

Muscle content of pork carcasses and cuts as influenced by restricted feeding or amino acid deficiency

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Introduction: The profitability of pig farms is mainly driven by the growth performance of animals and carcass grading. The aim of the study was to quantify accurately the increase in muscle content due to restricted feeding (RF) or its decrease due to amino acid deficiency (AD). The hypotheses tested were that muscle content is increased under RF (Quiniou et al., 1996) but decreased under AD (Lambe et al., 2013).

Material and Methods: A sample of 288 pigs was used in a 3x2 factorial design based on 3 feeding strategies (RF, AD, Control) and 2 sexes (gilts, castrates). Feeding level was either ad libitum (Control and AD) or 85% of ad libitum (RF). More details about feeding can be found in Quiniou et al. (2021). Two batches were studied, either in winter or summer, with four pens of six gilts or castrates per strategy each. The pigs were crossbred between Piétrain boars and Large White x Landrace sows and were heterozygous for the halothane gene. Carcasses were classified on the slaughterline by the French Image-Meater method (Blum et al., 2014). After an overnight chilling, left half-carcasses were scanned by computed tomography. The four primal joints, ham, shoulder, loin and belly, were also scanned for a subsample of 140 carcasses. Image acquisition parameters and analyses were similar to those used by Daumas and Monziols (2011) to calculate the percentage of muscle in the carcass and in each of the four cuts. Least square means of muscle contents were assessed by a general linear model including feeding strategy, sex, batch and block within batch as fixed effects and interactions. Differences between RF or AD and Control were tested by a unilateral Dunnett test with a 5% critical probability.

Results: Treatment and sex influenced significantly all variables. All differences between RF or AD and Control were significant. Feed restriction increased the muscle content of carcass by 3.5 percent points (68.5 vs. 65.0; $P < 0.001$). The increase ($P < 0.001$) was higher in loin (+3.5) and belly (+3.7) than in ham (+2.2) and shoulder (+2.7). Amino acid deficiency decreased the muscle content (at least $P < 0.01$) by 1.9 percent point in ham, 2.0 in shoulder, 2.3 in belly, and 2.7 in loin. However, an interaction between strategy and batch was observed for the carcass muscle content, with a significant decrease ($P < 0.01$) only in summer (-2.6 percent points, 63.0 vs. 65.6). Such an interaction was not detected on the lean meat content assessed by the commercial grading method based on backfat and muscle thicknesses.

Conclusion: Muscle contents measured by computed tomography was increased by RF and decreased by AD as expected. The difference was about twice that is estimated by the Image-Meater grading method, and higher effects of RF and AD were observed in the middle cuts than in ham and shoulder. In order to estimate accurately the effect of feeding strategy on composition of the body weight gain, computed tomography should be promoted in growth trials on pigs.

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Literature:

Blum, Y., Monziols, M., Causeur, D., & Daumas, G. (2014). New calibration of the main method for classifying pig carcasses in France. *Journées Rech. Porcine*, 46, 39-43.

Daumas, G., & Monziols, M. (2011). An accurate and simple computed tomography approach for measuring the lean meat percentage of pig cuts. *Proceedings of the 57th ICoMST*, Ghent, Belgium, Paper 061.

Lambe, N. R., Wood, J. D., McLean, K. A., Walling, G. A., Whitney, H., Jagger, S., Fullarton, P., Bayntun, J. A., & Bunger, L. (2013). Effects of low protein diets on pigs with a lean genotype. 2. Compositional traits measured with computed tomography (CT). *Meat Sci.*, 95, 129-136.

Quiniou, N., Dourmad, J.-Y., & Noblet, J. (1996). Effect of energy intake and growth potential on tissular composition of body weight gain in finishing pigs. *Journées Rech. Porcine*, 28, 429-438.

Quiniou, N., Renaudeau, D., & Daumas, G. (2021). Effect of feed restriction and level of amino acid supply on performance of fattening pigs reared under different climatic conditions. *Journées Rech. Porcine*, 53, 169-174.