



# WEEKLY CROP UPDATE

UNIVERSITY OF DELAWARE COOPERATIVE EXTENSION

Volume 25, Issue 3

April 14, 2017

## Vegetable Crops

**Mitigating the Effects of Climate Change in Fruits and Vegetables** -Gordon Johnson, Extension Vegetable & Fruit Specialist; [gcjohn@udel.edu](mailto:gcjohn@udel.edu)

Climate change has the potential to affect fruits and vegetables as temperatures increase, extreme weather events such as heavy rainfalls become more frequent, and there is a higher frequency of "false springs".

Climate data from the Delmarva region has shown a steady increase in average temperatures over the last 100 years with average night temperatures in summer months increasing the most.

In the last 20 years, all but 3 of those years have had high temperatures above the 100 year average with 2 of the last 5 years having record highs (8 of the last 20 breaking records). We have also had 2 false springs with destructive late freezes in the last 5 years and some damage in 2017 from record high February temperatures.

Hotter temperatures can reduce yield in fruits and vegetables by lowering photosynthesis, increasing respiration, and causing reproductive failure (split sets, flower drop, reduced seed set, reduced fruit set). Quality of fruits and vegetables can also suffer due to higher numbers of size and shape culls (reduced pollination), increased internal defects (heat necrosis), and increased tissue damage (sunburn and sunscald).

As growers face the challenges of climate change, there are a number of tools or strategies that can be used to mitigate the effect of higher temperatures.

Managing mulch is one such tool. This includes changing plastic film to white, silver or metalized colors for summer production and the use of natural mulches such as rolled small grain cover crops to reduce soil temperatures. In tomatoes, high soil temperatures have been shown to reduce potassium uptake and increase fruit quality defects (white tissue and yellow shoulder). Use of white plastic has been shown to reduce these defects. Day-neutral strawberries had higher summer yields on white plastic in our trials in the past.

Radiation blocks or reflective materials can reduce heat effects by reflecting away some solar radiation. Commonly, particle films are used as radiation blocks including kaolin (white clay) based or calcium carbonate (lime) based materials. These are sprayed on plants during high temperature periods. Particle films are commonly used to reduce sunburn in watermelons in southern regions. Wax based reflective materials have also been used in fruits such as apples to maintain color.

Shading is another strategy. Commonly, shade cloth or netting is used for this purpose. This netting comes in black, green, white, and reflective aluminum colors and is commonly used at the 20-30% shade levels. Shading is applied during the hottest periods or periods when the plant is most sensitive to heat (such as tomato fruit development). Research by Jerry Brust on tomatoes at the University of Maryland showed

that shading tomatoes during fruiting can improve fruit quality and reduce culls. Research at the University of Georgia on peppers showed similar results with improvement in the number of marketable fruits. Our research with shading of strawberries for summer production showed mixed effects with shading benefiting in some years but not in others.

Metabolic and developmental regulators may also have a place in stress mitigation. These are chemicals that are applied to plants and reduce stress through different mechanisms. Ethylene inhibitors such as 1-MCP and strobilurins reduce flower and fruit drop. Hormones such as cytokinins and jasmonates alter different biochemical pathways related to plant stress. Flower or fruit initiating hormones (auxins, gibberellins, cytokinins and combinations) can improve flower and fruit set. Unfortunately, we have few labels for use of these products in vegetable crops.

Water-based cooling can be employed to reduce heat loading in crops and crop environments. Evaporative cooling has been commonly used in greenhouses to cool air entering houses and reduce temperatures for greenhouse grown vegetables. Fogs and misters have also been employed for this purpose. In the field, low water volume sprinklers, either continuous or pulsed, have been successfully used during hot daytime periods for plant cooling. Irrigation timing can also be used to as a tool. For example, by starting drip irrigation soon after dawn, soil under black plastic mulch will remain cooler for longer periods during the day.

Some biological root inoculants have also been shown to reduce plant stress. Mycorrhizal fungi can act as root system enhancers, increasing the effective area for absorbing water from the soil. The University of Delaware has released a *Bacillus subtilis* bacteria for root inoculation that has been shown to improve plant stress tolerance.

While stress mitigation tools may be more commonly used in fruits and vegetables as the climate warms, adaptive changes should be considered for more long-term stress management.

One adaptive change would be to switch to crops that are more heat tolerant for summer production. Sweet potatoes would be an example of a very heat tolerant crop.

Another adaptive change would be to alter planting dates. By planting earlier in the spring (for summer maturing crops) or later in the summer (for fall maturing crops), you can avoid the hottest growing periods and have better production potentially. We are currently studying the effects of planting dates on broccoli and Brussels sprouts at the University of Delaware.

Two other adaptive strategies would be to change to more heat tolerant cultivars (for summer production) or to varieties that mature in cooler periods (to match with later plantings). Past research in a very hot year (2012) showed significant differences between seedless watermelon varieties in heat tolerance. The 7187 triploid watermelon variety (Nunhems) shows good heat tolerance and has been shown over many years to be widely adapted throughout the Eastern and Southern watermelon producing regions. We will be conducting variety trials with snap bean varieties (processing and fresh market) to test heat tolerance in 2017. We also have been evaluating southern highbush blueberries for adaptability to Delaware conditions as our climate warms.

Finally, the most effective adaptive strategy is to breed vegetable and fruit crops that are more stress tolerant. For example, currently the lima bean breeding program at the University of Delaware is making significant progress in understanding heat stress losses in lima beans and breeding for heat tolerance.

---

**Belay Label Change** - *Bill Cissel, Extension Agent - Integrated Pest Management;*  
[bcissel@udel.edu](mailto:bcissel@udel.edu)

Valent is voluntarily removing or limiting certain crop uses of Belay® insecticide. All Fruiting Vegetable and Cranberry uses have been removed. Uses for Cucurbits, Grape, and Potato have been modified. These changes have been made to both State and Federal labels. If you have inventory with the old Belay label, it can

be used since an expiration period has not been imposed. Belay produced after April 1, 2017 will have the new label and can be distinguished by its new color scheme.

### New Label



### Old Label



**Pea Progress 2017** -Gordon Johnson, Extension Vegetable & Fruit Specialist; [gjohn@udel.edu](mailto:gjohn@udel.edu)

Pea planting is nearing 75% across Delmarva and planting will continue through the first week in May. The first plantings were made at the end of February in 2017 and progress is well advanced compared to the average. A small number of very early planted peas were hurt by freezes after emergence but in general, most peas are in good shape this year.

The last year that we had an advanced crop similar to this year was in 2012. Early peas flowered at the end of April that year and the first harvests that year were on May 15. In our early pea variety trial, which was planted on

March 15, 2012, the first variety was harvested on May 19 at 1112 heat units. Cabree, a standard early pea, was at a T-reading of 103 on May 21 with 1060 heat units and advanced to a T-reading of 126 the following day.

If temperature trends continue, expect a similarly early start to pea harvest in 2017.

## Agronomic Crops

**Stripe Rust Confirmed in Delaware** - Nathan Kleczewski, Extension Specialist - Plant Pathology; [nkleczew@udel.edu](mailto:nkleczew@udel.edu); @Delmarplantdoc

We have confirmed stripe rust activity in Southern Delaware. As the disease is active in S. DE, I suspect it also is present in parts of lower MD as well. Most wheat in the southern part of the DE/MD region is about 7 days from flag leaf, and cooler weather is forecast over the next ten days. Dynagro Shirley and Dynagro 9600 appear to be highly susceptible. Barley is infected by a different species of the rust pathogen and is not at risk.

Growers should check their fields and consult their seed catalogues for stripe rust resistance ratings. Varieties with excellent or very good stripe rust ratings should not be at risk for significant damage from this disease. Susceptible varieties may need a fungicide application if stripe rust is detected. Group 3 (DMI) and premix fungicides containing a DMA (Stratego YLD, Quilt Xcel, Aproach Prima, Priaxor, etc.) will provide excellent control.

**White Mold in Canola** - Nathan Kleczewski, Extension Specialist - Plant Pathology; [nkleczew@udel.edu](mailto:nkleczew@udel.edu); @Delmarplantdoc

Several growers are growing rapeseed this season. A major disease affecting rapeseed is white mold caused by the fungus Sclerotinia. Yes, this is the same white mold that affects our lima beans, snap beans, soybeans, and even sunflowers. The pathogen survives for many years in soils as resistant fungal structures, and when soil is wet and conditions are cool, produce tiny, fleshy "trumpets" that produce

infective spores. Spores that land on senescing tissues, especially flower petals, are colonized by the fungus. Once colonized, they can enter the plant, colonize the stem, and choke off water and nutrient movement in the plant. If you planted canola and that field has a history of white mold in other crops, especially if you experienced white mold in this field last season, you may have an elevated level of white mold risk. Other factors that can increase white mold risk include variety (leafier varieties tend to hold more moisture in the canopy), lodging, planting populations (dense plantings favor disease). In my opinion, the dry weather has not been favorable for white mold, but cooler temperatures and potential rains next week may increase the potential for disease development. Fungicides for white mold suppression should be applied when plants are between 20-40% flowering, and there are several options to select from. However, remember to put pen to paper and consider your actual risk level for significant loss relative to commodity price and yield potential.

Below is a risk checklist you can use to determine your potential need for management of white mold in rapeseed:

<b>Sclerotinia Stem Rot Checklist</b>		
<i>(For each risk factor, circle the risk points that apply to your field).</i>		
RISK FACTOR	POSSIBLE ANSWERS	RISK POINTS
NUMBER OF YEARS SINCE LAST CANOLA CROP	More than six years	0
	Three to six years	5
	One to two years	10
DISEASE INCIDENCE IN LAST HOST CROP	None	0
	Low (1 to 10%)	5
	Moderate (11 to 30%)	10
	High (31 to 100%)	15
CROP DENSITY	Low	0
	Normal	5
	High	10
RAIN IN THE LAST TWO WEEKS	Less than 10 mm (0.4")	0
	10 to 30 mm (0.4 to 1.2")	5
	More than 30 mm (1.2")	10
WEATHER FORECAST	High pressure	0
	Variable	10
	Low pressure	15
REGIONAL RISK FOR APOTHECIA DEVELOPMENT	None found	0
	Low numbers	10
	High numbers	15
<b>TOTAL RISK POINTS FOR ALL RISK FACTORS =</b>		
From canolawatch.org		

**Bacterial Diseases on Small Grains - Nathan Kleczewski, Extension Specialist - Plant Pathology; [nkleczew@udel.edu](mailto:nkleczew@udel.edu); @Delmarplantdoc**

Heavy rains and cooler weather over the past 3 weeks provided excellent conditions for some rarely observed, bacterial pathogens, to make guest appearances on small grains in Delaware and New Jersey. Bacteria in small grains are spread by rain splash from soil residue onto foliage, and may be brought into a field through seed. Wet, humid conditions result in enlargement of openings in the foliage that allow for exchange of carbon dioxide and oxygen. These openings serve as doorways for bacteria, which can grow and reproduce, and eventually enter the water conducting tissues of the plant. The results are long strips of "wet" tissue on foliage and occasionally stems (Figure 1 a.b). Bacterial diseases in small grains are not a major concern and typically cease to grow and persist as temperatures increase or wet conditions persist. No chemical intervention should be needed. To avoid issues in subsequent crops ensure that you are using certified disease free seed.







Elongated, water soaked lesions on barley stems and foliage caused by bacteria.

Another disease you may start seeing in fields at low levels in Barley Yellow Dwarf. This is a virus carried by several species of aphids, and transmission dynamics are extremely complicated and related to aphid dynamics, viral types present in said aphids, time of infection, and variety of wheat or barley planted in fields. It is far past the time when this disease infected your fields, and management is not warranted. BYDV can be observed as small patches of plants with shorter stature and often foliage with red or orange leaf tips. Infection in the fall, the previous year, is mostly associated with significant yield losses. Maintaining good rotations, managing volunteer weeds, especially grasses, and planting varieties with good BYDV tolerance can impact any potential yield impact caused by this virus.



Wheat showing symptoms of BYDV infection. Note red leaf tips.

---

**Forage Crops and Micronutrients** - Jarrod O. Miller, Extension Educator, Somerset County, MD; [jarrod@umd.edu](mailto:jarrod@umd.edu)

In many cropping systems micronutrients may be overlooked until a problem arises. These nutrients are needed in such small quantities that it often takes certain soil types (e.g. sandy) or conditions for deficiencies to occur. There are seven commonly discussed micronutrients for crops, known as boron (B), chloride (Cl), copper (Cu), iron (Fe), manganese (Mn), molybdenum (Mo) and zinc (Zn). Other important micronutrients in forage systems is cobalt (Co) and selenium (Se). Of those two, Se is important for livestock, but not considered an essential plant nutrient.

Whether we are dealing with grain crops or forages, soil texture and pH can tell you a lot about micronutrient availability. Crops are more likely to show deficiencies in micronutrients (except Mo) when pH rises above 6.5. Sandy soils are naturally deficient in micronutrients due to parent material, increased drainage and minimal

cation exchange capacity. In addition, both Mo and B are likely to leach from sandy soils due to their negative charge. Soils with high organic matter (peaty, swamp type soils) may also adsorb and limit micronutrient availability. At high pH (>7) in Maryland, Mn, Cu and Zn are the most likely to be an issue, even when soil levels may appear adequate.

Most forages shouldn't have micronutrient issues if pH is managed properly, however, two of the micronutrients (B and Mo) can be a problem where legumes are planted. Research worldwide has observed that legumes (alfalfa, clover, soybeans) are more sensitive to B and Mo deficiencies than grasses. Both B and Mo are important in nodule formation and nitrogen fixation, so their lack will be noticeable in legume crops.

Boron tends to leach easily from sandy soils and is the only non-metal of the micronutrients. In alfalfa, B deficiency results in yellow/red young leaves and prevents flower formation. Alfalfa is more sensitive than clover to a lack of boron. Soil applications of 0.5 to 1.0 lb/acre of B on sandy (or soils low in B) can make up for deficiencies.

Molybdenum is the only micronutrient to become more available as pH rises. It readily adsorbs to iron oxides, so it can be a problem in acidic, weathered soils. Oxides are typically higher in clay textured soils, which show a better response to Mo availability with liming than sandy soils. Grasses will respond to Mo fertilization, but not as much as legumes. Alfalfa is more sensitive than both soybeans and clover to a lack of Mo. Due to the low concentration of Mo in most soils, tissue test may be a better indicator of plant deficiencies. Seed treatments for Mo are recommended (0.5oz/acre) or foliar applications of 2-3 oz/acre.

Tissue tests are also better indicators for Co and Se deficiencies in plants. While Co is essential to the nitrogenase enzyme for plant growth, Se has shown no essential plant function. Animals do require Se, and can receive it through mineral supplements as well as forages. Typically it is recommended to supplement animal diets, however soil fertilization has shown positive results. In Oregon, applications of 0.5-2 lb Se/acre increase the Se content of forage

clippings as well as the blood levels of grazing animals. It was not recommended to both fertilize and supplement animal feeds though.

In summary, soil tests can reveal micronutrient deficiencies, but tissue tests can be more effective at determining actual bioavailability. In most cases maintaining a pH 6.0-6.5 will cover most micronutrient issues. Alfalfa, which prefers a pH close to 7 for nodulation, should be scouted more often on sandy soils if a higher pH is desired.

- Kelling, K.A. Soil and Applied Boron (A2522). University of Wisconsin.

- Kelling, K.A. Soil and Applied Molybdenum (A3555). University of Wisconsin

- Gupta, U.C. et al. Micronutrients in Grassland Production. Crops and Livestock Research Center. Agri Food Canada.

- Angima, S. 2007. Selenium Fertilization of Forages. Oregon State University.

## General

**Chlorpyrifos Registration Update** - Bill Cissel, Extension Agent - Integrated Pest Management; [bcissel@udel.edu](mailto:bcissel@udel.edu)

The EPA has denied a petition from the Pesticide Action Network of North America and Natural Resources Defense Council to revoke all pesticide tolerances and cancel all chlorpyrifos registrations. The EPA "will continue to review the science addressing neurodevelopmental effects of chlorpyrifos". Chlorpyrifos remains registered as it undergoes registration review and the EPA intends to complete the assessment by October 1, 2022. Here are a couple links for more information about EPA's order to deny the petition to revoke all tolerances for chlorpyrifos:

<https://www.epa.gov/ingredients-used-pesticide-products/order-denying-petition-revoke-all-tolerances-pesticide>

<https://www.epa.gov/newsreleases/epa-administrator-pruitt-denies-petition-ban-widely-used-pesticide-0>



**Guess the Pest!** - *Bill Cissel, Extension Agent - Integrated Pest Management; [bcissel@udel.edu](mailto:bcissel@udel.edu)*

Congratulations to Howard T. Callahan for correctly identifying the seedling corn injury as bird damage and for being selected to be entered into the end of season raffle for \$100 not once but five times. Everyone else who guessed correctly will also have their name entered into the raffle. Click on the Guess the Pest logo below to participate in this week's Guess the Pest!



The damage to seedling corn from this past weeks *Guess the Pest* was bird damage. This was actually damage from a wild turkey that uprooted the seedling corn plant to feed on the corn seed. While turkey injury on seedling corn is unusual, bird damage from blackbirds and crows unfortunately isn't.

In Delaware, we have a Special Local Needs (SLN) 24-C label for the use of Avipel Hopper Box (Dry) and a SNL 24-C label for Avipel liquid seed treatment (commercially applied only) for managing **blackbirds and crows** in field corn and sweet corn. These labels will expire on July 15, 2017 and a copy of the label must be in your possession to use. To obtain a copy of the 24-C labels and for use directions please visit Arkion's website at: <http://arkionls.com/av/states/delaware.html>

**Guess the Pest # 2**

What caused this damage to wheat? Think you know the answer.... Click on the Guess the Pest Icon below to submit your best guess.



What's your best guess? Guess correctly and your name will be put into a hat for a chance to win a \$100.00 Visa gift card at the end of the season. Each week, one lucky winner will also be selected to have their name entered into the end of season raffle not once but 5 times. Click on the "Guess the Pest" logo or go to <https://goo.gl/forms/pWjHQUpmjABFB0v32> to submit your guess.



# Announcements

## Growing Farmers Workshops

Coverdale Farm Preserve is a 356-acre farm and nature preserve located in Greenville, DE. We are pleased to offer a series of free hands-on workshops for farmers of all levels of experience and scale of operation. Registration is required. *To register please contact Michele Wales: [michele@delnature.org](mailto:michele@delnature.org).*

Spring 2017 Series: Protected Culture Growing includes the use of greenhouses, high tunnels, low tunnels, hoop houses, and caterpillar tunnels. Both high and low tech options are designed to help defend your crops against the extremes of nature from torrential rains, parching drought, scorching heat, and frigid cold. Protected Culture Growing extends your seasons, brings harvests earlier in spring and later in fall to your customers, and can be used on acres of open field to urban raised bed gardens. Engage in hands-on workshops that take you from construction to production targeting key topics for your growing success.

### High Tunnel Construction II & “Ground Breaking”

Wednesday, April 19, 8:00pm – 12:00pm  
Rain/Wind date: Friday, April 21, 8:00am – 12:00pm

This continuation from Protected Culture Construction I will complete the 24' x 96' high tunnel with the installation of the plastic exterior shell. Then move inside the newly constructed tunnel and focus on the soil and preparations for planting. Learn how to test soil (free soil test kits for all participants), methods for soil amendments, laying plastic, and installing a fertigation system.

### Vegetable Production in High Tunnels

Wednesday, May 17, 8:00am – 12:00pm  
Rain Date: Friday, May 19, 8:00am – 12:00pm

Vegetables are the focus of this workshop with particular attention to selected varieties trailed for protected culture growing, operating and managing irrigation and fertigation systems, utilizing a vine clip trellis system, plant health, pruning, and planting schedules for maximized production.

### Troubleshooting in High Tunnels

Wednesday, June 21, 6:00pm – 8:00pm

Keep your plants thriving and productive. Learn to identify common pests including insects, plant

diseases, nutrient deficiencies. Discover preventative strategies, steps, and solutions to compromising conditions in order to maximize yields.

---

## Healthy Soil Workshops

April 21, 2017  
Chesapeake College  
Health Professions Center Room

April 26, 2017  
Frederick Community College  
Conference Center

Come out to these free workshops and learn about soil science and health. The sessions also include a presentation on the guidelines and application process for a \$100,000 Innovation Technology grant that will be awarded for projects dealing with the integration of nutrient reductions with climate change adaptation.

### The agenda is the same for both workshops:

8:30 -9:00 Registration and Breakfast

9:00-9:10 Welcome and Introduction; Susan Payne, Maryland Department of Agriculture

9:10-10:10 Dishing More Dirt on the Science of Soils; Dr. Sara Via, University of Maryland Extension

10:10-10:20 Break

10:20-11:20 An Awesome and Interactive Look at Healthy Soils; Dean Cowherd and Carl Robinette, USDA NRCS

11:20-11:50 \$100,000 Opportunity through the Innovative Technology Grant Program; Ronnie Gist, Maryland Industrial Partnerships

11:50-12:00 Closing

*The events are free, but registration is requested via e-mail: Phillip Stafford at the Maryland Department of Natural Resources, [phillip.stafford@maryland.gov](mailto:phillip.stafford@maryland.gov), or Susan Payne at the Maryland Department of Agriculture, [susan.payne@maryland.gov](mailto:susan.payne@maryland.gov).*

*For more information about the workshops or to register visit the site [here](#).*



# Weather Summary

Carvel Research and Education Center Georgetown, DE

Week of April 6 to April 12, 2017

Readings Taken from Midnight to Midnight

## Rainfall:

0.83 inches: April 6

## Air Temperature:

Highs ranged from 81°F on April 11 to 57°F on April 7.

Lows ranged from 59°F on April 11 to 33°F on April 9.

## Soil Temperature:

56.9°F average

Additional Delaware weather data is available at <http://deos.udel.edu/>

*Weekly Crop Update is compiled and edited by Emmalea Ernest, Associate Scientist - Vegetable Crops with assistance from Don Seifrit.*

University of Delaware Cooperative Extension in accordance with Federal civil rights law and U.S. Department of Agriculture (USDA) civil rights regulations and policies, the USDA, its Agencies, offices, and employees, and institutions participating in or administering USDA programs are prohibited from discriminating based on race, color, national origin, religion, sex, gender identity (including gender expression), sexual orientation, disability, age, marital status, family/parental status, income derived from a public assistance program, political beliefs, or reprisal or retaliation for prior civil rights activity, in any program or activity conducted or funded by USDA (not all bases apply to all programs). Remedies and complaint filing deadlines vary by program or incident.

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