

USDA-ARS sugar beet germplasm, evaluated for *Rhizoctonia* resistance, 2005.

Thirty-seven sugar beet germplasms released over the past 30 years for resistance to Rhizoctonia root-rot by the USDA-ARS Sugar Beet Research Unit located in Fort Collins, CO were evaluated for resistance to Rhizoctonia root rot. The trial was a randomized complete-block design with five replications. One-row plots (56 cm row spacing) 4 m long were planted at the ARS Fort Collins Research Farm, CO, on 25 May. The field had been summer fallowed in 2004 and planted to barley in 2003. The soil (Garrett loam, 0 to 1 % slope, pH 7.8) was deep ripped and plowed in early Apr, 2005, disked, roller harrowed and landplane-leveled prior to bedding and planting. Seed was planted to moisture, and furrow irrigated as needed. Inoculation with dry, ground, barley grain inoculum of *Rhizoctonia solani* isolate R-9 (AG-2-2) was performed on 28 Jul at a rate of 25 g/m row with inoculum applied on the crown of the plant. Immediately after inoculation, plots were cultivated (using an in-row duck-foot cultivator) to place soil onto the plant crowns. The plant population was thinned to 20-25 cm spacing by hand. Beets were harvested 19 Sep, with a single row lifter (pulled and cleaned by hand) and each root was rated for rot on a scale of 0 (no damage) to 7 (dead plant with root completely rotted). The avg disease severity was determined to create a disease index for each germplasm. Analyses of variance (PROC ANOVA) were performed on disease indices (DI), % healthy roots (classes 0 and 1 combined) and % roots in classes 0 through 3 (harvestable roots). Data in classes 0-1 and 0-3 were transformed using arcsine square root to normalize the data for analyses (AP 0-1 and AP 0-3, respectively). Both percentages and transformations are shown below.

The germplasms were tested in a disease nursery that included 11 additional tests involving experimental breeding material and commercial cultivated varieties. Controls were included in all 12 tests. Rhizoctonia root rot for the entire nursery reached moderate severity levels in early Sep. The avg DI across all 12 tests in the 2005 nursery for resistant FC703, and susceptible FC901/C817 controls were 3.1, and 4.9, respectively. Percentages of healthy roots (those in disease classes 0 to 1) were 25.4, and 6.4% for these controls, respectively. The percentages of harvestable roots (those in disease classes 0 through 3) were 56.7, and 18.3% for these controls, respectively. The greatest and least DI for all of the lines evaluated in the nursery, including materials not in the germplasm test, were 7.0 and 1.5, respectively.

For the germplasms reported below, differences in the DI among entries were significant ($P < 0.001$). All germplasms in this test, with the exception of FC717, exhibited significantly less disease (DI score) than the susceptible check; FC725 was the only line that was significantly more resistant than the resistant check.

ID	Seed Source	Release information*	DI**	% 0-1	% 0-3	AP 0-1	AP 0-3
FC201	2003A025	2005 – PI 634018 CS 45:1169-1170.....	4.4	16	22	18.3	22.4
FC701	19931024	1968 – PI 590660 CS 12:400.....	3.8	42	42	40.2	40.2
FC701-4	20021016	1976 – PI 590663 CS 17:678.....	2.5	44	68	41.0	58.8
FC701-5	19721056	experimental –selection from GW 674-56C.....	3.5	22	59	18.3	54.8
FC701-6	19801059H	1983 – PI 590756 CS 25:374.....	2.5	44	74	41.4	60.1
FC702/2	19991016	1968 Sugar Beet Research 1968:A3.....	3.4	21	49	24.0	44.4
FC702-4(4X)	20011009	1978 – PI 590724 CS 19:935.....	3.7	20	52	23.9	49.3
FC702-6	19811055H	1981 – PI 590703 CS 22:454.....	2.2	53	78	46.5	62.7
FC703	19991017	1976 – PI 590656 CS 17:678.....	3.1	42	57	39.4	49.1
FC705	20001019	1978 – PI 590660 CS 19:935.....	2.8	36	70	36.8	57.9
FC706	20001020	1979 – PI 590701 CS 19:935.....	3.2	22	55	26.8	48.5
FC707	20001021	1979 – PI 590702 CS 19:935.....	3.8	22	36	24.8	33.6
FC708	19831085HO	1980 – PI 590845 CS 21:802.....	3.6	13	47	13.9	40.4
FC709	19991018	1987 – PI 518643 CS 28:1039.....	2.6	48	68	43.6	55.9
FC709-2	20041003	1999 – PI 599668 CS 39:298-299.....	2.5	35	77	32.8	64.4
FC710	19941024	1990 – PI 542971 CS 31:494.....	2.4	40	78	38.6	62.9
FC710(4X)	19971017	2004 – PI 633733 CS 44:1885-1886.....	3.5	13	58	11.3	53.8
FC711	19821087	1982 – PI 590729 CS 23:601-602.....	3.9	15	51	18.0	45.4
FC712	19881032H	1985 – PI 590766 CS 26:213-214.....	2.3	41	83	36.7	74.0
FC712(4X)	19971018	2001 – PI 607379 CS 41:1374.....	3.1	36	51	33.8	46.0
FC715	19911026HO	1992 – PI 574625 CS 34:290.....	2.8	39	66	35.4	55.0
FC716	19971019	1992 – PI 574627 CS 35:291.....	3.3	26	52	29.7	46.3
FC717	19981025	1992 – PI 574628 CS 35:291.....	5.4	6	13	7.5	11.3
FC718	19911032	1992 – PI 574629 CS 35:291.....	3.0	27	63	25.2	53.5
FC719	19911037	1992 – PI 574630 CS 35:291.....	2.9	41	59	39.1	51.2
FC720	19961015	PI 636335CS in press.....	2.3	45	82	42.1	68.1
FC721	19931005HO	1997 – PI 594910 CS 37:1675-1676.....	3.5	15	52	19.2	46.2
FC721CMS	19931005HO1	1997 – PI 594911 CS 37:1675-1676.....	3.4	21	55	24.4	48.2
FC722	19961010HO	PI 636336 CS in press.....	4.0	8	44	7.9	40.7
FC722CMS	19961010HO1	PI 636337 CS in press.....	3.5	27	55	25.0	50.9
FC723	19951016HO	PI 639917 ARS release.....	3.1	26	64	27.8	53.9
FC723CMS	19951016HO1	PI 639918 ARS release.....	2.6	35	73	33.3	59.5
FC724	19961014	2004 – PI 632251 CS 44:361-362.....	2.7	42	61	40.3	51.9
FC725	19921008	1995 – PI 591314 CS 36:819-820.....	1.9	65	79	56.8	66.3

ID	Seed Source	Release information*	DI**	% 0-1	% 0-3	AP 0-1	AP 0-3
FC726	19931010	1995 – PI 591315 CS 36:819-820.....	3.2	41	57	36.4	46.8
FC727	19951017	1999 – PI 599669 CS 39:298-299.....	2.6	37	73	37.5	59.5
FC728	19921025	1995 – PI 591316 CS 36:819-820.....	2.6	47	63	43.0	53.1
	941025	(FC901/C817)//413 – 'Susceptible Check	5.7	2	4	3.5	7.2
	991017	FC703 - 'Resistant Check	3.4	27	47	30.6	43.4
		LSD (P=0.05).....	1.24			20.8	23.1
		Trial Mean.....	3.3	30	56	29.4	48.5

* Year Registered – Germplasm identification (plant introduction no.) and *Crop Science* (CS) reference or comments.

** DI = Disease index on a scale of 0 (no damage) to 7 (plant death), % 0-1= % roots in class 0 and 1 combined, % 0-3 = % roots in class 0 to 3 combined, AP is the arcsine square root transformation of % roots in classes 0-1 and 0-3 to normalize the data for analyses.