

Green Manure Crops for Control of Verticillium

Michele Konschuh<sup>1</sup>, Simone Dalpé<sup>1</sup>, Ron Howard<sup>1</sup>, Sharon Lisowski<sup>1</sup>, Ross McKenzie<sup>2</sup>, Allan Middleton<sup>2</sup>, Shelley Woods<sup>2</sup>, Larry Kawchuk<sup>3</sup>, Doug Waterer<sup>4</sup> and Jill Thomson<sup>4</sup>

<sup>1</sup>Alberta Agriculture and Rural Development, 301 Horticultural Station Road East, Brooks, AB T1R 1E6

<sup>2</sup>Alberta Agriculture and Rural Development, 5401 – 1 Avenue S, Lethbridge, AB T1J 4V6

<sup>3</sup>Agriculture and Agri-Food Canada, P.O. Box 3000, Lethbridge, AB T1J 4B1

<sup>4</sup>University of Saskatchewan, Plant Sciences Dept., 51 Campus Drive, Saskatoon, SK S7N 5A8



Purpose

- This study was initiated to generate locally relevant information about green manure strategies and their potential impact on soil fertility, soil organic matter, potato diseases and yield of potatoes.
- Green manure plots were established the year prior to potato production for three consecutive years in commercial fields in southern Alberta.
- Use of green manure crops may make soil fumigation unnecessary, and keep costs of production competitive in the global marketplace.

Objectives

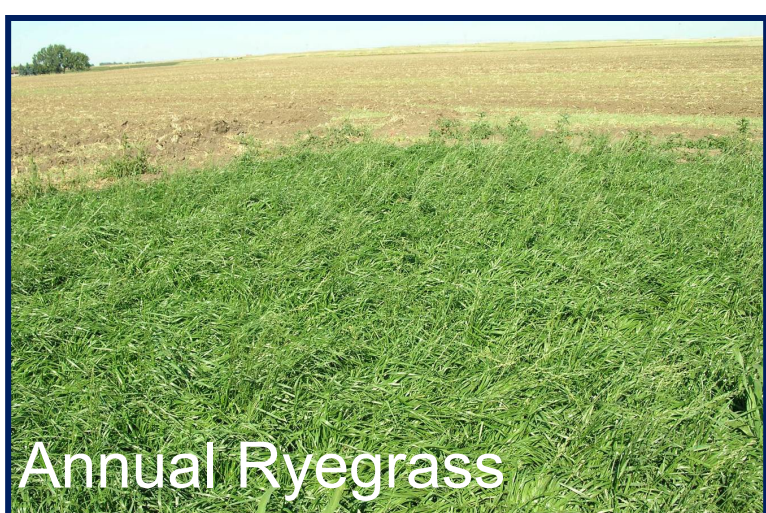
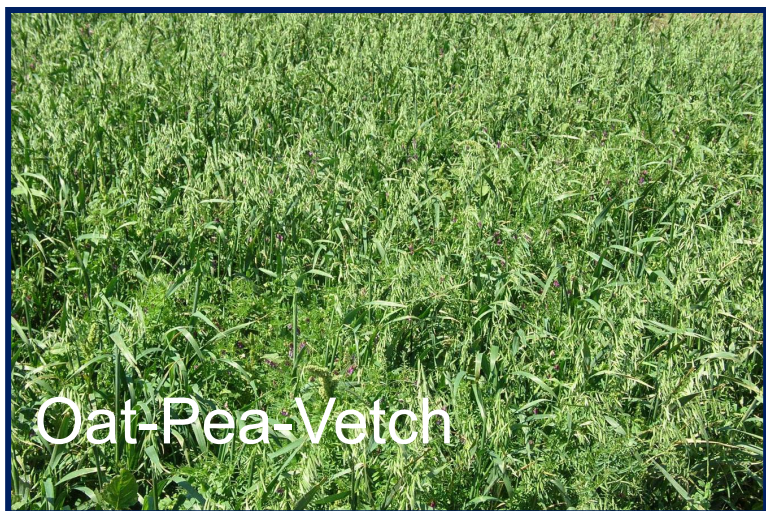
- Determine whether green manure crops are effective at reducing soil-borne potato pests and diseases;
- Determine which green manure crop is most effective at reducing specific potato pests and diseases;
- Determine the impact of using green manure crops on yield and quality in subsequent potato crops, and
- Provide economically viable alternatives to soil fumigation.



Figure 1. Green manure plots in southern Alberta

Key Findings

- Several green manure crops can be grown in southern Alberta
- Agronomics and pest control in green manure crops are essential to successfully use them in potato production systems
- *Verticillium dahliae* was not prevalent in many of the soil samples
- *Verticillium dhaliae* may not be the primary cause of Early Dying in southern Alberta potato fields
- The was a high prevalence of *Colletotrichum coccoides* in fields with Early Dying symptoms
- Soil health is much more complex than simply reducing the inoculum of one pest
- Further work may be required on Teff, Sorghum Sudan Grass, and an Oat-Pea-Vetch mixture
- Key findings from a related study indicate that crop rotation may be a more effective means of controlling Early Dying in potato crops than the use of green manures per se.



Results

- Biomass varies with the green manure crop planted, the field used and the environmental conditions each year.
- Sorghum Sudan grass and CFPM 101 (millet) typically resulted in the highest biomass per m<sup>2</sup>, followed by Oat-Pea-Vetch, wheat and others.
- Total soil N was typically unchanged by incorporating green manure cover crops, but available N was sometimes affected. Results varied between fields and with environmental conditions.
- Soil dilutions detected *Verticillium dahliae* inoculum as high as 30 to 40 cfu/g soil in one field, but below 6 cfu/g soil in most fields in the study.
- PCR methods detected relative quantities of *Verticillium* that correlated well with Early Dying symptoms.
- Early Dying was not always observed, even when *Verticillium* could be recovered from stem samples.
- Other soil-borne pathogens, such as *Colletotrichum coccoides*, were isolated from plants exhibiting Early Dying symptoms.
- Eggplant bioassays confirmed that organisms other than *Verticillium dahliae* may be related to Early Dying in Alberta.
- Root lesion nematode populations varied with the field and the crop; some green manure crops, such as Teff, do not appear to support populations of root lesion nematodes.
- There was no significant difference in yield of potatoes from the green manure plots.

Future Considerations

- Work is needed to incorporate green manure crops into a potato production cycle.
- Agronomic and pest control recommendations for green manure crops must be developed before these crops can be widely used.
- More work is required on the prevalence of *Colletotrichum coccoides* in potato rotations.
- The potential role of Teff in reducing populations of root lesion nematodes may require further exploration.
- Further work may be required on Teff, Sorghum Sudan Grass, and an Oat-Pea-Vetch mixture

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