CARCASS AND MEAT QUALITY TRAITS OF PIGS DERIVED FROM PIETRAIN BREED

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Abstract – The Pietrain breed has been used as terminal boars for increasing lean meat in fattening pigs. Crossing between Pietrain pig with Duroc or LargeWhite pig establishes the synthetic breed with elevated lean meat property in fattening pigs. Pakchong 5 (PC5) is synthetic terminal boar that was bred from Duroc and Pietrain pigs (Duroc x Pietrain). The PC5 was used to produce high productivity fattening pigs with increased growth rate and lean. In this study, carcass and meat quality of PC5 including its fattening pigs were compared. Sixteen of PC5 and its fattening pigs (PC5 x two-crossbred sows) were fattened from 20 to 100 kg body weight. Pigs were slaughtered with the measurements of their carcass and meat quality. Carcass quality traits included carcass percentage, lean percentage, fat percentage, back fat thickness and Lenden-Speck-Quotient (LSQ) index of PC5 were better than fattening pig (P<0.05). Meat quality traits of both groups were not significantly different. However, dry matter percentage of fattening pigs was higher than PC5 (P<0.05). Thus, meat quality traits of terminal boar efficiently inherit to fattening pigs. Furthermore, maternal genetics may affect the carcass quality of fattening pigs. This PC5 is the elite terminal boar to produce fattening pigs targeting for meat quality traits.

Key Words – Pakchong 5, Synthetic breed, Terminal boar

I. INTRODUCTION

Pakchong 5 (PC5) is synthetic terminal boar that was bred from Duroc and Pietrain pigs (Duroc x Pietrain). The PC5 was used to produce high productivity fattening pigs with increased growth rate and lean. The PC5 swine breed derived from the *inter se* mating and selected over 5 generations on economically important traits. The economic traits of PC5 can be consistence transmitted to the fattening pigs (Chaweewan *et al.*, 2012). Thus, the potential of PC5 as terminal boar to produce fattening pigs can improve productivity, reduce costs and increase profits directly to the farmers. However, carcass and meat quality of PC5 including its fattening pigs still have not been addressed. Due to behavior of consumer tend to change to the quality of meat, to study in meat science of PC5 and its fattening pigs will be extended the research to meat products development and supporting consumer demand. The PC5 terminal boar will be promoted to farmer in swine production with their carcass and meat advantages. In this study, carcass and meat quality of PC5 and its fattening pigs were compared.

II. MATERIALS AND METHODS

The study was carried out on 32 of PC5 and its fattening pigs (PC5 x two-crossbred sows) distributed into 2 experimental groups. Each group comprised 16 pigs (8 castrated male and 8 female) were fattened from 20 to 100 kg body weight. Initial and final weight was records. Pigs were slaughtered after reaching 100 kg body weight with the measurements of their carcass and meat quality. Live weight, warm carcass weight, carcass length and back-fat thickness were collected. Loin eye area was determined using area meter (LI-3100C) from drawn surface area at the *longissimus dorsi* muscle between the 10th and 11st rib. Lenden-speck quotient (LSQ) index was calculated from the left side carcass according to Sethakul (1997). Temperature and pH was measured in the *longissimus dorsi* muscle between the 10th and 11st rib using pH meter (Metler-Toledo, SevenGoTM SG2) at 45 min (pH45) and 24h (pH24) after slaughter. Carcass and fat percentage were calculated.

Meat samples were collected from the loin of the left side carcass. Color parameters were determined using a Minolta Chromameter CR-300 with an Illuminant D65 and 2°observer interpret in form of L* (lightness) a* (redness) and b* (yellowness). Drip loss, thawing loss and cooking loss were defined. Shear force analysis (Warner-Bratzler shear force) using Texture analyzer (Instron model 1011, USA) according to Wheeler *et al.* (2005). Chemical composition of meat were analyzed, i.e. total protein, fat, ash and dry matter (AOAC, 2005). Collagen analysis according to Wheeler *et al.* (2005), muscle fiber diameter according to Melton *et al.* (1974) and Sarcomere length analysis according to Cross *et al.* (1981) using Helium-Neon Laser SC-31004. Statistical analysis was performed using General linear model (GLM) in order to determine the carcass and meat quality. Least Square Mean (LSM) using Pdiff was applied to compare the mean value.

III. RESULTS AND DISCUSSION

The obtained results indicated that pure bred PC5 could be facilitated by significantly higher ($P<0.05$) carcass percentage as well as lean percentage and ham percentage in comparison to fattening (Table 1) due to PC5 contain of 37.5 % of Pietrain higher than 18.75% of Pietrain in fattening pigs. According to Morales *et al.* (2013) have been reported that Pietrain breed found heavier ham and highly carcass percentage. In contrast, PC5 pigs had the lower fat percentage, belly percentage and back-fat thickness than fattening ($P<0.05$), these results may have resulted from that the ratio between higher meat and lower fat. Together with the live weight of PC5 were lower than fattening, thus, the fat percentage in the carcass was lower. Similar to the study of Kim *et al*. 2005)(reported that the higher live weight pigs were higher in fat percentage and back-fat thickness than lower live weight pigs.

LSQ index of fattening pigs was significantly higher ($P<0.05$) than PC5, LSQ index evaluate carcass quality by fat and lean ratio, if they are highly lean percentage, LSQ index will be low (Sethakul *et al.*, 2010). These results regarding high LSQ index of fattening pigs relate to interaction between cross-bred of dam line (Landrace x LargeWhite) and sire line. However, McCann *et al.* (2008) have been reported that Duroc, Duroc x Landrace x LargeWhite and Pietrain x Landrace x LargeWhite were not significantly different in loin eye area and back-fat thickness at the last rib. This study also confirmed that sex have not significant different in carcass quality paralleled with Latorre *et al.* (2003b) found that castrated male and female results in no significant difference in loin weight. In fact, castrated male contained higher level of fat in comparison with female.

The result found that there were no significant difference in meat quality i.e. pH45, pH24, color of meat, drip loss, thawing loss, cooking loss, shear force, muscle fiber diameter, Sarcomere length and chemical composition of meat between PC5 and fattening except the dry matter of PC 5 was lower than fattening as presented in table 2. The results obtained in this work indicated that sex have not significant different in meat quality except meat lightness consistent with previous work, Latorre *et al.* (2003b) reported the effect of breed and sex to chemical composition in muscle found that Duroc x LargeWhite and Pietrain x LargeWhite cross bred pigs were no significant different in dry matter, total protein and fat. These reported also stated that total protein in loin muscle were no significant different between castrated male and female. Weston *et al*. (2002) reported that connective tissue was correlated with meat tenderness. However, soluble and insoluble collagen were not significant different consistent with Alonso *et al.* (2009) and McCann *et al.* (2008) who reported that Duroc x Landrace x LargeWhite and Pietrain x Landrace x LargeWhite were no significantly difference in pH24, meat lightness, meat redness and yellowness, drip loss, cooking loss and shear force in loin. Considerate pH24 and meat lightness in both groups, this study found that there were stated in the regular range (pH 5.71-5.75 and lightness between 52.14-52.42) not likely to be Pale Soft Exudative (PSE) or Dark Firm Dry (DFD) (Adzitey *et al.*, 2011; Faucitano *et al.*, 2010; Warriss *et al.*, 1987). Castrated male was higher lightness than female ($P<0.05$). Meanwhile, Alonso *et al*. (2009) have been reported that castrated male and female were no significant difference in meat lightness but castrated male was higher redness and yellowness than female.

Table 1 Carcass quality of PC5 pigs and fattening pigs derived from Duroc-Pietrain terminal boar.

Trait	Breed		Sex		SEM	P-Value
	PC5	Fattening	Male	Female		
Number of pigs	16	16	16	16		
Carcass weight (kg.)	79.25[a]	84.53[b]	83.71	80.02	34.28	0.0095
Carcass length (cm.)	83.37	85.00	84.53	83.81	19.51	0.7011
Carcass percentage (%)	79.54[a]	78.09[b]	79.30	78.40	3.58	0.1328
Lean percentage (%)	47.04[a]	44.33[b]	45.19	46.24	4.28	0.0051
Loin percentage (%)	8.33	8.16	7.91	8.57	0.50	0.0769
Ham percentage (%)	21.49[a]	19.37[b]	20.51	20.43	2.16	0.0042
Fat percentage (%)	11.26[a]	12.99[b]	12.85	11.39	3.59	0.0074
Belly percentage (%)	12.12[a]	13.37[b]	13.11	12.37	1.62	0.0152
Backfat thickness (mm.)	17.83[a]	22.33[b]	21.50	18.60	18.81	0.0099
Loin Eye Area (cm^2)	55.03	53.83	51.48	57.23	86.91	0.2099
LSQ	0.18[a]	0.26[b]	0.24	0.20	0.00	0.0058

PC5: Pakchong 5 terminal boar, LSQ: Lenden-speck quotient index

Table 2 Meat quality of PC5 pigs and fattening pigs derived from Duroc-Pietrain terminal boar.

Trait	Breed		Sex		SEM	P-Value
	PC5	Fattening	Male	Female		
Number of pigs	16	16	16	16		
pH45	6.12	6.21	6.13	6.20	0.07	0.2683
pH24	5.75	5.71	5.70	5.76	0.02	0.4388
Meat lightness (L*)	52.42	52.14	53.52[a]	51.13[b]	5.50	0.0610
Meat redness (a*)	3.28	3.89	3.25	3.89	1.39	0.0820
Meat yellowness (b*)	11.82	12.23	12.23	11.82	1.14	0.2462
Drip loss (%)	3.16	3.07	3.00	3.22	0.50	0.8098
Thawing loss (%)	8.62	8.72	8.88	8.47	4.24	0.8253
Cooking loss (%)	22.10	21.72	21.25	22.54	10.19	0.4661
Shear force (N)	6.29	6.55	6.28	6.55	0.54	0.3164
Diameter (μM)	71.30	70.96	70.42	71.81	24.25	0.8693
Sacromere (μM)	1.70	1.63	1.70	1.64	0.01	0.0898
Dry matter (%)	25.83[a]	26.72[b]	26.39	26.16	0.56	0.0321
Protein (%)	23.17	23.83	23.30	23.70	1.18	0.0962
Crude fat (%)	1.51	2.11	1.78	1.83	0.46	0.2669
Ash (%)	1.02	1.03	1.04	1.01	0.01	0.8707
Insoluble collagen (%)	3.68	3.36	3.71	3.33	0.73	0.1890
Soluble collagen (%)	0.54	0.60	0.62	0.52	0.02	0.2931

PC5: Pakchong 5 terminal boar, pH45 and pH24: pH at 45 min and 24h after slaughter, respectively

In addition, Latorre *et al*. (2003a) stated that castrated male was higher yellowness than female, PC5 tend to have Sarcomere length much more than fattening (P=0.08). These results showed meat quality traits of terminal boar efficiently inherit to fattening pigs. Furthermore, maternal genetics may affect the carcass quality of fattening pigs. This PC5 is the elite terminal boar to produce fattening pigs targeting for meat quality traits

IV. CONCLUSION

PC5 pig derived from higher proportion of Pietrain breed was higher significant difference in carcass quality than its fattening pigs and there were no difference in meat quality.

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