Carcass Quality and Meat Quality of Fattening Pigs Derived from Different Terminal Boars

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Abstract - The objective of this study was to compare carcass quality and meat quality of fattening pigs derived from different terminal boars. The terminal boars in this study were Pakchong 5 (PC5), Commercial 1 (CM1) and Commercial 2 (CM2) pigs. Sixteen pigs in each group (8 males and 8 females); PC5-derived fattening pigs (PC5F), CM1-derived fattening pigs (CM1F) and CM2-derived fattening pigs (CM2F) were slaughtered for carcass and meat quality evaluation. Data were analyzed using General linear model (GLM)and least square means analysis. Results indicated that carcass weight, carcass percentage, lean percentage, back fat thickness and loin eye area (LEA) were not significantly different among groups. Fat percentage and LSQ of PC5F were not different to CM2F but higher than CM1F. PC5F tend to similar in meat colors between commercial terminal boars. Muscle fiber diameters of PC5F were smaller than CM1F and CM2F (P<0.05), while similar trend was found in cooking loss (P<0.05). There was no difference in Warner-Bratzler shear force (WBSF). In conclusion, carcass quality and meat quality of PC5F were not significantly different from the commercial terminal boars.

Key Words - Pakchong 5, Synthetic breed

I. INTRODUCTION

The terminal boar is the male pig with high genetic potential to produce the fattening pig to meet the market demands. Growth traits and meat quality traits will be inherited from boars to its fattening. Pakchong 5 (PC5) is synthetic terminal boar that was bred from Duroc and Pietrain pigs. The PC5 was used to produce high productivity fattening pigs that grow quickly and efficiently, and more meat content. The economic traits of PC5 can be consistence transmitted to the fattening pigs [1]. This terminal boar was established by government and the targets are small farmers to industrial scale farmers. Most of commercially synthetic terminal boars were produced from Duroc and Pietrain breed. The objectives of these synthetic boars are combine growth traits from Duroc and lean meat traits from Pietrain pigs. In this study, carcass and meat quality of fattening pig produced from PC5 terminal boar and commercially terminal boars were compared.

II. MATERIALS AND METHODS

Forty eight fattening pigs derived from PC5 (PC5F), Commercial 1 (CM1F) and Commercial 2 (CM2F) terminal boars were used in the experiment. Each group comprised 16 pigs (8 castrated males and 8 females) were slaughtered about 110 kg body weight for carcass and meat quality evaluation. Live weight, warm carcass weight, carcass length and back-fat thickness data were collected. Loin eye area (LEA) 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 [2]. 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) post mortem. 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, WBSF) using Texture analyzer (Instron model 1011, USA) according to Wheeler *et al.* [3]. Muscle fiber diameter was measured according to Melton *et al.* [4] and Sarcomere length was analyzed according to Cross *et al.* [5] 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 Means (LSM) was applied to compare the mean value.

III. RESULTS AND DISCUSSION

The obtained results indicated that terminal boars did not influence to carcass length, carcass percentage, lean percentage, back fat thickness and LEA (Table 1). The tender loin of PC5F was smaller than CM1F and CM2F ($P<0.05$). Warm carcass weight of PC5F was similar to CM1F and CM2F. However, loin and ham percentage of PC5F were less than CM1F but not different from CM2F. Fat percentage and LSQ of PC5F were similar to CM2F but higher than CM1F ($P<0.05$). LSQ index evaluate carcass quality by fat and lean ratio, if they are highly lean percentage, LSQ index will be low [2]. These results regarding high LSQ index of fattening pigs relate to interaction between cross-bred of dam line (Landrace x Large White) and sire line. The studied indicated that the carcass quality of fattening pig derived from Pakchong 5 tend to be similar to commercially synthetic terminal boars. These terminal boars were also bred from Duroc and Pietrain breeds.

Sex was no influence on carcass weight, carcass length, tender lion, LEA and LSQ index. The loin and ham percentage of castrated male were less than female ($P<0.05$). The belly percentage and fat percentage of male were higher than female ($P<0.05$). This study also confirmed that sex have not significant different in carcass quality paralleled with Latorre *et al.* [6] except loin weight.

The results found that there were no significant difference in meat quality traits i.e. pH45, drip loss, thawing loss, WBSF and Sarcomere length of meat between groups. However, pH24 of PC5F was higher than commercial terminal boars ($P<0.05$) and cooking loss of PC5F was lower than commercial terminal boars ($P<0.05$) as presented in table 2. This result similar to Bulotienė and Jukna [7] who reported that meat pH48 post mortem was highly correlated with water holding capacity and cooking loss. The lactic acid in muscles post mortem that increase will leading to reduce pH, denaturation of myosin and reduction of water holding capacity, respectively. Muscle fiber diameter of PC5F was smaller than CM1F and CM2F ($P<0.05$). Lower pH and larger muscle fiber caused reduction of water holding capacity [7]. CM1F showed lower lightness than PC5F and CM2F ($P<0.05$) because reduction of pH. This finding was not in accordance with Karamucki *et al.* [8] who report that lightness will increase after lower of pH. The meat redness and yellowness of CM2F were higher than PC5F and CM1F ($P<0.05$). More meat lightness result in rise of yellowness that Bulotienė and Jukna [7] reported the correlation of lightness and yellowness. The results obtained in this work indicated that sex have not significant different in meat quality. Alonso *et al.* [9] 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.

These results showed using terminal boar that cross between Duroc and Pietrain breed will improves meat content of fattening pigs without decrease meat quality as report by Šimek *et al.* [10]. Rybarczyk *et al.* [11] reported that no significant influence of using Duroc-Pietrain crossbred on carcass and meat of its fattening pigs.

Table 1 Effect of terminal boar breed and sex on carcass quality of fattening pigs.

Trait	Breed			Sex		SEM	P-Value		
	PC5F	CB1F	CB2F	Male	Female		Breed	Sex	Breed*sex
Number of pigs	16	16	16	24	24				
Carcass weight (kg.)	86.84^{ab}	87.85^{b}	86.23^{a}	86.76	87.19	0.64	0.04	0.33	0.61
Carcass length (cm.)	85.01	85.97	83.64	85.24	84.51	0.34	0.09	0.28	0.98
Carcass percentage (%)	79.19	79.33	78.22	78.80	79.43	0.18	0.64	0.10	0.24
Lean percentage (%)	43.20	44.42	42.68	42.62^{a}	44.32^{b}	0.24	0.08	<0.01	0.79
Tender loin (%)	1.14^{b}	1.31^{a}	1.26^{a}	1.21	1.24	0.02	<0.01	0.28	0.93
Loin percentage (%)	8.04^{a}	8.88^{b}	7.91^{a}	8.02^{a}	8.83^{b}	0.09	<0.01	0.01	0.35
Ham percentage (%)	18.53^{a}	19.75^{b}	18.36^{a}	18.51^{a}	19.26^{b}	0.14	0.01	0.02	0.56
Fat percentage (%)	14.19^{b}	12.69^{a}	14.39^{b}	14.26^{b}	13.26^{a}	0.20	0.02	0.02	0.88
Belly percentage (%)	13.42	13.48	14.12	13.95^{b}	13.39^{a}	0.11	0.06	0.02	0.84
Backfat thickness (mm.)	24.94	22.60	24.08	25.10^{b}	22.64^{a}	0.43	0.18	0.01	0.58
Loin Eye Area (cm^2)	52.31	57.05	48.98	52.23	53.32	1.31	0.20	0.70	0.22
LSQ	0.28^{b}	0.22^{a}	0.32^{b}	0.29	0.26	0.01	0.01	0.12	0.54

PC5F :Pakchong 5-derived fattening pigs, CB1F: Commercial 1-derived fattening pigs,
CB2F: Commercial 2-derived fattening pigs, LSQ :Lenden-speck quotient index
Different superscripts within row showed significantly different (P<0.05).

Table 2 Effect of terminal boar breed and sex on meat quality of fattening pigs.

Trait	Breed			Sex		SEM	P-Value		
	PC5F	CB1F	CB2F	Male	Female		Breed	Sex	Breed*Sex
Number of pigs	16	16	16	24	24				
pH45	6.19	6.21	6.13	6.19	6.16	0.04	0.69	0.74	0.68
pH24	6.06^{a}	5.56^{c}	5.71^{b}	5.78	5.77	0.02	<0.01	0.73	0.59
Meat lightness (L*)	50.89^{a}	49.16^{b}	51.49^{a}	51.04	49.99	0.35	0.02	0.13	0.29
Meat redness (a*)	3.42^{b}	3.66^{b}	4.63^{a}	4.11	3.70	0.16	0.01	0.22	0.67
Meat yellowness (b*)	10.94^{b}	10.94^{b}	12.31^{a}	11.63	11.16	0.13	<0.01	0.08	0.92
Drip loss (%)	3.18	3.25	3.59	3.14	3.54	0.16	0.53	0.21	0.74
Thawing loss (%)	8.84	7.79	8.67	8.48	8.38	0.29	0.29	0.87	0.53
Cooking loss (%)	20.18^{b}	23.88^{a}	23.07^{a}	22.54	22.22	0.49	0.01	0.75	0.70
WBSF (kg)	5.45	5.95	5.77	5.53	5.92	0.16	0.45	0.24	0.52
Muscle fiber diameter (μM)	71.41^{b}	83.34^{a}	77.44^{a}	76.01	78.79	1.23	<0.01	0.26	0.04
Sacromere length (μM)	1.60	1.63	1.61	1.62	1.61	0.01	0.44	0.57	0.65

PC5F :Pakchong 5-derived fattening pigs, CB1F: Commercial 1-derived fattening pigs,
CB2F: Commercial 2-derived fattening pigs, pH45 and pH24 :pH at 45 min and 24h post mortem, respectively
WBSF: Warner-Bratzler shear force
Different superscripts within row showed significantly different (P<0.05).

IV. CONCLUSION

Carcass quality and meat quality of fattening pigs produced from PC5 terminal boar were not different to commercial terminal boars. PC5 terminal boar has beneficial traits that can be utilized in commercial pork production.

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