

INCREASING MARKET WEIGHT HAS MINIMAL EFFECT ON PORK LOIN QUALITY

Brandon Fields^{1*}, Steve Jungst¹, Neal Matthews², and Andrzej Sosnicki¹

¹PIC Global Genetic Development and Technical Services, Hendersonville, Tennessee, USA;

²PIC Global Genetic Development and Technical Services, Barcelona, Spain.

*Corresponding author email: brandon.fields@genusplc.com

Abstract – This study was conducted to ascertain the effects of increased market weights on 24-hour pork quality and the resulting influence on eating quality. Pigs (n = 4077) were reared at a commercial research barn until the average pen weight was 141 kgs. They were then harvested at a commercial abattoir where meat quality was evaluated at 24-hours post-mortem. A sub-sample of loins (n = 173) were collected and sent to the University of Illinois where they were aged for 10-days and evaluated for pH, purge, cooking loss, and shear force. Loins were then cooked and evaluated by a trained sensory panel for tenderness, juiciness, and off-flavor. No differences (P > .05) were observed for subjective Japanese color or marbling as pigs got heavier. However, the heavier pigs had lower pH (-.0008 / kg) and increased firmness scores (.022 / kg) (P < .05). After aging, tenderness was slightly improved (P < .10) as weights increased. No differences were detected in any other instrumental traits or sensory attributes. From these data, it is concluded that an increase in market weight does not negatively impact pork quality or the eating quality experience for consumers.

Key Words – marbling, pH, pigs, sensory quality

I. INTRODUCTION

Pig market weights have been steadily increasing across the world. Specifically in the United States, an increase of over 500 g / year has been occurring [1]. Increasing market weights helps dilute fixed costs of production and is due, in part, to improvements in genetics and production practices that allow modern pigs to grow faster with less feed, while remaining lean [2]. Whereas reducing costs and maintaining a lean carcass is beneficial to the industry, considerations for the consumer must also be understood. While it is not the purpose of this paper to investigate consumer preferences in terms of size or portion, it is of interest to the authors to determine if the increase in weight has detrimental effects on pork quality that would translate to reduced pork purchases or impact export product quality.

II. MATERIALS AND METHODS

For this study, 4077 pigs were reared in a commercial research barn and harvested at an average pen weight of 141 kg under standard practices at a commercial abattoir utilizing electric stunning and blast chilling. At 24-hours post-mortem, meat quality data were collected, including pH, objective Minolta color (Minolta CR-400 colorimeter) and subjective scores for Japanese color (JCS), National Pork Board marbling score, and firmness. A sub-sample of 173 loins was retained, vacuum packaged, and delivered to the University of Illinois for aging and further analysis. Loin samples were evaluated after a 10-day aging period for pH, Minolta color, package purge, and Warner-Bratzler shear force. Loin chops were cooked to an internal temperature of 70° C, then measured for cooking loss, and presented to a trained taste panel for evaluation of the traits of juiciness, tenderness, and off-flavor. Data were analyzed using the PROC GLM procedure in SAS 9.4. Statistical models included fixed effects for slaughter date, sire line, sex, dietary energy level (3179 or 3430 Kcal ME / kg) and linear and quadratic covariates for head-off hot carcass weight. Quadratic covariates were removed from the final models if P > .10.

III. RESULTS AND DISCUSSION

At 24-hours post-mortem, there was a quadratic effect for lighter color as carcass weight increased (higher Minolta L* and lower JCS). Additionally, pH decreased linearly, which fits known relationships between pH and color. (Table 1).

Table 1. Regression Equations for 24-hour Loin Quality to Hot Carcass Weight (kg)

Trait	Intercept	b _{Linear}	b _{Quadratic}	R ²
pH	5.7277	-.00080*	--	.2724
Minolta L*	56.2462	-.26189	.00151*	.1233
Minolta a*	8.3531	-.00546	--	.0943
Minolta b*	2.5228	.00640*	--	.1013
Japanese color score (1 to 6)	1.5870	.02980	-.00018 [†]	.2619
Marbling score (1 to 10)	1.8236	.00277	--	.2390
Firmness score (1 to 5)	0.6985	.02243***	--	.2411

[†] P < .10; * P < .05; *** P < .001;

While differences were observed, they are of minimal practical importance, as the changes are too small to be noticed by the consumer, even over the full range of carcass weights observed in this trial (83 to 118 kgs). Furthermore, after 10-days of aging only the tenderness score had a significant relationship with carcass weight as it improved by .026 / kg (P < .10). (Table 2).

Table 2. Regression Equations for 10-day Loin Quality to Hot Carcass Weight (kg)

Trait	Intercept	b _{Linear}	R ²
pH	5.4870	.00164	.4409
Minolta L*	55.7802	-.06043	.4865
Minolta a*	8.2728	-.00819	.4158
Minolta b*	5.6879	-.00462	.7424
Purge, %	2.3773	-.00654	.2176
Cook loss, %	27.7532	-.04578	.0935
WB Shear Force, kg	3.8227	-.01161	.1854
Tenderness (0 to 15)	6.2039	.02600 [†]	.0987
Juiciness (0 to 15)	6.9855	.00993	.0660
Off-flavor (0 to 15)	0.1345	.00214	.1923

[†] P < .10

IV. CONCLUSION

These results indicate that increasing market weight has no adverse effects on meat or sensory quality of pork loins. While differences were observed for some traits at 24-hours, the relationships with carcass weight were extremely small. Furthermore, these differences were negated by the 10-day aging period. After the 10 days, tenderness was slightly improved as weight increased. These results are corroborated by other recent work from Choi and Oh [3]. Therefore, the pork industry should feel confident that continuing to increase market weights will not impact the final product quality.

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