VEGETABLE CROPS HOTLINE

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

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In This Issue

Tips for Managing Tomato Spotted Wilt Virus (TSWV)

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To regular readers of the *Vegetable Crop Hotline*, it may seem that we include an article about tomato spotted wilt virus every year out of custom. However, we have again observed large outbreaks of this disease. Please read the article below carefully if you raise tomato transplants or mature tomatoes in a greenhouse or high tunnel.

Tomato spotted wilt virus (TSWV) is a plant disease caused by a virus that infects more than 1,000 species of plants (Table 1), including ornamentals and vegetables. Visual symptoms of TSWV vary depending on the plant that is infected, but general characteristics include yellow or brown ringspots on fruit and small, dark-colored ringspots on foliage that may make the entire leaf appear bronzed in severe cases (Figure 1). The virus is moved (vectored) from plant to plant by the piercing-sucking feeding of tiny insects called thrips. So, managing this disease requires strong and continued efforts to: (1) manage the source of the virus (other plants that are already infected), and (2) manage thrips, which move the virus from infected plants to healthy plants. If possible, choose tomato varieties that are resistant to TSWV. See this article for a list of options, https://extension.sdstate.edu/tomato-spotted-wilt-virus.

Figure 1. TSWV symptoms on a tomato plant and fruit.

The insect that moves TSWV from plant to plant: Thrips

1. Thrips feed on plants by puncturing the outer layer of leaf cells and sucking up the contents, which results in silvering, stippling, and discolored flecking of the surface (Figure 2 and 3). Thrips feeding may also cause leaves and flowers to be deformed in appearance. Western flower thrips (*Frankliniella occidentalis*), the most common thrips vector, preferentially feed on flowers. In the presence of flowers, shake the bloom vigorously over a white piece of paper to monitor for this vector. They may be present in flowers in the absence of feeding damage on leaves.

Figure 2. Silvering and flecking caused by thrips feeding on tomato leaves.

Figure 3. Feeding damage from thrips on tomato fruit.

2. Larval (immature) thrips are the only life stage that can acquire ("pick up") TSWV when they feed on infected plants, but adult thrips are the only life stage that can transmit (spread) the virus to new plants. This means adults can only infect healthy plants if they fed on an infected plant as a larva. TSWV is not transmitted vertically from adult thrips to offspring.

Figure 4. The two nymphal stages of thrips: smaller, first instar (on right) and larger, second instar (on left). Adult thrips are less than 1/10 of an inch in length. Photo by John Obermeyer.

3. Thrips lay their eggs inside leaves or flower petals where they are difficult to reach with insecticides. Once eggs hatch, the larvae often remain in protected areas, like inside flower buds or within leaves at the top of the plant. After two larval stages (Figure 4), thrips move down to the soil or leaf litter and enter a pupal stage where they are inactive (no feeding and almost no movement) (Figure 5). During this phase, the insects are not managed by insecticides that are directed at the leaves. Adult thrips live for 30-45 days and can lay 150-300 eggs. The development from egg to adult ranges from 7.5 – 13 days depending on temperature; warmer temperatures = faster development.

4. Several species of thrips transmit TSWV, but the most important ones are the western flower thrips, tobacco thrips, and onion thrips. Because thrips are so tiny, they can be carried by the wind from surrounding areas or on your clothing as you move from outdoor to indoor environments. Thrips do have wings and can also fly to disperse from infected to healthy plants.

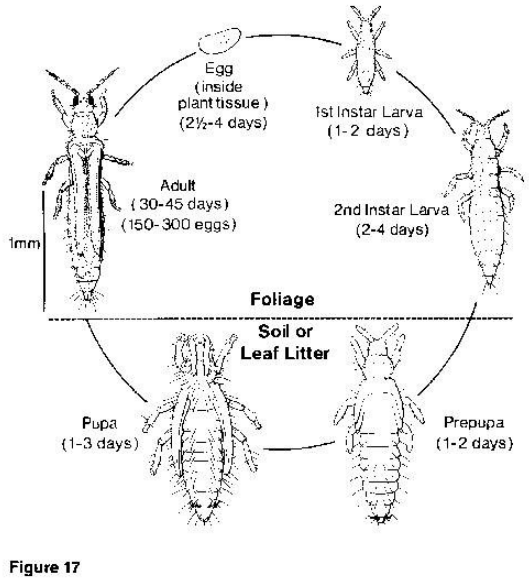


Figure 5. Diagram of the thrips life cycle. Image adapted from http://vegetablemdonline.ppath.cornell.edu/factsheets/Virus_SpottedWilt.htm

Keeping TSWV out of your greenhouse

1. Start with healthy, virus-free plants and **inspect all incoming plant material for TSWV symptoms and thrips infestation.** Vegetatively-propagated ornamentals can be an important source of TSWV! For example, you could accidentally introduce TSWV into your greenhouse from propagated plants or transplant seedlings that are already infected, then once thrips arrive, they will spread the virus to other plants in the greenhouse. *Do not buy vegetable starts that are produced in the same greenhouse as ornamentals. Do not raise flowers and tomatoes together either as transplants or mature plants. If flowers are grown in a separate greenhouse facility, avoid moving personnel or equipment from flower to tomato greenhouse.* Seed transmission is not considered important for spread of this disease.

2. **Manage weeds, both inside and around your greenhouse because they are an important source of the virus each year.** Many perennial ornamentals and weeds can be infected by TSWV and these plants can become a source of the virus at any given time during the current or following year. In addition to the plants listed in Table 1 amaranth and

purslane are hosts to thrips (Table 1).

Table 1. Partial Host Range of Tomato Spotted Wilt Virus[1]

Ornamentals			
African violet	Columbine	Geranium	Poppy
Amaryllis	Cosmos	Gladiolus	Primrose
Anemone	Cyclamen	Gloxinia	Ranunculus
Aster	Dahlia	Impatiens	Salvia
Begonia	Delphinium	Larkspur	Snapdragon
Calendula	Dusty miller	Marigold	Statice
Calla	Exacum	Nasturtium	Stock
Chrysanthemum	Fuchsia	Peony	Verbena
Cineraria	Gaillardia	Petunia	Zinnia
Vegetables			
Bean	Celery	Kale	Pepper
Broccoli	Cowpea	Lettuce	Potato
Cabbage	Cucumber	Pea	Spinach
Cauliflower	Eggplant	Peanut	Tomato
Weeds			
Burdock	Curly dock	Lambsquarter	Pigweed
Buttercup	Field bindweed	Morning glory	Shepherdspurse
Chickweed	Jimsonweed	Nightshade	Wild tobacco
Clover			

[1]Table modified from Putnam and Dutky, *Tomato Spotted Wilt Virus,* Maryland Department of Agriculture.

Once TSWV is confirmed in your greenhouse, remove and destroy all infected plants because they cannot be cured and will serve as a source of new infections.

During the Growing Season

1. Monitor for the presence of thrips by placing yellow sticky cards just above the crop canopy (Figure 6 and 7). It is recommended to place 1 sticky card per 1000 square feet, as well as near doors and air vents to monitor the movement of thrips from outside. Check sticky cards every week and record the number of thrips captured to monitor population levels and inform management decisions.

Figure 6. Several thrips (designated with arrows) captured on a yellow stick card. Image from Cornell University, J. P. Sanderson

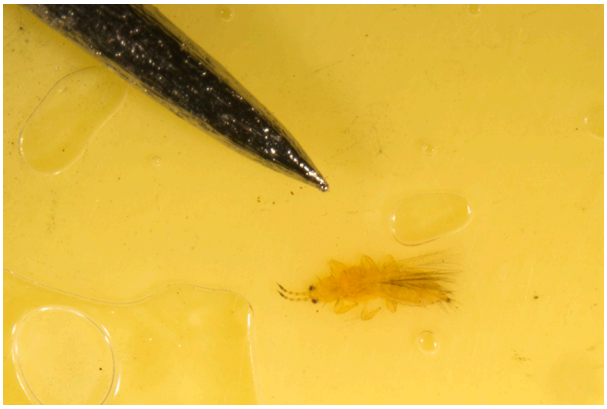


Figure 7. Close up of adult thrips captured on a yellow sticky card. Photo by John Obermeyer.

2. If you plan use biological control, begin to introduce a predator that will forage on the foliage-feeding AND the soil-dwelling stage of thrips. For foliage feeding stages, predatory mites are a great option. Orius insidiosus work well in ornamental and flower production, but do not navigate well on tomato plants. Three commonly available soil-dwelling options include the mite *Stratiolaelaps scimitus*, predatory rove beetles (*Dalotia coriaria*) and entomopathogenic nematodes (nematodes that eat insects, *Steinernema* spp.).
3. If using insecticides, spray in the morning, when thrips are most active. Five-day insecticide application intervals are more effective than 7-day intervals in reducing thrips infestation. Follow a rotation plan when applying insecticides to prevent the development of resistance. Be sure that you refer to the IRAC code (Insecticide Resistance Action Committee). These codes have been established, in part, for growers to easily select chemistries that have different modes of action (in other words, the way it works to kill the pest). To reduce the development of resistance, do not make more than two applications of the same mode of action (IRAC code) in a row. Table 2 is a list derived from the Midwest Vegetable Production Guide (mwveguide.org) with insecticides that *are allowed* for high tunnel/greenhouse use in Indiana. It is crucial to read the label of all of the products that you are using. Many of the products are listed as *suppression only* or indicating that they will only be effective at impacting the foliar-feeding stages of the pest, not the soil or flower feeding stages.
4. Follow the label closely. Many products kill the insect by coming into contact directly so adequate coverage and rates of application are crucial to get the most out of a product. If possible, apply insecticides with equipment that produces very small spray particles that will penetrate foliage and flowers to provide the

best coverage. *Note: Some insecticides may damage certain plants so please read and follow all label instructions.*

5. If you are utilizing insecticides and beneficials, be sure to check their compatibility. Chemistries such as novaluron, spinosad, and tolfenpyrad applied in the soil as a drench or drip are compatible with the predatory mite species (i.e. the chemical won't destroy the population of beneficial mites). Bifenthrin, imidacloprid and lambda-cyhalothrin have been reported as non-toxic and safe to use with entomopathogenic nematodes. Various suppliers of beneficial insects have an interactive tool on their website to look at the impacts of a chemical product on the beneficial organism.
6. Protect plants early, when they are young and most vulnerable which is also when thrips populations tend to be lower and you have a better chance of getting them under control.
7. Manage (i.e. remove) all weeds within and around the space (Figure 8). Almost all of the weed species that are commonly encountered in Indiana can host these pests, and many of these weeds have been reported to host the virus as well, including nightshade, morning glory, lambsquarter, clover, chickweed, and the list goes on (Table 1). These plants can be infected with the virus but may not show the same symptoms that you see in tomatoes, so it is vital to manage these potential reservoirs.
8. For TSWV in particular, if infection rates are low (only a few plants) and it is early in the season it is advantageous to remove infected plants to reduce the spread of the virus.

Figure 8. Weeds within and between high tunnels that can harbor both the insect and the virus.

Table 2. Pesticides allowed in high tunnel production for control of thrips on tomato.

Trade Name	Active Ingredient	REI[1] (hr)	PHI[2] (days)	IRAC[3] code
Admire Pro	Imidacloprid	12	21	4A
Azera	Azadiracthin & pyrethrins	12	0	UN/3A
Baythroid	Beta-cyfluthrin	12	0	3A
Brigade	Bifenthrin	12	1-tomato, 7-pepper	3A
Entrust	Spinosad	4	1	5
Exirel	cyantraniliprole	12	1	28
Minecto Pro	Abamectin & cyantraniliprole	12	1	6,28
Mustang Maxx	Zeta-cypermethrin	12	1	3A
Rimon	novaluron	12	1	15
Torac	Tolfenpyrad	12	1	21A
Venom	Dinotefuran	12	21 soil, 1 foliar	4A
Warrior II*	Lambda-cyhalothrin	24	5	3A

* Not for use against Western Flower thrips
[1]REI = Re-entry interval
[2]PHI = Pre-harvest interval
[3]IRAC = Insecticide Resistance Action Committee

Bolting and Blooming in High Tunnels

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

Bolting of crops overwintered in high tunnels is common in the spring. 'Bolting' refers to lengthening and blooming of the flowering stalk. Bolting is often a problem because the quality of the marketable part of the plant declines. Also, plants subject to bolting are programmed to die once they complete flowering and seed production so yield will decline in quantity as well as quality. Sometimes bolting is not a problem because the stalk, buds, and flowers can be sold as a new product while they last; this is often the case with kale, mustards and related crops.

Crops susceptible to bolting include those in the mustard family such as kale, mustards, tatsoi, bok choy (pac choi), mizuna, turnip, radish, etc.; carrots; beets and in some cases Swiss chard; onions; lettuce; and spinach. (Figure 1)

Figure 1. A variety of crops in the mustard family bolting in mid-March in a high tunnel.

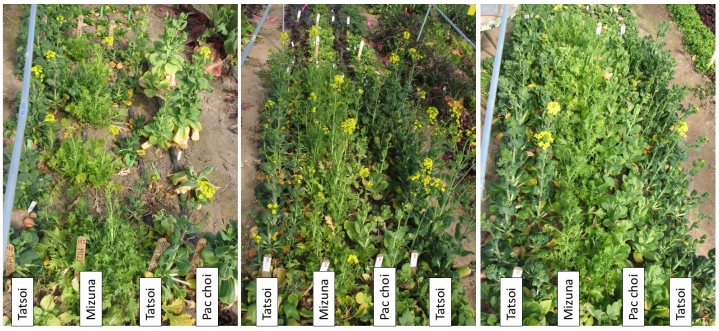
Bolting is triggered by environmental conditions. Some plant

types are triggered to develop flowers by extended periods of cool temperatures. This is called “vernalization.” In high tunnels vernalization might occur from late fall to early spring, depending on when a crop is planted and temperatures in the structure. After vernalization, when temperatures warm, the flowering stem lengthens, flowers continue to develop, and eventually bloom. Generally the warmer it is after vernalization has occurred, the faster the flowering process proceeds. All of the crops listed above except lettuce and spinach are triggered to flower by cool temperatures; for mustard family crops (e.g. radish) lengthening days further promote flowering. The wild relatives of crops with these traits are typically winter annuals or short-lived biennials: they emerge from seed one season, bloom the following spring, and then die–think of yellow rocket or Queen Anne’s Lace (wild carrot).

Lettuce and spinach also bloom in the spring, but their flowering is not triggered by cool temperatures. Long days trigger the switch to flowering in spinach, and high temperature combined with longer days trigger flowering in lettuce. These crops may not bolt until after the high tunnel has been rotated into summer crops.

Bolting is often predictable, so the first step in dealing with it is knowing what to expect for the crops you grow. With fall-planted crops it may be difficult to manage the high tunnel environment to eliminate spring bolting in crops where cool temperatures trigger flowering. However, it might be possible to slow development of the flowering stalk in the spring by keeping temperatures cool in the tunnel with frequent venting. For crops triggered to bloom by cool temperatures that are planted in the spring, it might be possible to reduce bolting by planting them a little later and managing for warmer temperatures inside the high tunnel. This is an area in which more research would likely lead to more useful recommendations.

Another way to deal with bolting is to look for existing crops and varieties of crops that are less susceptible to bolting, and over time, develop new ones through selection and breeding. This can be done on an individual farm, at research farms, and by those who breed new varieties. There are plenty of lettuce and spinach varieties already available that have been bred for delayed bolting in field production. Figures 2, 3, and 4 below illustrate some of the existing differences in bolting among kinds, types, and varieties of crops in the mustard family. In Figure 2, tatsoi, mizuna and pac choi are all bolting by March 8. In Figure 3, mustard ‘Ruby Streaks’ has completely bolted by March 30, but ‘Golden Frills’, ‘Giant Red’, and ‘Green Wave’ mustards are still mainly vegetative. In Figure 4, kale varieties haven’t bolted by March 8, but by April 10, ‘Red Russian’, ‘Ripbor’, and ‘Vates’ are all flowering, while only a few plants of ‘Lacinato’ have bolted. With continuing increases in high tunnel production we can expect more knowledge about and development of crops and varieties that resist bolting in those environments.

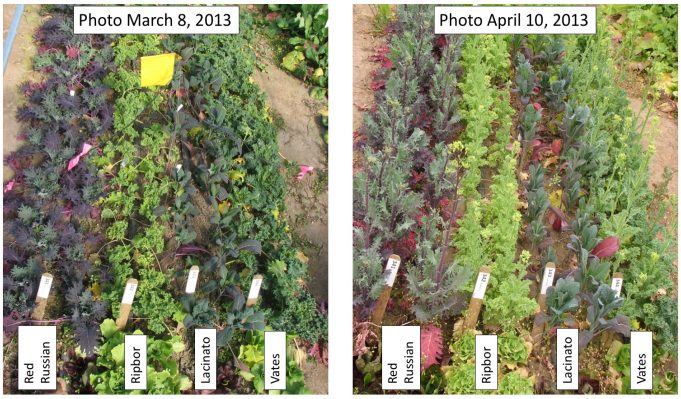


Tatsoi, mizuna, and pac choi grown in unheated high tunnel, photographed March 8, 2013.

Figure 2. Tatsoi, mizuna, and pac choi seeded in a high tunnel in late Sept. – Oct. bolted by early March the following year.

Mustards grown in unheated high tunnel, photographed March 30, 2013.

Figure 3. Mustards seeded in a high tunnel in Oct. varied in how early they bolted the following year.



Kale grown in unheated high tunnel, seeded Oct. 13, 2012.

Figure 4. Kale varieties seeded in a high tunnel in Oct. varied in how soon they bolted the following spring.

This article was originally published in March 2019, issue 654.

Strawberry Frost Protection

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

Last week when the heavy frost hit us, air temperature at Southwest Purdue Ag Center (SWPAC) in Vincennes, IN dropped to 24°F. We did not take action for frost protection on the strawberries growing with the annual plasticulture system, considering only two early cultivars start to bloom at that time. However, this appears to be a mistake. After a few warm days, flowers grow out on a few other cultivars and they all seem to be damaged. Apparently, the frost not only killed open blooms but also damaged flowers in the popcorn stage. It is important to keep in mind that open strawberry flowers can not tolerate temperatures lower than 30°F, popcorn stage flowers and tight buds may tolerate temperatures low to 26 and 22°F, respectively. Our mistake illustrated the importance of carefully checking the blooming stage of plants in the spring. Even if they have not had open blooms, the spring frost can damage popcorn-stage flowers and cause yield loss. It became apparent that the harvest of early cultivars in our trial will be delayed and yield of some of the cultivars will be reduced significantly. These may include cultivars Radiance, Sensation, San Andreas, Ruby June, and Rocco. Cultivars that have not bloomed in our trial include Chandler, Liz, Camino Real, Galletta, and Flavorfest. They were not affected by last week's frost in our trial. As more cultivars on the plasticulture system are entering full bloom and early cultivars grown with matted-row system are starting to have open flowers, it became extremely critical for growers to be very careful of any potential frost event in the next a few weeks.

One way to protect strawberry plants from spring frost damage is using floating row covers. Floating row covers have many different weights. Strawberry growers should choose the heavy-weighted ones (1.5 oz/sq. yard or above) in this case. Place the row covers on top of strawberry plants prior to the frost event, and remove them after the frost; adding wire hoops on top of strawberry bed so that the floating row cover is not directly touching the plants will add protection. In a case study last year at SWPAC, we placed 1.5 oz floating row cover on wire hoops in strawberry rows successfully protected flowers as temperature dropped to 24 °F (Figure 1. detailed information about this case study was in this article). Light-weighted row covers (0.5 oz) provide little frost protection. They are more suitable to be used as an insect barrier that covers plants for an extended period of time.

If strawberries are growing in a field without overhead irrigation for frost protection, growers should consider investing in heavy-weighted floating row covers, which can save the crop if there was a heavy frost in the spring. Although we hope not, mother nature may not work the way we hope.

Figure 1. The strawberry field was covered with floating row covers (1.5 oz) for frost protection in the spring.

Clean Sweep 2021

WHAT: An Indiana Pesticide Clean Sweep Project designed to collect and dispose of suspended, canceled, banned, unusable, opened, unopened or just unwanted pesticides (weed killers, insecticides, rodenticides, fungicides, miticides, etc.) is being sponsored by the Office of Indiana State Chemist (OISC). This disposal service is free of charge up to 250 pounds per participant. Over 250 pounds there will be a $2.00 per pound charge. This is a great opportunity for you to legally dispose of unwanted products at little or no cost.

WHO: All public and private schools, golf courses, nurseries, farmers, ag dealers, cities, towns, municipalities and county units of government or others receiving this notice are eligible to participate.

WHEN: 9:00am to 3:00pm Local Time

WHERE: August 17, 2021: Elkhart County Solid Waste, 59530 County Rd 7 Elkhart, IN

August 18, 2021: Fountain County Fairgrounds, 476 US Hwy 136 Veedersburg, IN

August 19, 2021: Knox County Fairgrounds, 11728 IN-67 Bicknell, IN

August 24, 2021: Harrison County Fairgrounds, 341 S Capitol Ave Corydon, IN

August 25, 2021: Union County Co-Op, 101 W. Campbell St Liberty, IN

August 26, 2021: Hendricks County Fairgrounds, 1900 E Main St Danville, IN

HOW: Complete the enclosed Pesticide Clean Sweep Planning Form to the best of your ability. Mail, fax or e-mail the completed form to Nathan Davis at 765-494-4331 or cleansweep@groups.purdue.edu no later than Fri., August 6, 2021. Then bring your labeled, leak free and safe to

transport containers to the collection site. DO NOT mix materials. In case of an emergency, you should bring with you a list of products you are carrying and a contact phone number.

COVID-19 Guidelines: When you arrive to drop off materials please stay in your vehicle and a team member will check you in. We will be unloading one vehicle at a time to maintain physical distancing.

***NOTE**: OISC reserves the right to cancel this Pesticide Clean Sweep Project if there is not adequate demand. Participants submitting the enclosed planning form by August 6, 2021 will be contacted immediately if cancellation is necessary.

CFAP 2 – USDA Pandemic Assistance for Producers

USDA is establishing new programs and efforts to bring financial assistance to farmers, ranchers and producers who felt the impact of COVID-19 market disruptions. The new initiative—**USDA Pandemic Assistance for Producers**—will reach a broader set of producers than in previous COVID-19 aid programs. USDA is dedicating at least $6 billion toward the new programs. This includes $2 million to establish partnerships with organizations to provide outreach and technical assistance to socially disadvantaged farmers and ranchers. These cooperative agreements will support participation in programs offered by FSA, including the **Coronavirus Food Assistance Program (CFAP).**

The Department will also develop rules for new programs that will put a greater emphasis on outreach to small and socially disadvantaged producers, specialty crop and organic producers, timber harvesters, as well as provide support for the food supply chain and producers of renewable fuel, among others. Existing programs like CFAP will fall within the new initiative and, where statutory authority allows, will be refined to better address the needs of producers.

USDA announced an expansion of CFAP on March 24, 2021. This is part of a larger effort to reach a greater share of farming operations and improve USDA pandemic assistance. CFAP updates include reopening of Coronavirus Food Assistance Program 2 (CFAP 2), additional payments for eligible cattle and row crop producers, and the processing of payments for certain applications filed as part of CFAP Additional Assistance.

Information related to CFAP can be found at farmers.gov/cfap. Also, watch for updates on this page, farmers.gov/pandemic-assistance, for information as additional COVID-19 aid programs are announced.

No-till Sweet Corn, Pumpkin and Winter Squash after Winter Rye – Reports from 2020

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

At the Pinney Purdue Ag Center in northern Indiana we had plots in 2020 with no-till sweet corn, pumpkins and winter squash following a rye cover crop. As is common when adapting new planting and tillage systems, we had both challenges and successes. Check out the video presentations to see photos of the plots, and dive into the reports for more detail.

- No-till Pumpkin and Winter Squash after Winter Rye – Report on the 2020 Trial

Video

Report

- No-till Sweet Corn after Winter Rye – Report on the 2020 Trial

Video

Report

We also had the opportunity to do some small trials with planters, one on-farm and one at the Pinney Purdue Ag Center. For those of you adapting equipment for no-till situations, our experiences might give you some ideas. Learn more here: Case Studies in Planter Adjustments for No-till Sweet Corn and Pumpkin.

Transplanting is an option for pumpkins and squash. Our colleagues at the University of Illinois Extension do a lot of work with no-till pumpkins and often transplant. Nathan Johanning shared tips in the video Making a No-Till Transplanter Work for Vegetable Crops, and more detail in the presentation No-till Transplanter Modifications for Real World Applications.

IPM Videos in Spanish from the Great Lakes Vegetable Working Group

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

Three new vegetable IPM videos in Spanish are available on Youtube. They were made by a team led by Natalie Hoidal, Extension Educator at Univ. of Minnesota.

- Búsqueda de problemas en el campo (Scouting for problems in the field)
- Diagnóstico de problemas de las plantas (Diagnosing

plant problems)
- Recolección de plantas enteras para el diagnóstico de problemas de plantas (Collecting plant samples for diagnosis)

Subtitles are available in Spanish. By using the settings option at Youtube subtitles auto-translated into English are available.

A Free Course to Teach Farmers with On-site Visitors to Manage Risk

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

Iowa State University Extension and Outreach is offering the free online course "Risk Management Education for Farmers with On-Farm Visitors". Producers will learn practical management techniques to enhance the safety and health of their on-farm visitors. For more information about this course, please visit Farmers with On-site Visitors Can Learn to Manage Risk during Free Online Course | News (iastate.edu)

Purdue is Hiring an Extension Organic Agriculture Specialist

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

Department of Horticulture and Landscape Architecture at Purdue University is looking to hire an Extension Organic Agriculture Specialist. Detailed information about this position is available at Extension Organic Agriculture Specialist (purdue.edu) If you know someone who might be interested for the position, please encourage them to apply. Thank you for helping spreading the word.

April Showers or Lingering Drought?

(Beth Hall, hall556@purdue.edu)

March wrapped up as one of Indiana's wettest (44th wettest out of 126 years) and warmest (16th warmest). It was marked by unusually warm days and then cool days. Was it ever just average? Certainly, most days fell within the climatological range of temperatures. Precipitation seemed to be partial to the southern part of the state with only teasing amounts up north. This kept the northern counties in an *Abnormally Dry* or *Moderate Drought* status throughout the month while the southern counties were hoping to avoid any serious flooding.

Which brings us to April.

The national Climate Prediction Center is indicating enhanced probabilities for a warmer than average April, but unfortunately the predictive models were all over the place with respect to precipitation. As plants start to come out of dormancy and thoughts of early planting are crossing farmers' minds, the question folks are wondering is if 2021 will be more like 2019 (wetter) or 2012 (drier). Shorter-termed outlooks are predicting enhanced probability for drier-than-normal conditions through the middle part of the month (April 12-20) and then after that, there is too much uncertainty. During this same period, temperatures are predicted to be favored toward cooler-than-normal conditions, so this should discourage evaporative demand from drying out soils too much. Additionally, the April-May-June outlook is still favoring wetter-than-normal conditions so the dry periods in April should not last long enough for us to start worrying at this point. With climate outlooks favoring warmer-than-normal temperatures over the next few months, a repeat of 2019 is highly unlikely. We'll have to keep monitoring for potential drought development or enhancement.

The cooler-than-normal temperatures later this month could pose a risk for near freezing or freezing conditions, so keep an eye on those forecasts and don't get too hasty to plant those flowers. In the meantime, sit back and enjoy the longer days and the nice evenings before Mother Nature starts testing our patience with the emergence of the Brood X cicadas, heat waves, and wind storms!

Finally, growing degree day accumulations have just started (Figure 1), but things are ahead of average in the northern half of the state and slightly behind average for this time of year along the Ohio River (Figure 2). Recent warm temperatures have helped get things started across the state, but look for these accumulations to slow down over the next few weeks.

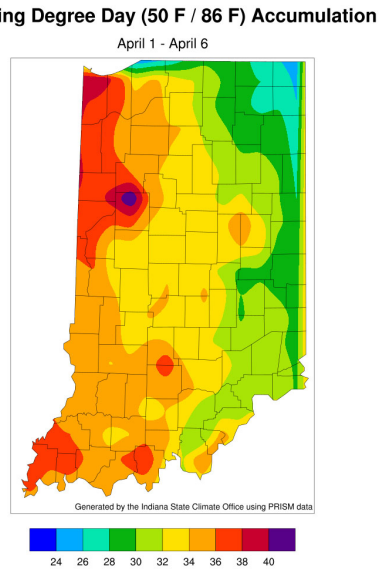


Figure 1. Growing degree day accumulations since April 1, 2021.

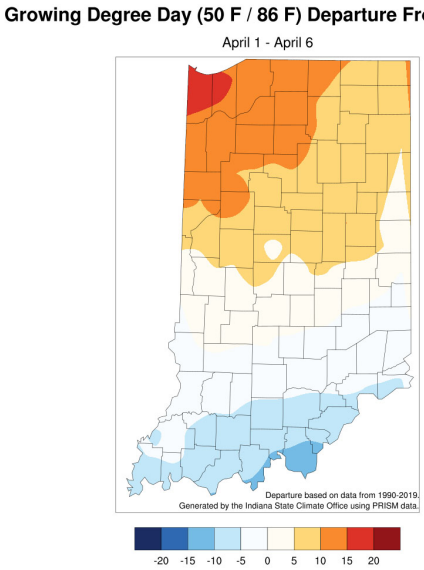


Figure 2. The growing degree day departure from average from April 1 through April 6.

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