Registration of 38 Maize (Zea mays L.) Breeding Populations Adapted to Short-Season Environments

The 38 maize (Zea mays L.) populations described herein (Reg. no. GP-512–GP-549, PI613059–PI613096) are the result of over 30 yr of population development and improvement by the University of Guelph corn breeding program and were released by the University of Guelph in October 1999 (Table 1). They are adapted to short-season environments [<2800 Ontario Crop Heat Units (OCHU) (Brown and Bootsma, 1993)] [Note that 2800 OCHU = 95-d relative maturity (RM) rating = 350 FAO rating = 2150 growing degree days (GDDs)]. The populations encompass 24 distinct genetic backgrounds, most of which, based on their initial composition, would be expected to represent extensive genetic diversity. Seven of the 38 populations have not undergone recurrent selection, i.e., are cycle 0 (C₀) populations, although three (CG-SynA C₀, CG-SynB C₀, and CG-Syn C C₀) underwent mild mass selection during their development. For 21 of the remaining 31 populations, various recurrent selection procedures were employed including selfed progeny (S), half-sib (HS), reciprocal recurrent selection (RRS), or combined S and RRS (COM) (Table 1). Selection was based on a performance index (PI) of grain yield/grain moisture which, beginning in the 1980s, included an adjustment (Stojšen and Kannenberg, 1994), although such was also a selection criterion during the early program as well. Visual selection of individual plants was practiced during the development of each population on the response of the germplasm to the environmental conditions during a particular growing season. Lines tested per cycle varied from 37 to 100 and selected genotypes to recombine to form the next cycle varied from eight to 30. Generally, higher numbers of lines were selected and recombined from the 1980s on. The object was to maintain a selection intensity of around 20%. Also, beginning in the 1980s, the S and RRS procedures were changed to testing of S₂ lines instead of S lines, and in addition, two generations of single cross were done to establish the subsequent cycle of selection. The half-sib procedure also was dropped this time from modified ear-to-row (ME) (Lonnquist, 1964) to half-sib progeny selection (HS) (Compton and Comstock, 1976). Detailed examples of the Guelph selection procedures can be found in Stojšen and Kannenberg (1994) and Kannenberg (1987). The relative combining abilities and performances of 12 of the populations are given in Doersken et al. (2003) and Lee et al. (2003).

The remaining 10 of the 38 populations were developed using unadapted germplasm with potential for short-season purposes, and depending on relative maturity, were either subjected directly to mass selection (M) for earliness (PI613096), or in the case of the least adapted populations, subjected to six generations of mass selection (M) for earliness (PI613093–PI613092) (Table 1). For most of these populations, flowering segregants of good agronomic type were selected out of a population of approximately 200 plants for each cycle of selection.

Seed for these releases was produced through the most recent completed cycle of the populations. Nursery blocks were planted (15 plants per row), and 100 to 120 ears were pollinated by bulking pollinated ears in the other ten rows and pollinating ears in the other ten rows.

CG-SYNA

Synthesis and Development of C₀

CG-SynA is a 2600 OCHU population developed from 20 short-seasoned sources including eight population crosses: Early Manitoba Cold Tolerant (EMCT-2 (op), Golden Glow, Rutherford (op), Resistant Synthetic, Schindelmeiser F2, Mani-