

Inbred Line Development and Hybrid Evaluation in GEM Breeding Crosses

James A. Hawk and Teclé Weldekidan

Department of Plant and Soil Sciences, University of Delaware

Objectives:

Identify GEM breeding crosses and lines with desirable agronomic characteristics, resistance to abiotic and biotic stresses, and high, consistent yield performance.

Materials and Methods:

Forty-six GEM breeding crosses were evaluated for adaptability, maturity, flowering synchrony, standability, plant and ear height, pest resistance, stay green, grain quality, and drydown. Inbreeding was also initiated on four new Stiff Stalk GEM breeding crosses. Three to four hundred plants per population were selfed. S₁ ears were harvested from selected plants based on agronomic traits, disease and European corn borer (ECB) resistance. The major diseases were gray leaf spot and anthracnose stalk rot. S₁ lines from six breeding crosses were advanced through a modified single seed descent bulk (MSSDB) method. One hundred seventy-eight MSSD(S₂) lines from four breeding crosses were grown under observation to evaluate per se for agronomic performance of open-pollinated ears. One hundred S₂/S₃ lines were also advanced and selected per se on agronomic performance. Five hundred thirty-one hybrids were evaluated at one dryland location in collaboration with the Southern GEM Program.

Results:

A joint project to evaluate GEM breeding crosses was conducted by the University of Delaware, USDA-GEM at Ames, Memphis, TN, and Mycogen Seeds at Mount Vernon, IN. Results and recommendations will be presented jointly by the cooperators at the December TSG GEM meeting. We gave higher ratings for AR16042:S2028, AR16042:S2030, BR105:N16a16b, BR51675:D27S21, CL-00331:N1834, CML329:N1834, DKXL212:S0928, GEMS-0002\GEMS-0003, GUAT209:N11c46, and UR13085:S(N28)(CUBA117:S1520-156-1-B-B) based on per se rating performance. We also suggest crossing BR105:N(PHZ51), BR106:N(PHZ51), and BR106:S(B47) to a lower eared line for making additional 75% breeding crosses. Based on per se evaluations for plant height, ear placement, stalk and root strength, ear traits, maturity, disease and ECB resistance, 642 S₁ selections were made from four Stiff Stalk (DKXL212:S09, AR16021:S099j, AR16021:S0908c, and AR16021:S08b09b). Two hundred eighteen S₂ ears were selected from six breeding crosses that had been advanced from the S₁ stage by a modified single seed descent bulk procedure. We have selected 102 lines from the MSSD(S₂) per se open-pollinated ears observation nursery for further evaluation of yield and other agronomic traits. We are using a modified single seed descent method to more efficiently advance S₁ families to the S₂ stage. Yield test results are not presented due to poor plant stand associated with winter seed production.

Acknowledgements: We thank the USDA-GEM Project at Iowa State.