INFLUENCE OF PRODUCTION FACTORS ON BEEF PRIMAL TISSUE COMPOSITION

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I. OBJECTIVES

Primal composition, specifically lean meat yield, is an economically important trait that drives the final cattle payment in the beef industry. Production factors may have beneficial or costly influences on the primal composition of the carcass. Understanding the impact of certain production factors on primal composition is important to beef cattle producers in order to optimize proportions of lean, fat, and bone for improved profitability. As the study of primal cut weights has been well studied, improved understanding of factors influencing primal tissue composition is needed. Therefore, the objective of this study was to understand the influence of and relationship between production factors (production system, use of implants, and breed composition) on individual beef primal tissue composition (i.e., lean, fat, and bone).

II. MATERIALS AND METHODS

This study used 1,083 crossbred steers, selected from previous projects conducted at the Agriculture and Agri-Food Lacombe Research and Development Centre (LRDC). Data included pedigree, environmental, performance, grading, and phenotypic information related to primal cut composition. All animals were slaughtered and processed at the federally inspected abattoir of the LRDC, and full blue tag Canadian grade data were assessed by a Canadian Beef Grading Agency certified grader, including fat thickness, grade fat, ribeye areas, estimated total lean yield, and marbling. The primal cut data were evaluated using manual dissection of individual primals (i.e., chuck, rib, brisket, flank, fore-shank, loin, round, and plate) from the left carcass sides to measure total lean, fat, and bone content. Data were analyzed using the SAS mixed model procedure (SAS Institute Inc., Cary, NC) using production system (calf-fed vs. yearling-fed), implants (implanted vs. nonimplanted), breed composition (high Angus [>70%] vs. low Angus [<70%]), and their interactions as the fixed effects, research project as a random effect, and slaughter weight (kilograms) nested within production system as a covariate. Least-squares means were computed and separated using least significant differences when treatment effects were significant at $\alpha \leq 0.05$. The adjusted multiple R^2 (representing the overall fit of the proposed model or the variability of trait explained for the analyzed factors) was calculated.

III. RESULTS

High Angus (>70%) breed resulted in animals with increased marbling and fat content ($P \leq 0.05$) and decreased yield and lean content ($P \leq 0.05$), while use of implants increased lean ($P \leq 0.05$) and decreased marbling and total fat ($P \leq 0.05$). Additionally, the individual primal

as well as total lean and fat content differed significantly for calf-fed versus yearling-fed animals ($P \leq 0.05$). R^2 values for each primal's fat and lean content ranged from 0.26 to 0.42 and from 0.19 to 0.42, respectively, while R^2 values for total fat, total lean, marbling, and muscle score were all between 0.32 and 0.38. For most traits evaluated, the model explained <50% of the total variation, indicating that other factors are significantly influencing primal composition.

IV. CONCLUSION

Production system, use of implants, and breed significantly impacted the lean and fat composition of the animals based on both grading and cutout parameters. Calf-fed animals, animals with implants, and with low Angus (<70%) breed composition were leaner than their counterparts. Future research will include additional factors, such as genetics to explore phenotypic and genetic correlations and estimate molecular breeding values for individual beef primal tissue composition traits.

Keywords: Angus, calf-fed, implant, primal composition, yearling-fed