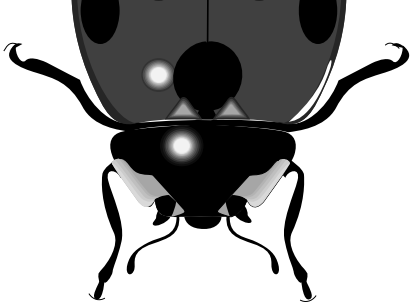

PEST MANAGEMENT & CROP DEVELOPMENT

BULLETIN

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In This Issue

INSECTS

Insects and Cool, Wet Weather—Abbreviated Comments

In issue no. 7 (May 10, 2002) of the *Bulletin,* I provided an overview of the effects of delayed planting on several insect pests of corn and soybeans. Sadly, not much has changed since that article was published, except temperatures have been even cooler! Corn and soybean planting has proceeded at a snail's pace in many areas of Illinois, and corn that has emerged is growing very slowly. The slow-growing corn has been a prime target for some subterranean insects, such as white grubs and wireworms, in some areas of the state. On the other hand, small corn plants are not going to be very supportive of rootworm larvae or very attractive to female European corn borers laying eggs for the first generation. For example, Ron Hines, senior research specialist at the University Dixon Springs Agricultural Center, is capturing European corn borer moths (as well as other species of moths), but there is very little corn available for the egg-laying females. Such a scenario suggests that populations of some of our major insect pests could be seriously reduced by the environmental conditions we have experienced this spring.

Keep the article from issue no. 7 (May 10, 2002) of the *Bulletin* handy for the near future when planting resumes in earnest. Understanding the complex relationship among crop growth stages, temperatures, rainfall, and insects could give you a heads-up for possible problems.—*Kevin Steffey*

Soil Degree-Days and Rootworm Development

The words "degree-day accumulations" don't mean much when temperatures are abnormally cool for this time of year. No self-respecting, cold-blooded insect is going to develop much under these conditions. Figure 1 shows actual soil degree-day accumulations (base 52ºF), at the 4-inch level, from January 1 through May 20, 2002. If you compare this map with the one published as Figure 1 in issue no. 8 (May 17, 2002) of the *Bulletin,* you won't notice much of a difference. Although we suspect that rootworm larvae have hatched in southern Illinois and have begun hatching in central Illinois, no one has reported finding them yet. (There was one report of a rootworm larva observed doing a prothorax stroke [insect equivalent of a breaststroke] in a ponded field in Champaign County, but the report has not been verified.)

We should begin to learn whether rootworm larvae will have an impact on small corn plants very soon. If the excessive rains have been good for anything, we can at least hope that rootworm larvae have hatched into saturated soils and have died.—*Kevin Steffey*

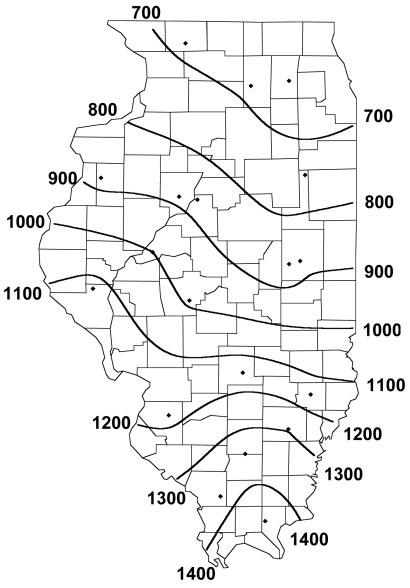

Figure 1. Actual soil degree-day accumulations (base 52ºF), at the 4-inch level, from January 1 through May 20, 2002. (Map courtesy of Bob Scott, Illinois State Water Survey.)

Stalk Borers Could Be Moving Into Cornfields in Some Areas

It seems almost silly to talk about stalk borers under the circumstances, but many farmers in northern counties, where quite a bit of corn has been planted, have had enough experience with stalk borers to know that watchfulness is worthwhile. Although stalk borers can be very difficult to manage, timely field scouting can forestall significant problems.

Life history of stalk borers. Stalk borers usually have a close relationship with weeds, in and around cornfields. In late summer, female adults deposit eggs on suitable grasses, such as smooth brome grass, quackgrass, orchardgrass, woolly cupgrass, and wirestem muhly, and on some broadleaf weeds such as giant ragweed. The eggs overwinter on weed hosts. Fencerows infested with these weeds are excellent sites from which stalk borer larvae can move into adjacent rows of corn.

Larvae hatch from overwintering eggs in late April and early May. Newly hatched larvae tunnel into aboveground stems, usually of grasses. Older larvae outgrow the grass stems and crawl to nearby larger-stemmed host plants such as corn.

Stalk borer larvae develop through 7 to 10 instars and actively feed for 8 to 10 weeks. Older larvae feed on many secondary hosts (an estimated 176 plant species), including many weeds. Weeds with larger stems, such as giant ragweed, cocklebur, giant burr-elder, docks, and burdock, can support fully grown stalk borer larvae. After the larvae finish feeding, they pupate within host stems or in cells in the soil. Adults begin emerging in late August; peak emergence occurs during the first 2 weeks of September. The adults mate, shortly after which females seek hosts for oviposition. Stalk borers complete one generation each year.

Description. Larvae are 1 1/2 to 1 3/4 inches long, depending upon instar. (Small instars are very small, rendering them difficult to find.) Although newly hatched larvae may appear to be brown, they are purple to black with five longitudinal white stripes (one on top, two on each side) broken by a purple band encircling the body just behind the legs. The last instar is dirty gray or whitish and may be more difficult to identify as a stalk borer.

Injury to corn. Stalk borers injure corn plants in two ways. If a larva enters the plant through the lower portion of the stalk and tunnels upward, its feeding injures the growing point, often resulting in dead heart—the center leaves discolor, wilt, and die. A larva that enters through the top of the plant tunnels downward into the stalk. Injury first appears on newly emerging leaves, which may be cut off or have ragged holes that increase in size as the leaves expand. Later, the growth of the tassel may be affected, and the upper part of the plant may be deformed.

S*couting for stalk borers.* Start watching for stalk borers when the larvae outgrow their initial host plants (typically weeds along field margins or in waterways) and begin to crawl to nearby corn. This movement takes place over several weeks. We can estimate the movement of stalk borer larvae by accumulating degree-days above a base temperature of 41°F. Stalk borers first begin to move into corn when about 1,100 degree-days have accumulated from January 1; 50% movement occurs when about 1,400 to 1,700 degree-days have accumulated. We recommend scouting when 1,300 to 1,400 degree-days have accumulated, and a decision to treat with an insecticide should be made when 1,400 to 1,700 degree-days have accumulated.

Figure 2 shows actual heat-unit accumulations (base 41°F), from January 1 through May 20, 2002. Initial movement of stalk borers may be under way in the southern one-third of the state. Fifty percent movement may have just begun in the extreme southern tip of Illinois.

Management of stalk borers. Probably the best way to manage stalk borers is to eliminate their oviposition sites

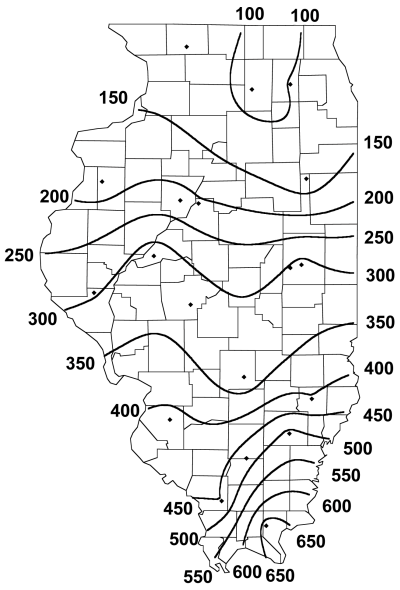

Figure 2. Actual degree-day accumulations (base 41ºF) from January 1 through May 20, 2002. (Map courtesy of Bob Scott, Illinois State Water Survey.)

before late summer. Obviously good weed control within a field reduces the potential for stalk borers to become established within the field. Burning or mowing grassy field edges also may reduce egg-laying sites, but the drawbacks (e.g., potential erosion, destruction of wildlife habitat) may outweigh the benefits. Consequently, many farmers rely on insecticides applied when they begin to notice stalk borers feeding on corn plants along the edges of fields. (Refer to degree-day information in the preceding paragraphs.)

I will provide economic thresholds and insecticide recommendations in next week's issue of the *Bulletin*. In the meantime, keep your eye on field edges that may begin to show the first signs of the presence of stalk borers.—*Kevin Steffey*

A Few Insect "Thumbnail" Reports

In this strange season, maybe a few "thumbnail" reports of insects are all we need. Most farmers have a lot more pressing issues on their minds. So, here's a quick overview of a few reports I have received:

- Check out "The Hines Report" (http://www.ipm.uiuc.edu/publications/hines-report/) for information about captures of armyworms, European corn borers, southwestern corn borers, and other moths. Ron continues to record "intense captures" of black cutworms, indicating that moths are still arriving on storm fronts passing through. However, reports of black cutworm problems are few and far between.
- White grubs are the subjects of most reports of insect damage in corn. Japanese beetle grubs have been particularly troublesome this year. Again, I remind you that there are no effective "rescue" treatments for white grubs. Chris DiFonzo, Extension entomologist at Michigan State University, wrote a nice piece about identification of different grub species in Michigan in the May 16, 2002, issue of MSU's *Crop Advisory Alert*. You can find the article at http://www.msue.msu.edu/ipm/CAT02_fld/FC5-16-02.htm#2. Make certain you click on the links to the color fact sheet she has prepared. She arranged a nice series of white grub butts for your viewing pleasure.
- Although alfalfa weevils are still active, *Zoophthora phytonomi* epizootics seem to be wiping out weevil populations in many areas. Nevertheless, continue to scout for these pests in central and northern Illinois. I have received a couple of reports of "resurging" weevil problems—probably leftovers, but some larvae may be late hatchers from spring-deposited eggs.
- Matt Montgomery, Sangamon/Menard Extension unit educator in crop systems, has found a few potato leafhoppers in alfalfa. It's not surprising that they're here; they take advantage of weather systems, too. As most alfalfa growers know, shortly after alfalfa weevils let up, potato leafhoppers start to take over. I'll provide more information about potato leafhoppers in future issues of the *Bulletin*.

Don't hesitate to contact me if you find something that can be shared with others. Sometimes even the tiniest bit of information can be remarkably helpful.—*Kevin Steffey*

PLANT DISEASES

Scab of Winter Wheat

The very wet weather has kept many of you from slogging through the fields on wheat scouting missions; however, the weather has been very good for scab to develop. Myself, I have not slogged through any fields this week, either, but now is the time to look for head scab in fields.

Scab (also called head scab or head blight) is caused by fungi in the genus *Fusarium*. Principally, the pathogens are *Fusarium graminearum, F. avenaceum, F. culmorum,* and *F. nivale*. These Fusarium species are all asexual forms that produce only conidia. The sexual stage is known as *Gibberella zeae*. Scab-infected wheat seed that is planted may develop root rot, as well. These Fusarium fungi are ubiquitous and can, unfortunately, also cause a seedling blight and stalk, ear, and root rot of corn.

Symptoms

Typical symptoms of scab infection occur soon after flowering. Spikelets appear bleached, with a light straw color, and will ripen prematurely. The heads may be sterile, or, if kernels are produced, the berry will be small, shriveled, and off color. You will see the typical white, bleached, scabbed heads scattered throughout a field. The Fusarium spores are produced during warm, wet weather and only infect wheat flowers that are blooming. So, it is not unusual to see only half of a wheat head infected or scattered spikelets on a head infected. It is just dependent on the blooming pattern of the wheat variety and the presence of the spores. If you carefully examine the bases of the glumes on an infected head, you may see the diagnostic pink-to-salmon-colored Fusarium mycelium.

Disease Cycle

Scab fungi survive and reproduce in and on the soil as spores and mycelium, or in sexual fruiting structures (perithecia). The asexual spores (conidia) are produced during warm, moist weather. The sexual spores (ascospores), produced in the perithecia, are discharged into the air during warm, moist weather in the spring and early summer. Wind and splashing rain carry the ascospores and conidia to the wheat spikelets. The spores germinate in a film of moisture and first invade the flower parts. Infections are most frequent and serious at anthesis. Scab symptoms will develop within 3 days after infection, when temperatures range between 77º and 86ºF and moisture is continuous.

Planting scab-infected seed generally results in very poor stands. Scabby kernels are often dead or else germinate weakly. If a sprout manages to emerge from the soil, it frequently decays before it can become established.

Wheat seedlings may also be infected. These infections result primarily from seedborne mycelium and spores. When the soil temperature is above 60ºF, seedlings from clean seed may also become infected from mycelium in decaying crop residues on or in the soil. Note that head infections occur independently of seedling blight and root rot because the fungus cannot grow for any distance within the cereal plant.

Mycotoxins

The growth of the Fusarium fungi in infected grain produces serious mycotoxins that cause muscle spasms, acute vomiting, nausea, dizziness, diarrhea, and soreness in humans, young chickens and ducklings, pigs, dogs, horses, and other nonruminant animals with simple stomachs. In swine feed, 3% or more of scabby grain causes vomiting, and then the swine refuse to eat the mixture. Cattle, sheep, and mature poultry (except pigeons) do not react to scabbed grain. Because one of the mycotoxins involved has some estrogenic activity, scabby grain should not be fed to breeding animals. The mycotoxins apparently remain stable for years in stored grain.

Heavily scabbed wheat kernels are generally very lightweight and easily removed by modern cleaning equipment. In other words, turn the blower up on the combine.

University Recommendations for Management of Scab

1. Rotate small grains and corn with legumes, allowing at least a one-year break in cereal, grass, or corn cultivation. Plant small grains as far as possible from old cornfields.

2. Sow only plump, small-grain seed that has been thoroughly cleaned to eliminate all lightweight seed and then treated with a protective, broad-spectrum fungicide or fungicide mixture. Proper seed treatment controls seedling damage from infected seed but will not control the head-blight or scab, foot-rot, and stem-blight phases of the disease.

3. Sow adapted and recommended small-grain varieties in a fertile, well-prepared seedbed.

4. Delay the sowing of winter cereal grains until the temperature is 60ºF or below, to reduce the chances of severe seedling blight. Sowing spring cereal grains early tends to reduce losses from seedling blight, crown rot, and head blight.

5. Where feasible, plow under cleanly and deeply all infected stubble debris and straw of small grains and weed grasses, cornstalks, and rotted ears. Complete coverage of crop residues helps reduce head-blight infections. Sanitation is most effective when it is done on a communitywide basis. Manure containing infected straw or cornstalks should not be used for top dressing.

6. No highly resistant varieties of wheat, oats, barley, or rye are available. Some varieties are infected less frequently, apparently due to physical barriers to the infection of florets and spikelets. Not all differences in the incidence of head blight among wheat or barley varieties growing in adjacent fields are genetically based. The time of anthesis and prevailing weather conditions at flowering can also influence the development of scab.

7. Store grain at a moisture level of less than 14% to prevent the growth of the fungus and the possible production of additional mycotoxins.—*Suzanne Bissonnette*

Soybean Cyst Nematode HG-Type Test

Everyone who has soybean cyst nematode (SCN) knows that there are many good SCN-resistant varieties available. Everyone has also heard horror stories of resistant varieties that didn't work. Believe it or not, it is possible for a resistant variety to have good resistance that fails in certain fields.

There are two main explanations for "resistance failure." First, if you grow the same resistant variety two or more times in a row (even with corn in between soybean seasons), you may have selected a nematode population that is adapted to that variety. Second, if you have extremely high numbers of SCN, they will cause yield loss in resistant varieties.

You can protect the useful life of resistant varieties by making sure you don't plant the same variety in the same field. With so many varieties to choose from (see, for example, http://www.cropsci.uiuc.edu/vt/), you shouldn't have much trouble finding alternatives. If you have extremely high numbers of SCN (say, more than 10,000 eggs/250 cm^2 soil), the best thing to do is to plant a nonhost (such as corn).

If you don't have extremely high numbers of SCN and you haven't used the same resistant varieties in the same field, then you might have a population of SCN that is *virulent* (causes disease) on certain resistant varieties. Since 1970, we have identified virulent populations of SCN in terms of a "race test." Race 3 SCN was essentially *avirulent* (unable to cause disease) on resistant varieties, whereas the other common races in Illinois—races 1 and 5—were virulent on some resistant varieties.

The SCN race test will soon be replaced by a new test, called the HG-type test (HG is for *Heterodera glycines,* the scientific name for soybean cyst nematode), developed by agronomists, nematologists, plant pathologists, and soybean breeders.

An HG-type test is a greenhouse test performed on an SCN population isolated from a field to determine how well the SCN population can reproduce on various sources of resistance used in developing SCN-resistant

soybean varieties. The test is similar to the old race test, except that the old test used three sources of resistance and the new test uses seven, giving us a lot more information about SCN populations. We call these seven soybean lines "indicator lines" because they indicate the virulence characteristics of the SCN population.

To determine the HG type of an SCN population, the nematode population from the field of interest is grown on the seven indicator lines under controlled conditions. After 30 days, enough time for a single generation of the nematode, the numbers of SCN females that form on the roots of each indicator line are counted and compared to the number of females that formed on a standard susceptible soybean variety. Finally, we note which indicator lines show elevated SCN numbers. Armed with this knowledge, we can recommend resistant soybean varieties that have effective resistance to the SCN population that is present in the field.

The HG-type test will become "legal" when it is published later this summer in a scientific journal. Until that time, the old race test will continue to be the standard for testing SCN virulence in most places. Seed companies will probably not incorporate information relating to HG types in their variety descriptions until after the test is published and the companies have time to determine how to deal with it. Expect to begin to see information on HG types later in 2002.

Do you need an HG-type test? Probably not. Most recommendations can be based on the number of SCN in the field and the field history. But if you think you need one or want more information, contact nematologist Terry Niblack, tniblack@uiuc.edu, (217)244-5940.—*Terry Niblack*

Diseases of Corn Seed and Seedlings

In the areas of Illinois where corn has been planted and is growing, many of the seedlings appear yellow, stressed, and stunted. In most fields this is due to the obvious environmental stresses that have plagued Illinois recently: the frequent rain, wet soils, and cool temperatures. Stress caused by these conditions (if not excessive) should readily disappear when warm and drier conditions return. However, seed and seedling diseases may also cause the yellow and stunted appearance. Disease is likely to be a minor problem compared to environmental stresses in most areas, but it may be important in some fields. Although most seed corn in Illinois is treated with fungicides to reduce problems with seed and seedling diseases, these chemicals have a limited time of efficacy (probably in the range of 14 to 24 days after planting depending on soil conditions). In some cases the cool temperatures and saturated conditions may have created a situation where the seedlings are very small and susceptible and have minimal protection remaining from the seed treatments. This article briefly describes some of the pathogens and diseases that may affect seedling corn.

Most corn seed and seedling diseases have several common generalized effects. Plants may fail to emerge due to seed rot or preemergence damping-off; growth may be slow, resulting in stunted plants; plants may appear yellow; wilting may occur; and plants may collapse due to postemergence damping-off. In some cases, infection may cause damage that persists into the growing season.

It can be difficult to distinguish environmental stress from some disease damage, but symptoms can help deduce whether pathogens are causing problems. Here is a list of symptoms that may indicate problems with corn seed or seedling disease in a field. Symptoms of seed and root infections include rotted seed; rotted seedlings (preemergence damping-off); leaf tip necrosis; stunting (sometimes with a mixture of short and tall plants); yellowing-reddening of older leaves; roots that are rotted, pruned-off, and discolored with firm or soft, brown-reddish to gray lesions or decay; poorly developed root systems; soft and discolored coeleoptile; leaf tip necrosis in streaks or patches; wilting seedlings; and discolored sunken and soft lesions on mesocotyl. Symptoms of foliar seedling infections include round to elliptical tan spots on leaves (holcus spot); necrotic, wavy necrotic streaks on leaves (Stewart's wilt); and oval lesions on seedling leaves (anthracnose).

A number of different pathogens can cause one or more of the symptoms of seed and seedling disease. Some of the more common genera of fungi or fungal-like organisms are *Pythium, Fusarium, Rhizoctonia, Diplodia (Stenocarpella), Colletotrichum,* and *Penicillium*. Their importance will depend in part on crop rotation, location, and soil conditions. *Pythium* is a widespread soil fungal-like pathogen that causes seed rot and seedling infections, and is favored by wet and cool soil conditions. *Erwinia (Pantoea)*, which causes Stewart's wilt (see the article in a previous 2002 edition of this newsletter), and *Pseudomonas*, which causes holcus spot, are two bacterial pathogens that can infect corn seedlings. Nematodes also may affect corn seedlings in some areas (see the article in a previous 2002 edition of this newsletter).

Various conditions, factors, and cultural practices favor infection by these pathogens. The following list is not complete, but covers common problems. Favorable factors include poor seed quality (such as cracked seed and infected seed), soil temperatures at planting below 50° to 55°F, wet soil conditions, soil compaction, slow emergence and growth, fertilizer burn, improper use of pesticides, injury from herbicides, soil crusting, high temperatures (*Penicillium* seedling blight—not a problem yet this year!), high populations of flea beetles (Stewart's wilt), and sandy soils (nematodes). The obvious theme here is a combination of conditions that favor the pathogens and stress the corn seed and seedlings.

Table 1. Maximum grass and corn sizes for postemergence grass herbicides in corn.

		Annual grasses										*Perennials*					
Herbicide	*Rate /A*	*Barnyardgrass*	*Corn, volunteer*[a]	*Crabgrass*	*Cupgrass, woolly*	*Foxtail, giant*	*Foxtail, yellow*	*Panicum, fall*	*Sandbur*	*Shattercane*	*Signalgrass, broadleaf*	*Johnsongrass, seedling*	*Johnsongrass*	*Quackgrass*	*Yellow nutsedge*	*Wirestem muhly*	*Corn size (over-the-top applications)*
		Maximum grass, nutsedge, and corn heights are in inches															
Accent	2/3 oz	4	-	-	4	4	4	4	3	12	2	12	18	10	-	-	20
Accent Gold	2.9 oz	3	-	1	1*	3	3	3	2	6*	-	8	-	8*	2*	-	12
Basis	1/3 oz	2	-	-	1*	2	2	2	-	4*	-	-	-	-	-	-	6
Basis Gold	14 oz	3	-	1	1*	3	3	3	2	6*	2	8	-	8*	2*	-	12
Beacon	0.76 oz	-	-	-	-	2*	2*	2	4*	12	-	12	16	8	4*	-	20
Callisto	3.0 fl oz	-	-	2	-	-	-	-	-	-	- -	-	-	-	-	-	30
Celebrity Plus	4.7 oz	4	-	-	4	4	4	4	3	12	2	12	18	10	-	-	24
NorthStar	5.0 oz	-	-	-	-	3*	3*	3*	4*	12	-	12*	16*	8*	4*	-	20
Option	1.5 oz	4	-	2	2	3	3	3	2	12	2	16	16	10	-	10	16
Spirit	1.0 oz	-	-	-	-	-	3*	-	-	12	-	12*	16*	8*	-	-	20
Steadfast	0.75 oz	4	-	1	3	4	4	4	2	6	2	8	-	8	2*	-	12
Herbicides require specially designated corn hybrids (herbicide-resistant hybrids)																	
Liberty	24 fl oz	*	*	*	4	3	*	2	*	*	2	2	-	-	-	-	24
(LL)	28 fl oz	3	10	3[b]	6	6	3[b]	3	*	6	4	6	*	-	-	-	
	34 fl oz	4	12	4[b]	8	8	4[b]	4	3[b]	8	5	8	*[c]	*[c]	-	*[c]	
Liberty ATZ	40 fl oz	*	*	3	6	4	2	2	*	6	3	4	-	-	-	-	12
(LL)	48 fl oz	2	10	3	8	4	3	3	*	8	4	6	*[c]	*[c]	-	*[c]	
Lightning (CL)	1.28 oz	3	12	3	3	6	3	3	1	8	8	8	8*	3*	3*	-	20
glyphosate	0.56 lb ae	6	20	18	12	18+	18+	12	12+	18	5	18	-	-	-	-	30
(RR)	0.75 lb ae	12	20+	18+	12+	18+	18+	18	12+	18+	7	18+	12	8	6	>8	
ReadyMaster ATZ	2.0 qt	2	-	2	4	4	4	2	4	2	2	4	4	4	-	4	12
(RR)																	

- = size not listed on the label.
* Suppression or partial control.
[a] Volunteer corn that is not resistant to the herbicide.
[b] Prior to tillering.
[c] Sequential application of 28 fl oz Liberty provides control.

Fortunately, in most normal springs, seed and seedling diseases cause minimal damage in most fields in Illinois. Other than using fungicidal seed treatments, no special management tactics need be put into effect. Most management tactics are obvious from the list above: follow good agronomic practices and try to avoid those conditions and factors that favor seed and seedling diseases. In addition, crop rotation and practices that minimize corn residue may be of value. As noted, most seed corn in Illinois is treated with fungicides. The treatments used have distinct efficacies against various pathogens. The primary fungicidal seed treatments used are of two main groups. The first group targets *Pythium;* some examples are ApronXL, Allegiance, and Apron. The second group targets the true fungi (all other fungal genera listed above); two examples are Captan and Maxim. Other products may also be available that offer similar efficacy, and products are available as mixtures of the active ingredients from both of these fungicidal groups.—*Dean Malvick*

WEEDS

Options for Postemergence Grass Control in Corn

In the next couple of weeks, grass control in corn could be a major challenge for some producers in the state. Fields where postemergence grass control measures may need to be taken are fields where a soil-applied grass herbicide may have been on for a number of weeks prior to planting or may have failed due to excessive precipitation. Additionally, there also have been a number of corn acres planted that have not received a soil-applied grass application due to untimely rains. In these situations, what options do we have for postemergence grass control in corn? There are currently a number of herbicides that are available to control grasses in these situations. Some of these options require the use of a special corn hybrid, such as Roundup Ready (RR), Liberty Link (LL), or Clearfield (CL). Other products, such as Accent, Accent Gold, Basis, Basis Gold, Celebrity Plus, Option, Steadfast, and atrazine, do not require the use of a special corn hybrid. When making a decision on what postemergence grass control option you may want to use, there are a number of things you need to consider.

The first question to ask is "What type of corn hybrid did I plant?" If a herbicide-resistant crop wasn't planted, whether it be a Roundup Ready, Liberty Link, or a Clearfield hybrid, it narrows your options to using only herbicides that do not require the use of a herbicide-resistant/-tolerant hybrid. These options generally consist of products that contain one of three sulfonylurea active ingredients: the active ingredient nicosulfuron (Accent), the active ingredient primisulfuron (Beacon), or the new active ingredient foramsulfuron (Option). These active ingredients are ALS-inhibiting herbicides and will not control grass species that are resistant to this class of herbicides. As mentioned in issue no. 7 of the *Bulletin,* there are some isolated incidences of ALS-resistant shattercane in certain areas of Illinois.

Another question that needs to be asked is "What are the grass species that I am trying to control and what sizes are they?" Atrazine plus crop oil controls a number of grass weed species, as long as they are less than 1.5 inches in height. The herbicide Basis provides control of foxtails, barnyardgrass, and fall panicum 2 inches in height or less. Other grass herbicides control grasses ranging up to 20 inches in height, depending on the herbicide and target grass species. A complete listing of the postemergence grass herbicides and maximum grass heights for these herbicides can be found in Table 1.

Along with knowing the size of the target grass species, it is important to realize that there are maximum corn heights that are listed for many of these herbicides. If these corn heights or stages are exceeded, a number of these herbicides can cause significant corn injury that may result in a reduction in yield. These corn heights should be monitored carefully. For example, the herbicides Accent Gold and Basis Gold may be applied to corn up to 12 inches tall or at the V6 stage, whichever is more restrictive. Table 1 lists the maximum corn heights to which these herbicides can be applied. Remember that a number of these herbicides also have maximum leaf stages also listed on their labels that may be more restrictive.

Another important consideration is the environmental conditions at the time of the postemergence application. Over the last week, we have seen some extremely cool temperatures, especially in the evening. Many of these postemergence grass herbicides warn against applications in cooler weather. For example, the Accent label warns against applications made during or immediately following periods of large day/night temperature fluctuations or where temperatures do not exceed 50°F. Applications during these times may result in lack of weed control performance and also can cause crop injury. It is important to consult labels for these environmental precautions.

Finally, adjuvant selection is also very important when using these different herbicides for postemergence grass control. The appropriate adjuvant selection increases the activity of the herbicide on a particular weed species, as well as helps prevent injury to the crop. For example, the new herbicide Option requires the use of methylated seed oil (MSO) and a nitrogen source for maximum grass control. Adjuvant selection options can vary with the herbicide, tank-mix partner, and environmental conditions. Always consult the herbicide label for the appropriate adjuvant selection, and remember that these herbicides should not be applied in a liquid fertilizer carrier or severe corn injury can occur.—*Christy Sprague and Aaron Hager*

Table 2. Corn–sorghum herbicide recropping restrictions, months.

Herbicide[a]	Comments	Field corn	Sorghum	Wheat	Oats	Rye	Alfalfa	Clover	Soybeans
Acetochlor and its premixes									
Degree, Harness	acetochlor	AT	NY	4	2Y	2Y	2Y	2Y	NY
Degree Xtra, Harness Xtra 5.6L	w/atrazine	AT	NY	15	2Y	2Y	2Y	2Y	NY
DoublePlay	w/EPTC	AT	NY	4	2Y	2Y	2Y	2Y	NY
FulTime	w/atrazine	AT	NY	15	2Y	2Y	2Y	2Y	NY[b]
Surpass, TopNotch	acetochlor	AT	NY	4	2Y	2Y	2Y	2Y	NY
Atrazine and its premixes; simazine									
AAtrex, Atrazine	pH < 7.2	AT	AT	NY	2Y	NY	2Y	2Y	NY[b]
Bicep II Magnum	w/metolachlor	AT	AT[c]	NY	2Y	NY	2Y	2Y	NY[b]
Bicep Lite II Magnum	w/metolachlor	AT	AT[c]	NY	2Y	NY	2Y	2Y	NY[b]
Buctril + Atrazine	w/bromoxynil	AT	AT	NY	2Y	NY	2Y	2Y	NY
Bullet	w/alachlor	AT	AT[c]	NY	2Y	NY	2Y	2Y	NY[b]
Guardsman Max	w/dimethenamid-P	AT	AT[c]	NY	2Y	NY	2Y	2Y	NY[b]
Laddok S-12	w/bentazon	AT	AT	15	15	15	18	18	NY
LeadOff	w/dimethenamid	AT	AT[c]	NY	2Y	NY	2Y	2Y	NY[b]
Liberty ATZ	w/glufosinate	AT	AT	NY[b]	2Y	NY[b]	NY[b]	NY[b]	NY[b]
Marksman	w/dicamba	AT	AT	10	2Y	10	2Y	2Y	NY[b]
Princep, simazine	simazine	AT	NY	NY	2Y	NY	2Y	2Y	NY
ReadyMaster ATZ	w/glyphosate	AT	AT	NY	2Y	NY	2Y	2Y	NY[b]
Flumetsulam and its premixes; clopyralid									
Hornet WDG	w/clopyralid	AT	12	4	4	4	10.5	26[Fba]	10.5[e]
Python	flumetsulam	AT	12	4	4	4	4	26[Fba]	AT
Stinger	clopyralid	AT	10.5	AT	AT	AT	10.5	18	10.5[e]
Isoxaflutole, flufenacet, and premixes									
Balance PRO	isoxaflutole	AT	6	6	6	6	6	6	6
Epic	isoxaflutole + flufenacet	AT	12	12	12	12	12	12	6
Define	flufenacet	AT	12	12	12	12	12	12	AT
Axiom	flufenacet + metribuzin	AT	12	12	12	12	12	12	AT
Axiom AT	flufenacet + metribuzin + atrazine	AT	NY	2Y	2Y	2Y	2Y	2Y	NY?
Mesotrione									
Callisto	mesotrione	AT	NY	120d	120d	120d	NY	18	NY
Imazethapyr and its premixes									
Lightning	w/imazapyr	8.5[f]	18	4	18	4	9.5	40[Fba]	9.0
Pursuit	imazethapyr	8.5[f]	18	3	18	4	4	40[Fba]	AT
Pursuit Plus	w/pendimethalin	8.5	18	4	18	9.5	9.5	40[Fba]	AT
Sulfonylureas and their premixes									
Accent	nicosulfuron	AT	10[d]	4	8	4	10	10	0.5
Accent Gold	nicosulfuron + rimsulfuron + Hornet	AT	12	4	8	4	10.5	26[Fba]	10.5[e]
Basis	thifensulfuron + rimsulfuron	AT	10	4	8	18	10	18	0.5
Basis Gold	nicosulfuron + rimsulfuron + atrazine	AT	10	10	18	10	18	18	10[b]
Beacon	primisulfuron	0.5	8	3	8	3	8	18	8

Table 2. Corn–sorghum herbicide recropping restrictions, months (cont.).

Herbicide[a]	Comments	Field corn	Sorghum	Wheat	Oats	Rye	Alfalfa	Clover	Soybeans
Sulfonylureas and their premixes (cont.)									
Celebrity Plus	dicamba + nicosulfuron + diflufenzopyr	0.25	10[d]	4	8	4	12	12	4
NorthStar	primisulfuron + dicamba	0.5	8	3	8	3	8	18	8
Permit	halosulfuron	1	2	2	2	2	9	9	9
Spirit	primisulfuron + prosulfuron	1	10	3	3	3	18[g]	18[g]	10–18[h]
Steadfast	nicosulfuron + rimsulfuron	AT	10[d]	4	8	4	12	12	0.5
Others									
Aim	carfentrazone	30d	30d	30d	30d	30d	30d	30d	30d

[Fba] = field bioassay needed (see label); NY = next year; 2Y = second year; AT = anytime; d = days; NY? = Injury may occur if planted next spring.

[a]Other corn herbicides have no significant recropping restrictions, but Banvel, Clarity, Eradicane, and 2,4-D have replanting limits for soybeans.

[b]2Y (second year) if applied after June 10 with high atrazine or Liberty ATZ and after July 1 with Basis Gold.
[c]Concep or Screen seed protectant needed.
[d]18 months if pH ≥7.5.
[e]18 months if <15 inches of rainfall received *and* if soil has <2% organic matter.

[f]Clearfield (CL, formerly IMI) designated corn hybrids may be replanted anytime.

[g]Spirit: pH <7.8, applied before July 1, rainfall >12 inches within 5 months and >1 inch within 4 weeks of application.

[h]I-70 to I-80: Spirit 10 months. Above I-80: Spirit 18 months.

Corn Replanting and Herbicide Considerations

With each successive rain, the likelihood of having to replant corn increases. We would like to hope that replanting would need to occur only in small areas of a given field, but with many streams and ditches running over their banks this spring, entire fields may have to be replanted. While there are many agronomic considerations associated with replanting, some weed control/herbicide issues should also be considered.

Hybrid selection for the replanting operation should be taken into account, especially if the field has been previously treated with certain soil-applied or postemergence herbicides that require a particular herbicide-resistant/-tolerant corn hybrid. For example, if a Clearfield corn hybrid was initially planted and received a preemergence application of Pursuit Plus or has already been treated postemergence with Lightning, the replanted corn must also be a Clearfield hybrid. If a nonresistant/tolerant hybrid is replanted instead, the potential exists for the herbicide to cause a great deal of crop injury. If you initially planted a Roundup Ready corn hybrid and have areas that need to be replanted, either replant these areas with a Roundup Ready hybrid or take special precautions during the postemergence glyphosate application if you replant with a conventional hybrid.

Is there an interval between when a herbicide was applied and corn replanting? For soil-applied corn herbicides, replanting can proceed whenever field conditions are feasible. However, for a small number of postemergence corn herbicides, there are intervals between application and replanting. For example, if a cornfield previously treated with Spirit, NorthStar, Permit, or Yukon is lost due to excessive precipitation and must be replanted, there is a 4-week, 14-day, 1-month, and 1-month, respectively, interval that must elapse between the herbicide application and corn replanting.

While most soil-applied herbicides allow more than one application per season, a few can be applied only once per season. For example, the Epic label indicates that only one application per year can be made; Prowl can be used as a soil-applied or postemergence treatment, but if a previously treated corn crop must be replanted, do not make another application prior to replanting. In instances where small areas of a field will be replanted, some may elect to simply replant without applying any additional herbicide. If, however, you elect to make a second application of a particular corn herbicide, keep in mind that many product labels indicate a maximum per-acre rate that can be applied during one growing season. The maximum atrazine rate for combined soil-applied and postemergence applications that can be applied per acre per year is 2.5 pounds of active ingredient.

Rotating to Other Crops

For the time being, most producers with areas to replant will opt to replant

to corn, but as the season progresses and wet field conditions persist, others may switch to soybeans. If no corn herbicide has been applied, switching to soybeans can be done without having to worry about corn herbicide residues that may cause soybean injury. However, if a corn herbicide has been previously applied, the potential for soybean injury may exist. Table 2 is reproduced from the 2002 *Illinois Agricultural Pest Management Handbook* and provides label information with respect to corn herbicide recropping restrictions. Several people have already asked about switching to soybeans in fields that were treated previously with atrazine or an atrazine-containing premix. *Planting soybean in fields previously treated (this season) with atrazine is not recommended by the University of Illinois, and most labels of herbicides containing atrazine restrict planting soybean in fields where atrazine has been applied.*

However, from a practical standpoint, it's highly likely that some planting of soybean into atrazine-treated fields will occur. While (again) this is *not* a recommended procedure, some of the following practices are offered for consideration.

The persistence of triazine herbicides is strongly influenced by soil pH. As a general rule, as the soil pH increases, so too does the persistence of these herbicides. When soil pH values are 7.0 or greater, the dissipation of triazine herbicides is greatly reduced. So, before you switch to soybeans, it might be worthwhile to check the soil pH.

Anything that can be done to dilute the atrazine in the soil could prove beneficial. The easiest way to achieve this is through tillage. Tillage can help to reduce areas of high atrazine concentration in the soil so that the soybeans may not be exposed to zones of high concentration all at once. Is this strategy practical, given the currently wet conditions? If field conditions are suitable to plant, a tillage pass prior to planting may also be feasible.

Certain soybean varieties are more sensitive than others to the herbicide metribuzin (Sencor). It may also be beneficial to avoid planting metribuzin-sensitive soybean varieties into fields previously treated with atrazine. Contact your soybean seed representative to determine if the soybean variety you intend to plant is overly sensitive to metribuzin.

Along a similar line, producers may want to consider avoiding soybean herbicides containing metribuzin when planting soybeans into fields previously treated with atrazine. Metribuzin belongs to the same chemical family as atrazine, and the added effect of two triazine herbicides may be more than the soybeans can handle. Soybean herbicides containing metribuzin include Sencor, Canopy, Axiom, Boundary, and Domain.

Soybean seed size may also influence tolerance to atrazine. Early research suggests that planting large soybean seeds may be more beneficial than planting smaller seeds in fields treated with atrazine. The larger seed contains more stored food reserves for the seedling to survive on longer before relying on photosynthesis for its food supply.

Finally, producers may want to consider increasing the planting rate slightly to compensate for plants that may be lost due to the atrazine. The later into the growing season the soybean planting occurs, the higher the planting rate adjustment producers may want to consider making in order to capture as much sunlight as possible.

A similar scenario may unfold for cornfields that received a fall application of Princep (simazine). As with atrazine, soybeans can be severely injured by simazine residues, and simazine persistence increases with higher soil pH levels. If fields where a fall Princep application are "greening up" with weed species susceptible to simazine, it may be reasonable that the risk of soybean injury from simazine residues is less than if these species were not present.

There are many factors to consider when making replanting decisions. Planting soybeans in fields previously treated with certain corn herbicides is very risky, as soybeans are very sensitive to some of these herbicides. Many factors contribute to the availability of atrazine in the soil for plant uptake. Those factors that reduce the availability of atrazine can be beneficial for soybean survival. However, other factors (high soil pH) favor enhanced atrazine availability for plant uptake. At this time, it's not possible to predict which factors will predominate.—*Aaron Hager and Christy Sprague*

CROP DEVELOPMENT

Corn Still a Worry, Soybean's Turn Next

Travels this week took me to St. Louis and back, with a good look at the crop—or, rather lack of a crop—through a swath of south-central Illinois, both on and off the interstate. I saw only one field (in Shelby County) where planting was being done. Corn stands looked okay on the higher areas of fields, but almost every field with corn planted (and almost all planted corn was up since there has been little planting for 2 weeks or more) had areas drowned out. Corn all had poor color, due mostly to cool temperatures. That should improve slowly as temperatures return to more normal levels. So far in May, we've had barely more growing degree-days than we had in the month of April, so it's no mystery why the corn has not been growing very quickly. If we're lucky and the weather continues to be good during the next week, a lot of the remaining corn will be planted, though planting around wet areas in fields will be very common. According to the official estimates, there was no planting progress at all for the week ending May 19.

If planting can get under way at a good pace in most of the unplanted areas within the next week, we think that most producers can probably still plant the hybrid they had planned to

plant a month ago. Exceptions might be hybrids relatively late for the area and perhaps hybrids that are known not to do very well under stress. Most people who still have water standing in low areas of fields are going to want to get enough seed of early hybrids to replant (or plant for the first time) the low spots. Most of these will not be "drivable" until early June and, by then, only if it doesn't rain and refill them.

There are also reports this week of frost injury to corn in the northern half of the state. As usual, such injury was scattered, but some fields had most of the leaf area of emerged corn plants killed. Leaf color was not very good and leaf tissue was not very healthy, so loss of existing leaf area should not greatly affect yield prospects in most fields. Plants with one or two emerged leaves can be killed by frost, but because the growing point, which is about 3/4 to 1 inch deep in the soil, needs to be frozen for that to occur, we don't expect that to have occurred. Still, it pays to watch corn for a day or two after lows in the lower 30s, especially in lighter soils (where cold air penetrates much more easily) and in lower-lying parts of fields, where cold air settles at night. Frost injury of leaf area will delay development of the plants, but because growth is slow in undamaged fields and parts of fields, this delay will not be as great as it might have been.

With corn planting at least starting to move again, thoughts will swing toward soybean planting. Only 10% of the crop was planted as of May 19, and for many producers soybean planting will not start until corn planting is complete. That's appropriate, as corn is losing yield much faster with planting delays now than is soybean. We do not have a lot of solid data on the effects of late planting on soybean yield, but our data from last year showed that yield decreases, while quite variable, averaged about 3/10 of a bushel per day of delay during the last half of May in the northern half of the state; soybean planted at the end of May would be expected to yield 3 to 5 bushels per acre less than that planted in early May. We expect this loss rate to be a little less in the southern half of the state, but with average weather during the season, we expect yields to start to decline as planting is delayed past May 25 or so. We did not plant into June at most locations in this study, but in the southern part of Illinois, we would expect losses of about a quarter of a bushel per day of delay or so during the last week of May and the first half of June. Effects of planting delay in soybean are as variable as the weather in July and August, though, so one can be pessimistic or optimistic about what to expect this year.

While it is tempting to try to "finesse" soybean management to compensate for late planting, we do not see evidence to support making many changes. The real problem that late-planted soybeans often encounter is lack of sufficient growth to make a complete canopy by the time the crop flowers or even for the entire season. Such lack of full canopy almost always results in yield decreases. This principle should guide management decisions for late-planted soybeans:

- Changing to an earlier-maturing variety should not be done because earlier-maturing soybean varieties usually grow shorter than fuller-season ones. Flowering is triggered by warm temperatures and decreasing day length, and early varieties will flower earlier and with smaller plants than later-maturing ones. This might get them to mature quicker, but it will also mean they are smaller plants and, often, plants with less ability to survive stretches of dry weather later in the season.
- There is little reason to increase seeding rate if planting is delayed. When emergence percentage is normal, seeding rates used by most producers are already substantially higher than those needed to maximize canopy formation and yield. Delays in planting, even if they result in smaller plants, usually do not call for higher seeding rates unless planting is delayed past mid-June. And later planting into warmer soil usually results in higher emergence percentage, providing that seed was stored well and didn't lose germinability during the delay.
- The yield advantage of narrow (20 inches or less) rows over wider rows tends to increase as planting is delayed. If the option exists, planting at less than 30 inches might decrease the size of the yield penalty from delayed planting. That is the case, however, only if the planting equipment for narrow rows is good; I would not want to drag an old drill out of the shed just to get narrow rows if the drill weren't capable of doing a good job of seed distribution and placement.
- With warmer soils and more mineralized nitrogen, we would typically expect less response to inoculation when soybean is planted late. Tests of inoculant have been inconsistent in Illinois, in any case. In general, given the lower yield potential, late planting is usually not the best time to make additional expenditures on inputs without a proven record of return.

A final note: late planting in both corn and soybean, especially when done in soils that are marginally too wet, usually means that the crop develops with smaller-than-usual root size and rooting depth. Warm temperatures during vegetative growth also tend to favor top growth at the expense of root growth. Except for waiting until soils are in better shape to plant, there is little we can do about this, though it will pay to think about this when supplying nutrients (and water if we have any control over that) to the crop. Restricted root growth is a major reason why stress tolerance and yielding ability tend to be lower in later-planted crops.—*Emerson Nafziger*

REGIONAL REPORTS

Extension center educators, unit educators, and unit assistants in northern, west-central, east-central, and southern Illinois prepare regional reports to provide more localized insight into pest situations and crop conditions in Illinois. The reports will keep you up to date on situations in field and forage crops as they develop throughout the season. The regions have been defined broadly to include the agricultural statistics districts as designated by the Illinois Agricultural Statistics Service, with slight modifications:

- North (Northwest and Northeast districts, plus Stark and Marshall counties)
- West central (West and West Southwest districts, and Peoria, Woodford, Tazewell, Mason, Menard, and Logan counties from the Central district)
- East central (East and East Southeast districts [except Marion, Clay, Richland, and Lawrence counties], McLean, DeWitt, and Macon counties from the Central district)
- South (Southwest and Southeast districts, and Marion, Clay, Richland, and Lawrence counties from the East Southeast district)

We hope these reports will provide additional benefits for staying current as the season progresses.

Northern Illinois

Corn planting is about 95% complete in northwestern Illinois and more than 80% complete in northeastern Illinois. There are some small areas in northeastern Illinois that received heavier rainfall on May 11 that are considerably farther behind. Heavy frost was experienced on the mornings of May 18, 19, and 21, causing corn leaf injury, but it will have minimal yield effect since most of the corn is from the 1- to 3-leaf stage. Weather conditions have limited corn growth and caused the crop to have a yellow, unhealthy color.

Soybean planting in some areas will easily surpass 50% before the next rainfall, which is expected on Thursday, May 23. Fieldwork and planting started again in far northwesten Illinois on May 18, with other areas in the region starting up again on May 21. To date, there have been no reports of frost injury on the limited acres of emerged soybeans.

Alfalfa harvest has started this week.

West-Central Illinois

A limited amount of fieldwork has begun in the region. These operations include anhydrous application, tillage, and postemergence herbicide applications on corn. Planting will resume very soon, also, if no additional rain falls.

Cool, wet weather has prevented the corn from growing very much in the last week. Most of the corn is still in the V2 to V3 stage. But this may change rapidly as growing conditions improve.

Not many pests have been reported in corn. However, as soil conditions get better, more thorough scouting will begin. Cutworm will be a major concern because of the excessive weed growth in some fields that will still be planted to corn.

Alfalfa harvest has begun, also. If the field was not treated for weevil, quality will be down significantly. Pasture growth also has been suppressed because of the cool, wet weather.

Wheat is headed, and the wait begins to see if disease will set in as a result of the wet weather.

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