Vegetable Crop Update

A newsletter for commercial potato and vegetable growers prepared by the University of Wisconsin-Madison vegetable research and extension specialists

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Calendar of Events

July 23– Hancock Ag Research Station Field Day, Hancock, WI (tentative agenda begins at noon)

Vegetable Crop Update. A.J. Bussan. Professor of Horticulture, University of Wisconsin-Madison. 608-225-6842. ajbussan@wisc.edu.

The growing season has obviously been delayed due to late arrival of spring, snow cover and frost, and more recently spring showers. After last season, I have a hard timing being frustrated by these spring rains, but I do have to admit it does try one's patience. The question now is what are the consequences of the delayed arrival of spring and the subsequent delay in planting?

Potatoes: Potato seed was harvested last year after a warm and extended storage season. As such, many signs indicate that the seed is physiologically older. In a general sense, we recognize what the consequences of physiologically older seed are including more rapid loss of dormancy, higher stem and tuber count, and less duration of vine vigor or earlier vine senescence. The higher stem and tuber number and earlier vine senescence suggest the crop might have a shorter duration of tuber bulking. When combining the effects of higher set and shorter bulking duration, the crop typically ends up with smaller tubers.

That all said, I have had some difficulty in being able to predict what tuber set will actually be after the crop emerges. In large part, this has to do with variable temperatures and sunlight from the time of crop emergence until tuber set. Even though physiological age has been proven to have a consistent impact on tuber and stem number, the interaction with spring growing conditions has been unpredictable. I might increase in-row spacing by up to one inch - especially for some of the crop that remains to be planted – but I also believe we have established in-row spacing to account for variability in seed age and our growing environment over the years.

There may be real value in having a crop that is physiologically older, as we really could benefit from rapid emergence this spring. Many of the seed potatoes were shipped late due to the consistent freezing temperatures in April. The result is we have seed that is in good condition for mechanical planting with only small planting. That said, with 80°F weather and sunshine this crop may come out of the ground relatively quickly.

Rapid emergence could be a big deal for the 2013 potato crop. May 10 is an important planting date for long-season potatoes in Central Wisconsin. This is primarily because potatoes planted by May 10 can catch up relatively quickly to potatoes planted earlier in the year. Even though the crop is being planted almost 30 days later than 2012, the yield potential will be set by the timing

of crop emergence and tuber initiation. The more days the tuber has to develop before July 1 the larger the yield potential in general. Sprouts of tubers planted the week of April 29 are already over an inch in length. If growth continues at that rate much of the crop will likely emerge by May 20 to May 25. That should allow for tubers to set by the first week of June.

In short, the potential remains for a good crop given the challenging spring so far especially if Mother Nature provides plenty of sunshine and warm conditions to allow for rapid crop emergence and tuber development.

Processing vegetable crops: The spring has greatly delayed the planting of carrots, peas, and sweet corn which will likely lead to delays in harvest schedules. That said, the general rule of thumb is it takes 2-5 days in April to accumulate the heat units of one day in late May. Of course this is driven by temperatures, sunshine, and other factors.

The bigger challenge is getting access to fields with medium textured soils. Some crops have been planted, field corn and soybean planting has been delayed due to the showers and wet soils. That said, a lot of field work progressed over the first few days of last week. A return to those conditions should promote good soil conditions for field work.

Onion: Onion may be the crop most impacted by the delays in planting this spring. Heat units accumulated from the time of planting until July 1 is critical for long day onions. Onions grow vegetatively or only produce leaves up until the summer solstice. However within several days of June 22 the crop recognizes that the days are growing shorter and it switches its development from vegetative to reproductive.

You all recognize that onions are biennial. Onions grow a bulb during the first year that is used to store up carbohydrates and increase seed production during year two. In the first year, once the onion starts to 'bulb' or store energy for seed production it will not produce any new leaves. The duration of vegetative growth increases the number of leaves, amount of sunlight the crop can convert to energy, and the ability of the crop to continue capturing sunlight for bulb development. Shorter duration of growth from the time of planting until bulbing will reduce the yield potential of the entire crop and the maximum potential size of the individual bulbs.

Our research has shown that delaying onion planting into May can reduce potential yield and size. Of most importance, delaying planting of onion transplants until after April 25 results in onions that fail to meet colossal size (>4" diameter). This may have a lot of ramifications for those growers trying to market colossal onion through local markets. Again, it will depend on sunlight and warmth from planting through the remainder of the summer.

Fresh market vegetables: Spring vegetables are certainly delayed and many Wisconsin Farmers Markets have little fresh produce. High tunnels and other season extension approaches will be crucial for making early markets. Over wintering crops such as asparagus and rhubarb are slow because of the cold spring AND because of the stressful summer last year. Those crops do not have stored energy unless they were well watered and/or kept free of weeds in 2012.

Vegetable Disease Update – Amanda J. Gevens, Assistant Professor & Extension Vegetable Plant Pathologist, UW-Madison, Dept. of Plant Pathology, 608-890-3072 (office), Email: gevens@wisc.edu. Vegetable Path Webpage: http://www.plantpath.wisc.edu/wivegdis/

"Early" season soilborne diseases of vegetables: Early season damping-off and seedling failures are often caused by one or more soilborne pathogens that are promoted by cool, moist soils. Slow or delayed growth of early planted seeds or transplants contributes to damping-off and seedling failures. Fungi and fungus-like pathogens that may be involved in disease include Pythium species (fungus-like 'water mold'), Rhizoctonia (fungus), and Fusarium (fungus). Each of these pathogens can overwinter in the soil or in infected plant debris and are typically 'weaker' pathogens that require a stressed plant to thrive. This group of pathogens can continue to be problematic even as plants mature; typical symptoms are root and crown rots.

Symptoms of damping off include soft, brown roots, collapse of lower stem or stem below soil line, and eventually plant wilting and death. The seeds themselves can be infected as soon as moisture enters the seed coat or as radicle emerges, resulting in pre-emergence damping-off which may be mistaken as poor germination or seed viability. Damping-off can be mistaken for plant injury caused by insect feeding, over-fertilization, high levels of soluble salts, extreme temperatures, excessive or insufficient soil moisture, or chemical toxicity in air or soil.

Management of damping-off requires several approaches including: 1) purchase of disease free plants and seeds, 2) fungicide seed treatments, 3) plant into well-drained soil, 4) avoid setting transplants too deeply in the soil (avoid crowns below soil line), 5) avoid overcrowding plants to promote good airflow, 6) practice good crop rotation (rotate by plant families on a 2-3 year schedule), and 7) fungicides at-plant or in banded application. Once soil temperatures warm up above approximately 50ºF, incidence of pre- and post-emergence damping off is drastically reduced.

Hop downy mildew: Downy mildew (caused by the water mold, or fungus-like organism *Pseudoperonospora humuli*) may be in the crown or rhizome or have overwintered in buds in hop yards. As such, the pathogen may already be associated with the plant and can 'awaken' when spikes emerge in the spring. Cool and wet conditions favor the pathogen. Downy mildew symptoms on hops can include pale to yellow new spikes that are rigid, stunted, and brittle. Leaf undersides may appear dark gray in color due to masses of downy mildew pathogen sporulation. Leaves of all ages can become infected and symptoms include brown angular (vein-restricted) lesions. Infected cones (flowers) can become covered in brown lesions, shrivel, and drop. Severe infection can result in a decline of the perennial crowns. **Cultural control methods** (from the work of Drs. David Gent and Cynthia Ocamb, Oregon State University) include:

- Resistant varieties. 'Fuggle' and 'Tettnang' are resistant. 'Willamette,' 'Mt. Hood,' 'Chinook,' 'Liberty,' 'Cascade,' 'Bullion,' and 'Brewers Gold' are tolerant. 'Clusters,' 'Galena,' and 'Nugget' are susceptible.
- Destroy escaped hop bines near or in hop yards.
- Prune crown before growth starts in the spring or burn back green tissue before training. Complete removal of green tissue or pruning of entire hill is necessary for most effective disease management. This method removes infected buds and removes early inoculum sources that may thrive in earlier season cool and wet conditions.
- Remove diseased hills and mark for replanting.
- Train bines early to prevent them from coming in contact with soil.

- Begin suckering as soon as bines are strung. Continue at regular intervals until warm, dry weather prevails.
- Strip leaves from bines at a height of 4' soon after training to reduce the spread of downy mildew up the canopy.
- Avoid overhead irrigation, especially during and after burr development.


Cynthia Ocamb, Oregon State, 2004

Fungicides can be important for continued control of this pathogen. Early season applications may limit the amount of initial inoculum that can become available to the developing crop as the season progresses. The start of a preventative fungicide program for downy mildew may begin at spike emergence. This timing is based on temperature or growing degree days, aligning with growing degree days (GDD) of 111.3. Notes below provide further explanation and directions for determining this number for your location.

Based on David Gent's recent work in Oregon, the time to initiate a fungicide program for preventative downy mildew control in hops is at predicted spike emergence (emergence of basal shoots in spring, growing degree day 111.3 air temperature). This is calculated using growing degree days starting from February 1 (base 6.5°C). To get to this emergence date, there is a GDD calculator (http://www.weather.com/outdoors/agriculture/growing-degree-days/53706:4) that can be used with your specific zip code. Base 6.5°C can be defaulted to 40°F to simplify. With this tool, you select current day's date for 'end'. For example, today May 11, 2013, in Madison, we are at GDD 350. As you move northward in the state, GDD accumulate more slowly. I ran a few additional cities to demonstrate the difference in expected spike emergence dates based on GDD across the state.

WI City	GDD (base 6.5C, start Feb 1, end May 11)
Janesville	422
Madison	350
Stevens Point	202
Antigo	187
Rhinelander	174
Superior	66

The tool should indicate a crop physiological status (emergence). Emergence can simply be observed, however, emergence is progressive and spans a period of time for 'complete emergence'. In theory, the tool enables you to identify the earliest phase of emergence and as such aids in timing of early/preventative downy mildew control.

When to follow up with fungicide sprays for downy mildew?: This will vary depending upon the weather. There is a disease risk index utilized by some Pacific northwestern hop growers that has not yet been validated for WI. The premise is that the more rainfall and relative humidity present under moderate temperatures (46-86°F) the greater the disease pressure. Under high pressure times, fungicides should be applied on a 5-7 day spray program. When rainfall is reduced, relative humidity is low and we experience either temps cooler than 46 or higher than 86°F, disease pressure is low and fungicides should be applied on a 10-14 day program.

Many growers may be unsure as to what diseases are active in the yard, or when to be on critical look out. I recognize that most have utilized fungicides, to date, on a limited basis. However, in this and upcoming years, additional programming is planned to support this effort. Below, please find information which is intended to provide suggested fungicide programs for control of downy and powdery mildew.

A good fungicide for use in a 14-day calendar program is fosetyl aluminum or Aliette/Linebacker. Phostrol also provides similar extended control as it believed to upregulate disease defense in the plant. Use of an 'Aliette' type product alternated with a tank mix of copper hydroxide plus cymoxanil (Curzate) creates a sound program. Western states also alternate with copper hydroxide (ie: Kocide) and trifloxystrobin (Flint) in control of powdery mildew.

Below, I have outlined a general foliar fungicide program by calendar for Wisconsin hop yards with additional notes in the right-hand column. If you raise other crops and have familiarity with common base protectant fungicides, remember that **you cannot use captan, chlorothalonil, or mancozeb on hops.** These fungicides do not have EPA Section 2 or any other special labeling to permit their use on this crop. The only base protectant, broad spectrum fungicide for hops is copper (or copper containing formulations such as Kocide).

Time of application	**Fungicide selection** **Active ingredient (trade name examples)**	**Comments**
Spray 1: Spike emergence (or GDD 111.3, 40C base, Feb 1 start) *For southern WI 2013, this may be the 1st week in May*	Fosetyl aluminum (Aliette, Linebacker) Salts of phosphorous acids (Phostrol)	The Aliette program is used in the Pacific northwest with good results. Fosetyl aluminum products cannot be tank mixed with coppers. Phostrol has similar activity as Aliette. Be careful with spray volume and rate – as concentrated Phostrol can potentially be phytotoxic.
Spray 2: 2 weeks after Spray 1 *Roughly May 15*	Cymoxanil (Curzate) Copper hydroxide (Kocide) Dimethomorph (Forum) Cyazofamid (Ranman) Pyraclostrobin + Boscalid (Pristine) Famoxadone + Cymoxanil (Tanos) Mandipropamid (Revus) Mefenoxam (Ridomil Gold SL)	The Curzate + Kocide tank-mix program is used in the Pacific northwest with good results. Curzate and Kocide are good downy mildew fungicides across multiple vegetable crops. Pre-mixes that have good downy mildew and powdery mildew control are: Pristine and Tanos. Price point and availability of products in this list may influence selection. All listed have performed well on downy mildews of various crops.
Spray 3: 2 weeks after Spray 2 *Roughly May 30*	Fosetyl aluminum (Aliette, Linebacker) Salts of phosphorous acids (Phostrol)	The Aliette program is used in the Pacific northwest with good results. Fosetyl aluminum products cannot be tank mixed with coppers. Phostrol has similar activity as Aliette. Be careful with spray volume and

		rate – as concentrated Phostrol can potentially be phytotoxic.
Spray 4: 2 weeks after Spray 3 *Roughly June 15*	Cymoxanil (Curzate) Copper hydroxide (Kocide) Dimethomorph (Forum) Cyazofamid (Ranman) Pyraclostrobin + Boscalid (Pristine) Famoxadone + Cymoxanil (Tanos) Mandipropamid (Revus) Mefenoxam (Ridomil Gold SL)	The Curzate + Kocide tank-mix program is used in the Pacific northwest with good results. Curzate and Kocide are good downy mildew fungicides across multiple vegetable crops. Pre-mixes that have good downy mildew and powdery mildew control are: Pristine and Tanos. Price point and availability of products in this list may influence selection. All listed have performed well on downy mildews of various crops.
Spray 5: 2 weeks after Spray 4 *Roughly June 30*	Fosetyl aluminum (Aliette, Linebacker) Salts of phosphorous acids (Phostrol)	The Aliette program is used in the Pacific northwest with good results. Fosetyl aluminum products cannot be tank mixed with coppers. Phostrol has similar activity as Aliette. Be careful with spray volume and rate – as concentrated Phostrol can potentially be phytotoxic.
Spray 6: 2 weeks after Spray 5 *Roughly July 15*	*For Powdery and Downy mildew control:* Pyraclostrobin + Boscalid (Pristine) Famoxadone + Cymoxanil (Tanos) *For Powdery mildew control:* Trifloxystrobin (Flint) Tebuconazole (Tebuzol, Orius, Toledo, Monsoon, ONSET, Tebustar) Myclobutanil (Rally, formerly Nova) Quinoxyfen (Quintec) Triflumizole (Procure) Neem oil *For Downy mildew control:* Cymoxanil (Curzate) Dimethomorph (Forum) Cyazofamid (Ranman) Mandipropamid (Revus) Mefenoxam (Ridomil Gold SL)	Powdery mildew (PM), if present, may be problematic at this time of the year. We often see PM on cucurbits and other crops at this time (earlier in hot years). Pristine and Tanos are good pre-mix selections for both PM and Downy mildew. Products with individual disease activity can be tank-mixed. If you have primarily or just a PM problem, good selections include: Flint, Tebustar, Rally, Quintec, Procure. Neem oil and other horticultural oils are good choices for PM control on organic hops. If you have primarily or just a Downy mildew problem, good selections include: Curzate, Forum, Ranman, Revus, or Ridomil Gold SL. As you start to use a reduced risk, single site fungicide multiple times over the production season, keep in mind that some fungicide labels restrict total # of applications per season (ie: Forum, do not apply more than 3X per season).
Spray 7: 2 weeks after Spray 6 *Roughly July 30*	Fosetyl aluminum (Aliette, Linebacker) Salts of phosphorous acids (Phostrol)	
Spray 8: 2 weeks after Spray 7 If needed – follow alternation pattern as needed based on status of disease in crop.	Spray 6 program and comments	

The 2013 A3422 Commercial Vegetable Production in Wisconsin guide is available for purchase through the UW Extension Learning Store website: http://learningstore.uwex.edu/Commercial-Vegetable-Production-in-Wisconsin2013-P540.aspx

A pdf of the document can be downloaded or is available at the following direct link: http://learningstore.uwex.edu/Assets/pdfs/A3422.pdf

Weed Control Update - Jed Colquhoun, Professor, UW-Department of Horticulture, Phone: 608-890-0980, E-mail: colquhoun@wisc.edu

Starane Ultra receives 24c Special Local Need registration for volunteer potato control in Wisconsin dry bulb onions

Volunteer potatoes can not only reduce dry bulb onion yield and impede harvest, but also harbor plant diseases such as late blight. With this in mind, a Special Local Need (24c) registration was recently approved for Starane Ultra in Wisconsin dry bulb onions for the suppression of volunteer potato. The active ingredient in Starane Ultra is fluroxypyr, a synthetic auxin herbicide. This mode of action of herbicides also includes several other common active ingredients used in other crops such as 2,4-D and dicamba. Common symptomology includes leaf and stem twisting and leaf cupping.

Volunteer potatoes are suppressed by Starane Ultra and daughter tuber formation may be reduced, but potato plants may not be totally killed. Onions can be damaged by Starane Ultra, particularly as they grow larger or if stressed. Additionally, varieties differ in sensitivity. With this in mind, the tolerance for crop damage should be weighed against the severity of volunteer potato infestations, and this option should be considered a rescue treatment.

The Special Local Need registration will expire on December 31, 2014 and is valid in Wisconsin only. For more details and use instructions, the 24c label can be found on the DATCP special registrations web site: http://datcp.wi.gov/Plants/Pesticides/Special_Registrations/index.aspx. As always, read and follow the appropriate pesticide labels prior to use.