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## Effects of Crop Management on Leaf Spots of wheat in Eastern Saskatchewan

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### Introduction

Leaf spots (LS) are widespread diseases of wheat on the Canadian Prairies. All wheat cultivars grown in western Canada are susceptible to this disease complex. Crop rotation and tillage system have been shown to affect the development of leaf spots, although the effects of these and other agronomic practices have not been consistent.

Producers in Saskatchewan and the other Prairie provinces have been increasingly growing more oilseed and pulse crops in rotation with wheat and barley and continue to adopt conservation tillage practices. The objective of this extensive spring wheat survey was to examine the effects of cropping sequence and tillage practice/glyphosate use on LS severity and fungal pathogens.

### Materials and Methods

- Sampled 581 randomly-selected common and durum wheat fields in eastern Saskatchewan (crop districts 1B and 5A) in 2000–2002 for LS severity using a 0-11 scale.
- Lesioned flag leaves were surface-disinfected, and plated on nutrient agar for fungal identification and quantification.
- Agronomic information obtained from producers was used to classify fields according to the type of preceding crop(s) or summerfallow, tillage operations and glyphosate applications in the previous 3 years.
- Multivariate analysis was used to investigate the association between disease/fungal attributes and their coincidence with the different production systems. ANOVA was used to confirm differences for percent fungal isolations and disease levels among production systems.

## Results

- Most commonly isolated fungi were *Pyrenophora tritici-repentis* (tan spot) followed by the “septoria leaf blotch” fungi *Mycosphaerella graminicola*, *Phaeosphaeria nodorum*, and *Leptosphaeria avenaria* f. sp. *triticea*.

- LS severity was least associated with *P. nodorum* (Fig. 1).

- LS severity was greater with more intensive tillage systems and with summerfallow the previous year. Disease severity and percentage isolation of the most common pathogens were lowest when wheat was preceded by two years of non-cereal crops (Fig. 1).

- *P. tritici-repentis* was associated with a decrease in tillage intensity and cropping sequences that included at least one cereal crop in the previous two years, and was least prevalent when grown after two years of non-cereal crops (Fig. 1). Percent isolation of this pathogen was also higher in wheat that had been preceded by a pulse crop than by another crop or summerfallow.

- *M. graminicola* and *L. avenaria* f. sp. *triticea* were in turn associated with increased tillage (Fig. 1).

- Analysis done only on wheat crops under minimum-till management showed significant negative effects of previous glyphosate use on *P. tritici-repentis*. Wheat grown in fields that had received two or more applications of glyphosate formulations in the previous 3 years had lower percent isolation of *P. tritici-repentis* (48%) than those that had received none or only one application in the same time period (55-59%). However, total disease severity was not affected.

## Conclusions

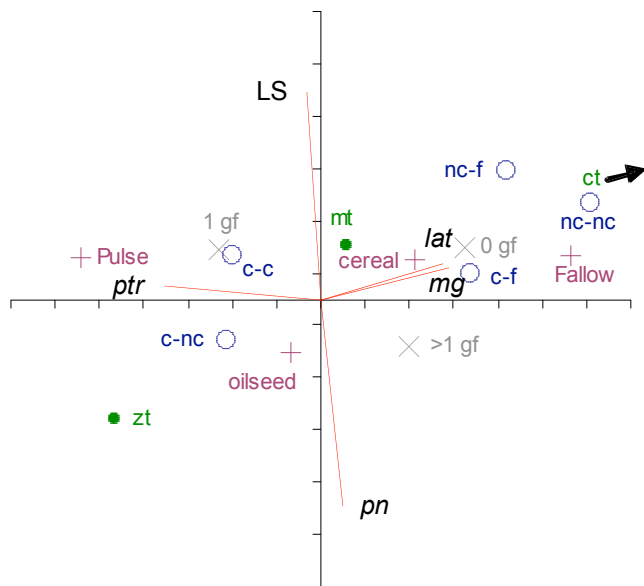
- Tan spot, caused by *P. tritici-repentis*, was the most common leaf spotting disease in the common and durum wheat crops sampled in eastern Saskatchewan in 2000-2002.

- The observed increase in levels of tan spot associated with reduced tillage systems could be mitigated by growing noncereal crops for two years previous.

- This is the first study to show a negative impact of previous glyphosate use on colonization of wheat tissue by *P. tritici-repentis* in western Canada.

## Acknowledgements

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**Figure 1.** Biplot for the first two principal components derived of the multidimensional preference analysis for leaf spot (LS) data collected from spring wheat crops in eastern Saskatchewan (1999-2002). Tillage systems= ct: conventional, mt: minimum, zt: zero; previous crop: cereal, oilseed, pulse or fallow; two previous crops: c-c, c-nc, nc-nc, c-f, or nc-f (c=cereal, nc=noncereal, f=fallow); applications of glyphosate formulations (gf) in previous 3 years: 0 gf, 1 gf, or >1 gf. *Ptr*: *Pyrenophora tritici-repentis*, *mg*: *Mycosphaerella graminicola*, *pn*: *Phaesphaeria nodorum*, and *lat*: *Leptosphaeria avenaria f. sp. triticea*.