BRIEF ARTICLES

OCCURRENCE OF PYTHIUM APHANIDERMATUM ON TABLE BEETS IN BRITISH COLUMBIA[1]

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In June 1967, large areas of a 30-acre field of table beet, Beta vulgaris L. 'Detroit Dark Red', near Armstrong, British Columbia, contained fewer plants than the average number throughout the field Plants in these portions of the field were stunted and had yellow leaves and small roots. Plants in the rest of the field appeared normal. The soil of this area, which had been reclaimed from swamp 15 years previously, was black and high in organic matter. Crops that had preceded the beets included timothy, potatoes, parsnips, carrots, and oats. The grower stated that in 1966, the first year when table beets were grown, the crop had shown similar unsatisfactory growth in certain areas. In 1966, and again in 1967, many plants in the affected areas had died shortly after emergence, while the survivors had grown slowly to display the effects that were observed. Affected plants had scurfy black lesions on the roots at the soil level, but attempts to isolate pathogens from such lesions failed to yield any organisms deemed likely to be responsible for the disorder.

Subsequently, soil was collected from the areas of the field that were most affected and was sown with seed of 'Detroit Dark Red' beets in flats in a greenhouse that was maintained at 21 C. Seedlings emerged after 5 days, but most of them collapsed within a few hours of emergence. Wilted seedlings had conspicuous, black, wet lesions that girdled the plants at the soil level Pure cultures of a rapidly growing fungus were consistently isolated on Difco corn meal agar from such lesions. The fungus was identified on the basis of Middleton's description (2) of Pythium aphanidermatum (Edson) Fitap.

The pathogenicity of the fungus was confirmed in greenhouse tests at 21 C A homogenate, prepared by blending four petri-dish cultures of the fungus, in 100 ml water, was applied to three 2-ft rows of newly emerged 'Detroit Dark Red' seedlings growing in steamed potting soil in flats. Seedlings in a second flat were similarly treated with a fungus-free homogenate of corn meal agar. Thirty hours after inoculation, seedlings began to collapse in the flat to which inoculum had been added and additional plants were affected during the next 3 days. Pure cultures of P. aphanidermatum were readily recovered from affected seedlings.

From the evidence obtained, it has been established that P. aphanidermatum was present in the soil of the problem portions of the field, and that this pathogen causes damping-off of table beet seedlings. It has not been established with certainty that stunting and scurfy root lesions were due to infection by P. aphanidermatum. It is however conceivable that these symptoms were caused by chronic attacks by the pathogen on plants that had grown beyond the stage at which they succumb completely to damping-off.

P. aphanidermatum, although known to cause damage to sugar beets in Ontario (1), has not been recorded previously on table beets in Canada.

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OBSERVATIONS ON THE GERMINATION OF THE OOSPORES OF PHYTOPHTHORA CITRICOLA

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The observations reported here are preliminary ones having to do mainly with the germination of the oospores of Phytophthora citricola Saw., which is associated with a shoot blight of lilac (*Syringa vulgaris* L.) and a crown rot of elder (*Sambucus* sp.) in Alberta (4). P. citricola is homothallic and it produces oospores rapidly and abundantly on slants of lima bean agar in test tubes. In its sexual state, particularly, it closely resembles Phytophthora cactorum (Leb. & Cohn) Schroet. (6).

About 1 week after the initiation of a new colony of P. citricola on Diffo lima bean agar (ph 5.8), numerous oospores may be formed under ordinary laboratory conditions at 70-75 F (21-24°C). The first

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isolate of the fungus that we examined was obtained in 1965 from the stem of a blighted lilac. It produced oospores regularly on lima bean agar, but none were observed to germinate over a two-year period. In 1967, three isolates of the fungus were obtained from other sources, two from elders affected with crown rot, and one from soil under diseased lilacs. Germinating oospores were soon found in cultures of all three isolates. Eventually, in the same year, the original isolate from lilac gave rise to oospores in which the percentage germination was even higher than in those of the other three isolates.

The time that elapsed between the starting of the cultures and the observation of the first germinating oospores varied from about 3 to 6 weeks. Allowing about 1 week for oospore formation, this indicates that at least some of the spores were able to germinate without a long period of dormancy. In view of the experience of other workers with the oospores of other species of Phytophthora, these results seem somewhat unusual, especially since they were obtained without special treatment of the oospores to stimulate germination. Germination of the oospores of P. cactorum has been induced with difficulty, but according to Miss Blackwell (3), special methods such as chilling "shortened the requisite time to two months" for the germination of month-old oospores of this species.

The most common method of germination of the oospores of P. citricola that we have observed is characterized by the formation of a germ tube that terminates in a single sporangium (Fig. 1). Frequently this may simply be an initial stage in the process. Quite often a chain of two or more sporangia forms from the apex of the germ tube. On one occasion a branched sporangiophore bearing sporangia was seen arising from an oospore. Before the appearance of a germ tube, marked striation and other changes in the inner wall of the oospore were noted regularly. These changes probably result from a process of digestion, as has been suggested for P. cactorum (2).

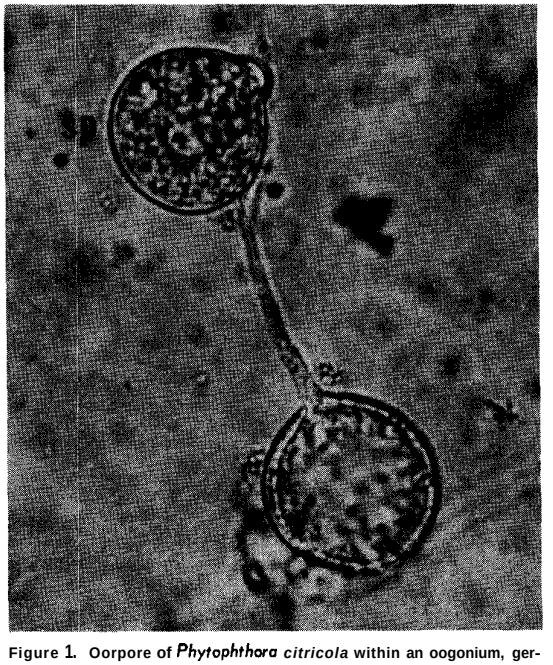

Figure 1. Oorpore of *Phytophthora citricola* within an oogonium, germinating by o germ tube bearing a single sporangium (sp) following partial disintegration of the inner wall of the oospore.

Germination of the oospores that we have observed in P. citricola has occurred under quite ordinary conditions in the laboratory. Germination was first observed in cultures contaminated with bacteria, but it has since occurred in pure cultures. Moreover it has taken place under widely different light conditions, and sometimes it has occurred under limited light supply, as has been noted for P. cactorum (1, 5). Studies have been initiated to determine more precisely the effects of variations in light and other environmental factors on the germination of these spores.

Acknowledgments

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