Integrated Pest & Crop Management

Early Season Soybean Injury Does Not Always Translate into Yield Loss

by Mandy Bish and Kevin Bradley

Last year, we had more soybean injury from pre-emergence herbicides than I've ever seen. It was an epidemic that many farmers across the state experienced, brought on mostly by the prolonged periods of cool and wet weather before and after planting.

This year, there are already some calls and samples that have started to come in with these same issues. I don't know if we're going to see as much soybean injury as last year or not (I hope not), but I do think that if we are going to continue to have resistant waterhemp as our number one weed problem, our growers are going to have to get used to seeing some degree of early season soybean injury. And the good news is, early season injury as a result of pre-emergence herbicides doesn't always translate into soybean yield loss. Of course whether or not you have yield loss will depend on a lot of factors, most notably the growing conditions after herbicide application, but we conducted one study last year that has helped us understand this issue a little better.

In this study, we measured soybean height and biomass reduction in response to pre-emergence soybean herbicides 5 weeks after emergence and then followed this through to see what impact these injury levels had on yield at the end of the season. A small portion of the results from the study are shown in the graph below (to see all of the results go to (http://weedscience.missouri.edu/weedtrials/graphs/PPO%20and%20ALS.pdf).

Basically, what this one year of data would suggest is that soybean plants can recover from

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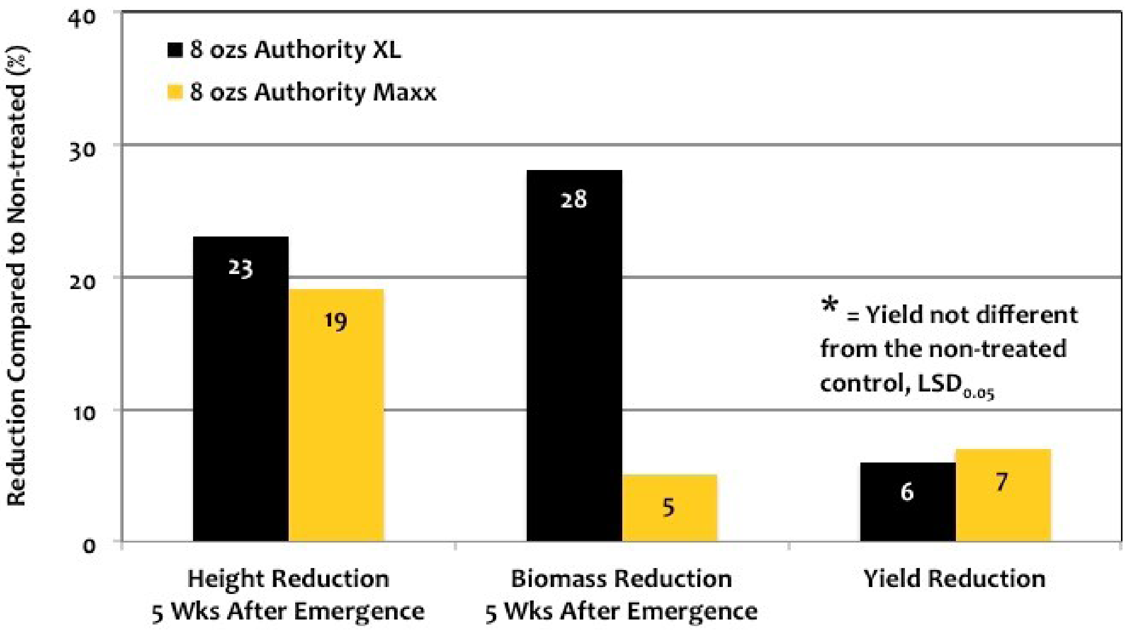
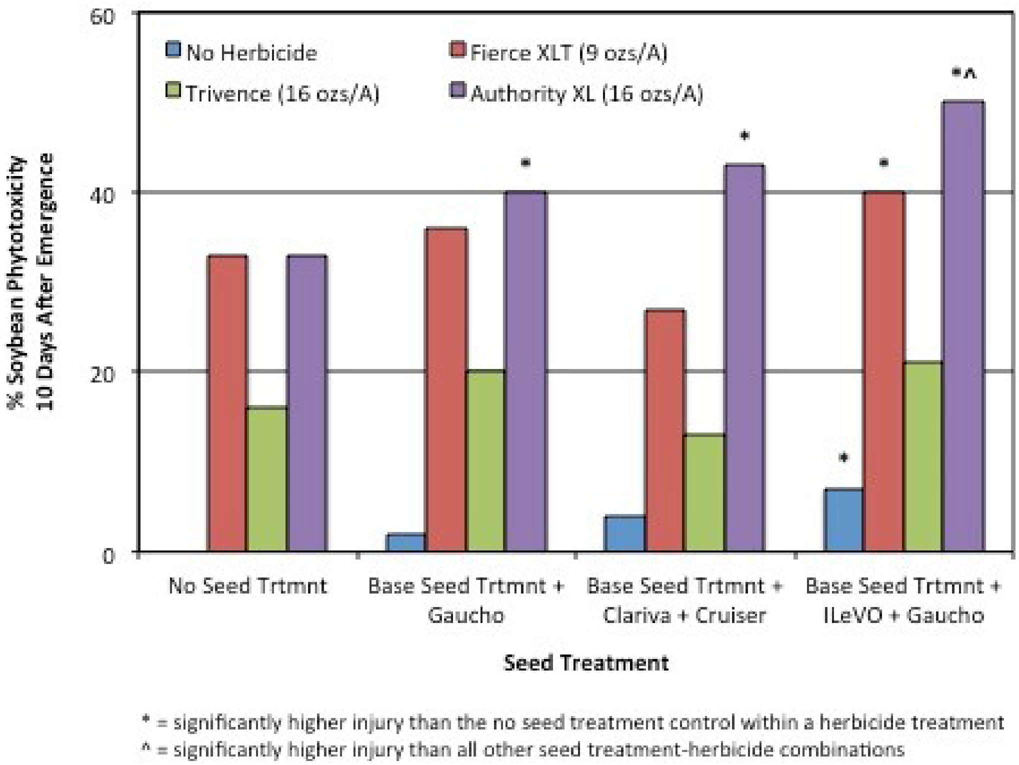


a substantial amount of early season injury and, as mentioned above, that early season injury doesn't always translate into soybean yield loss. As shown in the graph below, we measured as much as 23% soybean height reduction and 28% biomass reduction in response to these pretty standard Authority XL and Authority Maxx herbicide treatments, but neither resulted in any statistically significant yield loss when compared to the weed-free, non-treated control. I think these results can be used as a guide for what we could experience in the next several weeks--we may see some pretty substantial injury that looks significant, but just wait for the soybean to get some better growing conditions and grow through it and chances are you will be much better off to keep the original stand than to tear it all up and start over. We have a new student that is beginning his research this season and will be tackling this issue for the next several years. We hope to be able to provide more results about how early season soybean injury correlates with yield loss in the future.

Soybean Seed Treatments and Pre-emergence Herbicides

by Kevin Bradley and and Blake Barlow (Graduate Research Assistant)

I have received numerous calls and questions over the past week about the potential interactions that may exist between soybean seed treatments and pre-emergence herbicides. Most often, the question being asked is whether the ILeVO seed treatment in some way interacts with Authority (sulfentrazone) herbicides and results in more soybean injury than what might normally have occurred had the soybean been treated with some other seed treatment. We initiated a field study this year that should eventually provide some answers to this question. I want to emphasize that ordinarily, I would not share data that is this "new" and from only one location in one year, but since I have received so many questions about this issue, I thought it might be worthwhile to share what we have learned thus far. It is important to note that a more comprehensive discussion of this issue and data, including yield, from one complete season of field research has recently been published by Dr. Kiersten Wise at Purdue University here: http://extension.entm.purdue.edu/pestcrop/2015/Issue8.



The objectives of our study are to: 1) determine if there are any interactions between certain seed treatments and pre-emergence herbicides, and 2) determine to what degree early-season soybean injury might correlate with yield loss, if any. In order to accomplish this, we decided to put as much stress on the soybean seedlings as we could, so we applied 2X rates (twice the normal use rate) of Fierce XLT, Trivence, and Authority XL, and we planted as early as we could under cool, wet conditions. Within a given soybean variety, we evaluated 3 different common soybean seed treatments in comparison to seed that had no seed treatment at all. Although we will be gathering a variety of information such as stand counts, height reduction, biomass reduction, and ultimately yield in response to each treatment, for the purposes of this article we are only going to share our visual soybean phytotoxicity ratings which we conducted 10 days after soybean emergence.

As you can see in Figure 1, we achieved our desired objective of stressing the soybean seedlings! Keep in mind that these levels of visual soybean injury would not normally be encountered with labeled rates of these herbicides, but these are 2X rates applied under very stressful conditions. So far, our results appear to indicate that the ILeVO seed treatment does result in more phytotoxicity to soybean seedlings than the comparison treatments of Gaucho, Clariva + Cruiser, and non-treated seed when used in combination with certain pre-emergence herbicides like Authority XL. Our results also indicated a higher level of phytotoxicity from the ILeVO seed treatment and Fierce XLT combination, but there was no interaction with Trivence.

For the most part, our results are consistent with what Dr. Wise reported in her study at Purdue. It is important to note that in the Purdue study, the authors reported no effect on soybean stand density and no yield reductions as a result of ILeVO seed treatment. From our perspective, we still have much to learn about these potential interactions and we will be gathering much more data throughout the season. It remains to be seen if these levels of early-season injury will correlate to any significant degree of soybean stand loss or yield reduction.

Weed of the month: Velvetleaf, Highly Competitive Weed with a Soft Touch

by Mandy Bish and Kevin Bradley

Velvetleaf is an erect, summer annual that is easily identifiable by the heart-shaped leaves and soft hairs, which cover the weed. This plant was introduced and cultivated in the U.S. in the 18th century as a source of fiber[1] and is now a weed present in the 48 contiguous states and categorized as noxious in 4 of those[2]. It is a highly competitive weed with allelopathic properties and thus has become a problematic pest of row crop systems (Figure 1). Published studies have shown that when velvetleaf emerges at the same time as soybean at a density of 1 plant per foot of soybean row, the soybean yield can be reduced from 14 to 27%. (Velvetleaf tends to be more competitive with the crop during days with shorter daylight hours. Because of this, if soybean and velvetleaf emerge together in early May, there is a greater potential for yield loss. When soybean planting is delayed to late May or early June, 1 velvetleaf plant emerging per foot of soybean row will cause approximately 14% yield loss [3].)

Velvetleaf seedlings can be confused with prickly sida, which begins to emerge at the same time and has 2 heart-shaped cotyledons.

Velvetleaf seedlings have one heart-shaped cotyledon and one round cotyledon (Figure 2). The cotyledons and the stem below the cotyledons (hypocotyl) are covered with soft, short hairs.

The leaves of velvetleaf are heart-shaped, covered with hairs on both the upper and lower surfaces, have toothed margins, and grow to 2 to 6" long and wide. The main veins on the leaves are clearly visible (Figure 3). The stem of velvetleaf can reach 7 feet in height, is mostly unbranched, and is also covered with soft hairs. Both the leaves and stem emit an unpleasant odor when crushed. The root consists of a taproot with an extensive system of fibrous roots that branch from that main root.

Velvetleaf flowers are approximately ½ to 1" wide and consist of 5 orange-yellow petals (Figure 4). Each plant can produce up to 8,000 seeds, which are kidney-shaped, covered in hair, grayish brown to brownish black in color, and approximately 1/8" square (Figure 5). The seed will remain dormant until the following spring. However, studies have indicated that the seed can remain dormant and viable for up to 60 years making velvetleaf particularly difficult to eradicate once present.

Pre-emergent herbicides are most effective in controlling velvetleaf and allowing the crop to gain the competitive advantage. Most 2- or 3-way pre-packaged combination products that contain atrazine, Corvus, Callisto, Hornet, and Python provide good PRE control in corn. It is also

Figure 1: A velvetleaf plant outcompetes the neighboring soybean plants.

Figure 2: Velvetleaf seedlings have 1 round cotyledon, such as the one on the left, and one heart-shaped cotyledon, like the one on the right.

Figure 3: Each leaf of velvetleaf grows 2 to 6" both long and wide, is covered with hairs, and has visible main veins.

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Figure 4: The velvetleaf flower is comprised of 5 orange to yellow petals. Two seed pods, a green immature pod and a black, mature pod, can also be seen in this image.

Figure 5: The distinct seeds of velvetleaf are kidney-shaped and covered in hairs.

noteworthy that velvetleaf with resistance to atrazine has been confirmed in four states, but we are not aware of any in Missouri. In soybean, most of the Authority products, Canopy, Envive, Fierce, Fierce XLT, Firstrate, Gangster, Pursuit, Python, Sencor, Sharpen, Trivence, and Valor XLT are all effective PRE herbicides for velvetleaf. Cultivation may also help with preventing emergence. The optimal soil depth for velvetleaf seed germination and emergence is 1 inch; however, emergence rate is reduced by 50% for every inch that the seed is buried below that depth.

Studies have suggested that velvetleaf plants that emerge 3 weeks or more after soybean emergence contribute little to soybean yield loss as the soybeans are usually large enough to shade out velvetleaf seedlings. However, POST applications can prevent velvetleaf plants from going to seed. In corn, there are a variety of effective POST options. Some of the more common include products that contain 2,4-D, dicamba, atrazine, and mesotrione, although there are others. Aim, Cadet, FirstRate, Pursuit, Resource, Liberty, and glyphosate products are effective POST options in soybean. To see a more comprehensive list of chemical control options view our Pest Management Guide (M171) here: http://weedscience.missouri.edu/publications/m00171.pdf.

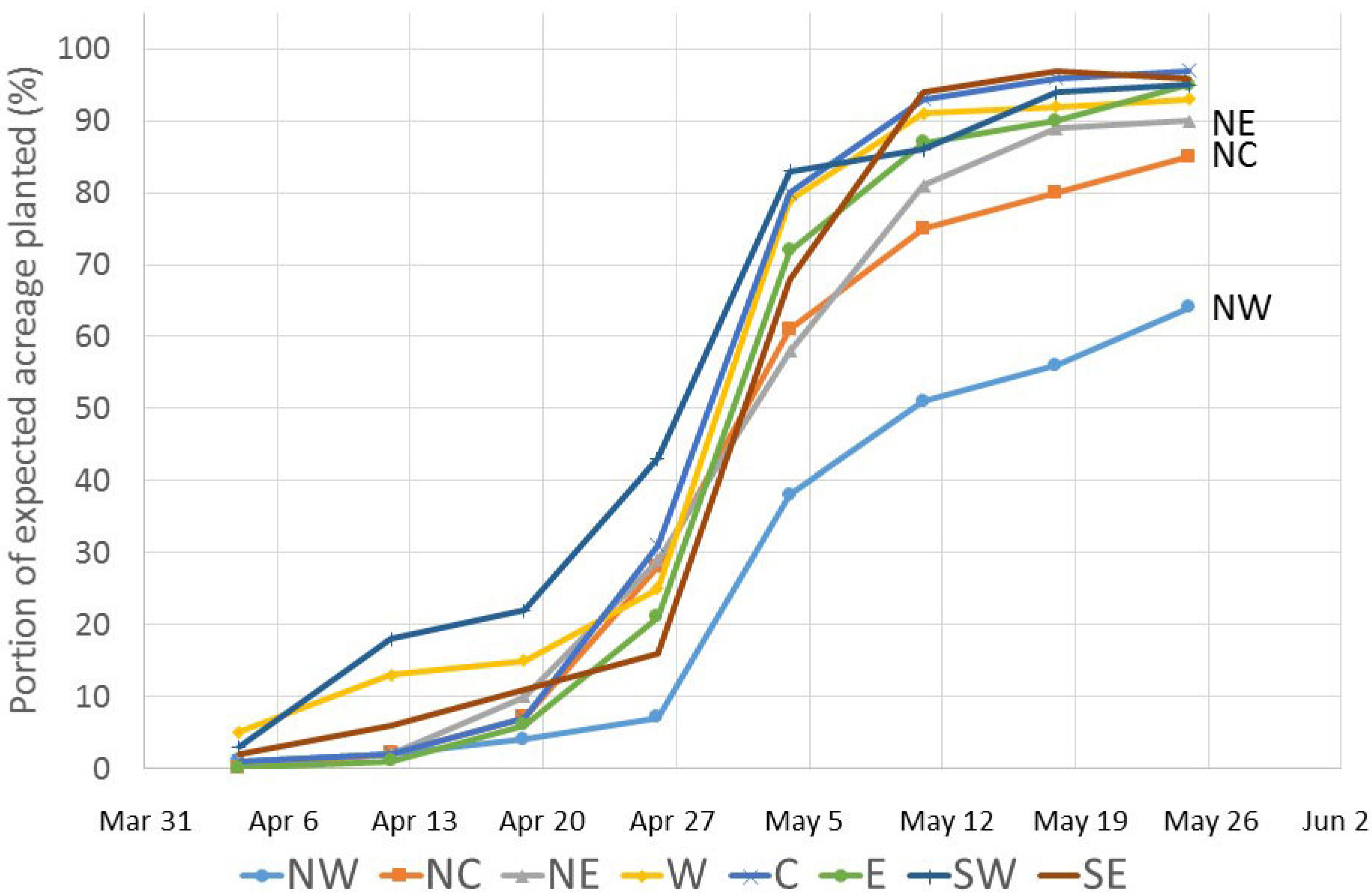
Because velvetleaf leaves droop extensively from late evening until early morning, the most effective herbicide applications will occur during the middle portion of the day when the maximum amount of velvetleaf surface area will come into contact with the herbicide.

To read more about velveltleaf or check out other common Missouri weeds, visit our Web site: weedid.missouri.edu

[1]Spencer NR. (1984) Economic Botany 38(4): 407-416.
[2]USDA Plants Database: plants.usda.gov
[3]Oliver LR. (1979) Weed Science 27(2): 183-188.

Delayed Corn Planting Affects Crop Management Decisions

by Bill Wiebold



Source: USDA/NASS

The latest USDA report on planting progress (May 26) shows that about 15% of the planned corn acres in Missouri have not been planted. This is almost 500,000 acres. Most of these acres are located in northwest Missouri. The USDA report suggests that only 64% of the anticipated corn acres have been planted in the NW Missouri crop reporting district.

Frequent rains have slowed corn planting in nearly all of Missouri, but most locations were able to plant a majority of anticipated corn acres before the latest string of rain days. Figure 1 shows corn planting progress in eight Missouri USDA/NASS crop reporting districts from early April through late May. NW and NC districts clearly lag behind other districts for corn planting progress.

Farmers that have not completed corn planting may be considering switching from corn to soybean or keeping corn, but switching to an earlier hybrid. Both of these decisions can be complicated and depend on yield and other information that are imprecise estimates and highly dependent on weather conditions the crops experience throughout the rest of the growing season.

Yield predictions are an important part of any decision. I have conducted planting date trials for corn and soybean for at least six years. Multiple years are important because the response to planting date differs among the years. Part of the variation in response is because weather during July and August highly influence corn and soybean yields. Weather in those months cannot be predicted very well. So, we can only offer average responses. On average, yield when corn was planted on June 1 in central Missouri is 22% less than when planted on the optimum date. But, soybean yield is also affected by planting date. On average, yields of soybean planted on June 1 are 10% less than when soybean planted on the optimum date.

One consideration that faces many Midwestern farmers, but may be less important in Missouri is timing of black layer relative to frost. Black layer is an important stage when making planting

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date decisions because that is physiological maturity of the corn plant. At physiological maturity, corn kernels stop accumulating weight. Grain moisture is about 32%, so much drying needs to occur before harvest, but full yield has been reached.

Unlike soybean plants, which are highly sensitive to photoperiod, development and maturity timing of corn plants is controlled primarily by temperature and the accumulation of heat units. Growing degree days (GDD) are calculated using a simple formula that uses high and low temperatures of each day during the growing season (see http://plantsci.missouri.edu/grains/corn/calculator/about.cfm for more information).

I have a corn maturity calculator located at http://plantsci.missouri.edu/grains/corn/calculator/, but a more powerful model is located at https://mygeohub.org/groups/u2u/gdd. My calculator only estimates silking and black layer dates, whereas the U to U site also displays various freeze date scenarios. The site allows you to change parameters and see the effects of these changes on growing degree day (GDD) accumulation and black layer date.

Models are important and highly useful decision tools, but no model can take into account all the intricacies of a living plant and Mother Nature. Plant response to temperature is controlled by genes, so hybrids probably differ somewhat for their responses. Other factors such as photoperiod, the distribution of temperature throughout the 24-hour day, changing sensitivity with development stages may modify the actual response from what a model predicts.

Daily high and low temperatures decrease rapidly during October in north Missouri. For example, average high temperature decreases from 72F on October 1 to 59F on October 31 (Maryville, Nodaway County). Average GDD for October 1 is 11, but only 4 for October 31. The U to U web site provides ranges of calendar dates for black layer formation. These ranges are broad because relatively small changes in temperature can have a large effect on the predicted calendar date for black layer. This uncertainty adds to the complexity of making cropping decisions.

Farmers will also differ in their acceptance of risk. Both my corn calculator and the U to U provide estimated black layer dates if "normal" temperatures occur for the rest of the year – a situation not likely to happen. Individual farmers must determine if a 50% chance of frost before black layer is acceptable or is the acceptable risk closer to 10%. The U to U web site uses 30 years of weather data to calculate black layer dates. The range in black layer dates is often more than a month. Determining acceptable risk is an essential (but stressful) part of making cropping decisions.

Bob Nielsen, Purdue University, describes a "wrinkle" (his word) in the concept of GDD accumulation and timing of black layer stage of development (http://www.agry.purdue.edu/ext/corn/news/timeless/HybridMaturityDelayedPlant.html). He reports that corn hybrids require fewer GDDs to reach black layer when planted on June I than when planted on May 1. If true, this is good news for farmers that have corn acers to plant. Dr. Nielsen's disclaimers are appropriate considerations. He reminds us that "hybrids undoubtedly vary in their GDD response to delayed planting" and "GDD response to delayed planting in other parts of the country may differ from what we have documented in the eastern Corn Belt".

So where does that leave us, besides confused or with a headache? My estimation is the farmers in north Missouri should continue with corn until at least June 1. For farmers in central Missouri that date may be June 10, or later. Please remember that my estimation is based on average weather and local conditions will likely differ from average. Those differences are just as likely to be helpful as harmful, but the risk of frost before corn maturity is a possibility – a risk that increases as planting is further delayed.

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 (and this year even late 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 later than last year because of usually wet conditions across most of the state. The unusual fluctuations in air temperatures and soil temperatures further impact corn germination and emergence as well as seedling vigor and thus impact the amount of seed decay, seedling blight and crown rot which may occur.

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 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

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continued from page 8, Seed Decay and Seedling Blights of Corn.

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.

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 May 26, 2015, "soybeans were 20 percent planted, compared to 57 percent for the previous year and 43 percent for the 5-year average". Emergence appears to be slow and uneven in the few planted fields due to cool, wet conditions

Because weather is a key factor this season, soil-borne pathogens may be contributing to some of the uneven stands and poor vigor in seedlings and may continue to be a problem. 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 comprised 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 (50-550F), wet soils.

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

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.

Wheat Disease Update

by Laura Sweets

The majority of the winter wheat in Missouri is well past flowering so it is too late to be considering fungicide applications. But the recent spell of alternating warm drier weather with cool, wet weather has led to the development or increase in some wheat diseases. It is still important to check wheat fields and note which varieties are showing high levels of stripe rust, Fusarium head blight or other diseases and which are showing better resistance to these diseases for future planning.

The foliage disease which seems to be of most concern is stripe rust. There are been scattered reports of Septoria leaf blotch and leaf rust. Although we haven't received many reports or samples of diseased wheat heads yet, the weather has certainly been favorable for the development of Fusarium head blight, Stagonospora glume blotch and bacterial black chaff.

Stripe rust, caused by the fungus Puccinia striiformis, has become more prevalent in Missouri over the last few years. Stripe rust may develop earlier in the season than leaf rust or stem rust. The pustules of stripe rust are yellow or yellowish-red and occur in obvious stripes or streaks running lengthwise on the wheat leaves. This disease is more commonly associated with cooler temperatures, especially cooler night temperatures. The stripe rust pathogen does not survive in infested residue left in a field. Rather, stripe rust is reintroduced into this area each season when spores are carried up on air currents from the southern United States. Following reports of stripe rust development in southern states or southern portions of Missouri may be helpful in making the decision to apply a foliar fungicide for stripe rust management.

Fusarium head blight or Scab: Fusarium head blight or scab of wheat develops on plants in the flowering to early grain fill stages of growth. 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 next several weeks will determine the extent and severity of scab in this year's wheat crop. Fusarium head blight or scab problems will be more severe if rains coincide with flowering of wheat fields. If the rain continues as the crop moves through the flowering stages, the risk for scab will increase.

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. The susceptibility or resistance of the variety to Fusarium head blight will have an effect on how much of the head develops symptoms. On susceptible varieties, initial infection may be confined to several spikelets but if weather conditions remain favorable, the entire head may eventually be infected. Varieties with more resistance may only have individual spikelets showing symptoms.

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 and residue management are preventative measures for managing scab in wheat. At this point in the season the only remaining management option would the application of a fungicide to try to reduce scab levels. The fungicide table in this issue of the Integrated Pest & Crop Management Newsletter lists the fungicides labeled for the suppression of Fusarium head blight or scab. Growers should be scouting fields to get a feel for incidence and severity of scab in this year's wheat crop. Because of possible mycotoxin concerns and seed quality concerns, grain from fields with scab may require special handling. Wheat planted on corn, sorghum or wheat residue (even wheat double cropped with soybeans) has a greater risk for scab.

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Other Head Diseases of Winter Wheat:

From flowering through the early stages of grain fill is also the time to scout for other head diseases of wheat such as loose smut, Septoria and Stagnospora infections on heads, bacterial stripe and black chaff on heads and take-all.

Loose smut is 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 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. Spores produced on smutted heads are wind carried to adjacent plants in the field and infect through the flowers. The fungus that causes loose smut survives within the embryo of wheat seeds. If infected seed is planted, the plants growing from those seeds will be infected and develop smutted heads the next season. If seed from a field that has a "small" amount of smut in one season is used for seed, the field planted with that seed may have a substantially higher level of smut. Loose smut is best controlled by planting either disease-free seed or using a systemic fungicide seed treatment.

Glume blotch: Septoria leaf blotch is present in the lower canopy of many fields this year. It hasn't seemed to move up in the canopy to the flag leaf or head but with increased precipitation and high humidity it could still develop on flag leaves and 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.

Weather Data for the Week Ending May 26, 2015

Station	County	Weekly Temperature (ºF)						Monthly Precipitation (in.)		Growing Degree Days‡	
		Avg. Max.	Avg. Min.	Extreme High	Extreme Low	Mean	Departure from long term avg.	April 1-29	Departure from long term avg.	Accumulated Since Apr 1	Departure from long term avg.
Corning	Atchison	70	53	81	39	61	-4	5.84	+2.07	520	+98
St. Joseph	Buchanan	68	53	78	43	60	-5	8.63	+4.55	509	+75
Brunswick	Carroll	71	55	81	44	63	-3	6.51	+2.15	630	+171
Albany	Gentry	69	52	78	42	60	-5	6.22	+2.15	481	+82
Auxvasse	Audrain	72	54	82	41	63	-2	4.59	+0.17	612	+143
Vandalia	Audrain	73	54	83	44	63	-2	4.21	-0.22	598	+171
Columbia-Bradford Research and Extension Center	Boone	72	54	82	42	62	-4	3.90	-0.52	593	+94
Columbia-Capen Park	Boone	75	53	87	41	63	-3	3.81	-0.74	602	+74
Columbia-Jefferson Farm and Gardens	Boone	72	54	82	42	62	-4	4.29	-0.12	623	+123
Columbia-Sanborn Field	Boone	73	55	84	44	63	-3	3.63	-0.90	677	+147
Columbia-South Farms	Boone	72	54	82	42	62	-4	4.39	-0.08	616	+116
Williamsburg	Callaway	73	54	83	43	63	-2	4.91	+0.72	615	+161
Novelty	Knox	72	52	80	39	62	-2	4.03	-0.30	527	+102
Mosow Mills Ninth Grade Center	Lincoln	74	56	84	45	65	0	3.74	-0.25	*	*
Linneus	Linn	70	52	79	40	61	-3	3.82	-0.57	540	+123
Monroe City	Monroe	73	53	82	42	63	-2	3.61	-0.59	583	+126
Versailles	Morgan	72	54	84	42	63	-4	4.92	+0.08	658	+110
Green Ridge	Pettis	69	54	81	45	61	-6	6.33	+2.15	590	+109
Putnam County R-1, Unionville	Putnam	69	52	76	41	61	-3	4.20	-0.74	*	*
Lamar	Barton	70	54	81	45	62	-6	6.54	+1.50	634	+68
Cook Station	Crawford	72	54	82	38	63	-4	4.81	+0.50	629	+68
Round Spring	Shannon	73	52	84	39	62	-4	2.79	-1.76	613	+90
Mountain Grove	Wright	71	52	79	38	61	-5	4.34	-0.04	567	+86
Delta	Cape Girardeau	72	56	83	45	64	-5	5.59	+1.03	698	+29
Cardwell	Dunklin	74	58	86	46	66	-6	5.53	+1.15	827	+41
Clarkton	Dunklin	73	56	86	44	65	-6	5.30	+1.49	780	+26
Glennonville	Dunklin	73	57	84	45	65	-6	5.45	+1.65	795	+38
Charleston	Mississippi	73	57	85	45	65	-5	4.78	+0.50	782	+108
Portageville-Delta Center	Pemiscot	74	58	85	47	66	-6	4.78	+0.73	842	+66
Portageville-Lee Farm	Pemiscot	75	58	86	45	66	-6	4.39	+0.27	843	+76
Steele	Pemiscot	74	58	87	46	66	-6	5.78	+1.04	821	+37

‡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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