BEET (*Beta vulgaris*)
BEET, WILD (*Beta vulgaris* ssp. *maritima*)
Rhizoctonia root rot; *Rhizoctonia solani*

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Rhizoctonia root rot resistance of *Beta* PIs from the USDA-ARS NPGS, 2004.

Forty-three Plant Introductions (PI) from the USDA-ARS National Plant Germplasm System (NPGS) (including garden beet, sugar beet, leaf beet, fodder beet, and wild beet) 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) were 4.5 m long and were planted at the Crops Research Lab-Fort Collins Research Farm, CO, on 17 May. Inoculation with dry, ground, barley-grain inoculum of *Rhizoctonia solani* isolate R-9 (AG-2-2) was performed on 27 Aug at a rate of 2.3 g/m row with inoculum applied to the crown of the plant. Immediately after inoculation, plots were cultivated to throw soil into the beet crowns. The plant population was thinned to 20-25 cm spacing by hand and irrigated as necessary. Beets were harvested 13 Sept., and each root was rated for rot on a scale of 0 (no damage) to 7 (dead plants). The average disease severity was determined to create a disease index for each PI. Analyses of variance (PROC ANOVA - SAS) were performed on disease indices (DI), percent healthy roots (classes 0 and 1 combined) and percentage of roots in classes 0 through 3 (those most likely to be harvested and taken to the factory). Percentage of roots 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 given in the table.

Rhizoctonia root rot reached moderate severity levels in early September given the moderate temperatures in the summer of 2004. Differences in the DI among entries were highly significant ($P < 0.001$). Mean DI across all tests in the 2004 nursery for highly resistant FC705-1, resistant FC703, and highly susceptible FC901/C817 controls were 2.1, 2.4, and 3.5, respectively. Percentages of healthy roots (those in disease classes 0 to 1) were 36.1, 32.1, and 12.3% for these controls, respectively. The percentages of harvestable roots (those in disease classes 0 through 3) were 88.9, 80.1, and 40.7% for these controls, respectively. The highest and lowest DI for all of the lines evaluated in the nursery, including materials not in the PI tests, was 6.9 and 1.5, respectively. Two PIs (#546377 and Ames 19156) had DI that were not significantly different from the resistant control. Both of these PIs were not significantly different from the resistant control based on the percentage of harvestable roots in classes 0-3.

Seed Source	Subspecies*	Donor's ID	DI**	% 0-1	% 0-3	AP 0-1	AP 0-3
PI 540622	*maritima*	WB 916, France	4.92	0.00	25.20	0.0	27.0
PI 540664	*maritima*	WB 918, France	4.98	0.00	12.40	0.0	15.7
PI 540667	*maritima*	WB 921, France	5.81	0.00	4.60	0.0	5.7
PI 540689	*maritima*	WB 943, Belgium	4.06	0.00	43.40	0.0	41.1
PI 546377	*maritima*	Cal IDBBNR 5654, US	3.18	3.40	68.80	4.9	56.2
PI 504236	*maritima*	Wild beet, Italy	4.68	0.00	13.00	0.0	18.1
PI 540620	*maritima*	WB 874, France	5.14	0.00	19.50	0.0	22.7
PI 518421	*maritima*	En IDBBNR 5915, UK	5.40	0.00	14.20	0.0	14.6
PI 518338	*maritima*	En IDBBNR 5832, UK	4.79	0.00	22.00	0.0	24.1
PI 540660	*maritima*	WB 914, France	5.76	0.00	2.80	0.0	4.4
PI 504241	*maritima*	Wild beet, Italy	5.63	0.00	17.20	0.0	18.4
PI 504226	*maritima*	Wild beet, Italy	5.33	0.00	6.60	0.0	7.0
PI 518436	*maritima*	En IDBBNR 5930, UK	4.82	0.00	15.60	0.0	18.2
Ames 19156	*maritima*	IDBBNR 9555, Russian Federation	3.06	6.40	68.40	9.3	58.9
PI 504201	*maritima*	Wild beet, Italy	4.76	0.00	33.20	0.0	31.2
PI 504250	*maritima*	Wild beet, Italy	5.71	0.00	8.25	0.0	8.8
PI 504251	*maritima*	Wild beet, Italy	5.25	0.00	17.50	0.0	17.9
PI 504260	*maritima*	Wild beet, Italy	6.67	0.00	0.00	0.0	0.0
PI 518303	*maritima*	En IDBBNR 5797, UK	5.61	0.00	16.60	0.0	16.0
PI 518324	*maritima*	En IDBBNR 5818, UK	5.71	0.00	0.00	0.0	0.0
PI 518398	*maritima*	IDBBNR 5892, Ireland	6.05	0.00	8.20	0.0	12.8
PI 518405	*maritima*	IDBBNR 4899, Ireland	5.71	0.00	16.40	0.0	20.6
PI 540594	*maritima*	WB 848, France	5.39	0.00	6.80	0.0	11.7
PI 540636	*maritima*	WB 890, France	5.07	0.00	17.00	0.0	18.7
PI 540658	*maritima*	WB 912, France	5.69	0.00	18.40	0.0	22.2
PI 504215	*maritima*	IDBBNR 5696	4.90	0.00	19.40	0.0	23.4
PI 504212	*maritima*	IDBBNR 5693	4.50	2.20	44.00	3.9	44.2
PI 504227	*maritima*	IDBBNR 5708	5.37	0.00	12.60	0.0	13.6
PI 504224	*maritima*	IDBBNR 5705	4.33	0.00	26.20	0.0	30.1
PI 504222	*maritima*	IDBBNR 5703	4.47	3.25	24.25	5.3	25.1
PI 504218	*maritima*	IDBBNR 5699	4.55	0.00	36.60	0.0	36.8
PI 504229	*maritima*	IDBBNR 5710	5.30	0.00	10.00	0.0	11.9

Seed Source	Subspecies*	Donor's ID	DI**	% 0-1	% 0-3	AP 0-1	AP 0-3
PI 504231	*maritima*	IDBBNR 5712	4.64	0.00	15.60	0.0	15.5
PI 504187	*maritima*	IDBBNR 5668	4.38	0.00	41.60	0.0	39.7
PI 504249	*maritima*	IDBBNR 5730	5.46	0.00	16.75	0.0	13.7
PI 504246	*maritima*	IDBBNR 5727	6.09	0.00	4.00	0.0	5.3
PI 504245	*maritima*	IDBBNR 5726	5.55	0.00	20.00	0.0	18.0
PI 518344	*maritima*	IDBBNR 5838	4.83	0.00	20.00	0.0	23.1
PI 518336	*maritima*	IDBBNR 5830	5.69	0.00	5.00	0.0	6.6
PI 504252	*maritima*	IDBBNR 5733	4.67	0.00	30.00	0.0	27.0
PI 518317	*maritima*	IDBBNR 5811	6.02	0.00	4.00	0.0	5.3
PI 518357	*maritima*	IDBBNR 5851	4.95	0.00	30.60	0.0	30.2
PI 504244	*maritima*	IDBBNR 5725	5.97	0.00	13.40	0.0	11.0
931017	*vulgaris*	*(FC901/C817)//413 – 'Susceptible Check*	*3.28*	*9.40*	*56.00*	*15.6*	*49.0*
831083	*vulgaris*	*FC705/1 - 'Highly Resistant Check*	*2.51*	*13.80*	*89.20*	*17.1*	*77.5*
991017	*vulgaris*	*FC703 - 'Resistant Check*	*2.58*	*12.60*	*87.20*	*16.3*	*71.7*
		LSD (*P*=0.05)	1.3			6.6	26.5
		Trial Mean	*4.96*	*1.14*	*23.97*	*1.6*	*23.7*

* Shown are the subspecies of *Beta vulgaris* examined.

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