

# Fruit & Vegetable News

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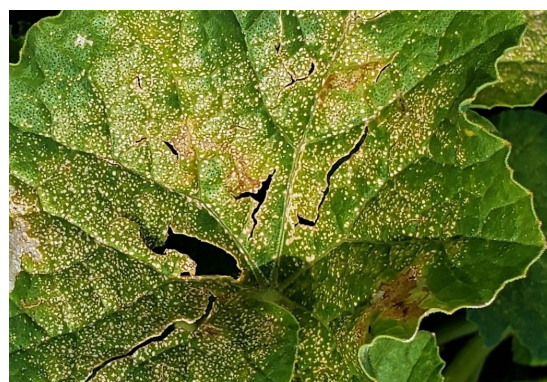
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## Ozone Damage to Cucurbit Foliage

*Jerry Brust, UMD IPM Vegetable Specialist,  
University of Maryland*

The weather for the last week or so in our area has been ideal for air pollutants to cause injury to vegetable crops, especially cucurbits. One of these air pollutants is ozone, which is considered



to be the most damaging phytotoxic air pollutant in North America. Injury is most likely during hot, humid weather with stagnant air masses. Symptoms consist of small, irregular shaped spots or flecks that range in color from dark brown to black or light tan to white (fig.1).

*Fig 1.) Ozone damage to cucurbit foliage. Photo G. Brust, Univ. Maryland.*

Symptoms also include stippling (small darkly pigmented areas approximately 2-4 mm in diameter), bronzing, and reddening. These symptoms usually occur between the veins on the upper leaf surface of older and middle-aged leaves, but may also involve both leaf surfaces for some cultivars.

The type and severity of injury depends on the duration and concentration of ozone exposure, weather conditions, and plant genetics. Some or all of the symptoms can occur on vegetables under various conditions.



*Fig 2.) More advanced ozone damage to watermelon foliage. Photo G. Brust, Univ. Maryland.*

Symptoms on one cultivar can differ from the symptoms on another. With continuing ozone exposure, the symptoms of stippling, flecking, bronzing, and reddening are gradually replaced with chlorosis and necrosis (fig. 2). Early ozone foliar damage can resemble spider mite injury. The presence of mites can be confirmed by examining the underside of the leaf. Mite populations would have to be comparatively great ( $\geq 45$ /leaf) to cause the type of leaf injury shown in figure 2. As the exposure to ozone continues the spots may fuse forming larger dam-



Fig 3.) Ozone damage to cantaloupe foliage. Photo G. Brust, Univ. Maryland

aged areas (fig. 3). Due to the tissue collapse induced by ozone, leaves are prone to infection by pathogens such as *Alternaria* sp (early blight) and will senesce sooner. Symptoms of ozone damage can appear on one side of a plant or stem depending on the source of pollution and microclimate.

The injury pattern on watermelon foliage is initially observed on older mature leaves near the crown or center of the plant, often progressing with time to the younger foliage. The yellowing of the plant centers in rows of watermelon is quite distinctive and can give fields an obviously striped pattern of alternating yellow and green bands. This type of injury on watermelon can be referred to as "center of the crown dieback." In contrast, injury on muskmelons is

typically less severe and is visible at a later stage of plant development. Irrigated plants will promote greater symptom development if the cultivar is sensitive compared with drought-stressed plants. Ozone injury on watermelons generally appears in mid to late July prior to fruit maturation.

Trying to estimate yield loss due to air pollutants in the field is difficult and only approximations can be made. In a California study, ozone damage to crops caused the greatest yield losses (10-30%) in watermelon, cantaloupe, grape, onion, and bean. Other research has shown that when average daily ozone concentrations are moderate to high, yields of vegetables can be reduced by 5-15%.

### Possible Changes to Atrazine Use

*Kurt M. Vollmer, Extension Weed Management Specialist, University of Maryland*

The EPA is proposing several changes to its interim registration review decision for atrazine. The primary issue is the aquatic ecosystem level of concern (CE-LOC). The EPA had previously set this level at 15 ppb, but this was challenged in the Ninth Circuit Court of Appeals. Currently the EPA is proposing a much lower CE-LOC level of 3.4 ppb. This proposed level will have significant impacts on growers' ability to use atrazine and other triazine products. Labels will also likely include new language to help mitigate the risk to aquatic plant communities. These include:

- restricting atrazine applications when soils are saturated,
- restricting atrazine applications during rain or storm events,
- prohibiting aerial applications,
- and reducing the annual atrazine application rate from 2.5 lbs. to 2 lbs. per acre annually.

Additional information can be found here: <https://list.mg2.mlgnserv.com/track/click?u=df0ec74ed0bf23e091847f07c1d2c483&id=c31eec13d8967c36&e=d300d03f14fec2b3https://list.mg2.mlgnserv.com/track/click?u=df0ec74ed0bf23e091847f07c1d2c483&id=c31eec13d8967c36&e=d300d03f14fec2b3>. The EPA is currently seeking public comments about the proposed decision (<https://www.epa.gov/dockets/commenting-epa-dockets>).

In addition the USDA Office of Pest Management Policy is conducting a related survey on atrazine usage practices for farmers involved in corn and sorghum production over the last three years ([https://usdaopmp.gov1.qualtrics.com/jfe/form/SV\\_agW8JjsVXqR4jig](https://usdaopmp.gov1.qualtrics.com/jfe/form/SV_agW8JjsVXqR4jig)).

## Broad Mites Found in Maryland Raspberry Fields.

*Jerry Brust, UMD IPM Vegetable Specialist,  
University of Maryland*

Broad mites *Polyphagotarsonemus latus* have been found in a couple of raspberry fields in Maryland in the last week or so. Most fields had light to moderate infestations of broad mites. The problem is recognizing whether or not you have broad mites because they are so small, they are very difficult to find even with a 10x hand lens and their feeding can look very similar to the

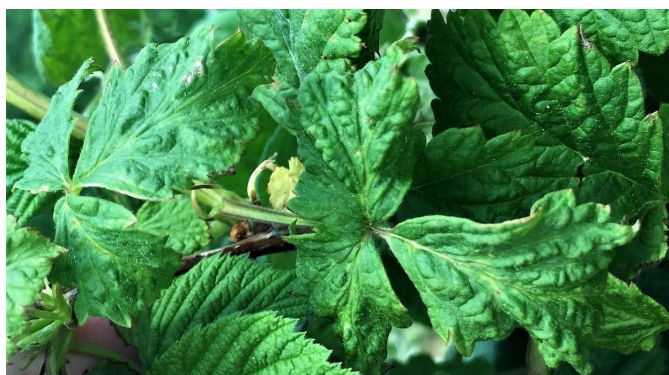


Fig 1.) Broad mite damage to raspberry leaves. Photo G. Brust, Univ. Maryland

damage caused by some environmental problems or by viruses (which are usually the causes of the damage symptoms).

Damage by broad mites usually consists of a distortion of young leaves (Fig. 1) or flower buds as the mites show a preference for young, developing plant tissue. This feeding preference will result in the lower leaves of the plant remaining unaffected while the younger leaves are damaged. Mites feed on the underside of foliage near the leaf stalk. This feeding often causes the growing tips to become misshapen with distorted leaves that curl up and have irregular brown discoloration. A light infestation of mites can result in bronzing of the leaves (Fig. 2). A more serious infestation causes a loss of green tissue, with the veins remaining green and necrotic spots developing on leaves (Fig. 2). On the leaf stalks brown, corky patches can appear. What exactly



Fig 2.) Broad mites causing interveinal bronzing and necrotic spots on raspberry leaves. Photo G. Brust, Univ. Maryland

causes the leaf tissue distortion and necrosis is not known, although it is thought that the mites release enzymes and other substances when they feed that disrupt localized plant growth. These distortions remain for weeks even after the mites have been eliminated and is the reason why extensive damage can be caused by a relatively low population of mites. Flowers that are fed upon will become discolored and deformed while fruit will develop corky areas and also become deformed.

When I look for broad mites I look for their eggs which are very distinctive, relatively large and are not moving around as adults and immatures are. The eggs are clear with a symmetrical pattern of white dots

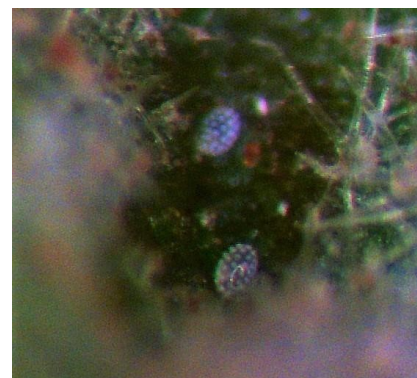


Fig 3.) Two broad mite eggs greatly magnified. Photo G. Brust, Univ. Maryland

on their surface (Fig. 3). Even with a 20X hand lens it is still difficult to find the mites as they are often wedged down into folded or curled plant tissue. It really is important though to verify their presence as there are other causes of similar looking symptoms on raspberries.

When mite numbers reach 5 mites per leaflet (granted it will be difficult to see) or leaf deformities are found then treatments should begin. Horticultural oils are recommended when temperatures are below 88 °F. Using the oils at temperatures above this may cause phytotoxic problems. Agri-Mek with a NIS has been found to be an effective product to control the motile stages of broad mites but it does not control the eggs so you'll need to make two applications. There are other miticides that are available and can be used, but the key to any of them and the oils is to get good coverage of the curled and distorted plant tissue especially the underside of the leaf.

### Winter Killed Cover Crops for Vegetable Cropping Systems.

*Gordon Johnson, UD Extension Vegetable & Fruit Specialist*

\*Note: This article was first published on the [University of Delaware Weekly Crop Updates](#) on August 5, 2022.

Cover crops that put on significant growth in the fall and then die during the winter can be very useful tools for vegetable cropping systems. These winter killed cover crops add organic matter, recycle nutrients, improve soil health, and allow for earlier spring vegetable planting.

Winter killed cover crops that are late-summer and early-fall planted include spring oats, several mustard species, and forage and oilseed radish. Earlier planted summer annuals (millets; sorghums, sudangrasses, and hybrids; annual legumes such as cowpeas or forage soybeans; buckwheat and many others) can also be used as winter killed species. Timing of planting will vary according to the species being used and winter killed species selection will depend on when fields will be available for seeding. Summer annuals should be planted in August for use in a winter killed system to obtain sufficient

growth.

Spring oats and mustard species can be planted from late August through September. For best effect, forage and oilseed radishes should be planted before the middle of September. Spring oats, radishes and mustards are not suited for October or later planting because they will not produce adequate fall growth. The winter killed non-legumes mentioned above will benefit from the addition of 30-60 lbs. of nitrogen.



Fig 1.) Fall growth on mustards and radishes that will then winter kill. A potential winter kill mix would include a radish, a mustard, and spring oats. Photo G. Johnson, University of Delaware

The following are several options for using winter killed species with vegetables:

Compaction mitigation for spring planted vegetables. Where there are compacted fields, the use of forage radish has worked very well as a winter killed cover crop by “biodrilling”. The extremely large taproot penetrates deep into the soil, and after winterkilling, will leave a large hole where future crop roots can grow. Oilseed radish also provides considerable “biodrilling”. Winter killed radishes works well with spring planted crops such as spinach, peas, early sweet corn, and early snap beans. One issue with radishes is that on mild winters they may not fully winter kill. A potential winter kill mix would include a radish, a mustard, and spring oats.

2) Early planted vegetables. A wide range of early planted vegetables may benefit from win-

ter killed cover crops. For example, peas no-till planted or planted using limited vertical tillage after a winter killed cover crop of forage radish, oilseed radish, or winter killed mustard have performed better than those planted after conventional tillage. Early sweet corn also has potential in these systems as do a wide range of spring vegetables including spinach, potatoes, and cabbage. Winter killed radishes and mustards also have the advantage of outcompeting winter annual weeds leaving relatively weed free fields and recycling nutrients from the soil so that they are available in the spring for early crops (decomposition has already occurred).

**3) *Mixed systems with windbreaks for plasticulture.*** By planting planned plasticulture bed areas with winter killed cover crops and areas in-between with cereal rye you can gain the benefits of these soil improving cover crops and eliminate the need make tillage strips early in the spring. The winter killed areas can be tilled just prior to laying plastic.

**4) *Bio-strip till.*** By drilling one row of forage or oilseed radish and other adjacent rows with rye or other small grains, you can create a biodrilled strip that winter kills and that can be no-till plant-

ed into the spring without the need for strip-till implements. This presents dozens of options for strip tilling (seed or transplanted) spring vegetables.

One challenge with milder winter temperatures, is that many cover crops may not fully winter kill, including fall planted spring oats, forage radish, and some mustard species. For vegetable growers seeking to have early areas for spring planting, this will require that these cover crops be killed by non-selective herbicides or tillage. This will also limit the potential to plant no-till vegetables into these areas.

Another concern is with higher risk of seed corn maggot damage to early planted vegetables if these cover crops do not winter kill. There are no rescue treatments for maggots, once damage is found it is too late to control them. Cultural control options to consider include avoiding planting into fields where a cover crop was recently incorporated (this will be an issue with cover crops that did not winter kill) and early disking or plowing under of crop residues to ensure that they are completely decomposed before planting – this should take place 2-4 weeks before planting.

## Tomato and Blossom End Rot

*Jerry Brust, UMD IPM Vegetable Specialist, University of Maryland*

This is just a reminder with the usual summer weather we have had lately with stretches of very high temperatures and the occasional very heavy down pour we have had over the last few weeks blossom end rot can become a real problem in tomatoes. Sunny days will suck water through a plant quickly and the downpours will disrupt calcium movement through the plant. The key is to try and maintain consistent soil moisture while the fruit is developing. Easier said than done I know, but soil moisture levels need to be monitored as best as they can. When you see something like figure 1, with all the tomatoes on a cluster with blossom end rot you know the soil moisture fluctuated greatly over a fairly long period of time. Applying some foliar calcium sprays may help, but the applications can't overcome poor soil moisture management.



*Fig. 1.) All the tomatoes on this one cluster have blossom end rot—indicating poor soil moisture management. Photo G. Brust, Univ. Maryland*

## Plant Growth Regulators for Controlling Apple Pre-harvest Drop

*Brian Money, Candidate for B.S. in Biochemistry and  
Macarena Farcuh, Assistant Professor and Extension Specialist  
University of Maryland, College Park*

As apples ripen, among many other processes, they begin to increase their production of the ripening hormone ethylene. As ethylene is being produced, it leads to notable changes in apple quality, which include changes in color, texture, and flavor. Furthermore, increased ethylene production also leads to the phenomenon of pre-harvest drop, which refers to the abscission of the fruits from the tree before horticultural maturity. The production of ethylene results in weakened tissue in the abscission zone (the region where the pedicel of the apple is connected to the supporting limb) leading to cell wall breakdown and eventual drop.

In addition to ethylene production, pre-harvest drop can be increased by events such as droughts, heat, and high winds all of these being able to act as significant sources of stress. Heavy insect infestation and late summer pruning can also increase the severity of fruit drop. It has been reported that different apple cultivars can have different sensitivities to preharvest drop, as early-ripening cultivars (i.e., Honeycrisp, Gala) are more prone to dropping than later-ripening cultivars (i.e., Fuji, Cripps Pink). However, ethylene is considered the primary driver of pre-harvest fruit drop. Therefore, fruit dropping can be counteracted by using different types of plant growth regulators (PGRs) which have different modes of action, such as inhibiting ethylene production or its perception, or directly delaying the formation of the fruit abscission zone. These will be briefly discussed below.

### Harvista™

Harvista™, whose active ingredient is 1-methylcyclopropane (1-MCP) acts by blocking the apple fruit's receptors for the plant hormone eth-

ylene, thus blocking the fruit from responding to the produced ethylene, slowing down the ripening process and pre-harvest fruit drop. Harvista™ can delay fruit softening, starch disappearance, affect fruit red skin coloration, decrease pre-harvest fruit drop and has also been shown to decrease watercore development. Harvista™ is recommended to be applied within three days prior to anticipated commercial harvest, just before any damaging effects start to take place. Harvista™ should not be used in stressed trees. To apply Harvista™, a proprietary formulation tank and injector pump needs to be attached to a commercial sprayer (Fig. 1), based on recommendations from its manufacturer, AgroFresh.



Fig 1). Harvista™ application using a standard commercial applicator fitted with an AgroFresh formulation tank, seen as the large white container, accompanied by the Injection pump to the right of the formulation tank. Source: AgroFresh.

### ReTain

ReTain, whose active ingredient is aminoethoxyvinylglycine (AVG) uses a mode of action which inhibits the biosynthesis or production of the ripening hormone ethylene. As a result, fruit ripening processes are slowed down, including fruit softening, starch disappearance, and fruit red skin coloration development, in addition to decreasing pre-harvest fruit drop. ReTain has been reported to be able to also delay or reduce watercore development as well as reduce fruit cracking. ReTain will have a poor response on

highly stressed trees, so its use is not recommended. In general, in order for ReTain to be effective, it needs to be applied before the natural rise in ethylene production or climacteric peak (which indicates the onset of fruit ripening), and that corresponds to three to four weeks before anticipated commercial harvest. Because different cultivars differ in ethylene production rates, they will also have different responses to ReTain applications. For example, Gala, which normally produces low amounts of ethylene will be very sensitive to ReTain and thus strongly influenced by this PGR, while high ethylene producers such as McIntosh will be less sensitive and thus responsive. Other cultivars such as Honeycrisp, which can be spot-picked and potentially have multiple harvests, can have ReTain applied 7 to 14 days before the expected first harvest date. When applied in this manner, the ReTain is not affecting the maturity of the apples in the first harvest, but rather regulating the maturity of the apples in subsequent harvests. ReTain can be applied using a standard commercial sprayer (Fig. 2), and is manufactured by Valent USA.



Fig 2) ReTain application in a Honeycrisp orchard using a standard commercial sprayer. Source: Daniel Weber, PSU.

## NAA

Another PGR that can also be used to reduce fruit pre-harvest drop, whose active ingredient is naphthaleneacetic acid (NAA), is commercially sold as Fruitone-L® (AMVAC), Fruitone-N®

(AMVAC), Refine 3.5 WSG™, Refine 3.5L™, PoMaxa. NAA is a synthetic auxin that directly interferes with the enzymes that create the abscission zone that cause fruit to drop during pre-harvest. Although NAA is used to prevent pre-harvest drop, unlike Harvista™ or ReTain, NAA does not delay fruit maturity, but can on the contrary, accelerate it, particularly under temperatures above 85°F. This means that it does not decrease the production or perception of ethylene, but instead it's mode of action is based on inhibiting the enzymes which work to weaken the cellular composition around the stem, which would normally break the cells apart from one another causing the fruit to drop. NAA has notable effects on increasing the overall ripening process, resulting in increased red skin coloration, flesh softening, and starch disappearance, while, at the same time, allowing the apple to stay on the tree, decreasing fruit drop. As the recommended application time for NAA is very close to the onset of fruit drop, NAA is considered more as a "rescue PGR", as it is used in order to stop the drop of mature apples due to unforeseen circumstances. Application of NAA requires close monitoring of fruit maturity. NAA sprayed at a rate of 10 ppm will control fruit drop for a period of 7-10 days, but it will take ~3 days for the product to get into the fruit. Therefore, applications that occur too early may not allow for real control of fruit drop, while applications that occur too late might risk dropping a significant amount of the crop before the effect of the PGR takes effect. It is also very important to note that apples treated with NAA will be decreased in their long-term storage potential, as the ripening process is sped up. NAA can be applied using a standard commercial sprayer.

## Late Summer Insect Tips

Emily Zobel, AgFS Agent, UME

Remember to rotate modes of action from one spray to another and to rotate modes of action out every 30 days. Be sure to read the label. Not all materials are labeled for all crops, insects, or application methods. See the Mid-Atlantic Commercial Vegetable Production Recommendations Guide for more information (<https://go.umd.edu/MidVegGuide>).

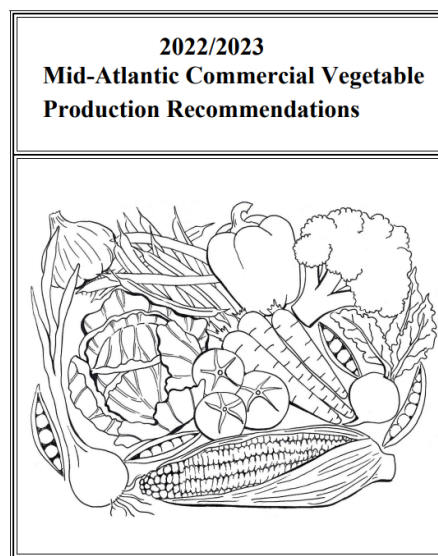
**Cole Crops/ Brassicas:** Check seedlings and new transplants of fall brassicas for caterpillar, and harlequin bugs feeding damage. For fresh-market cabbage, Brussels sprouts, broccoli and cauliflower, treat when 20% or more of the plants are infested with any species of caterpillar (imported cabbage worm, cross striped worms, cabbage looper, diamondback moth or armyworms) during seedling stage, then 30% infestation from early vegetative to cupping stage. From early head to harvest in cabbage and Brussels sprouts use a 5% threshold. For broccoli and cauliflower, use 15% at curd initiation/cupping, then 5% from curd development to harvest. If treatment is needed make sure to adjust your spray pattern such that spray is getting sideways to the undersides of leaves, particularly when using *Bacillus thuringiensis* and contact materials. Due to resistance development, pyrethroid insecticides (Group 3A) are not recommended for control of diamondback moths (Fig 1.). Remember to rotate between two modes of action within a 1 month period and among two different modes of action during the next month.

**Melons:** Continue to scout melons for aphids, cucumber beetles, spider mites and rind-feeding lepidopteran worms (yellow striped armyworm, corn earworm, beet armyworm). Beet armyworm and corn earworm are com-



Fig 1.) Diamondback moth and feeding damage on cabbage. Photo: Clemson University - USDA Cooperative Extension Slide Series, Bugwood.org

pletely or partially resistant to pyrethroids. Any fields that were treated with broad-spectrum insecticides, such as pyrethroids, should be checked since they can severely reduce these natural enemies causing spider mite outbreaks. If you see large aphid populations, look for beneficial insect activity. If numerous lady beetle, syrphid maggot and lacewing larvae are present, wait and check a few days later as these natural enemies can greatly reduce aphid population. The cool night will also slow them down aphid population growth. These infestations can be spotty/localized so treatment might not be across the whole field.



The 2022-2023 Mid-Atlantic Commercial Vegetable Production Recommendations Guide is available for free at

<https://go.umd.edu/MidVegGuide>



## New Online Training Available to Assist Growers Better Understand Risk Management Tools

The University of Maryland (UMD) is partnering with the Maryland Department of Agriculture (MDA) and USDA to create a four-module online training course *Maryland Farming Success*.

This course will allow farmers to develop a plan, focused on financial skills, risk management tools, and legal topics regarding their farm operations, and understand additional existing assistance available from USDA, including Farm Service Agency (FSA) programs and Risk Management Agency programs. The online training course is separated into four modules designed around preparing farmers for success by providing information about available USDA programs and creating the ability for participants to have a successful business plan, including - mission and goals, enterprise budgeting, risk management, and legal risk management.

For more information on the [Maryland Farming Success learning course](https://go.umd.edu/md_farm_success), or to REGISTER at [https://go.umd.edu/md\\_farm\\_success](https://go.umd.edu/md_farm_success)

## New Online Course for Maryland Cottage Food Producers & On-Farm Home Processors

UNIVERSITY OF MARYLAND EXTENSION



If you are starting a value-added food business in Maryland, sign up today for the Maryland Food Ventures interactive self-paced online course!

### Topics include:

- Product Development
- Food Safety & Licensing
- Marketing
- Packaging
- Financing & Pricing for Your Business
- Success Stories from Maryland Value Added Producers

### Course Structure

- Short videos, exercises, and quizzes with an average course completion time of five to six hours
- Surveys to assess attitude and behaviors related to value-added foods

This course covers information for food subject to Maryland Cottage Food or On-Farm Home Processing regulations, like high acid jams, most breads, dried herbs, and raw honey.

## Register Today!

Free for a limited time only

<https://go.umd.edu/mfvcourse>

Dr. Shauna Henley  
[shenley@umd.edu](mailto:shenley@umd.edu)

For special accommodations, please contact Dr. Shauna Henley before starting the course at [shenley@umd.edu](mailto:shenley@umd.edu) or 410-887-8090.

## UMES Small Farms Bus Tour!

UMES Extension's summer Farm Bus Tour will be back on the road visiting farms in Eastern and Central Virginia, including a stop at Virginia State University College of Agriculture's annual field day. Stops along the tour will introduce unique marketing approaches aimed at helping farmers work directly with the customer and leaving the middle-man out-improving the bottom line

The tour starts (7:30 a.m., Aug. 31) and ends (6 p.m., Sept. 1) at the UMES. Registration includes bus transportation to farm sites, educational packets, lunch (Day One) and one night hotel accommodation on Wednesday, August 31, in addition to VSU's field day on Thursday, September 1.

Registration at :  
<https://farmbustour2022.eventbrite.com>.

Fees are \$75 for a single registrant and \$125 for a party of two. The deadline to register is August 24. Anyone in need of special services or accommodations must call 410-621-5450, Ext. 106 two weeks in advance.

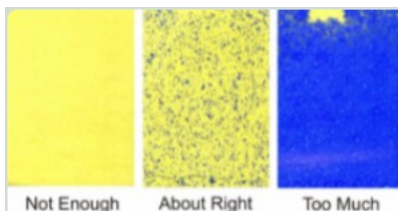


# Sprayer and Pesticide Application Twilight Meeting.

- Western Maryland: Thursday September 1, 2022, 5 - 8pm at the Western Maryland Research and Education Center, 18330 Keedysville Road, Keedysville, MD  
Registration: <http://twilightmeeting.eventbrite.com/>
- Eastern Shore: Thursday September 8, 2022, 5 - 8pm at the Wye Research and Education Center Farm 211 Farm Lane, Queenstown MD.  
Registration: <https://go.umd.edu/SprayerTwilight>

**Maryland pesticide recertification credits will be available for attending this meeting.**

For more information, please contact Dr. Kelly Hamby at [kahamby@umd.edu](mailto:kahamby@umd.edu) or (301) 314-1068



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Header photo By E. Remberg

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2022/2023  
Mid-Atlantic Commercial Vegetable  
Production Recommendations



The 2022-2023 Mid-Atlantic Commercial Vegetable Production Recommendations Guide is available for free at <https://go.umd.edu/MidVegGuide>

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Emily Zobel, Editor  
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