ORTHO-DIHYDROXY PHENOLS AND THEIR RELATION TO FUSARIUM RESISTANCE IN BEANS

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Young bean (Phaseolus vulgaris L.) plants were analyzed for ortho-dihydroxy phenols using Arnow's procedure. These phenols were most concentrated in the younger tissue, intermediate in the older leaves and stems and quite low in roots and stems below ground. O-dihydroxy phenols in the unifoliate leaves of 32 selections were found to be inversely related to Fusarium root rot resistance. Varieties could generally be classified as resistant, intermediate, or susceptible by their o-dihydroxy phenol content. Sanilac, Seaway and UI 74 were the only exceptions. These varieties were resistant according to their o-dihydroxy phenol content, but are considered susceptible.

Beans infected with F. solani f. phaseoli had the same quantity of these phenols in the unifoliate leaves as healthy plants. O-dihydroxy phenols in F2 plants from an intermediate x resistant cross indicated that this phenol content behaved as a quantitatively inherited character and not as discrete segregations of high and low phenol content.

Even though o-dihydroxy phenols content of unifoliate leaves is generally inversely related to Fusarium root rot resistance this test will probably not be used as a means of classifying beans for root rot resistance. Most genotypes tested would fall in the intermediate range of resistance, and the test does not appear to provide a means of distinguishing between degrees of resistance in the intermediate range.

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PHYTOALEXINS AND THEIR RELATION TO ROOT ROT IN BEANS

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Two phytoalexins are known to be formed in beans when infected with Fusarium solani f phaseoli. These compounds appear to be a part of the mechanism of resistance to Fusarium root rot in beans. All beans tested thus far are able to produce both phytoalexins. A procedure was developed whereby hypocotyls of individual plants could be analyzed for these phenols.

Resistant varieties produce larger quantities of both phytoalexins in a period of one or two days after inoculation than do susceptible varieties. For hypocotyls sampled five or seven days after inoculation this same relationship often did not hold as susceptible varieties often had as many or more phytoalexins than resistant lines. Data on phytoalexin in F2 segregates in the cross UI 36 x R 370 (R 370 is a sister line of R 275)

could not be interpreted on the one gene basis which was predicted on the basis of field readings for root rot resistance. There was no association between phaseolin content and substance II (the ethyl acetate extractable phytoalexin) in these segregates. These results suggest that the genetic controls of the induction of these substances are independent.

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NATURAL HYBRIDIZATION OF PHASEOLUS VULGARIS L. x PHASEOLUS COCCINEUS L.

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Frequency of natural hybridization of P. vulgaris and P. coccineus was observed in two seasons. Natural hybridization ranged from zero to 6.79%, and was dependent upon the particular parental combinations. Bumblebees appeared to be the principal insect pollinators. The best P. coccineus pollen parent, P. I. 223803, had scarlet flowers and was relatively early in maturity. The P. vulgaris variety which hybridized most frequently, Tendergreen, had a high frequency of atypical flowers. In most of the atypical flowers the standard and/or keel petals were not fully developed, thereby leaving the reproductive parts exposed to insect pollinators. It is suggested that natural hybridization might be useful in transferring P. coccineus genes for disease resistance and other characters into P. vulgaris lines.

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SURVIVAL OF BACTERIAL PATHOGENS OF BEANS

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A. Survival in the Field

Survival studies were initiated by inoculation of a susceptible bean variety with each of six bean bacterial pathogens (Pseudomonas phaseolicola Races 1 and 2; Xanthomonas phaseoli; Xanthomonas fuscans; Corynebacterium flaccumfaciens and its variety aurantiacum). Plants were harvested on September 10, 1965 and samples were placed in sunken clay tile (4' x 1 1/2') in which the bean straw was either placed on the soil surface or incorporated to a depth of about eight inches.

Initially, isolations were made in September, 1965 to determine the presence of bacteria in the straw samples. Bacteria were obtained from all