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Evaluation of Total Lean and Saleable Meat Yield Prediction Equations and Dual Energy X-Ray Absorptiometry for a Rapid, Non-Invasive Yield Prediction in Beef

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Objectives

The objective of this study was to evaluate the beef yield equations currently used in North America and the potential use of the Dual energy X-ray absorptiometry (DXA) technology to predict either total or saleable yield of beef carcasses.

Materials and Methods

A total of 316 left carcass sides over a wide range of weight (192 to 453 kg) and backfat thickness (1 to 29 mm) were fabricated into primal and retail cuts. Carcass break points were identified following Institutional Meat Purchase Specifications (IMPS) for Fresh Beef Products, Series 100. The primals collected from the left fabricated carcass side were the chuck (IMPS #113), rib (IMPS #103), brisket (IMPS #118), flank (IMPS #193, non-trimmed), foreshank (IMPS #117), loin (IMPS #172A), round (IMPS #158A) and plate (IMPS #121) primal cuts. All the cuts were scanned with an iDXA unit (GE Lunar Prodigy Advance, General Electric, Madison, WI) and then for the chuck, rib, loin and round, broken into closely trimmed retail cuts. Cuts were then fully dissected into fat [subcutaneous (SQ), intermuscular (IM) and body cavity (BC)], lean and bone and weighed.

Results

Regressing total lean meat yield predicted using the Canadian grade ruler versus dissected total lean meat yield resulted in an R^2 of 0.56 (i.e., the equation predicted 56% of the variation). Regressing USDA calculated meat yield estimation (saleable yield) versus actual saleable yield of the boneless, closely trimmed round, loin, rib and chuck retail cuts resulted in an R^2 of 0.34. Regressing total lean meat yield versus saleable meat yield yielded a moderate R^2 (0.63). DXA was able to accurately predict total lean and total fat content in the carcass ($R^2 = 0.98$) using partial least squares regression (PLSR). Predictions of saleable yield for each of the four major primals, using DXA technology were slightly lower (R^2 ranged from 0.70 to 0.87) than those for total carcass lean and fat estimations.

Conclusion

Accurate prediction of beef yield is required to provide fair settlements for producers, and to help guide genetic improvements. This database provides important knowledge regarding the prediction accuracy and relationships between total lean meat yield and saleable meat yield necessary to support North American grade harmonization. In addition, DEXA technology may have the potential to estimate beef carcass traits such as total or saleable yield performance.