

TUNGLAND, LEE, and ROY MARTENS, Novartis Seeds, 1020 Sugarmill Road, Longmont, CO 80501. **Sugar yield gains from testcross recurrent selection.**

Testcross recurrent selection is a half-sib family selection procedure based on topcrossing with a tester (Hallauer and Miranda, 1981). Pseudo self-incompatible sugarbeet populations are uniquely adapted to this breeding procedure, since both self and outcrossed seed may be produced on a single plant. The objective of this research was to determine the applicability of this procedure to "typical" breeding populations. Four populations representing diverse germplasm groups were used as the test material: Population 1 (M6RE) was derived from 10, 4x, curly top resistant lines released by Dr. Helen Savitsky; Population 2 (I6HB) was derived from 4, 2x, rhizoctonia resistant releases of Dr. Richard Hecker and 2, 2x, elite proprietary sources; Populations 3 (I6G4) and 4 (LD2Q) were composed of 8 and 7, 2x, elite proprietary populations, respectively. Selection in M6RE, I6G4, and LD2Q, was imposed for sugar content (minimum of 100% of the population mean) and gross sugar yield. In I6HB, similar selection criteria for sugar content and sugar yield were used in tandem with selection for rhizoctonia resistance. Two breeding cycles from each population were evaluated in replicated yield trials at Glyndon, MN and Longmont, CO in 1998 to measure gain from selection. All populations showed improvement for root yield and gross sugar yield, ranging from 0.45% to 11.4% gain per cycle. I6HB showed zero (0%) gain for sugar content while the other populations ranged from 2.1% to 5.7% gain per cycle. Measured gain was significant ($p < 0.05$) for sugar content and sugar yield in M6RE and I6G4. Although no significant gain was found for root yield, certainly the numerical gain found contributed greatly to gross sugar yield. The significant gain in sugar content, with only modest selection pressure, demonstrates the higher heritability of this trait. The results of this research shows that testcross selection can improve both yield and quality traits simultaneously. With the diverse origins of the populations evaluated, we conclude that this procedure could be applied to any heterogeneous pseudo self-incompatible sugarbeet population with high probability of sugar yield gain.