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Green Manure Crops for Control of Verticillium

PAA Meeting

Corvallis, OR

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Government of Alberta

Objectives:

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

Approach Taken:

- Located in commercial potato fields in southern Alberta
- Intention was to utilize “experienced” potato land, where Verticillium had been observed or was expected
- Planted after spring rush and grew until just before main harvest
- Evaluated the potato crop in the following year

Treatments:

- Check - wheat
- Sorghum Sudan grass
- Canadian Forage Pearl Millet 101
- Hairy Vetch (2006); Oat-Pea-Vetch (2008 & 2009)
- Oilseed radish (2006, one field only)
- Oriental Mustard (2006; one field only)
- Annual Ryegrass
- Phacelia
- Teff (2009 only)
- Control – surrounding crop

Planting Green Manure Crops

Plots in Commercial Field

Wheat

Sorghum Sudan Grass

CFPM 101

Oat – Pea - Vetch

Oilseed Radish

Oriental Mustard

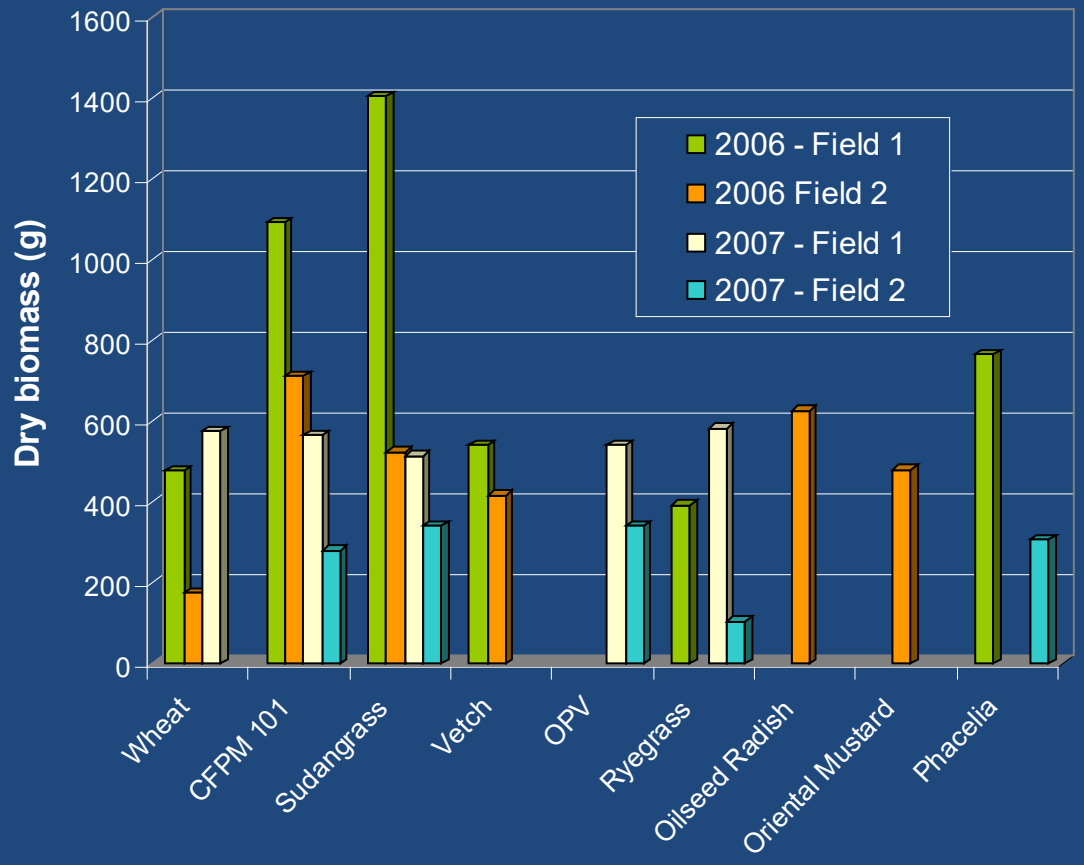
Phacelia

Annual Ryegrass

Teff

Biomass

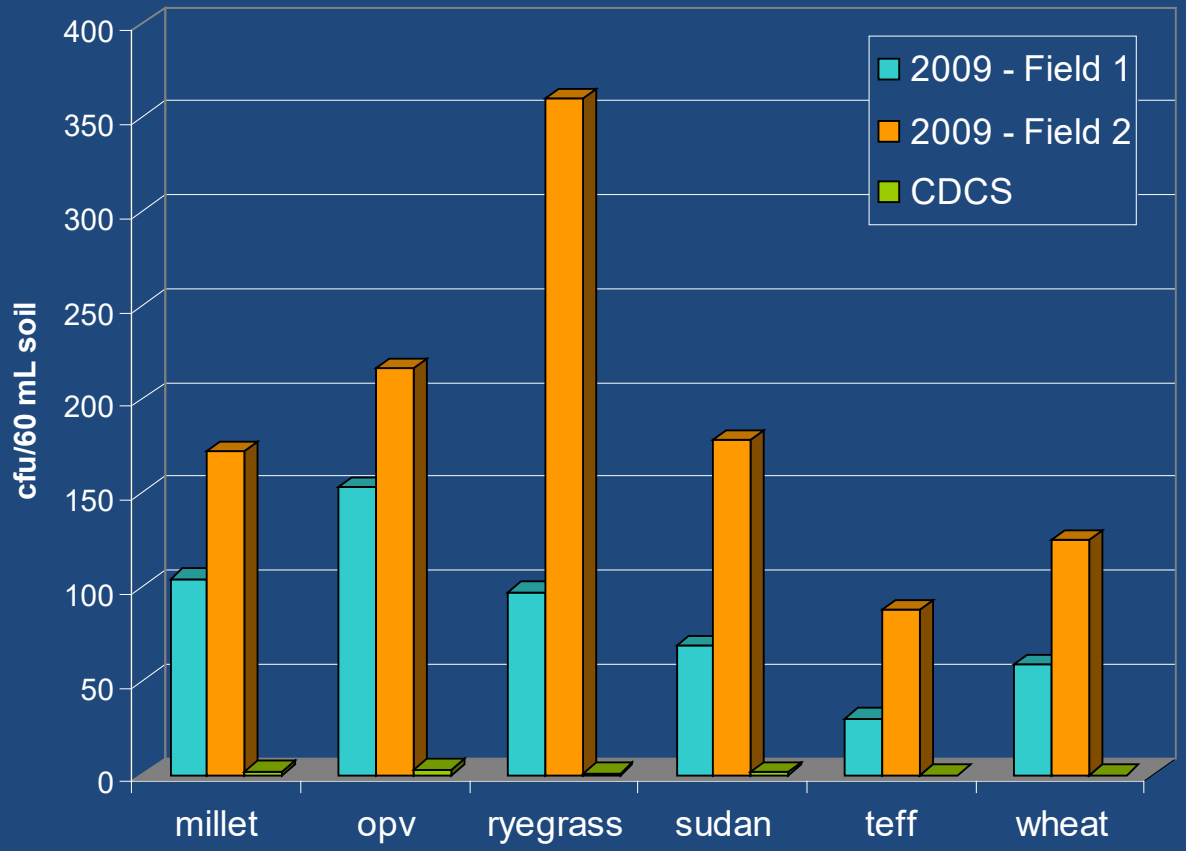
Biomass


Dry biomass (g)
1600
1400
1200
1000
800
600
400
200
0
2006 - Field 1
2006 Field 2
2007 - Field 1
2007 - Field 2
Wheat
CFPM 101
Sudangrass
Vetch
OPV
Ryegrass
Oilseed Radish
Oriental Mustard
Phacelia

Verticillium

- Typical levels in “experienced” fields in the range of 10 cfu/g soil
- Verticillium in soil decreased after most green manure crops
- Disease incidence not always affected, but reduced in some cases
- Other species implicated in early dying

Root Lesion Nematodes



RLN Control

- In a combined analysis, teff supported significantly lower *Pratylenchus* population densities than ryegrass, millet and wheat; population densities under sudangrass and oat-pea-vetch were intermediate in value and not significantly different from either teff or ryegrass.
- These results are somewhat consistent with the 2008 cover crop results from the YPMA fields in that the oat-pea-vetch plots had low nematode population densities (teff was not evaluated in 2007).

Unexpected Findings

- Agronomics and pest control in green manure crops is critical to successfully using them in potato production systems.
- *Verticillium dahliae* may not be the primary cause of Early Dying in southern Alberta potato fields.
- *Verticillium dahliae* was not very prevalent in soil samples.
- The eggplant bioassays indicated a much higher prevalence of *Colletotrichum coccoides* than *Verticillium dahliae* in soils collected from experienced fields.
- Teff may require additional evaluation in southern Alberta for its impact on root lesion nematode population levels.

Conclusions

- Several green manure crops can be grown in southern Alberta, but more work is required on insect and pest control.
- Soil health is more complex than simply reducing inoculum of one pest.
- Rotation crops may be a better fit for southern Alberta than green manures per se.

Acknowledgements

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