

Increase of *Mycosphaerella* Blight in Field Pea through Plant Injury

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Introduction

Mycosphaerella blight, caused by *Mycosphaerella pinodes*, is a major constraint to field pea production in the prairies. Controlling the disease by developing better genetic resistance is a major goal of field pea breeding programs around the world. There are no major resistant genes to this disease and breeding relies on incremental increases in tolerance through hybridization and selection of material with slightly improved tolerance. Disease incidence and severity appear to be promoted by plant injury, caused, for example, by heavy thunder storms or hail during the growing season. Experiments were conducted at the Crop Development Center to quantify the effect of plant injury on disease development. The objective of this study was to investigate the possibility of exploiting plant injury as a tool to develop screening techniques for disease nurseries without irrigation and under low rain incidences.

Materials and Methods

Experiments were conducted in growth chambers at the University of Saskatchewan. Pea varieties 'PI251051', 'AC Tamor' and 'Bohatyr' were grown for 14 days prior to treatment. Pea stems of 6 plants (=2 pots) of each variety were injured by using the following abrasive methods on the second node of the pea stem from soil level: fine sandpaper, medium sandpaper, coarse sandpaper, a paste of fine, sandy soil (light soil), a paste of loamy soil (medium soil) and a paste of clay-based soil (heavy soil). Sandpaper was moved along the node once while the soil paste was rubbed along the stem three to four times. Injured plants as well as healthy control plants were immediately sprayed with a spore suspension of 5×10^5 and 5×10^3 spores/ml, using approximately 7 ml of suspension for each pot which was equivalent to run-off. Each pot was put into a plastic bag to create high humidity for infection. Plants were assessed for disease severity every second day from 4 days after inoculation until 14 days after inoculation. Stem lesions and leaf lesions were scored separately using an assessment key with a scale from 0 (no disease) to 5 (more than 75% of leaf or hull covered by necrosis; necrotic zone wider than 3 mm encircling the stem) (Tivoli *et al.*, 1996). Experiments were conducted twice for each spore concentration.

A field experiment was initiated at Saskatoon in the experimental plots of the University of Saskatchewan. Nine varieties (AC Tamor, PI 184128, PI 251051, PI 280616, Carneval, BohatyrRadley, Vienna, Highlight) were seeded in a 6 x 6 lattice with 3 replicates. Treatments consisted of 1. Injuring plants by using a sandblaster and fine silica sand (110g/m^2) (S), 2. Injuring plants by using a sandblaster and fine silica sand, and covering the plot with a floating

row cover (Agribon AG-19) to increase humidity (S+C), 3. Healthy plants covered with the floating row cover (NS=C), and 4. Healthy plants uncovered (NS). All plots were treated 4 weeks after planting and were inoculated with *Mycosphaerella pinodes* grown on sterile wheat grains at a concentration of approximately 10 g per m² immediately afterwards. The floating row cover was put in place and removed after 14 days. Two simple spore traps with glycerine covered glass slides were installed in both, covered and uncovered plots. Glass slides were removed from 15 days after inoculation (d.a.i.) onwards twice a week and *Mycosphaerella* spores were counted under the microscope. Assessment of disease severity was done once a week starting from 4 weeks after inoculation until the beginning of September. Data was analysed by ANOVA in the package SAS.

Results and Discussion

In growth chamber studies, at spore concentrations of 5×10^5 spores, significantly higher disease scores were recorded for pea stems which had been injured with sandpaper or soil, than on plants which had not been injured (Fig.1). Highest disease scores were observed on plants where coarse sandpaper had been used. All sandpaper treatments caused more serious injury in stem tissue leading to significantly higher disease scores than on plants treated with soil. AC Tamor consistently reacted stronger to treatments than Bohatyr and PI 251051.

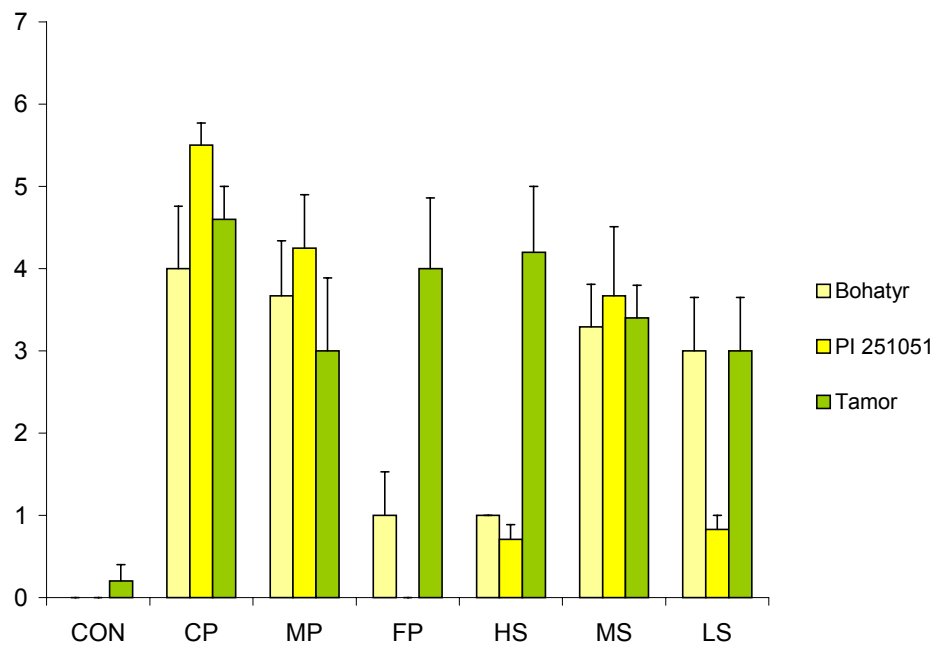
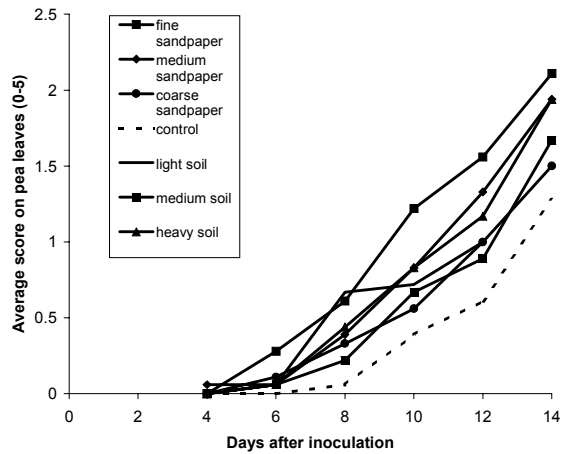


Fig.1: Average disease score on pea stems after injury with sandpaper or soil and inoculation with *Mycosphaerella pinodes* (CON = control, CP, MP, FP: coarse, medium, fine sandpaper; HS, MS, LS: heavy, medium, light soil; scores with SE, inoculation with 5×10^5 spores/ml).

Plant injury also caused earlier infection and a steeper increase in disease severity in comparison to healthy plants on both, stems and leaves (Fig. 2). Both results suggest that disease

injury promotes infection of plant tissue by the fungus leading to quicker and stronger symptom development. Increase in disease due to tissue injury has been reported in *Ascochyta pisi* (Heath & Wood, 1969), but has never been researched in detail in any of the leaf spot causing pathogens of peas.

a)



b)

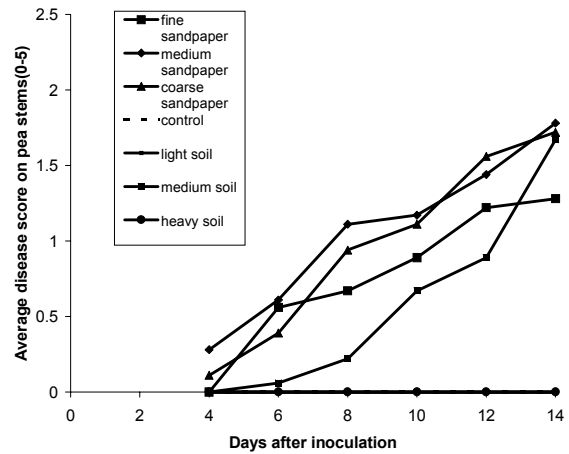


Fig. 2: Disease severity on a) pea leaves and b) pea stems after stem injury with sandpaper or soil and inoculation and inoculation with *Mycosphaerella pinodes* (Average of 3 varieties tested at 5×10^3 spores/ml)

Field experiments revealed no significant difference between treated (=injured) and untreated (=healthy) pea plants in disease scores on leaves or stems (Fig. 3). This was probably due to heavy infection pressure which lead to fast disease development on all tissue regardless of injury. Spore counts in the spore traps showed an explosive increase in conidia spores numbers between 200 and 700 spores /14 mm² glass slide to more than 30, 000 spores/ 14 mm² glass slides in mid August after a rainy period. There was no significant difference between spore counts of the two spore traps. These results suggest that under heavy infection pressure and under optimal infection condition, plant injury does not influence disease development significantly.

Results of this study suggest that there is a potential to exploit plant injury in disease nurseries to promote disease development under suboptimal conditions. Earlier and faster infection on injured plants would require shorter spells of humid conditions thus allowing pea lines to be screened in the drier regions without the need for irrigation facilities. However, further field studies are required to study the influence of plant injury on the development of *Mycosphaerella* blight in seasons with more average weather conditions than experienced in the season of 1999.

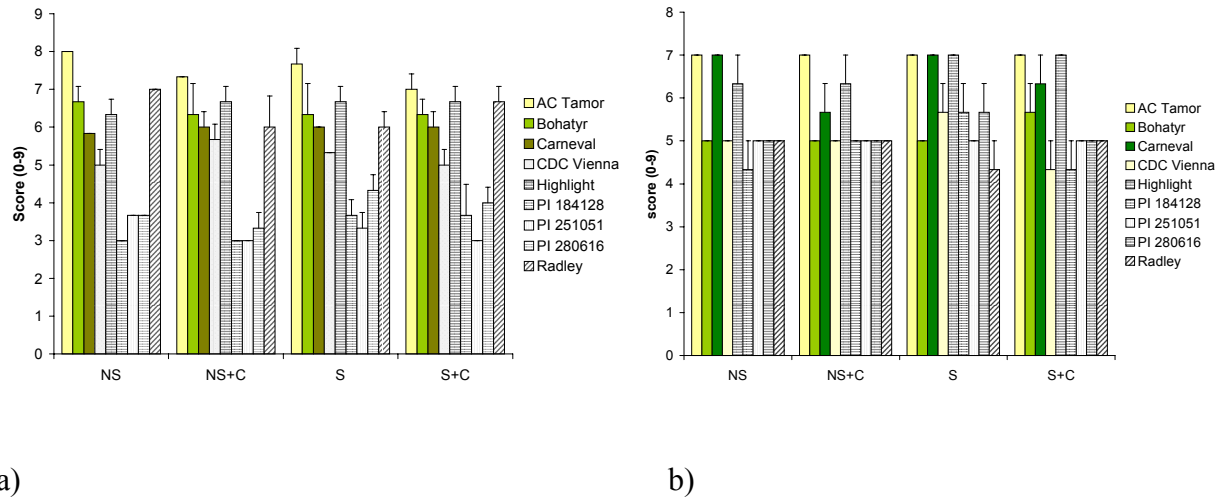


Fig.3: Average disease score on a) pea leaves and b) pea stems in a field plots with healthy or injured plants after inoculation with *Micosphaerella pinodes* (NS= no sandblasting, NS+C= no sandblasting with cover, S= sandblasting, S+C= sandblasting with cover)

Acknowledgement

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References

- Heath, M.C. & Wood, R.K.S., (1969): Leaf spots induced by *Ascochyta pisi* and *Mycosphaerella pinodes*. *Annals of Botany* 33:657-670.
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