FEED EFFICIENCY IN GROWING STEERS: RELATIONSHIPS BETWEEN EFFICIENCY AND CARCASS ULTRASOUND TRAITS

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Abstract

Phenotypic correlations between feed efficiency and carcass traits were examined in growing steers. Two feed efficiency trials were conducted using 233 Santa Gertrudis steers. Steers were individually fed a roughage-based diet for 77 days. Individual feed intake was recorded weekly and body weight was measured bi-weekly. Ultrasound measurements of the 12th rib fat thickness (back fat), longissimus muscle area (REA) and percentage intramuscular fat were obtained on day 0 and 77. Residual feed intake (RFI) was a measure of feed efficiency that attempts to measure variation in feed intake beyond that needed for growth and maintenance. Residual feed intake was calculated as the difference between actual feed intake and expected feed intake predicted by a linear regression model of dry matter intake (DMI) on mid-test BW(2)(MBW) and average daily gain (ADG) with trial x MBW and trial x ADG as random effects. Steers were ranked by RFI, separated into low, medium, and high efficiency groups that were 0.5 SD, ±0.5 SD, and > 0.5 SD, respectively, from the mean RFI. Overall means for ADG and DMI were 0.38 kg/d (SD ± 0.57) and 9.79 kg/d (SD ± 1.05), respectively. Stepwise regression indicated that inclusion of gain in back fat (GBF) into the base model increased the r(0.43 vs. 0.46). RFI was positively correlated (P < 0.05) with DMI (r = 0.76), and FCR (r = 0.49), but not with MBW or ADG. Feed to gain ratio (FCR) was negatively correlated (r = 0.05) with ADG (r = -0.70). Carcass adjusted for RFI (RFIc) was positively correlated (P < 0.05) with DMI (r = 0.75) and FCR (r = 0.49), but not with MBW or ADG. Gain in back fat was positively correlated (P < 0.05) with RFIp (r = 0.14), but not correlated (P > 0.05) with FCR or RFIp. Gain in REA was not correlated (P > 0.05) with FCR, RFIp, or RFIp. The Spearman rank correlation between RFIp and RFIp was high (r = 0.91). Results suggest that RFI is independent of growth rate and mature size, but related to DMI. Selecting for favorable RFIp phenotypes can potentially improve feed efficiency in cattle. Adjusting RFI for ultrasound carcass traits could also improve feed efficiency independent of growth, body size, and carcass composition.

Conclusion

Results in this study indicate that RFIp is independent of growth rate and mature size, but highly correlated with DMI. Selecting for favorable RFIp phenotypes has the potential to improve feed efficiency in cattle. Adjusting RFI for ultrasound carcass traits could also improve feed efficiency independent of growth, body size, and carcass composition.

Materials and Methods

Two trials were conducted with Santa Gertrudis steers (n = 233) during which steers were fed a roughage-based diet (2.1 Mcal ME/kg DM) during the growing phase.

Steers were weighed at 14-d intervals and DMI measured (Calan gate or GrowSafe) for 70 d during both the growing.

Ultrasound measurements of the 12th rib fat thickness (BF), longissimus muscle area (REA), and percentage intramuscular fat (IMF) were taken on day 70.

Calculations and Statistical Analysis:

Partial correlation and least squares means were determined using PROC CORR and GLM functions of SAS. Results are from PROC GLM with trials as random effects, and DMI, ADG, and MBW as covariates. Phenotypic correlations were calculated using PROC CORR SPEARMANN of SAS.

RFI was negatively correlated (P < 0.05) with DMI (r = -0.70).

RFIp was positively correlated (P < 0.05) with DMI (r = 0.76) and FCR (r = 0.49).

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Gain in BF was positively correlated (P < 0.05) with RFIp (r = 0.14).

Gain in REA was not correlated (P > 0.05) with FCR, RFIp, or RFIp. The Spearman rank correlation between RFIp and RFIp was high (r = 0.91).