VEGETABLE CROPS HOTLINE

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

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In This Issue

Why Your Insecticide May Not Be Working as Well as You Would Like

(Rick Foster, fosterre@purdue.edu, (765) 494-9572) & *(Laura Ingwell, lingwell@purdue.edu)*

It's not uncommon for us to get calls from growers who are expressing concern about a particular insecticide product that is not working as well as the growers would like. Often, growers will suggest that Product X is no good or that the target insect has now developed resistance to that particular insecticide. Before we jump to conclusions, we need to consider a number of possible causes for poor performance by an insecticide. Here are some questions to consider if you are not getting the control you would like.

1. **Are you using the right product?** Every fall, a group of vegetable entomologists from throughout the Midwest thoroughly revise the insecticide recommendations in the Midwest Vegetable Production Guide (ID56). The products we list in the guide are the ones that we believe work for a particular pest, based either on research trials or through our experience with growers. That's why we always like to hear from growers when a new product comes along to determine if they are satisfied with the control they received. Sometimes a product will look good in small trials but not so good in large field situations, so that is good information for us to know. Related to this question is "have you identified the pest correctly?" Products can vary greatly on how well they control various pests, so correct identification is critical. Most of you deal with the same insect year after year, so this would not be an issue. However, for some newer or less frequent pests, make sure you are treating for the right pest.
2. **Was your timing right?** For many insect pests (for example, corn earworm in sweet corn), timing is critical. Missing the optimal timing for earworms by a couple of days because of a muddy field, can greatly increase the amount of damage when pressure is high. Timing is not as critical for some other insects but growers should be sure to use the economic thresholds that we suggest. We purposely set those conservatively because we know that cleaning up an extremely high population of some pests can be extremely difficult.
3. **How is your water?** Many insecticides are subject to degradation by alkaline hydrolysis. Each insecticide has an optimal range for the pH of the water in which it is mixed. Generally speaking, water should be either neutral or slightly acid (pH of 7 or below) to avoid breakdown of the active ingredient. If your water, like much of the water in Indiana, has a pH higher than the optimal range for your insecticide, you should treat the water to lower the pH and improve your control. Likewise, some insecticides are rendered less effective by excessively hard water, another common trait of water in Indiana. Again, for some insecticides, lowering the level of hardness will improve control.
4. **How is your coverage?** An old expression on how to get good insect control with insecticides is "the right insecticide at the right place at the right time." For insecticides that are not systemic (don't move through the plant), good coverage is essential. We've been doing some research on the control we receive from different sprayers or boom types for earworms in sweet corn. We used water sensitive cards to measure the amount of coverage we are getting on the ears and compared that to the level of infestation of earworms in the ears. What we found is that there is a very high correlation between the amount of

coverage and the control we received. I encourage all growers to purchase some water sensitive cards and test their sprayers to see what level of coverage they are receiving. If you do that and are not getting the coverage you would like (and your control is not satisfactory), here are some options for improving your coverage: increase your gallonage, increase your pressure, use drop nozzles for sweet corn, increase the number of nozzle tips, change the type of nozzle tips, drive slower.

5. **Is your sprayer properly calibrated?** When was the last time you calibrated your sprayer? It should be done at least annually. Nobody likes going through the process of catching water from each of the nozzle tips and doing the math to see if your rates are correct, but it is a necessary evil if you want to get good control. Likewise, if you are spraying a 40 acre field, you are not really spraying 40 acres. You have to account for fence rows and field margins when calculating how much area you are spraying.
6. **Is your sprayer in good working order?** If you calibrate your sprayer, you will quickly find out if some nozzle tips are clogged or worn. There should be less than 5-10 percent variation between the output of different nozzles. If the variation is greater than that, the nozzles should be either cleaned or replaced. Have you checked all your hoses to make sure that there are no leaks? Insecticide leaking from a hose is not going to kill any insects and that means you are putting on a lower rate than you intended on the plants.
7. **What time of day are you spraying?** Most insecticides are broken down by heat and sunlight so the optimal time to spray insecticides is late evening or at night when temperatures are dropping and sunlight is fading. Many insect pests are nocturnal, so spraying right before they become active will increase the control of that first night. Also, when spraying in the heat of the day, some of the insecticide will volatilize before it reaches the plant, again resulting in a lower rate of residue on the plant. An added benefit of spraying in the evening/night is that pollinators will have left the field and any harm done to them will be minimized.
8. **What are you mixing with your insecticide?** Some insecticide/fungicide combinations are not compatible. Be sure to check the labels before mixing. Also, check the label to see if the manufacturer recommends any adjuvants be mixed with the insecticide.
9. **What is the weather like?** Weather can be an important factor in the effectiveness of an insecticide application. For example, the pyrethroid insecticides (Warrior®, Capture®, Baythroid®, Mustang Maxx®, etc.) tend to break down more quickly when temperatures are high, upper 80s or 90s. If you are experiencing decreased control with pyrethroids during warm period, consider switching to a non-pyrethroid option. In contrast, products that need to consumed by the pest, such as Bt products, tend to be more effective when temperatures are warmer because the insects are more active and consuming more insecticide as they feed. Rainfall can also be a big factor. Insecticides vary greatly in how well they adhere to the plant after a rainfall. As a general rule of thumb, if the insecticide completely dries on the plant before rain occurs, a light rain will have little effect on the residues. The heavier the rain event, of course, the more insecticide will be washed off the plant. Ideally, you would want to spray after the rain, but that often is not possible because the fields are too muddy for your sprayer to pass through the field.
10. **Is the target pest resistant to the insecticide?** We purposely listed this possibility last because, while resistance is a real and increasing problem, it is usually not the reason for poor control. In recent years, corn earworms developed resistance to pyrethroid insecticides that had provided excellent control for many years. We were able to confirm that with laboratory studies, but growers should not jump to conclusions about resistance based on a single case of poor control.

10 Useful Rules for Fungicide Applications

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

Since there is an article about the application of insecticides in this issue, below I list 10 rules that will help vegetable growers apply fungicides effectively and safely.

1. Apply fungicides prior to the development of disease. Although many fungicides have systemic (“kick back”) action they will not completely eradicate diseases after they have started. And by the time a single disease lesion is observed in the field, many more lesions too small to observe are already working at your crop. Most systemic fungicides move less than an inch toward the tip of the plant or may just move from the upper to the lower side of the leaf.
2. Use shorter spray intervals during weather conducive to plant disease. Each plant disease has its own

"personality" and thus prefers different weather. However, most plant diseases require leaf wetness. Therefore, during periods of rain and heavy dews, more frequent fungicide applications are a good idea. The normal range of spray applications is every 7 to 14 days. Cantaloupe and watermelon growers have the guesswork taken out of this process with a Purdue University program known as **MELCAST**. Ask the author for more details by calling (812) 886-0198 or go to **melcast.info.**

3. Apply fungicides before a rain if possible. Water is necessary for most fungal spores to infect a plant and for the splash dispersal of many spores. Therefore, apply fungicides before a rain if it appears that the fungicide will have a chance to dry before the rain. It is not necessary to apply fungicides again after every rain. Most fungicides have a good sticker and will persist through rains pretty well. The **MELCAST** program takes into account the affect weather has on fungicides.
4. Know when to alternate fungicides. Systemic fungicides, those with a single mode of action, if applied again and again in sequence, may cause disease causing fungi to mutate into a form resistant to the fungicide. It is always a good idea to alternate fungicide applications from one FRAC code (MOA code) number to another. Read the label carefully to find language about fungicide alternation. Contact fungicides with a FRAC code of M like chlorothalonil and mancozeb are very unlikely to cause such mutations and therefore may be applied in sequence. Although some fungicides may have designations such as M01 or M02, any fungicides with an M does not need to be alternated. (Products with copper as an active ingredient may have resistance issues-see article about bacterial spot of tomato in the last issue of the *Hotline*.) Table 32 in the *Midwest Vegetable Production Guide* **http://mwveguide.org/** will help growers alternate fungicides.
5. Timing of fungicide applications is more important than nozzle type and spray pressure. Studies here in southern Indiana as well as by researchers in other areas of the country have found that nozzle type and spray pressure doesn't make as much difference as we once thought. See the article in this issue of the *Hotline*. In general, the more water one uses per acre, up to about 50 gallons, results in better coverage.
6. Some diseases cannot be managed by foliar sprays. Problems caused by soil borne fungi or nematodes cannot be controlled with foliar fungicides. Examples of these types of problems would be Fusarium wilt of watermelon or root-knot nematodes of tomatoes. Also, be certain that the problem you observe is really a disease. No amount of fungicide will improve a problem caused by soil fertility. Send a sample to the Purdue Plant and Pest Diagnostic Laboratory to find out the official diagnosis **http://www.ppdl.purdue.edu/ppdl/index.html**.
7. Use copper products for bacterial diseases. For the most part, copper products are more effective against bacterial diseases than they are against fungal diseases.
8. Some diseases require specialized fungicides. Diseases, such as downy mildew and Phytophthora blight, may require specialized fungicides. It may be wasteful to apply specialized fungicides all season long for diseases that are not a threat. For example, downy mildew of cucurbits usually does not arrive in Indiana until late in the season.
9. Double-check the label for details. Rates may vary widely based on label changes and different formulations. While you are checking the rate, also make sure that the crop and disease are on the label. (Can this fungicide be applied in the greenhouse?) Did you get the rate from the *Midwest Vegetable Production Guide for Commercial Growers*? **http://mwveguide.org/** Check the label anyway.
10. Play it safe. Always adhere to the Post-Harvest Intervals, Re-Entry Intervals and Worker Protection Standards listed in the label. No one wants an accident or lawsuit. Besides, the label is the law.

Spray Pressure and Nozzle Type

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

Many years ago, I was told that to successfully use fungicides on vegetables, one must use high spray pressures and hollow cone nozzles. However, I had trouble finding any research on this topic, just rumors. So, I did my own research.

Dennis Nowaskie, Superintendent at the Southwest Purdue Agricultural Center (SWPAC) built a single row sprayer that could be used to vary nozzle types between flat fans and hollow cones and spray pressures from 30 to 150 PSI. We used the sprayer to conduct experiments on Alternaria leaf blight of cantaloupe during three years of field tests. The fungicide we used to try to manage this disease was the contact product chlorothalonil (trade names include Agronil®, Bravo®, Echo® and Terranil®). Phillip Harmon, now a professor at the University of Florida, was my co-author on this paper.

Try as we might, we could not find any statistical differences in disease severity or yield between any of the nozzle type or spray pressure treatments. We also used water sensitive paper to measure coverage at each treatment; we found no statistical differences in the coverage of water sensitive paper as a result of spray pressure or nozzle type. Regardless, of the nozzle type or spray pressure there was no statistical difference in coverage. This research was on cantaloupe and Alternaria leaf blight. However, I have reason to believe that the research applies to other situations as well. Read on for research on other crops and diseases.

University of Florida researchers lead by Tom Kucharek found that regardless of whether flat fan or hollow cone nozzles were used, no difference in disease severity was observed in the following diseases: early or late leaf spot of peanut, bacterial spot of pepper and blast or purple blotch of onions. Kucharek also found that spray pressures ranging from 50 to 250 psi made no differences in disease control in early or late leaf spot of peanut.

In general, higher spray pressures (and to some extent, hollow cone nozzles) are often linked with smaller droplet size. Small droplet sizes are often associated with better coverage. If this is so, why wasn't I able to find better disease control or coverage using hollow cones and high spray pressures? One reason may have to do with where the spray ends up. If one watches a boom sprayer from a distance, it is often possible to see a mist that is generated by the spray that floats across the field. Clearly, this mist represents water plus active ingredients that may very well not end up in contact with the crop. It may be that while small droplet size helps to increase coverage, too high a population of small droplets increase the amount of non-target impacts.

I was not able to obtain funding for the question of how much water per acre to use for fungicide applications. My observations are that one should use between 20 and 50 gallons per acre. My personal opinion is the more the better, within this approximate range.

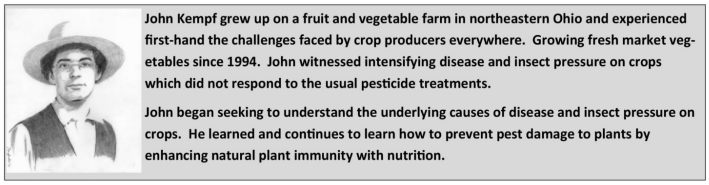
Based on this research and the work of others, it might be that we have overestimated the importance of high pressures and small droplets in protecting vegetables from diseases. It seemed reasonable that more drops would provide better coverage and less disease. However, the data doesn't indicate this at all. If buying a house is location, location, and location, then using fungicides on cantaloupe, and perhaps other vegetables, is all about timing.

The timing of fungicide applications is usually more important than nozzles and pressures. Some of my thoughts on fungicide timing are given in this issue of the *Hotline* on fungicide application hints.

Upcoming Events

Daviess Co. Produce Production Meeting

Date: Aug. 14, 2018 6:30 pm – 8:30 pm
Location: Daviess Co. Produce Auction, LLC, 5567 N 900 E, Montgomery, IN 47558



Small Farm Education Field Day

Date: Aug. 30, 2018

Location: Purdue Daniel Turf Center (1340 Cherry Lane, West Lafayette, IN 47907) and Purdue Student Farm (1491 Cherry Lane, West Lafayette, IN 47906)

PURDUE UNIVERSITY | Extension HORTICULTURE AND LANDSCAPE ARCHITECTURE

Small Farm Education Field Day

Thursday, August 30th 8:30am-2:00pm

Purdue Daniel Turf Center 8:30-11:30am
1340 Cherry Lane
West Lafayette, IN 47907

Purdue Student Farm noon-2pm
1491 Cherry Lane
West Lafayette, IN 47906

The Purdue University Student Farm is a working small farm. We grow vegetables and herbs using the principles that naturally govern balanced eco systems, including emphasis on diversity, healthy soil, healthy plants, and healthy people. Our educational work is all about food: how to grow it on a small, ecological scale, the art of production and marketing produce for profit, understanding how food intersects with environment, economy and community.

The Purdue Student Farm is proud to host its first Small Farm Field Day. The event is packed with educational sessions during the morning, followed by a tour and practical experiences on the farm. Topics of discussion throughout the day include Small Farm Design, Hoop House Production, Organic Nutrient and Pest Management, Social Media and Marketing, Food Safety (Good Agricultural Practices and Fresh Produce Safety - FSMA), and Small Farm Implements. Lunch will be provided by Juniper Spoon.

$10 registration
Register here http://www.cvent.com/d/hgqx6g
For questions or reasonable accommodation needs, contact Lori Jolly-Brown
ljollybr@purdue.edu, 765-494-1296

PURDUE UNIVERSITY | Extension HORTICULTURE AND LANDSCAPE ARCHITECTURE

Greenhouse and Indoor Hydroponics Workshop

Date: Sept. 5, 2018

Location: 625 Agriculture Mall Drive, West Lafayette, IN 47907

PURDUE UNIVERSITY | Extension HORTICULTURE AND LANDSCAPE ARCHITECTURE

Greenhouse and Indoor Hydroponics Workshop

Wednesday, September 5, 2018
8:00am-3:00pm
(Lunch provided)

Classroom sessions 8am-noon
Deans Auditorium
Pfendler Hall- PFEN 1159
Purdue University, 715 W State St
West Lafayette, IN 47907

Hands-on activities/tours 1:00-3:00 pm
Horticulture Greenhouse
625 Agriculture Mall Drive
West Lafayette, IN 47907

You will learn about best varieties, nutrient recipes, production systems, artificial lighting and temperature needs for hydroponic lettuce produced in greenhouses and indoors. Attendees will tour our latest state-of-the art greenhouse and indoor hydroponic facilities (built this year!) and experience many hands-on activities. Hurry up! Seating is limited!

Registration is free but required

Register Here
https://tinyurl.com/yaxd4k2z

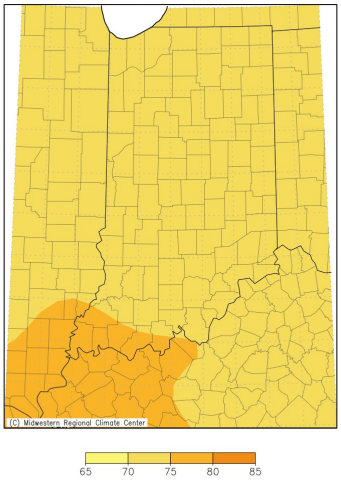
Questions? Contact Lori Jolly-Brown
ljollybr@purdue.edu, 765-494-1296 or
Dr. Krishna Nemali, knemali@purdue.edu

Workshop sponsored by:
INDIANA STATE DEPARTMENT OF AGRICULTURE

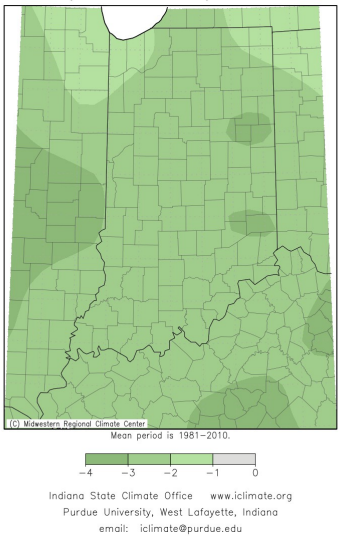
Temperature and Precipitation July 21 and July 27

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

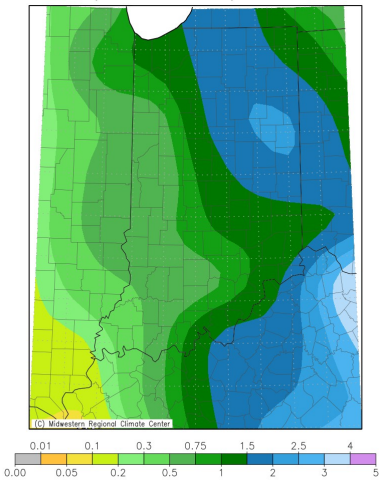
Average Temperature (°F)
July 21, 2018 to July 27, 2018



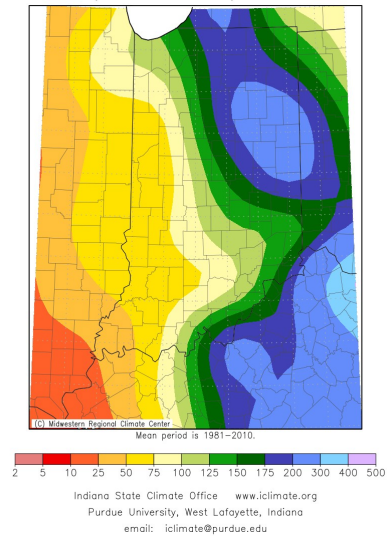
Average Temperature (°F): Departure from Mean
July 21, 2018 to July 27, 2018



Accumulated Precipitation (in)
July 21, 2018 to July 27, 2018

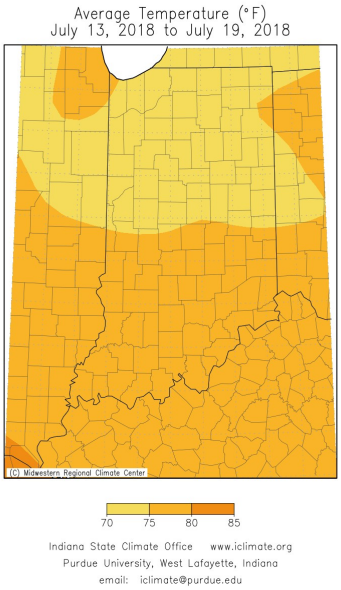


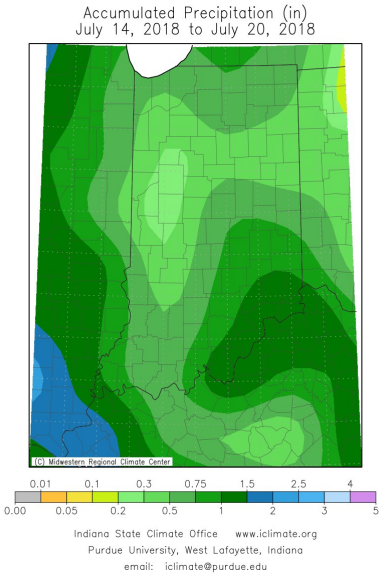
Accumulated Precipitation: Percent of Mean
July 21, 2018 to July 27, 2018

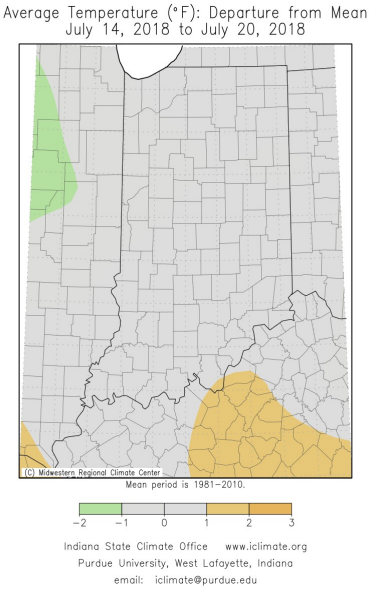


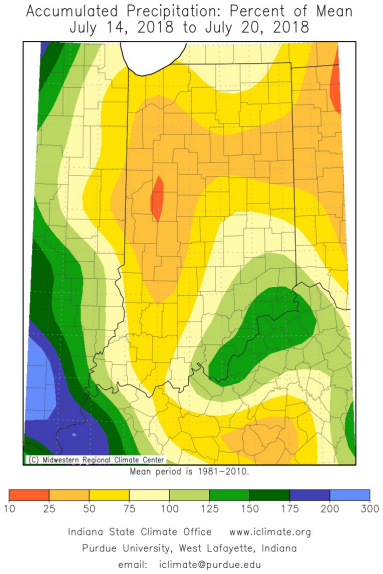
Temperature and Precipitation July 14 and July 20

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









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