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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