WEEKLY CROP UPDATE
UNIVERSITY OF DELAWARE COOPERATIVE EXTENSION

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Vegetable Crops

Vegetable Crop Insects - *Joanne Whalen, Extension IPM Specialist*; jwhalen@udel.edu

Melons
Continue to scout all melons for aphids, cucumber beetles, and spider mites. Although aphid populations still remain low in most fields, we are starting to see localized infestations. At this time of year, early detection is critical since populations can quickly explode. Over the past week we have started to see an increase in cucumber beetle populations that can start feeding on rinds as adult beetles. It is also the time of year to watch for beet armyworm, yellow striped armyworm, and cabbage looper larvae feeding on the rinds of watermelons. If beet armyworm is in the mix, it is important to select a material that is effective on this insect (refer to the Commercial Vegetable Recommendations) – the pyrethroids do not provide effective control.

Lima Beans
Be sure to scout fields for leafhoppers, spider mites, plant bugs and stink bugs. As soon as pin pods are present, be sure to watch carefully for plant bug and stinkbug adults and nymphs. As a general guideline, treatment should be considered if you find 15 adults and/or nymphs per 50 sweeps. The higher rates of labeled products will be needed if stinkbugs are the predominant insect present.

Peppers
Depending on local corn borer trap catches, sprays should be applied on a 7 to 10-day schedule once pepper fruit is ¼ - ½ inch in diameter. Be sure to check local moth catches in your area by calling the Crop Pest Hotline (302-831-8851) or visit our website at http://agdev.anr.udel.edu/trap/trap.php . At this time, you will also need to consider a treatment for pepper maggot. Be sure to also watch for beet armyworms (BAW) - chemical selection is important once this insect is found in peppers. Be sure to select a material that also has BAW control on the label.

Potatoes
Continue to scout fields for Colorado potato beetle, leafhoppers, and aphids. Controls will be needed for green peach aphids if you find 2 aphids per leaf during bloom and 4 aphids per leaf post bloom. This threshold increases to 10 per leaf at 2 weeks from vine death/kill. If melon aphids are found, the threshold should be reduced by half.

Snap Beans
Continue to sample all seedling stage fields for leafhopper and thrips activity. As a general guideline, corn borer sprays are needed at the bud and pin stages on processing beans. Additional sprays may be needed after the pin spray on processing beans for corn borer and corn earworm. Since trap catches can change quickly, be sure to check our website for the most recent trap catches and information on how to use this information to make a treatment decision in processing snap beans after bloom.

After the pin spray on processing beans, the spray schedule will be determined by a combination of both moth catches and field scouting.

http://agdev.anr.udel.edu/trap/trap.php

http://extension.udel.edu/ag/insect-management/insect-trapping-program/ecb-and-cew-moth-catch-thresholds-for-processing-snap-beans/

Sweet Corn
Continue to sample all fields through pre-tassel stage for whorl feeders (corn borer, corn earworm and fall armyworm). A treatment should be applied if 12-15% of the plants are infested with larvae (regardless of the species). Since fall armyworm (FAW) feed deep in the whorls, sprays should be directed into the whorls and multiple applications are often needed to achieve control. FAW can also be a problem in silk stage sweet corn, especially in outbreak years. The first silk sprays will be needed for corn earworm as soon as ear shanks are visible. Be sure to check both blacklight and pheromone trap catches since the spray schedules can quickly change. Trap catches are generally updated on Tuesday and Friday mornings on our website (http://agdev.anr.udel.edu/trap/trap.php) and the Crop Pest Hotline (302-831-8851). Information on scouting sweet corn and how to use the trap catch information can be found at http://extension.udel.edu/ag/insect-management/insect-trapping-program/action-thresholds-for-silk-stage-sweet-corn/.

Summer Planting Dates for Fall Vegetable Harvest

– *Gordon Johnson, Extension Vegetable & Fruit Specialist;* gcjohn@udel.edu

Late plantings of summer vegetables will go in the field in July and early August. Cool season crops will also be planted at this time for fall harvest. The following are some guidelines for these plantings.

With sweet corn, growing degree days become limiting with plantings after August 1. With an 80 day corn that requires 1400 GDD to harvest, a July 15 planting will be ready to harvest before September 10. A July 25 planting will not be ready until after September 20, and an August 1 planting will not be ready until early October. Past August 5, the risk of frost before corn matures is high. Late plantings will need to be closer together than spring plantings to account for reduced heat unit accumulations that occur as days shorten later in the year.

For cucumbers (pickles and slicers), the latest planting date for Delmarva should be August 7. Experience has shown that after that date yields drop considerably. With summer squash, late plantings can be made until August 10. Pumpkins will need to be planted by July 5 to hit the October markets. Cantaloupes and specialty melons do poorly in cool nights and should not be planted after July 5 unless they are being grown in a high tunnel. While watermelons can be planted up to early July, there are limited markets after early September so last plantings are made in June.

Late tomatoes in the field should be planted by July 10 unless going into a high tunnel. High tunnel tomato plantings for fall harvest should be made by July 20 for best yields. Peppers for fall harvest can be planted in the field up to July 25 and in a high tunnel up to August 10.

Snap bean crops can be planted up to August 10. Baby lima beans should not be planted after July 20 and Fordhook types should not be planted after July 5.

Cole crop planting for fall harvest will begin soon using transplants. Broccoli is transplanted from July 15 to August 20, cabbage from July 15 to August 10, and cauliflower from July 15 to August 10.

Kale and collards should be seeded before August 15 for best yields, transplants can go in up to August 30. Turnips and mustard greens can be planted from late July through the first week in September.

Beets are best planted before August 10 for roots, carrots should be planted by July 5.

Green onions should be planted by the end of August for fall harvest. Overwintering green onions can be planted through October using hardy varieties.

Bulbing onions for overwintering should be seeded from September 1 through September 15 using overwintering specific varieties. Bolting will be a problem if planted too early. If using transplants, planting should not take place until October. Leeks are transplanted from August 1 through August 20. Garlic cloves are best planted November 1 through November 20.

Spinach for fall harvest is seeded August 10 through the end of August for fall harvest and from October 1 to October 20 for overwintering.

Lettuce for heads from direct seeding should be planted during August. Transplanted lettuce for heads best planted from August 10 to September 10. Fall adapted varieties are required. Earlier plantings may be subject to bolting and only bolt resistant varieties should be used. For baby lettuce, field plantings can continue through mid-September.

For all late crops, variety selection is very important. For example, late planted cucurbits such as squash need broad virus resistance. For fall harvested crops, switch to shorter maturing varieties as plantings gets later. When planting late, remember that a few days delay in planting can mean several weeks later harvest. A longer maturing variety may not produce if planted too late. On the other hand, planting several maturities of varieties on the same day will often give long extended harvest in the fall for crops such as broccoli.

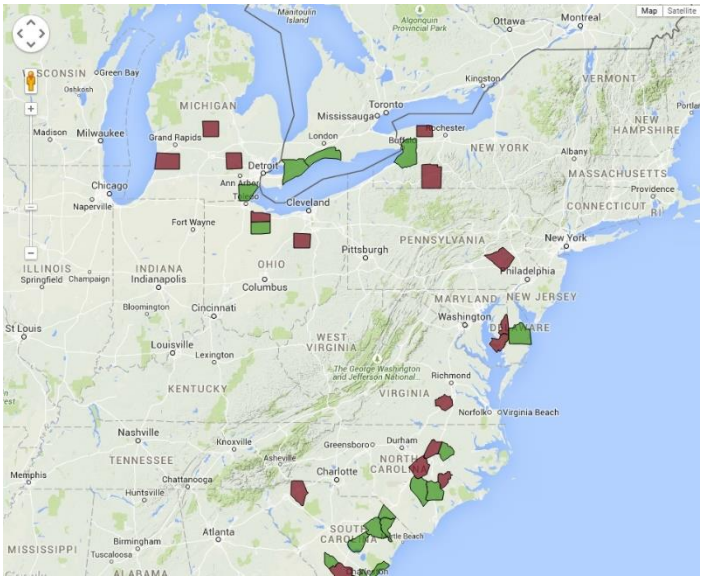
For crops that are transplanted, transplant production will need to start 4-6 weeks before planting. For many of our late planted crops, we are already too late to produce transplants.

High tunnels, planting on black plastic, and using row covers will often require changes in planting dates. For example, lettuce and other leafy greens in high tunnels can be direct seeded through early November. Overwintering crops in high tunnels should be planted much later than field plantings.

Downy Mildew Present on Cucumber on Delmarva

– *Kate Everts, Vegetable Pathologist, University of Delaware and University of Maryland*; keverts@umd.edu

Downy mildew on cucumber was confirmed July 7 on the border of Caroline and Dorchester counties in Maryland and in Sussex County Delaware. It also was found on cucumber in Burks County, Pennsylvania this week. Downy mildew does not overwinter here in the MidAtlantic and must be reintroduced each year. The map here is from http://cdm.ipmpipe.org/ site, which tracks movement of the pathogen throughout the US. The counties shaded red indicate new reports in the last 7 days. Downy mildew is spreading rapidly to new areas. Even though it has only been reported in two Maryland counties and in Sussex Co., I believe it is likely present, but not yet detected in additional counties. Preventative applications are more effective that applications made after disease is detected. Effective products such as Ranman and Previcur Flex should be tank mixed with a protectant and alternated with other efficacious materials such as Zampro, Tanos, Forum or Curzate. Organic cucumber can be protected with copper and Serenade or other biorationals.



Map of reported cucurbit downy mildew distribution on July 9, 2015.

Early symptoms of downy mildew on cucumber.

Late Blight Present on Tomatoes in the Mid-Atlantic Region

– *Kate Everts, Vegetable Pathologist, University of Delaware and University of Maryland*; keverts@umd.edu

Late blight on tomato was confirmed July 7 in Maryland on tomatoes grown at Beltsville. Tomato and potato crops in Prince George's and surrounding counties should be treated with targeted sprays for late blight. All tomato and potato crops should be scouted aggressively for signs and symptoms of late blight.

Specific recommendations for conventional tomato and potato crops can be found at the University of Delaware Commercial Recommendation Guide. http://extension.udel.edu/ag/vegetable-fruit-resources/commercial-vegetable-production-recommendations/. Fungicides such as Curzate, Forum, Presidio, Previcur Flex, Ranman, Reason, Revus Top or Tanos should be tank mixed with a protectant fungicide. Fungicides with different modes of action should be alternated.

Organic tomato and potato crops should also receive sprays for protection. In the few replicated evaluations of organic approved materials for late blight management that have been conducted, copper applied on a regular preventive schedule is the most effective. A program of copper plus Regalia alternated with copper plus Actinovate may reduce disease spread. Information on late blight for organic growers is available at: http://www.longislandhort.cornell.edu/vegpath/photos/lateblight_tomato.htm

Upper and lower surface of leaf infected with late blight. Note white sporulation on the lower leaf surface.

Additional Vegetable Disease Notes

– *Kate Everts, Vegetable Pathologist, University of Delaware and University of Maryland*; keverts@umd.edu

Basil Downy Mildew

Basil downy mildew has been confirmed in Howard County Maryland in a home garden. Excellent information is available from Dr. Meg McGrath at Cornell. Her website, http://vegetablemdonline.ppath.cornell.edu/NewsArticles/BasilDowny.html, includes information on both conventional and organic management options.

Bacterial Spot in Tomato

Bacteria spot in tomato is a perennial problem on the crop. A new tool has just been registered for conventional tomato production. Quintec, which was previously registered for bacterial spot on pepper, is now available for tomato bacterial spot. More information is available at

http://www.growingproduce.com/vegetables/quintec-fungicide-receives-label-for-bacterial-spot-suppression-in-tomatoes/

Watermelon
I continue to see lots of **gummy stem blight** on watermelon. Regular fungicide applications should slow the spread of lesions from the leaves onto the petioles or stems, where yield damage will occur. Our weather has been highly conducive to gummy stem blight. Continue regular fungicide sprays.

Downy mildew on watermelon is also present in Delaware. Effective products for this disease should be added to management programs.

Downy mildew on watermelon.

Powdery Mildew on Summer Squash
Yellow squash fields have powdery mildew, now. For conventional squash, continue applying a protectant fungicide and mix with a targeted products such as Torino, Procure, tebuconazole, Proline, Inspire super, Fontelis, Pristine, or Rally. Rotate materials with different modes of action. Organic producers can use copper and sulfur as well as biorational material such as Regalia, Cease, Sonata, Serenade, Oxidate, and others.

Helping Fruit Set in Tomatoes

– *Jerry Brust, IPM Vegetable Specialist, University of Maryland*; jbrust@umd.edu

The high temperatures we have had this week and probably next week, with daytime highs at 90°F and above and nighttime lows only getting down to 70°F in much of the mid-Atlantic may cause blossom drop and fruit abortion in tomatoes. Ordinarily in tomato fields, pollination is achieved just by the action of the wind. Pollen is released from the tomato flower and falls onto the stigma. Without pollination flowers die and drop. In tomatoes the pedicle turns yellow before the flower falls from the plant (Fig. 1). Tomato flowers must be pollinated within approximately 2 days of becoming viable or they will abort. Tomato plants can tolerate extreme temperatures for short periods, but several days or nights with temperatures above 86°F (daytime) or 70°F (nighttime) will cause the plant to abort flowers (Fig. 2). At these temperatures the pollen can become sticky and/or nonviable, preventing pollination from occurring. The relative humidity also plays a role in pollination with high levels (>80% RH) during pollen shed causing the pollen to be release improperly, resulting in poor or incomplete pollination.

There are some possible remedies to these high temperatures that could increase pollination and fruit set. One of the things I have been working on the last several years is using shade cloth that is draped over the tomato stakes when plants begin to set fruit. Timing of the shade cloth is important, as you cannot put it over the plants during vegetative growth as this will decrease growth. However you also cannot wait too long after fruit set begins or you will lose the advantages of the shade on fruit quality. In my studies with shade cloth and tomatoes, yields were increased in the shaded areas by an average of 30%, quality and size of tomatoes increased significantly when the same varieties were shaded vs. when they were not (Fig. 3). Two years ago, when it was not very hot and we had good rainfall throughout the summer yields still increased in the shaded areas vs non shaded

areas by about 15%. I do not think growers should go out and cover all of their tomato fields with shade cloth, but it could be used for certain tomato varieties that are grown because customers really like them, but the tomatoes just do not produce well in the summer heat. This shade method does not work inside high tunnels as the entire structure needs to be covered to reduce heat, not just the rows inside. There are other trials being conducted to help tomatoes and other vegetables come through the heat, but those results will have to wait.

Figure 1. Several flower pedicels turning yellow (arrows).

Figure 2. Aborted flowers and fruit (arrows) on tomato plant caused by high temperatures

Figure 3. Tomatoes in the bin on the top were harvested from shaded areas with white plastic mulch while tomatoes in the bin on the bottom were harvested from non-shaded areas with black plastic mulch.

Blossom End Rot in Tomato – *Jerry Brust, IPM Vegetable Specialist, University of Maryland*; jbrust@umd.edu

This is just a reminder, with the peculiar weather we have had lately -- stretches of very high temperatures then cooler days along with the very heavy down pours we have had over the last few weeks -- blossom end rot can become a real problem in tomatoes. The sunny days with low humidity will suck water through a plant quickly and the downpours will disrupt calcium movement through the plant. The key is to try to maintain consistent soil moisture while the fruit is developing. Easier said than done, I know, but soil moisture levels need to be monitored as best as they can. When you see something like Figure 1, with all the tomatoes on a cluster with blossom end rot, you know the soil moisture fluctuated greatly over a period of time.

Applying some foliar calcium sprays will help, but the applications can't overcome poor soil moisture management.

Figure 1. All the tomatoes on this one cluster have blossom end rot—indicating poor soil moisture management.

Tomato Ripening Problems

– *Jerry Brust, IPM Vegetable Specialist, University of Maryland*; jbrust@umd.edu

Every year about this time I write something about tomato ripening problems I start to see in the field such as blotchy ripening, yellow shoulders, grey wall, internal whitening, etc. (Figures 1, 2 and 3). By now everyone or most everyone should know that they all have the same root cause; a lower level of potassium (K+) than what is needed by the fruit to ripen properly. One of the more common problems I have seen is internal whitening. Whit this disorder the outside of the tomato appears nice and red, but when cut open there are large areas of white blotches of hard corky tissue which are not confined to the outer wall of the fruit but are found throughout the interior walls of the fruit (Fig. 2). We usually find that the soil potassium levels are adequate or even at high levels for K+, but the tissue samples are low to very low in K+ (2.5-1.5%). These maladies usually start to show up in the field in mid to late July when plants are putting on a heavy fruit load and the temperature and humidity are high. The cause is the same, K+ levels too low in the plant. This is often caused by roots that are concentrated in the top 6-8 inches of soil under black plastic, which can raise soil temperatures to the point where the uptake of K+ and other nutrients are reduced enough to cause ripening problems. Some things I have discussed in the past that help reduce these ripening problems include feeding more K+ through the drip, using foliar sprays to add a little more K+, using white plastic mulch instead of black for mid-season tomatoes and using a 30% shade cover over the tomatoes.

Figure 1. Various forms of ripening problems for tomatoes in the mid-Atlantic

Figure 2. Internal whitening of tomato fruit

Figure 3. Yellow shoulders in tomato

Potato Late Blight Update #12: July 10, 2015 - *Nathan Kleczewski, Extension Specialist - Plant Pathology*; nkleczew@udel.edu

Note: Late blight has been found on a tomato field near Beltsville, MD on 7-6-15. Growers should scout fields ASAP for indications of foliar and or fruit symptoms on potatoes and tomatoes. The website http://usablight.org/ has images to assist you.

	Townsend		Smyrna		Dover	
Date	DSV	Total DSV	DSV	Total DSV	DSV	Total DSV
5/11-5/15	1	1	1	1	8	8
5/15-5/22	3	4	3	7	2	10
5/22-5/28	0	4	0	7	0	10
5/28-6/5	24	28	15	15	8	18
6/5-6/11	12	36	5	20	6	24
6/11-6/19	11	47	8	28	6	30
6/19-6/24	2	49	1	29	3	33
6/24-7/1	9	58	4	33	10	43
7/1-7/7	13	71	5	38	2	45
7/7-7/10	5	76	0	38	0	45

Notes: Season severity of 18 severity values indicates the need for the first fungicide application. An accumulated severity of 7 after fungicide application identifies the need for a subsequent fungicide application.

Green row: May 11th, 2015

See the 2015 Commercial Vegetable Production Recommendations-Delaware for recommended fungicides.

Any suspect samples can be sent to the UD Plant Diagnostic Clinic, dropped off at your local extension office. Dr. Nathan Kleczewski can also be contacted at nkleczew@udel.edu or 302-300-6962.

The website USABlight tracks tomato and potato late blight across the nation and can be found here: http://usablight.org/. Information on scouting, symptomology, and management can also be found on this website.

Explaining Late Blight Lineages - *Nathan Kleczewski, Extension Specialist - Plant Pathology*; nkleczew@udel.edu

Late blight is a disease that we deal with to some extent in the mid-Atlantic each year and there have been some recent reports in the area (MD, NJ) over the last few days. When reports come in you may see something mentioned about the lineage that was detected. US 23? Isn't that a highway?

Each lineage has unique genetic characteristics that may impact management practices and also level of concern in the region. Some lineages prefer to cause disease on potatoes, some tomatoes, and some both. In addition, some are sensitive, intermediate, or insensitive to mefanoxam fungicides. As a quick reference, you can view the recent lineages reported in the United States at the USAblight website http://www.usablight.org/node/52. I have simplified the information for you below.

Genotype	Host	Sensitivity to mefenoxam
US-8	Potato	I/R
US-11	Potato/Tomato	R
US-20	Tomato	I/R
US-21	Tomato	S/I/R
US-22	Potato/Tomato	S/I
US-23	Potato/Tomato	S/I
US-24	Potato	I

Source USAblight.org: Summary of multilocus genotypes of *Phytophthora infestans* collected in the US and Canada, 2002-2009 (from Hu et al., Plant Dis. 2012 and Fry et al., APSnet Features 2012)

Late Blight Look-Alike Detected on Potato Foliage - *Nathan Kleczewski, Extension Specialist - Plant Pathology*; nkleczew@udel.edu

For the second time in 3 years Nancy Gregory, diagnostician at the UD clinic, detected *Phytophthora nicotianae* on the foliage of potato plants. Unlike late blight, symptoms seem to be restricted to the lower canopy, close to the soil surface. The pathogen typically is found in the soil causing pink rot under hot, humid conditions and typically we do not see it on foliage. Continuous potato production and excessive warm, wet days are likely to result in this fungus making an appearance on foliage. Management for *P. nicotianae* on foliage is not required, but if detected it does indicate that you may have a greater potential for pink rot issues later in the season.

Fruit Crops

Spotted Wing Drosophila Increasing - *Joanne Whalen, Extension IPM Specialist*; jwhalen@udel.edu

Population levels found in traps throughout the state increased this past week. Small fruit growers (especially bramble and blueberry growers) will need to maintain their spray schedules for this very damaging insect pest. For more information on management of SWD in fruit, you will want to consider the following resources:

Rutgers Plant Pest Advisory - http://plant-pest-advisory.rutgers.edu/category/fruit/small-fruit/

Michigan State - http://www.ipm.msu.edu/invasive_species/spotted_wing_drosophila

Virginia Tech - http://www.virginiafruit.ento.vt.edu/SWD.html

Agronomic Crops

Agronomic Crop Insects - *Joanne Whalen, Extension IPM Specialist*; jwhalen@udel.edu

Alfalfa
Continue to sample for potato leafhoppers on a weekly basis. Once plants are yellow, yield loss has already occurred. The treatment thresholds are 20 per 100 sweeps on alfalfa 3 inches or less in height, 50 per 100 sweeps in 4-6 inch tall alfalfa and 100 per 100 sweeps in 7-11 inch tall alfalfa.

Field Corn
Although we continue to find Japanese beetles and brown stink bugs in silking corn, population levels are variable throughout the state. The following are general guidelines for management of these two insect pests in silk stage field corn:

(a) Japanese Beetle – Treatment may be needed if silks are clipped back to less than ½ inch before 50% pollination and beetles are present and actively feeding. Pollen shed for an individual tassel generally takes 2-7 days to complete and 1-2 weeks for an entire field (information from Bob Nielson, Purdue University).

(b)Stink Bugs - During the pollination to blister stages, stink bugs can feed through the husk and damage individual kernels. Although we do not have thresholds for our area, information developed in states to our south can be used to make a treatment decision. From the end of pollen shed to blister/milk stage, the threshold

used in the south is one stink bug for every two plants (50% infested plants). Please refer to the following link for more information on stink bug management in field corn http://entomology.ces.ncsu.edu/2014/07/stink-bugs-in-corn/.

Soybeans
We continue to find a variety of defoliators in soybean fields including grasshoppers, green cloverworm, silver spotted skipper, oriental beetles and Japanese beetles. In general, a treatment decision should be based on percent defoliation. Before bloom, the defoliation threshold in full season soybeans is 30% defoliation. Once fields reach the bloom stage, this threshold decreases to 15% defoliation.

Low levels of spider mites and thrips are also present in fields. Although no precise thresholds are available for thrips, as a general guideline, treatment may be needed if you find 4-8 thrips per leaflet and plant damage is observed. Although spider mite populations can start on field edges, be sure to also watch for hot spots of activity in field interiors. Early detection and control is needed for spider mite management.

We are starting to see an increase in stinkbug populations (native green and brown); however, populations are still relatively low. Economic damage from stink bugs is most likely to occur during the pod development and pod fill stages. You will need to sample for both adults and nymphs when making a treatment decision. Available thresholds are based on beans that are in the pod development and fill stages. As a general guideline, we are using a new threshold in the Mid-Atlantic Region: 5 stink bugs per 15 sweeps. This is the threshold for soybeans produced for grain. If you are producing soybeans for seed, the threshold is still 2.5 per 15 sweeps

When is Fungicide Use in Corn Economical?

- *Nathan Kleczewski, Extension Specialist - Plant Pathology*; nkleczew@udel.edu

Each year around this time we receive questions about the chance that fungicide use in corn will pay. The answer depends on several factors including: 1) potential for disease (hybrid resistance level, environment, presence of disease), and 2) economics (grain price, yield potential, and the cost of fungicide application). This article is similar to one I wrote this time last year with some additional information and links.

1) Potential for disease. The first thing you need to do when deciding if you could benefit from a fungicide application to corn this year is to **scout the field to determine how much disease you have and the identity of the disease in question.** The most common diseases of potential concern in Delaware this year are Grey leaf spot and Northern corn leaf blight. These diseases originate from corn residue and can progress up the plant under favorable conditions (wet, overcast, moderate temperatures-see last week's Weekly Crop Update for more information). Both diseases tend to be more problematic in no till fields of continuous corn. Under favorable conditions, these diseases can kill large areas of leaf tissue, placing carbohydrate stress on the plant and increasing the likelihood for yield losses and lodging. Anthracnose is less of a concern as a foliar disease after tassel because most hybrids produce chemicals in their foliage as they develop that inhibit the ability of the fungus to grow on/in newly developing tissue. As a result, anthracnose often is limited to lower foliage and does not progress very far up the plant to a significant degree. Anthracnose can cause a top dieback or stalk rot, but does so by infecting the plant through the roots. Consequently, foliar fungicides are not efficacious for suppressing anthracnose stalk rot or top dieback. For Grey leaf spot and Northern corn leaf blight, if you have greater than 5% severity on the ear leaf or two leaves leaves below the ear in 50% or more plants in the field just prior to or just after tassel then you might consider a fungicide application (Figure 1).

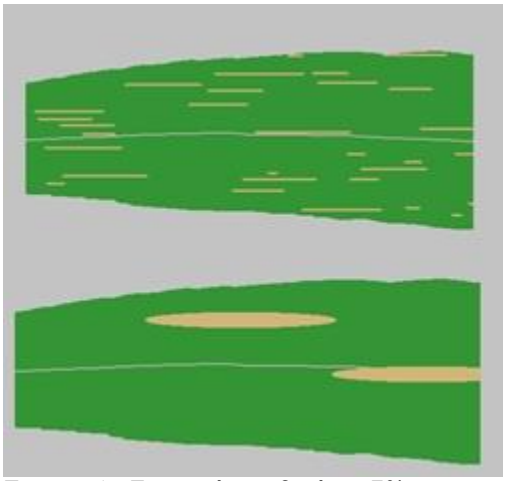


Figure 1. Examples of what 5% severity would look like for Grey leaf spot (top) and Northern corn leaf blight (bottom) of corn.

Other factors also impact the speed of disease development and disease severity. These include **hybrid genetics** and the **environment**. Hybrids with good ratings to Grey leaf spot or Northern corn leaf blight have sets of resistance genes that slow the development of lesions on leaves therefore the rate of disease spread. Susceptible hybrids allow the disease to progress at a normal rate and extensive lesions can develop, resulting in loss of photosynthetic area. Persistent wet, overcast conditions favor disease development. Extremely hot conditions (over 86˚) greatly slow or cease development; however, it may continue once favorable conditions return.

A "worst case scenario" for a residue-borne disease such as Grey leaf spot is a no-till, irrigated field of late-planted continuous corn rated poorly for the disease in question. These fields are more likely to develop disease earlier in the season provide an environment more conducive for continued disease development. **Table 1** provides some guidelines that may help you determine the risk level of your field based on hybrid resistance rating and irrigation practice. Here I use Grey leaf spot as an example.

Table 1. Hybrid resistance rating to Grey leaf spot, irrigation, and potential need for fungicide application. In this table disease is assumed to be present on 50% or more of plants at greater than 5% severity on the ear leaf or two leaves below the ear leaf.

Hybrid Resistance Rating to GLS	Irrigation practice	Potential need for fungicide application (VT-R2)
Highly Resistant	Irrigated	Low-Medium
	Unirrigated	Low
Moderate	Irrigated	Medium
	Unirrigated	Low-Medium
Low resistance	Irrigated	High
	Unirrigated	Medium-High

Economics. With corn around $4.30 per bushel, a greater yield benefit is needed to cover application costs. **Table 2** provides examples of the bushel returns you would need to cover fungicide treatment (applicator cost + product) at different grain prices.

Table 2. The required bushel/acre yield increases required to pay for various fungicide application costs at 5 different grain prices.

Application Cost (per Acre)	Grain Price (bu)				
	$3.50	*$4.00*	*$4.50*	*$5.00*	$7.00
$20	5.7	5	4.4	4	2.9
$25	7.1	6.3	5.6	5	3.6
$30	8.6	7.5	6.7	6	4.3

The likelihood that a fungicide will pay for itself is greatest in situations where disease potential is high, application costs are low, and grain prices are high. Research examining 187 separate corn fungicide studies from around the United States provides some insight into weather a fungicide will pay for itself in corn. Researchers estimated the chance that fungicide application costs ($16-40 / acre) would be covered by the yield return across a range of grain prices ($2-7 / bu). Results of the analysis indicated that **in over 85% of the grain / application** cost combinations, **there was a greater than 50% chance that the application of a fungicide *would not* pay for itself if there was less than 5% disease severity on the ear leaf between R4 and R6. Conversely, 66% of the grain / application cost combinations payed when there was more than 5% disease severity on the ear leaf between R4 and R6.**

Therefore, the greatest chance for a grower to break even or profit from a fungicide is when the potential for disease reaching the ear leaf before R4 is high.

In addition, the study showed that although fungicide use in the absence of significant disease corn can be beneficial, responses are also highly variable from location to location and year to year. For example, fungicide applications reduced corn yields in 26-48% of the studies included in the metaanalysis. Since some companies suggest that products with group 11 fungicides improve stalk strength, individuals may apply fungicides as insurance against lodging. A discussion on the effects of fungicides on stalk strength in the absence of disease is too much for this week, but I encourage anyone interested in the subject to peruse an article entitled, "Are fungicides no longer for fungi? An analysis of foliar fungicide use in corn" by Kiersten Wise (Purdue University) and Daren Mueller (ISU) http://www.apsnet.org/publications/apsnetfeatures/Pages/fungicide.aspx. They have a nice section on foliar fungicides, stalk rots, and standability about three quarters through the article that provides a brief review of some experiments on the subject. Unfortunately there aren't any exciting pictures in the article.

In sum: You need a greater bu/A yield increase this year to cover your application cost. You are more likely to recover this cost in disease favorable environments (no till, irrigated, corn after corn, history of GLS or other common residue-borne diseases) when susceptible hybrids are planted and disease is present on the ear leaf or 2 leaves below the ear leaf on 50% or more of plants just prior to or just after tasseling. In the future, we may want to look more closely at these relationships under Delaware conditions, particularly with such an abundance of products on the market and the amount of irrigated corn acres in the area.

Reference: P. A. Paul, L. V. Madden, C. A. Bradley, A. E. Robertson, G. P. Munkvold, G. Shaner, K. A. Wise, D. K. Malvick, T. W. Allen, A. Grybauskas, P. Vincelli, and P. Esker. 2011. Meta-Analysis of Yield Response of Hybrid Field Corn to Foliar Fungicides in the U.S. Corn Belt. Phytopathology **101**:1122-1132.

Announcements

Blueberry Educational Meeting and Tour

Tuesday, July 14, 2015 6:00-8:00 p.m.
University of Delaware
Carvel Research & Education Center
16483 County Seat Highway
Georgetown, DE 19947

This meeting will highlight our extension IPM program addressing Spotted Wing Drosophila monitoring and management in small fruits as well as ongoing variety testing and other research with blueberries and other small fruit.

• Tour the blueberry variety trial, mulch and soil amendment experiments.

• See and sample berries from the blueberry variety trial.

The meeting will conclude with an ice cream and berry treat.

Please pre-register before July 10 by contacting Karen Adams at (302) 856-7303 or adams@udel.edu.

Ag Law Webinar

Thursday, August 6, 2015 12:00 noon (EST)

The Northeast Extension Risk Management Education Center at the University of Delaware will sponsor a webinar featuring Dr. Shannon Ferrell, Oklahoma associate professor of agricultural economics, Department of Agricultural Economics, Oklahoma State University, discussing the implications of the Resource Conservation and Recovery Act (RCRA) and Clean Air Act (CAA) on animal agriculture, recent litigation, and other legal issues: https://webmeeting.umd.edu/aglaw

Watermelon Twilight Field Day

Tuesday, July 28, 2015 5:30-8:00 p.m.
Carvel Research and Education Center
16483 County Seat Highway
Georgetown, DE 19947

Meet in "The Grove"

Watermelon research to be highlighted will include variety trials, pollinizer trials, pollinizer placement, pollen viability, growth regulators and fruit set, hollow heart, watermelon development, compost and poultry manure use, slow release fertilizers, nitrogen rates, irrigation, drive row management, food safety, grafting, stress mitigation, pest management, and more. Researchers will be on-hand to discuss these projects and answer questions. Light refreshments will be provided.

To register, contact Karen Adams at (302) 856-7303 or email adams@udel.edu.

For additional program information, contact Gordon Johnson, gcjohn@udel.edu, (302)-856-7303, gcjohn@udel.edu.

WANTED
Phytophthora Samples from Vegetables

Samples of vegetable crops such as cucumbers/pickles, watermelons, squash, pumpkins, peppers, lima beans, or tomatoes infected with *Phytophthora capsici* are needed for a research project looking at the diversity and virulence of the disease organism in Delaware. Please email or phone Gordon Johnson at gcjohn@udel.edu, 302-545-2397 or Heather Baker at hnbaker@udel.edu if you have infected plants (stems, roots, or fruits) that can be collected.

Weather Summary

Carvel Research and Education Center Georgetown, DE

Week of July 2 to July 8, 2015

Readings Taken from Midnight to Midnight

Rainfall:

0.89 inch: July 25
0.04 inch: July 25
0.10 inch: July 25
0.06 inch: July 25

Air Temperature:

Highs ranged from 88°F on July 8 to 73˚F on July 2.

Lows ranged from 75˚F on July 8 to 61˚F on July 3.

Soil Temperature:

79.1˚F average

Additional Delaware weather data is available at http://www.deos.udel.edu/monthly_retrieval.html and http://www.rec.udel.edu/TopLevel/Weather.htm

Weekly Crop Update is compiled and edited by Emmalea Ernest, Associate Scientist – Vegetable Crops