A REVIEW OF THE RHIZOCTONIA CROWN AND ROOT ROT DISEASE OF SUGARBEET[1/]

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Rhizoctonia crown and root rot of sugarbeet is incited by the fungus, Rhizoctonia solani Kuhn (Pellicularia filamentosa (Pat.) Rogers). Corticium praticola Kotila, which also has a Rhizoctonia stage, has been isolated from sugarbeet (17) but its importance in regard to crown and root rot has not been clarified.

The disease is characterized by a sudden wilting of leaves which turn brown or black and persist on the dead crown. Roots are wholly or partially rotted, and the decayed tissue turns blackish brown. Deep fissures often appear at or near the crown. Several adjacent plants in a row may show symptoms, indicating spread of the infection from one plant to the next (4, 10).

A dry rot canker of sugarbeet roots has also been reported to be incited by R. solani (8, 13). Symptoms include numerous circular lesions with alternating dark and light brown concentric rings on the roots. Below the lesions are deep cankers filled with mycelium of the fungus. R. solani also causes seedling blight, leaf blight (6), and storage rot (4) of sugarbeet.

Rhizoctonia solani causing crown and root rot has been found wherever sugarbeet is grown in the United States. Incidence of the disease ranges from less than 1 percent in some fields to over 50 percent in others.

Isolates of R. solani from sugarbeet comprise a vast number of strains that differ in pathogenicity and virulence on sugarbeet and other hosts (7, 9, 11, 15). Isolates associated with one syndrome on sugarbeet may differ in pathogenic capabilities from isolates associated with another syndrome. For instance, isolates from dry rot cankers and from blighted leaves did not cause crown and root rot when introduced into sugarbeet roots (6,8). Some isolates associated with seedling blight incite crown rot, whereas, others do not (7, 15).

The host range of R. solani comprises over 160 plant species (11). Some strains of the fungus appear to be limited in their pathogenicity to certain plant species, whereas, others are capable of attacking a wide spectrum of host species (5). Isolates of R. solani from pigweed (Amaranthus retroflexus) caused crown rot when inoculated into sugarbeet (2). Isolates from bean, cotton, cowpea, potato, rhubarb and sugarbeet were pathogenic on sugarbeet roots, (5).

Rotation has been the preventive measure most cited for control of Rhizoctonia crown and root rot (4, 10, 11). In field experiments on irrigated

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land in Nebraska, incidence of crown rot decreased as length of rotation increased (16). Strains of R. solani pathogenic to sugarbeet were shown to persist in the soil for at least seven months after harvest, as hyphae in dead plant tissue or as sclerotia on surfaces of plant debris (1). This could account for higher incidence of the disease when sugarbeet follows sugarbeet instead of a non-host crop. Little has yet been published concerning the effects of other crops on incidence of the disease, except that severe cases of Rhizoctonia disease of sugarbeet following potatoes have been described (3, 11).

No effective fungicidal control of the disease has been reported. In 1968, none of 11 fungicidal seed and soil treatments tested in an artificially induced field epiphytotic at the East Lansing station effectively controlled the disease (14). Inasmuch as control of Rhizoctonia root rot of other crops by certain fungicides has been reported, the possibility of controlling crown and root rot of sugarbeet by similar means is still considered. At the East Lansing station, new fungicidal compounds are routinely screened and various methods of effectively applying them are tested.

Recently, the development of an effective method of inoculating and testing sugarbeet, for resistance to R. solani (12), has given impetus to attempts to produce Rhizoctonia-resistant sugarbeet varieties. In 1968, in a field test at the East Lansing station, five sugarbeet cultivars developed for Rhizoctonia resistance by J. O. Gaskill in Colorado, were inoculated with a Michigan isolate of the fungus. At harvest most of the plants of these five improved cultivars showed only light symptoms of the disease, whereas, most of the plants of the other 10 cultivars in the test that had no history of selection for Rhizoctonia resistance had either died or were severely rotted (unpublished data). As efforts to develop Rhizoctonia-resistant sugarbeets continue, studies on pathogenic capabilities of strains of R. solani would be very pertinent, especially in regard to the possibility of the existence of strains capable of attacking and rotting varieties developed as resistant.

Good soil drainage, prompt cultivation, and proper fertilization have also been recommended as ways to control the disease (4, 10). In Nebraska experiments, application of farm manure and mineral fertilizer reduced Rhizoctonia disease where successive crops of sugarbeet had been grown, but not where there had been a 4-6 year interval between sugarbeet crops (16). As yet, little more information is available concerning effects of soil amendments and tillage practices in development of Rhizoctonia crown and root rot, or on its control.

(15) Schuster, M. L., Stanley Jensen and Richard M. Sayre. 1958. Toothpick method of inoculating sugarbeets for determining pathogenicity of Rhizoctonia solani. Jour. Amer. Soc. Sugar Beet Tech. 10:142-149.

(16) _____, and L. Harris. 1960. Incidence of Rhizoctonia crown rot of sugarbeets in irrigated crop rotation. Jour. Amer. Soc. Sugar Beet Tech. 11:128-136.

(17) Vanterpool, T. C. 1953. Corticium praticola and the Rhizoctonia solani problem. Phytopathology. 43:488 (Abstract).

Literature Cited

(1) Boosalis, M. G., and A. L. Scharen. 1959. Methods for microscopic detection of Aphanomyces euteiches and Rhizoctonia solani and for isolation of Rhizoctonia solani associated with plant debris. Phytopathology 49:192-198.

(2) _____ and _____. 1960. The susceptibility of pigweed to Rhizoctonia solani in irrigated fields of western Nebraska. Plant Dis. Reporter 44:815-818.

(3) Buchholtz, W. F. 1937. A severe case of Rhizoctonia root rot of sugarbeet after potatoes. Phytopathology 27:1180.

(4) Coons, George H. 1953. Some problems in growing sugarbeets. USDA Yearbook of Agriculture. 1953:509-524.

(5) Houston, B. R. 1945. Culture types and pathogenicity of isolates of Corticium solani. Phytopathology 35:371-393.

(6) Kotila, John E. 1947. Rhizoctonia foliage blight of sugarbeets. Jour. Agric. Research. 74:289-314.

(7) Le Clerg, E. L. 1934. Parasitism of Rhizoctonia solani on sugarbeet. Jour. Agric. Research. 49:407-431

(8) _____ 1939. Studies on dry-rot canker of sugarbeets Phytopathology 29:793-800.

(9) _____ 1941. Pathogenicity studies with isolates of Rhizoctonia solani obtained from potato and sugarbeet. Phytopathology 31:49-61.

(10) Lill, J. G. 1954. Sugarbeet culture in the North Central states. Farmers' Bulletin 2060, 42 pp.

(11) Maxson, A. C. 1939. Beet root rot caused by Rhizoctonia solani. Proc. Amer. Soc. Sugar Beet Tech., Reg. Meet. of E. Slope and Inter Mtn. area:38-45.

(12) Pierson, Victor G., and John O. Gaskill. 1962. Artificial exposure of sugarbeets to Rhizoctonia solani. Jour. Amer. Soc. Sugar Beet Tech. 11:574-590.

(13) Richards, B. L. 1921. A dry-rot canker of sugarbeets. Jour. Agric. Research 22:47-52.

(14) Schneider, C. L., and H. S. Potter. 1969. Rhizoctonia solani in sugarbeets. Fungicide-Nematicide Tests-Results of 1968. Vol. 24 (In press).