



# VEGE

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## A Primer on *Pythium*

Elizabeth Buck, Cornell Cooperative Extension, Cornell Vegetable Program

### What is *Pythium*?

*Pythium* can cause damping off in seedlings and root rot in a wide range of fruits, vegetables, and flowers when soil conditions are wet and soil temperatures are cool. *Pythium* is a widespread, common soil-residing oomycete that ordinarily plays a role in breaking down dead plant material. While *Pythium* is typically a spring disease that attacks seedlings and transplants, it can occasionally cause problems in late summer and early fall if the weather becomes cool and wet.

*Pythium* thrives by taking advantage of crop stress and root injuries. Cold, wet, gray conditions giving seedlings a hard time developing their roots? Roots abraded or torn from transplanting? Maybe a bit of injury from insects feeding on the roots? *Pythium* sees root stress and says, "Looks like a good place to make a home!"

### What does *Pythium* do to my plants?

*Pythium*'s signature is macerated roots that lose their outer coating and leave only the stringy center behind. You can tug gently on diseased looking roots to test whether the outsides slip off easily. If so, *Pythium* is likely to be your culprit.

Early on, roots stop having lots of nice bright white hairs and begin to discolor. You may also notice wilting or leaf discoloration that could mimic insufficient water or nutritional deficiencies. These foliar symptoms are caused by the roots dying off, and not by a lack of water or nutrients.

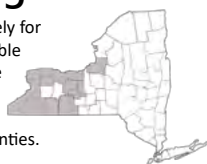


*Pythium* symptoms on a tomato are discolored roots with outsides that slip off to leave the stringy inside exposed plus a reduced rootball. Adventitious roots are developing as stem protrusions on the left and a brown, soft *Pythium* lesion is present further up the stem and out of focus. Photo: E. Buck, CCE

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## About VegEdge

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The newsletter is a service to our enrollees and is intended for educational purposes, strengthening the relationship between our enrollees, the Cornell Vegetable Program team, and Cornell University.

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The next issue of VegEdge newsletter will be produced on May 17, 2023.

## Accumulated Growing Degree Days, 5/1/23

Nina Gropp, CCE Cornell Vegetable Program

Accumulated Growing Degree Days (AGDD)

Base 50°F: April 1 - May 1, 2023

Location**	2023	2022	2021
Albion	105	55	67
Appleton	98	45	51
Arkport	122	50	69
Bergen	115	53	71
Brocton	127	66	93
Buffalo*	103	56	97
Ceres	106	50	81
Elba	106	51	69
Fairville	125	57	68
Farmington	176	58	72
Fulton*	131	49	73
Geneva	133	57	72
Hammondsport	126	63	73
Hanover	113	64	87
Jamestown	117	57	90
Lodi	156	82	80
Lyndonville	104	51	55
Niagara Falls*	108	60	62
Penn Yan*	138	56	80
Rochester*	131	61	73
Romulus	128	58	76
Sodus	126	60	77
Versailles	129	63	90
Waterport	96	40	46
Williamson	109	53	56

\* Airport stations

\*\* For other locations: <http://newa.cornell.edu>

As the disease progresses, roots die off and the stem constricts at the soil line. Sometimes you may see a soft brownish lesion may appear on the stem near the soil line. Some plants, like tomatoes, have a natural tendency to grow adventitious roots and will often try to develop new from the stem above their original root ball in an attempt to save themselves.

If *Pythium* enjoys favorable conditions long enough, plants eventually wilt, tip over and die. In seedlings, *Pythium* can move quickly and the wilting and tipping over (aka damping off) will often be the first and final symptom. Older plants that survive a noticeable *Pythium* problem will often be stunted or lack vigor and will be at higher risk for struggling while under heavy fruit load or during wet late summer conditions.

### How does *Pythium* behave?

*Pythium*'s life preferences can be hard to conceptualize because it attacks below ground, where it can't be easily seen. To help understand how *Pythium* behaves, let's compare it to another common plant disease that has a broad host range: *Botrytis* gray mold.

Much like *Pythium*, *Botrytis* gray mold is opportunistic and excels at taking advantage of weakened plant tissue. Both *Pythium* and *Botrytis* gray mold thrive under wet conditions and are thought of as cool weather diseases. The presence and severity of both diseases is highly influenced by the prevailing weather and environmental conditions, with discouraged by dry or hot conditions. Both *Pythium* and *Botrytis* have a nasty habit of returning in an affected planting once conditions become favorable (wet and cool) again.

Unlike *Botrytis*, *Pythium* is first and foremost a root rot that infrequently attacks fruit or other above ground plant parts. Also, unlike *Botrytis*, *Pythium* is not a true fungus but an oomycete.

### *Pythium* is an oomycete. What are oomycetes?

Oomycetes have swimming spores and move more easily in water than many true fungi. More pragmatically, oomycetes often uncontrolled by many fungicides and tend to be difficult to stop, destructive plant diseases. Examples of other plant diseases we get in NY that are caused by different oomycete organisms include cucurbit downy mildew, basil downy mildew, downy mildew of cole crops, downy mildew of onions, late blight of potato and tomato, phytophthora blight of vegetables, and sudden oak wilt. Luckily, *Pythium* is less aggressive than many of these other oomycete diseases.

Home growers can often skip fungicides altogether and gain good control over *Pythium* using preventative strategies like environmental modification and sanitation. Because *Pythium* losses are tightly tied to the combination of favorable environment and stressed plants and because we tend to miss early below-ground symptoms and folks usually don't notice the disease until it is severe, prevention of *Pythium* is the way to go.

### How to Prevent Losses from *Pythium* - Inside

1. Use treated seed. Seed fungicide treatments do provide real *Pythium* protection to early roots.
2. Clean your transplant raising area and tools. De-squizz water containers, disinfect growing benches, and sanitize reused seeding trays, transplant flats, and pots.
3. Give young plants just enough water, avoid soggy-ness. Extra water is not a seedling's friend.
4. Inspect your plants for root health once the plant is big enough to remove and replace the plug in the tray without causing damage.
5. Keep seedling and transplant flats out of direct contact with the ground

### How to Prevent Losses from *Pythium* - Outside

1. Remediate compaction and improve your drainage. Compaction is common at the bottom of your tillage zone and is exacerbated when soils are worked wet.
2. Don't plant into ground that is too wet. Patience pays off.
3. Avoid planting into ground that is too cold for your crop/flower choice. Cold soils cause plants to sit without actively establishing and this gives *Pythium* an opportunity.
4. Plan to plant later, in warmer drier conditions, if you have a recent history of *Pythium* problems.
5. Rotate areas with a recent history of *Pythium* to a grass ornamental or corn.
6. Don't overwater young plants. Check the soil moisture in the top 1-2" of soil near your plants.

Remember, *Pythium* is naturally occurring in the environment – growers will benefit from keeping *Pythium* prevention in mind when establishing new plantings both inside and outside. *Pythium* problems can be mitigated by creating a drier environment if the disease is caught early. *Pythium* remains difficult to stop if it is caught late. ●



# Boron Toxicities

Judson Reid, Cornell Cooperative Extension, Cornell Vegetable Program

For crop nutrients, we often make divisions between macro, secondary and micro nutrients. Macro and secondary nutrients include nitrogen, phosphorus, potassium, calcium, sulfur and magnesium. These 6 nutrients are taken up in the largest volume by vegetables, as indicated by application rates, often in dozens or hundreds of pounds per acre. Foliar analysis of our crop for macro nutrients is expressed in percent (%) foliar mass. In comparison, micro nutrients are applied in ounces or single pounds per acre, and measured in foliar mass as parts per million (ppm).

Although the relative crop demand level for these nutrients can be measured from least (micros) to greatest (macros), this doesn't mean there is a hierarchy of nutrients, with the micros as least important. If micro nutrients are severely deficient, they can be as yield limiting as macro nutrients. One of the key differences to understand these nutrients, is the realization that the micro nutrients have a smaller margin for error than the macros. Since they are required in minute amounts, it is very easy to become deficient, *and* it is just as easy to reach a toxicity level.

## Boron

This week boron (B) has revealed itself as a problematic micronutrient in soil-based greenhouse tomatoes.

Boron is critical for cell wall, pollen and flower health. Boron influences meristem growth, so crops such as broccoli and cauliflower logically will suffer in deficient soils compared to fruiting vegetables or legumes. However, crops differ widely in their response to boron additions. As noted, the cole crops are rather responsive, while tomatoes are listed as medium, while peas and beans have low response to additions beyond base levels to the soil. Sandy soils in particular are susceptible to boron deficiencies, as this nutrient is easily leached.

Adequate soil levels of boron range from 0.5 to 3 pounds/ac. With a small difference between deficiency and toxicity, how do we know whether to apply additional boron? Unfortunately, this micronutrient is not part of most standard soil tests. Boron analysis is available as an additional test from Dairy One Agronomy Services (formerly Agro-One) in Ithaca for just \$11.50—well worth the small fee.

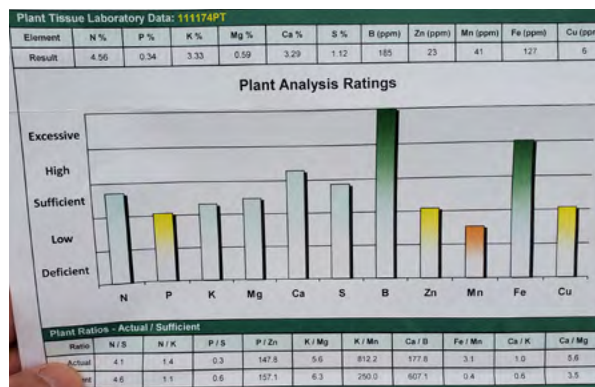
A trusted source for greenhouse tomato sufficiency lists desirable boron levels between 20-40 ppm. However, in multiple samples this past week, we have seen levels approaching 200 ppm! When this happens boron builds up along the leaf margins causing black necrosis and spotting. Fertilizer companies note that excess boron can obstruct calcium transport.

Soil based greenhouses or high tunnels should pay attention to boron as they are susceptible to toxicity for several reasons:

- Lack of precipitation means no leaching, year-to-year.
- Greenhouse grade fertilizers often include a micronutrient package with additional boron.
- High organic matter soils may retain additional boron.
- Low ventilation rates during cool, cloudy weather increases marginal buildup of boron due to high relative humidity indoors.
- The countryside is crawling with fertilizer sale reps preaching the benefits of boron.

## What to do when there is excess boron in the soil?

- Time and water are our friends here, as leaching will improve the situation.
- Read fertilizer and compost analysis. Is there additional B included?
- Pay for the optional B test when conducting annual soil tests. The boron test is located on page 2 of the [Soil Sample Submission Form for Commercial Vegetable Crops](#) from Dairy One. Soil sampling supplies can be [ordered online](#). Email [supply@dairyone.com](mailto:supply@dairyone.com) or call 607-252-7540 for more information. Or, contact one of the Cornell Vegetable Program Specialists for further guidance on how to submit a soil sample for analysis.
- Be mindful that the dead tissue from toxicities is susceptible to *Botrytis* Gray Mold infections.
- Ventilate greenhouses/tunnels to avoid buildup of boron at the leaf margin.



Desirable boron levels are between 20-40 ppm. Here we are over 4X the desired value!



Levels of boron above 100 ppm can be toxic. This crop has a level over 175 ppm and black margins and spots are evident. Photo: Judson Reid, CCE Cornell Vegetable Program

## Spongy Moth Forecast for 2023

*Anya Osatuke, Cornell Cooperative Extension, Harvest NY*

Spongy moth (*Lymantria dispar*) caterpillars defoliated blueberry bushes in New York State berry farms over the past few years. The adult moths fly to new locations every mating season to lay their eggs, with a preference for wooded areas. The eggs overwinter, and caterpillars emerge in early spring.

Spongy moth emergence is calculated by the number of Growing Degree Days (GDD) with a base of 37.5°F. The countdown of emergence:

- 0 -299 GDD: No caterpillars anytime soon.
- 300-377 GDD: Caterpillars expected to emerge in 2-3 weeks.
- 387-471 GDD: Caterpillars expected to emerge in 1-2 weeks.
- 472-570 GDD: Caterpillars expected to emerge in a week or sooner.
- 571-1300 GDD: Caterpillars will start to emerge now.
- 1300 GDD and beyond: Caterpillars have turned into moths.

Counties across WNY have accumulated enough degree days to expect spongy moth emergence within a week or less. The cold, wet weather will likely hold the caterpillars back, but as soon as things warm up, growers who have had issues the previous year should be prepared to manage the spongy moth larvae. DiPel (Btk) is the safest and most effective insecticide to use on small caterpillars, and this product will also target cranberry and cherry fruitworm that are active during late bloom.

Below are cumulative degree days, base 37.5°F, in CVP-participating counties as of May 2, 2023.

- Allegany (Ceres): 585
- Chautauqua (Jamestown): 510
- Cattaraugus (estimated from Jamestown, Buffalo, and Ceres): 534
- Erie (Buffalo): 508
- Genesee (Bergen): 532
- Monroe (Rochester): 558
- Niagara (Corwin): 487
- Ontario (Geneva): 570
- Oswego (Fulton): 523
- Orleans (Albion): 525
- Steuben (Arkport): 523
- Wayne (Fairville): 549
- Yates (Penn Yan): 611



Spongy moth larva soon after emergence. Black caterpillars less than an inch long are vulnerable to Btk-based products such as DiPel. Photo: Anya Osatuke, CCE

Spongy moth populations have a boom-and-bust cycle due to two natural predators that stop their populations from growing exponentially. Both predators attack larvae while they are active, while adults and egg masses are no longer vulnerable. One predator is a pathogenic fungus that thrives in wet weather. Last year, June and early July were dry in Western New York, therefore, we can expect a low mortality from this fungus. The second predator, a virus, emerges sporadically and is more likely to decimate spongy moth larvae when populations are dense. We do not know the status of this predator last year.

Thanks to the new [GDD calculator](#) added to the NEWA website, calculating spongy moth emergence for any NEWA station has become easy. Using the degree day calculator, we set the start date for 1 January 2023, the end date to today, and select the degree day type "Base 37.5° F BE (sine wave)".

### Resources and Further Reading

- Weather Archive: [World Weather Info \(Jamestown\)](#)
- Weather Archive: [World Weather Info \(Rochester\)](#)
- USA Phenology Network | [Spongy Moth](#)
- Network for Environmental and Weather Applications (NEWA) | [Degree Day Calculator](#)
- Michigan State University | [A Virus and a Fungal Disease Cause Spongy Moth Outbreaks to Collapse](#) ●

## Muck Onion Update

*Christy Hoepting, CCE Cornell Vegetable Program*

Onion planting went smoothly this spring in Elba with one of the best record times from start to finish for the direct seeded crop, despite starting a few days later than normal. Transplanting is rolling along at a good clip too. 80-degree weather in mid-April got the earliest planted onions off to a quicker than usual start. Earliest planted directed seed crop is at the loop stage and earliest transplants are just starting their third green leaf. Most of the seeded crop is still under ground or just starting to poke through. There was a scramble to get herbicides applied before the rain. This week's forecast of 6 days of rain and cold weather has made growers nervous about herbicide applications, both of crop injury caused by herbicide application prior to heavy rain and about not being able to get on the field to make an herbicide application after heavy rain(s). ●



Baby onions! Beginnings are so hopeful! May they grow up to be strong healthy high-quality onions. Photo: Christy Hoepting, CCE

# Increased Risk of Herbicide Injury in Direct Seed Onion in Cold, Wet Weather

Christy Hoepting, Cornell Cooperative Extension, Cornell Vegetable Program

## Outlook

- Outlook is a soil-applied shoot inhibitor and can cause improper unfurling of the leaves, which commonly results in “looping” injury, but it can also stunt onion growth.
- Actively growing onion seedlings protect themselves from Outlook injury by metabolizing it into inactive molecules. Therefore, onions are more prone to Outlook injury when soils are cold.
- Outlook injury also increases with shallow planting and when Outlook is co-applied with Prowl, which can also reduce stand.
- **To minimize Outlook injury, do not co-apply it with Prowl, and do not use more than 11 fl oz in the pre-emergent to onion timing.** Some growers delay the first Outlook application to loop stage (with Prowl).

## Prowl

- Prowl is a soil-applied root inhibitor that is effective against emerging weed seedlings.
- It can cause stunting and reduced stand when soil conditions are cold and wet, and especially when Prowl is moved into the root zone with heavy rainfall or seeds are planted shallow (may be a result of wind erosion), and when it is co-applied with Outlook.
- **To avoid excessive injury from Prowl, delay its application until post-onion emergence at loop to flag-1<sup>st</sup> leaf start (can coincide with barley-kill spray), use a lower rate (e.g. 1 pt or less) or H2O formulation. Rate at barley kill can be adjusted according to risk of injury.**

## Buctril/Brox/Broclean (a.i. bromoxynil)

- Bromoxynil is a photosynthetic inhibitor that controls emerged weeds. It can be used before onions emerge only on muck soil; generally, the last stage to safely use this product is when a few onion loops are emerging from the soil surface.
- In a 2020 herbicide trial designed to push the limits of Buctril, it was clear that onion seedlings in any version of the flag leaf stage were most susceptible to injury from bromoxynil (Fig. 1), which is why this use is not allowed.
- But what was really surprising in this trial was how many onions were not killed, despite using high rates in unfavorable weather (cool & wet) – resulted in only 33% stand loss! (I was expecting 80-100% stand loss.) Since the worst-case scenario was not as bad as I thought it would be, now I am much less nervous about pushing the timing of Buctril towards early loop stage.
- In wet soil conditions, bromoxynil could be in water solution and more readily contact and kill the tender tissue of emerging seedlings. If all of exposed green tissue is burned off, the seedling may not recover. **Do not “push the limits” of Buctril to loop stage when soil conditions are wet.**
- **Do not apply bromoxynil to germinating seed that has been exposed due to wind erosion,** because it could easily kill newly germinated tissue.
- If you miss timely application of Buctril (e.g. because fields are too wet following rain to make the application), don’t worry! It is only one component of the overall pre-emergent weed control program.
  - **Ragweed is the most likely weed species that will escape if Buctril is missed** as Outlook and Prowl do not have much activity on ragweed. At 2021 onion twilight meeting in Oswego, we demonstrated how to clean up ragweed escapes when Buctril was skipped in the pre-emergent herbicide program with post-emergent applications of Goal 2XL 0.5 fl oz with barley-kill herbicide, Chateau 2 oz at 1.25 leaf and Buctril 2E 8 fl oz + Goal 2XL 4 fl oz at 2.5 leaf.
  - Increased mustard weed escapes may also occur if Buctril is missed. Use high rate of Prowl EC 2-3 pt/A in next pre-emergent spray at loop or flag+ (may be with barley-kill herbicide) to help compensate for some of the lost mustard control. Mustard weed escapes can easily be cleaned up with timely post-emergent applications of Chateau. ●

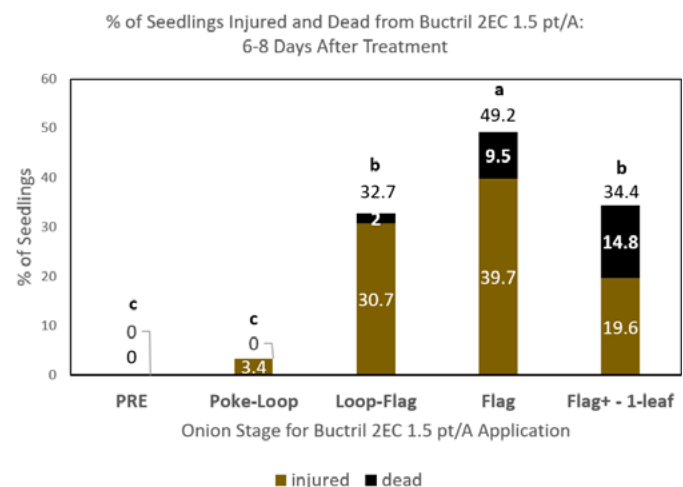


Figure 1. Tolerance of emerging/emerged onions (poke to flag+ - 1-leaf) to application of Buctril 2E 1.5 pt/A: % of seedlings injured & dead 6-8 days after treatment (DAT)/18 DAT pre-emergent to onion (Hoepting et. al., 2020). Bars followed by the same letter are not significantly different, Fisher's Protected LSD test,  $p = 0.0000$ .



# Cabbage Dropped from Command Herbicide Label – Alternative Options

Christy Hoepting, Cornell Cooperative Extension, Cornell Vegetable Program

Command 3ME is a pre-emergence herbicide that cabbage growers apply to the soil surface just before transplanting cabbage as part of their pre-emergent herbicide program. Unlike other pre-emergent herbicides commonly used in cabbage including Treflan and Dual Magnum, Command is the only one with good activity on velvet leaf. If velvet leaf escapes the pre-emergent herbicide program, it will have to be hand weeded, because the post-emergent herbicides available in cabbage are not very effective on velvet leaf.

Figure 1 shows the current version of the Command 3ME label (a.i. clomazone 31.1%, EPA No. 279-3158), which is no longer labeled on cabbage. It is still labeled in broccoli, however.

## Options

1. Existing stocks of product that contain the old label that includes cabbage may still be used (Fig. 2).
2. Generic formulations of Command 3ME have cabbage on the label (Fig. 3), including:
  - Caravel (EPA No. 60063-58, Sipcam Agro)
  - Civic 3ME (EPA No. 87290-55-89391, Innvictis Crop Care, LLC)
  - Up-Stage 3CS (EPA No. 70506-35, UPL NA, Inc.)
3. Instead of using Command, rely on Prowl H2O and/or Goal 2XL/Goaltender in your pre-emergent herbicide program for control of velvet leaf, especially Prowl H2O. For example, you could use Prowl H2O instead of Treflan. Prowl H2O is also excellent on Lamb's quarters and Goal products are very good on pre-emergent control of ragweed, especially when used with Dual Magnum.

Check with your pesticide distributor to make sure that they have old Command product with cabbage still on its label, or the generic substitutes.



Figure 1. Current version of Command 3ME herbicide label which no longer includes cabbage.



Figure 2. Older version of Command 3ME herbicide label, which includes cabbage. It is legal to use existing product that contains this label.

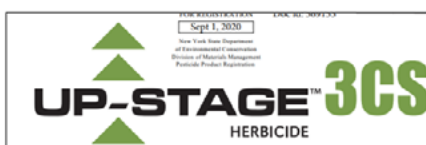


Figure 3. Generic formulations of Command 3ME that are labeled in cabbage. ●

# New Information for Cabbage Maggot Control in Brassicas for 2023

Christy Hoepting, Cornell Cooperative Extension, Cornell Vegetable Program

## Summary

- Verimark applied as a tray drench (TD) in 2022 resulted in excellent control of cabbage maggot under low pest pressure in a research trial on a commercial farm. Growers who used Verimark in 2022 also were satisfied with its performance.
- For Verimark, applying it as a TD was the most effective application method, followed by transplant water (TW), while directed sprays at the base of the plant (DS) were the least effective.
- When using Verimark as a tray drench, use a minimum rate of 0.0008 fl oz/plant for effective cabbage maggot control.
- Mustang Maxx applied as a directed spray at the base of plants failed to control maggots in the 2022 on-farm research trial.
- Generally, DS and broadcast insecticide applications are less effective than TD and TW applications.
- To be effective at all, DS applications need to be applied more than once, especially Mustang Maxx and Hero, which have short residuals and do not move in the soil.
- Alternatives to Lorsban/chlorpyrifos tend not to have as long residual control as Lorsban, with the exception of Diazinon.
- Key timing to protect against cabbage maggot is April through June.

## More Information

- [Control Options for Control of Cabbage Maggot in New York, 2023](#) summary guide.
- Detailed 2022 newsletter article: [Lorsban is Banned: How to Control Cabbage Maggot in Brassicas Now?](#)  
[https://rvpadmin.cce.cornell.edu/uploads/doc\\_1053.pdf](https://rvpadmin.cce.cornell.edu/uploads/doc_1053.pdf)

## First, how did it go without Lorsban in 2022?

After decades of being the first line of defense for cabbage maggot control in brassicas (cabbage, broccoli, kale, radishes, etc.), Lorsban/chlorpyrifos was banned in New York and nationally in 2021. Thus, 2022 was the first growing season without it. In January, I conducted a quick email survey of brassica growers in NYS to see how cabbage maggot control in 2022 went without Lorsban. Unfortunately, my response rate was very low. But, a huge thank you to the 15 growers who answered my survey!

There was a wide variety of products and application strategies used in 2022 as well as a broad range of satisfaction among growers in their performance (**Table 1**). Greatest grower satisfaction appeared to be with Verimark. It should be noted that although pest pressure varied among sites, cabbage maggot pressure was considered by respondents as fairly low in 2022. Thus, products perceived as providing good control in 2022 may be considered unacceptable in a year when cabbage maggot pressure is higher. More research is needed to know how well these products and application strategies perform under higher maggot infestations.

**Table 1. Alternatives to Lorsban/chlorpyrifos used for cabbage maggot control in New York, 2022: Survey Results (15 respondents).**

Percent of Respondents - Alternative to Lorsban	Application Method <sup>1</sup>	Effectiveness Rating
20% - Verimark	TW	Good
	TD	Very Good
	TD fb. Mustang Maxx DS	Excellent
13% - Mustang Maxx	DS 3x	Good
	Broadcast ?x	Good*
13% - Radiant	DS fb. Hero broadcast	Good
	Broadcast ?x	Fair*
27% - Coragen	TW	Excellent
		Very Good
		Fair
27% - Diazinon	TW fb. Mustang Maxx DS 2x	Poor*
	DS 10-inch band	Good*
	PPI	Good
	TW	Fair (2)*

\* Indicates control of cabbage maggot was perceived as being worse than with Lorsban/chlorpyrifos.

<sup>1</sup> 2 responses

**1 Application Method:** TW: transplant water. TD: tray drench. DS: directed spray at base of plants. PPI: pre-plant incorporated.

## Verimark Shined and Mustang Maxx Bombed in 2022 Field Trial (Table 2)

Cabbage maggot pressure was low in the 2022 field trial in Oakfield with only 13% infested cabbage plants in the untreated 41 days after planting on June 10.

continued on page 9



**Verimark**

- Both Verimark at a rate of 0.0016 fl oz/plant TD, and Verimark at a rate of 0.0008 fl oz/plant TD fb. Verimark 13.5 fl oz/A (= 0.0008 fl oz/plant) DS 14 days later significantly controlled cabbage maggot by 99%!
- Numerically, as the rate of Verimark increased from 0.0004 fl oz/plant to 0.0008 fl oz/plant to 0.0016 fl oz/plant, control of cabbage maggot also increased. Note: cabbage maggot control using the lowest rate of Verimark was not significantly different than the untreated.
- Generally, TD applications were more effective than TW applications, which were more effective than DS applications.

**Mustang Maxx**

Going into the 2022 growing season without Lorsban, we were very excited about the results from 2021 Cornell insecticide trial in Riverhead (Long Island): Mustang Maxx DS at 4 fl oz/A applied 4 times (5 days after transplanting, then weekly for 3 weeks) resulted in 72% reduction of infested plants compared to the untreated under moderate-high cabbage maggot pressure (57% infested). At ~\$1/fl oz, four applications of Mustang Maxx at a rate of 4 fl oz/A would cost ~\$16/A, which was by far the most affordable alternative to Lorsban for the level of control that it provided. So, we worked with FMC to get both Mustang Maxx and Hero (a.i. in Mustang Maxx + bifenthrin) labeled on all brassica crops for cabbage maggot control in 2022 and beyond (available as 2ee labels).

- Unfortunately, in the 2022 field trial in Oakfield, Mustang Maxx at a rate of 4 fl oz/A DS at 40 gpa applied either 4-times or 2-times and at 80 gpa applied 4-times all failed to control cabbage maggot.
- A single DS application of Mustang Maxx at a rate of 4 fl oz/A timed 5 days after planting also failed in the 2022 trial on Long Island.
- Given these highly variable results, we caution growers to lower their expectations for cabbage maggot control when using Mustang Maxx and Hero DS.**

**Other**

- Coragen** at a rate of 5 fl oz/A applied as a TW treatment did not result in significant control of cabbage maggot in the Oakfield field trial, despite growers reporting in our survey that it worked for them.
- Diazinon** at a rate of 2.4 qt/A applied as a pre-plant incorporated (PPI) treatment was the only treatment in the 2022 Long Island trial that significantly reduced cabbage maggot; 91% damage in the untreated to 53% in Diazinon treatment (= 42% control). In the 2021 trial in Oakfield, Diazinon AG500 at a rate of 3 qt/A applied as a TW treatment resulted in 93% control of cabbage maggot, while Diazinon AG 500 at a rate of 3 qt/A PPI failed to control cabbage maggot. In grower survey, there were two growers who reported fair control of cabbage maggot with diazinon TW.

**Table 2. Evaluation of conventional insecticides for control of cabbage maggot, on-farm trial, Oakfield, NY, 2023: % Control of cabbage maggot (in order from worst to best).**

Treatment		Application		Cabbage Maggot % Plants Infested June 10 (41 DAP)
Product	Rate	Method <sup>1</sup>	Timing	
Untreated Control	N/A	N/A	N/A	12.9 ab <sup>2</sup>
Mustang Maxx	4 fl oz/A	DS 40 gpa	2 DAP	19.7 a
Fb. Mustang Maxx	4 fl oz/A	DS 40 gpa	14 DAT	
Mustang Maxx	4 fl oz/A	DS 80 gpa	2 DAP	18.3 a
Fb. Mustang Maxx	4 fl oz/A	DS 80 gpa	14 DAT	
Mustang Maxx	4 fl oz/A	DS 40 gpa	2 DAP	13.9 ab
Fb. Mustang Maxx	4 fl oz/A	DS 40 gpa	7 DAT	
Fb. Mustang Maxx	4 fl oz/A	DS 40 gpa	14 DAT	
Fb. Mustang Maxx	4 fl oz/A	DS 40 gpa	21 DAT	
Coragen	5 fl oz/A	TW 400 gpa	At-planting	13.2 ab
Fb. Mustang Maxx	4 fl oz/A	DS 40 gpa	14 DAT	
Verimark	13.5 fl oz/A	TW 400 gpa	At-planting	10.8 abc
Fb. Verimark	13.5 fl oz/a	DS 40 gpa	14 DAT	
Coragen	5 fl oz/A	TW 400 gpa	At-planting	9.4 abc
Verimark	13.5 fl oz/A	DS 40 gpa	2 DAP	3.7 abcd
Fb. Verimark	13.5 fl oz/a	DS 40 gpa	14 DAT	
Verimark	0.0004 fl oz/plant	TD	At-planting	2.6 bcd
Verimark	13.5 fl oz/A	TW 400 gpa	At-planting	1.9 bcd
Verimark	0.0008 fl oz/plant	TD	At-planting	1.0 cd
Verimark	0.0016 fl oz/plant	TD	At-planting	0.1 d
Verimark	0.0008 fl oz/plant	TD	At-planting	0.1 d
Fb. Verimark	13.5 fl oz/A	DS 40 gpa	14 DAT	
Verimark	0.0008 fl oz/plant	TD	At-planting	0.1 d
Fb. Mustang Maxx	4 fl oz/A	DS 40 gpa	14 DAT	
<b>P value (<math>\alpha = 05</math>)</b>				<b>0.0010</b>

**DAP:** Days after planting. **DAT:** days after treatments. **Fb.:** Followed by. **gpa:** Gallons per Acre.

**1 Application Method:** **DS:** direct spray at base of plants in 4-6 inch band. **TW:** transplant water. **TD:** tray drench (per 288-cell plug transplant tray: ~ 1 pt of water with insecticide fb. ~ 1 pt water to wash residue off of leaves into soilless mix, enough to saturate without runoff).

**2** Numbers in a column followed by the same letters are not significantly different, Tukey's Honest Significant Difference [HSD] test,  $p < 0.05$ .

### Tips for Using Verimark as a Tray Drench

- Our research results suggest that a minimum rate of **0.0008 fl oz/plant will provide the best control of cabbage maggot when using Verimark as a tray drench.**
- Because planting density varies widely for brassica crops (e.g. ~ 10,000 - 17,000 plants/A for cabbage, ~25,000 plants/A for some broccoli plantings, ~5,000 plants/A for Brussels sprouts), the amount of Verimark per plant will also vary widely when the rate per acre is divided by the planting density. The table (on right) outlines how rate/plant converts to rate and plants per acre.
- 16,875 plants/A is the maximum planting density that will allow for 0.0008 fl oz/plant when the highest per acre rate of Verimark is used (13.5 fl oz/A).
- If your planting density was 14,500 plants/A and you want to use 0.0008 fl oz/plant, then your Verimark rate/A would be  $14,500 \times 0.0008 = 11.6$  fl oz/A.
- To figure out how much product to use per tray:  $288 \text{ plants/tray} \times 0.0008 \text{ fl oz/plant} = 0.23 \text{ fl oz/tray}$ .
- Verimark is supposed to be applied to transplant trays to saturate the soil media without allowing it to run out the bottom. Stop watering 24 h before applying the insecticide tray drench. I had good luck in my experiments when applying ~ 1 pt of insecticide + water to a 288-cell tray with a backpack sprayer (more uniform coverage than using a watering can), and then washing the insecticide residue off of the leaves into the soil media with a second application of ~ 1 pt of clean water.

Verimark Rates

Rate/Plant	No. Plants/Acre	Rate/Acre
0.0008 fl oz	16,875	13.5 fl oz
0.0008 fl oz	12,500	10 fl oz
0.0016 fl oz	8,438	13.5 fl oz
0.0004 fl oz	33,750	13.5 fl oz

### Organic Options

**The most effective option to control cabbage maggot in brassicas is to use insect exclusion netting or row cover, which can result in 100% control.** The caveat to making this technique work is to not use row covers over ground that is infested with cabbage maggot, as they may emerge under the row cover. Similarly, brassica plants should be free of other pests including worms, aphids and flea beetles prior to applying exclusion netting/row cover. Ground should be rotated away from brassicas for at least 1 year, the longer the better when using barrier control tactics.

Note: Entrust is labeled on brassica crops, but not for cabbage maggot control. It generally has given inconsistent and poor results for control of cabbage maggot in research trials. ●

## It's Raining. What Better Time to be Reminded About Irrigation

*Robert Hadad, Cornell Cooperative Extension, Cornell Vegetable Program*

Yes, I hop on this topic often. The weather patterns have shown us that we can't depend on it raining when it is needed in the field. Once the season is underway, a wet spring turns quickly into a blazing inferno with droughty conditions and everyone is scrambling to get a little water on the plants. For maximum yields, a consistent amount of water spread over several days a week will help keep the soil moisture there. If you wait until it has been dry for 5 days, it will take much longer to refresh the soil moisture in a large enough area to reach all of the plants' roots. Enriching the soil with organic matter from cover crops is a great practice to build up water holding capacity (but that is a discussion for another time).

So, what better time to get prepared for having irrigation water available before conditions get dry is when it is raining and fields are too wet to work. Time to pull together what you need and check over the system.

- **Where is the pump?** Was the water drained out of it before winter set in? If not, you may want to check to see if there are any cracks. You want to make sure the pumps are in working order. Change out the oil. Clean the spark plug. Clean out the intake pipes. Put in new thread tape to seal connections.
- **Where are the irrigation pipes or the drip header lines?** Probably off in the hedgerows somewhere. Best find them before a plow finds them for you. Check for damage. Check for rodent hotels. For drip headers, replace the snapped off valves before connecting to water supply. Set up headers and pipes to blow out. check seals between sections for leaks.
- **Find the sand filters.** When was the last time they were cleaned out and sand replaced? Check connections from the pump and connections to the lay-flat or header line. Set the filter onto a sturdy stand.
- **Scout around the surface water source** you'll be pumping water from. Mowing down tall grass and weeds keep waterfowl from nesting (if on your property). Check for any floating carcasses, trash, or other potentially hazardous materials. Do waterfowl hang out in the pond during irrigation periods?
- **Does your pond or surface water source been prone to algae blooms?** Not talking about the little leaf duck weed but the green slime that looks like oily lime juice. Hazardous algae bloom HABs are a serious situation and a future article will address this issue that seems to be getting worse when the hot weather patterns settle in.
- **Assess the water source for sources of contamination.** Is it a pond that receives runoff from neighboring fields? What are the fields used for – livestock grazing? Do you draw water from a stream? What is upstream? What might be possible con-

continued on page 11

tamination that gets into the stream that you can easily figure out?

- **Take water quality samples for testing.** Find the closest water testing lab near you (might be the county health department). Pick up sample bottles and instructions for taking the samples. READ the instructions. Most water samples need to get to the lab (kept cold) in a few hours from taking the sample. Ask for the water test that gives a number a quantitative generic E. coli test. If you are looking for where labs are located, check with your department of health to see if they do the test or go to the CVP website for a listing of water test drop off sites in WNY [https://rvpadmin.cce.cornell.edu/uploads/doc\\_1101.pdf](https://rvpadmin.cce.cornell.edu/uploads/doc_1101.pdf)
  - Take water samples in the spring and 2-3 times more during the season (especially if there are harvests spread out over the summer and into fall). READ the results of the tests. Compare each test to see if there is a pattern for the numbers of CFUs (colony forming units) or MPN (most probable number of units). A season's worth of tests will give you your baseline for water quality. If there is a large spike in the numbers between tests, check the water source and see if you can figure out the problem. Maybe migratory birds came in or something is dead in the water, or maybe a heavy rain washed contamination from a neighbor's field into the water. Retake the test and see if the numbers have gone down.



A common type of farm irrigation pump that moves waters into vegetable fields either through overhead sprinklers or larger drip systems. Photo from North Carolina State University Extension.

The moral of the story is to be prepared before you get buried. Severe weather swings seem to be the new normal and can come on fast. Don't get caught short. If the forecast is for hot dry windy weather moving in, start irrigating beforehand. It takes a lot more water to make a difference if the soil has dried down than it does when the soil is damp. Keep up with watering (when it isn't a monsoon passing through) even during mild weather to be ahead of the game especially for soils that don't hold water well (growing and incorporating cover crops can help build up organic matter and water holding capacity).

For locations of water testing labs, check the Produce Safety Alliance website, your county health department, or contact the Cornell Vegetable Program team – Robert Hadad, [rgh26@cornell.edu](mailto:rgh26@cornell.edu), 585-739-4065. ●

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# VEGEdge

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VegEdge is the highly regarded newsletter produced by the Cornell Vegetable Program. It provides readers with information on upcoming meetings, pesticide updates, pest management strategies, cultural practices, marketing ideas, and research results from Cornell University and Cornell Cooperative Extension. VegEdge is produced every few weeks, with frequency increasing leading up to and during the growing season.

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