

Registration of FC723 and FC723CMS Monogerm Sugarbeet Germplasm Resistant to *Rhizoctonia* Root Rot and Moderately Resistant to *Cercospora* Leaf Spot

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Sugarbeet (*Beta vulgaris* L.) germplasms FC723 (Reg. No. GP-259, PI 639917) and FC723CMS (Reg. No. GP-259cms, PI 639918) were developed by the USDA-ARS at Fort Collins, CO, in cooperation with the Beet Sugar Development Foundation, Denver, CO. FC723 has resistance to root-rotting strains (AG-2-2) of *Rhizoctonia solani* Kühn and intermediate resistance to cercospora leaf spot (caused by *Cercospora beticola* Sacc.) but is not resistant to the *Beet curly top virus* (BCTV). FC723 is a population from which to select rhizoctonia- and cercospora-resistant, monogerm, O-type parents to infuse some rhizoctonia and leaf spot resistance on the female side of hybrids, and FC723CMS provides a cytoplasmic male sterile (CMS) female with these characteristics. FC723 is released from seed production 951016HO, and FC723CMS is released from seed production 951016HO1.

FC723 is an O-type germplasm with 100% red (*RR*) hypocotyls (89 plants counted) and is segregating for monogerm (of the bulked seed, 94% is *mm*). FC723 has FC708 (PI 590845) (Hecker and Ruppel, 1981), a rhizoctonia- and cercospora-resistant monogerm O-type release from the Fort Collins program, as one parent. The other parent, EL44 (PI 590855) (Hogaboam and Schneider, 1982), is a germplasm released from the USDA-ARS sugarbeet improvement program in East Lansing, MI, which was selected from a curly top resistant parent for characters that enhance pollen and seed production.

FC723 is a product of five generations of mass selection for rhizoctonia resistance. It was strongly selected for mono-

germ, and the smallest population size was 12 individuals. FC723CMS is the genetic CMS equivalent of FC723 backcrossed seven times. It has 100% red (*RR*) hypocotyls (51 plants counted) and is segregating for monogerm (of the bulked seed, 90% is *mm*). The original cross was EL44CMS (PI 590856) (Hogaboam and Schneider, 1982)/FC708. FC723CMS is a BC₇, which was backcrossed to the populations from which FC723 was derived, as it was being developed. FC723CMS went through five generations of cyclic mass selection for rhizoctonia root rot resistance.

FC723 and FC723CMS exhibited good resistance to rhizoctonia root rot when tested under strong disease pressure (Ruppel et al., 1979). FC723's and FC723CMS's performances were equal to the rhizoctonia-resistant check in disease index (DI) ratings (0 = no root rot; 7 = all plants dead). In 1999, 2000, 2001, and 2002, FC723 had mean DIs of 3.8, 4.1, 2.1, and 2.6 and FC723CMS had mean DIs of 3.9, 4.3, 2.1, and 2.1, respectively, whereas the resistant check had mean DIs of 3.8, 3.8, 2.6, and 2.9, respectively.

FC723 and FC723CMS exhibited intermediate resistance to cercospora leaf spot when tested in an artificial epiphytotic (Ruppel and Gaskill, 1971). In 4 yr of tests (1997, 1998, 1999, and 2002), they were significantly better than the susceptible check in years of moderate disease pressure (1998 and 2002) and not significantly different from the susceptible check under more severe disease pressure (1997 and 1999). The following DI ratings (0 = no leaf spot; 10 = all plants dead) represent the most severe rating (last of three or four ratings each season). For the years 1997, 1998, 1999, and 2002, the DIs of FC723 were 5.8, 3.5, 5.8, and 3.7; the DIs of FC723CMS were 5.4, 3.7, 5.2, and 3.3; the DIs of the resistant check (FC504CMS/FC502-2//SP6322-0) were 2.9, 2.9, 2.7, and 3.7; and the DIs of the susceptible check (SP351069-0) were 6.5, 5.9, 6.3, and 5.0, respectively. FC723 and FC723CMS showed little tolerance to BCTV, even though the parent line, EL44, was BCTV-resistant.

Breeder seed of FC723 and FC723CMS is maintained by USDA-ARS and will be provided in quantities sufficient for reproduction for at least 5 yr on written request to Sugarbeet Research, USDA-ARS, Crops Research Laboratory, 1701 Center Ave., Fort Collins, CO 80526-2083. Seed of this release will be deposited in

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the National Plant Germplasm System, where, after 5 yr, it will be available for research purposes, including development and commercialization of new cultivars. We request that appropriate recognition be made of the source when this germplasm contributes to a new cultivar. U.S. Plant Variety Protection will not be requested for FC723 and FC723CMS.

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