Registration of Four Sugarbeet Germplasms:
y317, y318, y322, and y387

Sugarbeet (Beta vulgaris L.) germplasms y317, y318, y322, and y387 (Reg. no. GP-160 to GP-163, PI 583778 to PI 583781) were developed by the USDA-ARS in cooperation with the Beet Sugar Development Foundation and released in 1994. These lines add new genetic variability from wild sources for sugarbeet breeding purposes.

These germplasms were derived from a cross between sugarbeet inbred L53cms (GP 35) and wild beet accession PI 546420 followed by four cycles of mass selection for root shape. L53cms is the cytoplasmic male-sterile equivalent of L53 (GP 34). It is self-fertile, O type, and multigerm with high general combining ability for both root yield and sugar percentage (1). PI 546420, B. vulgaris L. subsp. maritima L., was collected near Thessaloniki, Greece, by C. Goulas of Hellenic Sugar Industries in 1978. It is multigerm, non-O type, annual, and prostrate in growth habit. The above cross is one of several between L53cms and wild beet accessions, of which the cross L53cms/PI 546420 gave the most rapid progress toward sugarbeet-type roots (cone shaped and nonsprangling).

Segregating populations were planted at the North Dakota State University Experiment Station field plots at Fargo, ND, and thinned to 45 cm within rows to eliminate competition. Bolted annuals were eliminated in the F2 and subsequent selection cycles prior to selection for root shape. Four successive cycles of selection for sugarbeet root shape were completed, with the addition of selection for specific gravity in Cycles 2 and 3. Selection in each cycle commenced when the plants were ≈4 mo old. For each cycle, all selected plants (≈20% of the total population) were increased by open pollination within isolation cages and, except for Cycle 4, harvested in bulk. In Cycle 4, seed was harvested from each plant and maintained as individual family lines.

Family lines from Cycle 4 were crossed to sugarbeet inbred line L33cms for combining ability analyses. The resulting crosses along with the respective parental lines were tested in replicated field trials in 1993. Significant heterosis was observed for each of the family line crosses. Seventy-three percent of these hybrids were equal to or greater than the commercial sugarbeet hybrid checks for root yield, but were slightly lower in sugar concentration. Family line and sugar percentages were lower than the commercial hybrid checks.

All four of these germplasm lines have sterile cytoplasm, are multigerm, and segregate for multicrown and green hypocotyl color. The determination of self-fertility has not been completed; however, segregation ratios suggest that both self-sterility and self-fertility are present in these germplasms.

These germplasms could be useful in elite sugarbeet breeding pools as new sources of genetic variation for combining ability for root yield. To purge the sterile cytoplasm, crosses need to be made with pollen-fertile plants from these germplasms to normal cytoplasm plants.

Breeder seed will be maintained at the USDA-ARS, Northern Crop Science Laboratory, Fargo, ND, and upon written request will be provided to sugarbeet breeders in sufficient quantities for reproduction. Requests for seed should be made to the author.

References and Notes

2. USDA-ARS, Northern Crop Science Lab., P.O. Box 581055, Fargo, ND 58105-5677. A joint contribution of the USDA-ARS and the Beet Sugar Development Foundation. The United States government is an equal opportunity affirmative action employer and all agency services are provided without discrimination. Registration by CSSA. Acc. No. 497.

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