

# Integrated Pest & Crop Management

## Don't Lose your Shirt to Nitrogen Deficiency

By Peter Scharf

Plan. Watch. Act.

Those are my key recommendations to avoid losing your shirt to nitrogen deficiency in this year's corn crop.

### The Situation

Drenching rains since April 1 have endangered fertilizer nitrogen applied before that time, as well as nitrogen contributed by the soil. Over 58 million acres in the midwest received more than 16 inches of rain from April 1 to June 9. Iowa and Missouri lead the charge, with more than 15 million acres each, with Illinois close behind at 12 million acres. These areas are shown in cross-hatch in the map on the right.

Snow and rain in February and March also contributed greatly to re-wetting dry soil and beginning the processes leading to N loss.

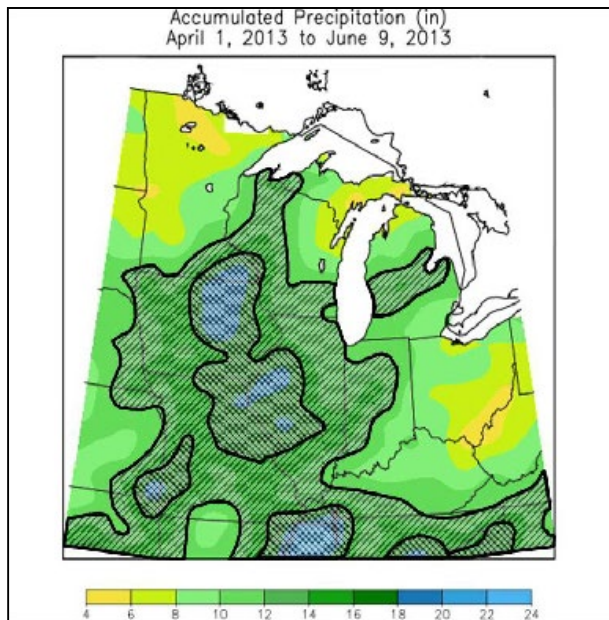
In Missouri, more fall anhydrous ammonia was applied last fall than in any of the five previous years. This N has now been in the field for about 7 months. I would say that much of it has already been lost, or is in serious danger of being lost in coming weeks. N-Serve will not provide adequate protection to many of these fields.

I am also guessing that more N has been lost from well-drained soils than from poorly-drained soils to date. This is, if I'm correct (and I'm far from sure that I am), unusual. I've seen many more acres of yellow corn in areas with poorly-drained soils than in areas with well-drained soils over the years. But this year's heaviest rains were in April, when well-drained soils are vulnerable to loss and poorly-drained soils are less vulnerable.

### Plan

I believe that every farmer who applied all of their N before planting should have a plan for how they will apply more N fertilizer to the growing corn crop if it appears to need it. Further, every fertilizer retailer should have a plan for how they will help

*Continued on page 30*



Over 16 inches of rain have fallen since April 1 in cross-hatched areas. These areas have likely lost enough N to result in N deficiency in many fields that received all N before planting, especially in well-drained soils. Diagonally-shaded areas are on track to get 16 inches of rain from April 1 to June 30, and are likely to develop N deficiency if that occurs.

### In This Issue

**Don't Lose your Shirt to Nitrogen Deficiency**  
Page 29

**"Black" Wheat Heads**  
Page 30

**Early Season Leaf Spots and Blights of Corn**  
Page 31

**Plan Now to Attend the MU Pest Management Field Day on July 11th**  
Page 33

**Seed Decay and Seedling Blights of Corn**  
Page 34

**Early Season Soybean Diseases**  
Page 35

**Weather Data for the Week Ending June 27, 2013**  
Page 37



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## Don't Lose your Shirt to Nitrogen Deficiency

*continued from page 29*

customers apply N to their growing corn. Tractor-drawn injection equipment, tractor-drawn dry N buggies, sprayers equipped with drop nozzles, high-clearance self-propelled spinners, airplanes....all are excellent options for how to apply more N if needed. Now is the time to develop a plan for how to apply more N, if you don't already have one. Developing a backup plan as well would be even better. Fertilizer source should be planned and verified along with application equipment.

You may not need this plan. But if you don't have one, your odds of getting more N applied if you need it are greatly reduced.

### **Watch**

Watching the crop is the most reliable way to tell whether it needs more N or not. If the corn is lighter green than it should be, it probably needs more N, especially if it stays light once the soil is no longer waterlogged. This is reliable mainly for corn that is at least a foot tall.

Watching many fields from ground level is difficult and not very accurate. Getting up in an airplane with a camera is much better. Many local airfields have a pilot who can be hired.

I can predict how much yield will be lost from a straight-down aerial photo of corn that is at least hip-high. If you're interested in trying this, call me. We can process a limited number of fields this year. Obviously the problem with this is that a limited number of machines are available that can apply N to corn this tall. The corn itself won't mind at all.

Watching the corn is the most reliable indicator of whether additional N is needed, but requires waiting. Plans to get N applied may require quicker action on at least some fields to accommodate equipment limitations. Watching weather may need to be the basis for at least some decisions. The map above comes from my Nitrogen Watch page, which is based on cumulative precipitation

maps and is updated weekly. You can find these maps at: <http://plantsci.missouri.edu/nutrientmanagement/nitrogen/Nitrogen%20watch%202013/nitrogen%20watch%202013.htm>

### **Act**

This is the most important part. If you need to act and don't, you will lose a lot of yield and a lot of money.

I think that most producers in the cross-hatched area of the map who applied all their N before planting will profit from applying additional N even if it is not targeted. This is especially true for fields fertilized in the fall.

Fields that received anhydrous ammonia this spring, or that received the bulk of their N after planting, are least likely to need additional N.

Watching fields and targeting additional N to those fields that need it most, or putting higher rates on the fields that need it most, will increase the odds of profitability.

Targeting N within fields would be even better. My research shows the best return on rescue N applications in the areas with the greatest N stress. And my observations show that there is usually a wide range of N stress in fields that have lost N. You can see this in the N loss aerial photo galleries on my website: <http://plantsci.missouri.edu/nutrientmanagement/nitrogen/loss.htm>

Crop canopy sensors are the most widely available way to target N applications within fields, applying higher rates to more stressed corn and lower rates to less stressed corn. However, not all sensor interpretations follow this logic so look for those that do.

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## "Black" Wheat Heads

*By Laura Sweets*

Wheat harvest is underway or rapidly approaching in most areas of the state. Foliage diseases such as Septoria leaf blotch did occur in low levels across much of the state. Virus diseases, especially barley yellow dwarf, were present in low levels. Fusarium head blight or scab was perhaps more widespread and severe than predicted. But now the questions seem to focus on black heads on wheat plants or black discoloration on wheat heads.

There are several possible explanations for black heads on wheat plants or for a black discoloration on portions of wheat heads.

The black heads due to loose smut are most obvious as heads emerge from the boot and for several weeks after that. The kernels on infected heads are replaced with masses of powdery black spores. So the heads have

*Continued on page 31*

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## “Black” Wheat Heads

*continued from page 30*

a very distinct black, powdery appearance. These spores are eventually dislodged by wind and rain, so later in the season the smutted stems are less evident and only the bare rachis will be left.

Septoria leaf blotch was present in the lower canopy of many fields this year. It didn't seem to move up in the canopy to the flag leaf in many fields but with the continued precipitation and high humidity in some areas it may have developed on wheat heads. On the heads dark brown to black blotches may develop. *Stagnospora nodorum* may also cause leaf lesions but is usually more common on heads- again causing dark blotches on glumes of part or all of the head.

Bacterial stripe or black chaff is a bacterial disease that produces symptoms on both leaves and heads. Water-soaked lesions may develop on young leaves. These expand into reddish-brown to brownish-black streaks on the leaves. Glumes and awns show brown-black blotches or streaks. Fungicides are not effective against bacterial stripe or black chaff so the use of resistant or tolerant varieties and crop rotation are the main management options. Again, wind driven rains, rain in association with hail and heavy rains can spread this bacterial disease through a wheat field quite rapidly.

Another likely cause of black wheat heads or black discoloration of wheat heads and plants is sooty molds. Sooty molds are a number of saprophytic or weakly parasitic fungi which grow on senescing or dying plant tissue. *Alternaria*, *Cladosporium*, *Aureobasidium* and

other species are frequently found on these discolored or black plants. Since the affected plants may have a sooty appearance these fungi are sometimes called sooty molds. These sooty molds or secondary fungi tend to develop on plants when wet or humid weather occurs as the crop is maturing, if harvest is delayed because of wet weather or if portions of the plants have died prematurely ( ex. portions of wheat heads damaged by *Fuarius* head blight). Typically these fungi come in on plants that are shaded, undersized, weakened or prematurely ripened and on senescing foliage. Plants that are lodged or that have been stressed by nutrient deficiencies, plant diseases or environmental conditions may be more severely affected. Although many of these fungi produce dark or black mold growth, the color of the mold growth can range for dark or black to olive green or even pink to white.

On wheat these secondary fungi tend to develop the heads or portions of the heads but may also occur on leaves and stems of wheat plants. These black molds also tend to produce large quantities of spores. It is not uncommon to see dark clouds of spores around combines moving through fields with high levels of black mold or sooty molds.

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## Early Season Leaf Spots and Blights of Corn

*By Laura Sweets*

There are several leaf spot and leaf blight diseases which can develop on young corn plants including anthracnose, holcus leaf spot and Stewart's bacterial wilt. There have been a few questions about distinguishing between these diseases so a review of their symptoms and disease cycles seems appropriate.

**Anthracnose leaf blight**, caused by the fungus *Colletotrichum graminicola*, usually occurs early in the season on the lower leaves of young corn plants. Anthracnose lesions tend to be brown, oval to spindle-shaped lesions with yellow to pinkish to reddish-brown borders. Lesions may be 0.2 to 0.6 inch in length. Lesions may merge or coalesce to kill larger areas of leaf tissue. Concentric rings or zones are sometimes apparent

within the diseased areas of leaf tissue. Lesions may be concentrated towards the leaf tip (or portion of the leaf that was emerged when rain occurred) giving the leaves a fired appearance that might be mistaken for nutrient deficiency or herbicide injury.

The fungus which causes anthracnose leaf blight produces fruiting bodies in the dead leaf tissue. Dark, hairlike structures called setae are produced in association with the fruiting bodies. It is possible to see the setae on infected plant material in the field if a hand lens is used.

Anthracnose tends to be most common early in the season on the lower leaves of young corn plants. These leaves may be severely affected, yellow and die

*Continued on page 32*

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## Early Season Leaf Spots and Blights of Corn

*continued from page 31*

prematurely. Generally the disease stops at this point because of drier, warmer weather conditions and is not considered a significant problem. Under favorable weather conditions, the fungus may move up the plant causing foliage symptoms on higher leaves. If favorable weather conditions occur mid-season (especially wet), anthracnose may actually move up to the ear leaf. The anthracnose fungus can also cause top dieback and stalk rot later in the season. High temperatures and extended periods of wet weather favor anthracnose. Anthracnose leaf blight is more likely to occur if corn is planted following corn.

In a normal year anthracnose leaf blight in Missouri is not serious and would not warrant a fungicide application. It is a little too early in the season to know how severe anthracnose will be or to know if it might spread beyond the very lowest leaves on the plants. Following the weather patterns over the next several weeks and keeping an eye on disease development or lack of development will be important.

**Holcus leaf spot** is caused by the bacterium *Pseudomonas syringae* pv. *syringae*. Lesions are usually oval to elliptical and range in size from 0.25 to 1.0 inch. Initially they are dark green and water-soaked. Later they become dry and turn light brown with a reddish margin.

The bacteria that cause holcus leaf spot are spread by wind-driven rain or splashing rain, so outbreaks frequently occur several days after a rainstorm or storm with strong wind-driven rains. Since holcus leaf spot is caused by a bacterium, common corn fungicides will have little effect on this disease.

Holcus leaf spot might be confused with herbicide injury such as that caused contact herbicides. If similar lesions are evident on broad leaf or other weeds among the corn, it is less likely that the symptoms on corn are holcus leaf spot. Holcus leaf spot might also be confused with anthracnose leaf blight. Holcus leaf spot lesions tend to be a little more oval to elliptical or even circular in shape while anthracnose tends to be oval to spindle-shaped or even diamond-shaped. Both types of lesions may have darker borders but anthracnose tends to have larger borders, lesions may coalesce to kill larger areas of leaf tissue and discoloration surrounding the lesions may be more extensive. Holcus leaf spot tends to remain as discrete spots on the leaf surface. Finally, the holcus leaf spot pathogen does not produce fruiting bodies or the hairlike setae which the anthracnose pathogen produces in the dead leaf tissue of the lesions. Checking the centers of the lesions with a hand lens for the presence of fruiting

bodies or setae will help distinguish which pathogen is present.

On young corn plants the symptoms of **Stewart's bacterial wilt** include linear, pale green to yellow streaks that tend to follow the veins of leaves and originate from feeding marks of the corn flea beetle. Lesions may extend the length of the leaf. Plants may appear stunted or somewhat distorted. If the bacteria become systemic within the plant, the entire plant wilts and may die prematurely. Cavities of a brown, soft rot can develop in the stalk pith.

The variations in weather conditions this spring have put stress on young corn plants. In some fields seedlings have been showing yellowing and/or stunting from cool, wet soils immediately after planting and saturated soils since planting. However, with the more recent warm weather, corn in many parts of the state has really taken off and is now 12 to 18 inches tall. So symptoms of Stewart's bacterial wilt might begin to develop on these rapidly growing young corn plants.

On field corn the disease tends to be limited to the leaf blight phase of the disease in which foliage symptoms develop but the pathogen does not become systemic within the plant. With the leaf blight phase of Stewart's bacterial wilt, the linear, pale green to yellow lesions develop on the leaves. These lesions tend to parallel the leaf veins and to have wavy, irregular margins. These streaks soon become dry and brown.

The bacterium which causes Stewart's bacterial wilt overwinters in the guts of some species of adult corn flea beetles. Adult beetles feeding on corn seedlings in late spring and early summer can contaminate the feeding wounds with the causal bacterium. Flea beetles can continue to spread the bacterium throughout the season by feeding on infected plants and then healthy plants. The potential for Stewart's bacterial wilt to develop on young corn plants is greater after mild winters when higher levels of the corn flea beetle may be present.

Most field corn hybrids have enough resistance to Stewart's bacterial wilt that additional management is not necessary. Also, the increased use of insecticide seed treatments on corn appears to have reduced early season corn flea beetle feeding and thus reduced the incidence of Stewart's bacterial wilt.

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# Plan Now to Attend the MU Pest Management Field Day on July 11th

By Kevin Bradley

The annual Pest Management Field Day will be held this July 11th at the Bradford Research and Extension Center near Columbia, Missouri. This field day will include a variety of pest management topics that are of interest to agricultural industry representatives, agrichemical dealers, Extension specialists, and producers throughout Missouri and surrounding states.

Registration will begin at 8:30 a.m. and will include guided wagon tours with stops that feature presentation of results and talks by university weed scientists, entomologists, plant pathologists, and agronomists. **There will be a \$10 registration fee collected at the time of check-in** to cover costs associated with lunch and refreshments.

Some of the weed management research topics and trials that will be discussed at this year's field day include: considerations for future herbicide-resistant crop offerings like dicamba-resistant, HPPD-resistant, and 2,4-D resistant soybeans; an update on the status of herbicide resistance in Missouri waterhemp populations; effective herbicide programs for killing cover crops; the effect of cover crops on winter and summer annual weed emergence; specific results and recommendations pertaining to the control of glyphosate-resistant horseweed and waterhemp; a summary of results related to drift from growth regulator herbicides on soybean; and as usual periodic stops along


the guided tours to preview new herbicides and herbicide programs that will be available in 2014 and beyond.

Dr. Laura Sweets, state extension plant pathologist, will also provide an extensive update on diseases that have already appeared in 2013 and what to look out for the rest of the season. Dr. Bruce Hibbard, USDA entomologist, will discuss the problems with corn rootworm resistance to Bt corn that is showing up in parts of the Midwest.

As usual, attendees will have the opportunity to view plots that showcase a wide variety of herbicide treatments and weed management systems for use in corn, soybean, or grain sorghum on their own. Each year we have hundreds of separate weed management treatments on display at the research and extension center.

For certified crop advisors, 2 CEU credits for the field day are pending. **If you plan on attending the field day, you must pre-register before July 5th by calling 573-884-7945 or by sending an e-mail to [chismt@missouri.edu](mailto:chismt@missouri.edu).** The Bradford Research and Extension Center is located 7 miles east of Columbia, off of highway WW. For more complete directions call 573-884-7945 or visit <http://aes.missouri.edu/bradford/index.stm>.

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# Seed Decay and Seedling Blights of Corn

By *Laura Sweets*

Some years, early season stand establishment problems are widespread and, in some cases, severe. The weather pattern during and immediately after planting is a major factor contributing to those problems. Corn which begins to germinate before periods of cold or wet weather in April or early May tends to show damage from saturated soils, cold soil temperatures, frost injury, herbicide injury, nitrogen deficiencies, seed decay and seedling blights. In some fields the seed decay and seedling blight may progress into crown decay resulting in even more severe stunting and yellowing of plants. If weather patterns are favorable for germination and emergence of corn and not as favorable for development of corn seed and seedling diseases, there will be a substantial reduction in seed decay and seedling blight problems in corn.

Corn planting was later than normal and much later than last year because of usually wet conditions across most of the state. The unusual fluctuations in air temperatures (near record highs one weekend followed by lows the next weekend) and soil temperatures further impacted corn germination and emergence as well as seedling vigor.

Seed decay and seedling blights of corn are generally caused by soil-inhabiting fungi such as species of *Pythium*, *Fusarium*, *Diplodia*, *Rhizoctonia* and *Penicillium*. These fungi may rot the seed prior to germination or cause preemergence or postemergence seedling blight. Affected seeds are usually discolored and soft and may be overgrown with fungi. Rotted seed may be difficult to find because they decompose very rapidly and because soil adheres fairly tightly to the decomposing seed.

With preemergence seedling blights, the seed germinates but the seedlings are killed before they emerge from the soil. The coleoptile and primary roots are usually discolored and have a wet, rotted appearance. With postemergence seedling blights, the seedlings emerge through the soil surface before developing symptoms. Seedlings tend to yellow, wilt and die. Discolored, sunken lesions are usually evident on the mesocotyl. Eventually the mesocotyl becomes soft and water soaked. The root system is usually poorly developed, and roots are discolored, water soaked and slough off. If the primary root system and mesocotyl are severely affected before the nodal or permanent root system has developed, the plants have little chance of surviving.

Most of the fungi which cause seed decay and seedling blight of corn may also contribute to decay of the permanent root system and crown rot of young plants.

Tips of the permanent root system may be water soaked and discolored with the outer layers sloughing off. The base of the crown on the young plant is discolored and soft. This discoloration may be evident on the outside of the plant but may be more evident in internal tissues if the crown is split open. The internal crown tissues may be discolored ranging from light pink to light brown or dark brown to black and the texture may be very soft and spongy. Severely affected plants are not likely to survive. Less severely affected plants may survive but may remain stunted and low in vigor throughout the rest of the season.

The *Pythium*, *Fusarium*, *Diplodia*, *Rhizoctonia* and *Penicillium* species which cause seed decay, seedling blight and crown decay are common in soils throughout the state. If conditions are favorable for germination and emergence, these fungi may not have the opportunity to invade seed, germinating seed or young seedlings so seed decay, seedling blights and crown rot will not be significant problems. On the other hand, conditions that are not favorable for germination and emergence, give these soil fungi more time to attack the seed and developing plants.

Numerous other factors also contribute to early season corn establishment problems. Insect damage, nutrient imbalances, herbicide injury, soil conditions and environmental factors, especially saturated soil conditions and oxygen deprivation, may also cause or contribute to early season corn establishment problems. Corn seedling blights are more severe in wet soils, in low lying areas in a field or in soils that have been compacted or remain wet for an extended period of time. Low soil temperatures (50-55°F) and wet soil conditions especially favor *Pythium* seed decay and seedling blight. Disease severity is also affected by planting depth, soil type, seed quality, mechanical injury to seed, soil crusting, herbicide injury or other factors which delay germination and emergence of corn.

Planting high quality seed into a good seedbed when soil temperatures are above 50F will help minimize these early season problems. Virtually all field corn seed comes with a fungicide seed treatment. Hopper box treatments can be used to supplement the existing seed treatment.

**Outlook-** unfortunately, there are no controls for seed decay, seedling blights and crown decay in corn at this point. When evaluating corn stands this season it is important to check several plants to determine the extent of damage to the initial root systems, the mesocotyls and

*Continued on page 35*

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## Seed Decay and Seedling Blights of Corn

*continued from page 34*

the permanent root systems. It can also be helpful to split the lower stem and crown open on several plants to check for crown decay. With good growing conditions, marginally affected plants might recover and take off. If stressful conditions continue, marginally affected plants may continue to decline and more plants may show symptoms. Also, although warm, drier conditions would be helpful; hot, dry conditions, especially with drying

winds would not be helpful. Warm temperatures with drying winds could stress plants with poor root systems causing them to wilt, turn gray-green to brown in color and even die.

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## Early Season Soybean Diseases

*By Laura Sweets*

This is another interesting year for soybean production and early season soybean diseases in Missouri. According to the Missouri Agricultural Statistics Service as of June 23, 2013, "soybeans were 84 percent planted which is 24 days behind last year but the same as normal. Emergence was 67 percent, 20 days behind last year and 5 days behind normal. Emergence was reported as uneven across the state." Certainly weather has been a key factor in this. Unusually cold, wet conditions across most of the state delayed planting and have resulted in some uneven or poor stands.

Although weather is a key factor this season, soil-borne pathogens could still be contributing to some of the uneven stands and poor vigor in seedlings. A heavy rain event and slow emergence due to compaction could have given *Pythium* species an opportunity to attack developing seedlings. Plants which are struggling to send out roots and to survive could be targets for *Rhizoctonia* or *Fusarium* species. Plants with compromised root systems were more prone to desiccation from warm, drying winds during the recent spell of higher than normal temperatures. Some marginal browning of leaflets, wilting of plants and even premature death of plants may occur in drier areas of fields or across large areas of fields. Thus far this season *Rhizoctonia* seems to be the most prevalent problem.

Soybean seedling blights have the potential to cause losses in Missouri soybean fields every year. The specific seedling blights that occur and their severity vary with the environmental conditions each season. When checking stands this season, it is important to take into account soil conditions and environmental stress as well as checking for seedling diseases.

*Pythium* and *Phytophthora* are favored by wet conditions and are more likely to be serious problems when wet conditions exist at or just after planting. *Rhizoctonia* and *Fusarium* are not as restricted by soil moistures and soil temperatures but still need some moisture to initiate infection. *Macrophomina phaseolina* grows best at temperatures between 82-95°F. Infection of seedlings with *Macrophomina* is most likely to occur if conditions of high soil temperatures and low soil moisture exist during the first two to three weeks after planting.

Symptoms of *Pythium* damping-off range from seed rot or preemergence damping-off to early postemergence damping-off. Affected tissue develops a soft, watery brown rot. *Pythium* damping-off is most likely to occur in cool (50-55°F), wet soils.

*Phytophthora* can cause seed rot, preemergence damping-off and early postemergence damping-off. Initially affected tissue develops a soft, watery brown

*Continued on page 36*

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## Early Season Soybean Diseases

*continued from page 35*

rot. Within several days the affected plant parts may dry out and shrivel up becoming dark, dry and brittle. This early stage Phytophthora is difficult to distinguish from Pythium damping-off. Phytophthora can also cause a seedling blight in which established seedlings turn yellow, wilt and die. Generally the entire seedling is affected and roots may be poorly developed and rotted. Phytophthora root rot is more likely to occur in heavy, wet soils, low areas or compacted areas, but it may occur in light soils or better drained areas if heavy rains occur after planting.

*Rhizoctonia* can cause seedling blight and root rot of soybean. Affected stands may have an uneven appearance and seedlings appear pale green in color and stunted in growth. The identifying feature of this disease is a small, reddish lesion on one side of the stem at or just below the soil line. This lesion develops into a sunken, cankered area at the point of infection. Sometimes the lesion will expand to completely girdle the stem. On severely infected seedlings, the entire hypocotyl may be discolored and shriveled into a dry, stringy or wiry stem.

*Fusarium* can also cause root rot of soybean. Infection is usually confined to roots and lower stems. The lower part of the taproot and the lateral root system may be discolored, deteriorated or completely destroyed. General roots show a nondescript brown discoloration and a dry, shrunken rot. Above ground portions of plants may appear off-color and stunted. Plants with severe Fusarium root rot may die prematurely.

Charcoal rot, caused by *Macrophomina phaseolina*, may be more commonly recognized as a mid to late season disease on maturing soybean plants, but it can also occur early in the season on seedlings. Infected seedlings tend to show a reddish brown discoloration from the soil line up the stem. The discolored area changes from reddish brown to dark brown to black. Foliage may appear off color or begin to dry out and turn brown. If the growing point is killed, a twin stem plant may develop. Under hot, dry conditions, infected seedlings may die. Under cooler, wetter conditions, infected seedlings may survive but carry a latent infection. Then symptoms may reappear later in the season with hot, dry weather.

Once the crop has been planted, there is little that can be done to reduce incidence or severity of soybean seedling diseases. Additional stress from poor growing conditions, herbicide injury or other factors may compound problems with soybean seedling diseases. Prior to planting it is important to consider variety selection (especially in fields with a history of *Phytophthora*), fungicide seed treatment, crop rotation, seedbed preparation and conditions at planting.

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# Weather Data for the Week Ending June 27, 2013

By Pat Guinan

Station	County	Weekly Temperature (°F)						Monthly Precipitation (in.)		Growing Degree Days‡	
		Avg. Max.	Avg. Min.	Extreme High	Extreme Low	Mean	Departure from long term avg.	June 1-27	Departure from long term avg.	Accumulated Since Apr.1	Departure from long term avg.
Corning	Atchison	89	71	95	64	80	+4	2.58	-1.68	1213	+97
St. Joseph	Buchanan	87	71	92	66	79	+4	1.69	-2.88	1141	+32
Brunswick	Carroll	92	73	100	68	82	+6	2.50	-2.10	1262	+112
Albany	Gentry	87	70	92	65	79	+4	3.668	-0.76	1112	+37
Auxvasse	Audrain	91	70	93	67	80	+4	2.02	-2.33	1191	+24
Vandalia	Audrain	91	69	93	67	79	+3	3.27	-0.57	1166	+51
Columbia-Bradford Research and Extension Center	Boone	91	70	94	66	79	+3	1.62	-2.49	1151	-53
Columbia-Capen Park	Boone	93	68	96	64	79	+3	1.83	-2.74	1181	-71
Columbia-Jefferson Farm and Gardens	Boone	90	70	95	66	80	+4	2.07	-2.04	1197	-9
Columbia-Sanborn Field	Boone	92	73	96	68	81	+5	1.41	-3.04	1284	+29
Columbia-South Farms	Boone	90	70	94	66	80	+4	2.06	-2.08	1185	-20
Williamsburg	Callaway	92	70	96	66	79	+4	1.66	-2.54	1201	+74
Novelty	Knox	89	70	91	66	78	+3	2.83	-0.99	1081	-25
Linneus	Linn	88	70	92	65	79	+5	2.20	-2.46	1110	+29
Monroe City	Monroe	90	70	92	66	79	+4	3.52	-0.03	1150	-1
Versailles	Morgan	93	74	98	70	83	+7	2.44	-1.47	1398	+145
Green Ridge	Pettis	*	*	*	*	*	*	*	*	*	*
Lamar	Barton	92	73	97	71	82	+5	5.68	+0.53	1267	-32
Cook Station	Crawford	90	69	93	66	80	+5	2.49	-1.47	1236	-32
Round Spring	Shannon	92	66	96	63	78	+3	4.19	+0.76	1207	+1
Mountain Grove	Wright	88	70	91	66	79	+4	4.28	+0.91	1151	-4
Delta	Cape Girardeau	91	70	94	66	80	+2	9.40	+6.38	1433	-39
Cardwell	Dunklin	93	72	98	67	82	+2	2.62	-0.30	1579	-69
Clarkton	Dunklin	94	72	100	69	83	+3	3.48	+0.31	1525	-85
Glennonville	Dunklin	94	73	100	68	84	+5	3.51	+0.68	1555	-47
Charleston	Mississippi	92	72	95	69	82	+3	5.58	+1.92	1498	+16
Portageville-Delta Center	Pemiscot	94	75	99	71	84	+5	3.47	0.00	1635	+5
Portageville-Lee Farm	Pemiscot	94	75	99	71	84	+5	4.07	+0.76	1623	+8
Steele	Pemiscot	96	75	101	72	85	+5	2.44	-1.10	1659	+14

‡Growing degree days are calculated by subtracting a 50 degree (Fahrenheit) base temperature from the average daily temperature. Thus, if the average temperature for the day is 75 degrees, then 25 growing degree days will have been accumulated.

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