

# VEGETABLE CROPS HOTLINE

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

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### INDIANA GROWN INITIATIVE TO BE LAUNCHED -

(Jodee Ellett, [jellett@purdue.edu](mailto:jellett@purdue.edu), 765-494-0349) - The Indiana State Department of Agriculture is officially launching the Indiana Grown Initiative on July 7, 2015. This free marketing program will enable all Indiana agricultural and food products to be labeled and marketed



with an Indiana brand. It is a very comprehensive program that will include many market channels and farm products. This program has immense potential to create new local and regional market channels for Indiana agricultural and food businesses through three initiatives: 1) Educate consumers on the importance of buying Indiana Grown products; 2) Increase networking and sales opportunities for Indiana farmers; and 3) Expand support for Indiana processors in their effort to process more Indiana Grown products. There are four categories for the program:

- **100% Indiana** - Must be grown and/or all ingredients from Indiana
- **Prepared in Indiana** - Ingredients can be sourced elsewhere, but 100% of production is in Indiana
- **Partner** - Company or institution that will assist in marketing Indiana Grown products and members
- **Indiana Grown** - All others

Addressing initiative 2 (above), the ISDA and Tiny Footprints Distribution will be hosting a food show for Kroger on June 26, 2015, at the Hendricks County Fairgrounds. Kroger will be placing 107 Indiana Grown kiosks in their Indiana stores, and they are seeking producers of shelf-stable, fresh, frozen, proteins or

seafood products to feature. As a result of these marketing kiosks, some of these brands may find a future place on permanent shelves in Kroger stores throughout their distribution. This is a fantastic opportunity for those of you who are interested in selling your Indiana products to this retailer. These businesses do not need to be absolutely ready to sell to Kroger, but need to have a quality product that will sell. Kroger will assist with the requirements necessary to bring that product into these Indiana Grown kiosks. Even if you grow fresh produce and cannot bring your product to the show, you may be able to attend this event. To attend the Kroger Product Selection Show please contact David King at the ISDA: [dking@isda.in.gov](mailto:dking@isda.in.gov) or 317-607-9797.

The Kroger event, and future events with retailers, distributors, and other buyers, will all require that you are a member of Indiana Grown. This free application can be completed on line or in paper format and mailed to the ISDA. Information is included in the application: <http://in.gov/isda/2513.htm>. As an Indiana Grown member, you gain the right to use the Indiana Grown label on your products, receive marketing support and have access to a community of buyers and producers seeking to increase their supply of Indiana Grown agricultural products. For more information, please contact David King at the ISDA, [dking@isda.in.gov](mailto:dking@isda.in.gov) or 317-607-9797.



### PHYTOPHTHORA FRUIT ROT OF WATERMELON - (Dan Egel, [egel@purdue.edu](mailto:egel@purdue.edu), 812-886-0198) -

Most growers first notice this disease when large, soft areas develop on mature watermelon fruit. These lesions can be several inches across and are often covered with a white mold. The lesions usually form first on the bottom of the fruit, close to where the fruit comes into contact with the soil. Further development of the disease often results in lesions on the top of the fruit as well (see Figure 1). Conditions that favor Phytophthora fruit rot include warm, rainy weather such as occurred recently over much of Indiana. Water that stands in pools also favors severe disease symptoms. Overhead irrigation may help the disease to spread. Phytophthora fruit rot can spread rapidly when conditions are favorable.



Figure 1. Phytophthora fruit rot causes large, soft areas on watermelon fruit. These lesions may be covered with a white mold during moist conditions. (Photo by Dan Egel)

The organism that causes Phytophthora fruit rot of watermelon is *Phytophthora capsici*. This organism is more closely related to algae than to fungi. Therefore, *P. capsici* is sometimes referred to as a fungus-like organism. The close relationship of *P. capsici* to algae helps explain why this disease is favored by water; one of the life stages is a spore that is motile in water. Perhaps because of the taxonomic difference between *P. capsici* and most fungi, the fungicides that are most effective against *P. capsici* are less effective against most fungal diseases.

To control this disease, choose fields that are well drained, preferably fields that do not have a history of the disease. Watermelon fields with plastic mulch and raised beds may have less disease severity.

Fungicides, if used, are best applied before the disease appears. This is because by the time a few lesions appear, many more lesions are present, but are too small to see. For the most part, growers will want to wait until fruit are present to apply fungicides. Applications to small fruit may include Forum® or one of the products with phosphorous acid as an active ingredient (e.g., Agri-Phos®, Phostrol®, Kphite®). However, during conducive conditions (such as rainy weather on fields with a history of the disease) Presidio® can be alternated with Revus®. A newer product, Zampro®, has also proven effective.

Be careful to alternate fungicide modes of action, or FRAC codes. For example, Revus® and Forum® both have 40 FRAC codes and should not be alternated with each other. Zampro® has two FRAC codes, 40 and 45, and therefore should not be alternated with Revus® or Forum®.

Phytophthora fruit rot of watermelon can be a serious disease. Prepare for this disease before it appears in a field near you.

This article was originally published on the VeggieDiseaseBlog at <https://veggiediseaseblog.org> on June 23, 2015.



**NITROGEN LOSS FROM WET SOILS** - (Liz Maynard, [emaynard@purdue.edu](mailto:emaynard@purdue.edu), 219-531-4200) - High rainfall amounts lead to loss of nitrogen from the soil. Sometimes the loss is great enough that a crop will benefit from additional nitrogen application. This article will describe how nitrogen is lost and factors to consider in deciding whether to apply extra nitrogen.

There are two main ways nitrogen is lost from wet soils. Nitrogen is lost to the air by denitrification. Denitrification occurs in saturated soils when there is little oxygen in the soil. In the denitrification process, nitrate is broken down by bacteria to form oxygen and volatile nitrogen compounds including nitrous oxide and nitrogen gas. These volatile compounds move into the air and nitrogen is lost from the soil. Denitrification is common on heavier soils. In Indiana, saturated soils lose 4% to 5% of their nitrate nitrogen for each day they are saturated.

Nitrogen is lost below the root zone of the crop by leaching. Nitrogen in the soil solution will be carried with water as it percolates down through the soil. Nitrate leaches very readily. Leaching losses are greater on light-textured soils and when rains fall over a period of time so that water has time to soak into the soil rather than run off the surface. An inch of rain may move nitrogen a foot deeper in a sandy soil; after 4 inches the nitrogen may be down 4 feet and below the root zone of many crops. Leaching losses from rainfall are much reduced when nitrogen is applied under plastic mulch.

For both denitrification and leaching, it is the nitrate form of nitrogen that is lost. Some fertilizers, such as calcium nitrate and potassium nitrate, contain all the nitrogen in the nitrate form and so are very susceptible to nitrogen loss as soon as they are applied. Other materials, such as urea or diammonium phosphate, break down initially to supply nitrogen in the form of ammonium, and then the ammonium is converted by bacteria into nitrate in the process called nitrification. The bacteria are not active in dry or cold soil; most nitrification occurs when soil temperatures are 60 to 86 degrees F. Under typical Indiana conditions, the ammonium will be completely converted to nitrate in a month. With these materials, the longer it has been since application, the more nitrogen will be in the nitrate form, and the greater the potential for nitrogen losses. By this time in the growing season, much of the preplant nitrogen for summer crops will have been converted to nitrate.

What about organic fertilizers, or nitrogen from a legume cover crop? Nitrogen from these sources also eventually gets converted to nitrate, and then is susceptible to loss as described above. How quickly the conver-

sion occurs depends on the C:N ratio of the material as well as other factors. Once the nitrogen becomes available to the crop it can be converted to the nitrate form. As an example, last year at Pinney Purdue Ag Center on June 16 we measured 80 lb. nitrate-N/A in plots where a hairy vetch cover crop had been incorporated in early May, and 128 lb. nitrate-N/A in plots where an organic 13-0-0 fertilizer had been applied in addition to the hairy vetch. On our sandy loam soil that nitrate would have readily leached, and on a heavier soil, it could have denitrified.

To evaluate the potential for nitrogen loss in a particular field this year, consider the following questions:

- How much nitrogen was in the nitrate form when it rained? Only the nitrate form is lost to leaching or denitrification. All kinds of fertilizer nitrogen eventually gets converted to nitrate. If ammonium or urea was applied, it would take about one month for all the nitrogen to be converted to the nitrate form.
- How warm has the soil been since fertilizer application? The warmer the soil, the faster the conversion of ammonium to nitrate, which can then be leached or denitrified. With soil temperatures in the 40s or 50s conversion to nitrate will be slow.
- Was plastic mulch used and when? Little leaching due to rains will occur under plastic mulch.
- What is the soil type? On a sandy soil 5 inches of soaking rain can leach nitrate beyond the root zone of most vegetables. On a heavier soil it will take more water to leach beyond the root zone.
- How much rain has fallen, and how much at one time? Rains that soak the soil rather than run off will result in more leaching. Periods of soil drying between rains will cause water (and nitrate) to move upwards in the soil.
- How long has the soil remained saturated? Denitrification occurs in saturated soils, but conversion of ammonium to nitrate does not.
- How deep is the crop root zone? For a shallow-rooted crop like lettuce, nitrogen is effectively 'lost' to the crop if it leaches below 12 inches; for a deep-rooted crop like pumpkin, nitrogen could be available even if it leached two or three feet down. Effective rooting depths for vegetable crops are listed in the *Midwest Vegetable Production Guide for Commercial Growers* (Table 5, p. 25 [https://bteny.purdue.edu/Pubs/ID/ID-56/24\\_IrrigationMulchesFrost.pdf](https://bteny.purdue.edu/Pubs/ID/ID-56/24_IrrigationMulchesFrost.pdf)).
- How much nitrogen has already been taken up by the crop?

If nitrogen has been lost, is it worth replacing it?

One tool to help evaluate whether additional nitrogen will benefit the crop is the soil nitrate test. This test has had most research done in the context of a pre-sidedress nitrate test, or PSNT. That test measures the amount of nitrate in the soil shortly before the time of sidedressing. If the nitrate level is above a certain value, it is unlikely that additional nitrogen will lead to higher yields. The value depends on the crop, and is determined empiri-

cally for different crops and environments. Much of the development of the PSNT for use in vegetables has been done in the Northeastern and Mid-Atlantic states. The critical values suggested by John Howell of the University of Massachusetts are a good starting point for using this test in Indiana. According to Howell, for sweet corn no additional nitrogen is needed if the nitrate level is 25 parts per million (ppm) or greater. For pumpkins, squash, tomatoes and peppers, no additional nitrogen is needed if the nitrate level is greater than 30 ppm. Although the PSNT has not been evaluated for use on vegetables in the Midwest, it has been studied in field corn in the Midwest, and the response is similar to that in the Northeast. This gives us some confidence that recommendations for vegetables developed in the Northeast will be reasonable in Indiana.

Soil samples for a nitrate test are normally collected about a week before normal sidedressing, but in this situation they can be collected when soil conditions permit. Take 15 to 20 cores 12 inches deep and mix them well. Dry one cup of the composite sample by spreading it thinly on a clean, non-absorbent material. Quick drying will prevent changes in nitrate levels of the sample. Send the sample to be analyzed for nitrate by a reputable soil testing laboratory that will provide results quickly. Use the guidelines above to determine whether or not to apply more nitrogen. Or, for a more quantitative approach, see the June 18 Issue of Purdue's *Pest & Crop Newsletter* <http://extension.entm.purdue.edu/pest-crop/2015/Issue12/> where Dr. Bob Nielsen has provided guidelines for calculating rates of nitrogen to apply to field corn based on a soil nitrate test and the amount of preplant nitrogen applied and considering the stage of crop growth. The principles presented there should be relevant for vegetables where fertilizer is broadcast as well.

Other factors worth considering when deciding whether and how much to apply include the cost and practicality of application, whether the preplant nitrogen application was high enough that some loss could be afforded; whether the crop is still healthy enough to produce the quality and yield expected; and whether it is still early enough in crop development for the application to make a difference.



**WATERLOGGED SOILS AND PLANT GROWTH** - (Liz Maynard, [emaynard@purdue.edu](mailto:emaynard@purdue.edu), 219-531-4200) - Much of the state has seen excessive rains in recent weeks (see Figure 1). When soils are saturated vegetable crops suffer. This article, slightly revised from its original publication date in July 2003, describes and explains

problems that are likely to occur.

Vegetable crops become stressed in waterlogged soils. Aboveground wilting, yellowing and death of leaves, and epinasty, or downward curling of leaves and stems are all responses to what is happening to roots. If we had a window into the soil we would see roots stop growing and root tips die due to lack of oxygen. Wilting occurs because roots in waterlogged soil do not conduct water as well and lack of new root growth limits water uptake, while the aboveground portion of the plant may continue to grow for a time even after the root has stopped. The root system just cannot supply water fast enough to prevent wilting. Nutrient uptake by the injured root system is also limited, which can partially explain leaf yellowing and death. Epinasty occurs because ethylene concentrations in the root increase, and this natural plant hormone causes downward curling of leaves and stems. The ethylene also stimulates production of air spaces in the root, and development of adventitious roots on the stem.

Damage from waterlogging is worse in warm soils than in cool soils. The demand for oxygen by roots and soil microbes is greater at higher temperatures, and so lack of oxygen leads to more injury in warm soils. Some damage to waterlogged roots is delayed until the soil dries out a little and oxygen is available again. At that time compounds formed during the waterlogged period react with oxygen to form even more damaging compounds. Because of this, root damage may increase after the soil is no longer waterlogged.

Water and nutrient uptake are not the only root functions inhibited by waterlogged soils. Shoot-promoting plant hormones, cytokinins and gibberellins, normally produced by the root are reduced. The lack of soil oxygen also results in changes in the availability of some mineral nutrients. For instance, manganese (Mn) is made more available, and in low pH soils the chance of manganese toxicity is increased. See *Vegetable Crops Hotline* No. 585 for photo and more information on manganese toxicity <https://ag.purdue.edu/hla/Extension/VegCropsHotline/Documents/PastIssues/VCH585.pdf>.

What steps can a grower take to minimize plant stress from waterlogged soil? This is one time when foliar application of nutrients might be beneficial to offset the reduced root uptake. Up to 10 lb. of actual N per acre from urea, 28% nitrogen solution, or calcium nitrate can be applied at a time. Organic growers might choose to apply materials such as fish emulsion or liquid seaweed if the products meet criteria for food safety. For the next several weeks, manage irrigation (if available) with the awareness that the root system is probably below 'normal' size.

#### References:

Marschner, H. 1995. *Mineral Nutrition of Higher Plants*. 2<sup>nd</sup> ed. Academic Press, New York. pp. 626-641.

Indiana: Current 7-Day Observed Precipitation  
Valid at 6/23/2015 1200 UTC- Created 6/23/15 20:30 UTC

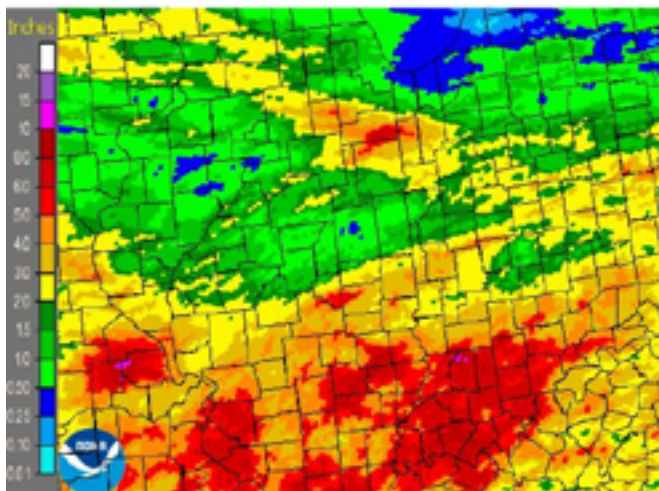


Figure 1. Seven day observed precipitation (in.) ending June 23, 2015. Source: NOAA/ National Weather Service. Advanced Hydrologic Prediction Service <http://water.weather.gov/precip>



#### QUINTEC LABELED FOR BACTERIAL SPOT OF TOMATO -

(Dan Egel, [egel@purdue.edu](mailto:egel@purdue.edu), 812-886-0198) - Bacterial spot of tomato causes lesions on foliage and fruit of tomato. On leaves, the lesions begin as small water soaked areas and turn into brown lesions with a yellow halo. Lesions on stems often lack a yellow halo. Fruit lesions, which are responsible for direct loss of marketable yield, are often scabby in appearance (see Figure 1).

Bacterial spot of tomato is favored by warm, wet weather. The causal bacterium survives on crop debris and may be seed borne. Volunteer tomatoes and peppers may also carry the disease. Transplant greenhouses should be cleaned and sanitized after each generation of transplants is produced.

Management of bacterial spot of tomato has been covered in more detail here <https://ag.purdue.edu/arp/swpap/VeggieDiseasesBlog/Lists/Posts/Post.aspx?ID=31>. *The Midwest Vegetable Production Guide for Commercial Growers, 2015* also has recommendations. In this article, however, I would like to discuss a new product that has recently been labeled for this disease. Quintec® has been labeled for several years for powdery mildew on various crops. Evidence has been produced that Quintec® has some efficacy to reduce the severity of bacterial spot. Recently, this product was issued a 2ee. While Quintec® will not solve our bacterial spot problems, used with other products, it may help. Importantly, the efficacy of Quintec® does not depend on whether the strain of the bacterium is copper resistant or not. That is, used properly, Quintec® should help to manage strains of bacterial spot that are copper resistant.

The 2ee bulletin gives the rate of 6 fl oz per gallon in no less than 30 gallons of water per acre. Quintec® must be alternated with other products recommended for management of bacterial spot. When more than one application of Quintec® is made per season, at least one of the applications must be a tank mix with another product effective against bacterial spot. No more than four applications can be made per season if powdery mildew is present.

Many more restrictions and details are listed on the 2ee bulletin, which must be in possession of the grower when Quintec® is applied. One must also be in possession of the regular label when applications are made. The supplemental and regular labels should be available wherever Quintec® is sold. Contact me for details, questions, or a label.

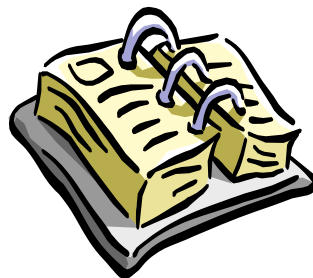


Figure 1. Lesions of bacterial spot of tomato often appear scabby.



**USDA OFFERS WEBINAR ON ORGANIC MARKET NEWS REPORTING** - (Liz Maynard, [emaynard@purdue.edu](mailto:emaynard@purdue.edu), 219-531-4200) - The Agricultural Marketing Service (AMS) at USDA publishes information about prices, supplies, movement, and quality of vegetables every business day. On Thursday, July 16, 2015, 2:00 to 3:00 p.m. Eastern Time, AMS will offer a webinar about the Fruit & Vegetable Market News, what information on organic crops is available, and how to use the Market News Portal. There is no cost, but participants should register in advance at <http://bit.ly/FVWebinarMN071615>. The market news reports have

a wealth of information; I would encourage any grower not already aware of what is available to take a look at the Market News Portal <https://www.marketnews.usda.gov/mnp/fv-home> even if it is not possible to attend the webinar.



#### UPCOMING EVENTS

**Bringing in the Harvest - Preparing for the 2015 Melon Season.** Tuesday, June 30, 2015. 8:00 A.M. - 12:00 P.M. EDT. Oaktown Produce Depot, 13990 N. Old U.S. 41, Oaktown, IN. This program is designed primarily for cantaloupe and watermelon growers, although all produce growers are welcome to attend. The Indiana State Department of Health will be on hand to discuss current departmental activities. Purdue scientists will update growers on current research. Other topics relevant to produce harvesting and packing will be discussed. For more information, contact Scott Monroe, [jmonroe@purdue.edu](mailto:jmonroe@purdue.edu), or 812-886-0198.

**Planning for Success: Food Safety Plan Writing – Using Templates and Other Resources.** Wednesday, July 1, 2015. 12:00 P.M. - 1:00 P.M. EDT. To participate online, go to <http://bit.ly/FSPlanWriting>. To participate by audio only, call 888-854-1541. For more information contact Scott Monroe, [jmonroe@purdue.edu](mailto:jmonroe@purdue.edu), or 812-886-0198.

**Southwest Purdue Agricultural Center Field Day.** Thursday, July 9, 2015. Southwest Purdue Agricultural Center, 4369 N. Purdue Rd., Vincennes. IN. 7:30 A.M. Health Fair. 8:30 A.M. Registration. Morning topics: managing cucumber beetles while protecting bees, production of vegetables in high tunnels, canola production, hybrid cottonwood as a bioenergy crop, grape production, field crops disease update, soybean production, maximizing seed corn investment and benefits of starter fertilizer. Lunch is free with registration. A PARP class will be offered after lunch. Please contact Barb Joyner at 812-886-0198 or [joynerb@purdue.edu](mailto:joynerb@purdue.edu) to RSVP or go online at <http://tinyurl.com/2015SWPAC>.

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