An Integrated Approach to Potato Early Dying: Lessons Learned & Next Steps

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The synergistic interaction between the soil borne fungus, *Verticillium dahliae*, and the plant pathogenic nematode, *Pratylenchus penetrans*, leads to the syndrome known as Potato Early Dying (PED). Surveys show that the majority of Wisconsin’s potato fields are infected by both pathogens. PED can reduce plant growth by 60% and result in potato tuber yield losses of 20-50%. Soil fumigation is currently the only effective treatment for PED.

Having effective alternative treatments to chemical soil fumigation is important for PED management on Wisconsin potato and vegetable farms. In 2004, a project was initiated through Dr. Ann MacGuidwin to investigate alternative integrated pest management (IPM) strategies for PED that can lengthen the time between fumigation events or replace fumigation. The cornerstone of this approach is to keep pathogen population levels below the economic threshold value and to reserve fumigation for pathogen “hot spots”.

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**Fumigation Alternative Planning Checklist:**

1. Did you sample for **Verticillium** and nematodes site specifically?  
   (e.g. half pivots, quarter pivots, entire fields—preferably in multiple locations where you can maintain and track your sites from year to year, using GPS when applicable)  
   - YES  
   - NO

2. Did you plan your rotations to limit PED complex buildup?  
   (used cover crops, planted resistant varieties, planned long term rotations, etc)  
   - YES  
   - NO

3. Did you plant crops that break the cycle of increase for nematodes and/or **Verticillium**?  
   (short-season vegetables like pea, snap bean, peppers)  
   - YES  
   - NO

4. Did you incorporate plant residues or add organic amendments to build soil organic matter?  
   (cover crops, sweet corn residue, paper mill residuals)  
   - YES  
   - NO

5. Did you plant cover crops known to suppress **Verticillium** and/or nematodes?  
   (forage pearl millet, sorghum-sudangrass, biofumigant mustards or rapeseed)  
   - YES  
   - NO

6. Did you plant PED tolerant varieties of potatoes?  
   - YES  
   - NO

7. Did you use soil solarization?  
   - YES  
   - NO

8. Did you use site specific fumigation?  
   - YES  
   - NO

9. Did you remove and discard potato vines before harvest to reduce **Verticillium** inoculum for future potato crops?  
   - YES  
   - NO

10. Did you track your fields long term to see “hot spots” of PED?  
    - YES  
    - NO

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*If you said YES to the majority of the questions, you are adequately working toward limiting your fumigation use by using multiple strategies to combat PED. It is recommended that you still sample to determine PED thresholds in your fields. If you said NO to the majority of the questions, you can look at these practices as future strategies to incorporate into your practices for combatting PED in your fields.*

PED is often found in patches within an otherwise healthy field.
Lessons Learned

Large scale studies were implemented to look at specific practices which may be used as alternatives:

- A combination of cover cropping and solarization—using cover crops and naturally degrading them under plastic covers.
- Cover cropping as a biofumigation method.

Overall, it was determined that the combination of solarization and cover crop residues are an effective alternative to fumigation. However, the economics of solarization and lack of sustainability—due to energy inputs and few recycling options for the materials—make this approach currently unfeasible.

Cover cropping systems were studied without solarization to determine if they alone are an effective alternative to fumigation. It was found that cover crops vary in their ability to suppress nematodes and fungi, and that very few crops are ideal for reducing both pathogens. Even the bio-fumigant mustard crops are hit or miss, depending on the timing for crop incorporation.

Through this project we have been able to:

- Gain more knowledge about biofumigation cover cropping systems.
- Increase awareness of the types and benefits of cover crops to growers.
- Increase awareness of biologically-based alternatives to fumigation.
- Design a checklist for growers that uses an IPM approach to increase adoption of multiple strategies for optimal PED control (see back page for checklist).

Next Steps

Further studies are being conducted to look at the timing and types of cover crop that would be most beneficial to growers. The PED pathogens remain in the soil after potatoes are grown so practices to reduce their levels can occur any time during the rotation. Additional research funding has been leveraged as a result of this project. Overall, we are building an ecologically sound, research-based, and economically viable plan for PED management.

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