Asparagus miner integrated pest management research update
Zsofia Szendrei, Entomology and Rob Morrison, Ph.D. student

Research in the MSU vegetable entomology lab focuses on integrated pest management (IPM) of the asparagus miner (Ophiomyia simplex (Loew), Diptera: Agromyzidae). This insect is a putative vector for pathogenic species of Fusarium fungus, which is the causative agent for “early decline syndrome” in asparagus fields. Fusarium can shave five to eight years off the life span of an asparagus field, making it economically unsustainable to continue production.

We have been monitoring the abundance of asparagus miners throughout the summer, by counting the adult flies weekly on yellow sticky cards placed at five commercial asparagus fields in the Hart area. We started monitoring in late June, and are still checking traps as of this week.

We observed a peak in adult activity in mid- to late-July and a smaller peak in the second half of August (Figure 1 on page 2). Yellow sticky cards placed at the edge of fields caught more flies (seasonal average: 7.2 per trap) than sticky cards inside the crop (seasonal average: 5.5 per trap). Yellow sticky cards that were placed at canopy level (4 feet from ground) caught more adults (seasonal average: 10 per trap) than sticky cards placed close to the soil surface (seasonal average: 2 per trap).

We are currently in the process of identifying naturally occurring arthropod parasitoid species of the miner, as well as examining their abundance. So far, parasitoids have been identified from the Pteromalidae (most abundant parasitoids of miner), Eulophidae and Braconidae families (Figure 2 on page 2). Forty percent of the miner pupae collected from the five commercial fields was infected with parasitoids. In the future, we will investigate ways in which their efficiency and absolute abundance can be increased in order to better control asparagus miner populations. Projects are currently under way to explore the chemical ecology of the asparagus miner/asparagus system. Specifically, we are interested in host plant finding by the
Asparagus insecticide trial results

Zsofia Szendrei, Entomology and Adam Byrne, research technician

The MSU vegetable entomology lab conducted an insecticide trial in an experimental asparagus field in Hart, Michigan, this summer. We had nine insecticide treatments including six products and tested three application methods (chemigation through drip irrigation, foliar spray, and in-furrow at planting). The asparagus crowns were planted May 19, 2010 and the drip irrigation system was set up June 10, 2010. The only currently registered insecticides in asparagus as used in this trial are Sevin 4F and Radiant SC. Foliar and drip treatments were applied twice during the season. Sampling was done by visually surveying and recording the number of damaged stems or insect life stages weekly. Drip irrigation was used only for chemigation (i.e. plots were not watered throughout the summer), but plots that were not assigned to chemigation treatment received equal amounts of water through the drip system as those receiving a chemigation treatment. Our results indicated that chemigation was able to suppress immature (eggs and larvae) stages of the asparagus beetle and asparagus miner damage. In general, insecticides applied through the drip irrigation performed the best in insect pest suppression, followed by foliarly applied products. In furrow, at planting applications were the least effective in controlling insect pests.

Since this was the first year of this experiment and the field was established this year, pest pressure in general was at low levels especially early in the season. This is likely because pests need some time to immigrate into and colonize new fields.

We will continue to look at the performance of our treatments next season.

Asparagus miner damage on asparagus stem on a scale of 0-5. (0 - no damage; 5 - severe damage).

See addition figures on page 3.
Asparagus beetle egg abundance in our experimental asparagus plot.

Asparagus beetle larval abundance in our experimental asparagus plot.

Onion thrips insecticide trial results

Zsofia Szendrei, Entomology

The weather conditions this year were favorable for onion thrips development; therefore many commercial onion farms experienced unusually high numbers of onion thrips in Michigan. The vegetable entomology laboratory at MSU conducted an onion thrips insecticide trial this summer on a commercial farm in mid-Michigan. This year, we had nine insecticide treatment combinations (see graph with seasonal averages and table at http://bit.ly/onionthrips) with multiple types of insecticides in rotation in each treatment.

Starting in mid-June, 2010, we visually counted thrips on onion leaves, and nymph numbers were recorded weekly. We started applying our insecticide treatments once we reached the 1 thrips nymph per leaf threshold in our experimental plot (June 18, 2010). Thereafter, weekly visual counts were made and insecticides were applied to those treatment plots that exceeded the 1 thrips nymph per leaf threshold. Because of the high thrips abundance this year, only one of our treatment combinations (“treatment code number 6,” see the graph and table for details) suppressed thrips nymph numbers below threshold after week 3.

Unfortunately, numbers climbed back up in “treatment 6” plots at week 5, and so we continued applying insecticides. Our best performing product combination was alternating use of Lannate and Radiant. Although this treatment combination suppressed thrips nymph numbers to the numerically lowest average value, it was not significantly different from other treatments that had also Lannate and Radiant in combination with an experimental product (HGW86). The Movento, Lannate, Radiant combination was also not statistically significant from the lowest average values. Our plan for next year is to include some products that were not tested this year, but may be of interest to commercial onion growers in Michigan.
**Phytophthora, films and fumigants**

Mary Hausbeck, Tiffany Enzenbacher, Brian Cortright, and Sheila Linderman, Plant Pathology

In 2009, Michigan producers grew over 80,000 acres of vegetables that are susceptible to *Phytophthora capsici*, including cucumber, zucchini, summer and winter squash, watermelon, cantaloupe, pumpkin, pepper, eggplant, tomato and succulent bean. The pathogen may overwinter in the soil and persist for many (greater than 10) years. *Phytophthora capsici* is favored by rain and warm temperatures and spreads readily via water. It has also been found in irrigation ponds and surface water sources. Fumigants, combined with good management practices, can reduce the likelihood of infection occurring in the field.

When considering fumigation, it is important to take several factors into account. In Michigan, fumigation is recommended during the fall as soil temperature will more likely be appropriate for effective fumigation. The soil temperature for fumigation is what allows the fumigant to become a gas. If it is too hot, the movement of the fumigant will be too fast. If it is too cold, the fumigant effects will be limited. It is also important for the soil to be at 50-80 percent field moisture capacity. The soil in the seed bed needs to be aerated; avoid hard-packed clumps and limit the crop residues left on the soil.

In order for the fumigant to work, a moisture seal to lock in the fumigant needs to be present. There are two ways to accomplish this task. A plastic film seal can be applied on the soil surface, or machinery seals are another option. Two different plastic mulches are available to producers: virtually impermeable film (VIF) and low-density polyethylene (LDPE). VIF has a nylon layer that holds the fumigant in the soil better than LDPE, potentially increasing effectiveness. However, sometimes vegetables grown in beds covered in VIF will have phytotoxic injury because the fumigant has not completely off-gassed. Fumigants can be injected into the soil with shank or drip applications.

A large-scale field trial (Trial 1) on a commercial farm tested reduced rates of fumigants applied under LDPE and VIF on yellow squash. The trial was established in a field with severe *Phytophthora* disease pressure, and replicated four times in a randomized complete block design. Treatments included 300 lb Methyl Bromide/Chloropicrin (both 67/33 and 50/50), 230 lb Chloro-Pic 60, 150 lb Midas, and 30 and 60 gal Sectagon K54. Each mulch treatment was paired with an unfumigated/LDPE control. Holes were punched in the plastic and seeds were sown after the appropriate off-gassing period had expired. Data on stand counts and yield were taken and analyzed.

In Trial 1, both formulations of Methyl Bromide/Chloropicrin, Sectagon K54, and Midas had significantly less disease than the paired untreated control. The high rate of Sectagon K54, applied as a broadcast treatment and bedded 14 days later, significantly impacted the vigor of squash plants in all replicates. The low rate of Sectagon K54, applied 14 days before bedding paired with VIF, did not impact plant vigor.

Trial 2 compared two rates of unregistered dimethyl disulfide (DMDS, Paladin™) with two rates of Methyl Bromide/Chloropicrin applied under VIF. DMDS at 40 gal (low rate) and 50 gal (high rate) per acre and Methyl Bromide/Chloropicrin 67/33 at 175 lb (reduced rate) and 350 lb (full rate) per acre were tested. ‘Sunray’ yellow squash seeds were sown after the proper off-gassing period had passed with yield and vigor data taken and analyzed.

Both rates of the new DMDS fumigant produced plants with significantly better vigor ratings (rating=1.0) compared to the untreated control (rating=4.0) and the low rate of Methyl Bromide/Chloropicrin (rating=2.0). Both rates of DMDS had higher yields (>136.5 lb) than the untreated control (26.7 lb) and were similar to the high rate of Methyl Bromide/Chloropicrin (171.6 lb). The low rate of Methyl Bromide/Chloropicrin had a significantly lower yield (100.2 lb) than both the high rates of DMDS and Methyl Bromide/Chloropicrin. DMDS is not labeled and is currently for experimental use only.

Remember that fumigation is not the only strategy for limiting *Phytophthora*. Avoid rotating with other crops that are susceptible to *Phytophthora*. Irrigate conservatively only with non-surface water sources, and use drip irrigation whenever possible. Avoid moving farm equipment between infested and clean fields without proper cleaning, and never dump diseased plants and fruits onto a field. Apply fungicides early and often, and scout fields continuously for any sign of disease.

Remember that the pesticide label is the legal document on pesticide use. Read the label and follow all instructions closely. The use of a pesticide in a manner not consistent with the label can lead to the injury of crops, humans, animals, and the environment, and can also lead to civil or criminal fines or condemnation of the crop. Pesticides are good management tools for the control of pests on crops, but only when they are used in a safe, effective and prudent manner according to the label.

**Effective fumigation requires:**
- Proper soil temperatures.
- Proper soil moisture.
- Good soil condition.
- Moisture seal to keep fumigant in soil.
- Proper application depth.
- Proper off-gassing of product. **IPM**

**Managing Phytophthora on winter squash**

Mary Hausbeck, Jennifer Foster, and Sheila Linderman, Plant Pathology

Michigan producers are experiencing significant losses in hard squash from *Phytophthora capsici*. The most obvious symptoms on the fruits are white spores that look similar to powdered sugar on the fruit surface. Eventually, the infected fruits will rot. It is possible to harvest fruits that look healthy, but symptoms of *Phytophthora* appear days later while the crop is in transit or on grocers’ shelves. Symptoms on the roots and crowns include browning of tissue and rot, and...
lesions may appear on the foliage.

The best way to avoid Phytophthora in a field is to take preventive measures before there is an outbreak. If there is a history of Phytophthora in a field, do not plant susceptible crops in the future.

Water management is an important component of managing Phytophthora. Because the disease can spread through water, it is essential that fields be well-drained and that low-lying areas of the field be left unplanted. Overhead irrigation should be sparse and drip irrigation is recommended. Irrigation water should not be drawn from surface water sources as it may be infested with Phytophthora spores.

If Phytophthora is recognized in the field, remove the diseased plants and the surrounding, healthy-looking border plants. Make sure to clean any equipment used in the field to prevent spread to other areas, and discard the infected fruit in an area where crops are not grown. Hard squash and pumpkins can also be planted into raised beds, which allows for excess water to move away from the susceptible root and crown area.

For most crops, applying fungicides early and often is recommended. Many hard squash and pumpkin plants produce large, dense canopies and proper application equipment is often required to achieve adequate protection of the fruits. Air-assisted nozzles will push the fungicide through the canopy more effectively than conventional nozzles. Several fungicides are registered for use on hard squash and pumpkin. In Michigan, some Phytophthora is insensitive to the fungicide mefenoxam (Ridomil Gold, Ultra Flourish). Mefenoxam is no longer effective in these regions.

Fumigants Telone C35, Sectagon-K54, Sectagon 42, and Vapam HL are registered for use on winter squash and pumpkin to control Phytophthora. Please consult the accompanying fumigation article for further information.

If you do not have a history of Phytophthora in your fields, do everything you can to prevent it from occurring. Scout often for disease, rotate only with nonsusceptible crop hosts, and irrigate conservatively from a well. Rotate fungicides in order to prevent the pathogen from becoming resistant.

Remember that the pesticide label is the legal document on pesticide use. Read the label and follow all instructions closely. The use of a pesticide in a manner not consistent with the label can lead to the injury of crops, humans, animals, and the environment, and can also lead to civil or criminal fines or condemnation of the crop. Pesticides are good management tools for the control of pests on crops, but only when they are used in a safe, effective and prudent manner according to the label.

**Recognizing Phytophthora on winter squash and pumpkin**
- Wilted vines and plant death.
- Dark, water-soaked lesions on fruit and leaves.
- White spores on the surface of the fruit that look similar to powdered sugar.

**Management strategies**
- Avoid using surface water for irrigation.
- Plant into well-drained, tiled fields.
- Include rotational crops.
- Use raised beds and drip irrigation.
- Scout fields regularly for Phytophthora.
- Irrigate sparingly from a well.
- Powerwash equipment after it has been in infested fields.
- Remove any diseased plants and adjacent healthy plants.
- Keep fruit off of the ground.
- Apply fungicides preventively and at short intervals when needed.
- Remove fruit from field as quickly as possible and store in a warm, dry place.
- Do not dump diseased culls in production fields.

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**Preferred Fungicides for winter squash and pumpkin**

<table>
<thead>
<tr>
<th>Product</th>
<th>A.I.</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acrobat 50WP, Forum 4.18SC</td>
<td>dimethomorph</td>
<td>--</td>
</tr>
<tr>
<td>Presidio 4SC</td>
<td>fluopicolide</td>
<td>use in a fungicide tank mix</td>
</tr>
<tr>
<td>Revus 2.08SC</td>
<td>mandipropamid</td>
<td>include surfactant</td>
</tr>
</tbody>
</table>

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*Note the wilted vines and sporulating fruits.*
Potato late blight update and late season recommendations

Willie Kirk, Plant Pathology

Late blight was reported in potatoes at the earliest ever recorded date in the last 15 years in Michigan in 2010; June 21. The first report was US-8 in St. Joseph County. Since then there have been several more reports, again in St. Joseph County near the original crop in potatoes close to the original reported crop and in a 60A crop of tomatoes. In addition, there have reports from Mecosta County and Montcalm County through July and August and the most recent in late August from Rogers City, Presque Isle in potatoes. Except for the original report, all the other genotypes have been the new US-22 genotype that was so prevalent in 2009.

All the outbreaks were well contained by the growers, advisors and industry professionals who utilized the integrated management tools available to them developed over the past 15 years of research by the MSU potato pathology research program. These included the use of scouts on a weekly basis; sampling symptomatic plants and sending them for diagnosis; the judicious application of appropriate fungicides early in the season when risk was high; continued application of residual protectant fungicides; desiccation of infected areas. The indication of high risk was communicated early in the season to the industry; this included information from the university that winter temperatures were likely to have resulted in a high likelihood that volunteer tubers would have survived the winter; feedback from scouts that survival of volunteer potatoes was profuse; this intense early scouting resulted in late blight being reported early and the flurry of early protection, which in my opinion resulted in many acres of potatoes being spared from late blight in 2010. The early action of the MPIC in conjunction with MSU to contact growers also alerted growers to the possibility of late blight risk in 2010, which would have had a mitigating effect on the progress of the disease. One further fact for 2010; for all areas of Michigan the accumulated late blight disease severity values for 2010 are among the highest we have recorded in the past 10 years.

Late season disease biology and recommendations

Sporulation in this pathogen is favored by wet weather with moderate temperatures (60 to 80°F), high humidity and frequent rainfall. Under such conditions, the disease can spread extremely rapidly and has the potential to completely defoliate fields within three weeks of the first visible infections if no control measures are taken. In addition to attacking foliage, P. infestans can infect tubers at any stage of development before or after harvest and rot of tubers often occurs in storage following tuber infections.

Symptoms

The first symptoms of late blight in the field are small, light to dark green, circular to irregularly shaped water-soaked lesions (See the MSU Late Blight Bulletin). These usually first appear on the lower leaves where the microclimate is more humid. However, they may occur on upper leaves if weather conditions are favorable and the pathogen has been carried into the field by air currents. Lesions often begin to develop on the compound leaf near the point of attachment to the petiole (which is often cupped) or edges, where dew is retained longest. During cool, moist weather, lesions expand rapidly into large, dark brown or black spots, often appearing greasy. Lesions are not limited by leaf veins, and if formed at leaf tips or edges, they can cause young expanding leaves to be misshapen. As new infections occur, and existing lesions coalesce, entire leaves may become blighted and killed within a few days. On stems, lesions are often initiated at the point of attachment to the stem and leaves become detached shortly after infection. The lesions continue to develop along the length of the stem and even in hot dry weather can remain active.

In the early morning or during cool, damp weather, a white velvety growth may be seen on the underside of infected leaves. This white velvety growth distinguishes late blight from several other foliar diseases of potato. A pale green to yellow border is also often present around lesions. Plants severely affected by late blight also have a distinctive odor resulting from the rapid breakdown of potato tissue. This odor is similar to that produced by chemical vine-kill or after severe frost.

Late blight infection of tubers is characterized by irregularly shaped, slightly depressed brown to purplish areas on the skin. These symptoms may be less obvious on russet and red-skinned cultivars. A tan to reddish-brown, dry, granular rot is found under the skin in the discolored area, extending into the tuber usually less than half an inch. The extent of rotting in a tuber depends on the susceptibility of the cultivar, temperature, and length of time after the initial infection. The margin of diseased tissue is not distinct and is marked by brown finger-like extensions into the healthy tissue of the tuber. In time, the entire tuber becomes blighted and discolored. Late blight rot of tubers is often accompanied by soft rot.

Positive identification of late
Late season disease cycle

Sporangia may germinate at temperatures between 44 to 55°F when free water is present on leaves and form eight to 12 zoospores per sporangium. These swim freely in water films, attach to the leaf surface (encyst), and infect the plant. Encysted zoospores infect leaves by penetrating the leaf surface with a germ tube, either through stomata (breathing pores) or by means of direct penetration. At temperatures of 55 to 70°F, sporangia germinate by means of a single germ tube. Night temperatures of 50 to 60°F accompanied by light rain, fog, or heavy dew, followed by days of 60 to 75°F with high relative humidity, are ideal for late blight infection and development. Tubers may become infected if sporangia produced on the foliage are washed down into the soil by rain or irrigation. Water-borne spores appear to follow stems and stolons in a water film into the soil, reach tubers, and cause infection. Tubers near the soil surface are thus more likely to be infected.

**Phytophthora infestans** can only survive in living potato tissue, and usually survives from year to year in infected tubers placed in storage, in piles of cull potatoes or infected tubers missed during harvest that remain unfrozen over the winter (volunteer potatoes). In the spring, the pathogen can be transmitted from infected tubers in cull piles or volunteers to potato foliage by airborne spores. Infected seed potatoes are also an important source of disease. Some infected tubers may rot in the soil before emergence, and not every potato that emerges from an infected tuber will contract late blight. Sporangia of *Phytophthora infestans* may be spread from infected plants in one field to healthy plants in surrounding fields by wind, splashed rain, mechanical transport and animals thereby continuing the disease cycle. Many reproductive cycles are possible within a season that accounts for the rapid increase in disease once it becomes established in a field.

**Recommendations**

Late in the season it is advisable to avoid excessive irrigation as tubers become infected with late blight when spores wash down through the soil from infected leaves. Late season fertilizer applications should also be limited. Although they will maintain green vines and promote tuber bulking, green and vigorous vines can also be difficult to kill with desiccants and immature tubers are more prone to skinning and therefore infection at harvest. Green vines may also harbor inoculum that can infect tubers during harvest. At the end of the season, petiole nitrate levels should drop down to levels that encourage vine senescence. Vines should also be killed at least two weeks before harvest, especially in blight infected fields. This interval minimizes the chance of tubers getting contaminated with late blight inoculum during harvest, and allows previously infected tubers to decompose in the field. If blight is present in the field or in the vicinity of the field at harvest, it may also be beneficial to spray foliage after vine killing with labeled fungicides to kill living late blight spores on the foliage.

Finally, after harvest if tubers are stored, they should be dry when placed in storage, and the storage air temperature and humidity should be managed so that the tubers remain dry. Condensation of moisture on tubers, resulting from air circulating through the tubers that is warmer than the temperature of the tubers, will cause any late blight present to form spores, and late blight may spread in the pile. Potatoes should be held at the lowest temperature possible consistent with their ultimate use (table stock or chipping). Most fungi do not grow much at temperatures of 38°F or lower, but some development will occur at higher temperatures.

**Chemical control**

Under high disease pressure situations, the programs incorporating Revus products, Forum, Curzate 60DF, Ranman, Tanos, Gavel or Pevicur Flex should be used. Consult your local advisor for appropriate rates and additional combinations. These products must be used in combination with protectant materials such as EBDC or chlorothalonil-based products. New products of note include Tanos [Group 11, duPont, 25% cymoxanil (as in Curzate) + 25% famoxadone]) which should be applied at 6.0 oz/A (No more than 6 applications per year and mixture with Manzate or chlorothalonil recommended; do not mix or follow with a Group 11 fungicide e.g. Quadris, 14 day PHI); and for early blight and white mold, Endura (Group 7, BASF, 70% Boscadin, no more than 4 applications per season maximum of 20.5 oz/A/season, 30 day PHI). Other new very effective products include Revus (Group 40, mandipropamid) and Ranman (Group 21, cyazofamid). Applied within a protectant program all of these products give excellent late blight control. Gavel (zoxamide + mancozeb, Gowan) is also best used as a protectant and has been reported to reduce tuber blight.

Destruction of areas within crops with late blight should follow the rules that 30 rows either side of the newest lesions at the border of the late blight locus and 100 feet along the row (either side) are killed with Reglone or with Gramoxone. Although harsh, trials at MSU have shown that the latent period between infection and symptom development is about seven days and, although not visible, plants within this area are already infected.

In seasons when the severity of weather conditions would not favor severe late blight development, programs based on chlorothalonil [e.g. Bravo WS 6SC, Echo 6SC, Equus 6SC or other formulations], EBDC (e.g. Dithane 75DF, Manzate 75DF, Manex 4FL, Pencozeb 75DF, Polyram 80WP) will reduce the risk of the establishment of the disease. The addition of TPTH 80WP to any of the protectant programs would enhance disease control particularly towards the end of the growing season. (TPTH 80WP has a seven-day pre-harvest interval, also note maximum use rate since 2002 is 11.25 oz per season). Fixed copper-based products (such as Champ and Kocide) can also be used in protectant programs. These products are best used early in programs or immediate post-harvest for killing spores perhaps from adjacent crops and should always be applied at the full recommended rate of application. The observations of individuals responsible for implementing programs should determine when best to change from one product to another.
Of major note, is that the Fungicide Resistance Action Committee (FRAC) has specific recommendations for mixing fungicides with high risk of resistance development. Fungicides are now labeled with a Group number e.g. Headline, Tanos, Quadris, Gem are all Group 11; these fungicides should be not mixed or immediately alternated in a fungicide-based protectant program. The application of these fungicides as stand-alone products has never been recommended by MSU for late blight control. They should always be mixed with a protectant surface residual fungicide and not be used late in the season.

The appropriate placement of translaminar and other systemic products within programs is determined by the mode of action of the product in relation to host and disease development but all products are best used within a preventative protectant program. For example, Previcur, Acrobat, Quadris, Headline, Gem, Gavel or Curzate may be applied to protect new growth early in development. Curzate and Previcur Flex may be applied while the canopy is expanding but before senescence and Forum is most effective during canopy expansion and as a post-senescence product and can be applied up to late crop senescence.

Recommended programs for late blight control are not straightforward. The product of choice may well depend on how and from where the disease has developed. Some possible scenarios are shown in Table 1 where a range of containment procedures is described for susceptible varieties and different levels of disease in the field. **IPM**

### Table 1. Suggestions for appropriate fungicides for late blight control including semi-systemic fungicides under different late blight conditions in susceptible potato varieties.

<table>
<thead>
<tr>
<th>Disease category</th>
<th>Late maturing especially storage varieties</th>
<th>Mid - late senescence</th>
</tr>
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<tbody>
<tr>
<td><strong>a)</strong> none</td>
<td>Curzate or Tanos or Forum or Previcur Flex or Rebus or Ranman + EBDC or chlorothalonil Quadris or Headline or Gem + EBDC or Gavel Omega Champ or Kocide can be added to enhance activity</td>
<td>Curzate or Tanos or Forum or Previcur Flex or Rebus or Ranman + EBDC or chlorothalonil+ Supertin/Agritin+ EBDC or chlorothalonil Chlorothalonil or Gavel (various + ZN) Omega Champ or Kocide can be added to enhance activity</td>
</tr>
<tr>
<td><strong>b)</strong> few random lesions even distribution throughout field (0 - 1% foliar infection)</td>
<td>Curzate or Tanos or Forum or Previcur Flex or Rebus or Ranman + EBDC or chlorothalonil+TPTH or Chlorothalonil fb EBDC+TPTH or Chlorothalonil + TPTH 5 day fb Chlorothalonil (various + ZN) or Gavel</td>
<td>Curzate or Tanos or Forum or Previcur Flex or Rebus or Ranman + EBDC or chlorothalonil+TPTH or Chlorothalonil fb EBDC+TPTH or Chlorothalonil + TPTH 5 day fb Chlorothalonil various + ZN) or Gavel</td>
</tr>
<tr>
<td><strong>c)</strong> one or more (up to 5) loci spreading from the edge of the field or from several centers within the field (1% overall field infection but locally heavily infected plants 5 - 10%)</td>
<td>Curzate or Tanos or Forum or Previcur Flex or Rebus or Ranman + EBDC or chlorothalonil+TPTH kill infected area with Reglone**** fb EBDC+TPTH or Chlorothalonil + TPTH every 5 days until vines dead</td>
<td>Curzate or Tanos or Forum or Previcur Flex or Rebus or Ranman + EBDC or chlorothalonil+TPTH kill infected area with Reglone fb EBDC+TPTH or Chlorothalonil + TPTH every 5 days until vines dead</td>
</tr>
<tr>
<td><strong>d)</strong> partial crop infection large areas infected with up to 20% loss of GLA evenly distributed throughout the field or large areas of the field</td>
<td>Curzate or Tanos or Forum or Previcur Flex or Rebus or Ranman + EBDC or chlorothalonil+TPTH Chlorothalonil (various + ZN) + TPTH kill infected area with Reglone fb EBDC+TPTH or Chlorothalonil + TPTH every 5 days until vines dead</td>
<td>Curzate or Tanos or Forum or Previcur Flex or Rebus or Ranman + EBDC or chlorothalonil+TPTH Chlorothalonil (various + ZN) + TPTH kill infected area with Reglone fb EBDC+TPTH or Chlorothalonil + TPTH every 5 days until vines dead</td>
</tr>
<tr>
<td><strong>e)</strong> 20-100% crop infection with large loss of GLA***</td>
<td>kill infected area with Reglone fb EBDC+TPTH or Chlorothalonil + TPTH every 5 days until vines dead</td>
<td>kill infected area with Reglone fb EBDC+TPTH or Chlorothalonil + TPTH every 5 days until vines dead</td>
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fb followed by:
- GLA Green Leaf Area
- * TPTH has 7 day post harvest interval (max 11.25 oz/Acre/season);
- ** Chlorothalonil has 7 day post harvest interval;
- *** Protectant applications of an EBDC or chlorothalonil-based fungicide should be maintained on a 5 day schedule until the vines are completely dead.;
- **** Infected areas should be treated last and a fungicide should be applied during the exit from the field.
Potato quality can be impacted by excess heat during the growing season. Potato growth begins when soil temperature reaches 40°F and, above this threshold, development is proportional to temperature. So it is not surprising that, during a warm growing season like 2010, the season is shorter and development is faster.

However, temperatures that are too warm, are detrimental to potatoes. According to Dave Douches, MSU professor of potato breeding and genetics, and Chris Long, MSU potato specialist, night temperatures above 70°F increases respiration, which reduces tuber gravity or solid content and causes stem end defects (due to the reversal of translocation of storage carbohydrates).

Daytime temperatures greater than 90°F or any 24-hour period with more than 35 degree-day accumulation (base 40), may enhance internal tuber defects such as heat necrosis, internal brown spot, and hollow heart.

Enviro-weather has two on-line tools that help potato growers assess the degree of heat stress in their potato crop (Figure 1). The first, the “Heat Stress Summary” displays a yearly synopsis of weather factors affecting potato growth. For example, at the MSU Montcalm Potato Research Farm (Entrican, Michigan) (Figure 2), there were more days and more total hours with more than 35 degree-days accumulation (base 40) during the 2010 growing season than in the previous five years. The 2010 growing season also had more nights and more total evening hours with temperatures above 70°F than in the previous five years. Total rainfall during the season is also shown in the summary since water affects stress in potatoes.

The second heat stress tool available on Enviro-weather is the “daily heat and moisture accumulation” table (Figure 3). You can view the daily temperature and moisture information for the current growing season (users can elect to see previous years by changing the date range). In addition to maximum and minimum air temperature and soil temperature at two inches, you can access daily degree-day accumulations (base 40) and soil moisture at four inches.

To access these tools, go to the Enviro-weather site (www.enviroweather.msu.edu) and select your local weather station and the vegetable page. Then, click on “Potato” from the crop list on the left. You will see a list of tools for potatoes.

As always, if you have questions, concerns, comments or suggestions for Enviro-weather, please contact me at (517) 432-6520, bishopb@msu.edu.
Making it in Michigan specialty food show and conference October 26

Do you have a food business idea you want to explore? Or want to make your current food business more profitable? Then mark your calendars for MSU Product Center’s 4th annual “Making it in Michigan” premiere specialty food show and conference. The event will take place on October 26 at the Lansing Center in downtown Lansing, Michigan. For the event agenda and to register, please visit www.makingitinmichigan.msu.edu.

2010 Women in Sustainable Agriculture Conference

This year’s conference will be held November 1-3, 2010 at the Lake Morey Resort in Fairlee, Vermont. This event brings together farmers, ranchers, educators, agricultural service providers and activists to:
- Build production and business skills.
- Share educational and organizational strategies.
- Forge new connections that support farm women.

The conference will feature:
- Intensive skill-building sessions.
- Engaging speakers and practical workshops.
- Small-group, roundtable discussions with other farmers.
- Locally grown food that showcases the bounty of the season.

Join us in celebrating farm women’s accomplishments and help us set the stage for further success.

Registration opens September 7. Fees will range between $100 and $150, depending on the conference options you select. Early registration discounts are available through September 30. Sign up to receive email updates about the conference at http://www.uvm.edu/wagn/?Page=conference/updates.html&SM=conference/sub-menu.html. Visit www.uvm.edu/wagn and click on “2010 Women in Sustainable Agriculture Conference” in the green “Quick Links” box for more information. For questions, please email wagn@uvm.edu.

Weather

Temperatures at SWMREC have averaged mostly normal with highs from 63°F to 80°F and lows 49°F to 69°F and the area received 0.75 or more inches of rain for the week. Conditions are generally dry for the area. Growers are hoping to stretch harvests through September, but this may be difficult for some crops due to warmer temperatures experienced earlier in the season.

Crop report

Virus symptoms have been noted on vine crops and peppers and bacterial diseases continue to be a problem on tomatoes and peppers. Pumpkins and fall squash are being harvested.

Stakes and plastic are being removed from many fields, and the fields are being made ready for fall cover crops.

Corn earworm (tomato fruit worm) has increased in tomatoes since corn is no longer attractive to the adults.

1 - SW Michigan Research and Extension Center

Ron Goldy

2 – Grand Rapids Area

Bill Steenwyk

Weather

The weather cooled down abruptly beginning last Thursday. Rainfall for the past seven days totaled 0.8 to 1.2 inches in most of my district. Sparta and Fremont were at about two inches, while the Fennville Enviro-weather station recorded just 0.55. Seasonal heat accumulation totaled around 2,550 base 50 GDDs in Newaygo, northern Kent and northern Ionia counties. From south of Grand Rapids to the Allegan County line, accumulations averaged around 2,650. South of Allegan County, near the I-94 corridor, totals were near 2,800, with Grand Junction totaling more than 2,900. It has been a very warm summer indeed.

Crop report

Harvest continues in earnest. Some onion growers have seen pretty good yields and quality, but others are harvesting small bulbs where populations remained high. Where the stand was reduced by June/July rainfall, the onions have good size, but yield is reduced.

Celery continues to come in with mixed results. There are good yields and plant sizes to be had, but the heat has kept size and yield down in a number of fields. Aphids (see photo) and spider mites are a problem in many areas. Celery leaf-tier is still present, but pressure is reduced (see photos). We also continue to see a fair number of fields with plants being found to have aster yellows, but symptoms very atypical.
Vegetable Crop Advisory Team Alert  September 8, 2010

11 of the disease (see photo). Harvest will continue through early/mid-October.

Recent plantings of radishes and red beets appear to be doing well.

Sweet corn harvest is over 90 percent complete. Yields continue to be good. Growers continue control measures for European corn borer, corn earworm and western bean cutworm.

My southern Kent County traps held eight European corn borer moths and sixteen corn earworm moths.

Although I haven’t seen many tomato and pepper fields this past week, the harvest appears to continue with acceptable yields. A scout continues to find European corn borer egg masses on peppers.

Zucchini harvest continues with good yields. Hard squash growth and yields are also good, with the exception of the more poorly drained fields that received high rainfall earlier this year.

Acreage of harvested cabbage appears to be modest with product availability continuing below market demand. IPM

4 – Macomb, Lapeer, St. Clair counties

Hannah Stevens

Weather and crop conditions

It remains very dry in the southern part of these three counties with scarcely more than 0.1 inch of rainfall last week, while the parts of Lapeer County, were graced with an inch or more. Very high winds throughout the day yesterday, September 7, were probably hard on plants already short on moisture.

Crop report

The large Prizewinner and Atlantic Giant pumpkins are huge and heavy this year if they were irrigated and protected from insects (particularly squash vine borer) and disease. Giant pumpkin growers who go all-out to grow a winner using some unique methods, but trying to trap-out adult vine borers using pheromone traps should not be one of them. These devices only monitor the population and may draw in more males.

I am still seeing foliar symptoms of gummy stem blight on these as well as on Jack-O-Lantern types although fruit symptoms (black-rot) have not been reported.

Tomato harvest continues to be good on later plantings while flowers produced on earlier plantings during hot weather may have dropped from the vines, reducing current fruit production. Well-tended tomatoes are showing little fungal problems but bacterial issues such as canker and speck are common on foliage, if not fruit. There was a report from the Monroe County area of a large number of corn earworm moths in a pepper field. Also known as tomato fruitworm, the larvae may enter the ear near the calyx and cause the fruit to rot.

Finally, on late season cole crops, the three major worm species, imported cabbage worm, diamond-back moth and cabbage looper seem to be making the final push to reproduce before the season’s end. If the crops are not clean you may find the small cocoon of a very successful parasitic wasp which attacks diamond-back moth larvae. Small larvae of these caterpillars are successfully controlled with Bt products as well other labeled materials. IPM
Weather news

Jeff Andresen, Agricultural Meteorology and Geography

An active jet stream pattern across the Upper Midwest will lead to fall-like weather across Michigan and the Great Lakes region for the next several days and possibly longer. The center of low pressure responsible for the strong winds Tuesday, September 7, will move eastward and out of the region Wednesday, September 8, with gradual clearing and diminishing winds expected by Thursday, September 9. Friday should be mostly sunny and warmer statewide. Temperatures will range from highs from the low 60’s north to the low 70’s south Thursday with lows generally in the 40’s through Friday morning, September 10. Some scattered light frost is possible in low-lying areas across interior sections of the Upper Peninsula Thursday and Friday mornings.

Look for daytime temperatures to warm back into the 70’s to low 80’s by Saturday and Sunday, September 11-12, with lows from the mid- and upper 50’s to low 60’s. The next chance for significant rainfall will be late Friday into Saturday, when a frontal boundary is forecast to move west to east through the region.

One wildcard in the forecast at this point will be remnants of Tropical Storm Hermine, which made landfall in extreme northeastern Mexico Monday night. Current forecast guidance suggests that the remnants of this storm will move northward into the central Great Plains by Thursday, and possibly into the Ohio Valley by Saturday. The odds of rain and rainfall totals will definitely increase Saturday if the residual moisture associated with this system can be drawn northward ahead of the front into Michigan.

Further ahead, medium range forecast guidance suggests a mostly west to east, zonal pattern across North America with an active storm track along the United States and Canadian border. Both the 6-10 day for September 13-17 and 8-14 day for September 15-21 outlooks call for near normal mean temperatures. Precipitation totals for both periods are forecast to range from near normal levels across southern sections of the state to above normal levels across the north.
**ACTUAL AND PREDICTED DEGREE-DAY ACCUMULATIONS SINCE MARCH 1, 2010 (*)**

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| Michigan State University Cooperative Agricultural Weather Service

**CUmulative Precipitation Summary For 09/07/2010**

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* Since weather data for some agricultural stations are not available prior to April 1st, GDD values for those stations during February and March are estimated with closest available station data.

** Distinct normals were calculated as the mean of daily GDD totals at several stations within each district for the period 1951-1980.

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Integrated Pest Management Program
Michigan State University
B 18 Food Safety & Toxicology Building
East Lansing, Michigan 48824 -1302

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