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# Optimizing Canola and Field Pea Production: Disease Implications of Intensive Canola and Field Pea Rotations

H.R. Kutcher<sup>1</sup>, S.A. Brandt<sup>2</sup> and E.G. Smith<sup>3</sup>  
Agriculture and Agri-Food Canada: <sup>1</sup>Melfort, SK; <sup>2</sup>Scott, SK; <sup>3</sup>Lethbridge, AB

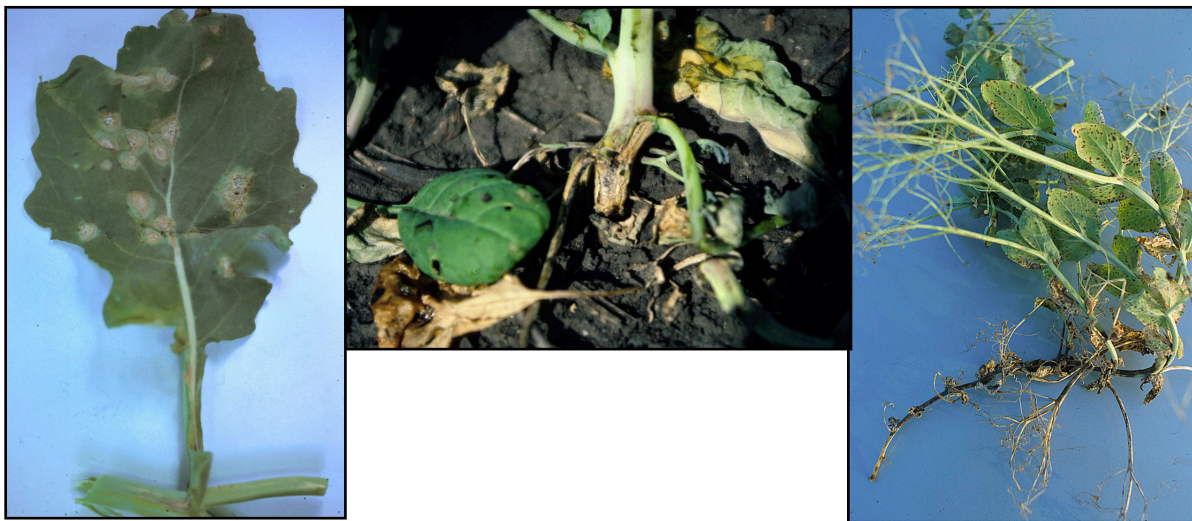
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## Introduction

In many years canola and field pea provide the best economic return to producers compared to other field crops grown in western Canada. Knowledge of the consequences of intensive rotations of these crops will allow producers to prepare for unwanted outcomes such as pest problems. Blackleg [*Leptosphaeria maculans* (Desmaz.) Ces. & De Not.] of canola and mycosphaerella blight [*Mycosphaerella pinodes* (Berk. & Blox.) Vestergr.] of field pea have been observed to be the most common diseases of these crops in western Canada (Pearse et al. 2006; McLaren et al. 2006; Figure 1).

The recommendation to grow canola or field pea only once every four years is advocated as a means to manage diseases. Crop sequence research has indicated that more diverse rotations tended to have less pest problems and lower production risk than intensive rotations (Johnston et al. 2005). However, with disease resistant crop varieties and current fungicides, producers question the need for 4-year rotations.



**Figure 1.** Blackleg symptoms on canola leaf and lower stem (left and centre) and mycosphaerella blight symptoms on field pea leaflets and lower stem (right).



## Experimental Method

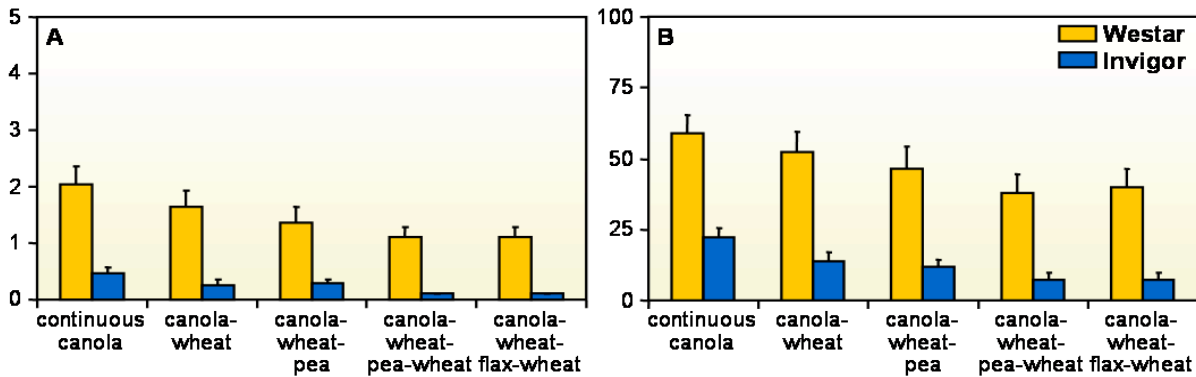
The study was conducted at Scott and Melfort, SK, which represent the Moist Dark Brown and the Moist Black soil zone. Field experiments were designed as 4 replicate split-plots of 7 rotations. Fungicides were applied to sub-plots of each crop. Rotations with canola had variety as an additional factor. Canola varieties were a conventional herbicide, blackleg susceptible variety (Westar) and a herbicide resistant hybrid with good blackleg resistance (Invigor2663, 5030, 5020). The field pea varieties used (Highlight, CDC Mozart, Eclipse) were resistant to powdery mildew (*Erysiphe pisi* Syd.) but none had a high level of resistance to mycosphaerella blight. Varieties were updated periodically as the study progressed. The study was conducted under conservation tillage and used best management practices to optimize crop production at each location.

The fungicide azoxystrobin (Quadris, Syngenta) was applied from 2000 to 2003 at 125 g. ai. ha<sup>-1</sup>, to split-plots of canola at the 2-6 leaf stage for blackleg control and to field pea at early flowering for mycosphaerella blight control. From 2004 to 2006, pyraclostrobin (Headline, BASF) at 99 g.ai ha<sup>-1</sup> was applied to field pea at early flower. Fungicides were applied in 100 L ha<sup>-1</sup> of water. Disease severity was evaluated using scales based on disease symptoms, with higher values representing increased severity or incidence. Canola disease assessment at swathing (30% seed colour change) was conducted on 50-100 plants/plot, depending on year, using a 0-5 scale for blackleg severity, as well as recording disease incidence (% of plants infected). Foliar and stem assessments were conducted on 10 plants per plot for mycosphaerella blight near physiological maturity using a 0-9 scale.

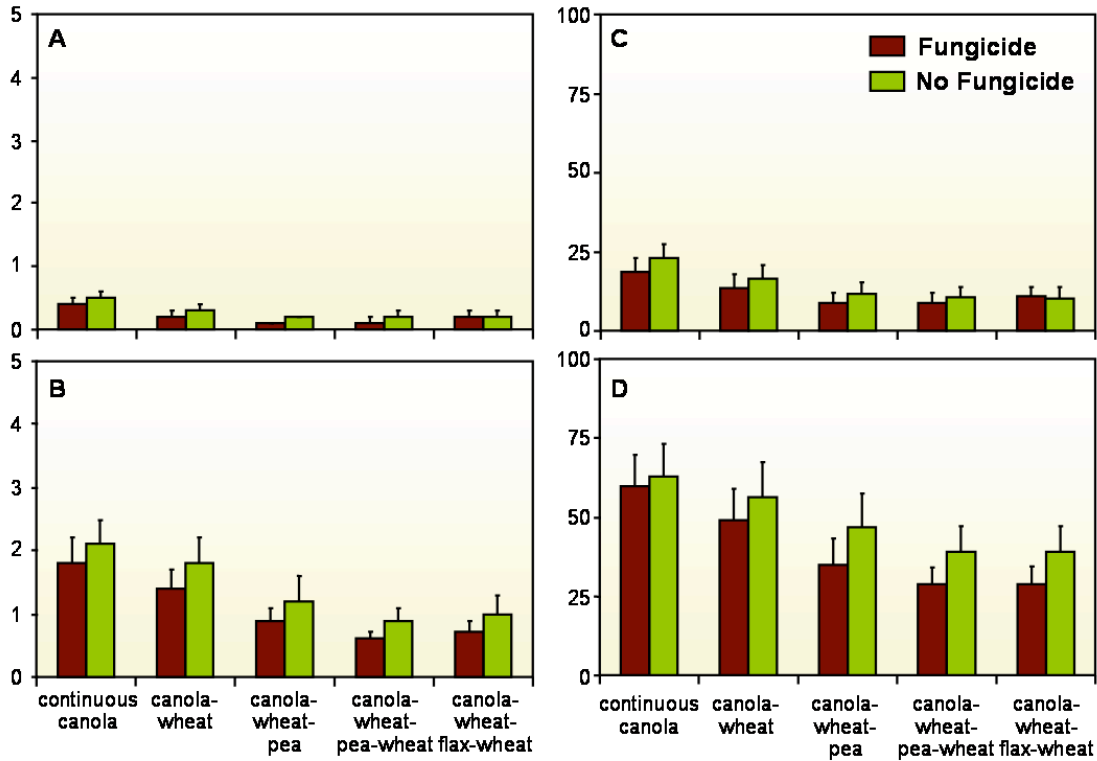
## Conclusions

- Blackleg of canola was higher (incidence and severity) in more intensive rotations of canola of both varieties, although the resistant variety greatly reduced the impact of the disease, indicating that genetic resistance was very effective in the control of blackleg disease (Figure 2).
- The 4-year crop rotations provided the most effective disease control (Figure 2). The amount of infected canola crop residue of either variety would be expected to increase as rotation is shortened. This would increase the risk of selecting for virulent races of the pathogen over time.
- Fungicide reduced blackleg incidence and severity, but the magnitude of disease reduction was generally low (Figure 3).
- The length of crop rotation had little impact on severity of mycosphaerella blight of field pea in this study (Figure 4).
- Fungicide application reduced mycosphaerella blight severity although over all years and locations the reduction was small (Figure 4). Separating seasons into moist and dry indicated that fungicide application reduced disease severity in the moist years but had no impact in dry years.
- The results clearly indicate the importance of genetic resistance and crop rotation of at

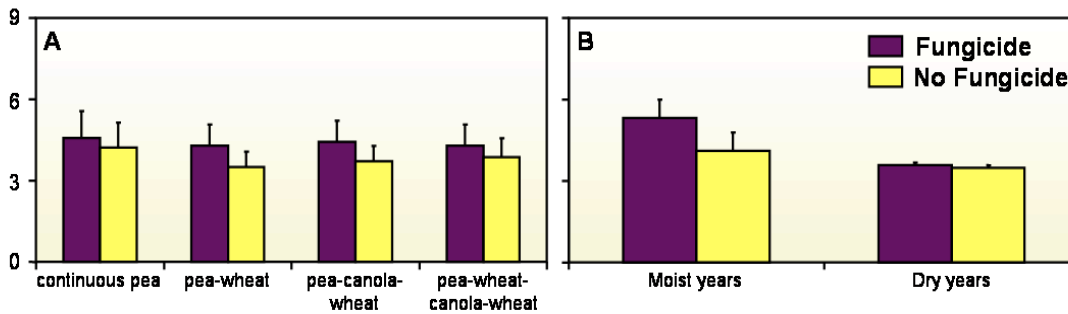
- minimum 3 years in the management of blackleg disease of canola.
- Strategies for the control of mycosphaerella blight of field pea are more limited due to the low level of genetic resistance in field pea to this disease, and the marginal impact of crop rotation. Use of fungicides to control mycosphaerella blight may be warranted in moist growing seasons.



**Figure 2.** A) Severity (0-5 scale), and B) incidence (% of plants) of blackleg disease symptoms on Invigor (disease resistant) and Westar (disease susceptible) canola varieties in each crop rotation. Means  $\pm$  SE of 13 site-years (Melfort & Scott; 2000-2006).



**Figure 3.** Severity (0-5 scale) of blackleg disease symptoms on: A) Invigor (disease resistant) and, B) Westar (disease susceptible) canola varieties, and disease incidence (% of plants) on C) Invigor and D) Westar in each crop rotation. Means  $\pm$  SE of 8 site-years (Melfort & Scott; 2000-2003).



**Figure 4.** Effect of fungicide treatment on mycosphaerella blight severity (0-9 scale) of field pea in: A) each crop rotation (means  $\pm$  SE of 8 site-years, Melfort & Scott, 2001-2006), and B) moist and dry seasons (means  $\pm$  SE of 4 site-years, Melfort & Scott; moist 2004-2006; dry 2001-2003).



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