# Vegetable & Fruit News

**The University of Maryland Extension Agriculture and Food Systems and Environment and Natural Resources Focus Teams proudly present this publication for commercial vegetable and fruit industries.**

Volume 12 Issue 4 July 15, 2021


## Mid-July Vegetable IPM Scouting Tips


By Emily Zobel
Senior Agent Associate, Agriculture
Dorchester County Extension


**General Tips:** Check > 50 plants throughout the whole field when making treatment decisions. Localized infestations can be spot treated to save time and money. For up-to-date chemical recommendations, check the Mid-Atlantic Commercial Vegetable Production Guide. Read all labels carefully for rates and restrictions.

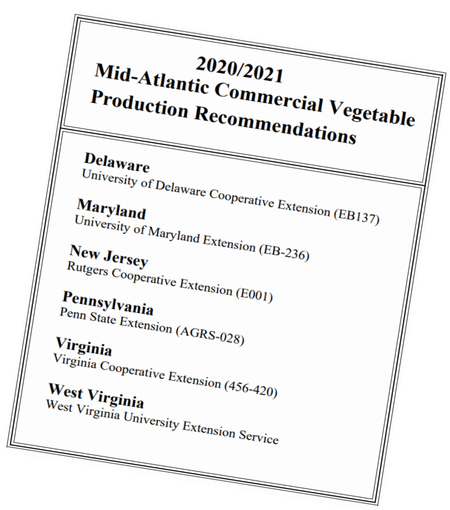
**Cucurbits:** Continue to scout for aphids, cucumber beetles and spider mites. Early detection is critical since these pest populations can quickly explode during hot, dry weather. Watch for rind feeding pests such as beet armyworm, yellow-striped armyworm, cabbage loppers, and cucumber beetle adults in melon fields.

**Sweet Corn:** Sample pre-tassel stage for whorl feeders (corn borer, corn earworm, and fall armyworm). Treatment should be applied when 15% of plants are infested with larvae and should be directed into the whorls.

**Lima Beans and Snap Beans:** Scout fields for aphids, leafhoppers, and spider mites. The leafhopper threshold is an average of 5 per sweep. As soon as pin pods are present, check for plant bugs and stink bug adults and nymphs. As a general guideline, treatment should be considered if you find 15 adults and/or nymphs leafhopper per 50 sweeps. Continue to scout for bean leaf beetles and Mexican bean beetles—Control when there is an average of 20% defoliation or 1 beetle per plant.

**Potatoes:** Scout fields for Colorado potato beetle, leafhoppers, and aphids. Controls will be needed for green peach aphids if you find 2 aphids per leaf during bloom and 4 aphids per leaf post-bloom. This threshold increases to 10 per leaf at 2 weeks from vine death/kill. If melon aphids are found, the threshold should be reduced by half.





2020/2021
Mid-Atlantic Commercial Vegetable Production Recommendations

**Delaware**
University of Delaware Cooperative Extension (EB137)
**Maryland**
University of Maryland Extension (EB-236)
**New Jersey**
Rutgers Cooperative Extension (E001)
**Pennsylvania**
Penn State Extension (AGRS-028)
**Virginia**
Virginia Cooperative Extension (456-420)
**West Virginia**
West Virginia University Extension Service

On-Line PDF
Click Here

What more great information between issues of the Fruit and Vegetable Newsletter, then check out the New Maryland Fruit & Vegetable Blog!


blog.umd.edu/umefruitveg/

# Watch Your Pumpkins and Squash for Squash Vine Borer

**By Jerry Brust**
**Extension IPM Vegetable Specialist**
**University of Maryland**
**jbrust@umd.edu**

I have gotten several emails and calls from growers in different areas of the state reporting they are seeing the beginnings of squash vine borer problems in their pumpkins or squash crops. IF you rotated at least 1/2 mile from your squash/pumpkin fields of last year you should be OK, however I know some growers either cannot rotate or they cannot rotate very far from last year's crop.


**Fig. 1 Adult squash vine borer at rest.**

Squash vine borer adults, *Melittia cucurbitae*, are moths that look like wasps. They are about ½ inch long with an orange abdomen and black dots (fig. 1). These moths are day flyers and can easily be spotted flitting about a squash or pumpkin field. The adults emerge in mid or late June in our area. Adults lay most of their eggs in the first 12-15 inches of the stem. Pumpkins, zucchini and summer and winter squash are preferred plants, rarely have I seen them in watermelon, cucumber or cantaloupe. The eggs hatch in about one week at which time larvae bore directly into stems and feed. The large cream-colored larvae are 1-1.5 inches long (fig. 2). Their feeding blocks the flow of water to the rest of the plant. Larvae feed for 4-6 weeks, then exit the stems and burrow into the soil to pupate, where they overwinter.


**Fig. 2 Squash vine borer larvae (4) in stem.**

The first symptom of a borer attack is the wilting of plants, which usually occurs in July. The wilting may occur at first only when in direct sun, but the plants will eventually die. At the base of the plant you can find greenish-yellow sawdust like material (frass) and a scarred swollen stem (fig. 3).


**Fig. 3 Frass (arrow) and pumpkin stem damaged by borers.**

Squash vine borers can be difficult to manage once larvae are in the stem, as it is too late to do much. When squash vines begin to run or you see adults you can treat the base of the stem (the first 15-18 inches of stem) with a pyrethroid insecticide (or any other recommended pesticide in the Mid-Atlantic Vegetable recommendation guide) every 7-10 days, over the next 21-30 days. You could also use Bt insecticide (it is OK but not great) or Entrust which is better and both are OMRI approved.

# Club Root Found in Brassica Crops

By Jerry Brust
Extension IPM Vegetable Specialist
University of Maryland
jbrust@umd.edu

It is odd that we would have a couple of reports of an unusual disease of brassicas turn up in the same week, but we did. Clubroot caused by *Plasmodiophora brassicae* is a major disease of brassica, i.e., broccoli, cabbage, turnip, rutabaga, and radish. It can also infect weeds in the mustard family as well as some grasses. This soil-borne fungus infects susceptible plants through their root hairs. Diseased roots become swollen, misshapen and deformed (clubbed or galled) often cracking and rotting (fig. 1). As a result, plants have difficulty absorbing water and nutrients. The symptoms can at times look similar to root knot nematode damage and you would need to send a sample into a diagnostic lab to be sure.

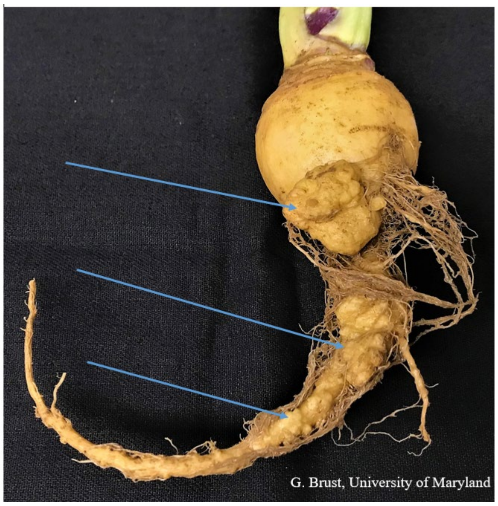



**Fig. 1 Club root disease on rutabaga, galls on main tap root (arrows).**

Infected roots enlarge to form galls that differ in size and shape depending on the host plant. On crops with fleshy roots such as rutabaga and turnip, galls form on the taproot or secondary roots (fig. 1). Crops with fibrous roots such as cabbage and broccoli produce club-like, spindle-shaped swellings on individual roots (fig. 2). The disease can be well established in the roots before any above ground symptoms are apparent. At first plants will grow poorly and wilt during the heat of the day but recover at night. Outer leaves may turn yellow or brown. Root galls are often invaded by secondary organisms causing root decay and the death of the plant. Club root can reduce yields and at times cause total crop failure.

Disease development occurs over a wide range of conditions, but is favored by excessive moisture, low soil pH (below 6.5) and soil temperatures between 64$^{o}$ and 77$^{o}$F (warmer soils increase disease severity with a minimum soil temperature of 57°F being needed). The repeated production of brassica crops in the same field can lead to a rapid build-up of the pathogen. Spores can survive in the soil for as many as 10-20 years. The disease is spread by drainage water, infested soil on equipment and tools and infected transplants.


**Fig. 2 Club root disease on fibrous crucifer roots.**

Clubroot can be difficult to manage because the pathogen produces thick-walled, long-lived spores. Although there are reports that suggest clubroot spores can live for as long as 20 years, enough spores are expected to die within 5 to 7 years to make this (5-7 years) a more realistic rotation period. Even so, the pathogen is unlikely to be eradicated once established in a field. Some things that can be done culturally to help reduce its severity are to maintain a 'high' pH (>7.1) using calcitic lime instead of dolomitic, except where magnesium levels are very low. While liming will not eliminate clubroot problems in the field, it can significantly reduce infection rate and disease severity. Because a high pH can lead to boron deficiency in sandy soils boron may be needed as a foliar spray. In addition to pH changes growers can improve soil drainage, so there is little waterlogging or run-off, reduce any brassica weeds both during the growing season and between seasons and make sure transplants are clean. Although resistant cultivars are available they might not fit into a grower's production practices. Resistant cultivars should be used in combination with other methods of clubroot control.

Because infected plants may show no obvious aboveground symptoms or yield loss when disease severity is low or moderate it is recommended to randomly dig a few plants up and inspect their roots for galls if your farm has any history of clubroot.

# Unusual Pest Found in Tomatillo Crop

By Jerry Brust
Extension IPM Vegetable Specialist
University of Maryland
jbrust@umd.edu

I was at a farm the other day that had a wide variety of crops on it and the grower showed me what we at first thought were odd looking Colorado potato beetle larvae in their tomatillos, but they did not really look like CPB. These larvae were three-lined potato beetle *Lema trilinea*, which can be found on Solanaceae crops such as potato, tomato, eggplant, pepper, etc. The funny thing is they are usually not found on potato or tomato, but most commonly found on tomatillo *Physalis ixocarpa* as they were on this farm.

Adults are orange-yellow, with three lengthwise black stripes (fig. 1). These stripes can look very similar to striped cucumber beetle stripes. The head and thorax are usually orange. Female beetles lay 6-20 orange-yellow eggs in groups, usually on the undersides of leaves.


**Fig. 1 Adult three lined potato beetle.**

Eggs hatch in about two weeks and larvae feed side by side in a row (fig. 2), starting at the leaf edge and moving backward. When larvae are larger they separate and move around the plant. Larvae are full grown in about two to three weeks. Larvae pupate in the ground and emerge in 1-2 weeks as adults that will eventually overwinter and emerge next year in early spring.


**Fig. 2 Three lined potato beetle larvae covered in feces lined up to feed.**

The weird thing about these larvae is that their body is kept moist and sticky by a coating of their own feces. The larvae feed on Solanaceous plants that contain glycoalkaloids which most other insects do not like to eat. So the larvae cover their bodies with their own feces, making them distasteful to predators.

Larvae and adults feed on Solanaceous crops and prefer tomatillos and husk tomatoes (*Physalis pruinosa* or *P. pubescens*). Both larvae and adults chew angular shaped holes in the leaves, feeding along the margin of the leaf and can consume most leaf tissue except for the mid-vein. Larvae tend to feed on the underside of leaves.

Although the damage by this pest is sporadic and population levels rarely reach economic levels, I have seen them more often in the last couple of years feeding on various solanaceous crops, possibly because tomatillo crops are becoming more common. As of right now controls are rarely needed for management. However if necessary the pesticides used for Colorado potato beetle, also can be effective against the three-lined potato beetle.

# Black Dot Root Rot Found in High Tunnel Tomatoes

**By Jerry Brust**
**Extension IPM Vegetable Specialist**
**University of Maryland**
**jbrust@umd.edu**

A root disease that is most commonly associated with potato has turned up on tomato in a high tunnel. This disease goes by the delightful name of black dot root rot. The causal agent is *Colletotrichum coccodes,* which also causes anthracnose fruit rot on tomato (sunken, water-soaked, circular lesions). *C. coccodes* infection on tomato roots appears as lesions on the root surface that produce black microsclerotia (the 'black dot' in its name) (fig. 1). Infected plants will sometimes wilt with the lower and middle leaves of the plant turning yellow.

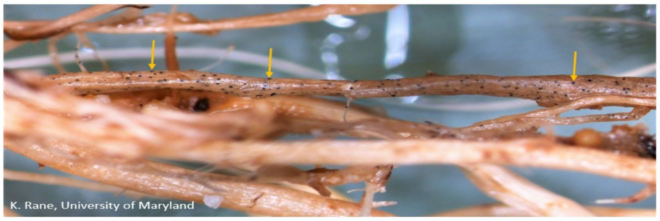



**Fig. 1 Black dots (microsclerotia of *C. coccodes,* arrows) on tomato root.**

*C. coccodes* has a very large host range, which includes members of Solanaceae, Cucurbitaceae and Leguminosae, both crops and weeds. Nightshade in particular (a solanaceous weed) can harbor the fungus, often without showing symptoms. The pathogen can survive in the soil for up to eight years as microsclerotia.

This pathogen causes problems only under poor growing conditions or when other pathogens are present. The disease occurs in greenhouses or high tunnels where there has been a continuous cropping of tomato for several years, resulting in very high levels of inoculum. Other conditions that can be encountered in high tunnels, such as high soluble salt levels, low pH, low or excessive fertilization, high temperatures and water stress, can predispose plants to infection and root rot by *C. coccodes*. These infected plants can at times show few symptoms, but still be responsible for yield reductions.

The disease can be prevented by growing in optimal conditions for tomato in the high tunnel. Deep plowing (12-15 inches, not easy to do in a high tunnel we know) degrades infected plant debris more rapidly and buries propagules both of which may help reduce fungal populations. Steam sterilization of the soil can greatly reduce disease incidence. Crop rotation is another tried and true management plan if growers can rotate out of any solanaceous, leguminous or cucurbit crops for 3-4 years - something most growers probably cannot financially do. Grafting is another possibility, but even grafted plants can still become infected with this disease. A particular root stock may be resistant or more tolerant of the disease, but this is something that would need to be checked before using. Small grain or corn can be used in rotation to reduce fungal populations.

# Fusarium Crown Rot in Squash

By Jerry Brust
Extension IPM Vegetable Specialist
University of Maryland
jbrust@umd.edu

A County agent sent pictures of squash that were turning yellow and wilting (fig. 1). This was found to be Fusarium crown rot caused by the fungus *Fusarium solani* f. sp. *cucurbitae* with a little Anthracnose caused by *Colletotrichum orbiculare* mixed in with it. In the field, Fusarium crown rot is generally a problem in summer and winter squash, and some pumpkin cultivars, but most cucurbits have been found to be susceptible.


**Fig. 1 Squash plants turning yellow and wilting.**

Early symptoms of Fusarium crown rot consist of stunting and wilting of the plant. The symptoms first observed at the crown include light colored water-soaked areas that become increasingly darker. A characteristic dark brown necrotic rot of the crown and at times the upper portion of the tap root develops soon after initial symptoms (fig. 2). Infected plants break off easily at or just below the soil line. During typical summer weather (hot and humid), white or pink mycelial growth can be seen on the lower stem. While the roots of a plant can become infected, this pathogen is most often found in the stem just above the soil line or possibly in the fruit of the plant. If fruit are attacked there is a dry (not mushy) rot that develops. These rotted areas can develop a bulls-eye pattern. Other soil borne pathogens can make Fusarium crown rot even worse and the occurrence of anthracnose in these particular plants did not help matters.


**Fig. 2 Rotted base of stem of squash from Fusarium crown rot.**

Inoculum can come from the soil or the seed. Inoculum from the soil comes from previously infected plants incorporated into the soil. From seed, Fusarium crown rot can be internally or externally seedborne. It is found in the seed coat and between the seed coat and cotyledons, however, it generally does not infect the cotyledons or reduce seed viability of seeds. It remains viable in seeds for 1-2 years. This pathogen is host specific and occurs as races.

Fusarium crown rot occurs sporadically in most areas, and disease severity is determined by the amount of soil moisture and inoculum density. Because the fungus survives in the soil for 2–3 years as chlamydospores a 4-year rotation is often effective for disease control. Planting fungicide-treated seed also helps in reducing the occurrence of the disease that is introduced from infected seed.

# Pumpkin Disease Control

By Gordon Johnson
Extension Vegetable & Fruit Specialist
University of Delaware
gcjohn@udel.edu

*Note: I was recently asked about disease control programs for pumpkins. The following was modified from an article by Dr. Kate Everts in 2019 that I have added updated fungicide recommendations and additional information about certain diseases.*

A frequent question that I get from growers is, "What is the best spray program for my pumpkin crop and other ornamental squashes?" It is a challenging question to answer, in part because each field/farm may have different disease pressure, and Ag Chem suppliers may only stock some fungicides. With that in mind, I have come up with the following step-by-step procedure to use as a guide in designing an individualized pumpkin program. The numbers in parenthesis that follow the fungicide name are the Fungicide Resistance Action Committee (FRAC) code for the product. Except for the broad- spectrum fungicides chlorothalonil, mancozeb and copper, always alternate other fungicides with different FRAC codes to avoid disease resistance buildup.

**Step 1**
Use all available cultural practices to reduce disease pressure, including planting disease resistant varieties when possible, using good rotations, and using no-till mulch based systems. If possible, modify your spray equipment to get excellent fungicide coverage on both the upper and lower surfaces of leaves.

**Step 2**
Learn to identify key diseases: powdery mildew, downy mildew, Plectosporium blight, gummy stem blight/black rot and bacterial leaf spot.

**Step 3**
Begin a basic preventative spray program with a chlorothalonil or mancozeb product. Spray every 7 to 14 days, beginning when vines run. (Organic alternative:

copper). This will give protection against most foliar diseases.

**Step 4**

Use predictive models or scout for disease presence and if the following diseases occur or are predicted, use the following guidelines:

### *Gummy Stem Blight/Black Rot and Anthracnose*

Alternate chlorothalonil with Rally (3), tebuconazole (3), Procure (3), Proline (3), Rhyme (3), Inspire Super (3+9), Aprovia Top (3+7), Switch (9+12), or Miravis Prime (7+12).

### *Bacterial Leaf Spot*

Add a copper product to the basic preventative program (applied every 7 to 10 days).

### *Powdery Mildew*

Powdery mildew control is critical to maintain quality of pumpkins and maintain strong "handles". Some varieties have resistance or tolerance to powdery mildew and should be used when possible. Powdery mildew generally occurs from mid-July until the end of the season. Development on tolerant varieties will vary from year to year. Planting tolerant varieties will help delay the development of powdery mildew and improve the performance of fungicides.

Make first application when powdery mildew is observed in the area or is detected by scouting (one lesion on the underside of 45 old leaves per acre). Add powdery mildew specific products to basic preventative program. Alternate FRAC codes. *Select one of these*: Vivando (50), Luna Experience (3+7), Torino (U06), or Quintec (13). *And alternate with one of the following*: Rally (3), tebuconazole (3), Proline (3), Rhyme (3), Inspire Super (3+9), Luna Experience (3+7), Aprovia Top (3+7), Magister(39), Miravis Prime (7+12) or Pristine (7+11). (Organic alternative: Regalia, Micronized Wettable Sulfur)

### *Downy Mildew*

Only apply if the disease is predicted in the region. Strains of downy mildew that infect cucumbers and cantaloupe may not affect pumpkins and winter squash. If found in the region, add downy mildew specific product to the basic preventative program. Select two downy mildew products with different FRAC codes and alternate them. *Downy mildew products include*: Orondis Ultra (U15+40), Orondis Opti (M5+U15), Ranman (21), Previcur Flex (28), Presidio (43), Elumin (22), Zing! ((M5+22), Ariston (M5+27), Tanos (11+27), Curzate (27), Forum (40), and Zampro (40+45).

### *Plectosporium Blight*

Chlorothalonil is good on Plectosporium blight. Full coverage will be needed for control.

**Step 5 Special cases:**

### *Phytophthora Fruit Rot.*

Avoid planting pumpkins in a field with a history of this disease. To manage Phytophthora fruit rot, select two of the following Phytophthora products that are in different FRAC code groups and rotate them. Phytophthora fruit rot products include Orondis Ultra (U15+40), Orondis Opti (M5+U15), Ranman (21), Presidio (43), Elumin (22), Zing! ((M5+22), Forum (40), and Zampro (40+45).

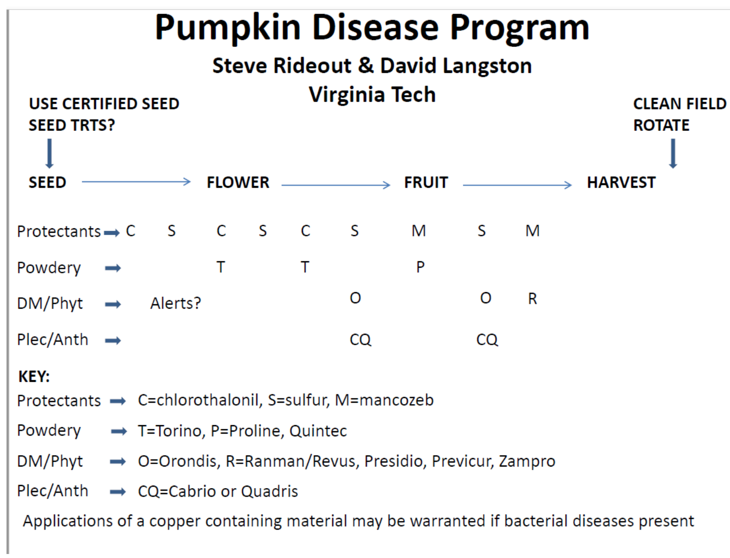
### *Fusarium Fruit Rot*

This disease is especially destructive in fields where pumpkins are grown every year. Once the pathogen is established in a field, loss can be significant. Fruit rot is caused by several Fusarium spp., and fungicide applications are not effective. Hard rind cultivars are less susceptible to Fusarium fruit rot than other cultivars. Production of pumpkin on a no-till cover crop mulch layer such as winter rye plus hairy vetch has been shown to help reduce disease incidence. Greater disease reductions will occur when the mulch layer is thicker.

### *Viruses (WMV, PRSV, ZYMV, and CMV)*

The most prevalent virus in the mid-Atlantic region is WMV, followed by PRSV, ZYMV, and CMV. For control use varieties with virus resistance whenever possible. Reduce aphid transmission of viruses with insecticide programs.

This information was adapted from
https://sites.udel.edu/weeklycropupdate/?p=14260
Written by Kate Everts, Vegetable Pathologist, University of Maryland and the Mid-Atlantic Commercial Vegetable Production Recommendations:
https://www.udel.edu/content/dam/udelImages/canr/photography/extension/sustainable-ag/NFP-2020-F-Pumpkin.pdf





**Plectosporium blight** on pumpkin stem or "handle." (Photo by A. Bratsch, VT)

**Phytophthora blight** on pumpkin stem http://vegetablemdonline.ppath.cornell.edu

**Phytophthora blight** on pumpkin stem http://vegetablemdonline.ppath.cornell.edu


**Powdery Mildew** on pumpkin leave University of Missouri Extension


**Curcurbit downy mildew** on bottom of pumpkin leaves University of Georgia


**Curcurbit Downy Mildew** on the top of pumpkin leaves University of Georgia

# Heat Damage in Vegetables Revisited

**By Gordon Johnson**
**Extension Vegetable & Fruit Specialist**
**University of Delaware**
gcjohn@udel.edu

The current heat wave is causing losses in vegetables and fruits. The following are some effects of high temperatures on vegetable and fruit crops.

The plant temperature at which tissue dies is around 115°F. Normally, plant temperature is just above air temperature. However, plant temperature can rise to a critical level under certain conditions. Plants have 3 major ways in which they dissipate excess heat: 1) long-wave radiation, 2) heat convection into the air and 3) transpiration.

A critical factor is transpiration. If transpiration is interrupted by stomatal closure due to water stress, inadequate water uptake, injury, vascular system plugging or other factors, a major cooling mechanism is lost. Without transpiration, the only way that plants can lose heat is by heat radiation back into the air or wind cooling. Under high temperatures, radiated heat builds up in the atmosphere around leaves, limiting further heat dissipation.
Dry soil conditions start a process that can also lead to excess heating in plants. In dry soils, roots produce Abscisic Acid (ABA). This is transported to leaves and signals to stomate guard cells to close. As stomates close, transpiration is reduced. Without water available for transpiration, plants cannot dissipate much of the heat in their tissues. This will cause internal leaf temperatures to rise.

Vegetables can dissipate a large amount of heat if they are functioning normally. However, in extreme temperatures (high 90s or 100s) there is a large increase the water vapor pressure deficient (dryness of the air). Rapid water loss from the plant in these conditions causes leaf stomates to close, again limiting cooling, and spiking leaf temperatures, potentially to critical levels causing damage or tissue death.

Very hot, dry winds are a major factor in heat buildup in plants. Such conditions cause rapid water loss because leaves will be losing water more quickly than roots can take up water, leading to heat injury. Therefore, heat damage is most prevalent in hot, sunny, windy days from 11 a.m. to 4 p.m. when transpiration has been reduced. As the plants close stomates to reduce water loss, leaf temperatures will rise even more. In addition, wind can decrease leaf boundary layer resistance to water movement and cause quick dehydration. Wind can also carry large amounts of advected heat.

Photosynthesis rapidly decreases above 94°F, so high temperatures will limit yields in many vegetables and fruits. While daytime temperatures can cause major heat related problems in plants, high night temperatures can have great effects on vegetables, especially fruiting vegetables. Hot night temperatures (nights above 75) will lead to greater cell respiration. This limits the amount of sugars and other storage products that can go into fruits and developing seeds.

High temperatures also can cause increased developmental disorders in fruiting vegetables. A good example is with pollen production in beans. As night temperatures increase, pollen production decreases leading to reduced fruit set, reduced seed set, smaller pods, and split sets. Most fruiting vegetables will abort flowers and fruits under high temperatures.

Heat injury in plants includes scalding and scorching of leaves and stems, sunburn on fruits and stems, leaf drop, rapid leaf death, reduction in growth, and lower yields. 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.

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 have limited shading of the plastic. This can cause heat lesions just above the plastic. Heat lesions are usually first seen on the south or south-west side of stems. High bed temperatures under plastic mulch can also lead to reduced root function limiting nutrient uptake. This can lead to increased fruit disorders such as white tissue, yellow shoulders, and blotchy ripening in tomato fruits.

High heat and associated water uptake issues will cause heat stress problems. As heat stress becomes more severe a series of event occurs in plants starting with a decrease in photosynthesis and increase in respiration. As stress increases, photosynthesis shuts down due to the closure of stomates which slows or stops $CO_2$ capture and increases photorespiration. This will cause growth inhibition. There will be a major slow-down in transpiration leading to reduced plant cooling and internal temperature increase. At the cellular level, as stress becomes more severe there will be membrane integrity loss, cell membrane leakage and protein breakdown. Toxins generated through cell membrane releases will cause damage to cellular processes. Finally, if stress is severe enough there can be plant starvation through rapid use of food reserves, inefficient food use, and inability to call on reserves when and where needed.

Another negative side effect of reduced plant photosynthate production and lower plant food reserves during heat stress is a reduction in the production of defensive chemicals in the plant leading to increased disease and insect vulnerability.

The major method to reduce heat stress is by meeting evapotranspiration demand with irrigation. Use of overhead watering, sprinkling, and misting can reduce of tissue temperature and lessen water vapor pressure deficit. Certain mulches can also help greatly. You can increase reflection and dissipation of radiative heat using reflective mulches or use low density, organic mulches such as straw to reduce surface radiation and conserve moisture. In very hot areas of the world, shade cloth is used for partial shading to total incoming radiation and heat. Research at UD has shown that use of shade cloth can have significant benefits in heat sensitive crops if applied at the right time.

# Sunburn in Fruiting Vegetables and Fruit Crops and Sunburn Protection

By Gordon Johnson
Extension Vegetable & Fruit Specialist
University of Delaware
gcjohn@udel.edu

With the recent hot temperatures and more predicted, there is high potential for sunburn in fruits and fruiting vegetables. Growers may need to consider ways to protect against sunburn. Sunburn is most prevalent on days with high temperatures, clear skies and high light radiation. We commonly see sunburn in watermelons, tomatoes, peppers, eggplants, cucumbers, apples, strawberries, and brambles (raspberries and blackberries).

There are three types of sunburn which may have effects on the fruits. The first**, sunburn necrosis**, is where skin, peel, or fruit tissue dies on the sun exposed side of the fruit. Cell membrane integrity is lost in this type of sunburn and cells start leaking their contents. The critical fruit tissue temperature for sunburn necrosis varies with type of fruit. Research has shown that the fruit skin temperature threshold for sunburn necrosis is 100 to 104°F for cucumbers; 105 to 108°F for peppers, and 125 to 127°F for apples. Fruits with sunburn necrosis are not marketable.


**Injury may be white to brown in color.**

Sunburn necrosis and photooxidative sunburn on pepper fruit. Note secondary disease infections on damaged tissue. The second type of sunburn injury is **sunburn browning**. This sunburn does not cause tissue death but does cause loss of pigmentation resulting in a yellow, bronze, or brown spot on the sun exposed side of the fruit. Cells remain alive, cell membranes retain their integrity, cells do not leak, but pigments such as chlorophyll, carotenes, and xanthophylls are denatured or destroyed. This type of sunburn browning occurs at a temperature about 5°F lower than sunburn necrosis (i.e. 115 to 120°F in apples). Light is required for sunburn browning. Fruits may be marketable but will be a lower grade.

The third type of sunburn is **photooxidative sunburn**. This is where shaded fruit are suddenly exposed to sunlight as might occur with late pruning, after storms where leaf cover is suddenly lost, or when vines are turned in drive rows. In this type of sunburn, the fruits will become photobleached by the excess light because the fruit is not acclimatized to high light levels, and fruit tissue will die. This bleaching will occur at much lower fruit temperatures than the other types of sunburn. Damaged tissue is often white in color.

Recent storms have caused canopies in some vegetable crops to be more open, exposing fruits to a high risk of both sunburn necrosis and photooxidative sunburn. Genetics also play a role in sunburn and some varieties are more susceptible to sunburn. Varieties with darker colored fruit, those with more open canopies, and those with more open fruit clusters have higher risk of sunburn. Some varieties have other genetic properties that predispose them to sunburn, for example, some blackberries are more susceptible to fruit damage from UV light.

Control of sunburn in fruits starts with developing good leaf cover in the canopy to shade the fruit. Fruits most susceptible to sunburn will be those that are most exposed, especially those that are not shaded in the afternoon. Anything that reduces canopy cover will increase sunburn, such as foliar diseases, wilting due to inadequate irrigation, and excessive or late pruning. Physiological leaf roll, common in some solanaceous crops such as tomato, can also increase sunburn.

In crops with large percentages of exposed fruits at risk of sunburn, fruits can be protected by artificial shading using shade cloth (10-30% shade). However, this is not practical for large acreages.

For sunburn protection at a field scale, use of film spray-on materials can reduce or eliminate sunburn. These materials are kaolin clay based, calcium carbonate (lime) based, or talc based and leave a white particle film on the fruit (such as Surround, Screen Duo, Purshade and many others). There are also film products that protect fruits from sunburn but do not leave a white residue, such as Raynox. Apply these materials at the manufacturer's rates for sunburn protection. They may have to be reapplied after heavy rains or multiple overhead irrigation events.

While particle films have gained use in tree fruits, their usefulness in vegetables is still unclear. Research at UD and the University of Maryland has shown reduced fruit disorders such as sunburn in peppers and white tissue in tomatoes when applied over those crops. Watermelon growers have used clay and lime-based products for many years to reduce sunburn in that crop in southern states.

There are some drawbacks to the use of particle films. If used for sunburn protection on fruits, there is added cost to wash or brush the material off at harvest. Where overhead irrigation is used, or during rainy weather, the material can be partially washed off of plants, reducing effectiveness and requiring additional applications. Produce buyers can also have standards relating to the use or particle films and may not accept products with visible residues. For example, some watermelon brokers will accept watermelons where calcium carbonate protectants have been used but will not accept watermelons sprayed with clay-based products.

# Brown Rot of Peaches and Nectarines

**By Gordon Johnson**
**Extension Vegetable & Fruit Specialist**
**University of Delaware**
gcjohn@udel.edu

Conditions have been highly favorable for the development of brown rot in nectarines and peaches. Brown rot has blossom, shoot, canker, and fruit phases.

Brown rot is caused by the fungus *Monilinia fructicola.* The disease overwinters in orchards with mummified fruit, infected twigs, and branch cankers. It is the fruit mummies that are the major initial source of inoculum. Good orchard sanitation to remove mummies is necessary to reduce brown rot pressure.

**Brown rot of peach.**

Blossom and twig infections that occur earlier in the year are the major source of inoculum for fruit infections. Fruit become more susceptible to brown rot as they color up and fruit with damage (branch abrasions, insect damage, bird damage, etc.) are most susceptible.

Brown rot infections need free moisture from dew or rain and infections are greatest in warm conditions (optimum temperature for infection is 77°F) with humidity above 95%. Under optimal conditions of moisture and temperature, infection takes one to six hours.

Fungicides are critical for brown rot control in nectarine and peach orchards. A good fungicide program requires two to three applications during bloom and two to three applications prior to harvest. Ripe fruit ready to be picked are very susceptible to brown rot infection. An application of a brown rot fungicide immediately before harvest (1 to 3 days) may be needed to provide fruit with an adequate shelf life. Always check the fungicide labels for days to harvest for any product used in the orchard.

In recent years, the brown rot organism has developed resistance to certain fungicides in some orchards in the east. Resistance has been documented to Benzimidazole (BZI) fungicides (such as Topsin M), demethylation inhibitor (DMI) fungicides such as propiconazole, fenbuconazole, tebuconazole, and metconazole, and the Quinone outside inhibitors (QoIs) including azoxystrobin and pyraclostrobin According to Rutgers University "At least three different chemistries should be utilized in the preharvest sprays since these highly effective compounds are at-risk for resistance development. Some example programs are:

Merivon / Indar / Merivon
Luna Sensation / Indar / Luna Sensation
Flint Extra (at maximum rate) / Indar / Fontelis
Note, other DMI fungicides, such as Orbit, PropiMax, Orius, and Rhyme could be substituted for Indar."

Sulfur and captan are labeled for use against pre-harvest brown rot: however, these products are not effective enough when utilized alone for pre-harvest brown rot management.

Again from Rutgers: "Unlike the at-risk materials, captan is a multi-site inhibitor and therefore not susceptible to resistance development. Thus, the combination of captan and use of three different at-risk chemistries provides an excellent strategy against resistance development in the preharvest fungicides."

The key therefore to management of brown rot with fungicides is to include captan, rotate other chemistries, use highest recommended rates where brown rot pressure is high, and use proper timings.

# Determining Peach Fruit Maturity

**By Yixin Cai**
**Graduate Student, Farcuh Lab**
**&**
**Macarena Farcuh**
**Assistant Professor and Extension Specialist**
**University of Maryland, College Park**
mfarcuh@umd.edu

The maturity stage of peach at harvest depends on its target market. Peaches for wholesale are usually harvested firm when their skin just turns yellow for better storability, while peaches sold at farmer markets or pick your own can delay harvest timing until red blush develops with softer texture and higher sweetness for better eating equality. Thus, it is key to develop peach maturity indices for an optimum fruit quality harvest depending on your target market.

**Representative sample collection**
Peach maturity differs among cultivars/rootstock, different blocks of orchard or even the same tree. Therefore, each cultivar and each block should be sampled separately, and representative samples should be collected in the same manner from each sampled tree.

Sampling for maturity ideally takes place four weeks before the estimated time of harvest and continues until harvest. Analysis for maturity should be performed weekly and every other day when fruit is close to its anticipated maturity. Days after full bloom (DAFB) is a useful tool to estimate the harvest timing if the previous harvest dates for each block are well recorded. In general, the DAFB can range from 150-180 days depending on cultivars. Keep in mind that the actual DAFB can vary 5 to 20 days depending on the environmental conditions of the season.

The first step for sampling is to choose 10 to 20 trees per block per cultivar and rootstock. Selected trees should be representative in terms of the crop load and vigor. Avoid choosing trees from the borders of any blocks, as those trees are likely encountering more traffic, wind, and irradiation. Label the sampled tree and keep sampling from the same tree.

Fruits from outer part of tree can receive more irradiation and usually ripen earlier than fruits from the inner part. Therefore, sample 2 to 3 fruits from the periphery of each marked tree. Select fruit with uniform size without any visible defects. Keep sampling methods consistent and collect samples at the same time of day and measure quality within 2 hours of picking.

### Measurement of peach fruit maturity indices

### A) Color changes

**Surface color:** The red skin color in most peach cultivars increases with sunlight exposure which is influenced by its location in the canopy, but decreases with high temperature and excessive or insufficient nutrient availability. There is also cultivar/rootstock variation in red skin color. Therefore, the degree of red coloration is not a good indicator for maturity, although it is a key aspect for its marketability.

**Background color:** Changes in background color are widely used as one of the maturity indices for peaches. The break from green to yellow (for yellow flesh peaches) or cream color (for white color peaches) is a sign of maturity for harvest, if targeting for long distance shipping or long duration storage. In general, a fully ripen peach has dark yellow color and should be sold immediately, while orange color indicates that the fruit is over-ripe. Tools such as color charts (Fig. 1) are useful to help estimate more defined maturity stages. However, background color measurement does not work well with solid red cultivars such as 'Sunhigh'. They will have higher percent of red coloration even before their optimal maturity and background color change is not perceptible to the naked eye. For those cultivars, it is necessary to choose other maturity indices for accurate harvest timing. The background color cannot be used alone as a maturity indicator.

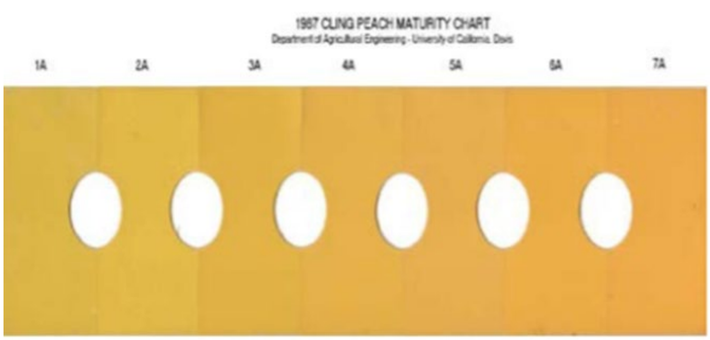



**Figure 1.** **Peach background color chart (1 to 7 scale). Image adapted from How to use a color chart. Source: UC Davis Postharvest Center.**

**Chlorophyll content:** As fruit ripens, chlorophyll contents decrease. The DA meter is a portable device measuring the Index of Absorbance Difference ($I_{AD}$), which has a strong relation to the chlorophyll-a content in fruit skin. The $I_{AD}$ value decreases as chlorophyll degrades during ripening. The DA meter shines LED light to fruit skin and measures the amount of light reflected back. In general, an immature peach has $I_{AD} > 0.9$; a peach that is ready to be harvested for the wholesale market has $I_{AD}$ between 0.4 and 0.9 (Fig. 2); while a ready to eat peach, sold locally through farmers markets, has $I_{AD}$ between 0 and 0.4. Although DA meter is a handy tool to access maturity stage, it cannot be used solely and must be used in combination with other indices.

**Figure 2.** **Using a DA meter to quantify the Index of Absorbance Difference ($I_{AD}$) in peach which relates to the actual content of chlorophyll-a in the fruit skin. Source: Yixin Cai, University of Maryland.**

### B) Size and diameter

Peach maturity can also be determined by the fruit shape and fullness of cheeks, especially when the shoulders and suture are filled out and well developed. The diameter of a peach can be measured equatorially by a hand-held caliper at its widest part (Fig. 3). The size of peach varies by canopy position, crop load, water and nutrient status as well as genetic of cultivar and rootstock (Layne, 2010). Peaches with 2.5 inches and larger in diameter appeals more to consumers, and are highly demanded in farmers markets.

**Figure 3.** **Using a hand-held caliper to measure the diameter of peach. Source: Yixin Cai, University of Maryland.**

### C) Flesh firmness

As fruit matures, flesh firmness decreases. Firmness can be easily measured by either a hand-held penetrometer (i.e. Effegi firmness tester). The instruments measure the amount of force needed to penetrate the fruit flesh. To measure, first use a peeler and remove a disk of skin between the size of a nickel and a quarter on both equatorial sides of the peach at a point midway between the stem end and tip. Choose a 5/16-inch (8mm) diameter plunger (the 7/16-inch one is for harder fruits such as apple). Hold the peach against a stationary, hard surface and penetrate the plunger into the flesh to the scribed line on the plunger (Fig. 4). It is important to apply a smooth and uniform penetration force. Pay attention to the speed of penetration. It should take about 2 seconds to push the plunger with constant speed. Read to the nearest 0.5 Ib-force. Measure both sides to get an average of firmness. The same person should perform the tests for each fruit for consistency.

Figure 4. **Using a hand-held penetrometer to measure the flesh firmness of peach. Source: Yixin Cai, University of Maryland.**

Peaches with a flesh firmness of 10-16 Ib-force are recommended for wholesale and long-term storage, while peaches with a 2-4 Ib-force are considered ready to eat and can be sold at farmers markets and pick your own operations. In general, ready to eat peaches have a better eating quality and flavor than firmer peaches, but they are prone to damage during transportation and have a reduced storability potential.

Firmness is not uniform on peach, and the tip, suture and shoulders are considered weak points, which are prone to bruising and damage during postharvest handling. Early season cultivars (i.e. Rich May, Flavorcrest) tend to soften faster at the tip, while late season cultivars (i.e. O' Henry, August Sun) soften faster at the suture/shoulders. For the wholesale market, firmness at the tip of early season cultivars should also be measured to ensure fruit has minimum firmness (above 10 lb-force) for transportation and storage.

**D) Soluble solid contents (SSC)**

Sugar is the major component of soluble solid contents (SSC) in fruit. Changes in SSC in juice can be measured by a manual or digital refractometer in order to estimate the sugar content (Fig. 5). The device measures the light deviation when passing the juice and scale the refractive index into °Brix or SSC percent.

Cut two wedges from both sides of the fruit. Each wedge should be sliced longitudinal from stem end to calyx end and to the center, and use a garlic or potato-pressor to squeeze juice through a cheesecloth. It is important to keep the temperature of juice constant for each measurement. Digital and some manual refractometers have temperature compensation capability to correct. To use a manual device (Fig. 5), drop a small amount of juice to the prism. Close the lid and turn the instrument toward light. The position where the light and dark region cross gives the reading. The digital refractometer has an internal light source and sensor, and it minimizes operator's error. Use DI water to rinse the prism and wipe with soft tissue paper after each measurement.

Figure 5. **A hand-held manual refractometer (right) and digital refractometer (left) for measuring soluble solids contents of extracted peach juice sample. Source: Dr. Macarena Farcuh, University of Maryland.**

SSC in peaches continues to increase till fully mature but stays constant after harvested. Peach with higher SSC (12% up) is higher quality and receives highest consumer acceptance. Depending on the target market, decisions of how late peach can be left on tree to accumulate SSC should be made to balance with its storability.

**E) Acidity change**

Organic acids decrease as peach matures, and it can be measured as titratable acidity (TA). However, TA itself is usually not used as a maturity index because there is little guideline for peach maturity based on TA. This is due to the large variation of TA among peach cultivars, which ranges from 0.2% to over 1%. Peach cultivars can be sorted into three groups based on its acidity: low acidity (TA< 0.5 or pH>4); standard/medium acidity (TA: 0.5-0.7 or pH:3.8-4); and high acidity (TA>0.7 or pH<3.8).

The organic acidity measurement usually requires specialized laboratory instruments, such as a titrator. TA is measured by titrating a known volume juice with a base such as sodium hydroxide to an end point of pH=8.2. TA is calculated based on the volume of juice, base used and acid milliequivalent factor of malic acid in peach.

**F) Ratio of soluble solids content over titratable acidity**

SSC/TA is an important quality index as human's taste is a combination of sweetness and sourness. Ratio of SSC and TA increases as peach fruit develops and ripens; however, there is no suggested SSC/TA values corresponding to maturity stages due to the large variation in SSC and TA among different cultivars. It is important not to compare SSC/TA across different acidity groups as low acidity cultivars can yield a ratio 4 times or more higher than standard/high acidity cultivars. Generally, the higher ratio is linked to consumers' sweetness perception and satisfaction.

**Summary**

Multiple maturity indices, including change in background coloration, chlorophyll contents, fruit size/diameter, firmness, sugar contents and acidity, can be applied to determine peach maturity and harvest dates. It is important to remember that none of these maturity indices alone is sufficient to indicate the maturity stage of peach. Be sure to consider using multiple indices when making harvest and marketing decisions. Moreover, the value of each maturity index is based on fruit target market. In general, peach for farmer's market or pick your own practice is more advanced in its maturity than peach for wholesale/retail.


**References**

**Crisosto, C. H., and D. Valero. 2008. 22: Harvesting and Postharvest Handling of Peaches for the Fresh Market. The Peach: Botany, Production and Uses, CAB International, Wallingford: 575-596.**

**Fruit & Nut Research & Information Center Website, UC Davis <http://fruitsandnuts.ucdavis.edu/Weather_Services/Harvest_Prediction__About_Growing_Degree_Hours/>**

**Kelley K M, Primrose R, Crassweller R, et al. Consumer peach preferences and purchasing behavior: a mixed methods study[J]. Journal of the Science of Food and Agriculture, 2016, 96(7): 2451-2461.**

**Layne, D. 2010. How to determine peach ripeness. Clemson Cooperative Extenion. <[https://hgic.clemson.edu/how-to-determine-peach-ripeness/](https://hgic.clemson.edu/how-to-determine-peach-ripeness/)>**

**Marini, R. 2019. Peach Marketing: Can Peach Consumption be Increased? Penn State Extension.**


MARYLAND STATE HORTICULTURAL SOCIETY
Fruit Growers Striving for the Best
mdhortsociety.org

Established in 1898
MARYLAND
STATE HORTICULTURAL SOCIETY

# MSHS is Reminding Everyone About Membership Renewal

## Membership is important.

Membership is open to everyone, especially those involved in the production of fruit and vegetables.

Consider the benefits you receive from the Maryland State Horticulture Society. Share information with other producers and encourage them to consider being a member.

If you have not already, please consider renewing your 2021 MSHS membership.

Your dues dollars support much-needed research and more! Membership Renewal


Timely Viticulture is an electronic newsletter that is designed to give those in the grape industry a timely reminder of things they should be considering in the vineyard. Since we are all busy it is not meant to be an exhaustive list of things to consider or even a full discussion of the options. It is just meant to think about what is happening and what is coming up, with some comments. To view Timely Viticulture Click Here

**Mid-Season (June-July)**

- Brown Marmorated Stink Bug (BMSB) - Part 1
- Brown Marmorated Stink Bug (BMSB) - Part 2: Management in the Vineyard
- Crop Estimation
- Crop Management
- Disease Management - Botrytis
- Drought Stress, Vine Performance, and Grape Quality
- Grape Berry Moth
- Hail Damage
- Japanese Beetles
- Mid-Season Disease Management
- Red Leaves in the Vineyard—Diagnosis, and Management
- Spotted Lanternfly (SLF) I - Background
- Spotted Lanternfly (SLF) II - Scouting and Management

**Pre-Harvest (August)**

- Brown Marmorated Stink Bug (BMSB) - Part 1
- Brown Marmorated Stink Bug (BMSB) - Part 2: Management in the Vineyard
- Brown Marmorated Stink Bug (BMSB) - Part 3: Fruit Damage and Juice/Wine Taint
- Crop Development Sampling
- Disease Management - Botrytis
- Early Warning: Multi-Colored Asian Ladybeetle (MALB) for Grape Growers
- Evaluating Grape Samples for Ripeness
- Grape Berry Moth
- Determining Harvest Priorities
- Nematode Sampling
- Pre-Harvest Disease Management
- Red Leaves in the Vineyard—Diagnosis, and Management
- Round Two: Multi-colored Asian Ladybeetle (MALD) Management for Grape Growers
- Spotted Lanternfly (SLF) I - Background
- Spotted Lanternfly (SLF) II - Scouting and Management
- The Spotted Wing Drosophila (SWD) - Part 1: History, Background, and Damage
- The Spotted Wing Drosophila (SWD) - Part 2: Management

# Reminders for Monitoring and Managing Spotted-Wing Drosophila

By Kelly Hamby
Department of Entomology
University of Maryland
kahamby@umd.edu

Spotted-wing drosophila (SWD, *Drosophila suzukii*) is a small fly that lays its eggs into ripening and ripe soft-skinned fruit, causing direct damage and wounds that other pests and pathogens can use. Although they prefer fully colored ripe fruit, they are capable of infesting fruit that is just starting to turn color and will do so when populations are high. SWD can make use of a wide range of resources throughout the year, including ripe fruit in crop and non-crop habitats as well as damaged/overripe fruit, compost, manure, nectar, and fungi. Populations in non-crop habitats can move into fruit crops, causing near continual pressure during the season in addition to pressure building on farm, especially when multiple susceptible fruit crops are grown.

In the mid-Atlantic, caneberries (raspberries and blackberries) experience heavy pressure because they are preferred hosts and fruit during the mid-summer when SWD populations rapidly grow. Cold winters reduce overwintering populations, helping earlier season fruit such as strawberries, cherries, and earlier blueberry varieties escape damage. However, when we have warm winters with fewer days below freezing and warmer low temperatures, such as 2020 and 2021 (**Table 1**), populations build faster and more damage will occur, especially in cherries and blueberries[1].

**Table 1. Calendar year minimum temperatures and days <32˚F. Weather data recorded by station USC00182336 in Damascus, MD.**

| Calendar Year | Minimum Temperature ˚F | Total Days <32 ˚F |
|---|---|---|
| 2018 | -1 | 100 |
| 2019 | -1 | 96 |
| 2020 | 15 | 63 |
| 2021 | 16 | 61 |

**Monitoring.** Monitoring can be used to determine if SWD is active on farm, and management decisions that combine SWD activity and fruit susceptibility (the riper the more susceptible) can help avoid unnecessary applications. There is no treatment threshold for SWD and acceptable damage varies by market and operation.

To determine when adults are active in cherries and blueberries, commercial adult traps and lures can be purchased and/or home-made traps and baits can be used (for more details and images see Michigan State Extension 2020[2]). Traps have to be checked weekly and will capture non-target insects that must be sorted through to find the adult flies.

Checking fruit for SWD damage, eggs, and larvae can be used to determine SWD pressure and the effectiveness of management programs. Visual inspection of fruit by looking for soft and leaky fruit can work to find infestation, and sampling fruit from the interior part of the plant where the habitat is more favorable and insecticide deposition is often poorer can help with early detection.

A sensitive and easy approach for monitoring infestation is to use salt or sugar water solutions to float eggs and larvae out of fruit[3]. Depending on whether you want to know if your management program is working (market ripe) or if you want to evaluate SWD pressure (interior, soft, ripe and overripe fruit), collect fruit and lightly crush (break the blueberry skin or separate the caneberry druplets) them in a plastic bag or container. Add salt (1 cup salt to 1 gallon water) or sugar (1/4 cup granulated white sugar to 4 ¼ cup water) water and let the fruit soak below the surface for at least 15 minutes and up to one hour (the longer the more likely the larvae will leave the fruit). Pour the fruit and water solution through a coarse filter (to remove fruit pieces) stacked over a reusable basket style coffee filter (for more details and images see Van Timmeren et al. 2017[3]). Rinse the soaking bag/container and pour the rinse liquid through the coffee filter too. The coffee filter will collect the eggs and larvae as well as smaller plant parts and fruit flesh if the fruit were crushed a bit too much. Carefully inspect the filter for SWD eggs and larvae, they are very small so using a magnifier can help (**Figure 1**, Van Timmeren et al. 2017[3]).

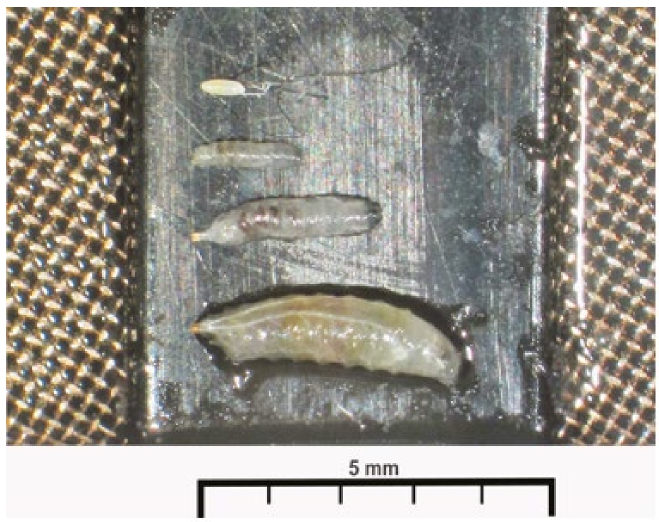



**Figure 1. From the top: SWD egg, small, medium, and large larvae. Scale shows 5mm. Image from Van Timmeren et al. 2017[3].**

**Management.** Due to their broad host range and quick reproduction, SWD are difficult to manage. In most cases, especially in preferred hosts such as caneberries and later season varieties, a 7-day spray interval is required to maintain near 0 infestation levels, with tighter intervals when rain events occur[2]. In laboratory bioassays, poorer spray coverage results in more SWD adults surviving, though it can still be sufficient to protect fruit from infestation[4]. Accurate calibration of sprayers, appropriate spray volumes and tractor speeds, and other best practices to ensure good spray coverage are important.

There are multiple effective insecticide modes of action for SWD, with group 1A carbamates (e.g., Lannate®) and group 1B organophosphates (e.g., diazinon, malathion), group 3A pyrethroids (e.g., Mustang-Maxx®, Danitol®), group 5 spinosyns (e.g., Delegate®, Entrust®), group 28 diamides (e.g., Exirel®, Verdepryn®) and the premix Cormoran® (group 4A neonicotinoid + group 15 benzoylurea) all ranking good to excellent[5].

For organic production[5,6], there are a few OMRI approved materials, with Entrust® being the most effective option. Rotating modes of action (at a minimum alternate) helps avoid insecticide resistance. *The label is the law, make sure the product is registered in your state and crop(s) and follow all restrictions.*

Within crop fruit can serve as a reservoir for SWD, so removing and destroying cull fruit and shortening harvest intervals to every 2-days can help reduce on farm populations[6,7]. For some operations, mesh netting (1.0 x 0.6 mm or smaller) has proven very effective for delaying or reducing SWD, though sprays may be needed later in the season if populations build under the netting and supplemental pollination should be considered for some crops. Netting must be installed before SWD are active and cannot have any holes or be left open (e.g., worker or picker entry), so structures with entryways work best. Fruit yields and quality tend to be better when using netting which also protects from bird and other damage. Many natural enemies feed on and parasitize SWD; however, these currently do not provide sufficient control and are sensitive to pesticide sprays. Efforts are ongoing for permits to import and release wasps that parasitize SWD in non-crop areas. Cooling fruit (32-36˚F) and holding it cold throughout the supply chain increases shelf life and reduces the likelihood that infestation will result in damaged or unmarketable fruit[6,7].

### References and Further Resources


[1]**Brust, J. 2020. SWD found in blueberries and cherries in Maryland.**
**https://sites.udel.edu/weeklycropupdate/?p=15340**

[2]**Michigan State Extension. 2020. Managing spotted wing drosophila in Michigan cherry.**
**https://www.canr.msu.edu/ipm/uploads/files/MI%20SWD%20Guide%20Cherry%20June_2020.pdf**

[3]**Van Timmeren et al. 2017. A filter method for improved monitoring of *Drosophila suzukii* (Diptera:Drosophilidae) larvae in fruit. Journal of Integrated Pest Management 8(1): 23**
**https://academic.oup.com/jipm/article/8/1/23/4157137**

[4]**Lewis, M.T., and Hamby, K.A. 2020. Optimizing caneberry spray coverage for *Drosophila suzukii* (Diptera: Drosophilidae) management on diversified fruit farms. Journal of Economic Entomology 113(6): 2820-281**
**https://academic.oup.com/jee/article-abstract/113/6/2820/5945791**

[5]**SCRI SWD Management. 2021. 2021 ranking of insecticides for their performance against spotted-wing drosophila.**
**https://swdmanagement.org/wp-content/uploads/2021/05/SWD-rankings-document-2021.pdf**

[6]**University of Georgia Extension. 2018. Management recommendations for spotted-wing drosophila in organic berry crops.**
**https://secure.caes.uga.edu/extension/publications/files/pdf/B%201497_3.PDF**

[7]**Schöneberg et al. 2021. Cultural control of *Drosophila suzukii* in small fruit—Current and pending tactics in the U.S.**
**https://www.mdpi.com/2075-4450/12/2/172**


Plant Science Food Safety Group
Department of Plant Science and Landscape Architecture
College of Agriculture and Natural Resources
College Park, MD


## *Check out our weekly newsletter!*

Subscribe to our weekly newsletter coming from the Plant Science Food Safety Group. Its focus is you, the Maryland fruit and vegetable farmer and will contain timely information to keep you updated on food safety work shops, webinars, classes, and other news. Here is our latest edition:

## Food Safety Newsletter for Maryland Farmers Click Here


## Maryland food Safety Website Click Here

FieldWatch®
Communication. Cooperation. Collaboration.


To register, go to FieldWatch.com
For more information about FieldWatch, read this helpful resource or call the department's Pesticide Regulation Section at 410-841-5710.

*NEWS RELEASE* — www.mda.maryland.gov
Office of the Secretary — 50 Harry S Truman Parkway — Annapolis, Maryland 21401

# MDA Announces Dates for Annual Pesticide Container Recycling Program

The Maryland Department of Agriculture's Pesticide Regulation Section has announced the 2021 dates and drop-off locations for its Pesticide Container Recycling Program. On certain days from June through September farmers, pesticide applicators, and other pesticide users can recycle used plastic pesticide containers at no cost at locations in Frederick, Harford, Kent, Montgomery, Talbot, Washington, and Wicomico counties.

"For the past 28 years, the department has provided farmers and pesticide applicators with the opportunity to dispose of used pesticide containers safely and responsibly for free at convenient locations around the state," said Secretary Joseph Bartenfelder. "This program not only recycles plastics, it also helps keep pesticide residue out of our local waterways and soil, ultimately helping to improve the health of the Chesapeake Bay and its tributaries."

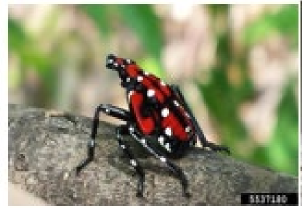
Those participating in the program are asked to properly rinse containers before drop-off. Containers acceptable for recycling will be chipped into recyclable plastic flakes by the Agricultural Container Recycling Council and transported to an approved recycling facility. Since its inception, the program has yielded over 1 million tons of recyclable plastic flakes.

Maryland's Pesticide Container Recycling Program is a combined effort of state, county, and federal agencies and the private industry working together to protect the environment. Rinsing and recycling empty pesticide containers will help to reduce the potential for contamination in groundwater and the Chesapeake Bay while also saving valuable landfill space. The program is free and open to all agricultural producers and pesticide applicators.

A schedule of 2021 collection dates and locations is available on the department's website. Please be sure your containers meet the department's specifications prior to drop-off.

Additionally, for farmers or producers who want to safely dispose of any unwanted or unusable agricultural pesticides, the department also offers the Maryland Pesticide Disposal Program. To participate in this free, voluntary program, farmers must submit an application before Sept. 15, 2021.

For more information on Maryland's Pesticide Container Recycling Program, contact the department's Pesticide Regulation Section at (410) 841-5710 or visit the department's website.



# Marylanders Encouraged to Keep a Lookout for this Invasive Pest

If you suspect you have found a spotted lanternfly or their egg masses, snap a picture of it and then smash it. Report the sighting with photo attachments and location information to the Maryland Department of Agriculture at: DontBug.MD@maryland.gov.

Dead samples of spotted lanternfly from any life stage can be sent to the Maryland Department of Agriculture's Plant Protection and Weed Management Program at 50 Harry S. Truman Parkway, Annapolis, MD 21401.




**Paraquat Dichloride Training for Certified Applicators**

As required by EPA's Paraquat Dichloride Human Health Mitigation Decision and amended paraquat dichloride (a.k.a. paraquat) product labels, certified applicators must successfully complete an EPA-approved training program before mixing, loading, and/or applying paraquat. The training provides important information about paraquat's toxicity, new label requirements and restrictions, and the consequences of misuse. The EPA-approved training module can be accessed here. This training was developed by paraquat manufacturers as part of EPA's 2016 risk mitigation requirements and has been approved by EPA.

CDMS | Applied Intelligence

## CDMS

**Pesticide Labels and MSDS On-Line at:**

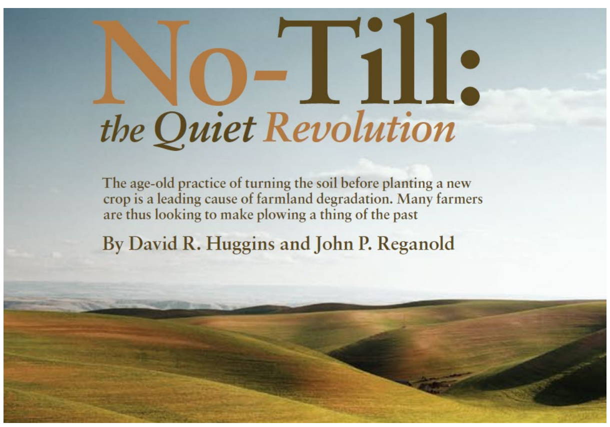
**http://www.cdms.net/**



## Small Fruits & Hops Information Resource Portal

[Click Here](#)

*A virtual library of presentations, research data, cultivar trials, training videos and other resources for regional producers*




For a copy of No-Till: The Quiet Revolution [Click Here](#)


For a copy of the SARE Cover Crop Economics Bulletin [Click Here](#)


# IPM Diagnostics of Plant Disease and Insect Problems Educational IPM Summer Sessions

### Organized by University of Maryland Extension

**Dates:**

First Session - Wednesday July 21, 2021
Second Session - August 18, 2021
Third Session - September 22, 2021

**Time of training:** 12:30 –3:00 pm.

**Location:** Central Maryland Research and Education Center, University of Maryland Extension, 11975 Homewood Road, Ellicott City, MD

**Instructors:**

**Karen Rane**, Director of the Plant Diagnostic Clinic, University of Maryland Extension
**David Clement**, Plant Pathologist Specialist, University of Maryland Extension
**Andrew Ristvey**, Commercial Horticulture Specialist, University of Maryland Extension
**Stanton Gill**, Entomologist and IPM Specialist, University of Maryland Extension
**Suzanne Klick**, Lead Technician, CMREC, University of Maryland Extension
**Matthew Price**, Student Intern, University of Maryland Extension

Sign up for one day or all three sessions $15 per session. MD Pesticide Recertification Credits for 3A, 3B, 3C, 10, and PVT

**Outdoor Event:**

These sessions will be held outdoors with pop up tents. There will be live samples and a walk through in-field diagnostic process as part of an IPM approach. We highly encourage you to bring in samples for diagnosis. These are interactive training session. Bring your own chair. Unless heavy downpours are predicted, we will have the program. If the program is postponed or cancelled, we will notify registrants via email through Eventbrite.

**Bringing Samples:**

Participants can be bring samples for diagnosis, but contact us before to establish the size and condition of the sample and the history of the site. Email us at clement@umd.edu (Dave Clement), rane@umd.edu (Karen Rane), and sgill@umd.edu (Stanton Gill), Andrew Ristvey, ristvey@umd.edu.

**To register:** contact Suzanne Klick, Lead technician, CMREC at Sklick@umd.edu

## Crops Research Twilight & Ice Cream Social

**CMREC Upper Marlboro Farm**
**August 4, 2021**

**You are invited to the Fields Crops Research Twilight and Ice Cream Social** at the Central Maryland Research & Education Center, 2005 Largo Road, Upper Marlboro, on Wednesday, August 4, 2021 from 4:00 to 9:00 p.m.

University of Maryland Extension Educators and Specialists are looking forward to sharing with you their field crop, vegetable and fruit research plots. Dinner may be purchased, courtesy of the University of Maryland Alpha Gamma Rho (AGR) Fraternity Cooking Team, and will be served from 4:00 p.m. to 6:00 p.m., followed by homemade ice cream prior to the evening tours.

- **Purchased Meal, Alpha Gamma Rho Fraternity Cooking Team from 4:00-6:00 p.m.**
- **Homemade Ice Cream Served at 5:15 p.m.**
- **Crops Twilight Tours at 6:00 p.m.**

**Please arrive on time as the walking and wagon tours will start promptly at 6:00 p.m.**

**A reserved event ticket is required.** If you need special assistance to participate, please contact the Anne Arundel County Extension office at 410-222-3906 by August 2nd.

**Register on-line at the Anne Arundel County Extension website: Click Here or call 410 222-3906.**

*Mask are still required to be worn by non-vaccinated individuals when maintaining social distance is not possible.*

# *Vegetable & Fruit News*

A timely publication for the commercial vegetable and fruit industry available electronically in 2021 from April through October on the following dates: **April 15, May 13, June 10, July 15, August 19, September 9 and October 28 (Special Research & Meeting Edition).**

***Published by the University of Maryland Extension Focus Teams: 1) Agriculture and Food Systems; and 2) Environment and Natural Resources.***

**Submit Articles to:**
Editor,
R. David Myers, Extension Educator
Agriculture and Natural Resources
97 Dairy Lane
Gambrills, MD 21054
410 222-3906
myersrd@umd.edu

**Article submission deadlines for 2021 at 4:30 p.m. on:**
**April 14, May 12, June 9, July 14, August 18, September 8 and October 27 (Special Research & Meeting Edition).**

# Vegetable Production and IPM Twilight Walking Tour

Evening of Wednesday- July 28th, 2021
Tour from 6 p.m. - 8 p.m.
Refreshments and Homemade Ice Cream at 5:30 p.m.
Registration Not Required

To be held at the farm of:

Shawn and Eugene Stauffer
41400 Friendship Court
Mechanicsville, Maryland

Rain or Shine

*If you are currently growing vegetables or considering it as a future crop, plan to attend the Vegetable Twilight Tour. For questions call Ben Beale at 301-475-4481 or email bbeale@umd.edu*

This is a diversified vegetable operation with tomato, watermelon, squash, pumpkins, peppers, cantaloupe and other minor crops. This will be an informal tour, with plenty of opportunity to discuss your vegetable questions with other growers. Handouts and other brochures will be available.

Information will be presented by University of Maryland Extension Specialists and Agents.

Directions:
From points South: From Rte. 235 take a left onto Friendship School Road, proceed ½ mile and take a right onto Friendship Court. First farm on right is the Stauffer's.

From points North: Take Route 5 South to Rt. 235. Continue on Rt 235 for Five miles. Take a right onto Friendship School Road, proceed ½ mile and take right on Friendship Court, first farm on right is the Stauffer's.

UNIVERSITY OF MARYLAND EXTENSION

Equal Opportunity and Access Programs

Equal Opportunity Programs