Vegetable Crops Hotline

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



Issue: 632 July 20, 2017

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Caterpillars in Crucifers (Rick Foster, fosterre@purdue.edu, (765) 494-9572)

There are three important caterpillar pests of crucifers in Indiana, the imported cabbageworm, the cabbage looper, and the diamondback moth. Each of these caterpillars will feed on leaves and heads. All are capable of producing serious damage to most crucifers.

The adult imported cabbageworm is a common white butterfly with black spots on the forewing that can be observed flying early in the spring. The larva is a sluggish green caterpillar (Figure 1), exceeding 1 inch in length at maturity, with a light yellow stripe running down its back. The larvae can consume enough leaf material to reduce plant growth; can feed on the head, making it unmarketable, and can foul the head with excrement.



Figure 1. Imported cabbageworm larva (photo by John Obermeyer)

The cabbage looper does not overwinter in Indiana, but flies into the state each spring from more southerly locations. Larvae are light green with a white stripe along each side of the body. They reach a length of 1 1/2 inches when mature. When they crawl, the central region of the body is pushed up into a hump, thus the name looper (Figure 2). Loopers tend to be more of a later season

problem, with the timing of their arrival here depending on when conditions are right for them to fly or be blown up from the South.



Figure 2. Cabbage looper larva (photo by John Obermeyer)

The adult stage of the diamondback moth is a very small (1/3 -1/2 inch), slender moth that, with its wings folded, appears to have a row of three diamond-shaped yellow spots in the middle of the back. The larvae are much smaller than those of the other two caterpillar species, reaching a maximum length of 1/3 inch (Figure 3). They can also be identified because of their vigorous wriggling behavior or by their dropping from the plant by a silken thread when disturbed. The larvae are pale greenish-yellow and pointed at both ends. The larvae can complete development in as little as 10 days when temperatures are warm.



1 Figure 3. Diamondback moth larva on a cabbage leaf (photo by John Obermeyer)

All three of these caterpillar species cause similar feeding damage. However, each cabbage looper larva will consume more foliage than an imported cabbageworm and much more than a diamondback moth larva. Cabbage is fairly tolerant of leaf feeding, but care must be taken that the caterpillars do not feed on the heart leaves, which could prevent head formation, or

within the head, which could render the head unmarketable. Cauliflower and broccoli can tolerate substantial feeding on the leaves, but any feeding on the heads must be avoided. Radishes and turnips grown for roots can tolerate significant feeding damage. However, turnips grown for greens, collard, and mustard must be well protected, because the leaves are the marketable portion of the crop.

Organic methods for controlling caterpillars on crucifiers include Bt insecticides (Agree, Biobit, Dipel, Javelin, Lepinox, Xentari) or Entrust. These insecticides provide good control of all three species.

Conventional insecticides that will provide good to excellent control of these caterpillars include Ambush[®], Asana[®], Avaunt, Baythroid[®], Brigade[®], Confirm[®], Coragen[®], Exirel[®], Intrepid[®], Larvin[®], Mustang Maxx[®], Proclaim[®], Radiant[®], Rimon[®], and Warrior[®].

Caterpillars in Peppers

(Rick Foster, fosterre@purdue.edu, (765) 494-9572)

European corn borers used to be a serious pest of peppers. The larvae would burrow into the fruit under the cap, making it difficult to cull out infested fruit. With the widespread adoption of Bt corn by agronomic farmers, populations of corn borers have been greatly reduced. However, it appears that in the last couple of years, corn borers have been making a comeback, so management of this pest is still recommended.

Corn earworms can also attack pepper fruit. They usually tunnel into the side of the fruit, making it easier to cull out infested fruit. Sometimes when fruit have been treated with insecticides, the larvae will die before they enter the fruit, leaving behind a feeding scar that will render the fruit unusable for fresh market sales.

Corn borers can be controlled with Ambush[®], Avaunt[®], Bt[®], Baythroid[®], Brigade[®], Coragen[®], Entrust[®], Exirel[®], Intrepid[®], Lannate[®], Mustang Maxx[®], Permethrin[®], Radiant[®], and Warrior[®]. Because of concerns about resistance, the pyrethroid insecticides are unlikely to be effective against corn earworm.



Figure 1. The small hole on pepper fruit is likely caused by corn earworm (photo by Wenjing Guan)

Corn Earworms

(Rick Foster, fosterre@purdue.edu, (765) 494-9572)

Populations of earworms, as evidenced by pheromone trap catches, have not gone to zero as the often due in July. Catches have been fairly low, but moths are still flying and presumably laying eggs. The good news is that in most areas, dent corn is silking, which attracts most of the moths away from our fields of sweet corn and other vegetables. For sweet corn, we would expect pheromone trap catches of less than 10 per night to be safe from damaging infestations of earworm. This is often a good time for growers to avoid the time and expense of spraying their sweet corn. Other vegetable crops such as tomatoes and peppers are less attractive to the moths for egg laying than sweet corn, so they are unlikely to suffer damage when the neighboring field corn has fresh silks present.

Bacterial spot of pumpkin

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

I have observed this disease in scattered commercial pumpkin and squash fields across Indiana. Bacterial leaf spot of pumpkin is perhaps the most serious disease of pumpkin in Indiana today.

Symptoms: Bacterial spot causes ¹/₈-¹/₄ inch angular leaf lesions that are white to light brown in color (Figure 1). These leaf lesions may be accompanied by yellowing (chlorosis). The more important symptom is the lesions on fruit that are scabby to raised, round and a light brown in color. These lesions are often less than ¹/₈ inch in diameter and do not extend into the surface of the fruit. However, lesions may become secondarily infected in which case lesions can become an inch or more in diameter. Such lesions may grow into the flesh of the fruit (Figure 2). Any type of fruit lesion can ruin the marketability of the fruit.



Figure 1. The angular lesions of bacterial spot on pumpkin leaves do not cause yield loss.



Figure 2. Bacterial spot can cause scabby lesions on the surface of the pumpkin. Occasionally, lesions become infected with secondary fungi and are enlarged.

Biology: Leaf lesions, while unimportant economically, are important in diagnosing bacterial spot before fruit is present. This head start allows growers to begin preventive measures. The idea behind such measures is to slow the spread of leaf lesions in which the bacteria survive and grow. Fruit lesions often begin when bacteria splash from the leaf to the fruit. Fruit remain susceptible to lesions of bacterial spot until about 14 days post pollination.

Management: Foliar applications of a copper product, usually copper hydroxide or copper sulfate, should be applied once the leaf lesions of bacterial spot have been confirmed or when pumpkin plants have reached the bush stage if the disease threatens. That is, don't wait to start copper applications if one expects bacterial spot to occur either because of field history or some other factor. Applications of a copper product are more likely to be more effective if applied with a mancozeb product. Dithane[®] and Manzate[®] are mancozeb products that are labeled on pumpkins.

Another product that is labeled for bacterial spot of pumpkins is Actigard[®]. Actigard[®] is a product that 'tells' the plant it is under attack. The active ingredient itself is not active against any fungus or bacterium. Instead, it starts the plant's defense system. So, in the case of bacterial spot, we would hope it sends a signal to the plant to start producing plant compounds that help slow the disease. There is data to support the use of Actigard[®]. Otherwise, it wouldn't be labeled. However, Actigard[®] can also lower yields if applied when the plant is under stress. That's why there are specific restrictions on the label. For example, only apply Actigard[®] to healthy plants and do not apply more than 8 oz. per acre per year. Actigard[®] is labeled for pumpkins for bacterial spot and angular leaf spot as well as other diseases: powdery mildew, downy mildew, bacterial fruit blotch, etc. But I would use it only for bacterial spot and angular leaf spot. If you decide to use Actigard[®] for bacterial spot, Apply Actigard[®] once at two weeks before first female flower and again at first female flower.

All the fungicides in the world, however, will not reduce bacterial spot problems if there has not been proper crop rotation. After a pumpkin crop, growers should keep fields out of cucurbits from 3-4 years. This is, perhaps, the most important management decision for bacterial spot.

The literature on the seed borne nature of the bacterial spot pathogen is not clear. However, it makes sense not to save seed from pumpkins that were grown in a field with bacterial spot. Closely monitor seedlings for symptoms of bacterial spot.

I will be happy to answer any questions about bacterial leaf spot of pumpkins or any of the compounds mentioned.

Optimal Storage Conditions for Vegetables

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

After harvest, storing vegetables in optimal conditions is important to ensure the whole season's hard work has paid off. This article discusses the optimum storage conditions for tomato, pepper, cucumber, watermelon, cantaloupe and sweet corn.

<u>Tomato</u>

Ideal storage conditions for tomatoes depend on the maturity stage of picking. If tomatoes are picked at mature green, store them in 66 to 70°F with 90 to 95% RH would encourage uniform ripening. Temperatures above 81°F reduce intensity of red color and reduce fruit shelf-life. Green tomatoes are chilling sensitive. If the temperature is below 55°F, fruit may develop chilling injury. Red tomatoes are safe to store at 50°F, however, flavor and aroma may be negatively affected compared to storing them at 55°F.

<u>Pepper</u>

Optimum storage condition for peppers is 45 to 55°F with 90 to 95% RH. Temperatures lower than 45°F may cause chilling injury. Colored peppers are in general less chilling sensitive than green peppers. Storage temperatures higher than 55°F accelerate ripening, it should be avoided for green peppers. However, if partially colored fruit are harvested, store them at 68 to 77°F with RH >95% is effective to color peppers. Peppers are sensitive to ethylene. Avoid store peppers together with ethylene producing fruit such as ripening tomatoes and cantaloupes.

<u>Cucumber</u>

Ideal storage condition for cucumber is 50 to 54°F with RH >95%. Cucumbers are chilling sensitive, chilling injury can develop if fruit is stored below 50°F for more than 2 or 3 days. Storage temperature above 59°F can lead to rapid fruit yellowing and loss of quality. Greenhouse grown cucumbers that have very thin skins are very sensitive to water loss. If they are not shrinkwrapped, storing them in sealed bags can help ensure above 95% RH and prevent fruit water loss. Cucumbers are very sensitive to ethylene that accelerates yellowing and fruit decay. Avoid store cucumbers together with ethylene producing fruit such as ripening tomatoes and cantaloupes.

<u>Watermelon</u>

Although ideal storage temperature for watermelons is in the range of 50 to 59° F with approximately 90 % RH. Many

watermelons are shipped in unrefrigerated trucks. Watermelons can develop chilling injury when stored below 50°F for more than a few days. The fruit is extremely sensitive to ethylene. Exposing to a low level of exogenous ethylene can cause fruit softening, fading of flesh color, and over-ripeness.

<u>Cantaloupe</u>

Cantaloupe should be cooled right after harvest to delay ripening and retain sugar content. The optimum storage temperature is 36 to 45°F with 95% RH. Full-slip melons are not chilling sensitive, they may be stored for 5 to 14 days at 32 to 36°F. Less mature melons may develop chilling injury when temperature <36°F.

Sweet Corn

Sweet corn loss sweetness rapidly if they are not cooled right away after harvest. If they remain in temperatures around 85°F, more than half of sugar in sweet corn can be converted to starch in a single day. To maintain quality, sweet corn should be cooled immediately after harvest, and stored in temperatures as close as possible to 32°F. Since it is critical to cool sweetcorn to a lower temperature than many vegetables, whenever possible, harvest sweet corn early in the morning when the pulp temperature is the lowest during the day. Sweet corn is not chilling sensitive, and exposure to exogenous ethylene normally is not a problem.

Time to Dispose of Unwanted Pesticides

The Indiana Pesticide Clean Sweep Project is a great opportunity to legally dispose of unwanted chemicals. It is free of charge up to 250 pounds.

To dispose of pesticides, complete the **2017 Pesticide Clean Sweep Planning form** (the form is attached to the newsletter) and mail, fax or e-mail the completed form to Kevin Neal at Purdue University. 175 South University Street, West Lafayette, IN 47907-2063, (765) 494-4331 (fax) or

nealk@purdue.edu no latter than Monday, July 31, 2017. Then bring your labeled, leak free and safe to transport containers to the collection site. Do NOT mix materials.

Pesticides will be accepted from 9:00 am to 3:00 pm local time at the following dates and locations:

- August 15, 2017: LaPorte County Fairgrounds in LaPorte, IN
- August 16, 2017: Tippecanoe County Fairgrounds in Lafayette, IN
- August 17, 2017: Grant County Fairgrounds in Marion, IN
- August 22, 2017: Franklin County Fairgrounds in Brookville, IN
- August 23, 2017: Greene County Fairgrounds in Bloomfield, IN
- August 24, 2017: Hendricks County Fairgrounds in Danville, IN

More information about the project please refer to http://www.oisc.purdue.edu/pesticide/clean_sweep.html

Information provided by the Indiana State Chemist and Seed Commissioner's office.

Upcoming Events Southwest Purdue Ag Center High Tunnel Tour

Date: Thursday, August 10, 7 p.m.-9 p.m. (EDT)

Location: Southwest Purdue Agricultural Center, 4669 North Purdue Road, Vincennes, IN, 47591

Registration: Visit http://tinyurl.com/yc5lqvez or call (812) 886-0198

For more information, contact: Wenjing Guan at guan40@purdue.edu or Dan Egel at egel@purdue.edu

During the evening event at Southwest Purdue Agricultural Center, attendees will see demonstrations of soil solarization, end-of-season clearance of soil covers, sprayers used for smallscale plots, and an innovative season-long low tunnel system for growing tomato and pepper. Attendees will also learn how to ID tomato diseases by walking in the field with a plant pathologist. You are also welcome to bring your own disease samples for identification. A NRCS representative will share the insights about high tunnel cost-share program. We will also discuss issues relating to how to choose, locate and make pre-construction decisions for a high tunnel.



Southwest Purdue Ag Center (SWPAC) 4369 N. Purdue Road Vincennes, IN 47591

Thursday August 10, 2017

High Tunnel Tour

7:00 PM - 9:00 PM (EST)

In the tour, you will see demonstrations of • Soil solarization

- End-of-season clearance of soil covers
- Sprayers used for small-scale plots
- An innovative season-long low tunnel system for growing tomato and pepper You will also learn how to ID tomato diseases by walking in the field with a plant pathologist. You are welcome to bring your own disease samples for identification.
 A NRCS representative will share the insight about high tunnel cost-share program.

We will also discuss issues regarding how to choose, locate and make pre-construction decisions for a high tunnel.



Tour is free, to register please visit <u>http://tinyurl.com/ycSlqvez</u> or call (812) 886-0198 For more information please contact: Dan Egel (<u>egel@purdue.edu</u>) or Wenjing Guan (<u>guan40@purdue.edu</u>)

The program is co-sponsored with the Dept. of Recreation, Park & Tourism Studies at Indiana University. Funded in part by the Indiana Dept. of Agriculture and a USDA Specialty Crops Block Grant.

Purdue University is an equal opportunity / equal access / affirmative action institution.

Pinney Purdue Vegetable and High Tunnel Field Day

Date: Tuesday, Aug. 15, 5 p.m. -8:30 p.m. (CDT)

Location: Pinney Purdue Agricultural Center, 11402 South County Line Road, Wanatah, IN 46390

Registration: Visit http://tinyurl.com/yc5lgvez or call (219) 386-5232

For more information, contact: vegcrops@purdue.edu or (219) 386-5232.

The Vegetable and High Tunnel Field Day at Pinney Purdue Agricultural Center will feature tours of tomato production in moveable high tunnels, using both conventional and organic management systems. The event also will include walking tours of sweet corn and pumpkin variety trials, an overview of research findings about the opportunities available through high tunnels, and information about the NRCS EQIP Seasonal High Tunnel Initiative. Attendees will also learn about pollinators; low-cost high tunnel structures for the home gardener; irrigation in high tunnels; and ideas for using fresh produce in meals and snacks. Dinner and sweet corn variety tasting will follow the tours. Growers who would like to donate corn for tasting may contact Lyndsay Ploehn at 219-465-3555 or lploehn@purdue.edu. Indiana private applicator recertification credits (PARP) are available for a \$10 fee. The event is co-sponsored by Purdue and Indiana Universities.



Vegetable & High Tunnel **Pinnev Purdue Field Dav**

August 15, 2017 5:00 pm-8:30 pm Central Time

Pinney Purdue Ag Center 11402 S. County Line Rd., Wanatah, IN 46390 Just north of US 30 between LaPorte and Porter Cou

To register, visit: http://tinyurl.com/yc51qvez_or call 219-386-5232

PURDUE LOCAL FACES EXTENSION Purdue Dept. of Horticulture and Landscape Architecture www.hort.purdue.edu



unded in part by the Indiana State Dept. of

Hiah Tunnels Tomatoes

Sweet Corn

Pumpkins Pollinators

PURDUE LOCAL FACES

Pinney Purdue Vegetable and High Tunnel Field Day Tuesday, August 15, 2017, 5:00 pm - 8:30 pm Central Time

Join us for presentations, plot tours, supper, and sweet corn tasting.

High Tunnels Why High Tunnels? Tomato Variety Performance Irrigation NRCS EQIP High Tunnel Initiative

Home Gardens Sweet Corn and Pumpkins in Gardens Pollinators Common Tomato Insects and Diseases Low-cost Hoophouses for Home Gardeners

To register, visit <u>http://tinyurl.com/yc51qvez</u>or call 219-386-5232.

For more information: vegcrops@purdue.edu

Dept. of Horticulture and Landscape Architecture Purdue University

Sweet Corn Sweet Corn Variety Trial Sweet Corn Tasting*

Pumpkins Powdery Mildew Resistant Pumpkin Varieties Underseeded Cover Crops Pollinators & Pumpkins

Recipes for Fresh Produce

Indiana Private Applicator Recertification (PARP) credit available: \$10 fee

*Growers who would like to donate corn for tasting, please contact Lyndsay Ploehn at 219-465-3555 or lploehn@purdue.edu.

Organic Vegetable Seed Production & Varietal Selection Workshop

Date: August 22, 2017, 9:00 am - 3:00 pm.

Location: Daniel Turf Center, 1340 Cherry Ln, West Lafayette, IN, 47907.

Registration: http://tinyurl.com/y7da7dsh

Topics include Seed biology fundamentals; Harvesting, processing, and storing seed; Population size and isolation requirements; Managing pathogens during seed production and after harvest; On-farm variety trialing and participatory breeding techniques. Registration fee is \$15 including workshop and lunch.

ORGANIC VEGETABLE SEED PRODUCTION & VARIETAL SELECTION WORKSHOP

West Lafa te, Indiana g) and The Student Farm

\$15 registration includes worksho ch by The Juniper Sp

aestions? Loci Jolly-Brown at 76 4-1296 or ljollybr@purdue.edu

Register today http://tinyurl.com/ 7da7dsh

AUGUST 22ND, 2017 9:00 A.M. - 3:00 P.M. WEST LAFAYETTE, INDIANA

Join partners from the Carrot Improvement for Organic Agriculture (CIOA) and Tomato Organic Management and Improvement (TOMI) projects for a one-day classroom and field based workshop on organic varietal development and seed production. Nationally renowned rensin, and Organic earchers from Purdue University, University of Wisc Seed Alliance will lead this course and instruction will include:

Seed biology fundamentals Harvesting, processing, and storing seed Population size and isolation requirements Managing pathogens during seed production and after harvest On-farm variety trialing and participatory breeding techniques

We'll also connect with chefs to develop and identify varieties that shine in the kitchen. The morning classroom portion will be held at the Daniel Turf Center, We'll head to the field at The Student Farm in the aftern to tour and taste test advanced carrot and tomato breeding populations.

SPEAKERS

MICAELA COLLEY, Organic Seed Alliance, Program Director JULIE DAWSON, University of Wisconsin-Madison, Assistant Professor LORI HOAGLAND, Purdue University, Associate Professo LAURIE MCKENZIE, Organic Seed Alliance, Research & Education Associate KAREN MITCHELL, Purdue Extension, Agriculture & Natural Resource Educator LOCAL CHEF AND FARMER PANEL, TBA

PURDUE

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Beginning Farmer Tours and Workshops

Join Purdue's beginning farmer team for farm tours in 2017.

September 11. Tour Little Prairie Farms, a small acreage vegetable farm near Brookston, IN, and the Purdue Student Farm near West Lafayette to learn about farming practices and tools for small acreage farms.

September 27. Full Hand Farm is a diverse vegetable farm located near Noblesville, IN. The tour will include information on the use of high tunnels in vegetable production.

October 2. Aficionado Farms produces organically grown produce, herbs, and flowers near Elberfeld, IN. Learn about their farm and Farm to School programs.

More information about these tours are available

at http://www.cvent.com/events/beginning-farmer-tours-and-work shops/event-summary-0f7526f0380a432788708b2f2edcf1e7.aspx



Join Purdue's Beginning Farmer team for farm tours in 2017!

August 26. Goat Milk Stuff is a dairy goat farm located near Scottsburg, IN that produced soaps, candies, and cheeses. The tour will include information on agricultural tourism and value-added products.

September 11. Two tours for the price of one I Tour Little Prairie Farms, a small acreage vegetable farm near Brookston, IN, and the Purdue Student Farm near West Lafayette to learn about farming practices and tools for small acreage farms.

September 27. Full Hand Farm is a diverse vegetable farm located near Noblesville, IN. The tour will include information on the use of high tunnels in vegetable production. October 2. Aficionado Farms produces organically grown produce, herbs, and flowers near Elberfeld, IN. Learn about their farm and Farm to School programs

October 14. Blue Yonder Organic Farm is a Veteran owned and operated farm near North Salem producing pastured poultry, sheep, and other products. Learn about poultry production and organic certification.

October 28. Freedom Valley Farm is an organically managed farm located near Freedom, IN. The tour will include information on winter markets and developing business plans.

Registration Now Open!

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2017 PESTICIDE CLEAN SWEEP PLANNING FORM

I have the following pesticides (weed killers, insecticides, rodenticides, fungicides, miticides, etc.) to bring to the Indiana Pesticide Clean Sweep. I understand that there will be no charge for disposal of up to 250 pounds of pesticides per participant. I also understand that if there is not adequate demand for these disposal services, I will be contacted by the Office of Indiana State Chemist to be notified of the program cancellation.

Contact Name	Contact Phone #		
Please indicate at which location you will be participating.			
□ LaPorte – August 15	Lafayette – August 16		
□ Marion – August 17	□ Brookville – August 22		
□ Bloomfield – August 23	Danville - August 24		
List of pesticide products to be disposed:			
1. Trade Name			
Active Ingredient			
	□LiquidGallons □Aerosol		
2. Trade Name			
Active Ingredient			
	□LiquidGallons □Aerosol		
3. Trade Name			
Active Ingredient			
Check One: Solid Pounds	□LiquidGallons □Aerosol		
4. Trade Name			
Active Ingredient			
Check One: Solid Pounds	□LiquidGallons □Aerosol		

RETURN by July 31, 2017, to KEVIN NEAL, <u>nealk@purdue.edu</u> OR 765-494-4331 (fax). Questions may be directed to Kevin at 765-494-1585.