Prediction of maize single-cross performance by mixed linear models with microsatellite marker information

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ABSTRACT. We evaluated the potential of the best linear unbiased predictor (BLUP) along with the relationship coefficient for predicting the performance of untested maize single-cross hybrids. Ninety $S_{0:2}$ progenies arising from three single-cross hybrids were used. The 90 progenies were genotyped with 25 microsatellite markers, with nine markers linked to quantitative trait loci for grain yield. Based on genetic similarities, 17 partial inbred lines were selected and crossed in a partial diallel design. Similarity and relationship coefficients were used to construct the additive and dominance genetic matrices; along with BLUP, they provided predictions for untested single-crosses. Five degrees of imbalance were simulated (5, 10, 20, 30, and 40 hybrids). The correlation values between the predicted genotypic values and the observed phenotypic means varied from 0.55 to 0.70, depending on the degree of imbalance. A similar result was observed for the specific combining ability predictions; they varied from 0.61 to 0.70. It was also found that the relationship coefficient based on BLUP provided more accurate predictions than similarity-in-state predictions. We conclude

that BLUP methodology is a viable alternative for the prediction of untested crosses in early progenies.

Key words: BLUP; Molecular markers; Similarity-in-state; Untested hybrids