Vegetable Crops Hotline

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

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Anthracnose of Pumpkin - (*Dan Egel*) - Anthracnose of cucurbits causes brown necrotic angular lesions on cucumbers, cantaloupe and watermelon leaves. Lesions on cucumber, cantaloupe and watermelon fruit are round, sunken, and appear pink or salmon colored under humid conditions. Until this summer, I had not observed anthracnose on pumpkin in Indiana. This article describes the observation of anthracnose of pumpkin in a single field this summer.

The anthracnose lesions I observed this summer were on pie or sugar pumpkins. The lesions were round and about a half inch in diameter. The lesions began as light colored areas and became darker with time. Mature lesions had concentric rings caused by the fungus growing on the pumpkin surface (see Figure 1). I did not observe any lesions on the pumpkin foliage. Anthracnose also causes spindle shaped lesions on stems of cucurbits. However, I did not see lesions on the stems of the pumpkin foliage.

I also observed Fusarium fruit rot on the pumpkin fruit. I believe that the anthracnose lesions may have provided entry to the fungus that causes Fusarium fruit rot. That is, anthracnose may have caused the Fusarium fruit rot to become more severe.

There are two primary races of the fungus that causes anthracnose on cucurbits. Race 1 causes lesions on cucumbers, race 2 causes lesions on watermelon. Cantaloupe appears to be affected by both race 1 and 2, but is not as susceptible as either cucumber or watermelon. It is not clear to me what race affects pumpkins. With the isolate of the fungus I obtained this summer, I may be able to get some answers.

Anthracnose may be managed by host resistance (cucumber), fall tillage, and crop rotation. Crop residue is an important source of over-wintered inoculum. The fungus may also be transmitted on seed. Several fungicides are effective on anthracnose and are listed in the Midwest Vegetable Production Guide for Commercial Growers.

Anthracnose of pumpkin may continue to be an unusual occurrence in Indiana. However, pumpkin growers should become aware of the symptoms of this disease.

Figure 1: Lesions of anthracnose of pumpkin are slightly sunken and exhibit concentric rings caused by the dark fungus growing on the pumpkin surface.(Photo by *Dan Egel*)

Cercospora Leaf Spot of Cucurbits - (*Dan Egel and Tom Creswell*) - This disease was observed on watermelon and pumpkin this year in a few commercial fields. Although the loses due to Cercopsora leaf spot are unlikely to be significant, a brief description of the disease is given here so that growers may learn to recognize the symptoms.

Cercospora leaf spot causes medium brown lesions on watermelon leaves, which may have light gray centers (see Figure 2). Although the disease has been reported on stems, I did not observe any stem lesions. Cercospora leaf spot does not cause fruit lesions on any host. I observed many lesions on the margins of leaves as well as in the leaf center. The lesions on watermelon could be confused with Alternaria leaf spot, another disease that is unusual on watermelon. On pumpkin, the lesions were a light gray and could easily be confused with bacterial spot (see Figure 3).

Cercospora leaf spot is more often found in tropical and subtropical regions. Although the weather this season was very warm, I am surprised Cercospora leaf spot showed up in what was also a very dry year.

The causal fungus survives on residue, so adequate crop rotation (2 to 3 years) and fall tillage are important management tools. Several fungicides are labeled for the control of Cercospora leaf spot including products with the active ingredient chlorothalonil (e.g., Bravo®, Echo®, Equus®), Cabrio®, Quadris® and Inspire Super®.

Cercospora leaf spot was limited to a very few fields in 2012 and I have never before observed this disease in Indiana. The disease was not responsible for significant losses this year and I do not anticipate that there will be any future problems. However, it is a good idea for cucurbit growers to be familiar with the symptoms described here.

Figure 2: Cercospora leaf spot causes brown necrotic lesions that may have gray centers on watermelon leaves. (Photo by *Dan Egel*)

Figure 3: On pumpkin leaves, Cercospora leaf spot causes light gray necrotic lesions. (Photo by *Dan Egel*)

News for Women and Hispanic Farmers from USDA – (*Liz Maynard*) – Women and Hispanic farmers who believe USDA discriminated against them between 1980 and 2000 may file claims between September 24, 2012 and March 25, 2013. According to the USDA, the process is a voluntary alternative to litigation for those who can prove that USDA denied their applications for loan or loan servicing assistance for discriminatory reasons. To register for a claims package, or for more information, visit **http://www.farmerclaims.gov**, or call 1-888-508-4429.

Extending Market Season with Storage – (*Liz Maynard*) – As interest in local food grows, opportunities for direct sales extend into late fall and winter. One way to take advantage of these markets is to store produce for a few weeks or months after field production ends. If storage isn't yet part of an operation, it makes sense to research how to do it right and investigate the costs and returns expected before deciding to do it. This article can't provide all the information needed to do that, but it offers key *do's* and *don't's*, and provides information on proper storage conditions for common fall-harvested vegetables.

Store only high quality produce. High quality means harvested at the proper maturity, and with no disease, decay, or injury. Injury includes mechanical injury, insect feeding, and chilling or freezing injury. For most crops, the proper maturity 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 4), because they will continue ripen in storage.

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% relative humidity (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% RH. Garlic and onions need a warm, dry, environment with good airflow so that the outer scales or skin and neck tissue dries down (see Figure 5). Quick drying reduces losses from neck rot in onions.

Provide adequate ventilation in the storage area. Ventilation is used to manage temperature, humidity, and air quality. If there is not enough ventilation the humidity is likely to be too high, which will increase decay.

The amount of ventilation required will depend on the crops in storage.

If containers are used, they should be clean, ventilated, and stackable. Stack containers to allow airflow between them. Don't stack them so high that the container bends or collapses.

Don't overload the storage area or pack containers too close together. It becomes difficult to manage the environment when a storage area is overpacked. Put containers on pallets, not directly on the floors. Leave enough space between pallets and the wall so that you can check for rodents and other pests.

Keep the storage area clean. Wash and sanitize it before storing produce. Don't store other items in the area designated for produce.

Keep rodents and other animals out of the storage area. Maintain the area around the storage so that it doesn't attract rodents. Get rid of trash and weeds. Use traps to monitor and control rodents. Use only control measures that are approved for food storage areas. Other poisons can contaminate the food.

Monitor the storage environment and the stored produce regularly. Check and record the temperature using thermometers or sensors at various locations. Inspect the produce for injury, water loss, damage, and disease. Remove damaged and diseased product so the problem doesn't spread.

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.

Keep crops with strong odors away from odor-absorbing products. For instance, don't store apples with cabbage, carrots, onions, or potatoes.

Store crops in the dark. This is especially important for potatoes because they will turn green under the skin when exposed to light, and in the process, produce solanine, which is not good to eat.

Avoid exposing chilling sensitive crops to cool temperatures. These crops include sweet potatoes, peppers, tomatoes and winter squash. Temperatures below 50-55°F lead to chilling injury that will reduce storage life and cause more rapid decay when the product is brought to a warmer temperature. Chilling injury is cumulative; hours spent below 50-55°F in the field count towards the total chilling for a piece of produce.

Table 1 provides recommended storage temperatures and relative humidity for a variety of fall-harvested vegetables. If it isn't feasible to provide the optimal temperatures, the product may not last as long, but storage can still be useful. For most products with optimal storage temperature near 32°F, storage below 41°F is acceptable. Crops that require high relative humidity (over 90%) will quickly lose water and weight and shrivel if it is too dry. 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.

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 **http://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 **http://www.ba.ars.usda.gov/hb66/**.

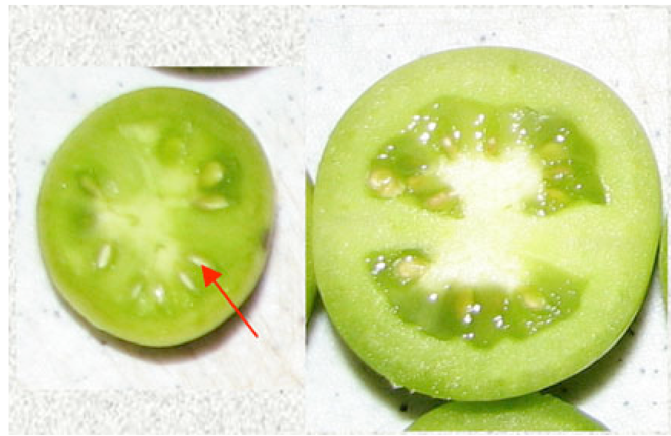

Figure 4: The mature green tomato on the right is green on the outside, and jelly has developed so that seeds move out of the way and are not cut when the tomato is sliced with a sharp knife. Tomatoes that have reached the mature green stage will continue to ripen when removed from the plant. The tomato 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*)

Figure 5: A greenhouse not being used for crop production can provide a warm, dry environment for curing crops like the onions in this image. (Photo by *Liz Maynard*)

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; buttercup: 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

Upcoming Events

Southwest Indiana Melon and Vegetable Growers Association Meeting. Thursday, December 6, 2012, 6:00 p.m. Southwest Purdue Agricultural Center, 4369 N. Purdue Rd., Vincennes, IN. The meeting will start with dinner, which is free with your paid SWIMVGA membership. Nonmembers may join at the door. Members will receive a postcard in the mail in November reminding them to RSVP. For more information contact Dan Egel at 812-886-0198 or **egel@purdue.edu**.

Illiana Vegetable Growers Symposium. Thursday, January 3, 2013. Teibel's Restaurant, Schererville, IN. Program will be available in early December and posted at **https://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 22 – 24, 2013. Wyndham Indianapolis West, Indianapolis, IN. **http://www.inhortgress.org**. Register online at **http://www.regonline.com/Register/Checkin.aspx?EventID=1127338**. Contact: Tammy Goodale at 765-494-1296 or **tgoodale@purdue.edu**.