WEEKLY CROP UPDATE
UNIVERSITY OF DELAWARE COOPERATIVE EXTENSION

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Vegetable Crops

How High Heat Affects Vegetables and Other Crop Plants

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

The plant temperature at which tissue dies is around 115°F. Normally, plant temperature is just above air temperature. However, plant temperature can rise to a critical level under certain conditions.

Plants have 3 major ways in which they dissipate excess heat: 1) long-wave radiation, 2) heat convection into the air and 3) transpiration.

A critical factor is transpiration. If transpiration is interrupted by stomatal closure due to water stress, inadequate water uptake, injury, vascular system plugging or other factors, a major cooling mechanism is lost. Without transpiration, the only way that plants can lose heat is by heat radiation back into the air or wind cooling. Under high temperatures, radiated heat builds up in the atmosphere around leaves, limiting further heat dissipation.

Dry soil conditions start a process that can also lead to excess heating in plants. In dry soils, roots produce Abscisic Acid (ABA). This is transported to leaves and signals to stomate guard cells to close. As stomates close, transpiration is reduced. Without water available for transpiration, plants cannot dissipate much of the heat in their tissues. This will cause internal leaf temperatures to rise.

Vegetables can dissipate a large amount of heat if they are functioning normally. However, in extreme temperatures (high 90s or 100s) there is a large increase the water vapor pressure deficient (dryness of the air). Rapid water loss from the plant in these conditions causes leaf stomates to close, again limiting cooling, and spiking leaf temperatures, potentially to critical levels causing damage or tissue death

Very hot, dry winds are a major factor in heat buildup in plants. This causes rapid water loss because leaves will be losing water more quickly than roots can take up water leading to heat injury. Therefore, heat damage is most prevalent in hot, sunny, windy days from 11 am to 4 pm when transpiration has been reduced. As the plants close stomates to reduce water loss, leaf temperatures will rise even more. In addition, wind can decrease leaf boundary layer resistance to water movement and cause quick dehydration. Wind can also carry large amounts of advected heat.

Photosynthesis rapidly decreases above 94°F so high temperatures will limit yields in many vegetables. While daytime temperatures can cause major heat related problems in plants, high night temperatures have great effects on vegetables, especially fruiting vegetables. The warmer the night temperature, the faster respiration processes. This limits the amount of

sugars and other storage products that can go into fruits and developing seeds.

Heat injury in plants includes scalding and scorching of leaves and stems, sunburn on fruits and stems, leaf drop, rapid leaf death, and reduction in growth. Wilting is the major sign of water loss which can lead to heat damage. Plants often will drop leaves or in severe cases will "dry in place" where death is so rapid, abscission layers have not had time to form.

On black plastic mulch, surface temperatures can exceed 150°F. This heat can be radiated and reflected onto vegetables causing tremendous heat loading. This is particularly a problem in young plants that have limited shading of the plastic. This can cause heat lesions just above the plastic. Heat lesions are usually first seen on the south or south-west side of stems.

High heat and associated water uptake issues will cause heat stress problems. As heat stress becomes more severe this series of event occurs in plants:

1. decrease in photosynthesis

2. increased respiration

3. closing down of photosynthesis -closed stomates stops CO_2 capture and increases photo-respiration

4. major slow-down in transpiration (cooling process loss and internal temperature increase)

5. cell membrane leakage (signals changes in protein synthesis)

6. continued physical water loss

7. growth inhibition

8. plant starvation through rapid use of food reserves, inefficient food use, and inability to call on reserves when and where needed

9. toxins generated through cell membrane releases and respiration problems

10. membrane integrity loss and protein breakdown

The major method to reduce heat stress is by overhead watering, sprinkling, and misting for improved water supply, reduction of tissue temperature, and lessening of the water vapor pressure deficit. Mulches can also help greatly. You can increase reflection and dissipation of radiative heat using reflective mulches or use low density, organic mulches such as straw to reduce surface radiation and conserve moisture.

In very hot areas of the world, shade cloth is used for partial shading to reduce advected heat and total incoming radiation. We will be demonstrating the use of shade cloth for summer production of day-neutral strawberries.

Much of this information was adapted from an article Heat Stress Syndrome by Kim D. Coder, Professor, Silvics/Ecology, Warnell School of Forest Resources, the University of Georgia

Leaf Scald in Sweet Corn and Other Crops

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

We have seen a few processing sweet corn varieties in our variety trials that are showing leaf scald symptoms in the upper canopy (see photos below). Most of the varieties in the trial had little or no leaf scald.

This type of leaf scald is a physiological disorder and is not caused by a disease pathogen. Newly emerged leaves in the upper canopy of susceptible varieties that are the most exposed will be the most likely to scald.

Leaf scald occurs most commonly when temperatures are in the high 90s. At these air temperatures, crop leaf temperatures may rise to a critical level where plant cells are damaged and they desiccate quickly, leaving the scalded appearance. Upper leaves are the most exposed to radiation from the sun and therefore the most susceptible. Drying winds and low humidity will make scald more severe. Any interruption in transpiration during this period will increase leaf temperature even more and make scald more severe.

Three rows of a variety showing scald flanked by unaffected varieties.

Variety on the right affected by scald, variety on the left unaffected.

Close up of scalded leaves.

Scald is a very rapid tissue death. Leaf scorching, especially on margins, is more common and related to water stress, soil moisture deficits, or root system problems where inadequate water cannot be taken up. This is often most prevalent on larger leaves. Leaf tissues that are furthest from the veins (the margins and areas between the veins) are the first ones affected by the lack of water, leading to this scorch.

Leaf scald and scorch can also be cause by disease organisms in some vegetables. Most commonly we see this with bacterial and fungal disease organisms that affect vascular systems of plants. Verticillium wilt would be a good example. In Nebraska, Colorado, and some Midwestern states, Goss's wilt in corn causes upper canopy leaf scorching. This is a bacterial disease that is not present in the East. However, Stewart's wilt is common in our area in susceptible sweet corn varieties and will cause scorch-like symptoms. Use of resistant varieties is the best control for vascular diseases that cause scorch.

Squash Bugs in Pumpkins – *Jerry Brust, IPM Vegetable Specialist, University of Maryland*; jbrust@umd.edu

Every year it seems just as pumpkin plants are coming up squash bugs magically appear. This year is no exception as squash bugs were found feeding at the base of 3-5 leaf pumpkin plants

(fig. 1). The adults are very difficult to see when they hide out at the base of plants whether the plants are on plastic or in dead mulch. Growers need to be sure to check the base of their pumpkin plants for the adults. Heavy feeding at this early stage of pumpkin development can cause plants to wilt and die or at least fall behind in development by a few weeks. Sprays need to be directed at the base of the plant, using an air-blast sprayer may not get enough material down to the base of the plant.

Fig. 1 Squash bugs feeding at base of pumpkin plant

Powdery Mildew on Watermelon – *Kate Everts, Vegetable Pathologist, University of Delaware and University of Maryland*; keverts@umd.edu

Watermelon is the least susceptible to powdery mildew of all locally grown cucurbit crops. However in recent years the Southeast region of the U.S. has seen an increase in powdery mildew on watermelon. Yield loss has been observed under some conditions, particularly hot and dry weather. Disease is also favored by low light intensity (such as cloudy weather or low in the canopy). Because powdery mildew doesn't overwinter here, and is introduced each year, the disease should always be confirmed before applying a fungicide.

To determine if a fungicide spray is warranted, scout at least 50 leaves across a field. For example a minimum of 10 plants and 5 leaves on each plant should be examined. Typical symptoms are chlorotic spots on the upper leaf surface accompanied by sporulation on the lower surface. Alternatively sporulation may occur on both upper and lower leaf surfaces or on petioles or stems. Because sporulation is sparse, powdery mildew on watermelon is more difficult to diagnose than on other cucurbits, and a sample may need to be submitted to University of Maryland or University of Delaware for confirmation.

If powdery mildew is confirmed, an initial fungicide application is warranted. A good program would be to alternate Quintec (6 fl. oz/ A) plus chlorothalonil with one of the following products tank mixed with chlorothalonil: Procure (8 oz/A), or Rally 5 oz/A), or Folicur (4-6 fl. oz/A). Once the first spray is applied, scout the field to determine if a follow up spray is needed. If the disease does not spread or if weather conditions change, additional sprays are not necessary.

Powdery mildew sporulation on the upper surface of a watermelon leaf. (Photo courtesy of Bugwood images and David Langston.)

Hot Weather and Blossom End Rot – *Jerry Brust, IPM Vegetable Specialist, University of Maryland*; jbrust@umd.edu

The extreme heat that just recently ended was exceptionally stressful on plants, especially

newly transplanted plants. But even well established plants found in high tunnels or that were planted early in the year were stressed. Tomato plants in a high tunnel I visited had severe blossom end rot problems that are just now becoming apparent. Usually with blossom end rot you get a few tomato fruit that are all of one general size scattered about on plants. This shows that calcium uptake was deficient just as the fruit was developing. Tomato fruit that reaches the size of a dime usually has all the calcium it is going to need and if it does not the cells of the fruit furthest from the stem do not develop normally and collapse as the cells and fruit expands causing blossom end rot. Calcium (Ca) moves to the plant via mass flow, i.e., where dissolved minerals like calcium move to the root in soil water that is flowing towards the roots. If anything interrupts this constant flow calcium deficiency can occur in developing fruit. For different sized fruit to develop blossom end rot there must have been an extended disruption in calcium uptake. This can be seen in figure 1 where several different size fruit all have developed blossom end rot. Figure 2 shows that large fruit on this particular plant developed before there was a Ca interruption, but the fruit a little younger suffered the hot weather induced Ca interruption, with the smallest, youngest fruit suffering the greatest damage. Tissue analysis from this same set of plants showed that calcium was in the high range when the blossom end rot took place, demonstrating the importance of irrigation and water supply to reduce blossom end rot.

Fig. 1 Several fruit of different sizes with blossom end rot

Fig. 2 Older, larger fruit received enough Ca, but younger, smaller fruit did not

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Potato Disease Advisory #8 – June 13, 2011 - *Bob Mulrooney, Extension Plant Pathologist*; bobmul@udel.edu

Location: Art and Keith Wicks Farm, Rt 9, Little Creek, Kent County.
Greenrow: May 3

Date	Late Blight		Early Blight	Spray Interval Recommendation
	DSV	Total DSV	Accumulated P-days*	
5/27-5/28	2	54	175	5-days
5/28-5/29	2	56	183	7-days
5/29-5/30	1	57	191	5-days
5/30	0	57	197	7-days
5/31-6/1	0	57	207	10-days
6/1-6/5	0	57	232	10-days
6/6	1	58	251	10-days
6/6-6/8	0	58	263	10-days
6/8-6/9	0	58	267	10-days
6/10	2	60	274	10-days
6/11	4	64	282	5-days
6/12	2	66	291	5-days
6/13	0	66	301	7-days

Continue to scout fields for symptoms of late blight. Conditions will continue to favor early blight. We have reached the 300 P-day threshold for initiating early blight sprays.

P days
We use the predictive model WISDOM to determine the first fungicide application for prevention of **early blight** as well. The model predicts the first seasonal rise in the number of spores of the early blight fungus based on the accumulation of 300 physiological days (a type of degree-day unit, referred to as P-days) from green row. To date, **301 P-days** have accumulated at the site. Once 300 P-days have accumulated, the first fungicide for early blight control should be applied. This usually occurs when rows are touching.

If **pink rot or leak** is a concern and no pink rot fungicide was applied at planting consider applying one of the following when potatoes are nickel-sized and repeating 14 days later. Apply in as much water as possible (20-30 gal/A): Mefanoxam/chlorothalonil (Ridomil/Bravo) 2 lb/A, or Ridomil Gold/MZ 2.5 lb/A, or Ridomil Gold/Copper 2 lb/A. If Platinum/ Ridomil Gold was applied at planting the label allows **one** foliar application of one of those products at tuber initiation if conditions warrant. **Presidio** was also labeled this spring for pink rot.

Agronomic Crops

Grain Marketing Highlights - *Carl German, Extension Crops Marketing Specialist*; clgerman@udel.edu

Are Commodity Prices Done?
New crop corn prices have fallen 60 cents per bushel, new crop soybeans nearly 40 cents, and new crop SRW wheat 62 cents per bushel since June 9. The drop in commodity prices over the past four trading sessions is cause for concern. However, it does not seem logical to assume that new crop corn and soybean prices are done rallying for the summer. So the answer to the question, "Are commodity prices done?" would likely seem to be not by a long shot, at least not for corn or soybean prices. Wheat could be the exception, with wheat harvest underway we wouldn't expect to see a significant rally until harvest is complete, unless yield results are

poor. Fundamentally, the corn and soybean markets are still bullish. So why the recent sell-off? The sell-off happened for a couple of primary reasons. First, the economic situation at home and abroad has had a negative impact upon commodity prices. The Dow has weakened considerably, oil prices have dropped and are expected to continue dropping in the near term due to ample supplies. Second, due to economic problems abroad being viewed as worse than those facing the U.S., the dollar index has recently strengthened. Both of these factors led to market longs taking profits and heading to the sidelines, waiting for a buy signal.

Another factor weighing heavily upon commodity markets this week was the Weekly Crop Progress Report, with 99 % of the nation's corn crop reported to be planted as of June 12. Illinois, Indiana, Iowa, Minnesota, and Nebraska, the five largest corn producing states, were reported to be 99, 96, 100, 99, and 100 percent complete. The remaining issues concerning the U.S. 2011 corn crop are the growing season and the fact that a larger percentage of this year's corn crop was planted later than normal. Therein lies the reason as to why commodity prices should not be counted out at this point in time. In Ohio, one of the states where planting was delayed the most, progress was reported to be 97 percent complete. Crop conditions are also reported as part of the weekly crop progress report. Currently, crop conditions for new crop corn and soybeans are somewhat of a mixed bag and could spell trouble if we get into a 'weather market' this summer.

USDA Export Sales Report 06/16

Pre-report estimates for weekly export sales of soybeans ranged from 5.5 to 16.5 million bushels. The weekly report showed total old-crop export sales of 6.6 million bushels, above the 0.7 million bushels needed this week to stay on pace with USDA's demand projection of 1.54 billion bushels. Total shipments of 5.3 million bushels were below the 12.5 million bushels needed. This report should be considered neutral-to-bearish.

Pre-report estimates had weekly corn export sales at 33.5 to 51.2 million bushels. The weekly report showed total old-crop and new-crop export sales of 33.6 million bushels, with old-crop sales of 11.6 million bushels, below the 13.5 million bushels needed this week to stay on pace with USDA's demand projection of 1.9 billion bushels. Total shipments of 32.3 million bushels were below the 43.6 million bushels needed this week. This report should be considered bearish.

Pre-report estimates for weekly wheat export sales ranged between 12.9 to 25.7 million bushels. The weekly report showed total export sales of 16.7 million bushels, below the 20.2 million bushels needed this week to stay on pace with USDA's 1.05 billion bushel export demand projection. Total shipments of 23.9 million bushels were above the 20.2 million bushels needed this week. This report should be considered neutral.

Market Strategy

It is now June 16 and much of the nation's corn and soybean crop have just recently been planted. With no room for margin of error in U.S. production this year it seems advisable to place advancing sales on hold at current price levels. Currently, Dec '11 corn futures are trading at $6.66; Nov '11 soybeans at $13.56; and July '11 SRW wheat at $6.97 per bushel.

For technical assistance on making grain marketing decisions contact Carl L. German, Extension Crops Marketing Specialist.

Announcements

Please Join Us for a Summer Pasture Walk

Monday, June 20, 2011 6:00 - 8:00 p.m.
1201 Bullock Road, Harrington, DE 19952
(From Harrington: Route 14 West, go 1.8 miles. Turn right on Whiteleysburg Road, go 6.2 miles. Turn left onto Bullock Road. Michael Bullock Farm is on right.)

A summer pasture walk is being held by the University of Delaware Cooperative Extension for those interested in pasture management. Learn pasture management information including pasture nutrient needs, grazing management for livestock, identifying and controlling weeds, evaluating pasture stands as well as pasture establishment and maintenance. A variety of specialists from the University of Delaware will be on hand for discussion and to help answer your

questions! This meeting is free and everyone interested in attending is welcome. Participants are encouraged to bring a lawn chair and comfortable walking shoes.

Please RSVP by calling (302) 730-4000 **by June 15th** or email Carol Hrupsa carolm@udel.edu.

Nutrient Management and CCA Credits will be available

If you have special needs in accessing this meeting, please notify Carol two weeks in advance. It is the policy of the Delaware Cooperative Extension System that no person shall be subjected to discrimination on the grounds of race, color, sex, disability, age or national origin.

2011 Weed Science Field Day

Wednesday, June 22 8:30 a.m.
UD Research and Education Center,
16483 County Seat Highway, Georgetown, DE.

The day will begin with **registration beginning at 8:30** at the Grove near the farm buildings and new office building on the north side of the road. We will start to view the plots at 9:00 am. Coffee, juices, and donuts will be provided. We will also provide sandwiches for lunch.

A variety of herbicide programs for conventional tillage and no-till are being evaluated. Many of the registered corn and soybean herbicides are being tested, herbicide evaluation for watermelons, weed control programs for snap and lima bean, and a number of studies with traditional soybean herbicide programs are included. Credits are available for Pesticide Credits and Certified Crop Advisors (CCA).

Weather Summary

Carvel Research and Education Center Georgetown, DE

Week of June 9 to June 15, 2011

Readings Taken from Midnight to Midnight

Rainfall:

0.62 inch: June 10
0.15 inch: June 11
0.03 inch: June 12

Air Temperature:

Highs ranged from 97°F on June 9 to 74°F on June 14.

Lows ranged from728°F on June 9 to 54°F on June 14.

Soil Temperature:

80.4°F average

Additional Delaware weather data is available at http://www.deos.udel.edu/monthly_retrieval.html and http://www.rec.udel.edu/TopLevel/Weather.htm

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