SPECIES OF PYTHIUM ASSOCIATED WITH BARLEY IN SOUTH AUSTRALIA

by

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SUMMARY

A field survey of barley soils conducted at three sites in South Australia : Roseworthy and Virginia, north of Adelaide, and Strathalbyn, south of Adelaide, revealed that Pythium species are common inhabitants of barley soils in South Australia. Population levels are higher in the 0-10 cm layer of the soil that in the 10-20 cm layer. A seasonal variation was found in the Pythium population of barley soils over 12 months. Monthly assays suggested that activity of Pythium in soil was directly influenced by temperature in two sites, whereas rainfall affected the Pythium population in only one site.

Eleven species of Pythium, isolated from soils and from infected barley seedlings, were identified and characterized. P. irregulare was found to be the predominant species. P. volutum was recorded for the first time in Australia.

The influence of environmental factors influencing Pythium species on barley was studied. There was a high positive correlation between soil moisture and the incidence of disease on barley seedlings caused by P. irregulare, P. graminicolum and P. volutum. The relationship between soil water and inoculum density of P. irregulare on the growth of barley revealed that, for this fungus, inhibition in growth of barley seedlings is associated with high population levels in soils with a high level of moisture.

The relationship between pH of the medium and growth rate of P. irregulare showed that the fungus can grow linearly and in weight at relatively high and low extremes with an optimum growth at neutral pH.

Experiments carried out to evaluate the influence of temperature on mycelial growth of Pythium irregulare and on disease severity indicated that the optimum temperature for mycelial growth was between 25-30°C, whereas the pathogenicity test showed that root length of barley seedlings was significantly reduced by the fungus at 13°C.

The influence of Pythium irregulare and the nematode Pratylenchus thornei was assessed to test the hypothesis that a statistical interaction occurred between the two organisms in their effect on host plants (barley and wheat). P. thornei seems to be equally pathogenic in wheat and barley, unlike Pythium irregulare which is more damaging in barley than in wheat. Nematode and fungus appear to act independently in terms of plant response to infection ; Pythium irregulare more so in barley than in wheat.

Pythium volutum, was recorded for the first time in Australia. It was consistently isolated from infected barley roots and from soil in the survey of barley soils. Furthermore, P. volutum occurred in another 10 barley and wheat fields, with pH values and clay contents quite different from each other. Some aspects of fungus biology were studied in vitro such as the influence of temperature, pH and soil water on growth. Three barley cultivars commonly grown in South Australia were sown in artificially infested soil to assess varietal resistance and susceptibility to P. volutum. There were no differences between cultivars in terms of response to infection. All cultivars tested were susceptible to infection by P. volutum.

Studies on possible control measures for Pythium species were conducted. Metalaxyl (Ridomil 25 W P) was tested in vitro, in pots and

in the field. Metalaxyl, a fungicide specific against *Pythium* spp. and other oomycetes, produced a marked increase in growth when applied as a seed treatment.

Pythium oligandrum was tested *in vitro* and in pots to control other species of *Pythium* which were found to be pathogenic to barley seedlings. Clear evidence of control was achieved.