SOILBORNE INOCULUM OF UNDESCRIBED PHOMA SPECIES CAUSES ASCOCHYTA BLIGHT SYMPTOMS ON FIELD PEA (PISUM SATIVUM)

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INTRODUCTION

The causal agents of Ascochyta blight on field pea (Pisum sativum) are recognised as Mycosphaerella pinodes, Phoma medicaginis var. pinodella and Ascochyta pisi (1). These fungi usually occur together on individual plants although they act independently. In South Australia A. pisi is rarely found (2), but an undescribed species of Phoma was regularly isolated from lesions on pea plants. The ability of soilborne inoculum of these fungal species to cause Ascochyta blight lesions on field peas was tested in a pot bioassay conducted in 2006.

MATERIALS AND METHODS

Field pea plant samples Pea plants with Ascochyta blight symptoms were collected from 15 field pea trials across South Australia in October 2005. Samples were air-dried, and 3 g sub-samples were assayed with specific real-time PCR assays (Taqman®) (SARDI, unpublished) to confirm the presence of the undescribed Phoma sp., M. pinodes and P. medicaginis var. pinodella. The latter two fungi were not distinguished in the DNA assay used.

Soil samples In May 2006, soil samples were taken from 18 sites across South Australia including two sites at Kingsford Research Station, one of which had grown Ascochyta blight-infected peas in 2005. At each site, soil cores were collected in a W pattern, and bulked to approximately 500 g. A 2 kg sample was collected from the infected site at Kingsford Research Station, and serially diluted by mixing with sterile sand.

Estimation of pathogen populations Soil from each field site and from the dilution series was tested with DNA assays for the presence of the undescribed Phoma sp. and for M. pinodes and P. medicaginis var. pinodella. The assays quantified the amount of DNA (pg per g soil) in all soil samples.

Pot bioassay Soil from each of the dilution series and from the trial sites was placed into 12 cm pots, two pots per sample. Each pot was sown with four seeds of pea cv. Parafield and placed under irrigation. Length of Ascochyta lesions on stems and % Leaf Area Diseased on leaves were measured weekly for 6 weeks, beginning 6 weeks after sowing. Disease data were regressed against soil DNA quantities measured in the assays. Fungal cultures were isolated from lesions on stems and leaves of bioassay plants to confirm pathogen presence.

RESULTS

Field pea plant samples The Ascochyta blight fungi and the Phoma sp. were detected by DNA assays in all of the plant samples.

Estimation of pathogen populations DNA levels of the Ascochyta blight fungi were high in the soils from the two Kingsford sites, while the amount of DNA of the undescribed Phoma sp. was high only in the soil where Ascochyta blight had been severe in 2005. All the remaining soils had medium to non-detectable levels of both pathogens. The reducing levels of pathogens in the dilution series were quantified by the DNA assays.

Pot bioassay There was a logarithmic relationship between the amount of pathogen DNA in the soil and disease on stems ($r^2=0.54$, $P<0.001$) and leaves ($r^2=0.25$, $P<0.001$) in the dilution series bioassay from 2 to 6 weeks, with the most significant relationship at 5 weeks (Figure 1). The regression between stem lesions and amount of Phoma sp. in the soil ($r^2 = 0.55$, $P<0.001$) was similar to the regression between stem lesions and amount of soilborne M. pinodes and P. medicaginis var. pinodella ($r^2 = 0.52$, $P<0.001$) (Figure 1). All three pathogens were isolated from leaf and stem lesions in similar numbers.

DISCUSSION

Mycosphaerella pinodes, P. medicaginis var. pinodella and the undescribed Phoma sp. are widely distributed across the pea-growing areas of South Australia. Symptoms of field pea Ascochyta blight caused by these three pathogens are indistinguishable from each other.

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