

Identification of tissue-specific resistance in new field pea cultivars

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Introduction and Literature Review

Mycosphaerella blight caused predominantly by *Mycosphaerella pinodes*, is the most serious foliar disease of field pea (*Pisum sativum*) in western Canada (Hwang et al., 2005). The disease can infect all above-ground plant tissues, including the seeds. Early, severe epidemics of Mycosphaerella blight increase plant lodging (Banniza et al., 2005; Wang et al., 2006) and can reduce field pea yields by as much as 50-60% (Xue et al., 1997; Wang et al., 2006). The pathogen may survive on infected stubble for several years, infect subsequent crops and it can be dispersed by air-borne spores over long distances (Baranger et al., 1997). Mycosphaerella blight is generally regarded as a major constraint to field pea production.

Currently, there are no commercially grown pea cultivars with high levels of resistance to Mycosphaerella blight in Canada. Various forms of tissue-specific resistance (i.e., in the leaves, stems or pods) to Mycosphaerella blight have been reported among some old field pea cultivars (Xue and Warkentin 2001; Conner et al., 2006). Some cultivars expressed more than one form of tissue-specific resistance. The different types of resistance were often associated with reduced lodging and smaller yield losses.

Objectives

Identify sources of tissue-specific genetic resistance (i.e., in the leaves, stems, pods) to Mycosphaerella blight through screening of pea cultivars.

Milestones

From 2009 to 2012, evaluate new field pea cultivars for tissue-specific resistance to Mycosphaerella blight.

Deliverables/outputs

Improved strategies for controlling Mycosphaerella blight will increase yield and seed quality of peas for commercial production on the prairies. These studies will provide new information on disease resistance/ tolerance in new pea cultivars. Research findings from these studies will assist field pea producers in selecting cultivars that will reduce economic losses in field pea caused by Mycosphaerella blight. The identification of Mycosphaerella blight resistant lines and cultivars will enable breeders to develop efficient strategies to access resistance genes to incorporate into new cultivars. For example, the effectiveness of stem, leaf and pod resistance (alone or in combination) for decreasing Mycosphaerella blight severity will be determined. Data on cultivar yield losses and its relationship to disease severity will provide producers with the information needed for better cultivar selection.

Approach/methodology

The experiments were arranged in a split-plot design with inoculation and fungicide treatments as the main plot treatments and field pea cultivars as the subplot treatments. A total of 27 field pea cultivars were evaluated in three separate experiments consisting of 10 cultivars each. In each experiment, the check cultivars included the moderately susceptible cultivars CDC April and Radley and the susceptible cultivar Topper. The two main plot treatments included (1) a non-inoculated treatment that was sprayed twice with the foliar fungicide Headline and (2) an inoculated treatment in which chopped straw that was heavily infected with *M. pinodes* was evenly spread throughout each plot. Mycosphaerella blight severity was assessed on a 0 to 9 scale (Xue et al. 1996) at weekly intervals starting in mid-July after the second fungicide application

and ending at crop maturity. The ratings were summarized as the area under the disease progress curve (AUDPC). In mid-August, 10 randomly selected plants from each plot were individually rated on a scale of 0 to 7 (Horsfall and Cowling 1978) for *Mycosphaerella* blight severity on the leaves, stems and pods. A few days before harvest, the plots were scored for lodging. The value of different forms of tissue-specific resistance in preventing or reducing yield losses was determined by comparing the yields of inoculated and fungicide-protected plots of each cultivar.

Results

Each year from 2009 to 2012, three replicated field experiments were conducted at AAFC-Morden to evaluate *Mycosphaerella* blight development in new field pea cultivars from flowering to maturity. In each field experiment, significant differences were recorded among the field pea cultivars for AUDPC, final disease severity, and yield. Dry weather in July and August in 2011 and 2012 inhibited the spread of *Mycosphaerella* blight from the leaves onto the stems and pods, which made it difficult to detect cultivar differences in disease severity on these types of tissues. Depending on the experiment, differences were observed among the field pea cultivars for ratings on the leaves, stems and pods.

Discussion

The evaluation of *Mycosphaerella* blight resistance in new field pea cultivars indicated that substantial differences existed among the field pea cultivars for different ratings of *Mycosphaerella* blight severity at the end of the season and over time. Differences in tissue-specific resistance were also observed between field pea cultivars on the leaves, stems and pods. Examination of the test results over the last four years showed that disease development on at least six cultivars was consistently reduced during the growing season and disease severity was significantly reduced at maturity. The same cultivars often had lower leaf infection ratings. Yield losses above 10% were observed in 11 of the field pea cultivars, but these did not include any of the six cultivars that consistently had low AUDPC values.

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