Recent research in our laboratory has been concerned with improved techniques for developing multiple disease resistance in bean, *Phaseolus vulgaris*. One of the areas of this research has involved the sequential and/or simultaneous inoculation of young bean plants in the greenhouse with 1) *Xanthomonas campestris* pv. *phaseoli* (XCP), the incitant of common blight, 2) *Colletotrichum lindemuthianum* (CL), cause of anthracnose, 3) *Uromyces appendiculatus* (UA), the rust pathogen, and 4) *Isariopsis griseola* (IG), the cause of angular leaf spot. Very encouraging results were obtained with these studies because with the use of proper timing of inoculations, and the employment of appropriate incubation conditions and periods, satisfactory development of each disease could be obtained on a single trifoliolate bean leaf. Most recently we have researched the use of detached bean leaves for simultaneous inoculations with the above-named pathogens. This paper will briefly explain the technique used and the results obtained.

The comparative disease reaction studies were made using second or third trifoliolate leaves of various growth chamber-grown bean cultivars. The leaves were removed at the time they were 2/3 expanded. The petiole of each leaf was inserted into a large 14 cm dia. petri dish through a small slit in the parafilm dish cover and the leaf rested on this cover. Distilled water half-filled the petri dish. Three small pieces of thin pot label were placed on the edge of the parafilm to hold the glass petri-dish cover above the abaxial leaf surface. Bean leaves would remain turgid and green for up to 15 days in this miniature "growth chamber". Inoculation of CL was by brushing a drop of 10^6 conidia/ml on the midrib of the adaxial leaflet surface; 0.2 ml of IG inoculum containing 10^5 conidia/ml was rubbed on the adaxial surface; 0.2 ml of UA inoculum containing 10^5 uredospore/ml was applied by rubbing on the abaxial leaflet surface; XCP inoculum containing 10^8 cfu cells/ml was applied by dipping a razor blade into the inoculum and making three 1 cm cuts at the edge of leaflet perpendicular to the midrib and 1 cm apart. Inoculated leaves were placed in a mist chamber for 48 hr and transferred to a 24 C growth chamber to allow disease development.

Disease severity ratings for detached leaves, and for the whole plant controls, were made after 7-10 days. Disease ratings for IG and CL were based on a 0-5 rating scale where 0 = no disease and 5 = lesions covering 76-100% of the leaflet surface. Rust (UA) severity was expressed as percent leaflet diseased, and XCP severity was rated on a scale of 0-3 with 0 = no disease and 3 = tissue between razor blade incisions totally blighted.

Results were encouraging and indicated that the reaction of detached leaves to CL, IG, XCP and UA was similar to that of whole plants. This is a critical requirement and must be met before the detached leaf technique can become a viable procedure for studying the reaction of beans to several pathogens. With
the susceptible cultivar Bountiful, whole plants had a CL mean disease rating (MDR) of 1.9 vs. 1.5 for detached leaves. After inoculation with 1G detached leaves of the susceptible cultivar Montcalm showed a modest increase (2.7 vs. 1.7) in disease compared to whole plants. For XCP, on the susceptible Bountiful cultivar, the MDRs were almost identical -- 2.9 for whole plants, 2.8 for detached leaves. For UA on susceptible Bountiful leaflets were 36% rusted on whole plants vs. 21% for detached leaves; detached leaves of resistant cultivars remained resistant regardless of treatment. Furthermore, the reaction of both detached leaves and leaves on whole plants was basically similar regardless of whether there were 0, 2 or 3 other pathogens inoculated.

We believe that these preliminary results are very encouraging and that the use of detached leaves for studying the reaction of beans to multiple pathogens can become a very useful technique.

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DISEASE AVOIDANCE AND RESISTANCE IN DRY BEANS TO SCLEROTINIA SCLEROTIORUM (Lib.) deBary.

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White mold, caused by Sclerotinia sclerotiorum (Lib.) deBary, is a serious fungal disease of dry beans with losses easily exceeding 50% unless chemical and cultural control measures are practiced. The disease is favored by dense plant canopies, high soil moisture and low to moderate temperatures all of which are commonly associated with prostrate growth habits.

A two-year study was conducted during 1984 and 1985 to determine the effects of different plant architectures and/or levels of resistance in dry beans on S. sclerotiorum inoculum production and disease development in a field nursery infested with 1-2 sclerotia/kg air dried soil. Eleven dry bean cultivars and breeding lines from national and international programs were compared in protected and control plots. 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.

Plant architecture or level of resistance had no effect on the number of germinated sclerotia/m² or on the number of apothecia/m² which developed in the test plots. Disease incidence was significantly greater in cultivars with indeterminate, prostrate plant architectures (Olathe, U.I. 114) than those with indeterminate upright architectures (83 VEF MXA 222, A51) or a high level of resistance (P.I. 169787) (Table 1). The amount of disease observed in the resistant P.I. 169787 line was similar to that observed in the 83 VEF MXA 222 and A51 architecture lines under high disease pressure. The variation in disease indexes and yield losses reflect the increased disease pressure in 1985 (39.2% overall) compared to 1984 (25.4% overall).