

VEGETABLE CROPS HOTLINE

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

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<http://www.entm.purdue.edu/entomology/ext/targets/newslett.htm>

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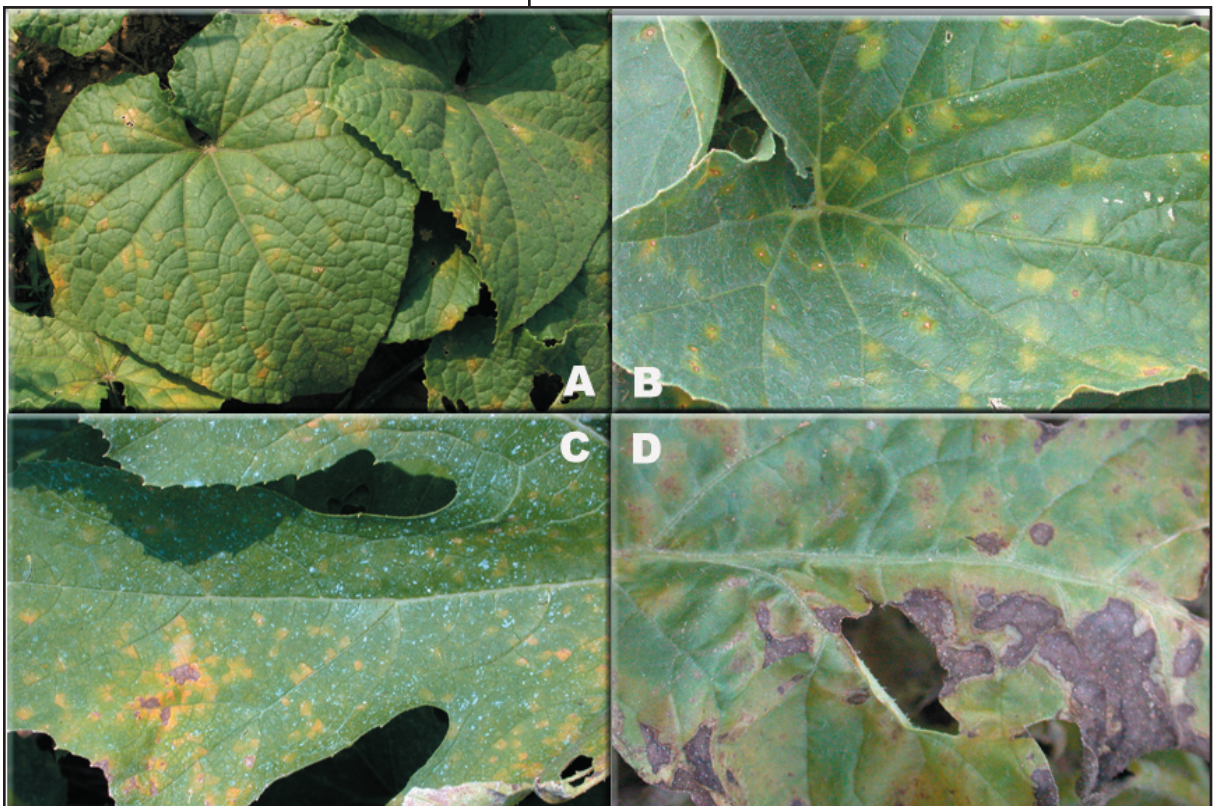
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DOWNY MILDEW OF CUCURBITS - (Dan Egel) - It was reported that downy mildew of pumpkins was observed in Washington County Indiana. This disease appears to have spread quickly around the state. The fungus that causes downy mildew of pumpkins also affects other cucurbits. The photos shown here should help growers identify downy mildew on cucumber, muskmelon, pumpkin and watermelon (Figures 1 and 2). Additional details and management recommendations were discussed in Issue #454 of the *Vegetable Crops Hotline*.



Figure 2. In the morning or during wet periods, it is possible to see the fungal growth on the underside of the leaf (in this case pumpkin). (Photo by Dan Egel)

Figure 1. Initial symptoms of downy mildew of cucurbits are chlorotic areas of the upper leaf surface of A) cucumber B) muskmelon C) pumpkin and D) watermelon. (Photo by Dan Egel)





COMMERCIAL FRUIT & VEGETABLE PLOT TOURS - (Liz Maynard) - Fruit and vegetable farmers and market gardeners are invited to tour the Meigs Horticultural Facility at the Throckmorton Purdue Ag Center on Sept. 7, 2005, from 5:00 to 8:00 p.m. The tour will include pumpkin and sweet corn variety plots, as well as apple and grape research plots. Specialists will be present to discuss harvest practices for food safety, insect, disease, and weed management, and highlights of melon trials in SW Indiana. Dinner will be served following the tour at a cost of \$5/person. To register please call (219) 785-5674 and leave a message with your name and the number of people attending. The program is sponsored by Purdue Extension, Purdue Ag Centers, and the Departments of Horticulture and Landscape Architecture, Botany and Plant Pathology, and Entomology.

URL: <www.hort.purdue.edu/fruitveg/>

Contacts: Program information: Liz Maynard, (219) 785-5673

To Register: Pleasant McGuire, (219) 785-5674

E-mail: purduehort@pnc.edu

Directions:

From Lafayette take US 231 S to CR 800 S intersection (flashing lights), turn left on CR 800 go 1 mile & turn right on CR 100 E. Farm is 1 mile on left.

From Crawfordsville take US 231 N to CR 800 S (approx. 3 miles north of Romney), follow above directions.

From Indianapolis take I 65 north to SR 28 exit and turn left and stay on SR 28 until you reach US 231 (Romney). Turn right onto US 231 and go 3 miles to CR 800 S intersection. Turn right on CR 800 and then right again onto CR 100E, go 1 mile, farm is on left. Watch for signs.

TIME IS RUNNING OUT - (Jennifer Dennis) – The 2005 Survey will officially close at 12:00 Midnight Pacific Time on September 5th. All winners, including the grand prize drawing from the first 777 completed surveys and the NAFDMA annual memberships will be announced September 8th. The North American Farmers' Direct Marketing Association (NAFDMA) is conducting an extensive survey of farm direct marketers and agritourism operations. Dr. Ed Mahoney from

Michigan State University is conducting this survey in partnership with NAFDMA. The organization would like any grower/retailer that does Pick Your Own, has a farm stand, travels to Farmers' Markets, has an on-site operation, or engages in any related direct marketing activity. This is a web survey and has gone through extensive review to make sure all respondents are protected from having their names sold. Results entered into the survey are confidential. This is very important information to Indiana. The results of the survey will: provide a realistic impact of the industry, make broad based benchmarks that have never been captured before making information available to the industry for expansion, make it easier to give information to financial institutions about the industry, help growers and farmers with pertinent information for zoning and insurance, document facts that help represent your interests and issues relevant to the industry and give communities a realistic analysis of the importance of direct marketing and agritourism. The first 777 responses received will be entered into a drawing for \$1900 towards attending the NAFDMA convention in San Antonio, TX or \$1000 cash. We encourage you to participate even if you are



not a member of NAFDMA. To complete the survey, go to <www.farmmarketresearch.com>. You will need to register first by providing email, zip/postal code and name of your operation. If you have any questions, you may contact Dr. Jennifer Dennis at Purdue University at jhdennis@purdue.edu or (765) 494-1352 or contact Dr. Ed Mahoney at Michigan State University (survey coordinator) by email at rirc@msu.edu or phone (517) 432-0285. If you have any questions or concerns about your rights as a study participant or you are dissatisfied at any time with any aspect of this study, you may contact - anonymously, if you wish - Peter Vasilenko, Ph.D., Chair of the University Committee on Research Involving Human Subjects by phone (517) 355-2180, fax (517) 432-4503, or email uchris@msu.edu.

HANDLING YOUR FOOD SAFETY RISK - (Shari L. Plimpton) - By now, most growers have heard of GAPs (Good Agricultural Practices), and some, even of GMPs (Good Manufacturing Practices), yet, after a couple of years of speaking and consulting about GAPs and all of its related topics, I still get some blank stares when I men



tion GHPs (Good Handling Practices). What that tells me, of course, is that I haven't done a good enough job of providing useful information about GHPs and I hope to rectify that now.

GHPs are all of those precautions you take from storage through transportation through warehousing to minimize the risk of foodborne illness. Our emphasis on preventing contamination in the GAPs program doesn't stop at the packinghouse. GHPs include chilling, storing and transporting produce (and storage again if you are warehousing). GHPs also overlap with GAPs in the areas of worker health and hygiene and water quality. Training and education in food safety is just as important for workers who are handling produce in storage and in the loading of trucks as it is for those in the fields and in the packing house. Water used post-packing (especially that used for ice) should meet potable standards.

Cleaning, sanitation, and temperature control are the focus for GHPs. In storage facilities, this means developing and implementing cleaning and sanitizing procedures prior to turning on the refrigeration units and filling your storage with produce. I want to emphasize cleaning and sanitizing as two separate activities and two separate procedures. Cleaning is done first to remove debris and organic materials by using a cleanser designed for the job. After rinsing, a sanitizer is then used to inactivate any remaining microorganisms. If you are developing a food safety plan, you would describe in writing your Standard Operating Procedure (SOP) for cleaning including the type of cleanser, the amount to use and how to rinse. An SOP would also then be written separately for the sanitation procedure.

Cleaning and sanitizing is compromised if there are any cracks or crevices in which organic material and therefore microorganisms can hide. Inspect, replace, repair and/or meticulously clean as appropriate the following:

Cracked hoses, damp insulation, hollow framework, rubber seals around doors, poorly-maintained filters, light switches, standing water, cleaning tools, open bearings, trash cans, porous surfaces (e.g. wood), icemakers, condensate; especially walls and pipes over packing lines.

If you are using ice, recognize that you are using a material that is a potential hazard if not handled properly. One microorganism that is well known for causing foodborne illness and is particularly tolerant of cooler

temperatures is *Listeria monocytogenes*. This microorganism and others can be present in ice, ready to multiply and grow rapidly when the ice melts and temperatures increase. For this reason, the water and everything used in the manufacture, conveyance and storage of ice must be clean and sanitized. Using potable water is a must. After that, recognize that the ice house itself, and all conveyors and chutes, must be cleaned and sanitized on a regular basis. Porous surfaces such as wood should be replaced with cleanable surfaces wherever the surface comes in contact with the ice.

Maintain your storage temperatures. Keep storage facilities within the recommended temperature range for the produce you are storing. Monitor and document your storage temperatures on a regular schedule, so you can demonstrate that produce is handled safely while under your control. If produce is kept cool up front, microbial growth is minimized and your risk is minimized. Temperature abuse after produce has left your control is less likely to result in cases of foodborne illness if growth is prevented early in on in handling.

Finally, inspect trucks prior to loading to insure cleanliness and proper refrigeration. This is often the last thing a grower can control in their operation. Identify prior loads hauled in the truck. Trucks that have hauled raw animal products should be avoided due to the risk of cross contamination, so specify up front that you don't want trucks that are hauling raw animal products. From my own experience, it is often possible to tell if a truck has been properly cleaned by both appearance and the smell. Know where the closest truck cleaning station is to your operation, so you can direct drivers to it if they come to you too dirty to load. As a part of your food safety program, document truck temperature, cleanliness, state of the product, and required shipping temperature range at time of shipment. Including your recommended temperature range on the bill of lading is a good way to communicate and easily document your expectations for the handling of your produce after its left your control.

A complete food safety program includes GAPs, GMPs (if you have a packing house), and finally, GHPs. Be thorough, be prepared, and you will significantly reduce your risk for microbial contamination of fresh produce. The Ohio and Indiana Specialty Crop Food Safety Initiative offering growers a variety of tools to address pests and other food safety issues. The Initiative is presented in partnership with the United States Department of Agriculture's Risk Management Agency.

Ohio and Indiana fruit and vegetable growers can get help with the development of a food safety program by contacting Mid American Ag and Hort Services by phone at (614) 246-8286, fax at (614) 246-8686, or email at maahs@ofbf.org. More information about the Ohio and Indiana Specialty Crop Food Safety Initiative may be found at www.midamservices.org by clicking on "Projects."

VIRUS DISEASES IN PUMPKINS - (Dan Egel) - I have observed many pumpkin fields with virus symptoms. Although there is not much that can be done about the problem now, it might be worthwhile to review this annual problem.

The first question that usually comes to mind is how much yield will be lost as a result of pumpkin viruses? The answer depends on when the pumpkins were infected. Virus symptoms that occurred before or at early flowering can cause poor fruit set and/or mottled, disfigured fruit (Figure 1). Although these small fruit are unusual looking and may generate some interest, they can be difficult to market.



Figure 1. Pumpkin fruit disfigured by virus infection. (Photo by Dan Egel)

Infections that occur after fruit set is well along may have little affect other than to disfigure the leaves (Figure 2). Regardless of planting date, virus diseases will likely show up in all pumpkin patches. Since virus infection usually only cause's problems in late-planted



Figure 2. Pumpkin leaves disfigured by virus infection. (Photo by Dan Egel)

pumpkins, planting early can be one solution to virus diseases. In southern Indiana, growers have avoided virus damage by planting seed by June 20. Growers in other parts of the state should vary their planting dates

accordingly. Another option is to use reflective mulch that appears to confuse aphids in the critical early season.

The reason that virus diseases don't usually appear on pumpkins until later in the season is that the aphids that carry the disease travel to Indiana from southern states where virus diseases exist year round. **Although aphids can transmit virus diseases, applying insecticides has not been effective.** Aphids can transmit viruses within a matter of seconds. Therefore, the aphid is relatively unaffected by the insecticide.

CORN EARWORM/TOMATO FRUITWORM - (Rick Foster) - Pheromone trap catches of corn earworm/tomato fruitworm moths, the same insect is known by both names) (Figures 1-3) have been running in the range of 10-12 per night for the last two weeks. Generally speaking, we would consider catches of 10 moths per night to be the economic threshold for most crops. Catches of this size usually means that the moths are from the second generation of our local population of earworms. If we were catching large numbers (> 50 per night), that would usually be indicative of migration from the South. The weather conditions have not been right this summer to bring large numbers of moths northward. So far, we are only dealing with our local earworms.



Figure 1. Corn earworm in pepper. (Photo by John Obermeyer)

For sweet corn growers, corn earworms are a threat when you have corn with fresh green silks. Earworm moths don't lay many eggs on leaves and prefer not to lay eggs on brown silks, so the treatment window is when silks are green. Make your first application when you have at least 70% of the plants with silks showing. With the relatively low number of moths flying now, I would recommend a spray interval of 4 days if daily highs are

above 85 degrees or 5 days if temperatures are cooler. You can cease spraying when silks turn brown. This means that you should probably only make two applications for earworm control. You will also need one additional application at pre-row tassel for corn borer control. For more details see the next article.

Earworms/fruitworms can also be a problem on tomato, pepper, green beans and other vegetables (Figure 4). Just like with sweet corn, the biology of the insect will drive the spray program. On these crops, the eggs

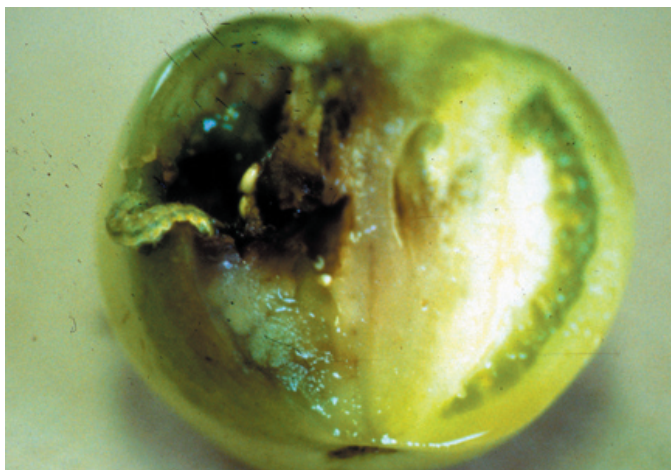


Figure 2. Tomato Damaged by tomato fruit worm. (Photo by Gerald Brust)



Figure 3. Corn earworm larva. (Photo by Brian Christine)



Figure 4. Corn earworm pod damage. (Photo by Brian Flood)

will be laid on leaves and the larvae will wander around for several days feeding on leaves before they find the fruit. This will allow much longer intervals between sprays. The more advanced pyrethroid insecticides, such as Capture, Mustang Max, and Warrior will provide long periods of control. On green beans, for example, an application made today will control any larvae that have hatched during the past 7 days, because they will not have begun feeding on the pods yet. That application will also kill adults that will be laying new eggs for the next couple of days and any larvae that hatch in the next 3-4 days. Overall, that application will provide 10-11 days of control. Your spray interval should be 10 or 11 days. The scenarios for tomatoes and peppers should

be similar. See ID-56 <www.entm.purdue.edu/entomology/ext/targets/ID/index.htm> for specific insecticide recommendations.

Over the past few years, we have had a number of reports of control failures with the pyrethroids on earworms/fruitworms. We believe that this occurs primarily with moths that have migrated from the South, where resistance resulted from heavy use of pyrethroids on cotton to control bollworm, which is the same insect as earworm or fruitworm. If you have control failures, please call me at (765) 494-9572 or email me at rfoster@purdue.edu. I would be very interested in collecting larvae that survived your pyrethroid applications.

EUROPEAN CORN BORER - (Rick Foster) - As often happens during hot years, we are now seeing the beginning of a third generation of European corn borers (Figure 1). Although corn borers are always a problem, this third generation is especially problematic for vegetable growers. One reason that the first two generations are not as bad for vegetable growers is found in the insect's name.



Figure 1. Corn borer ear damage. (Photo by Brian Flood)

The preferred host is corn, and we grow our vegetables in an ocean of corn. With all that corn around to attract them, corn borers just don't pay much attention to vegetables. However, when third generation moths start flying around looking for places to lay their eggs, most of the field corn is drying down and doesn't look like a good place to raise their young. Our late season vegetables, on the other hand, are usually nice, lush green (Figure 2). Even though the vegetables (other than sweet corn) are not their preferred host, the moths will lay eggs on pretty much anything that is green. At this



Figure 2. European corn borer pod damage. (Photo by Brian Flood)

point, we have all those moths coming from all those acres and acres of field corn being funneled down into our relatively few acres of vegetables.

On sweet corn, the one insecticide application that is targeted at corn borers should be made at the stage we call pre-row tassel. Row tassel is when you can first look down the row and see tassels all the way to the end. Pre-row tassel is just before then, when the tassels are visible when you look down on the plant but not when you look down the row. This is the optimum time to spray for corn borers. The later sprays for earworms will take care of any new corn borers that come along after this first spray. The pyrethroids such as Warrior, Capture, and Mustang Max will provide excellent control.

For other crops such as tomato, pepper, pumpkin, etc., the control characteristics described in the previous articles for pyrethroid insecticides also applies for corn borers. Because the larvae are feeding on foliage for several days before finding the fruit, the insecticides will kill larvae that hatched up to 6 days before the application and will provide adult kill for 3 days and residual control of newly hatched larvae for 3-4 days. Again, your spray interval should not be less than 10 days. See ID-56 <www.entm.purdue.edu/entomology/ext/targets/ID/index.htm> for specific insecticide recommendations for particular crops.

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