

Search for new sites for predicting the composition of pork cuts

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Introduction: The industrial sorting of pork cuts, as well as the grading of carcasses, suffers from a high error in the prediction of fat and muscle composition. X-ray tomography is a modern, non-destructive technique for effectively measuring body composition (Scholz et al., 2015). By tuning a low slice thickness (typically 1-3 mm) it allows accurate scans and makes computed tomography an ideal tool to find the best predictors of the cut's composition. The aim of this study is to identify and locate potential predictors of tissue composition as well as to quantify their accuracy in the three primal pork cuts, which sorting is important: ham, loin and belly.

Material and methods: Two samples were selected in a meat plant: 100 hams and 80 bellies (Daumas et al., 2019). A third sample of 125 loins was selected in 2 batches in another cutting plant. All cuts were weighed and scanned by computed tomography, with a slice thickness of 3 mm. Tomographic images were segmented to determine muscle and fat weights, as well as their contents, for each slice. Acquisition parameters, image analysis and contents calculation were described in Daumas and Monziols (2011) and in Daumas et al. (2019).

For each cut, the maximum and minimum of each of the two tissues, for weight and content, were used as potential predictors. The cut's weight was included too. Regression models were established by ordinary least squares and the R² was calculated in cross-validation performing 50 random partitions of the data into 10 segments.

Results: The predicted median R² were all greater than or equal to 0.90. Those for weight prediction were generally higher than those for content prediction. The R² for weights and contents of fat and muscle ranged from 0.96 to 0.99 for hams, 0.93 to 0.96 for bellies, and 0.90 to 0.96 for loins. More in detail, the R² for fat and muscle weight were respectively: 0.96 and 0.99 in ham, 0.96 and 0.93 in belly and, 0.97 and 0.96 in loin. The R² for fat and muscle content were respectively: 0.96 and 0.93 in ham, 0.93 and 0.94 in belly and, 0.93 and 0.90 in loin.

By way of comparison, the R² for estimating the muscle content of the three cuts of this study by carcass grading devices in France were between 0.64 and 0.73 with the CGM and between 0.41 and 0.52 with Image-Meater (Daumas and Monziols, 2017).

Conclusion: These very promising results show that a small number (3-4) of measurement sites are sufficient to accurately predict the composition of hams, bellies and loins. This opens up new prospects for greatly improving the industrial sorting of cuts, and even the classification of carcasses. The next step will consist in evaluating the error of variables (thicknesses for example) more easily measurable in industry in the most promising areas.

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