

Registration of FC201, a Heterogeneous, Disease-Resistant, Monogerm, O-type Sugarbeet Population

Sugarbeet (*Beta vulgaris* L.) germplasm FC201 (Reg. no. GP-246, PI 634018) was developed by the USDA-ARS at Fort Collins, CO, and Salinas, CA, in cooperation with the Beet Sugar Development Foundation (BSDF), Denver, CO. FC201 is a segregating population with a high frequency of the *Rz1* allele conferring resistance to rhizomania caused by *Beet necrotic yellow vein virus*. It is segregating for resistance to root-rotting strains (AG-2-2) of *Rhizoctonia solani* Kühn and to the sugarbeet root aphid (*Pemphigus betae* Doane), has moderate resistance to *Cercospora* leaf spot (caused by *Cercospora beticola* Sacc.), *Aphanomyces* root rot (caused by *Aphanomyces cochlioides* Drechs.), and *Beet curly top virus*. FC201 is a heterogeneous population from which to select disease-resistant, monogerm, O-type parents to infuse multiple disease resistance on the female side of hybrids. There is no CMS equivalent. FC201 is released from Salinas seed production 01-FC1014 and has been tested as 00-FC1014 and 01-FC1014.

FC201 is an O-type germplasm segregating for self-sterility (*S*^s), hypocotyl color (50% *rr*) and monogermity (90% *mm* in seed harvested from monogerm plants). It is the F₄ of the cross 'C890'*aa* (Lewellen, 1998) × 'FC708' (Hecker and Ruppel, 1981) (23 F₁ plants) bulked with the cross 'C859'*aa* (Lewellen, 1995) × 'FC708' (Hecker and Ruppel, 1981) (18 F₁ plants). Seed from both F₁ populations was combined for bulk increase of the F₂ after germination testing to make the parental contribution 25% from C890, 25% from C859, and 50% from FC708. The F₂ seed was planted in Salinas and selected for rhizomania resistance, agronomic performance, and percentage sucrose. The F₃ population was a bulk increase of 25 monogerm plants selected from 600 grown in the field under severe rhizomania conditions and increased in the greenhouse. Seed from the F₃ production was sent to Oregon for steckling production and the F₄ was an increase at Salinas of about 250 stecklings without selection; seed from only male-sterile plants was harvested. Half-sib family grow-outs indicated that the male-sterility was genetic male-sterility (*aa*) and genetic-cytoplasmic male-sterility (CMS). Progeny testing could be used to identify and separate genetic-male sterility from CMS and to produce a near equivalent CMS counterpart to the male fertile, O-type.

FC201 was tested at Fort Collins, CO, in 2002 and 2003 for resistance to *Rhizoctonia* root rot under strong disease pressure (Ruppel et al., 1979). In 2002, the FC201 population was not significantly different from the susceptible check or from the highly resistant check, and individual roots (approximately 30%) were scored as resistant; that is, DI < 3 (DI of 0 = no root rot and 7 = all plants dead). In 2003, the FC201 population was not significantly different from the susceptible check and significantly different from the resistant checks, but again individual roots were scored as resistant. In a greenhouse test for resistance to sugarbeet root aphid at Shakopee, MN, in 2003 again, although the population was not different from the susceptible control, there were a number of roots which were scored as 1 (1 = free from aphids to 4 = heavily infested with aphids).

When tested at Fort Collins, CO, and Rosemount, MN, in 2002 and 2003 for resistance to *Cercospora* leaf spot (Ruppel and Gaskill, 1971), the scores were intermediate (significantly more resistant than the susceptible check and significantly less

resistant than the resistant check). Intermediate resistance also was seen when FC201 was tested at Shakopee, MN, in 2002 and 2003 for resistance to *Aphanomyces* root rot. In the BSDF curly top nursery at Kimberly, ID, in 2003, FC201 had a DI of 5.0 over three replications (not statistically analyzed) compared to 'US H11' with a DI of 3.3 and 'Monohikari' with a DI of 7.0 (1 = no damage to 9 = plant dead). When FC201 was tested for O-type, restorer genes were present at a very low frequency.

In observation and evaluation tests at Salinas in 2002 and 2003, FC201 was moderately susceptible to powdery mildew (caused by *Erysiphe polygoni* DC.); intermediate in reaction to *Erwinia* root rot [caused by *Erwinia carotovora* (Jones) Bergey et al. subsp. *betavasculorum* Thomson et al.] with 60 to 70% resistant plants; and moderately susceptible to intermediate for bolting tendency in fall plantings. Sucrose concentration was intermediate to a group of monogerm populations and inbred lines. The canopy of FC201 is dark green with leaf shape similar to FC708.

Breeder seed of FC201 is maintained by USDA-ARS and will be provided in quantities sufficient for reproduction on written request to Sugarbeet Research, USDA-ARS, Crops Research Laboratory, 1701 Center Ave., Fort Collins, CO 80526-2083. Genetic material of this release will be deposited in the National Plant Germplasm System where it will be available for research purposes, including development and commercialization of new varieties and 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 FC201.

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Tests at Shakopee and Rosemount, MN, were conducted at Betaseed, Inc. by M. Rekoske and J. Miller, and reaction to BCTV was tested in the BSDF nursery at Kimberly, ID.

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