PE1.22 Fat content and fatty acid composition in Longissimus dorsi muscle of crossbred pigs by Korean native black pig and Landrace 189.00

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Abstract— The relationships between carcass weight, backfat thickness, intramuscular fat (IMF) content and fatty acid composition in porcine Longissmus dorsi muscle, and their influence on meat quality traits of pork loin were investigated with 594 crossbred (Korean native black pig × Landrace) F2 pigs. There was a large variation in carcass weight range 60 kg to 128 kg, resulted in variation of backfat thickness and IMF content. Carcass weight was closely related to backfat thickness (r=0.43), but was not significantly related to IMF content, saturated fatty acid (SFA) and unsaturated fatty acid (UFA). Backfat thickness had a positive correlation with IMF content (r=0.17) and SFA (r=0.25). IMF content was positively related to SFA (r=0.32) and negatively related to polyunsaturated fatty acid (PUFA) (r=-0.64). Especially, IMF content showed a strong correlation with arachidonic acid (r=--0.65) and linoleic acid (r=-0.62). Also a* and b* values were positively related to SFA (r=0.22) while L* value was not significantly related to SFA or UFA. The a* and b* value were negatively related to arachidonic acid (r=-0.52) and linoleic acid (r=-0.42). UFA had a positive correlation with drip loss (r=0.11) and filter paper fluid (r=0.21). Results suggested that IMF content and fatty acid composition were related to backfat thickness but not carcass weight, although carcass weight was related to backfat thickness. Results also implied that IMF content had a positive correlation with SFA that was positively related to redness and negatively related to drip loss of pork loin.

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Index Terms— Carcass weight, fatty acid composition, Korean native black pig, pork quality

I. INTRODUCTION

PORK quality has become a primary focus for producers, researchers, packers, processors, and consumers. For the last decade, one of the main objectives of the swine and pork industry in Korea has been to increase the intramuscular fat (IMF) content in pork muscles. The IMF level is often reported to have beneficial effects on eating quality of pork [1]. Also, fat content and composition of fatty acids are important because of their effects on human health. Therefore, there has been increased interest in recent years in ways manipulate the fatty acid composition of meat [2]. There is a large individual variation in fat content and fatty acids composition 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. In spite of crossing in pig production is aimed to increase IMF content of pork, there are little reports concerning the effects of crossing on IMF content and fatty acids composition of KNP × Landrace crossbred pigs. Therefore, IMF content and fatty acids composition in relation to pork quality of crossbred (KNP × Landrace) F2 pigs were investigated in this study.

II. MATERIALS AND METHODS

A total of 594 crossbred (KNP × Landrace) F2 pigs were fed the same commercial diet and slaughtered at age of 6 months approximately. Pigs were slaughtered at a commercial pork plant, and carcasses weight and backfat thickness at the 4-5th thoracic vertebra were measured at 24 hrs postmortem. Loin samples were taken at adjacent to the 5th thoracic vertebra to measure meat color, water-holding capacity, fat content and fatty acids composition. Meat color (CIE L* a* b*) was determined using Chromameter (CR-300, Minolta Co., Japan). Drip loss was determined as the weight

loss during suspension of about 30 g over 24 hr, and cooking loss was recorded for each sample by weighing before and after cooking. Filter-paper fluid uptake (FFU) was measured as described by Kauffman et al. [3]. IMF contents were measured by AOAC [4]. For the fatty acid analysis, lipids were extracted with chloroform and methanol [5], and methylated using 14% BF3. Fatty acid methyl esters were examined using Gas Chromatography (6890N, Agilent Technologies, Germany).

III. RESULTS AND DISCUSSION

There was a large variation in carcass weight from 60 kg to 128 kg, resulted in variation of backfat thickness and IMF content (Table 1). Backfat thickness varied from 12mm to 43mm and IMF content varied from 0.85% to 19.51% in loin muscle. Also a large variation in meat quality traits such as meat color (CIEL*a*b*), drip loss, FFU and cooking loss was observed. These results suggested that a large variation in carcass traits and meat quality traits of crossbred pigs occurred by crossing KNP and Landrace. Carcass weight was positively related to backfat thickness (r=0.43), but there was no significant correlation between carcass weight and IMF content (Table 2). Backfat thickness was positively related to IMF content (r=0.17), and IMF content was closely related to a* value (r=0.63), b* value (r=0.43), drip loss (r=-0.23), FFU (r=-0.26) and cooking loss (r=-0.16). These results suggested that IMF content increased with increasing of backfat thickness, but carcass weight was not related to IMF content of pork loin. Also data implied that redness and yellowness increased, and drip loss and exudative fluid of pork loin decreased as increasing of IMF content in muscle. No significant correlation between carcass weight and fatty acid composition (SFA or UFA) was observed although carcass weight was related to capric acid (r=0.16), palmitic acid (r=0.09) and linolenic acid (r=-0.17) (Table 3). However, backfat thickness had a positive correlation with SFA (r=0.25) and a negative correlation with PUFA, especially linoleic acid (r=-0.40) and linolenic acid (r=-0.49). Also, IMF content was positively related to SFA (r=0.32) and negatively related to UFA, especially linoleic acid (r=-0.62) and arachidonic acid(r=-0.65). These results suggested that UFA ratio in IMF increased due to increasing of linoleic, linolenic and arachidonic acids when backfat thickness was increased. Fatty acid composition was significantly related to meat color and water-holding capacity of pork loin (Table 4). Although SFA and UFA were not related to L* value, SFA had a positive relation with a* value (r=0.22) and b* value (r=0.12). Moreover, a* and b* values showed a positive correlation with MUFA and a negative correlation with PUFA, although UFA had a negative correlation with a* and b* values. SFA was negatively related to drip loss (r=-0.11) and FFU (r=-0.21). PUFA had a positive correlation with drip loss (r=0.13) and FFU (r=0.26) while MUFA had a negative correlation with them. However, there was no significant correlation between fatty acid composition and cooking loss. These results implied that pork loin had more red color and less drip loss as increasing of SFA ratio in IMF.

IV. CONCLUSION

A large variation in carcass traits and meat quality traits of crossbred pigs by Korean native pig and Landrace was observed. Carcass weight was not related to IMF content, but IMF content increased with increasing of backfat thickness, resulted in more reddish color and less drip loss of pork loin. The reddish color and less drip loss of pork loin were due to higher SFA ratio in IMF.

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