In Stevens Point, Wisconsin (nearly the center of the state from North to South), day length will be less than 14 hours per day by the end of the month. This has dramatic consequences for a number of crops as this will mean we no longer have light saturation for growth of many crops and plants. For example, tomato growth is maximized when day length is at least 14 hours long and as photosynthesis begins to decline longer time periods are required for crops to mature. For crops like potato and onion, the decrease in growth will result in decline of tops and vines and preparation for harvest as well.

**Potatoes:** Harvest season has begun for many growers harvesting chipping and processing potatoes, and of course fresh potatoes of all types direct to the processing plants or packing sheds. Yields appear to be quite good across the state, but there are some quality issues that have begun to raise concerns. Determinate crops, including Norkotah, are beginning to mature, but early samples suggest the yields are good and this in naturally occurring in many fields.

We have started larger scale bulking plots this summer to provide us with better yield and quality estimates. This experiment was planted during the last full week of April so please keep this in mind when making your own crop projections. Russet Norkotah CO8 total yield was 321 and 448 cwt/a on July 25 and August 6, respectively. Snowden total yield was 407 and 529 cwt/a over the same dates. Potatoes appear to continue bulking in a linear fashion at a rate of approximately 10 cwt/day. This is consistent with bulking of potatoes in small plots at the Hancock Ag Research Station.
Potato bulking has been in the linear growth phase since at least June 19. If we project 10 cwt/a/day growth current yields would suggest late bulking initiated approximately 45 d prior to August 6 or somewhere around June 15 to 20. Bulking graph above for Norkotah CO8 and TX 296, Goldrush, Snowden, and Lamoka would support that claim. It would appear that individual plants are increasing per plant tuber yield by 0.75 to 1 oz per day over the month of July.

Specific gravity of the CO8 was 1.067 and 1.072 on July 25 and August 6, respectively. These are reasonable specific gravities for Russet Norkotah and this is quite encouraging given the heat of the summer and potential impact this might have had on lowering specific gravity. The Snowden specific gravity was 1.075 to 10.76 over the same time span. The Snowden are still quite immature and solid content and thus specific gravity should increase as the crop matures.

Tuber set is quite high with about 9 to 10 harvested tubers per plant for CO8 and 9 to 11 harvested tubers per plant for Snowden. Tuber size distribution indicates the crop is still quite small with about 75% of CO8 tubers still less than 6 oz in size and 50% of Snowden less than 2” in diameter as of August 6. Average tubers size appears to be 4.5 to 5 oz. The tubers appear to be growing at about 0.1 oz/day based on a 10 cwt/a increase in yield per day. This year’s crop needs about 15 to 20 good bulking days from August 6 to improve size distribution and value of the crop.

The crop canopies have begun to senesce in many regions of the state. Some of this is attributable to the natural maturation process and senescence of the crop especially in the case of the Goldrush and Norkotah line selections. There is some early dying that is also evident by the ‘flagging’ appearance of stems or necrosis or death of the leaflets on one side of the petiole in contrast to the other.

That said, daily water use is beginning to decline even in the indeterminate crops such as Russet Burbank, Bannock Russet, and Silverton indicated that the crops are fast approaching the last days of late bulking and will soon begin to mature. Even though canopies are green and lush, adjusted ET appears less than potential ET. This is evident by evaluating soil moisture prior to irrigation. Soils that should be near the critical point based on reported potential ET still have soil moisture as evident by staining of the hands from the clay and silt particles when forming a
ball. Again, some of this is due to early dying while in other cases this is simply the natural senescence of the crop.

Crop quality concerns do exist across the state and we have a long way to go to harvest conditions for storage. Warm temperatures may have triggered heat necrosis back when tubers were less than 1.5 cm in diameter. Hot soils with declining vines might dramatically increase respiration rates in the hills causing black heart. Furthermore, insect damage has been seen (wire worm) that is also triggering defects. Finally, specific gravity appears to be in decent shape, but continued bulking will be necessary to optimize gravity for processing and chip potatoes.

**Processing crops:** Cooler conditions during the later parts of July and first part of August has improved the quality of snap beans. There were issues with split set even under irrigated conditions a couple of weeks ago that seems to have disappeared. Yields are much more respectable for sweet corn and snap beans as well under irrigation.

Non-irrigated snap beans have begun to grow again. The lack of rain led to poor pollination and few pods for many snap beans planted during June. That said, recent rains in some regions have facilitated pollination and pod formation and potential for some yield. This is all dependent on the emergence of the crop, rainfall received, and continued favorable weather.

**Fresh market crops:** Many quality issues have continued to persist across different parts of the state. Many of these are linked to inadequate moisture through the pollination or fruit development phases of growth. Again, recent rains have dramatically improved harvest. Be aware, that the rains have caused many defects on fruit including:
- Blossom end rot
- Growth cracks
  - subsequent infection by pathogenic bacteria or fungi
- Grey wall in tomato
- Sun burn in numerous fruiting crops.

Even watering is absolutely essential for avoiding these quality concerns in fresh vegetables. Recent rains likely promoted rapid growth that led to these and other defects.

**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 Pathology Webpage:** [http://www.plantpath.wisc.edu/wivegdis/](http://www.plantpath.wisc.edu/wivegdis/)

**Potato Early Blight:** Over the past 2 weeks, early blight has rapidly progressed in central and southern Wisconsin potato crops. Unmanaged early blight can prematurely defoliate the crop impacting yield and quality. Symptoms may vary as our survey has indicated presence of both classic, bull’s eye dark brown early blight lesions in lower potato canopies (early blight), as well as smaller fleck lesions with slight bull’s eye patterning on upper canopies (brown spot).

**Potato and Tomato Late Blight:** While we had a couple of days of warmer temperatures and dry weather, much of the state is entering a period of rainy weather with cool nights and moderate summer days. This cooler, wet weather is favorable for late blight. Be mindful of upcoming rain
when timing necessary protectant fungicide applications. 7-day programs are recommended for most of the state, with tightened 5-day programs for counties with infected fields. I am aware of no new reports of late blight in WI since the last newsletter was sent on 11 Aug 2012.

This past week there were several new late blight reports from CT (tomato), ME (tomato and potato), NY (tomato), OH (tomato), and PA (tomato). To date this production year, late blight has been reported in CA, CT, FL, MA, ME, NC, NH, NJ, NY, OH, PA, VA, VT, and WI. The website: [http://www.usabligh.org/](http://www.usabligh.org/) indicates location of positive reports of late blight in the U.S. and provides further information on disease characteristics and management.

In order to help better understand the epidemic at hand, please submit samples to my lab or work through your county agent and request that they send to me for genotyping. All we need to know is the county of sample origin, we do not need to have specific field or grower information associated with the sample. Identification of genotype at the county level would be very helpful. Lab address: Amanda Gevens, 1630 Linden Dr, Room 689, Plant Pathology Dept., University of Wisconsin, Madison, WI 53706. Please send infected leaves in a slightly inflated ziplock bag with no paper towel. Overnight shipping is best.

**Current P-Day (Early Blight) and Severity Value (Late Blight) Accumulations. Thresholds for both diseases have been met. Accumulations will continue to be provided until the end of potato production season.**

<table>
<thead>
<tr>
<th>Location</th>
<th>Planted</th>
<th>50% Emergence</th>
<th>P-Day Cumulative</th>
<th>DSV Cumulative</th>
<th>Calculation Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antigo Area</td>
<td>Early 5/1</td>
<td>5/30</td>
<td>527</td>
<td>46</td>
<td>8/11</td>
</tr>
<tr>
<td></td>
<td>Mid 5/10</td>
<td>6/6</td>
<td>489</td>
<td>46</td>
<td>8/11</td>
</tr>
<tr>
<td></td>
<td>Late 6/1</td>
<td>6/16</td>
<td>423</td>
<td>46</td>
<td>8/11</td>
</tr>
<tr>
<td>Grand Marsh Area</td>
<td>Early 4/3</td>
<td>5/8</td>
<td>647</td>
<td>48</td>
<td>8/11</td>
</tr>
<tr>
<td></td>
<td>Mid 4/15</td>
<td>5/16</td>
<td>600</td>
<td>48</td>
<td>8/11</td>
</tr>
<tr>
<td></td>
<td>Late 4/30</td>
<td>NA</td>
<td>545</td>
<td>47</td>
<td>8/11</td>
</tr>
<tr>
<td>Hancock Area</td>
<td>Early 4/1</td>
<td>5/1</td>
<td>723</td>
<td>28</td>
<td>8/11</td>
</tr>
<tr>
<td></td>
<td>Mid 4/15</td>
<td>5/10</td>
<td>666</td>
<td>22</td>
<td>8/11</td>
</tr>
<tr>
<td></td>
<td>Late 5/1</td>
<td>5/17</td>
<td>622</td>
<td>22</td>
<td>8/11</td>
</tr>
<tr>
<td>Plover Area</td>
<td>Early 4/3</td>
<td>5/17</td>
<td>651</td>
<td>42</td>
<td>8/11</td>
</tr>
<tr>
<td></td>
<td>Mid 4/19</td>
<td>5/18</td>
<td>586</td>
<td>42</td>
<td>8/11</td>
</tr>
<tr>
<td></td>
<td>Late 5/1</td>
<td>5/27</td>
<td>523</td>
<td>38</td>
<td>8/11</td>
</tr>
</tbody>
</table>

*Cucurbit Downy Mildew*: has not been identified in Wisconsin at this time in commercial fields, home gardens, or our sentinel monitoring plots. Several states have reported cucurbit downy mildew this season across a wide range of cucurbit hosts in AL, CT, DE, FL, GA, IN, KY, LA, MD, MI, NC, NJ, NY, OH, PA, SC, VA, and Ontario Canada. **The newest reports within the**
past 7 days have been on cucumber, cantaloupe, winter squash, and Jack-o-lantern pumpkin with closest detects in northwestern IN (LaPorte Co.) on cucumber.

No forecasted risk of movement of spores from states reporting detects to Wisconsin at this time. Disease forecaster, Tom Keever of North Carolina State University reports, “high risk for cucurbits from the lower Lakes region into central sections of NY and PA; and in eastern KY / western WV / southwest OH. Moderate risk along the Gulf Coast and into the Southeast, through the southern Appalachians and mid-Atlantic states through eastern NY. Low risk for coastal SC / NC / VA, southern New England, and a few scattered areas in the Ohio Valley and South. Minimal risk to cucurbits in most other areas.” The website: http://cdm.ipmpipe.org/ offers up to date reports of cucurbit downy mildew and disease forecasting information.

Early detection and management of this disease is critical. If you suspect downy mildew, please contact your county agent, me, or submit a sample for confirmation.

For further information on any fungicides that may be mentioned in this newsletter, please see the 2012 Commercial Vegetable Production in Wisconsin Guide A3422. An online pdf can be found at the link below or a hard copy can be ordered through the UWEX Learning Store. http://learningstore.uwex.edu/assets/pdfs/A3422.PDF

Vegetable Insect Update – Russell L. Groves, Associate Professor and Applied Insect Ecologist, UW-Madison, Department of Entomology, 608-262-3229 (office), (608) 698-2434 (cell), or e-mail: groves@entomology.wisc.edu.

Vegetable Entomology Webpage: http://www.entomology.wisc.edu/vegento/index.html

Colorado potato beetle (CPB) – Persistence of the 2nd generation of Colorado potato beetle (CPB) can still be observed at several locations in central and northern Wisconsin. Most of the summer adults have emerged from the soil at this time and middle to later stage larvae can be found feeding in areas of the field where insecticide skips have occurred. Control of this second generation remains critical as many of these insects will become the parents for next year’s 1st generation. Concentrations of adult and later instar larvae can be effectively controlled with insecticides containing the following active ingredients; chlorantraniliprole (e.g. Voliam Xpress), phosmet (Imidan), rynaxypyr (Coragen), spinetoram (Radiant).

Fall armyworm / Beet armyworm / Corn earworm – The appearance of young larvae of each of these 3 caterpillar pests signifies some risk for susceptible sweet corn. Armyworms are typically middle to late-summer pests in this crop as the insect normally overwinters successfully southern Florida and south Texas. The fall armyworm is a strong flier, and disperses long distances annually during the summer months until it finally reaches the upper Midwest. The life cycle is usually completed in about 30 days during the summer and the number of generations occurring in an area varies with the appearance of the dispersing adults. In Wisconsin, adults appeared in traps relatively early this season on strong, south-westerly breezes. In Wisconsin, where fall armyworm moths do not appear until early August, there may have been 1-2 generations this season. In corn, they sometimes burrow into the ear, feeding on kernels in a similar manner as European corn borer (ECB). Fall armyworm may also enter sweet corn by burrowing through the husk on the side of the ear, similar to ECB. The beet armyworm has a
wide host range, occurring as a serious pest of many vegetable, field, and ornamental crops. Among susceptible vegetable crops are asparagus, snap bean, beet, broccoli, cabbage, cauliflower, celery, sweet corn, eggplant, lettuce, onion, pea, pepper, potato, sweet potato, and tomato. Field crops damaged include alfalfa, corn, sorghum, soybean, and sugarbeet. Several weeds also are suitable for larval development. Continued flights of the corn earworm have been observed from the Wisconsin DATCP’s Pest Bulletin (http://datcpservices.wisconsin.gov/pb/), with adult moth captures registered in many locations throughout southern and central portions of the state. Recall that trap captures exceeding 10 or more moths for two consecutive nights indicates the need for protective treatment of silking sweet corn fields.

Matt Ruark, Assistant Professor of Soil Science, UW-Madison, Department of Soil Science, 158 Soil Science Building, Phone: 608-263-2889, Email: mdruark@wisc.edu.

Ruark Extension Web site: http://www.soils.wisc.edu/extension/
Ruark Lab Web site: http://www.soils.wisc.edu/~ruark/

Matt Ruark, and co-authors: Kevin Shelley, UW-NPM Program, Jim Stute, Rock County Extension, Francisco Arriaga, UW-Extension Specialist

Considerations for cover crops in 2012: With a growing season like we are having in 2012, it is likely that residual nitrate concentrations in the soil will be high, especially if corn was harvested early as silage or if yields are well below expected. One benefit of planting cover crops after corn silage, small grain, or a processing vegetable crop, or after a manure application is that the cover crop can take up residual nitrate and reduce the risk of nitrate leaching between harvest and planting. Other benefits of cover crops include reduction in soil erosion and weed suppression. This article focuses on using cover crops for nutrient conservation benefits rather than growing cover crops for forage. For tips on growing cover crops for forage see Winnebago County Agricultural Agent Nick Schneider’s article on Emergency Forage Cover Crop Tips (http://go.wisc.edu/xvmh3a).

Government program and insurance considerations:

- The USDA-NRCS has announced additional funding through Environmental Quality Incentive Program (EQIP) to provide financial assistance to establish cover crops. The sign up for this program runs to August 24. It is important to note that this program does not allow for harvesting of biomass as forage (http://goo.gl/EvrQN). Another program, the Conservation Stewardship Program (CSP), has cover cropping as part of the program, but sign up was required at the beginning of the year.
- If deciding to grow a cover crop for forage, and mechanically harvest, you will not be eligible for some government programs and you may not be able to insure the subsequent crop.

Cover crops to trap nitrate. The ideal cover crops for a nitrate trap crop are grass crops that establish quickly, such as cereal rye (aka winter rye), oat, barley, annual ryegrass (aka Italian ryegrass), and sorghum-sudangrass. These cover crops also have a fibrous root system. Brassicas (e.g. radish, turnip, mustard) and legumes (clover, hairy vetch) will also take up residual nitrate, but do not establish as quickly. Radish has been popular cover crop in no-till systems and, if
planted early enough, radish can take up as much or more N compared to grass cover crops during the winter, but grass cover crops can scavenge N deeper into the soil profile. The radish will winterkill, while rye will continue to grow (and take up N) in the spring. Oats, barley, sorghum-sudangrass, and annual ryegrass will typically winterkill during Wisconsin winters. However, growers have noted that annual ryegrass can be difficult to control if it survives the winter and is not completely killed with tillage.

The planting timing and seeding density of these cover crops is very important for establishment. Our recommendations for seeding rates (drilled) are 90-112 lb/ac for rye, 15-20 lb/ac for annual ryegrass, and 80-110 for oat, 60-90 lb/ac for barley, and 35-40 lb/ac for sorghum-sudangrass. Apply toward the higher end of the range with later plantings (especially after Sept. 15th), in weedy fields, or if broadcast seeded. Grass cover crops are more likely to establish during the fall months, while legumes and brassicas need to be planted in summer months to ensure a quality stand. The NRCS Wisconsin Agronomy Technical Note provides some general, statewide recommendations for seeding rate and planting time for cover crop species (http://goo.gl/hXxMO).

Legume cover crops (i.e. green manure crops) will also take up residual N; high residual nitrate environments will cause nodulation to be delayed. However, if the goal is to trap N or grow a cover crop to provide soil conservation benefits, we would not recommend planting legumes. If the goal is to supply N to the subsequent crop, then legumes would be recommended. The N contribution from a green manure crop is called “nitrogen credits”. This N credit means that when you terminate the legume prior to planting, you can reduce your N fertilizer by the value of the credit. The total amount of N in the biomass will be greater than the “credit”, as not all of this organic N will be mineralized for the subsequent crop. The credit is based on field research, comparing optimum N rates when using green manures to optimum N rates when not using green manures. Late plantings of legumes are not ideal, as at least 6” of growth is needed to produce a predictable N credit.

Do we get the “trapped” N back? The N taken up by a cover crop is cycled back into the soil during the decomposition of the plant biomass. The release of N into the soil is, in-part, a function of the carbon to nitrogen (C:N) ratio of the plant material. In general, the decay of plant material with a C:N ratio between 20 to 30 results in no net contribution to, nor consumption of, plant available N. Plant material with a C:N ratio less than 20 can result in a net excess of N after microbial decomposition. As the microbes break down the material, N is produced in excess of what the microbes need to function, and thus, this N is available for plant uptake. As a result, the termination of a cover crop like red clover, which typically has a C:N ratio of 15, is equivalent to an application of 40 to 80 lb/ac of N fertilizer depending on plant height (Fig. 1). However, grasses and brassicas have a C:N ratio of 20 or greater, resulting in no net effect to available N. If the C:N ratio of the plant material is greater than 30:1, net immobilization can occur, meaning that N from the soil is consumed (i.e. immobilized) by microbes during the decomposition process, resulting in a decrease in plant available N. Grasses tend to increase in C:N ratio as they grow. For this reason, we recommend killing rye cover crops as early as possible in the spring to minimize any effect of immobilization.

The low C:N ratio materials (e.g. red clover) also breakdown much more rapidly compared to grasses and brassicas. This results in greater synchrony of N release with periods of high N uptake by the corn crop. Release of N from the grass crops does occur, but often occurs later in
the growing season, after peak N uptake rate for corn has occurred. Thus, we do not recommend taking an N credit for grass cover crops. However, the slow breakdown of grass crops, along with their higher C:N ratio, can lead to a greater contribution of organic material to the soil, which can increase the soil organic carbon and soil organic nitrogen content over time. The extensive root system also can lead to an increase in soil organic carbon in the subsurface soil, which can be beneficial for fertility and water retention. These types of soil building benefits will not be realized after only one year of cover cropping, but instead, is a long term effect of using cover crops as part of the cropping system.

There are tremendous benefits to water quality with growing a cover crop after manure application in the late summer or fall. It has been clearly shown that fall cover crops reduce nitrate leaching losses, especially on tile drained land ([http://www.agry.purdue.edu/drainage/AY-04-01.pdf](http://www.agry.purdue.edu/drainage/AY-04-01.pdf)). While this trapped N will not likely become plant available the following year, as previously mentioned, there are other long-term benefits of trapping the manure nitrate in plant biomass and incorporating this biomass into the soil. If concerned about the amount of time required for application of both manure and cover crops, slurry seeding of cover crops has been shown to be a viable method ([http://www.mccc.msu.edu/slurryseeding.html](http://www.mccc.msu.edu/slurryseeding.html)). The slurry seeding method creates a one-pass system where cover crop seeds are tank mixed with the manure. If interested, check out the link, especially the YouTube® videos.

<table>
<thead>
<tr>
<th>Table 9.5. Green manure nitrogen credits.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Crop</strong></td>
</tr>
<tr>
<td>Alfalfa</td>
</tr>
<tr>
<td>Clover, red</td>
</tr>
<tr>
<td>Clover, sweet</td>
</tr>
<tr>
<td>Vetch</td>
</tr>
</tbody>
</table>

<sup>a</sup> Use the upper end of the range for spring seeded green manures that are plowed under the following spring. Use the lower end of the range for fall seedings.

<sup>b</sup> If top growth is more than 12 inches before tillage credit 110–160 lb N/a.

**Figure 1.** Green manure nitrogen credits for commonly used legumes in WI (Table 9.5 in A2809).

**Figure 2.** Corn field in Columbia Co. where rye was grown for forage and harvested 10 May (left) compared to a corn field where rye was not grown (right). Corn was planted on the same date. Picture taken on 29 June 2012.

There is also little, if any, WI-based data to support taking an N credit following radish. We do know that radish can take up a lot of N, but are less certain how available that N becomes the following year. Current research trials in Sheboygan, Washington, Rock, and Jefferson counties are being conducted to evaluate if the benefits of growing radish in WI.

**What about water use?** Another reason to kill the rye as early as possible in the spring is to minimize water uptake. In a year like 2012, severe yield losses on corn are expected on fields where rye was harvested as a forage crop in May (following a previous crop of corn silage). The deep, fibrous root system consumed too much subsurface water and with the drought conditions, this subsurface water was not replenished, thus creating a worse-case scenario for this type of double forage-cropping system (e.g. Fig. 2).
Popular options for cover crop use:

**If interested in scavenging excess N**, plant rye, oats, or ryegrass to get quick establishment and soil coverage. Of these three crops, only rye will survive the winter. Make sure you kill the rye as early as you can in the spring.

**If interested in supplying N**, grow a legume. An option that would be recommended through August 15th is planting berseem clover with a companion crop of oats. The oats will establish first and take up some of the excess N in the root zone, and if planted early enough, the berseem clover will establish nicely, outgrow the oats, and provide an N credit for the following crop. Oats/berseem can be planted in August, but good growth will depend on adequate moisture. A recommended seeding rate would be 8 to 10 lb/ac for berseem clover and 40 to 55 lb/ac for oats. Both the oats and berseem clover will winterkill.

**If interested in experimenting**, try radish or a combination of radish and winter pea. This will have the greatest benefit on no-till land. The addition of a legume to the mix increases the potential for an N credit, but, it should be noted that there is no data to indicate what an N credit would be from this cover crop mixture.

**Antigo Potato Research Field Day Announcement**

**Alex Crockford, UW Seed Potato Certification Program**

We welcome the public again to the Langlade County Research Station Field Day on Thursday, August 23rd at 9:30 a.m. The experimental station is operated by UW Extension with funding and support from the Wisconsin potato industry at the Langlade County Airport (corners of Hwy 64 and Hwy 52 just east of Antigo).

A seed potato grower industry portrait will be taken first to commemorate 100 years of seed potato certification in Wisconsin in 2013. All current and former seed potato growers are encouraged to attend. Following the picture, the tour will highlight potato research now ongoing at the research farm.

UW faculty and local Extension staff have been working on several novel research projects. We continue to study the use of light oils to discourage aphid feeding, a main vector of a troublesome virus disease in potato (PVY). In addition to using these oils, this year's management trial includes treatments evaluating new insecticides, and studying the effects of using no systemic insecticides. Reducing the impact of this virus is of great importance to the local seed potato industry.

We are also evaluating dozens of new products across three trials that address other industry concerns. Products that we hope may improve vine killing, or reduce the severity of common scab, a new trial this year evaluates products with promise to reduce potato early dying complex. New potato varieties will be appearing in the Wisconsin Potato Variety & Advanced Selection Evaluation Trial.

Other topics at the tour will include a discussion on Colorado Potato Beetle insecticide resistance by Dr. Russ Groves, current season disease update from Dr. Amanda Gevens, and a weed and herbicide update from Dr. Jed Colquhoun.
Following the tour and program (complete agenda below) we will meet at the City Park shelter. Questions can be directed to Alex Crockford at 715-527-8939 or abcrockford@wisc.edu.

2012 Antigo Field Day, August 23rd

9:30  Group photograph for UW Seed Potato Certification 100th Year Anniversary (2013)

9:45  Load Wagons

10:00 Program begins in field

Vegetable Pathology Update
  .  The effect of tillage practices on Fall bed fumigation with Pic Plus
  Dr. Amanda Gevens, UW-Plant Pathology and Alex Crockford, UW Seed Potato Certification.
  .  Potato Early Dying product efficacy trial, Dr. Amanda Gevens

Breeding Program Update
  .  Wisconsin Variety and Advanced Breeding Line Trial
  Bryan Bowen and Mary Lemere, UW Ag Research Stations

Vegetable Entomology Update
  .  PVY symptom plot, Dr. Amy Charkowski, A. Crockford, R. Hafner, UW Seed Potato Certification
  .  Best management practices to limit PVY using combinations of foliar protectants
  Dr. Russ Groves, UW-Entomology and Alex Crockford, UW Seed Potato Certification
  .  Weed and Herbicide Update
  .  The evaluation of potato vine dessicants
  Dr. Jed Colquhoun and Dan Heider, UW-Horticulture

Potato Production and Storage Update
  .  Evaluation of fresh market russet and red-skinned varieties
  Dr. A.J. Bussan, UW-Horticulture

Common Scab Work
  .  Potato Common Scab Fungicide Efficacy Trial
  Bryan Webster, Amanda Gevens, UW-Plant Pathology & A. Crockford, WSPCP
  .  Breeding for Resistance to Common Scab in Potato
  Sarah Braun, Ph.D. Candidate, Jansky
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 Pathology Webpage: http://www.plantpath.wisc.edu/wivegdis/

Late blight has been confirmed on tomato from a home garden in Adams County (8/16/2012). Symptoms were consistent with those of late blight and subsequent testing confirmed the diagnosis. This is the first report of late blight on tomato in Wisconsin this year.

Confirmations of late blight this season have been on potato in Barron, Adams, Portage, Oneida, and Waushara Counties. All samples of late blight tested by allozymes analysis so far are US-23, a prolific spore-producing strain that is pathogenic on potato and tomato.

Managing Late Blight in Tomatoes

**Introduction:** Late blight is a potentially destructive disease of tomatoes (and potatoes) caused by the fungal-like organism, *Phytophthora infestans*. This pathogen is referred to as a ‘water mold’ since it thrives under wet conditions. Symptoms of tomato late blight include leaf lesions beginning as pale green or olive green areas that quickly enlarge to become brown-black, water-soaked, and oily in appearance. Lesions on leaves can also produce pathogen sporulation which looks like white-gray fuzzy growth. Stems can also exhibit dark brown to black lesions with sporulation. Fruit symptoms begin small, but quickly develop into golden to chocolate brown firm lesions or spots that can appear sunken with distinct rings within them; the pathogen can also sporulate on tomato fruit giving the appearance of white, fuzzy growth. The time from first infection to lesion development and sporulation can be as fast as 7 days, depending upon the weather. In Wisconsin, late blight has been reported in each of recent years since 2009, after having an approximately 7 year period (2002-2009) without detection. We know that the predominant clonal lineage (strain or genotype) of *Phytophthora infestans* that we have in WI this season is US-23 and can be aggressive on tomato and potato. Based on the biology of the pathogen, we know that this A1 mating type late blight strain cannot produce persistent overwintering spores in the soil without pairing with a strain of the opposite (A2) mating type. However, the pathogen can overwinter on infected plant material that is kept alive through the winter. Such plant materials can include late blight infected tomato and potato plants kept warm in a compost pile and late blight infected potato tubers that remain in the soil after harvest or are stored in a warm place. For this reason, do not compost late blight infected tomatoes or potatoes, do get seed potatoes from a certified clean source, and do control volunteer tomato and potato plants in your 2013 planting. Although the late blight pathogen has the potential to infect
other plants in the Solanaceae family (tomato, potato, pepper, eggplant, nightshade weeds), we have seen late blight on just tomatoes and potatoes in recent years.

**Symptoms of tomato late blight on foliage and fruit.**  
A. Brown, water-soaked lesion on surface of leaf.  
B. Brown lesion with white pathogen sporulation on leaf underside.  
C. Brown and sporulating lesion on stem.  
D. Entire row of plum tomatoes with dead foliage.  
E. Brown, firm, lesions on ‘Roma’ tomato fruit.  
F. Sporulating lesion on shoulders of a ripening fruit.

**Management:** Every effort should be made to avoid introducing late blight into the production field. This includes getting potato seed from certified clean sources and purchasing only healthy-appearing tomato transplants (or raising your own transplants from seed). There are tomato varieties with varying levels of resistance to late blight. A list of tomato varieties with documented late blight resistance can be found at the “Late Blight” tab of the UW-Vegetable Pathology website cited at the start of this document. Once late blight has been identified in a region, it is critical that tomato plants be protected prior to first infection. Although there are several fungicides registered for control of tomato late, there are considerations to be made for your specific production system.

**For organic production,** coppers are most effective if applied before initial infection and applied repeatedly. Copper products must be present on new foliage in order to have a protective, disease-slowing effect, so repeat sprays are necessary. Little disease control can be had when copper applications are made only after disease onset. A recent study compared copper and non-copper containing organic-approved fungicides for late blight control on potato. Results from these replicated trials showed that the best organic-approved fungicide for potato late blight control was copper (Dorn, et al. 2007. Control of late blight in organic potato production: evaluation of copper-free preparations under field, growth chamber, and laboratory conditions. Eur. Journal of Plant Pathology 119:217-240). If you are a certified organic grower, check with your certifying agency as to what copper products you can use. From year to year, the list of OMRI-approved coppers may change.

In the laboratory, my research group has evaluated several organic fungicides for control of late blight on tomato. Our results indicate great variability in efficacy – and we have evaluated the application of materials only in advance of disease (prior to inoculation with US-23 late blight pathogen). We are interested in further evaluating the potential of these fungicides for use in...
Foliar disease control of vegetables, as the timing of their application in the disease cycle may prove useful in developing an overall program. However, at this time, we do not have conclusive or field level data supporting use of non-copper materials for effective late blight control.

For conventional production, there are many fungicides registered for managing tomato (and potato) late blight. A complete list of registered products can be found in the University of Wisconsin Extension publication entitled Commercial Vegetable Production in Wisconsin Guide A3422 (available at the UW-Extension Learning Store). Previous newsletters further describe effective fungicides for late blight control. Archived newsletters can be found at the UW-Vegetable Pathology website (link above). For smaller operations or home gardens, the list is a bit more narrow and includes products which contain chlorothalonil and/or copper. Both products can be effective when applied in advance of initial infection and when applied repeatedly, if conditions remain favorable for disease. Be sure to follow all label instructions to ensure that the product you select is used in the safest, most effective means possible.

For home gardeners: Scouting plants on a daily basis is recommended. Management of late blight in the home garden can result in healthy produce for the gardener and limits the amount of inoculum which can contribute to larger commercial epidemics that can be costly and require use of additional pesticides to control. We recently released a fact sheet which list fungicides available to the home gardener (link below). Fungicides containing chlorothalonil or copper can be effective. Home gardeners with no or limited experience in using pesticides should pay close attention to the label instructions and consult a UWEX county agent for assistance. If late blight has become out of control, plants should be destroyed to limit production of more spores which lead to new infections.

http://www.plantpath.wisc.edu/wivegdis/pdf/2012/Home%20Garden%20FungicidesLC.pdf

Frequently asked questions

Where did this late blight come from?
Based on symptoms, timing of appearance of symptoms, and spread of this disease in WI, it is likely that inoculum (source of spores for late blight infection) entered the state on air that had moved into WI. The late blight pathogen produces a lot of spores on infected plants and spores can move in air up to 40 miles. Many states have experienced late blight epidemics on tomatoes and potatoes this season. Such states include: CA, CT, FL, MA, ME, NC, NH, NJ, NY, PA, VA, VT, and WI.

Where can I find more information on tomato late blight symptoms and management?
http://www.plantpath.wisc.edu/wivegdis/
http://www.extension.org/article/18351
http://www.extension.org/article/18361
http://www.attra.org/attra-pub/lateblight.html

How do I destroy and/or dispose of my late blight-infected tomato plants?
There are several methods of destroying infected plants: 1) pull up plants by the roots, bag, leave in the sun for a few days for plant and pathogen to die, and put out for trash pickup. This method
is OK for a few plants. 2) For many infected plants, plants can be cut at the base and allowed to die in place. Once plants are dead, you can go in and remove stakes, strings, and plastic and dead plant material can be incorporated into the soil. Shallow incorporation of debris is recommended to avoid creating a warm, sheltered environment which would keep the plant tissue and pathogen alive for extended periods of time beneath the soil surface. 3) Plants can be flame-killed with a propane or other torch; and 4) infected plants can be pulled and placed in a small pile covered over with a dark colored plastic tarp and left in the sun. This will create heat in the pile from the sun beating on the plastic tarp and plants will die within a few days. The winter will provide an excellent freeze kill for exposed infected plants. Do not compost late blight infected plant material, as many piles may have warm centers that can allow plant material and the pathogen to remain viable. The goal is to kill the plants and this will kill the pathogen.

Are tomato fruits from late blight infected tomato plants safe to eat?
Healthy-appearing fruit from late blight-infected tomato plants are safe for human consumption. If they have been infected, but aren't yet showing symptoms, they won't keep in storage. There are some concerns about canning infected fruit because bacteria can enter late blight infected fruit and impact quality. UW-Extension food science extension specialist, Dr. Barbara Ingham recommends avoiding canning tomatoes that exhibit late blight infection. Further information:

How fast will late blight infected tomato plants die?
This depends upon how many points of infection the plant received, the cultivar (some cultivars are more susceptible than others), the history of use of protectant fungicides (such as copper), and on the weather. Hot, dry, sunny weather typically holds back late blight; whereas cool, rainy, overcast weather will cause late blight to progress rapidly killing the plant in 7 to 10 days.

I have tomato late blight in my garden – will I get it next year if I plant tomatoes again?
The strain of late blight that we have detected in WI in 2012 (US-23) cannot survive outside of living plants. It requires living plants or plant parts to remain viable and infective. Therefore, it is critical to kill infected tomato plants and plant parts such as fruit. Infected potato tubers can also serve as a source of overwintering inoculum and should be destroyed.

Can late blight be seedborne in tomatoes?
Generally, the late blight pathogen is not considered a seedborne pathogen in tomato.

In order to help better understand the epidemic at hand, please submit samples to my lab or work through your county agent and request that they send to me for genotyping. All we need to know is the county of sample origin, we do not need to have specific field or grower information associated with the sample. Identification of genotype at the county level would be very helpful. Lab address: Amanda Gevens, 1630 Linden Dr, Room 689, Plant Pathology Dept., University of Wisconsin, Madison, WI 53706. Please send infected leaves in a slightly inflated ziplock bag with no paper towel. Overnight shipping is best.

For further information on any fungicides that may be mentioned in this newsletter, please see the 2012 Commercial Vegetable Production in Wisconsin Guide A3422. An online pdf can be found at the link below or a hard copy can be ordered through the UWEX Learning Store.
http://learningstore.uwex.edu/assets/pdfs/A3422.PDF
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 Pathology Webpage:  http://www.plantpath.wisc.edu/wivegdis/

**Early Blight Complex:** Early blight continues to progress in Wisconsin potato and tomato crops. Unmanaged early blight can prematurely defoliate the crop impacting yield and quality. Symptoms may vary as our survey has indicated presence of both classic, bull’s eye dark brown early blight lesions in lower potato canopies (early blight), as well as smaller fleck lesions with slight bull’s eye patterning on upper canopies (brown spot).

Typical foliar symptoms of early blight, caused by *Alternaria solani.*  
Typical foliar symptoms of brown spot, caused by *Alternaria alternata.*

Differences in control of early blight and brown spot were noted in our early blight foliar fungicide trial at the Hancock Agricultural Research Station this past week. Timing of early blight targeted fungicides seemed to play a role in the later season control of brown spot. We will further evaluate the efficacy of the fungicides and their timing and follow up with reports in winter 2012 grower educational sessions.
Early blight has also been seen on tomato fruit in the past week. The symptoms may vary, but typically include sunken and dark brown lesions often on shoulders. In the fruit shown here, irrigation stress was also involved and is evidenced by cracking.

Over the past few years, septoria and early blight have been very problematic on tomato. However, with the dry conditions of much of the growing season, we have not seen these diseases until just recently when we received some rainfall and prolonged dew periods.

**Potato and Tomato Late Blight:** In the past week, late blight has been confirmed on both tomato (Waushara County) and potato (Marathon County) in Wisconsin. To date, the following counties have had confirmed reports of late blight: Barron, Adams, Portage, Oneida, Waushara, and Marathon. All late blight samples that have been tested to date, from potato and tomato, have been of the US-23 strain or genotype.

Management of late blight is critical as unmanaged late blight creates significant inoculum which is readily airborne and can spread to nearby fields and gardens, causing further infection. The Wisconsin Department of Agriculture, Trade, and Consumer Protection (WDATCP) has a policy in place to support protection of the state’s potato and tomato crops due to the potential risk and economic loss that can be had with late blight. Good preventative and reactive stewardship in all production systems (home gardens, commercial farms, conventional, organic) is essential in successfully controlling late blight through the production season and post-harvest in potatoes.

Nationally, new late blight reports from CT (tomato), NY (tomato), OH (tomato), Ontario Canada (tomato) and PA (potato). To date this production year, late blight has been reported in CA, CT, FL, MA, ME, NC, NH, NJ, NY, OH, PA, VA, VT, WI, and Ontario Canada. The website: [http://www.usablight.org/](http://www.usablight.org/) indicates location of positive reports of late blight in the U.S. and provides further information on disease characteristics and management.

In order to help better understand the epidemic at hand, please submit samples to my lab or work through your county agent and request that they send to me for genotyping. We are also offering free diagnostic services for potential late blight samples (along with the UW-Plant Disease Diagnostic Clinic). All we need to know is the county of sample origin, we do not need to have specific field or grower information associated with the sample. Identification of genotype at the county level would be very helpful. Lab address: Amanda Gevens, 1630 Linden Dr, Room 689, Plant Pathology Dept., University of Wisconsin, Madison, WI 53706. Please send infected leaves in a slightly inflated ziplock bag with no paper towel. Overnight shipping is best.
Current P-Day (Early Blight) and Severity Value (Late Blight) Accumulations. *Thresholds for both diseases have been met. Accumulations will continue to be provided until the end of potato production season.*

<table>
<thead>
<tr>
<th>Location</th>
<th>Planted</th>
<th>50% Emergence</th>
<th>P-Day Cumulative</th>
<th>DSV Cumulative</th>
<th>Calculation Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antigo Area</td>
<td>Early 5/1</td>
<td>5/30</td>
<td>587</td>
<td>47</td>
<td>8/20</td>
</tr>
<tr>
<td></td>
<td>Mid 5/10</td>
<td>6/6</td>
<td>549</td>
<td>47</td>
<td>8/20</td>
</tr>
<tr>
<td></td>
<td>Late 6/1</td>
<td>6/16</td>
<td>482</td>
<td>47</td>
<td>8/20</td>
</tr>
<tr>
<td>Grand Marsh Area</td>
<td>Early 4/3</td>
<td>5/8</td>
<td>716</td>
<td>53</td>
<td>8/20</td>
</tr>
<tr>
<td></td>
<td>Mid 4/15</td>
<td>5/16</td>
<td>669</td>
<td>53</td>
<td>8/20</td>
</tr>
<tr>
<td></td>
<td>Late 4/30</td>
<td>NA</td>
<td>614</td>
<td>52</td>
<td>8/20</td>
</tr>
<tr>
<td>Hancock Area</td>
<td>Early 4/1</td>
<td>5/1</td>
<td>801</td>
<td>31</td>
<td>8/20</td>
</tr>
<tr>
<td></td>
<td>Mid 4/15</td>
<td>5/10</td>
<td>743</td>
<td>25</td>
<td>8/20</td>
</tr>
<tr>
<td></td>
<td>Late 5/1</td>
<td>5/17</td>
<td>700</td>
<td>25</td>
<td>8/20</td>
</tr>
<tr>
<td>Plover Area</td>
<td>Early 4/3</td>
<td>5/17</td>
<td>717</td>
<td>43</td>
<td>8/20</td>
</tr>
<tr>
<td></td>
<td>Mid 4/19</td>
<td>5/18</td>
<td>652</td>
<td>43</td>
<td>8/20</td>
</tr>
<tr>
<td></td>
<td>Late 5/1</td>
<td>5/27</td>
<td>589</td>
<td>39</td>
<td>8/20</td>
</tr>
</tbody>
</table>

*Cucurbit Downy Mildew:* has not been identified in Wisconsin at this time in commercial fields, home gardens, or our sentinel monitoring plots. Several states have reported cucurbit downy mildew this season across a wide range of cucurbit hosts in AL, KY, MA, MD, MI, NC, NY, OH, WV. The newest reports within the past 7 days have been on cucumber, winter squash, and Jack-o-lantern pumpkin with closest detects in southeastern MI on cucumber and cantaloupe.

No forecasted risk of movement of spores from states reporting detects to Wisconsin at this time. Disease forecaster, Tom Keever of North Carolina State University reports, “low to moderate risk for cucurbits in southern VA through the Carolinas into eastern GA, parts of southern GA and FL, southwest LA, and near the sources in eastern WV / western MD. Minimal risk to cucurbits most other areas.” The website: [http://cdmpipe.org/](http://cdmpipe.org/) offers up to date reports of cucurbit downy mildew and disease forecasting information.

Early detection and management of this disease is critical. If you suspect downy mildew, please contact your county agent, me, or submit a sample for confirmation.

For further information on any fungicides that may be mentioned in this newsletter, please see the 2012 Commercial Vegetable Production in Wisconsin Guide A3422. An online pdf can be found at the link below or a hard copy can be ordered through the UWEX Learning Store. [http://learningstore.uwex.edu/assets/pdfs/A3422.PDF](http://learningstore.uwex.edu/assets/pdfs/A3422.PDF)
Vegetable Entomology Webpage:  http://www.entomology.wisc.edu/vegento/index.html

Zebra Chip / Potato Psyllids – Potato psyllids have recently been described as the biological vector of the bacterium that is responsible for the disease condition known as ‘Zebra Chip (ZC)’.  

Every week, Dr. Don Henne, USDA ARS scientist located in Weslaco, TX, provides a detailed report on the potato psyllids captured within the trapping network located in the following states:  (Colorado, Kansas, Minnesota, Nebraska, North Dakota, Texas, and now Wisconsin).  At selected locations, a series of yellow sticky cards are placed along linear transects extending into potato fields and checked and replaced weekly to determine the numbers of insects captured.  A portion of these insects are sent to Washington for detection of the bacterial pathogen.  

The mollicute pathogen, *Liberibacter solanacearum*, causing the internal tuber necrosis condition described as ‘Zebra Chip (ZC)’, was recently documented in the Columbia Basin (2011) potato production region in the western U.S. as well as throughout much of Idaho where significant disease has again been observed in 2012.  In 2012, a single trap line (5 sticky traps) was placed in a field in Menominee, WI.  And during the week of 6-13 August, a single adult potato psyllid was captured on a single card at this location, but the infection status of this insect has yet to be determined.  In 2009, our laboratory also collected a total of nine adult potato psyllids from among all of the non-aphid insects captured in the North Central Region’s, Aphid Suction Trap Network.  These insects were obtained from late August collections and were obtained from 4 traps, 3 in MN and 1 in Wisconsin (Spooner, WI).  The epidemiological significance of these new captures is unknown, and the likelihood that we will continue to see increased captures later this fall and into the coming year(s) is also unknown.  This is, however, an area of investigation that we will begin to monitor closely  

The organism apparently causes sugars to accumulate in areas of the tuber instead of starch and affected tubers have necrotic lines throughout the length of the tuber.  In chipping varieties, these areas darken when the chips are fried, creating a striped condition resulting in ZC.  Infested plants produce fewer tubers and yield losses range between 20 to 50%.  Tubers produced on plants that have been infected early in the plant development will prematurely sprout in storage and may result in a condition known as ‘Haywire”.  Severe symptoms include overall yellowing with enlarged nodes, development of clusters of small leaves in the axillary buds that appear rosetted, and the formation of aerial tubers.  Internodes are shortened and the plant eventually is dwarfed and appears pyramid shaped.  The bacterium is transmitted in a persistent manner by the potato psyllid and infected adult insects (and perhaps nymphs) can remain as potentially inoculative for the remainder of their lives.  

The organism causes sugars to accumulate in areas of the tuber instead of starch and affected tubers have necrotic lines throughout the length of the tuber.  In chipping varieties, these areas darken when the chips are fried, creating a striped condition resulting in the name "ZC".  Infested plants produce fewer tubers and yield losses range between 20 to 50%.  Tubers produced on plants that have been infected early in the plant development will prematurely sprout in storage and may result in a condition known as ‘Haywire”.  Severe symptoms include overall yellowing with enlarged nodes, development of clusters of small leaves in the axillary buds that appear
rosetted, and the formation of aerial tubers. Internodes are shortened and the plant eventually is dwarfed and appears pyramid shaped.

Potato psyllids used to be an occasional problem in portions of the western U.S. in certain years when they would migrate into southern states from Mexico. In recent years, however, a more invasive form of the species has been found in portions of south Texas and California and appears to have the ability to overwinter in parts of the southern U.S. Populations of the potato psyllid now occur annually in these areas and have become a chronic problem in several locations along the front range of the Rocky Mountains as well as the inter-mountain west. Potatoes infected with the Zebra Chip pathogen have now been detected in California, Texas, New Mexico, Colorado, Wyoming, Kansas, and Nebraska. The risk of Zebra Chip in Wisconsin is still considered low and this results from the fact that potato psyllids have only intermittently been detected in the state late in the season and in very low numbers.
Antigo Potato Research Field Day Announcement
Alex Crockford, UW Seed Potato Certification Program

We welcome the public again to the Langlade County Research Station Field Day on Thursday, August 23rd at 9:30 a.m. The experimental station is operated by UW Extension with funding and support from the Wisconsin potato industry at the Langlade County Airport (corners of Hwy 64 and Hwy 52 just east of Antigo).

Following the tour and program (complete agenda below) we will meet at the City Park shelter. Questions can be directed to Alex Crockford at 715-527-8939 or abcrockford@wisc.edu.

2012 Antigo Field Day, August 23rd

9:30   Group photograph for UW Seed Potato Certification 100th Year Anniversary (2013)
9:45   Load Wagons
10:00  Program begins in field

Vegetable Pathology Update
. The effect of tillage practices on Fall bed fumigation with Pic Plus
Dr. Amanda Gevens, UW-Plant Pathology and Alex Crockford, UW Seed Potato Certification.
. Potato Early Dying product efficacy trial, Dr. Amanda Gevens

Breeding Program Update
. Wisconsin Variety and Advanced Breeding Line Trial
Bryan Bowen and Mary Lemere, UW Ag Research Stations

Vegetable Entomology Update
. PVY symptom plot, Dr. Amy Charkowski, A. Crockford, R. Hafner, UW Seed Potato Certification
. Best management practices to limit PVY using combinations of foliar protectants
Dr. Russ Groves, UW -Entomology and Alex Crockford, UW Seed Potato Certification

Weed and Herbicide Update
. The evaluation of potato vine dessicants
Dr. Jed Colquhoun and Dan Heider, UW-Horticulture

Potato Production and Storage Update
. Evaluation of fresh market russet and red-skinned varieties
Dr. A.J. Bussan, UW-Horticulture

Common Scab Work
. Potato Common Scab Fungicide Efficacy Trial
Dr. Amanda Gevens, UW-Plant Pathology & A. Crockford, WSPCP
. Breeding for Resistance to Common Scab in Potato
Sarah Braun, Ph.D. Candidate, Jansky