



Compositional and Physical Factors Associated with Pork Belly Softness and Overall Impacts on Bacon Yield

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Objectives

Pork belly softness is a major quality defect that has reduced processors' and packers' profitability due to its effect on fabrication efficiency, bacon shelf stability, sensory quality and possibly, bacon slicing yield. Despite the importance of pork belly softness, its multifactorial nature has hampered its effective assessment, sorting and quality control in the industry. The present research attempted to explore various physical and compositional factors that may influence pork belly softness.

Materials and Methods

A total of 199 pigs of 3 different genotypes (Duroc, Lacombe and Iberian crossbred), 2 sexes (barrow and gilt), 2 slaughter weights (120 and 140 kg) and 3 different diets (flaxseed, canola, and control) were utilized in this study to comprehensively represent potential variability in the pork market place. Following a 24 h chill, left bellies were fabricated and belly softness assessed using both an objective measure of belly flop angle and a 5-point subjective scale. Physical factors including measures of belly thickness, length, width and weight were obtained from the pork bellies. Compositional factors including proximate analysis, fatty acid profile and iodine value were also determined on three pre-determined belly layers. Forty-five right side bellies were also processed into bacon to assess overall bacon yield.

Results

The subjective belly score and the belly flop angle measurement were strongly negatively correlated ($r = -0.89$, $P < 0.01$). Parameters that were negatively correlat-

ed with belly flop angle measurements ($r = -0.46$ to -0.72 , $P < 0.01$) included: belly moisture and lean content; iodine value (IV), linoleic acid content, polyunsaturated fatty acids (PUFA), PUFA/SFA, n-6 and n-3 (omega 6 and 3) fatty acids; and belly width and thickness of the *latissimus dorsi* muscle. Belly flop angle was positively correlated ($r = 0.45$ to 0.76 , $P < 0.01$) with belly total fat content, weight, back fat firmness, saturated fatty acids (SFA), fat layers thickness and overall belly thickness. Following appropriate data cleansing for collinearity, a significant model with eight predictors accounting for about 85% of the objective measure for belly softness was developed using the step-wise regression procedure ($P < 0.05$). About 84% of the observed belly softness variability was accounted for by six factors, including belly width at the midpoint, length, weight, palmitic acid of the subcutaneous fat, linoleic acid of the intermuscular fat and thickness of the *latissimus dorsi*. Other predictors that marginally contributed to this model included total fat content and fat firmness assessed with a durometer. Overall, physical factors contributed more to the belly softness prediction model compared to the compositional parameters when analyzed separately ($R^2 = 0.82$ vs. 0.67). In the present study, IV only accounted for 49% of the observed variation. Although belly softness did not seem to have any relationship with bacon slice yield on the subset of bellies considered ($r = 0.05$, $P = 0.76$), it was significantly correlated with bacon cook loss and smokehouse yield ($r = 0.62$ to 0.76 , $P < 0.01$).

Conclusion

Incorporation of physical measures into a system to assess belly firmness in the industry may be warranted. Belly softness may be associated with bacon cook loss and smokehouse yield, but its association with slice yield may require further consideration.