

VEGETABLE CROPS HOTLINE

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

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<<http://www.btny.purdue.edu/pubs/vegcrop>>

No. 553
June 8, 2012

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BLACK ROT OF CABBAGE AND OTHER CRUCIFERS - (Dan Egel) - Last week, I observed a large field of cabbage just beginning to form heads. While the crop initially appeared healthy, close inspection revealed the disease black rot on the lower leaves. All vegetables in the crucifer family, including broccoli, Brussels sprouts, cabbage, cauliflower, Chinese cabbage, kale, mustard, radish, rutabaga, and turnip, are susceptible to this bacterial disease known as black rot.

Lesions of black rot may start out as chlorotic (yellow) areas before growing into necrotic (brown) V-shaped lesions with chlorotic margins (See Figures 1 & 2). In severe cases, the infected areas may extend to the base of the leaf and the entire plant may be stunted.

Fortunately for this cabbage grower, only the lower leaves were affected; the crop will probably be able to mature with minimal damage from black rot.

Management recommendations for black rot include:

- Purchase only disease free transplants or seed that has been tested for the bacterial pathogen.
- Grow cabbage in fields that have been rotated out of plants in the cabbage family for 3-4 years or more.
- Eliminate all weeds in the crucifer family as well as all volunteers from previous crucifer crops.
- Avoid overhead irrigation.
- A copper containing fungicide may slow the spread of black rot of cabbage to uninfected plants.
- Deep plow to bury all crucifer crop residues after harvest.

Cabbage growers should inspect their crops now so that damaged heads can be culled. If black rot is present, the field should be noted so that proper measures can be taken in the future.



Figure 1: Early symptoms of black rot of cabbage may include chlorotic (yellow) areas along the margin of leaves. (Photo by Dan Egel)



Figure 2: Typical symptoms of black rot include V-shaped necrotic (brown) areas at the margin of leaves. Necrotic areas are often surrounded by yellow (chlorotic) areas. (Photo by Dan Egel)



APHIDS IN HIGH TUNNELS - (*Rick Foster*) - One of the arthropod pests that is consistently more serious within high tunnels than in field-grown vegetables is aphids. There are several species of aphids that will attack vegetables in Indiana but they all do similar types of damage. Aphids use their sucking mouthparts to remove liquids from the leaves. Almost invariably, aphids will feed on the underside of leaves. Therefore, when scouting for aphids, be sure to turn the leaves over.

Aphids have a fairly unique life cycle in that during most of the growing season, all the aphids are females. These females give birth to live young, and in warm weather these young will reach adulthood and start giving birth in less than a week. This is why aphids usually occur in large colonies. Most aphids are wingless, but occasionally winged ones are produced so that they can migrate to new host plants.

In field situations, aphids rarely become a serious problem because they have a number of mortality factors that keep their numbers low. Aphids are attacked by a number of predators (including lady beetles, lacewings, etc.), parasites, and pathogens. When growers spray insecticides to control other pests, it is not uncommon for those insecticides to kill the predators and/or parasites but not the aphids. The result is that the aphids are allowed to reproduce unchecked and an outbreak may occur. This is one reason why we encourage growers to use insecticides only when necessary. Natural enemies can be purchased and released in high tunnels for aphid control. I do not recommend this strategy during the summer months because most high tunnels have too many opportunities for the natural enemies to escape when the tunnels are vented to release excess heat.

Another of the mortality factors that keep aphid populations low in field situations is rainfall. Very small insects like aphids are significantly impacted by heavy rains washing them off the plants. In high tunnels, the aphids are protected from rainfall and so this mortality factor is removed. This is likely the most important reason aphid populations are higher in high tunnels than in field situations.

Several insecticides are available for control of aphids. Check the ID-56 for the recommended products for your particular crop. Remember, however, that not every insecticide can be used in high tunnels or greenhouses. Check the list of insecticides labeled for use in high tunnels on page 12 of *Midwest Vegetable Production Guide* (ID-56). According to the Office of the Indiana State Chemist, pesticides may be used in greenhouses/high tunnels unless their use is specifically prohibited in high tunnels. M-Pede® is probably the best option for organic production.



CORN EARWORMS - (*Rick Foster*) - Sweet corn growers who have very early sweet corn should be aware of the corn earworm situation in their area. Our pheromone trapping network is just getting started so we don't have a complete handle on how moths are flying around the state, but I have received reports of relatively high (more than 20 moths per night) in southwest Indiana. Our catches near Lafayette have been relatively low, 0 to 2 per night recently. My recommendation is that growers ignore the usual threshold of 10 moths per night for this very early sweet corn for two reasons. First, your early sweet corn is silking earlier than any field corn in the area, so it will be the most attractive egg laying location for the earworm moths. Therefore, a high number of eggs may be laid than we would otherwise predict from the moth catches. Second, because the early sweet corn is more valuable than normal so the threshold should go down. One of the variables that we use to calculate economic thresholds is the value of the commodity. The higher the value, the lower the economic threshold (insect density at which a spray is justified). So for early sweet corn, I recommend spraying if the corn is in a vulnerable stage (green silks present) and any moths are being caught in a nearby pheromone trap.



EVAPOTRANSPIRATION AND PRECIPITATION - (*Liz Maynard*) - In the last issue of this newsletter (issue # 552) an article on drip irrigation discussed the use of reference evapotranspiration (ref ET) to estimate crop water use, and where to find ref ET estimates from the Indiana State Climate Office. The table below shows ref ET and precipitation from that office for five sites in Indiana for the past two weeks. For May 23 to 29, ref ET was almost 1.6 inches at two locations, and above 1 inch at all locations. The following week it was not as high, less than 1 inch at all locations. As discussed last week, expected water use by a full-grown crop would be about the same as ref ET. For a crop in earlier stages of growth, water use would be less.

The second row of the table shows precipitation. No locations measured significant rain May 23 to 29 and all except Throckmorton PAC reported rain from May 30 to June 5. The third row shows ref ET minus precipitation. For a full-grown crop this would approximate the net loss of water for that week. To fully meet the crop's water needs, this is the amount of water that would need to be applied by irrigation. If the value is less than 0, rainfall has been more than enough to meet crop needs. A closer approximation could be achieved by multiplying ref ET by the appropriate crop coefficient, as mentioned in the previous article.

The next two rows of the table have no data so that the reader may enter their own information if desired. In the row for Irrigation, enter the amount of water applied by irrigation for that week, in inches. (To convert from gallons per acre to inches, divide by 27,154 gallons per acre-inch.) Calculate the value for the following row

by subtracting 'Irrigation' from 'ref ET - Precip.' If irrigation plus rainfall has been sufficient to fully meet the needs of a full-grown crop, the value in row 5 will be close to 0, or less than 0.

The sixth row of the table shows one-half the ref ET. This would be closer to the expected water use for a crop that is in the initial stages of growth. The final row shows that value (0.5 X ref ET) minus precipitation, to give an estimate of the net loss of water for such a crop. For the first week, this net loss ranges from about 0.6 to 0.8 inches at the five locations. For the second week, three locations had a net loss less than 0, meaning that more than enough rain fell to meet needs of a crop in the early stages of growth. The other two locations had

net losses of one-quarter to one-third inch. To meet crop water needs, that is the amount that would be supplied by irrigation.

This table has summarized ref ET and precipitation by week. This can be a useful way to look back at a period of time and evaluate whether crop water needs are being met. For day-to-day irrigation planning, keeping a running total of ref ET, precipitation, irrigation, and net water loss is more useful. When drip irrigation is applied several or many times a week, updating totals daily make sense. When overhead irrigation is applied less frequently, biweekly or weekly totals could be used.

Table 1: Evapotranspiration and precipitation (in inches) for five sites in Indiana¹.

Where:	ACRE ²		NEPAC		PPAC		SEPAC		TPAC	
Date:	May 23-29	May 30-June 5	May 23-29	May 30-June 5	May 23-29	May 30-June 5	May 23-29	May 30-June 5	May 23-29	May 30-June 5
Reference Evapotranspiration (Ref ET)	1.58	0.85	1.58	0.98	1.55	0.84	1.19	0.7	1.21	0.63
Precipitation	0	0.5	0	0.24	0	0.49	0.01	1.27	0	0
Ref ET - Precip.	1.58	0.35	1.58	0.74	1.55	0.35	1.18	-0.57	1.21	0.63
Irrigation										
Ref ET - Precip. - Irrig.										
0.5 X Ref ET	0.79	0.43	0.79	0.49	0.78	0.42	0.60	0.35	0.61	0.32
0.5 X Ref ET - Precip.	0.79	-0.08	0.79	0.25	0.78	-0.07	0.59	-0.92	0.61	0.32

¹Compiled from data collected by Purdue automated weather stations and reported by the Indiana State Climate Office at climate.org. Accessed 06-07-2012. Data were taken May 23 to 29 and May 30 to June 5, 2012.

²ACRE: Agronomy Center for Research and Education, W. Lafayette; NEPAC: Northeast Purdue Ag Center, Columbia City; PPAC: Pinney-Purdue Ag Center, Wanatah; SEPAC: Southeast Purdue Ag Center, Butlerville; TPAC: Throckmorton Purdue Ag Center, Lafayette.



FARMER FEEDBACK NEEDED REGARDING FEASIBILITY OF CENTRAL INDIANA FOOD HUB - (Roy Ballard) - The Hancock County office of Purdue Extension is conducting a study to assess the need for and feasibility of a Food Hub for Central Indiana. Farmer input is a vital component in the success of this feasibility study.

A food hub, by definition, is a "centrally located 'facility' with a business management structure facilitating the aggregation, storage, processing, distribution, and/or marketing of locally/regionally produced food products."

Farmers and growers who produce fruits, vegetables, or a variety of other raw or value added farm products may find more efficient marketing and improved sustainability by working through a food hub.

Those farms wanting to bring a family member back to the farm may find it easier if a food hub provides a way to reach niche markets.

Farmers' market vendors wishing to expand production or reduce their hours spent in market preparation and staffing could find a food hub a way to generate income while reducing their marketing time and expense. Food hubs increase market availability by creating links to markets that farmers might not otherwise explore or be able to access.



A virtual hub - one of a number of hub possibilities - would serve as an online "match making" service between producer and consumer allowing online ordering and payment.

With the infrastructure possible in a more advanced hub, consumers could benefit from access to frozen, canned and otherwise preserved and stored regional products year-round. Possibilities would include a retail facility, drop-off of prepared, customized products at community pickup points and even direct-to-door delivery. Each of these would build on the existing more traditional direct marketing options of farmers' markets, roadside stands and farm markets.

Farmers who would be willing to offer feedback on this concept should contact Roy Ballard, Purdue Extension Educator for Hancock County, at 317-462-1113 or rballard@purdue.edu or the Educator in their county.

A written survey is available at <http://www3.ag.purdue.edu/counties/hancock/> or on Facebook at <http://www.facebook.com/pages/Central-Indiana-Food-Hub/230958950351192>.



NEW FROM eXTENSION: ORGANIC CUCUMBER BEETLE MANAGEMENT - (*Liz Maynard and Rick Foster*) - Cucumber beetles command the attention of cucumber, melon, squash, and pumpkin growers throughout Indiana because of the damage they can do. They are frequently the subject of articles in this newsletter, including one this year in issue 551, and several Purdue Extension publications address their biology and management (see list at end of this article). A new bulletin published on the national Extension web site <http://www.extension.org> addresses cucumber beetle management in organic production.

The article, written by William Snyder at Washington State University, covers cucumber beetle biology, natural enemies, cultural controls, organic pesticides, and other organic methods such as flaming and vacuuming. Growers won't find a single 'recipe' for managing beetles on their farm, but will learn about numerous practices that have potential to play a part in reducing crop losses to beetles. Scientific references for the practices discussed are provided so readers can get more detailed information if they wish.

Based on experience in Indiana, recommendations for managing cucumber beetles in organic muskmelons would be to use row covers until flowering, and plant a trap crop around the edge of the melon field.

This bulletin is one of many about organic vegetable production that has been developed by eOrganic, a national community of researchers, educators, growers, and others dedicated to research and outreach through eXTension. Cucurbit production has been a focus of recent bulletins, including publications on aphid, squash bug, and pickleworm and melonworm management. Combining information in these publications with knowledge about crop, arthropod, and plant pathogen biology under Indiana conditions should help growers improve their organic vegetable production.

Purdue Extension Publications with Information about Cucumber Beetles:

Search by title at <https://mdc.itap.purdue.edu/> or call 888-398-4636.

Cucurbit Insect Management

Managing Insects in the Home Vegetable Garden

Managing Striped Cucumber Beetle Populations on Cantaloupe and Watermelon

Midwest Vegetable Production Guide for Commercial Growers 2012 (ID-56)

Monitoring and Decision Making for Cucumber Beetles on Muskmelon

Organic Vegetable Production



HIGH TUNNEL CROP TALK CONTINUES - (*Liz Maynard*)

- At the June 4 High Tunnel Crop Talk session, we discussed a variety of issues in tomato and bramble production. Blossom end rot and 'zippering' observed on tomatoes can reduce marketable yield. Symptoms suggesting nutrient disorders in brambles will require tissue analysis to determine what the specific problem is.

Notes of this and previous sessions, including images, are posted at indianahightunnels.blogspot.com. If you would like to receive a copy of the notes by email, go to the blog page, submit your email address in the 'follow by email' box (you may need to scroll down to see it), and follow instructions on the screen to complete your subscription. No internet access? Please call and we'll find a way to get the notes to you: 219-531-4200 ext. 4206.

On Monday, June 18, Dr. David Conner from Univ. of Vermont will join us to discuss results of his economic research on high tunnel production in Michigan. Join in at 12:30-1:30 p.m. Eastern/11:30-12:30 Central. Point your web browser to <https://gomeet.itap.purdue.edu/htct/> and click on the phone icon to be dialed in to the call. Or just dial 1-866-492-6283. It isn't necessary to be at a computer to listen and participate in the discussion.

Future sessions will continue on alternate Mondays, same time and 'place': July 2, 16, and 30, and August 13 and 27.



SOUTHWEST INDIANA TWILIGHT TOUR - A field day will be held at the Southwest Purdue Agricultural Center on U.S. 41 just north of Vincennes, IN, on July 12 from 4:30 to 9 p.m. (Eastern Time). Participants will be able to choose one of three demonstration tours to view the latest work being conducted by Purdue Extension specialists and educators: (1) poplar trees as a source of biomass and a grape variety trial; (2) high tunnel tomatoes and organically-produced heirloom tomatoes; or (3) canola/wheat/double crop soybean system and nitrogen/sulfur management on sandy soils. Sponsors will provide a complimentary meal to accompany the tour. The evening speaker, Extension Specialist Fred Whitford, will talk on "Measuring Devices." Space is limited so registration is required. Contact Valerie Clingerman, Knox County Extension Educator at 812-882-3509 to register or for more information. Those requesting PARP credit will need to bring their Private Applicator Permit and \$10. Individuals requesting reasonable accommodation should contact Valerie Clingerman.

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