Registration of the Maize Germplasm CRW3(S1)C6 with Resistance to Western Corn Rootworm


Maize (Zea mays L.) germplasm CRW3(S1)C6 (Reg. No. GP-553, PI 644060) was developed with resistance to western corn rootworm (WCR; Diabrotica virgifera virgifera LeConte) by the USDA-ARS Plant Genetics Research Unit in cooperation with the Missouri Agricultural Experiment Station at the University of Missouri-Columbia, and was released in February 2007.

Development of CRW3 began in the 1996–1997 winter nursery when crosses for a diallel of nine parents were made for the purpose of evaluating combining ability for WCR resistance (Hibbard et al., 1999). The parents included a number of inbred lines and populations that showed less root pruning damage by WCR. The diallel crosses and their parents were evaluated for WCR damage in replicated trials in summer 1997. The six most resistant diallel crosses, which included only four of the nine original parents, were crossed as a second diallel in the 1997–1998 winter nursery. Parental materials of the second diallel included NGSDCRW1(S2)C4-15-2S2 × PI340839, TL92A-PAR1779 60-4 × PI340839, TL93A-PAR1774 28-1 × NGSDCRW1(S2)C4-15-2S2, TL92A-PAR1779 60-4 × NGSDCRW1(S2)C4-15-2S2, TL92A-PAR1779 60-4 × TL93A-PAR1774 28-1, and TL93A-PAR1774 28-1 × PI340839. NGSDCRW resulted from interplanting hybrid R802/R109B with open-pollinated SDCRW1SY population and subsequent selection for large root size and root-pulling resistance. Lines beginning with TL are from the CIMMYT tropical breeding program. PI340839 is a Supergold popcorn from the J.C. Eldridge popcorn collection at Iowa State University. Other pedigree information for these parental materials can be found in Hibbard et al. (1999). A balanced bulk was created and recombined in the summer of 1998 to form CRW3 C0. For the first cycle of selection, approximately 1000 C0 plants were grown and selfed in the 1998–1999 winter nursery. Progeny from these were evaluated in two replications for WCR damage in the summer of 1999. The 62 most resistant entries (selection intensity of 20%) were recombined from remnant seed in the winter nursery to form CRW(S1)C1. For cycles 2 and 3, ears were evaluated for WCR resistance in two replications during the summer. Approximately 25 to 30 of the best entries (selection intensity of 12.5–15%) were selected in cycles 5 and 6, where 120 and 220 S lines were screened for WCR reaction. The 25 to 30 most resistant lines were determined before pollen shed and were open-pollinated; pollinators were selected within each cycle for rows for lower ear height, flowering synchrony, and absence of excessive disease symptoms. The endemic northern corn leaf blight [incited by Exserohilum turcicum (Pass.)], common smut [Ustilago maydis (Pers. ex. Pers.)], and often Stewart's Wilt (incited by Pantoea stewartii) were evaluated at the Neuros (WCR) laboratory. Eggs of the WCR were provided by the USDA-ARS Northern Grain Insects Research Laboratory. Eggs were suspended in 0.15% agar solution and mechanically infest plots (Moellenbeck et al., 1994) at the V2 stage of plant development, with approximately 10 WCR eggs cm−2 of row. Before root excavation, nylons were used to attach laminated barcodes containing unique identifiers.