BEEF CATTLE RESEARCH UPDATE

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Do Maintenance Energy Requirements Affect Meat Quality?

Standardized Performance Analysis records have shown that feed costs account for more than 60% of beef producers' annual cow cost.[1] It has been estimated that feed cost for maintenance represents at least 60 to 65% of the total feed requirements for the cowherd.[2] Breed associations have provided EPDs for production traits for several decades. The Red Angus Association of America developed a maintenance energy EPD (ME EPD) that is predicted from the mature weight of the cow adjusted for body condition score and from milk production because these traits affect maintenance requirements.[3] University of Idaho researchers recently conducted a study comparing the meat quality of progeny sired by Red Angus bulls with either high or low ME EPDs.[4] It is assumed that high ME EPD cattle are less efficient because their maintenance energy requirements represent a larger proportion of their dietary intake. This study demonstrated that selection for efficient Red Angus cattle based on ME EPD did not adversely affect meat quality. In addition, these researchers suggested that selecting for efficient Red Angus beef cattle may improve fresh meat quality within Red Angus beef cattle.

Substituting Steam Flaked Corn with Whole shelled Corn in Feedlot Diets Containing Wet Distillers Grains

Steam flaking corn increases starch digestion and improves cattle performance. A 2007 survey of 29 consulting feedlot nutritionists conducted by Texas Tech University researchers reported that these consultants considered steam-flaked corn (SFC) to increase in NEg concentration by an average of 10.9% compared with dry-rolled corn (DRC) and 6.8% compared with high-moisture corn (HMC).[5] However, processing costs are considerably greater for SFC than for other grain processing methods.[6] The use of co-products (corn gluten feed and distiller's grains) in feedlot diets has increased over the past two decades due to the rapid growth of wet corn milling for production of corn-based sweeteners and of dry milling of grain for fuel ethanol production.[7] The 2007 Texas Tech survey showed that 83% of feedlot consulting nutritionist's clients used grain coproducts in finishing diets with an average inclusion rate 16.5% (range of 5 to 50%, dry matter basis).

Research has demonstrated that there are interactions between grain processing method and the inclusion amount of wet distiller's grains plus solubles (WDGS) in feedlot diets. For example, Nebraska research showed that optimal feedlot performance was observed with 40%, 27.5%, and 15% WDGS in DRC, HMC, and SFC based diets, respectively.[8] These researchers concluded that a greater response to WDGS was observed with less intensely processed corn. For this reason, New Mexico State University researchers recently evaluated whether substituting SFC with whole shelled corn (WSC) in finishing diets containing WDGS could reduce grain processing costs without compromising feedlot cattle performance.[9] This study conducted at the Clayton, NM Livestock Research Center used 642 Angus-cross heifers (908 lb initial weight, 108 day trial). The cattle were assigned to 36 pens arranged in a 2 × 3 factorial design consisting of six finishing diets based on SFC with 0 or 20% WSC replacing SFC, and 0, 15, or 30% WDGS replacing SFC (dry matter basis).

These researchers reported that no WSC by WDGS interactions occurred for feedlot performance and most carcass characteristics. Heifers fed diets containing 20 vs. 0% WSC consumed more feed (18.04 vs. 17.27 lb/day, $P < 0.01$), but final body weight (1198 lb), average daily gain (2.62 lb), and gain to feed ratio (0.149) were not affected ($P \geq 0.11$) by WSC. The percentage of carcasses grading USDA choice or better tended to be lower ($P = 0.07$), and the percentage grading USDA select was higher ($P = 0.03$) for cattle fed diets with 20 vs. 0% WSC. However, other carcass characteristics were not affected by WSC. It was also reported that increasing WDGS in SFC diets decreased final body weight in a linear manner ($P < 0.01$), tended to decrease daily gain (linear, $P = 0.10$), tended to increase feed intakes (linear, $P = 0.08$), and decreased gain to feed ratio (linear, $P = 0.01$). Furthermore, the addition of WDGS to SFC diets tended to decrease carcass weight in a linear manner ($P = 0.09$), but other carcass characteristics were not affected.

The results of this study demonstrated that substituting SFC with 20% WSC in finishing diets did not affect animal performance and feed conversion, but decreased carcass quality. In contrast, substituting SFC in finishing diets with increasing amounts of WDGS decreased animal performance and feed conversion, but did not affect carcass characteristics. These researchers speculated that the limited responses to the substitution of 20% WSC could in part explain the lack of WSC by WDGS interactions. They concluded that that it is not clear if grain processing could be reduced in finishing diets containing WDGS without affecting feedlot cattle performance and feed conversion.

As a part of this study, ruminal fluid samples were collected from two heifers per pen on day 98 of the feeding period to evaluate the effect of WSC and WDGS on ruminal fermentation characteristics and ruminal bacterial populations.[10] These researchers reported that there were few significant interactions between the amount of WSC and the amount of WDGS. However, they also noted that there appeared to be a decrease in favorable fermentation characteristics when WSC was included in SFC-based diets with WDGS implying that ruminal fermentation may be negatively altered, which might ultimately impact performance and carcass characteristics.

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[1] Miller, A. J., D. B. Faulkner, R. K. Knipe, D. R. Strohbehn, D. F. Parrett and L. L. Berger. 2001. Critical control points for profitability in the cow-calf enterprise. Prof. Anim. Sci. 17:295-302.

[2] Arthur, P. F., J. A. Archer, D. J. Johnston, R. M. Herd, E. C. Richardson and P. F. Parnell. 2001. Genetic and phenotypic variance and covariance components for feed intake, feed efficiency, and other postweaning traits in angus cattle. J. Anim. Sci. 79:2805-2811.

[3] Enns, M., D. Garrick and S. Speidel. 2003. Maintenance Energy Requirements The Technical Details Explained. Red Angus Association of America. Available at: http://redangus.org/assets/media/Documents/Genetics/Maintenance/Maintenance_Energy_Requirements.pdf.

[4] Thornton, K. J., C. M. Welch, L. C. Davis, M. E. Doumit, R. A. Hill and G. K. Murdoch. 2012. Bovine sire selection based on maintenance energy affects muscle fiber type and meat color of f1 progeny. J. Anim. Sci. 90:1617-1627.

[5] Vasconcelos, J. T. and M. L. Galyean. 2007. Nutritional recommendations of feedlot consulting nutritionists: The 2007 Texas Tech university survey. J. Anim. Sci. 85:2772-2781.

[6] Macken, C. N., G. E. Erickson, T. J. Klopfenstein, and R. A. Stock. 2006. Effects of corn processing method and protein concentration in finishing diets containing wet corn gluten feed on cattle performance Prof. Anim. Sci. 22:14-22.

[7] DiLorenzo, N., and M. L. Galyean. 2010. Applying technology with newer feed ingredients in feedlot diets: Do the old paradigms apply? J. Anim. Sci. 88:E123-E132.

[8] Corrigan, M. E., G. E. Erickson, T. J. Klopfenstein, M. K. Luebbe, K. J. Vander Pol, N. F. Meyer, C. D. Buckner, S. J. Vanness, and K. J. Hanford. 2009. Effect of corn processing method and corn wet distillers grains plus solubles inclusion level in finishing steers. J. Anim. Sci. 87:3351-3362.

[9] McDaniel, M. R., D. A. Walker, K. M. Taylor, N. A. Elam, N. A. Cole, and C. A. Löest. 2011. Evaluation of whole corn substitution in steam-flaked corn-based diets containing different concentrations of wet distiller's grains. Proc. West. Sec. Am. Soc. Anim. Soc. 62:358-362.

[10] Tracey, L. N., M. R. McDaniel, J. Browne-Silva, N. A. Cole, C. A. Löest, and S. L. Lodge-Ivey. 2011. Whole corn and wet distillers grains substitution in steam-flaked corn diet alters rumen fermentation and bacterial dynamics. Proc. West. Sec. Am. Soc. Anim. Soc. 62:330-334.