

PROGRESS REPORT: ORGANIC CROPPING RESEARCH FOR THE NORTHWEST

TITLE: Management of seedling blights in organic vegetable production in the Pacific Northwest (original: 'Evaluation of seed treatments for organic vegetable production in the Pacific Northwest' modified based on grower interviews and PhD committee's feedback).

PERSONNEL: Lindsey J. du Toit, Associate Professor/Vegetable Seed Pathologist; Ana Vida Alcala, PhD student, WSU Dept. of Plant Pathology/WSU Mount Vernon NWREC

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COOPERATORS: Lyndon Porter, Plant Pathologist, USDA ARS at WSU Prosser, IAREC; Tim Paulitz, USDA ARS at WSU Pullman; Carol Miles, Extension Horticulturist, WSU Mount Vernon NWREC; Alec McErlich, Small Planet Foods; Todd Crosby, Mercer Canyon Farms.

DATE (period which report covers): 2009

KEYWORDS: vegetables, pea sweet corn, organic, seedling blight, damping-off, seed treatments, drench treatments, Pacific Northwest

ABSTRACT (Maximum of 250 words in length, written in non-scientist/layperson language, briefly summarizes your work to date): A PhD student, Ana Vida (Avi) Alcala, started on this project in January 2009. Avi spent spring and fall semesters of 2009 in Pullman completing course work towards her PhD degree. This study will evaluate management options for damping-off caused by *Pythium* species in pea and sweet corn crops grown under organic production systems in central Washington. The biology and ecology of the pathogens will be examined under low soil temperatures and high soil moisture, which represent conditions growers encounter in early spring in the Columbia Basin when losses to damping-off are most severe. Management strategies, such as seed or drench treatments using microbial and non-microbial products, will also be explored within the context of appropriate cultural management practices in organic vegetable production.

OBJECTIVES: Continue research from MS student, Jaime Cummings, evaluating organic treatments for management of soilborne pathogens that cause damping-off of vegetables. After interviewing growers of organic vegetable crops in Washington, the focus of Alcala's PhD project was revised to address damping-off in pea and sweet corn crops in the Columbia Basin under cold, moist spring soil conditions, because growers reported greatest economic losses to damping-off in organic vegetable in under these conditions. Specific objectives and activities:

- a) Identify the concerns of organic vegetable growers in western and central WA with regards to management of damping-off.
- b) (Based on grower/field rep interviews) Evaluate the severity of damping-off caused by *Pythium* spp. at low soil temperature and high soil moisture (typical during early season planting in central Washington). Identify the *Pythium* species causing damping off and the abundance of these species in organic fields.

- c) Evaluate the degree of seed exudation (electrolyte leakage) of pea and sweet corn cultivars typically planted in early spring in central Washington, and the relationship to susceptibility of these crops to damping-off under low soil temperature and high soil moisture conditions. Assess the potential use of quantitative seed exudation assays as a tool for growers to identify risks of damping-off for pea and sweet corn cultivars commonly planted in central Washington.
- d) Evaluate microbial and non-microbial products or formulations that meet organic standards for controlling *Pythium* spp. in organic pea and sweet corn crops under early planting conditions in central Washington.

The project is expected to lead to an understanding of *Pythium* spp. most prevalent and aggressive in organic pea and sweet corn crops in early spring in the Basin. This will identify the species to focus on for evaluating organic seed/drench treatments under cold, moist soil conditions. Results are expected to contribute towards registration of seed treatments that were in an experimental phase of development during Cummings' MS project and had potential for management of damping-off pathogens. The project should clarify the potential for using electrolyte leakage assays to identify risks of germination problems for specific seed lots.

PROCEDURES:

a) Personal farm visits or phone interviews were completed in summer 2009 to identify the immediate concerns of organic vegetable growers in western and central WA with regards to diseases in their crops and to help Avi plan her PhD research project proposal. The following is the list of growers and production managers that Avi and Lindsey met to gather this information:

Grower or Production Manager	Name and location of farm or operation in Washington	Market Type	Approx. acres of organic production
Nash Huber	Nash's Organic Produce, Sequim	Fresh Market & CSA	400 acres
Brian Anderson	Brian Anderson Farm, Royal City	Fresh Market & CSA	120 acres certified and 60 in transition
Todd Crosby	Mercer Canyon Ranch, Tri Cities	Processing and fresh market	1,200 acres
Alec McErlich & Joe Bennett	Small Planet Foods, Sedro Woolley	Processing	Multiple farms in US and internationally
Keith Keisler	Finn River Farm, Chimacum	Fresh market & CSA	approx. 5 acres
Anne Schwartz	Blue Heron Farm and Nursery, Rockport	Fresh Market & CSA	6 acres for vegetables & 1 acre small fruits
John and Chris Hyer	Desert Ridge Farm, Moses Lake	Processing	6,000 acres
Gilbert Hintz and Darwin Hintz	Trout Lake Farms & Benchmark Farms, Ephrata	Processing	2,000 acres organic herbs, corn and pea
Dave Hedlin	Hedlin Farms, La Conner	Fresh Market & CSA	200 acres

b) Soil was sampled from 37 certified organic fields across the Columbia Basin to identify the *Pythium* species most important and abundant in organic pea and sweet corn production. The soil samples are being used to bait, isolate, and identify (morphological and molecular methods) the *Pythium* species most prevalent in organic pea and sweet corn production. The sampled fields planted to pea crops in spring 2010 will be monitor for damping-off; plant/soil samples (if damping-off is observed) will be collected to compare with *Pythium* isolates obtained from the fall 2009 soil samples. Real-time PCR assays will be completed on subsamples of the 37 organic fields for the 5-10 most commonly isolated *Pythium* spp. identified, to quantify the potential inoculum of each species. Growth chamber trials will be set up to evaluate damping-off of pea

and sweet corn caused by the most prevalent *Pythium* spp. identified, under low soil temperature and high soil moisture conditions, to assess aggressiveness of these species.

c) Electrolyte leakage multiple seed lots and cultivars of of pea and sweet corn cultivars typically planted early in central Washington will be quantified to assess the potential for quantitative measurements of seed exudation to provide a tool for growers to identify risks of damping-off for pea and sweet corn cultivars. Growth chamber and lab trials will be completed to evaluate the relationship of seed exudation on susceptibility of pea and sweet corn to damping-off under low soil temperature and high moisture condition.

d) Microbial and non-microbial products that meet organic standards will be evaluated for controlling *Pythium* spp. in organic pea and sweet corn crops in cold, wet soils in growth chamber trials. These will be followed by field trials to evaluate various organic products for under field conditions in grower-cooperator sites in central Washington and at the NWREC.

PROGRESS TOWARDS OBJECTIVES (Comparison of actual results with the original goals):

a) Responses of vegetable growers interviewed in summer 2009 were summarized:

1. There are two main types of organic vegetable production in WA – for fresh produce markets and processing markets. Organic production for fresh markets is generally smaller scale (a few acres to ~400 acres) with diversity in crops and flexibility in production practices. Organic production for processing markets entails large areas (up to 6,000 acres for one farm interviewed in central WA), with limited diversity in crops (3-5) and production practices largely dictated by processing contracts.
2. Growers' duration of certified organic production: 10 years to several decades. Most growers for fresh markets have entire operations certified, while some in processing markets devote part of the land to conventional production.
3. Generally, growers for processing markets experience problems (sometimes significant) with damping-off in early season (late February to early March in the Columbia Basin). It is not uncommon for these growers to replant entire fields or use extra seeds in case of damping-off. Growers for fresh markets never or rarely encounter this if they use appropriate management recommendations. Damping-off is usually controlled by adjusting practices (e.g., rotation, field site or planting date).
4. Early planting is associated with poor stands in organic crops for processing markets. Reasons for such early plantings are: (1) to avoid weed problems (e.g., nightshade in later-planted pea crops - berries are toxic and difficult to separate from peas in the processing plant); (2) to ensure harvest before conventional crops so processors can avoid cleaning out the plant before moving to conventional crops; (3) to meet market demands; and (4) for double-cropping (e.g., pea planted early followed by sweet corn planted no later than early July in the Basin).
5. The use of high quality, vigorous seed lots is important for good stands and minimal losses in early plantings. Seed damage during handling (e.g., when pea seed is moved by auger from large bins into a planter vs. using bagged seed) can contribute to poor stands.
6. Growers of organic crops capitalize on building "healthy soils" through crop rotation, incorporation of green manure crops and animal composts, etc. They emphasize these practices for improving soil health and ensuring vigorous crops.
7. Organic seed treatments are not widely used. For those tried seed treatment products, inconsistency in efficacy under field conditions did not warrant the expense. Some

processing vegetable growers indicated a willingness to pay \$100 to \$150 per acre for a seed treatment that consistently reduces damping-off (>30% improvement in stand).

8. Crops that need most attention for damping-off are pea and sweet corn (super-sweet sweet corn and sugar snap pea) planted early in central WA.
9. Seed treatments effective at controlling damping-off in cold, wet soils in early spring are most needed. Early planted crops are also irrigated with cold water which delays emergence and increases the window of susceptibility to damping-off.

The information was presented to Avi's PhD committee in August 2009. A timeline for the project activities was prepared. In October 2009, soil samples were collected from each of 37 certified organic fields in the Columbia Basin (15 in south, 7 in central, and 15 in north Basin) that have been planted to organic pea and/or sweet corn crops. The soil is being used for objective 'b'. Baiting for *Pythium* spp. using published methods has been initiated by Avi while in Pullman completing courses in fall 2009/spring 2010. Technical assistance is being provided by Paulitz' program. Objectives 'c' and 'd' will be initiated in summer/fall 2010 after Avi returns to the WSU Mount Vernon NWREC. Avi is writing a literature review for her dissertation.

OUTPUTS (Publications including newsletter articles, workshops and meetings, presentations, web sites or pages, field days):

1. Aclala, A.C., and du Toit, L.J. 2009. Management of damping-off in organic vegetable crops in the Pacific Northwest. *Sustaining the Pacific Northwest* 7(4):5-7.
<http://csanr.wsu.edu/publications/SPNW/SPNW-v7-n4.pdf>.
2. A.C. Alcalá presentation to growers, consultants, field reps, extension educators, graduate students, and researchers at the WSU Mount Vernon NWREC Field Day, 9 July 2009.

IMPACT (In what way has your work influenced organic agricultural practices, economics/marketing and environmental stewardship): Too soon to assess, but the interviews identified key research needs for damping-off in organic vegetable crops in the PNW.

INSTITUTION: Washington State University

STATE: WA

FUNDING SOURCE(S) (list matching funds if applicable): WSU CSANR

FUNDING AMOUNT(S): \$40,000

ORGANIC RESEARCH LAND (indicate number of acres on all that apply):

Station	<input type="checkbox"/> non-organic	<input type="checkbox"/> transitional	<input type="checkbox"/> certified
On-farm	<input type="checkbox"/> non-organic	<input type="checkbox"/> transitional	<input checked="" type="checkbox"/> >15,000 certified

FARMER COOPERATOR(S): Number 9

Names Brian Anderson, Brad Baillie, Joe Bennett, Todd Crosby, Dave Hedlin, Gilbert Hintz, Nash Huber, Chris Hyer, Alec McErlich, Anne Schwartz