UNIVERSITY OF MARYLAND EXTENSION
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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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Strawberry Notes from WyeREC

By Michael Newell
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Depending on your location in Maryland and your cropping system you may be picking berries now or your plants may be just starting to bloom. Here at WyeREC, our plasticulture Chandlers are still blooming with small green berries. We are about three weeks from harvest. A warm February pushed the plants ahead, but a cold March slowed things down. Three cold events in March, as flower buds were emerging from the crown, caused damage to the earliest flowers even with row covers on (sometimes two!). We estimate that we lost four to five flowers per plant.

No *Botrytis* crown rot has been detected in our plots. Depending on the amount of dead leaves and flowers, which can be a source of *Botrytis* inoculum in your fields, leaving wet row covers on as temperatures begin to warm may increase the incidence of crown rot. Good sanitation and a well-timed and placed spray can help limit *Botrytis* crown rot. Some minor occurrence with Bacterial Angular Leaf Spot is on-going. Although usually not a problem if it remains on the lower leaves, if it moves onto the fruit calyx leaves, it could make them an unsightly black color. Multiple fixed-copper spray applications can help with control, but can cause phyto-toxicity if used too frequently. Cool, wet weather increases the symptoms. Try to not handle the plants when they are wet to prevent movement of this disease.

April has been warm and somewhat dry which is good for limiting diseases thus far. We need to be sure that we keep our plants well hydrated, especially when growing on black plastic. Warm daytime temperatures and still conditions can push canopy temperatures into the 90's.

It's time to begin leaf/petiole sampling for nutrient analysis. There is no way to know the nutrient status of your plants without a few well timed samples for analysis. Results will dictate what and how much nutrients to apply. This usually results in higher quality fruit.

Always remember to read, understand and follow all pesticide labels. The label is the law! Good Luck!

Seedcorn and Onion Maggot Damage Bad Now and Over the Next Few Weeks

By Jerry Brust
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The unusually warm and dry winter and spring we have had up to now has allowed large populations of seed and root maggots to invade our vegetable fields. Some farms have been hit particularly hard in their onion crop this early season by maggots. These maggots include seedcorn maggot *Delia platura* (SCM), onion maggot *Delia antiqua* (OM) and cabbage maggot *Delia radicum* (CM), the latter being a specialist of the cabbage family. All three species overwinter in the soil as a maggot inside a brown pupal case. In March and April small, grayish-brown flies (fig. 1) emerge, which are usually SCM or CM, OM flies usually peak 2-3 weeks later. Adult flies are most active from 10 a.m. – 2 p.m. and are inactive at night, in strong winds and when temperatures are below 50° F or above 80° F. Adults live 2-4 weeks and females lay hundreds of eggs.

Fig. 1. Root maggot adult on yellow sticky card

Seedcorn maggot eggs are oviposited in soils with decaying plant material or manure. Onion maggot females lay eggs in soil near onion plants. Female cabbage maggot flies seek out and lay eggs on the lower portions of stems of young host seedlings or in nearby cracks in the soil. Some wild crucifers, such as yellow rocket, are important hosts for cabbage maggot and are especially important for their overwintering success; when these weeds are abundant they can lead to heavy infestations of spring crucifers. Combine this with the very mild winter we had and infestations are almost assured in some fields. The adults are also attracted to the organic media around the roots of transplants and germinating seeds. Within a few days the eggs hatch and the tiny maggots burrow down to the roots and into stems and begin feeding. Larvae of seedcorn maggots attack seedlings, feeding on the developing roots and stem. Their damage is usually restricted to the early seedling stage. SCM larvae will move into small stems and move up the plant causing a swelling of the stem just above ground level, while also causing root collapse and decay (fig. 2). If these stems are split you usually can find the white cylindrical larvae (fig. 3).

Fig. 2 and 3. Swollen stem of cucurbit plant with collapsed rotting roots. When stem is cut open the white maggots often can be found.

Onion maggots inflict similar damage (fig. 4) but usually continue to feed on the expanding bulb during later stages of growth.

Fig. 3. Maggots found in base of onion plant

A single maggot can destroy up to 20 small seedlings. Either SCM or OM can attack onion bulbs, while SCM also can attack vegetable seeds and transplants. Complete larval development requires 2-4 weeks. Maggots then enter a pupal stage that lasts another 2-4 weeks. There are 3-4 generations per season in our area, with the most destructive being the spring and fall generations. When wilted transplants or newly emerging seedlings are inspected in the field, maggots are sometimes not found (they have already pupated), but their tell-tale damage appears as hollowed out seeds or stems and roots held together by a few strands of plant material.

Cultural controls: Avoid planting in soils that have a great deal of non-decomposed organic matter, such as fields with a heavy cover crop or are very weedy. Rotate early season crops away from any areas that had onions or crucifers last fall. Early spring-planted crops are more likely to be damaged when the soil is too cool for rapid germination and emergence. If serious infestations are expected, wait until the soil warms up in the spring. You can get an idea of how serious a possible infestation could be by using yellow sticky cards that attract adult flies and can be put out a few weeks ahead of time. It may take a few seasons of using the cards to readily recognize when a certain fly population on the cards represents a significant possibility of a heavy crop infestation. Recently seeded or transplanted crops should be covered with floating row covers, which act as barriers against any of the root maggot flies. Do not use row covers where onions or brassicas were grown the previous year. When soil temperatures increase and maggot first-flights end, the row covers can be removed.

Chemical controls: The use of treated seed (Trigard ST- commercially treated onion seed only) or banding of an insecticide (diazanon as a preplant application, Cyantranilprole as a soil or foliar application for CM or chlorpyriphos as a post plant drench for dry bulb onions only) gives some control of SCM, CM and OM, however, replacing dead transplants is the only solution after

these maggots are inside a plant. Once seedcorn maggot or onion maggot damage is noticed, it is too late to apply control procedures. Thus, economic thresholds are not useful and all management options are preventative.

The adult flies can often be found dead; stuck to vegetation during periods of warmer weather. These flies have been infected by a fungus, *Entomophthora sp*. These infected flies usually are found at the top of a tall object in the field such as a grass seed head or a wire field-flag (fig. 5).

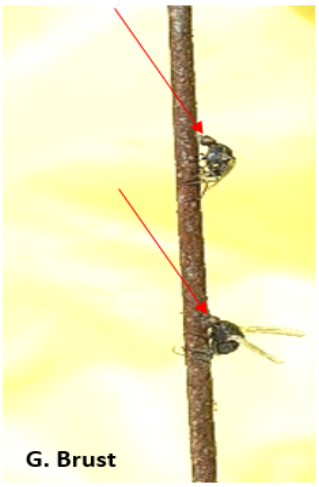


Fig. 5. Two SCM flies killed by a fungus stuck to a wire field-flag via their mouthparts

Just before the fungus kills them the flies cement their body via their mouthparts to the tall object and die. If you look closely you'll see the fly's body is filled with a white fungus that has ruptured between the segments (fig. 6). Being on a tall object allows the spores of the fungus to move longer distances and infect more flies than if the fly had died on the ground. Unfortunately, the infection rate is not enough to reduce seed or root maggot populations and stop infestations.

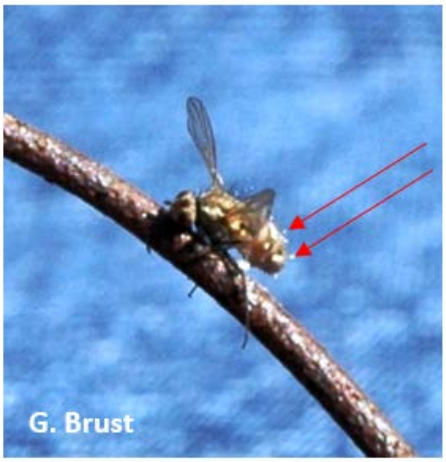


Fig. 6. Adult SCM killed by a fungus - white strands coming out of abdomen

False Spring: Just the Same Old Variable Weather or New Territory?

By Sara Via
Entomology Professor
UME Climate Science for Farmers Extension Team

February 2017 was the second warmest in history—as warm as the average March in our region. Grass greened up, it felt like spring, and many plants started to break dormancy. Everything was great until things went back into the deep freeze from March 20-22, when many locations in Maryland had night temperatures between 23-28 degrees for 1-3 nights. This is what climate scientists call "false spring"—very warm weather that seems like a welcome end to winter, just to be followed by a hard freeze later in March or April. In the past ten years, the Eastern US has experienced three devastating false springs: 2007, 2012 and 2017.

The extent of agricultural damage after the freeze during this year's false spring depends not just on the developmental stage of the crop, but on a number of other factors—when the weather began to warm, how long it stayed warm, whether development was slowed by subsequent cooler weather, how far along crops had gotten by the time the freeze hit, air speed and humidity, how cold it got and for how many days the cold weather lasted. Because these factors can vary widely across a region, it isn't surprising that the damage seen after the March 2017 freeze depended on location.

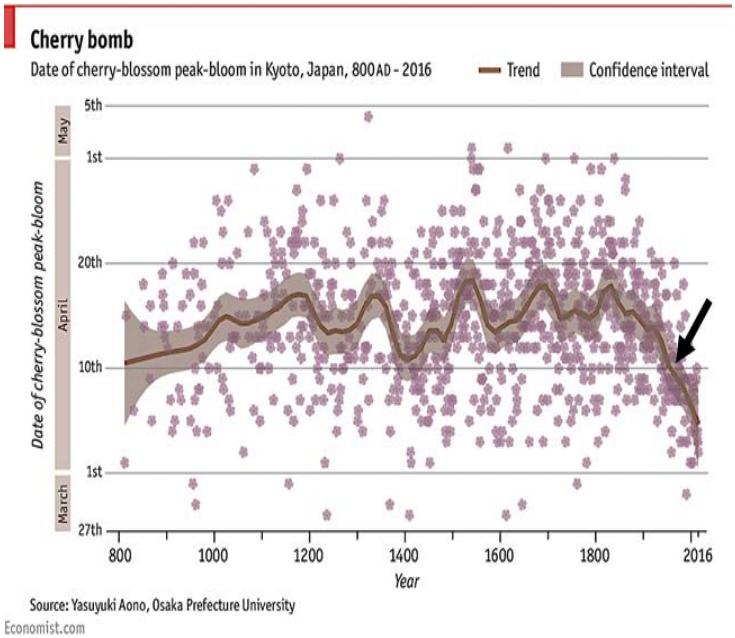
Maryland farmers were lucky—although the earliest blooming fruits like apriums and apricots were heavily damaged in central Maryland, grapes, apples and blueberries were not far enough along to be affected, and strawberries were still weeks from breaking dormancy.

At Swann Farm in Calvert Co., it originally appeared that up to 85% of peach blossoms had been lost. However, more extensive sampling of blossoms revealed that early and late blooming peach varieties sustained only 25-50% damage, while the mid-summer varieties were at their most vulnerable at the time of the freeze, and were 100% destroyed for the year. Swann Farms published some useful pictures that show how to determine damage to a blossom by pulling off the damaged bloom to see if there is a tiny peach underneath (see white structure under the word "Peach" in this photo).

Farmers to the South of us weren't so lucky. In central Virginia, peaches, nectarines and cherries were damaged, and some plum orchards were lost entirely. Fortunately, most apples bloomed after the freeze, though some crabapples used for pollination of apples were damaged. South Carolina lost 90% of their peach crop, and Georgia peaches and blueberries were severely damaged. Some North Carolina farmers were able to save their strawberries by pulling out the row cover—using two layers in some cases.

So, when we get a spring freeze, is it just bad luck we can chalk up to typical weather variability? Maybe not-- climate scientists have shown clearly that spring is coming earlier these days. The 2014 National Climate Assessment showed that the Northeast (which includes Maryland in the eyes of climate scientists) now experiences an average of 10 fewer frost free days than we did between 1901-1960. Studies of plant populations show that many plants are blooming earlier in response. When Smithsonian scientists analyzed 30 years of data on bloom times of common plants in the DC area, they found that 89% are blooming earlier now than in 1970 by an average 4.5 days. Scientists from Cornell showed that apples in upstate New York are blooming an average of 8 days earlier than in the 1960s, while grapes are blooming 6 days earlier.

By far the most amazing demonstration of earlier blooming is shown in a study of bloom dates of cherry trees in Japan, which have been monitored since 800AD. Despite a lot of noise due to weather variation, the trend line shows a sharp decline in flowering date from about 1875 to the present (see the arrow, where the trend line goes below the previous limit of April 10). This is just what we would expect if the earlier flowering is a response to global warming, which started during the Industrial Revolution in the mid-1800s.



Although spring is coming earlier, temperature variability has increased, so those spring freezes we are used to in March and April remain highly probable. Any way you look at it, earlier spring coupled with a continued or even increased probability of March and April frosts means that the threat of freeze damage to spring crops is likely to be a problem that farmers on the East Coast will face more and more often.

How can you protect your fruit crops from false spring and damaging late freezes? The experience at Swann Farms illustrates one of the best ways to minimize freeze risk—plant multiple varieties that break dormancy and/or flower at different times. If varieties are at different stages when a freeze occurs, only part of the overall crop will be damaged. Fortunately, many farmers already plant several varieties in order to market a given crop over a longer period of time.

UME Extension Specialist Joseph A. Fiola has a number of good articles on detecting and preventing freeze damage in grapes. Links to basic freeze protection techniques that can be modified for other fruit crops can be found on his webpage Timely Viticulture. One clever method from Michigan State that might be useful in particular situations involves improving air flow through orchards by removing vegetation in key locations; additional information about basic freeze protection is also available at that link.

If you have comments or experiences with false springs you'd like to share, please email me at svia@umd.edu

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Announcing the *NEW* University of Maryland Extension

Climate Science for Farmers

The University of Maryland Extension is proud to announce the formation of the new Climate Science for Farmers Extension team. The team will be headed by Dr. Sara Via, Professor, Department of Entomology, University of Maryland College of Computer, Mathematical and Natural Sciences. Be sure to visit the UME Climate Science website at: https://extension.umd.edu/anmp/climate-change

Don't Cook Your Crops! High Tunnel Temperature Management

By Neith Little
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It's that time of year again. You're out in the fields, busy, excited, maybe a little overwhelmed, getting your annual crops into the ground. The day started off cold and misty, but it cleared up just before noon and you got in a long, hot day of work planting transplants. Triumphant, you come back to your high tunnel to find all the rest of your transplants and your early crop of greens and herbs wilted and drooping.

Don't let this happen to you. On a sunny day, a closed high tunnel can reach temperatures that my old friends in Massachusetts would describe as "wicked hot." Even in the winter, when outdoor temperatures hover around freezing, an unvented high tunnel can reach near 90 degrees F, which is plenty to cause heat stress in cool-season crops. On a sunny spring day like we've been having lately, when outdoor temperatures near 80, I would not be at all surprised to see the inside of a high tunnel reach 120 degrees F.

So what can you do to manage the temperature in your high tunnel?

First off, consider investing in a thermometer. It can be difficult to believe the high temperatures your tunnel is achieving until you see the numbers yourself. Even an analog $5 thermometer is a good check, and if you are willing to spend a little more, digital thermometers are available for about $30 that will record minimum and maximum temperatures. Higher end digital thermometers on the market, costing about $200, will even text you an alert when the temperature passes a set threshold. Whatever thermometer you choose, remember to install it somewhere in your high tunnel that is out of direct sunlight, which will throw off the measurement.

Passive ventilation is the standard, go-to method to cool high tunnels. Most high tunnels are designed with roll-up sides, creating a cross-draft of air. Some have removable end walls or ceiling vents. The key is to invest the management time necessary to make use of these design elements. Think of a high tunnel almost more like livestock than like outdoor plant crops: when you're growing in a high tunnel, it's going to require daily attention. Keep an eye on the weather, check the temperature, and open or close the ventilation as necessary to maintain the temperature within an acceptable range. Cool season crops like spinach tend to prefer 60 to 65 degrees F, while warm season crops like tomatoes are more comfortable between 70 and 75 (Jett 2010).

In addition to passive ventilation, some farmers use fans, whitewash, or shade cloth. Fans can be used to either vent air out the end-walls, or circulate air within the high tunnel. Whitewash can be sprayed onto the plastic, increasing the amount of light reflected off the plastic and thus reducing the amount of light (and heat) transmitted through the plastic into the tunnel. Whitewash is relatively inexpensive, but can be washed off by rain over the course of the season, and can be labor-intensive to wash off yourself when you finally want the high tunnel to heat up again in the fall. Similarly, shade cloth can be stretched over the tunnel to reduce light infiltration. Shade cloth will be more expensive up front than whitewash, but when taken care of a shade cloth high tunnel cover can be reused for multiple years. Choosing the correct grade of shade cloth, and deciding when to put it on can have big impacts on warm season crop productivity (Trinklein 2012).

To learn more about high tunnel management, check out the following resources:

Butler B and L Bauer (2013) High tunnel production: the basics for success and three case studies on profitability. University of Maryland Extension Fact-sheet 957. www.bit.ly/UMEHighTunnels

Lamont B (2003) High tunnel production manual, 2nd Edition. Penn State Extension. www.bit.ly/PennSeasonExtension

Jett LW (2010) High tunnel temperature management. Sustainable Agriculture Research and Education. http://www.bit.ly/Jett2010

Trinklein D (2012) Greenhouse / high tunnel shading. University of Missouri. www.bit.ly/Trinklein2012

Pythium and Fusarium can cause severe tuber rot in some cases.

Pythium and Fusarium in Potatoes

By Nathan Kleczewski
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Nancy Gregory received several samples of potatoes over the last 10 days that were affected by Fusarium and Pythium, which can cause tuber rot and impact seed quality. Wounding at harvest can facilitate infection by these pathogens, as can swelling and enlarged lenticels. Potato plants can compensate for stand losses of approximately 3%, and seed is very limited this season. Therefore, there is no guarantee that subsequent lots will be any better in terms of quality. If you have low

levels of these pathogens in your potatoes or do not want to roll the dice on a new load and potentially delay planting, an in furrow application of Ridomil Gold + Quadris will help minimize any additional issues with these diseases during the growing season. As always, make sure to save your seed certification certificate and lot number for future reference.

Planting Spring Cover Crops for Vegetable Rotations

By Gordon Johnson,
DE Extension Vegetable & Fruit Specialist;
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One principle of managing soil for improved health is to always have a crop growing on the soil. This will maintain or add organic matter, provide benefits from the action of growing roots, and recycle nutrients.

Where fall cover crops were not planted due to late harvest, spring cover crops can be planted in March or early April to provide soil health benefits where vegetables and field crops are not scheduled until late May or the month of June.

The most common cover crop options for late March or early April planting include spring oats, mustards and annual ryegrass. Plant oats 90-120 lbs per acre, mustards at 10-20 lbs per acre, and annual ryegrass at 20-30 lbs per acre.
Field peas are another option for spring planting. We are somewhat south of the best zone for spring planting. One type of field pea is the winter pea which is often fall planted in our area but can be spring planted. It has smaller seed so the seeding rate is 30-60 lbs per acre. Canadian or spring field peas are larger seeded and used as a spring cover crop planted alone at 120-140 lb/A.

Mixtures also can be used. Field peas are well adapted to mixing with spring oats or with annual ryegrass. Reduce seeding rates of each component when using in mixtures. Recommended seeding rates are 70 lbs of oats per acre and 40 lbs/A of Austrian winter peas or 80 lbs/A of Canadian or spring field peas.

Many mustard family crops have biofumigation potential. When allowed to grow to early flower stage and then incorporated into the soil, they release compounds that act as natural fumigants, reducing soil borne disease organisms. Some biofumigant mustard varieties and blends include 'Pacific Gold', 'Idagold', 'Caliente', 'Trifecta', and 'Kodiak'. Other mustard family crops serve as non-hosts, trap crops, or deterrents for pests. In research at the University of Delaware biofumigation using early spring planted biofumigant crops such as 'Image' radish, 'Dwarf Essex' rapeseed, or 'Nemat' arugula showed potential for managing root knot nematode populations. When used as a biofumigant, mustard family cover crops should be grown to achieve maximum biomass by adding 60-100 lbs of nitrogen per acre. Nitrogen is also required to produce high biomass with spring oats and annual ryegrass at similar rates. When planting mixtures with peas, nitrogen rates should be reduced.

An often forgotten spring seeded legume crop that can also be used is red clover. Red clover can be frost seeded into small grains, seeded alone, or mixed with spring oats or annual ryegrass. Seeding rates for pure stands would be 10-16 lbs/A, for mixtures 6-10 lbs/A.

Seedless Watermelon Management – Thoughts Ahead of the Season

By Gordon Johnson,
DE Extension Vegetable & Fruit Specialist;
gcjohn@udel.edu

Plastic is being laid across the region in anticipation of the first watermelon plantings about a month away. The following are some thoughts on watermelon management addressing questions received over the past year and in light of recent applied watermelon research.

Managing Fruit Size, Spacing, and Marketable Yield

Some growers have had a problem with producing too many oversized watermelons (which have limited markets) in the last 2 years. Fruit size is best managed by choosing varieties that have been evaluated and selected for filling different size classes. A variety that commonly produces a high percentage of 36 count watermelons may, under certain growing conditions, produce high numbers of oversized melons. Conversely, under heat stress conditions, a predominately 60 count watermelon variety may produce high numbers of undersized melons.

Watermelon yield and size is also affected by planting density. In reviewing the past research on plant density with seedless watermelons, marketable yield of standard sized seedless watermelons was optimized at densities of 8-10 sq ft per plant (1 ft. between plants). For mini-seedless watermelons and small ice-box types optimal yields were at 4-5 sq ft per plant (0.5 ft. between plants). These are much higher densities than commonly used in our industry. Growers must strike a balance between cost of plants and potential yield. Industry standards in our area are between 20-28 sq ft per plant for standard seedless types (3-4 ft between plants) and 12-20 sq ft per plant for small fruited types (2-2.5 ft between plants). These common spacings maximum size potential. Wider spacings do not produce heavier watermelons. Fruit size can be reduced to a certain degree by reducing in-row spacing (increasing plant density).

Reductions of average fruit size of 0.5-1.0 lbs per fruit can be expected for every foot of in-row spacing reduced.

Vine Management in Drive Rows and Row Middle Management

There has been interest in alternative vine management techniques to reduce labor costs and manage diseases. Vine turning in drive rows is time-consuming and requires hand labor. An alternative would be using discs to cut the vines which can be done mechanically. In research over the past 2 years we observed that vine cutting had no adverse yield effects as an alternative to vine turning. Of concern is the potential for disease transmission because a wound is made by the disc. This can potentially be mitigated by spraying these wounds with anti-microbial or bactericidal/fungicidal compounds. This will be focus of research this year.

Another interest has been in reducing the potential of *Phytophthora capsici* fruit rots in watermelons with row middle management. This disease proliferates when row middles remain saturated or have standing water for extended periods of time. High volume rains (more than 2 inches received in a short period of time) and saturated soils are the risk factors. Therefore, the issue with Phytophthora in watermelons is two-fold: getting water off the field a quickly as possible, and how to manage row middles where water accumulates as it runs off the plastic. On flat fields with little or no slope these are major issues. Compaction from traffic between rows and in drive rows makes the problem worse. Field planning to drain water off of watermelon row middles is a key. Orient beds to improve water movement and then install cross drains at regular intervals to move excess rain water off rapidly. Shaping between bed areas to expedite water removal and eliminate ponding is also important. Subsoiling between plastic beds is another potential practice to improve drainage. Increasing spacing between plastic beds may also reduce ponding by having more soil surface to allow for water infiltration.

Another practice to consider is using planted mulch cover between plastic beds to keep fruits from contacting the soil and to reduce soil splash which can move Phytophthora onto fruits. This would require growing a cover between plastic beds and killing it. Rye windbreaks between every row also serve this function.

Exciting Cover Crop News! Webinar

By Sara Hirsch[1] & Ray Weil[2]
University of Maryland
[1]Graduate Student and [2]Soils Professor

The webinar is now available online at:
https://extension.umd.edu/anmp/workshop-tools/cover-crops-workshop-tools

UNIVERSITY OF MARYLAND EXTENSION
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TPM/IPM Weekly Report
for Arborists, Landscape Managers & Nursery Managers

By Stanton A. Gill
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Dodging Bullets

The cold snap that came in late March killed blossoms on peach trees in areas near Washington D.C. and on the eastern shore of Maryland. It basically wiped out peach blooms in Georgia and parts of North Carolina and Virginia. Expect to see fewer peaches this year form the south.

Fortunately, the peaches were not as far along in central, north and western Maryland so the peach blossoms open last week during this perfect warm weather. The set looks good.

One of the diseases that hit apples, pears and Serviceberry hard in 2013, 2014 and 2015 was the bacterial disease fireblight. In 2016 the weather conditions were not good for infection form this disease and it looks like we avoid the weather conditions necessary for fireblight infection in 2017. Your customers should see pretty good apple and pear production in 2017. If you are growing Serviceberry in the nursery this is another year hopefully free of fireblight weather.

View inks to all of the Horttips newsletters. The most recent is at the bottom of the list at:
https://extension.umd.edu/hgic/home-and-garden-information-center-and-grow-it-eat-it-publications#hortTips

USDA United States Department of Agriculture

Do You Know About Nontraditional Irrigation Water?

By Paul Goeringer
Specialist, Agriculture Law
University of Maryland
lgoering@umd.edu

The U.S Department of Agriculture (USDA) considers possible nontraditional sources of irrigation water to include recycled, brackish, desalinated, fracking, agricultural runoff, aquaculture, livestock wastewater, and process waters. With funding from the USDA National Institute of Food and Agriculture, CONSERVE: A Center of Excellence at the Nexus of Sustainable Water Reuse, Food, and Health, a multi-partner project, is

focusing on multiple types of nontraditional irrigation water in the Mid-Atlantic and Southwest regions of the United States. The CONSERVE team of researchers, Extension professionals, and educators aim to provide effective on-farm irrigation solutions.

To help steer the future of the center, Extension professionals from the University of Maryland and the University of Arizona are conducting a joint needs assessment survey at: https://go.umd.edu/q5n

This agricultural community assessment has three goals:
1) Assessing prior knowledge of nontraditional water sources;
2) Determining concerns; and
3) Understanding the most effective outreach methods.

The results of this survey will be used to inform priority areas for CONSERVE researchers as well as direct future educational programming and resource development for farmers in the study areas. The survey will be distributed in several ways, including at a variety of agricultural meetings and electronically through Extension and other networks.

If you are a farmer in the Mid-Atlantic or Southwest and would like to take the survey, you can find it here: https://go.umd.edu/q5n

This survey is open to all individuals who are at least 18 years old. To learn more about CONSERVE, please visit the website at: www.ConserveWaterForFood.org

AG MARKETING ALERT!

Good Afternoon Ag Marketing Subscriber,

Mastering Marketing – April 2016: ***"Your Feedback for Program Planning Needed and Appreciated"*** **has been posted on the web. To access the article click on the link below:**

http://extension.umd.edu/learn/your-feedback-program-planning-needed-and-appreciated

If you have any questions or comments about this article or have clients or colleagues that would value receiving it as well, please contact Ginger Myers at: gsmyers@umd.edu or sbarnes6@umd.edu

Ginger S. Myers
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Director, Maryland Rural Enterprise Development Center
gsmyers@umd.edu

2016 - 2017 Mid-Atlantic Commercial Vegetable Production Recommendations

On-Line at:
http://extension.umd.edu/sites/extension.umd.edu/files/_docs/2016-2017%20Mid-Atlantic%20Commercial%20Vegetable%20Production%20Recommendations.pdf

High Tunnel Twilight Meeting
Wye Research and Education Center
Wednesday May 17, 2017
6:00 PM until Dark

Please join us for an informative evening program, where you'll:

See High Tunnel Tomato production, and High Tunnel production of Ground Cherries

Chat with the experts:

Kate Everts, UM Vegetable Pathologist
Jerry Brust, UME Vegetable Specialist
Ben Beale, UME Senior Agent, St Mary's County
Andrew Ristvey, Senior Agent, Commercial Horticulture
Mike Newell, WyeREC Horticulture Crops Manager about all aspects of High Tunnel production.

Registration is required. We'll have a light fare at 6:00 PM (sub, chips, and drink for $5.00).

Contact Debby Dant for registration @410-827-8056 X115; ddant@umd.edu; and Mike Newell for more program information @410-827-7388; mnewell@umd.edu.

2017 Annual Strawberry Research Twilight Meeting
Wye Research and Education Center
Wednesday, May 24, 2017
6:00-8:00 PM

Please join us on this date as we view and discuss research plots:

- **Timed Fall row cover deployment for increased Spring yields Michael Newell, Wye Research and Education Center.**
- **Deficit irrigation study Bruk E. Belayneh, UMD Department of Plant Sciences and Landscape Architecture.**
- **Additional topics and speakers to be announced.**

Registration required.
Strawberry dessert will be served after the program.

Contact Debby Dant @410-827-8056 x115, ddant@umd.edu for registration; contact Mike Newell @410-827-7388, mnewell@umd.edu for program information.
****If you need special assistance to attend this program, please contact Debby Dant no later than May 17, 2017.**

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.

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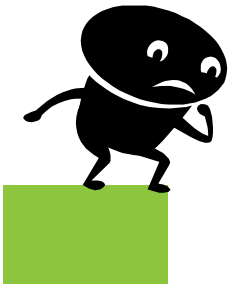

See the Attachments!

1) *IPM Threshold Guide for Vegetable Crops*
2) *2017 Multi-Fruit Spray Guides for Small Fruit and Tree fruit.*

Vegetable & Fruit News

A timely publication for the commercial vegetable and fruit industry available electronically in 2017 from April through October on the following dates: **April 20, May 18, June 29, July 20, August 17, September 7 and October 26 (Special Research Edition).**

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UNIVERSITY OF MARYLAND EXTENSION
Solutions in your community

IPM Threshold Guide
Vegetable Crops

ECONOMIC THRESHOLD –
Level of pest activity when control action is suggested to prevent economic injury

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COLE CROP INSECTS

Plant Emergence (or Transplanting) to Beginning of Heading or Reproductive Development

CABBAGE ROOT MAGGOT
Control when planting

FLEA BEETLES
> **50%** of newly emerged plants infested and "shothole injury" is present.
Treatment thresholds for leafy cultivars not available

CABBAGE APHIDS AND OTHER APHID SPECIES
Broccoli and Cauliflower - infestations of all species combined reach nearly **100%**
Brussel Sprouts > **15%** of plants are aphid infested from transplanting till **3** weeks before harvest
Cabbage **2%** of plants are infested with **5** or more aphids on leaves

THRIPS
Fresh market cabbage > **20%** of plants infested

IMPORTED CABBAGEWRM, CABBAGE LOOPERS & DIAMONDBACK MOTH CATERPILLARS
Sample 50 plants - treat when count is > **0.5** larval units per plant

Weighting factor for larval unit determination:
Cabbage Looper: large=**1.0** small=**0.7**
Imported Cabbageworm: large=**0.07** small=**0.1**
Diamondback Caterpillar: any size=**0.1**

Heading or Sprout Development

CABBAGE APHIDS AND OTHER APHIDS
Treat when **2%** of plants are infested with > **5** aphids

IMPORTED CABBAGEWRM, CABBAGE LOOPERS & DIAMONDBACK MOTH CATERPILLARS
Cabbage – treat when count is > **0.5** larval units per plant
Broccoli, Cauliflower and Brussel Sprouts – treat when > **1** caterpillar per **25** plants

CUCURBIT INSECTS

Plant Emergence to Three Leaf Stage

SPOTTED AND STRIPED CUCUMBER BEETLES
For wilt susceptible cucumbers and muskmelons – use systemic insecticide treatment at planting time
Provisional threshold for pickling cucumbers – foliar insecticide when **20%** of plants are infested with cucumber beetles

Three Leaf Stage to Harvest Maturity

MELON APHID
Provisional threshold > **20%** of runners have > **5** aphids on leaves

THRIPS
Heavy infestation, leaf injury, plants not actively growing

SPIDER MITES
> **50%** of runners show early leaf injury on crown leaves and live mites present

Three Leaf Stage to Harvest Maturity

SPOTTED AND STRIPED CUCUMBER BEETLES
Thresholds not available
Treat moderate to high CB infestations levels on wilt susceptible varieties
Treat all cucurbits when high CB infestations cause excessive fruit damage

LEAFHOPPERS
Severe leaf injury expected to retard fruit maturity and affect yield

SQUASH VINE BORER
As soon as moths are trapped

LIMA BEAN INSECTS

Bloom to Harvest

PLANT BUGS (LYGUS) –
Early bloom to harvest >**6-10** adult/nymphs per **20** sweeps
After mature bud set >**20-40** adults/nymphs per **20** sweeps

CORN EARWORM
> **50%** of larvae are > **1/2**"

Fordhook Lima Beans:
Up to **4** weeks from harvest > **1** larvae per **6'** of row
Less than **4** weeks from harvest **3** larvae per **6'** of row

Baby Lima Beans:
> **1** larvae per **6'** of row, from late flat pod stage to harvest

PEA INSECTS

PEA APHID - **50** aphids per sweep or **5-10** per plant

PEPPER INSECTS

Early Fruit Set to Harvest

GREEN PEACH APHID

Before fruit formation > **2** aphids per leaf

Once fruit is present **4** aphids per leaf

PEPPER MAGGOT

As soon as flies are caught on sticky traps

EUROPEAN CORN BORER

When fruits are forming on plants > **25** moths trapped per **5** days, average

Shorten treatment schedules if > **100** moths trapped per **5** days

CORN EARWORM

When fruits are forming on plants, >**100** moths trapped per **5** days (see sweet corn section for MDA Pest Survey website link)

POTATO INSECTS

Plant Emergence to 12" Shoots

POTATO FLEA BEETLE

>**20%** leaf loss

COLORADO POTATO BEETLE

Overwintered >**5** adults per **10** plant clusters and > **10%** shoots chewed off at ground level

All stages

Chemical treatments:

Defoliation **20%** and density per **10** plant clusters > **5** adults or > **40** small larvae or **15** large larvae or combination of any **2** stages, at **1/2** above levels

Bt treatment:

10% plant infestation, > **30%** eggs hatched (trigger date)

Greater Than 12" Shoots to Bloom

GREEN PEACH APHID, POTATO APHID

Prior to bloom - **2** per leaf

During bloom - **4** per leaf

Within 2 weeks of vine kill - **10** per leaf

Greater Than 12" Shoots to Bloom

MELON APHID -

Prior to bloom >**1** per leaf

During bloom > **2** per leaf

Within 2 weeks of vine kill > **5** per leaf

POTATO LEAFHOPPER

> **3** adults per sweep or > **1** nymph per **10** leaves

EUROPEAN CORN BORER

100 moths trapped per **5** days (reduce if host plants unavailable) or **5%** of leaves are infested with egg masses

Bloom to 50% Leaf Yellowing or Vine Kill

COLORADO POTATO BEETLE

Defoliation > **30%** and potential for further damage

SNAP BEAN INSECTS

Plant Emergence to 3rd Trifoliate Stage

SEEDCORN MAGGOT

5 to **10** maggots per seed

THRIPS

> 6 per leaflet with leaf injury

SPIDER MITES

> **20** live mites per leaflet

BEAN LEAF BEETLE AND MEXICAN BEAN BEETLE

Pre trifoliate stage **6** or more per **row foot**

Post-trifoliate stage **20%** leaf loss, > **2** per plant

Prebloom Stage (3rd Trifoliate to Bud)

POTATO LEAF HOPPER

> **5** adults+nymphs per sweep

MEXICAN BEAN BEETLE

> **20%** defoliation

BEAN APHID

50% or more have **5** or more aphids per terminal, distributed throughout

GREEN CLOVERWORM

>**20%** defoliation and >**15** larvae < **1**"per sweep

Bloom to Harvest

LEAFHOPPERS

During podset >**25** per adults/nymphs per sweep

During bloom >**12** adults/nymphs per sweep

MEXICAN BEAN BEETLE

Defoliation > **10%** during podding and population present

EUROPEAN CORN BORER

>**25** moths trapped per **5** days

CORN EARWORM

> **100** moths per **5** days

SWEET CORN INSECTS

CUTWORM

1-2 leaf - **10%** damaged plants

3-4 leaf - **5%** damaged & 4 larvae per 100 plants

WHITE GRUB

Heavy soils - **2** per **sq. ft.**

Sandy soils - **1** per **sq. ft.**

WIREWORM

1 per bait station

SLUG

Spike to 3 leaf - **5** per plant

STALKBORER
4%, **6%** or **10%** damaged at the 2, 3 or 4leaf stage
ARMYWORM
35% of plants > **50%** defoliated & larvae < **3/4"**
EUROPEAN CORN BORER
Not irrigated - **80%** infested with live larvae
Irrigated - **50%** infested with live larvae
CORN ROOTWORM
1 Western or **2** Northern per plant
FLEA BEETLE
For Stewart's wilt susceptible varieties from spike stage to silking >5% of plants infested
CORN EARWORM
At tassel emergence >15% tassel infestation
From tasseling to harvest -1st spray at 30% silk and apply subsequent sprays according to 5-day trap catch

TOMATO INSECTS

Plant Emergence or Transplant to 10" Plants
COLORADO POTATO BEETLE
Overwintered CPB:
At plant emergence - adults reducing plant densities below recommended levels for maximum yield
Actively growing > **15** adults per **10** plants
10" Plants to Early Fruit Set
COLORADO POTATO BEETLE
All stages
Chemical Treatments:
Defoliation **20%** throughout and > **20** adults and/or larvae per **10** plants
Bt Treatment:
10% plant infestation with egg masses and > **30%** eggs hatched (trigger date)
10" Plants to Early Fruit Set
POTATO APHID, GREEN PEACH APHID
Natural controls not present and > **20%** of terminals are infested
SPIDER MITES
No specific threshold - treat during hot dry weather when damage is noticed due to heavy infestations
HORNWORMS
20 % defoliation and further damage potential
Early Fruit Set to Fruit Maturity or Vine Kill
COLORADO POTATO BEETLE
Defoliation potential > **10%** or > **2%** of plants have at least **1** freshly-injured fruit
TOMATO PINWORM
Active leaf mines > **0.7** per trifoliate leaf
TOMATO FRUITWORM
> **5** damaged fruit in sample of **200** (**2.5%** damage)

WEEDS OF FIELD CROPS

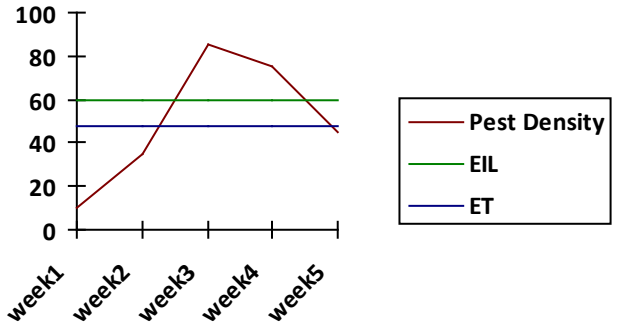
ANNUAL WEEDS
 # per 25 sq. ft. to cause 10% loss:
Cocklebur ---------- **3**
Jimsonweed or Velvetleaf ---------- **3**
Pigweed, Lambsquarters
or Morningglory ---------- **5**
Annual grasses ---------- **20**
PERENNIAL WEEDS
% of field infested:

Light	<**5%**	Heavy	<**30%**
Moderate	<**10%**	Severe	>**30%**

NOXIOUS WEEDS -- no threshold, eliminate all

IPM DEFINITIONS

Economic Injury Level - EIL
"The lowest pest population density that will cause economic damage. At the EIL the Cost of Control equals the Benefit of Control."
Economic Threshold (Action or Treatment Threshold) - ET
"The density of a pest at which control measures should be implemented to prevent an increasing pest population from reaching the EIL - ET is generally 80% of the EIL."



EIL = Pest Density (P)
P = C
V X D
C = Cost of Control
V = Value of Crop
D = Damage

Note: At EIL Benefit = Cost; B=C

Compiled R. D. Myers 2000; Updated 2009 & 2017
Compilation and layout assistance by Carol Jelich, Master Gardener, Anne Arundel County
This reference was adapted from the University of Maryland and Delaware Cooperative Extension Filed Crop and Vegetable IPM Pest Management Manuals
Reviewed by Galen Dively, Terrance Patton, and Sandra Sardenelli University of Maryland, College Park

Spray Program for Multi-Tree Fruit Orchards

Many local orchards are composed of multi-fruit combinations producing for fresh market apples, peaches, pears, plums, nectarines, and cherries. Aggressive fruit tree spray programs are required to achieve high quality fruit. These multi-fruit orchards create many spray management challenges for the achievement of good pest control in accordance to label guidelines.

Therefore, the following multi-fruit orchard spray program for the control of major tree fruit pests and diseases may offer some assistance: **Labeled as noted in 2017 for All Tree Fruit – Pomes: Apples & Pears Stones: Peaches, Plums, Nectarines, and Cherries.**

FUNGICIDES: [FRAC]	*RATE	NOTES
Captan® 80WDG [M4] (Not Labeled for Pears; Reduce Rates for Cherries)	3-5.0 lbs	General Protectant
Dormant Oil [NC]	4.0 gal	Apply Temp 35-85° F
Kocide® DF [M1] (Stones: Dormant Spray Only)	6.0 lbs	Other Fixed Coppers
Rally®40W [3]	4.0 ozs	Powdery Mildew
Sulfur 95W [M2]	3.0 lbs	General Protectant
Gem® 500 SC [11] (Stones Only) **or**	3.0 ozs	Brown Rot & Peach Scab
Adamant® 50WG [3/11] (Stones Except Plums)	6.0 ozs	Brown Rot, Peach Scab & Powdery Mildew
Pristine® [7/11] or (Limited to 4 Sprays/Season With Only 2 Consecutively)	14.5 ozs	Brown Rot, Powdery Mildew, Scab, Rusts & Fruit Spots
Indar® 2F [3]	6.0 ozs	Powdery Mildew & Rusts
Topsin-M® 70W [1]	8.0 ozs	General Protectant
Ziram 76DF [M3] (Captan Substitute for Pears)	5.0 lbs	Dormant Peach Leaf Curl General Protectant
Agrimycin® 17 W (Apples & Pears Only)	24.0 ozs	Fireblight Control

INSECTICIDES: [IRAC]	*RATE	NOTES
Imidan® 70W [1A]	2.0 lbs	Curculio, SWD, Scale & Fruit Moths
Warrior® [3]	4.0 ozs	Borers, Curculio, SWD, BSMB
or Tombstone® [3]	2.0 ozs	& Fruit Moths
Actara® [4A]	4.5 ozs	Aphids & Curculio
Lorsban® Advanced [1B]	1.5 qts	Dormant & Trunk Borer
Acramite® 50WS [25]	1.0 lbs	Mites Only
Sevin® 50W [1A] (Apple Thinning Agent)	4.0 lbs	SWD, Japanese Beetles, Hornets & Sap Beetles

***Rate for 50-100gal Acre Concentrate Spray**
****Be sure to follow all labels closely for PHI and REI!**

Multi-Fruit Spray Calendar*

March 15 - Dormant Spray
Dormant Oil 4.0 gal (Scales & Mites)
Kocide® DF 6.0 lbs
Lorsban® 4E 1.5 qts (Mites)

April 5 - Peach Bloom
Apple Tight Cluster
Captan® 80WDG 3.0 lbs

April 15 - Peach Petal Fall
Apple Bloom
Captan® 50W 3.0 lbs
Indar® 2F 6.0 ozs
Agrimycin® 17 W 24.0 ozs (Fireblight Control Add for Apples & Pears Only)

April 25 - Peach Shuck Split
Apple Petal Fall
Pristine® 14.5 ozs
Warrior® 4.0 ozs (Curculio)
Agrimycin® 17 W 24.0 ozs (Fireblight Control Add for Apples & Pears Only)

May 5 - 1st Cover Spray
Captan® 80WDG 4.0 lbs (Cedar Apple Rust - Higher Rates for Wetter Conditions)
Indar® 2F 6.0 ozs (Powdery Mildew & Rusts)
Actara® 4.5 ozs (Curculio & Aphids; PHI: 35- Days Pomes, 14-Days Stones)

May 15 - 2nd Cover Spray
Captan® 80WDG 3-4.0 lbs
Rally® 40W 4.0 ozs (Peach Rusty Spot Only)
Warrior® 4.0 ozs (Curculio; PHI 21-Days Pomes, 14-days Stones)

June 1 - 3rd Cover Spray
Captan® 80WDG 3-4.0 lbs
Topsin-M® 70W 8.0 ozs(Apple Scab Resistance Likely)
Imidan® 70W 2.0 lbs (Curculio, Scale & Fruit Moths; PHI: 7-Days Pomes, 14-Days Stones)
Acramite® 50WS 1.0 lbs (For Mites if Required PHI: 7-Days Pomes, 3-Days Stones)

June 15 - 4th Cover Spray
Captan® 80WDG 3-4.0 lbs
Sulfur 95W 3.0 lbs (0-day PHI; Stones Only)
Tombstone® 2.0 ozs (Borers, Curculio & Fruit Moths – 7-day PHI)

July 1- 5th Cover Spray
Early Peach Harvest
Captan® 80WDG 3-4.0 lbs (0-day PHI; 1-day REI); or
Pristine® 14.5 ozs (Early Stones 0-day PHI; Limited to 4 Sprays/Season With Only 2 Consecutively)
Tombstone® 2.0 ozs (Borers, Curculio & Fruit Moths – 7-Day PHI)

July 15 - 6th Cover Spray
Peach Harvests
Captan® 80WDG 3-4.0 lbs (0-day PHI; 1-day REI)
Rally® 40W 4.0 ozs(0-dayPHI, except apples 14-days)
Sevin® 50W 4.0 lbs (Japanese Beetle & Moths – 5-Day PHI for All Fruit)

August 1- 7th Cover Spray
Peach Harvests
Captan® 80WDG 4.0 lbs (0-day PHI; 1-day REI); **or**
Pristine® 14.5 ozs (Early Pomes 0-day PHI)
Sevin® 50W 4.0 lbs (Japanese Beetle & Hornets – 5-Day PHI for All Fruit)

August 15 - 8th Cover Spray
Early Apple Harvests
Late Peach Harvest
Captan® 80WDG 4.0 lbs (0-day PHI; 1-day REI); **or**
Pristine® 14.5 ozs (Pomes 0-day PHI)

September 1 - 9th Cover Spray
Apples and Pears Only
Captan® 80WDG 4.0 lbs (0-day PHI; 1-day REI); **or**
Pristine® 14.5 ozs (Pomes 0-day PHI)
Sevin® 50W 4.0 lbs (Japanese Beetle & Hornets – 5-Day PHI for All Fruit)

September 15 - Trunk Bore Spray
Lorsban® 4E 1.5 qts (Post Harvest for Borers)

HERBICIDES: [HRAC]	*RATE	NOTES
Gramoxone ® [22]	1.0 qts	Burndown, Directed Spray
Roundup ® [9]	1.0 qts	Burndown, Shielded & Directed Spray
Devrinol ® 50 DF [15]	4.0 lbs	Spring/Summer 35-day PHI
Princep ® 4L [5]	1.0 qts	Spring Dormant, Avoid High pH Soils
Solicam® [12]	2.5 lbs	Spring/Fall Dormant, 1-yr Established
Goal ® or Galigan® [14]	2.0 pts	After Harvest to Spring Bud Swell
Chateau [14]	12.0 ozs	After Harvest to Spring Bud Swell
Aim®, Shark® or Venue [14]	2.0 ozs	Directed Spray, 0-3-day PHI
Matrix ® [2]	4.0 ozs	Late Spring, 1-yr Established
Prowl ® [3] or Surflan® [3]	2.0 qts	Spring/ Summer, Prowl 60-day PHI
Poast® [1]	1.5 pts	Summer Grasses, Variable PHI
Karmex ® [7] or Diuron® [7]	1.6 qts	Spring/Fall Dormant, 3-yr Established

***Lowest Use Rate Recommended Initially**

Organic Approach Substitutions:

Conventional Product	Organic Certified Product (OMRI)
Captan® & Topsin-M®	Surround® or Sulfur or Lime Sulfur
Rally®	Kaligreen® (Powdery Mildew Eradicant)
Listed Insecticides	Neem® or Pyganic® or Entrust® (Stone Fruits Only)
Agrimycin®	Agrimycin® or Fixed Copper (Apples & Pears Except During Bloom)
Gramoxone® or Roundup®	Avenger® or Burnout®or AXXE®/BioSafe® or (Scythe® no OMRI label)

*** Important Note: The calendar spray dates given are an average estimate for Anne Arundel and Prince George's County Orchards, and may vary by location in Southern Maryland. Be sure to adjust your spray schedule application dates accordingly. The above recommendations very closely reflect the current spray program utilized at the University of Maryland Research and Education Center, Upper Marlboro Facility for its research orchards. Remember to always "Read the Label**

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Spray Program for Multi-Small Fruit Plantings

Many local farms are composed of multi-small fruit combinations producing for fresh market blackberries, raspberries, blueberries, strawberries and grapes. Aggressive fruit spray programs are required to achieve high quality fruit. These multi-small fruit plantings create many spray management challenges for the achievement of good pest control in accordance to label guidelines.

Therefore, the following multi-small fruit spray program for the control of major small fruit pests and diseases may offer some assistance:
Labeled as noted in 2017 for All Small Fruit – Strawberries, Brambles: Blackberries, Raspberries, Blueberries, and Grapes.

FUNGICIDES: [FRAC]	*RATE	NOTES
Lime Sulfur [M2]	10.0 gals	Dormant Fall Sanitizer
JMS® Stylet Oil [NC]	1.0 gal	Apply Temp 35-85° F
Kocide® DF [M1]	2.0 lbs	Other Fixed Coppers
Captan® 50W [M4]	2.0 lbs	General Protectant
Ziram® 76DF [M3] (Except for Strawberry use **Thiram®**)	5.0 lbs	General Protectant
Sulfur 95W [M2] (Grape variety sensitivity)	3.0 lbs	General Protectant
Rally®40W [3] (Except for blueberry use **Tilt®**)	4.0 ozs	Powdery Mildew & Black Rot
Pristine® [7/11]	14.5 ozs	Fruit Rots, Fruit Spots, Powdery & Downy Mildew & Cane Blight
Elevate® 50 WG [17]	1.5 lbs	Botrytis & Powdery Mildew
Switch® 62.5 WG [9/12]	11.0 ozs	Anthracnose, Mummy Berry, Phomopsis, Sour Rot & Botrytis
Phostrol® [33]	4.0 pts	Downy Mildew & Red Stele

INSECTICIDES: [IRAC]	*RATE	NOTES
Provado® Admire® [4A] or Actara® [4A]	4.0 ozs	SWD, Grubs, Aphids, Hoppers, Curculio & Whitefly
Brigade® WSB [3]	12.0 ozs	BMSB, SWD, Clipper Beetle, Plant Bug, Mites & Root Weevil
Malathion [1B]	2.0pts	SWD, Scale, Fruit Moths & Whitefly
Sevin® 50W [1A]	4.0 lbs	SWD, Japanese Beetles, Hornets & Sap Beetles

***Rate for 50-100gal Acre Concentrate Spray**
****Be sure to follow all labels closely for PHI and REI!**

Multi-Small Fruit Spray Calendar*

March 5 - Spring Dormant Spray
JMS® Stylet Oil 1.0 gal (Scales & Mites)

April 10 - Early Strawberry Bloom
Captan® 50W 2.0 lbs (0-3 Day PHI & 2-Day REI)
Thiram® 75WDG 5.0 lbs (Strawberry Only)

April 15 - Strawberry Bloom/ Blueberry Early Bloom
Captan® 50W 2.0 lbs (0-3 Day PHI & 2-Day REI)
Ziram 76DF 5.0 lbs (Except Strawberry)
Brigade ®WSB 12.0 ozs (Clipper Beetle, 0-3-day PHI)

April 25 - Strawberry Full bloom/Blueberry Mid-Bloom/ Grape Bud Break
Captan® 50W 2.0 lbs (0-3 Day PHI & 2-Day REI)
Pristine® 14.5 ozs
Brigade®WSB 12.0 ozs (Clipper Beetle, 0-3-day PHI)

May 5 - Strawberry 1st Cover & Early Harvest Spray/ Blueberry Full Bloom/Grape & Bramble Shoot Growth
Captan® 50W 2.0 lbs (0-3 Day PHI & 2-Day REI)
Elevate ®1.5 lbs (0-day PHI)
Provado® 4.5 ozs (Curculio & Aphids; 7-Day PHI)

May 15 - Strawberry 2nd Cover & Harvest Spray/ Blueberry 1st Cover/Grape Bloom Spray/Bramble Cane Development
Captan® 50W 2.0 lbs (0-3 Day PHI & 2-Day REI)
Switch® 11.0 ozs (0-day PHI)
Malathion® 2.0 pts (Curculio, Scale & Fruit Moths; 0-3-day PHI)

June 1 - Strawberry 3rd Cover & Harvest Spray/Blueberry 2nd cover/Grape 1st Cover/Bramble Bloom
Captan® 50W 2.0 lbs (0-3 Day PHI & 2-Day REI)
Pristine® 14.5 ozs (0-day PHI)
Malathion® 2.0 pts(Curculio, Scale & Fruit Moths; 0-3-day PHI)

June 15 - Strawberry 4th Cover & Harvest Spray/Blueberry 3rd Cover & Early Harvest/ Bramble 1st Cover/ Grape 2nd Cover
Captan® 50W 2.0 lbs (0-3 Day PHI & 2-Day REI)
Elevate ®1.5 lbs (0-day PHI)
Sevin® 50W 4.0 lbs (sap beetle, 5-Day PHI)

July 1- Strawberry Renovation/Blueberry 4th Cover & Harvest/ Bramble 2nd Cover & Early Harvest/ Grape 3rd Cover
Captan® 50W 2.0 lbs (0-3 Day PHI & 2-Day REI)
Pristine® 14.5 ozs (0-day PHI)
Rally 40 W 4.0 ozs (Except Blueberry, 0-day PHI))
Brigade®WSB 12.0 ozs (0-3-day PHI)

July 15 - Strawberry Post Harvest/ Blueberry 5th Cover & Harvest/ Bramble 3rd Cover & Harvest/ Grape 3rd Cover & Veraison
Captan® 50W 2.0 lbs (0-3 Day PHI & 2-Day REI)
Switch® 11.0 ozs (0-day PHI)
Sulfur 95W 3.0 lbs (0-day PHI)
or Kocide DF 2.0 lbs (0-day PHI)
Malathion 2.0 pts (0-3-day PHI)

August 1- Strawberry Post Harvest/ Blueberry 6th Cover & Harvest/ Bramble 4th Cover & Harvest/ Grape 4th Cover & Early Harvest
Captan® 50W 2.0 lbs (0-3 Day PHI & 2-Day REI)
Pristine® 14.5 ozs (0-day PHI)
Sevin® 50W 4.0 lbs (Japanese Beetle, 5-Day PHI)

August 15 - Strawberry, Blueberry & Bramble Post Harvest/ Grape 5th Cover & Harvest
Captan® 50W 2.0 lbs (0-3 Day PHI & 2-Day REI)
Elevate ®1.5 lbs (0-day PHI)
Phostrol® 4.0 pts (0-day PHI)
Sevin® 50W 4.0 lbs (Hornets – 5-Day PHI for All Fruit)

September 1 - October 30 Strawberry Post Harvest/ Grape 6th Cover & Harvest
Captan® 50W 2.0 lbs (0-3 Day PHI & 2-Day REI)
Phostrol® 4.0 pts (0-day PHI)
Sevin® 50W 4.0 lbs (Hornets – 5-Day PHI for All Fruit)

November 25 Fall Dormant
Lime Sulfur 10.0 gals
Kocide DF 2.0 lbs (0-day PHI)

HERBICIDES: [HRAC]	*RATE	NOTES
Gramoxone® [22]	1.0 qts	Burndown, Directed Spray
Roundup® [9]	1.0 qts	Burndown, Shielded & Directed Spray
Devrinol® 50 DF [15]	4.0 lbs	Spring/Summer 35-day PHI
Princep® 4L [5]	1.0 qts	Spring Dormant, Avoid High pH Soils
Solicam® [12] (Except strawberry)	2.5 lbs	Spring/Fall Dormant, 1-yr Established
Aim® [14] or Shark® [14]	2.0 ozs	Directed Spray to Weeds, 3-day PHI
Venue [14] (Grapes only)	2.0 ozs	Directed Spray, 0-day PHI
Chateau [14] (Except brambles)	12.0 ozs	After Harvest to Spring Bud Swell
Surflan® [3] (Except strawberry)	2.0 qts	Spring/ Summer, Prowl 60-day PHI
Poast® [1]	1.5 pts	Summer Grasses, Variable PHI
Sinbar® [5]	4.0 ozs	Fall Dormant, 1-yr Established

***Lowest Use Rate Recommended Initially**

Organic Approach Substitutions:

Conventional Product	Organic Certified Product (OMRI)
Captan®	Surround® or Sulfur or Lime Sulfur
Rally®	Kaligreen® (Powdery Mildew Eradicant)
Listed Insecticides	Neem® or Pyganic® or Entrust® or Dipel®
Gramoxone® or Roundup®	Avenger® or Burnout®or AXXE®/BioSafe® or (Scythe® no OMRI label)

*** Important Note: The calendar spray dates given are an average estimate for Anne Arundel and Prince George's County small fruit production, and may vary by location in Southern Maryland. Be sure to adjust your spray schedule application dates accordingly. The above recommendations very closely reflect the current spray program utilized at the University of Maryland Research and Education Center, Upper Marlboro Facility for its research fruit plots. Remember to always "Read the Label".**

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