VEGETABLE CROPS HOTLINE

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

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In This Issue

Hail Damage

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

(*This article is modified from one published in issue 537 of this newsletter written by Sarah E. Hulick and Steve Reiners, Department of Horticulture Science, Cornell University, NYSAES. Liz Maynard also contributed to this article.)*

Recent storms have brought hail to parts of Indiana. Loss of yield and quality in vegetable crops due to hail depends on the crop, stage of growth, amount of injury, and future growing conditions.

Disease control is absolutely essential after hail damage. Surviving plants will also benefit from a sidedressing of nitrogen about a week after the damage occurred. The following is a summary of all the information we could find relating to hail and vegetable recovery.

Bell Peppers. A study was conducted in North Carolina to determine the impact of hail on the incidence of bacterial spot. The hailstorm occurred 38 days after transplanting when the plants were still young and recovery was possible. Researchers found that a copper plus maneb spray program helped suppress bacterial spot and induce recovery of a young pepper crop from hail damage. Damage from a hailstorm increases plants' susceptibility to pathogens immensely. Prior to the hailstorm, 53% of unsprayed plants and 13% of weekly and bi-weekly sprayed plants showed symptoms of bacterial spot. After the hail damage all plants showed disease. In unsprayed plots, the combination of hail and early Bacterial spot caused a 6-fold reduction in yield. In sprayed plots the reduction in yield was only 2-fold.

In a jalapeno pepper trial at Pinney-Purdue a few years ago, many of the plants had the main stem broken by hail. Yields from plants with broken stems were about 72% of the yield from plants with undamaged stems.

Tomatoes. Direct damage to fruit can make fruit unmarketable and open fruit up to secondary pathogens. It is best to remove all damaged fruit as keeping unmarketable fruit on the vine wastes the plant's resources. If plant damage is mostly defoliation with some broken stems, recovery can occur. This is especially true for large, indeterminate plants. Harvest may be delayed significantly as it takes about 40-50 days from flowering to ripe fruit. Growers may want to invest in floating row covers to protect the later fruit from an early frost in the fall.

Melons and other vine crops. Defoliation has the greatest negative impact on marketable yield when it occurs just before the canopy covers all bare ground on the plots, or approximately 30-40 days before first harvest. Defoliation decreases the fruit soluble solids concentration, which can make the melons less flavorful. Muskmelons and watermelons have the ability to fully recover from defoliating hail damage if it occurs early in the season (especially during fast vegetative growth stage) and if the growing season is long enough. Defoliation causes fruit exposure to the sun, sunscalds and premature ripening. All vine crops have some capacity to compensate for lost leaf area if it happens before vegetative growth slows. Figures 1 to 3 show recent hail damage on pumpkins.

Figure 1. Hail has tattered leaves on this bush-stage pumpkin plant growing in a roller-crimped rye cover crop.

Figure 2. Hail has punched holes in leaves, broken petioles, and bruised the stem of this pumpkin plant that is beginning to vine. Photos taken 7/13/2020. Hail 7/12/2020. Pinney Purdue Ag Center, Wanatah, IN.

Figure 3. The stem of this pumpkin has been damaged by hail just below the node where a female flower bud is visible. Buds at this stage sometimes abort in stressful conditions. If I can find it later I will check back and see whether it develops or not.

Sweet Corn. In a variety trial hit by hail, sweet corn was at the tasseling stage and suffered shredded leaves. Total yields were reduced by 57% compared to the prior 3-year average. Sweet corn at the 12-18 inch stage experienced the same hail and yields were reduced 42 % compared to the 3-year average. In a trial conducted in Delaware, all hail treatments reduced the percentage of marketable ears of sweet corn, except for the light application in the 13th leaf stage (early vegetative) in 1991. In 1992, additional treatments consisting of clipping all leaves were conducted. Clipping leaves at the early silking stage reduced marketable ears, indicating the loss of foliage adversely affected the growth of the ear. Clipping leaves just prior to harvest reduced the yield of Jubilee, but not Silver Queen. Figures 5 and 6 show recent hail damage on sweet corn.

Figure 5. Sweet corn at about the 6-7 leaf collar stage that has been damaged by hail. (The bleached leaf areas are a response to an earlier herbicide application.)

Figure 6. Hail injury on sweet corn at about the 4-5 collar stage, planted into a rolled rye cover crop. Shredded leaves and bruised leaf sheaths are visible.

Onions. Defoliation has the greatest impact on total marketable yield and yield of individual market classes when it occurs near the onset of bulbing. The greatest effect the hail damage inflicts on onions is the market class distribution. Jumbos (>3.25”) decrease in number and the medium and prepack size distribution increases. Yields of the larger marketable class decrease to a greater extent than the total marketable yield. In a study conducted in Colorado a 67% defoliation at 14,18, 42,and 56 days before maturity caused a 10%, 52%, 63%, and 51% decrease respectably in jumbo yields. A 33% plant defoliation on the same dates resulted in a 15%, 21%, 17%, and 24% reduction in Jumbo class yields. The medium class makes up for these decreases by increasing in number. Defoliation can delay crop maturity and makes onions more susceptible to disease infection.

Cauliflower. Damage done before budding does not significantly affect the budding process. Later defoliation tends to change the color of the cauliflower heads from white or ivory to a yellowish-white. The yellowing is more pronounced the greater the defoliation and the later the stage at which defoliation occurs. In plants in which the stems

get bent back, the heads can be elongated and in some cases deformed. Defects: sunburn, frost damage, warts, and attack by slugs and snails are more frequent in plants with greater defoliation and/or later in the season. Most importantly, defoliation at later stages is going to have a greater adverse effect on number and mass of heads than defoliation at earlier stages. The greatest mass lost from hail damage will occur when heads are between 2-3.8 cm.

Soybeans. We could not find any studies on snap beans but in this Oregon soybean study, 80% defoliation on plants with substantial stem breakage, 5 weeks after planting resulted in a 40% reduction in yield. Plants grew back, but not to full stature.

Ozone Injury on Vegetable Plants

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

When ground level ozone is high enough to trigger an Air Quality Action Day alert from the Indiana Dept. of Environmental Management (IDEM) it is a reminder that crops may be injured by ozone. A number of areas around the state have experienced alerts in recent days, e.g. July 14 in S. Indiana. If crops show the symptoms described below and ozone levels have been high, consider the possibility of ozone injury.

Ozone is a gas with three oxygen atoms per molecule. It is formed in the air when nitrogen oxides and volatile organic compounds react in the presence of sunlight. Ground-level ozone is a primary component of smog. Ozone harms people by aggravating existing breathing problems like asthma and injuring lung tissue. It harms sensitive plants by damaging leaf tissue, reducing the capacity to photosynthesize.

IDEM issues daily air quality forecasts for ground level ozone from May to September, available at https://portal.idem.in.gov/smogwatch/Today.aspx, and through the EPA AIRNow app. An Air Quality Action Day is called when ozone (or other pollutants) are expected to be high enough to cause problems for sensitive groups of people. Sensitive plants are injured by ozone at or below these levels. Injury is more likely under hot and humid conditions. Seasonal average ozone levels of 40-60 ppb have been reported to reduce yield of broadleaf crops by 5% to 15%. Indiana counties that have historically experienced frequent high levels of ozone include Lake, Porter, Floyd, and Clark. Figure 1 illustrates days when air quality has been a human health concern around the state over the past month. In most cases the concern has been high ozone levels; around the 4th of July high levels of particulate matter were also a problem in some locations.

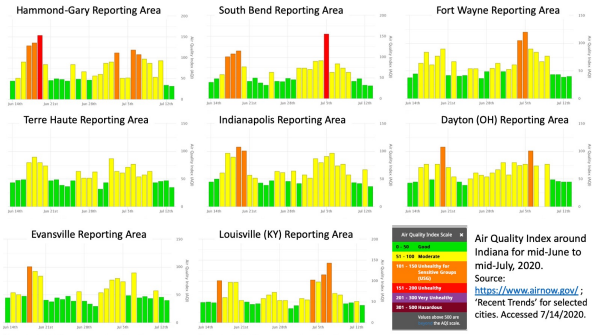

Figure 1. Daily air quality index for reporting areas around Indiana from mid-June to mid-July, 2020. On most days ozone was the pollutant of concern. Source: https://www.airnow.gov.

Symptoms of ozone injury on plants include interveinal chlorosis and necrosis, bleaching, stippling (small darkly pigmented areas approximately 2-4 mm diameter), flecking (tiny light-tan irregular spots less than 1 mm diameter), bronzing, and reddening. Older and middle-aged leaves are usually affected first. Often just the upper leaf surface is affected. On some plants both upper and lower leaf surfaces are affected. The chlorosis and necrosis can be similar to what is seen with normal leaf aging and death. Crops and varieties differ in sensitivity and specific symptoms. The stage of crop growth and environmental conditions also influence the degree of injury observed.

On watermelons injury appears first on older leaves. Areas between veins yellow (interveinal chlorosis) and eventually turn dark and then white (Figure 2). On squash and pumpkins older leaves show interveinal chlorosis and bleaching (Figure 3). On snap beans ozone causes bronzing on upper leaf surfaces and leaves may yellow and die (Figure 4). On potatoes, younger leaves show dark stippling on upper and lower leaf surfaces (Figure 5).

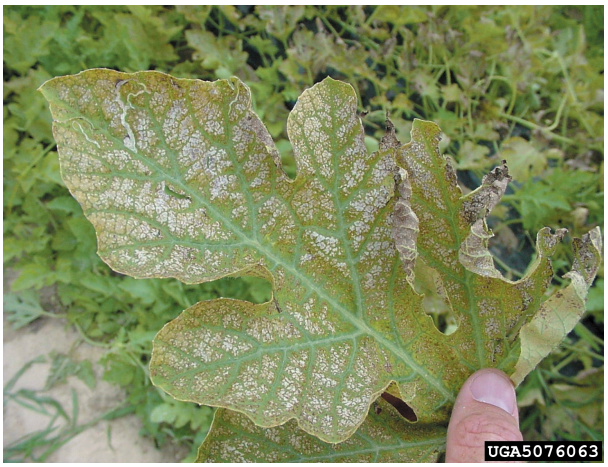

Figure 2. Ozone injury on watermelon leaf. Photo by David B. Langston, University of Georgia, Bugwood.org.

Figure 3. Ozone injury on pumpkin leaf. Photo by M. McGrath, USDA ARS.

Figure 4. Ozone injury on snap beans. Photo by Scott Bauer, USDA ARS.

Figure 5. Ozone injury on potato leaf. Photo by Mary Ann Hansen, Virginia Polytechnic Institute and State University, Bugwood.org

If crops show these symptoms, other possible causes are ruled out, and ozone has been high in the area, it is reasonable to suspect ozone injury. To the extent possible, avoid additional stresses on the plants. Don't apply unwarranted pesticides or nutrients. Note which varieties show fewer symptoms and in the future, select varieties that are less susceptible.

Individuals and businesses can help to reduce ground-level ozone by conserving electricity, refueling vehicles after dusk, limiting engine idling, and using volatile chemicals in ways that keep evaporation to a minimum. For additional suggestions, visit 'What You Can Do' at www.airnow.gov.

An earlier version of this article was published in Vegetable Crops Issue 541, July 22, 2011.

References

USDA-ARS 2016. Effects of Ozone Air Pollution on Plants. https://www.ars.usda.gov/southeast-area/raleigh-nc/plant-science-research/docs/climate-changeair-quality-laboratory/ozone-effects-on-plants/Accessed 7/14/2020.

IDEM 2020. Current Nonattainment Areas. https://www.in.gov/idem/airquality/files/nonattainment_areas_map.pdf Accessed 7/14/2020

Mites on the Rise

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

While we might be struggling with the heat and lack of rain, there is one pest that is loving it, Mites! Now is the time to be on your toes watching out for this pest. Early detection and treatment are key. In protected environments prevention and early intervention are especially important; In the field, heavy rains can help knock these pests back.

Two-spotted spider mites (TSSM) are one of the most common mite pests on vegetables. TSSM occur throughout the world. They are known to feed on over 300 plant species, including tomatoes, cucumbers, melons, grapes, apples, and a variety of common flower and weed species. They disperse by walking or flying on the wind currents. The adults are a pale green to yellowish color, or almost appear translucent, with two black spots on their back. Eggs and nymphs are present and overlapping with adults. The eggs are very small yellowish or translucent circles and the nymphs are yellowish to green in color. Spots are not present until they are mature.

Early infestations can be spotted by scouting the leaves for the characteristic stippling that occurs as a result of mite feeding, then turn over the leaf to look for the pest or feeding damage resulting from the pest scraping the contents from the plant cells (Figure 1). As infestations build you will be able to spot the characteristic webbing that these mites build, leading to their name (Figure 2). TSSM can be found on the underside of leaves with a 10X hand lens (Figure 3).


Figure 1. Early signs of spider mite damage on cucumber leaves.


Figure 2. Heavy infestation of TSSM on cucumber plants in a high tunnel.


Figure 3. Close-up of adult TSSM and an egg. Photo by John Obermeyer.

Another species of mite that has been encountered in Indiana is the tomato russet mite. They are much smaller than TSSM, conical in shape and yellow to translucent in appearance. As the name suggests, this

mite feeds on crops in the solanaceous family: tomato, potato, eggplant, pepper. Their damage leads to bronzing and curling of the leaves (Figure 4). Russet mites require a 14X hand lens at least to be viewed (Figure 5).

Figure 4. Tomato russet mite symptoms on a tomato plant in a high tunnel. Photo by John Obermeyer.

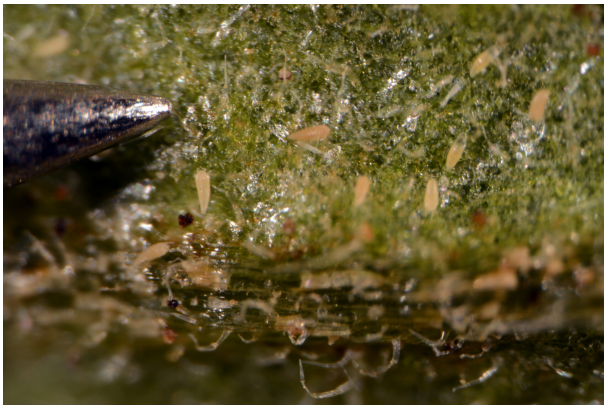

Figure 5. Close-up of tomato russet mites on the underside of a tomato leaf. Photo by John Obermeyer.

There are a variety of insecticides/miticides available to treat these pests such as those containing abamectin (Agri-Mek®), bifenthrin (Brigade®), spriomesifen (Oberon®), acequinocyl (Kanemite®), fenpyroximate (Portal®). When making any pesticide applications this time of year it is important to consider the impacts of the application on non-target organisms, such as predatory insects and pollinators. Some of the chemistries available have less impact on these beneficial insects. Choosing a chemistry that has fewer non-target impacts according to the labels, such as Portal®. Also, make applications as late in the day as possible, when the flowers have closed, and pollinators are less active. For more information on protecting pollinators in your fruit and vegetable crops read this publication of production practices and this one for commercial applicators.

Considerations for Irrigation Management in Watermelon Production

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

About half of the watermelon fields in our area are not equipped with supplemental irrigation. Watermelon production in these fields is therefore dependent exclusively on rainfall. In fields where supplemental irrigation is available, drip irrigation under black plastic mulch is the most commonly used system. Overhead irrigation through central pivot is also used in some fields.

Irrigation management is complex in our area because of significant but unpredictable rainfalls during the watermelon production season. Supplemental irrigation is profitable because it avoids water stress during periods of drought, thereby increasing and stabilizing yields. However, there is always a question whether supplemental irrigation is required for watermelon production in our region; if so, how much water should be applied; if not, what would be the consequence if there was an extended drought period. I do not have a straightforward answer to all the questions. But here are a few facts that I think are helpful in guiding water management in watermelon production.

Effects of water stress on watermelon yield. What happens in a dry year?

It is important to understand that effect of water stress on watermelon yield is different at the different growth stages. The majority of yield reductions occur when drought stress happens at the flowering and fruit set stage. The second most sensitive stage is at the fruit expansion stage. The direct consequence of drought stress that happened at the fruit expansion stage is the smaller-sized fruit. During the vegetative period, watermelon is less sensitive to water stress.

Black in 2018, there was an extended dry period from June 20 to July 20, with total precipitation less than 0.5 inches in the one month period recorded at the Southwest Purdue Agricultural Center (Figure 1). we compared watermelon yield from two adjacent fields: one received weekly 1-inch water applied to the mulched area through drip tape; the other field was not irrigated. About a 5% yield decrease was observed in the field without irrigation. There was no difference in fruit numbers, but average fruit weight decreased from 16.6 lb to 15.8 lb.

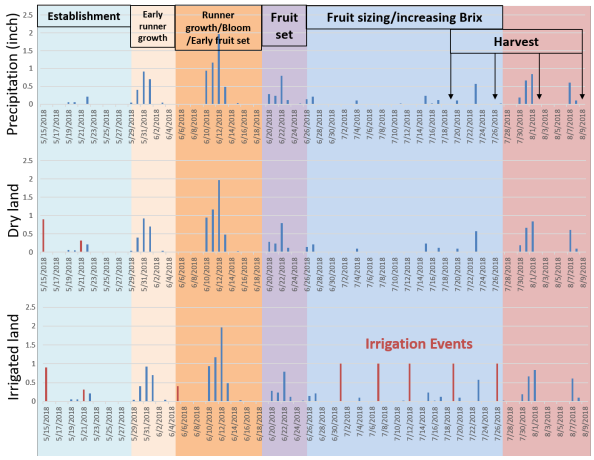

Figure 1. Irrigation and precipitation events at different stages of watermelon growth during the 2018 watermelon production season at the Southwest Purdue Agricultural Center.

How much water should be applied through irrigation?

Supplemental irrigation eliminates water stress during the drought period. But it also brings the possibility of overwatering. Overwatering not only results in inefficient use of water, but also leads to fertilizer leaching, and may increase the risk of certain soilborne diseases, like vine decline of watermelons.

A common rule of thumb widely used in vegetable production is a crop at full growth in the middle of the summer uses about 1 to 1.5 inches of water per week. This assumption is based on the average reference evapotranspiration (ETo). If assuming about 1/3 of the field is covered with plastic mulch, and the water applied through drip tape is eventually distributed under plastic, about 9,051-13,577 gallons of water per acre watermelon land per week should be given to the crop. The actual ETo may be obtained from climate centers that can help guide irrigation applications more accurately.

Should the theoretically optimal irrigation rate be followed for

watermelon production in a humid area like our region? A three-year study conducted in Delaware that has a similar climate as ours sheds some light on this question. Three irrigation treatments: 100% crop water use based on ETo applied to mulch area (optimal irrigation), 50% (deficient irrigation) and 150% (excessive irrigation) of the optimal level were applied to watermelon fields. Although there was a wide range of differences in water application, surprisingly, watermelon yield was similar across the treatments. The soil water content in the 50% irrigation treatment as measured in the center of the bed down to 2' deep was clearly declining over the season, indicating the crop was using more water than what was replaced in the center of the beds. But the lack of yield response indicated watermelon roots are extensive enough to extract water either in the deeper soil or outside of the plastic mulch-covered beds.

Without plastic mulch, water on the surface easily evaporates. But the evaporation is reduced once the soil surface layer dries sufficiently to inhibit water transport to the surface from deeper soil. Following large rainfalls, water will wet the deeper soil between the beds, and to some extent, horizontally move to the center of the bed. This water potentially will be available to plant roots if roots are present to take advantage of the water. Plants will need extra energy to grow a more extensive root system, this might disrupt water balance for some crops, and cause detrimental effects to the yield. However, this seems is not the case of watermelons.

What does this mean practically? Using ETo as the guidance for irrigation management is a good starting point. Indiana State Climate Office is working to get the ETo readily available for growers. The National Weather Service provids the forecasts of ETo. Please read the article in this issue Reference Evapotranspiration Forecasts across Indiana to learn how to access the forecast ETo. Using the general rule of thumb (1-1.5 inches of water per week) is also valuable. If growers are currently irrigating over that level, irrigation should be cut back. Lower than optimal irrigation level to 50% probably is also safe in many years based on the study conducted in Delaware. This is especially true if there are large rainfall events that significantly rewetted the deep soil.

Reference:

McCann, I., E. Kee, J. Adkins, E. Ernest and J. Ernest. 2007. Effect of irrigation rate on yield of drip-irrigated seedless watermelon in a humid region. Scientia Horticulturae. 113:155-161.

Erdem, Y. and A. N. Yuksel. 2003. Yield response of watermelon to irrigation shortage. Scientia Horticulturae. 98:365-383.

Reference Evapotranspiration Forecasts across Indiana

(Beth Hall, hall556@purdue.edu)

The past 30 days have been met with warmer than normal temperatures in the northern counties and drier than normal conditions throughout most of the state (Figures 1 and 2). This warm and dry environment is conducive to developing drought – particularly with the increased evapotranspiration rates. While climate outlooks are calling for increased confidence of above-normal precipitation throughout the rest of July, these events are likely to remain spotty with inconsistent coverage across the state.

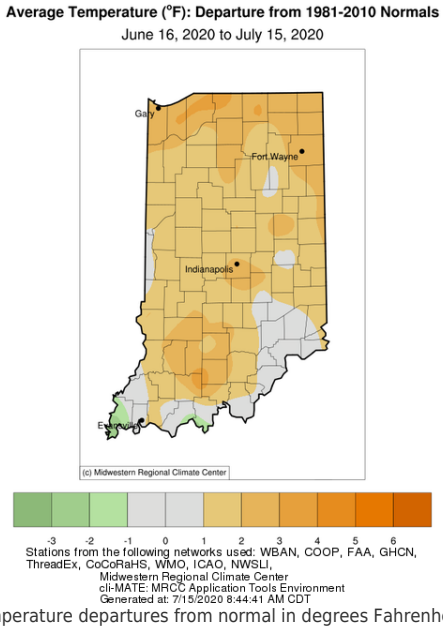

Figure 1. Temperature departures from normal in degrees Fahrenheit for June 16 through July 15, 2020.

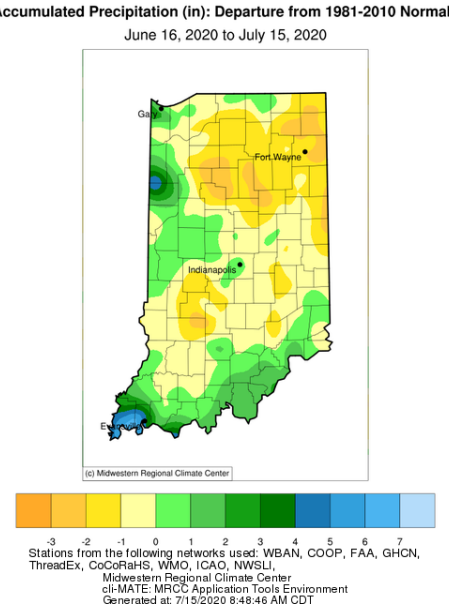

Figure 2. Precipitation departure from normal in inches for June 16 through July 15, 2020.

For planning purposes, it may be helpful to know what the forecast is for reference evapotranspiration (ET). The National Weather Service provides a nice graphical tool (https://digital.weather.gov/) where users can zoom into their area of interest and then view a variety of variables for future time periods out to six days (e.g., Figure 3). Several derivations of the forecasts of reference evapotranspiration (FRET) can be found at the very bottom of the variable pull-down list, including weekly total FRET, daily FRET, and daily departure from normal FRET.

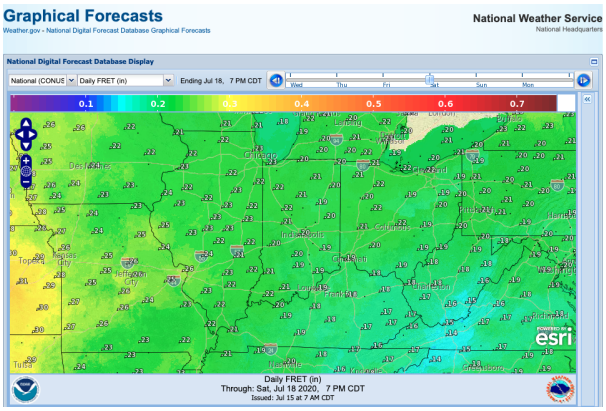

Figure 3. Screenshot of the National Weather Services daily forecast for reference evapotranspiration (FRET) in inches.

Manganese Toxicity on Cantaloupe Observed Again

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

Manganese (Mn) toxicity was observed in a cantaloupe field at the Southwest Purdue Agricultural Center this year. This is a plant nutritional disorder related to acid soils and it usually occurs in clusters in a field. A plant tissue test confirmed that the Mn level in the leaves of the affected plants was 3766 ppm, which was 23 times higher than the Mn level in healthy leaves.

The symptom occurs first on older leaves. The diagnostic feature of manganese toxicity is the tiny pin-hole type lesions with yellow halos clustered between the veins. Leaves are best viewed when held up to the light. In severe cases, it may cause heavy defoliation and exposed fruit to sunburn (Figure 1). More photos and information about the symptom can be found in the article Manganese Toxicity in Cantaloupe published in Issue 631 of 2017. The remedy for these disorders is to raise soil pH, but this can be difficult to accomplish during the crop seasons.


Figure 1. chlorosis of manganese toxicity is formed by numerous tiny pin-hole type spots growing together.

The last time we saw Mn toxicity at the Southwest Purdue Agricultural Center was in 2017. Mn toxicity was not a large problem in 2018, a dry year, or 2019, a wet year. It is not clear that weather is a factor in this nutritional disorder. Another problem associated with acid soil in cantaloupe is Magnesium (Mg) deficiency. However, we did not see Mg deficiency at the Southwest Purdue Agricultural Center in the past four years.

Corn Earworm Trapping Update

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

After weeks of successive trap catches in the double digits, our recent catches have gone down. Be sure to check the CEW trapping website for updates daily. At this point in the season, when field corn is in the silking stage, the threat to sweet corn, and potentially hemp, goes down. The current action threshold is 10 moths in the trap per night. Spray decisions should be made based on the closest trap location. In the table online, if no value is entered, it means the trap has not been emptied. A zero will be present in the data table if the trap was checked and there were no moths present.

As field corn dries out and is no longer silking, the threat to flowering hemp and silking sweet corn goes back up. The trap catch threshold lowers to 1 moth per night. Closely monitor your crop and the surrounding environment to best understand the risk of corn earworm oviposition.


Figure 1: Adult CEW recovered in a trap.


Figure 2: Hartstack trap baited with a female pheromone lure at the Meigs Horticulture Farm.

Horseweed

(Jeanine Arana, jcordone@purdue.edu, (765) 588-7787) & (Stephen Meyers, slmeyers@purdue.edu, (765) 496-6540)

Scientific names: *Erigeron canadensis* or *Conyza canadensis*

Horseweed, also known as marestail, fleabane, or colt's tail, is a common and troublesome weed throughout North America due to its high seed production, wind dissemination, lack of seed dormancy, and adaptability to dry and moist soil. Moreover, horseweed populations

have shown to be resistant to Group 2 (ALS-inhibitors) and Group 9 (glyphosate) herbicides.

Figure 1. A likely resistant horseweed plant continues to grow following a glyphosate (Group 9) application in northern Indiana (Photo by J. Arana).

Historically, horseweed has had many uses. Native Americans in the Zuni River Valley of New Mexico inserted crushed horseweed flowers into their nostrils to stimulate sneezing and help relieve rhinitis. Other Native Americans used the leaves to treat sore throat and dysentery. Dried plants were scattered in animal bedding to prevent fleas. Young leaves were used as a flavoring substitute for tarragon.

Identification: Seedling is a basal rosette. Cotyledons are oval, and young basal leaves are egg-shaped with toothed margins. After the stem elongates, basal leaves deteriorate. Stem leaves are lanceolate to linear with nearly entire margins and become gradually smaller up the stem (Figure 2).

Figure 2. An overhead view of horseweed (Photo by S.L. Meyers).

Growth habit: Erect, annual that can reach six feet tall. It can either be a summer or winter annual. Seeds that emerge in fall result in overwintering rosettes that bolt the following spring. Seeds that emerge in spring result in plants that bolt in early summer.

Reproduction: Flowers from July through October from a terminal panicle can produce 200,000 seeds per plant. Seeds are between 1 to 1.2 mm and accompanied by whitish bristles (pappus) that facilitate wind dispersal more than a quarter mile. Approximately 86% of the seeds germinate quickly due to lack of dormancy.

Integrated weed management strategies:

Cultural and mechanical practices:

- Cultivation and planting date: A planting date in mid-May that follows spring tilling will reduce horseweed populations (Figure 3). Weeds that emerge after tilling can be controlled with burndown pre-planting applications.

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Figure 3. Spring tillage influences the types of weeds present. Horseweed is far more abundant in no-till plots (left) while other weeds are more abundant in plots with conventional tillage (right) (S.L. Meyers).

- Crop rotation: Horseweed is not tolerant of shade. In areas with heavy horseweed infestations, consider rotating to high-density and upright crops that are more competitive with weeds. Corn (field corn, sweet corn, or popcorn) is an example of an upright and competitive crop that also has numerous effective herbicides for managing broadleaf weeds, including horseweed.
- Mulching: Polyethylene (plastic) mulch reduces emergence near the crop as horseweed cannot grow through it. Carbon-based mulches, including terminated cover crops, can also be effective if they are present with sufficient biomass.
- Cover crops: Fall-seeded cereal crops like cereal rye can compete with both fall emerging and spring emerging horseweed (Figure 4). Termination of the cover can consist of mechanical (rolling/rolling-crimping, mowing, plowing) and/or chemical methods (synthetic or OMRI-approved herbicides) to help control escape horseweed.

Figure 4. Horseweed is suppressed by a cereal rye cover crop (left) compared to bare ground plots receiving no fall cover crop (right) at Wanatah, Indiana (Photo by S.L. Meyers).

Chemical control:

Fall management: In recent years there has been a push to manage troublesome winter annual weeds, including horseweed, with fall-applied herbicides and in some cases the combination of both postemergence and residual herbicides. In many years this practice is not possible because there is very little time between when crops are harvested and when winter weather prevents access to fields. If time and conditions permit, consider using only a postemergence herbicide in the fall. The use of residual (preemergence) herbicides promotes bare soil, which can result in erosion and is counter-productive for healthy soils.

Burndown options: Because glyphosate-resistant horseweed populations are wide-spread, a glyphosate-only application is not likely to provide sufficient control. Consider glyphosate tank-mixed with an auxinic herbicide (dicamba or 2,4-D), saflufenacil (Sharpen®), or carfentrazone (Aim®) depending on the crop to be planted. Target horseweed plants in the rosette stage. Controlling bigger plants is difficult and may require a follow-up mechanical control measure. For cool season crops planted in the spring, a soil-applied residual herbicide may be necessary to control spring-emerging horseweed. Consult the *Midwest Vegetable Production Guide* (mwveguide.org) for crop-specific recommendations. You can see some horseweed burndown strategies demonstrated in this Purdue University Extension video by Dr. Bill Johnson and Marcelo Zimmer https://www.youtube.com/watch?v=TevnpknMbGE.

Specialty Crops Soil Health Podcast Episodes – Beneficial Insects, Cover Crops in Sweet Corn

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

June and July episodes about specialty crops are available in the CCSI-HAT-Soil Health Podcast from Conservation Cropping Systems Initiative (CCSI) in partnership with Purdue University and Hoosier Ag Today (HAT).

'Pollinators and Other Beneficial Insects for Specialty Crops' features guests Dr. Laura Ingwell and Dr. Elizabeth Long from Purdue Entomology and Dennis Nowaskie from SW Purdue Ag Center. They discuss what they have learned about protecting pollinators and other beneficials in cucurbits while keeping the crop healthy and preventing yield loss from insect pests.

'Cover Crops in Sweet Corn Production' is an opportunity to hear from Tom and Victor Hackman, Hackman's Family Farm, and Chuck Mohler, Sweet Corn Charlie's, about how they use cover crops to benefit sweet corn production.

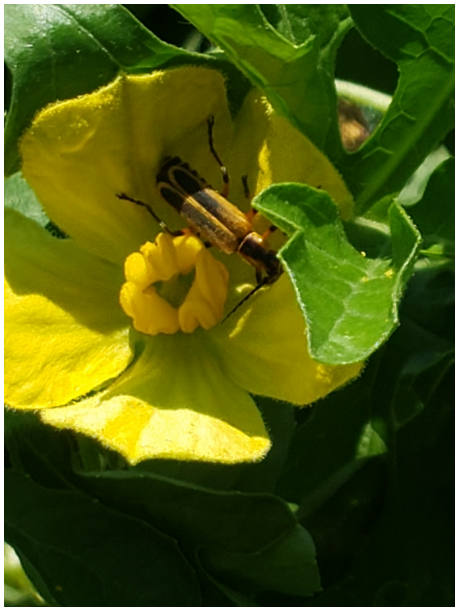
Find the podcast at https://www.ccsin.org/podcast or https://www.hoosieragtoday.com/category/hat-soil-health-podcast/, or subscribe to it on Stitcher, Spotify, iTunes, or Google Play.

Future monthly episodes on specialty crops will cover managing cover crops on small-scale and urban vegetable farms, soil health in high tunnels, and other practices to improve soil health on fruit and vegetable farms. Listen in and learn from farmers, educators, and researchers.

Question of the Issue (7-16-2020)

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

This insect provides two important ecosystem services in your crops. Can you identify the bug and tell us what they do?



Answer to Question from Last Issue (7-02-2020)

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

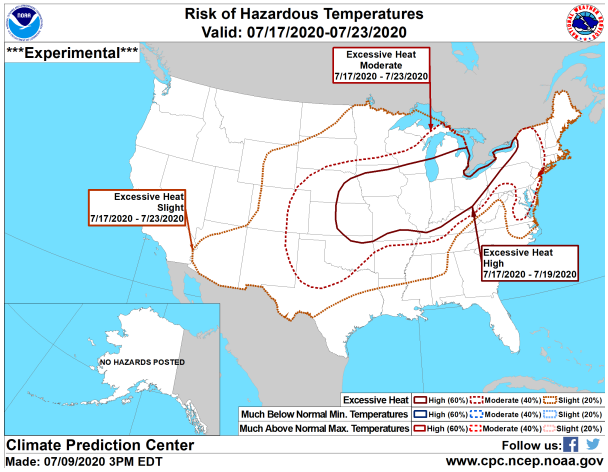
What's this insect? Is it a friend or foe?

This is a lady beetle larvae. Although it may look dangerous, they are actually beneficial insects. It feeds on aphids. learn more about beneficial insects for aphids control, please check this recent article Organic Aphid Control Update.

Protect Yourself from the Heat

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

The NOAA Climate Prediction Center is showing consistent patterns the last several days for a high risk of excessive heat July 17-19. Please be prepared.



Here is a factsheet about *Protecting Yourself from Sun Exposure* provided by Purdue Safety Specialist Brian McDonald that can be very helpful this time of the year.

NIOSH Fast Facts

Protecting Yourself from
Sun Exposure

Anyone working outdoors is exposed to the sun's ultraviolet (UV) rays, even on cloudy days. UV rays are a part of sunlight that is an invisible form of radiation. There are three types of UV rays. UVA is believed to damage connective tissue and increase the risk for developing skin cancer. UVB penetrates less deeply into the skin, but can still cause some types of skin cancer. Natural UVC is absorbed by the atmosphere and does not pose a risk.

Sunburn

Sunburn is not immediately apparent. Symptoms usually start about 4 hours after sun exposure, worsen in 24–36 hours, and resolve in 3–5 days. They include red, tender and swollen skin, blistering, headache, fever, nausea, and fatigue. In addition to the skin, eyes can become sunburned. Sunburned eyes become red, dry, painful, and feel gritty. Chronic eye exposure can cause permanent damage, including blindness.

First Aid

- Take aspirin, acetaminophen, or ibuprofen to relieve pain, headache, and fever.
- Drink plenty of water to help replace fluid losses.
- Comfort burns with cool baths or the gentle application of cool wet cloths.
- Avoid further exposure until the burn has resolved.
- Use of a topical moisturizing cream, aloe, or 1% hydrocortisone cream may provide additional relief.

If blistering occurs:

- Lightly bandage or cover the area with gauze to prevent infection.
- Do not break blisters. (This slows healing and increases risk of infection.)
- When the blisters break and the skin peels, dried skin fragments may be removed and an antiseptic ointment or hydrocortisone cream may be applied.

Seek medical attention if any of the following occur:

- Severe sunburns covering more than 15% of the body
- Dehydration
- High fever (>101 °F)
- Extreme pain that persists for longer than 48 hours

Skin Cancer

Skin cancer is the most common form of cancer in the United States. The most common types of skin cancer include basal cell carcinoma, squamous cell carcinoma, and melanoma.

Indicators of skin cancer may include:

- Irregular borders on moles (ragged, notched, or blurred edges)
- Moles that are not symmetrical (one half doesn't match the other)
- Colors that are not uniform throughout
- Moles that are bigger than a pencil eraser
- Itchy or painful moles
- New moles
- Sores that bleed and do not heal
- Red patches or lumps

Protect Yourself

- Avoid prolonged exposure to the sun when possible.
- Wear sunscreen with a minimum of SPF 15.
  - SPF refers to how long a person will be protected from a burn. (SPF 15 means a person can stay in the sun 15-times longer before burning.) SPF only refers to UVB protection.
  - To protect against UVA, look for products containing: Mexoryl, Parsol 1789, titanium dioxide, zinc oxide, or avobenzone.
  - Sunscreen performance is affected by wind, humidity, perspiration, and proper application.
  - Throw away sunscreens after 1–2 years (they lose potency).
  - Apply liberally (minimum of 1 oz) at least 20 minutes before sun exposure.
  - Apply to ears, scalp, lips, neck, tops of feet, and backs of hands.
  - Reapply at least every 2 hours and each time a person gets out of the water or perspires heavily.
  - Some sunscreens may lose their effectiveness when applied with insect repellents. You may need to reapply more often.
- Wear clothing with a tight weave or high-SPF clothing.
- Wear wide-brimmed hats and sunglasses with UV protection and side panels.
- Take breaks in shaded areas.

DEPARTMENT OF HEALTH AND HUMAN SERVICES
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health
www.cdc.gov/niosh/topics/outdoor/
DHHS (NIOSH) Publication No. 2010–116

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