ADAPTABILITY IN TROPICAL BEEF CATTLE: GENETIC PARAMETERS OF GROWTH, ADAPTIVE AND TEMPERAMENT TRAITS IN A CROSSBRED POPULATION*

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Adaptability in tropical beef cattle can be assessed by measurable traits such as growth under the influence of environmental stressors, by parasite resistance as measured by indicator traits such as tick counts (TICK) and faecal egg counts of worms (EPG), by heat resistance as measured by indicator traits such as rectal temperatures (TEMP) and coat scores (COAT) and, to a certain extent, temperament of the animal as measured by flight time (FT). Data from a crossbreeding experiment involving various genotypes derived from tropically adapted British, Sanga-derived, Zebu cross, Zebu and Continental beef cattle breeds were analysed to estimate variance components and genetic parameters of growth, adaptive and temperament traits. Breed group differences were accounted for by including fractional coefficients of direct and maternal additive and dominance genetic effects as covariates. In the univariate analyses, 6 models were compared ranging from the simplest model with animal as the only random effect to the full model comprising direct and maternal additive genetic variance and their covariance and the permanent environment effect due to dam (growth traits) and animal (adaptive and temperament traits).

The heritability estimates were 0.41, 0.21, 0.19, 0.28, 0.41 and 0.15 for birth weight (BWT), weaning weight (WWT), pre-weaning average daily gain (PREADG), yearling weight (YWT), final weight at around 18 months of age (FWT) and post-weaning average daily gain (POADG), respectively. The maternal component of additive genetic variance as a proportion of phenotypic variance in BWT, WWT and PREADG was 0.15, 0.10 and 0.10, respectively. The heritability estimates for TICK, EPG, TEMP, COAT and FT were 0.13, 0.24, 0.12, 0.26 and 0.20, respectively. High positive genetic and phenotypic correlations were observed among growth traits. Low (insignificant) genetic correlations were observed between TICK, EPG and growth traits. However, genetic correlations between growth traits and heat tolerance traits (TEMP and COAT) were moderately negative implying that as the ability of an animal to handle heat stress increases, growth also increases at the genetic level. Genetic correlations among TICK, EPG and TEMP were positive, suggesting that closely-linked genes affect these adaptive traits. The significant negative genetic relationship between TEMP and FT suggests that cattle with high heat resistance have desirable temperament. With the increasing crossbred populations in the northern Australian beef cattle industry, the best breeding strategy should aim to exploit both crossbreeding and within population selection to make improvements in growth, adaptive and temperament traits to increase overall productivity of the enterprise.

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