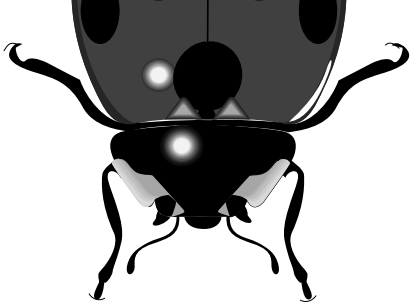

PEST MANAGEMENT & CROP DEVELOPMENT

BULLETIN

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In This Issue

INSECTS

Wet Weather, Delayed Planting, and Insects

Most farmers are not focused on insect problems at the moment. Farmers fortunate enough to have been able to plant corn (mostly in the western and central counties) are witnessing slow emergence and slow growth of corn seedlings; much of the emerged corn is yellow. The cool, wet soils are not contributing to rapid, healthy corn growth. On the other hand, many farmers have planted very little, if any, corn. They're waiting for the rains to cease, just to get started or to resume planting after having planted only a few acres here and there. As of May 5, the Illinois Agricultural Statistics Service estimated that 26% (Southwest Crop Reporting District) to 52% (Central Crop Reporting District) of the corn had been planted in western and central counties. In eastern counties, 6% (Southeast Crop Reporting District) to 32% (East Crop Reporting District) of the corn had been planted.

Although the focus is on the weather right now, the weather may have a dramatic impact on the potential for insect problems. The cool, wet soils and delayed planting may represent either bad news or good news, depending on the crop and the insect. Following is an overview of how our current spring weather conditions may affect the potential for certain insect pests to cause problems (or not):

- Corn seeds and seedlings in cool, wet soils are more likely to be injured by subterranean insects such as grape colaspis, seedcorn maggot, white grubs, and wireworms. Corn seeds and small seedlings remain susceptible to feeding by these insects when both emergence and growth are slow. Slow-growing corn seedlings can't "grow away" from the damage. White grubs are the primary insect concern among many farmers right now; I continue to receive reports of very large densities of white grubs. Thus far, all samples received have been Japanese beetle grubs. Although no injury has been reported, we'll have to remain vigilant.

- On the other hand, later planting may enable corn to escape damage caused by these same subterranean insects. These insects are most problematic early in the season. Many of these insects will be finished feeding for the season by the time corn roots are available.

- Delayed planting increases the potential for black cutworm problems. Black cutworm females seek vegetation in which to lay eggs, and delays in fieldwork have allowed many fields to get pretty fuzzy with weeds. When corn is planted into these fields, black cutworm larvae will stop feeding on the weeds when they are killed with herbicides and will begin feeding on corn seedlings.

- Slugs survive better during cool, wet springs. Entomologists in Ohio recently observed slugs hatching from eggs in northern counties. We should anticipate some occurrences of slugs any time now. No-till fields are most likely to harbor populations of slugs.

- Planting later reduces the risk of injury caused by first-generation European corn borer. Moths of European corn borers that will lay eggs to

begin the first generation seek tall (usually early-planted) corn plants on which to deposit eggs. If corn is not available at the time of egg laying, the first generation won't develop. The first capture of a European corn borer adult in Illinois this year occurred in Pulaski County on April 30. From this first capture we can predict when first instars (larvae) hatch from eggs—212 degree-days (base 50ºF) accumulated after the first capture. Bob Scott, Illinois State Water Survey, has predicted that 212 degree-days will be accumulated on May 15. Without much corn in the area, egg-laying females will have little success.

- Planting later reduces the risk of injury caused by corn rootworm larvae. Although corn with small root systems could be damaged severely by rootworm larvae, many of the larvae will starve to death because of the lack of availability of food.
- Planting later reduces the risk of injury caused by bean leaf beetles. Bean leaf beetles that have emerged are "hanging out" in fields of alfalfa and clover, waiting for soybeans to emerge. They will have a long wait in many areas. Consequently, many bean leaf beetles will perish without laying eggs.
- Planting later increases the potential for infestations of second-generation European corn borers and southwestern corn borers (in southern Illinois). Assuming any of these borers survive this spring, later-planted corn will be highly attractive for moths that lay eggs to begin the second generations of both species.
- Later-planted corn also is highly attractive to corn rootworm adults. The fresh silks and pollen will provide a great food source during the heat of the summer, and females often lay large numbers of eggs in late-planted cornfields.

In some areas of Illinois, there will be a mixture of early- and late-planted corn, giving some insects obvious choices. Consequently, people in these areas will have to remain very alert for the development of insect problems. When targeting fields for scouting, make certain you understand the relationship between planting time and the potential for insect problems.—*Kevin Steffey*

Watch for Armyworm and Black Cutworm Larvae in Any Fields That Have Been Planted

We have reported captures of several species of moths in the past several issues of the *Bulletin*. However, at this time, with corn still to be planted in many areas, it's almost an overstatement to suggest that people should watch for armyworms and black cutworms as soon as corn seedlings emerge. Both species will be large enough to cause noticeable injury to corn seedlings very soon. For an update on captures of moths in southern Illinois, refer to "The Hines Report" at http://www.ipm.uiuc.edu/publications/hines-report. You'll learn that Ron Hines, senior research specialist at the University of Illinois Dixon Springs Agricultural Center, has found small (1/4- to 1/2-inch-long) armyworm larvae in grass hay fields. I suspect you can find armyworm larvae in wheat right now, too. Numbers of armyworm larvae encountered thus far have been small. However, after some recent heavy flights of armyworm moths, the numbers of larvae could increase in some areas.

Check in previous issues of the *Bulletin* for scouting tips, thresholds, and suggested insecticides for control of both armyworms and black cutworms.—*Kevin Steffey*

Southern Corn Leaf Beetles Are Right on Schedule

During the past few years, we have expected southern corn leaf beetles to show up in western Illinois at about this time of the season. Well, Mike Roegge, Adams/Brown Extension unit educator in crop systems, received his first report of southern corn leaf beetle injury on May 7. Approximately 10% of the field was affected by their feeding injury. This report follows on the heels of other recent reports of this insect infesting corn in other states—Kansas, Missouri, and Tennessee.

Of primary interest is the fact that this pest has become troublesome in several states in the Midwest during the past few years, after having gone virtually unnoticed for decades. Although you may be weary of my referring to THE article, I am aware of only one fully developed scientific article about the southern corn leaf beetle. E. O. G. Kelly wrote an article titled "The Southern Corn Leaf-Beetle," as a *Bulletin of the U.S. Department of Agriculture* (no. 221) in 1915. Since then—nothing. So, Kelly's article has become the sole source of information about the biology of this pest and the injury it causes.

Following is information that we have gleaned from Kelly's article and from field observations during the past few years. This overview should give you a sense of what to look for and what to expect if you encounter the southern corn leaf beetle.

What do southern corn leaf beetle adults look like, and where should I look for them?

Adult southern corn leaf beetles (Figure 1) are 3/16 inch long, dark brown, and often covered with bits of soil, making them difficult to find in the field. The shield just behind the head has three "teeth" on each lateral edge. When disturbed, these beetles drop from the plants to the ground and hide. According to Kelly, the adults feed mostly early in the morning, late in the evening, or at night, or on cloudy days.

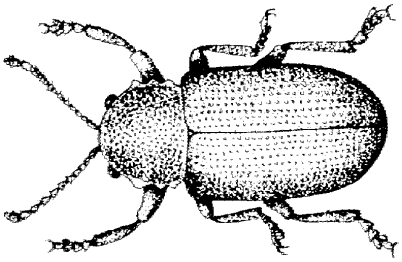

Figure 1. Southern corn leaf beetle adult.

What does injury caused by southern corn leaf beetles look like?

Adults emerge early in the spring to feed on young weed hosts, especially cocklebur, and early-planted corn. The adults feed on the stems and chew out characteristic notches on the edges of leaves of corn seedlings (Figure 2); injured plants appear ragged. Sometimes the beetles feed in such large numbers that injured plants die. If corn seedlings are small, the beetles may eat the seedlings to the ground. Consequently, the injury caused by these beetles could be likened to a combination of feeding by armyworm and black cutworm larvae.

What types of fields are most susceptible to damage caused by southern corn leaf beetles?

Since 1915, when this type of information was generated, agriculture in the Midwest has changed more than just a little. Therefore, I don't think we have enough information to answer this question very well. However, observations have suggested that fields with reduced or no tillage are more prone to attack by southern corn leaf beetles. The beetle also is prevalent in fields infested with cocklebur, another host. Other species of weeds might be hosts for this insect, too.

How did southern corn leaf beetles get into my field, and what happens after they get there?

Southern corn leaf beetles overwinter as adults beneath soil and plant debris and in clumps of some species of weeds. In the spring, the adults emerge and begin to feed on weeds, such as

Figure 2. Young corn plant injured by southern corn leaf beetle adults.

cocklebur, smartweed, and crabgrass. However, they fly from weed hosts into cornfields, where host plants are more plentiful, shortly after corn emerges.

After they finish feeding, the adults mate and females lay eggs in clusters of 10 to 50 in weed debris or in the soil within a field. In a week to 10 days, the larvae hatch and begin to feed on corn roots. The larvae develop over 10 weeks and from early May until mid-July in the central portion of the Corn Belt. Adults begin emerging from the soil in mid-July; after a limited feeding period, they begin to seek overwintering sites. The adults are strong fliers, so movement from field to field is common.

As a bit of a side note, I wonder whether southern corn leaf beetle larvae cause injury to young corn plants by feeding on the roots. Kelly stated more than once in his article that larvae were found in close proximity to corn roots "which were more or less eaten." However, he never observed them feeding on the roots in the field, and his description of "more or less eaten" is a bit vague. The reason I am curious is that the larva of this species closely resembles the grape colaspis larva. In fact, the former scientific name of the southern corn leaf beetle was *Colaspis denticollis* (the current scientific name is *Myochrous denticollis*). The scientific name for the grape colaspis is *Colaspis brunnea*. Obviously these two species are closely related, and the larvae of both species can be present in the same fields at the same time. One wonders whether all of the reports of grape colaspis injury during the past few years were attributable solely to grape colaspis, or possibly to southern corn leaf beetles, or even a combination of the two.

When is control of southern corn leaf beetles justified?

Economic thresholds have not been established. The economic thresholds established for black cutworms could be used as management guidelines, but these thresholds don't accommodate foliage-feeding injury. Maybe the threshold for armyworm larvae in corn (25% of the plants are being injured) will suffice, but I don't have a huge amount of confidence in the threshold for armyworms, even for armyworms! Maybe a blending of the two thresholds is a compromise. However, until research is conducted to address this question, suggested thresholds are nothing more than guesswork. However, "nominal thresholds" (thresholds based solely on experience) are not all bad.

Over the past few years, several insecticides have been labeled for control of southern corn leaf beetles (Table 1). However, not much efficacy data have been generated. As a rule of thumb, higher volumes of water improve the coverage, and therefore the efficacy, of most products.

Table 1. Insecticides suggested for control of southern corn leaf beetles in corn.

Product	*Amount of product per acre*
*Capture 2EC	2.1 to 6.4 oz
*Lorsban 4E	1 to 2 pt
*Mustang	2.9 to 4.3 oz
*Warrior	3.84 oz

*Use restricted to certified applicators.

Although none of the new seed treatments (i.e., Gaucho, ProShield with Force ST, Prescribe) have included southern corn leaf beetle among the pests that are controlled, I am interested in learning if any of these has any impact on this pest. Because the active ingredient (imidacloprid) of Gaucho and Prescribe is systemic and because both include flea beetles (an aboveground pest) on the labels, one wonders whether these seed treatments will offer any protection against southern corn leaf beetles. Let me know if you encounter some comparisons that would help address this question.—*Kevin Steffey*

When Will Rootworm Larvae Hatch?

It's unlikely that we will experience an early hatch of rootworm larvae from overwintering eggs this year. Western and northern corn rootworm eggs have a developmental threshold of 52ºF. Approximately 380 to 426 accumulated degree-days are required for 50% of the larvae to hatch. As you can see in Figure 3, degree-day accumulations (base 52ºF), from January 1, at the 4-inch level in soil, are not far enough along for us to encounter rootworm larvae anywhere except extreme southern Illinois, where little corn has been planted. So, we'll wait and watch. It's possible that the soggy soil conditions will have a negative impact on rootworm larvae when they do hatch. Let's keep our fingers crossed.—*Kevin Steffey*

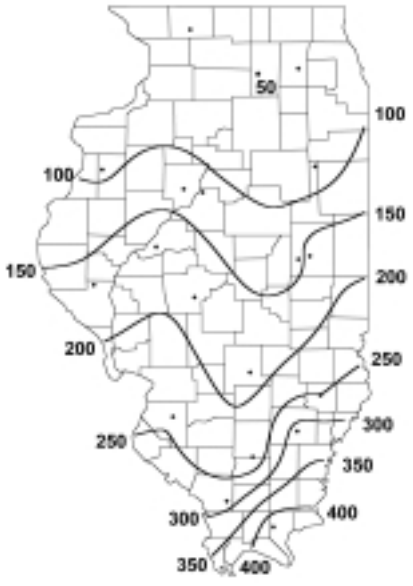

Figure 3. Actual soil degree-day accumulations (base 52ºF), at the 4-inch level, from January 1 through May 6, 2002. (Map courtesy of Bob Scott, Illinois State Water Survey).

Controlling Bean Leaf Beetles

Although it seems a bit silly to be talking about insecticides for control of bean leaf beetles (Table 2), at least a few fields of soybeans have been planted. Consequently, they will be at risk when bean leaf beetles find them. The beetles don't have much to choose from right now, so any seedling soybeans will have to do.

As I indicated in last week's *Bulletin* (issue no. 6, May 3, 2002), insecticides are warranted when densities of bean leaf beetles reach 16 per foot of row in the early seedling stage or 39 per foot of row at stage V2+. These thresholds are based solely on the potential damage resulting from defoliation and have no bearing on the situation with bean pod mottle virus. Based on what I have learned from the entomologists and plant pathologists at Iowa State University, the situation with bean leaf beetles and bean pod mottle virus is real (especially in western Iowa), although still not thoroughly understood. The situation in Illinois is uncertain. However, Marlin Rice, Extension entomologist at Iowa State University, has made the following qualifiers quite clear: "The qualifier for insecticide treatment is the presence of beetles and a history of bean pod mottle virus in the field (or adjacent field when rotated). Without the confirmation of the virus (late-season green stem or discolored beans from last year), then the application of an insecticide to prevent the insects/disease cannot be justified, in our opinion."—*Kevin Steffey*

Alfalfa Weevil Report

I've said about all I need to say about alfalfa weevils by now. People in southern and central Illinois have experienced some of the heaviest infestations of alfalfa weevils they have witnessed in many years. The defoliation caused by the larvae has been excessive. Wet weather has hampered control with insecticides and, in some instances, reduced the efficacy of an insecticide after it had been applied.

Figures 4 and 5 show actual and projected degree-day accumulations (base 48ºF), respectively, from January. Figure 4 indicates that alfalfa weevil larvae are active throughout the state. By May 20 (Figure 5), and even before in southern Illinois, alfalfa producers will have lived through the onslaught, except in northern counties.

Table 2. Insecticides suggested for control of bean leaf beetles in soybeans.

Product	*Amount of product per acre*
*Ambush	3.2 to 6.4 oz
*Asana XL	5.8 to 9.6 oz
dimethoate	See product label. (Different formulations have different rates of application.)
*Lorsban 4E	1 to 2 pt
*Mustang	3 to 4.3 oz
*Penncap-M	2 to 3 pt
*Pounce 3.2EC	2 to 4 oz
Sevin XLR Plus	1/2 to 1 qt
*Warrior	1.92 to 3.2 oz

* Use restricted to certified applicators.

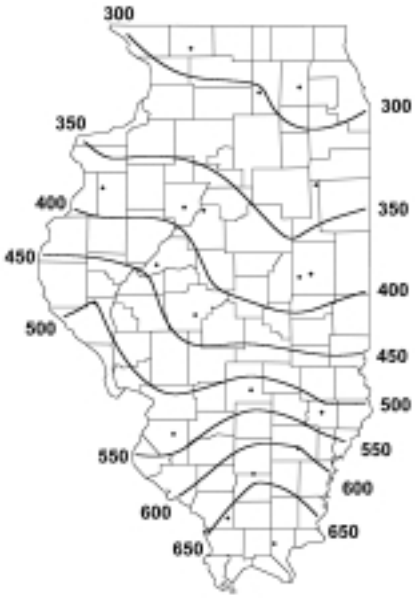

Figure 4. Actual degree-day accumulations (base 48ºF) from January 1 through May 6, 2002. (Map courtesy of Bob Scott, Illinois State Water Survey.)

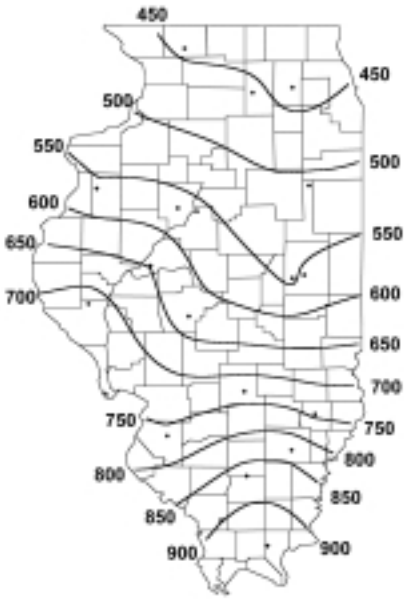

Figure 5. Projected degree-day accumulations (base 48ºF) from January 1 through May 20, 2002. (Map courtesy of Bob Scott, Illinois State Water Survey.)

In last week's *Bulletin* (issue no. 6, May 3, 2002), I mentioned that harvesting alfalfa early is an alternative to applying insecticides. However, the wet ground has delayed harvest in many counties. As the alfalfa continues to grow, the plants will produce more blossoms. Consequently, I urge anyone who still intends to apply an insecticide for control of alfalfa weevils to be aware of the effect of insecticides on honey bees visiting alfalfa fields. Spraying blossoming alfalfa can be extremely hazardous to bees. Coordinate with local beekeepers before applying an insecticide to alfalfa.—*Kevin Steffey*

Degree Days, Phenology Models, and Insects

By now you are used to our reliance on accumulation of degree-days (or heat units) to predict the development or first occurrences of several important species of insect pests in field crops in Illinois. If you are interested in learning more about degree-days and phenology models (the models used to predict time of events in an organism's development), I encourage you to visit the following Web site, created by the University of California Statewide Integrated Pest Management Project: http://axp.ipm. ucdavis.edu/PHENOLOGY/models.html. In addition to excellent explanations of degree-days and phenology models, this Web site includes a huge amount of information on the use of these tools for management of many insect pests, as well as some other pests, some beneficial insects and mites, and crops. Although not all of this information relates specifically to Illinois crops, their overall treatment of the topic is excellent and worth a look. We hope to develop something similar for Illinois insect pests in the near future.—K*evin Steffey*

PLANT DISEASES

Curly Wheat: An Exercise in Troubleshooting

Some very odd leaf symptoms have been showing up in winter wheat fields in south-central Illinois. Gregg Barnard, of Barnards Soil Service in Wayne City, and Dennis Epplin, Extension crop systems educator of Mt. Vernon, alerted me to the situation. Upper leaves on affected plants are curly. The curl is reminiscent of curling ribbon, or, for those of you who don't spend a lot of time decorating packages, the curl looks like an unfurling wood shaving. So naturally this unusual symptom begs the question, "What is it?"

Good question! And I admit it has strained my troubleshooting skills, in particular. Thanks to R. Kiesling and H. Bissonnette for sharing their advice, gleaned from many years of wheat work with me. Here's what can be pieced together. The fields have not had the same wheat variety; they have sound agronomic practices (nothing odd about N application, planting, etc.); some had herbicide applications, some didn't. Again, nothing questionable there. They are all in the same region of the state. The fields also exhibit characteristic, but nontested, symptoms of BYDV and WSMV. So, in evidence, are many leaves with pinkish yellow discoloration, some stunting, and leaves with mottling and vertical (like drought-stressed corn leaves) rolling, as well as the wood shaving curl. Please refer to issue no. 3 of this year's *Bulletin* for more information on wheat virus symptomatology. No wheat curl mites were found in these fields. Many of the leaves with the wood shaving curl have whitish stripes. A few plants are showing some frost injury, with leaves looking like a rubber band had been stuck around them. I think we can safely rule out drought. So that's the picture.

What facts can we bring to the table to try to solve the question? First, what causes leaf curl in wheat? A few possibilities: WSMV can exhibit a vertical leaf roll; herbicide damage can cause some crinkling and bending at nodes; some varieties have a genetic tendency to exhibit the wood shaving–type curl; and an aphid, not known to be in Illinois, the "Russian wheat aphid" (RWA), can cause the wood shaving curl. Then, for those of you who have

taken one of my troubleshooting workshops, you know "environmental factors" must be added to the list.

Now we try to draw some conclusions. It was recommended that the fields be tested for BYDV and WSMV. Neither, of course, is known to exhibit the odd curling symptom, but very obvious symptoms of them are present; so the problem is not solved, but the whole picture can be documented. Next, the genetic tendency of some varieties to exhibit a wood shaving–type curl is a very real possibility, but it loses strength as a solution as the number of fields and varieties expands. Next, what about Russian wheat aphid? Well, the leaf curl closely resembles RWA-affected leaves, but so far no RWAs have been found; and to the best of our knowledge, if RWA aphids fed in the fall and were absent now, what we likely would see would be significant stunting and winter kill instead of curling. The RWA is quite distinctive, though, so if you see any lime-greenish aphids with stubby antennae I would like to know. You may notice by now that about our only conclusion left is environmental factors. Not a very palatable conclusion, and I try to rely on it only when no other possibility exists. As this situation develops, I would be interested to receive your observations so that we can try to come to a more substantial explanation of the unusual leaf curl.—*Suzanne Bissonnette*

Chances of Stewart's Wilt of Corn Increased After Warm Winter

One of the potential impacts of the warm winter of 2001–2002 is an increased chance of Stewart's bacterial wilt of corn this summer. This disease is primarily a problem on susceptible inbreds and sweet corn; however, some hybrids with low levels of resistance or other hybrids may also be affected when corn flea beetle populations are very high. In the March 22, 2002, issue of this newsletter, Dr. Kevin Steffey provided a report on the predicted survival of corn flea beetles in Illinois. This article will add to the Stewart's wilt story this season in Illinois.

A key to whether Stewart's wilt will be a problem is based in part on winter survival of corn flea beetles. Corn flea beetles are the primary vectors and overwintering location of the bacterial pathogen (*Pantoea* [= *Erwinia*] *stewartii*) that causes Stewart's wilt. The bacterium survives in the gut of hibernating adults, and the bacteria are transmitted when flea beetles feed on corn. The bacterium can also be transmitted at low levels via infested seed, but generally transmission via the corn flea beetle is considered to be much more important and common.

Winter survival of corn flea beetles, and the incidence of Stewart's wilt, is strongly influenced by winter temperatures. As reported by Rick Weinzierl and Kelly Cook in the Illinois Fruit and Vegetable News newsletter, the winter was warm enough for survival of corn flea beetles in much of Illinois. Survival of the corn flea beetle, and the potential incidence and severity of early-season Stewart's wilt, can be predicted on the basis of average December, January, and February temperatures. Nearly no disease is expected if the average is below 27; the incidence will be low if the average is 27–30; the incidence will be moderate if the average is 30–33; and above 33 the incidence is predicted to be high. Kelly Cook, a pest management graduate student in the Department of Crop Sciences, summarized temperature data from the Midwestern Climate Center to determine the average temperatures for December through February (see Table 3).

They also reported that because the winter in 2000–2001 was fairly cold, corn flea beetles and Stewart's wilt were somewhat rare north of I-80 in the 2001 season. Thus, although a high percentage of beetles probably survived the past winter, their numbers and the portion carrying the Stewart's wilt bacterium are likely to be low this spring in northern Illinois. Through much of the state, however, Stewart's wilt will be a concern this year.

There are two phases of Stewart's wilt. In the first (seedling blight) phase, young plants become systemically infected and often quickly wilt. Leaves develop yellow or light green streaks with wavy margins that parallel veins, and lesions turn brown and dry. Cavities may form in the stalk pith near the soil line, and plants may be killed. The second (leaf blight) phase of Stewart's wilt is more common and usually affects plants after tasseling, but is usually not as damaging as the seedling phase. Pale green streaks develop along the veins, and these often die and become tan in color. In severe cases whole leaves may die.

Based on the predictions, scouting efforts should be intensified to identify problems with Stewart's wilt this spring and summer. Preventative management with resistance and seed treatment insecticides are the keys for reducing problems with Stewart's wilt.

For more information on the value of seed treatment insecticides for Stewart's wilt and hybrid resistance for sweet corn, see the Stewart's wilt link on Dr. Pataky's Web site at http://www.sweetcorn.uiuc.edu. Foliar insecticides for control of corn flea beetles and Stewart's wilt may be warranted in some cases if leaves on seedling plants are severely damaged. See the *2002 Illinois Agricultural Pest Management Handbook* for more information on the use of insecticides to control corn flea beetles.—*Dean Malvick*

Watch for Stripe Rust of Wheat in Illinois

Stripe rust of wheat may show up in Illinois this year unless the weather becomes and stays hot or dry. You may have heard about stripe rust (also called yellow rust) in other states this spring. The Arkansas Wheat Pest Management Newsletter (April 24, 2002) reports that Arkansas has experienced widespread stripe rust this

Table 3. Average temperatures for December through February.

Location (Illinois)	*Average temperature (°F) for Dec. 2001, Jan. 2002, and Feb. 2002*	*Predicted incidence of Stewart's wilt for 2002*
Rockford	30.0	Low to moderate
Mendota	30.5	Moderate
Urbana	34	High
Brownstown	35.8	High
Dixon Springs	39.7	High

spring, and stripe rust has been noted in the southeast corner of Missouri. The newsletter reports that fungicides have been applied to an estimated 200,000 to 250,000 acres of wheat in Arkansas, primarily to control stripe rust. We don't expect stripe to be a major problem in Illinois, but it is something to watch for in wheat fields. Minor levels of this disease were reported in central Illinois in 2000 and 2001, and in southern Wisconsin in 2001. Last year (2001) stripe rust was reported in central Illinois in the first week of June, but may have occurred earlier in scattered areas in the southern counties.

Stripe rust is severely limited by climate, and this is one reason why this disease has been uncommon in Illinois. Stripe rust develops in wet and cool conditions. The disease develops most rapidly when temperatures are between 50° and 60°F, and stops when night temperatures are above 70°F. Spores may be blown up from the south to initiate infection in Illinois, and stripe rust can develop and spread quickly when weather is cool with frequent dew or rainfall. Another factor that has contributed to increased incidence of stripe rust in parts of the United States is new races of the stripe rust fungus (*Puccinia striiformis*). At this point we don't know which races may be most common in Illinois, although it is reasonable to consider that the common race(s) in Arkansas may become the common race(s) in Illinois too.

Stripe rust often appears earlier in the season than stem rust and leaf rust. These different rusts on wheat are distinguished by the color and pattern of the infected areas. The stripe rust pustules usually appear closely arranged in yellow stripes parallel to veins on leaves. Heads may also be infected with yellow pustules. The pustules of the other rusts are dark to light red or brown in color and are arranged singularly in an arbitrary pattern over the leaves or stems.

Stripe rust can be managed with fungicides and to some degree with resistant wheat varieties. Some effective fungicides for control of rust include Tilt, PropiMax, Quadris, and Stratego. All of these compounds are systemic. Product labels should be consulted for proper application. If stripe rust is observed in fields with high yield potential, a decision whether or not to apply a fungicide should be made quickly, because the disease has the potential to develop rapidly if weather conditions are favorable.

The other option for management in future years may be resistant varieties, although the predominant races of the stripe rust fungus in Illinois will dictate the efficacy of different sources of resistance. Preliminary observations from Arkansas (Arkansas Wheat Pest Management Newsletter, April 17, 2002) suggest that there are differences in resistance among wheat varieties. Agripro varieties Shelby and Mallard, as well as Pioneer varieties 26R38 and 2684, were susceptible to the race(s) in Arkansas. AGS 2000, DK 1551W, and NK Coker 9663 appeared to be less susceptible in Arkansas, and they reported that field observations suggested that the following varieties had relatively fewer problems with rust this spring: AgriPro Patton, AgriPro Shiloh, Armor 3135, Armor 4045, Pioneer Variety 26R24, Pioneer Variety 2580, Delta King 9121, Delta King 9027, Delta King 9416, Sabbe, and Terral TV 8555. Again, we don't expect a major problem with stripe rust in Illinois. But this disease has the potential to be a problem, and scouting should be done to check for its appearance in Illinois.—*Dean Malvick*

WEEDS

Results on Herbicide Resistance in Illinois

Herbicide-resistant weed biotypes have plagued Illinois growers for more than 20 years. During this time we have confirmed nine different herbicide-resistant weed biotypes in Illinois. All of these biotypes were suspected herbicide-resistant weeds that were sampled and sent from various locations around the state to the University of Illinois to be tested for resistance. From these samples and others, we have been able to keep fairly good records on where, when, and how widespread the herbicide-resistance problem is. An extensive list of confirmed herbicide-resistant weed biotypes in Illinois is presented in Table 4. However, like most other problems in agriculture, herbicide resistance has continued to spread throughout the state.

In the last issue of the *Bulletin,* we reported results from the "Illinois Invasive Weeds Survey" that was conducted this past winter. A series of questions from this survey was focused on herbicide resistance to give us a broader perspective on how widespread the problem is, what new species are suspected to be resistant to what herbicides, and when the resistance problem was first encountered. From this survey, 43% of the participants answered yes, indicating that they have a herbicide-resistant weed problem in their area. There were 26 different weed species identified as resistant to nine different herbicide classes, showing up as early as 1986.

Table 4. Confirmed herbicide-resistant weed biotypes in Illinois.

ALS resistant	*Triazine resistant*	*ALS/Triazine resistant*
common cocklebur	common lambsquarters	kochia
common ragweed	kochia	smooth pigweed
eastern black nightshade	smooth pigweed	waterhemp
giant ragweed	waterhemp	
kochia		
shattercane		
smooth pigweed		
waterhemp		

Table 5. Suspected herbicide-resistant weeds from the Illinois Invasive Weed Survey.[a]

			Suspected resistance to				
	Weed species	*Frequency[b]*	*ALS inhibitors*	*Triazines*	*PPO inhibitors*	*Glyphosate*	*Others*
		----- % -----	---------- % reported ----------				
1.	*Amaranthus* spp.[c]	44	54	28	5	10	3
2.	Ragweed spp.[d]	18	86	4	2	5	3
3.	Common lambsquarters	10	17	74	0	9	0
4.	Common cocklebur	8	64	29	0	7	0
5.	Kochia	4	50	33	0	0	17
6.	Horseweed	3	60	0	10	30	0
7.	Velvetleaf	3	20	40	0	40	0
8.	Foxtail spp.	2	67	0	0	0	33
9.	Eastern black nightshade	2	80	0	20	0	0
10.	Morningglory	2	0	0	0	75	25
11.	Woolly cupgrass	1	67	0	0	0	33
12.	Shattercane	1	100	0	0	0	0

[a] Not all of these weed species have been confirmed resistant. Results are generated from grower/retailer survey.
[b] Weeds that appeared less than 1% of the time were not reported.
[c] Not all *Amaranthus* species were specified; over 75% of responses were specifically listed as waterhemp.
[d] Type of ragweed species was not always designated; more than 70% were listed as giant ragweed.

The results from this survey identified *Amaranthus* spp., ragweed spp., common lambsquarters, and common cocklebur as comprising 80% of the herbicide-resistant weed species in the state (Table 5). These four weed species have been confirmed resistant for a number of years to the ALS inhibitors, triazine herbicides, or both classes, depending on species (Table 4). However, the survey participants identified some of these weeds as also being resistant to other herbicides, including glyphosate and the PPO inhibitors (i.e., Flexstar, Ultra Blazer, and Cobra). Even though none of these species have actually been confirmed resistant to these herbicides in Illinois, there have been reports of waterhemp not being effectively controlled by glyphosate and the PPO inhibitors (diphenyl ethers). Some of these escaped waterhemp plants may be due to environmental conditions; however, there are a number of populations that don't seem to fit this explanation.

In Illinois, Iowa, and Missouri, weed scientists are currently working with waterhemp populations that have not been effectively controlled with glyphosate and have determined that some of these populations have increased tolerances. While there are no confirmed glyphosate-resistant waterhemp populations, there is still some concern that this could be a potential problem in the future. In addition, during this past growing season, there were some reports of waterhemp populations resistant to the diphenyl ether herbicides. These populations have not yet been confirmed in Illinois; however, this past year, Kan-

sas State University identified a waterhemp population resistant to this family of herbicides.

The survey also identified other weed species that have not been confirmed resistant in Illinois. Some of these species include horseweed, velvetleaf, morningglory, and woolly cupgrass (Table 5). Most of these species were identified by only a few participants and may not truly be resistant to these herbicides. However, in the case of horseweed, there have been confirmed cases of resistance to ALS inhibitors in Ohio and glyphosate in Delaware and Tennessee. While none of these species are currently confirmed resistant in Illinois, there is still some concern that this could be a potential problem in the future.

To learn more about herbicide resistance and management strategies that will help delay the development of herbicide-resistant weed biotypes, refer to the article "Herbicide Resistance: Where Are We?" in issue no. 3, April 13, 2001, issue of the *Bulletin*.
—*Christy Sprague and Aaron Hager*

CROP DEVELOPMENT

Rain Delay 2002—Holding On

It takes an extra dose of patience to watch rain systems move through Illinois in early May and to hear forecasts for more of the same. What looked like a temporary setback with the rains in the last half of April has turned into something that looks considerably less temporary. If there's any comfort here, it's that no one is alone in this; that it's not some sort of "failure" that we should have foreseen and prevented; and that, despite what things look like, the rains will end and it will dry off so that planting can resume. How long that will take is a guess, but history tells us it will happen.

We can choose to be optimistic—as recently as last year, May rainfall was very heavy in northwestern Illinois, planting was delayed until the last half of May in many areas, and yet the regional corn yield was above the state average. Realistically, although yields of corn planted late can be very good, the odds of getting high yields decrease as planting is delayed. One way to think of this is that high yields from late-planted corn simply require weather conditions—primarily rainfall—for the rest of the season to be better than historical records show to be highly likely. We remember when we had late planting followed by good yields because that was an exception, not because it was expected.

It could be worse. The National Agricultural Statistical Service indicates that corn planting by May 5 was 42% complete nationally, compared to a 5-year average of 51% on that date. Indiana and Ohio were 10 and 11% complete, Illinois was 30%, and the western Corn Belt states were at or above 50%. In 2001, though, we had almost 90% of our corn planted in Illinois by this date. If there are any bright spots from all this, it is that the stands of corn that were planted in April are quite good, with the rain helping to prevent crusting. Warmer soil temperatures from now on will also mean rapid germination and emergence, providing we don't return to crust-forming conditions. Crusting is increased when soils are too wet at planting; when planting is followed by hard rainfall; and when the weather turns sunny, warm, and windy after planting but before emergence, essentially "baking" the soil surface into a crust.

As we wait for soils to dry out in much of Illinois, thoughts are turning to management changes that we might consider in an attempt to improve chances for better yields of late-planted corn. The most common questions have to do with changing to earlier-maturing hybrids. Producers in northern Illinois (where conditions this week have not been as wet and where planting progress is therefore better in many areas), who planned to use fuller-season hybrids (which we might define as longer than about 111 days CRM in that area) might want to switch to hybrids a little earlier than that if planting is delayed past May 20 or so. In central and southern Illinois, where most hybrids used are in the 110- to 115-day relative maturity range, there is little reason to switch to earlier hybrids if planting can be done in May. Earlier hybrids will have drier grain in the fall and so will require less drying cost; but they will also tend to yield less, which can quickly cancel out savings from drier grain. If you have fields that you feel won't be planted in the next two weeks and you were planning to use hybrids later than 113 days CRM, then you might consider switching now, but probably to something not earlier than 108 days or so. Very early hybrids were not developed for the southern half of Illinois and so have often not been tested thoroughly under these conditions.

The *Illinois Agronomy Handbook* (http://web.aces.uiuc.edu/aim/iah) has information relating planting date to chances of the crop reaching maturity before first frost. These maps are based on the growing degree-day (GDD) requirements for corn hybrids and on what weather records tell us the average GDD accumulations will be. Work in Indiana and Ohio has shown that hybrids planted late require less than their normal GDD to reach maturity. The average decrease in this requirement was found to be 6.8 GDD for each day of delay after May 1. That means that a hybrid that needs 2,700 GDD if planted on May 1 (which would be typical for a hybrid of about 111 days CRM) would need 136 fewer GDD, or only 2,564 GDD, if planted on May 20. While that means that we should be slow to change to earlier-season hybrids as planting is delayed, we should also understand that *a decreased requirement for GDD almost always is related to a decreased yield*. There is no "free lunch" here.

Are there any other management changes we should consider as planting is delayed? While we have not seen strong evidence that corn planted later has a lower optimum plant population, percentage emergence tends to

be slightly better with late planting; and if we are planting in fields where drought is more likely, we might want to back off plant population slightly, especially if normal practice is to push populations above 30,000. In a general sense, corn planted in the second half of May more closely matches the crop's subtropical habitat and so will respond favorably to warm soils and warm temperatures. There are no obvious extra requirements for the crop when it's planted late. Let's just hope the weather breaks and we're backing in planting before the end of the month.—*Emerson Nafziger*

Wheat Crop Holding Its Own, So Far

While the winter and spring have been relatively kind to the wheat crop, the wet weather in recent weeks has not been helpful. We have not seen extensive disease problems yet, but rainfall during flowering (shortly after head emergence) provides ideal conditions for Fusarium head blight (scab) to develop. Leaf disease may not be far behind. The pace of heading this year is about average, with heading moving up the state toward I-70 now. Color of the crop is not too bad so far, with help from spring N applications and cooler temperatures. How well the crop maintains this color will signal how well it's maintaining yield potential. The ideal weather for this stage of wheat—sunshine, little rainfall, and highs in the 70s—has not been very common during recent weeks. Head numbers appear to be adequate in most fields, but diseases that develop now can decrease the rate and extent of kernel filling over the next month. As a rule of thumb, it is usually about 6 weeks from heading to maturity. This will depend some on temperatures and on how much disease develops, but it's not a bad guide to expected harvest date for the crop.—*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.

East-Central Illinois

RAIN—little other news. Corn development has been minimal. Alfalfa weevil larva infestations are heavy in many alfalfa fields.

Northern Illinois

Considerable progress was made during the past week in corn planting. Corn planted several weeks ago has started to emerge and has a yellow appearance due to cool temperatures and cloudy conditions. Soybean planting started last week, as well.

Jim Morrison and Dave Feltes, Extension educators, both report light alfalfa weevil activity throughout northwestern Illinois, but no economic infestations were observed. Even though several storm fronts went through the area, there were no reports of black cutworm moth catches.

West-Central Illinois

A little planting was done last weekend in the extreme north part of the region. However, heavy rains, beginning Sunday night and continuing early in the week, halted all fieldwork for several days in the entire region. The already ponded areas in some fields have enlarged dramatically; replanting in those areas now seems very likely.

In those fields with adequate drainage, corn has emerged with good population. Plant color has improved somewhat in the past few days.

At this point cropping plans have not changed; however, some producers have indicated that they may consider switching to a shorter-maturing corn hybrid after May 25.

Planted fields have stayed fairly weed free during the cooler temperatures, but that may change rapidly as warmer temperatures begin.

A large population (five to seven per plant) of flea beetle has been reported in a cornfield in Montgomery County. The field will be monitored for possible treatment as soon as weather conditions allow. No other pest problems in corn have been reported.

Yellow spots due to saturated soil, nitrogen loss, and/or disease in some wheat fields are now beginning to appear.

Alfalfa harvest will begin soon, when weather and soil conditions improve.

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