APPLICATION OF MULTI-ENVIRONMENT BAYESIAN MODELS TO STUDY GENOTYPE-BY-ENVIRONMENT INTERACTION IN MAIZE

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Proper understanding of genotype-by-environment interaction (GxE) is one of the greatest challenges faced by plant breeders. Several modelling approaches have been developed to explore GxE, being the most appealing ones that consider modelling the genetic variance-covariance (VCOV) matrix across environments. Therefore, the goal of this study was to evaluate the GxE of single-cross maize hybrids in multi-environment trial (MET) analysis modelling different VCOV structure via Bayesian approach. Field data comprise 36 single-cross maize hybrids evaluated at 10 environments (combinations of locations and seasons "safra" or "safrinha" in Brazil in 2012 using lattice design (6x6) with 2 replications. Grains of each plot were weighed, corrected for 13% moisture, and converted to tons per hectare. All analysis were fitted using the statistical package MCMCglmm in R software. Genetic correlation varied considerably between pair of environments, varying from -0.014 to 0.723. Estimates of deviance information criteria (DIC) ranged from 2323.48 to 2142.24 among the tested models. In all cases, models that consider heterogeneity of variance for residuals presented higher goodness-of-fit values than models with homogeneity of variances. Our results suggested that Bayesian modelling of VCOV across environments represents an efficient and a promising way to perform MET analysis. Models that borrow information across environments, such as UN (unstructured) with heterogeneity of variance showed the best results based on DIC. Moreover, information from molecular markers and pedigree can be easily incorporated to the model. Based on the used model it was possible to identify mega-environments and select hybrids stable across "safra" and "safrinha" or select hybrids for specific season. Once we are doing Bayesian analysis, the prior knowledge can be incorporated to the model, once it is available. This kind of Bayesian model has potential to be implemented in plant breeding programs.

Key words: Plant Breeding; Multi-Environment Trials; GxE.

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