

Results from six generations of selection for intramuscular fat in Duroc swine using real-time ultrasound. II. Genetic parameters and trends

C. R. Schwab, T. J. Baas, and K. J. Stalder

Department of Animal Science, Iowa State University, Ames 50011

Abstract :

Design of breeding programs requires knowledge of variance components that exist for traits included in specific breeding goals and the genetic relationships that exist among traits of economic importance. A study was conducted to evaluate direct and correlated genetic responses to selection for intramuscular fat (IMF) and to estimate genetic parameters for economically important traits in Duroc swine. Forty gilts were purchased from US breeders and randomly mated for 2 generations to boars available in regional boar studs to develop a base population of 56 litters. Littermate pairs of gilts from this population were randomly assigned to a select line (SL) or control line (CL) and mated to the same boar to establish genetic ties between lines. In the SL, the top 10 boars and 75 gilts were selected based on IMF EBV obtained from a bivariate animal model that included IMF evaluated on the carcass and IMF predicted via ultrasound. One boar from each sire family and 50 to 60 gilts representing all sire families were randomly selected to maintain the CL. Carcass and ultrasound IMF were both moderately heritable (0.31 and 0.38, respectively). Moderate to high genetic relationships were estimated among carcass backfat and meat quality measures of IMF, Instron tenderness, and objective loin muscle color. Based on estimates obtained in this study, more desirable genetic merit for pH is associated with greater genetic value for loin color, tenderness, and sensory characteristics. Intramuscular fat measures obtained on the carcass and predicted using ultrasound technology were highly correlated ($r_g = 0.86$ from a 12-trait analysis; $r_g = 0.90$ from a 5-trait analysis). Estimated genetic relationships among IMF measures and other traits evaluated were generally consistent. Intramuscular fat measures were also genetically associated with Instron tenderness and flavor score in a desirable direction. Direct genetic response in IMF measures observed in the SL corresponded to a significant decrease in EBV for carcass loin muscle area (-0.90 cm² per generation) and an increase in carcass backfat EBV (0.98 mm per generation). Selection for IMF has led to more desirable EBV for objective tenderness and has had an adverse effect on additive genetic merit for objective loin color.

Key Word :

genetic parameter, intramuscular fat, selection, swine, ultrasound

Volume 88, Number 1, January 2010