

VEGETABLE CROPS HOTLINE

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

Liz Maynard, Editor
600 Vale Park Road
Valparaiso, IN 46383
(219) 531-4200
emaynard@purdue.edu



vegcropshotline.org

No. 576

September 19, 2013

IN THIS ISSUE

- DOWNY MILDEW OF CUCURBIT UPDATE
- STORING CROPS FOR LATER SALE
- MANAGE MANURE PROPERLY
- VENDORS SOUGHT
- SARE FARMER RANCHER GRANTS AVAILABLE
- GROWER PARTICIPATION IN NEW TOMATO GRAFTING PROJECT AT OHIO STATE
- HACCP TRAINING AND GAPs A TO Z FOR FRUIT AND VEGETABLE OPERATIONS TO BE OFFERED
- FAREWELL
- UPCOMING EVENTS

DOWNY MILDEW OF CUCURBIT UPDATE - (Dan Egel) -
Four different counties reported the presence of downy mildew of cucurbits and it is likely that the disease was spread beyond those 4 counties. The good news is that almost all cucurbit crops are sufficiently mature that downy mildew no longer needs to be controlled. Nevertheless, some growers may still have questions about how to tell whether downy mildew is in their fields. Purdue University now has a new YouTube video to help growers learn more about this important disease. Point your browsers to: www.youtube.com/watch?v=sz0vZ-t0gyg Comments and suggestions are welcome.



STORING CROPS FOR LATER SALE - (Liz Maynard) - Many crops harvested at this time of year can be stored for sale over a period of weeks or months. Extending the marketing season in this way is common for root, tuber, and bulb crops; winter squash and pumpkins; cole crops like cabbage and Brussels sprouts; and can even work with green tomatoes. Storage adds more risk, however, and having a high quality product after storage requires attention to a number of issues reviewed in this article.

First, put only disease-free, undamaged and uninjured (or well-healed), insect-free produce in storage. What looks like a tiny spot or break in the skin now is just likely to grow, provide an opening for decay organisms, and permit excess water loss during the time in storage. Consider reviewing the grading process with employees to assure that only top quality product goes

into storage.

For most crops, the proper harvest maturity for storage will be the same as if the product were to be sold right away. However, when frost threatens, some may choose to harvest all tomatoes that are at or past the 'mature green' stage (see Figure 1), because they will continue ripen in storage.

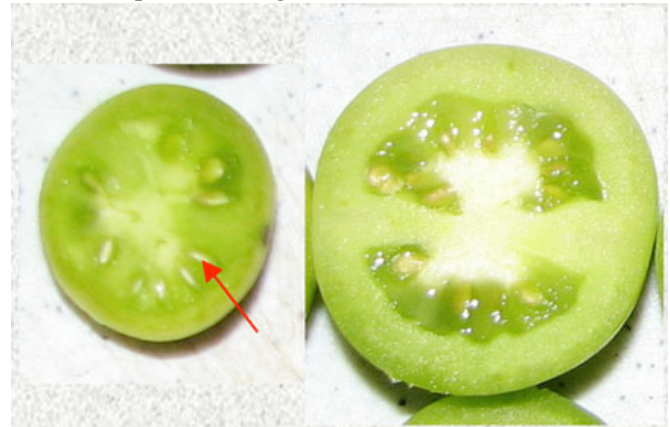


Figure 1: The mature green tomato on the right is green on the outside, and jelly has developed so that seeds move out of the way and are not cut when the tomato is sliced with a sharp knife. Tomatoes that have reached the mature green stage will continue to ripen when removed from the plant. The tomato on the left is immature green: the arrow points to a seed that was cut when the tomato was sliced because the jelly had not formed. (Photo by Liz Maynard)

Some root, tuber, and bulb crops benefit from curing before storage. They can be stored longer with less decay if properly cured. Curing provides conditions and time for wounds to heal, skin of roots and tubers to toughen, and scales and necks of bulbs to dry. For sweet potatoes curing also improves eating quality. Sweet potatoes cure best at 82- 86°F and 94-97% RH for 4 to 7 days. Cure Irish potatoes for 1 to 2 weeks at 50-60°F when harvested in the fall and 80-100 % relative humidity (RH). Garlic and onions need a warm, dry, environment with good airflow so that the outer scales or skin and neck tissue dries down. Quick drying reduces losses from neck rot in onions.

If produce is washed before storage, use a labeled sanitizer that will help to reduce postharvest decay.

Maintain storage area at appropriate temperature for the crop in question (see Table 1). Keep it as cold as

possible without injuring the crop. By keeping it cool or cold you can: 1) slow metabolism of the crop, which helps maintain quality and weight; 2) slow growth of decay organisms. Many chilling sensitive crops (e.g. tomato, squash, sweet potato) are injured at 50-55°F or below, while cool season crops can withstand temperatures near or just below 32°F. Chilling injury of sensitive crops may not be visible at first, but when they are taken out of storage to warmer temperatures, symptoms like pitting can develop quickly.

Keep humidity in the desired range for the crop. Keeping humidity high reduces water loss so the crop doesn't lose weight and shrivel. But if humidity is too high, growth of decay organisms can get out of hand. Maintain humidity by adjusting ventilation, misting the air, or using a moisture barrier in packaging. Do not apply water directly to the product in storage.

Be aware of air quality. It is not uncommon to find ethylene causing problems in storage. This gas can reduce quality in some vegetables and speed ripening of others. Ethylene is naturally produced in a variety of situations: by some fruits as they ripen, by injured plant tissue, and by plants under stress. Don't store ethylene-producing crops with ethylene-sensitive products. Apples (and many other tree fruits), cantaloupe, and tomatoes produce ethylene. Don't store them with broccoli, Brussels sprouts, cabbage, carrots, cauliflower, chard, cucumbers, cut flowers, eggplants, snap beans,

leafy greens, lettuce, peas, peppers, spinach, squash, sweet potatoes, or watermelons, which are all sensitive to ethylene.

Ethylene is also created when fossil fuels and other organic matter is burned, and can be found in exhaust from appliances and vehicles that use those sources of fuel.

Air quality also includes other volatiles that are released by crops during storage. Keep crops with strong odors away from odor-absorbing products. For instance, don't store apples with cabbage, carrots, onions, or potatoes.

Proper ventilation is important for controlling temperature, humidity, and air quality. The amount of ventilation required will depend on the crops in storage.

Manage the storage for food safety. Before crops are loaded in, clean and sanitize the storage area. Keep produce containers off the floor with pallets or shelves. Monitor in and around the storage area for rodents and other pests, and take control measures when necessary. Maintain the area around the storage so that it doesn't attract rodents and other pests. Don't store hazardous materials or other items with the food.

Monitor the storage environment and the stored produce regularly. Check and record the temperature and relative humidity using thermometers or sensors at various locations. Inspect the produce for injury, water loss, damage, and disease. Remove damaged and diseased

Table 1: Recommended temperature and relative humidity for storing selected fall-harvested vegetables.

Vegetable	Temperature (°F)	Relative Humidity (%)	Expected Storage Life
Beets	32-36	98	4-6 months without tops
Brussels sprouts	32	95-100	3-5 weeks, longer if left on stem
Cabbage	32	98-100	5-6 months
Carrots	32-34	98-100	5-6 months
Cauliflower	32	95-98	3-4 weeks
Garlic	30-32	60-70	9 months; at 68°-86°F 1-2 months
Leafy greens	32	95-98	2 weeks
Lettuce	32-41	98-100	2-4 weeks
Pepper, green	45-55	90-95	2-3 weeks
Potato	45-50	95-98	2-12 months
Onions (bulb)	32	65-75	pungent: 6-9 months; sweet: 1-3 months
Radish	32	90-95	without tops: 3-4 weeks; with tops: 1-2 weeks
Salad greens	32-36	95-100	1 to 2 weeks
Sweet potato	55-60	85-90	5-6 months
Winter squash	50-55	50-70	acorn: 5-8 weeks; butternut: 2-3 months; butternut: 3 months; hubbard: 6-12 months
Tomato, mature green	55-62, ripening best at 66-70°F	90-95	1-2 weeks
Turnips	32	90-95	4-5 months

product so the problem doesn't spread.

For more information on storing produce and storage structures, see Small-Scale Postharvest Handling Practices: A Manual for Horticultural Crops (4th Edition) by Lisa Kitinoja and Adel A. Kader, available at ucce.ucdavis.edu/files/datastore/234-1450.pdf and USDA, ARS Agriculture Handbook Number 66, The Commercial Storage of Fruits, Vegetables, and Florist and Nursery Stocks, available at www.ba.ars.usda.gov/hb66/



MANAGE MANURE PROPERLY - (J. Scott Monroe) - With the 2013 season quickly winding down, it will soon be time to start making plans for next year's crops. As those plans are made, growers are urged to follow food safety guidelines when using manure in vegetable crops.

While manure is a good source of plant nutrients and organic matter, it may also contain pathogens that can be transferred onto fresh fruits and vegetables. Guidelines for the window between manure application and crop harvest vary. **Always follow the guidance given by your particular audit protocol or food safety plan.** While some plans require a 3-year waiting period after manure application, in general, a period of at least 9 months between manure application and harvest is considered adequate. Those using composted manure may apply closer to harvest (proposed FDA guidelines suggest 45 days before harvest), taking care to avoid application to the edible parts of the plants. Remember that compost has a very specific legal definition and must be produced in accordance with strict guidelines. Unless you have documentation that manure was composted properly, it should be treated as nothing more than aged raw manure.

One of the best ways to utilize manure is to apply it in the fall. A fall application, followed by incorporation and a cover crop, is a good way to insure that the application-to-harvest window is met. One additional advantage is that fall-applying manure cuts one more job from what is, for most people, an increasingly hectic spring season. For those wishing to use a fall manure application, Purdue's *Midwest Cover Crops Field Guide* (ID-433) can provide valuable cover crop information.

It should be noted that no cases of foodborne illness were associated with Indiana-grown produce in the 2013 season. Across the state, growers have worked to incorporate food safety into the culture of their farms. For those whose food safety plan permits it, fall-applying manure is a good way to start the process of minimizing the risk of a foodborne illness outbreak in 2014.



VENDORS SOUGHT FOR HOOSIER HARVEST MARKET

WINTER PROGRAM - (Roy Ballard) - Now with over 200 registered shoppers and 24 vendors the Hoosier Harvest Market (HHM) is a new virtual farmers market that has enjoyed a good initial growing season of operation.

With the end of the traditional peak growing season the HHM is seeking ways to "winterize" the market to allow consumers the ability to continue to make selections throughout the winter months and to make sure we begin the new growing season with a full complement of shoppers.

The HHM is currently seeking vendors who will have products available during some part of the coming months...these could be storage vegetables, crops grown under season extending row covers, high tunnels or greenhouses, value added products such as baked goods, breads, jellies, jams, apple butter, salsa, etc. (produced in a certified kitchen... sorry no home based vendor products), ornamentals, or other suitable products.

We are seeking vendors who are willing to think outside the box and willing to go the extra mile to engage the consumer in a positive manner with consistently high quality products and great customer service. Vendors may have one product or dozens to offer.

If you are interested in joining our farmer membership and trying out a new on line marketing opportunity to add to your other ways that you engage the consumer please feel free to contact Market Coordinator, Michael Morrow at michael.morrow@hoosierharvestmarket.com or Roy Ballard, Purdue Extension Educator, ANR, Hancock County at rballard@purdue.edu

Those who are interested may wish to visit the Hoosier Harvest Market website at www.hoosierharvestmarket.com or follow us on Facebook at www.facebook.com/HoosierHarvestMarket

How the market operates:

Farmers input and weekly update their inventories of product availability by Friday at noon when customers gain access to the shopping site and are able to make their selections and purchases. Consumers pay for their products electronically in advance to the Market and farmers deliver the product to the aggregation point (the Purdue Extension Office in Hancock County) on Thursday for delivery by the market to the consumers at one of 6 pick-up points. Farmers receive payment electronically for their products within 2 weeks of delivery (typically one week).

The HHM is organized as a mutual benefit farmer cooperative with the State of Indiana. Vendors are members of the cooperative. The HHM is currently funded in part through a USDA Specialty Crop Block Grant that is administered by the Indiana State Department of Agriculture.



SARE FARMER RANCHER GRANTS AVAILABLE - (*Liz Maynard*) - Do you have an idea that might help your farm stay in business for the long run? Be a better place to work or contribute more to the community? Conserve or improve natural resources like soil and water? Reduce use of fossil fuels? The North Central Region Sustainable Agriculture Research and Education program (NCR SARE) of the USDA wants to fund ideas like these and others to make agriculture more sustainable – economically, socially, and environmentally.

The 2014 Farmer Rancher Grant Program of NCR SARE offers grants for farmer-initiated projects of up to \$7,500 for individuals, \$15,000 for partners, and \$22,500 for groups. Grants applications are due in the NCR SARE office on Thursday, November 14, 2013. To learn more about the grants and download a grant application, visit www.northcentralsare.org/Grants/Our-Grant-Programs. To receive a hard copy or e-mail file of the call, contact Joan Benjamin at NCR-SARE, (573) 681-5545 or nrcsare@umn.edu.

Purdue Extension will be offering a two-part program “Funding Opportunities for Indiana Agriculture” on September 25 and October 2 that will explain this program in more detail and provide tips on grant-writing. Contact your county Extension office for more information.



GROWER PARTICIPATION IN NEW TOMATO GRAFTING

PROJECT AT OHIO STATE - (*Stephanie Short*) - Do you grow and sell tomatoes? If so, an Ohio State University / OARDC-based team hopes to hear from you soon. The team has set up a project to help ensure that commercial tomato growers benefit as much as possible from their investments in grafted tomato plants. The team began this process nearly eight years ago. Now, they will focus on identifying tomato rootstock and scion varieties ideal for combining into grafted plants. The best varieties to include in experiments are ones that growers nominate or grow as ungrafted plants. Tomato growers are invited to steer this new project by nominating their choice of varieties to include in it. Nominating varieties is free and easy. Growers may contact Dr. Kleinhenz directly (call (330) 263-3810 or email kleinhenz.1@osu.edu). Or, they may complete a short ‘variety nomination’ form online at this website hcs.osu.edu/vpslab/organic-grafted-tomato-variety-nominations, which also gives additional details on the project.



HACCP TRAINING AND GAPs A TO Z FOR FRUIT AND VEGETABLE OPERATIONS TO BE OFFERED IN NOVEMBER - (*Liz Maynard and Katie Clayton*) - Purdue Extension will offer fruit and vegetable farmers and packers both Hazard Analysis and Critical Control Point (HACCP) program training and Good Agricultural Practices workshops at separate events this November. Attendance at either workshop fulfills current requirements of the Indiana State Department of Health for producers who sell to restaurants, grocery stores, and other wholesale accounts to have food safety training.

GAPs November 14, 19, 21. The GAPs A to Z workshop covers practical methods for improving food safety practices on fruit and vegetable farms. It is a 3-part series on November 14, 19, and 21 from 1:00 to 4:00 P.M. Eastern Time. Attendance at all three sessions is required to complete the workshop and receive a certificate of attendance. The program will be hosted at locations around the state yet to be determined. Contact your county Extension educator to let them know of your interest. The registration form and additional information will be available closer to the event at ag.purdue.edu/hla/fruitveg/Pages/Events.aspx. For more information, contact Jodee Ellett, jellett@purdue.edu or (765) 494-0349.

HACCP November 20-21. The HACCP program will be offered November 20-21 in Indianapolis. This training is especially useful for those who do any type of processing on site, pack or hold produce grown by others, or participate in food safety audits that require a HACCP plan. This training goes beyond the GAPs (Good Agricultural Practices) workshops.

The HACCP course provides instruction for developing HACCP programs for the meat, poultry, egg and fruit and vegetable industries. The 2-day workshop focuses on providing the participant with a better understanding of how to develop and implement food safety management programs through HACCP, and prerequisite programs including: Good Manufacturing Practices (GMPs), Sanitation Standard Operating Procedures (SSOPs), Good Agricultural Practices (GAPs), Best Management Practices for Animal Production, as well as general hygiene and sanitation practices.

The HACCP workshop will include an overview of foodborne hazards and prevention strategies, an understanding of HACCP principles, and an awareness of the regulatory requirements for HACCP programs. A customized track will be offered for the meat/poultry/egg industry participants and another track for the fruit/vegetable industry. This workshop is well suited as an introductory course for first time participants and as a good update for those that have already had HACCP training. This course is an International HACCP Alliance approved course. Registered persons attending both days will receive a certificate of completion.

For more information on the HACCP course, contact Katie Clayton, (765) 494-3726 or katie-clayton@purdue.edu. The registration brochure will be available soon at

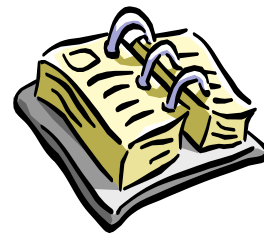
ag.purdue.edu/foodsci/extension.

Not sure which program to attend? Many growers begin food safety education with a GAPs workshop due to the lower expense and emphasis on practices in produce fields and packing facilities. HACCP is a more rigorous, proactive approach to food safety than GAPs. HACCP is a specific, 7-step approach to identifying risk and minimizing it. In order for HACCP to succeed, other programs (prerequisite programs) including GAPs, GMPs, and SOPs must be in place. The HACCP workshop will provide an overview of these prerequisite programs but will then focus on the 7-step approach and implementing that approach at your facility.



FAREWELL - (*Shubin K. Saha*) - For the past four years it has been my pleasure to serve as the Vegetable Specialist at the Southwest Purdue Ag Center in Vincennes, IN. I thoroughly enjoyed working in Purdue Extension during my time at SWPAC. I have had the opportunity to interact with many growers throughout the entire state of Indiana. I have learned much from many of you and I hope I was able to help some in a variety of settings with respect to vegetable production practices. However, the time has come for me to say goodbye as I recently was offered a position as an Assistant Professor / Vegetable Specialist in the Department of Horticulture at the University of Kentucky in Lexington, KY. This is a once in a lifetime opportunity for me and my family as Lexington is my home town. I would gladly provide assistance from a distance if need be so if you have any questions or problems which I can be of help, do not hesitate to contact me. I hope to see some of you this December at the annual technical meeting of the Southwest Indiana Melon and Vegetable Growers Association in Vincennes as well as at the Indiana Horticulture Congress in 2014. My new contact information is as follows: Department of Horticulture, N-322C Ag Science Building North, University of Kentucky, Lexington, KY, 40546-0091, Shubin.saha@uky.edu, (859) 257-3374.

Editor's note: We appreciate all Shubin has done while here at Purdue and wish him the very best in his new position!



UPCOMING EVENTS

GAPs A to Z Workshop. November 14, 19, and 21, 2013, 1:00-4:00 P.M. Eastern time. Various sites around the state. Contact Jodee Ellett, jellett@purdue.edu or (765) 494-0349.

HACCP Training. November 20-21, 2013. Farm Bureau Building, Indianapolis, IN. Katie Clayton, (765) 494-3726 or katie-clayton@purdue.edu. ag.purdue.edu/foodsci/extension

Winter Technical Meeting and Variety Trial Showcase. Thursday, December 5, 2013, 6:00 P.M. Eastern time. Southwest Purdue Agricultural Center, Vincennes, IN. Dinner will be included in the program. For more information, contact Dan Egel at (812) 886-0198. Watch this space for more details.

Illiana Vegetable Growers Symposium. Tuesday, January 7, 2014. Teibel's Restaurant, Schererville, IN. Program will be available in early December and posted at www2.ag.purdue.edu/hla/fruitveg/Pages/Events.aspx. Contact: Liz Maynard at (219) 531-4200 ext. 4206 or emaynard@purdue.edu.

Indiana Horticultural Congress. January 21 – 23, 2014. Wyndham Indianapolis West, Indianapolis, IN. www.inhortcongress.org. Contact: Tammy Goodale at (765) 494-1296 or tgoodale@purdue.edu.



AUTHOR INFORMATION

Roy Ballard, Extension Educator, ANR, Hancock County, (317) 462-1113, rballard@purdue.edu
Katie Clayton, Extension Outreach Specialist, Food Science, Purdue, (765) 494-3726 or katie-clayton@purdue.edu
Dan Egel, Vegetable Pathologist, Southwest Purdue Ag Center, (812) 886-0198, egel@purdue.edu
Liz Maynard, Extension Specialist, Purdue, (219) 531-4200 or (219) 508-1429, emaynard@purdue.edu
Scott Monroe, Extension Educator, ANR, Daviess County, (812) 254-8668, jmonroe@purdue.edu
Stephanie Short, Dept. of Horticulture and Crop Science, The Ohio State University / OARDC, (330) 202-3555 ext. 2687, short.189@buckeyemail.osu.edu

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