Estimates of genetic parameters for preweaning growth traits of beef cattle of different breed compositions

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Crossbreeding in beef cattle has been used not only to produce a final product to be sent to market, but also to form composite populations in which selection is to be practiced. In a selection program, an important procedure is to evaluate genetic variability for relevant traits. The aim of this study was to estimate genetic parameters for birth weight (BW), standardized 240 days weaning weight (WW) and daily weight gain from birth to weaning (ADG) of calves of several breed compositions. The calves were sired by Nellore (Ne), Angus (An), Bonsmara (Bo), beef type Brown Swiss (Bs), Brangus (5/8 An + 3/8 Zebu), Charolais (Ch), Canchim (5/8 Ch + 3/8 Zebu), Hereford (He), Limousin (Li), Senepol (Se), or Simmental (Si) bulls, and were out of commercial Nellore, 1/2 An + 1/2 Ne, 5/16 Ch + 11/16 Ne, 1/2 Se + 1/2 Ne, or 1/2 Si + 1/2 Ne cows. Cow-calf pairs were maintained under extensive or intensive pasture management. Data from 6,180 (BW), 5,760 (WW) and 5,760 (ADG) animals, born from 1998 to 2014, were used. Calves of different genetic groups were born in different years and seasons, but there was no complete confounding of genetic group (GG) with year and season of birth. Single and two trait analyses were performed using the restricted maximum likelihood method and three different models. Model I included the fixed effects of year and season of birth, sex of calf, age of cow at calving, weaning age (linear effect), and class of genetic group of the calf (CGG), formed by the proportion of indicine (Zb: Ne), and adapted (Ta; Se and Bo), British (Tb; An and He) and continental (Tc; Ch, Bs, Si, and Li) taurine breeds, as well as the direct and maternal additive, permanent and residual environment effects, depending on the trait. In model II, the effect of CGG was substituted by the covariates proportions of Ta, Tb and Tc in the calf, and expected proportion of loci heterozygous for Ta-Zb, Tb-Zb, Tc-Zb, Ta-Tb, Ta-Tc and Tb-Tc in the calf, which are the additive breed and individual heterotic effects, respectively. In model III, these heterotic effects of model II were substituted by h^i_{tz} and h^i_{tt}, which are the heterotic taurine-indicine and taurine-taurine effects. Pasture management was not included in the models since the effect was not significant (P>0.05) for neither of the traits. Maternal breed and heterotic effects were not included in these last two models due to confounding with other effects. The estimates of direct heritability, obtained by the single trait analyses, were very similar by the three methods, and by model III they were equal to 0.33 ± 0.04 (BW), 0.32 ± 0.04 (WW), and 0.28 ± 0.03 (ADG), suggesting the possibility of obtaining response to selection for these traits, while the estimates of maternal heritability were lower, 0.06 ± 0.03 for BW, 0.14 ± 0.04 for WW, and 0.15 ± 0.03 for ADG. The genetic correlations by model III were equal to 0.37 for BW and ADG, 0.38 for BW and WW, and 0.97 for WW and ADG, suggesting that selection for any of the traits should result in response in the same direction in the others.

Keywords: crossbreeding, genetic correlations, heritability, indicine, taurine.

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