

PYTHIUM ROOT ROT OF WHEAT IN QUEENSLAND SOIL

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Oospores similar in appearance to those found in roots of browning root rot infected plants in Western Canada were commonly found in wheat roots on the Darling Downs of Queensland. The crops, when observed, were past the stage when field symptoms of the disease are readily apparent. However, relatively low numbers of oospores and absence of extensive root lesions indicated that injury may have been minimal. It should be realized that browning root rot rarely kills the wheat seedlings or young plants; nevertheless, the partial destruction of the root system often leads to a yield reduction of 3–10 bus/ac.

Wheat seedlings grown in the green-house in soil from a field at Brookstead, Queensland, showed root lesioning similar to that caused by *Pythium* species with lobulate sporangia on the Canadian prairies. One difference was that individual lesions frequently affected longer portions of the roots and were slightly darker in colour than is usual in plants from the Canadian prairies (Figure 1). In both, the outer leaves showed a yellowing, followed by a browning from the tips downwards.

Microscopic examinations showed that oospores and phycomycetous mycelium were present in many lesions.

An attempt was made to isolate pythiaceous fungi present by using the method commonly employed in obtaining cultures of these fungi from infected roots. Lesioned portions of the moist, fresh roots were kept in running water overnight. Individual pieces were lifted, placed on filter paper to remove excess water, and then plated on plain agar and cornmeal agar. After 2 or 3 days, hyphae tip transfers were made to cornmeal agar tubes or plates. These cultures were usually pure, as the hyphae outgrow any bacteria present in the root tissue.

About 2 dozen isolates were taken and laboratory pathogenicity tests were made on wheat. The pythiaceous fungi could be separated quite clearly into three groups and the results of these tests; namely, severely pathogenic (Figures 2 and 3), moderately pathogenic (Figures 4 and 5) and virtually non-pathogenic. Cultural studies showed that the severely pathogenic isolates belonged to the lobulate sporangial type of *Pythium*, while the moderately pathogenic and non-pathogenic groups were sphaerosporangial forms. As a result of more detailed cultural studies, it was found that the lobulate isolates fitted most closely the characteristics of *Pythium arrhenomanes* Drech. and are considered to belong to this species (C.M.I. Descriptions of Pathogenic Fungi, No. 38 *Pythium graminicola* and No. 39 *Pythium arrhenomanes*, 1964). The moderately pathogenic form is

closely related to *P. paroecandrum* Drech., and to *P. rostratum* Butl., but it morphologically agrees more closely with the former species, to which it is provisionally assigned, in spite of the fairly common reports of *P. rostratum* as a parasite on cereal roots. Comparative studies with type cultures of some closely related forms are now in progress. The majority of the non-pathogenic forms fall into the *P. debaryanum* De Bary type; in addition, one non-virulent isolate is considered to be *P. intermedium* De Bary. It is possible that the presence of the moderately pathogenic *P. paroecandrum* in addition to *P. arrhenomanes* in the wheat roots from the Queensland soil accounts for the more severe symptom expression than where *P. arrhenomanes* alone is responsible.

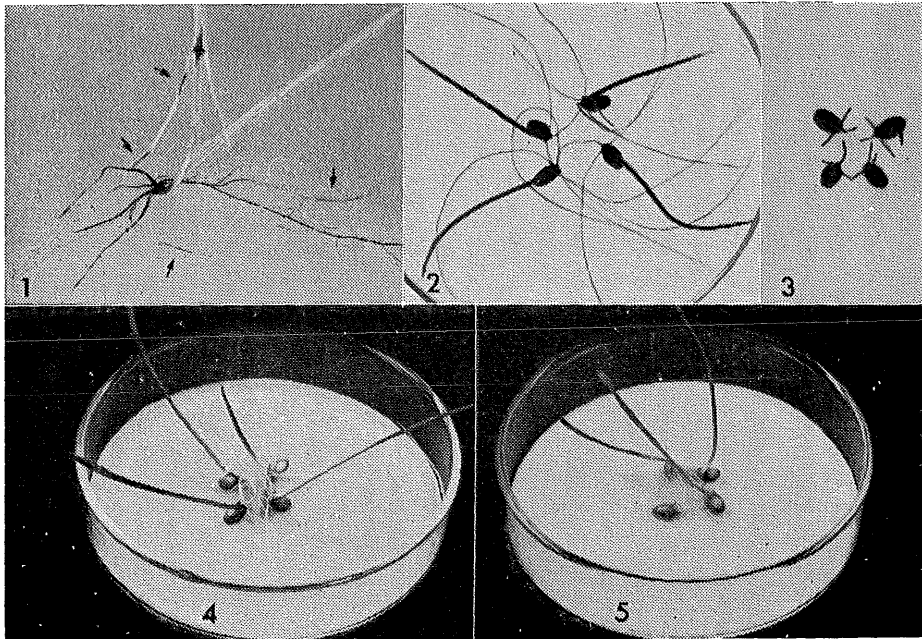


Fig.1.—Pythium root rot of wheat.

(1) Wheat var. Redman grown in Darling Downs, Queensland, soil. *Pythium arrhenomanes* was isolated from lesions similar to those indicated by the arrows. The black lesioning is not typical of *Pythium* injury on wheat roots; other fungi are probably implicated.

(2) Uninoculated wheat on moist filter paper (control).

(3) Wheat inoculated with a piece of cornmeal agar inoculum of *Pythium arrhenomanes*.

(4) Uninoculated wheat on moist filter paper (control).

(5) Wheat inoculated with a piece of cornmeal agar inoculum of the *Pythium* isolate closely related to *P. paroecandrum*.

This appears to be the first report of *Pythium arrhenomanes* on cereals in Queensland, although Millikan (1938) noted browning root rot of cereals in Victoria. The suggestion is made that one reason why this species has not hitherto been more widely reported on cereals in various parts of the world is because of the rather restricted or specific method of isolation required to obtain *Pythium* species in pure culture, and of the further difficulty of isolating the *Pythium* forms if the roots are allowed to dry. The usual routine methods of isolation used by cereal pathologists for isolating root-rotting fungi are likely to favour the growth of non-pythiaceous types such as *Helminthosporium* and *Fusarium* species, etc. If, therefore, oospores are detected in diseased cereal roots the method briefly outlined above for the culture of *Pythium* species should be followed.

REFERENCE

- MILLIKAN, C. R. (1938).—Eelworm (*Heterodera Schachtii* Schmidt) diseases of cereals. *J. Dep. Agric., Vict.* 36:452-68, 507-20.

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