12 x 12 Diallel – Experimental Design

A broad population was been created, based on a study by Mikel and Dudley (2006), which spans the range of genetic diversity in U.S. contemporary proprietary dent corn germplasm. Twelve founder inbred corn lines were selected and crossed in a diallel fashion. Ten are proprietary inbreds that have come off of Plant Variety Protection (PVP) and represent the lineage of key heterotic germplasm pools used in present-day commercial corn hybrids, and two are predominant public inbreds B73 and Mo17. This diallel facilitated the creation of F1 hybrids that are adapted to the U.S., fairly elite in performance, and commercially relevant (see Table 1). The set is diverse enough to facilitate a broad sweep of the heterotic sub-groups that comprise U.S. commercial germplasm. Of the total 66 F1 hybrids (no reciprocals), 32 hybrids represent F-inbred x M-inbred crosses whereas the others represent within-heterotic-group crosses.

Table 1. Ex-PVP lines that span the genetic diversity of current US maize hybrids (derivation based on information by Johnson, 2008, Nelson et al., 2008; Mikel, 2006).

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| Line Assignee Background |
| B73 None (Public) Stiff Stalk Synthetic  PHG39 Pioneer Hi-Bred International Maize Amargo/Stiff Stalk Synthetic; B37/B14 type  PHJ40 Pioneer Hi-Bred International Stiff Stalk Synthetic  LH1 Holden Foundation Seeds Stiff Stalk Synthetic; B37 type  Mo17 None (Public) Lancaster  PH207 Pioneer Hi-Bred International Iodent  LH82 Holden Foundation Seeds Pioneer Hybrid 3358  PHG35 Pioneer Hi-Bred International Oh07-Midland/Iodent  LH123 Holden Foundation Seeds Pioneer Hybrid 3535  PHG84 Pioneer Hi-Bred International Oh07-Midland/PH848  PHG47 Pioneer Hi-Bred International Oh43  PHZ51 Pioneer Hi-Bred International Oh07-Midland/PH848 |

The experimental design includes the 66 F1 hybrids, the 12 inbred parents, and 2 current commercial check hybrids grown in an incomplete block design with 3 replications; hybrids and inbreds were grouped separately. The test was grown at Urbana, IL in 2009, 2010, and 2011. Plots consisted of 4 rows (17.5’ long, each which is ~1/1000th of an acre), with all observations taken from the inside 2 rows to minimize effects of shading and maturity differences from adjacent plots.

Observations were collected on traits pertaining to grain yield, grain yield components including ear attributes, flowering, plant and ear height, lodging, staygreen, barrenness, and seedling vigor. Plots were hand-harvested to facilitate collection of yield component data.