****

Field Resistance of Snap Beans to Root Rot Determined by Root Dry Mass.

Department of Horticulture, University of Wisconsin
Madison, WI 53706 USA
K.A. Kmiecik and F.A. Bliss

Field screening of common bean (Phaseolus vulgaris L.) plants for root rot resistance has relied primarily on visual evaluation of roots for disease severity symptoms. The difficulties of using visual rating methods in breeding programs have been three-fold; first, statistical analyses using ANOVA are not always applicable; second, visual ratings and scores are subjective and depend heavily upon the person making the comparisons; and third, the visual procedures are time consuming, with the number of plants able to be evaluated being limited by the number of people available.

In 1985 snap beans grown in the field at University Experimental Farm at Hancock, Wisconsin were evaluated for root rot resistance using different procedures. The plant materials included 32 snap bean cultivars and advanced breeding lines. These were chosen to include some lines known to be "tolerant" i.e., BBL 94, G6-6, and some known to be "susceptible" i.e., Cascade, Astro.

The seeds were planted in two fields, V3 and W2. Field W2 was chosen because of a presumed low root rot potential and field V3 a high potential for root rot development. Soil samples from previously planted or unplanted sections of each field were analyzed for snap bean root rot potential by Bob Rand in the Plant Pathology Dept., University of Wisconsin, Madison. Previously unplanted areas sampled at the end of the season were indexed at 75 for field V3 (high potential) and 37 for field W2 (low potential). Areas planted to beans during 1985 showed ratings of 78 for field V3 and 78 for field W2 in fall of 1985 after being cropped with beans. Fields with an index rating of 50 to 100 were considered to have high potential, 41 to 50 moderate potential, and 0 to 40 low potential for root rot development (Kobriger et al., 1982).

Field V3 (high potential) was drilled with 60 Kg|ha of bean seed in 15 cm rows two weeks prior to planting and the seedlings disced-under several days before planting to obtain uniform inoculum potential. Each field was then prepared in a typical commercial fashion and rows approximately 1 m apart were marked for planting.

Four reps of each entry were planted in field V3 and two reps in W2 each using a REB design. Each experimental plot consisted of ten seeds hand-planted 2.5 to 4.0 cm deep, 10 cm apart. Seeds of Porrillo 70 were sown at each end of each row to provide guard plants. Stand counts were recorded 15 days after planting (DAP). At 50 DAP, guard plants were pulled and discarded, then the experimental plants were dug using a "U" shaped blade. An area approximately 25 cm under and 15 cm on each side of the row was dug and lifted. The soil was removed from the roots and the stem cut at or slightly below the cotyledonary node. The roots of plants in each plot were bagged, tagged and dried. Dry weights were then taken on root and hypocotyl portions and on roots only for the plants in each plot (g|plot).

Analyses of variance showed that root mass and root + hypocotyl dry mass were significantly different for both location and cultivar. Stand counts were not significantly different. The data for nine lines in this group are summarized in Table 1.

The time involved in digging and evaluating 1200-1300 plots for root mass data included 42 hours in the field and 40 hours for weighing. To evaluate a similar number of lines in 1984 using a visual scoring method required 120 hours of field work. Time savings and data precision suggest that root mass may be a useful parameter in breeding for root rot resistance.

Reference

Kobriger, K.M., D.J. Hagedorn, and W.R. Stevenson, 1982. Analysis of the Snap Bean Root Rot Potential of Wisconsin Fields. University of Wisconsin - Extension Bulletin A3242.

Table 1. Dry mass of roots and hypocotyl (roots+hypoc.) and of roots only of plants grown in a field with high root rot potential (V3) and one with medium to low potential (W2). Hancock, Wisc., 1985.

Cultivar or line	Roots sampled	Root Dry Mass		Reduction[y]
		Field W2	Field V3	
		(g/plot)		(%)
BBL 94	Roots+Hypoc.	6.4	4.8	25
	Roots	3.2	2.2	31
G6-6	Roots+hypoc.	7.0	6.1	13
	Roots	4.2	2.7	46
Sfx 11-7	Roots+hypoc.	8.6	7.8	9
	Roots	4.6	4.0	13
Sfx 11-13	Roots+hypoc.	7.1	6.2	10
	Roots	3.8	2.7	29
Astro	Roots+hypoc.	6.8	3.8	44
	Roots	3.1	1.5	52
Cascade	Roots+hypoc.	8.2	2.8	66
	Roots	3.7	1.0	65
Comm. Cv.1[z]	Roots+hypoc.	6.0	2.1	65
	Roots	2.8	0.9	68
Comm. Cv.2[z]	Roots+hypoc.	6.6	2.1	68
	Roots	3.4	0.8	66
Comm. Cv.3[z]	Roots+hypoc.	5.5	2.2	60
	Roots	3.1	0.8	75
$LSD_{.01}$	Roots+hypoc.	4.4	2.6	
	Roots	3.4	1.6	

[z] unnamed commercial cultivars
[y] % reduction compares growth in the field V3 with high root rot potential with that in field W2 having low to medium root rot potential.