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Fusarium pathogens that cause root rot identified

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Fusarium solani f. sp. *pisi* and *F. avenaceum* were the most aggressive species on CDC Meadow pea. Both *F. solani* f. sp. *pisi* and *F. avenaceum* caused significant disease symptoms on pea, chickpea, dry bean, and faba bean, but not on cereal crops, soybean, green lentil, or canola.

Pea root rot disease is caused by different pathogens such as *Fusarium* species, *Aphanomyces euteiches*, *Rhizoctonia solani*, and *Pythium* spp. In Alberta, *F. avenaceum* has been identified as one of the predominant pathogens.

Research was conducted at AAFC Lethbridge to assess the ability of the main *Fusarium* species isolated from pea to cause root rot disease (pathogenicity), and to evaluate which crops/cultivars are infected by two *Fusarium* species.

Fusarium species isolates collected from earlier surveys of commercial pea fields in southern and central Alberta were used in this study. Forty-five isolates belonging to six species were selected to determine their aggressiveness on CDC Meadow pea under greenhouse conditions. These included *F. avenaceum* (19 isolates), *F. solani* f. sp. *pisi* (three isolates), *F. redolens* (seven isolates), *F. culmorum* (six isolates), *F. oxysporum* (eight isolates) and *F. acuminatum* (two isolates).

The majority of the examined isolates was pathogenic and showed a range of aggressiveness from weak (DS=1-3), intermediate (DS=4-5) to highly (DS=6-7) aggressive.

Fusarium avenaceum and *F. solani* f. sp. *pisi* showed the highest level of disease severity followed by *F. oxysporum*, *F. culmorum*, *F. redolens* and *F. acuminatum*.

Not all crops were susceptible to Fusarium species

Fusairum solani f. sp. *pisi* and *F. avenaceum* were chosen for further testing on common rotational crops grown in Alberta. Ten cereal, oilseed and pulse crops were inoculated with isolates of those species in the greenhouse.

The varieties tested were:

- Lillian wheat
- CDC Anderson and AC Metcalf barley
- Rogo Gazelle, Prima and AC Hazlet rye
- an unknown canola variety
- NSC Warren soybean
- Snowbird faba bean
- Maverick and US1140 dry bean
- CDC Consul, CDC Cory, CDC Leader, and CDC Orion chickpea
- CDC Maxim, CDC Dazil, and CDC Impower lentil.

CDC Meadow pea was also included as a susceptible host for comparison to the other crops.

Fusarium avenaceum and *F. solani* f. sp. *pisi* did not cause obvious disease symptoms on wheat, barley, rye or canola. Inoculated plants showed slight or no disease symptoms.

Pulse crops had variable susceptibility to the two pathogens. Generally, dry bean, pea, chickpea, faba bean, and lentil inoculated with *F. avenaceum* had significantly greater disease severity compared to non-inoculated plants, with severity ranging from moderate to high. Similar severity was observed for dry bean, pea, chickpea, and faba bean inoculated with *F. solani* f. sp. *pisi*.

Pea and faba bean showed the highest level of disease followed by dry bean and chickpea.

Soybean inoculated with *F. solani* f. sp. *pisi* showed low disease symptoms that were significantly higher than the control plants, but no difference in disease when inoculated with *F. avenaceum*.

Faba bean was highly susceptible to both pathogens.

Dry bean varieties inoculated with *F. solani* f. sp. *pisi* had significantly higher root rot ratings than the non-inoculated plants, but at low severity. Similarly, both dry bean varieties inoculated with *F. avenaceum* showed significant difference from control plants. 'Maverick' showed low disease symptoms while US1140 had moderate disease symptoms.

In chickpea, CDC Orion had severe disease level caused by *F. solani* f. sp. *pisi*, followed by CDC Cory and CDC Consul with low levels, while CDC Leader disease level did not differ from the un-inoculated control. For *F. avenaceum*, CDC Leader had a very high disease rating due to severe seedling blight, followed by CDC Orion and CDC Cory with low to intermediate levels, and CDC Consul with weak disease levels.

Red and green lentil inoculated with *F. solani* f. sp. *pisi* showed slight disease symptoms, which were not significantly different than the non-inoculated plants. *Fusarium avenaceum* caused significant root rot symptoms on red lentil, however, the disease severity was low. Disease severity on green lentil was not significantly affected by inoculation with *F. avenaceum*.

The overall findings indicate that *F. avenaceum* and *F. solani* f. sp. *pisi* found on pea are aggressive on some varieties of chickpea, faba bean, and dry bean. These species were not aggressive on cereals, soybean, lentil, or canola, which suggest that these crops can be planted in rotation with pea even if Fusarium root rot pathogens are present. However risk to faba bean, chickpea and dry bean when grown in rotation with pea needs further testing in the field.

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Samira Safarieskandari, Syama Chatterton & Linda M. Hall (2020): Pathogenicity and host range of Fusarium species associated with pea root rot in Alberta, Canada, Canadian Journal of Plant Pathology, https://doi.org/10.1080/07060661.2020.1730442

