

Consequences of long-term inbreeding accumulation on preweaning traits in a closed nucleus Angus herd

J. A. Carrillo and F. Siewerdt

Department of Animal and Avian Sciences, University of Maryland, College Park 20742

Abstract :

The effect of individual and dam (maternal) inbreeding was quantified for preweaning traits in an Angus nucleus herd that has been closed to outside breeding for 70 yr. The effectiveness of 5 models (linear, quadratic, exponential, Michaelis-Menten, and Rumford-Newton) was evaluated for describing the effect of inbreeding on growth traits, hock length (HL), and scrotal circumference (SC). Pedigree information and production records were retrieved for 10,938 animals and analyzed in an animal model that included the fixed effects of year of birth, age of the dam, sex, and age at weaning (for traits measured at weaning). Average individual and maternal inbreeding in the herd were 0.068 and 0.066, respectively, for all animals; in the last calf crop these values were 0.120 for the calves and 0.121 for their dams. Inbreeding depression was observed for BW at birth (WB), weaning weight (WW), BW adjusted to 205 d of age (W205), ADG, HL, and SC. The effect of maternal inbreeding was smaller than for individual inbreeding for WB, WW, W205, and ADG. Nonlinear prediction was done more effectively by the exponential and Michaelis-Menten models. Quadratic polynomials were an inadequate descriptor of inbreeding effects. Genetic gain from selection at an intensity equivalent to 0.25 can be nullified by an inbreeding accumulation of 0.187 (WB), 0.056 (WW), 0.068 (W205), 0.065 (ADG), or 0.092 (SC). Inbreeding accumulation of 0.018 is required to nullify genetic gain for HL; this particular prediction is valid for non-inbred cows due to an observed interaction between individual and maternal inbreeding. At current inbreeding accumulation levels in this herd, 7 generations of inbreeding accumulation will be necessary to nullify the genetic progress from 1 generation of selection in growth traits.

Key Word :

beef cattle, growth, inbreeding depression, nucleus herd, scrotal circumference

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