

GENOTYPE BY ENVIRONMENT INTERACTION MEASURED BY
USING REACTION NORMS IN U.S. ANGUS BEEF CATTLE

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ABSTRACT

The objective of this study was to evaluate GxE by comparing reaction norms among U.S. Angus bulls. Dependent variables were adjusted weights at birth, 205 d weaning, and 365 d yearling. Environments were defined as progeny groups based upon data record location. Data were included in the analysis if each sire had at least 100 progeny, at least 6 progeny per environment, and at least 5 environments represented, while each environment required at least 6 qualifying bulls. The average performance of progeny within each herd environment was defined as the environmental mean. Four statistical models were analyzed using herd environment (categorical (CM) and genotype by environment (GEM)) or environmental mean (continuous environment (CEM) and random regression (RRM)) for estimating breeding values and heritabilities. Fixed effects included year–season, contemporary group, and sex. The RRM produced reaction norms for each bull which were calculated by regressing progeny means within an environment on environment means (SAS PROC GLM and ASREML). Regression coefficients differed among bulls for all traits ($P < 0.0001$). Heritability estimates with pedigree information ranged from 0.293 to 0.401 for birth weight; 0.141 to 0.289 for weaning weight; and 0.147 to 0.259 for yearling weight. The RRM had the best fit when evaluated using environmental mean. These results suggest that bulls differ in the consistency of their progeny's performance across environments. Estimates of genetic merit of regressions from reaction norms may be a useful selection tool for ranking bulls to be used across diverse environments.