Vegetable Crops Hotline

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

Issue 621 - September 15, 2016

In This Issue

- Downy Mildew of Cucurbit Update
- Late Season Pumpkin Disease Management
- Harvest and Postharvest Storage of Pumpkins and Winter Squash
- High Tunnel Evaluation of Vertically-Grown Cantaloupe and Galia Melon Varieties
- North Central Region Center for FSMA Seeking Grower Input
- Looking for Ideas for Winter Meetings
- Cover Crop Decision Tool for Vegetable Growers
- Upcoming Events

Downy Mildew of Cucurbit Update

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

Downy mildew has now been observed on butternut squash, jack-o-lantern pumpkins and cucumbers in Knox County. The list of cucurbits observed in Porter County has been updated to include butternut squash and giant pumpkin. All cucurbit growers should assume that downy mildew is present nearby and may attack any cucurbit crop.

However, it is not clear what affect downy mildew may have on cucurbit crops this late in the season. Pumpkin growers who expect to harvest in the next few weeks may not need to take any management steps at this time. Downy mildew affects only leaves; stems and fruit are unaffected. Indirect effects of downy mildew in fruit are unlikely to be observed in a few weeks. Another article in this Hotline issue discusses the question of when to stop managing diseases in pumpkins. If the decision is made to apply fungicides, this article https://vegcropshotline.org/article/cucurbit-downy-mildew-watch/ or the *Midwest Vegetable Production Guide* mwveguide.org will help to select a treatment.

Other cucurbit crops, such as cucumbers, cantaloupe and watermelon are even more likely to be close to the final harvest. All cucurbit growers should weigh the cost of a fungicide application against the possibility of increased yield or fruit quality.

Late Season Pumpkin Disease Management

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

Several pumpkin growers have asked me when to stop managing for pumpkin diseases. That is, when should a pumpkin grower stop applying fungicides? I cannot provide a definitive answer for this question; every grower will have to make his or her own decision. Below, however, are some factors to consider.

Estimate the crop yield – walk through the field and evaluate the yield of pumpkins that are ready to harvest. Be sure to only consider fruit of marketable quality. If the yield is at or above what is expected, it may be time to put the sprayer away.

Estimate when harvest will take place – Pumpkins that are scheduled for harvest in the next week or two are less likely to need any fungicide treatment. A longer period to final harvest may indicate that there is time for immature fruit to ripen. For example, pumpkins that are to be picked by the consumer up to Halloween may have time to mature.

Estimate the ratio of mature to green fruit – When growers scout fields to assess yield, it may be beneficial to also estimate fruit close to maturity. Growers should be realistic about how long it will take for green fruit to mature. Figure 1 shows two pumpkin fruit, one clearly orange and mature and the other green. It is impossible to estimate how long it will take the green fruit to properly mature. However, factors include weather, variety and health of vines. Warm weather, in general, favors ripening. For the most part, larger varieties will take longer to mature than smaller ones. Green, healthy vines tend to promote proper fruit maturity over yellow vines.

Figure 1. It may not be cost effective to apply late season fungicides in order to get this green, immature pumpkin to ripen.

Jack-o-lantern pumpkins are estimated to need 60 to 90 days to go from pollination to market maturity under warm growing conditions (see Table 11, *Midwest Vegetable Production Guide* mwveguide.org). Even when pumpkin fruit color change has taken place, fruit quality may be improved by leaving the fruit on the vine for another 10 to 20 days. Look again at the green fruit in Figure 1. The green fruit may be 2 to 4 weeks away from proper maturity. Additional fungicides applied to attempt to bring this fruit to maturity may be wasted depending on the estimated harvest date. See accompanying article in this issue about pumpkin fruit maturity.

Figure 2, on the other hand, shows a mature orange pumpkin and another yellow one that sports a bit of green yet. The yellow pumpkin in figure 2 is more likely to mature properly in the next few weeks than the green pumpkin in figure one. Depending on circumstances, this fruit may benefit from additional disease management.

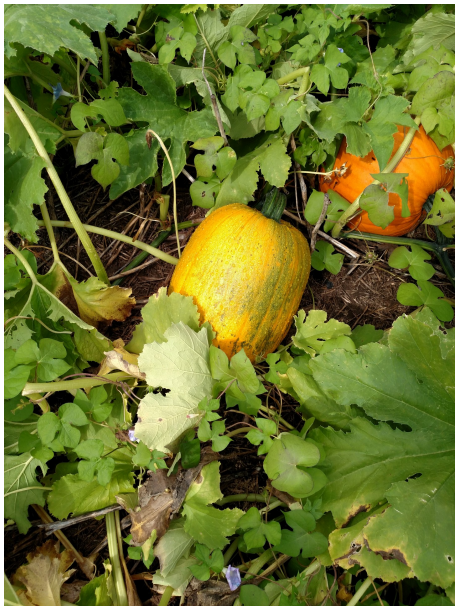


Figure 2. The yellow pumpkin with a bit of green is more likely to ripen with additional late season management than the green pumpkin in Figure 1.

Determine which diseases are present – Foliar diseases will vary in how much yield or fruit quality loss may be observed late in the season.

- Downy mildew affects leaves only. Fruit will be unaffected; fruit quality is unlikely to be affected by late season outbreaks. See article in this issue about downy mildew in Indiana.
- Powdery mildew – my Purdue mentor, Dr. Rick Latin, advised pumpkin growers to protect pumpkin plants from powdery mildew through September. Growers who follow such advice will make a final powdery mildew fungicide application in Mid-September. However, if pumpkins are harvested in September, it doesn't make sense to make applications a few days away from harvest. Although powdery mildew doesn't affect fruit directly, pumpkin handle quality can be lost due to severe infections as outlined in this article https://vegcropshotline.org/article/powdery-mildew-of-cucurbits/
- Plectsporium blight can cause lesions on pumpkin handles. Regular fungicide applications during the season can lessen the severity of this disease. It is unclear if late applications of fungicides after the disease has been discovered can be helpful.

Perhaps a story will help to explain how we decide when to stop pumpkin disease management at the Southwest Purdue Ag Center (SWPAC). Downy mildew was observed last week in the pie pumpkin field at SWPAC where we invite school children the first week of October. The vines are in modest shape-some yellowing of older leaves is present in addition to the initial lesions of downy mildew that can now be seen. Powdery mildew is present, but is not severe. Dennis Nowaskie, SWPAC superintendent and I estimate that the crop is made; we have enough pumpkins for all the first graders that will visit. Therefore, Dennis and I have decided not to apply any more fungicides to this field. In fact, Dennis and I sometimes joke that a little downy mildew in Mid-September may prevent us from losing any first graders in the pumpkin foliage come October!

I hope growers who are deciding on whether or not to apply another fungicide application will weigh the benefits outlined here of a treatment with the expense of such an application. A more general article about when to stop applying fungicides can be found here https://vegcropshotline.org/article/when-to-stop-spraying-fungicide/.

Harvest and Postharvest Storage of Pumpkins and Winter Squash

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

With the start of pumpkin harvest, it is a good time to review important considerations for harvest and postharvest storage of pumpkins and winter squash (butternut, acorn and hubbard squash etc.).

First, pumpkin and winter squash should be harvested fully mature to reach their optimal quality and fulfill their potential for long shelf lives. Characters indicating fruit maturity include loss of rind surface gloss, ground spot yellowing, and hardening of the skin to the level that it is resistant to puncture with a thumbnail. Except for some striped varieties, mature fruit should have solid external color. If fruit have to be harvested pre-mature because of plant decline, these fruit won't store as well as mature fruit. The best practice is to harvest the fruit as soon as they are fully mature and then store under proper conditions. If mature fruit are left attached to the vines, it increases the chance of disease infection on stems and fruit. Several foliar diseases may cause cosmetic damage on handles, and reduce potential quality and longevity of fruit; examples include plectosporium blight and bacterial spot. In addition, if diseases such as powdery mildew and downy mildew cause significant loss of foliage, fruit left in the fields are likely to suffer sunscald and low quality handles as

explained in this article https://vegcropshotline.org/article/powdery-mildew-of-cucurbits/. In some situations like pick-your-own or other reasons, mature fruit have to be held in the field, scout carefully to manage diseases and insects to maintain healthy vines and protect fruit. Recommended fungicides can be found at *Midwest Vegetable Production Handbook*.

After harvest, pumpkins may benefit from curing, especially when fruit show non-hardened skin and surface damage. Curing is conducted under temperatures between 80 to 85 °F in a shaded area for about 10 days. Studies have shown that curing heals wounds, hardens the rind, enhances fruit color and increases sugar content. If pumpkins are washed after harvest, be sure to dry them thoroughly before curing. It should be noted that curing is detrimental to acorn squash; it accelerates skin color change, deteriorates fruit texture and taste, and stimulates fruit decay.

Pumpkins and winter squash are best stored at temperatures between 50 to 55 °F and relatively humidity between 50 to 75%. With higher storage temperatures, excessive loss of weight, color and eating qualities might be experienced. When temperatures are above 55 °F, surface of acorn squash becomes yellow and flesh becomes stringy. Under the optimal storage conditions, acorn squash can be stored for 5 to 8 weeks, pumpkins and butternut squash for 2 to 3 months, and hubbard squash for 5 to 6 months. Both pumpkins and winter squash are sensitive to ethylene. They should not be stored near apples, ripening tomatoes or cantaloupes. When temperature is below 50 °F, fruit might develop chilling injury. Pumpkins, butternut and acorn squash may survive one or two cold nights in the field, however, a frost might lead to fruit rot. If fruit is displayed in the field or a farm stand, they should be protected if frost is anticipated.

High Tunnel Evaluation of Vertically-Grown Cantaloupe and Galia Melon Varieties

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

In issue 619 and 620 of the Vegetable Crops Hotline newsletter I gave you a brief background of the materials used and methods followed during the variety evaluation. I also discussed some of the challenges we encountered while doing the trial work. The varieties evaluated included:

Entry #	Variety
1	Sephia (Galia type)
2	Tirreno (Italian netted cantaloupe)
3	Rawan (Ananas type)
4	Rowena (Ananas type)
5	Migdal (Galia type)
6	Magnificenza (Italian netted cantaloupe)
7	Kenza (Charentais)
8	Karameza (fully netted cantaloupe)

Figure 1. Cantaloupe and Galia melon fruit

Preliminary data will be discussed in this article. Statistical analysis of all the data has not been concluded and therefore only treatment averages are reported.

Yield: One of the criteria that was set for the variety trial was that the fruit size needed to be between 2 – 4 lbs. At Meig's Farm Magnificenza, Sephia and Kenza produced fruit that varied in weight between 3.28 and 3.96 lbs. Migdal and Magnificenza produced fruit less than 4 lbs at HGRH.

The yield per plant was lower than expected. Several factors, i.e. environmental stress and pests, have contributed to the lower yield. Average yields in Southern Indiana is approximately 6,000 fruit per acer at a planting density of 2,904 plants per acre. Productivity, depending on the variety used, in the high tunnel at Meig's Farm was 50% to 343% higher than field grown melons. At the HLA Plant Growth Facility (HGRH) a 16% decrease in yield was observed with Rawan. The other varieties showed yield increases of between 6% and 225% compared to field grown melon. The worst performing varieties were Rawan and Rowena. The very large fruit size made these varieties not suitable for vertical high tunnel production. At Meig's Farm Magnificenza, Karameza and Kenza produced the highest yields followed by Sephia, Migdal and Tirreno. Magnificenza produced at Meig's Farm was the only variety to reach and average fruit yield of 2 fruit per plant. Fruit yields of more than 4 per plant will be ideal for this production system. The much higher total number of fruit produced per acre in these trials are mainly driven by the much higher plant densities that were used (Meig's Farm 11,805 and HGRH 13,280 plants per acre).

Very few fruit were unmarketable. Unmarketable fruit included fruit that were too small or fruit with visible cracks in the exocarp. Kenza and Karameza were the only varieties that produced fruit with cracks. A few Kenza fruit actually burst open at the blossom-end. Charentais are known to crack when it receives too much water during the last 10-14 days of ripening.

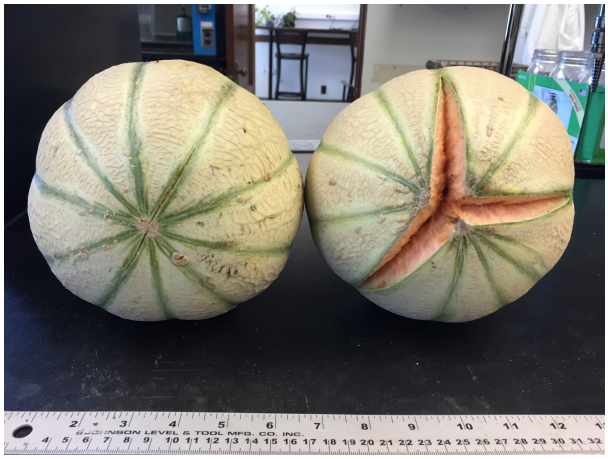


Figure 2. Kenza cracked open at the blossom-end

Table 1: Yield

Variety	*Fruit Size (lb)*		*# Fruit/plant*		*# Fruit/Acre*	
Trial location	HGRH	Meig's	HGRH	Meig's	HGRH	Meig's
Sephia	4.67	3.84	1.2	1.5	14,166	19,920
Migdal	3.94	4.72	0.9	1.5	10,034	19,920
Magnificenza	3.65	3.28	1.7	2.00	19,478	26,560
Tirreno	4.86	5.15	0.8	1.50	9,444	19,920
Kenza	4.55	3.96	1.5	1.75	17,708	23,240
Karameza	4.57	5.41	0.9	1.83	10,625	24,347
Rawan	11.50	7.94	0.4	0.75	5,066	9,960
Rowena	11.53	7.40	0.5	0.92	6,345	12,173

Quality: Variation in cantaloupe fruit juice pH values exists as a result of varietal differences and growing conditions. The approximate cantaloupe fruit juice pH is usually between 6.13 and 6.58. Sephia had lower pH levels at both trial locations. All varieties produced at HGRH, except Karameza, had a below normal pH level. According to the USDA Standards for Grades of Cantaloupe "very good internal quality" and "good internal quality" means that juices from the edible portion of a cantaloupe sample contains no less than 11 and 9 percent soluble solids, respectively, as determined by a hand refractometer. Only Migdal (at Meig's Farm and Magnificenza (HGRH) produced fruit that almost reached the USDA "good internal quality" grade. All other varieties had suboptimal soluble solids levels. Fruit produced at Meig's Farm were firmer than those produced at HGRH, except for the variety Rowena. In general fruit quality was suboptimal.

In the next round of trials other varieties will be included and a lot of focus will be placed on increasing the number of fruit per plant, fruit size, finding the optimal plant density, pest control strategies and increasing the soluble solids content of fruit.

Table 2: Internal fruit quality at harvest

Variety	*pH*		*Brix (% SS)*		*Firmness (kg)*	
Trial location	HGRH	Meig's	HGRH	Meig's	HGRH	Meig's
Sephia	5.60	5.80	5.68	5.96	4.52	5.62
Migdal	5.93	6.58	7.28	8.82	6.80	7.80
Magnificenza	6.09	6.47	8.96	7.96	4.42	6.85
Tirreno	5.71	6.22	6.43	7.07	5.63	7.40
Kenza	6.01	6.15	6.58	5.81	4.42	5.47
Karameza	6.14	6.16	8.25	6.16	7.71	10.28
Rawan	6.02	–	7.75	–	4.79	–
Rowena	5.92	6.12	7.28	5.65	6.80	2.50

North Central Region Center for FSMA Seeking Grower Input

(Amanda J Deering, adeering@purdue.edu)

Amanda Deering is the Indiana Leader for the North Central Region Center for Food Safety Modernization Act (FSMA) Training, Extension and Technical Assistance. As the state leader, she is responsible for identifying and notifying partner organizations, businesses, and agencies in Indiana that can assist with communicating and disseminating information about FSMA to fruit and vegetable producers. In addition, the Center is asking growers to complete a brief, anonymous survey to introduce fruit and vegetable growers to the Center and to help them determine if they will need to comply with the FSMA Produce Rule. This will also help determine the top educational needs in Indiana. The survey can be found at http://qeasttrial.co1.qualtrics.com/jfe/form/SV_8FWKOX9AYADrWqF.

We recognize that your time is extremely valuable so as a token of appreciation, the Center will hold a drawing and award three participants a $50 gift card. Note entry in the drawing will require that you provide your name and contact information in another link found at the end of the survey. It is NOT tied to your survey responses.

The deadline for completing the survey is September 30, 2016. For more information on NCR FSMA and additional food safety news and resources, go to the Center's website at https://ncrfsma.org.

If you have any questions, or would like additional information, please contact Amanda Deering, Clinical Assistant Professor, Fresh Produce Food Safety at (765)494-0512 or adeering@purdue.edu.

North Central Region
Center for FSMA Training, Extension and Technical Assistance

Looking for Ideas for Winter Meetings

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

We are planning programs for the 2017 Indiana Horticultural Congress and other winter meetings. We really hope these meetings can benefit you. Please let us know what you want to hear and who you want to hear it from. Call or email with suggestions. Thanks!!

Cover Crop Decision Tool for Vegetable Growers

(Anna Morrow, annamorrow@purdue.edu, (317) 392-6417)

The Midwest Cover Crops Council (MCCC) strives to facilitate widespread adoption of cover crops throughout the Midwest, to improve ecological, economic, and social sustainability. The Cover

Crop Decision Tool is an initiative by the MCCC to consolidate cover crop information by state to help farmers make cover crop selections at the county level. The tool makes seeding date recommendations based on county specific weather information, and sorts cover crop species by desirable attributes of the farmer's choosing. Indiana was the first state in the Midwest to implement a decision tool for field crops and Michigan is currently the only state with a decision tool for vegetable crops. Indiana SARE (Sustainable Agriculture Research and Education) is funding the creation of a decision tool for vegetable crops in Indiana this fall. Both the IN field crops tool and MI vegetable tool can be found on the MCCC website (mccc.msu.edu). Figure 1 is an example of generated result by using this tool.

Figure 1. A example of generated result by using this tool.

We are seeking farmers who use cover crops in vegetable production to assist in crafting the Indiana Vegetable Decision Tool. We will have an in person discussion about seeding dates, seeding rates, and species attributes in central Indiana in November. If you are interested in participating in the construction of the IN Cover Crop Decision Tool for Vegetable Crops, please look for meeting details in the next issue of Vegetable Crops Hotline. If you can not participate the meeting in person, we would appreciate if you could send us your suggestions and expectations on the upcoming tool. If you have questions about this process or would like to know more, please contact Midwest Cover Crops Council Program Manager Anna Morrow at annamorrow@purdue.edu or 317-392-6417.

Upcoming Events

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

Southwest Indiana Melon and Vegetable Growers' Technical Meeting

Date: November 28, 2016 5:00 PM to 8:00 PM (EST)

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

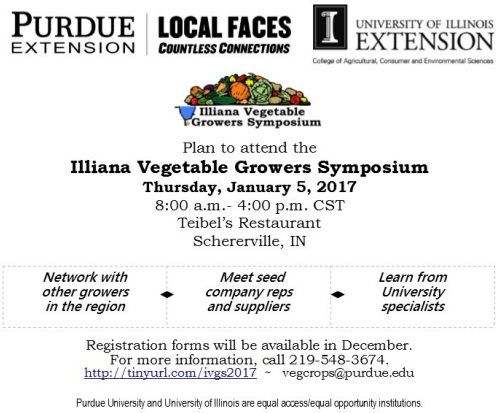
The meeting will start at 5 P.M. for board members to discuss topics for the March meeting. Any member who wants to participate in the discussion is welcome. At 6 P.M., dinner will be served. Following that, we will showcase variety trials conducted at SWPAC in 2016, which include seedless watermelons, cantaloupes, personal-sized watermelons, and seeded 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. 22. Any questions, please contact Wenjing Guan at guan40@purdue.edu

Illiana Vegetable Growers Symposium

Date: January 5, 2017 8:00 A.M. to 4:00 P.M. CST

Location: Teibel's Family Restaurant, 1775 US 41, US 30 & US 41, Schererville, Indiana

Registration will be available in December. For more information, please contact vegcrops@purdue.edu or (219) 548-3674. Updated information will be available at http://tinyurl.com/ivgs2017



Indiana Horticultural Congress – Note New Date and Venue

Date: January 10-12, 2017

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

The Indiana Horticultural Congress is an educational meeting designed to meet the needs of fruit, vegetable, wine, organics, and specialty crop growers and marketers in Indiana and surrounding states. All interested individuals are invited to attend. For hotel reservations: **Book your group rate for Indiana Horticultural Congress & Trade Show** on-line, or call (800) 991-3346 and state you are making a reservation for the Indiana Horticultural Congress, Indianapolis Marriott East.

Beginning Farmer Tour

Date: September 29, 2016

Location: River Ridge Farm, Roann, IN.

This four-season farm produces vegetables and small fruits. The tour will include information about operating an on-farm store, farm-to-school, and four-season growing.The tour will be 9:00 A.M. – 3:30 P.M. (EST). Lunch will be served. The tours are free, but registration is required. Registration at https://mdc.itap.purdue.edu/wk_rules.asp?itemID=22368

Beginning Farmer Tour for U.S. Military Veterans

Date: October 15, 2016

Location: Ponderosa Aqua Farm, Cataract, IN

All military veterans, active service members, and their families are invited for a tour of Ponderosa Aqua Farm. The farm is a functioning aquaponics system that raises talapia and uses the emulsions from the fish to provide nutrients for their organic microgreens. Expert presentations on hydroponics and aquaculture will precede the farm tour. The event is 10 A.M..-4 P.M. A lunch will be served. The tours are free, but registration is required. Registration at https://mdc.itap.purdue.edu/wk_rules.asp?itemID=22370

Aquaponics Conference

Date: October 28-29, 2016

Location: Kokomo Event & Conference Center, 1500 N. Reed Road in Kokomo

Aquaponics is a system that combines fish rearing and vegetable production. Topics include food safety of vegetables, pest control in aquaponics operations, indoor environmental conditions, vegetables for aquaponics, greenhouse structures and fish in aquaponics operations.

Early-bird registration fee through Sept. 18 is $90 for Indiana Aquaculture Association Inc. (IAAI) members and $100 for non-members. After that date, registration is $100 for IAAI members and $125 for non-members. An optional tour of Green River Greenhouse can be added for an additional $20 per person. Registration is available at www.indianaaquaculture.com.

Organic Soil-borne Disease Management Webinar

Date: October 13, 2016 from Noon – 1:00 P.M. (CST)

University of Illinois Local Food Systems/Small Farms Extension Educators Laurie George and James Theuri will discuss different soil pathogens that can cause production issues in vegetables, as well as present non-chemical ways of suppressing some of the more common soilborne disease-causing organisms. Discussions will also include biological control of bacterial and fungal organisms. The webinar is free, pre-registration is required by October 11, 2016. Registration and more information is available at https://web.extension.illinois.edu/registration/?RegistrationID=14944

7th National Small Farm Conference

Date: September 20-22, 2016

Location: Virginia Beach Convention Center, Virginia Beach, VA

More information about the conference can be found at http://www.vsu.edu/nationalsmallfarmconference/

Vegetable Crops Hotline © Purdue University - vegcropshotline.org
Editor: Wenjing Guan - 4369 N. Purdue Road Vincennes, IN 47591 | (812) 886-0198 | guan40@purdue.edu