******

Evaluation of new sources of dry bean germplasm for field resistance to *Sclerotinia sclerotiorum*

Deanne H. Casciano and H.F. Schwartz
Department of Plant Pathology and Weed Science
Colorado State University
Fort Collins, CO 80523

Genetic resistance and plant architectural characteristics can reduce damage caused by the white mold fungus, *Sclerotinia sclerotiorum* (Lib.) de Bary. Many bean improvement programs have studied these factors in field and laboratory situations, and are incorporating disease resistance and architecture (avoidance) mechanisms into commercially acceptable beans. Our program at Colorado State University has worked in cooperation with plant breeders (D.R. Wood, M. Ballarin and M.A. Brick) to identify new and promising parents for the white mold resistance project.

A field experiment in 1984 compared twelve dry bean cultivars and breeding lines from national and international programs (Table 1) in fungicide protected and unprotected plots infested with conditioned sclerotia. Apothecia production, disease incidence and yield data were collected and are reported herein. Two row (56 cm) wide plots (four replicates) were randomly split into two-3 meter long sections, one unprotected and the other protected with three foliar sprays of benomyl (2.24 kg/hectare) during blossoming and early pod set.

Apothecia production was determined by counting the number of individual apothecia or apothecial clusters per unit area beneath the plant canopy 62 and 71 days after planting. There were no significant differences between entries, treatments or sampling dates. Apothecia per square meter of soil surface varied from 0.37-3.27 on August 14 to 1.26-5.28 on August 23. Fewer apothecia were generally associated with the more upright plant types such as A 51, 83 VEF MXA 222, P.I. 169787 and Black Valentine. Higher densities were found beneath the canopies of Agate (prostrate bush), UNL Isoline-VL (prostrate vine) and Olathe (prostrate vine). These associations generally agree with earlier reports on the effects of plant growth habits and canopy development upon inoculum production.

Disease incidence (and severity) was determined as the average proportion of each plant affected by white mold at harvest. The disease index (DI) was obtained by the following formula: relative difference in % disease between the protected and unprotected plots of each entry multiplied by the % disease in the unprotected plot divided by 100%. A small DI indicates that the entry was resistant to or avoided serious infection, whereas a large DI was associated with greater susceptibility. Table 2 summarizes the disease incidence and index data; and significant differences were observed for cultivar (main plot), treatment (subplot) and cultivar by treatment (interaction) levels. The P.I. 169787, Black Valentine, A 51 and 83 VEF MXA 222 entries has less than 30% maximum infection, and had low disease indices due to their resistance and/or disease avoidance (upright plant architecture) attributes. The resistance of P.I. 169787 has been previously reported by

Table 1. Cultivar descriptions.

Cultivar	Type	Growth Habit	Seed Source
P.I. 169787	Brown snap	Determinate, upright	Cornell Univ. M.H. Dickson
Black Valentine	Black snap	Determinate, upright	Rogers Brothers
UNL Isoline-BE	Pinto	Determinate, prostrate	Univ. of Nebr. D.P. Coyne
UNL Isoline-BL	Pinto	Determinate, prostrate	Univ. of Nebr. D.P. Coyne
Agate	Pinto	Determinate, prostrate	Rogers Brothers
83 VEF MXA 222	Pinto	Indeterminate, upright	CIAT - CSU selection
A 51	Cream	Indeterminate, upright	CIAT - CSU selection
Fiesta	Pinto	Indeterminate, prostrate	Idaho Seed Bean
UNL Isoline-VE	Pinto	Indeterminate, prostrate	Univ. of Nebr. D.P. Coyne
UNL Isoline-VL	Pinto	Indeterminate, prostrate	Univ. of Nebr. D.P. Coyne
Olathe	Pinto	Indeterminate, prostrate	CSU - D.R. Wood
U.I. 114	Pinto	Indeterminate, prostrate	Idaho

Table 2. % Disease Incidence and Yield Resistance

Cultivar	% Disease Incidence			Disease	% yield
	Protected	Unprotected	Mean	Index	reduction
P.I. 169787	0.0 a*	3.2 a	1.6 a	0.10 a	-3.20
Black Valentine	3.2 a	16.8 ab	10.0 ab	3.02 a	-8.17
A 51	10.4 a	21.1 ab	15.8 abc	3.82 ab	-11.54
83 VEF MXA 222	6.8 a	29.8 bc	18.3 bcd	8.54 abc	-12.38
Fiesta	9.1 a	33.7 bc	21.4 bcde	11.34 abc	-11.61
UNL Isoline-BE	8.1 a	41.0 cd	24.6 cde	14.12 abcd	-32.59
UNL Isoline-VE	6.0 a	46.1 cd	26.1 cde	21.77 bcd	-16.76
Agate	15.2 a	41.6 cd	28.4 cde	14.85 abcd	-11.02
Olathe	14.5 a	46.6 cd	30.5 cde	17.82 abcd	-22.66
UNL Isoline-VL	15.5 a	54.6 d	35.1 e	23.16 cd	-30.46
U.I. 114	13.6 a	58.9 de	36.2 e	29.56 d	-25.73
UNL Isoline-BL	39.7 b	73.8 e	56.8 f	25.21 cd	-31.99
Treatment Mean	11.8	38.9			

* Treatments followed by the same letter and not significantly different (FLSD, P = 0.05).

Dickson and Hunter at Cornell with their limited term inoculation test, while Black Valentine has been observed to have some field resistance in Nebraska by Steadman, Coyne and Schwartz. Inoculation tests need to be be performed on A 51 and 83 VEF MXA 222, but it is assumed that their field performance was largely conferred by their desirable plant architecture.

Yield differences between cultivars and treatments were significant, but % yield reduction data were not (Table 2). This latter parameter was obtained by the following formula: protected yield minus unprotected yield divided by the protected yield multiplied by 100. Disease development was moderate (25% overall), but not sufficient to provide more uniform pressure required to separate the germplasm more precisely on yield differences. Additional research with these cultivars is planned, but it appears that P.I. 169787, A 51, 83 VEF MXA 222 and possible Fiesta may provide some useful attributes for improvement of white mold resistance and disease avoidance in commercially acceptable dry beans in this region. Black Valentine also possesses some interesting characteristics, but is a poor parent for crossing with our pinto and other bean germplasm.

******

Virulence of the Soybean Rust Pathogen, *Phakopsora pachyrhizi*, on *Phaseolus vulgaris* Cultivars

J. R. Stavely, J. L. Rytter, and M. H. Royer
ARS, USDA, Plant Pathology Laboratory, Beltsville, MD 20705
and Plant Disease Research Laboratory, Frederick, MD 21701

The causal organism of soybean rust, *Phakopsora pachyrhizi*, has not been reported from the continental United States, but it causes severe losses on soybeans in Asia and Australia (1,2). In 1976 this fungus was found in Puerto Rico, producing a susceptible, sporulating reaction on *Glycine max*, *Phaseolus vulgaris*, *Dolichos lablab*, *Phaseolus lunatus*, and other leguminous hosts (5). It was suggested that *P. pachyrhizi* may also occur in other Caribbean islands even closer to the continental United States. Epidemiological studies indicate that climatic conditions are favorable for development of *P. pachyrhizi* throughout most of the United States (2). In 1981, teliospore formation by *P. pachyrhizi*, which had been previously reported on field plants of soybean, was shown to occur on *P. vulgaris* and other hosts artificially submitted to a prolonged period of cool (15C) night temperature (6).

Three to five plants of some of the *P. vulgaris* cultivars or lines having the broadest resistance to races of the bean rust fungus, *Uromyces appendiculatus* (=*U. phaseoli*), representative cultivars of the major types of *P. vulgaris* grown in the United States, and soybean cv. Wayne were inoculated with urediniospores of Brazilian isolate BZ82-1, a composite of Puerto Rican collections of *P. pachyrhizi*, and race 52 of *U. appendiculatus* (1,3,5). The broadly bean rust resistant *P. vulgaris* cultivars were also inoculated with *P. pachyrhizi* Taiwan isolate 72-1 (1). In separate inoculations, both unifolioate and trifoliolate leaves were inoculated, but the former were predominantly tested on *P. vulgaris* and the latter on *G. max*. Conventional greenhouse cultural conditions, urediniospore concentrations, and inoculation