

VEGETABLE CROPS HOTLINE

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



Issue: 700
March 17, 2022

In This Issue

- [Ethylene Damage on Tomato](#)
- [EZ \(liquid\) Formulations Set to Replace Granular Valor SX and Chateau SW](#)
- [Bell Pepper Varieties for Phytophthora Resistance](#)
- [Reevaluation of Fertilizer Application Practices](#)
- [Virtual Strawberry Chat April 6](#)
- [La Niña Sticking Around Longer than Expected](#)
- [Annual Meeting of the Indiana Vegetable Growers Association](#)
- [Participate in Pest Monitoring to Inform Management](#)
- [Survey to Gage Willingness to use Row Covers to Manage Pests](#)
- [Survey for Vegetable Growers on use of Reduced Tillage Production](#)
- [IHC 2022 Educational Session Recordings Now Available!](#)

Ethylene Damage on Tomato

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

We are getting close to the time of year when I begin to get phone calls about strange symptoms on tomato plants in greenhouses. Too often, the problem is ethylene damage. Read on to find out how to avoid this problem.

Tomato plants with ethylene damage often have leaves that are curled down and stems that are twisted (Figure 1). Stems or leaves that are curled downwards are said to have epinasty (in botanical terms). Epinasty is a common symptom of ethylene damage. Ethylene is a common by-product of incomplete combustion of several different types of fuel. Incomplete combustion is often the result of heaters that are not working efficiently. Tomatoes are very sensitive to ethylene damage; however, other crops may also show ethylene damage.



Figure 1. The tomato seedlings above exhibit downward curled leaves (see plant in upper left corner of photo) which maybe a symptom of ethylene damage and yellow seed leaves with lesions, a possible symptom of sulfur damage (Contributed Photo).

The tomato plants in figure 1 also have yellow seed leaves. Ethylene damage does not include yellowing. Furthermore, there is a spotting on the lower leaves that is not typical ethylene damage. I believe that the symptoms on seed leaves were as a result of a different compound, perhaps sulfur dioxide, a heavier than air compound that would remain relatively close to the heater. In fact, the yellowing leaves were observed close to the heater, while the curling leaves, caused by ethylene gas, were spread throughout the greenhouse. The production of sulfur dioxide may also be as a result of incomplete combustion.

While some greenhouses are heated with a furnace attached to the greenhouse, many greenhouses are heated with a standalone unit inside the structure. In the example in figure 1, the grower stated that the heater was of this latter type—a standalone unvented unit. While this type of heating is not recommended, natural gas, propane and kerosene generally burn clean and do not need to be vented. However, even units that burn clean fuels may cause problems if out of adjustment (see citation below).

I cannot prove that the symptoms in Figure 1 above are caused by ethylene. But a few years ago, we witnessed ethylene-like damage at a greenhouse here at the Southwest Purdue Agriculture Center (See article in the [November](#)

2007 Vegetable Crops Hotline). Therefore, we were able to confirm that ethylene was the cause of the symptoms shown in Figure 2. Given the similarities of the two examples and the circumstantial evidence, I believe the example given in Figure 1 was due to a heater malfunction. The grower reports that after the heater was serviced, the plants began to look healthier.



Figure 2. These tomato plants are exhibiting epinasty or a downward growth of the leaves in response to ethylene produced from a malfunctioning heater in a greenhouse. The topmost leaves are growing normally because the plants were removed to a separate greenhouse after exposure to ethylene. (Photo by Dan Egel).

Poorly adjusted heaters can also add water to the greenhouse air-as much as 22 gallons of water a night! This unwanted moisture can lead to disease problems.

To avoid damage from ethylene and other air pollutants:

1. Have unit heaters checked by a professional and follow maintenance recommendations.
2. Assure adequate air supply for complete combustion. For each 2500 BTU's of heater output, 1 sq. in. of vent cross section is needed.
3. Prevent back drafts. Make sure the chimney extends 2 ft. above the ridge of the greenhouse, or 2 ft. above a 10-ft. line to any part of the structure.
4. Install an inexpensive carbon monoxide detector. If carbon monoxide levels rise it's likely ethylene and other pollutants are present also. And if carbon monoxide levels are high it is a significant human health hazard.
5. Scout for possible growth effects of ethylene and investigate right away if you see anything.

This article was updated from an article published in Issue 623 in Jan. 2017.

EZ (liquid) Formulations Set to Replace Granular Valor SX and Chateau SW

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

If you use the herbicides Valor® or Chateau®, you may notice a change with your next jug. Valent U.S.A. Corporation is phasing out production of Valor SX® and Chateau SW®, both water soluble granule formulations. The new liquid formulations are called Valor EZ® and Chateau EZ®. While the granular formations contain 51% of the active ingredient flumioxazin by weight, the new liquid version will contain 4 lb of flumioxazin per gallon. But there is good news: the new liquid formulation can be applied at the same “ounce rate” as the granular versions.

So, if you would normally use 3 ounces of Chateau SW® per acre, you would use 3 fluid ounces of Chateau EZ® per acre.

For crops that rely on a Chateau 24(c) special local needs label, the new EZ formulation will require its own 24(c) label.

To learn more about weed management options in vegetable crops, visit the *Midwest Vegetable Production Guide* at mwvegguide.org.



Figure 1. Chateau SW (water soluble granule) label.



Figure 2. Chateau EZ (liquid) label.

Bell Pepper Varieties for Phytophthora Resistance

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

Phytophthora blight caused by the pathogen *Phytophthora capsici* is one of the most important diseases in pepper production (Figure 1). The disease is difficult to control once established in a field. Using host resistance is an important approach in managing this disease. In past years, Rutgers Cooperative Extension has evaluated new bell pepper cultivars and breeding lines for their resistance to *P. capsici*.

In the 2021 bell pepper variety trial report, cultivars Playmaker, Paladin, Aristotle X3R, Turnpike, Captain were identified as resistant. Turnpike and Aristotle X3R had a high yield among the resistant cultivars. Turnpike tend to produce more extra large fruit compared to Aristotle.

Detailed information about this variety trial can be found at [Rutgers-Pepper-Phytophthora-Blight-Final-Report-2021.pdf](#)



Figure 1. The pepper plants in the foreground have wilted and died from infection from *Phytophthora* blight. This disease tends to concentrate in low areas of the field where water stands.

Reevaluation of Fertilizer Application Practices

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

Fertilizer prices have increased dramatically this year. More than ever, we need to think carefully about whether we are using fertilizers wisely. This article will be one of a series to help vegetable growers reevaluate their fertilizer use strategies.

One of the lessons I learned in Plant Nutrition class in graduate school was the 4Rs of fertilizer management principles. It does not matter if you have heard about this before. Now is a good time to review the 4Rs to reevaluate the fertilizer application practices.

The Four Rs stand for Right Source, Right Rate, Right Timing,

and Right Placement.

Right source considers the price of the fertilizers, ease of application; synthetic or organic source; efficiency of nutrient use, etc. Most fertilizer recommendations for field-grown vegetables list pounds of a specific nutrient per acre. Different fertilizers have different nutrient content; thus, supplying the same amount of one nutrient would require a different amount of fertilizers with different nutrient content, which leads to very different price ranges. Whether to use a liquid or a solid form of fertilizers depends on the application systems. If fertilizers are supplied through an irrigation system, the solubility of a solid fertilizer is an important consideration. A decent amount of nutrients can come from organic sources. Be sure to consider the soil organic matter and previous crops in determining the required nitrogen. A controlled-release nitrogen source that delivers small amounts of nutrients over a more extended period may work better than a soluble source that offers a large amount of nitrogen at one time.

Right rate starts from a soil test. A soil test helps determine the portion of the crop nutrient requirement that is already available from the soil. The rest needs to be supplied through synthetic fertilizers or organic source nutrients. Right rate depends on cropping systems. A single fertilizer application system may require a different amount of a nutrient compared to a frequent fertigation system. Right rate varied by crops, even varieties. Developing the right rate recommendation requires intensive research over multiple years and varies among cropping systems. Unfortunately, due to limited resources in this type of research, that information is not always available for various vegetables grown with different systems in every region.

Right timing takes into consideration the growth pattern of a crop. The nutrient requirement is typically low at initial plant growth and increases quickly as plants develop and set fruit. It decreases as fruit ripens. When frequent fertigation is used, right timing and right amount correspond to different plant growth stages. Without frequent fertigation, split fertilizer application is preferred over one-time fertilizer application to meet nutrient needs and limit fertilizer loss as much as possible.

Right placement refers to placing the nutrient where the plants have the best access, the root zone. Two general approaches to apply fertilizers are banding and broadcast. The idea for banding is to place fertilizers right where the plant roots are. Applying preplant fertilizers right at the beds or applying fertilizers through drip systems are approaches to band apply fertilizers. Typically, this approach maximizes fertilizers use efficiency. Broadcast is to apply fertilizers uniformly over the entire field. Whether banding or

broadcast, the decision depends on the crops' types, the developing stage, the management system, and the nutrient itself. If the crop grows an extensive root system, broadcast applying fertilizers, especially in the later season is efficient. Nutrient such as phosphorus is easily fixed in the soil and becomes unavailable. Place phosphorus fertilizers in a concentrated area close to the root zone can increase the chance of phosphorus remaining soluble and being available for root uptake. So banding works more efficiently for phosphorus fertilizers.

The 4Rs principles are general rules of applying fertilizers. We will discuss these rules in more detail in future articles under a specific crop scenario.

Virtual Strawberry Chat April 6

(Wenjing Guan, guan40@purdue.edu, (812) 886-0198) & (Miranda Purcell, mrpurcel@purdue.edu)

The next Virtual Strawberry Chat will be on April 6, 2022. 12:00-1:00 pm EST.

The event is free. Please register at

<https://purdue-edu.zoom.us/meeting/register/tjlofu-hpzwtHdMo29A06PVZ6GMafuANxWpc> After registration, you will receive an email with the participating Zoom link.

Dr. Bruce Bordelon will be our guest at April 6 Strawberry Chat. We will discuss spring planting and crop management activities. If you have specific questions, please email them to Wenjing Guan (guan40@purdue.edu) or Miranda Purcell (mrpurcel@purdue.edu). We are looking forward to seeing you on April 6!

If missed our previous chat, below is a recording for the March 2 Strawberry Chat. <https://anchor.fm/wenjing-guan>

La Niña Sticking Around Longer than Expected

(Beth Hall, hall556@purdue.edu)

This past winter has been mild across Indiana. With the second La Niña winter in a row, there were expectations that the season would start of mild with some hope that winter would come back fiercely in February and March. While most of the season's snowfall happened in February, it still was not enough to make up for the lack of snow in December and January. Figure 1 shows this winter's temperature departure from normal through March 15th. While the northern part of the state was near normal, southern Indiana's temperatures averaged slightly above normal. A similar north-south separation occurred regarding precipitation over that same period where southern Indiana received well above the climatological normal amounts and northern Indiana was

near normal (Figure 2). Considering the winter's precipitation climatology alongside the snowfall climatology (Figure 3), one can see that Indiana is well behind the typical amount of winter-season snowfall and yet the state is still very wet. This is unfortunate when translated to more runoff, soil erosion, and nutrient depletion. While there is still significant potential for several more days below freezing and possibly a snowfall event here and there, the current climate outlooks are not favoring winter-like conditions to last much longer.

Average Temperature (°F): Departure from 1991-2020 Normals
December 01, 2021 to March 15, 2022

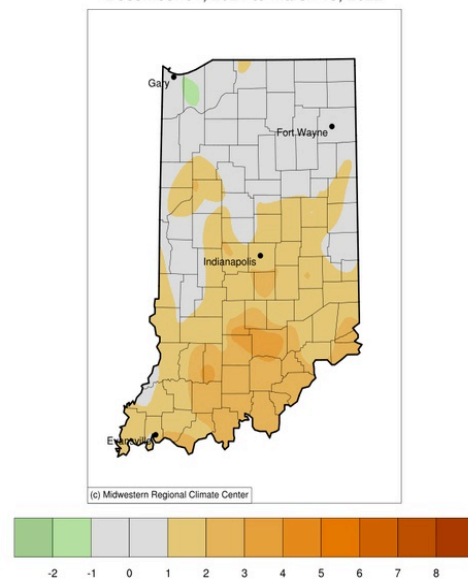


Figure 1. Average temperature departure (in degrees Fahrenheit) from the 1991-2020 normals for the winter period of December 1, 2021 through March 15, 2022.

Accumulated Precipitation (in): Percent of 1991-2020 Normals
December 01, 2021 to March 15, 2022

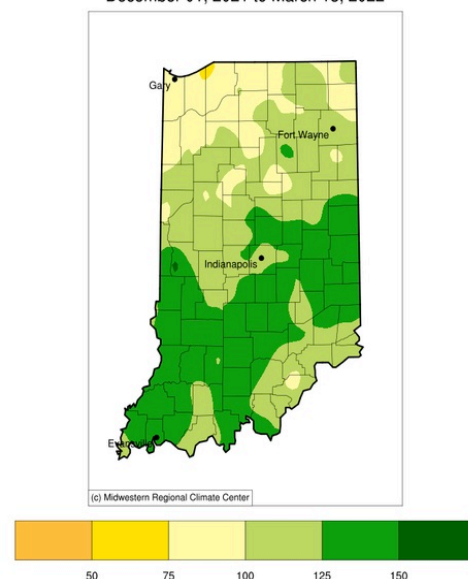


Figure 2. December 1, 2021 through March 15, 2022 precipitation represented as the percent of the average precipitation amount of the same time period from 1991-2020.

Accumulated Snowfall (in): Departure from 1991-2020 Normals

December 01, 2021 to March 15, 2022

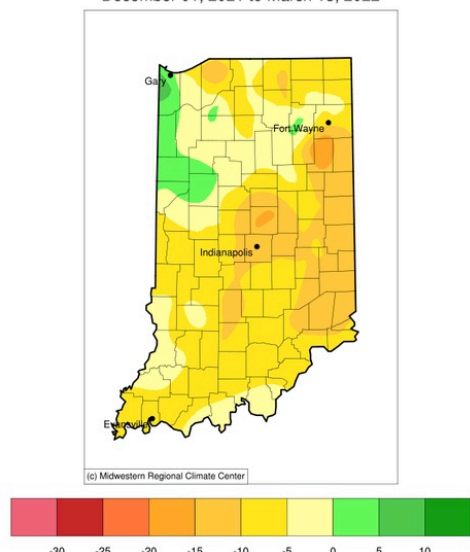
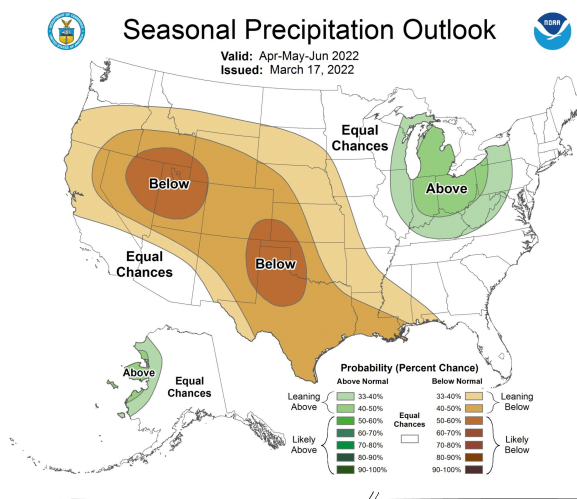
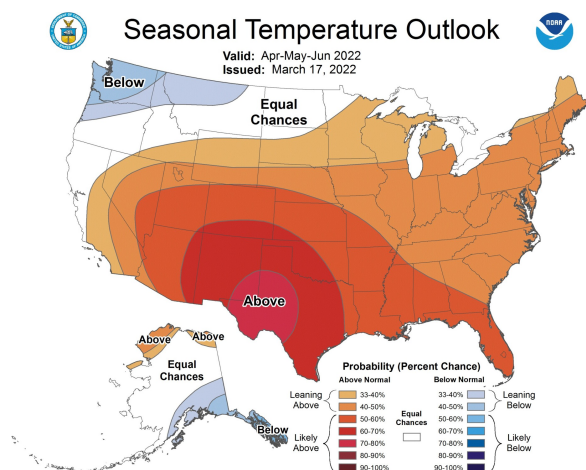


Figure 3. Average snowfall departure (in inches) from the 1991-2020 normals for the winter period of December 1, 2021 through March 15, 2022.

Over the last several months, climate models were predicting the La Niña conditions in the equatorial Pacific Ocean to start transitioning to the “neutral” phase of this teleconnection event (Note, there are 3 phases to the El Niño – Southern Oscillation (ENSO) phenomena: El Niño (warm phase); neutral; La Niña (cool phase)). However, this La Niña phase has been more persistent than predicted and will likely continue for a few more months. What this means for Indiana is higher confidence in above-normal temperatures and above-normal precipitation. The national Climate Prediction Center’s three-month outlook for the April-May-June period is favoring confidence that the period’s average temperature will be above normal with above-normal amounts of precipitation (Figures 4 and 5). The warmer temperatures will likely encourage perennials to leave dormancy soon enough to hopefully help absorb some of the excess precipitation. Additionally, warmer temperatures will encourage more evapotranspiration to further offset above-normal precipitation amounts.



Annual Meeting of the Indiana Vegetable Growers Association

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

The annual membership meeting of the IVGA is Wed., March 30, 2022, 11:00 am-noon Eastern time. All are welcome to attend! The meeting will be held in person at the [Purdue Extension Hancock County Office](#), 972 E. Park Avenue, Greenfield.

Members may also attend the meeting by going to the [Southwest Purdue Ag Center](#) (SWPAP), 4369 N Purdue Rd, Vincennes, where a virtual connection to Hancock County will be set up. Sign-up is not required, but if you think you will attend at SWPAP, it would be helpful if you could send a note to ivga@ivga.org or call Barb Joyner (812)886-0198, so we can get an idea of how many people to expect.

Members may also attend the annual meeting virtually via zoom from their own home or farm. If there is interest, other locations may be set up with a virtual connection where people could attend in person. Contact ivga@ivga.org if you are interested in one of these options.

Participate in Pest Monitoring to Inform Management

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

We will continue to host two trapping networks in the 2022 growing season. The historical corn earworm (Figure 1) trapping network will continue. This state-wide trapping and monitoring program for corn earworm is crucial to assist growers with timely management decisions in sweet corn production. The latest trap catch information can be found [here](#). Traps (Figure 2) will once again be placed at seven Purdue Agricultural Centers throughout the state.



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



Figure 2. Harstack Trap used to monitor Corn earworm adult activity. Photo by John Obermeyer.

The second trapping network was established in 2021 to monitor squash vine borer (Figure 3), which appears to be particularly damaging on urban farms. The latest trap catch information can be found [here](#). Using bucket traps (Figure 4) baited with a pheromone that smells like the female moth, we can draw males into the trap and monitor adult emergence and mating times.



Figure 3. Squash vine borer adult moth. Photo by John Obermeyer.



Figure 4. Bucket trap used to monitor squash vine borers.

Both of these trapping networks are a monitoring tool that provide important biological information about the pests species they target. As a grower, you can use this information to time your management strategies more effectively.

If you would like to host either of these traps on your farm, please contact me at lingwell@purdue.edu.

Survey to Gage Willingness to use Row Covers to Manage Pests

We are conducting a survey to learn about your experiences using row covers and your willingness to adopt a new row cover approach known as mesotunnels. Our study is evaluating the use of mesotunnels in the eastern half of the US for control of the full range of pests and diseases on organic production of cucurbit crops.



Your participation in this survey is voluntary. You may not have used mesotunnels or row cover systems in your production, that is perfectly fine and we still value your opinions. Your responses are valuable to us and will contribute to improving row cover innovations.

To participate the survey, please use this link:

<https://go.iastate.edu/EHWJCH>

The responses you provide will be kept completely confidential, and results will be reported in a summary form only. Please answer the questions by clicking on a response option or entering text in the box. You will have an opportunity to add comments at the end of the survey.

(Note: Use the corresponding PI's name)

Dr. David Gonthier, Assistant Professor of Entomology, University of Kentucky, gonthier.david@uky.edu, (859) 257-9364

Dr. Ric Bessin, Extension Professor of Entomology, University of Kentucky, ric.bessin@uky.edu, (859) 257-7456

Thank you in advance for your time and attention!

Survey for Vegetable Growers on use of Reduced Tillage Production

Rue Genger and Claire Strader at UW-Madison are surveying vegetable growers on use of reduced tillage production methods as part of a larger research study into methods that increase resilience to extreme weather events. The survey will take about 10-15 minutes to complete. Your participation will help us develop better research and education programs for reduced tillage in vegetable production.

To start the survey, please scan the QR code below or click this

link: https://uwmadison.co1.qualtrics.com/jfe/form/SV_eleWVfVQpM5ue9g



IHC 2022 Educational Session Recordings Now Available!

(Petrus Langenhoven, plangenh@purdue.edu, (765) 496-7955)

The Department of Horticulture and Landscape Architecture successfully presented the 2022 Indiana Horticulture Conference Webinar Series between February 1 and March 1, 2022. We delivered 18 educational hours to 785 attendees from 19 States and Puerto Rico. We also had several international attendees. The co-chairs Petrus Langenhoven, Stephen Meyers, Lori Jolly-Brown, and Nathan Deppe would like to thank everyone that helped us to plan and execute this webinar series. A big shoutout goes to all our experts who presented and communicated with our audience. Well Done!

All webinar recordings are now available and can be viewed on our Purdue Extension YouTube playlist, [Indiana Horticultural Conference 2022 Webinar Series](#).



It is the policy of the Purdue University that all persons have equal opportunity and access to its educational programs, services, activities, and facilities without regard to race, religion, color, sex, age, national origin or ancestry, marital status, parental status, sexual orientation, disability or status as a veteran. Purdue is an Affirmative Action Institution. This material may be available in alternative formats. 1-888-EXT-INFO Disclaimer: Reference to products in this publication is not intended to be an endorsement to the exclusion of others which may have similar uses. Any person using products listed in this publication assumes full responsibility for their use in accordance with current directions of the manufacturer.

Vegetable Crops Hotline © Purdue University - vegcropshotline.org

Editor: Wenjing Guan | Department of Horticulture and Landscape Architecture, 625 Agriculture Mall Dr., West Lafayette,
IN 47907 | (812) 886-0198