Vegetable Crops

**Vegetable Crop Insects** - Joanne Whalen, Extension IPM Specialist; jwhalen@udel.edu

**Cole Crops**
Continue to sample for cabbage looper, diamondback larvae, beet and fall armyworms and Harlequin bug. Although the pyrethroids will provide control of Harlequin bugs they are not effective on beet armyworm or diamondback. Be sure to scout and select controls options based on the complex of insects present in the field.

**Lima Beans**
Continue to scout for stink bugs, lygus bugs, and corn earworm. A treatment will be needed if you find one corn earworm larvae per 6 ft-of-row. Soybean loopers have been detected in a few fields. Remember that they are a migratory pest, difficult to control and pyrethroid resistance has been documented in states to our south. If they are present in the mix, you will need to select a material labeled for soybean loopers. Be sure to check the label for rates, restrictions (including plant back/rotational crop restrictions) and days from last application to harvest.

**Melons**
Continue to scout all melons for aphids, cucumber beetles, and spider mites. We continue to see a significant increase in aphid populations. Treatments should be applied before populations explode and leaf curling occurs. In addition, be sure to read the label regarding when a penetrating surfactant is needed in order to achieve effective control.

**Peppers**
At this time of year, corn borer, corn earworm, beet armyworm and fall armyworm are all potential problems in peppers. Be sure to select the material that will control the complex of insects present in the field. Be sure to check local corn borer and corn earworm moth catches in your area by calling the Crop Pest Hotline (302-831-8851) or our webpage at http://agdev.anr.udel.edu/trap/trap.php. We are starting to see aphid populations increasing, especially in fields where pyrethroids have been used on a weekly basis. Labeled materials are only effective if applied before populations explode.

**Snap Beans**
At this time, you will need to consider a treatment for both corn borer and corn earworm. You should also watch for beet armyworms and soybean loopers. Sprays are needed at the bud and pin stages on processing beans for worm control. With the diversity of worm pest that may be present in fields, be sure to scout fields and select materials that will control the complex of insects present. You will need to call the Crop Pest Hotline (302-831-8851) or check our website for the most recent trap catches to help decide on the spray interval between the pin stage and harvest for processing snap beans:

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

**Spinach**
As soon as plants emerge, be sure to watch for webworms and beet armyworms. Both moths are active at this time and controls need to be applied when worms are small and before they have moved deep into the hearts of the plants. As a reminder, the pyrethroids have not provided effective beet armyworm control in past years. Remember that both insects can produce webbing on the plants. Generally, at least 2 applications are needed to achieve control of webworms and beet armyworm.

**Sweet Corn**
The first silk sprays will be needed as soon as ear shanks are visible. Be sure to check both blacklight and pheromone trap catches since the spray schedules can quickly change. Trap catches are generally updated on Tuesday and Friday mornings on our website (http://agdev.anr.udel.edu/trap/trap.php) and the Crop Pest Hotline (302-831-8851). Information on scouting sweet corn and how to use the trap catch information can be found at http://extension.udel.edu/ag/insect-management/insect-trapping-program/action-thresholds-for-silk-stage-sweet-corn/.

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**Calcium and Boron Deficiencies in Cole Crops** - Gordon Johnson, Extension Vegetable & Fruit Specialist; gcjohn@udel.edu

**Calcium Deficiency**
Calcium deficiency is most commonly seen as tipburn of cauliflower, cabbage, and Brussels sprouts. This problem can cause severe economic losses. Tipburn is a breakdown of plant tissue inside the head of cabbage, individual sprouts in Brussels sprouts, and on the inner wrapper leaves of cauliflower. It is a physiological disorder which is associated with an inadequate supply of calcium in the affected leaves, causing a collapse of the tissue and death of the cells. Calcium deficiency may occur where the soil calcium is low or where there is an imbalance of nutrients in the soil along with certain weather and soil nutrient conditions, such as high humidity, low soil moisture, high potash or high nitrogen all of which can reduce calcium availability. Secondary rot caused by bacteria can follow tipburn and heads of cauliflower can be severely affected. Some cabbage and cauliflower cultivars are relatively free of tipburn problems.

Cabbage varieties with good resistance to tipburn include Artost, Blue Vantage, Bobcat, Cecile, Emblem, Green Cup, Megaton, Padok, Platinum Dynasty, Quick Start, Royal Vantage, Solid Blue 780, Superstar, Thunderhead, and Vantage Point. Check with your seed supplier for tipburn ratings for other varieties.

Controlling tipburn starts with managing liming so that soil pH is above 6.0. Avoid using only ammonium forms of nitrogen, and ensure an adequate and even supply of water. Adjust planting date so that head maturation occurs during cooler temperatures. Plant a cultivar that is less susceptible to the disorder. In general, calcium foliar sprays have not been shown to be effective for controlling tipburn incidence.

**Boron Deficiency**
Cole crops have a high boron requirement. Symptoms of boron deficiency vary with the cole crop. Cabbage heads may simply be small and yellow. Most cole crops develop cracked and corky stems, petioles and midribs. The stems of broccoli, cabbage and cauliflower can be hollow and are sometimes discolored. Cauliflower curds become brown and leaves may roll and curl. It is important to note that cole crops are also sensitive to boron toxicity if boron is over-applied. Toxicity symptoms appear as scorching on the margins of older leaves.

It is recommended in broccoli and kale to apply 1.5-3 pounds of boron (B) per acre in mixed fertilizer prior to planting. In Brussels sprouts, cabbage, collards and cauliflower, boron and molybdenum are recommended. Apply 1.5-3 pounds of boron (B) per acre and 0.2 pound molybdenum (Mo) applied as 0.5 pound sodium molybdate per acre with broadcast fertilizer. Boron may also be applied as a foliar treatment to cole crops if soil applications were not made. The recommended rate is 0.2-0.3 lb/acre of...
actual boron (1.0 to 1.5 lbs of Solubor 20.5%) in sufficient water (30 or more gallons) for coverage. Apply foliar boron prior to heading of cole crops.

Potato Disease Advisory #14 - August 21, 2014 - Nathan Kleczewski, Extension Specialist - Plant Pathology; nkleczew@udel.edu

<table>
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<tr>
<th>Date</th>
<th>DSV</th>
<th>Total DSV</th>
<th>Accumulated P-Days</th>
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</tr>
</tbody>
</table>

*Red text indicates that a preventative fungicide application is recommended. Fungicides are most effective if applied prior to disease development. Follow all label directions regarding application methods, etc. Remember that the label is the law.*

Location: Leipsic, Kent Count, Delaware
Green row: May 12, 2013

Any suspect samples can be sent to the UD Plant Diagnostic Lab or dropped off at your local Extension office. See the 2014 Commercial Vegetable Production Recommendations-Delaware for recommended fungicides: [http://extension.udel.edu/ag/vegetable-fruit-resources/commercial-vegetable-production-recommendations/](http://extension.udel.edu/ag/vegetable-fruit-resources/commercial-vegetable-production-recommendations/).

The website USABlight tracks tomato and potato late blight across the nation and can be found here: [http://usablght.org/](http://usablght.org/). Information on scouting, symptomology, and management can also be found on this website.

Late blight map from usablght.org as of 8/22/14

Agronomic Crops

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

Soybeans
Once again we are finding a few fields with whiteflies; however, populations are not as high as past years when soybeans were under heat and drought stress. Although we have limited experience with whiteflies in our area, they have generally not been a problem in the past, especially if moisture is adequate. They are related to aphids (that is they are in the same order of insects) and so can cause yellowing on the leaves if populations are high enough. The following links provides pictures of whiteflies and some additional comments regarding whiteflies in soybeans.

[http://bulletin.ipm.illinois.edu/article.php?id=832](http://bulletin.ipm.illinois.edu/article.php?id=832)

We continue to find a variety of defoliating caterpillars as well as grasshoppers in full season and double crop fields but in general populations remain low. In some fields, fungal pathogens have helped to crash caterpillar populations. Continue to use defoliation thresholds to make treatment decisions for these insects. Remember, that in addition to defoliation, grasshoppers can feed on and/or scar pods.

Corn earworm populations still remain low and spotty in fields throughout the state. Since population levels will vary from field to field, the only way to know if you have an economic level will be to scout all fields. Once pods are present, the best approach to making a decision on what threshold to use for corn earworm is to access the Corn Earworm Calculator developed at Virginia Tech (http://www.ipm.vt.edu/cew/) which estimates a threshold based on the actual treatment cost and bushel value you enter.

We found our first adult Kudzu Bugs just yesterday in a kudzu patch in Sussex County. We have not found any in soybeans so far this year. The treatment threshold is 1 nymph per sweep (one sweep = one “swoosh” of the net) during and after July.

Field Corn
During the past week, we received a number of calls about aphids in field corn. In many cases, populations are spotty within fields or are only being found on field edges. Currently, there are no treatment thresholds for aphids in corn past tasseling. In many cases, fields are beyond the point of considering a treatment due to the maturity of the crop and the presence of beneficial insects and/or parasitized aphids.

Although we have no thresholds for aphids in corn in our area, here are some considerations developed by entomologist in the Midwest that can help to make a treatment decision:

1. Are 80 percent of the plants infested with aphids?
2. Do most of the ears have aphids? What about the ear leaf and above?
3. How long has the field been infested and is the density increasing?
4. Do you see honeydew or sooty mold on the stalk, leaves or ear?
5. Are you seeing winged aphids or nymphs with wing pads? That may be a sign of migration out of the field.
6. Is the field under drought stress?
7. Do you see any bloated, off-color aphids? Natural fungi can quickly wipe out aphids. In addition are beneficial insects/parasitized aphids present.
8. What is the corn growth stage? Fields reaching hard dent should be past the point of justifying a treatment.
9. Some insecticides have a long pre-harvest interval so be sure to check the label.

Corn Disease Update - Nathan Kleczewski, Extension Specialist - Plant Pathology; nkleczew@udel.edu

We are about 2-3 weeks away from finishing most of our corn. Currently grain is filling and the majority of photosynthate is being mobilized to the ears to support grain fill. This also is a time where stress can cause issues towards harvest. In particular, the effects of drought and disease on plant foliage can result in proportionally more carbohydrate reserves being moved to the ear, which results in less available to support the physiological functions within the stalk. A reduction in carbohydrates in the stalk may result in weaker stalks or stalks more prone to stalk rots and lodging. With recent heavy rains and more wet weather approaching, we may see some root/stalk rotting organisms picking up in activity during this crucial time in plant growth. This would be a good time to scout your fields, particularly dryland fields, to see where they stand in terms of foliar health, particularly the ear leaf, which contributes the majority of carbohydrates to grain fill. If your fields look like they are under a fair amount of stress then check back in another week or two to test for stalk strength. For more information on scouting
and stalk rots on corn please see my factsheet posted on the University of Delaware Website:

http://extension.udel.edu/factsheet/stalk-rots-on-corn/

We also have had some rust move into our corn. For more information see my article on my Field Crops Disease Management Blog:

http://extension.udel.edu/fieldcropdisease/

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**Soybean Disease Update** - Nathan Kleczewski, Extension Specialist - Plant Pathology; nkleczew@udel.edu

This year looks like it will be a good one for our soybean crop. The vast majority of fields are clean with few, if any, major issues. I have seen a few fields where Frogeye leaf spot has taken off a bit (Figure 1). In terms of management, the fields I have looked at are at R5 or later which is past the point where chemical intervention is recommended. In addition, the severity of the disease has been low and unlikely to have an impact on yield. If you have noticeable amounts of Frogeye leaf spot and you already applied a fungicide, please contact me at nkleczew@udel.edu or send a sample to the UD diagnostic clinic. We are in the process of collecting samples to determine if our populations are developing fungicide resistance as has been observed in Midwestern states and North Carolina. For more information on Frogeye leaf spot, see my factsheet:

http://extension.udel.edu/factsheet/frogeye-leaf-spot-on-soybean-2/

We also have had a few reports of sclerotinia stem blight (white mold) on soybeans (Figure 2). This is a cool season disease that we see almost every year, but only to a very small degree. Often you will see it in high yield environments and in shaded areas of the field, such as along wood edges. If you notice sclerotinia stem blight (white mold) in your field it is likely there to stay. The best management practice at this point in full season beans is to schedule infested fields to be harvested last to minimize spread of the pathogen from field to field on farm equipment. In double crop beans planted into fields with a known history of sclerotinia stem blight, applications targeting the R1-R2 stage are most efficacious. Example fungicides for SSB suppression include labeled group 1s (Topsin), labeled group 3s (Proline), Fluazinam (Omega); labeled group 7s (Endura) and labeled group 11s (Aproach). Often fungicide applications are not justified in Delaware but they can be beneficial under some circumstances. As usual, preventative applications are most efficacious. For more information on fungicide ratings, please see the NCERA 212/218 fungicide efficacy tables:

http://extension.udel.edu/factsheet/fungicide-efficacy-for-control-of-foliar-soybean-diseases/

For more information on Sclerotinia stem blight (white mold) on soybean, see my factsheet:

http://extension.udel.edu/factsheet/sclerotinia-stem-blight-white-mold-on-soybean/

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![Figure 1. Full season beans with frogeye leaf spot on the upper canopy. In this particular example we are looking at roughly 1-3% leaf severity, which isn’t likely to impact yield to a noticeable degree.](image)
We have started to see some SDS (Sudden Death Syndrome) popping up to a very low degree in full season soybeans. This is likely a result of planting full season beans into cool, wet soils which favors early season infection of plants by this pathogen. SDS can easily be confused with other diseases of the stem and other disorders. Early symptoms of the disease include mottling and crinkling of the leaves. As the disease progresses the leaf tissue between the veins turns yellow/brown, while the veins remain green. Soon thereafter the leaves shrivel and fall from the plant, but the petioles often remain intact. If the plant is removed from moist soil tiny blue structures may be visible at the base of the stem. In most cases diagnosis is completed by sectioning the lower portion of the stem lengthwise. The cortex of a stem infected with SDS will be streaked with tan/light brown lesions, and pith of infected plants retains a white coloration. There is nothing you can do for with season management, but SDS can be associated with SCN, so the presence of SDS may indicate the field also has soybean cyst nematode. See my factsheet on SDS for more information on identification and management: http://extension.udel.edu/factsheet/sudden-death-of-soybeans-sds/

Troubleshooting samples for Soybean Cyst Nematode
A reminder that if you have a field that you think has soybean cyst nematode issues, ask that your soil be assessed for SCN egg counts. The information from juvenile extractions is limited and can be easily misinterpreted. SCN egg assays are more representative of what your field “sees” during the course of the season and are much more sensitive than juvenile assays.

Distinguishing Active from Inactive Nodules on Soybeans - Richard Taylor, Extension Agronomist; rtaylor@udel.edu and Shawn Tingle, Extension Agent; tingle@udel.edu

At a recent soybean diagnostic field day, our Delaware Extension staff wanted to show photos of active and inactive nitrogen fixing nodules of soybeans but found a lack of web-available photos of inactive nodules. We were able to find both active and inactive nodules on some plants after visiting a number of soybean production fields and would like to share some of the photos we took of the inactive nodules so growers and consultants can more easily determine the status of the nodules on the soybean crop. As soybeans move to the R5 or beginning seed stage of growth, nitrogen fixation is critical since the demand for nitrogen (N) to build proteins to be stored in the developing soybean seed is approaching maximum.
Photo 2. A small soybean nitrogen fixing nodule shows pink interior color after being sliced open when it is active.

Photo 3. A small soybean nitrogen fixing nodule which shows a green interior color after being sliced open is a non-active nodule.

Photo 4. Of these four soybean nodules, the two on the left showing pink interior color after being sliced open are active nitrogen fixing nodules but the nodule on the right with a green interior is inactive and the nodule on the lower right side which has a white interior is also an inactive nodule. White interior can also indicate an immature nodule or one that has not begun fixing nitrogen. Not shown but sometimes seen is a nodule with a brown or black interior which also indicates an inactive nodule.

Photo 5. The root system of the R3 growth stage soybean plant with an inactive (green interior) nodule is in the center of the photo just to the right of the thumb. A small nodule on another root is appears to be sitting on top of the sliced open inactive nodule.
All these photos are great, but what can you as a producer do about ensuring good active nodulation for your soybean crop. There are a number of equally important management decisions that can affect nodulation and nodule activity. The following list is given in no specific order of importance as any of the points listed can significantly impact nodulation or nodule activity:

- Manage your soil pH to keep it in the optimum range for your soil type and native fertility levels (especially with respect to manganese availability).

- If a field has been out of soybean production for longer than about three years, use an improved inoculum source when returning to soybean production.

- If a field has never been planted to a soybean crop before such as newly cleared forest land, it is imperative that seed be inoculated just prior to seeding as well as for soil pH to be brought to optimum well before planting soybean.

- Avoid preinoculated, lime-coated soybean seed if possible and apply fresh inoculum (both liquid and dry, graphite- or peat-based, inoculum is available). Although preinoculated and lime-coated forage legume seed is becoming standard in the forage industry, there have been enough inoculation failures to suggest that producers might be rewarded by going to the extra trouble to apply the inoculum just before planting.

- Avoid manure and commercial N fertilizer applied prior to or shortly after planting since high soil N levels can either delay nodulation or reduce the activity of the nodules so that, when the demand for N peaks during pod development, the nodules are unable to fix enough N to support maximum growth (See Photos 6 and 7).

- Consider using one of the new high efficiency strains of Bradyrhizobia as your inoculum source and apply inoculum to the seed every second or third time you plant soybeans. Many soybean yield trial winners report that they apply fresh inoculum to every soybean crop planted and with the new liquid inoculants the time and expense of applying soybean inoculant is much less than that experienced in the past. Many of the soybean fields in Delaware were found to contain strains of Bradyrhizobia that were either very inefficient at fixing N or actually produced toxins that could reduce soybean yield according to a Delaware Soybean Board project many years ago.
Photo 7. Soybean plants from plots that received 100 lb N/acre at planting show many fewer nodules than on plants from the control plots that received no N fertilizer.

Is It Time to Think about Renovating or Planting a New Pasture or Hay Field? Part II: Planning to Planting - Richard Taylor, Extension Agronomist; rtaylor@udel.edu

In Part I, (WCU 22:4, April 18, 2014) I covered testing the soil in the field in which you plan to establish a new pasture or plan to do a total renovation and species selection. Depending on how close you are to planting and whether you will be working the soil or planting using a no-till drill, it’s probably time to recheck soil pH and fertility levels in the field to be planted or renovated. The final soil test should be taken approximately 6 to 9 months after the earlier limestone application. This should be enough time for previously applied lime to react with both the active acidity (hydrogen ions in soil solution) and the reserve acidity (hydrogen and aluminum ions on the clay and organic matter cation exchange sites) and the soil pH to be reaching an equilibrium state. In this way if another smaller application of limestone is needed to move the soil pH slightly higher, the lime can be applied and worked in the soil, assuming some type of tillage for incorporation of the limestone. In no-till situations, the process of adjusting the soil pH takes much longer and should be started as much as two or three years in advance of seeding or renovation since lime moves downward through the soil at about one inch per year.

Now that the soil fertility requirements have been completed, it’s on to the planning and planting process. One of the biggest challenges these days, especially if you have a small number of acres in the field, is finding someone with equipment the right size to fit the field and a willingness to do the job in a timely fashion. Of course even if you’re lucky enough to find the equipment and operator, cost is going to be a critical factor when making the decisions of what parts of the plan are actually doable. Another factor that has become more of a challenge in recent years is the availability of forage seed of the selected species and variety. Many forage seed production fields have been converted to row crop production and in some locations restrictions on burning seed production fields have allowed disease issues such as ‘choke’ to reduce forage seed yield potential.

In planning the whole procedure, your time will be a valuable asset. With high prices, limited seed supplied, and challenges in finding equipment and help to fertilize, lime, control weeds, and plant seeds, the time you take to shop around should pay big benefits. July and August are the time to do these chores since the fall planting season is right around the corner.

For planting date, forage agronomists often list from mid-August through September as being the time to plant as long as soil moisture is adequate. Soil moisture for many hay producers and grazers in the state and region really will be at critically low levels for much of August. This can extend late into September due to the drought and hot weather conditions we usually experience during July and August. With all our pre-planning and planning activities, the final decision on when to plant and even whether to plant on time will be determined by the weather conditions during August and September. You may be tempted to plant as soon as the field receives the first rainfall in the planting window but you should keep in mind that if the deeper layers of soil are deficient in moisture the new planting will likely fail if fall turns dry. Use a shovel or your soil probe to test the soil for moisture at the 6 to 12 inch depth. If the field hasn’t received enough rainfall to supply this soil depth with at least some water, a new planting will be very much at risk if rain events do not continue from planting until winter dormancy takes hold. Only you know the amount of risk you are willing to take to establish the new seeding this season and none of us know what the future weather will be.

What if enough rain to supply water to the deeper soil layers doesn’t fall until very late in September? Certain species, such as low alkaloid reed canary grass, require a specific amount of time between planting and first frost (six weeks minimum for reed canary grass) but almost all species will not only yield less the following year but take a lot more time to reach full
establishment if planted late. Again, the hay producer or grazer must evaluate the amount of risk they are willing to take on when deciding to plant after September.

You should maintain frequent contact with your fertilizer/lime dealer, seed dealer, equipment supplier, and others who will be helping you with the process of planting the new pasture or hay field. If you will be using equipment provided through the county conservation districts, be sure to get your name on the list as early as possible since many folks may want to seed about the same time when moisture conditions become favorable.

What’s the best means of seeding fields, no-till or conventional tillage (a prepared, weed-free, firm seedbed)? As with any choice, there are advantages and disadvantages to each method. Both seeding methods allow for weed control activities before seeding but no-till is limited only to herbicide applications. Whenever deciding on an herbicide to use, read the label carefully to be sure there are no rotation restrictions of what can be seeded following the herbicide application or how many days or months must separate the application and seeding activities. Also use the label to determine if a single application will be all that is needed or whether you will need follow-up applications and if you will at what stage of growth must the new seedlings reach before the next application is applied. This latter concern is especially important for perennial and hard to kill weeds such as hemp dogbane, Canada thistle, horsenettle, and others.

No-till drills must be calibrated properly to deliver the correct amount of seed per acre as well as be set to place the seed at the correct seeding depth with adequate soil to seed contact for fast germination and emergence. Never assume that the last person to use the drill set it up properly for your seeding. When you spend a hundred or more dollars per acre just for seed, you need to be sure the seed is being planted as best as possible to ensure a successful establishment. No-till drills also place the seed in rows usually from 7 to 10 inches apart so it often is useful to cover the seeded area in two directions making a cross hatch pattern over the field to help the plants fill in the space quicker.

Brillion seeders that broadcast seed over a prepared seedbed and then press the seed into the soil have the advantage of achieving canopy closure much sooner than no-till seeding.

Canopy closure is when the new plants get large enough that they are able to shade the underlying soil and therefore reduce the ability of weeds from germinating and establishing in the field. Fields seeded with no-till drills can be many years (if ever) filling in so that a full canopy exists during normal grazing activity. This is one disadvantage to the no-till drill although it is offset by the soil conservation advantage of no-till when a field has enough slope to allow significant water erosion or enough exposure to allow wind erosion problems if the weather turns dry again.

Which method is best? Since each has both advantages and disadvantages, it will depend on your situation. No-till helps conserve the soil in situations where soil can be lost; it reduces moisture loss since the soil is not disturbed; it doesn’t encourage new weed growth since buried weed seeds are not brought to the surface; it does not introduce oxygen into the soil causing the soil organic matter to be reduced via oxidation; and when done correctly it ensures rapid germination and emergence since seeds are placed in the soil and soil is firmed around the seeds. From the negative side, no-till does not allow nutrients and lime to be worked into the soil profile; no-till does not help break up compaction issues from previous grazing or haying equipment use; and no-till seeding is often in rows that can be seen, for years in some cases.

Conventional tillage does allow nutrients and lime to be incorporated in the soil; it allows tillage during the summer to help with weed control issues; it allows for the summer establishment of annual smother crops for weed control and to introduce organic matter into the soil; it allows you to rip fields to help alleviate compaction issues; and it allows seed to be broadcast to ensure rapid canopy closure. Some of the disadvantages include the loss of soil moisture during the tillage operation as well as the loss of soil organic matter during tillage. The above lists of advantages and disadvantages are not meant to be exhaustive but to point to some
of the important factors you should consider when deciding on seeding method.

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**Dramatic Potassium Deficiencies are Appearing in Soybean Fields** - Richard Taylor, Extension Agronomist; rtaylor@udel.edu

Potassium deficiency symptoms occur when plants cannot extract adequate K from the surface soil. Probably the majority of the soybean root system is located in the top four inches of soil where the plant obtains much of its needed water. Although inadequate K uptake can occur due to root restricting problems such as compaction, the most likely cause of an inadequate uptake rate for K is when the soil test K level is below optimum. When growers have used intensive grid sampling for soil nutrient evaluation, they have almost always found that there is a huge variability in soil test K levels. This variation plus inadequate K fertilization in the past few years when the price of K fertilizer was very high has resulted in some of the problems we’ve been observing this year.

Legumes such as soybean use some potassium (K) as young seedlings but dramatically increase uptake during rapid vegetative growth just prior to flowering and during reproductive growth. Uptake peaks just before flowering begins. Potassium taken up by the vegetative mass is used to supply the large amount of K transferred to the seed during seed development. As much as 60% of total plant K found in the vegetative tissue is transferred to the developing seed. On a weight basis, this results in the soybean seed containing more than twice the K of corn seed. For this reason, deficiency symptoms often are observed during the period from late flowering (late R2) to early seed fill (R5—beginning seed to R6—full seed). A deficit of K during the late vegetative stage or during the reproductive stages will be reflected in the yield of the soybean crop.

In the past two weeks, a half dozen or more fields have come to my attention in which severe K deficiency symptoms have appeared (Photos 1 and 2). Most of the severely affected fields have been located in the northern portion of the Delmarva Peninsula. The size of the affected area within a field has been increasing the last couple of years according to the individuals scouting the fields.

Potassium and phosphorus (P) are two nutrients that are taken up by plants primarily through the process of diffusion rather than the process of mass flow [nitrogen (N), sulfur (S), the other macronutrients and almost all the micronutrients]. The slow rate of diffusion and limited distance that K and P can move in soils means that these nutrients aren’t as easily available to crop plants as N. Availability is more influenced by nutrient placement than for soil mobile nutrients such as N and S. Typically for K, deficiency symptoms appear first on the oldest leaves since K is mobile in plants and can be quickly moved by the plant from old leaves to the growing point (younger leaves).

Since K is taken up by diffusion, symptoms often occur after a dry spell and usually first in no-till fields where all fertilizer is surface applied. If rainfall resumes or returns to normal, many of the affected plants will recover and the severity of the symptoms will lessen or go away entirely (Photo 2). Where just areas of a field are affected, the size of the area will often decrease following the resumption of rainfall.

![Photo 1. Soybean field at the R3 growth stage showing severe K deficiency.](image1.jpg)
Potassium deficiency shows up initially as general yellowing (chlorosis) around the margins of individual leaflets on the older leaves (Photo 3). As the deficiency worsens, the marginal yellowing can change into marginal burning or necrosis on the leaf edges and the entire set of symptoms gradually moves up the plant to younger and younger leaves.

Potassium is critical to the soybean plant since it is used to regulate water use in the plant and control transpiration by the plant. Transpiration is the cooling mechanism in plants but also has a major influence on nutrient uptake for all nutrients other than phosphorus and potassium. In addition, potassium is important since it is needed for the movement of sugars and this is critical during the seed fill period. Potassium also is essential in helping plants withstand all kinds of stress problems ranging from disease pressure to insect feeding to heat and drought tolerance. For a following corn crop, inadequate K can lead to stalk strength and quality concerns especially if high rates of nitrogen are applied to the corn crop. Late season wind from thunderstorms or a hurricane can cause severe lodging in K deficient fields.

In one field, a green stripe was observed that showed regular changes in the width of the stripe (Photo 5). Broadcast fertilizer had been applied to this field on a previous crop and the pattern possibly indicated that some unevenness occurred during spreading. In the past, we've observed even very small changes in soil test K level when it was near the critical level could dramatically affect the growth and appearance of the soybean crop.
Photo 5. Potassium deficiency in a soybean production field possibly showing the impact of a fertilizer spread pattern [note the greener stripe on the right side of the photo that expands and contracts across the field in a regular (man-made) pattern].

If the problem areas are the result of low soil test K levels, growers or consultants should make note of the areas affected and mark them and a border around them for extra K fertilizer in the future. Another option is to begin intensive soil mapping in the field to allow the grower or fertilizer dealer to use variable rate applications of K fertilizer. If the problem is the result of compaction, root pruning, seed furrow sidewall compaction, or soil test K stratification, the grower will need to consider management techniques to eliminate the particular problem that is limiting root growth or K uptake by the crop.

Results from 2014 Delaware Small Grain Trials - Bob Uniatowski, Associate Scientist; bobuni@udel.edu

Results from the 2014 Delaware Small Grain Trials are available online at http://extension.udel.edu/ag/field-crop-resources/variety-trials-corn-hybrids-small-grains-soybeans/#grains.

The available 2014 reports are as follows:

2014 Wheat Variety Trial Disease Writeup
2014 New Castle County Small Grain Report

2014 Kent County Small Grain Report
2014 Sussex County Small Grain Report
2014 High Organic Matter Soil Small Grain Report

General

UD Nematode Assay Services Change
September 1 - Nathan Kleczewski, Extension Specialist - Plant Pathology; nkleczew@udel.edu

The University of Delaware understands the importance of assaying soil samples for the presence of numerous plant-parasitic nematodes. While some nematode problems can be diagnosed in the field, laboratory assay of soil and roots is typically necessary to confirm field observations and is critical in determining crop rotations. Reading nematode samples requires highly specialized expertise, is time-consuming, and can be costly. The University of Delaware is proud to be able to continue to provide this important and unique service to the mid-Atlantic region. Please know that in order to continue the service, the University of Delaware will need to impose minimal fees to off-set increased costs as of September 1, 2014. These fees will allow us to cover escalating costs associated with labor and supplies. To contain further costs, the assay service is currently only accepting commercial vegetable and field crop samples.

The Virginia Tech Nematode Assay laboratory has agreed to accept Delaware and Maryland Fruit and Ornamental nematode samples at the following address:

Nematode Assay Laboratory
115 Price Hall
Virginia Tech
Blacksburg, VA 24061-0331 Phone: (540)231-4650 Fax: (540)231-7477 Email: jon@vt.edu Web site: https://www.ppws.vt.edu/extension/nematode-laboratory/index.html (for sample submission fees, instructions, and forms)
The 2014-2016 UD Vegetable and Field Crop Nematode Assay Service price structure is as follows:

<table>
<thead>
<tr>
<th>Assay</th>
<th>Price as of September 1, 2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetable and Agronomic crops</td>
<td></td>
</tr>
<tr>
<td>Juvenile assay</td>
<td>$50 per sample</td>
</tr>
<tr>
<td>Soybean cyst nematode egg assay</td>
<td>$30 per sample</td>
</tr>
<tr>
<td>3 day rush analysis</td>
<td>Additional $20 per sample</td>
</tr>
</tbody>
</table>

A 10-14 day turnaround time will be required for most samples. A 3-day-rush analysis can be conducted for an additional $20 per sample.

For more information and sample submission sheets please visit the following site: http://extension.udel.edu/ag/plant-diseases/nematology/

**Announcements**

**Association of Specialty Cut Flower Growers Conference:**
“Growing Growers”
October 19-22, 2014
Hilton Wilmington/Christiana
100 Continental Drive
Newark, DE 19713

**Sessions On:**
Successful Wholesaling
Designing & Weddings
Greenhouse Management
Hiring & Managing Crew
& MUCH MORE

**Growers School, Trade Show, Tours & New Varieties!**

Online brochure at:

Additional conference information at:
http://www.ascfg.org/index.php?option=com_content&task=view&id=503&Itemid=1014

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**Weather Summary**

**Carvel Research and Education Center Georgetown, DE**

**Week of August 14 to August 20, 2014**

**Readings Taken from Midnight to Midnight**

**Rainfall:**
0.03 inch: August 17

**Air Temperature:**
Highs ranged from 82°F on August 19 to 71°F on August 15.
Lows ranged from 65°F on August 20 to 53°F on August 16.

**Soil Temperature:**
72.6°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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