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VEGEdge

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Tomato Powdery Mildew 2024

Judson Reid, Cornell Cooperative Extension, Cornell Vegetable Program

White fuzzy growth at the time of heavy fruit load? Yes, Powdery Mildew of tomatoes can come as a surprise—as it isn't a common disease in New York—and indeed the symptoms are quite similar to the Powdery Mildew we are used to seeing on zuchinni and other vine crops in the field. However, Powdery Mildew of tomato is not the same fungi that cause the disease on vine crops.

For tomatoes, there are at least 2 different fungal pathogens causing slightly different symptoms; *Leveillula taurica* and *Odium neolycopersici*. *L. taurica* tends to sporulate on the lower leaf surface first, whereas *O. neolycopersici* readily sporulates on the upper surface before the lower. The symptoms we have found in local tomatoes this season are likely caused by *O. neolycopersici.* If left untreated the spores can overtake a plant and dramatically reduce marketable yield.

Although Powdery Mildew does occur on field tomatoes, it is more likely to occur in a greenhouse or high tunnel. Why? This disease thrives in high humidity and absence of rain. It does not overwinter here, as it requires a living host. The disease travels northward from Florida and does not occur each season in New York. Outbreaks in tunnels and greenhouses can spread to nearby field plantings.

Powdery Mildew caused by *Odium neolycopersici* has bright white spores that begin on the upper leaf surface. *Photo: Judson Reid, CCE Cornell Vegetable Program*

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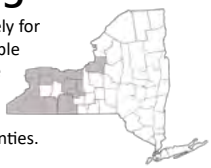
About VegEdge



VegEdge newsletter is exclusively for enrollees in the Cornell Vegetable Program, a Cornell Cooperative Extension partnership between Cornell University and CCE Associations in 14 counties.

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 will be produced on July 24, 2024.

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Initial Powdery Mildew symptoms can come as a surprise and appear similar to spray residue or even Late Blight. *Photo: J. Reid, CVP*

Over time the individual patches of Powdery Mildew spores grow together and take over the leaf surface, reducing photosynthesis and yield. *Photo: J. Reid, CVP*

The good news is that the disease is treatable. Pruning and promoting airflow are the first steps for prevention. We have seen good control with sulfur products, and caution that phytotoxicity can occur at high rates and daytime applications. Stylet Oil is also effective, and both products can provide suppression of thrips and mites as a bonus. These materials are suitable for both organic and conventional growers.

A stronger conventional material for severe outbreaks is Switch 62.5WG (Groups 9 and 12); labeled for the *L. taurica* version of Powdery Mildew with 0 days pre-harvest interval. This material also includes Botrytis on its label. For our friends on Long Island, it is not allowed for tomatoes, but is acceptable in the remaining 60 counties of New York State.

Pruning and promoting airflow are the first steps for prevention of Powdery Mildew in tunnels. *Photo: J. Reid, CVP*

Managing Heat Stress in Vegetable Crops

UMass Extension Vegetable Notes, V36:12; edited by R. Hadad, CCE Cornell Vegetable Program

[We have been seeing a lot of heat related problems in veg crops across the region. We are not alone. Rutgers, UMass, and others have written about it. Here is an abridged version of a compiled article from UMass Ext. who borrowed parts of podcasts and articles from U. Delaware and Rutgers. ed. R. Hadad, CVP]

Heat injury in plants includes scalding and scorching of leaves and stems, sunburn on fruits and stems, leaf drop, rapid leaf death, and reduction in growth. Wilting is the major sign of water loss, which can lead to heat damage. Plants often will drop leaves or in severe cases will “dry in place” where death is so rapid, abscission layers have not had time to form. Normally, plant temperature is just above air temperature, but plant temperature can rise to a critical level under certain conditions. High leaf temperatures result in heat damage to the proteins that allow the plant to photosynthesize and carry out metabolic processes. Photosynthesis rapidly decreases at temperatures above 94°F, so high temperatures will limit yields in many vegetables and fruits.

Plant stomates will close earlier in the day, thus limiting gas exchange and thereby photosynthesis. Respiration increases with temperature. While daytime temperatures can cause major heat-related problems in plants, high night temperatures can also have great effects on vegetables, especially fruiting vegetables. Hot night temperatures (nights above 75°F) will lead to greater cell respiration. This limits the amount of sugars and other storage products that can go into fruits and developing seeds. Because of this increased respiration the plant expends stored photosynthates and they do not contribute to yield.

In flowering and fruiting crops, high heat will affect pollen production, often reducing viable pollen numbers. Reproductive parts in plants (anthers, stigmas) may not form properly or function properly. If pollen is transferred to stigmas, pollen germination may be reduced or halted due to heat and desiccation. Reduced pollination can result in smaller fruit or misshapen fruit. [Eds. note: High heat will also reduce pollinator activity, amplifying pollination issues.] If pollination is successful, early fruit abortion may occur due to lack of photosynthates or heat damage. In heat-stressed plants, the hormone balance is affected and there is an increase in abscisic acid that is involved in these abortions.

High soil temperatures can damage surface roots, limiting water and nutrient uptake, especially potassium. This is particularly an issue in crops grown on black plastic mulch, a common cultural practice. On black plastic mulch, surface temperatures can exceed 150°F. This heat can be radiated and reflected onto vegetables causing tremendous heat loading. This is particularly a problem in young plants that provide limited shading of the plastic. Vegetable transplants are exposed to these high soil temperatures at the soil line around the transplant hole. The stem tissue just at or above the level of the plastic may be killed at these high temperatures and the transplants will then collapse and die.

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Strategies for Managing Heat Stress

Transplants. Control stem heat necrosis by hardening off transplants and using larger transplants with thicker stem diameters and more leaves. Make a larger hole when transplanting and water sufficiently in the hole to reduce heat load. Plant in the evening or early in the morning and avoid planting on very hot days or when long stretches of hot weather are forecast. Switch to white plastic mulch for later spring plantings; this can reduce losses significantly (white plastic will be 10-20°F cooler than black plastic mulch). White particle films (clay- or lime-based) sprayed at the base of plants over the mulch can also reduce plant losses to heat necrosis. Putting a small mound of clean sand around the plant stem will also eliminate this problem.

Irrigation. Overhead irrigation over black plastic mulch can help to reduce heat loads until plants have sufficient canopies to shade over the mulch. Fixing drip irrigation leaks and clogs. Issues with drip can include plugged emitters, leaks due to insect or animal chewing, leaky connections reducing flow, tape twisting and binding, improper tape selection or improper irrigation timing, limited well capacity, emitter spacing that is too wide for the crop or soil, and beds that are too wide for a single tape (with double rows of plants). Any of these could lead to inadequate water being applied to the crop.

Mulching. Increase reflection and dissipation of radiative heat by using white or reflective mulches or low-density, organic mulches such as straw to reduce surface radiation and conserve moisture.

Shading. Shade cloth or netting comes in black, green, white, and reflective aluminum colors and is commonly used at the 20-30% shade levels. Shading is applied during the hottest periods or periods when the plant is most sensitive to heat (such as tomato fruit development). Research at the U. Maryland showed that shading tomatoes during fruiting can improve fruit quality and reduce culls. U. Georgia studies on peppers showed similar results with improvement in the number of marketable fruits. Kansas research showed that lettuce production was improved where white shade cloth was used.

To summarize, there is good evidence that 30% black shade cloth during early June - early August improves bell pepper yield and quality. There is also good evidence that shade cloth reduces bitterness in lettuce, especially when used with a heat tolerant variety. There is some evidence that 30% black shade cloth increases tomato quality. ●

Japanese Beetle Management in Berry Crops

Anya Osatuke, Small Fruit Specialist, CCE Harvest NY

Japanese beetles (*Popillia japonica*) are scarab beetles that are native to Japan. It is thought that the beetles made their way to the United States in the early 20th century on a shipment of iris bulbs. These insects spend most of their year-long lifespan underground, emerging for a 2-month period as adults to eat, mate, and lay eggs. Japanese beetles can damage berry crops belowground as grubs, and aboveground, as hungry adults. Aboveground damage is more typical and widespread.

Life cycle of Japanese beetles. The white lines along the border signify beetle activity at each month of the year, starting with January on the left. Beetles emerge in late June or early July and lay eggs in August. *Image: Joel Floyd, United States Department of Agriculture Animal and Plant Health Inspection Service*

In strawberries, Japanese beetles occasionally lay eggs in large plantings. Due to the comparatively small root system of strawberry plants, the damage to the crown can predispose the field to collapse, both from damage to the vascular system as well as the increased vulnerability to soilborne diseases. This is most likely to occur when strawberries are planted in or near land that was previously turf or sod. It is important to distinguish Japanese beetle larvae in strawberries from other beetle grubs, namely rose chafers: rose chafer adults emerge and lay eggs roughly a month earlier than Japanese beetles.

In blueberries and raspberries, Japanese beetles often emerge just when the earliest flush of fruit is ripening. For mature plantings, the damage can be a nuisance that reduces marketable yields of fruits in dry years. However, if the planting is healthy and the grower does not anticipate all the fruit being picked, the damage may or may not be worth an intervention. In young or distressed plantings, on the other hand, damage to leaves can reduce photosynthesis and affect the health of the plants the following spring.

Management

Managing Japanese beetles continues to be a topic of research and innovation. In raspberries and blueberries, few insecticides that target the spotted wing drosophila will also affect Japanese beetles. Many insecticides that target Japanese beetles have a long pre-harvest interval (PHI). Malathion 8 Aquamul is one option that is appealing due to its 1-day PHI. This product is not restricted-use in New York and is labeled for Japanese beetle management in blueberries and raspberries; not strawberries. Malathion has several drawbacks: Firstly, some growers find

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the odor of malathion disagreeable and do not wish to apply it on ripe fruit before harvest. Secondly, malathion is not a systemic insecticide and must be re-applied if washed off by rain. Thirdly, insects can develop resistance, thus only 3 applications of malathion are permitted per year. Finally, this product is highly toxic to bees and aquatic life, which makes it a poor choice for application in blooming brambles or fields near creeks or wetlands.

Several cultural strategies have been evaluated for Japanese beetle management: pheromone lures, soil treatments to target grubs, and exclusion netting.

Pheromone lures for Japanese beetles have gained a poor reputation. The most accessible Japanese beetle trap uses a bag slightly less than a gallon in volume, attached to 1 or 2 attractant lures. These are hung up and left all season to trap Japanese beetles. Usually, the volume of beetles attracted far exceeds the capacity of the trap, and crop damage is increased. Now, lure traps are getting a much-needed makeover. Jaime Piñero of UMass Extension has designed two Japanese beetle traps with improved capacity, a 4-foot long sock, and a 32-gallon trash drum. Both of these methods, when used to line the perimeter of a field and emptied weekly or more often, have shown promising results.

Soil treatments to target grubs have both conventional and organic approaches. For any soil treatment, it is useful to apply it in August and into the autumn, as this is the time of year when next year's generations of grubs is forming. For strawberries, a conventional soil treatment that targets grubs is imidacloprid (active ingredient of Admire Pro Systemic Protectant), while pyrethrins (PyGanic EC 1.4 II and PyGanic EC 5.0 II) are labeled for organic production.

In terms of biologicals, *Beauveria bassiana* (Mycotrol) is a fungus that parasitizes larvae, but persistence in the soil is low. For *Beauveria bassiana* to achieve good control within one year, it's recommended to make calendar applications every 5-10 days for "as long as pest pressure persists". There is no maximum application rate per acre of this product. Milky spore is another entomopathogenic fungus that targets Japanese beetle grubs. This product isn't labeled for berry crops specifically, but rather for grassy areas around fields. The label recommends making an application in spring, summer, and fall. In practice, researchers in Extension have observed good control over the course of 2 years with such an application schedule.

Another biocontrol is entering the market, too—beneficial nematodes. Nematodes of the species *Heterorhabditis bacteriophora* (Hb) and *Steinerema carpocapsae* (Sc) have the most research on their ability to control Japanese beetles, with some sources suggesting that Hb nematodes are more effective than Sc. Proper storage of the nematodes after shipment is critical, and during application, it's important to use cool water under 85˚F. A single application is recommended, but to keep the larvae alive while they establish, it is suggested to keep the ground watered for 5 weeks post-application. Anecdotally, such nematodes have offered control in strawberry fields for up to 7 years—persistence in the soil is influenced by soil conditions which fluctuate from year to year.

The challenge with Japanese beetles is their tendency to fly in from great distances. In-ground applications such as those above have the greatest success rate when growing in enclosed environments, especially under insect exclusion netting, where the field is totally encapsulated. Treating the ground can be beneficial for open field growers with large swaths of grass-covered land, but may not offer the best control. Hand-picking beetles off the crop in the early evening remains a common and effective control method for folks with smaller patches.

Resources and Further Reading

Don't Fall Into the Japanese Beetle Trapping Trap | Marissa Schuh, Extension Educator, Horticultural IPM | University of Minnesota Extension: https://extension.umn.edu/yard-and-garden-news/dont-fall-japanese-beetle-trapping-trap

Organic Management Options for the Japanese Beetle in Home Gardens | Jaime Piñero and James Quinn | University of Missouri IPM: https://ipm.missouri.edu/MEG/2018/1/organic_management_japanese_beetle/

Rose Chafers | Jemery Hahn, Associate Professor, Department of Entomology | University of Minnesota Extension: https://www.maine.gov/dacf/php/gotpests/bugs/documents/rose-chafer-mn.pdf

Using Beneficial Nematodes for Grub Control | Anonymous, YardScaping | Maine State Government: https://www.maine.gov/DACF/php/pesticides/yardscaping/lawn/documents/Beneficial_Nematodes.pdf

Sweet Corn Pheromone Trap Network Report

Marion Zuefle, NYS IPM, 7/16/24

Statewide, 26 of the 35 sites reporting this week (see trap count table). European corn borer (ECB)-E was trapped at 4 sites and ECB-Z was trapped at 6 sites. Corn earworm (CEW) was trapped at 14 sites, with 13 sites high enough to be on a 4, 5 or 6-day spray schedule (see chart). Fall armyworm (FAW) was caught at 7 sites and Western bean cutworm (WBC) numbers really went up this week with 24 sites reporting catches.

Peak WBC flight is expected to occur the first week of August. Be sure to scout your pretassel corn for egg masses.

CROP Insights

Observations from the Field and Research-Based Recommendations

BEETS

According to the **Cercospora leaf spot (CLS)** decision support system (DSS), the weather this past week was favorable for infection of beets with *Cercospora beticola*. The CLS DSS, which is available for free at https://newa.cornell.edu/beet-cercospora-leaf-spot calculates the risk of infection based on temperature and relative humidity. Choose the weather station that is closest to your field(s). Note that there is a CLS DSS support manual online available on the website. Primary sources of pathogen inoculum include infested crop residue, alternate weed and crop hosts, and infected seeds. Elevated temperatures, high relative humidity, and prolonged leaf wetness are conducive for disease development. The disease usually starts as patches or "hot spots" within a field. Secondary spread of the disease is via wind and rain splash that spread fungal conidia. Beet plantings with closed, dense canopies are at highest risk because they retain moisture within the canopy. Such fields should be scouted weekly. An iOS app called "Sampling by Cornell" is available for iPhone and iPad users to assist with scouting for CLS. **Fungicide applications are generally only warranted if disease is present in the field, there is elevated risk based on the weather conditions, and the field has a considerable time until harvest** by top-pulling machines or the beets are being sold with the tops on (bunching beets).

Please use fungicides wisely. **Cercospora has an elevated risk of developing resistance to fungicides with single site modes of action.** In recent NY surveys, approx. 90% of *C. beticola* were resistant to azoxystrobin (Quadris) and 30% were moderately resistant to propiconazole (Tilt). Rotate among different Fungicide Resistance Action Committee (FRAC) groups to minimize fungicide resistance and read and follow all label instructions. FRAC group 11 fungicides by themselves (e.g. Quadris, Cabrio, Flint Extra) provide low to moderate efficacy against resistant *C. beticola*, but products that contain a mixture of group 11+7 (e.g. Merivon Prime, Luna Sensation) provided improved control. Group 3 products (e.g. Tilt, Cevya) and group 7+12 (e.g. Miravis Prime) provide a moderate to high level of control. Group M01 (e.g. Champ 2F, Cueva), group BM02 (e.g. Double Nickel LC) group P06 (e.g. LifeGard), provide moderate control and are good FRAC group rotational products. – JK

CUCUMBERS

In addition to widespread downy mildew, starting to see angular leaf spot on foliage and fruit. Spotted cucumber beetles have emerged and the 2nd flight of striped cuke beetles are picking up. On Tuesday, I did see phytophthora blight starting in one field with a known history. This weather has been highly favorable.

Remember that downy mildew resistant cukes are only tolerant, not fully resistant. You will see disease to a lesser extent. Especially under very DM favoring weather (like this past week) it is beneficial to support your DM-tolerant varieties with oomycete-specific fungicide applications. Organically, that would be copper. – EB

DRY BEANS

Many dry bean fields are now entering bloom stage, so white mold management should now be considered. An initial application of Omega 500F is recommended followed by a second application of Endura 70 WDG. The first application should be made at the early bloom stage. – ML

Western Bean Cutworm Report

Western bean cutworm trapping has begun at 16 locations in the region (Table 1). Moth numbers started low at most locations, but have started to take off this week, with some locations already passing the 50 cumulative moth threshold recommended for scouting. (Project funded by the New York Farm Viability Institute and the NYS Dry Bean Endowment and led by Margie Lund, CVP)

Table 1. Western bean cutworm adult moth numbers by date for each dry bean trap location.

Dry Bean Location	July 3	July 9	July 16	Cumulative Moths
Avoca Hill East (Steuben Co.)	0	0	38	**38**
Avoca Hill West (Steuben Co.)	1	5	23	**29**
Avoca Valley (Steuben Co.)	0	1	27	**28**
Caledonia (Livingston Co.)	3	23	29	**55**
Churchville (Monroe Co.)	5	45	70	**120**
East Bethany (Genesee Co.)	NA	7	82	**89**
LeRoy (Genesee Co.)	NA	7	101	**108**
North Chili (Monroe Co.)	1	0	11	**12**
Pavilion (Genesee Co.)	1	7	53	**61**
Penfield (Monroe Co.)	NA	7	33	**40**
Penn Yan North (Yates Co.)	NA	4	4	**8**
Penn Yan South (Yates Co.)	NA	3	3	**6**
Scottsville (Monroe Co.)	0	4	14	**18**
Wayland Hill (Steuben Co.)	0	13	45	**58**
Wayland Valley (Steuben Co.)	3	2	10	**15**
Wyoming (Wyoming Co.)	11	77	82	**170**

GARLIC

There appears to be some trouble with splitting papers coming out of the field, sometimes with rusty discoloration and a mildly slimy rot. We're interested in collecting samples of such heads to learn what is causing this. Please reach out to us!

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ONIONS

Onions look beautiful! Full canopy and green to the tips of their leaves! The crop had excellent rainfall over the past week during the critical bulbing stage, especially Elba, which was the driest and in most need of rain of the three muck-onion growing regions in CVP. The first fields of earliest planted early varieties of transplants were harvested in Elba last week. Most direct seeded fields have 9 leaves and 1-inch bulbs.

With rainfall comes conditions that are favorable for leaf diseases, the effects of which we anticipate to see in next week's scouting. Stemphylium leaf blight (SLB) is now occurring to some degree in most fields. For the most part, tan-colored target spots can be detected on the necrotic tissue of the outermost leaves that are dying off and tan SLB sporulation/coloration can be seen coming in on necrotic leaf tips. Sometimes, tan or purple SLB target spots can be seen on green tissue, which is an indication of the primary form of the disease. In Elba, all growers decided to apply their first of only two FRAC 3 fungicide applications this week, timed to follow the 1.5" of rain and prior to significant onset of disease while plant foliage is still healthy. Hopefully, this will "flatten the curve" as to what could have been a spike in SLB. It is always tricky deciding when to apply the only two applications of FRAC 3 that we allow for strict resistance management practices, because they are also critical for a strong finish in August. Viathon 3 pt (FRAC 3c + P07) + Tilt 8 fl oz (FRAC 3a) remains the best treatment, as it was the best in both on-farm trials and appeared to hold or decrease primary SLB (as measured by target spots on green tissue) in 50% of applications made to commercial fields in the onion scouting program in 2023. However, we also learned that FRAC 3a in Tilt and FRAC P07 in Viathon are likely doing the majority of the work in this tank mix, while SLB has mostly developed fungicide resistance to the FRAC 3c in Viathon. Thus, Viathon + Tilt should perform the same as Tilt + FRAC P07 (e.g. Rampart, Reveille, etc.). These two treatments are being trialed in fungicide trial now. For more information, see articles on Onion SLB fungicide research updates and implications for management in last week's issue of VegEdge (Part I – the FRAC 3 situation and 2024 onion fungicide recommendations for SLB) and Part II on FRAC M5, 2, 7, 9, 12, 19 and P07 on page 8.

Generally, Botrytis leaf blight (BLB) halo lesions decreased this week as older leaves with BLB halo lesions are sloughing off and new infections have decreased. Although, we may see an increase again next week following this week's rain. BLB necrotic spots are currently low (less than 5 per leaf). Bravo 3 pt has very good activity on BLB necrotic spots and can help a little bit with SLB. Thus, growers are encouraged to add Bravo in their tank mixes when they can (e.g. when risk of Bravo reducing insecticide efficacy is low). We noticed tank mix phytotoxicity (not sure the cause) that caused irregular-shaped as well as round lesions tan-to-white in color lesions that may be confused with BLB necrotic spots. They tend to occur in clusters on the same side of the leaf and on the same leaf in each plant where the spray hit the leaf (Fig. 1).

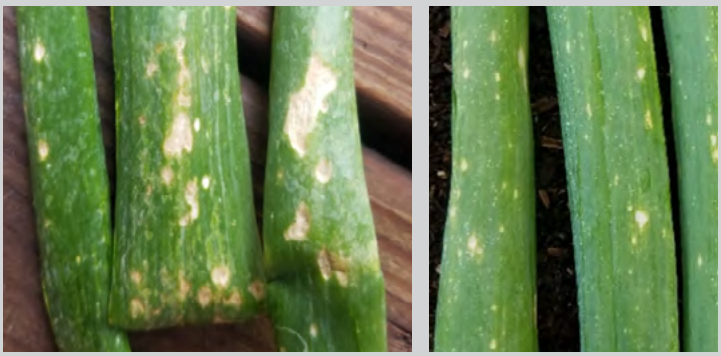

Figure 1. Tan-to-white necrotic spots caused by a phytotoxic tank mix (left) can be confused with the disease, Botrytis leaf blight (BLB) necrotic spots (right). Spotting from a phytotoxic tank mix tends to appear in clusters along the same side of the leaf on the same leaf on every plant. BLB necrotic spots occurs on both sides of the leaves on all leaves, although higher densities tend to occur on outer leaves and towards the leaf tip. *Photos: C. Hoepting, Cornell Vegetable Program*

Onion thrips continue to be a force to be reckoned with in Elba, and IYSV continues to increase, especially now that onions are being harvested and thrips are moving out of harvested fields into adjacent green fields. The growers are dealing with them accordingly. The scouting fields in Wayne and Oswego were enjoying low thrips pressure with the "momentum of Movento". – CH

Fresh Market Onions – Bacterial rot issues are really picking up in fresh market plantings. Copper is not effective against bacterial rots in onion, so you need to follow these cultural practices. Center rot you can see moving down a leaf. Those bulbs can sometimes be pulled and marketed green before the rot reaches the bulb. Sour skin rot seems to be worsened as bulbs expand and sit tight against the plastic, trapping moisture and not enjoying all that heat. Reducing thrips pressure and not overfeeding nitrogen can also help. – EB

PEPPERS

Bacterial leaf spot/speck is flaring up in several plantings. Copper is the standard treatment. Tanos is labelled with a 3-day PHI and can offer some suppression. Mancozeb is another effective protectant, but it is restricted use and the 7-day PHI is unattractive moving into harvest. – EB

POTATOES

Colorado potato beetles and potato leaf hoppers are active in potato fields. Be sure to monitor populations and treat if thresholds are reached. As we continue to have storm systems moving through western NY, it is important to remain consistent with fungicide treatments and monitor for any signs of disease. No new late blight has been reported this week. – ML

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SNAP BEANS

Rain and humid weather put beans at greater risk for a range of diseases including bacterial leaf spot. Flooded fields and wet spots because of recent heavy rains put plants at risk of drowned roots and diseases such as Pythium crown rot and *Phytophthora capsici*. Fields with a history of Sclerotinia white mold and with dense canopies are most at risk for developing white mold. Rainy weather is highly favorable! Flowers become infected and disease spreads to the rest of the plant. A first fungicide should be applied to fields at risk when there is an average of 1 open flower/plant in 10% of the plants; a second application may be considered at 100% bloom (this may happen within a day or two in some varieties in warm weather). Research in the Pethybridge group at Cornell focused on the products Endura, Topsin 4.5 FL, and Omega 500F. Each of these products is highly efficacious when applied at optimal timing and there was no significant difference in the disease control between the products. In further teasing out the optimal application timings, our research has shown that the optimal timing of Topsin 4.5 FL is at 10% bloom, and that this product is not effective when applied at 100% bloom. Furthermore, there is no benefit to a second application. Conversely, disease control with Omega 500F was not related to timing (10% or 100% bloom) and there was no benefit from a second application even when applied at 100% bloom. For growers who were not able to put on a spray at 10%, then Omega 500F would be the choice product to use. The timing of the other possible fungicides was not tested. For organic growers, the most efficacious and reliable product from year to year is Double Nickel (*Bacillus amyloliquefaciens* strain D747). Both the LC and 55 formulations are equally effective. While labeled at the rate of 1 to 2 quart/acre, there was no benefit of the higher rate, and thus 1 quart/acre is recommended. – JK

SQUASH

Squash vine borer very active in some locations. *[See last week's issue of VegEdge, "Squash Vine Borer: Nobody Likes a Bore!" ed. A. Ochterski, CVP]* The female moth flies early in the morning and resemble wasps. Eggs are deposited on the stem near the soil line. Eggs hatch and the larvae burrow into the stems. Frass can be seen coming out of the burrow holes. As larvae grow, internal stem damage interferes with moisture flowing through the vines. Vines wilt from stem tip back. In the beginning, during the heat of the day, wilting occurs then clears up during the night and by next morning, vines look good again. Within a few days, however, the wilting becomes worse and the vines die off. Some labeled conventional materials include Assail several pyrethroids such as Asana, Warrior, Mustang). For organic growers, Spinosad – Entrust or *Bt* - Dipel, Xentari. To work effectively, products must be sprayed ahead of egg hatching so that larvae can come into contact and must be ingested. – RH

SWEET CORN

Bird pressure usually increases around the third week of July, so now is the time to put out any deterrents you plan to use. Once the birds find a field, it is more difficult to deter them. – JK

TOMATOES

Early blight, septoria, bacterial diseases are all present. – EB

Stemphylium Leaf Blight (SLB) of Onion 2023 Research Highlights and Implications for Management in 2024: Part II – Piecing Together Tank Mixes with Low-Risk Mediocre Products (FRAC M5, 2, 12, 19, P07)

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This article is complimentary to:

- **The information presented by Christy and Frank at the Muck Onion Twilight Meeting in Oswego on June 20, 2024.** Please contact Christy if you would like the handouts from that meeting (Charts of key results from the fungicide trials, Plant Disease Management Reports including additional results and photo file of Wolcott trial).
- **Part I of this article which included the FRAC 3 situation, appeared in July 10 issue of VegEdge (includes Summary of Fungicide Recommendations for SLB in 2024).**
- **An article on Botrytis leaf blight necrotic spots** will be in a following issue of VegEdge.
- **The 2024 version of Cornell Onion (Dry Bulb) Fungicide "Cheat Sheet" for Control of Leaf Diseases in New York** found on the Cornell Vegetable Program website: CVP.CCE.CORNELL.EDU

Highlights from Part I

- Stemphylium leaf blight (SLB) of onion remains an important foliar disease of muck-grown onions in New York. When uncontrolled it causes severe leaf dieback that reduces bulb size, yield and bulb quality.
- The primary form of SLB is emphasized for purposes of evaluating fungicide trials and making management decisions.
- **SLB has developed resistance of varying degrees to fungicides that belong to FRAC groups 2, 3, 7, 9 and 11 in muck-onion production in New York.**

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- In 2023, new results were gleaned from 2 on-farm fungicide trials (Elba & Wolcott), fungicide sensitivity testing from isolates collected from Elba fungicide trial and reviewing spray programs and scouting data from 18 commercial muck-onion fields.
- Not all FRAC a.i.s are the same: Three novel (never used/labeled) FRAC 3 active ingredients were trialed in on-farm fungicide trials.
  - One (FRAC 3g prothioconazole, applied as Proline 5.7 fl oz/A) appeared to have no fungicide resistance and provided excellent control of SLB.
  - Alternatively, FRAC 3e (flutriafol, applied as Topguard) and FRAC 3f (tetraconazole, applied as Domark) were poor-to-fair or failed to control SLB, similar to Quadris Top/Inspire Super (FRAC 3b).
  - These results may be proof that the mechanism of fungicide resistance of SLB is not caused by a target site gene mutation, and that cross-resistance does not occur uniformly among all FRAC 3 a.i.s. Although cross-resistance appears to be occurring among FRAC 3a, 3b, 3c, 3e and 3f.
- Of the labeled FRAC 3s, 3a (Tilt) had the best field performance, while 3b (Inspire Super/Quadris Top) and 3c (in Viathon) had poor field performance.
- Viathon (FRAC 3c + P07) + Tilt (FRAC 3a) was the best treatment, but FRAC 3a and P07 appear to be doing most of work, not FRAC 3c.
- Fungicide sensitivity revealed that stacking 3a + 3c in Viathon + Tilt tank mix was not any riskier for selecting for highly insensitive isolates (= uncontrollable) than Viathon (3c) alone. Since Viathon + Tilt has better field performance than a single FRAC 3, it should be safe to use twice per growing season (e.g. no more than 3 apps per FRAC 3 + 3 per season).
- Increasing rates of FRAC 3 or adding more than 2 FRAC 3s to a tank mix did not significantly improve SLB control or plant health, but it did select for highly insensitive SLB isolates (= uncontrollable) and should not be done.

FRAC P07 alone has plant health benefits, some activity on SLB

- FRAC P07 applied as Rampart 3 qt/A alone had some activity on plant health (preventing leaf dieback, preventing plants from dying standing up and keeping foliage green) in both Elba and Wolcott fungicide trials.
- It significantly reduced primary SLB target spots and sporulation of necrotic leaf tissue in Wolcott but had no activity on SLB in Elba.
- FRAC P07 products include Rampart, Reveille, Kphite, etc. They have a low risk of fungicide resistance. Reveille 4 pt may be used up to 7 times per crop per season.

FRAC P07 has become an important tank mix partner

- **Bravo (FRAC M5) + FRAC P07**: In 2023, although not previously trialed in a fungicide trial, we decided to pair up Bravo 3 pt, which can have some/poor activity on SLB sporulation of necrotic leaf tips and SLB target spots, but is known for its very good activity on BLB halos and BLB necrotic spots, with FRAC P07 to add a little bit of extra activity on BLB necrotic spots, SLB sporulation of necrotic leaf tips, SLB target spots and prevention of leaf dieback, especially in a week when an insecticide needed to be sprayed.
  - Out of 19 commercial applications of Bravo + FRAC P07 +/- mancozeb that were sprayed in the onion scouting fields in 2023, 82% (16 sprays) appeared to hold or decrease primary SLB as measured by SLB target spots on green tissue.
  - It worked especially well earlier in the season before SLB pressure was high, and when it was placed between Viathon + Tilt and/or Miravis Prime + Rovral/Oso.
  - Bravo + FRAC P07 was not as effective when it was applied late in the season when SLB pressure was high and onions had begun lodging.
  - This combo is not included in the 2024 onion fungicide cheat sheet, because we only have observational data at this time. It is included in the 2024 on-farm fungicide trial.
  - This combo has a very low and low risk of fungicide resistance and maximum rates may be used up to 6 times per crop per season.
- **Oso (FRAC 19) + FRAC P07**: First attempts at evaluating Oso alone in fungicide trials failed, because Oso does not prevent excessive leaf dieback. When we first paired Oso 13 fl oz/A with FRAC P07 in 2022, it was as good as the best treatment and significantly better than FRAC P07 alone for reducing SLB target spots and SLB sporulation on necrotic leaf tip tissue.
  - In 2023 in the Wolcott trial, FRAC P07 applied as Rampart 3 qt/A performed very well, so there were no significant differences between Oso 10 fl oz + Rampart and Rampart. Overall, Oso 10 fl oz + Rampart placed 5th out of 19 treatments and was not significantly different than the best treatment for reducing primary SLB target spots and primary SLB sporulation of necrotic leaf tips.
  - In 2023 in Elba, where Rampart alone did not perform as well, Oso 10 fl oz + Rampart had significantly better control of SLB sporulation of necrotic leaf tips, and numerically more green foliage, fewer plants dying standing up and higher yield than Rampart alone.
  - This combo is included in the 2024 onion fungicide cheat sheet. Oso has a medium risk of fungicide resistance. Although the label allows for 6 maximum rate (13 fl oz) apps and it will always be used with another FRAC group to

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"guard" against fungicide resistance, since Oso has a medium risk for fungicide resistance just like FRAC 3, it is best to be prudent and not use Oso more than 3 times per season to preserve the useful longevity of this FRAC group, given our experience with FRAC 3 fungicide resistance.

FRAC 12 Cannonball has some activity on SLB

- Cannonball is the FRAC 12 in Miravis Prime. It has a mow-medium risk of fungicide resistance.
- In Wolcott, Cannonball significantly reduced primary SLB target spots and SLB spore colonization of necrotic leaf tissue by ~50% and had 3-times more green foliage then the nontreated.
- In Elba, Cannonball significantly reduced primary SLB sporulation on necrotic leaf tissue by 72% (placed 5th out of 18, not significantly different than best treatment), but did not have any activity on preventing leaf dieback or improving green foliage.
- Addition of Cannonball to Viathon + Tilt did not improve SLB control or plant health over V + T alone in Elba.
- Addition of Cannonball to Miravis Prime significantly improved control of primary SLB sporulation of necrotic leaf tips and green foliage, but not primary SLB targets, over Miravis Prime alone, in Wolcott.
- In Wolcott, there was no difference between Miravis Prime + Cannonball and Miravis Prime + Rovral 1.5 pt for primary SLB target spots, SLB sporulation on necrotic leaf tissue and green foliage, which were generally not significantly different than the best/2nd-best treatments and numerically better than Miravis Prime alone.

Tank mixes with FRAC 7 premixes: Miravis Prime + Oso/Rovral better than Luna Tranquility + Rovral for green foliage, 3-way tank mixes best in field

- Throughout the different SLB and plant health variables, there is a general trend for tank mixes to place among the better treatments, while single products tend to place closer to the worst treatment.
- There was generally no significant difference between Miravis Prime/Luna Tranquility + Rovral/Oso, except that Miravis Prime + Rovral/Oso had significantly greener foliage than Luna Tranquilty + Rovral in both trials.
- Miravis Prime + Oso consistently placed as good as the best or second-best treatments for all SLB and plant health variables in both trials.
- In the 2023 onion scouting program, primary SLB targets as measured by SLB targets on green tissue:
  - **Increased 75% of time following 2-way FRAC 7 premix applications** including Luna Tranquility (LT) + FRAC P07 (3 out 3), LT + Rovral (2 out of 3, 3rd reduced), Miravis Prime + FRAC P07 (1 out of 1) and Miravis Prime + Rovral (6 out of 8, other 2 held). Primary SLB targets decreased following Miravis Prime + Oso.
  - **Decreased 89% of the time following 3- & 4-way FRAC 7 premix applications** including Luna Tranquility + Rovral + FRAC P07 (2 out of 2), LT + Rovral + Bravo (4 out of 4), Miravis Prime + Rovral + Bravo (1 out 2, 2nd held) and Miravis Prime + Oso + Rampart (1 out of 2, 2nd held).
  - **These results suggest that 3-way tank mixes with Miravis Prime/Luna Tranquility + Rovral/Oso will perform better against SLB and plant health when Bravo or FRAC P07 is added to the tank.** This is what I will be recommending as a rotation partner with Viathon + Tilt for a strong finish.

FRAC 2 Rovral and FRAC 9 Scala: Combo no longer recommended for SLB

- In Wolcott, Rovral had some/poor activity on primary SLB sporulation on necrotic leaf tissue and plant health, and there were no significant differences between 1x (1.5 pt/A) and 2x (3 pt/A) rates of Rovral for any of the variables.
- In Elba, 1x rate Rovral 1.5 pt had had no activity on SLB sporulation of necrotic leaf tissue or plant health, yet Miravis Prime (MP) + Rovral 1.5 pt had significantly greener foliage than MP, Rovral and Luna Tranquility + Rovral. There were no differences between 1x (1.5 pt/A) and 2x (3 pt/A) rates of Rovral for any of the variables, except the 2x rate had some activity on SLB sporulation of necrotic leaf tissue.
- **These results suggest that the useful life of Rovral for SLB is over, although it appeared to still have some health benefits when used as a tank mix partner, and possibly some/poor activity for SLB sporulation on necrotic leaf tissue in Wolcott.**
- In Wolcott (not trialed in Elba), FRAC 9 Scala 18 fl oz/A had no activity on SLB or plant health.
- Of the 7 applications made in the 18 commercial fields of the onion scouting program in 2023, Scala 9 fl oz + Rovral 1.5 pt resulted in an increase in primary SLB as measured by % SLB targets on green tissue 57% of the time. It held (14%) or decreased primary SLB (28%) 43% of time, in which case one of the sprays included P07 Rampart.
  - Similarly, SLB increased following Rovral + Bravo (14%), Rovral + mancozeb (28%), and Rovral + Rampart (14%) 56% of the time but did hold following Rovral + mancozeb 28% of the time (6 sprays total).
  - SLB increased following Scala 9 fl oz/A, the one time that it was used.
- Given that Scala no longer has any useful activity on SLB, and **Scala + Rovral performed so poorly in commercial onion fields, Scala + Rovral has been dropped from the 2024 onion fungicide cheat sheet**.
- Rovral likely has more activity on SLB in Wayne and Oswego Cos. than it does in Elba, and it still has utility as a tank mix partner with FRAC 7 premix fungicides for improving plant health/keeping onion foliage green.
- We plan to conduct fungicide sensitivity testing on FRAC 2 on SLB isolates collected from onion scouting fields in 2024.

*==> See **Summary of Fungicide Recommendations for SLB in 2024** in July 10 issue of VegEdge. Look forward to 2023 research highlights and 2024 management implications for Botrytis leaf blight (BLB) necrotic spots in an upcoming issue of VegEdge.* ●

Upcoming Events

Vegetable Pest and Cultural Management Field Meeting for Auction Growers (Seneca)

July 24, 2024 (Wednesday) | 7:00 pm - ~9:00 pm
Levi Esh's farm, 2033 Yerkes Rd, Romulus, NY 14541

A hands-on demonstration of weed, insect and disease identification in vegetables including management options such as inter-row cover crops, grafting, and where appropriate, spray options primarily for those growing for wholesale auction. Details on each topic will focus on field observations at the farm. 1.75 DEC credits in categories 10, 1a, 23, and 24. FREE!

Lake Erie Region Vegetable Meeting

July 25, 2024 (Thursday) | 6:00 pm - 8:00 pm
Yerico Farms LLC, 3186 E Main St, Dunkirk, NY 14048

We'll take a look at sprayers, pepper anthracnose, and walk the fields discussing other crop production issues. 2.0 DEC credits in categories 1a, 10, and 23.

FREE! **Pre-registration requested by noon on Weds, 7/24**. Call Elizabeth Buck at 585-406-3419 to register.

Tree Fruit and Small Fruit Twilight Meeting

July 25, 2024 (Thursday) | 6:30 pm - 8:30 pm
Simpelaar Fruit Farms, 6018 State Rt 3, Mexico, NY

This meeting will examine seasonal changes in tree fruit and berry crops, demonstrate scouting techniques, and discuss integrative pest management solutions to maximize the health and productivity of berry and fruit plantings.

1.5 DEC credits available in categories 1a, 10, 22. This event is FREE, and no pre-registration is required. Pizza and refreshments provided by Valent. Questions? Contact aco56@cornell.edu

Niagara Region Vegetable Meeting

August 14, 2024 (Thursday) | 5:00 pm - 8:00 pm
Root Down Farm, 5850 Shimerville Rd, Clarence Center, NY 14032

We'll start this meeting off at Root Down Farm to hear late season disease management updates in peppers and cole crops, plus current best management practices to limit fungicide resistance. Potato variety recommendations and disease control questions in potatoes will be addressed.

Then we'll head to Kreher's beet field to view and discuss alternative weed control technologies. The beet field is an on-farm demonstration of various flame weeding protocols in comparison with stacked tool cultivation equipment. One or two weeding robots will be on-hand for live demonstrations and discussion of the technology's current abilities and future potential. We'll also cover industry updates and a review of late summer disease management in squash. See the full meeting agenda at CVP.CCE.CORNELL.EDU

2.0 DEC credits will be available in categories 23, 1a, and 10. FREE! Contact Elizabeth Buck at 585-406-3419 with questions.

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