

# VEGETABLE CROPS HOTLINE

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



Issue: 702  
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## Black Rot of Onions

(Dan Egel, [egel@purdue.edu](mailto:egel@purdue.edu), (812) 886-0198)

In November of last year, a grower brought onion samples to my attention. The samples had been stored on a greenhouse bench after harvest. A black mold had developed on many of the onions. Some of the onions appeared to have developed rotten areas on the top of the onion at the neck (Figure 1). In the laboratory, I could observe a common soil fungus on the onions. Further, I was able to isolate the same fungus in the laboratory, thereby confirming the disease as black mold of onion.



Figure 1. Black rot of onions often results from improper storage conditions.

The causal fungus, *Aspergillus niger*, is very common in the soil. Black mold may occur where there is injury especially at the neck of the onion. Black mold is most common when storage temperatures are higher than 86°F in the field or higher than 75°F in storage. Free moisture for 6 hours or more is needed for infection to occur.

Fungicides may lessen the severity of black mold when applied to seeds, seedlings or bulbs. But most control measures will involve storage conditions. Onion bulbs should be stored cool and dry. Avoid any type of injury at or after harvest. The grower reported that there were differences in varieties affected. This may be due to maturity date. If onions are harvested before mature, this may make them more prone to disease. Likewise, if the onions are left well past maturity, post-harvest disease may become a problem.

While it may seem too early to talk about an onion storage disease, the proper measures to avoid such problems is during the season.

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# Leaf and Stem Curling on Young Tomato Plants

(Wenjing Guan, [guan40@purdue.edu](mailto:guan40@purdue.edu), (812) 886-0198)

Tomatoes grown in a controlled environment are exposed to different conditions from their original habitats. As a result, some plants may respond to the controlled environment with abnormal symptoms.

Leaf and stem curling and distortion are symptoms we may see in the early season in greenhouses (Figure 1). This symptom might be caused by ethylene damage, an air pollutant caused by a malfunctioning heater. You can find more information about this problem in this [article](#) March 16, 2022 Issue #700



Figure 1. Leaf and stem curling symptom on tomato seedlings can be caused by ethylene damage or a combination of low light and high relative humidity caused edema.

Ethylene is not the only factor that may cause tomato leaf and stem curling symptoms. Low light and high humidity can also cause similar symptoms, known as edema (oedema). In this case, bumps, galls or blisters may develop on leaves, petioles or stems (Figure 2). While ethylene seems to affect all varieties, varieties vary greatly in their susceptibility to edema. I have observed the most severe symptom on tomato rootstocks bred from wild tomatoes.



Figure 2. Bumps on tomato leaves, an edema symptom under low light.

Recently, I received photos of tomato seedlings that had leaf and stem curling symptoms. The farmer told me that his first response was to ask professionals to check the heater, but he was told the heater was functioning properly. We then discussed light. The farmer shared that the greenhouse plastic is seven years old. He was planning to change it last fall but could not do it. Apparently, the recent cloudy, rainy, and cool days did not help the situation.

Different from a disease problem where specialists can find the pathogen and be able to ID the disease. It is not easy to confirm a problem caused by environmental factors. However, the above discussion does make me think low light might be the cause of the problem. It is known that low light, especially low UV light can cause tomato edema.

I suggested moving the plants out of the greenhouse. Ideally, exposing them to full sunlight for a few days. It looks like the coming warm and sunny weekend may provide an opportunity. If plants continue growing in a low light condition, cut down irrigation and increase air movement to reduce relative humidity. I hope this practice can help lessen the symptoms.

Another piece of advice, not delay changing greenhouse or high tunnel plastic. The life expectancy of greenhouse polyethylene cover is typically 3-4 years. After that, light transmission can decrease significantly, causing problems, especially under extended cloudy days. This [article](#) (July 19, 2018 Issue#647) provides a case study about light levels under an old vs. new plastic in a high tunnel.

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# National Weather Service Maps Can Aid Decision-Making to Reduce Wind Damage

(Liz Maynard, [emaynard@purdue.edu](mailto:emaynard@purdue.edu), (219) 548-3674)

High winds can cause serious damage to high tunnels and greenhouses. Design and construction with this in mind is important to reduce risk. In this article the topic is day to day risk management for a structure that is already constructed. When strong winds threaten, closing up the endwalls and sidewalls can help reduce risk. As I heard a greenhouse engineer explain, the plastic greenhouse acts like an airplane wing: when wind rushes through the structure it creates a lift that works to pull the ground posts up and out of the ground, or rip plastic. When doors and sidewalls are closed, wind moves over the top of the structure instead of through it, and the lifting does not occur.

The decision about when to close down a tunnel due to wind will vary for each operation. For some operations, decisions can be made on a moment-to-moment basis because people are always around and available to do the work. For others, decisions have to be made in advance, because people are away for hours or days. A good prediction for when damaging winds might occur is a useful tool.

I want to share a website for prediction that I have found helpful for deciding when to close down high tunnels at the Pinney Purdue Ag Center. It is the Convective Outlook

<https://www.spc.noaa.gov/products/outlook/day1otlk.html> from the National Weather Service Storm Prediction Center. The Center also posts regularly on their Twitter account [@NWSSPC](https://twitter.com/NWSSPC). The website provides a map with color-coded overlays representing the likelihood of severe weather associated with thunderstorms. There are separate maps for 1-day, 2-days, 3-days, and 4 to 8 days out. For the 1-day and 2-day predictions, separate maps are available for overall thunderstorm risk, tornado, wind and hail. Explanation of the color codes is provided at

<https://www.spc.noaa.gov/misc/about.html#Convective>.

For example, a slight chance for severe wind indicated by yellow shading indicates a 15% probability of wind greater than 58 mph. A slight change of severe

thunderstorm indicated by yellow indicates a similar probability of organized severe storms that aren't widespread with varying intensity. The map below from last July shows a slight to enhanced risk for northwest Indiana. We closed down the high tunnel endwalls and sidewalls overnight during that period.

Are there other resources you use to help make decisions about managing tunnels to present wind damage? Please drop me a note if you'd like to share them.



July 29, 2021 Day 1 Convective Outlook from National Weather Service Storm Prediction Center.

[https://www.spc.noaa.gov/products/outlook/archive/2021/day1otlk\\_20210729\\_0100.html](https://www.spc.noaa.gov/products/outlook/archive/2021/day1otlk_20210729_0100.html)

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## Research Update on Nitrogen Management in Non-Irrigated Watermelon Production

(Wenjing Guan, [guan40@purdue.edu](mailto:guan40@purdue.edu), (812) 886-0198)

A large proportion of watermelon acres in Indiana are not currently using drip irrigation. Farmers may choose not to use drip irrigation because precipitation is usually abundant in most years for watermelon production. There is a desire to reduce costs and/or fear that over-irrigation may increase the risk of mature watermelon vine decline, a disease often appears after heavy rains in the field, and management recommendations include judicious irrigation.

Watermelons generally accumulate 145 to 160 lbs nitrogen (N)/acre in the vegetation and fruit. In the non-irrigated system, farmers apply most N fertilizers preplant. Urea is often used as the primary nitrogen source.

In 2021, we experimented to understand how the different amounts of preplant nitrogen as urea affect



watermelon growth and yield. The experiment was conducted in a loamy fine sand soil with 0.7% organic matter. The treatments include 75 (Trt1), 100 (Trt2), 150 (Trt3), 200 (Trt4), and 250 (Trt5) lb N/acre preplant as urea. Trt 1 received an additional 75 lb N/acre as urea seven weeks after transplanting.

### *Yield*

Trt2 that received 100 lb N/acre had the lowest yield among the treatments. Trt1 that received split N application had the highest yield numerically but did not differ statistically from yields of Trt3-5, which received equal or higher rates of N preplant.

### *Did Trt2 have the lowest yield because of insufficient N?*

Probably. The soil total N was the lowest in Trt2 at ten weeks after transplanting. Trt2 leaf tissue also had the lowest N rate (3.87 % N) compared to other treatments ranging from 4.28 to 4.54% N.

### *Why did increasing the preplant N rate not increase watermelon yield in Trt 4 and 5?*

The first consideration is whether the watermelons have reached the maximal yield in the study. This experiment was conducted in small plots (20' W by 28' L), including two rows and six plants per row. We converted the small plot yield to yield/acre; it ranged from 36280 lbs/acre (Trt 2) to 53925 lbs/acre (Trt1). Even though yield in the small plot experiment may not reflect yield in a large field, we do not think the lack of yield response was because the plants have reached maximal yield.

The second consideration is whether the extra N applied to Trt 4 and 5 has lost during the season. This was not likely because the total N in the soil at ten weeks after transplanting was the highest in Trt5, followed by Trt 4, then Trt 3; Trt1 and Trt2 were lower than Trt 3-5. These results indicated that the extra nitrogen applied to Trt 4 and Trt 5 was still in the soil toward the end of the season.

Why did watermelons not take the extra N and achieve a higher yield? Plant tissue tests provided us with a clue. Leaf potassium (K) was in the range of 1.9 to 2.19% at the end of the season, which was considered low or deficient. Trt5 had lower K compared to Trt1. Leaf magnesium (Mg) and Calcium (Ca) were low or deficient at the fruit-expanding stages. These results indicate that a K, Mg, and Ca deficiency may be the yield-limiting factors in Trt3-5.

All the treatments received 100 lb K/acre and 30 lb

Mg/acre, which should be adequate for watermelon production. Then why did plants not take up the K and Mg?

We found soil ammonium-N ( $\text{NH}_4\text{-N}$ ) to nitrate-N ( $\text{NO}_3\text{-N}$ ) ratio in the early season was greater as preplant N rate increased. Trt1 and Trt2 had relatively lower  $\text{NH}_4\text{-N}:\text{NO}_3\text{-N}$  ratios (0.2 to 0.5) than Trt4 and Trt5. The  $\text{NH}_4\text{-N}:\text{NO}_3\text{-N}$  ratio was 1.4 at two weeks after transplanting and decreased to 0.5 at six weeks after transplanting in Trt 5. The high  $\text{NH}_4\text{-N}:\text{NO}_3\text{-N}$  ratio in the early season will likely inhibit plant uptake of cations including K, Mg and Ca. A study on melons found that leaf composition of K, Ca, and Mg was significantly lower under  $\text{NH}_4\text{-N}:\text{NO}_3\text{-N}$  ratio at 0.5 compared to  $\text{NH}_4\text{-N}:\text{NO}_3\text{-N}$  ratio at 0.1. The soil  $\text{NH}_4\text{-N}:\text{NO}_3\text{-N}$  ratio in the current experiment was higher than 0.1, especially in the treatments with a higher preplant N rate.

When urea is applied to soil, it converts to  $\text{NH}_4\text{-N}$  through urea hydrolysis;  $\text{NH}_4\text{-N}$  then converts to  $\text{NO}_3\text{-N}$  through nitrification, a microbial process that requires moisture and air. We noticed soil water content at the top 6" soil were frequently above 50% water depletion in the first 6 weeks of the 2022 season. The dry soil may have suppressed the nitrification process.

**Take home message: in the non-irrigated system and in a dry year, we think the current N management practice may result in high  $\text{NH}_4\text{-N}:\text{NO}_3\text{-N}$  ratios that inhibit plant uptake of K, Mg, and Ca, which prevent watermelon from reaching maximal yield.**

We are planning to conduct additional studies in the 2022 season to improve watermelon fertilization management recommendations for the region.

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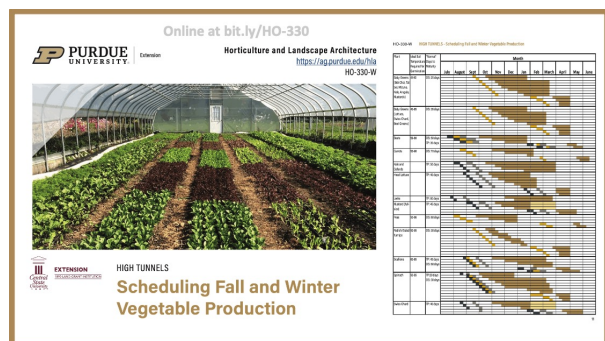
## Scheduling Fall and Winter Vegetable Production in High Tunnels

(Liz Maynard, [emaynard@purdue.edu](mailto:emaynard@purdue.edu), (219) 548-3674)

A new bulletin "Scheduling Fall and Winter Vegetable Production in High Tunnels" is available from the Purdue Education store at

[https://edustore.purdue.edu/item.asp?Item\\_Number=HO-330-W](https://edustore.purdue.edu/item.asp?Item_Number=HO-330-W). The publication brings together information collected on farms and research stations in Indiana and Ohio to provide detailed guidance on scheduling

vegetable crops for winter high tunnel production. It includes a fillable scheduling form, a planting date scheduling guide, two scenarios with revenue projections, and charts and figures covering six crops. It aims to help farmers improve quality and yield and help them better match production and market demand.



## Online PCQI Food Safety Certification

Course: Online PCQI Certification – Watermelon Packing

Dates: May 5 & May 6, 2022

Times: 8:00 am – 6:00 pm EST

Online Platform: Zoom

Cost: \$1000.00 each participant

To register: [pcqiclasses@gmail.com](mailto:pcqiclasses@gmail.com) or text 561-261-9747

Course Info: Kiley will lead a VIRTUAL but interactive training session (via ZOOM) across two days from 8:00 am – 6:00 pm each day.

The course will NOT include full International HACCP Alliance certification with gold seal, but it will meet the requirements of PrimusGFS v3.2 audit questions 6.01.02 and 7.01.02. Both questions state that an organization's HACCP and Preventive Controls Coordinator training is acceptable if it includes the following: "Preventive Control Qualified Individual (PCQI) training can also be accepted, as long as it is equivalent to the International HACCP Alliance training (covers the 7 Codex Alimentarius HACCP principles and the 12 HACCP implementation steps)."

This certification also helps fulfill new audit requirements for being the formal on-site, qualified food safety coordinator for a facility. The course agenda showing times and topics covered must always accompany the certification to be acceptable by a PrimusGFS auditor.

Each participant will get an electronic (Adobe PDF) Preventive Controls for Human Food manual and copy of

the instructor's HACCP Coordinator Review presentation emailed to them one day prior to the scheduled course.

## Cool and Wet Conditions now Predicted Over the Next Few Months

(Beth Hall, [hall556@purdue.edu](mailto:hall556@purdue.edu))

On the third Thursday of every month, the national Climate Prediction Center releases their 3-month climate outlook for temperature and precipitation. These outlooks are presented as the level of confidence (i.e., probability of occurrence) for conditions to be above or below normal. Since last fall, these outlooks have been consistently favoring above-normal temperatures and precipitation for Indiana. This suggested significant influence from the La Niña phase of oceanic temperatures over the tropical Pacific Ocean that has global impacts. Earlier models assumed that this La Niña event would weaken, transitioning to a more neutral phase by late spring. However, it has not shown much weakening, suggesting significant confidence that La Niña will continue into late summer. While this has happened in the past, the few cases coupled with the significant changes in global climates have made it difficult to draw strong comparisons for what to expect over the next few months. Regardless, the variety of climate models that contribute to the final climate outlooks have provided some guidance. For May, the climate outlooks are favoring cooler-than-normal temperatures and above-normal precipitation. Now that the temperature outlook has flipped from favoring above-normal temperatures to below-normal temperatures, there is increased concern that the number of favorable field days will be reduced. Lower temperatures will reduce evapotranspiration rates causing soil conditions to remain wetter for longer. The May-June-July climate outlook for temperature is indicating that the various climate models were inconsistent on whether temperatures would be above, near, or below normal (Figure 1). However, the 3-month climate outlook for precipitation is still favoring above-normal amounts (Figure 2). It is important to note, however, that if that outlook is correct, it only means that the 3-month total amount of precipitation is likely to be above normal with little-to-no guidance on its timing.

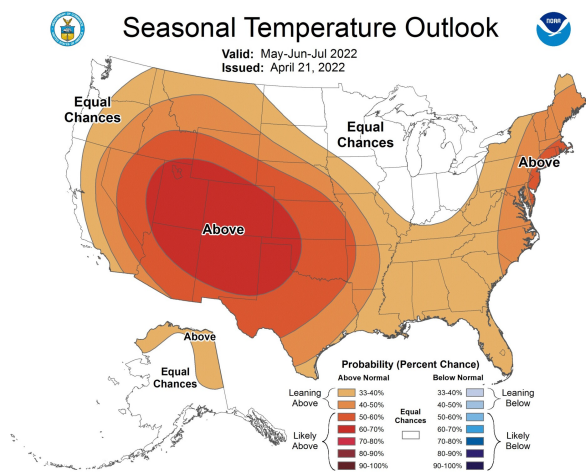


Figure 1. Temperature outlook for the May-June-July 2022 period. These are produced by the national Climate Prediction Center and illustrate confidence of favoring above- or below-normal conditions.

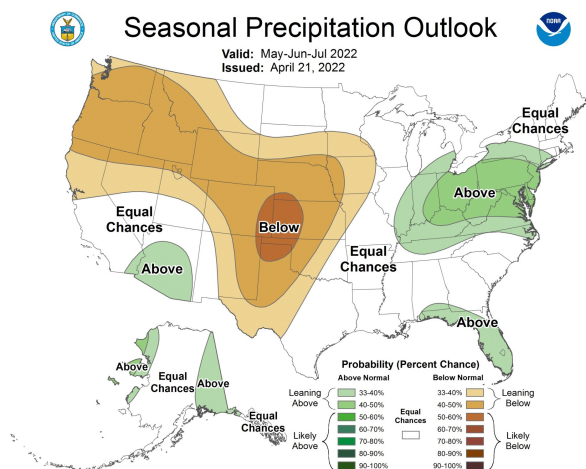


Figure 2. Precipitation outlook for the May-June-July 2022 period. These are produced by the national Climate Prediction Center and illustrate confidence of favoring above- or below-normal conditions.

The recent cooler temperatures across Indiana has led to a slow start for accumulated modified growing degree days (MGDD) with a start date of April 1. Figure 3 shows accumulated MGDDs ranging from the upper 30s in the northern counties to the lower 100s in southern Indiana. This is anywhere from 30 to 90 units below normal with the greatest differences occurring in southern Indiana (Figure 4).

#### Growing Degree Day (50 F / 86 F) Accumulation

April 1 - April 20, 2022

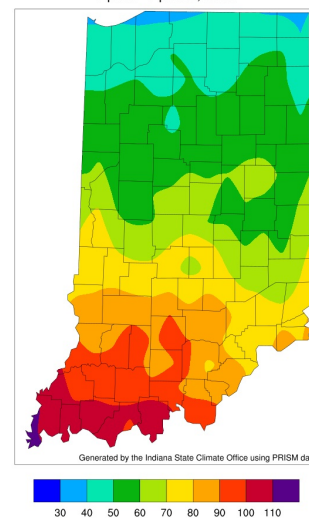


Figure 3. Modified growing degree day (50°F / 86°F) accumulation from April 1-20, 2022.

#### Growing Degree Day (50 F / 86 F) Departure From Average

April 1 - April 20, 2022

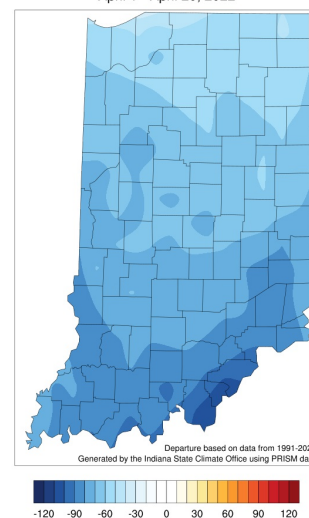


Figure 4. Modified growing degree day (50°F / 86°F) accumulation from April 1-20, 2022, represented as the departure from the 1991-2020 climatological average.



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## Strawberry Chat, April Episode Recording and May Episode Register

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

Listen to Strawberry Chat Episode 2. The episode was recorded on April 6, 2022, it featured Dr. Bruce Bordelon talking about spring activities for the strawberry matted-row system.

Are you interested in participating live in the next strawberry chat? It will be 12:00 -1:00 pm, May 4, 2022. Our guests will be Dr. Janna Beckerman and Mr. Austin Pearson.

Janna is a plant pathologist from Purdue University. Janna will discuss spring disease management and a weather-based tool for disease forecast.

Austin is a climatologist from Midwestern Regional Climate Center. Austin will bring us climatologists' insight on frost/freeze prediction.

Register for May strawberry Chat:

<https://purdue-edu.zoom.us/meeting/register/tJMoc-ChpjwpE9YPWUId9hTgUqQWgAEAJ20v>

After registering, you will receive a confirmation email containing information about joining the meeting.

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## Strawberry Field Day

(Wenjing Guan, [guan40@purdue.edu](mailto:guan40@purdue.edu), (812) 886-0198)

**Time:** Thursday, May 12, 2022, 1:30-4:00 pm EST

**Location:** Southwest Purdue Ag Center, 4369 N. Purdue Rd, Vincennes, IN, 47591

**Register:**

[https://purdue.ca1.qualtrics.com/jfe/form/SV\\_dgK5N8Ws9m2cJWC](https://purdue.ca1.qualtrics.com/jfe/form/SV_dgK5N8Ws9m2cJWC), or call 812-886-0198

- Visit strawberry research at Southwest Purdue Agriculture Center; see strawberry production on a plastic culture system, in high tunnels, and in bench systems.
- Discuss season extension in strawberry production, and understand challenges faced by each production system.



## STRAWBERRY FIELD DAY

### Strawberry Field Day & Open House

Thursday, May 12, 2022, 1:30-4:00 pm EST

Southwest Purdue Ag Center,

4369 N. Purdue Road Vincennes, IN 47591

The tour is free, register  
[https://purdue.ca1.qualtrics.com/jfe/form/SV\\_dgK5N8Ws9m2cJWC](https://purdue.ca1.qualtrics.com/jfe/form/SV_dgK5N8Ws9m2cJWC)  
or call 812-886-0198  
If you have any questions, please contact  
Wenjing Guan ([guan40@purdue.edu](mailto:guan40@purdue.edu))



- Visit strawberry research at Southwest Purdue Agriculture Center; see strawberry production on a plastic culture system, in high tunnels, and in bench systems.
- Discuss season extension in strawberry production, and understand challenges faced by each production system.



This Strawberry field day is sponsored by Purdue University and North-Central Sustainable Agriculture Research and Education (NC-SARE). Project number: LNC21-454.



Purdue University is an equal opportunity / equal access / affirmative action institution.

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## Vegetable Grafting Survey

**Tell us about your opinions on vegetable grafting practices**

**All growers are eligible whether you use vegetable grafting practices or not.**

Researchers at the University of Florida, in collaboration with Clemson University, North Carolina State University, The Ohio State University, Pennsylvania State University, Kansas State University, Washington State University, University of Arizona, University of California, Davis, and USDA - Agricultural Research Service are seeking participants who grow tomatoes or watermelons to complete a short survey regarding the use of vegetable grafting practices. The information will help identify research and extension needs for improving vegetable production. This survey takes 15-20 minutes to complete. Every 10th participant who completes the survey is eligible to win a \$50 VISA gift card. Participation is voluntary, and responses are confidential.

**Take the Survey Now**

[https://ufl.qualtrics.com/jfe/form/SV\\_1LmbB3l2aWRoiNw](https://ufl.qualtrics.com/jfe/form/SV_1LmbB3l2aWRoiNw)



The study has been approved by Internal Review Board

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(IRB) at the University of Florida (UF) with the IRB number IRB202101161. If you have questions about subjects' rights or other concerns, you may contact UF IRB Office at (352)-392-0433, PO Box 100173, Gainesville FL 32611. If you have any questions about the survey, please contact Yefan Nian (Ph.D. student) at [yfnian@ufl.edu](mailto:yfnian@ufl.edu) or Zhifeng Gao (professor) at [zfgao@ufl.edu](mailto:zfgao@ufl.edu).

Thank you on behalf of the vegetable grafting research and Extension team.

*\*\*If you received this invitation from a third party, the purpose of this email is to distribute researchers' invitations to assist with finding participants for the project. No third parties are engaged in nor sponsoring this research.\*\**

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