

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.

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Vegetable Crop Insect Scouting

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Sweet Corn

Fall armyworm is active in the area. Treatment thresholds are 12-15% infested plants. Corn earworm moth counts are very high for this time of year. Complicating the picture is that there is a wide degree of variation among various states in terms spray schedules based on pheromone trap counts. Our pheromone trap count of 13 or more moths per night triggers a 3-day spray schedule. Some states recommend a 2-day spray schedule when moth counts are at 20 per night and the temperature is above 80 °F.

Diamides (Coragen, Harvanta, Besiege) will give excellent earworm control and have translaminar activity. Recently questions have been raised regarding other labeled products for sweet corn because we do not want to rely heavily on just two modes of action.

Intrepid (methoxyfenozide) is labeled for sweet corn but it is a growth regulator. It kills larvae slowly during the molting process and it is possible that worms will still infest tips before dying. Obviously, this would not be acceptable for fresh market sweet corn.

Avaunt (indoxacarb) is not labeled for silking sweet corn, but is an excellent worm product for pre-silking worm applications.

Radiant and Blackhawk (spinosyn class) are good worm products in a rotational scheme. Last year we rotated it with daimide applications, and the last two applications were pyrethroids and it was effective. One to two applications with a diamide should provide excellent control and could allow a spray schedule some flexibility. However, a straight spinosyn application results in poor control. Under heavy moth flights, a more conservative approach would be to include a pyrethroid with a spinosyn. Lannate (methomyl) tank mixed with a pyrethroid is another excellent treatment to include in a rotation. Bottom line: incorporate multiple, effective modes of action (we have 4) to preserve earworm insecticide susceptibility.

Watermelons

Inclement weather earlier this week has prevented us from checking as many melon fields as usual. Several fields have been treated for mites, be sure to check fields and be prepared for a follow up spray. This is especially true of contact miticides. Also make sure that mites are in fact alive and active. Use a hand lens to determine if the mites are still moving and there are new, fresh looking eggs. Some miticides kill mites slowly, and dead mites will stick to the webbing for some time. Reports of worm activity have been increasing in the area. This includes corn earworm. While earworms feed mostly on the blossoms, they should be considered part of the 'rindworm' complex. They are not as aggressive as armyworm or leafrollers but can still scar up fruit.

Maryland Moth Map

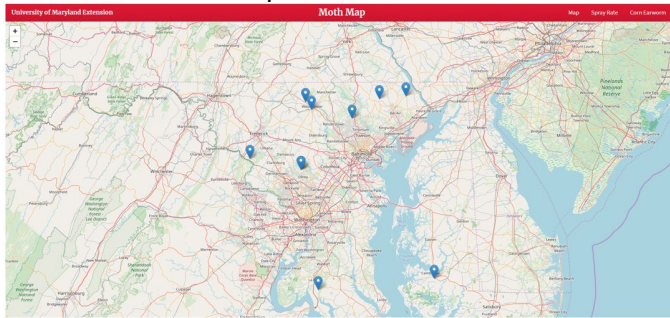
By Andy Kness
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If you're spraying non-GMO corn to manage corn earworm, then check out our new website for monitoring populations at www.mdmothmap.com. There you'll find up-to-date catch counts for pheromone traps located across Maryland. Just click on a pin to display the most recent 5-day total. These 5-day totals are used to calculate your recommended spray interval, which you can see by clicking "Spray Rate" in the top right corner of the page. This website also works on mobile devices.

If moth populations are high enough to warrant an insecticide application, be sure to use products that have efficacy and be sure to rotate modes of action in order to reduce the development of resistance. Some earworm populations are developing resistance to pyrethroids (Group 3A insecticides). Consult your local Extension Agent for more information, or reference the [Mid-Atlantic Commercial Vegetable Production](#)

Local Governments • U.S. Department of Agriculture

[Recommendations](#) for a list of effective insecticides. Always be sure to read and follow all pesticide labels before application. It should also be noted that GMO hybrids with the Vip3A protein provide nearly 100% control of corn earworm, which you may want to consider for future crops.



Sulfur Deficiency in Corn and Watermelon

By Jerry Brust
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In the last few weeks several sweet corn fields as well as some watermelon and even a few tomato fields have been found with sulfur deficiencies (fig 1). In sweet corn symptoms often appear as green leaves with light yellow or green striping on the newer leaves. In watermelon symptoms appear as a light green or light yellowing of the leaves of newer growth. In tomato unless severe you usually do not see any visible symptoms in the field, but fruit set and quality could be worse in deficient plants. Sulfur is vital to plant growth as it helps develop enzymes in plants. A deficiency in sulfur affects a plant's protein synthesis, structure, and chlorophyll production (hence why plants turn a pale green or light yellow). Overall plant development and growth are stunted without enough sulfur. After transplanting, seedlings often have a higher mortality rate than normal.

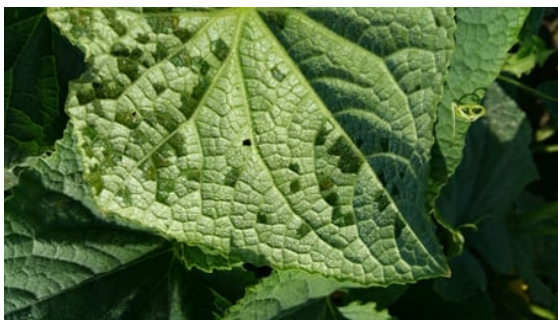


Fig.1 Sulfur deficiency symptoms in sweet corn and watermelon.

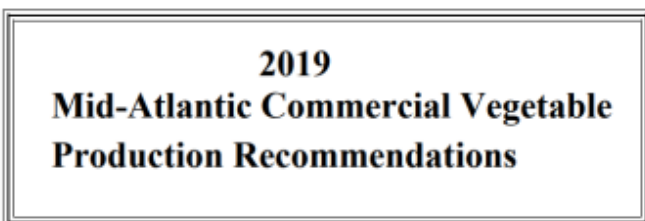
Cucumber Downy Mildew Found in Federalsburg, MD

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Downy mildew was confirmed on Tuesday, June 26, 2019 on cucumber from Federalsburg, MD. This is the furthest north the disease has currently been found in 2019. Cucumbers in the region should be protected with a fungicide that is effective on the disease. Initial symptoms are angular water-soaked lesions on the leaves. Preventative applications are more effective than applications made post-infection. Effective materials are listed in the Mid-Atlantic Commercial Vegetable Production Guide.



Early symptoms of downy mildew on cucumber.



On-Line at: [Commercial vegetable Guide](#)

This is the fourth year that we have seen sulfur deficiencies in at least two of these three crops (it is a bit unusual to see sulfur deficiency in tomato). I have not seen consistent sulfur deficiencies in other vegetable crops over this same time. Sulfate is relatively mobile in most soils and sulfur deficiencies can occur with heavy rainfalls. Organic matter supplies most of the sulfur to the crop, but sulfur must be mineralized to sulfate-S to be taken up by crop plants. Because mineralization is carried out by soil microorganisms, soil temperature and moisture primarily determine when and how much sulfur is made available to the crop. Excessively wet or dry conditions reduce microbial activity and reduce S availability from soil organic matter. For all the above reasons under field conditions sulfur deficiency and its symptoms can be highly variable. Although sandier soils are much more likely to be deficient in sulfur, I have seen sulfur deficient watermelon and sweet corn in soils with higher levels of clay or organic matter (2-4% OM).

There are other deficiencies that can cause striping or the general yellowing in sweet corn or watermelon respectively and only by conducting a tissue test can you be sure. Sulfur can be added to the crop in combination with several other nutrients such as ammonium or potassium and spray-grade ammonium sulfate is a good choice for foliar applications.

Stinkbug Damage Found in Tomato Fields

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I have seen and have gotten reports of (and some really nice pictures of) stinkbug damage in tomatoes over the past few weeks from all over Maryland including the Eastern Shore. Stinkbug feeding damage is called cloudy spot in tomato fruit (fig. 1).



Fig. 1 Stinkbug injury to grape tomatoes, white when tomato is green turning yellow as fruit ripens.

It occurs when the adult or immature stinkbug puts its needle-like mouth parts into the fruit and removes material from a large number of cells. On green fruit the damage appears as whitish areas with a black dot in the center and indistinct borders (fig. 2) on ripe fruit the spots are golden yellow (fig. 1).



Fig. 2 In the center of each cloudy spot is a tiny black dot where mouthparts penetrated into the tomato.

Individual spots may be 1/16 - 1/2 inch in diameter; or, the spots may merge and encompass a large area of the fruit surface (fig. 2). Peeling back the skin shows these areas as white shiny, spongy masses of tissue (fig. 3). This damage is usually most common from mid-July until the end of the season, but this year we started seeing it at the end of June. The Green and Brown as well as the Brown Marmorated

stinkbug are often difficult to see and usually go unnoticed as they spend much of the day deep inside tomato plants, any disturbance and the stinkbugs will drop to the ground and move under the plastic, which results in monitoring difficulties. Only a few are necessary to cause the appearance of cloudy spot on many tomato fruit. Although stinkbug damage has been observed in greater than usual amounts in tomato fields this year, observations of stinkbugs have been much less numerous.



Fig. 3 Stinkbug feeding causing cloudy spot on tomato fruit.

Stinkbugs are extremely difficult pests to control. As alluded to earlier there are no good methods for monitoring these pests. Traps do not work well, visually scouting for them has proven to be unreliable and too time consuming. Usually stinkbug damage is only a nuisance, but so far this year it has resulted in moderate losses in some fields. Growers should

examine the edges of their fields carefully for tomato fruit with cloudy spot. There are some acceptable chemical choices for stink bug control. Pyrethroids (Warrior II, Hero EC, Tombstone and Mustang Maxx) or Venom or Scorpion can be used to reduce damage. Sprays should be directed towards the center of the plant with high pressure and a high gallonage (50-100 gal/a). If harvest has started there are neonics and pyrethroids that have very short PHIs - check your Mid-Atlantic Commercial Vegetable Production Recommendations guide. It should be understood that none of the chemicals will give complete control but will reduce damage compared with no chemical usage. Organic growers can try Entrust or Azera or Pyganic for control of nymphs, but not for adults, i.e., they will not control adults.

Oregon Department of Agriculture Stops the Sale of Some Neem Products

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The Oregon State Dept of Agriculture stopped the sale of 6 products containing neem due to pesticide contamination. The contamination was not 1 or 2 synthetic pesticides, but many different ones. Some of the contaminated products were made by Safer, Certis, Bonide and others. Below is the link to the announcement on the Oregon Dept. of Ag website (you'll have to scroll down to find it): <https://www.oregon.gov/ODA/programs/Pesticides/Pages/PesticidesCurrentIssues.aspx>

Garlic Bulb Mites

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Bulb mites (usually *Rhizoglyphus* spp) are a problem of garlic that easily go unrecognized. Usually growers notice a general yellowing of their garlic plants with the tips of leaves often turning brown (fig 1).



Fig. 1 Garlic plants with early signs of root/bulb problems.

If you examine the bulb it can have feeding marks on the outside of the bulb (fig. 2) or the basal plate can separate easily from the bulb (fig. 3). The best way to determine whether these mites are present is to carefully dissect the region where the roots and bulb come together.



Fig. 2 Garlic bulb with feeding damage from bulb mites.

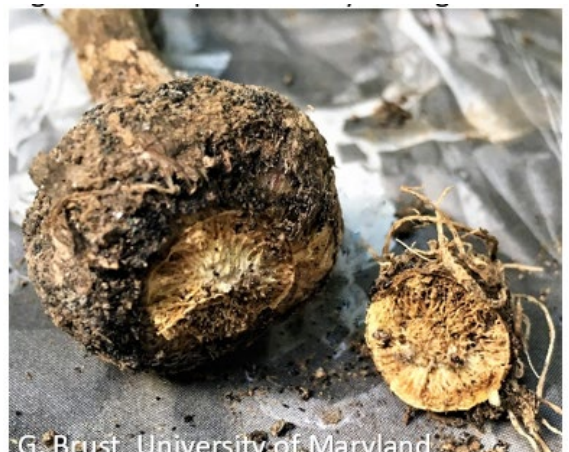


Fig. 3 Roots separate easily from garlic bulb.

There are usually other mites present, but with a hand lens the bulb mites usually can be identified from other mites. The mite is bulb shaped with its legs moved forward and a bulbous rear end and many long fine hairs (Fig. 4). The mouthparts and legs are purplish-brown while the main body is creamy white. The mites are extremely small (from 0.02 to 0.04 inches) and are very slow moving. They are usually found in clusters underneath scales and at the base of the roots.



Fig. 4 Bulb mite on garlic

Early in the growing season, bulb mites can cause poor plant stands and stunted growth as they feed on the plants. Infested plants easily can be pulled out of the soil because of the poor root growth. Later in the season, greater than normal amounts of *Botrytis* or soft rot or *Fusarium* dry rot may be seen because of the wounds caused by these mites. In some cases garlic that became infested with bulb mites was grown in new fields that never had any *Allium* species in it (usually it is new bulbs in an infested field). But bulbs were saved from last year's garlic harvest and used in the new soil and some of them were infested with the mites. Be sure to start with clean fields and clean bulbs as there is little chemically that can be done for control. If you find you have bulb mites in your harvested bulbs that you intend to use next year you can hot water treat the garlic seed but this will decrease germination. Put the seed in water heated to 130°F 10-20 minutes or you can soak the seed for 24 hours in a 2% soap (don't use detergent) and 2% mineral oil solution before planting.



CDMS

Pesticide Labels and MSDS On-Line at:

<http://www.cdms.net/>

Thrips Feeding Damage to High Tunnel Peppers

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Because of the bright sunny days we have had in the past 3-4 weeks as well as higher temperatures lately vegetables in high tunnels (HT) are highly susceptible to thrips and two spotted spider mite infestations because of the hot dry conditions. Peppers are a favorite of thrips as they will feed on the tender developing new leaves and this feeding causes the leaves to have a slight yellowing appearance and become deformed and puckered over time as the leaves expand (fig. 1). This damage can appear as possible virus infections such as tomato spotted wilt, which some thrips (usually western flower thrips) are capable of transmitting. But infection with the virus causes a more mottled overall-distorted appearance of the foliage (fig. 2). Growers can monitor for thrips using yellow sticky cards that are placed at the same height as the peppers and checking them 2-3 times a week. Early detection can mean using horticultural oils for thrips control rather than relying on synthetic chemicals such as methomyl, tolfenpyrad, spirotetramat or cyclaniliprole in HTs. Be sure you know how your state regulates pesticide use in HTs.



Figs. 1 and 2 Thrips feeding damage on pepper (left) and pepper plant with TSWV (right)

Fruit and Fruiting Disorders in Summer Squash and Cucumbers Revisited and Pumpkin Fruit Set

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A number of fruit and fruiting disorders have been observed in summer squash and cucumbers recently including lack of fruit set, bottlenecking, pinched blossom ends, crooks, nubs, hollow centers or cavities, fruit zippering and scarring.

Lack of fruit set can result from a lack of pollination due to reduced bee activity, reduced pollen viability, or reduced pollen germination in high heat. Water stress will compound this problem. When day temperatures are in the 90s and night temperatures are in the high 70s, plants will commonly abort fruits or produce misshapen fruits. To reduce losses due to heat, apply irrigation so that plants are never under water stress.

Growers should note that some squash (mostly zucchini) varieties will still set fruit without pollination. Steve Reiners at Cornell did a trial in 2013 with 21 varieties of summer squash to determine which were capable of setting fruit without pollination. Female flowers were bagged prior to opening to exclude pollinating insects. After 1 week, bags were removed and fruit rated as to whether it was marketable or not. The results can be found at this web site: <http://www.hort.cornell.edu/expo/proceedings/2014/Vine%20crops/Seedless%20squash%20Reiners.pdf>. For example, 'Golden Glory' and 'Dunja' zucchini both were able to set a high percentage of fruit without pollination. Selecting varieties with this ability can reduce losses due to poor pollination.



Golden Glory Yellow Zucchini can set fruit without pollination.

Parthenocarpic varieties of cucumbers and zucchini that set fruit without pollination are also available and can be less susceptible to environmental extremes or conditions that limit bee activity in monoecious or gynoecious varieties. We currently are evaluating 16 parthenocarpic pickle varieties for adaptation to our region.



Corinto cucumber, a parthenocarpic slicing type well suited for high tunnel production.

Lack of fruit set can also be due to harvest management. When summer squash or cucumbers are allowed to progress to an overly mature stage, plants will “shut down” and not reflower for a period of time. To manage this problem, frequent picking is necessary. This requires picking every 2 days in the summer.

Misshapen fruits commonly are found in high numbers with high temperatures and water stress in the summer or low night temperatures in the fall. This includes bottle necking, pinched blossom ends, crooked fruits or fruits with “narrow waists”. These defects are most commonly due to effects on pollination. Other stresses such as herbicide injury, root pruning in cultivation, or wind damage can increase the number of misshapen and unmarketable fruit. Potassium deficiency can also cause pinching at the stem end.

Hollowness or open cavities in cucumber and summer squash fruit can be caused by inadequate pollination and reduced seed set. Boron deficiency or the combination of boron and calcium deficiency can also result in increased hollowness.



Progression from marketable to unmarketable pickle fruits that are crooked, waist pinched, tip pinched or tip pinched with crook.



Small cavities in cucumber fruit. In a more severe form hollowness and cavities can render the fruits unmarketable or reduce processing (pickling) quality.

Pumpkin Fruit Set

Pumpkins have become an important income source for many Delmarva vegetable growers including u-pick, local sales and regional wholesale.

Each year we see pumpkin fields with poor fruit set or fruit retention. In larger pumpkin sizes, each plant will normally carry 1-2 fruits. The large vining plants also need considerable space – 25 to 50 square feet per plant. While planting jack-o'-lantern types at higher densities might at first seem to be a way to achieve higher yields, interplant competition will increase and you can decrease fruit retention because of this competition. Matching pumpkin types with space requirements is very important to optimize fruit set.

As with summer squash, a major reason for poor fruit set in pumpkins is high temperatures during flowering in July. Day temperatures in the 90s or night temperatures in the high 70s will cause flower and small fruit abortion. For pumpkin growers that do wholesale and start shipping right after Labor Day, this will limit early pumpkin availability. Varieties vary considerably in their ability to tolerate heat and to set under hot conditions. Inadequate irrigation and excessive water stress can also reduce fruit set, increase abortions, and reduce fruit retention. High temperatures and water stress reduce photosynthesis and the ability of the plant to carry fruits. Drought can also cause a higher than normal male/female flower ratio, thus affecting the amount of fruit per plant.

Another major factor that will reduce fruit set is poor pollination. Misshapen fruit can also result from inadequate pollination. A pumpkin plant has both male and female flowers and the first female flower opens one week after the first male opens. The flowers only last a few hours, blooming at dawn and closing later in the morning but well before noon. Pollinators need to be active during this short period.

Native pollinators can be very effective in pollinating pumpkins and some research has shown that most of the fruit set is occurring because of these native pollinators. Bumblebees and squash bees are native bees active in pumpkins. The squash bee is of particular interest because it has evolved along with pumpkins and squash in the Americas and is dependent on pollen from pumpkin and squash plants.

Other research has shown that honeybees do provide additional pollination benefits above what native pollinators are providing. In research from Illinois, Walters and Taylor found that while pumpkin fruit number was not increased with the addition of honeybees, pumpkin weights and size were increased significantly. Research

has shown that 10-15 visits by honeybees transferring 1200 pollen grains will result in full fruit set. Other reasons for poor fruit retention include foliar diseases and storm damage that reduce effective leaf area and photosynthesis.

Too much available nitrogen can also delay pumpkin fruit set so that many of the pumpkins that are produced do not reach maturity in time. Pumpkins do not normally need more than 80 lbs/acre N to grow a crop. Fertilizing above 100 lbs/acre N may cause the pumpkins to put on excessive vine growth and delay fruiting.

Does Spray Coverage Impact Spotted-Wing *Drosophila* Management in Raspberries?

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In small fruit production, spray coverage can impact pesticide efficacy; for example, increased spray coverage improves control of fruit rot fungi such as Gray mold. Spray coverage may also be important for key insect pests, including spotted-wing *Drosophila* (SWD). In brambles, higher infestation and adult SWD activity occurs in the inner and lower plant canopy [1, 2], regions that often receive low spray coverage [3, 4].

From 2016 – 2018, we evaluated how carrier water volume impacts spray coverage in red raspberries and blackberries under a variety of different application scenarios. Using both a CO₂ powered backpack sprayer and an airblast sprayer, we found that increasing carrier water volume from 50 to 100 gallons per acre (GPA) consistently improved spray coverage in the outer plant canopy. However, carrier water volume less consistently impacted coverage in the inner plant canopy.

Adjustments to the sprayer equipment, such as lowering the sprayer height or adding a two-sided row crop head, also improved spray coverage rates [3, 4]. Building off these field studies, we are now evaluating how variation in spray coverage impacts control of adult SWD as well as larval infestation rates.

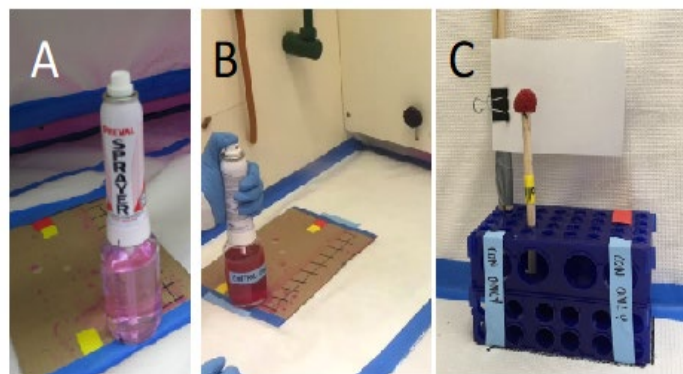


Figure 1. (A) Pre-Val paint canister sprayer. (B) Sprayer moving along track. (C) Raspberry mounted with spray card

Methods: Bioassays were run in 2019 using undamaged, store-bought raspberries that were washed before use. Individual fruit were sprayed inside a laboratory fume hood with Mustang Maxx using a Pre-Val refillable paint canister sprayer (Figure 1A) that was moved along a 9-inch track (Figure 1B) to simulate airblast sprayer coverage patterns. As a control, raspberries were also sprayed with water.

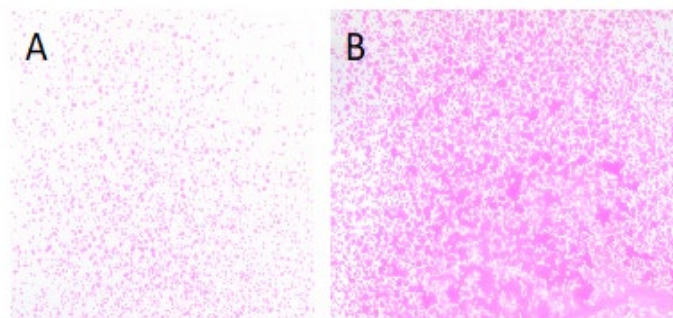


Figure 2. Spray cards representative of (A) low (~21%) and (B) high (~85%) spray coverage. Differences in coverage rates were obtained by manipulating the speed at which a sprayer passed the raspberry.

To create variation in spray coverage rates, we changed the speed at which the canister moved along the track. “Low Spray Coverage” was generated by moving the sprayer quickly, at a rate of 140 beats per minute (one-inch length traveled with every beat), and “High Spray Coverage” was generated by moving the sprayer slowly at 20 beats per minute (Figure 2). Across all spray trials, the “Low” and “High” spray coverage treatments respectively produced 21% and 85% coverage on average; these rates are comparable to spray coverage previously observed on commercial (Figure 3) and research farms.

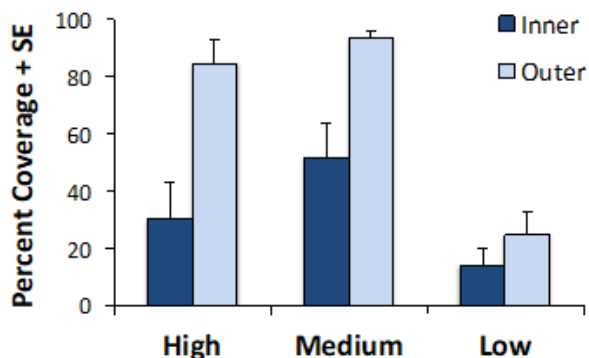


Figure 3. Average percent spray coverage plus standard error observed in six canopy locations in commercially produced raspberries.

To visualize spray coverage patterns, we added a pink marker dye to the pesticide mix and placed one spray card directly behind the raspberry (Figure 1C). Spray coverage was analyzed using ImageJ software. Each raspberry was sprayed twice, on the front and back side, to create optimal “best-case scenario” coverage. To account for variation in the amount of active ingredient in an individual spray droplet at different carrier water volumes, bioassays were repeated using both a “High Droplet Concentration” (4 fluid oz. Mustang Maxx per 50 gallons water) and a “Low Droplet Concentration” (4 fluid oz. Mustang Maxx per 100 gallons water).

Once spray treatments were applied, raspberries were dried for 24 hours before being placed in a 2 oz plastic deli cup along with five female SWD. Flies were left with the raspberry for 24 hours, at which point we assessed adult mortality. We then removed all flies and incubated the raspberries for an additional 4-5 days before extracting larvae using sugar floatation methods. Total larval counts were divided by the number of females present in the assay arena to standardize infestation as the number of larvae per female.

Table 1. Average percent spray coverage and percent female SWD mortality in raspberries sprayed using either “High Spray Coverage” or “Low Spray Coverage”. Bioassays were repeated using a low (4 oz. Mustang Maxx / 50 gallons water) and a high droplet concentration (4 oz Mustang Maxx / 100 gallons water).

Droplet Concentration	Spray Coverage Treatment	Average Spray Coverage (%)	Average SWD Mortality (%)
High	High	87.7	91.0
	Low	22.0	70.7
Low	High	85.7	80.8
	Low	18.4	38.8

Results: Mustang Maxx spray coverage on treated raspberries impacted female SWD mortality, regardless of droplet concentration (Table 1). For example, average mortality decreased by 41.9% between the “High” and “Low Spray Coverage” treatments at the low droplet concentration. We observed very low mortality in our untreated controls (averaging 0% and 1.25% in the low and high droplet concentration bioassays respectively), indicating that neither the marker dye nor our bioassay arena setup affected SWD mortality.

In contrast, spray coverage did not impact larval infestation rates. In raspberries sprayed with water (control), larval infestation was highly variable, ranging from 0 to 23.4 larvae per female, with no significant differences between “Low” and “High” spray coverage treatments (Figure 4). When raspberries were sprayed with Mustang Maxx, larval infestation was low regardless of coverage or spray droplet concentration and we observed no significant differences between the spray coverage rates (Figure 4).

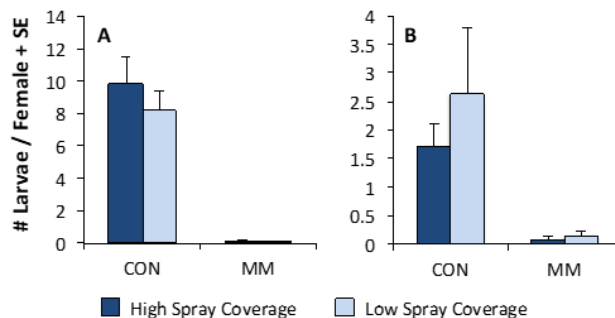


Figure 4. Mean larval infestation rates and standard error observed in raspberries sprayed with water (CON) or Mustang Maxx (MM) at either high or low spray coverage levels. Bioassays were repeated twice using (A) High Concentration Droplets and (B) Low Concentration Droplets. No significant differences in larval infestation were detected between the high and low spray coverage rates.

Conclusions: The spray coverage obtained in these bioassays is consistent with previous field assessments of spray coverage in raspberries and blackberries. In particular, the level of spray coverage achieved on “Low Spray Coverage” raspberries (~21%) is most similar to coverage rates observed in the inner and lower canopy of blackberry and raspberry plants [3, 4]. Under laboratory conditions, this reduced level of spray coverage does not appear to impact larval infestation, suggesting that even low amounts of insecticide may reduce SWD egg laying. But, lower spray coverage also correlated with significant reductions in female SWD mortality, suggesting that spray coverage may be an important factor for managing the adult life stages. Areas within the plant canopy that have reduced spray

Managing Tree Fruit Rots This Season

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coverage rates, such as the lower or inner canopy, may provide a refuge for adult SWD that allows on-farm populations to persist and increase. Sub-lethal insecticide exposure through reduced spray coverage could also contribute to the development of insecticide resistance in SWD, though further study is needed to test this hypothesis.

Achieving good spray coverage throughout the plant canopy can be difficult, and it is important to calibrate sprayers for the crop that is being sprayed. Checking spray coverage with water sensitive cards (if rain and dew will not interfere) or with a marker dye can help identify and address issues to improve coverage. The Hamby Lab will be evaluating spray coverage throughout summer 2019. If you would like us to measure spray coverage on your farm, please contact Maggie Lewis (email: mtlewis@umd.edu; phone: (301) 405 – 1613) for further information.

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The peach and nectarine season is here, and the apple season isn't far off. Consequently, preventing fruit rots is now the priority. Depending on your location, significant rainfall has occurred over the last couple of weeks. Unfortunately, these rainy, humid conditions are quite favorable for rot, both in establishment and spread. Vigilance is needed in the orchard, especially if brown rot pops up. Some nuggets of wisdom to keep in mind:

Peaches and nectarines: A review of brown rot management strategies

Peaches and nectarines are ripening, which means 'tis the season for brown rot. The fungus causing brown rot is quite opportunistic: it can kill blossoms and it can also ruin the fruit you've worked hard all season to grow. Brown rot disease is favored by warm, wet weather conditions. Under optimum temperature conditions, fruit infections can occur with only three hours of wetness when inoculum levels are high. Longer wet periods during infection result in shorter incubation times so symptoms develop more rapidly. It's not uncommon to have brown rot appear "overnight" on fruit.

Spores produced on early maturing cultivars can fuel a continuing outbreak on late maturing cultivars – this is especially important for those who have battled rot infections already this season. To add another headache to the issue, insects can be important vectors of the fungal spores during fruit ripening: they can carry spores to injury sites produced by oriental fruit moth, Japanese beetle, green June beetle, and other insects that can injure fruit. Wounded fruit are much more susceptible to brown rot than unwounded fruit. It's critical to be on top of insect management. Another concern to worry about is split pit. Unfortunately, these fruit are quite prone to rot problems. Keep in mind: under the right conditions, "healthy" fruit harvested can be contaminated and may decay later during storage.

Research at Rutgers has shown that timing brown rot sprays 18 days, 9 days, and 1 day before harvest provided greater than 95 percent control under heavy disease pressure. When following this regime, rotate chemistries by FRAC group for resistance management. Keeping in mind products that were used to control blossom blight, be sure to be in compliance by obtaining the current usage regulations and reading the product label.

For example, one could spray the following:

- 18 days: Fontelis (FRAC Group 7; 0 day PHI)
- 9 days: Indar (FRAC Group 3; 0 day PHI)
- 1 day: Merivon (FRAC Group 7 +11; 0 day PHI).

Other options to rotate:

- Luna Sensation (FRAC Group 7 + 11; 1 day PHI)
- Luna Experience (FRAC Group 7 + 3; 0 day PHI)
- Topsin M (FRAC Group 1; 1 day PHI)
- Inspire Super (FRAC Groups 3 + 9; 2 day PHI)
- Orius (FRAC Group 3; 0 day PHI)
- Tilt (FRAC Group 3; 0 day PHI)
- Quash (FRAC Group Code 3; 14 day PHI)
- Flint Extra (FRAC Group 11; 1 day PHI)
- Captan (FRAC Group M4; 0 day PHI)

As a result of the rain, postharvest diseases, such as Rhizopus rot, might create headaches. The spray closest to harvest will be important: the best options are Merivon or Luna Sensation. These products are labeled to control Rhizopus rot.

Additional options for peach/nectarine rot management

The key for growers who farm organically or prefer using alternative products is to spray as often as possible as disease conditions persist, manage insects, scout often, and prompt removal of infected fruit as soon as you see it. Spraying often ensures you have continuous protection; removing infected fruit from the trees ensures you are decreasing the amount of spores available to cause disease and hopefully minimizing an epidemic. Knocking infected fruit to the ground will be enough to limit spread. Vigilance is important and this may translate spraying every few days, especially if rain washes off products. According to studies at Rutgers, sulfur is not effective for controlling brown rot. Some organic options labeled for brown rot control are Cueva, Double Nickel, Serenade Opti (or Serenade ASO), and Regalia.



Bitter Rot of Apple. Photo by K.Peters

Apples: Protecting fruit from rot

We are nearing the home stretch of the apple season and folks will want to be considering sprays to keep their apples free of rot, especially while in storage. Not only a headache in the field, but the fungi causing fruit rots can be quite stealth since spores will land on the fruit and cause symptoms only after the fruit have been in storage. This is especially significant if your apples are headed for a packinghouse or even fresh market.

Last year was a very challenging year for bitter rot. There have been several reports of growers already observing bitter rot on some of their immature fruit. The fungi that cause bitter rot initially infect fruit early in the season and then go dormant, i.e. the fungus stops growing. There are no obvious symptoms for these early infections. Usually late July through early September, we begin to see these infections “awaken” and fruit rot symptoms become evident. Honeycrisp and Empire are especially susceptible to bitter rot. Unlike other fungi causing rot, the bitter rot fungus does not require fruit wounding to establish an infection and can directly penetrate the fruit skin. Rot spots usually appear on the side of the apple directly exposed to the sun as small, circular brown lesions and change to sunken, dark brown lesions as they enlarge. During humid conditions, large numbers of creamy to salmon colored spores are produced. Fruiting bodies visible to the naked eye appear after the lesion is one inch in diameter and are arranged in a concentric circle pattern in the center of the lesion (see picture). These spores are spread through the tree canopy via rain splashing.

For growers who struggled with bitter rot last year, I recommend at least one application of Omega (6.9 fl oz/A; 28 day PHI) in July to protect Honeycrisp and other vulnerable varieties. Be mindful of Omega’s PHI for earlier varieties. Rotate Omega with captan at 3 lb/A or 5 lb/A, depending on disease conditions: higher rate during very rainy periods; lower rate when not as rainy. I highly encourage growers to use Merivon (FRAC Groups 7 + 11; 0 day PHI) as their last one or two sprays prior to harvest since these products do show efficacy keeping rots, including bitter rot, in check while in storage. Based on our studies over the last year, Luna Sensation is not effective in controlling bitter rot. These recommendations are both for fresh market and juicing apples: the pack houses and processors will thank you!

For alternative methods, Serenade Opti or Serenade ASO (B. subtilis; 0 PHI) is an option. Our research has shown minimal fruit rot diseases in the field and storage, at least on Golden Delicious when we used this product during our last few sprays. These results may vary with other cultivars, depending on their susceptibility to certain rot diseases, as well as severity of disease conditions. We are evaluating additional alternatives during our 2019 trial season.



Management of Grape Downy Mildew: A Constant Battle in Maryland Vineyards

By Mengjun Hu

**Fruit Pathology, Assistant Professor
Plant Science and Landscape Architecture,
University of Maryland**

Downy mildew (DM) is certainly one of the major disease issues in vineyards in Maryland and other states where it is warm and wet during a growing season. The pathogen, *Plasmopara viticola*, is now recognized as an oomycete that behaves like a fungus. It overwinters on ground in infected leaves and release oospores in spring under favorable conditions. Oospores typically produce sporangia that produce zoospores to infect grapevine. Sporangia and zoospores are dispersed by splashing water (e.g. rainwater) and/or wind. It is worth noting that *P. viticola* is a multi-cycle pathogen, which causes secondary infections via zoospores from sporangia produced on sporangiophores that emerge through stomata of infected leaves and other tissues. Because moisture favors the development of DM, any practices (e.g. proper pruning and leaf pulling) that shorten drying time of leaves and fruit will be of benefit. Cultivars of grapevine varies significantly in susceptibility to DM, which should be taken into consideration when planting a new vineyard.

The control of DM largely relies on fungicides. Unfortunately, DM pathogen is able to develop fungicide resistance and resistance to some of the commonly used fungicides have been documented. For example, a high level of frequency of resistance to FRAC 11 (e.g. Flint) has been found in *P. viticola*. Resistance to FRAC 40 (e.g. Revus) has also recently been reported in our region. Therefore, we need to be careful with choosing fungicides that can effectively manage the disease throughout the season while following guidelines and principles of fungicide resistance management for a more sustainable production.

Unlike single-site fungicides, multi-site fungicides such as captan and mancozeb are NOT prone to resistance development. However, multi-site fungicides are generally less effective and lack of systemic activities compared to single-site fungicides. Based on these traits, it is important to:

1) Apply ONLY multi-site fungicides when disease pressure is low.

For instance, very few DM is present and little rain is forecasted in the next 7 to 10 days. In this case, captan, mancozeb or even copper (note that PHI of mancozeb is 66 days) alone would be good enough. The foremost benefit of using multi-site fungicides is to limit the number of applications of single-site fungicides. One may ask if it is ok to skip a spray for DM under low disease pressure? The answer would be YES and is in fact a better option for economic and environmental reasons, but it is not always reliable to predict disease infections without accurate weather data and knowledge.

2) Tank mix single-site with multi-site fungicides when disease pressure is high.

Fungicides may fail to control the disease if the pathogen population has developed the resistance. It is therefore critical to NOT apply single-site fungicides alone. Adding multi-site to the spray tank is an insurance and this is especially important under high disease pressure! Although multi-site fungicides are less effective against disease already occurred, but they can significantly reduce inoculum level by protecting uninfected leaves and other tissues.

3) Protective sprays are more effective than post-infection sprays.

This is because inoculum (spores) is accumulated/produced as the infection progresses. Post-infection sprays would then have to deal with more inoculum that may adversely affect fungicide efficacy. With a higher level of inoculum, it may also speed selection for fungicide resistance, as resistant traits or isolates are being selected from a larger pool.

Over the past few weeks, the DM pressure has been on a raise due to consecutive and scattered showers in many locations in Maryland. It seems like this disease-favorable weather pattern is going to continue for a while. If consecutive showers likely resulting in an extended moisture are expected, it is critical to spray PRIOR to the showers (i.e. protective sprays). Other general resistance management strategies include mixture or rotation of fungicides with different FRAC codes, and limiting each FRAC code to 2 applications per season. We have been developing the smartphone app MyIPM for grape section. Although it has not been completed, information about currently available fungicides for DM and a few other diseases are available. The app can be downloaded from the Google Play (Android devices) or the App Store (Apple devices), which is free of charge.



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.

Pre-Harvest (August)

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

Click on links below to go to:

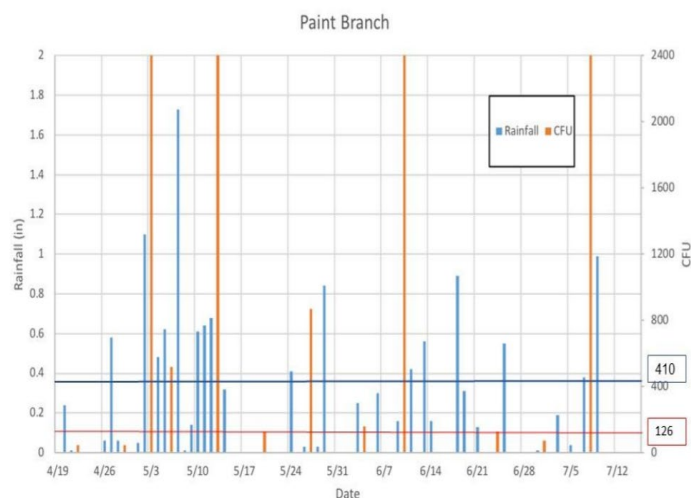
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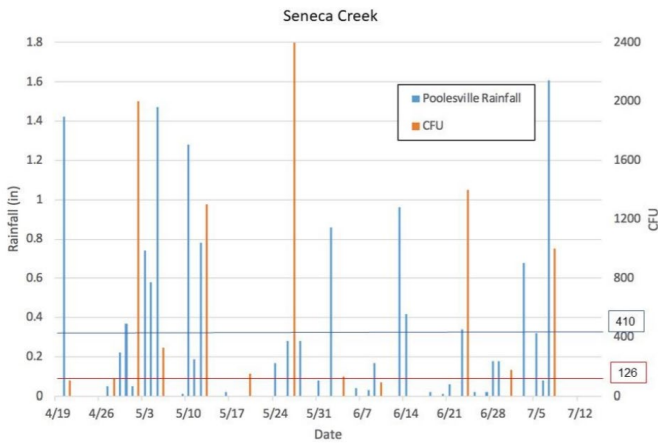
July Update from the Walsh Lab Surface Water Quality

By Carol Dianne Allen
Extension Associate in Food Safety
PSLA, University of Maryland
callen12@umd.edu

&
By Audra Bissett
Research Technician
PSLA, University of Maryland

This month we would like to take a closer look at the data we have obtained from our stream project. Surface water sampling for produce safety education has been taken from two streams in central Maryland: the Paint Branch in Prince Georges County and Seneca Creek in western Montgomery County. After drawing the samples, they were kept on ice and have been promptly transported to one of the MDA approved labs¹ to be tested for the presence of generic E. coli. Our interest has been to provide Maryland's farmers with information linking rain events and their effect on generic E. coli levels in surface water. The greatest concern is the use of surface water (streams and ponds) for overhead irrigation on particularly high risk crops such as strawberries and leafy greens right before harvest. As we face the summer months in Central Maryland, those crops have been harvested and are out the door. Now it is time to look to the next crop cycle and it may be a good time to look at accumulating the data for the Microbial Water Quality Profile that will be required in the future.²





In both graphs the orange bars represent CFUs of E. coli per 100 ml sample (reference scale on the right) and the blue bars represent inches of rainfall (scale on the left). The threshold lines for the geometric mean of 126 CFU/100 ml and the statistical threshold value of 410 CFU/100 ml have been added for reference. If you are looking to comply to the Produce Safety Rule under FSMA, these are the values you wish to record. It is of value to note the number of samples that were over the geometric mean and the number of samples over the statistical threshold. Higher numbers indicate a higher probability of fecal contamination in the water, increasing the food safety risk for overhead irrigation events. If the overhead use of surface water is part of your crop management plan, starting a Microbial Water Quality Profile is going to be invaluable. We would be happy to help you initiate your MWQP and help you with any questions you may have regarding either GAP or FSMA Produce Safety Rule compliance. We can be reached at: 301-405-4372 or by e-mail at: calen12@umd.edu.



NEWS RELEASE

Office of the Secretary 30 Harry S Truman Parkway Annapolis, Maryland 21401 www.mda.maryland.gov

Tax Credit Pilot Program Expands Across Maryland

Great news for Maryland farms, as HB 403 passed through the Maryland legislature in April. Starting July 1, farmers can receive tax credits for produce donations. Conventional produce donations will be valued at 50% of the market value, while certified organic donations are eligible for credits worth 75% of the market value. There is a \$5,000 cap per farm and \$100,000 statewide cap on this program.

As Farm to Food Bank coordinator for the Maryland Food Bank, I encourage farmers to take advantage of this program for several reasons:

- There are 650,000+ food insecure residents across Maryland. Those struggling to make ends meet likely can't afford to put food on their plate, especially nutrient dense food like fresh fruits and vegetables. As a result, they often make difficult tradeoffs between the quality and quantity of the food they purchase.
- Fresh produce provides vital nutrients that are necessary to sustain a healthy and active life. Individuals who regularly consume fresh produce are less likely to be hospitalized due to improved immune systems, are at decreased risk of chronic diseases, and are less likely to miss work and school due to improved general health.
- We hope this program will further encourage farmers to donate excess produce to MFB and allow us to coordinate volunteer gleanings of their fields so that we can distribute more fresh produce and educate Marylanders on the importance of good nutrition.
- The program needs to be used in order to keep it viable. If the legislators do not see farmers utilizing the money set aside, the fear is that it will go away and never return.
- Lastly, having worked with farmers for nine years and being a farmers' daughter, I am hoping that this credit benefits our Farm to Food Bank partners.

These donations must be made to Maryland Department of Agriculture (MDA) tax credit certification administrators (TCCA). As the largest charitable food provider in Maryland, the Maryland Food Bank (MFB) is one those organizations. At the time of the donation, the MFB will provide a MFB donation form to the farmer. The farmer will then use that record to complete a separate form that can be found on the MDA website. The MDA will then determine the value of the donation based on USDA market values at the time of the donation. That form will then be sent back to the farmer for use when filing taxes.

If you have any questions about this program you can contact Amy Cawley, Farm to Food Bank Coordinator for the Maryland Food Bank, at acawley@mdfoodbank.org. You may also reach out to Stone Slade of the Maryland Department of Agriculture at stone.slade@maryland.gov.



USDA Announces \$16 Million Funding Opportunity to Support Socially Disadvantaged and Veteran Farmers and Ranchers

The U.S. Department of Agriculture today announced up to \$16 million in available funding to help socially disadvantaged and veteran farmers and ranchers own and

operate successful farms. Funding is made through the USDA's Outreach and Assistance for Socially Disadvantaged Farmers and Ranchers and Veteran Farmers and Ranchers Program (also known as the 2501 Program). The program is administered by the USDA Office of Partnerships and Public Engagement (OPPE).

"All farmers and ranchers deserve equal access to USDA programs and services," said Mike Beatty, director of the USDA Office of Partnerships and Public Engagement. "2501 grants go a long way in fulfilling our mission to reach historically underserved communities and ensure their equitable participation in our programs."

For 30 years, the 2501 Program has helped reach socially disadvantaged agricultural producers – farmers and ranchers who have experienced barriers to service due to racial or ethnic prejudice. The 2014 Farm Bill expanded the program's reach to veterans. The 2018 Farm Bill boosts mandatory funding for the program through FY 2023. With 2501 Program grants, nonprofits, institutions of higher education and Indian Tribes can support underserved and veteran farmers and ranchers through education, training, demonstrations, and conferences on farming and agribusiness, and by increasing access to USDA's programs and services.

Since 1994, the 2501 Program has awarded 451 grants totaling more than \$103 million. Among recent 2501 projects, an FY 2018 grant awarded to the Mississippi Minority Farmers Alliance in Okolona, Mississippi helped agricultural community leaders connect senior farmers and new and beginning farmers to preserve farming legacies. A 2501 grant to Florida International University helped veterans and young urban farmers build sustainable urban agriculture operations in South Florida.

Eligible 2501 Program applicants include not-for-profit organizations, community-based organizations, and a range of higher education institutions serving African-American, American Indian, Alaska Native, Hispanic, Asian, and Pacific Islander communities.

The deadline for applications is August 15, 2019. See the [request for applications](#) for full details.



Cultivate Baltimore Urban Farming Workshops:

[Community Engaged Farming](#)

Friday, Jul. 26, 2019 - 6:00pm to 7:30pm
Filbert Street Garden, Baltimore, MD

[Hand-Scale Farm Tools](#)

Thursday, Aug. 15, 2019 - 5:00pm to 7:00pm



Interest in Urban Farming Assessment



Do you have an interest in urban farming? If so, please complete this short, 5-minute interest assessment survey.

Why take the survey?

The more interest there is for urban agriculture, the more resources and support will be available!

Take the survey here:

<https://forms.gle/RhQLfRpAAmyjkFmi8>

Survey created by Maria Gumerov--AGNR Student Intern at Anne Arundel County Extension Services, 97 Dairy Ln, Gambrills, MD 21054

The University of Maryland Extension is conducting a study on the well-being of farmers. We're conducting focus group discussions (maximum 90 minutes) to learn about the stresses that farmers face and how to support farmers. Participation is voluntary. Participants will be compensated for their time.

Are you a farmer?

Are you interested in participating in our study?

We have a discussion scheduled in Centreville, MD on Monday, July 22, 2019 • 10:00 a.m. at the Queen Anne's County Extension office 505 Railroad Ave #4, Centreville, MD 21617

There is also an online survey if you are not able to attend the discussion:

https://ume.qualtrics.com/jfe/form/SV_1MusoAo7Xn7AaI

If you have any questions about this, please contact: Jenny Rhodes at 410-758-0166 or jrhodes@umd.edu

Private appointments also available.



Crops Twilight Barbecue & Ice Cream Social CMREC Upper Marlboro Farm



August 7, 2019

You are invited to a **Fields Crops Research Twilight, Barbecue and Ice Cream Social** at the **Central Maryland Research & Education Center, 2005 Largo Road, Upper Marlboro, Maryland** on **Wednesday, August 7, 2019 from 4:00 to 9 PM**. A barbecue dinner will be served at 4:00 pm followed by homemade ice cream prior to the evening tour. University of Maryland Extension Educators and Specialists will showcase their field crop, vegetable and fruit research plots.

If you need special assistance to participate, please contact the Anne Arundel County Extension office at 410-222-3906 by August 6th.

Register on-line at the Anne Arundel County Extension website:

<http://extension.umd.edu/anne-arundel-county>
or call 410 222-3906.



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.

Vegetable & Fruit News

A timely publication for the commercial vegetable and fruit industry available electronically in 2019 from April through October on the following dates: **April 25, May 24, June 13, July 18, August 15, September 19 and October 24 (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
mymersrd@umd.edu



Article submission deadlines for 2019 at 4:30 p.m.
ON: April 24, May 22, June 12, July 17, August 14, September 18 and October 23 (Special Research Edition).

Note: Registered Trade Mark® Products, Manufacturers, or Companies mentioned within this newsletter are not to be considered as sole endorsements. The information has been provided for educational purposes only.



WMREC Horticultural Twilight Tour

Thursday, August 15, 2019
5:00 p.m. to 8:00 p.m.

Western Maryland Research & Education Center
18330 Keedysville Road, Keedysville, MD 21756

Questions regarding program content, please contact Bryan Butler at bbutlers@umd.edu.

There is no charge, but registration is required to help us plan for handouts and refreshments.

Please RSVP at <https://wmrectwilight.eventbrite.com> / or you may contact Susan Barnes at sbarnes6@umd.edu or 301-432-2767 x301 by Friday, August 9.

If you need special assistance to participate, please call 301-432-2767 x301 by August 9.

The University of Maryland Extension programs are open to any person and will not discriminate against anyone because of race, age, sex, color, sexual orientation, physical or mental disability, religion, ancestry, national origin, marital status, genetic information, political affiliation, and gender identity or expression.