

Bean Rust in the United States in 1988

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Bean rust caused by Uromyces appendiculatus, caused less disease loss in the United States in 1988 than in any other year of the 1980s. The extremely dry weather that occurred over most of the bean production areas east of the Rocky Mountains was unfavorable for disease development over most of the growing season. A moderate epidemic occurred in Southern Florida in late April that was most severe on the indeterminate, climbing cultivars. Light, natural infection occurred in the upper Red River Valley of North Dakota, but only a trace occurred in other areas where epidemics often occur.

A Uniform Snap Bean Rust Nursery (USBRN), with up to 132 entries and checks from one public and seven private breeders, was grown at five locations. Some entries were grown in only one or two of these locations. In Homestead, FL (Bob McMillan, Cooperator), the nursery was grown in early spring and contained 82 entries. This nursery was inoculated with urediniospores from nearby climbing beans. Late summer to early fall nurseries were grown at the other four locations. Urediniospores of historically prevalent (1,7) race 38 were used to inoculate spreader rows at Bridgeton, NJ (Joe Steinke, Cooperator) and Painter, VA (Bob Baldwin and Ricky Sterrett, Cooperators). Races 38, 39, 40, 41, and 43 (1) were inoculated at Beltsville. Natural infection was depended upon at Crossville, TN (Jim Hilty and Charles Mullins, Cooperators). Severe epidemics developed at Beltsville and Bridgeton, a light epidemic developed at Painter, and no rust developed at Crossville. In Homestead, light infection occurred on many entries and heavy infection occurred only on those entries susceptible to those races virulent on indeterminate cultivars.

A Uniform Dry Bean Rust Nursery (UDBRN) with 35 entries and checks from one private and five public breeders was grown at Beltsville; North Platte, NE (Jim Steadman, Cooperator); Saginaw, MI (Fred Saettler, Cooperator); and near Fargo, North Dakota (Ken Grafton, Cooperator). Spreader rows were inoculated with urediniospores of locally occurring races at each location. Moderate to severe epidemics developed at North Platte, Saginaw, and Beltsville, but no rust occurred in the ND nursery. Mobile nursery tests (3) at Beltsville indicated presence of races 38, 39, 40, 41, and 43, but no others. Aurora had a few susceptible type uredinia (pustules) in the Beltsville nursery from race 43, but it was immune at the other locations. Olathe was susceptible at North Platte due to presence of races virulent on it in that area (4), but was immune to resistant at the other locations.

Rust reaction grades were scored as previously described (6) and these grades were converted (2) to: immune (I), highly (hypersensitively) resistant (HR), resistant (R), moderately resistant (MR), moderately susceptible (MS), susceptible (S), or very susceptible (VS) descriptive designations.

From the USBRN and UDBRN, 29 entries had a MS reaction at one or more locations and were not S or VS at any location. Many entries in both nurseries were I-R at one or more locations. However, in the USBRN only 7-1970, 7-2003, 7-2004, 7-1618, 866085, 866088, 871415, 871422, 87MH62, 87MH65, 87-590, and the Beltsville BARC-Rust Resistant (RR) lines (4,5) were I, HR, or R at all locations. The only dry beans with the I-R reactions at all locations of the UDBRN were TARS-HP-8437-79, Sierra (P86299), Belneb-RR-2, and Beldak-RR-1 and -2. A few additional entries in the USBRN were segregating for this degree of resistance.

The most resistant entries from both nurseries have been tested for their reactions to the available races (1,7) in the greenhouse at Beltsville. Lines 7-1618, 871415, and 871422 were MS to several races. Homozygosity for the resistance to all races that is in BARC-RR-2-12 (4,5) occurred in 7-1970, 7-2003, 7-2004, 866085, 866088, 87MH62, and 87MH65. The line TARS-HP-8437-79 was segregating for reaction to several races, but contained at least one plant that was HR or R to all races. Sierra pinto has the HR reaction of Aurora to many races, but is S to at least 12 of the races in the Beltsville pathogen germplasm collection that are virulent on Aurora.

References

1. Stavely, J. R. 1984. Pathogenic specialization in Uromyces phaseoli in the United States and rust resistance in beans. *Plant Dis.* 68:95-99.
2. Stavely, J. R. 1987. Bean rust in the United States in 1986. *Ann. Rep. Bean Improvement Coop.* 30:67-68.
3. Stavely, J. R. 1988. Occurrence of rust resistance in Phaseolus plant introductions 90758 through 194331. *Ann. Rep. Bean Improvement Coop.* 31:128-129.
4. Stavely, J. R. 1988. Rust resistance in beans: the plant introduction collection as a resource and resistance development. *Ann. Rep. Bean Improvement Coop.* 31:64-65.
5. Stavely, J. R. and Steinke, J. 1985. Release of two snap bean germplasm lines, BARC-Rust Resistant-6 and -7. *USDA and NJ Agric. Expt. Stn. Germplasm Release Notice.* 2 p.
6. Stavely, J. R., Freytag, G. F., Steadman, J. R., and Schwartz, H. F. 1983. The 1983 bean rust workshop. *Ann. Rep. Bean Improvement Coop.* 26:iv-vi.
7. Stavely, J. R., Steadman, J. R., and McMillan, R. T., Jr. 1989. New pathogenic variability in Uromyces appendiculatus in North America. *Plant Dis.* 73:(In press).