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Current Challenges and New Methods for Maize and Sorghum Breeding

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Session I

FACTOR ANALYTIC APPROACH FOR THE ANALYSIS OF MAIZE EARLY TESTING MULTI-ENVIRONMENT TRIALS

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In early stages of maize breeding program, large number of new genotypes is grown in a set of field trial locations. The best ones are identified to move to the next stage so that in the final stages of breeding program small number of superior hybrids is grown in pre-registration and post-registration field trials across set of locations. Field trials were conducted in a partially replicated design, each genotype with two replications per location at six locations in 2020. The experiments included 150 hybrids obtained by crossing different S2 progenies with an elite inbred tester. These field trials were conducted to identify the best performing genotypes using appropriate statistical model. The factor analytic (FA) model accommodates the heterogeneity of genetic variance for locations and heterogeneity of genetic covariance between pairs of locations. Assuming that data from our field trials had high degree of the heterogeneity, we applied the FA model approach which resulted in accurate prediction of the hybrid by location effects. The FA (1) was identified as the best fitting model explaining about 80% of the hybrid × location interaction. The resulted genetic correlation matrix indicates moderate to high positive association among the locations. Using the FA (1) model, the most promising genotypes in terms of grain yield and yield stability were identified.

Keywords: *Grain yield, Yield stability, Maize breeding, Early testing, Hybrid × location interaction, Factor analytic model (FA)*