VEGETABLE CROPS HOTLINE

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

Issue: 691
June 17, 2021

In This Issue

Time to Scout for Squash Vine Borer (SVB)

(Laura Ingwell, lingwell@purdue.edu, (765) 494-6167)

For some, we may often forget about the pesky squash vine borer until it's too late. This pest of cucurbit crops tends to be sporadic in our region; you are either battling it every year or it hardly makes an appearance. And, unfortunately, our urban farmers tend to get hammered. While it is not so much of a problem on large farms, with many acres of cucurbits, small farms and organic growers tend to be the most impacted by this pest. The squash vine borer is a member of the clear-winged moths, a unique group of moths that are active during the daytime (Figure 1).

Figure 1. An adult clear wing moth, the larvae of which is the Squash Vine borer. (Photo by John Obermeyer.)

They are very beautiful with their bright colored orange tufts on their legs, but can be devastating. The insect overwinters as a late instar larvae or pupa in the soil. In our region, as the soil warms, they complete their development and adults emerge around mid-June. There are multiple ways to monitor for this pest, but currently I have bucket traps available for anyone who would like to host one and report moth catches to me. The traps are equipped with a pheromone lure that smells like the females, and pulls the male moths into the bucket. We place a strip in the base of the bucket trap that has been impregnated with insecticide, and will therefore kill the adult males that make their way in (Figure 2).

Figure 2. Bucket traps, such as this one, are available to catch the adult Squash Vine Borer. (Photo by John Obermeyer.)

Trapping adult male moths can help us better understand their biology, peak emergence, and timing of management strategies. Within three days of adult emergence, the females are ready to begin laying eggs. They lay eggs singly on the stem of the plant. The eggs are small, reddish-brown and each individual female can travel up to one mile and lay 150-200 eggs in a lifetime. The eggs will hatch in 6-11 days after being laid on the plant. The larvae that hatch then burrow into the stem, where they remain, protected and feeding on plant tissues. Their feeding disrupts water and nutrient transport in the plant, resulting in the plant wilting and ultimately dying if the main stem is attacked. The larvae remain in the plant, feeding for 24-27 days, before dropping into the soil to pupate. SVB damage can be distinguished

from other squash pests by the identification of the entry site of the larva into the stem and the presence of frass (insect poop) that looks like sawdust (Figure 3) In northern states (Wisconsin and Minnesota) there is only one generation per year. Here, in Indiana, we may experience two, with the second larval feeding damage occurring in Sept-Oct and often happening on ripening fruits (Figure 4). Cooperation with trapping will help us better understand these dynamics.

Figure 3. Entry site for the larvae of the Squash Vine Borer on a cucurbit stem. (Photo by John Obermeyer.)

Figure 4. Larvae of a squash vine borer in a fruit. (Photo by John Obermeyer.)

Management Strategies

Selecting resistant varieties is one method to reduce the damage. In general, this pest prefers varieties that have soft, wide stems. Selecting varieties that have narrow and more woody stems deters the pest. Selecting vine-type varieties over bush-type is beneficial because the vine-type can root at their nodes and lessen the damage to the overall plant. SVB are least attracted to varieties of *Cucurbita moschata* (Dickinson pumpkin, butternut) and *C. argyrosperma* (Green striped cushaw) compared to *C. maxima* and *C. pepo* varieties.

Crop rotation is an important preventative measure. This is most effective if you have large acreage and can rotate the location of susceptible cucurbits at least one mile from the previous year. For our small farmers and urban farmers, this may not be feasible. In that situation, growing cucurbits on a every other year rotation cycle is best.

Sanitation is another preventative measure to take. Do not leave wilting and infested plants in the garden or on the compost bin next to the garden. The pests can survive and reinfest the following year. Burning the crop residue or disking/tilling at a depth of at least 5 cm can destroy the overwintering larvae/pupae.

Using row covers to prevent the adults from reaching the plants is effective on small cropping areas. The covers can be installed when the crop is seeded/transplanted or can be placed over the crop when adults are caught in pheromone traps. The cover needs to be installed securely to prevent the females from reaching the vines and ovipositing on the plant. If you have not rotated your crops, covers may actually be detrimental because you could trap emerging adults underneath them. Pollination is also important in this crop, so removing the covers when trap catches are no longer happening or when you have 50% of plants blooming is necessary so you do not hinder pollination.

Pesticide applications can be effective on both conventional and organic farms. The important thing to consider is the exposure of pollinators to residues when applications for SVB co-occur with crop flowering. Pyrethroids remain an effective class of insecticides to manage this pest. For organic growers, formulations of Spinosad and *Bacillus thuringiensis* are also effective. The most important factor with pesticide control is making applications close to egg hatch so that larvae ingest the toxins prior to burrowing into the stem, where injections of the product would be needed to get control. As always, consult the *Midwest Vegetable Production Guide* (ID-56) found here when selecting a pesticide and be sure to check the label.

If you want to host a trap on your farm, call me at (765) 494-6167 or email lingwell@purdue.edu.

Black leg of Potato

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

This disease can cause loses by the wilt and decline of plants. This article describes the symptoms and management of two similar diseases of potato both known as black leg caused by different bacterial pathogens.

Both black leg diseases have similar symptoms. Often the first symptom one might observe is reduction in plant emergence. After emergence, one might notice stunting or wilting of the plant. Eventually, the stem may appear black and rotten. These symptoms usually occur from the ground up. This is because the infection often starts in the seed potato and travels up the stem. Severely affected plants may collapse.

Figure 1. Black leg of potato may cause a wilt of potato plants.

Figure 2. Black leg of potato often causes the stem to become black and rotten.

Black leg symptoms can also be observed on upper portions of the stem; this is known as aerial black rot. Such symptoms can be caused when bacteria are blown onto the upper stem from affected areas on the lower stem. Wounds on the stem are often where black rot symptoms start. Rain splash is usually necessary to cause the spread of aerial black rot.

The bacteria that cause black leg can also cause tuber rot symptoms in storage or transit. Small, off-white lesions may start on the surface of the potato and expand into the potato. Tubers may become slimy and mushy.

Black leg of potato usually starts by introduction of infected potato seed pieces. However, the bacteria may survive in soils for approximately 2 years or longer in plant residue. The bacteria may also be introduced from cull plies or volunteer potatoes from previous years.

Until about 2007, black rot was known to be caused by bacteria identified as *Pectobacterium* spp. (older literature may identify this bacterium as *Erwinia* spp.). More recently, bacterium in the Genus *Dickeya* have been identified in the US. The *Dickeya* bacteria are known to be generally more aggressive than *Pectobacterium*. Black leg of potato caused by *Dickeya* has been confirmed in Illinois, but not in Indiana. Black leg caused by *Pectobacterium* is widespread throughout the US.

The first step in successful management of black leg of potato is to accurately identify the disease. It is important to know which species of bacteria may be causing black leg in your operation. Plus, other diseases and maladies may be mistaken for black leg. Since the species of bacterium that cause black leg cannot be differentiated on site, a laboratory diagnosis is recommended. Contact the Purdue Plant and Pest Diagnostic Laboratory if you suspect black leg of potato or Dan Egel (contact above).

Seed source is an important factor in avoiding black leg of potato. Use seed certified as black leg free. Avoid planting potatoes in a potato field known to recently have been confirmed with black leg. Remember that cull plies may also spread the pathogen. During the season, excessive nitrogen and irrigation may increase severity of black leg. Copper products may decrease the spread of aerial black leg. Inspect tubers carefully for symptoms of black leg and maintain storage conditions to avoid excessive temperatures. Warm seed potatoes to at least 50 F to cut and handle. Store seed at 40-42 F and 85-90 percent relative humidity. Harvest when soil temperatures are 50-65 F. Tuber temperatures should be at least 50 F at harvest. Avoid injury to tubers.

Herbicide Drift on Tomatoes

(Stephen Meyers, slmeyers@purdue.edu, (765) 496-6540)

Off-target herbicide movement, whether from on-farm or neighboring farms, is not a new problem. However, in recent years it has been on the top of more minds. Although many crops seem to recover from an off-target herbicide event, vegetative recovery does not always imply that all is well.

To illustrate this point, let’s look at the impact of low-doses of dicamba on tomato:

Dicamba is considered a synthetic auxin herbicide. Auxin is naturally occurring in plants and in combination with other plant hormones helps to regulate plant growth, including cell elongation. However, at higher than normal rates auxin can cause uncontrolled cell division and the destruction of vascular tissues which transport water and sugars

throughout the plant. At even higher concentrations, auxin can stop cells from dividing and stimulate the production of ethylene. The production of ethylene, “the plant stress hormone”, results in tomato stems that are twisted following dicamba exposure (Figure 1). The bending and twisting of plant stems and petioles in response to ethylene is known as epinasty and typically occurs within days of exposure (Figure 2).

Figure 1. Epinasty (stem and petiole bending or twisting) of tomato 5 days after dicamba exposure (Photo by J. Arana).

Figure 2. Tomato plants 5 days after exposure to a 1/10X (left) compared a non-treated plot (right) (Photos by J. Arana).

In research trials tomato plants exposed to a 1/10X rate of dicamba looked healthy and similar to non-treated tomato plants one month after exposure (Figures 3a-3c). Despite recovery of vegetative plant parts, tomato yield can be drastically reduced. Tomatoes exposed to a 1/10X rate of dicamba at the early bloom stage had approximately 75% fewer flowers than non-treated control plants (Kruger et al. 2012). Those exposed at an early vegetative stage had approximately 55% fewer flowers than the non-treated control. The reduction of flower number in response to herbicide exposure resulted in a 30% to 70% reduction in tomato fruit yield. Dicamba exposure also delayed tomato fruit maturity and ripening.

Figure 3a. Tomatoes 1 month after exposure to a full rate of dicamba (Photo by SC Weller).

Figure 3b. Tomatoes 1 month after exposure to a 1/10 X rate (10% of the full rate) of dicamba (Photo by SC Weller).

Figure 3c. Tomatoes from an untreated check plot that was not exposed to dicamba (Photo by SC Weller).

The trend in yield reduction is similar among other classes of herbicides as well. In general, the greater the initial visual injury symptoms, the greater the impact on tomato yield.

For more information on herbicide drift risk management in specialty crops, visit the North Central IPM Center https://ipm-drift.cfaes.ohio-state.edu/

Literature Cited:

Kruger, GR, WG Johnson, DJ Doohan, and SC Weller. 2012. Dose response of glyphosate and dicamba on tomato (*Lycopersicon esculentum*) injury. Weed Technology 26:256-260.

Summer Cover Crops for Vegetables

(Liz Maynard, emaynard@purdue.edu, (219) 548-3674)

As spring crops finish up, areas where no crop is planned for a month or more are good candidates for a summer cover crop. A number of species reliably establish well in the summer. The best one for a particular situation will depend on the length of time available, the desired benefits, and the following crop. Three examples used in Indiana are provided here.

Sorghum-sudangrass and sudangrass are both excellent for building soil and very competitive against weeds. They can grow to 8 ft. tall. If that much height isn't desirable, they can be mowed one or more times. They can be flail mowed and mechanically incorporated while still green. If left to grow they will be killed by frost and form a thick mat of residue. When ground will be open 6 to 8 weeks or more these crops can be a good fit. Broadcast seed at 40-50 lbs/A or drill at 35-40 lbs/A.

Figure 1. A cover crop of sorghum-sudangrass emerging in late June.

Buckwheat is ranked very good for soil building and excellent for fighting weeds. It germinates, establishes, and flowers quickly, sometimes as soon as three weeks, so is a great choice when there are just a few weeks of cover needed. The flowers attract beneficial insects and pollinators. However, if seed matures it can germinate to become a weed in a future crop. To avoid this, terminate within 7 to 10 days after flowering begins. Many producers report that buckwheat leaves the soil in excellent condition prior fall crops of greens. It breaks down quickly once killed. It will be killed by frost. Broadcast at 96 lbs/A and incorporate into soil, or drill at 50-60 lbs/A.

Figure 2. A cover crop of buckwheat in full bloom in late August.

Cowpea is ranked good for soil building and fighting weeds, but as a legume, ranks very good for fixing nitrogen. It may fix 50 to 120 lbs N/A. It is a good crop for hot, dry weather. The plants attract a variety of beneficial insects. Many varieties of this crop are grown for human consumption, and known as southern pea, crowder pea, or black-eyed pea. Viny types are best for cover crops. Bloom occurs 60 to 90 days depending on variety. Cowpea will break down and release nutrients most quickly if incorporated while still green. Mowing or rolling can be used before incorporating to reduce regrowth. Cowpea will be killed by frost. Broadcast 100 lbs/A and till to cover seed, or drill 30-90 lbs/A. To gain benefits of nitrogen fixation, use a rhizobium inoculant meant for cowpea.

Figure 3. A cowpea cover crop in late September.

Additional options include oats, pearl millet, Japanese millet, crimson clover, and soybean. An excellent resource to learn more about these cover crops as well as others is the Midwest Cover Crops Council at http://mccc.msu.edu. The cover crop decision tool can be used to identify options that fit a desired planting window and address specific goals. Indiana-specific information sheets are available for the various cover crops. The site also includes chapters from Managing Cover Crops Profitably, 3rd Edition, and links to relevant publications from around the Midwest. For small-acreages, the publication Cover Crops in the Home Garden provides seeding rates per 100 sq. ft.

Corn Earworm Trapping for the 2021 Season is Beginning

(Laura Ingwell, lingwell@purdue.edu, (765) 494-6167)

We have begun our state-wide trapping and monitoring program for corn earworm (Figure 1). The latest trap catch information can be found here. Traps have been placed at seven Purdue Agricultural Centers throughout the state. Trapping will begin June 17, 2021. Please refer to E-31 to learn more about corn earworm identification and management.

Figure 1. Corn earworm adult on silk. (Photo by John Obermeyer.)

Management and insecticide sprays target the eggs that are laid on fresh corn silk. If no field corn in the area is silking, which is true for most this year, use a threshold of 1-3 moths per night per pheromone trap. You only need to spray your sweet corn if it has silk present. We recommend the first application around 50% of plants at silk stage. When field corn begins to silk and green silk is present the threshold increases to 10 moths per night in the trap. Eggs are laid individually on developing silk. They hatch within 2-5 days and the larvae follow the silk channel down into the developing ear to feed. Once inside the ear, there is no effective control. Therefore, monitoring and spray coverage are key. You want the hatching larvae to experience a lethal dose. See ID-56 for a complete list of spray recommendations, but briefly for organic production Bt products (Entrust®) are available and provides good control. For conventional commercial growers, we recommend Coragen® followed by Radiant®.

While there is no established threshold for trap catches and damage to hemp, we are also monitoring in this crop as CEW damage the buds. If you would like a trap in your area, especially if you are a hemp producer, please contact me at lingwell@purdue.edu.

How Likely will Drought Develop or Worsen in Indiana?

(Beth Hall, hall556@purdue.edu)

The news of the disastrous drought and extreme heat in the western United States (US) have local folks wondering if Indiana might be next. The latest release of the US Drought Monitor map (Figure 1) shows the exceptional drought in the western states as well as the expansion of extreme and exceptional drought in the north-central U.S. Currently, the lower Midwest states (that includes Indiana) seem to have been moderately spared and shorter-term forecasts and climate outlooks are suggesting relatively regular rainfall relief over the next several weeks. It is still early in the growing (and warm) season, so a drought in Indiana is not out of the question. However, the rest of June appears to be likely to receive above-normal precipitation. Combine this chance with the likelihood of above-normal evapotranspiration rates, Indiana is unlikely to gain too much ground in replenishing groundwater or surface water supplies. Figure 2 shows the additional precipitation needed (in inches) to bring the Palmer Drought Index to within normal ranges for this time of the year. With the exception of southeastern Indiana, the rest of the state needs anywhere from a little bit of rain (i.e., a trace) to as much as 9 inches (northern counties). That is a lot of rain needed for northern Indiana – particularly for an area of the state that already has below-normal groundwater levels and irrigates the most.

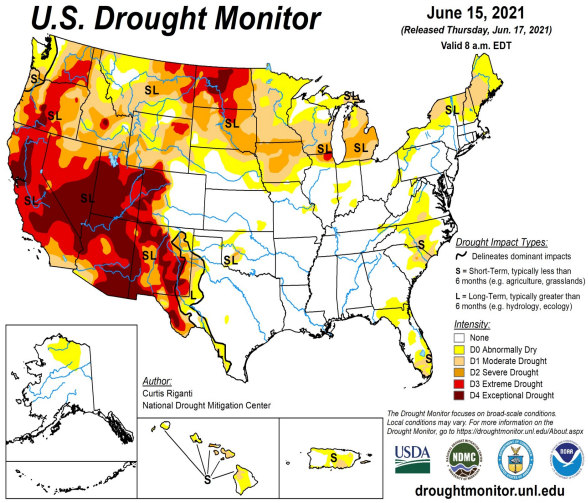

Figure 1. US Drought Monitor map released 17 June 2021 representing conditions as of 15 June 2021.

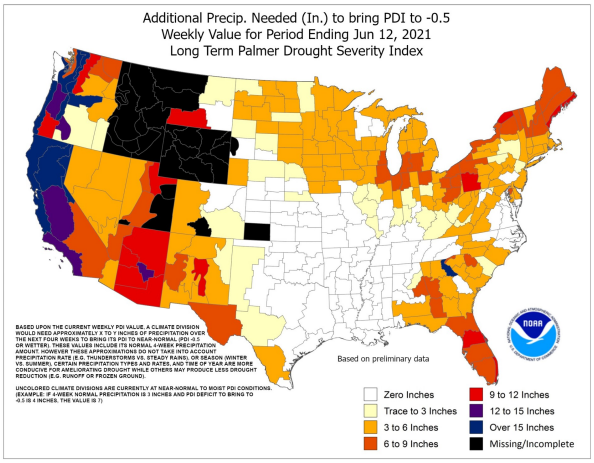

Figure 2. Modeled estimates of how much precipitation (inches) would be needed (by climate division) to return the Palmer Drought Index to normal ranges.

The 3-month climate outlook (representing July through September) is slightly favoring above-normal temperatures over that period as well as slightly favoring above-normal precipitation (Figure 3). Because the outlooks are only "slightly" confident, assume there is a bit of uncertainty on how the season will actually turn out, let alone how the timing of these conditions will occur. For example, the precipitation climate outlooks could prove to be accurate by the end of September when looking at the 3-month precipitation total. However, most all of that rain could have fallen in early July, leaving the rest of the 3-month period predominantly dry and therefore contributing to drought conditions.

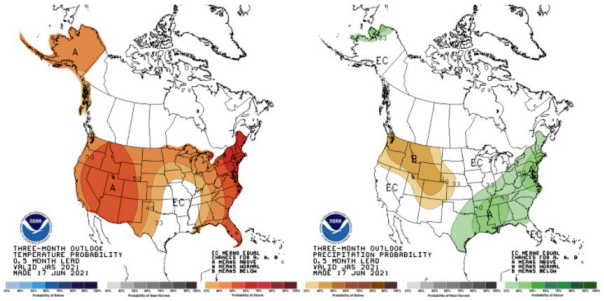

Figure 3. Climate outlooks for the July-August-September period for temperature (left map) and precipitation (right map). These are produced by the national Climate Prediction Center and illustrate confidence of favoring above- or below-normal conditions.

While modified growing degree day (MGDD) accumulations (Figure 4) continue to increase (what happens throughout the warm season), it is interesting how they still seem to be lagging the climatological average in the southern half of the state. The magnitude of how much behind those accumulations are seem rather insignificant compared to the seasonal totals thus far, but still noticeable on departure maps (Figure 5). Northern county MGDD accumulations are slightly above the 1991-2020 climatological average, however, lagging compared to the 2017 and 2018 seasons (Figure 6). Warm temperatures are expected over the next several days which may help increase those accumulations closer to normal, however the nature of modified growing degree days is that any daily maximum temperature above 86°F is modified down to the 86°F value. Therefore, warm days exceeding this maximum threshold do not increase MGDD accumulations at a faster rate.

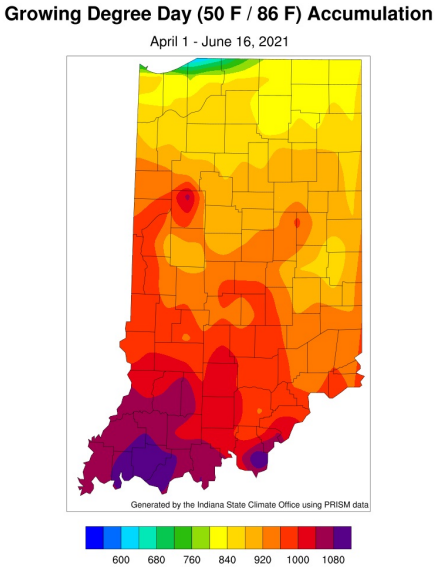

Figure 4. Modified growing degree day accumulations from April 1 to June 16, 2021.

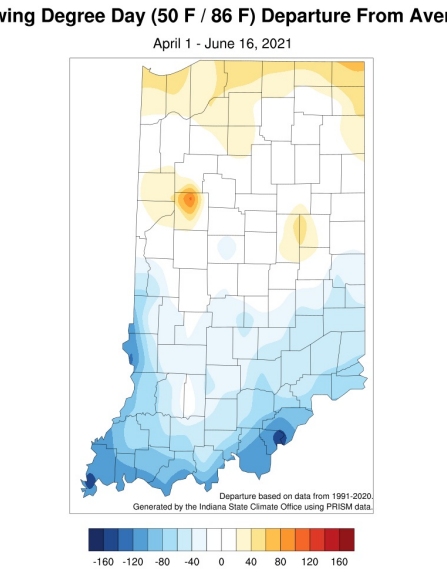

Figure 5. Modified growing degree-day departures as of 17 June 2021 compared to the 1991-2020 climatological average.

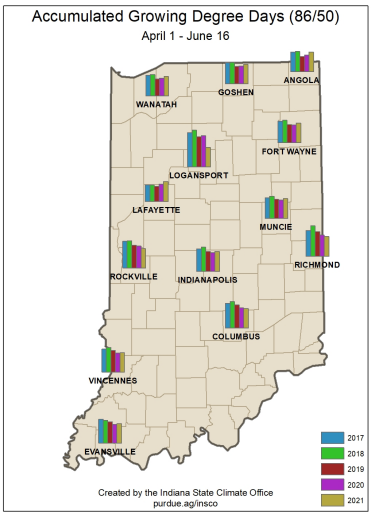

Figure 6. Comparison of 2021 modified growing degree day accumulations from April 1 – June 16 to the past four years.

USDA Announces Additional Aid to Ag Producers and Businesses in Pandemic Assistance

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

The additional aid will fill gaps in previous rounds of assistance and help beginning, socially disadvantaged and small and medium-sized producers that need support. The program includes $700 million for pandemic response and safety grants for PPE and other protective measures to help specialty crop growers, among others; and up to $20 million for additional organic cost share assistance, including for producers who are transitioning to organic.

Read the full USDA press release here USDA Announces Additional Aid to Ag Producers and Businesses in Pandemic Assistance for Producers Initiative | USDA

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