Characterizing Fusarium Species in Manitoba: Cross-Pathogenicity, Competitiveness and Mycotoxins

Fusarium strains that cause *Fusarium* head blight in wheat, barley and oats can also cause root rot in soybeans. Species from oats and soybeans were the most aggressive.

SOYBEAN CROPS ARE susceptible to diseases caused by different *Fusarium* species in the forms of root rot and wilting. *Fusarium graminearum*, the specific species of *Fusarium* that causes head blight in cereals has been reported to also infect soybeans and peas. Therefore, it was important to investigate if infection of cereal crops by common species of *Fusarium* is contributing to root rot infection in soybeans and peas, or vice versa. Cross-pathogenicity of *Fusarium*, or the ability of this disease to infect different crop types, would indicate a greater risk of disease development over the long term and reduce the usefulness of crop rotation as a management tool.

The objectives of this project were to:

1. study the cross-pathogenicity of *Fusarium* species between soybean and cereal crops,
2. investigate the competitiveness of *Fusarium* species isolates from soybeans/peas and cereals and
3. investigate the specific toxin-producing potential of *F. graminearum* isolates from soybeans versus cereals.

Fusarium isolates belonging to 11 different species were found to commonly infect cereals, soybeans and peas confirming cross-pathogenicity. Moreover, head blight-causing *Fusarium* strains were shown to induce root rot symptoms in soybeans. Disease symptoms were present in soybeans at V3 (3rd trifoliate) and ranged in severity from 0.5 to 8.3 on a scale of 0–9. Results showed that *F. graminearum* from oats and *F. avenaceum* from soybeans were the most aggressive species. This study was also the first ever to report *F. cerealis* as a cause of root rot in soybeans.

The competitiveness of *F. graminearum* isolates was assessed both in petri dishes and on plants. Petri dish tests showed that *Fusarium* strains isolated from wheat inhibited the growth of strains from other crop types. On soybean plants, the soybean-derived *Fusarium* isolate caused the most severe root rot compared to the wheat-derived isolate.

Several *Fusarium* species in addition to *F graminearum* are known to cause root rot in soybeans, including *F. avenaceum*, *F. poae*, *F. cerealis*, *F. culmurum*, *F. sporotrchioides*, *F. acuminatum*, *F. redolens*, *F. incarnatum* and *F. equiseti*. Most of these species are also known to produce mycotoxins (e.g., trichothecenes such as DON), which can impact both human and livestock consumers. Due to this, the mycotoxin production potential of select *Fusarium* species was assessed. Some *F. graminearum* isolates from soybeans in this study showed potential to produce toxins. However, further investigation is required to assess other species and understand their impact.

Among the root rot pathogens that infect soybeans, *Fusarium* is the most common in Manitoba. However, infection levels are still low in the province due to the relatively short history of soybeans. Knowledge of cross-pathogenicity from this study is especially useful for crop rotation planning, as soybeans are commonly grown in rotation with cereals in Manitoba. Longer rotations with greater crop diversity may reduce infection and delay the spread of pests. However, longer rotations require more diverse marketing and management strategies.

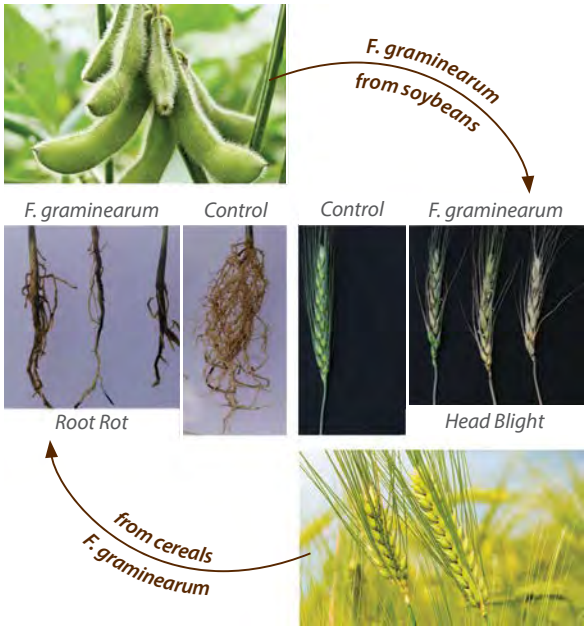

Figure 1. Cross-pathogenicity of some Fusarium *species between wheat and soybeans.* F. graminearum *isolated from soybean plants caused head blight in wheat and* F. graminearum *from barley caused soybean root rot.*

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