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.

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June Vegetable IPM Scouting Tips

By Emily Zobel
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When scouting, check 5-10 locations (~50 plants) throughout the 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 or consult your local extension agent. Be sure to read all labels carefully for rates and restrictions.

Cucurbits: Scout for aphids, cucumber beetles, and spider mites. Treatment should be applied for aphids when 20% of runners/plants are infested with 5 aphids per leaf. Spider mite activity will increase with the hot weather and can double within a few days if not controlled. The treatment threshold for spider mites is 20-30% infested crowns with 1-2 mites per leaf. The threshold for cucumber beetles is an average of 1 beetle per plant in cucumbers, melons, Hubbard and butternut squash, and younger pumpkins, and average of 5 cucumber beetles per plant in watermelon, other varieties of squash, and older pumpkins. When fields are blooming, it is important to consider pollinators when making an insecticide application.

Solanaceae: Scout for Colorado potato beetles (CPB), flea beetles, and spider mites.
Treatment threshold for CPB is 25 adult beetles per 50 plants, and defoliation has reached the 10% level on potatoes, or an average of 4 small larvae per plant or 1.5 large larvae per plant. CPB populations readily develop insecticide resistance so rotating between IRAC groups is crucial. See the Mid-Atlantic Commercial Vegetable Production Guide for options for use in a rotation. For eggplant, treat when the average is 1.5 adults per plant or 2 larvae (any size) for plants under 6 inches or 4 small or 2 large larvae per plant when above 6 inches.

Sweet Corn: Continue to scout for cutworms and flea beetles. As a general guideline, treatments should be applied if you find 3% cut plants or 10% leaf feeding by cutworms. Treat if 5% of the plants are infested with flea beetles. Scout whorls through pre-tassel stage sweet corn for corn borers and corn earworms. A treatment should be applied if 15% of the plants are infested.

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/

Corn Earworm Management in Sweet Corn Needs Assessment Survey

By Kelly Hamby
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Dr. Kelly Hamby, Associate Professor/Extension Specialist with the Department of Entomology at University of Maryland, is leading a team of researchers who have developed a survey to prioritize research and extension efforts for improving corn earworm management in sweet corn throughout the Northeast. We appreciate your participation in this survey and will use results to develop a grant proposal to try to get federal funding to address these needs. Complete the Survey: Click Here

Watch for Thrips and Mites in Vegetables

By Jerry Brust
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The hotter temperatures we have had have caused thrips and to a lesser extent two spotted spider mite, TSSM (*Tetranychus urticae*) populations to rapidly increase in some vegetable fields. These pests feed by puncturing the outer layer of plant tissue and sucking out the cell contents, which results in stippling, discolored flecking, or silvering of the leaf surface (fig.1). We will talk mostly about thrips this time as I covered TSSMs in an earlier article. Thrips feeding is usually accompanied by black flecks of frass (thrips poop) (fig. 1a), while mite poop is white or clear. These two pests can discolor and scar leaf, flower, and fruit surfaces, and distort plant parts and in the case of thrips vector plant pathogens.

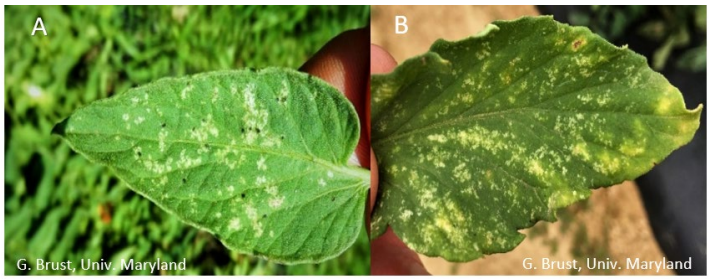


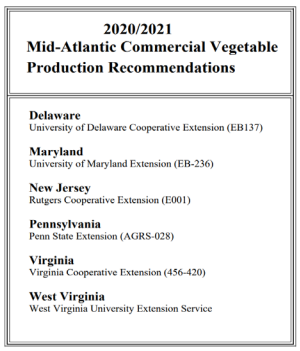
Fig. 1 Thrips feeding on tomato leaf, black specks are thrips feces (A) and feeding damage by mites (B).

There are several species of vegetable thrips with the most common being the Eastern flower thrips, *Frankliniella tritici*, Tobacco thrips *Frankliniella fusca*, Western flower thrips, *F. occidentalis* and Onion thrips *Thrips tabaci*. The last three species are the ones most likely to transmit tomato spotted wilt virus, TSWV. Thrips feeding produces various tissue responses, including scar formation and distorted growth (fig. 2). Females of most plant-feeding species lay their kidney-shaped eggs on or into plant tissue (this latter placement makes it practically impossible to find thrips eggs on plants). Thrips hatch from an egg and develop into two larval stages and then the prepupa and pupa stages, before becoming an adult. The prepupae and pupae of most species drop to the soil or leaf litter to pupate. Thrips have several generations (up to eight) a year. When the weather is warm, the life cycle may be as short as 2 weeks.

Fig. 2 Pepper leaf distortions due to thrips feeding.

Thrips thresholds for vegetables are: flowers of tomato, pepper or watermelon can tolerate 5 thrips/flower with no fruit developmental problems. Squash and pumpkin flowers can tolerate 5-10 thrips/flower with no effect on fruit quality. One or two applications of a pyrethroid or neonic or spinosad (see 2020/2021 Mid-Atlantic Commercial Vegetable Production Recommendation guide) applied with enough water (50-70 gal/a, you have to have thorough coverage) should control most thrips infestations. However, if you have widespread thrips problems (on many different crops) and you have applied Entrust several times you need to switch to another IRAC group (such as Torac that can be used on a wide variety of crops but check the label for the crops it can be used on) and possibly horticultural oils for a couple of sprays if temperatures are at or below 86°F. The oils will not completely control the thrips but they will help reduce their populations. For two spotted spider mites Agri-Mek has shown very good results even when spray coverage was inadequate. There are several other miticides such as Acramite that also will give good control of TSSM and can be found in the recommendations guide. Be sure to apply any pesticides when bees will not be active in the field.

Some of the populations of thrips and mites in the field now are probably the result of transplants that were lightly infested with these pests. These infestations usually consist of immatures, which are hard to spot or eggs that are just about impossible to find if they laid inside leaf tissue (thrips) or there are only a few of them on the underside of the leaf in crevices (mites). Studies I have conducted show that if you treat your transplants (especially tomatoes) with 2 applications of a horticultural oil spray (0.5-1% by volume) with the first application coming 7-10 days before transplanting and the 2nd coming 1-2 days (or per label instructions) before you go to the field, you can almost eliminate any thrips or two spotted spider mite problems that started from your transplants. During the season spraying more than 3-4 times for thrips or two spotted spider mites in the field over a 4-5-week period with little control will lead to an even worse problem. This is because the sprays will greatly reduce all of the pests' natural enemies, but not the thrips or TSSM that may have developed resistance to the applied pesticides. Once you apply an insecticide or miticide you need to evaluate how well it worked by scouting the field again a few days after the application. If the pests are still very active you need to reevaluate what was applied and how it was applied.



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Seeing Some Unhappy Cucurbit Plants

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Starting to see some watermelon, cucumber and other cucurbit crops that are looking a bit pale green or even yellow (Fig. 1).

Figure 1. Watermelon plant that is yellow with some dark spotting.

Sometimes the plants have brown speckles or spots on them that may look like a foliar disease has started (Fig. 2), but it has not.

Figure 2. Watermelon leaf that is yellow with dark marks caused by abiotic factors.

Most of the time if you look at the underside of the leaf with spots you do not see the same browning of the tissue or it is much reduced (Fig. 3).

Figure 3. Underside of a watermelon leaf that had dark spots on top but not underneath.

Also, as in the field of watermelon that these photos came from, much of the field looked like the plant in Figure 1. When the damage appears on one side of the leaf or is in much of the field it is usually an abiotic problem– one that is not caused by an insect, fungus bacteria, or other living pest, but is caused by a non-living factor such as weather. This is what seems to be popping up in some vegetable fields now, but especially in cucurbits in the last few days. The unusually cloudy, cool weather we had most of last week and this past holiday weekend along with some heavy rains have stressed the cucurbit crop and slowed its overall growth (foliar and root). Plants should recover and grow out of it with warmer weather.

Bruising on Strawberry Foliage

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Over the last few weeks I have been sent pictures of and have seen dark spots on the foliage of strawberry plants (figs. 1 and 2). These spots can look pretty bad at times and are thought to possibly be the start of some disease such as angular leaf spot or anthracnose. The dark spots are usually on the upper or lower surface of the leaf, but at times can be found on both surfaces of a leaf.

Figs. 1 and 2. Dark areas on strawberry leaves often mistaken for the start of a foliar disease.

These damaged areas of strawberry foliage can be very disconcerting when they appear as dark spots on the stems (fig. 3; these dark markings on petioles are not sunken as they would be if it were anthracnose). No bacteria or fungi have ever been found associated with these dark spots.

Fig. 3 Strawberry stem with dark spot.

I have seen this type of discoloration in strawberry foliage many times over the years and have never seen the spots turn into any disease problem or any other type of problem. The best that we can come up with is that the plant has 'bruised' foliage, usually appearing within a short time span after high winds occur. It is possible that disease organisms might enter the plant through this damaged tissue, but I have never seen this occur to any extent in the field—even during the wettest spring. Nothing needs to be done about this bruising; growers just need to be aware of the possibility occurring after wind events.

Cyclamen Mites Found in Strawberries

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Cyclamen mites have been found in a few mid-Atlantic strawberry fields as well as more widespread to the south of us in North Carolina. So once we start to really warm up they may become more of a problem along with two spotted spider mites. The cyclamen mites have been found most often in plasticulture strawberries and less often in matted row systems. Usually cyclamen mites (*Phytonemus pallidus*) cause much of their damage to bedding plants, but they also can cause significant problems in strawberries.

Fig. 1 Adult female cyclamen mite (yellow arrow), eggs (black arrows) and larva (red arrow).

Adult cyclamen mites are usually never seen as they are only a quarter of a mm long and a 20X hand lens or dissecting microscope is needed to see them.
Adult mites are oval-shaped and a glossy creamy orange (fig. 1) with males being smaller than females. The hind legs of females are thread-like and in males are pincer like (the male uses these hind legs to transport female pupae to new locations on the plant). The eggs are translucent and comparatively large, about ½ the size of an adult (fig. 1). Masses of eggs in leaf crevices can be so numerous that they look like tiny piles of salt. Female adults overwinter in strawberry crowns and also can be present on transplants. Female mites lay their eggs on strawberry leaves that hatch into tiny, white, six-legged larvae (fig. 1). The entire life cycle of the cyclamen mite is less than 3 weeks and therefore populations can build quickly. Although there are multiple generations each year, populations tend to peak in early spring and again in late summer.

Fig. 2 Cyclamen mite damage to strawberry—crinkled deformed younger leaves.

Cyclamen mites use their piercing-sucking mouthparts to feed on plant material. Symptoms of infestation can be found throughout the plant. However, at low populations cyclamen mites can usually be found along the midvein of young, unfolded leaves and under the calyx of newly emerged flower buds. As numbers increase mites can be found anywhere on the plant. The infested leaves will appear stunted and crumpled (fig. 2), while flowers wither and die and fruit becomes shrunken with protruding seeds (fig. 3). By the time these symptoms appear, it is too late to limit damage, so cyclamen mites should be managed preventively. Treatments should be applied when 1 leaf in 10 shows cyclamen mite damage.

Fig. 3 Cyclamen mite damage to strawberry fruit-protruding seeds.

Growers should watch for deformed leaves starting when new buds emerge from the crown and continuing until harvest. Older fields will most likely have more problems. In order to be sure of the presence of cyclamen mite, you need to examine the newest leaves in the crown, specifically the mid vein and lower part of a leaf where it joins the petiole. Magnification (20-40X) is recommended for confirmation of cyclamen mites.

Early detection of cyclamen mites is essential in achieving best control. Thorough spray coverage of the crown leaves is important for good control, so high volumes of water are needed (60-100 gal/a). Horticultural oils can be used if temperatures are below 88° F. Agri-Mek SC or Portal XLO also can be used for mite control. Predatory mites can be used and work best if cyclamen mite populations are small and confined to scattered hot-spots in a field.

Virus Problems Found in Garlic

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Garlic growers may be noticing symptoms of virus infection in their plants that show yellowing tips on many leaves with some that are completely yellow (fig 1).

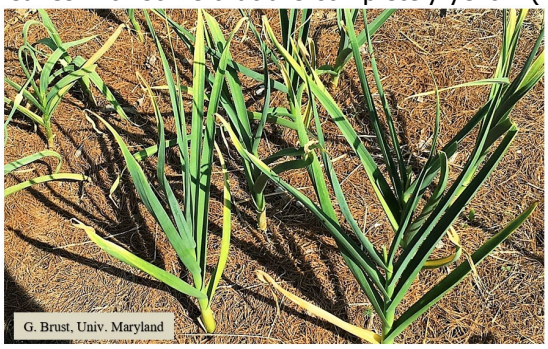

Fig. 1 Garlic plants showing symptoms of infection with virus complex.

If you look closely at the yellow leaves you will see mottling or striping on the leaves (fig 2). These symptoms are usually more pronounced on young leaves. Infected plants are stunted and bulb size can be reduced. Garlic crops infected with viruses are usually more susceptible to weather conditions like extreme heat, and do not keep well post-harvest.

Fig. 2 Streaking, striping on leaves of garlic infected with virus complex.

What is usually called a 'garlic virus' is caused by several different viruses that can be grouped under the name "Potyvirus"; all symptomatic garlic that was tested was positive for Potyvirus. Some people lump these viruses under the name "garlic mosaic". In this case garlic mosaic is thought of as a disease caused by one or more viruses that include onion yellow dwarf virus, leek yellow stripe virus, and others. These viruses can be transmitted through the planting stock or by aphids and it is thought because garlic is clonally propagated much of the planting stock could be infected with some type of virus. These viruses are usually mild and do not seriously affect yield. The problem comes in when the plants are infected with several different Potyviruses, and then there can be moderate to severe yield reductions. We may have had more aphid movement earlier this year, which may have increased additional virus infections in garlic plantings. You cannot reduce virus transmission by spraying pesticides. Any garlic with symptoms should be watched and possibly harvested early or rouged out if yellowing and decline increase in the coming weeks.

With Rainfall so Comes Phytophthora and Pythium

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This article originally appeared in the Rutgers University Plant and Pest Advisory.

Most of the region has finally gotten rain and pop-up thunderstorms making conditions ideal for pathogens such as Phytophthora and Pythium on spring-seeded and transplanted crops. Unfortunately, Pythium and Phytophthora blight can be found on many farms. Poor crop rotations with susceptible hosts only make matters worse. The Phytophthora pathogen has an increasing host range that now includes snap and lima beans; and all crops, other than a few resistant bell pepper cultivars, lack any resistance to the pathogen.

Control of Phytophthora blight and Pythium are extremely difficult (even with the use of fungicides) in the wet weather conditions. In the past few years a number of new fungicides, with new active ingredients, have become commercially-available for use on multiple crops. Mefenoxam or metalaxyl, both once widely-used to effectively control Phytophthora blight has been hit by resistance issues around much of Southern New Jersey the past decade. Growers with a known history of mefenoxam-insensitivity on their farm should use Presidio, Previcur Flex, or Ranman plus a Phosphite fungicide in rotation in their drip application programs. Importantly, if mefenoxam has not been used in particular fields on any crop for a number of years (more than 5+) the fungus may revert back to being mefenoxam-sensitive and control with these products may return. Mefenoxam, metalaxyl, Previcur Flex, and the phoshites are the most systemic of the group and should readily be taken up the by plant via application through the drip. Presidio has locally systemic and has translaminar activity and should offer some protection of the root system via drip. Ranman has protectant activity and thus will offer some root protection where it comes into contact with. Orondis Gold (oxathiapiprolin + mefenoxam, 49 +4) is the newest fungicide available with a new active ingredient in a new FRAC group. Additionally, in past research trials, mefenoxam, Orondis Gold, Presidio, Previcur Flex, Ranman, Revus and the phosphites in rotation and/or tank mixes have offered very good control of the fruit rot phase of phytophthora blight.

Recommendations

mefenoxam–1.0 pt Ridomil Gold 4SL/A or 1.0 qt Ultra Flourish 2E/A or metalaxyl (MetaStar)–4.0-8.0 pt 2E/A at transplanting via drip and 30 days later.
Orondis Gold (oxathiapiprolin + mefenoxam, 49 +4) at 4.8 to 9.6 fl oz/A 1.67S at transplanting and 30 days after. If applied as drip application it can not be applied as a foliar.
Presidio (fluopicolide, 43) at 3.0-4.0 fl. oz 4SC/A at transplanting via drip and in rotation.

Ranman (cyazofamid, 21) at 2.75 fl oz 400SC at transplanting via drip and in rotation. (Ranman can be added to transplant water, see label for specific crop uses)
Previcur Flex (propamocarb HCL, 28) at 1.2 pt/A 6F at transplanting via drip or directed spray at base of plant. (Previcur Flex can be added to transplant water, see label for specific crop uses). Use in rotation.
Phosphite materials (FRAC code 33) such as Rampart, ProPhyt, or K-Khite may also be tank mixed with one of the above to help suppress Phytophthora blight.
If mefenoxam-insensitivity is present, only use Presidio, Previcur Flex, Ranman, Revus, and/or phosphite fungicides. For more information on these fungicides and specific crop use please see the 2020/2021 Mid-Atlantic Commercial Vegetable Production Recommendations Guide.

Recommendations for Organic Growers
Applications of Double Nickel (Bacillus amyloliquefaciens) or Regalia (Extract of Reynoutria sachalinensis) as drenches or via the drip system prior to the onset of disease may help suppress phytophthora and pythium development. Other biopesticides, such as those containing Trichoderma spp. or Streptomyces spp. can also be used to help suppress these pathogens.

If Losses Become High?
If phytophthora or pythium losses become high because of the heavy rains, pre-emptive cultural practices need be taken immediately. Rogueing out, discing under, or hitting areas with Gramoxone to burn infected plants down will help slow down and reduce the spread of potential inoculum to healthier areas of the block or farm. If beds are chronically wet, plastic can be cut or completely removed to help soils dry out.

Pythium in Vegetable Production

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A few weeks ago, we discussed *Pythium* in field corn, but it can also cause problems in sweet corn, snap beans, and a number of other crops. Wet spring conditions and low or poorly drained areas of the field can all favor root rot and other diseases caused by the oomycete pathogen, *Pythium.*

Sweet Corn
While seed rot can be caused by a number of organisms, we most frequently observe *Pythium* as the causal organism. Whenever there are cool, wet soils or other factors that delay germination, the seedling has a greater chance of being exposed to *Pythium* in the soil. Seedlings may fail to make it out of the ground, or may germinate and display symptoms of yellowing, wilt and leaf drop, stunting, or death (damping-off) (Figure 1). When dug out of the soil, infected plants typically have brown, rotted roots and mesocotyl. *Pythium* is usually worse in early season plantings, but could appear at any planting date due to the range of *Pythium* species found in our soils. Chemical and biological seed treatments are available to help reduce damping-off.

Figure 1. Corn seedlings with post-emergent damping-off caused by Pythium spp.

Figure 2. Snap bean cottony leak.

Snap Beans
In snap beans, *Pythium* can be a problem at different stages throughout the season. Root rot can occur early in the season or into the summer, while cottony leak of pods occurs on mature plants near harvest or postharvest when beans are in transit to processing facilities. Cottony leak (Pythium Blight) is typically worse when there is rainy weather with cool temperatures. Look for thick, white, cottony growth on leaves, stems, or fruit (Figure 2). To reduce chance of disease, avoid close planting and maintain proper air circulation. It is also recommended to avoid harvesting and packing during wet weather. ProPhyte, K-PHITE, Phostrol, Rampart, and Ridomil Gold Copper are also options to help reduce the damage from Pythium blight.

Magnesium Deficiencies in Vegetables

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Magnesium deficiency in sweet corn.

Each year we see cases of magnesium deficiency in vegetables. This is a common problem with tomatoes, but all vegetables are susceptible. Magnesium (Mg) is considered a secondary macroelement and is essential for plant growth. It is a component of chlorophyll, the green pigment that captures light energy in photosynthesis. The chlorophyll molecule has a porphyrin ring with a magnesium atom at the center. Therefore,

deficiencies of magnesium will result in reduced chlorophyll production and yellowing of plants.

In most vegetable crops, magnesium deficiency commonly first appears as yellow or white areas between the veins of older leaves. As the deficiency progresses, the yellowed areas may turn into dead spots. Older leaves in plants may also have a purple or bronze appearance and leaf tips and margins may brown and die. The plants may be stunted and have an overall yellow appearance. Symptoms are most severe on older leaves because magnesium is a mobile element in plants and will be scavenged from older leaves and transported to new growth.

In Delaware, magnesium deficiencies are most commonly found in sandy, acid soils with a pH below 5.4. Therefore, magnesium deficiencies are commonly not field wide, but will be in areas of a field with depressed pH such as "sand hills" that have been excessively leached. Often a whole field pH will be in an acceptable range, so it is critical to check the soil pH in affected areas. Tissue tests should be considered to confirm the magnesium deficiency. Excessive levels of potassium can also induce magnesium deficiency in situations where available magnesium levels are low to moderate to begin with.

Commonly, magnesium is applied to soils with dolomitic limestone (Hi-Mag lime). Sulfate of potash and magnesia (K-Mag, Sul-Po-Mag) is a naturally mined mineral deposit that can also be applied to add magnesium to soils. Other magnesium sources include magnesium sulfate (same as Epsom Salts), magnesium oxide (basic slag), and magnesium chloride.

Magnesium deficiency in tomato.

To correct a deficiency in growing vegetables, soluble magnesium sources should be used. Foliar applications are effective but must be applied in a dilute solution to avoid salt injury. Spray 20 lbs of a soluble magnesium source (20 lbs of magnesium sulfate for example) in 100 gallons of water per acre (10 lbs in 50 gallons or 5 lbs in 25 gallons). Dry broadcasts of 15-25 lbs of actual magnesium per acre, irrigated in, or fertigation with similar amounts from soluble sources will also be effective. Sidedress applications may also be effective at 15-20 lbs of actual magnesium per acre. For drip irrigated vegetables, soluble magnesium fertilizers can be applied through the drip system.

Magnesium deficiencies corrected early enough in the growing season will often result in little yield loss. However, it is critical to target affected fields with corrective liming for future crops in the rotation. Variable rate liming may be considered and is recommended where there is excessive variability in pH in a field.

If pH is below 5.2 and vegetables are still small, dolomitic limestone may be broadcast over the top and cultivated in to correct pH related problems. This should be coupled with a foliar magnesium application to address the magnesium deficiency more quickly.

In vine crops, low pH may also be a causal factor for manganese toxicities, and you may see both magnesium deficiency and manganese toxicity in the same field. Foliar magnesium levels for most vegetables at mid growth should be in the 0.3 – 0.6 % range (leaves).

Poor Transplant Growth

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I recently had several trays of tomato seedlings that were not growing properly in 128 cell trays. They were reddish yellow in color and stunted. We moved them into 72 cell trays with new media and they greened up within 5 days. The following are some possible causes.

Problems with Transplants in Small Cell Sizes

More and more transplants are being grown in small tray cell sizes. These small size transplant plugs can become extremely root bound and may not put on new roots after transplanting. Another issue is when small cell transplants become waterlogged by overwatering. There will be limited oxygen to roots in this situation and plants may turn yellow and remain stunted. This is very common in peppers and tomatoes.

Poor Growth Due to Problems with Greenhouse Media

Each year there are some problems that arise with vegetable transplants related to issues with the growing medium. This is often seen as poor growth, yellow plants, or stunted plants. Greenhouse media manufacturers have good quality control measures in place, but things can go wrong on occasion – inadequate mixing, critical components missing or in the wrong proportions (i.e. wetting agents, fertilizers, lime), or defective, poor quality components. Media can also be affected by poor storage and handling. Most commonly this occurs when it is stored outside, and bales or bags get wet. In addition, media has a certain shelf life – old media often dries out and is hard to get rewetted.

When growers start filling trays, any media that does not handle well should be viewed as suspect and should not be used. Contact your supplier and have them inspect and run tests on the suspect media. Avoid using overly dry or caked media, media that is hard to loosen, media with a bad smell, water-soaked media or media that is hard to wet.

Most media (but not all) will come with a starter lime and fertilizer charge. The fertilizer is designed to give about 2-3 week of nutrients. If the fertilizer is missing or improperly mixed or in the wrong proportion, seeds will germinate but seedlings will not grow much and will remain stunted. In this case, liquid fertilizer applications will need to be started soon after plant emergence.

Peat based media are acidic in nature and we generally can grow at lower pHs than soil. Plants will perform well from 5.4 to 6.4. Lime is added to peat-based media and reacts over time after first wetting so pH will rise over time. Above 6.4 we often see iron deficiencies in transplants. This also occurs if irrigation water is alkaline (has high carbonates) causing pH to rise too high over time.

In high pH situations, to get transplant growth back to normal, use an acidifying fertilizer (high ammonium content) for liquid feeds. Use of iron products, such as chelated iron, as a foliar application on transplants can help them to green up prior to the pH drop with the acid fertilizer. In severe cases with very high media pH, use of iron sulfate solutions may be needed to more rapidly drop the pH. Acid additions to greenhouse irrigation water may also be considered for where water is alkaline.

If lime is missing or inadequate, and pH is below 5.2, plants may have calcium and magnesium deficiencies or may have iron or manganese toxicities. This also occurs in media that has been saturated for long periods of time. To correct this situation, apply a liquid lime solution to the media and water it in well. Calcium deficiencies will lead to damage to growing points and stunted and distorted plants.

Media that does not wet properly may not have enough wetting agent or the wetting agent may have deteriorated. They will be difficult to water and will not hold water well thus stressing plants. Application of additional greenhouse grade wetting agent may be needed.

If the initial media fertilizer charge is too high, or if too high of concentration of liquid fertilizer feed is used, or if incorporated slow-release fertilizer "dumps" nutrients, high salt concentrations can build up and stunt or damage plants. Leaf edge burn, "plant burn", or plant desiccation will be the symptoms. Test the media for electrical conductivity (EC) to see if salt levels are high. The acceptable EC will depend on the type of test used (saturated paste, pour through, 1:1, 1:2) so the interpretation from the lab will be important. If salts are high, then leaching the media with water will be required.

Bacterial Diseases in Tree Fruit

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This is the time of spring when we see the results from fire blight infections in pome fruits. In addition, warm weather with higher humidity and more frequent showers creates conditions that are very favorable for bacterial spot in stone fruits.

Fire Blight in Pome Fruits

May is when fire blight peaks in apples, pears, Asian pears, and ornamentals such as crabapples and flowering pears from earlier flower infections. After bloom, shoot blights are common in new growth. We are seeing both currently. The fire blight pathogen, *Erwinia amylovora*, overwinters on branch cankers from the previous year's infections. In spring, as temperatures warm, bacteria multiply at the edge of these cankers and create a yellow exudate that oozes on the bark surface several weeks ahead of bloom. Prior to bloom, insects that are attracted to the ooze, such as flies, spread the bacteria throughout the orchard. During bloom, pollinating insects (bees) spread the bacteria to the blooms. Blooms are susceptible to infection up to petal fall. Infections occur when temperature and moisture conditions are favorable, that is greater than 60°F with free water (rain or dew). Infection symptoms will appear 1-4 weeks after bloom. In addition, shoot blights can occur when inoculum is high in the orchard. Shoot tip infections occur most commonly on watersprouts and young shoots with about 10 leaves.

Fire blight shoot strike.

Symptoms of the blossom blight phase of fire blight will be the wilting and death of flower clusters which then can spread to the branch and kill portions of the branch. Areas turn dark in color (brown or black). Shoot infections appear as a wilt with a characteristic "shepherd's crook" symptom. Shoot infections can also spread to nearby branches and even the main trunk. Fire blight infected areas are often called "strikes". There are apple rootstocks that are highly susceptible to fire blight (M.26, M.9, Mark). If they become infected, the canker will infect the trunk of the rootstock below the graft union and the tree will decline over 1-2 year period. What makes this disease particularly devastating is that one flower or shoot infection has the potential to kill the whole tree (particularly in young orchards).

In fire blight susceptible orchards, prebloom sprays of copper fungicides can help reduce the bacteria on plant surfaces. Use bloom sprays of the antibiotic Streptomycin on a 3-7 day schedule when conditions are favorable

(above 60° F, and >60% humidity). Post bloom Streptomycin sprays may also be needed with susceptible trees to control shoot blights.

According to Penn State, post-bloom, to prevent shoot blight, prohexadione calcium (ProCa; Apogee/Kudos) applications should be used. Depending on the size of the tree (and rootstock), 2 – 12 oz/A is recommended. It takes 10-14 days for ProCa to harden off shoots, which makes the fire blight bacteria, *Erwinia amylovora*, less likely to invade shoots and causing shoot blight. Repeated applications may be necessary. Regular Cueva (type of copper) applications (2 qt/A) has shown to limit shoot blight when low to moderate disease conditions occur.

There are fire blight resistant apple and pear varieties and rootstocks. In our Delmarva production area, growers should consider using resistant varieties if they meet market and quality standards rather than trying to control the disease with sprays. Fire blight resistant apple rootstocks are also advised for our area.

Once fire blight "strikes" occur on branches, there is no curative action that can be taken. These strikes must be pruned out below the strike (8 inches below the visible discolored branch area) and destroyed. Do not leave the blighted prunings in the orchard. Also disinfest pruning shears and loppers between cuts using alcohol or bleach solutions to avoid inadvertent spread. If main trunks are infected, they should be cut 8 inches below the visible infection.

Bacterial Spot of Stone Fruits.

Bacterial spot on nectarine leaf. Note shot hole appearance
Current weather conditions are favorable for the development of bacterial spot in susceptible stone fruits including peaches, nectarines, apricots, plums, pluots, apriums, and plumcots. Bacterial spot is caused by the organism *Xanthomonas campestris* pv. *pruni.* It is found on leaves, twigs, and fruits. This time of year, we see the results of spring twig infections with shoot tips that are dead. Leaf symptoms after infection are most readily seen as a "shot hole" appearance, where the small, infected areas dry up and fall out, or as tattered leaf edges. Fruit infections are dark colored small spots on fruit skin in that then lead to fruit cracking later as spots coalesce.

The bacteria overwinter in twigs that were infected in the previous fall from diseased leaves. In the spring, during warm, wet conditions, the bacteria ooze out and can be splashed onto leaves and fruit. Fruit and leaf infections start around shuck split and then can continue throughout the season in susceptible varieties. Infections only occur during wet conditions.

In bacterial spot susceptible varieties, sprays of copper fungicides are applied in early spring prior to bloom to reduce surface bacteria numbers. To control the disease during the season, sprays should be applied from petal fall until 2 weeks before harvest. In wet conditions, applications should be close together (5-7 days), in dry conditions, applications can be spread further apart. Use antibiotic products (Mycoshield, Fireline) or use fixed coppers with low phytotoxicity potential. Copper can cause leaf damage so care should be taken with their use.

The best management strategy for bacterial spot is to use resistant varieties. Many eastern bred varieties have good bacterial spot resistance. Western bred varieties, developed in lower humidity areas, are often very bacterial spot susceptible and will be difficult and expensive to produce on Delmarva.

Keeping it Cool: Cold Storage Recommendations for Apples and Peaches

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Why do we need cold storage?

Fruits such as apples and peaches are highly perishable and thus have a limited market life potential. Cold storage is an efficient way to maintain fruit quality, mitigate losses and maximize harvest potential. At ambient temperatures, fruit quality characteristics are rapidly changing, decreasing storability. Specifically, long term ambient storage conditions lead to changes in color, texture, flavor (soluble solids, acidity, aroma) and nutritional value. Therefore, cold storage is a key solution to slow down these changes and thus maintain quality for longer periods of time.

Incorporation of cold storage into management practices also expands the market opportunities by extending the shelf life of fruit. With cold storage, local, regional and even international export is feasible. Additionally, fruit can be sold year-round, regardless of growing season. Both of these advantages signal increased profitability for the industry. Fruit appearance heavily influences purchasing decisions. Cold storage ensures that the appearance—a presumed indicator of freshness, crispness, and sweetness—is maintained.

Cold Storage Recommendations for Apples

Specific storage conditions and practices not only ensure the quality of fruit, but also limit cold related injury or damage. Mature apples can typically be stored at 32-39°F, depending on the cultivar, for 6 months, but this can be extended to 12 months with close monitoring. If the apples are partially ripe, they can be kept in cold storage for 2-3

months, while fully ripened apples are limited to less than a month in cold storage. However, certain cultivars are chilling sensitive, meaning that they are damaged by exposure to low non-freezing temperatures for a certain amount of time. Chilling sensitivity may occur in Honeycrisp, Granny Smith, Gala, Fuji, Red Delicious, and Cortland apples and can be characterized by disorders such as soft scald (Figure 1), soggy breakdown (Figure 2), and lenticel breakdown among others. Recommended storage temperatures for apples with or without chilling sensitivity can be observed in Table 1.

Figure 1. Soft scald as a result of chilling sensitivity in Honeycrisp apple. Picture Source: Dr. Macarena Farcuh, University of Maryland.

Figure 2. Soggy breakdown as a result of chilling sensitivity in Honeycrisp apple. Picture Source: Dr. Macarena Farcuh, University of Maryland.

Table 1. Recommended storage temperatures for apples.

Recommended Storage Temperatures for Apples		
Chilling Sensitive? (Y/N)	Storage Conditions (°F)	Storage Conditions (°C)
Yes	37-39	3-4
No	32-33	0-1

Delayed cooling or conditioning is the practice of temporarily exposing fruit to 50°F or 68°F for up to 7-10 days before cold storage. This practice is found to be helpful for the chilling sensitive cultivar Honeycrisp, as it decreases fruit susceptibility to chilling injury. There are reports indicating that a 7-day preconditioning period at 50°F dramatically reduced soft scald and soggy breakdown in Honeycrisp apples to be less than 1%, compared to control fruits. However, conditioning treatments have been frequently reported to exacerbate the incidence of bitter pit, another physiological disorder, induced in preharvest due to a nutritional imbalance, that results in small brown flesh lesions and also renders the fruit unmarketable. Bitter pit (Figure 3) is especially common in Honeycrisp apples, and is exacerbated by preconditioning treatments.

Figure 3. Honeycrisp apple with lesions and brown discoloration due to bitter pit. Picture Source: Dr. Macarena Farcuh, University of Maryland.

Cold Storage Recommendations for Peaches

For peaches on the other hand, storage life is much shorter than apples, thus they are much more vulnerable to spoilage. Peaches are ideally kept at 32°F, but a range of 29-34°F is acceptable, as shown in Table 2. However, if peaches are continuously stored in cold conditions of 36-46°F for more than 2 weeks, the physiological disorder of chilling injury becomes a concern. Chilling injury is a physiological disorder caused by prolonged exposure to these temperatures of 36-46°F, but only appears after the ripening process continues at room temperature**.** It may manifest in peaches via symptoms such as flavor loss, flesh browning, flesh bleeding, flesh mealiness, leatheriness (Figure 4). Flesh bleeding is characterized by an accumulation of red pigments in the flesh, mostly around the peach pit. Mealiness occurs when peach flesh lacks juice, and can often lead to flesh browning. Leatheriness refers to patches in peach flesh that fail to ripen, therefore remaining dry and firm. As chilling injury is only expressed at room temperatures, all of these symptoms are apparent when the peaches reach customers, reducing marketability.

Preventative measures such as postharvest preconditioning, and postharvest intermittent warming help avoid chilling injury symptoms. Postharvest preconditioning can be employed by storing peach at 68°F for 1 to 2 days after packing, but prior to cold storage at 32°F. Packing the fruit at cold temperature prevents additional damage, while the warming period allows gentle ripening to prevent chilling injury. Postharvest intermittent warming involves immediate storage at 32°F, with one day of storage at 68°F every 10 to 14 days. This technique ensures gradual ripening throughout the cold storage period.

Figure 4. Symptoms of flesh browning and mealiness in peaches as a result of chilling injury. Picture Source: Dr. Macarena Farcuh, University of Maryland.

Table 2. Recommended storage temperatures for peaches.

Recommended Storage Temperatures for Peaches		
Chilling Sensitive? (Y/N)	Storage Conditions (°F)	Storage Conditions (°C)
Yes	29-34	0-1

Additional Storage Considerations

Other factors to consider in postharvest cold storage, in addition to temperature management, include humidity, air circulation, sanitation, and gas content. Controlling storage humidity helps prevent dehydration in peaches and apples, which is a common symptom of chilling sensitivity and injury as well. Ideal storage humidity conditions are 90-95%. Proper air circulation is essential to maintain uniform temperature, humidity and gas content in all areas of the storage room. This can best be achieved by spacing out storage containers to allow for air movement between them, together with appropriate sanitation practices. For apples, low oxygen concentration (1-3%) is essential to prevent fruit respiration. Carbon dioxide levels should also be monitored and kept at least at 3% to prevent undesirable skin and flesh browning in apples.

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5. **https://extension.umaine.edu/fruit/harvest-and-storage-of-tree-fruits/cold-storage-conditions**

MARYLAND STATE HORTICULTURAL SOCIETY
mdhortsociety.org

Established in 1898
MARYLAND
STATE HORTICULTURAL SOCIETY

Exciting News!
Registration Information
Summer Tour News

The Maryland State Horticultural Society is excited to announce the 2021 Summer Tour on July 7th, giving orchard growers and others interested ideas on fruit production and marketing an opportunity to gather. The tour will start at 78 Acres, 23340 Fruit Tree Drive in Smithsburg, Maryland.

Check in will start at 8:30 a.m.
Others orchards on the tour include:
Mountain Valley Orchard & Gardenhour Orchard

A refreshing cold lunch will be provided at Mountain Valley Orchard. Plenty of drinks will be available on the tour, as the weather may be warm. Ticket costs for members are $25.00, and non-members $35.00. Young growers 6-16 are encouraged to attend at a reduced ticket cost of $10.00 and our youngest growers 5 and under are free. Carpooling is Strongly Encouraged. To register for this event use the following link. Click Here

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

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

June 8, 2021
World Food Safety Day

June 7th was World Food Safety Day. In 2018 the United Nations (UN) declared this day as a day to focus on and bring attention to the importance of safe food worldwide.

The annual number of foodborne illness cases is estimated to be 600 million worldwide and deaths exceed 420,000 with 40% of those deaths attributed to children under the age of five. We know that the

causes of foodborne illness can be invisible to the naked eye and can be viral, bacterial, from parasites, or due to toxic chemicals that enter the food stream.

The UN chose this year's theme as 'Safe food today for a healthy tomorrow'. The UN and the World Health Organization along with the US Food and Drug Administration (FDA) are concentrating on bringing awareness to the need for food safety in all aspects of the food chain, from growing, to harvesting, processing, distribution, handling and on to the consumer and consumption level.

In Maryland, we are privileged to have not only the FDA and USDA but also the Maryland Department of Agriculture (MDA) and the Maryland Department of Health (MDH) working to ensure a safe food chain. Farmers commit to safe food production and handling through compliance to the FSMA Produce Safety Rule (PSR). Employees of the MDA Food Quality Assurance Program have been inspecting farms for their compliance to the PSR.

For more information on navigating the levels of the PSR, Click Here
To watch a video to help guide Maryland farmers through the process of registration, Click Here

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The Plant Science Food Safety Group YouTube Page!
Check out the water sampling video: Click Here

Visit our website for more produce safety information
https://psla.umd.edu/extension/produce-safety

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

Department 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.

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.

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

Maryland Wine and Grape Promotion Fund Accepting Grant Applications

Proposals Due by July 15

The Governor's Advisory Commission on Maryland Wine and Grape Growing is accepting grant applications for funding from the Maryland Wine and Grape Promotion Fund. The fund seeks to promote the production and consumption of Maryland wine, and increase growth of commercial wine grapes across the state.

The Maryland Department of Agriculture is the administrative agency responsible for receiving the applications and disbursing grant money to selected applicants. Funding priorities include, but are not limited to:

- Improving the quality and acreage of Maryland-grown fruit available to the state's wineries;
- Increasing the market share for Maryland wine;
- Increasing awareness of Maryland wine and grapes; and
- Developing professional education opportunities to support wineries and the grape growing industry.

Proposal guidelines and application forms are available on the department's website. Applications can be found on Maryland's OneStop Portal and must be submitted by July 15, 2021, at 11:59 p.m.
For additional information, please contact Karen Fedor at: karen.fedor@maryland.gov or 410-841-5773.

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

Sign-Up Period for Cover Crop Program Begins July 1

The Maryland Department of Agriculture (MDA) today announced that the sign-up period for this year's annual Cover Crop Program will run from July 1-16, 2021.

The popular conservation program provides farmers with cost-share assistance to offset seed, labor, and equipment costs associated with planting cover crops on their fields in fall to build healthy soils and protect the Chesapeake Bay.

Enrollment will be conducted entirely by mail. Farmers who participated in last year's Cover Crop Program will receive registration packets in the mail later this month. Beginning July 1, applications will also be available on the program's website. To be considered for cost-share, applications should be mailed to the local soil conservation district for processing and must be postmarked by July 16, 2021. Farmers who have questions or need assistance with their applications should contact their local soil conservation district.

This year's Cover Crop Program features higher rates, more planting flexibility, and a variety of special incentives for certain highly-valued practices. Eligible farmers can receive up to $75/acre in cost-share grants to incorporate traditional cover crops into their fields this fall. The maximum payment for aerial seeding with incentives is $80/acre.

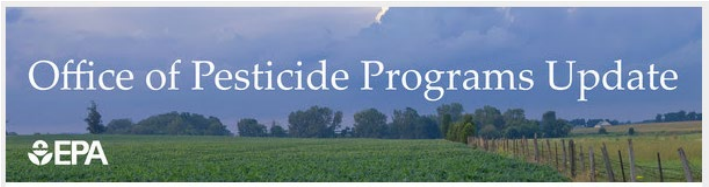
Incentives for this season include:

- Base payments have been raised to $45/acre for incorporated seed and $50/acre for aerial seed or aerial ground seeding.
- A $10/acre early planting incentive is being offered for incorporated seed.
- A $10/acre incentive is available to farmers who plant either rye or a multi-species cover crop.
- Maryland farmers who aerial seed or ground seed cover crops into standing corn on or before September 10 qualify for a $10/acre incentive payment.
- Incentives to terminate cover crops after May 1, 2022 are available.
- Farmers may plant cover crops after corn, soybeans, sorghum, tobacco, vegetables, hemp, and millet.

Cover crops are important to the health of the Chesapeake Bay and the productivity of Maryland's farmland. In the fall, cold-hardy cereal grains are planted as cover crops in newly harvested fields. As they grow, cover crops provide a living, protective cover against erosion and nutrient runoff while building the soil's organic matter for next year's crop. They can even protect fields from too much or too little rain. To help create diversity, eligible cover crop species may be mixed with radishes and legumes, including clover, Austrian winter peas, and hairy vetch using a variety of two and three-species mixes.

Farmers are required to include a completed current Nutrient Management Plan Certification with their cover crop applications. This form may be downloaded from the program's website, and must be signed by both the farm operator and the person who prepared the farm's plan. Maryland's Cover Crop Program is administered by MDA and the state's 24 soil conservation districts through the Maryland Agricultural Water Quality Cost-Share (MACS) Program. Applicants must be in good standing with MACS and in compliance with Maryland's nutrient management regulations. Other restrictions and conditions apply.

Funding for the 2021-2022 Cover Crop Program is provided by the Chesapeake Bay Restoration Fund and the Chesapeake and Atlantic Coastal Bays Trust Fund.
For more information, please visit MDA's Cover Crop Program webpage.
For questions, please contact Jason Keppler at (410) 841-5864 or jason.keppler@maryland.gov.



EPA Releases Updated Occupational Pesticide Handler and Post-application Exposure Calculators

EPA has updated the Occupational Pesticide Handler Exposure Calculator and Occupational Pesticide Post-application Exposure Calculator with the latest available data and sources to provide the agency with more efficiency in completing risk assessments and ensuring transparency to the public and affected stakeholders. EPA uses these tools to carry out risk assessments to make informed decisions when approving new pesticides, new uses of registered pesticides, and during regular reviews of existing pesticides. The updated exposure values are more reflective of actual exposures to occupational pesticide handlers and post-application scenarios, which reduces uncertainty in decisions and serves as the basis for labeling decisions.

The calculators also help state and local governments, pesticide manufacturers, academics, and others evaluate the potential for health effects to a person who might be exposed to pesticides as part of their work. They provide exposure information for risk assessments based on

exposure scenarios, exposure routes, and applicable personal protective equipment.

Updates to the occupational handler calculator include adding new handler exposure estimates from the Agricultural Handler Exposure Task Force (AHETF) that monitored dermal and inhalation exposure for workers using closed systems to load liquid and solid pesticides. The updated exposure values are based on a well-designed recruitment, monitoring, and data analysis efforts and will more accurately represent exposures to occupational pesticide handlers.

The occupational post-application calculator is updated to reflect contemporary agricultural practices and clarify crop-specific activities.
Learn more about the calculators and how EPA assesses pesticide risks on our website.

Crops 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 PM.

Dinner may be purchased, (provided by the UMD Alpha Gamma Rho (AGR) Fraternity Cook Team), and will be served from 4:00 pm to 6:00 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. University of Maryland Extension Educators and Specialists will showcase their field crop, vegetable and fruit research plots.

Purchased meal, provided by the UMD AGR Fraternity Cook Team at 4:00 PM
Ice cream Served at 5:15 PM
Crops Twilight at 6:00 PM

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

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 12, 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,
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Agriculture and Natural Resources
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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 11, September 8 and October 27 (Special Research & Meeting Edition).