



WEEKLY CROP UPDATE

UNIVERSITY OF DELAWARE COOPERATIVE EXTENSION

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Vegetable Crops

Vegetable Crop Insect Management - Joanne Whalen, Extension IPM Specialist;
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Cucumbers

Be sure to scout for cucumber beetles as well as aphids. Fresh market cucumbers are susceptible to bacterial wilt, so treatments should be applied before beetles feed extensively on cotyledons and the first true leaves. Although pickling cucumbers have a tolerance to wilt, a treatment may still be needed for machine-harvested pickling cucumbers when 5% of plants are infested with beetles and/or plants are showing fresh feeding injury. A treatment should be applied for aphids if 10 to 20 percent of the plants are infested with aphids with 5 or more aphids per leaf.

Melons

Continue to scout all melons for aphids, cucumber beetles, and spider mites. Although aphid populations are still relatively low in most fields we have started to see an increase in populations in a few fields. Populations can quickly explode. The treatment threshold for aphids is 20% infested plants with at least 5 aphids per leaf. The threshold for mites is 20-30% infested crowns with 1-2 mites per leaf. Cucumber beetles can continue to re-infest fields as we as hide under the plastic, so be sure to check carefully for beetles as well as their feeding damage. Multiple applications are often needed to achieve effective cucumber beetle

control. When fields are blooming, be sure to consider pollinators when making an insecticide application and read all labels for requirements regarding pollinator protection.

Peppers

As soon as the first flowers can be found, be sure to consider a corn borer treatment. Depending on local corn borer trap catches, sprays should be applied on a 7 to 10-day schedule once pepper fruit is ¼ - ½ inch in diameter. Be sure to check local moth catches in your area by calling the Crop Pest Hotline (302-831-8851) or visiting our website at:
<http://agdev.anr.udel.edu/trap/trap.php>.

Potatoes

Continue to scout fields for Colorado potato beetle (CPB) and leafhoppers. Adult CPB as well as the small and large larvae can now be found. A treatment should be considered for adults when you find 25 beetles per 50 plants and defoliation has reached the 10% level. Once larvae are detected, the threshold is 4 small larvae per plant or 1.5 large larvae per plant. As a general guideline, controls should be applied for leafhoppers if you find ½ to one adult per sweep and/or one nymph per every 10 leaves.

Snap Beans

Continue to sample all seedling stage fields for leafhopper and thrips activity. The thrips threshold is 5-6 per leaflet and the leafhopper threshold is 5 per sweep. If both insects are present, the threshold for each should be reduced by one third. As a general guideline, once corn borer catches reach 2 per night, fresh market and processing snap beans in the bud to

pin stages should be sprayed for corn borer. Sprays will be needed at the bud and pin stages on processing beans. After the pin spray on processing beans, the spray schedule will be determined by a combination of both moth catches and field scouting.

<http://agdev.anr.udel.edu/trap/trap.php>

<http://extension.udel.edu/ag/insect-management/insect-trapping-program/ecb-and-cew-moth-catch-thresholds-for-processing-snap-beans/>

Once pins are present on fresh market snap beans and corn borer trap catches are above 2 per night, a 7 to 10-day schedule should be maintained for corn borer control.

Sweet Corn

Continue to sample seedling stage fields for cutworms and flea beetles. You should also sample whorl through pre-tassel stage corn for corn borers and corn earworms. A treatment should be applied if 15% of the plants are infested with larvae. The first silk sprays will be needed for corn earworm as soon as ear shanks are visible. Be sure to check both black light and pheromone trap catches since the spray schedules can quickly change. Trap catches are generally updated on Tuesday and Friday mornings:

<http://agdev.anr.udel.edu/trap/trap.php>

and

<http://extension.udel.edu/ag/insect-management/insect-trapping-program/action-thresholds-for-silk-stage-sweet-corn/>

You can also call the Crop Pest Hotline for the most recent trap catches (302-831-8851).

Correcting Nutrient Deficiencies in Vegetable Crops - Gordon Johnson, *Extension Vegetable & Fruit Specialist*; gjohn@udel.edu

As the season progresses, growers and consultants will use tissue tests to determine the nutrient status of vegetable crops and take corrective actions if necessary. As a rule, if levels are in the adequate range or are high no corrective action is needed. If levels have

dropped to near deficient levels or are in the deficient category then additional mineral nutrients will need to be added. Critical tissue test values for many vegetables can be found in the [2016 Mid-Atlantic Commercial Vegetable Recommendations](#). The following are some guidelines for correcting low or deficient levels from tissue tests in vegetables.

Nitrogen

If tissue results are low or deficient for Nitrogen (N) apply additional nitrogen as a sidedressing or through fertigation:

Watermelon, muskmelons, mixed melons: 40 lbs/a N

Cucumbers, squash: 20 lbs/a N

Tomatoes, peppers: 40-60 lbs/a N

Eggplant: 30 lbs/a N

White potato: 40 lbs/a N before tubers start to size

Cole crops, greens: 30-40 lbs/a N

Sweet corn: 40-80 lbs/a N

Beans: 20 lbs/a N

Additional nitrogen may be needed for extended harvest in some crops such as watermelons. Use non-acidic forms of nitrogen for blossom end rot sensitive vegetables such as tomato or pepper (calcium or potassium nitrate is recommended).

Foliar applications of N can benefit most vegetables if the plant is low in N. Urea forms of N are the most effective; methylene ureas and triazones are effective with less injury potential; and ammonium sulfate is also effective.

Recommended rates are 1-10 lbs per acre N in sufficient water to have less than 2% salt solution. Multiple applications will be necessary to correct deficiencies, or combine with a soil application.

Potassium

If tissue test results are low or deficient for potassium (K) apply additional K as a sidedressing or through fertigation. Note that fruiting vegetables often have low K levels in tissue tests if fruit loads are heavy and first harvest often brings them back in balance.

Watermelon, muskmelons, mixed melons: 40 lbs/a K

Cucumbers, squash: 20 lbs/a K

Tomatoes, peppers: 40-80 lbs/a K

Eggplant: 40 lbs/a K

White potato: 40 lbs/a K
Cole crops, greens: 30-40 lbs/a K
Sweet corn: 40-80 lbs/a K
Beans: 40-80 lbs/a K

Foliar sprays of potassium nitrate or sulfate (4 lbs/a K foliar) may be useful on tomatoes and melons.

Phosphorus

If tissue test results are low or deficient for Phosphorus (P), apply an additional 20-40 lbs/a P for all crops as a sidedressing or through fertigation. Note that areas with high levels of calcium or magnesium in irrigation water can have problem with P precipitates clogging drip irrigation emitters and water may need to be acidified to prevent this.

Magnesium

If tissue test results are low or deficient for magnesium (Mg) apply 15-25 lbs of Mg as a sidedressing or through fertigation. Another option is to apply 2-3 applications foliarly (2-4 lb Mg/A) for sensitive crops such as tomatoes or melons.

Calcium

For vegetable crops low or deficient in calcium (Ca), foliar applications of 2-4 lb Ca/A. Calcium chloride at the rate of 5-10 lb per 100 gallons per acre or calcium nitrate at the rate of 10-15 lb per

100 gallons per acre is recommended for fruiting vegetables (tomatoes, peppers, eggplant). Calcium chelates are also available. For potatoes, sidedress gypsum (calcium sulfate) at a rate of 500 lbs/a.

Sulfur

For vegetables low or deficient in sulfur (S) apply 20 lbs/A S as a sidedressing or through fertigation.

Ammonium sulfate and ammonium thiosulfate are effective ways to add both N and S at the same time. Gypsum is an inexpensive material to use to provide S.

Micronutrients

For micronutrient metals (Iron - Fe, Manganese - Mn, Zinc - Zn) foliar application is often the most effective way to correct low or deficient levels. Suggested rates are: Fe, Mn, 1-2 lbs/a, and Zn ¼ lb/a.

The other micronutrient that can be effective as a foliar application is boron. Boron in the Solubor form is often recommended at 0.1 to 0.25 lbs/a for mustard family crops such as cabbage as a foliar application. Boron is very toxic to plants if applied in excess so applying at correct rates is critical. Do not use boron on bean crops.

Transplants - Understanding the Differences in Rooting and Plant Survival in a Cold Spring - Gordon Johnson, Extension Vegetable & Fruit Specialist; gcjohn@udel.edu

We have had large losses of cantaloupe and watermelon transplants this spring due to the cold, rainy, and cloudy conditions and several WCU articles have been written on the subject (see Dr. Kate Everts article this week).

To more fully explain this problem, it is necessary to understand how different vegetables regenerate roots and how this affects plant survival after transplanting. As has been discussed previously, soil temperature is very important. Rate of root growth or regeneration is temperature dependent with cool season vegetables such as cabbage or lettuce being able to produce new roots at much lower temperatures than warm season vegetables such as eggplant or watermelon. In soils that are below critical temperatures (60-65°F for watermelon and cantaloupes for example) roots do not grow into the soil bed and transplants will be subject to desiccation losses as soils dry around the root ball. The smaller the root ball (the smaller the tray cell size), the more quickly desiccation and plant loss can occur. For Solanaceous crops tolerance to cold soil is as follows Tomatoes > Peppers > Eggplant. For cucurbits tolerance to cold soils is in this order Cucumber > Summer Squash > Muskmelon = Watermelon.

A second problem relates to where plants can grow or regenerate new roots from. Solanaceous vegetables (tomatoes, peppers, eggplant) can generate new roots from both the existing transplant root system and also from stem tissue. Stem generated roots are called adventitious roots and in solanaceous transplants they can grow at any place along the stem above

the root system. There is still some bare root transplant production of solanaceous crops because of this ability to regenerate roots.



Adventitious roots on tomato transplant stem.



Adventitious roots on stem of tomato just starting to form



Cucurbit transplants will only grow from existing roots in the root ball (circle). Adventitious roots are only generated at nodes (arrow) and will not form on new transplants.

In contrast, cucurbit transplants will only generate adventitious roots at above-ground nodes and no nodal tissue will be in contact with soils at planting time in the spring. Therefore, all new roots in cucurbits must be generated from the existing root system. Cucurbit root systems that are damaged (torn or detached) during transplanting will not survive (Solanaceous crops will). Cucurbit crops must be firmly rooted in the plant trays so they will pull out with no tearing, otherwise plant losses will occur.

Low Soil Temperatures and Transplant Establishment - Kate Everts, Vegetable Pathologist, University of Delaware and University of Maryland; keverts@umd.edu

I have had several growers and consultants report watermelon transplants that have poor root growth. They wondered if a disease was causing the damage. In several cases there were no pathogens involved and the seedlings seemed to be affected by the low soil temperatures following transplanting to the field. There was an excellent article in the Vegetable Crops Hotline out of Purdue on this topic

<https://vegcropshotline.org/article/establishment-failure-of-watermelon-and-cucumber-transplants-because-of-low-soil-temperatures/> and Gordon Johnson also wrote an excellent article in an earlier WCU issue on transplant potential when plants are set into cold soils <http://extension.udel.edu/weeklycropupdate/?p=8993>.

Tips from the from the VCH and WCU articles for watermelons:

1. Do not plant watermelons if anticipated soil temperature is below 65°F at the time of planting;
2. If possible, use transplants that have developed a solid root ball;
3. Lay plastic early in the season to ensure adequate heat accumulated under plastic;
4. Make sure there is good plastic to soil contact to aid in heating the soil.

Our soils, especially in early May were unusually cold due to both cold weather and prolonged overcast conditions which failed to warm up soil under plastic. Soil temperatures at the University of Maryland Research and Education Center in Salisbury for the first 10 days in May are listed in the table below. These temperatures are the average daily temperatures in bare ground. Plastic would have increased temperatures, but only under sunny conditions. Temperatures of 65°F were reached only two days at the 2" depth and one day at the 6" depth.

Soil Temperatures at the UMD Research and Education Center, Salisbury, MD in Early May, 2016

Date	Soil temperature 2" depth	Soil temperature 6" depth
May 1	56.4	57.1
May 2	65.0	61.0
May 3	67.1	65.0
May 4	59.7	61.3
May 5	56.5	58.3
May 6	55.6	56.9
May 7	59.4	58.3
May 8	63.3	61.0
May 9	59.6	59.7
May 10	62.8	61.5

Dickeya dianthicola Update - Kate Everts, Vegetable Pathologist, University of Delaware and University of Maryland; keverts@umd.edu

Earlier this year, Nathan Kleczewski alerted all to a "new" bacterial disease of potatoes that is similar to, but more aggressive than black leg. He wrote an excellent article on the disease for the WCU on April 1 <http://extension.udel.edu/weeklycropupdate/?p=8900>. During the past week symptoms of black leg have shown up in potatoes in Delaware and Maryland. Samples have been collected and sent for diagnosis of the bacteria. We strongly suspect that it will be confirmed as *Dickeya dianthicola*. At this point in the growing season, there is little that can be done to prevent or manage the disease. However, growers should avoid excess irrigation and have a balanced fertility program. The following is a list from

Nathan's article on what to do if you have confirmed *Dickeya* in your field:

If you have symptomatic fields and *D. dianthicola* is suspected/confirmed:

1. Harvest these fields last
2. Disinfest equipment with quaternary ammonium. Typical sanitation products such as bleach will not work against *Dickeya spp.*
3. If potatoes are to be stored, ensure rooms are adequately ventilated and are maintaining cool temperatures
4. Avoid including brassicas or onions in rotations
5. Manage volunteer potatoes
6. Avoid placing cull piles near fields or production areas
7. Check your seed certificate

Photos below are potato samples from Maryland and Delaware. Note darkened aerial stem lesions (Fig. 1) and lesions emanating from the soil line (Fig. 2).



Figure 1. Darkened aerial stem lesions



Figure 2. Lesions emanating from the soil line

Potato Late Blight Update #8: June 2, 2016 - Nathan Kleczewski, Extension Specialist - Plant Pathology; nkleczew@udel.edu

Green row: April 29th, 2016

Note- Late Blight was discovered in a commercial greenhouse in Western MD on 5/17/16. Race is US-23. Also note that symptoms of blackleg have been appearing in some varieties. Please contact me if you notice wilting, black stems, or other symptoms of blackleg and see the article titled "Dickeya dianthcola Update" by Kate Everts in this week's WCU for more information.

Date	Townsend		Camden		Leipsic		Kenton	
	DSV	Total DSV	DSV	Total DSV	DSV	Total DSV	DSV	Total DSV
4/29-5/5	3	3	11	11	10	10	13	13
5/9-5/12	3	9	6	17	2	14	4	17
5/12-5/18	2	11	0	17	3	17	0	17
5/18-5/22	2	13	2	19	2	19	2	19
5/22-5/26	2	15	0	19	2	21	2	21
5/26-5/30	5	20	5	24	5	26	5	26
5/30-6/2	2	22	4	28	5	31	3	29

Notes: Season severity of 18 severity values indicates the need for the first fungicide application. An accumulated severity of 7 after fungicide application identifies the need for a subsequent fungicide application.

You can personalize your late blight forecasts for specific fields, sign up for email or text alerts, and enter in management information at <http://blight.eas.cornell.edu/blight/>. Real time fungicide application timing tables for locations within Delaware can be accessed at <http://blight.eas.cornell.edu/blight/DE>

See the [2016 Commercial Vegetable Production Recommendations-Delaware](#) for recommended fungicides.

Any suspect samples can be sent to the Plant Diagnostic Clinic or dropped off at your local extension office. Dr. Nathan Kleczewski can also be contacted at nkleczew@udel.edu or 302-300-6962.

The website USABlight tracks tomato and potato late blight across the nation and can be found here: <http://usablight.org/>. Information on scouting, symptomology, and management can also be found on this website.

Fruit Crops

Spotted Wing Drosophila Update - Joanne Whalen, Extension IPM Specialist; jwhalen@udel.edu

Over the last 7-day period, we detected our first adult fly in a trap in Sussex County. Although there are no thresholds available based on trap catches, small fruit growers will need to maintain a tight spray schedules for this very damaging insect pest. For more information on

management of SWD in fruit, you will want to consider subscribing to Rutgers Plant Pest Advisory <http://plant-pest-advisory.rutgers.edu/category/fruit/>. You can also check the following link from Michigan State for additional information. http://www.ipm.msu.edu/invasive_species/spot_ted_wing_drosophila.

Reminder - you will need to check all pesticide labels for rates, restrictions as well as determine if they are labeled in your state.

Section 18 for Brown Marmorated Stink Bug (BMSB) Management on Apples, Peaches and Nectarines Approved - Joanne Whalen, Extension IPM Specialist;
jwhalen@udel.edu

Our Section 18 request for the use of three bifenthrin products (Brigade WSB - FMC Corporation; Bifenture EC and Bifenture 10DF - both from United Phosphorus) to control BMSB on apples, peaches and nectarines has been approved by EPA. This use expires on Oct 15, 2016. You must have a copy of the label in your possession before making an application. Please contact either Chris Wade at the Delaware Department of Agriculture (Christopher.Wade@state.de.us) or Joanne Whalen (jwhalen@udel.edu) for more information.

Agronomic Crops

Agronomic Crop Insect Management - Joanne Whalen, Extension IPM Specialist;
jwhalen@udel.edu

Alfalfa

Continue to sample for potato leafhoppers on a weekly basis. We are starting to find the first nymphs as well as adults in fields. Although both life stages can damage alfalfa, the nymphs can cause damage very quickly. Once plants are yellow, yield loss has already occurred. The treatment thresholds are 20 per 100 sweeps on alfalfa 3 inches or less in height, 50 per 100 sweeps in 4-6 inch tall alfalfa and 100 per 100 sweeps in 7-11 inch tall alfalfa.

Small Grains

Be sure to check barley and wheat fields that were not treated for armyworms. Be sure to also check all labels for the days between applications and harvest (pre-harvest interval).

You will also want to sample wheat near your corn fields for stinkbugs. As I indicated in the newsletter last week, treatment for stinkbugs are generally not needed in wheat (research from the South shows it takes high numbers to damage wheat):

<https://entomology.ces.ncsu.edu/2015/05/stink-bugs-in-eastern-north-carolina-wheat/>

However, it will be important to scout wheat before harvest to watch for the potential movement of stink bugs from wheat into field corn. Information from North Carolina indicates that if you capture 5 or more stink bugs in 20 sweeps you should be vigilant for movement into corn.

Field Corn

Continue to watch fields that are next to maturing small grains for true armyworms, cereal leaf beetles and native brown stink bugs

(I) True Armyworms (TAW) - Fields planted next to barley and wheat fields, especially untreated fields, should be scouted for armyworms moving from small grains into adjacent corn fields. Control will be difficult once larvae move deep in whorls. Remember, worms must be less than 1 inch long - some labels indicate that larvae need to be even smaller - to achieve effective control. The treatment threshold for true armyworms in corn is 25% infested plants with larvae less than one inch long.

(II) Cereal Leaf Beetles (CLB) - We are starting to find a few fields with CLB adult feeding. Beetle adults can be found moving out of untreated small grains and feeding on the edge of corn fields. Although we do not have any firm thresholds for this insect on corn, as a general guideline controls may be needed if you find an average of 10 beetles per plant and 50% of the plants exhibit feeding damage. In the Midwest, it has been reported that the adult beetle is a vector of maize chlorotic mottle virus (MCMV) that causes corn lethal necrosis disease. Thresholds for beetle feeding would be much lower if this disease is an issue. We have not seen this virus in Delaware corn fields; however, please let us know if you suspect a problem.

(III) Native Brown and Green Stink Bugs -As indicated above under small grains, stinkbugs can potentially move from wheat into corn and cause damage in field corn. Although the predominant species found in wheat fields is the native brown stink bug we are also finding a few green stink bugs which can also damage corn. As indicated in last week's newsletter, sampling in wheat can give an indication for the potential for problems in nearby corn fields. Information from North Carolina indicated that if you capture

5 or more stink bugs in 20 sweeps you should be vigilant for movement into corn. If you do not have a nearby wheat field, you will want to check weeds and forested areas near your corn, especially if you have weedy ditches nearby. These areas can provide holding places for stink bugs that can move in and out of fields. For more information on management of stinkbugs in field corn, please visit the following link: <https://entomology.ces.ncsu.edu/2016/05/how-to-avoid-a-stink-bug-disaster-in-corn-2/?src=rss>.

Soybeans

As soon as soybeans emerge, be sure to begin sampling fields for the following seedling stage insect pests:

(I) Grasshoppers: We can find grasshoppers present in emerged no-till full season fields. As barley is harvested and soybeans are planted, these fields will be especially susceptible to attack by grasshoppers which can cause stand loss. If stand reductions are occurring from plant emergence to the second trifoliolate, a treatment should be applied. Although no precise thresholds are available, a treatment may be needed if you find one grasshopper per sweep and 30% defoliation from plant emergence through the pre-bloom stage.

(II) Bean Leaf Beetle: As a general guideline, a treatment may be needed for bean leaf beetle if you observe a 20-25% stand reduction and/or 2 beetles per plant from cotyledon to the second trifoliolate stages. These treatment thresholds should be reduced if bean pod mottle virus is present in your area and/or you suspected virus the previous season.

(III) Thrips: Thrips can feed and reproduce on the leaves and buds of soybean seedlings. Their feeding creates bleached-out lesions along the leaf veins and gives a silvery/bronzed appearance to the leaf surface when damage is severe. These insects are very small (less than one tenth of an inch) and are torpedo shaped. While thrips always occur on seedling stage soybeans, it is only during outbreak years that they cause concern. In particular, during dry weather and on earlier planted full-season soybeans, thrips populations can explode when plants are growing slowly. Under these circumstances thrips injury will occasionally kill

seedlings. Other stressors, such as nutrient deficiencies and herbicide injury, can add to thrips damage and cause plant loss. Yellowing can occur from thrips but there are also a number of other factors that can cause yellowing so it is important to scout fields to identify what is causing the yellowing. Although no precise thresholds are available, as a general guideline, treatment may be needed if you find 4-8 thrips per leaflet and plant damage is observed.

The Ins and Outs of Nutrient Management on Soybean - Amy Shober, *Extension Nutrient Management and Environmental Quality Specialist*; ashober@udel.edu and Richard Taylor, *Extension Agronomy Specialist*; rtaylor@udel.edu

A soybean crop can contain a large quantity of nitrogen (N) in the form of proteins, which are digestible by all animals. (It is important to note that soybean meal must be heat treated when fed to monogastrics, like poultry and swine.) Soybeans have high crude protein content, which results in roughly 5 to 7 percent N content in grain on a dry weight basis. Based on UD variety trial yields, we estimate current yield potential for soybean grown under ideal conditions to range from 65-80 bu/A for full season beans and 40-50 bu/A for double crop beans. As such, the N removed in the grain can range from 120-210 lb N/A for double crop beans and 195-340 lbs N/acre for full season beans. Even with these high removal rates, soybean crops are seldom purposely fertilized with N. Why?

Soybean is an efficient legume, which means that the plant does a good job of converting atmospheric nitrogen gas (N₂) into plant available N compounds (mainly ammonium) through a process called N fixation. Soybeans form a symbiotic relationship with *Bradyrhizobia* bacteria, which colonize roots of the soybean plants. The plant must supply the energy needed by the symbiotic bacteria as fixed carbon (sugars, ATP, etc.), but in return the plant benefits from conversion of atmospheric N to plant available forms. Many people automatically assume that legumes fulfill their entire N requirement by N fixation and do not remove N from the soil N pool; however, this is

incorrect. Soybean N fixation, as reported in the literature, ranges from 40-75%. Even an excellent N fixing soybean variety will only obtain 60-75% of the plant's N requirement from N fixation.

If the crop only fixes a portion of the N required for grain production, from where does the remainder come? The obvious answer is that the N comes from the soil, which occurs through mineralization of soil organic matter and other residual sources of N. So, why do we not generally fertilize a soybean crop with N? Legumes and the N-fixing bacteria have several special characteristics that limit the effectiveness of supplemental N fertilizer. The first special characteristic is that the plant has a tap root and not a fibrous root system. This means that if grasses are growing in competition with tap rooted soybean crop, the crop with the tap root is at a distinct disadvantage when competing for the soil available N. When compared to the fibrous root systems of grasses, the tap root system of soybean has access to a significantly smaller volume of soil from which it can obtain N.

The second special characteristic is that the symbiotic relationship between the plant and the *Bradyrhizobia* is adversely affected by soil available N levels. If the bacteria are already established in root nodules, N fixation decreases as soil N levels increase. If soil N levels are high at the time the plant is emerging or during the early establishment phase, fewer, smaller, and less active nodules will form on the soybean roots. If N is applied as commercial N or manure to a soybean crop and the crop is able to take up adequate N from the soil, the symbiotic relationship with the N fixing bacteria may account for very little of the N used during growth and development. If the soil N level remains adequate until just before flowering or sometime during flowering, the crop can come under yield limiting N stress at a critical time during development. It can take two or more weeks for nodulation to occur and active N-fixation to begin to supply the N needs of the crop. Under these circumstances, N fixation occurs too late and yields are significantly reduced. For these reasons, University of Delaware does NOT recommend pre-plant or early season application of N to soybean,

especially in the form of manure or compost. Use a good inoculant instead.

In a recent article, we discussed heavy residue impacts on the need for N fertilizer. For a soybean crop, heavy residue (if it does not interfere with stand establishment) could help immobilize soil N and create a low soil N level, which would be conducive to formation of nodules by applied soybean inoculants.

Are you irrigating your soybean crop? If so, there is a chance you are already supplementing your soybean crop with N. Due to elevated concentrations of N in groundwater in some areas (particularly in parts of Kent and Sussex Counties that irrigate from the surficial aquifer), soybean (and other crops) may receive small doses of N during irrigation events. Similarly, irrigation of soybean with wastewaters will provide some additional N to the soybean crop. If concentrations of N in the irrigation water are consistently high (as might occur with wastewater irrigation), nodulation of soybean will be suppressed and the crop will obtain N from the irrigation water.

Is there ever a situation where N fertilization of soybean is beneficial? There is some evidence that the crop benefits from in-season application of N when yields are high (≥ 70 bu/A). In high yielding conditions, the amount of N available from fixation and the soil may not be adequate to support maximum yield. Under these situations, researchers have suggested that an application of N at pod fill (approximately R5) can increase soybean grain yields. However, this is ONLY feasible if the crop is irrigated and can be fertigated. Otherwise, equipment damage to the crop that would occur during pod fill N application would cause too much damage and result in a yield loss to growers.

Sulfur deficiency is another fertility issue that we have yet to observe, but that could become more important in the future. The amount of sulfur (S) supplied by deposition from the atmosphere has declined significantly over the last decade due to air quality regulations. Since S is a component of some critical amino acids required for protein synthesis, the heavy uptake or fixation of N by soybean requires a corresponding higher uptake of S. Although the soybean tap root may be able to reach the S

stored in the subsoil of many of Delaware's sandy soils, compaction issues and acid subsoil issues could potentially limit soybean yield potential. Since S leaches so readily in sandy soils, the increased use of ammonium sulfate in corn production systems may not address the need for S by the soybean crop. Fertilization with gypsum, Epsom salts, or K-Po-Mag can supply the needed S.

Another fertility issue that growers often encounter in soybean crops is manganese (Mn) deficiency. There is still debate about the impact of Roundup Ready™ soybeans on the ability of the crop to take up Mn and metabolize the micronutrient. Regardless, low native soil Mn levels and high soil pH can also lead to Mn deficiency symptoms. Manganese deficiency symptoms appear first on the newest leaves, showing up as interveinal chlorosis that can become so severe that the newly emerged leaves appear almost white instead of green. Foliar Mn treatments are very effective at maximizing yield potential; although, the recommended rate of Mn application depends on the growth stage of the crop and available leaf area. Leaf area is important to allow the crop to take up enough Mn from the foliar treatment to satisfy the Mn need. Chelated Mn, as well as Tecmangam (manganese sulfate), work very well to correct Mn deficiency. We recommend 0.5 to 2.0 lbs Mn/A, usually applied as one application provided the leaf area is adequate.

Is that Pesky White Clover Becoming Too Much for You? - Richard Taylor, Extension Agronomy Specialist; rtaylor@udel.edu

Usually we think of white clover as a beneficial legume that can not only add protein to a grazing animal's diet but can supply much needed nitrogen (N) to the soil that it shares with the companion grass in a pasture situation. However for the equine pasture manager, white clover often seems to take over the pasture and even out-competes pasture grasses. Where this is especially true is when horses overgraze the grass in a paddock, allowing white clover to establish since it is very adapted to close grazing conditions. The University of Maryland and the Horse Outreach Work Group (HOW) suggests limiting the amount of clover or legume to no

more than 20 percent of a pasture. How can this be accomplished?

In general, legumes have tap root systems rather than fibrous root systems as is found in forage grasses. A fibrous rooted crop is much more efficient at obtaining soil N whether from organic matter mineralization or commercial fertilizer than is a tap rooted crop. White clover is also a relatively low growing crop since it spreads by stolons (rooted stems that hug the soil surface) and the only vertically growing parts are the flowers on peduncles and leaves on petioles. If not over-grazed and if soil N is available, grasses are able to grow above white clover and compete more effectively for sunlight. One of the ways we have to gradually reduce the density of white clover in a pasture is to manage the available N supply and try to reduce over-grazing.

To begin the conversion process, remove the animals when there is still 4 to 6 inches of regrowth in the pasture and immediately apply 30 to 50 lbs of N fertilizer. The fertilizer will be taken up more rapidly by the grass component of the pasture and because adequate leaf area remains, the grass will grow rapidly and shade the white clover plants. Allow the pasture to recover to 10 to 12 inches before grazing again and repeat the process if adequate soil moisture is available for growth.

Another option is using a herbicide to control the clover. A broadleaf herbicide like 2,4-D, which is sold under a wide variety of trade names such as Pasture Pro, can be useful in reducing the amount of white clover in a pasture and is labelled with no requirement that animals must be kept off the pasture for a specific period of time. There are environmental factors which must be observed, such as not applying it when the air temperatures is 80°F or above, when winds are gusty, and when the humidity is high. Although it might be more expensive, I suggest that it is best to hire a professional applicator to apply weed control products to protect yourself, your horses, and your neighbors since some herbicides are very volatile and can get into the air and move causing damage to neighboring sensitive plants.

After reducing white clover populations to the level you feel comfortable with, you should take

precautions to manage the pasture so overgrazing does not occur in the future. By managing in favor of the grass component, the pasture manager should be able to control the amount of white clover in the pasture.

General

It's Getting Hot, Hot, Hot! - *Jennifer Volk, Extension Environmental Quality and Management Specialist; jennvolk@udel.edu and Gordon Johnson, Extension Vegetable & Fruit Specialist; gcjohn@udel.edu*

Did you know that 2015 was the warmest year on record for our planet since the record began in 1880! Looking locally, the annual average temperature in Delaware has been on the rise too, increasing 0.2°F per decade. So, our annual average temperature today is about 2°F warmer than it was a century ago.

Delaware's Division of Energy and Climate led the development of a Climate Change Impact Assessment to investigate what kind of changes in temperature and precipitation we may experience in the future and how those changes could impact the resources in our state. In this assessment, climate data observed in Delaware was used to downscale global climate models to determine the range of potential future conditions we could see here. What will ultimately happen in the future depends on a number of factors. One of those factors is the rate at which humans emit carbon into the atmosphere – so the assessment looks at potential futures under both high and low carbon emission scenarios.

Like our recent trends, the projections show annual average temperatures continuing to increase out through 2100. Seasonally, spring and summer temperature increases are expected to be greater than the increases anticipated in fall and winter. For Delaware summers at the end of the century, temperature is projected to increase by as little as 3.5°F under low carbon emission scenarios to as much as 15°F under high carbon emission scenarios. Extremely hot days are expected to occur more frequently in the future too. Our local historical record shows that we had fewer than 5 days/year on average when temperatures exceed 95°F; but, by 2100, this

frequency could increase 4-10 fold. The probability of heat waves is also expected to increase. And, the worst is when it's not only hot, but also dry. The prediction is that the number of hot, dry days will increase from about 20 days/year in our historical record to 60-90 days/year by 2100. It won't just be warmer during the day either. Nighttime temperatures are not expected to drop as much as they have in the past, with more nights staying warm (>80°F).

All of these temperature changes have obvious implications for crop production. Yield reduction is predicted for many crops, particularly C3 plants (soybeans, most vegetables). In general, high temperatures negatively affect the plant reproductive cycle. In corn for example, periods of excessive and/or prolonged heat, especially when it is also dry, can decrease pollen viability, impact the timing and length of pollen shed and silking, and result in the silks drying out. Even if fertilization is successful, heat stress in the weeks following could cause the ovules to abort. Similarly in vegetables, higher temperatures and warmer nighttime temperatures could result in reduced fruit and seed development. Heat build-up in plants could also result in reduced quality with conditions like scorched stems and leaves, sunburned fruits, or blossom end rot. Hotter summers will increase the incidence of split sets in bean crops and require shifts in processing vegetable production scheduling.

To cope with these temperature increases, researchers are always exploring new varieties that are more heat and drought tolerant. We also know that irrigation is a tool that helps mitigate hot, dry conditions in crops and it is already widely employed in our state. Also, healthy soils tend to retain more moisture, so employing soil health practices is a good strategy too.

It will be interesting to see how hot we get this summer and where the annual average temperature for 2016 ultimately falls in the record books. If you are interested in learning more, visit the Delaware Climate Projections Portal where you can chart and download projection data for 14 weather stations across our state:

<http://climate.udel.edu/declimateprojections/>

Announcements

Free Webinars in June, Sponsored by the Mid-Atlantic Women in Agriculture

6/8: Basics of Presenting Prezi Style - The world of media is constantly changing and so are the mediums. Prezi is a presentation tool which allows you to customize your presentation in ways that a regular Power Point does not quite allow. The flow is more engaging, every transition can be different, the themes and elements associated range from creative to professional. You can easily add videos, music, photos, and thoughtful interactions. It runs online and you can download it to run on your local machine. Once you go Prezi, you'll likely not go back.

6/22: Snap It, then App It - With digital and smart phone photography, everyone can be a photographer! And a good one at that! This webinar will review the leading photography apps available. Learn how to correct mistakes and make an ordinary snapshot a work of art suitable for your family or business.

To register:

<http://www.eventbrite.com/e/wednesday-webinars-registration-11452674257>

Webinars begin at noon EST. Duration is approximately 1 hour. For optimal performance we suggest using Internet Explorer as your web browser and connecting via Ethernet connection instead of wireless (wireless will work, but a hard line is more stable)

See website for more information and other upcoming topics: <https://extension.umd.edu/womeninag/webinars>

If you do not have access to high speed internet and would like to participate in one of the above webinars, contact Tracy Wootten at wootten@udel.edu.

2016 Horticulture Short Courses

For the complete list of 2016 courses go to:

<http://extension.udel.edu/lawngarden/commercial-horticulture/2016-horticulture-short-courses/>

Pest and Beneficial Insect Walks

June 8 4:00 -6:00 p.m.

Sussex County Extension Office

16483 County Seat Highway, Georgetown, DE

Register with Tracy Wootten (302) 856-7303 or wootten@udel.edu

OR

June 22 4:00 -6:00 p.m.

University of Delaware Botanic Gardens

531 S College Avenue, Newark, DE

(Meet at the entrance to Fischer Greenhouse.)

Register with Carrie Murphy (302) 831-2506 or cjmurphy@udel.edu.

Cost: \$15

Credits: 2 Pest., 2 ISA, 1 CNP

Learn to identify insect and disease pests, as well as beneficial insects in the landscape at either the Sussex County Extension Office or the University of Delaware Botanic Gardens. Instructors: Nancy Gregory, Brian Kunkel, Carrie Murphy, Tracy Wootten, and Megan Pleasanton

2016 UD Weed Science Field Day

Wednesday, June 29 8:30 a.m.

University of Delaware

Carvel Research and Education Center

Route 9 (16483 County Seat Highway), Georgetown, DE

The 2016 Weed Science Field Day will be held **Wednesday, June 29** at the University of Delaware Research and Education Center, Route 9 (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 8:45 am. Coffee, juices, and donuts will be provided. We will also provide sandwiches for lunch.

Pesticide credits and Certified Crop Advisor continuation credits will also be available.

Dr. Charlie Cahoon, VA Tech, will hold a field day on Tuesday, June 28th at the Painter Research Facility

Dr. Burkhard Schulz, Univ of MD, will hold a field day on Thursday, June 30th.

Upcoming Agriculture Nutrient Management Certification Sessions

If you apply nutrients to 10 or more acres of land or have 8 or more animal units (an animal unit is equal to 1000 lbs of live weight) you need to be certified through the Nutrient Management Program.

The following is a brief summary of your certification needs:

- **Sessions should be taken in order. For example, you should attend Session I before attending Session II.**
- Poultry growers that do not land-apply nutrients (manure or fertilizer) will need to attend Session I and Session II.
- Grain or vegetable producers that apply nutrients to crops will need to attend Session I, Session II and Session III.
- Livestock owners (cattle, horses and sheep) who do not land apply manure need to attend Session I and Session II

The University of Delaware will offer the following Nutrient Management certification sessions.

You will NOT be able receive continuing education credits by attending these sessions.

Session I	Location
June 30, 2016 1:00 p.m. – 4:00 p.m.	Kent County Cooperative Extension Paradee Center 69 Transportation Road Dover, Delaware 19901
June 30, 2016 6:00 p.m. – 9:00 p.m.	Kent County Cooperative Extension Paradee Center 69 Transportation Road Dover, Delaware 19901
Session II	Location
July 7, 2016 1:00 p.m. – 4:00 p.m.	Kent County Cooperative Extension Paradee Center 69 Transportation Road Dover, Delaware 19901
July 7, 2016 6:00 p.m. – 9:00 p.m.	Kent County Cooperative Extension Paradee Center 69 Transportation Road Dover, Delaware 19901
Session III	Location
July 14, 2016 1:00 p.m. – 4:00 p.m.	Kent County Cooperative Extension Paradee Center 69 Transportation Road Dover, Delaware 19901
July 14, 2016 6:00 p.m. – 9:00 p.m.	Kent County Cooperative Extension Paradee Center 69 Transportation Road Dover, Delaware 19901
Session IV: Commercial Nutrient Handler	Location
July 21, 2016 1:00 p.m. – 4:00 p.m.	Kent County Cooperative Extension Paradee Center 69 Transportation Road Dover, Delaware 19901
Session IV: Nutrient Consultant	Location
July 21, 2016 9:00 a.m. – 12:00 noon	Kent County Cooperative Extension Paradee Center 69 Transportation Road Dover, Delaware 19901
Commercial Nutrient Handler Exam	Location
August 4, 2016 9:00 a.m. – 11:00 a.m.	Kent County Cooperative Extension Paradee Center 69 Transportation Road Dover, Delaware 19901
Nutrient Consultant Exam	Location
August 4, 2016 9:00 a.m. – 11:00 a.m.	Kent County Cooperative Extension Paradee Center 69 Transportation Road Dover, Delaware 19901

To register for the Delaware Nutrient Management Certification Sessions please contact the Kent County Cooperative Extension Office at (302)730-4000.

Maryland Grape Growers Association and University of Maryland Summer Field Day

Saturday, July 16, 2016 8:30 a.m. - 5:00 p.m.

The Vineyards at Dodon

391 Dodon Road

Davidsonville, MD 21035

Private & Commercial Pesticide Applicator Recertification Credits for this event are pending

Register online at: www.marylandgrapes.org.

Discounted registration until May 30.

AGENDA

8:30 - 9:00: **Registration**

Coffee, juice, and doughnuts provided.

9:00 - 9:30: **Welcome and Introductions**

Announcements from MGGA and Overview of The Vineyards at Dodon

Tom Croghan

9:30 – 11:00 **Grape IV**

Integrated vineyard management includes assessing the vineyard for current conditions, including canopy management, nutrition, crop level, diseases, and other pests. This session will be in the vineyard, so please bring your hat, sunscreen and sunglasses.

Dr. Joe Fiola, UME and Dr. Cassandra Swett, UMD

11:00 – 11:15 **Break**

11:15 – 12:00 **Ground Cover Management for Sustainable Grape Production**

Dr. Michela Centinari, Assistant Professor of Viticulture, Penn State University*

12:00 - 1:00: **LUNCH**

Bring your own lunch, favorite beverage, and your own lawn chair for seating.

1:00 – 1:45: **Frost and Frost Control in the Vineyard**

Dr. Centinari, PSU*

1:45 – 2:45 **Tasting of Regional R&D Wines**

Dr. Joe Fiola, UME

2:45 – 3:00: **Break**

3:00 – 4:00: **Sustainable Viticulture Workbook**

Dr. Joe Fiola, UME

4:00 – 5:00 **Winery Tour**

*Dr. Michela Centinari, is an Assistant Professor of Viticulture for Penn State University. Dr. Centinari's research and extension program integrates both basic and applied aspects of grapevine physiology to improve production and quality. She specializes in vineyard floor management and understanding and managing winter and frost/freeze damage.

Weather Summary

Carvel Research and Education Center Georgetown, DE

Week of May 26 to June 1, 2016

Readings Taken from Midnight to Midnight

Rainfall:

0.01 inch: May 29

1.80 inch: May 30

0.23 inch: May 31

Air Temperature:

Highs ranged from 90°F on May 26 to 76°F on May 30.

Lows ranged from 68°F on May 27 to 56°F on May 29.

Soil Temperature:

74.9°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, Associate Scientist - Vegetable Crops

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