen & Puolanne [6] that the percentage of the fiber types, either in number or area, greatly affected the redness of pork. No correlation between a* value and muscle fiber characteristics in crossbred (KNPxLandrace) F2 pigs was observed in this study. Also, there was no significant correlation between WBSF and muscle fiber characteristics, although sarcomere length was correlated with fiber diameter of type I and ¥±A. The diameter of type I had a strong correlation with drip loss ($r=0.55$) ($p<0.01$).

IV. CONCLUSION

There are large variation in muscle fiber characteristics and pork quality traits as well as carcass weight in crossbred (KNP x Landrace) F2 pigs. Proportion of type IIB in pork loin is increased with increasing of carcass weight while compositions of type I and IIA fibers are decreased. The composition of type IIB has a positive correlation with fat content, L* value and drip loss, and a negative correlation with moisture content and shear force. Consequently, when carcass weight of pig is increased, marbling and tenderness of pork loin are increased due to type IIB fibers increased, but lightness and drip loss are also increased.

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REFERENCES

[1] Karlsson, A. H., Klont, R. E., & Fernandez, X. (1999). Skeletal muscle fibres as factors for pork quality. Livesock Production Science, 60, 255-269.

[2] Brooke, M. H., & Kaiser, K. K., (1970). Muscle fiber types: how many and what kind?. Arch Neurol. 23, 369-379.

[3] AOAC (1984). Official Methods of Analysis (14th ed.). Washington, DC: Association of Official Analytical Chemists.

[4] Fiedler, I., Nurnberg, K., Hardge, T., Nurnberg, G., & Ender, K. (2003). Phenotypic variations of muscle fibre and intramuscular fat traits in longissimus muscle of F2 population Duroc£©ªBerlin Miniature pig and relationships to meat quality. Meat Science, 63, 131-139.

[5] Ryu, Y. C., & Kim, B. C. (2006). Comparision of histochemical characteristics in various pork groups categorized by postmortem metabolic rate and pork quality. Journal of Animal Science, 84, 894-901., Ruusunen, M., & Puolanne, E. (1997). Comparision of histochemical properties of different pig breeds. Meat Science, 45, 119-125.

[6] Ruusunen, M., & Puolanne, E. (1997). Comparision of histochemical properties of different pig breeds. Meat Science, 45, 119-125.