

BEAN STEM ROT IN MARYLAND AND DELAWARE CAUSED BY SEVERAL PYTHIUM SPECIES

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Pythium myriotylum Drechs. is a fungus requiring high temperatures for its best development. Along the Atlantic seaboard it is known to occur as a plant pathogen in Florida, Georgia, and South Carolina. In Florida, certainly it is widely active during the long hot season, causing damping-off, root-rot, stem rot, and fruit rot of various crop plants. In our northern States it has come to light occasionally as a cause of cottony rot in vegetable products of southern origin. I have not recognized it among the pure cultures isolated by me since 1922 from diseased plants found growing outdoors in the District of Columbia and in adjacent portions of Maryland and Virginia. During the last 18 years, it must be admitted, my efforts in isolating root-rotting fungi have in conformity with rules governing the transportation of cultures been restricted very largely to materials originating in a relatively small area.

Six years ago Pythium myriotylum appeared unexpectedly in a greenhouse at the Plant Industry Station, near Beltsville, Maryland, as the pathogenic agent in more than a dozen bean (Phaseolus vulgaris L.) seedlings which on June 25, 1946, were found falling over, though they were then twelve days old and about 15 cm. high. In all the affected seedlings a basal portion of the stem, extending 2 to 5 mm. above the soil line, was much softened and showed light brown discoloration. When sizable pieces of discolored stem tissue were placed in a shallow layer of water, evacuation tubes promptly grew out and within three hours large numbers of motile zoospores were swimming about. Despite a temperature of 29°C. development of zoospores continued more than a day longer. By planting fragments of affected stem on sterile maize meal agar, mycelia were obtained; these later formed abundant sexual reproductive apparatus and thus made possible the identification of the species.

The same fungus was isolated as causal agent responsible for a wilt that on July 2, 1951, was found affecting some potted bean plants 30 to 35 cm. high, in a greenhouse adjacent to the one in which stem rot had been noted 5 years earlier. In these larger plants the stems were neither much softened nor markedly discolored at the very base, but instead appeared in a somewhat flattened or collapsed condition from the ground level upward for a distance of 5 to 10 cm. No cottony mycelium was visible externally. Aerial development of the fungus had apparently been discouraged by frugal watering as well as by the reduced relative humidity attending the high temperatures -- often in excess of 35°C. -- prevalent in greenhouses during sunny summer days. Similar wilting of beans had been observed under glass for several years preceding 1951, the disease each time following the incidence of hot weather in June.

Bean plants affected with cottony stem rot at the Plant Industry Station, either in greenhouses or, during periods of hot wet weather, in field plots, have usually been found attacked by Pythium butleri Subr. Such occurrence of P. butleri is wholly commonplace since this species is wont to appear as an active parasite on many herbaceous host plants virtually every year for one or two weeks during or following periods of hot wet weather. Indeed, sporadic outbreaks of P. butleri take place not only in the middle latitudes of the eastern United States but also in regions considerably farther north. Of about twenty cultures isolated from affected bean pods and cucurbitaceous fruits early in August 1945, when cottony rot developed in spectacular abundance near Beltsville, all were found referable to P. butleri, though the high temperatures and extraordinarily heavy rainfall preceding and accompanying that outbreak should have been equally favorable for P. myriotylum. The bean variety Ranger, according to W. J. Zaumeyer, showed especially severe injury from cottony stem rot during the summer of 1950 in New Jersey, Delaware, and the Eastern Shore of Maryland.

Among the host plants of Pythium species the bean is unusual in permitting continued upward invasion of its stem at relatively advanced stages of growth. Early in August 1951, an irrigated field of beans near Frederica, Delaware, was reported to be seriously damaged through widespread fungus infection extending from the ground line to the lower branches. Diseased specimens from this field amply confirmed the report. Wefts of aerial mycelium in the crotches between the softened watery stem and the similarly affected proximal portions of the lower branches gave an appearance usual in instances of attack by P. butleri and P. myriotylum. Contrary to expectations, however, neither of the two species most frequently offering a cottony display under natural conditions was found responsible for the severe injury. All infected parts that were placed on sterile maize meal agar gave rise to mycelium of P. ultimum Trow with the promptness usual when that fungus is present in herbaceous tissues as a primary invader. Such extensive invasion of aerial vegetative parts by species of Pythium is assuredly not frequent among crop plants nearly full grown and generally vigorous at the time of infection.

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