

VEGETABLE CROPS HOTLINE

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

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FLOODED VEGETABLE FIELDS AND FOOD SAFETY - (Shari Plimpton and Liz Maynard) - Recent floods in Indiana have affected some vegetable and melon fields. For example, several experiments at the Southwest Purdue Agricultural Center were lost due to flooding (Figures 1 and 2). Floodwater is likely to be contaminated with



Figure 1: Floodwaters from the Wabash River recede at the Southwest Purdue Agricultural Center in Vincennes. Muskmelon plants that were covered with water have died while other plants survive. (Photo by Sara Hoke)

pathogens and/or chemicals that can cause human illness. Human consumption of fresh produce grown in these fields this season is risky and is not recommended. Good Agricultural Practices guidelines suggest that edible fresh market crops present in the field at the time of flooding be destroyed by incorporation or other means. The questions and answers below provide additional information.



Figure 2: Good agricultural practice guidelines suggest that melons harvested from this plant should not be sold for human consumption. The crop should be destroyed. If replanting, a nonedible crop is recommended. (Photo by Sara Hoke)

If a vegetable or melon field is flooded: What is the risk level and what are recommendations depending on type of crop and stage of growth? Risk can be described as follows:

Edible portion of crop present: Very High Risk, Fresh produce is considered adulterated by the FDA and may not be sold for consumption without violating FDA regulations.

Plant emerged, edible portion not present: High Risk. The potential presence of microorganisms in the plant as well as in the soil could result in indirect contamination of the crop post flooding.

Planted but not emerged: Still High Risk for reasons given above.

Preplanting: Moderate Risk. The soil contamination may be as high as that achieved with treating with uncomposted manure. Incorporation and a minimum of 120 days between the recession of waters and harvest is needed to reduce this risk.

Is it possible to test the soil to show that it is free of pathogens? Testing the soil is not a consistent method for determining the risk of microbial contamination; however, it may be useful for determining the presence of chemical hazards. Soil often contains the microorganisms that we use as indicators of fecal contamination and

the numbers are not useful unless you know their relative levels prior to the flood. Trying to rely on a test to assure the soil is not contaminated would be very risky.

Soil testing for chemical hazards should be discussed with local health and agricultural specialists who can make you aware of hazards suspected in your region.

Can I spray anything on the soil or on the crop to reduce risk of foodborne illness? No, there are no sprays that would be appropriate for either the soil or the crop to reduce the risk. Any sanitizer would become ineffective based on the level of organic material present. And washing does not eliminate pathogens, so recommendations focus on reducing the risk by discarding affected crops, incorporating, planting a nonfood crop and incorporating again next spring. If a field frequently floods, using it solely for agronomic or non-edible ornamental crops is recommended.

Does the bacteria enter into the tissue of the plant and then move to other parts of the plant that were not contacted or perhaps were not even present at the time of the flood water? This is a possibility. We have seen evidence in research that microorganisms could be drawn into tissues of non-woody plants and potentially transferred to produce this way. We cannot prove at this point that this does happen in field conditions; however, the risk that it could is considered great enough that we do not recommend harvesting produce for fresh market from plants that have been affected by a flood. Incorporating the top layer of soil, growing only nonfood crops and waiting until the following spring for planting crops intended for food is recommended.

Can flooded fields be replanted to vegetables - if so when, which vegetables, and what should be done prior to planting? Fields that have been flooded should be treated as if they had been treated with uncomposted manure. They are considered a very high risk for contamination with microorganisms that can cause foodborne illness as well as potentially harmful chemicals washed in from other areas.

With manure we recommend incorporation and a minimum of 120 days between incorporation and harvest. Even with this amount of time, a risk for fecal contamination could still exist. Much less risk can be achieved via incorporation and planting with a cover, agronomic, or non-edible ornamental crop and incorporating again pre-planting the next season.

My buyer requires third party food safety certification; what should I do about flooded fields? Contact the fresh produce safety certification company that you will be working with. They can let you know what practices they specifically recommend and the types of documentation they would expect to see. Often this involves writing out the steps you take to discard flood affected produce, and how you work with the affected fields to reduce the risk of microbial contamination. At this time each audit or certifying company has its own standards and it is best to be certain of what those are before the auditor comes out.

Should I do anything more than standard Good Agricultural Practices (GAPS) in the way of crop management or harvest/post-harvest handling? As stated above the crop and field should be treated as if they had been treated with uncomposted manure. In most cases that means discarding the crop, incorporating, planting a cover or agronomic crop, incorporating again and using the field the following season. Beyond that careful adherence to Good Agricultural Practices throughout production, harvest and post harvest is very important.

Where is the line that demarcates 'legal but risky' from 'illegal'? The FDA focuses on whether there is a probability that a food has become "adulterated." Adulteration is the term used to state that something has happened to the food to cause it to be injurious to health. The FDA clearly states that fresh produce that has come in contact with floodwaters is considered to be adulterated. That puts any grower trying to salvage a crop from a flood in the territory of engaging in violating FDA regulations. Legal but very risky behavior is harvesting from plants that had not set prior to or during the flood or from crops planted immediately after the flood.

How can I learn more about Good Agricultural Practices (GAPS)? Excellent GAPS resources are available online at the National GAPS web site: <www.gaps.cornell.edu>. "Food Safety Begins on the Farm Growers Guide" and "Food Safety Begins on the Farm Grower Self Assessment" are great places to start. The FDA web site <www.foodsafety.gov> is updated regularly and includes the "Guide to Minimize Microbial Food Safety Hazards for Fresh Fruits and Vegetables". Growers of tomatoes, melons, and leafy greens may also consult specific guidelines for those crops, available from the U.S. National Food Safety Program at <www.foodsafety.gov/~dms/fs-toc.html>.

Also, the USDA Risk Management Agency has partnered with Mid American Ag and Hort Services, Inc. this year for a Fresh Produce Food Safety Initiative through September 30, 2008. The initiative provides for phone consultations as well as free on farm food safety consultations. For more information call Deanne Maus at (419) 724-2930 or visit the website at <www.midam-services.org>. Additional information on Good Agricultural Practices may also be found at the Center for Innovative Food Technology at <www.eisc.org>.

FUNGICIDE RESISTANCE - (Dan Egel) - Systemic fungicides move into the plant tissue. This characteristic allows systemic fungicides to have some activity on existing infections. However, most systemic fungicides have only one mode of action-thus it is possible for fungi to become resistant to systemic fungicides. See Table 25, page 48 in the Midwest Vegetable Production Guide for Commercial Growers 2008 <www.btny.purdue.edu/Pubs/ID/ID-56/> or extension bulletins BP-134, 135 and 136 <www.btny.purdue.edu/Pubs/#vegetables> for information on how to apply systemic fungicides to

reduce the chance of resistance development. This article describes my experiences with the fungicide Pristine and what I have heard from growers recently.

Pristine is a combination of two active ingredients, pyraclostrobin and boscalid. Pyraclostrobin is a group 11 fungicide along with such products as Quadris and Flint. Boscalid is in the fungicide group 7. Pristine is labeled for cucurbit crops and has been very effective against diseases such as gummy stem blight of watermelon in all my trials including my trial of 2007.

Because Pristine is a systemic fungicide it is possible for fungi such as *Didymella bryoniae* (which causes gummy stem blight) to become resistant to either or both active ingredients in Pristine. In May of this year, I began to hear from watermelon growers that Pristine did not work well for them last year. A few weeks ago, a grower brought me a tray of watermelon he had purchased that had gummy stem blight. I tested the fungus I isolated for resistance to boscalid (Boscalid resistance was reported in Georgia last year).

In two separate tests in my laboratory, the strain described above was resistant to boscalid compared to a strain from 1996, long before the introduction of the product of Pristine. That is, when boscalid was added to Petri plates, the 1996 strain of the gummy stem blight fungus was inhibited, but the recent strain from watermelon transplants was not inhibited.

I am alarmed that a strain of *D. bryoniae* resistant to boscalid was almost 'released' into Indiana. However, I still have no evidence that there are any boscalid resistant strains on the loose in Indiana. If you think that Pristine has not been working for you, please contact me. I can isolate the strain and test for resistance to boscalid. Plus, we can talk about alternate strategies for the control of gummy stem blight.

If Pristine has worked for you in the past, I see no reason why you should stop using this product this year. But please scout your fields and call me *this season* with any problems or questions.

DOWNY MILDEW OF CUCURBITS- (*Dan Egel*) - This disease affects all cucurbits including cucumber, muskmelon, squash, pumpkin, watermelon and zucchini. Downy mildew can be recognized by the yellow, often angular lesions on the surface of the leaves. The key symptom of this disease is the dark 'fuzz' that is present on the underside of leaves under moist conditions. Severely affected plants may be defoliated and thus yield and quality of the fruit may suffer.

The fungus that causes downy mildew of cucurbits does not overwinter in Indiana. The organism must be blown in on wind currents. Historically, the fungus overwinters in states of the Gulf Coast where green tissue of cucurbits is available for infection all year. In the past several years, the pattern of spread of downy mildew across the US suggests that the fungus may also overwinter in Ontario, Canada, perhaps in greenhouses.

This year appears to follow recent trends-downy mildew has been reported in southwest Ontario, as well as Florida, Texas, Georgia, Louisiana and South Carolina. Cucurbit growers should follow the epidemic using this link - <www.ces.ncsu.edu/depts/pp/cucurbit/> or by reading the *Vegetable Crops Hotline*. All growers should scout their fields for symptoms of downy mildew and contact Dan Egel if symptoms are suspected. A publication that describes downy mildew of pumpkins including color photographs may be found here <www.ces.purdue.edu/extmedia/BP/BP-140-W.pdf>. It is a good idea to become familiar with what fungicides are labeled for downy mildew. Growers may consult the Midwest Vegetable Production guide for Commercial Growers 2008 <www.btny.purdue.edu/Pubs/ID/ID-56/> or the BP-134 and BP-135 <www.btny.purdue.edu/Pubs/#vegetables>. Since most of the fungicides that are effective against downy mildew are very specialized, it does not make economic sense to apply these products unless the disease has been observed nearby. Contact Dan Egel with any questions or a copy of the publications listed above.

UNUSUAL EARLY SEASON CORN EARWORM ACTIVITY - (*Rick Foster*) - Most vegetable growers know that corn earworm (also known as tomato fruitworm) is more of a late season pest. This is because they only overwinter in low numbers this far north. We usually have a small first generation about this time of year and a larger second generation in August, which is supplemented by moths migrating from the South on storm fronts. In most years, the migrant moths far outnumber the locally produced moths.

One of the additional consequences of the storms that have caused so many flooding problems here in the Midwest this year is that the storm fronts have also brought up large numbers of corn earworm moths. I put my corn earworm pheromone trap up on Monday, June 9 and by Wednesday, June 11 I had 178 moths in the trap. In most years, we would catch just a couple of moths at most at this time of year. Generally, we consider 10 moths per night to be the threshold at which we would treat sweet corn that was silking at the time, so the numbers that we caught are historically high and potentially very damaging. Fortunately, it appears that the catches in most of the traps are starting to go down.

I was fortunate enough to receive grant funds from the North Central IPM Center to purchase a number of corn earworm pheromone traps that I have begun to scatter around the state. Cooperators who are checking the traps are sending me their counts on a daily basis (more or less). The counts that I receive are posted on a web site at <<http://extension.entm.purdue.edu/cornearworm/index.php>>. There are some blank columns where I am hoping to have more traps located in the near future. Moths have been caught in fairly high to very high numbers in most areas of the state. The one exception is at the Pinney Purdue Farm near Wanatah. Kentucky, Illinois, Iowa and Minnesota have reported similarly large moth catches.

This flight of moths has the potential for causing some serious losses to vegetable crops. One sweet corn grower in northern Indiana reported that his very early sweet corn, targeted at the lucrative July 4th market, is already 50% infested with small corn earworms. Other early-planted sweet corn is also at risk. For management details, see E-31 at <<http://extension.entm.purdue.edu/publications/E-31.pdf>>. For those growers with early season sweet corn, I suggest we abandon our usual 10 moths per night threshold and treat sweet corn with green silks if we are catching any moths in the closest trap. This is because a field of silking sweet corn is by far the most attractive site in the area for earworm moths to lay eggs on.

In addition, other plants are also at risk. Earworms will also feed on tomato, cabbage, beans, melons, squash, pepper, many other vegetables, alfalfa, clover, soybeans, grapes, small fruits, peaches, pears, plums, roses, snap dragons, zinnias and other flowers. Homeowners, in particular, may report damage on plants that we don't often see earworms feeding on. Many of the general-purpose insecticides available to homeowners, particularly the pyrethroids, should provide good control. Please let me know if you receive reports of unusual earworm damage or if you have additional questions.

TECHNICAL ASSISTANCE RELATING TO THE RECENT FLOODS - (Announcement) - Purdue University Cooperative Extension Service experts and the Indiana State Department of Agriculture, with sponsorship from the Indiana Corn Marketing Council and the Indiana Soybean Alliance, joined forces to assist farmers with technical assistance relating to the recent floods. The group hosted a call-in forum on Friday, June 20 to provide technical assistance to crop farmers. Technical advice focused on recovering and replanting flooded fields. Lt. Governor Becky Skillman opened the call with the state's perspective and relief efforts to date. This was followed by technical advice to farmers from a panel of Purdue Extension Specialists including Bob Nielsen (corn and sorghum), Ellsworth Christmas (soybeans and wheat), Keith Johnson (forages), Greg Shaner (disease management), Bill Johnson (weeds and herbicides), and Tony Vyn (tillage management), as well as Bruce Erickson and Chuck Hibberd also with Purdue University. Advice was targeted to those farmers intending to replant flooded fields this crop year. A complete recording of the call-in forum can be found here <www.in.gov/isda/files/Indiana_Flood_Conference_6.20.08_web.wma>.

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