VEGETABLE CROPS HOTLINE

A newsletter for commercial vegetable growers prepared by the Purdue University Cooperative Extension Service

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In This Issue

Establishment Failure of Watermelon and Cucumber Transplants Because of Low Soil Temperatures

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Figure 1. Watermelon seedlings planted in a week.

Last week, we were called by a few watermelon growers who reported their newly planted watermelon seedlings were dead (Figure 1). After closely inspecting the affected plants, we did not find any pathogens. This reminded us of what happened to our cucumbers back in early April in our high tunnel. We will review the cucumber story first, and rethink what might have happened to the watermelons.

Cucumbers were planted on March 30 in a high tunnel located at Southwest PurdueAgricultural Center (SWPAC), Vincennes, IN. The lowest air temperature after planting was recorded at 37.5°F inside the high tunnel, which should not be low enough to cause frost damage. However, we lost 40% to 80% of the newly planted cucumbers depending on varieties. The symptoms were similar to water deficiency-caused plant wilt (Figure 2). Most of the dead plants had intact stems, however, we did find wire worms in the stems of a few dead plants. We drenched the soil with Admire® on April 8. Plants were reset on April 9.

Unfortunately, almost all the reset plants died again. The soil was moist, no pathogens were found, and most of the stems were free from the wire worm damage. Why did the plants wilt? Because when soil temperature is below 63°F, the ability of cucumber roots to absorb water is greatly inhibited. As a matter of fact, between March 30 and April 10, more than half the time the soil temperature inside the high tunnel was below 60°F, in the range of 52°F to 67°F. Interestingly, grafted cucumbers with cold tolerant rootstocks all survived at the first planting in the same high tunnel. The dead plants were replanted again on April 14, when soil temperature inside the high tunnel finally stabilized above 70°F, and all the seedlings survived.

Figure 2. Wilt cucumber plants in a high tunnel

Were the watermelon transplant symptoms we observed also caused by low soil temperature? let's take a look at the bare-ground soil temperature recorded at SWPAC in the past weeks (Figure 3). Starting from May 1, average bare soil temperature did not rise above 70°F until May 24. From May 15 to 19, soil temperatures were the lowest. The average bare soil temperature was between 60 and 63°F. Coincidently, the most severely damaged watermelon fields were planted during this time period. It is true that black plastic mulch is expected to increase soil temperature. However, considering the constant rains that occurred in early May, it is likely the plastic was not laid until

recently, and the cloudy days were not help at all. What other factors might contribute to the transplant failure? We noticed the transplants did not have a solid root ball when they were planted (Figure 4). These plants might survive if environmental conditions are ideal. However, under the adverse soil temperature, the weak transplants are more than likely to suffer first.

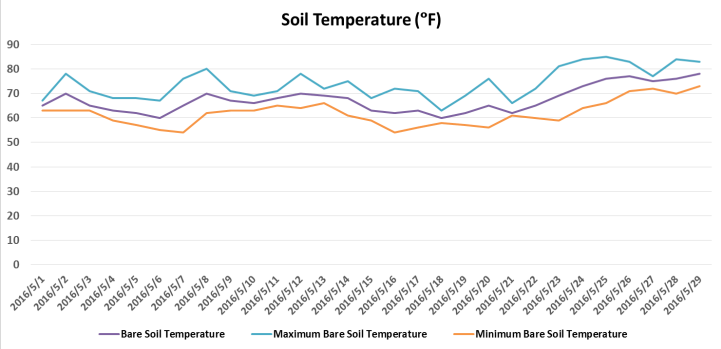

Figure 3. Soil temperature at SWPAC from May 1 to May 29, 2016 (data source: iclimate.org)

Figure 4. Watermelon transplant on the left has a loose root ball compared to transplant on the right. Note the above ground plants are in similar sizes.

We cannot control the weather, but there are a few points we should learn from this year's lessen: 1. If possible, do not plant if anticipated soil temperature is below 65°F at the time of planting; 2. If possible, using transplants that have developed a solid root ball; 3. Lay plastic early in the season to ensure adequate heat accumulated under plastic.

What happened in this season also raises a few research questions that warrant exploration: 1. whether watermelon varieties differ in their tolerance to low soil temperature, considering that varietal difference do exist among cucumber varieties. 2. what are the threshold soil temperatures for watermelon transplant establishment? 3. Whether grafting can be an approach to combat with low soil temperature in watermelon production? Hopefully, we could find answer to the questions in our future researches.

Leaf Mold of Tomato

(Dan Egel, egel@purdue.edu, (812) 886-0198) & (Wenjing Guan, guan40@purdue.edu, (812) 886-0198)

I have observed leaf mold of tomato in greenhouses and high tunnels recently. This article will discuss this disease and management options.

In the last issue of the Hotline, I discussed Botrytis gray mold. I noted how gray mold is favored by the cool, cloudy weather we experienced earlier this spring. The warmer and sunnier weather we have experienced more recently should favor leaf mold over gray mold.

Leaf mold is caused by the fungus *Passalora fulva*. Cercospora leaf mold of tomato is rare in Indiana and is discussed here (https://vegcropshotline.org/article/cercospora-leaf-mold-of-tomato/).

The first symptom of leaf mold one is likely to notice is a pale yellow lesion on the top side of the leaf (Figure 1). When the leaves are turned over, the fungal mold that gives the disease its name becomes evident (Figure 2). Leaf mold often becomes a problem under humid conditions (85% humidity or greater) and temperatures between 71 and 75°F, although leaf mold can cause infections at temps between 50 and 90°F. For the most part, only leaves are affected. The spores produced on the underside of leaves are readily airborne and spread easily from leaf to leaf. Leaf mold is more common in a greenhouse or high tunnel than in the field.

Figure 1. Upper side of tomato leaf with leaf mold.

Figure 2. Underside of tomato leaf with leaf mold.

Tomato plants with resistance to leaf mold are available. For example, we have noticed in our experiments at the Southwest Purdue Ag Center that Mountain Spring is susceptible while, for two years, Red Deuce was resistance. However, the fungus is variable and may overcome resistance. Crop rotation can help to reduce plant residue. If tomatoes are grown year after year in the same location, remove as much of the crop debris as possible from the greenhouse after the last harvest. However, we have observed that even though we remove all tomatoes at the end of the season, leaf mold shows up earlier each year. No doubt, leaf mold would be more severe if more crop debris were left in the soil. Space plants appropriately and prune lower leaves to improve air circulation. Reduce humidity in greenhouses by venting the structure before nightfall. Fungicides are available to help manage leaf mold. The Midwest Vegetable Production Guide for Commercial Growers 2016 has information on what products are labeled for leaf mold of tomato and what may be used in a greenhouse setting. More information on managing tomato diseases in a greenhouse may be found here.

At the Southwest Purdue Ag Center, we are working to find out more about leaf mold. Our current high tunnel experiment aims to:

- Determine how much yield loss or fruit quality loss is due to leaf mold.
- Find out if fungicides are necessary to control leaf mold and if so, which ones.
- Determine if grafted plants have more or less leaf mold and how grafting affects yield and fruit quality.

To find out more about our research, watch this space or come to our next field day!

Bacterial Wilt of Cantaloupe

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This disease has been observed in the southern part of Indiana. To identify bacterial wilt, look for the characteristic wilt and beetle feeding on the leaves and stem (Figure 1). The bacterium that causes this disease, *Erwinia tracheiphila*, is spread by the striped or spotted cucumber beetles. Once bacterial wilt is observed in the field, there is no treatment. To reduce the spread of bacterial wilt, treat for the striped or spotted cucumber beetles. Cucumbers are also susceptible to bacterial wilt. Pumpkins and squash are much less susceptible to bacterial wilt than cantaloupe or cucumbers. Watermelon are not susceptible to bacterial wilt.

Figure 1. Characteristic marginal wilt caused by bacterial wilt. Note cucumber beetle feeding on leaf and on stem in back ground.

Aphids in High Tunnels

(Rick Foster, fosterre@purdue.edu, (765) 494-9572) & (Laura Ingwell, lingwell@purdue.edu)

We have begun to receive the first reports of aphid outbreaks in high tunnels on tomato, pepper, and cucumber (Figure 1). Aphids are a very common problem in high tunnels because the covering excludes rainfall, which is a major mortality factor for small insects like aphids. Some growers are interested in using biological control in their high tunnels because the ability to contain natural enemies within the tunnels increases the likelihood of achieving control. Based on our experience, we believe that lacewing larvae hold the greatest promise for successful biological control of aphids in high tunnels. Because they don't fly, they are less likely to leave the high tunnel than many other biological control agents. There are a number of biological control suppliers who can provide lacewing larvae for growers.

Figure 1. Aphids on tomatoes in a high tunnel (Photo credit Wenjing Guan)

For growers interested in chemical control, some of the insecticides that could be expected to provide good control and are legal to use in high tunnels include Admire Pro®, Lannate®, Assail®, Belay®, Beleaf®, Exirel®, and Fulfill®. Be sure to confirm that the product you choose is labeled for your particular crop.

Corn Earworm

(Rick Foster, fosterre@purdue.edu, (765) 494-9572)

I continue to catch low numbers of corn earworm moths in my pheromone trap. Although the numbers are low, growers with very early sweet corn that is in the reproductive stage should be alert for potential damage. The threshold for spraying sweet corn that matures prior to field corn silking is only one moth per night. My cooperators at the Purdue Ag Centers around the state are putting up their earworm pheromone traps today (June 6), so by the time you receive this newsletter, we should have data available on moth catches around the state, which you can access at https://extension.entm.purdue.edu/cornearworm/index.php. As I suggested in the last edition of the Vegetable Crops Hotline, I have found corn earworm larvae feeding in the whorl of my knee high sweet corn, planted April 18.

Colorado Potato Beetles on High Tunnel Tomatoes

(Rick Foster, fosterre@purdue.edu, (765) 494-9572) & (Wenjing Guan, guan40@purdue.edu, (812) 886-0198)

Last week we had a report of an infestation of Colorado potato beetle larvae on tomatoes in a high tunnel (Figure 1). Potato beetles are a pest of most of the solanaceous crops (potato, tomato, eggplant, pepper), but they rarely become a serious problem on tomato in Indiana. In addition, we have not seen them in high tunnels before, so this is a new problem for us. There are a number of insecticides that are labeled for use on Colorado potato beetles, but that list gets much shorter when the problem is in a high tunnel. Remember that in Indiana, a high tunnel is considered a greenhouse, so insecticides that are prohibited in greenhouse cannot be used in high tunnels. The effective products that could be used in this situation are Admire Pro®, Intrepid®, Entrust® and Exirel®.

Figure 1. Colorado potato beetle larvae.

How Much Nitrogen is Too Much for Pumpkins

(Wenjing Guan, guan40@purdue.edu, (812) 886-0198)

We sometimes hear that excessive nitrogen could delay fruit set, stimulate excessive vine growth, and depress overall yield of pumpkins, but it is often unclear how much nitrogen is too much. This article reviews research on nitrogen fertilizer rates for pumpkins, and discusses the potential factors that might affect the recommended nitrogen rate.

In a study conducted in 1987 and 1988 in Kilbourne, IL, four nitrogen rates were compared: 50, 100, 150 and 175 lb N/acre. The first three rates (50, 100 and 150 lb N/acre) were applied through fertigation, while the highest rate (175 lb N/acre) was applied preplant and about a month after seeding. The study found the highest early and total marketable yields were obtained with fertigation of 100 lb N/acre. The lowest total yield was associated with the lowest nitrogen rate (50 lb N/acre). Fertigation with 150 lb N/acre and dry-blend with 175 lb N/acre delayed the start of flowering and reduced marketable yield.

In another study conducted in 1995 in Geneva, N.Y, three nitrogen rates (60, 100 and 140 lb N/acre) were compared. All the fertilizers were preplant applied and sidedressed when vines began to run. Interestingly, there was no difference in yield among the three nitrogen treatments. As the year was very dry, the author suggested higher yield might be expected from additional N input if there was more soil moisture.

In the third study conducted in 1996 and 1998 in Champaign, IL. Five N rates (0, 50, 100, 150 and 200 lb N/acre) were applied following each of the four cropping systems: 1) pumpkins following corn, 2) pumpkins following soybeans, 3) pumpkins following 2-years corn, and 4) pumpkins following fallow ground. Models were established. According to that, optimal N rate for pumpkins following soybean was 100 lb N/acre, following fallow ground was 115 lb N/acre, following corn was 134 lb N/acre and following 2-years of corn was 159 lb N/acre.

A more recent study on no-till pumpkins was conducted in 2003 in Waynesville, NC. Rye and wheat cover crops that were killed with paraquat before planting were used as covers. Nitrogen fertilizers at four rates (0, 36, 71, 107 lb N/acre) were broadcast applied. The highest rate (107 lb N/acre) applied maximized pumpkin yield. The author suggested that higher yield might be possible with even greater N rates. This study indicated that more N fertilizers are needed in no-till pumpkins than conventional tillage pumpkins.

As we can see from the research, optimal N rates are related to several factors such as fertilizer application methods, soil moisture level, previous crops, production system etc. Although we can not provide a cut-off number in the case of how much nitrogen is too much, hopefully, this literature review will be helpful for you to decide the fertilizer rate for pumpkins.

Veggie Extras

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If you visit the *Vegetable Crops Hotline* on-line, be sure to visit our new addition: Veggie Extras. The articles that you'll find when you click on the Veggie Extra link include brief observations, photos, research updates or in-depth subjects that we hope the vegetable professional might find interesting. Articles that are in the Veggie Extras might not be of immediate importance; therefore, Veggie Extra articles will not be included as part of regularly scheduled newsletters. However, we will keep you informed of new Veggie Extra posts with announcements through email. Thank you for your continued support of the *Vegetable Crops Hotline*.

Vegetable Disease Blog

(Dan Egel, egel@purdue.edu, (812) 886-0198)

Individuals who have visited Dan Egel's blog will notice a new look when they next visit. All articles have been migrated to a new site that will be maintained on the *Vegetable Crops Hotline* site. There is no need to change your bookmark and the same URL veggiediseaseblog.org will work. However, the site is new and improved. All of the articles that Dan writes for the *Hotline* and for *Veggie Extras* will be housed at the new blog site.

Upcoming Events

(Wenjing Guan, guan40@purdue.edu, (812) 886-0198)

Beginning Farmer Tours

June 25, 2016: Silverthorn Farm, Rossville. Organic fruits and vegetables, pastured pork and working with restaurants.

July 14, 2016: Melon Acres, Oaktown. Community-supported agriculture and agritourism.

Sept. 29, 2016: River Ridge Farm, Roann. Four-season vegetable farming, operating an on-farm store, and farm-to-school programs.

The tours are free, but registration is required. Registration at https://mdc.itap.purdue.edu/wk_group.asp?wk_group=BeginFarmer

For more information about the Beginning Farmer and Rancher program, or the farm tour schedule, contact Kevin Gibson at (765) 496-2161 or kgibson@purdue.edu.

Illinois Pumpkin Field Day

Dates: August 31, 2016

Location: Ewing Demonstration Center, 16132 N. Ewing Rd; Ewing, IL 62836

For more information, contact Nathan Johanning at (618) 687-1727 or njohann@illinois.edu

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