

Integrated Pest & Crop Management

Asiatic Dayflower: An Increasing Weed Problem in Missouri Corn and Soybean Fields

By Kevin Bradley

If there's one thing we have seen in our agricultural production fields over the past several decades, it's been a change in our predominant weed species.

These weed "shifts" usually occur in response to some specific pressure that has been placed on them. Since 1996, this pressure has come in the form of the rapid adoption of Roundup Ready cropping systems and the continuous use of glyphosate. As a result, we are starting to see a shift in our fields to those weeds that glyphosate does not control. One of these weeds is Asiatic dayflower (*Commelina communis*).

In the past two weeks I have received numerous calls about the control of this species in no-till corn and soybean fields. We have given presentations and written several newsletter articles on this species in the past, so I will only briefly summarize here.



Figure 1. Newly-emerged Asiatic dayflower seedlings are often confused as a grass plant with wide leaves. However these plants do not have a ligule or any of the typical characteristics of grasses.



Figure 2. Young Asiatic dayflower plants newly emerged in the spring. It doesn't take long for the plants to "tiller" and produce multiple shoots from a single rootstock.

First, I believe there is an increasing awareness about this species among our clientele, but I also believe that we have more work to do and that there are many who are completely unaware as to the identity of this plant. In some surveying we have done over the past several years, we have encountered this species on a fairly regular basis throughout the state, especially in no-till soybean fields. It is a species that can form thick canopies and cause significant yield losses, not to mention the fact that it is difficult to control.

Asiatic dayflower seedlings more closely resemble a "wide-leaved" grass plant when they first emerge

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Figure 3. Note the membranous sheath which encircles the base of the leaf and stem. Because of this, many have miss-identified Asiatic dayflower as one of the smartweed species.

in the spring (Figures 1 and 2). Asiatic dayflower can have an erect growth habit but more commonly creeps along the ground and is capable of rooting at the nodes. The leaves occur alternately along the creeping stem and are ovate to lanceolate in outline, as much as 5 inches long and 2 inches

wide. All leaves and stems are hairless, and each leaf has a membranous sheath which encircles the base of the leaf and stem (Figure 3). The flowers of Asiatic dayflower consist of two, very distinctive large blue petals with one white petal below (Figure 4). Asiatic dayflower generally blooms from mid- to late-summer in Missouri, with each flower blooming for a single day (thus the name). Several authors have found that the seed of Asiatic dayflower are capable of germinating throughout the growing season and that the seed can also remain viable in the soil for more than 4 ½ years.

Few herbicides provide acceptable control of Asiatic dayflower in soybeans. Firstrate, Sencor, and the Authority products are some of the only herbicides that will provide acceptable Asiatic dayflower control when applied as a pre-emergence treatment. Similarly, Firstrate is one of the only conventional herbicides that will provide acceptable control of this species when applied as a post-emergence treatment in soybeans, but applications must be made before this species reaches six inches in height. Even high

rates of glyphosate in Roundup Ready soybeans will usually only provide a moderate degree of suppression (<50% control).

In corn, there is much less information available about the control of this weed in the weed science literature. I usually get far fewer questions on the

control of this weed in corn, and I suspect that the use of atrazine in our corn production systems is the reason. S-metolachlor, or products that contain this herbicide (Dual, Bicep II Magnum, Lexar, Lumax, etc.) provide some degree of residual control of this species. Based on some research on the control of a similar dayflower species that occurs in the south, it appears that Aim has good post-emergence activity on dayflowers, and that a post-emergence program that includes Aim + S-metolachlor + glyphosate provides good control of populations that weren't initially controlled with a pre-emergence herbicide program. As mentioned previously, I'm sure there are other post-emergence programs that provide equivalent or higher levels of Asiatic dayflower as well; there just isn't much information on this species in the literature.



Figure 4. Notice the two blue petals above and one white petal below that are characteristic of the flowers of Asiatic dayflower.

Kevin Bradley
BradleyKe@missouri.edu
(573) 882-4039

Wheat Disease Update

By Laura Sweets

Barley yellow dwarf continues to be the most widespread disease of winter wheat in Missouri this season. Over the last two weeks or so, red to purple flag leaves have been evident in wheat fields across the state. In some fields the disease appears to be quite widespread and in other fields it is sporadic within the field. Yield losses will vary with time of infection, susceptibility of the variety, other stresses which might have affected plants and weather conditions from now to harvest. At this point in the growing season it is too late for any control measures.

Much of the state has been dry, especially over the last few weeks, so foliage diseases have been slow to develop

and to move onto the flag leaves. Susceptible varieties may be showing **Septoria leaf blotch**, **leaf rust** and in some cases **stripe rust**. When foliage diseases build up so late in the season, impact on yield is minimized. Again, at this point in the growing season it is too late for any control measures.

Fusarium head blight or scab of wheat develops on plants in the flowering to early grain fill stages of growth and the symptoms are most evident at that time. The wheat crop is still about three weeks ahead of normal

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Wheat Disease Update

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and in many areas wheat heads are beginning to dry down. So the time for possible infection by the Fusarium head blight fungus is past. Symptoms of Fusarium head blight are more difficult to detect once heads begin to dry down. Infection is very dependent on environmental conditions while wheat is in susceptible stages of growth, i.e. flowering. Moderate temperatures in the range of 77-86°F, frequent rain, overcast days, high humidity and prolonged dews favor infection and development of scab. Weather conditions over the past several weeks were not particularly favorable for the development of Fusarium head blight in most of the state. There may have been isolated geographic areas which did receive rain at the critical time of wheat flowering so Fusarium head blight may be a problem in localized areas this year but doesn't appear to be a statewide issue.

The characteristic symptom of scab on wheat is a premature bleaching of a portion of the head or the entire head. Superficial mold growth, usually pink or orange in color, may be evident at the base of the diseased spikelets. Bleached spikelets are usually sterile or contain shriveled and or discolored seed.

Scab is caused by the fungus *Fusarium graminearum*. This fungus overwinters on host residues such as wheat stubble, corn stalks and grass residues. Spores are carried by wind currents from the residues on which they have

survived to wheat heads. If environmental conditions are favorable, i.e. warm and moist, the spores germinate and invade flower parts, glumes and other portions of the spike. Scab infection occurs when favorable environmental conditions occur as the wheat crop is in the flowering to early grain fill stages.

Unfortunately, the detrimental effects of scab are not limited to its adverse effects on yield. The fungi which cause scab may also produce mycotoxins. Vomitoxin (deoxynivalenol or DON) and zearalenone may occur in wheat grain infected by scab fungi. This is a primary concern where grain is fed to non-ruminant animals. Ruminants are fairly tolerant of these two mycotoxins. Also, the fungi which cause scab may survive on the seed and can cause seedling blight and root rot problems when scabby grain is used for seed.

Crop rotation, variety selection, residue management and fungicide applications are preventative measures for managing scab in wheat. With the early wheat crop it is too late for fungicide applications this season. Wheat planted on corn, sorghum or wheat residue (even wheat double cropped with soybeans) has a greater risk for scab.

Laura Sweets
SweetsL@missouri.edu
(573) 884-7307



MU IPM Pest Monitoring Network

Taking an Environmentally Sensitive Approach to Pest Management



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<http://ipm.missouri.edu/pestmonitoring>

Missouri Soil Testing Association State Approved Labs

By *Manjula Nathan*

The Missouri Soil Testing Association (MSTA) Approval Program is designed to assure that results provided by participating public and private labs serving the citizens of Missouri agree with allowable statistical limits. This is accomplished by evaluating the soil testing laboratories in their performance through inter-laboratory sample exchanges and a statistical evaluation of the analytical data. Based on this premise, soil test results from MSTA approved labs will be accepted by the U.S. Department of Agriculture, Farm Service Agency (FSA) and Department of Natural Resources and Conservation Services (NRCS) in federally assisted cost share programs and nutrient management plans in the state of Missouri.

Beginning in 1999, MSTA combined its efforts with the North American Proficiency Testing Program (NAPT). In order to be approved by the Missouri State program, the participating labs should participate in all four quarter exchanges of the NAPT program and submit the MO State data release form each year to the NAPT coordinator. The NAPT coordinator in return sends soil test data from quarterly sample exchanges of the labs participating in MSTA program to the Missouri state coordinator. The MU Soil Testing Lab director serves as the state program coordinator and performs statistical analysis of the data as specified in the MSTA program. If a lab's results fall within the allowable limits, the lab will be placed on the Farm Service Agency's (FSA) list of approved labs. A lab that is not approved may re-apply after six months. An updated listing of Missouri State Approved Soil Testing lab list can be found at: <http://soilplantlab.missouri.edu/soil/msta.aspx>

List of Missouri State Approved Soil Testing Labs

Custom Lab Telephone: 573-882-3250
204 C St. Fax: 573-884-4288

Golden City, MO 64748
Telephone: 417-537-8337
Fax: 417-537-8337

Delta Soil Testing Lab
University of Missouri
PO Box 160
Portageville, MO 63873
Telephone: 573-379-5431
Fax: 573-379-3383

Perry Agricultural Lab
PO Box 418
State Highway 54 East
Bowling Green, MO 63334
Telephone: 573-324-2931
Fax: 573-324-5558

Ag Source Cooperative
Services
106 N. Cecil Street
PO Box 7
Bonduel, WI 54107
Telephone: 715-758-2178
Fax: 715-758-2620

May 31, 2012

Ag Source Harris
Laboratories
300 Speedway Circle #2
Lincoln NE 68502
Tel: 402-476-0300
Fax: 402-476-0302

A&L Analytical
Laboratories, Inc.
2790 Whitten Road
Memphis, TN 38133
Telephone: 901-213-2400
Fax: 901-213-2440

A&L Great Lakes
Laboratory, Inc.
3505 Conestoga Drive
Fort Wayne, IN 46808
Telephone: 260-483-4759
Fax: 260-483-5274

A&L Heartland
Laboratory, Inc.
111 Linn St.
PO Box 455
Atlantic, IA 50022
Telephone: 901-213-2400
Fax: 901-213-2440

Brookside Lab Inc.
308 S. Main St.
New Knoxville, OH 45871
Telephone: 419-753-2448
Fax: 419-753-2949

Ingrams Soil Testing Center
13343 Fitschen Road
Athens, IL 62613
Tel: 217-636-7500
Fax: 217-636-7500

Midwest Laboratories, Inc.
13611 B St.
Omaha, NE 68144-3693
Telephone: 402-334-7770
Fax: 402-334-9121

Mowers Soil Testing Plus Inc.
117 East Main St.
Toulon, IL 61483-0518
Telephone: 309-286-2761
Fax: 309-286-6251

MVTL Laboratories
Inc.-New Ulm
1126 North Front St.
New Ulm, MN 56073-0249
Telephone: 507-233-7139
Fax: 507-359-2890

Olsen's Agricultural
Laboratory
210 East First St.
PO Box 370
McCook, NE 69001
Telephone: 308.345.3670
Fax: 308-345-7880

Servi-Tech Laboratories
1816 East Wyatt Earp Blvd.
Dodge City, KS 67801
Telephone: 620-227-7123
Fax: 620-227-2047

Spectrum Analytical
1087 Jamison Road
PO Box 639
Washington Court
House, OH 43160
Telephone: 740-335-1562
Fax: 740-335-1104

Ward Laboratories
4007 Cherry Ave.
PO Box 788
Kearney, NE 68848
Telephone: 308-234-2418
Fax: 308-234-1940

Waters Agricultural
Laboratories, Inc.
257 Newton Highway
PO Box 382
Camilla, GA 31730
Telephone: 229-336-7216
Fax: 229-336-0977

Waters Agricultural
Laboratories, Inc.
2101 Old Calhoun Road
Owensboro, KY 42301
Telephone: 270-685-4039
Fax: 270-685-3989

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Note: Approval of soil analysis does not imply approval of fertilizer and limestone recommendations by the individual labs. The approval allows the clients to use the University of Missouri soil fertility recommendations as required by the federal and state agencies for cost share and nutrient management planning programs. In order to use the University of Missouri soil fertility recommendations

and get meaningful results, it is recommended that the labs use the soil test procedures required by the MSTA program.

Manjula Nathan
NathanM@missouri.edu
(573) 882-3250

Early Corn Root Development

By Bill Wiebold

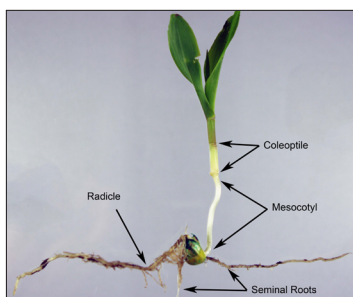


Figure 1. Corn seedling at late V1 stage.

“of the seed” and describes their origin. These roots anchor the seedling in the soil and sustain the seedling for the first couple of weeks after emergence. This root system is called primary, not because of its importance, but because it forms first.

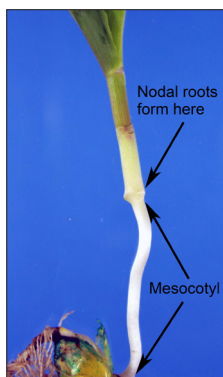


Figure 2. Close-up of first node on late V1 corn plant.

Corn plants, like most annual grass plants, produce two root systems. The first root system (primary) is composed of the radical and up to three pairs of seminal roots (Figure 1). All of these roots arise from within the seed.

The term seminal means “of the seed” and describes their origin. These roots anchor the seedling in the soil and sustain the seedling for the first couple of weeks after emergence. This root system is called primary, not because of its importance, but because it forms first. The main root system (secondary) of the corn plant is composed of numerous roots that originate from stem tissue outside of the seed. Because they arise from tissues other than roots they are called “adventitious roots”, and because they arise from stem nodes they are also called “nodal roots”. Again, the name of the root system, secondary, should not be confused with a description of their importance. It is merely a chronological term. The secondary root system is composed

of the roots that provide water, nutrients, and anchorage to the plant through nearly its entire life.

Adventitious roots are located at nodes along the stem, both below and above ground. They begin their development shortly after the seedling has emerged, but it takes several weeks before the roots are capable of sustaining the plant. The first node on a corn stem (other than the scutellar node in the seed) is located at the top of the mesocotyl (Figure 1). During germination and emergence, the mesocotyl elongates and pushes the coleoptile toward the soil surface. As the mesocotyl

elongates the coleoptile is also elongating. The junction between the mesocotyl and coleoptile is visible as a slightly swollen area that surrounds the stem. Perched on top of the mesocotyl and covered by the coleoptile is an area of rapid cell division or the growing point. When the coleoptile nears the surface it senses light and signals the mesocotyl to stop elongating. Under most situations the junction between the mesocotyl and the coleoptile will be located about 3/4 of an inch below the soil surface when elongation stops.

It is at this junction between the mesocotyl and the coleoptile that the first set of adventitious roots form. The first sign of developing nodal roots are small bumps that appear around the stem at the node (Figure 2). If

soil conditions are conducive to root growth these bumps will transform into easily recognized roots (Figure 3). Although timing varies because of conditions, by the time the plant is at V3 stage, nodal roots extend past well past where the kernel was placed during planting. As the plant continues to develop multiple roots from multiple nodes will be evident (Figure 4). The first four stem internodes elongate very little. So, the accompanying nodes remain underground. Other stem internode elongate, so that their accompanying nodes are above ground. Roots can and often do from several of these above ground nodes. These nodes are called brace roots, but they perform all the functions other corn roots including anchorage in the soil.

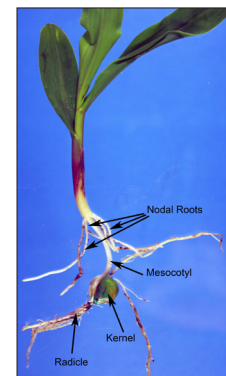


Figure 3. Late V2 corn plant.

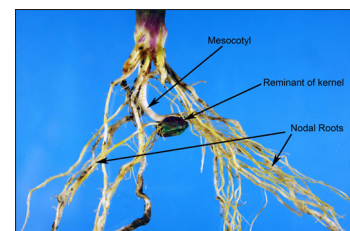


Figure 4. V5 corn plant.

Bill Wiebold
WieboldW@missouri.edu
(573) 882-0621

Considering Early Herbicide and Fungicide Combinations on Corn: Results from a 2011 Study

By Craig Solomon, Kevin Bradley, & Laura Sweets

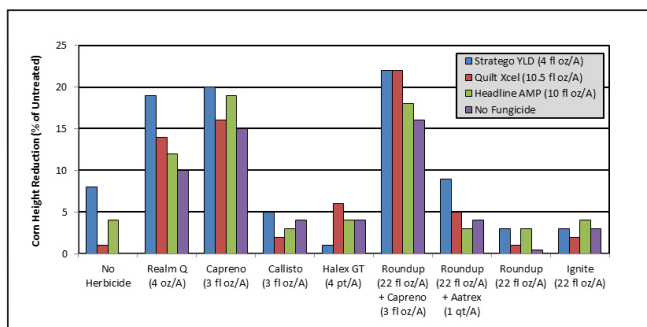


Figure 1. Corn height reduction seven days after treatment with various herbicide and fungicide combinations (Columbia, MO 2011).

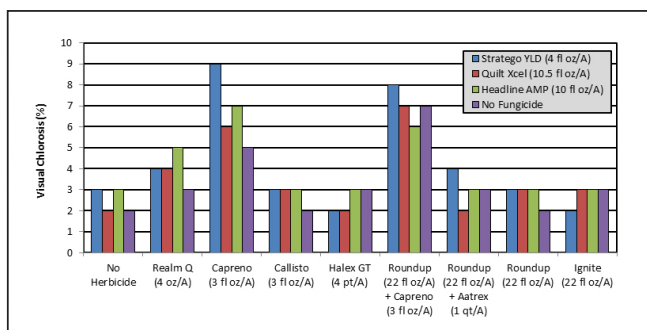


Figure 2. Visual chlorosis of corn seven days after treatment with various herbicide and fungicide combinations (Columbia, MO 2011).

In an attempt to increase yield, the use of foliar fungicides on field corn has increased dramatically in the last decade. Traditionally, applications of these fungicides have been made to corn at the tasseling stage of growth. However, in recent years some pesticide manufacturers have promoted early-season fungicide co-applications with post-emergence herbicide treatments. These applications typically occur around the V5/V6 stage of corn growth. The “rationale” of this practice is that an additional application of fungicide can be made in hopes of protecting and/or increasing corn yield without incurring additional application costs, since a post-emergence herbicide application will be made anyway. This use pattern is predominately thought of as a supplement to the tasseling fungicide application, not a replacement. Last year, we conducted the first year of a two-year experiment to investigate the effects of early-season co-applications of herbicides and fungicides on corn injury and yield.

In 2011 we applied Stratego Yld, Quilt Xcel and Headline AMP in combination with some of the most common herbicides used as post-emergence treatments in corn. Treatments containing Capreno and Realm Q did result in a 10 to 22% corn height reduction 7 days after treatment (Figure 1) and from 5 to 9% visual chlorosis on corn

plants (Figure 2), but by two to three weeks after treatment the corn had regrown and no visible signs of chlorosis were evident. Additionally, there was no effect of these combinations on the level of weed control observed (data not shown). Based on this one year of data, our results indicate that adding a fungicide with your early-season (V5/V6) post-emergence herbicide application will not increase corn grain yields in comparison to herbicide treatments alone (Figure 3). It is also important to note that in this trial, disease incidence was very low (<5%), so these results should be interpreted as to the effects of these combinations on corn yield in the absence of any significant disease pressure. As many university plant pathologists have indicated, fungicides are most profitable in corn production when a combination of factors are present, such as disease presence, weather conditions favoring disease development, disease susceptible hybrids, and late-planted corn.

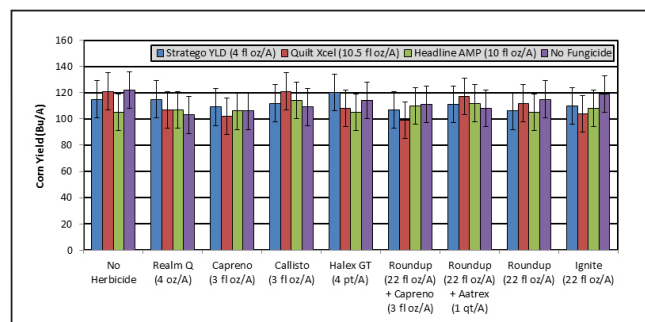


Figure 3. Corn yield response to various herbicide and fungicide combinations (Columbia, MO 2011).

Craig Solomon
University of Missouri
Division of Plant Sciences

Kevin Bradley
BradleyKe@missouri.edu
(573) 882-4039

Laura Sweets
SweetsL@missouri.edu
(573) 884-7307

Seed Decay and Seedling Blights of Corn

By *Laura Sweets*

Some years, early season stand establishment problems are widespread and, in some cases, severe- especially in early planted corn fields. 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 has been moving along with weather delays in some areas of the state. The unusual fluctuations in weather conditions (near record highs one weekend followed by lows the next weekend) make it difficult to predict how severe corn seed decay and seedling blights will be this year.

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. 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.

Laura Sweets
SweetsL@missouri.edu
(573) 884-7307

Forage of the Month: Red Clover

By Rob Kallenbach

Red clover is a short-lived, perennial legume grown on 7–10 million acres in Missouri. Although alfalfa has superior yield and quality under ideal conditions, red clover is much better adapted to the poorly drained, shallow or infertile soils frequently found on pasturelands. It is easier to establish than other legumes and works well in a

mixture with cool-season grasses. It has problems dealing with prolonged drought and root diseases. However, it can be reseeded rather easily and inexpensively. In fact, many producers broadcast 3 to 6 lb/acre of seed annually to maintain stands.



Red clover



Leaf



Flower

Origin: Asia Minor and southeastern Europe

Adaptation to Missouri: Statewide

Growth habit: Erect, short-lived perennial.

Leaf: Palmately trifoliate, pubescent with a pale, crescent-shaped mark on upper surface.

Stems: Hollow, pubescent.

Stipules: Fused to petiole.

Flowers: Terminal on main and axillary stems, consists of many compound racemes with pink to purple florets, forming a dense head.

Fertilization: No N needed if nodulated. Maintain 30 lb P/acre and 250 lb K/acre.

Timing of production: 65 percent of annual production between April 1 and June 30.

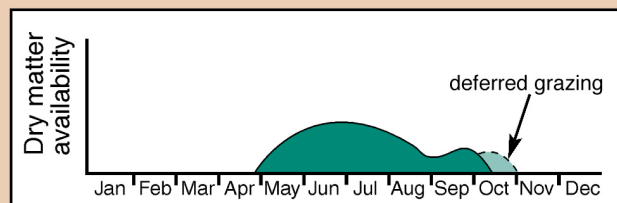
When to begin grazing: Often based on the height of the grass in the mixture. In pure stands, grazing

should begin when red clover is in the early- to mid-bud stage.

When to cut for hay: Early to midbloom

Lowest cutting or grazing height: 3 or 4 inches

Fall management: Avoid grazing below a 4-inch stubble height from Sept. 15 until the first hard killing frost.



Yield distribution of red clover in Missouri.

Rob Kallenbach
KallenbachR@missouri.edu
(573) 884-2213

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 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 by paraquat or other contact herbicides. 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 are beginning 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

Early Season Leaf Spots and Blights of Corn

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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.

*Laura Sweets
SweetsL@missouri.edu
(573) 884-7307*

Early Corn Root Development

By Bill Wiebold

As described in another article, corn plants produce two root systems. The primary root system is



Figure 1. Corn plants exhibiting symptoms of rootless corn syndrome.

composed of roots that arise from the seed. These roots do not become large nor do they extend very deep into the soil. Their purpose is to nourish the young plant until the secondary root system becomes established. The

secondary root system consists of many adventitious (nodal) roots that form at stem nodes both below and above the soil surface.

The transition between the plant's reliance on the primary root system to a fully functioning secondary root system is usually smooth with few problems. Unfortunately, weather and soil conditions can interfere with nodal root growth. All roots, including corn nodal roots, require moisture for growth. Roots will not grow into dry, hot soil. Roots extend through soil inside soil pores. Root development requires pore spaces large enough for root tips to enter, but not too large so that dry air touches the root tips rather than the thin films of water that surround soil particles.

Because nodal roots are initiated on stem nodes about 3/4 of an inch below the soil surface, the microclimate in the top inch or so of soil is crucial in determining the fate of nodal roots. Dry soil, compacted soil, cloddy soil, or waterlogged soil can limit or even prevent the growth of nodal roots.

Soil conditions that limit nodal root growth can lead to what is often called "rootless corn syndrome". Corn plants are not truly rootless, because they usually possess a functioning



Figure 2. Corn plant with stunted nodal root growth typical of rootless corn syndrome.

primary root system (Figure 1). The rootless adjective refers to the severely reduced growth of nodal roots. The nodal roots actually initiate and even begin elongation. But, with unfavorable soil conditions the root growing points desiccate and root elongation ceases. The results are very short, stubby roots that often end in a blunt point (Figure 2). It should be noted that herbicide injury to roots is almost never the cause of what I've described as rootless corn syndrome.

With this syndrome, corn plants may appear normal through V4 to V6. But, as plant continue to grow; they begin to lodge because nodal roots had not formed properly. The primary root system is unable to anchor large seedlings. Unfortunately, little can be done to counteract the syndrome. Rain is the only effective solution to the problem. Using a cultivator to push soil around the plant base is not effective. Although stunted roots with desiccated growing points will not resume growth, wet soil will allow for growth on newly initiated nodal roots.

*Bill Wiebold
WieboldW@missouri.edu
(573) 882-0621*

Weather Data for the Week Ending May 28, 2012

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.	May 1-28	Departure from long term avg.	Accumulated Since Apr.1	Departure from long term avg.
Corning	Atchison	89	64	94	57	77	+12	1.26	-2.76	882	+428
St. Joseph	Buchanan	85	64	87	58	75	+10	2.36	-1.95	794	+329
Brunswick	Carroll	87	64	92	48	76	+10	3.12	-1.58	827	+338
Albany	Gentry	86	61	91	51	75	+10	2.86	-1.50	753	+324
Auxvasse	Audrain	88	63	91	46	76	+10	1.80	-2.91	800	+299
Vandalia	Audrain	88	63	93	44	77	+12	0.87	-3.80	795	+338
Columbia-Bradford Research and Extension Center	Boone	87	62	92	45	75	+9	0.98	-3.68	777	+246
Columbia-Capen Park	Boone	89	60	93	42	74	+7	0.90	-3.87	735	+174
Columbia-Jefferson Farm and Gardens	Boone	87	63	91	45	75	+9	1.07	-3.57	807	+273
Columbia-Sanborn Field	Boone	89	65	92	48	77	+10	0.98	-3.77	875	+312
Columbia-South Farms	Boone	87	63	91	45	75	+9	1.16	-3.54	799	+267
Williamsburg	Callaway	89	63	94	45	76	+11	1.17	-3.39	806	+324
Novelty	Knox	86	62	91	46	74	+9	1.78	-2.75	702	+247
Linneus	Linn	86	62	91	46	75	+10	1.92	-2.80	735	+289
Monroe City	Monroe	87	64	92	46	76	+11	0.65	-3.90	774	+286
Versailles	Morgan	*	*	*	*	*	*	*	*	*	*
Green Ridge	Pettis	87	64	90	45	76	+9	1.29	-3.27	828	+315
Lamar	Barton	89	63	94	47	76	+8	2.85	-2.62	897	+297
Cook Station	Crawford	90	60	97	41	75	+8	0.55	-4.01	797	+203
Round Spring	Shannon	91	56	96	41	73	+7	0.28	-4.46	774	+218
Mountain Grove	Wright	88	62	93	40	75	+9	0.28	-4.42	816	+304
Delta	Cape Girardeau	89	61	94	50	76	+6	0.29	-4.53	968	+258
Cardwell	Dunklin	91	65	95	53	78	+6	1.59	-3.27	1112	+282
Clarkton	Dunklin	91	64	96	53	78	+6	1.14	-3.06	1073	+276
Glennonville	Dunklin	90	65	94	52	78	+7	0.85	-3.32	1081	+282
Charleston	Mississippi	89	61	95	52	76	+6	2.40	-2.18	1016	+300
Portageville-Delta Center	Pemiscot	92	66	98	54	79	+7	0.42	-4.11	1144	+325
Portageville-Lee Farm	Pemiscot	*	*	*	*	*	*	*	*	*	*
Steele	Pemiscot	93	65	98	55	79	+7	2.05	-3.08	1142	+315

‡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.

*Weather Data provided by Pat Guinan
GuinanP@missouri.edu
(573) 882-5908*

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Editor: Kate Riley (rileyka@missouri.edu).