

USDA-ARS sugar beet germplasm developed in Fort Collins, CO, evaluated for *Rhizoctonia* resistance, 2002.

Forty sugar beet germplasm lines released over the past 30 years, or under development 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. One-row plots, replicated five times were planted at the Crops Research Lab-Fort Collins Research Farm, CO, on 23 May. Plots were 4.5 m long with 56 cm between rows and 20 to 25 cm within-row spacing. Inoculation with dry, ground, barley-grain inoculum of *Rhizoctonia solani* isolate R-9 (AG 2-2) was performed on 17 Jul; immediately after inoculation, a cultivation was performed to throw soil into the beet crowns. The field was thinned by hand and irrigated as necessary. Beets were harvested 3 through 6 Sept. Each root was rated for rot on a scale of 0 (no damage) to 7 (dead). Analyses of variance (PROC GLM - SAS) were performed on disease indices (DIs), percent healthy roots (undamaged classes 0 and 1 combined), and percentage of roots in classes 0 thru 3 (those most likely to be harvested and taken to the factory). Percentages were transformed using arcsin-square root to normalize the data for analyses (“AP 0-1” and “AP 0-3” in the accompanying table). Both percentages and transformations are presented in the table.

We had high temperatures in the summer of 2002 and a moderate inoculum load. The *Rhizoctonia* epidemic progressed quickly, becoming severe by the beginning of September. Differences in DIs among entries were highly significant ($P < 0.001$). Mean DIs across all tests in the 2002 nursery for highly resistant FC705-1, resistant FC703, and highly susceptible FC901/C817 controls were 1.89, 2.24, and 4.40 respectively. Percentages of healthy roots were 39.3, 35.9, and 10.0% for these controls. Percentages of roots in disease classes 0 thru 3 were 91.2, 86.3, and 37.1%, respectively. The highest and lowest DIs for the evaluated lines were 6.5 and 1.3, respectively. There was a significant difference between all the resistant germplasm and the susceptible control with two exceptions. A 1993 seed increase of FC704 was significantly more susceptible than the susceptible control and a FC702, and early release (1968) was not significantly different from the susceptible control. Even though all the other germplasm performed significantly better than the susceptible control there were significant differences among resistant germplasm. FC701, the first *Rhizoctonia*-resistant germplasm, released in 1968, performed the worst of these.

Germplasm	Seed Source	Year Released – Crop Science (CS) Reference – Comments	DI	% 0-1*	% 0-3*	AP 0-1*	AP 0-3*
FC701	931024	1968 – PI 590660 CS 12:400	4.2	7	34	11.4	32.6
FC701-4	761068H	1976 – PI 590663 CS 17:678	2.6	30	74	32.1	59.4
FC701-5	721056	experimental – 6 cycles of selection from GW 674-56C	2.6	35	74	29.9	62.4
FC701-6	801059H	1983 – PI 590756 CS 25:374	2.1	43	86	38.0	71.1
FC702	681009-0	1968 – PI 590662 CS 12:400	4.6	0	43	0.0	36.1
FC702-2	19991016	1968 – Sugar Beet Research 1968:A3	3.7	4	46	7.1	42.6
FC702-4(4X)	20011009	1978 – PI 590724 CS 19:935	2.8	33	67	31.8	55.3
FC702-6	811055H	1981 – PI 590703 CS 22:454	2.1	45	86	39.1	72.8
FC703	751080H	1976 – PI 590656 CS 17:678 Resistant Check.....	2.9	23	69	27.5	59.6
FC703	19991017	1976 – PI 590656 CS 17:678 Resistant Check.....	2.9	21	65	26.9	54.4
FC704	19931021	1978 – PI 590659 CS 19:934-935	6.2	0	0	0.0	0.0
FC705	781066H	1978 – PI 590660 CS 19:935	2.3	34	83	34.4	69.0
FC705	20001019	1978 – PI 590660 CS 19:935	2.0	39	92	38.2	75.3
FC705-1	831083	1983 – PI 590754 CS 25:374 Highly Resistant Check	1.7	58	94	50.1	81.4
FC706	20001020	1979 – PI 590701 CS 19:935	2.9	25	64	26.7	56.0
FC707	20001021	1979 – PI 590702 CS 19:935	2.3	40	78	39.2	62.2
FC708	831085HO	1980 – PI 590845 CS 21:802	2.5	27	77	27.7	64.5
FC709-2	20001016HO	1999 – PI 599668 CS 39:298-299	1.7	51	99	45.7	86.9
FC710	891033	1990 – PI 542971 CS 31:494	2.2	39	84	38.1	68.8
FC710(4X)	971017	experimental -- FC710 colchicine doubled	2.0	35	97	32.9	85.1
FC710(4X)	20001022	experimental -- FC710 colchicine doubled	2.4	31	80	29.9	66.9
FC711	821087	1982 – PI 590729 CS 23:601-602	3.0	5	66	8.1	57.4
FC712	881032H	1985 – PI 590766 CS 26:213-214	2.1	50	81	45.2	65.0
FC712(4X)	971018	1982 – PI 590729 CS 23:601-602	1.7	57	93	49.1	80.5
FC715	911026HO	1992 – PI 574625 CS 34:290	2.9	33	68	29.5	62.3
FC716	971019	1992 – PI 574627 CS 35:291	2.5	28	76	28.7	63.7
FC717	981025	1992 – PI 574628 CS 35:291	3.5	9	50	11.4	45.5
FC718	911032	1992 – PI 574629 CS 35:291	2.5	27	75	28.2	60.8
FC719	911037	1992 – PI 574630 CS 35:291	2.7	27	71	27.7	58.2
FC720-1	961015	experimental -- C718/(C718/FC708)	2.4	30	81	30.1	67.1
FC721	931005HO	1997 – PI 594910 CS 37:1675-1676	2.9	31	63	30.4	55.4
FC721CMS	931005HO1	1997 – PI 594911 CS 37:1675-1676	3.4	11	51	16.8	45.9
FC722-1	961010HO	experimental -- C718/FC708	3.6	10	56	9.0	51.0
FC722CMS	961010HO1	experimental -- C718/FC708 CMS	3.8	9	37	10.9	33.8

Germplasm	Seed Source	Year Released – Crop Science (CS) Reference – Comments	DI	% 0-1*	% 0-3*	AP 0-1*	AP 0-3*
FC723	951016HO	experimental -- EL44/FC708 mm	2.6	27	75	29.9	63.9
FC723CMS	951016HO1	experimental -- EL44/FC708 CMS	3.1	21	62	21.8	52.0
FC724-1	961014	experimental -- FC702/LSR-CTR	2.5	30	80	29.4	65.4
FC725	921008	1995 – PI 591314 CS 36:819-820	2.1	42	87	39.9	71.0
FC726	931010	1995 – PI 591315 CS 36:819-820	2.6	28	74	28.0	60.2
FC727	951017	1999 – PI 599669 CS 39:298-299	2.6	23	80	28.3	64.2
FC728	921025	1995 – PI 591316 CS 36:819-820	2.3	25	86	27.3	70.5
FC729	921019	FC712/A4, 3 cycles Rhizoc, MM	2.1	50	85	41.9	71.9
FC801	19991015	1971 – W6 17140 F4, FC 901 (LSR-CTR) x SP 631001-0	3.0	18	61	24.5	51.9
	941025	Susceptible Check - (FC901/C817)	5.1	6	21	9.1	23.7
LSD _{p=0.05}			0.90			19.75	19.27

* DI = Disease Index on a scale of 0 (no damage) to 7 (plant death), % 0-1 = percent healthy roots, % 0-3 those roots most likely to be harvested and taken to the factory. AP is the arcsin-square root transformation of percentages to normalize the data for analyses.