WEEKLY CROP UPDATE

UNIVERSITY OF DELAWARE COOPERATIVE EXTENSION

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Welcome to the first issue of WCU for the 2022 season. The next WCU for this year will be issued on April 1. WCU will then be posted on the web and sent to mail subscribers by 4:30 p.m. each Friday until September 30. The cost of mail subscription is $40. You can subscribe by returning the form at the back of this issue.

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I will also send out a text message each week when a new issue is posted. The message will be brief, and the text message distribution list will not be used for other announcements except those of an urgent nature (i.e. pest or disease alerts). If you would like to receive the text reminder please send your name, number and cell phone carrier to me at the above email address or send a text message to 302-233-4719.

Emmalea Ernest

Vegetable Crops

Agrivoltaics - Growing Under Solar Panels

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

As the climate becomes hotter and wetter, loss of vegetable and fruit crops is expected to increase due to heat stress and damage from heavy rains.

Several projects across the country are researching the synergistic benefits of co-locating photovoltaic arrays on vegetable and fruit farms. Potential benefits to the crops will derive from lower plant temperatures, reduced sunburn and improved fruit set. Additional benefits are expected to be reduced evapotranspiration, increased soil water use efficiency and reduced damage from heavy rain or hail.

As the climate is expected to become wetter with more extreme rainfall events, losses of vegetable and fruits to excess rain will become more of a concern. Passive rain shelters using plastic coverings have been employed throughout the world to protect sensitive fruits and vegetables such as strawberries and tomatoes from excess rainfall. Research at the USDA Beltsville has shown that there is improved productivity and quality of repeat blooming strawberries under low tunnels serving as rain shelters. Rain shelters are also used for tomatoes which are susceptible to bruising and cracking. They also reduce foliar wetting and rain splash and therefore can reduce fungal and bacterial diseases if left on for the whole

growing cycle. Solar panels could be used to provide this rain sheltering effect.

Artificial shading is a known strategy to mitigate heat stress. Commonly, shade cloth or netting is used to provide 20-30% shade levels during periods when the plant is most sensitive to heat (such as tomato fruit development). Research at the Universities of Maryland, Georgia and Kansas has shown that passive shading can improve marketability and quality of tomatoes, peppers and lettuce, respectively.

Research at UD with 20-40% shading of tomato, pepper and strawberries for summer production showed mixed effects, benefiting in some years but not in others depending on sunlight and temperature . In 2019, which was sunnier and hotter than 2018, the shade treatments produced significantly more marketable peppers than the unshaded plots, e.g. yield of marketable first harvest for 30% shading was 18 times higher than unshaded. Lettuce trials conducted at UD over similar range of shade found shading reduced soil temperatures by 3 °C and reduced bitterness.

Only recently (in the last 3 years) have studies incorporated actual solar arrays to evaluate their shading. Oregon State University applied fixed tilt solar arrays over grazing land and found a substantial increase in moisture retention but concluded the economics of solar production as active shading devices should be studied as well. University of Massachusetts just initiated a study of solar module shading and found while vegetable production was lower and solar output was lower, the combined payback was greater than either alone. Arizona researchers found that some pepper and tomato varieties had 2-3 times higher yield under solar modules while other varieties had same yield but used half as much water. Agrivoltaics research is now underway at more than a dozen universities.

Shading is commonly used in nursery production of high value ornamental shade plant in areas such as Florida and Southern California. However, use of artificial shading in vegetable and fruit production has been limited in the temperate areas of the US due to the expense of shade house structures and limited profit potential. But the need for this is changing due to hotter and wetter weather.

Climate change has the potential to impact fruit and vegetable production as temperatures increase. Many vegetable crops have suffered losses due to the heat in recent years because photosynthesis rapidly decreases above 94°F, so high temperatures will limit yields in many vegetables and fruits. In flowering and fruiting crops, high night temperatures will affect pollen production, often reducing viable pollen numbers resulting in reduced set and lower yields. Sunburn of fruits increases on hot sunny days, especially where leaves wilt resulting in reduced fruit cover. Shading from solar panels could alleviate these problems.

Providing adequate moisture through irrigation is critical in high heat periods. However, irrigation cannot completely compensate for extreme heat. High soil temperatures can damage surface roots, limiting water and nutrient uptake. This is particularly an issue in crops grown on black plastic mulch, a common cultural practice. Solar shading can reduce the local temperature under the modules by blocking the direct sunlight on the hottest days of the year, mitigating many of these harmful effects

High value crops could be grown in the partial shade of solar panels or in areas between solar panels while simultaneously generating significant income from sales of clean electricity. If successful, this could also boost yield and quality of specific vegetable and fruit crops on farms.

Issues with current solar fields and agrivoltaics include:

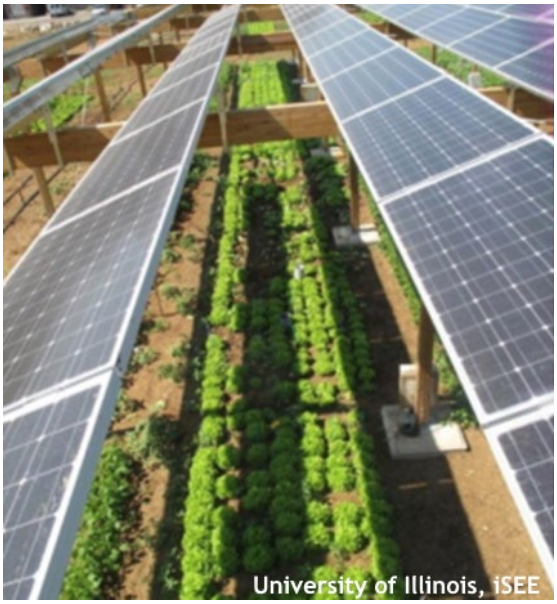
● Panels are low to the ground making them hard to work under. Panels will need to be higher for agrivoltaics to work for under panel production.

● Fixed solar arrays cut light significantly and will limit crops that can be grown under them. Panels will have to have gaps to allow enough light.

● Tracking solar arrays are always shaded limiting the used under the panels. Counter tracking could be used to solve this problem

(track opposite to let sun in the morning and afternoon).

● Growing in lanes between panels is possible but makes movement challenging. Equipment could be modified for between panel production mechanization.



Between fixed panel production.

Growing under solar panels with gaps.

Growing under and in-between tracking solar panels.

The University of Delaware has received funding to create agrivoltaic user-facilities at UD, in Newark and in Georgetown. We will study the benefits of co-locating uniquely designed sun-tracking PV arrays with crop production. The test crops will be high-value vegetables and fruits impacted by adverse climate change related weather (e.g., tomatoes, peppers, lettuce, and strawberries). Demonstrating mutual benefits could justify the use agricultural land for PV installations. This equipment allows separate control of module orientation and position on the tracker to optimize electrical and vegetable/fruit production. Another innovation is control of the solar panel orientation to serve as a shelter to keep damaging rain from crops.

System to be constructed at 2 University of Delaware research farms. Diagrams courtesy of SolAgra. This system allows for below panel production with common farm equipment.

Biofumigation for Soilborne Disease Control - Revisited

– *Gordon Johnson, Extension Vegetable & Fruit Specialist;* gcjohn@udel.edu

Crop rotation is a key to successful vegetable production. However, land limitations often make long term rotations difficult. Shorter rotations lead to a buildup of pests, with soil borne diseases and nematodes being a major challenge for many vegetable crops. One approach to tighter rotations is to fumigate soils using commercially available chemical fumigants. Fumigants such as chloropicrin; dicloropropene + chloropicrin; metam-sodium, and metam-potassium are being used in this region where labeled. A major drawback to chemical fumigation is material cost. There are also application requirements and equipment considerations to take into account.

There has been considerable interest in the use of certain crops as biological fumigants ahead of vegetable production to reduce the need for chemical fumigation, especially in tight rotations. These are crops that would be grown for their naturally occurring compounds that kill soil borne pests. Plants in the mustard family, such as mustards and rapeseed, and Sorghum species (sudangrass, sorghum-sudangrass hybrids) have shown the potential to serve as biological fumigants. Research in this region and across the country has shown promise in using these crops to reduce soil borne pests. Plants from the mustard family produce chemicals called glucosinolates in plant tissue (foliage particularly). These glucosinolates are released from plant tissue when it is cut or chopped and then are further broken down by enzymes to form chemicals that behave like fumigants. The most common of these breakdown products are isothiocyanates. These are the same chemicals that are released from metam-sodium (Vapam) and metam-potassium (K-Pam), commonly used as chemical fumigants. Sorghums produce a cyanogenic glucoside compound called Dhurrin that breaks down to release toxic cyanide when plant tissue is damaged.

Research on the control of *Phytophthora capsici* for cucurbit crops (pumpkins, melons, watermelons, squash) using biofmigation with mustards has been especially promising.

It is important to note that success with biofumigant crops depends on a number of factors. The following are some suggestions to achieve the best results:

● Plant biofumigant crop varieties selected or bred for higher levels of active compounds if available. An example is the Caliente mustard products including Caliente 61, 119, and 199. Most recently, Caliente Rojo has been released. It has been bred to produce up to 10% more Isothiocyanates and more biomass in a shorter growth period than Caliente 199.

Caliente Rojo biofumigant mustard.

● Produce as much biomass of the biofumigant crop as possible. This requires that you have a good stand, fertility, and sufficient growing time. The more biomass that is produced and that is incorporated, the more chemical is released. However, as plants mature, they will reach a point where levels of these active chemicals decline, and you should not let the plants go to seed. There is also the practical consideration that it is difficult to do a good job of incorporation with too much biomass. With a crop like sudangrass, this means you cannot let it get too tall. For biofumigant mustards, apply fertilizer at minimum 50 lb/A nitrogen with sulfur (ammonium sulfate is recommended). Sorghum species will require 80-120 lbs of N. Use

seeding rates recommended for the specific crop you are growing.

● The plant material must be thoroughly damaged so that enzymes can convert glucosinolates into isothiocynates or so that the Dhurrin is converted into cyanide. This means that you need to chop the material as much as possible and work it into the soil as quickly as possible so as to not lose the active compounds to the air. A delay of several hours can cause significant reductions in biofumigant activity. The finer the chop, the more biofumigant is released.

● The material should be incorporated as thoroughly as practical to release the biofumigant chemical throughout the root zone of the area that is to be later planted to vegetables. Poor distribution of the biofumigant crop pieces in the soil will lead to reduced effectiveness. Tractor mounted rototillers or a disk harrow with cultipacker are commonly used.

Flail mowing followed by immediate incorporation is critical to biofumigation success.

● Sealing with water or plastic after incorporation will improve the efficacy (as with all fumigants). Soil conditions should not be overly dry or excessively wet. Irrigate if rain is not imminent to promote biofumigation (water is needed because hydrolysis is the reaction step that transforms glucosinolate into isothiocyanate).

● Disk lightly before planting at least 7 days later to release any residual fumigant gas as well as manage any weeds that germinated.

Biofumigant crop systems include overwintering rapeseed; early spring planted mustards, and late spring planted sorghum/sudangrass. Each has the potential to fit different vegetable cropping sequences for early, mid, or late season production.

Different species and cultivars of biofumigant crops contain varying levels of active compounds. There have been significant efforts to evaluate species, and varieties within a species, for levels of biofumigant chemicals produced, as well as some breeding and selection efforts to increase levels of these compounds. This work is on-going in different parts of the US and the UK. Where varieties with higher levels of active chemicals are available, they should be used.

A major limitation to biofumigant crop use is the fact that you cannot deliver high enough levels of the active chemicals to do a complete fumigation job and the biofumigation effectiveness is also limited by the depth of incorporation. However, you are adding organic matter and do get the benefits associated with that addition.

The bottom line: biofumigant crops can suppress soil borne pests but are not a full replacement for chemical fumigants, nor are they a substitute for adequate rotations. However, using biofumigant crops in combination with disease tolerant vegetable varieties can allow for a greater chance of success in fields with soilborne disease or nematode problems.

Red Legged Winter Mites Causing Damage to Leafy Greens in High Tunnels

– *Jerry Brust, IPM Vegetable Specialist, University of Maryland*, jbrust@umd.edu

The red legged winter mite, *Penthaleus dorsalis* has been found in more high tunnels (HTs) growing leafy greens this past winter for the 4th year in a row. Most of the reports I have gotten from HTs in past years were from the Eastern seaboard, but now I am receiving reports from locations a little further inland, such as Baltimore, Howard and Prince George's counties in Maryland.

Red legged winter mites are very small with dark purple/black bodies and bright red legs (Fig. 1). They thrive in what we would normally consider conditions too cold for an arthropod to cause problems. This mite is cold adjusted and cannot stand hot dry soil conditions and will die as summer heat approaches. Eggs are laid in late spring and over-summer in the soil. These are stress resistant eggs (i.e., they withstand drying and heat as well as synthetic chemical applications, but not steam applications). In the fall they will begin to hatch and mites will be active throughout the fall and winter inside a high tunnel with crops. Damage appears as 'silvering' or 'whitening' of the fed upon foliage (Fig. 2). Mites are most damaging to newly emerging crops, greatly reducing seedling survival and development, but they also can make larger plants unmarketable.

Figure 1. Many red legged winter mites on a leaf

I think the red legged winter mite is more of a problem now because we have many more high tunnels that are producing winter vegetables and because our winters are not as cold as they once were. In addition, growers have a problem detecting the little pests until it is too late and the reasons for this are several. First the mites are very small and it takes many mites to do damage to a crop, so their numbers can slowly build over time. The mites also are most active in the evening and overnight, come morning and the high tunnel begins to heat up the mites tend to stay under the foliage of plants in contact with the cool moist soil and can go unnoticed. Another problem is the damage that mites do on plants early-on looks very much like cold damage. Figure 3 shows cold damage to plants that looks similar to mite feeding damage in Figure 4). So growers think the whitening damage they are seeing on their plants is from cold exposure and not mite feeding.

Figure 2. Red legged winter mite damage to spinach

Red legged winter mites are difficult to control even when using synthetic chemicals. Foliar sprays of Pyrethroids (check label for the particular crops that are labeled as this will vary greatly) or Entrust (spinosad) combined with neem or some other hort oil will reduce feeding, but if mite populations are high it will be difficult to eliminate the damage. This is usually the case when growers contact me, their mite populations are very high and little can be done at the time for control. Applications should start as soon as damage is noticed before mites have a chance to build their population. Foliage should be thoroughly covered with spray material as should soil around the base of plants.

Figure 3. Cold damage to crop

Figure 4. Red legged winter mite damage to crop

Cultural controls involve using high levels of heat such as clear plastic mulch that is used to heat the soil and kill mites and, if used in the summer, even their eggs. Steam heat used to control nematodes and soil pathogens can be used to greatly reduce mite numbers before the next planting. Many cultivations during the summer can significantly decrease the number of over-summering eggs that survive. During the winter growing season once a crop is done it may be possible to take out all the green material in a high tunnel wet the ground and place leaves of mustard greens on the soil as a way to bring the mites to the surface to feed, then use a propane torch to burn the leaves and the mites at the same time- this method is being trialed now to see if it helps. The growers at ECO City Farms have reported that the red legged winter mite's most preferred crops are purple mustards, mustard greens, Pac Choi and salanova with spinach, red Russian kale, collard greens, arugula and cilantro being moderately preferred.

High Tunnel Spinach Crop with Significant Cucumber Mosaic Virus Infection

– *Karen Rane, Plant Diagnostician, University of Maryland* rane@umd.edu; *Alan Leslie, UME Educator* and *Jerry Brust, IPM Vegetable Specialist, University of Maryland*, jbrust@umd.edu

Winter crops of spinach, crucifers and other leafy produce have been growing nicely throughout most of this winter, but we came upon a high tunnel in which the spinach crop was not doing very well. We found that plants were infected with cucumber mosaic virus, CMV.

The first symptom of cucumber mosaic virus on spinach is a mild yellowing of younger leaves and a strapping or "puckered" appearance with margins of infected leaves rolling downwards (Fig. 1). As the disease progresses the foliage will show a yellow/ green mottle (Fig. 2) with stunted and severely damaged crown leaves, and even death of the growing point. The earlier a plant becomes infected with the virus the more severe the symptoms and damage will be.

Figure 1. Yellowing and puckering of spinach leaves infected with CMV

Figure 2. Older CMV infected spinach with a greater mottled appearance and puckering

Cucumber mosaic virus is only one of more than 10 virus diseases of spinach, but it is one of the most common and economically important viruses of this crop. The virus is vectored by 75 different aphid species in a nonpersistent manner (meaning that the aphid acquires the virus within a minute of feeding on an infected plant but does not remain infective for very long). The virus can also be spread by cucumber beetles and by cultivating and handling plants. CMV can overwinter in many weed species and can survive the winter in the roots of a weed and move to the aerial parts in the spring, where it can then be transmitted by aphids to other plants. Some of the more important weed hosts include: bur- and wild-cucumber, catnip, chickweeds, clovers, curly dock, dandelions, fleabane, flowering spurge, groundcherries, horsenettle, Jimsonweed, milkweed, pigweed, pokeweeds, nightshades and white cockle. These infected weeds often show no virus symptoms. Vegetable hosts include carrot, celery, cucurbits, legumes, lettuce, onion, pepper, spinach and tomato.

The worst case scenario would be to have heavy weed pressure within a high tunnel along with a high aphid population and this is what we found in the HT with CMV infected spinach – there was a high population of green peach aphid (Fig. 3) and a lots of weeds, including chickweed, in the beds (Fig. 4). Winter annual weeds like chickweed need to be eliminated from the HT before planting and its management maintained throughout production of the crop. Growers also need to scout for aphids and manage this pest early, so that populations do not build to high levels. *Beauveria bassiana* can give good control of aphids when their populations are low but does not work as well in managing high populations. There are several aphicides that can be used to control aphids on spinach that can be found in the 2022-2023 Mid-Atlantic Commercial Vegetable Production Recommendations guide, but growers need to be sure how their state defines using pesticides in a high tunnel before using them. There are several commercial spinach varieties that are resistant to CMV that should be considered for use in a high tunnel: Avon, Renegade, Winter Bloomsdale, Melody F1, Menorca, Butterflay, Virginia Savoy, Bloomsdale Savoy, Early Hybrid #7, Marabu RZ, Unipak 151.

Figure 3. Green peach aphids on spinach

Figure 4. High population of chickweed alongside CMV infected spinach crop

Choose Heat Tolerant Snap Bean Varieties

- Emmalea Ernest, Scientist - Vegetable & Fruit Crops; emmalea@udel.edu

Snap beans are sensitive to high night temperatures during flowering. Sixty-eight degrees Fahrenheit (68 ˚F) is considered the threshold temperature for damage to anthers and pollen, which leads to poor pod set, misshapen pods and reduced marketable yield (Figure 1).

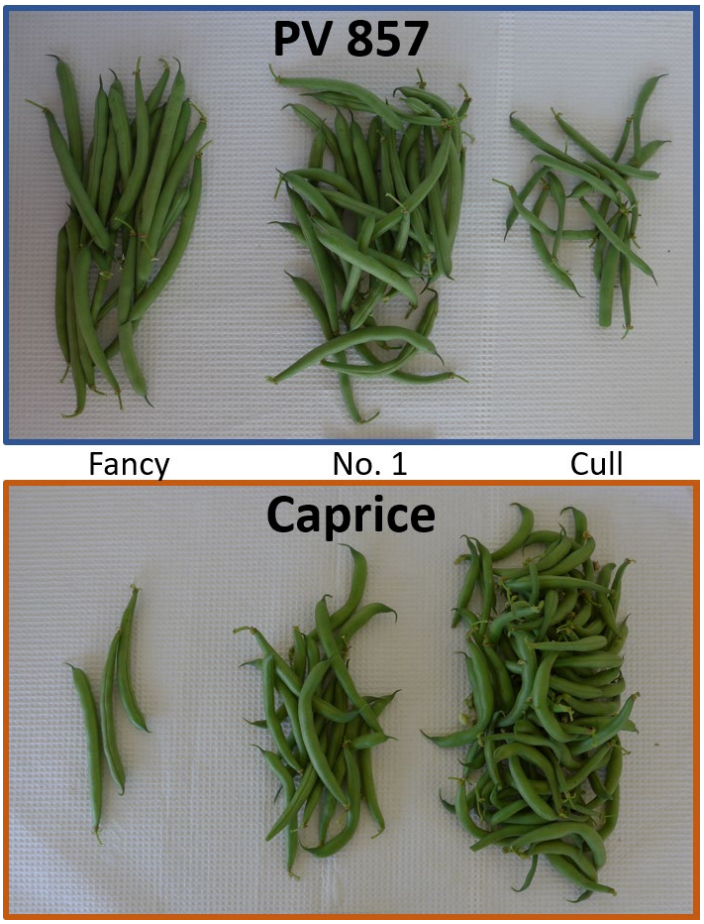


Figure 1. A 300 g sample of quality graded pods from heat tolerant PV 857 vs heat susceptible Caprice. Caprice has a high percentage of pods in the cull category whereas PV 857 produced mostly marketable pods graded Fancy or No. 1.

Plantings of snap beans made in June and early July are likely to be exposed to high night temperatures during flowering. Figure 2 shows the daily average minimum temperatures for three locations in Delaware for June, July, and August. These averages are based on 30 years of data (1991-2020). Average daily minimum temperatures are above 68 ˚F from July 1 to August 15 in Georgetown and from July 2 to August 10 in Dover. The heat-susceptible early flowering period begins about 30 days after planting, so snap beans planted from June 1 to July 16 in southern Delaware are at high risk of heat stress exposure.

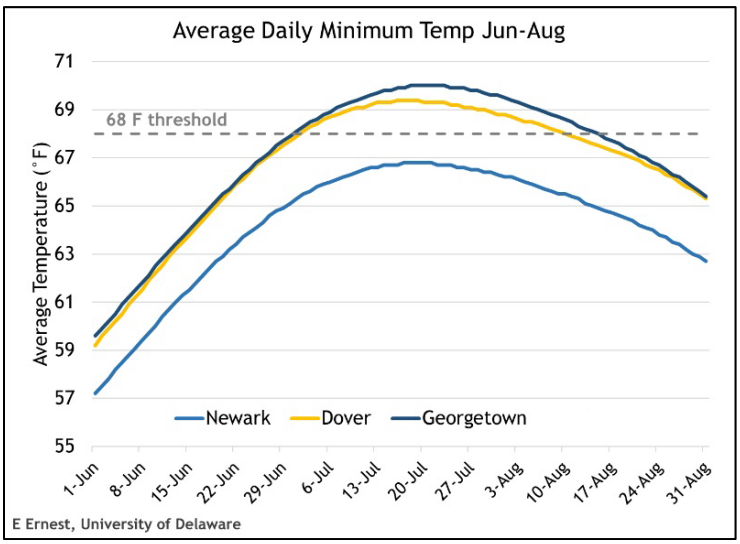


Figure 2. Average daily minimum temperatures for Newark, Dover and Georgetown, Delaware. Average of 30 years from 1991-2020. Data obtained from the National Centers for Environmental Information.

From 2017 to 2021 I conducted snap bean variety trials at the Carvel Research and Education Center in Georgetown, Delaware. The purpose of these trials was to identify snap bean varieties that maintain yield and quality when night temperatures are higher than 68 ˚F. The round-podded varieties that produced the highest marketable yields under heat stress in multiple years of trials are 'PV 857' and 'Bridger'. Two additional varieties of interest are 'Jaguar' and 'Byrd'. Jaguar performed well in the 2021 heat stress trial but has only been trialed in Delaware for one year. Byrd has moderate heat tolerance based on 2020 and 2021 trials and was the highest yielding variety in a 2021 trial where many varieties succumbed to pythium root rot. Among the flat podded varieties tested in 2019 and 2021, 'Usambara' performed well under heat stress in both years and produced significantly higher yields than the other trialed varieties. 'Tapia' is another flat podded variety that had good yields in both years' trials.

Full trial reports for the 2017-2020 trials are available on the Vegetable Variety Trials page. The 2021 Snap Bean Trial Report is linked here.

Timing Spring Vegetable Planting in a Changing Climate

– *Emmalea Ernest, Scientist - Vegetable & Fruit Crops*; emmalea@udel.edu

Success with spring planted vegetables depends on getting seeds or transplants into the field at the right time. Timing plantings correctly is getting trickier since the average growing season length for Delaware has increased by 27 days since 1895, with most of the increase occurring since 1990. On average, the last spring frost is occurring 19 days earlier and the first fall frost is occurring 8 days later. However, the spring weather conditions in any given year are unpredictable which can make the season stressful or downright discouraging. Plantings can be damaged by cold weather, or on the other end of the spectrum, unseasonable hot weather can stress cool season crops. Here are some tips to increase your chance for success with spring planted vegetables in a changing climate.

Know Likely Frost/Freeze Free Dates for Your Site

Frost can begin to form when air temperatures drop close to 32 °F. A freeze occurs when temperatures reach 32 °F or lower and a hard freeze occurs with sustained temperatures of 28 °F or lower. Some crops will tolerate a frost or freeze, some will tolerate a hard freeze and some will not tolerate either. The likelihood of frost or freeze after a certain date can be estimated based on past years' temperatures. The table below shows the probability of a freeze/frost or a hard freeze at 4 locations in Delaware based on recorded temperatures for the 30 years from 1991 to 2020.

Freeze and Hard Freeze Probabilities for Four Locations in Delaware for 1991-2020.

	Freeze/Frost (32 °F)		
	Rare After*	Uncommon After	Typical After
Georgetown	20-Apr	16-Apr	8-Apr
Dover	11-Apr	8-Apr	1-Apr
New Castle	20-Apr	16-Apr	8-Apr
Wilmington	22-Apr	16-Apr	6-Apr
	Hard Freeze (28 °F)		
	Rare After	Uncommon After	Typical After
Georgetown	7-Apr	2-Apr	25-Mar
Dover	5-Apr	1-Apr	24-Mar
New Castle	6-Apr	2-Apr	27-Mar
Wilmington	12-Apr	6-Apr	25-Mar

* Rare = 1 year in 10; Uncommon = 2 years in 10; Typical = 5 years in 10

Data is courtesy of Kevin Brinson, Associate State Climatologist and DEOS Director

You should also consider conditions that are specific to your location. Urban sites retain more heat creating a microclimate, termed a "heat island", with a longer frost-free period. Areas near large bodies of water or with topography that allows cold air to settle into lower elevation areas will be protected from freezes when temperatures near 32 °F. Conversely, low areas where cold air collects or flat areas where cold air cannot drain will be more at risk of late spring freezes. Knowing how your site deviates from the average for your area will help you decide if you can plant cold sensitive crops earlier in the season or if you should be more cautious. Even though the average growing season length has increased in Delaware the degree of increase varies by location in the state.

Use Historically Recommended Planting Dates as a Guide

Recommended planting dates for spring vegetables are available for commercial growers in the Mid-Atlantic Commercial Vegetable Production Recommendations. These planting dates are based not only on a crop's tolerance of cold weather but also on their time to maturity and desired harvest window. For example, Brussels sprouts are cold tolerant, but they are transplanted in June for fall harvest because

they require a long growing season. To adapt to warmer spring conditions and a longer growing season, choose dates earlier in the planting window for cool season crops, especially those that are prone to quality problems when exposed to heat (i.e. lettuce, cauliflower, broccoli). In many years, warm season crops can be planted early in their recommended window to achieve earlier harvest.

Variety Selection
For cool season crops that might be impacted by unseasonably hot conditions in April, May and June, choose varieties with heat tolerance. Heat tolerant lettuce varieties will be less prone to bolting and turning bitter tasting. Heat tolerant broccoli and cauliflower are less prone to quality reducing physiological disorders. Another strategy to avoid damage from heat stress is to plant several varieties with different days to maturity. Planting several varieties makes it less likely that all the plants will be at the heat susceptible growth state during a period of hot weather. A similar approach is to make sequential plantings of the same variety during the entire planting window.

Use Season Extension Aids for Very Early Plantings
Many growers use added inputs to modify the environment for seedings and increase the chance of success with early season plantings. This includes plastic mulch, floating row covers, low tunnels, and rye windbreaks. See the past WCU article by Gordon Johnson "Transplanting Warm Season Crops in April" for a detailed discussion of these practices.

Check the Forecast Before Planting
Before deciding on an early planting date, check the weather forecast to determine if predicted conditions will support plant growth. This is especially important if you are planting cold sensitive crops early. If you are in a freeze prone site, note any predicted clear nights which could result in frost even if temperatures are not forecast to drop to 32 °F. Try to plant at a time when temperatures are expected to be warm for a few days afterward. When direct seeding, warm temperatures promote faster germination resulting in less exposure to insects and diseases that impact seeds. Transplanting at the beginning of a warm period allows plants to quickly root into the soil, improving their stress tolerance. Also avoid transplanting right before forecasted strong winds which can quickly dry out transplants that have not yet rooted into the soil.

Acclimate Transplants
Make sure that transplants have the best chance of survival by acclimating them to higher light and lower humidity conditions before planting. Transplants should be moved from the greenhouse to an outdoor location in partial sun and protected from excessive wind. Maintain transplants in these conditions for a week before planting to the field. Move or cover transplants if very cold or windy conditions are expected.

Be Ready to Frost Protect
Even though some recent spring seasons have been warm we have still had years with very late frosts (such as in 2020) so be prepared to protect sensitive plants if freezing conditions are predicted. Some crops like potatoes and sweet corn will regrow if the plants are still small when frost damaged. Other crops like tomatoes, peppers and melons, will not regrow if plants are frozen. Row covers can be used to protect frost sensitive vegetables that have already been planted in the field. Covers should be applied in late afternoon before air temperatures fall to retain heat accumulated in the soil.

Processing Vegetable Budgets Updated

Nate Bruce, Farm Business Management Specialist, nsbruce@udel.edu

Enterprise budgets for processing vegetables have been updated with prices and information for 2022. You can use these budgets to estimate your production costs and returns for several different crops: pickling cucumbers, sweet corn, spinach, lima beans, snap beans, and peas. All enterprise budgets are in Excel. The first tab contains research estimated costs and returns. The second tab allows you to enter your own costs and returns.

To download the new enterprise budgets go to: https://www.udel.edu/canr/cooperative-extension/sustainable-production/commercial-crops/vegetable-crops/

If you have any questions on the budgets, please contact me at by email at nsbruce@udel.edu or by phone 302-363-7619.

Note: Input costs are highly volatile in 2022. Expect major fluctuations in costs of inputs as 2022 progresses.

Command in Peas – Can Now Rotate to Lima Beans – *Mark VanGessel, Extension Weed Specialist*; mjv@udel.edu

FMC Corporation collaborated with Departments of Agriculture in Delaware, Maryland, and New Jersey labeling Command 3ME for use on lima beans through the release of a 24(c) Special Local Need Label. This change occurred last spring. The label is available online at http://www.cdms.net/Label-Database.

Along with the label for use in lima beans, this label also allows for planting lima beans 60 days after application in a preceding crop. This allows use for Command use in peas and planting lima beans at least 60 days later.

Fruit Crops

Thinning Peaches and Nectarines – *Gordon Johnson, Extension Vegetable & Fruit Specialist;* gcjohn@udel.edu

I am currently pruning in my peach orchard. This is the first step in managing the fruit load. Most years, peaches and nectarines will set many more fruit than the tree can carry, and they will need to be thinned. Thinning is done to prevent limb breakage, increase fruit size, and improve fruit quality. Thinning techniques are used before, during and after bloom to reduce peach crop load.

Unfortunately, chemical thinners are extremely variable in stone fruits, unlike apples. However, a promising new thinner for peaches may be available soon from Valent BioSciences. They have announced U.S. EPA registration of a new plant growth regulator (PGR), which will be marketed under the brand name Accede. Accede is the first PGR based on a naturally occurring compound developed specifically for thinning of stone fruit, including peaches and nectarines. We will keep you posted as the product is introduced to our region.

Because chemical thinners are problematic in peaches and nectarines, the first thinning starts with **pruning** out excess or poor-quality fruiting wood in the dormant to pre-bloom pruning window (now). Eliminate limbs in the low center area of the tree where poor light and will cause small fruit size. Prune to remove all fruiting shoots shorter than 8 inches long, as these limbs tend to produce smaller fruit.

The next thinning is done during the **blossom** stage. Various mechanical aids have been used to remove excess blossoms from peach trees. These methods include dragging large diameter ropes across canopies, using rotating string thinners, rubbing with a gloved hand or brush and high-pressure water systems.

Then next thinning period is when **small fruits** have formed. With very high fruit densities go through the orchard with loppers to adjust crop load by cutting out entire fruiting limbs and remove the ends of many fruiting limbs longer than 12 inches. In the two to three weeks after bloom, the very short fruiting limbs less than four inches are brittle and can be quickly snapped off completely by hand with little damage to the supporting limb. At this early stage, running a hand along the bottom of a fruiting limb can remove half or more of the fruit.

Final thinning is done by removal of green fruit at the stage when they are the size of a nickel. The target fruit load is 400-600 fruit per mature tree. A general rule of thumb is to leave an average of 6 to 8 inches between fruit (the larger spacing for earlier or hard-to-size varieties). Two or three peaches can be left clustered if there is enough additional limb space to support their growth. Keep the largest fruit on a limb, even if they are clustered.

Hand thinning can start before various striking and shaking methods, which require fruit large enough to be dislodged by the vibration. If the fruit thinning has not been completed earlier, rubber-tipped poles, padded bats and plastic "wiffle" bats can be used to strike limbs to remove excess peaches and is faster than hand

thinning. Both striking and shaking strategies generally require follow-up hand thinning. Hand thinning provides greater control and causes less limb damage than limb shaking and striking.

Early ripening varieties and varieties with less potential for large fruit should be thinned first to provide the best opportunity for size enhancement.

In summary, the proper strategy for fruit thinning depends on many factors such as the variety characteristics, pruning style, the crew, fruit set and fruit growth rates. Each grower will develop the strategy that works for them. The key is to do what can be done earlier, quicker and more efficiently while there is time to benefit by improved fruit size growth.

This article was adapted from "Thinking through strategies for peach crop thinning" from MSU https://www.canr.msu.edu/news/thinking_through_strategies_for_peach_crop_thinning#:~:text=Peaches%20are%20thinned%20to%20prevent,fruit%20size%20by%20reducing%20competition

Announcements

2022 Profiting from a Few Acres Conference

March 10 & 11, 2022 9:00 a.m – 1:30 p.m
Online

The event is FREE, but reservations are required. Register now to receive the meeting link: https://bit.ly/DSUPFFA22

Thursday March 10 – Plant Track

9:00 AM - 9:15 AM
Introduction and COVID Presentation
Mr. John Clendaniel, Small Farms Program Leader, DSU Cooperative Extension
Dr. Gulnihal Ozbay, Professor & Extension Specialist - Natural Resources

9:15 AM – 10:00 AM
Making Money on A Few Acres
Mr. Cliff Slade, Farmer, Slade Farms Surry, Virginia

10:00 AM – 10:45 AM
Vegetable Production Status in Delaware Amidst Covid-19
Dr. Gordon Johnson, Horticulture Specialist, University of Delaware

10:45 AM - 11:30 AM
Beyond-Organic Community Supported Agriculture at the Homestead Scale
Ms. Rachel Yocum, One Hawk Homestead Dover, DE

11:30 AM - 11:40 AM BREAK

11:40 AM - 12:25 PM
Direct Marketing of Locally Grown Fruits and Vegetables
Dr. Kathleen Liang, Kellogg Distinguished Professor & Director of Center for Environmental Farming Systems, North Carolina A&T University

12:25 PM - 12:50 PM
Updates on Spotted Lanternfly in Delaware
Ms. Katie Bielicki, Delaware Spotted Lanternfly Program Coordinator, Delaware Department of Agriculture

12:50 PM – 1:05 PM
Recruiting Farmers for the Delaware Farm Fresh Program
Mr. Matthew Williams, Conscious Connections Inc., Wilmington, DE

1:05 PM - 1:30 PM
SARE Grants for Farmers
Dr. Naveen Kumar Dixit, Assistant Professor of Horticulture & Extension Specialist, NE-SARE Coordinator

Friday, March 11 – Animal Track

9:00 AM - 9:15 AM
Introduction and COVID Presentation
John Clendaniel & Dr. Gulnihal Ozbay

9:15 AM- 10:30 AM
Taking the Plunge: Making Money from my Hobby
Mr. Douglas Wood, 302 Aquaponics

10:30 AM - 11:15 AM
Marketing Sheep and Goat Products
Dr. Kwame Matthews, Associate Professor & Extension Specialist - Small Ruminants

11:15 AM -11:25 AM BREAK

11:25 AM – 12:10 PM
1st talk: **Getting Started with Beekeeping**
2nd talk: **Reducing Pesticide Risks to Pollinators**
Ms. Emily Wine, State Apiary Specialist, Delaware Department of Agriculture

12:10 PM – 12:45 PM
Pollinators and Farm Bill Programs
Ms. Heather Beaven, NRCS Resource Conservationist

12:45 PM - 1:30 PM
Circular Economy Towards Sustainable Agriculture in 21st Century
Mr. Nate Bruce, Farm Business Management Specialist, University of Delaware

For more information, to register, or for assistance due to disabilities, contact:
Dr. Gulnihal Ozbay | gozbay@desu.edu
302.857.6476 (office) | 302.233.8453 (cell)
Ms. Megan Pleasanton | mpleasanton@desu.edu

5th Annual Northeast Cover Crops Council Conference

March 10-11, 2022 9:00 a.m.-12:30 p.m.
Online

This will be a virtual meeting with speakers throughout the Northeast Region. Register now to join your fellow cover crop enthusiasts for a meeting of interactive online presentations, posters, panels, and training sessions.

Registration gives you access to the conference platform a week before and two weeks following the conference. Enjoy presentations and resources at your leisure. Plenary speakers include sustainable agriculture and climate resilience expert Dr. Mitch Hunter from American Farmland Trust, and Dr. Victoria Ackroyd with the University of Maryland sharing information on cover crop tools. Topic highlights include weed control, pest management, planting green, and tarping in cover crops, corn, soybean and on-farm research, precision agriculture, and more. Registration gives you access to the conference platform a week before and two weeks following the conference. Enjoy presentations and resources at your leisure.

Plenary speakers include sustainable agriculture and climate resilience expert Dr. Mitch Hunter from American Farmland Trust, and Dr. Victoria Ackroyd with the University of Maryland sharing information on cover crop tools. Topic highlights include weed control, pest management, planting green, and tarping in cover crops, corn, soybean and on-farm research, precision agriculture, and more.

Click the link below:
2022 NECCC Conference Agenda

Visit the northeastcovercrops.com to register, or https://na.eventscloud.com/ereg/index.php?eventid=658464&

Perk Up Your Pasture Webinar Series

March 15 & 29, 2022 Noon EST
Online

When and how to renovate pastures presented by University of Maryland Extension and University of Delaware Cooperative Extension.

Topics:
March 15: Forage Selection
March 29: Planting and Maintenance

To register, visit: https://go.umd.edu/perkypasture

For questions or if you need a reasonable accommodation, please contact Maegan at 443-523-4389

Listeria Intervention and Control Workshop

Friday, March 18, 2022 7:30 a.m. – 5:00 p.m.
Ag Commodities Building - Harrington Fairgrounds
18500 S. DuPont Hwy, Harrington, DE 19952

Registration for this event will close March 9, 2022

The Delaware Department of Agriculture will cover the cost of attending. Breakfast and Lunch will be provided.

Register at https://www.eventbrite.com/e/delaware-international-fresh-produce-association-listeria-workshop-tickets-228917086167 by 5:00pm, March 9, 2022. You may also register by e-mailing Anna Wicks at Anna.Wicks@delaware.gov. Class attendance is first come, first serve and limited to 40 participants. If you are registered and unable to make the event, please let Anna know as soon as possible.

The Delaware Department of Agriculture is hosting a one day Listeria Workshop lead by the International Fresh Produce Association.

The Listeria Intervention and Control Workshop is tailored for the fresh produce industry, including growers, packers, and others. This interactive, in-person workshop will be led by Dr. Jennifer McEntire, Chief Food Safety & Regulatory Officer at IFPA and Dr. Bob Whitaker, formally the Chief Science Officer with PMA. The Workshop itself will feature: general sessions on hygienic design, sanitation best practices and environmental monitoring with breakout sessions, panel discussions, produce-specific case studies and much more!

What is Listeria monocytogenes (Lm, or L. mono)?

Lm are bacteria that cause the foodborne illness Listeriosis.

Listeria can be found in the same environments where fresh fruits and vegetables are grown. It can be found in soil, water and decaying vegetation. It can also establish itself in cold, wet environments, which are common conditions in packing facilities.

Listeria could possibly be transferred from raw fruits and vegetables from the field and introduced into packing facilities. This transient Listeria could become established in the facility if proper sanitation practices are not carried out. These bacteria that find a home in niches in the facility are often referred to as resident.

This resident Listeria could multiply if conditions are favorable in the facility and then contaminate the produce by moving from facility contact surfaces onto fruits and vegetables.

This cross contamination can be prevented if proper cleaning and sanitation and environmental monitoring programs are established.

Berries and Brambles: Small Fruit Production Sessions

Attend in person at the New Castle, Kent or Sussex County Extension Office OR join by Zoom.

Session One: Introduction to Small Fruit Production
Thursday, April 7, 2022 6:00-8:00 p.m.

Which berry crops might be a good option for your farm? Learn about the soil and site requirements for strawberry, blueberry and bramble production. The timing of planting, maintenance activities and harvest will help you understand how berries would fit with your current cropping system. We will also discuss marketing options, establishment costs and how berries might fit with your farm business.
Speakers: Dr. Gordon Johnson, Dr. Emmalea Ernest, and Nate Bruce

Session Two: Small Fruit Establishment
Thursday, May 5, 2022 6:00-8:00 p.m.

Get started successfully with strawberries, blueberries or brambles. Learn what you need to know about soil preparation, variety selection, irrigation systems, planting dates and trellising options.
Speakers: Dr. Gordon Johnson, Dr. Emmalea Ernest, and James Adkins

There is no registration fee but pre-registration is required.

Register online or contact Karen Adams (302-856-7303 or adams@udel.edu)

Integrated Weed Management Workshops

Monday, March 14, 2022 8:00 a.m.-1:00 p.m.
Sudlersville Volunteer Fire Department
203 N Church St., Sudlersville, MD 21668

Thursday, March 24, 2022 8:00-11:00 a.m.
Online via Zoom

A series of workshops will be held in March for farmers interested in learning how to use integrated weed management (IWM)) techniques to control troublesome weeds in their fields. This is the fifth year for the workshop series, which is a collaborative effort between the University of Maryland, Virginia Tech, and the University of Delaware.

Education regarding weed identification and integrated management strategies continues to be critically important to enable early intervention and effective management options. 2022 is shaping up to be especially challenging with anticipated shortages of many commonly used herbicides. The 2022 workshop series will provide tactics to manage important weeds given limited herbicide availability and increased input prices. Material covered will target row-crop production systems, but tactics learned may be applicable to other systems.

Pesticide credits will be available for MD, DE, and WV. Two hours of CCA continuing education credits will be offered for each session.

These workshops are free, but participants will need to register at https://go.umd.edu/IWM
For more information, contact Kurt Vollmer at (443) 446-4260 or Ben Beale at (301) 475- 4481.

Cut Flower Short Course

University of Maryland is offering a great 3-day commercial cut flower growers' seminar coming up on March 15, 16, and 17, 2022. This program will be held at various locations for lectures and there will be site visits to different cut flower operations.

Day 1: High tunnel production: lectures and visiting locations with high tunnels.
Day 2: Crops to produce in high tunnels, Managing soil in high tunnels, Big bucks in spring cut flowers, Marketing cut flowers via local markets, Raised bed demonstration, Soil fertility, Using and calibrating fertilizer injectors
Day 3: Marketing – tricks of the trade, unusual woody cut stems, Walk-in coolers, Setting up a trickle irrigation system, Small equipment to make cut flower production easier

Detailed Schedule Online Registration

Smart Choice/Smart Use Heath Insurance Spring Series

Sign up for one session or multiple sessions!
https://go.umd.edu/hili_spring_2022

Smart Actions for Mental Health
March 7, 2022
12:00pm-1:00pm EDT or 6:30pm-7:30pm EDT

Knowing how to use your health insurance for your mental health is an important part of staying healthy.

Smart Use: Smart Actions
March 14, 2022
12:00pm-1:00pm EDT or 6:30pm-7:30pm EDT

Knowing how to use your health insurance will make you a smart health care consumer. Identify Smart Actions that will help you become a Smart User of health insurance.

Smart Use: Understanding and Estimating Health Care Costs
March 21st, 2022
12:00pm-1:00pm EDT or 6:30pm-7:30pm EDT

Taking control of your health care costs makes you a smart health care consumer. Better understand and estimate your health care expenses so you can plan for future health care costs.

Smart Choice / Smart Use: Healthcare in Your Senior Years
March 28th, 2022
12:00pm-1:00pm EDT or 6:30pm-7:30pm EDT

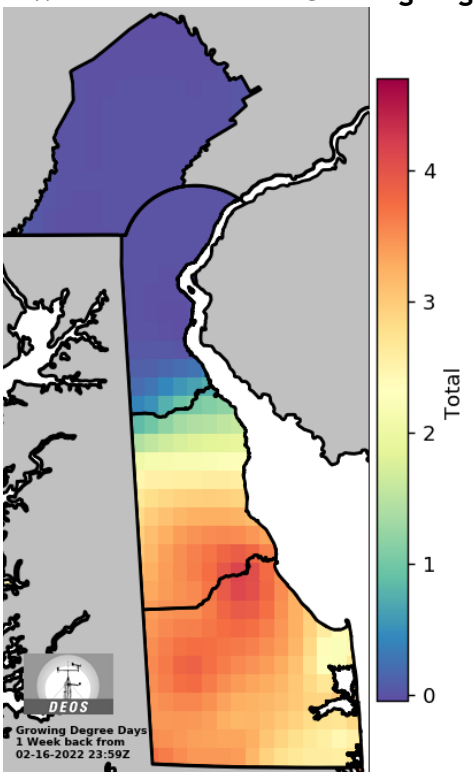
Health insurance options change in our senior years. Knowing how to navigate those changes and understanding Medicare can help you find a health insurance plan that fits your health care needs and your spending plan.

Health Insurance Options for Farmers and Small Businesses
April 4th, 2022
12:00pm-1:00pm EDT or 6:30pm-7:30pm EDT

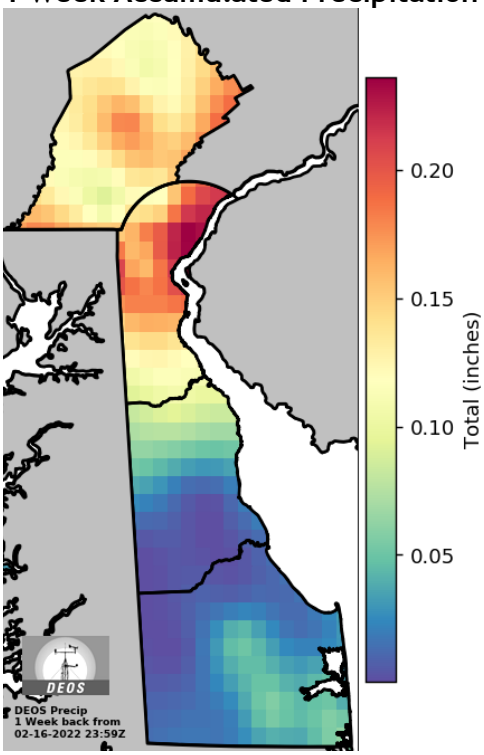
Know your health insurance options as a farmer or small business owner.

Weather Summary

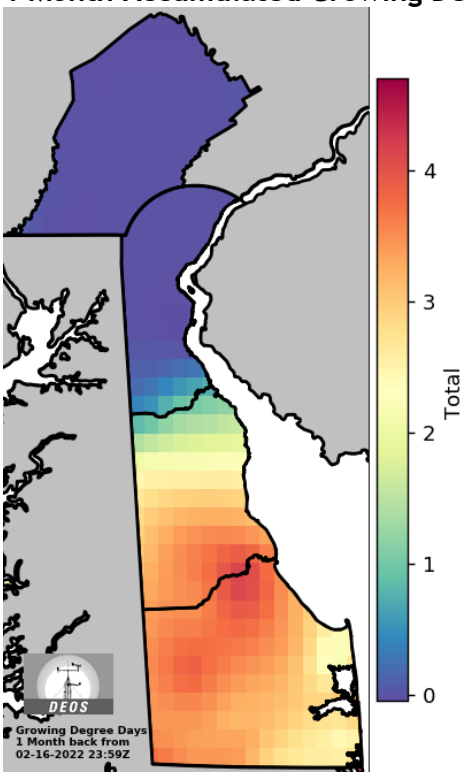
1 Week Accumulated Growing Degree Days



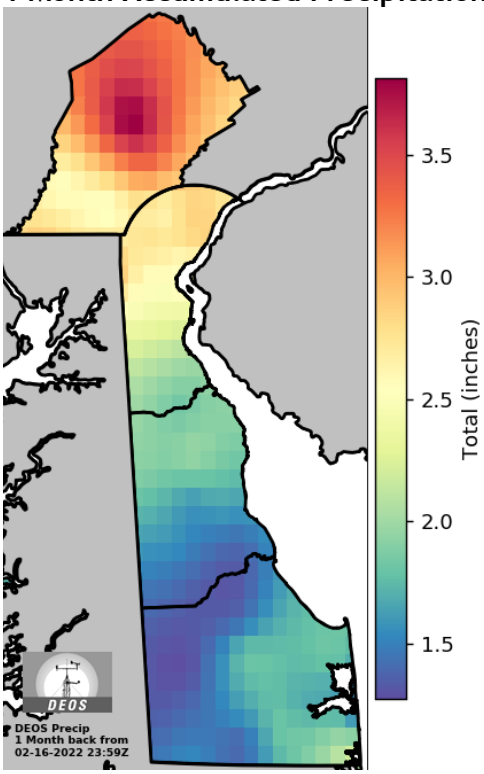
1 Week Accumulated Precipitation



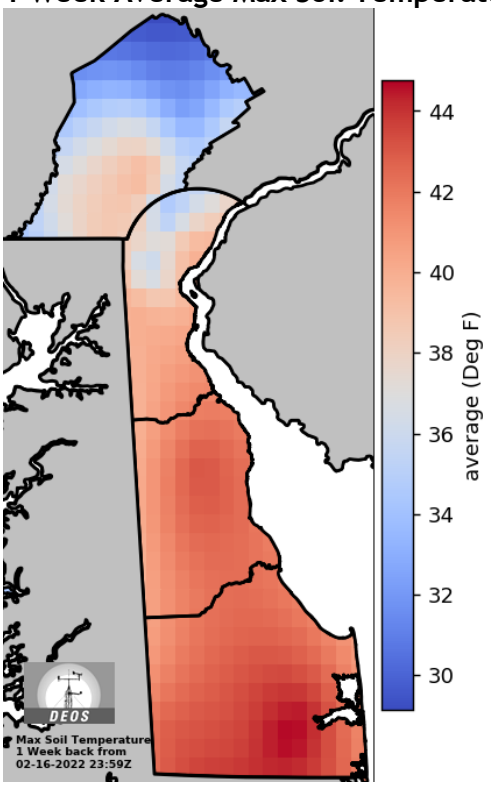
1 Month Accumulated Growing Degree Days



1 Month Accumulated Precipitation



1 Week Average Max Soil Temperature



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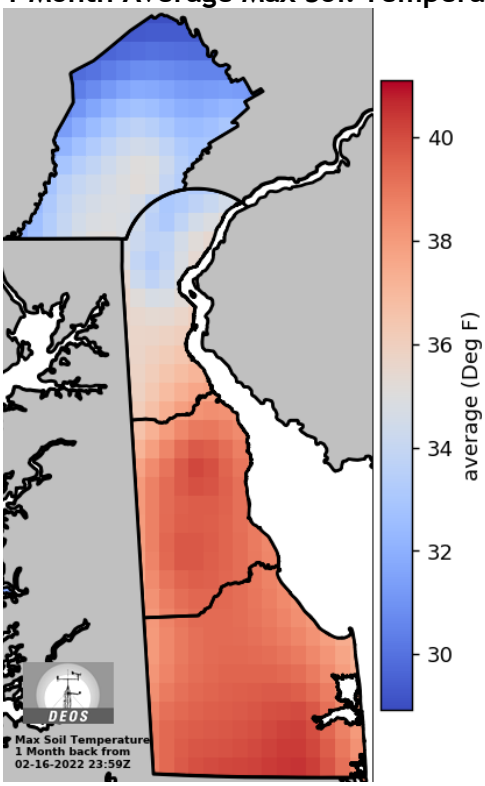

These weather maps are generated from DEOS weather station data and are part of a new Ag Weather website that is under development. Your feedback is welcome!
Thanks!! Emmalea (emmalea@udel.edu)

Weekly Crop Update is compiled and edited by Emmalea Ernest, Scientist – Vegetable Crops

Reference to commercial products or trade names does not imply endorsement by University of Delaware Cooperative Extension or bias against those not mentioned.