A SURVEY OF FARM OF ORIGIN AND PROCESSING PLANT EFFECTS ON PORK QUALITY

D. N. Hamilton[1], B. S. Bidner[1], M. Ellis[1], F. K. McKeith[1], A. A. Sosnicki[2], and J. Hair[2]

[1]University of Illinois at Urbana-Champaign, [2]PIC USA, Franklin, KY

ABSTRACT

❖ A total of 4500 commercial pigs of the same genetic background originating from four farms (A, B, C, and D) were slaughtered at two processing plants (1 and 2) on four days (one day in the spring, summer, fall, and winter). On each slaughter day, one truckload of pigs from each farm was dispatched to each plant. Pigs were slaughtered following an overnight rest period and a sub-sample of 800 pigs (25 pigs/farm/plant/slaughter day) was randomly selected for meat quality evaluation (M. Longissimus). Plant 1 had more desirable ($P < 0.001$) pork quality when compared to Plant 2, with greater ($P < 0.001$) 45-min. pH (6.16 vs. 6.06; SE = 0.009), 3-h pH (5.79 vs. 5.71; SE = 0.014), and ultimate pH (5.65 vs. 5.59; SE = 0.008), improved tenderness (8.01 vs. 7.58; SE = 0.072), and juiciness (8.94 vs. 8.47; SE = 0.076), and lower ($P < 0.001$) Minolta L* (45.4 vs. 47.4; SE = 0.18), purge loss (0.41 vs. 0.67; SE = 0.024), and drip loss (2.80 vs. 3.97; SE = 0.078). Farm of origin had a significant impact ($P < 0.05$) on pork quality characteristics such as 45-min. pH, (6.09, 6.14, 6.13, 6.10; SE = 0.012; $P < 0.001$; for farms A, B, C, and D, respectively), ultimate pH (5.67, 5.53, 5.59, 5.70; SE = 0.012; $P < 0.001$; respectively), drip loss (3.31, 4.22, 3.48, 2.54; SE = 0.110; $P < 0.001$; respectively), and purge loss (0.44, 0.76, 0.58, 0.40; SE = 0.034; $P < 0.001$; respectively). There was no effect ($P > 0.05$) of farm of origin on 3-h pH, shear force, cooking loss, or juiciness. There were significant ($P < 0.05$) farm × processing plant interactions for 45-min pH, 3-h pH, ultimate pH, Minolta L*, Minolta b*, drip loss, purge loss, cooking loss, shear force, tenderness, and juiciness, suggesting that the processing plant which generated the most desirable Longissimus quality differed among the four farms. Results from this study highlight the importance of simultaneously optimizing conditions at the farm, during handling and transport, and at the processing plant for achieving desirable pork quality.

OBJECTIVE

❖ The objective of this experiment was to evaluate the influence of farm of origin and processing plant on pork quality.

MATERIALS AND METHODS

❖ A total of 4500 commercial pigs of the same genetic background were harvested on four days (1 day in spring, summer, fall, and winter)

❖ Pigs originated from four farms (A, B, C, and D) and were slaughtered at two processing plants (1 vs 2)

- On each day 1 truckload of pigs from each farm was dispatched to each plant

❖ Pre-slaughter handling was standardized for all animals

- All pigs were given an overnight rest period prior to slaughter

❖ A random sub-sample of 800 pigs (25 pigs/farm/plant/slaughter day) was randomly selected for meat quality evaluation (M. Longissimus)

❖ At 24-h postmortem the longissimus was removed from the left side of each carcass for meat quality evaluation

STATISTICAL ANALYSIS

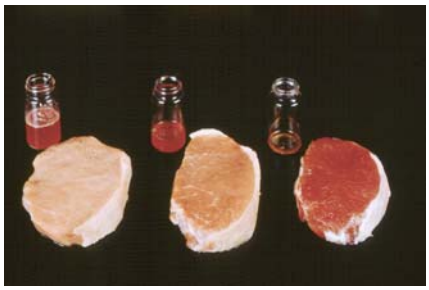
❖ Data were analyzed using the GLM procedure of SAS (Cary, NC). The model included the fixed effects of farm of origin, processing plant, slaughter day and all significant two and three-way interactions.

Table 1. Least square means of farm of origin x processing plant interactions for meat quality characteristics.

Farm of origin	A		B		C		D		Ave	Sig[1]
Processing plant	1	2	1	2	1	2	1	2	SE	Farm x Plant
Variable										
45 min. pH	6.15c	6.03a	6.19c	6.08b	6.19c	6.07ab	6.12b	6.08b	0.017	*
3 hr. pH	5.82c	5.70a	5.81c	5.65a	5.78bc	5.67a	5.72ab	5.81c	0.028	***
Ultimate pH	5.70d	5.63c	5.59bc	5.47a	5.61c	5.57b	5.69d	5.71d	0.017	***
Minolta L*	44.21a	46.92b	46.65b	49.29d	46.37b	48.04c	44.42a	45.15a	0.349	**
Minolta b*	2.16a	3.23c	2.73b	4.00d	2.57b	3.46c	2.16a	2.65b	0.105	**
Purge loss, %	0.33a	0.55b	0.53b	0.98d	0.43ab	0.73bc	0.35a	0.44ab	0.048	**
Drip loss, %	2.44a	4.18c	3.38b	5.05d	3.18b	3.77bc	2.21a	2.88b	0.157	***
Cooking loss, %	22.25a	27.22d	25.13bc	27.52d	24.70b	26.90cd	24.94b	25.04bc	0.691	**
Shear force, kg	2.81a	3.64c	3.11b	3.44c	2.95ab	3.45c	3.18b	3.34bc	0.079	***
Taste panel eval. [2]										
Tenderness	7.8bc	7.3a	8.3c	7.4ab	8.0c	7.9c	7.9c	7.6b	0.14	*
Juiciness	9.2c	8.4a	9.0c	8.3a	8.9bc	8.5a	8.6ab	8.6ab	0.15	*

[1] Means with differing letters on the same line differ; * = P<0.05, ** = P<0.01, and *** = P<0.001.

[2] Panelist evaluated juiciness and tenderness using a 15 cm structured line scale with anchors and a midpoint (0 cm = extremely dry and tough to 15 cm = extremely moist and tender).



CONCLUSIONS

❖ Farm of origin and processing plant were significant sources of variation for most fresh pork quality traits (Table 1)

❖ There were significant interactions between farm of origin and processing plant for most of the important meat quality traits

- These results suggest that the processing plant which generated the most desirable meat quality differed among the four farms

❖ Follow up studies are in progress to try to understand the reasons for this variation and to establish programs to consistently produce high quality pork