

# VEGETABLE CROPS HOTLINE

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

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**LATE BLIGHT CONFIRMED IN INDIANA** - (Gail Ruhl, Dan Egel, Purdue University and Margaret Tuttle McGrath, Cornell University) - *The following article was written as a Vegetable Crops Hotline - BULLETIN, August 7, 2009.*

This past week we have confirmed late blight in Indiana on tomato samples (fruit, leaves and stems) submitted to the Purdue Plant and Pest Diagnostic Lab from homeowner gardens in Vermillion and Tippecanoe county and from a commercial field in Bartholomew county.

When conditions are cool and wet, this is an extremely destructive disease when not managed, quickly killing foliage and rotting tomato fruit and potato tubers. Rainy, cloudy conditions have provided a favorable environment for the pathogen to be successfully dispersed, including long distance spread for infection. Clouds protect spores being dispersed in wind from the killing effect of ultraviolet radiation.

All tomato and potato crops are at high risk of developing late blight this season, especially if the rainy weather continues. All growers should assume their crops eventually will be affected and thus should be on a weekly schedule to both thoroughly inspect their potato and tomato plantings and apply fungicides.

Classic symptoms are (Figure 1) large (at least nickel sized) olive green to brown spots on leaves with slightly fuzzy white fungal growth on the underside when conditions have been humid (early morning or after rain). Sometimes the lesion border is yellow or has a water-soaked appearance. Leaf lesions begin as tiny, irregularly shaped brown spots. Brown to blackish lesions also develop on upper stems. Firm, brown spots develop on tomato fruit. Photographs are posted on the web at:

<[www.hort.cornell.edu/departments/Facilities/lihrec/vegpath/photos/lateblight\\_tomato.htm](http://www.hort.cornell.edu/departments/Facilities/lihrec/vegpath/photos/lateblight_tomato.htm)>

<[http://vegetablemndonline.ppath.cornell.edu/factsheets/Potato\\_LateBlt.htm](http://vegetablemndonline.ppath.cornell.edu/factsheets/Potato_LateBlt.htm)>.



**Figure 1:** Late blight causes a dark lesion on tomato leaves often associated with white fungal growth. (Photo by Ray Martyn)

**Commercial Fields** - When late blight is found in a localized spot in a field, promptly destroy all symptomatic plants plus a border of surrounding plants to eliminate this source of inoculum. Physically pull and drop affected plants, spray with herbicide, or disk. The herbicides diquat and paraquat are good choices for applying with a hand sprayer. Gramoxone is effective but dangerous; there is no antidote in the event of accidental exposure. When disking is used the crop should first be sprayed with fungicide because of the potential to move spores on equipment especially while driving out of the field, and the equipment should be pressure washed afterwards.

**Conventional Fungicides** - Begin a fungicide program with products specifically for late blight in this field and other fields near by. These products have translaminar activity and thus provide better coverage than contact, protectant fungicides. A five- to seven-day spray interval is recommended when weather conditions are wet and cool. It can be extended to 10 days under hot, dry conditions.

**Alternate among fungicides in different chemical groups (as indicated by FRAC Code) to manage resistance.** The late blight pathogen has demonstrated ability to develop resistance; Ridomil® fungicides are no longer

recommended because of resistance. Include in each application a protectant fungicide like maneb, mancozeb or chlorothalonil, or triphenyltin hydroxide for potatoes. This is important for resistance management and ensuring effective control, and is specified on the label and thus is a requirement. A spray program with just protectant fungicides applied regularly starting before late blight begins to develop can provide adequate control, but this is challenging to achieve when plants are actively growing and conditions are very favorable for disease development, as has been occurring this spring to summer.

Curzate® (FRAC Group 27 fungicide) or Tanos® (also contains cymoxanil, active ingredient in Curzate®) can be a good choice for the first application because these fungicides have some kickback activity, thus they can suppress some new lesions. The maximum kickback is about two days when it is cool, declining with increasing temperatures to about zero above 80°F. Cymoxanil has little residual activity, therefore, five days later apply another fungicide.

Previcur Flex® (Group 28) has some systemic activity, which is an important attribute even though it is not as systemic as Ridomil®. It was the only fungicide rated good for symptoms on stems and also for protecting new growth in a bulletin from the University of Maine; it is not known how effective many of the other products are on new growth that develops after the application. The product was not rated as highly as other late blight fungicides for leaf symptoms (good versus excellent). It is considered a good choice for an application made right before rain, as the product is rainfast in 30 minutes. According to the manufacturer, Previcur Flex® provides best control when applied in blocks of two applications alternated with two applications of other fungicides.

Revus Top® (Group 40 + 3) is a new fungicide that has excellent activity for late blight. It gets into plants fast, in about 30 minutes, and then slowly moves in the plant providing good residual. It has some kickback activity. It does not need to be applied with a protectant fungicide. Unfortunately, the U.S. inventory of this product has been used up. However, the manufacturer has responded to the situation and prepared a supplemental label for another fungicide, Revus® (Group 40), which was not labeled at the time of the outbreak for use on tomatoes and potatoes. EPA approved it promptly. These fungicides, especially when mixed with other products, should not be left in the spray tank as irreversible settling can occur.

Other fungicides to consider including in the fungicide program are Gavel® (Group 22), Forum® (Group 40), and Ranman® (Group 21) plus Presidio® (Group 43) for tomatoes and Omega® (Group 29) for potatoes. Gavel® is the only late blight fungicide formulated with a protectant.

Group 11 fungicides (Headline®, Quadris®, Reason®, etc) and Group 33 (phosphorous acid) fungicides are not considered as effective for late blight as the other products.

Good fungicide coverage is critical. Pathogen spores can be moved on equipment and workers, therefore spray and work in affected fields last and clean equipment between fields. For more information check the *Midwest Vegetable Production Guide* (ID-56) <[www.btny.purdue.edu/Pubs/ID/ID-56/](http://www.btny.purdue.edu/Pubs/ID/ID-56/)>.

Control information specifically for organic farmers will be posted on the new ag network website at: <[www.new-ag.msu.edu](http://www.new-ag.msu.edu)>.

If you have questions contact Dan Egel [egel@purdue.edu](mailto:egel@purdue.edu) or (812) 886-0198.

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**WIREWORMS IN MUSKMELONS** - (Rick Foster) - I have received several reports of wireworms tunneling into muskmelon fruit in southwest Indiana. We visited a field last week that had been reported to have that type of damage. The field had just been picked and we spent considerable time looking for damage in the non-ripe melons still in the field. We were unable to find any damaged fruit. However, when we returned to the packing shed, it was not difficult to find damage in the ripe fruit. Although this is very circumstantial, it suggests that the wireworms are targeting the ripe fruit. Since this is a brand new pest problem, if growers have contrary



**Figure 1:** Wireworm damage on muskmelon. (Photo by John Obermeyer)

or additional information they would like to share about their fields, I would be glad to hear it. Most of the damage we saw show-tunneling that only went 1/4 to 1/2 inch into the fruit. Even this limited amount of damage is enough to make the fruit unmarketable, so the damage is significant (Figure 1).

I am frankly surprised to see wireworms feeding on muskmelons fruit during August. Generally, wireworms are problems early in the growing season on various crops, and then they move down 6-8 inches into the soil during hot weather. Why the wireworms are behaving this way is anyone's guess.

The next question, of course, is what can you do to reduce the damage? The answer, unfortunately, is not much at this time of year. Wireworms are difficult to kill, and on other crops we use fairly toxic materials such as Thimet® or Counter® at planting time to control

them. There are no insecticides labeled for control of wireworms on melons that can be used during harvest season. As much as I hate to say it, you will just have to live with the damage this year. We can discuss how to approach potential wireworm problems for next year's crop later on.

I have received reports that some people are recommending DuPont's™ insecticide Coragen® for control of wireworms on melons. Wireworms are not on the Coragen® label. According to the DuPont™ Product Manager for Coragen®, "...we do not claim wireworm control anywhere on the Coragen® label. We do not have very much data with Coragen® for wireworm control. What data we do have has been highly variable with much of it showing little to no control." The Product Manager is the person who knows that insecticide better than anyone else. If anyone recommends that you use Coragen® for wireworms, please do not waste your money.

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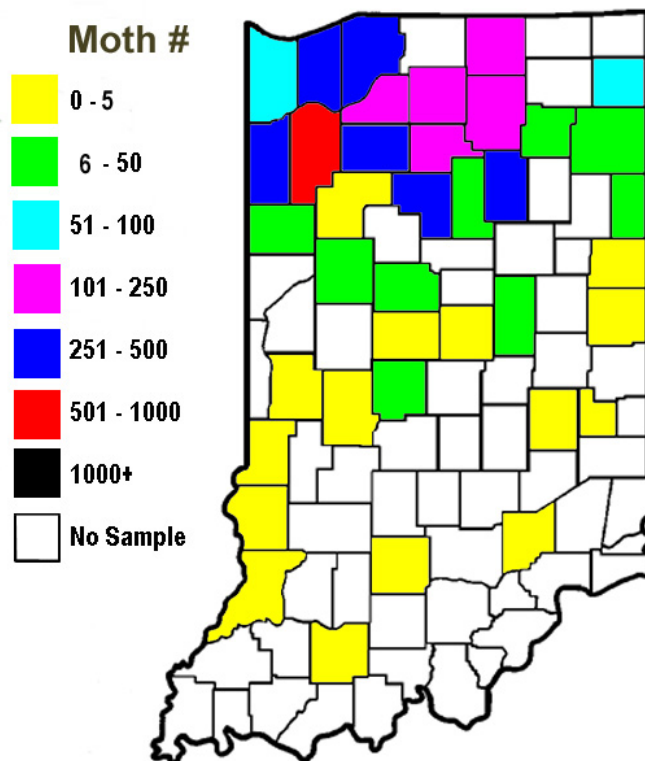
**WESTERN BEAN CUTWORM - (Rick Foster)** - The western bean cutworm is a relatively new pest in Indiana, first observed in 2006. The larvae feed on the ears of corn. Moths begin flying and laying eggs in late June and continue through early August. Eggs are laid in clusters of 20-200. Newly-hatched larvae feed on the tassel, corn pollen, behind the leaf sheaths, and silks. As the larvae get larger, they may feed on the ear tips or enter the ear through the side of the husk. When they reach maturity, they will chew their way out of the husk and overwinter in the soil.

The populations of western bean cutworms in northwest Indiana continue to increase over previous years and the range has spread farther south and east than before. See the map for pheromone trap catches for 2009 (Figure 1). Last week, I visited corn fields in Jasper County that had over 50% of the ear tips with western bean cutworm damage. Most of the larvae collected were medium sized, meaning that they still had a lot of feeding to do. One field had a small plot of sweet corn adjacent to it and we found damage in those ears as well.

One reason we are concerned about western bean cutworm is the timing of damage. The moths are laying eggs at a time when corn earworm moth flights are low (between generations) and we generally don't have to worry much about insects. If western bean cutworms become a problem, the early to mid season sweet corn will need to be scouted and/or treated with more vigilance. The proper time for treatment would be before the larvae become established in the ear. There is some hope that treatment after the larvae are in the ears might help, since these larvae, unlike earworms, will sometimes move to a second ear. I visited a field last week that had been treated with a pyrethroid insecticide and I had no trouble finding live worms in the ears. At least one consultant has reported excellent control in some fields. Of course, if you are growing fresh market sweet corn, killing the worms after they have damaged the

ears will only help to prevent additional ears from being damaged. The initially damaged ears will still be unmarketable. If you are growing for processing, these rescue treatments may be of some value.

I need to emphasize that we have seen very little damage to sweet corn at this point. Damage to field corn has been limited to the northwest corner of the state. It's pretty much time to start treating all your sweet corn for earworms (see the next article), so I wouldn't change anything this season. After the season is over and we've had some time to evaluate what has occurred, we will develop some strategies for 2010. If you think you have had western bean cutworm damage in your sweet corn, please let me know. Samples of the worms would be greatly appreciated as well.



**Figure 1:** Map of distribution of Western Bean Cutworm in Indiana in 2009.

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**CORN EARWORM - (Rick Foster)** - Pheromone trap catches continue to be low throughout the state. We are just starting to see an uptick in trap catches in some areas. My expectation is that catches will go up dramatically any day now. Please continue to monitor your traps or our website at: <<http://extension.entm.purdue.edu/topics/vegetable.php>> for updates on moth catches around the state. Remember that the treatment threshold is when moth catches exceed 10 per night and the treatment window is from 70% silks until the silks turn brown, about 10 days before harvest.

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**SQUASH BUGS - (Rick Foster)** - We have recently received a number of reports of squash bug problems in pumpkins and squash. Squash bug is the most consis-

tent insect pest of these crops and the most difficult to control. The key to management is early detection and control of the nymphs. The adults are extremely difficult to kill. Foliar insecticides should be applied to control the nymphs when you have more than an average of one egg mass per plant. When you find egg masses, mark them with flags and check every day or two to see when they hatch. When many of the egg masses are hatching, that is the time to begin application. Since eggs are laid and hatch over an extended period of time, several applications may be required. Brigade®, Mustang Max® and Warrior® have provided excellent control.

Squash bugs are also thought to be the vectors of a pathogen that causes a disease known as Cucurbit Yellow Vine Decline. If you have plants exhibiting those symptoms in your field, you likely have an infestation of squash bugs. Scout your field to confirm the presence of the bugs (don't bother to count them; just make sure they are there) and, if so, apply one of the insecticides listed above.

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**DOWNY MILDEW CONFIRMED IN INDIANA** - (*Dan Egel*) - Downy mildew has been observed on cucumber and muskmelon in Knox County. The strain observed in Knox County may or may not affect watermelon or pumpkin. However, all cucurbit growers should consider applying one of the fungicides listed in the *Midwest Vegetable Production Guide* <[www.btny.purdue.edu/Pubs/ID/ID-56/](http://www.btny.purdue.edu/Pubs/ID/ID-56/)> if they have high value crops in the field. More detailed information on downy mildew can be found in previous issues of the *Vegetable Crops Hotline* (for example issue 509) as well as BP-140W <[www.ces.purdue.edu/extmedia/BP/BP-140-W.pdf](http://www.ces.purdue.edu/extmedia/BP/BP-140-W.pdf)>.

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**IMPACT OF FARM MANAGEMENT PRACTICES - VOLUNTEERS NEEDED** - (*Abigail Borron, Communication Specialist, Extension Disaster Education Network (EDEN)*); <[www.EDEN.lsu.edu](http://www.EDEN.lsu.edu)>; <[www.extension.purdue.edu/eden](http://www.extension.purdue.edu/eden)>; PHONE: (765) 494-4390 | FAX: (765) 496-1117) - Currently, research is being conducted by Purdue University to investigate the impact of farm management practices on the microbial safety of produce with a goal of developing improved produce management practices to share with growers. As a result, the project is in need of vegetable growers who would be willing to participate.

Participation in this project is strictly voluntary. As a token of appreciation, participating growers will be provided with a \$50 gift card redeemable at Wal-Mart, as well as a free water quality analysis valued at \$40.

If you are interested, you will be asked to participate in a 45-60 minute survey at your farm. Produce samples will also be collected (both ripe field samples and washed samples), along with irrigation water and wash water samples (if applicable). The types of produce of interest to the project are leafy greens (mainly lettuce but also spinach, cilantro, parsley, or dill) and fresh market tomatoes or bell peppers.

The results of this research are strictly confidential – none of the data or findings will be connected to you or your farm. The final survey can be made available to you upon request.

If you would like to participate or if you have any questions, please contact Eric Carroll by e-mail at [ecarroll@purdue.edu](mailto:ecarroll@purdue.edu). You may also contact the project director, Mark Tucker, by phone or e-mail at (765) 494-8429 or [matucker@purdue.edu](mailto:matucker@purdue.edu). Thank you for your consideration.

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