BLACK DOT DISEASE OF POTATO - IS IT PART OF THE EARLY DYING PROBLEM?

by
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BLACKDOT SYMPTOMS:

Black dot, (caused by Colletotrichum coccodes) describes abundant, dotlike, black sclerotia on tubers, stolons, roots, and stems above- and below-ground. Symptoms vary from below-ground rot of roots, stems, and stolons to above-ground yellowing and wilting of foliage. Foliage symptoms, which first occur at plant apices and later at mid- and basal- regions, may be confused with those of other wilt pathogens (e.g., Verticillium and Fusarium spp.). Lesions on below-ground stems, and stolons may also resemble Rhizoctonia disease of potato. Severe invasion of cortical tissue causes sloughing of periderm. Following removal from the soil, roots may have a "stringy" appearance from decortication. As stems dry, cortical tissue is easily scaled away, an amethyst color is common inside the vascular cylinder, and sclerotia on stems develop abundantly externally and internally. With high relative humidity, the development of setae is inhibited.

Severe rotting of below-ground plant parts and early death of the plant cause reduction in tuber size. At harvest, pieces of dried stolons, with or without sclerotia, frequently adhere to the tubers. This is often referred to as "sticky stolons." Stolons may be severed at any stage of tuber development, with the lesion usually 15 to 45 mm from the tuber. Sclerotia may develop on the upper surface of tubers and, in storage, grayish areas on tubers may closely resemble silver scurf.

PATHOGENIC POTENTIAL OF COLLETOTRICHUM COCCODES TO POTATO: SOME NEW EVIDENCE:

Historically, Colletotrichum coccodes has been commonly regarded as a weak root-pathogen of potato. Recent greenhouse studies during 1986, 1987, 1988, and 1989 have introduced new evidence demonstrating the importance of this organism as a pathogen of foliage. Spray inoculations of the Russet Burbank potato with conidial suspensions of 10^6 conidia/ml have shown that it can cause distinct symptoms of necrotic lesions on stems and petioles, vein and leaf necrosis, die-back, and premature vine death. New evidence was obtained during 1989 that C. coccodes may not only cause potato early dying, but produce symptoms that are nearly identical to Verticillium dahliae and cause yield loss and declines in the tuber specific gravity. Fig. 1 and 2 demonstrate the relationships between wilt induced by Colletotrichum and both potato yield and specific gravity respectively. Our results point to the need for a greater understanding of the etiology of C. coccodes if the early dying problem is to be understood.

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Three isolates used in a greenhouse study (two very pathogenic and one less pathogenic) were used to inoculate potato foliage in the field to determine pathogenicity under field conditions. Wilt data showed that isolates that were most pathogenic in the greenhouse were the treatments producing the most wilt in the field. Fig. 3 and 4 illustrate the effect of C. coccodes on potato yield in the field. Even though symptoms were considered minimal, field inoculations resulted in a significant reduction of both total yield and larger tubers (>10 oz). This data corroborates earlier field studies also showing significant yield reductions when C. coccodes is applied to potato foliage.

In addition to wilt symptoms, C. coccodes was also shown to produce symptoms similar to early blight caused by Alternaria solani. Wilt symptoms, very similar to that produced by V. dahliae, were produced by almost all isolates of C. coccodes in a greenhouse study. To test pathogenic variation of C. coccodes, nine different isolates were used to inoculate the foliage of potatoes. Wilt and leaf lesion data were taken over several weeks. At harvest all isolates of C. coccodes were pathogenic and were shown to significantly reduce tuber yield even though some were almost symptomless late in the season. Those treatments producing the most severe wilt also reduced specific gravity. The occurrence of wilt was strongly correlated with the loss of both yield and specific gravity. At no time could the presence of V. dahliae be detected, only C. coccodes.

RELATIONSHIP TO POTATO SEED:

Our studies have shown certain seed areas to be heavily infested with C. coccodes. Soilborne inoculum in potato seed areas was shown to be highly correlated with contaminated seed. Similarly, inoculations of foliage were shown to result in infected seed. Studies with both inoculated potatoes and tubers naturally infested with C. coccodes showed that upward movement of the pathogen from seed did not occur, but movement did occur in a downward direction infecting both roots and daughter tubers with an introduction of C. coccodes into soil. Thus, seed serves as a means of inoculum spread into soils from field to field and into daughter tubers. Although infected seed may not have a significant effect upon the current-season crop, the possibility does exist that infected seed may have a negative effect upon potato yield following subsequent crops within the same field. Our studies demonstrate that when soilborne inoculum levels are adjusted to approximate naturally occurring levels of inoculum in the field (80-100 cfu/g of soil) that significant 16% yield reductions may occur. Thus, infected potato seed is a potential threat to the commercial grower.

SURVEY STUDIES OF COLLETOTRICHUM:

A survey of C. coccodes in soil and potato tubers was conducted in seed growing and production areas of southern Idaho to understand the natural occurrence and potential inoculum sources and spread. It was found in soil in 70% of the seed and 100% of the production areas sampled. The presence of the pathogen in potato seed was strongly correlated with its presence in soil and it was not found in soil that was not under cultivation.

RELATIONSHIP OF BLOWING DUST:

Since southern Idaho often has dust storms combined with high winds during the growing season, dust collectors have been constructed and placed at several locations within the state to determine whether the disease is spread in the blowing soil during these storms. This data is not yet available.

DISEASE CONTROL:

To-date there is no control for this disease. Although we can produce marginal symptoms in the field and show significant effects upon potato yield, we have not learned to produce severe symptoms in the field as are commonly observed under natural conditions. To understand the disease and the ability to produce severe symptoms in the field, should provide information vital for disease control.

COMMENTS:

Overall data to-date suggest that C. coccodes is having a negative impact upon both tuber yield and size. Field studies and observations suggest that losses from this pathogen may easily approximate 50 cwt/A. Continued studies of this pathogen are highly recommended.

Figure 1

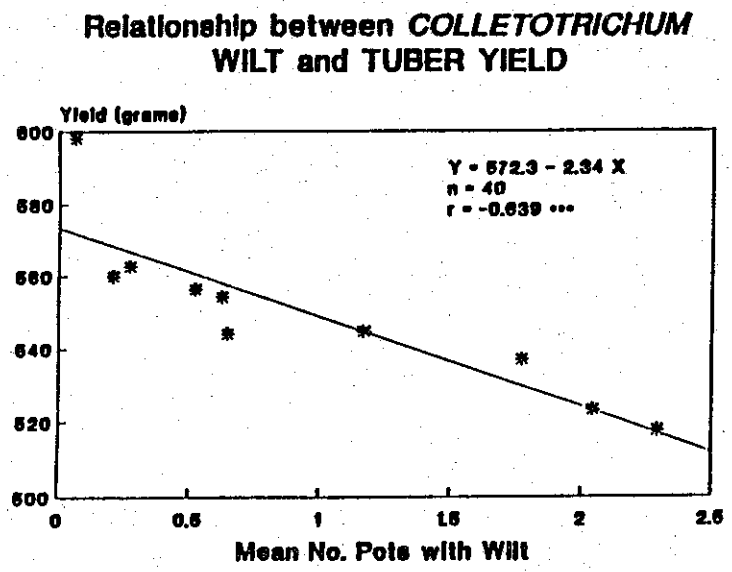

Figure 2

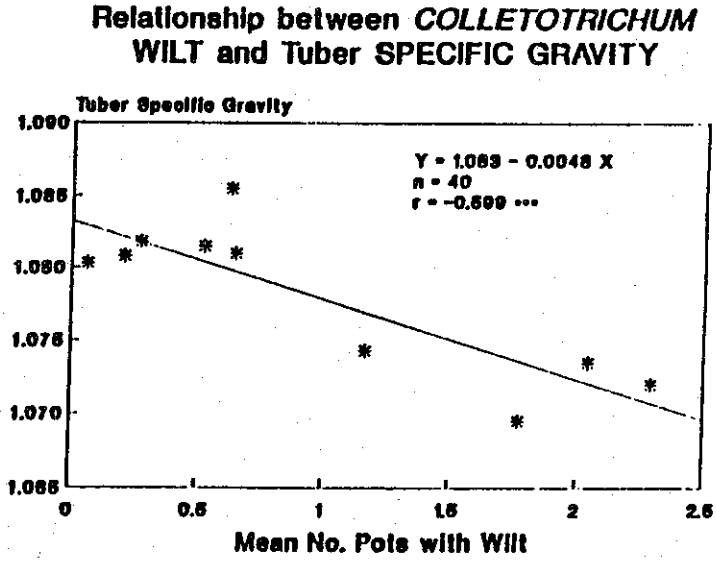

Figure 3.

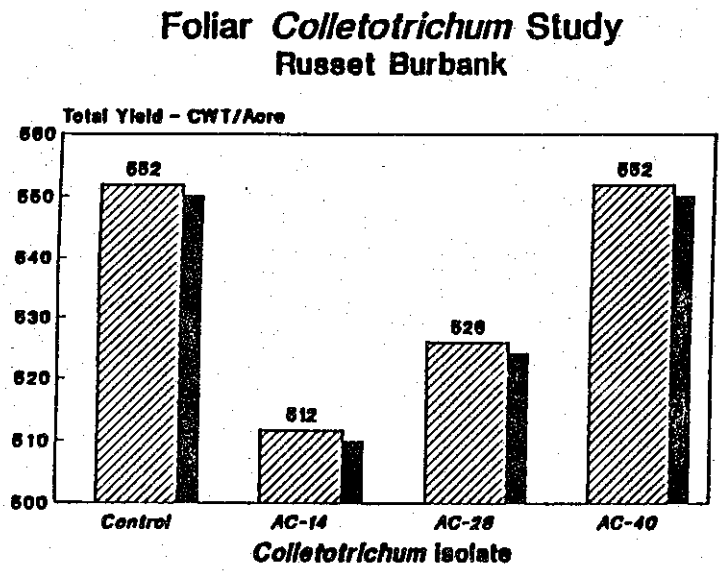

Figure 4.