

# VEGETABLE CROPS HOTLINE

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



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## Time to Renew

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

This is the final issue of the *Vegetable Crops Hotline* (VCH) for 2017. Now is the time for subscribers who receive a paper copy in the mail to renew. A renewal form is included with this issue. Note that we provide an up-to three years' subscription of VCH with a reduced price. You can also sign-up for Veggie Texts with the same form. Email subscribers will remain on the subscription list for VCH as long as the email address works. Email subscribers will need to send us an email or call us to sign-up for Veggie Texts. An Indiana Vegetable Grower Association (IVGA) membership form is included here too. IVGA membership no longer automatically includes the VCH subscription. You need to indicate you would like to subscribe the VCH on the membership form.

Thank you very much for your support of VCH. If you have any suggestions, ideas, comments, please do not hesitate to send me a note ([guan40@purdue.edu](mailto:guan40@purdue.edu) or Southwest Purdue Agricultural Center, 4369 North Purdue Road, Vincennes, IN 47591). Thank you for helping us to improve the newsletter!

## Phytophthora Blight of Cucurbits

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

This disease was a serious problem in much of the state this past summer. As a result, I have had many questions about managing this disease. The questions I have been asked have ranged from what do I spray to how does this disease work? Therefore, I have written an article about the symptoms, biology and management of *Phytophthora* blight. I will concentrate on *Phytophthora* blight of cucurbits, but this disease is also a very serious problem on peppers. In the following article, I will outline some of the information I think it is important to know about this important disease.

### Phytophthora blight-biology

*Phytophthora* blight is caused by a fungus-like organism known as *Phytophthora capsici*. Even when I was in graduate school in the 1980's, my professors told us that we would discuss *Phytophthora* and related organisms in our fungus taxonomy class even though these organisms are more closely related to brown algae than to fungi. This is why we refer to the organisms that cause *Phytophthora* blight and downy mildew as fungus-like organisms.

I promise not to bore you with a detailed taxonomy of these organisms. But the taxonomy of *Phytophthora capsici* is important.

1. We will discuss how *Phytophthora* blight is favored by heavy rains, standing water and poorly drained fields. This makes sense when one remembers that this fungus-like organism is closely related to the brown algae, an organism that lives in water. Sometimes you will hear *Phytophthora* and related organisms called 'water molds'.
2. The fungicides that are most effective against *Phytophthora* blight and downy mildew are often not the same products that are effective against, for example, anthracnose and powdery mildew. This is because anthracnose and powdery mildew are caused by fungi; *Phytophthora* blight and downy mildew are not really fungi and have different biochemistries than fungi.

*Phytophthora capsici* has a rather large host range. In addition to causing disease on all cucurbits, *Phytophthora* blight can cause disease on pepper, tomato, eggplant as well as snap beans and lima beans. Pepper plants are particularly susceptible to *Phytophthora capsici*. While tomato plants do not usually have as severe symptoms as cucurbits or pepper, Buckeye rot of tomato fruit can be caused by *Phytophthora capsici* as well as by

additional species of *Phytophthora*. Artificial inoculations in a greenhouse have resulted in *Phytophthora* blight symptoms on spinach, radish, turnip, onion and carrot. The common purslane, jimson weed and nightshade are among the weed hosts for *Phytophthora capsici*. Since many plants are susceptible to *Phytophthora capsici*, it is difficult to use crop rotation as an effective means of managing *Phytophthora* blight. I have had growers complain about a vegetable crop with *Phytophthora* blight in a field which hadn't had, for example, pumpkins in many years. Part of the reason that *Phytophthora* blight can occur in such situations is the large host range described here. (*Phytophthora* root rot and stem rot of soybean is caused by *Phytophthora sojae*, a different organism than the one described here.)

Another reason that crop rotation is not always effective against *Phytophthora* blight is because of the long-lasting spores that this fungus possesses. It turns out that there are two mating types of *Phytophthora capsici*. If both mating types are present in a field, which is common, a spore type known as an oospore may form. Oospores may survive 10 years or more in the absence of any host. Crop rotations of at least 4 years without a susceptible host are recommended. However, oospores may survive longer than 4 years. The combination of a large host range and resilient spores means that crop rotation is not usually recommended as a stand-alone management technique.

The long-lived oospore isn't the only spore type for *Phytophthora capsici*. A spore type known as sporangia may form when the temperature and moisture conditions are right. Sporangia look like balloons on stalks. In the presence of water, each sporangium may break open to release 20 to 40 zoospores. Zoospores are motile and can swim to cause another infection. Zoospores may also be splashed from leaf to leaf or from plant to plant. One of the recommendations for *Phytophthora* blight is to manage water: avoid poorly drained fields, use raised beds, avoid overhead irrigation. The motile zoospores and taxonomic relationship to the brown algae are some of the biological relationships that go into making those recommendations.

One more item regarding the water-loving nature of *Phytophthora capsici*: This fungus can survive in water. This fungus-like organism can wash off into a river or pond, surviving for period of time. If this water is then used for irrigation, the crop can be inoculated with *Phytophthora capsici*. Even farms downriver can end up getting *Phytophthora* blight from water.

Temperature and relative humidity are additional factors in understanding the biology of any plant/ pathogen system. Using cucumber fruit, 77°F was the best temperature for lesion formation. However, lesions formed on cucumbers from 59°F to 86°F. Lesions formed on cucumbers from 35 to 100 percent relative humidity. *Phytophthora* blight may cause disease, therefore, under a great range of environmental conditions.

### **Phytophthora blight-symptoms**

*Phytophthora* blight symptoms may be observed on all above-ground parts of a cucurbit plant. However, cucumbers and watermelons usually have symptoms on fruit, but not on foliage.

On the other hand, lesions readily form on the leaves and stems of pumpkins and squash (Figure 1). Cantaloupe, while perhaps less sensitive to *Phytophthora* blight than the other hosts listed here, may have symptoms on foliage or fruit.



Figure 1. *Phytophthora* blight has caused a light brown wedge-shaped lesion on this pumpkin leaf.

Lesions on leaves often start out a light green, sunken area that may be wedge shaped, becoming wider toward the margin of the leaf. With time, the lesions become necrotic. Stem lesions may cause the vine to wilt from the constricted area out toward the end of the vine (Figure 2). Lesions on fruit vary depending on the host. Lesions on watermelon are often round, water-soaked and may appear as a bruise (Figure 3). Under moist conditions, these lesions are covered with a white mold, caused the growth of *P. capsici*. Lesions on fruit may be more common on the underside of the fruit where moisture accumulates (Figure 4). Fruit lesions on pumpkin may be large and occur in no particular shape. *Phytophthora* blight may also cause damping-off of seedlings.



Figure 2. This stem lesion on this pumpkin vine, caused by *Phytophthora* blight, will result in the death of the vine from this point to the end away from the plant.



Figure 3. The round lesions on this watermelon are caused by *Phytophthora* blight. Note that the *Phytophthora* blight fungus can



be seen sporulating on the lesion under moist conditions.



Figure 4. The *Phytophthora* blight fungus is sporulating on the lesion on the underside of this pumpkin.

Symptoms caused by *Phytophthora* blight may appear similar to other diseases. For example, *Pythium* may also cause damping-off; often it is not possible to tell the difference between damping-off caused by *Pythium* and *Phytophthora* blight. *Fusarium* fruit rot of pumpkin may cause a white mold on pumpkin fruit similar to *Phytophthora* blight. *Fusarium* fruit rot lesions on pumpkin tend to appear drier compared to lesions caused by *Phytophthora* blight. White mold of pumpkin may be mistaken for *Phytophthora* blight; however, the former disease is accompanied by irregularly shaped, dark fungal bodies.

While experienced growers may learn to recognize symptoms of *Phytophthora* blight, if there is any doubt, it is always good to send lesions to the [Purdue Plant and Pest Diagnostic Laboratory](#).

### **Phytophthora blight management**

Management of *Phytophthora* blight with fungicides is not possible unless cultural methods are also put into place. Even the best management schemes, chemical and cultural, may fail to control *Phytophthora* blight completely when weather conditions are conducive to the disease. Therefore, cultural management methods will be discussed first.

Water management is perhaps the most important control measure for *Phytophthora* blight. If possible, choose fields with well drained soils. At best, such fields will have soils sufficiently light so that rains seep into the field shortly after each rain. If the soils are relatively heavy, hopefully there are no areas where water ponds after a rain. Even a few such areas are likely to be hot spots where *Phytophthora* blight can start. Once the disease has a foothold, *Phytophthora* blight can quickly work its way across a field, splashing from plant to plant.

Plants on raised beds are less likely to have the crown area under water after heavy rains. Thus, the use of raised beds may help plant survival. The use of drip irrigation instead of overhead irrigation, if possible, will help to reduce spread of the disease. Overhead irrigation, if used, should be applied so that the leaf surfaces dry before dew formation. Under no circumstances should irrigation water be allowed to stand in the field.

The use of a no-till situation such as for pumpkin or squash planted into a wheat cover crop may reduce splash dispersal of

the *P. capsici* spores and generally seems to keep the surface of pumpkins clean.

It is not clear whether plastic mulch favors *Phytophthora* blight or not. On the one hand, plastic mulch can act as a barrier to soil which may harbor *P. capsici*. On the other hand, water may readily pool on the plastic; such pools may contain *P. capsici* which may then splash up into the canopy with the next rain. Perhaps plastic mulch that is well fitted to slightly domed beds will act as a management tool for *Phytophthora* blight. Beds that are domed will help prevent water from standing on plastic mulch.

Since *P. capsici* spores may survive in surface water, a pond used for irrigation may spread *P. capsici* if a vegetable field with *Phytophthora* blight drained into that pond. A field with *Phytophthora* blight that drains into a river or stream may lead to spread of the disease in a field downstream.

There are no cultivars with host resistance to *Phytophthora* blight in cucurbits. Through experience, however, growers may learn what varieties are very susceptible and should be avoided.

Another feature of the *Phytophthora* blight organism is its potential to survive a long time in the soil. Most specialists recommend at least a 4-year crop rotation before planting a cucurbit crop. In the meantime, avoid susceptible crops such as tomatoes, peppers and green beans (see biology section).

Fungicides are an important part of most management schemes for cucurbit *Phytophthora* blight. However, under conducive weather conditions and in the absence of the cultural controls mentioned above, fungicides will be ineffective. In addition, some strains of *P. capsici* have been shown to be resistant to select fungicides.

While cucumber and watermelon fruit are very susceptible to *Phytophthora* blight, the foliage is not usually affected. In contrast, pumpkin and squash fruit and foliage are susceptible to *Phytophthora* blight. Therefore, cucumber and watermelon fruit need to be protected by fungicides, while pumpkin and squash foliage and fruit need to be protected. Cantaloupe foliage and fruit may be symptomatic, but this crop doesn't seem as susceptible as the other crops mentioned here.

Fungicides should be applied to pickling cucumber when fruit are 1, 2 and 3 inches long in addition to applications before and after significant rain events. Watermelon should have a preventative fungicide application at softball stage and approximately weekly thereafter.

Effective fungicides include:

- Zampro®
- Revus 2.08 SC®
- Elumin®-to be labeled in 2018.
- Presidio 4FL®
- Ranman®
- Ridomil Gold® - Since strains of the *Phytophthora* blight fungus that are resistant to Ridomil might be present, be sure to alternate this product with others with different modes of action.

- Orondis® products (Orondis Ultra®, Orondis Ridomil Gold® and Orondis Opti®). These products may be available at pre-mixes or co-packs. Orondis Ridomil Gold® may be applied at planting, in furrow, through drip or in transplant water. Orondis Opti® and Orondis Ultra® may be applied as foliar sprays. Do not follow a soil application of Orondis Ridomil Gold® with foliar applications of either Orondis Ultra® or Orondis Opti®. While Orondis Ultra® and Orondis Ridomil Gold® are combinations of two different systemic active ingredients, Orondis Opti® is a combination of a systemic and a contact active ingredient.
- The use of Actigard®, Forum® and products with phosphite as an active ingredient (e.g., Agri-Phos®, Confine Extra®, Phostrol®, Rampart®) in spray programs early in the rotation can be helpful.
- The products Gavel® and Zing!® are premixes of the systemic active ingredient zoxamide and the contacts mancozeb and chlorothalonil, respectively. These products may be useful because the combination of systemic and contact active ingredients can help manage fungicide resistance.

It is essential that one use products in such a way as to alternate FRAC codes. Use several different modes of action in a year if possible. In addition, some of these products have restrictions on how many times they can be used in a season. Re-entry periods and pre-harvest intervals should be noted on the label. For the most part, these products will not be useful controlling foliar diseases such as gummy stem blight, powdery mildew or anthracnose. Some of the products listed as effective against Phytophthora blight may also be effective against downy mildew. However, downy mildew is not present every year in Indiana.

Phytophthora blight can be serious and difficult to control because it is a foliar disease caused by an organism that survives years in the soil in the absence of a host. Many foliar diseases do not survive for long periods without a host; an example would be anthracnose of watermelon which may spread rapidly across a field, but survives in crop residue-not as a resilient spore. Fusarium wilt of watermelon, in contrast, is a soil borne disease that can survive for years in the soil, but does not spread across the field in one season. Because Phytophthora blight is a foliar disease caused by an organism that survives well in the soil, management can be a challenge in years when the weather is conducive to this important disease.

## Please Welcome Rhonda Taylor to Extension Food Safety

(Scott Monroe, [jmonroe@purdue.edu](mailto:jmonroe@purdue.edu), (812) 886-0198) & (Amanda J Deering, [adeering@purdue.edu](mailto:adeering@purdue.edu))



Rhonda Taylor

Rhonda Taylor has recently joined the Department of Food Science, and the Extension food safety team, as Food Science Outreach Extension Specialist and Food Processing Manager. Rhonda obtained her B.S. in Science from the Purdue University School of Agriculture focusing on Ecology and Land Management, as well as an additional A.S. Degree in Applied Science in Biotechnology. Prior to coming to Extension, she worked as a seed analyst for the Hardwood Tree Improvement and Regeneration Center and as a research technician working with soybeans and canola. Rhonda joined Purdue's Food Science department in 2013 as a laboratory manager/research assistant in Food Safety with a research focus on food-borne pathogens, primarily in poultry and beef.

In her new position, Rhonda will function as the point of contact for Food Science Extension programming. This includes working with the fresh produce industry, homebased vendors, and those interested in food processing validation studies. She will also maintain the ServSafe website, be the point of contact for Extension Educators offering Servsafe classes, and assist with coordination of Better Process Control School and FDA and Validation workshops.

Rhonda's work with the produce industry will involve coordinating PSA grower trainings, participating in the trainings as part of Extension's PSA training team, and maintaining the SafeProduceIN website.

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## New SafeProduceIN Website is Up and Running

(Scott Monroe, [jmonroe@purdue.edu](mailto:jmonroe@purdue.edu), (812) 886-0198), (Amanda J Deering, [adeering@purdue.edu](mailto:adeering@purdue.edu)) & (Rhonda Taylor, [taylorrm@purdue.edu](mailto:taylorrm@purdue.edu))

The new SafeProduceIN website is now live and may be accessed at [www.SafeProduceIN.com](http://www.SafeProduceIN.com).

SafeProduceIN is a collaboration between Purdue Extension, the Indiana State Department of Agriculture, and the Indiana State Department of Health. The purpose of the collaboration is to

assist Indiana produce growers with implementation of the Produce Safety Rule. The new website will serve as a one-stop website where growers can submit produce food safety related questions, access food safety and FSMA resources, and register for trainings.

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## Produce Safety Rule Updates

(Scott Monroe, [jmonroe@purdue.edu](mailto:jmonroe@purdue.edu), (812) 886-0198) & (Amanda J Deering, [adeering@purdue.edu](mailto:adeering@purdue.edu))

In the last two months, the U.S. Food and Drug Administration (FDA) has released several communications dealing with the Produce Safety Rule (PSR). The following is a brief summary of those communications:

### Guidance

On September 5, FDA released **Guidance for Industry: Standards for the Growing, Harvesting, Packing, and Holding of Produce for Human Consumption: What You Need to Know About the FDA Regulation - Small Entity Compliance Guide**. This is a compliance guide, prepared by FDA, to assist small entities in complying with the PSR. Copies of the document may be downloaded at [https://www.fda.gov/Food/GuidanceRegulation/GuidanceDocumentsRegulatoryInformation/ucm574281.htm?source=govdelivery&utm\\_medium=email&utm\\_source=govdelivery](https://www.fda.gov/Food/GuidanceRegulation/GuidanceDocumentsRegulatoryInformation/ucm574281.htm?source=govdelivery&utm_medium=email&utm_source=govdelivery).

### Testing of Agricultural Water

On September 11, FDA announced that it had determined that the following water testing methods are “scientifically valid” and “at least equivalent” to the method of analysis (EPA Method 1603) in §112.151(a) in accuracy, precision, and sensitivity:

1. **Method 1103.1** – *Escherichia coli* ( *coli*) in Water by Membrane Filtration Using membrane-Thermotolerant *Escherichia coli* Agar (mTEC) (March 2010). U.S. Environmental Protection Agency. EPA-821-R-10-002.
2. **Method 1604** – Total Coliforms and *Escherichia coli* in Water by Membrane Filtration Using a Simultaneous Detection Technique (MI Medium) (September 2002). U.S. Environmental Protection Agency. EPA-821-R-02-024.
3. **9213 D** – Natural Bathing Beaches (2007). In: Standard Methods for the Examination of Water and Wastewater, 22nd Edition (Rice E.W., et al., Ed.), 9-46 – 9-48. Washington, DC: American Public Health Association. (2012).
4. **9222 B** – Standard Total Coliform Membrane Filter Procedure (1997), followed by 9222 G – MF Partition Procedures (1997) using NA-MUG media. In: Standard Methods for the Examination of Water and Wastewater, 21st Edition (Eaton A.D., et al., Ed.), 9-60 – 9-65, and 9-70 – 9-71, respectively. Washington, DC: American Public Health Association. (2005).
5. **D 5392-93** – Standard Test Method for Isolation and Enumeration of *Escherichia coli* in Water by the Two-Step Membrane Filter Procedure. In: Annual Book of ASTM Standards, Volume 11.02. ASTM International. (1996,

1999, 2000).

6. **Hach Method 10029 for Coliforms - Total and coli**, using m-ColiBlue24® Broth PourRite Ampules.
7. **IDEXX Colilert® Test Kit**, but only if using IDEXX Quanti-Tray/2000 for quantification.
8. **IDEXX Colilert-18® Test Kit**, but only if using IDEXX Quanti-Tray/2000 for quantification.

These methods may be used as an alternative to EPA Method 1603 for purposes of complying with the water testing requirements of the PSR. If you are covered by the water testing provisions of the PSR, contact your testing laboratory to make sure that they are using one of these methods when testing your water samples.

### Compliance Inspections

In a recent speech to the National Association of State Departments of Agriculture (NASDA) on September 12, FDA Commissioner Scott Gottlieb, M.D., announced that large farming operations will still be expected to meet all produce safety requirements of the PSR, except those related to agricultural water, by the original compliance date. However, inspections to assess compliance with the non-water requirements of the PSR will not begin until 2019. This effectively delays inspections for one year after the compliance date for large farming operations. Details can be found on FDA’s website at <https://www.fda.gov/Food/NewsEvents/ConstituentUpdates/ucm575532.htm>.

### Extension of Compliance Dates

On September 13, FDA published a proposed extension of compliance dates for subpart E of the water testing provisions of the PSR in the Federal Register. FDA is proposing an additional two years for growers to comply with subpart E of the water testing provisions of the PSR for agricultural water. The entire proposal may be viewed in the federal register at <https://www.federalregister.gov/documents/2017/09/13/2017-19434/standards-for-the-growing-harvesting-packing-and-holding-of-produce-for-human-consumption-extension>. Stakeholders may submit comments on this proposed extension until November 13, 2017.

It should be noted that sprouts are not included in the proposed changes to compliance times or the extension of compliance inspection dates. Sprout growers will need to be in compliance with the PSR by the originally published compliance dates.

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## Are You Interested in Growing Greenhouse Type Cucumbers in High Tunnels, and Targeting for Early Season Production?

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

Consumers love cucumbers that are sweet, seedless and have thin skins. They are willing to pay high prices for the long or mini cucumbers sold at grocery stores. These cucumbers are often



grown in greenhouses and shipped long distances. It will attract consumers' attention if greenhouse type cucumbers can be produced locally in high tunnels, and be available in the early-season's market.

There are at least three benefits for targeting early-season cucumber production. First, prices are higher; second, there are less pest problems; and third, things are going slower in early seasons compared to in the summer. However, we all know that cucumbers love high temperatures and do not grow well when soil temperature is low, even in high tunnels. This is especially true for the greenhouse type cucumbers. The situation may be changed with the use of grafting technology. Using squash as rootstocks, we were able to harvest cucumbers as early as in the middle of April in a high tunnel that was not heated in our pilot study at Southwest Purdue Ag Center this spring. This project was funded by North-Central Sustainable Agriculture Research and Education (NC-SARE). The funding will allow us to continue the work and expand its scope to more on-farm trials.

We are going to supply grafted and normal cucumber plants for free, and try our best to meet your needs in terms of variety and the planting dates. What we want for you is to grow the same number and variety of grafted and normal cucumber plants, and keep track of the yields. We will provide a stipend for your efforts in tracking the data. The funding allows us to work with five high tunnel growers across Indiana. If you are interested in the project, please contact Wenjing Guan at [guan40@purdue.edu](mailto:guan40@purdue.edu) or (812) 886-0198. We are excited to work with you and promote sustainability of vegetable production in Indiana.



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## Indiana Farmers Markets Price Reports: How, Where, and Why

(Allan Pinto, [pinto7@purdue.edu](mailto:pinto7@purdue.edu)) & (Ariana Torres, [torres2@purdue.edu](mailto:torres2@purdue.edu))

Farmers markets are a centerpiece of local food systems. These markets connect farmers with consumers and provide important economic benefits. While Indiana farmers can take advantage of the opportunities from selling directly to consumers, they face a dearth of information regarding pricing and marketing strategies.

Information about pricing and product quality requirements are generally available for farmers who produce enough volume to enter wholesale markets. Larger farmers selling wholesale can access these weekly reports to define their marketing strategies,

assess investment in new technologies, and assure profitability. On the other hand, Indiana's small farmers have faced a lack of pricing and sales information regarding Indiana's 155 farmer's markets. Thus, Indiana farmers have had to rely on farmers market prices from neighboring states or walk down the market aisles to define prices, assess potential profitability, and determine market feasibility.

The Horticulture Business Extension Program at Purdue University team started collecting fruit and vegetable prices and sales in Indiana farmers markets. The goal of our program is to collect foundational data and establish long-term pricing reports for Indiana specialty crops sold at farmers markets. The Horticulture Business Program is also developing marketing tools (such as enterprise budgets) and training farmers and extension agents to support the economic viability of the Indiana specialty crop industry. Together, these resources can help farmers make production and marketing decisions for the upcoming year and evaluate potential earnings.

The specialty crop industry includes operations that grow fruit and vegetable, tree nut, dried fruit, horticulture, floriculture, and nursery crops. Thus, our project provides farmers, buyers, and communities with the prices of many different fruits, vegetables, and ornamentals that highlight the economy and gastronomy of Indiana. The reports can help farmers, farmers markets, buyers, and communities make decisions based on real-time pricing information. The weekly price reports can be found at: [www.purdue.edu/hla/sites/hortbusiness/price-reports](http://www.purdue.edu/hla/sites/hortbusiness/price-reports).

### The project

We collaborate with farmers market managers and county extension educators in several Indiana counties to collect and publish weekly prices of produce sold through Indiana farmers markets. The project has been funded by Purdue AgSEED and supported by the Indiana Vegetable Growers Association (IVGA).

We started our project with the Bloomington Winter Farmers Markets in January 2017, and we are currently publishing prices from seven farmers markets during the summer market season. Summer season prices include markets located in Lafayette and West Lafayette (Tippecanoe County), Plymouth and Culver (Marshall), Bloomington (Monroe), Warrick (Warrick), and Kokomo (Howard). Figure 1 illustrates the counties where we are collecting farmers market prices. Prices are recorded once a week per market and published on the Horticulture Business Program website.

Our price report website has over 1,500 page views since its release in February 2017. Page visitors may use a tablet, smartphone, or computer to access our information. Around 64 percent of the visitors are from United States (967); of those, 23 percent are from Indiana.

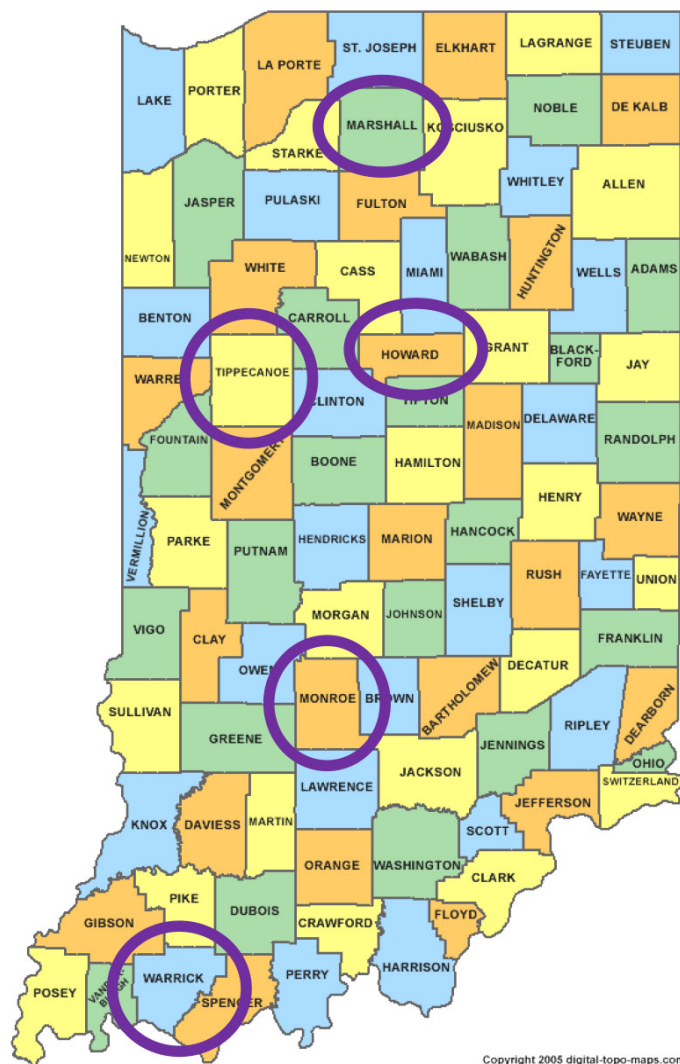


Figure 1. Counties in Indiana where our project collects farmers market prices for the summer season.

### Using Price Reports to Make Informed Decisions

Our reports provide farmers with price benchmarks to help them evaluate how their pricing strategies compare to other farmers selling locally. By looking at our weekly reports, farmers can assess the range of prices available at the farmers market for a specific week. In other words, farmers can observe the lowest and highest prices of produce sold per week at farmers markets. At the end of each pricing report, the website also summarizes the lowest and highest prices by item and across all farmers markets.

Figure 2 illustrates the Lafayette Farmers Market report for the week of August 28 to September 3, 2017. The figure lists all the produce, the lowest and highest prices, and any appropriate comments. For example, Figure 2 shows that farmers in the Lafayette market sold arugula by the bag for \$4, basil by the bunch between \$2 and \$3, beets by the bunch for \$4, and bok choy by the head for \$2. Farmers who use this information should be able to assess if selling their arugula for \$4 will be enough to cover their costs and assure profitability. We can also see that slicing tomatoes were sold by the pound (between \$3.95 and \$4.25) and by the box (\$9.50) in the Lafayette market.

Aug 28 - Sep 3, 2017

### Lafayette Farmers Market

Product and Unit	Lowest Price	Highest Price	Comments
Arugula-bag	\$4.00	\$4.00	
Basil-bunch	\$2.00	\$3.00	
Beets-bunch	\$4.00	\$4.00	
Bok choy-head	\$2.00	\$2.00	
Cabbage-head	\$3.00	\$3.50	
Blueberries-crate	\$5.00	\$5.00	
Celery tops-bunch	\$2.00	\$2.00	
Cucumber (pickling)-lb	\$1.50	\$1.50	
Cucumber (slicing)-each	\$0.50	\$1.50	
Garlic-head	\$1.00	\$2.00	
Kale-bunch	\$4.00	\$4.00	
Leeks-each	\$1.00	\$1.00	
Onions-lb	\$1.50	\$2.95	
Peaches-peck	\$6.00	\$6.00	
Potatoes (red, white, yellow)-lb	\$2.00	\$4.00	
Sweet potatoes-box	\$5.00	\$5.50	
Radish-bunch	\$3.00	\$3.00	
Raspberries-crate	\$3.00	\$3.00	
Squash, summer-other unit	\$1.00	\$1.50	
Squash, butternut-each	\$2.00	\$4.00	
Squash, yellow-each	\$1.00	\$1.50	
Sweet corn-dozen	\$6.00	\$7.00	
Tomatoes (slicing)-lb	\$2.00	\$3.95	
Tomatoes (grape, cherry)-crate	\$2.50	\$4.00	
Eggplant-each	\$1.00	\$2.50	
Cantaloupe-each	\$4.00	\$4.00	
Watermelon-each	\$2.00	\$6.00	
Apples-lb	\$2.00	\$2.00	
Pumpkin-each	\$5.00	\$5.00	
Zucchini-each	\$0.50	\$1.50	
Green beans-lb	\$2.00	\$3.95	
Plums-box	\$5.00	\$5.00	

Figure 2. Lafayette Farmers Market weekly price report for August 28 to September 3, 2017.

### The Benefits of Pricing Reports

Our pricing reports provide farmers with the prices for a wide variety of fruits and vegetables sold in Indiana farmers markets. Some of the benefits of using pricing reports are:

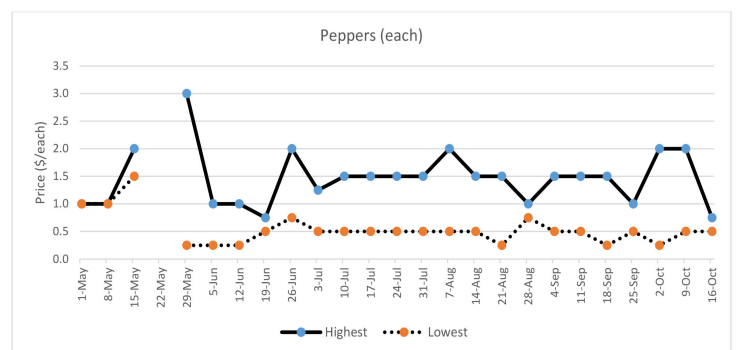
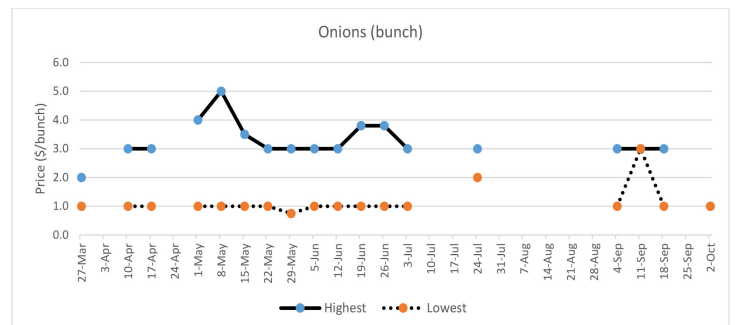
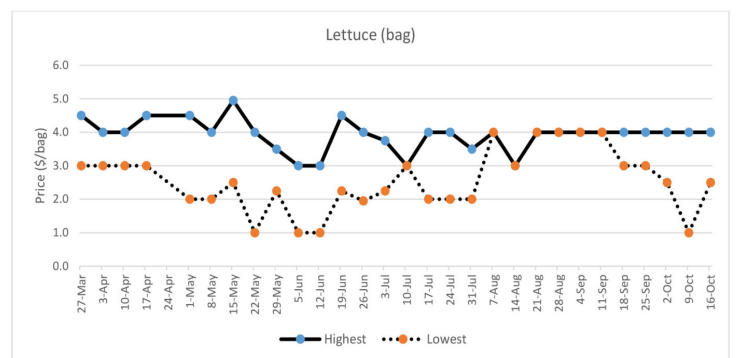
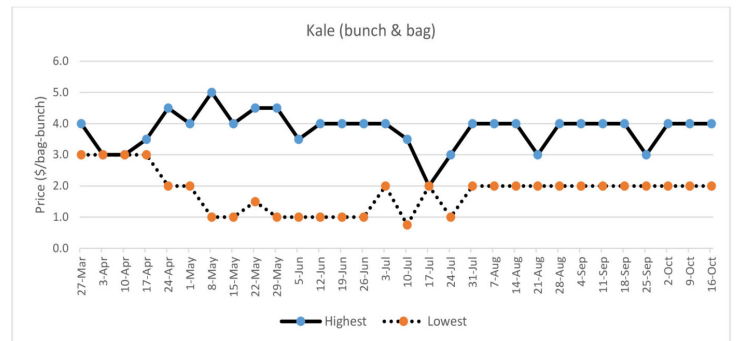
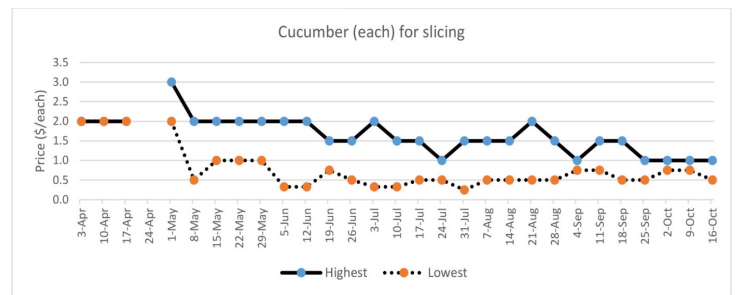
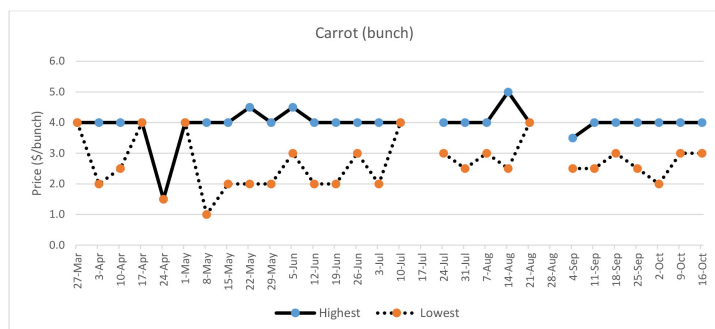
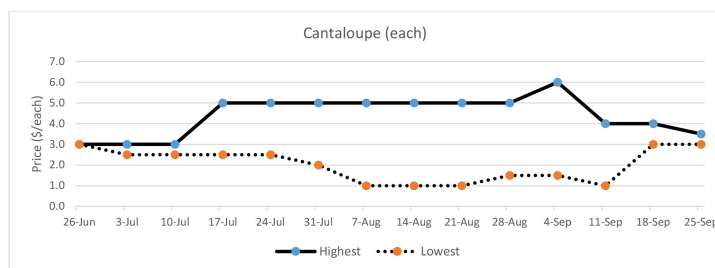
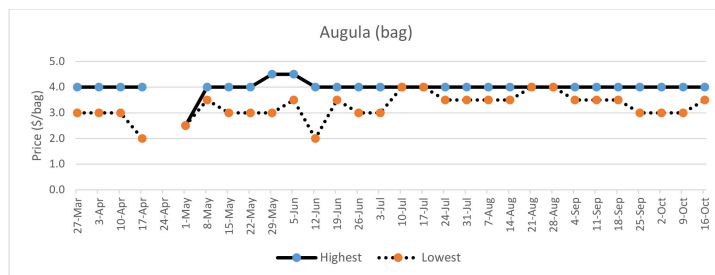
- Farmers can **compare produce prices** across markets (urban versus rural), presentations (selling by bag versus by pound), and seasons (selling in winter versus in summer). This information can help farmers assess the potential of increasing or decreasing prices depending on their market access, location, and time of the year.
- Farmers can **select market channels** for their products. A farmer may decide that selling in a rural market closer to the farm may generate enough revenue to meet their profitability goals and give them more time with their families compared to selling in more distant urban markets. On the other hand, farmers may find that selling to a neighboring farmers market brings as much revenue or more than selling to a wholesaler or retailer.
- Farmers have more information to **understand competition** in farmers markets by looking at the price ranges of produce and the supply of one or more vendors for specific crops.
- Farmers can **determine the market window** of their crops. Market window is the period of time when produce and prices are available for a specific market. Our price

reports show that asparagus availability in Bloomington started on mid-April (\$5 per pound) until mid-June (\$3.50 per pound).

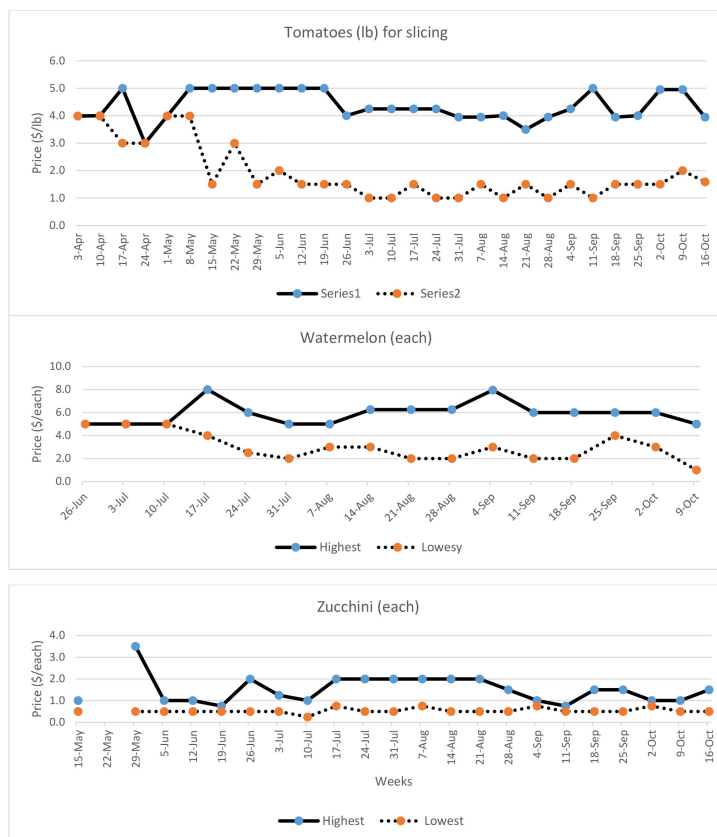
- Farmers can **assess the economic feasibility** of season extension technologies and new crops by considering when products reach the market (market window) and at what price. For example, farmers can determine if investing in high tunnels to extend the production season or new specialty crops is profitable given last year's market prices.
- Farmers can **evaluate the return on investing in valued-added strategies** by assessing if cut-washed-bagged produce has received price premiums when compared to produce sold by pound. For example, a head of lettuce tends to be sold by \$1.50, while a bag of washed lettuce tends to be sold by \$4.
- New and beginning farmers can use our price reports and integrate them with enterprise budgets to **estimate potential farm profitability**

## Weekly Prices

Below we display the weekly prices of 20 specialty crops sold in Indiana farmers markets. Some graphs show a gap in prices, which was due to the lack of those products in the market at the specific week.







This report displays farmers markets price data collected by the Horticulture Business extension program at Purdue University. Additional crops, specific market prices, and alternative unit prices can be obtained in the weekly price reports on our website [www.purdue.ag/hortbusiness](http://www.purdue.ag/hortbusiness).

## Educational Resources

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

Winter is the best time to recharge. In the last issue of this year's Vegetable Crops Hotline newsletter, I would like to highlight a few free webinar resources that I found very useful in the past season. Hopefully, you can also benefit from them, and have a productive winter.

- eOrganic webinars

<http://articles.extension.org/pages/25242/webinars-by-eorganic>

A lot of great information related to organic production, including using biofungicides, biostimulants and biofertilizers to boost crop productivity and help manage vegetable diseases; Management options for striped cucumber beetle in organic cucurbits; Impacts of the food safety modernization act on diversified organic vegetable farms, and a lot more.

- Commercial Horticulture Webinars by Alabama Cooperative Extension

<http://www.aces.edu/anr/beginningfarms/webinararchive.php>

The webinar series cover topics including irrigation, greenhouse

crop production, plant disease management, insect pest management, weed management and more.

- Vegetable webinars by Michigan State University Extension

[http://msue.anr.msu.edu/program/beginning\\_farmer\\_webinar\\_series/vegetable\\_webinars](http://msue.anr.msu.edu/program/beginning_farmer_webinar_series/vegetable_webinars)

The webinar series target for beginning farmers, topics include cover crops, season extension, plasticulture, food safety, etc.

- A series of short videos about backpack sprayer from Rutgers Cooperative Extension

<http://sustainable-farming.rutgers.edu/backpack-sprayer-modification/>

## Would Low Tunnels Provide New Opportunities for Strawberry Production in Indiana?

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

Strawberry production in Indiana primarily utilizes matted row systems, in which bare root strawberry plants are set in the spring, fruit is first harvested in the second year and plants are maintained for a few seasons. Strawberry production using an annual plasticultural system is popular in the southern states, at where strawberry is planted in the fall and harvested in the next spring. In the annual plasticultural system, strawberries have a longer harvest period and produce fruit with better quality. Growing strawberries as an annual crop is a challenge in Indiana. This is because our short fall makes it difficult for plants to reach the desirable sizes that lead to a sufficient yield in the following spring. This impression can be changed with the use of high tunnels that provide additional heat units and moderate frost protection. In a trial conducted in a 30 ×96 high tunnel at the Southwest Purdue Ag Center, strawberries were planted in Sep. 2015. The majority of strawberries were harvested in April and May 2016. A total yield of 1,295 lbs of strawberries were harvested from the 0.07 acre area. The yield is very promising. However, we realize that spacing in high tunnel is extremely valuable. We should consider high tunnel returns on a per square foot, and a per month basis. In this regard, strawberries that grow in soil and take eight months from planting to harvesting may not be the top crop to achieve the best returns. If a grower only has one or two four-season high tunnels, strawberry is not the top choice of crops growing in the high tunnels.

Considering these limitations, we initiated a project to evaluate retractable low tunnel system to grow strawberries. This system requires initial investment about 1/3 of the cost of a high tunnel. We planted strawberries on Sep. 13. Low tunnel was set up on Oct. 6. Eight varieties were grown side-by-side under low tunnels and open field (Figure 1.). In this trial, we are going to compare effects of the heat accumulation under low tunnels as compared with open-field to strawberry growth and yield. We will also compare effects of frost protection of traditional straw mulch with fabric row covers in the winter. Update about the trials will be

published on *Facts for Fancy Fruit and Vegetable Crops Hotline* newsletters. Please follow us to learn more about using the low-tunnel system to grow strawberries in Indiana.



Figure 1A. Strawberries grown under retractable low tunnels.



Figure 1B. Strawberries grown under retractable low tunnels.

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## Results of Specialty Melon Variety Trials will be Presented at the Indiana Hort Congress

(Petrus Langenhoven, [plangenh@purdue.edu](mailto:plangenh@purdue.edu), (765) 496-7955), (Wenjing Guan, [guan40@purdue.edu](mailto:guan40@purdue.edu), (812) 886-0198), (Ariana Torres, [torres2@purdue.edu](mailto:torres2@purdue.edu)) & (Amanda J Deering, [adeering@purdue.edu](mailto:adeering@purdue.edu))

In the past season, we tested performances of eight specialty melons grown under high tunnel, greenhouse, hydroponic, and conventional field systems. The melon varieties we have tested in our trials include Lilliput, Inspire, Sugar Cube, French Orange, Tasty Bites, Escorial, Savor, and Artemis. Many of these melon varieties are Charentais (*Cucumis melo* var. *cantalupensis*). A specialty melon type with an outstanding fragrant smell. If you are wondering how to grow these specialty melons, please follow us at the Indiana Hort Congress. We will present what we have learned about growing these specialty melons under different production systems.

## Upcoming Events

### Southwest Indiana Melon and Vegetable Growers' Technical Meeting

**Date:** November 21, 2017 5:00 p.m. to 8:00 p.m. (EST)

**Location:** Southwest Purdue Ag Center (SWPAC), 4369 N. Purdue Road, Vincennes, IN

The meeting will start at 5:00 p.m. for board members to discuss topics for the March meeting, which will be held in French Lick, IN. Any member who wants to participate in the discussion is welcome. At 6:00 p.m., dinner will be served. Following that, we will showcase variety trials conducted at SWPAC in 2017, which includes seedless watermelons, melons, and personal-sized watermelons. Any grower interested in becoming a member is invited to attend. Membership dues are \$15 per year and can be paid at the meeting. To register please call (812) 886-0198. Registration is due by Nov. 10. Any questions, please contact Wenjing Guan at [guan40@purdue.edu](mailto:guan40@purdue.edu)

**Save the Date**

**Southwest Indiana Melon & Vegetable Growers Winter Meeting**

**November 21, 2017 5:00 PM**

**Southwest Purdue Ag Center, Vincennes, IN**

(HWY 41 North of Vincennes)

**For more information, contact the Southwest Purdue Ag Program**  
812-886-0198



## Illiana Vegetable Growers Symposium

**Date:** 8 a.m. to 4 p.m. (CST) Jan. 4 2018

**Location:** Teibel's Restaurant, 1775 U.S. 41, Schererville, IN.

Commercial vegetable farmers and market gardeners will have networking opportunities and get tips on how to improve their business when they meet at the Illiana Vegetable Growers Symposium.

The program is a collaboration of [Purdue](https://www.purdue.edu) University and the [University of Illinois](https://www.illinois.edu) Extension services. Presenters will include Extension specialists from both universities.

Some highlighted presentations will be management of tomato bacterial canker, sprayers for controlling insects in sweet corn, new dicamba regulations, and updates on the federal food safety regulations.

There will also be breakout sessions during which participants can choose a focus on either marketing or production issues including cover crops and high tunnels.

Indiana private applicator recertification credits will be available

for a \$10 fee at the door. Indiana commercial pesticide applicator continuing certification hours and certified crop adviser continuing education units also are expected to be available.

Registration in advance costs \$30 and should be postmarked by Dec. 14 or completed online by Dec. 20. Participants can also register at the door for \$35, but they will not be guaranteed lunch.

Registration is available online through the Education Store at [www.edustore.purdue.edu](http://www.edustore.purdue.edu). For other information, contact Nikky Witkowski at (219) 755-3240 or [nikky@purdue.edu](mailto:nikky@purdue.edu) or Kym Schwinkendorf at (219) 386-5232 or [kschwink@purdue.edu](mailto:kschwink@purdue.edu)



Plan to attend the  
**Illiana Vegetable Growers Symposium**  
**Thursday, January 4, 2018**  
8:00 a.m. - 4:00 p.m. CST  
Teibel's Restaurant  
Schererville, IN

*Network with  
other growers  
in the region*

*Meet seed  
company reps  
and suppliers*

*Learn from  
University  
specialists*

Registration forms will be available in December.  
For more information, call 219-386-5232.  
<http://tinyurl.com/ivgs2018> ~ [vegrops@purdue.edu](http://vegrops@purdue.edu)

Purdue University and University of Illinois are equal access/equal opportunity institutions.

## Indiana Hort Congress & Trade Show

**Date:** Feb. 13-15 2018

**Location:** Indianapolis Marriott East, 7202 East 21st Street, Indianapolis, IN 46219

Vegetable farmers will find lots of new information at the 2018 Indiana Horticulture Congress February 13-15 in Indianapolis. Phytophthora blight has been on the mind of many growers in recent years. This soilborne water mold can devastate pepper, pumpkin and other crops when rainy weather provides favorable conditions. The morning of February 14 Drs. Dan Egel, Purdue, Mary Hausbeck, Michigan State University, and Mohammad Babadoost, University of Illinois will delve into biology, prevention, and management of this pathogen on peppers, pumpkin, squash and watermelon. There will be plenty of time for discussion and questions, too.

In the afternoon of February 14th presentations will focus on biostimulants, biopesticides, and biofertilizers. With the multitude of products and claims in the marketplace it is hard to know what is worth paying attention to, let alone buying. Drs. Lori Hoagland and Dan Egel, Purdue, and Matt Kleinhenz, The Ohio State University, will share what we know, and what we don't know about these products and their role in vegetable farming.

On Tuesday, February 13th, afternoon vegetable sessions at the Congress will include updates on variety performance including pumpkins, sweet corn, watermelon, cantaloupe, and the best

sprayers for controlling caterpillars in sweet corn. A roundtable discussion will follow the presentations.

Thursday morning will start off with a session about dealing with crop injury from herbicide drift. In the afternoon, Timothy Baker from Missouri will present high tunnel heating alternatives that could potentially further increase production in the structures. Dr. Krishna Nemali from Purdue will then discuss the possibility of adding supplemental lighting in high tunnels. The afternoon will wrap up with high tunnel variety updates including tomatoes, cucumbers and melons.

In addition to these educational sessions about vegetable farming, concurrent sessions over the three days include topics on farm management and marketing, tree fruit production, wine-grape production, hydroponics, and organic production. Recertification credits for Indiana Private Applicators, and continuing credit hours for Indiana Commercial Applicators will be available. The Indiana Vegetable Growers Association annual membership meeting will be held Wednesday afternoon. There will be plenty of chances to meet and talk with other growers, at the vegetable grower roundtable discussion on Tuesday afternoon, during social hours in the Trade Show, at ticketed luncheons, while sitting down with a few others for a meal or drink, or catching up in the hallway. The Trade Show gets bigger every year; it is a great place to connect with suppliers for your operation.

Registration opens in November. Visit [www.inhortcongress.org](http://www.inhortcongress.org) for more information, or contact Lori Jolly-Brown at (765) 494-1296 or [ljollybr@purdue.edu](mailto:ljollybr@purdue.edu).



## Produce Safety Alliance Grower Trainings and Webinar

Produce Safety Alliance (PSA) grower trainings will be offered throughout Indiana in the coming months. These trainings are approximately 8 hours in length and meet the training requirement for those who are covered under the FDA Produce Safety Rule. Trainings have been confirmed for the following locations and dates:

November 3, 2017    Atlanta, IN



November 14, 2017	Evansville, IN
November 29, 2017	Crown Point, IN
January 12, 2018	New Albany, IN
February 6, 2018	Fort Wayne, IN
February 15, 2018	Indianapolis, IN
March 1, 2018	Danville, IN
March 15, 2018	Vevey, IN
April 2, 2018	Terre Haute, IN
April 3, 2018	Rockville, IN
April 5, 2018	Richmond, IN

Growers should visit the SafeProduceIN website ([www.SafeProduceIN.com](http://www.SafeProduceIN.com)) for specific program times, locations, and to register for a program.

Additionally, a free webinar that outlines the value of FSMA

Produce Safety Training for exempt produce farms will be presented on November 2<sup>nd</sup> at 3:00 p.m. Central Time. The webinar is being presented by a collaboration of produce food safety groups.

While some growers may be exempt from the Food Safety modernization Act (FSMA) Produce Safety Rule, there are still some records and practices that farms need to keep under their exemptions. Also, being exempt from the regulation may not mean being exempt from buyer or other market requirements. This webinar will summarize the Produce Safety Rule and how it could impact growers, what a PSA training includes, and how training could help meet a grower's needs.

Participants may register for the webinar online at [https://cornell.zoom.us/webinar/register/WN\\_6tN8f4U1Tke6iwZjgK74NQ](https://cornell.zoom.us/webinar/register/WN_6tN8f4U1Tke6iwZjgK74NQ)

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

# 2018 Vegetable Crops Hotline Subscription Form

The *Vegetable Crops Hotline* newsletter provides the commercial vegetable grower with timely information about disease, insect and weed pests, fertility practices, post-harvest problems, pesticide label changes, meetings and much more. Each year, the *Hotline* is published 12 times during the growing season (April - September) with off-season issues in February, March and October.

In addition to the regularly scheduled issues of the *Hotline*, subscribers will be emailed articles published between issues about pressing matters. Growers may also use this form to sign-up for Veggie Texts. These texts, which will be of 160 characters or less, will deliver critical information to mobile phone numbers or email addresses.

**This year we will offer 3 subscription options: 1 year for \$15 / 2 years for \$25 / 3 years for \$30**

Yes, I would like to subscribe to the 2017 *Vegetable Crops Hotline*. Enclosed is a check made payable to **Purdue University**. (one year \$15, two years \$25 or three years \$30)

**Mail to:** Vegetable Crops Hotline Subscription  
Southwest Purdue Ag Program  
4369 North Purdue Road  
Vincennes, IN 47591

\*\*\*\*\* (Please complete the following) \*\*\*\*\*

Name: \_\_\_\_\_

Address: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip Code: \_\_\_\_\_

Phone: \_\_\_\_\_ (home) and/or \_\_\_\_\_ (work)

\_\_\_\_ **Yes, I would like to receive Veggie Texts.** Please provide your cell phone number and provider or an email address:

Cell Phone: \_\_\_\_\_

Carrier: (eg: Verizon, AT&T) \_\_\_\_\_

Email address: \_\_\_\_\_

If you would like to receive free email notification when a new issue of the *Vegetable Crops Hotline* is published online, please give us your email address or visit [lists.purdue.edu/mailman/listinfo/vch](https://lists.purdue.edu/mailman/listinfo/vch) to sign up: E-Mail address: \_\_\_\_\_

## Indiana Vegetable Growers Association

### Membership Renewal/Application

To renew or join, fill out the form below and send in with your check payable to IVGA. Memberships run January – December.

**Your contact information** will be included in the membership directory and used for IVGA correspondence.

Name: \_\_\_\_\_

Company: \_\_\_\_\_

Address: \_\_\_\_\_

City, State, Zip: \_\_\_\_\_

Tel: \_\_\_\_\_ Fax: \_\_\_\_\_

Email: \_\_\_\_\_

Web: \_\_\_\_\_

Would you like to receive **free subscriptions** to trade magazines that may be offered to IVGA members? If yes, we will provide your address to publishers who offer this. ☐ Yes ☐ No

### Payment Form

#### Membership Dues

Regular, \$20/year \$\_\_\_\_.00

Industry/Corporate, \$80/year \$\_\_\_\_.00

#### Publications

Midwest Vegetable Production Guide ID-56,  
\$15 each. \$\_\_\_\_.00

Postage if mailed to you \$5 \$\_\_\_\_.00

Vegetable Crops Hotline, \$15 for hard copy \$\_\_\_\_.00

Vegetable Crops Hotline, email notice  
check here to receive email \_\_\_\_\_ \$0.00

**Total Due** \$\_\_\_\_.00

#### Make check payable to:

Indiana Vegetable Growers Association (IVGA).

#### Return to:

Indiana Vegetable Growers Association

PO Box 1321

Valparaiso, IN 46384-1321

Questions? Call 219-508-1429 or email [ivga@ivga.org](mailto:ivga@ivga.org)

Office Use Only: Check no. \_\_\_\_\_ Check Date \_\_\_\_\_

Date Received: \_\_\_\_\_ Received by: \_\_\_\_\_