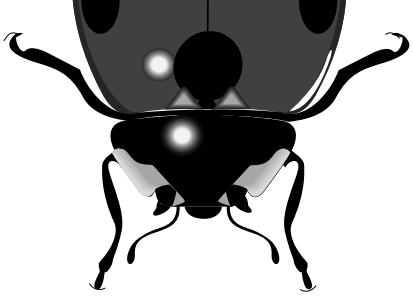

PEST MANAGEMENT & CROP DEVELOPMENT

BULLETIN

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Executive editor: Kevin Steffey, Extension Entomologist

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Also in This Issue

University of Illinois Plant Clinic to Open Its Doors

The University of Illinois Plant Clinic will be open for the 2003 season on May 2. No mail service to the building is available until that date, so please don't mail packages before May 2. At that time, however, we will be ready for all of your questions and requested diagnoses for the season. Following is some information about the Plant Clinic that may be useful.

Part of the University of Illinois Extension system, the Plant Clinic was initially instituted to help provide impartial plant-problem diagnosis across a range of disciplines. Services include insect, plant, and weed identification; disease diagnosis; nematode assays; interpretation of chemical injury symptoms and nutrient-related problems; and recommendations for pest and crop management. Plant Clinic personnel cannot handle herbicide injury problems on ornamental plants, nor can they assess nutrient levels in tissue or soil samples.

Diagnoses are available electronically as well as through the U.S. mail. Digital images of plant problems are welcome, along with the actual plant sample. Although the Plant Clinic is not part of Extension's Distance Digital Diagnosis System, we often receive samples that could not be diagnosed from images alone. Unlike the digital diagnosis system, a fee is charged for all samples submitted to the Plant Clinic. The fee varies depending on the type of service requested. If specific tests are needed, please state this clearly so that the turnaround time can be shortened. Fees have not changed since 2002, and we still require that appropriate fees be remitted with the sample. The Plant Clinic has no billing office.

Refer to Table 1 for the fees charged for various services provided at the University of Illinois Plant Clinic.

Most people still send samples by U.S. mail. The Plant Clinic's mailing address (beginning May 2) is

Plant Clinic
1401 West St. Mary's Road
Urbana, IL 61802

You also can call the Plant Clinic at (217)333-0519. The service is available weekdays from 8:00 a.m. to 12:00 noon and 1:00 to 4:30 p.m.

Table 1. Plant Clinic 2003

Service	*Fee*
General diagnosis (including cultures)	$12.50
Specialty tests (SCN, PWN, foliar nematodes, ELISA)*	$18.75
Complete nematode assay	$40.00

*SCN = soybean cyst nematode analysis, including both cyst and egg counts; PWN = pinewood nematode analysis

The Plant Clinic Web site provides a lot of information that should help you prepare and submit samples—service fees, data forms that should accompany samples, and directions for preparing and submitting a sample. If you wish to drive to the Plant Clinic, we provide directions. We also provide links to newsletters, publications, and equivalent clinics in other states. The Web address is http://plantclinic.cropsci.uiuc.edu/.

We look forward to serving you this year. Don't hesitate to contact us if you have questions or need assistance.—*Nancy Pataky*

INSECTS

On the Move: Black Cutworm Moths Are Here

As reported in last week's *Bulletin* (issue no. 3, April 11, 2003), black cutworm moths are beginning to make themselves known in the southern counties. Let's recap the "intense" captures (nine or more moths captured over a 1- to 2-day period) from last week. Ron Hines, senior research specialist at the University of Illinois Dixon Springs Agricultural Center, reported in the "Hines Report" (http://www.ipm.uiuc.edu/pubs/hines_report/index.html) that 19 black moths had been captured on April 7 in Pulaski County. In Gallatin County, Jeff Staley, Wabash Valley FS, reported an intense capture of moths over April 5–6 in two of his traps. On Monday, April 14, I received word from Mike Roegge, crop systems Extension educator in Quincy, of an intense capture in a trap operated by Sam Markert, Camp Point, April 11–12 and then again on April 13–14. Other captures of black cutworm moths, although not intense, have occurred in traps in Menard and McDonough counties, as reported by Matt Montgomery, crop systems Extension educator in Springfield, and Sean Evans, crop systems Extension educator in Macomb, respectively.

Reports of intense captures have been few and far between this season. The dates of cutting activity (fourth instars) can be predicted by accumulating degree-days from the date of the intense capture. The accumulation of 300 degree-days (base 50°), from the dates of intense captures, is projected to occur in Pulaski and Gallatin counties on May 4 and in Brown County on May 8. It is important to remember these projections are not exact and should be used as a guideline for monitoring black cutworm larvae. Projected dates of cutting are estimated by Bob Scott, Illinois State Water Survey, and will be provided in a table format in future issues.

Cutworm moths aren't the only organisms on the move—growers are planting corn feverishly! As corn planting coincides with moth flights, it's going to be important to scout fields that are especially attractive for egg laying. Fields or areas of fields in which early season weeds were growing at the time moths flew into the area are at a higher risk than weed-free fields. If tillage or herbicides eliminate weeds 1 to 2 weeks before planting, any black cutworms that had been present probably starve to death. The presence of weeds only a few days before planting increases the likelihood of cutworm damage if larvae are present in the field. Begin watching emerging seedlings carefully for early signs of cutworm feeding (pinholes in the leaves) and for plants that have been cut off by larger larvae.

Table 1 from last week's *Bulletin* (issue no. 3, April 11, 2003) lists preventive control measures for black cutworms in Illinois. Updates of black cutworms will be included in future issues of the *Bulletin*. Again, please keep us informed of cutworm activity in your area. I am also looking for cooperators to send weekly counts from black cutworm traps to monitor the spread of the insect across the state. If you are interested in sending trap counts, feel free to e-mail me at kcook8@uiuc.edu, or call (217)333-6651.—*Kelly Cook*

Captures of Insects Other Than Black Cutworms Also Noted

At this time of the year, some moths (order Lepidoptera), such as black cutworms, fly into Illinois from destinations farther south. Because of the potential for black cutworms to cause significant economic damage, we focus a lot of attention on that species. But we don't have to think back very far to recall the outbreak of armyworms that occurred in 2001. Like black cutworm moths, armyworm moths also fly from the southern United States into Illinois in the spring, arriving at about the same time as black cutworms arrive. In fact, Ron Hines, senior research specialist at the University of Illinois Dixon Springs Agricultural Center, has already captured a few armyworm moths in traps in Pope and Pulaski counties this spring. Refer to the "Hines Report" (http://www.ipm.uiuc.edu/pubs/hines_report/index.html) for specifics.

Ron and other observers also monitor flights of other important Lepidoptera adults, such as corn earworm, European corn borer, fall armyworm, and southwestern corn borer. In the past, we also have reported captures of beetles (order Coleoptera) such as western corn rootworm and Japanese beetles in different types of traps. Trapping insects is an excellent way to get relative information about insect abundance from year to year and from area to area, as well as an excellent way to project insect development and the occurrence of feeding injury. Consequently, we try to report as much trap-capture information as we can. Keep in mind, however, that reports of captured insects do not necessarily translate into projections of crop damage. With few exceptions (for example, western corn rootworms on yellow sticky traps), densities of insects captured in traps often have not been correlated with amounts of injury. So use the information about trap-captured insects with good judgment.—*Kevin Steffey*

DuPont and Monsanto and Rootworm-Protected Corn

On April 15, 2003, DuPont and its subsidiary, Pioneer Hi-Bred International Inc., and Monsanto Company agreed to a worldwide licensing agreement to Monsanto's recently approved YieldGard Rootworm insect-protected corn technology. Consequently, the Cry3Bb1 protein for protection against corn rootworm larvae will be available in even more hybrids than had been anticipated when Monsanto first received registration of YieldGard Rootworm corn on February 25, 2003.

As we indicated in an article ("Transgenic Corn Rootworm Hybrids: A Promising IPM Tool, Yet Important Concerns Linger") in issue no. 1 (March 21, 2003) of the *Bulletin*, the registration of this exciting new technology adds yet another tool to the toolbox for growers who need to manage corn rootworms. It's important to repeat, however, that implementation of a required insect-resistance management strategy is crucial for the future of this technology. For more details about this, please read the article that follows.—*Kevin Steffey and Mike Gray*

Pollen Drift and Refuge-Management Considerations for Transgenic Hybrids

The unseasonably warm weather across Illinois has hastened the pace of planting, or at least the preparations for planting. As noted in the first issue of the *Bulletin* (March 21, 2003), transgenic hybrids (MON 863 event, Cry3Bb1) that are designed to protect root systems from corn rootworm larval injury will be planted for the first time this spring. Despite the lingering concerns among many producers, farmer organizations, and major grain processors regarding grain-channeling issues, YieldGard Rootworm hybrids are being planted. Questions concerning pollen drift from YieldGard Rootworm hybrids into adjacent non-GMO fields of neighbors are being raised. At the 2003 Crop Protection Technology Conference, Martin Bohn, assistant professor of corn breeding in the Department of Crop Sciences, University of Illinois, offered remarks on the following topic: "Pollen Drift and Its Impact on Gene Flow Between GM and Non-GM Cultivars." I'll attempt to summarize his key points on this important issue.

Let's begin with some facts about the physical characteristics and longevity of pollen that Bohn discussed in his article:

- Corn pollen is 90 to 100 µ in diameter.
- Corn pollen is spherical.
- Pollen of many other species that depend on wind pollination is much smaller. For instance, the pollen of ragweed species or timothy is three to four times smaller than corn pollen.
- Corn pollen is among the largest of particles commonly found in the air.
- Corn pollen drifts to the earth quickly (0.3 meter per second).
- Wind speed and direction influence pollen drift.
- Corn pollen may remain viable for approximately 24 hours.
- Viability of corn pollen diminishes rapidly with desiccation.
- At flowering, 60% of pollen fresh weight consists of water.
- Pollen longevity drops rapidly if the water content falls below 40%.

How far will pollen drift? To answer this question, Bohn conducted a review of the scientific literature. Results from a 1948 study (Jones and Newell, *Journal of the American Society of Agronomy*, 40: 195–204) of pollen longevity of buffalo-grass and corn revealed a 1% pollen concentration at 427 meters in the atmosphere. Based on these findings, other researchers concluded that, if each corn plant produces 25 million pollen grains, 125,000 pollen grains could be expected at a distance of 500 meters from the original source.

In 1972, G. S. Raynor, C. O. Eugene, and V. H. Janet *(Agronomy Journal* 64: 420–427) used wind-impact samplers to estimate pollen concentration at selected distances from the original pollen source. They indicated that, at a distance of 60 meters from the source of pollen (in the main wind direction), the concentration of pollen averaged only 1%, compared with the pollen samples collected only 1 meter from the pollen source.

In 1947, A. J. Bateman *(Heredity* 1: 235–246) reported the results of some cross-pollination studies. He reported that the number of outcrosses was reduced by half at the relatively short distance of 3.77 meters from the pollen source. At a distance of 12 to 15 meters, the number of outcrosses was reduced by 99%.

In contrast to these results, M. D. Jones and J. S. Brooks reported (Oklahoma Agricultural Experimental Station, Bulletin T-38) in 1950 that outcrosses could occur at a distance of 503 meters from the pollen source. A more recent study published by S. V. Luna and others in 2001 *(Crop Science* 41: 1551–1557) indicated that cross pollination occurred at a distance of 200 meters. Variation in the distance of pollen movement among these studies is reflective of the different wind speeds that occurred during the times these experiments were conducted. For instance, the Jones and Brooks study (1950) was conducted in Oklahoma, well-known for its windy and stormy weather.

Based on the review of this literature, Bohn offered the following statements: "An adjustment of technical farm procedures can be used to avoid mixing of GM and non-GM seed, e.g., planting and harvesting conventional crops before GM crops. However, a containment of pollen employing normal farming procedures is not possible."

Are there strategies that producers can use to minimize pollen drift from YieldGard Rootworm hybrids into the nearby fields of neighbors? In February, Kevin Steffey and I presented some insect management information at a workshop near Ottawa. A producer in the audience asked us what our opinion was regarding the use of a 20% refuge deployed exclusively as a perimeter (border rows) around an interior block planted with a YieldGard Rootworm hybrid. We indicated that although this strategy may prove a bit more challenging at planting time, it certainly has some merit with respect to reducing the amount of unwanted pollen that could drift into a neighbor's field located nearby.

As a courtesy to their neighbors, I encourage producers to consider this approach. In addition, it's a good idea to let your neighbors know that you intend to plant a YieldGard Rootworm hybrid.—*Mike Gray*

Remain on the Watch for Alfalfa Weevil

Fluctuations in spring temperatures seem to have slowed alfalfa weevil development. Although confirmed reports of alfalfa weevil larvae have been almost absent, Kevin Black, with Growmark in Bloomington, reported alfalfa weevil larvae were found in Jackson County last week by Alan Mosler, with Southern FS. The warm weather we've experienced over the past week is sure to have accelerated weevil development. Accumulated degree-days (base 48˚F), from January 1 through April 13, indicate that alfalfa weevil larval hatch will occur in alfalfa fields in half of Illinois soon (Figure 1). Projected degree-day accumulations (base 48˚F) indicate that almost the entire state will have accumulated at least 200 degree-days by April 28 (Figure 2). Larval feeding should be more commonplace as warm weather continues. If you're heading out to check your alfalfa fields, remember, small larvae generally will be found in the terminal tips of the plant. Early feeding is identified as small pinholes in the leaves. As larvae continue to grow, they move down the plant and begin feeding on leaf margins and skeletonizing leaves. If you are out scouting and come across alfalfa weevil larvae and damage, we'd be curious to know what you're finding.—*Kelly Cook*

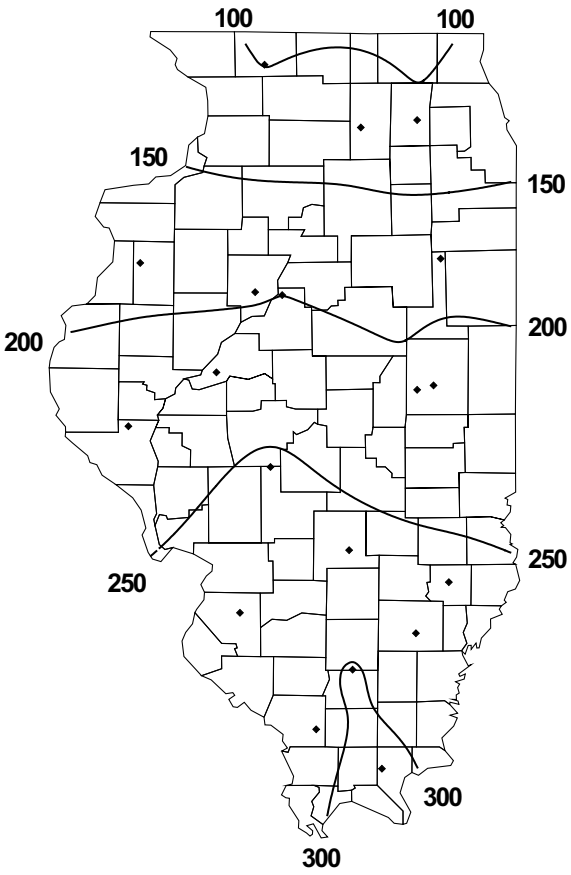

Figure 1. Actual degree-day accumulations (base 48˚F) from January 1 through April 13, 2003. (Map courtesy of Bob Scott, Illinois State Water Survey.)

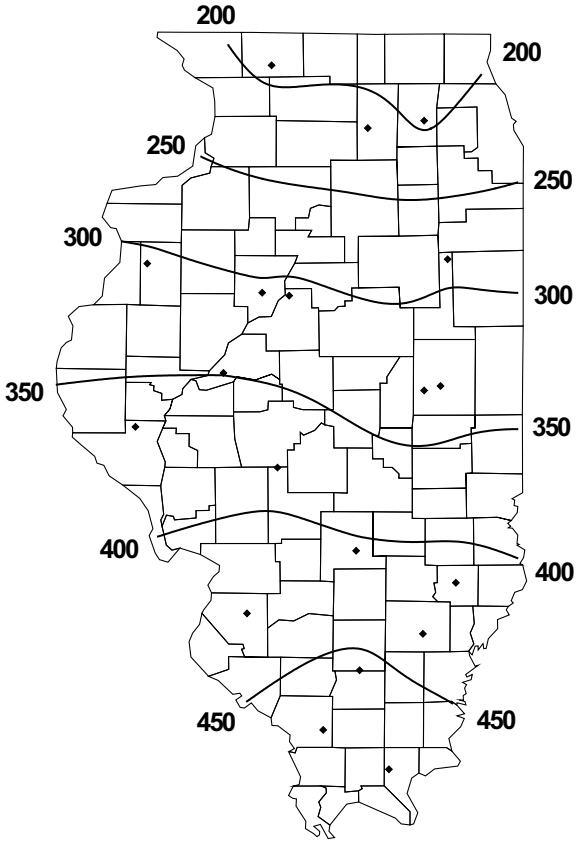

Figure 2. Projected degree-day accumulations (base 48˚F) from January 1 through April 28, 2003. (Map courtesy of Bob Scott, Illinois State Water Survey.)

PLANT DISEASES

Spring Alfalfa Diseases

This article will provide basic information on three diseases of alfalfa that are often seen in the spring: Sclerotinia crown and stem rot, Aphanomyces root rot, and spring black stem and leaf spot. Additional information and photographs for these and other alfalfa diseases can also be found at the University of Illinois Field Crop Diseases Web site (cropdisease.cropsci.uiuc.edu).

Sclerotinia crown and stem rot is an alfalfa disease that is most common in the southern half of Illinois. It is initiated primarily in the fall and continues to spread and infect into the spring. The damage is usually most readily seen in the spring and may be noticed as dying or rotting plants in large or small patches. This disease can destroy stands of alfalfa or thin out stands to result in low yields.

Sclerotinia crown and stem rot of alfalfa in the Midwest is thought to be caused primarily by the soilborne fungus *Sclerotinia trifoliorum*. A similar disease, white mold of soybean, is caused by a different pathogen (*Sclerotinia sclerotiorum*). Sclerotinia crown and stem rot of alfalfa causes soft rot of infected plant tissues. Young plants that are killed by this disease often degrade quickly and are seen as brown, dead tissue lying on the ground. On established plants, individual stems often wilt and die. These plants typically have infected internal crown tissue that is a brown–yellow color, and the infection may spread to kill the crown and all stems. A telltale sign of infection on infected tissue is sclerotia, which are small black to gray fungal structures that are round to elongated and about 1/8 to 1/4 inch in diameter and length.

Management of Sclerotinia crown and stem rot of alfalfa is based primarily on planting date, crop rotation, and resistant cultivars. Spring planting allows the plants to develop resistance prior to the time infection occurs in the late fall. This disease is typically most destructive in fall-seeded stands. If possible, new fields of alfalfa should be established where there is no history of severe Sclerotinia crown and stem rot of alfalfa or red clover. Alfalfa cultivars with resistance/tolerance to this disease have been developed that can be more productive than other cultivars under conditions of low to moderate disease pressure. If Sclerotinia crown and stem rot of alfalfa is seen in Illinois, please collect plants and contact Dean Malvick by phone at (217)265-5166 or e-mail at dmalvick@uiuc.edu.

Aphanomyces root rot is caused by the soilborne fungal-like pathogen *Aphanomyces euteiches*, which infects alfalfa roots in slowly drained soils and during extended periods of rain. This disease is typically most damaging to seedlings. It can dramatically reduce stands and reduce vigor and yield of plants that survive infection. We have found *Aphanomyces euteiches* to be very common in Illinois alfalfa fields, and race 2 appears to be more common than race 1 in our preliminary work.

Aphanomyces root rot can be difficult to diagnose in the field. Infected seedlings typically become stunted and yellow before they wilt and die. Cotyledons usually turn yellow first, and seedlings then often develop a purple tint. Older stands with significant disease pressure from Aphanomyces root rot may be stunted and significantly thinned. Two similar diseases, which are also favored by wet soil conditions, are caused by the pathogens *Pythium* and *Phytophthora*; but these pathogens tend to kill seedlings quickly before plants become severely chlorotic or discolored.

Management of Aphanomyces root rot is based primarily on resistant varieties and avoidance of slowly drained fields. Fungicides are not available for control of Aphanomyces root rot of alfalfa. The seed-treatment fungicides Apron XL, Allegiance-FL, and Apron-FL are not effective against *Aphaomyces*, but they do reduce seed rot and seedling damping-off caused by *Pythium* and *Phytophthora*.

The best approach to managing Aphanomyces root rot is through the use of resistant alfalfa varieties. Many varieties are resistant (R) or highly resistant (HR) to Aphanomyces root rot. They should be planted where slowly drained soils occur and where *Aphanomyces* may be a problem. However, most varieties with resistance to *Aphanomyces* are resistant only to race 1, and these can be killed by race 2 of *Aphanomyces*. Because we now know that race 2 appears to be common in many areas of Illinois, resistance to race 1 may not be effective in many Illinois fields. Several alfalfa varieties are available that are resistant to both races of *Aphanomyces*. If resistance to race 2 is not specified for an *Aphanomyces*-resistant alfalfa variety, then it is likely to be resistant only to race 1.

Spring black stem and leaf spot (caused by the fungus *Phoma medicaginis*) is a common disease at this time of the year (and in the fall). This foliar disease will be favored by the wet and cooler weather that is predicted in Illinois over much of the next week. This and other foliar diseases can develop quickly during favorable conditions. This disease often is most severe on the leaves, petioles, and stems near the soil and tends to progress upward in the plant. Small to large dark brown to black spots develop on the leaves, and lesions on the stems can become severe and girdle the stems. This disease can cause defoliation, which leads to reduced yield and forage quality.

Yield and quality losses caused by spring black stem and leaf spot can be reduced by cutting. Stands should be harvested as soon as possible if the disease becomes severe, and this may mean before the optimal harvest date based on growth stage of the alfalfa. Choose high-yielding alfalfa varieties adapted to your area. Alfalfa cultivars are not available with high levels of resistance to spring black stem; how-

ever, some new varieties are reported to be damaged less from this disease than older varieties. Good management and fertilization (especially K) practices may also help to reduce losses from foliar diseases.

If you wish to have alfalfa diagnosed for these or other diseases, samples can sent to the University of Illinois Plant Clinic in Urbana (217-333-0519; www.cropsci.uiuc.edu/research/clinic/clinic.html).—*Dean Malvick*

WEEDS

Insect–Weed Interactions in 2002

The 2002 growing season presented some "interesting" weed management challenges for growers around the state. In various fields, weeds such as giant ragweed, Pennsylvania smartweed, horseweed (marestail), common lambsquarters, and common waterhemp were not effectively controlled by glyphosate. Often the tops of these plants would become necrotic, but the lower portions seemed uninjured and rapidly produced new growth. Splitting the stems of these weeds revealed tunneling throughout the vascular tissue that ranged anywhere from a 1/4-inch-wide to 90% loss of the conductive tissue.

The culprit in many of these fields with "poor control" was not herbicide resistance or poor herbicide performance but insects feeding within the stems of these plants. This tunneling throughout the stems seemed to compromise herbicide effectiveness. Because glyphosate is a translocated herbicide, insect injury to the vascular tissue may have reduced its translocation throughout the plant, compromising herbicide performance.

Stem-boring insects. Several different insects were found in giant ragweed, Pennsylvania smartweed, horseweed (marestail), common lambsquarters, and common waterhemp in 2002. Of these insects, three species appeared most frequently in fields that experienced reduced weed control with glyphosate.

The first insect species found was common stalk borer larvae, *Papaipema nebris*, in giant ragweed. Last year was not the first year common stalk borer has reduced herbicide activity on giant ragweed; however, it seemed to have occurred on a larger scale. Common stalk borer larvae hatch from overwintering eggs in the spring and immediately burrow into available host plants (Ratcliffe et al. 2001). More than 100 plant species may serve as suitable hosts for common stalk borer larvae (Wright et al. 2000). These larvae continue feeding in the host plant until they are fully mature, until the girth of available stem material becomes too small, or until host plants are killed. As larvae outgrow their initial host plants, they move to nearby larger-stemmed host plants, usually in June. After they finish feeding, the larvae pupate, and adult moths emerge in late summer and early fall. Eggs are then deposited on weed hosts and overwinter (Ratcliffe et al. 2001). Common stalk borer have one generation per year and acceptable weed hosts include common burdock, curly dock, pigweed species, grass species, and giant ragweed (Steffey 2002).

The second insect observed tunneling in several weed species is yet to be identified to the species level. Both larvae and adults of this insect were observed feeding in weed stems in 2002. In October 2002, John Bouseman (Illinois Natural History Survey) identified the larvae as belonging to the genus *Lixus*. The larvae were legless and white, with orange heads; and the adults were slender and brown. Both larvae and adults could be found within weeds that had small-diameter stems. Some *Lixus* species are noted for their stem-feeding habits on weeds in the *Polygonaceae* family (Medland and Fewless 2002) and the *Amaranthaceae* family (Vrablova et al. 1997).

The third insect species found tunneling in weed stems was tentatively identified as Dectes stem borer (soybean stem borer), *Dectes texanus*. The Dectes stem borer larvae are about 1 inch in length, with an orange–red head capsule and a white body. These larvae were found in stems of various weed species. Adult Dectes stem borers are gray, with very long antennae, and have somewhat flattened bodies. Within a week of emergence, female Dectes stem borers mate and begin depositing eggs in plant petioles the following week. When the insect reaches the fourth instar (late summer to early fall), it tunnels to the base of the host plant (that is, giant ragweed and cocklebur) (North Carolina Agricultural Extension Service). Tunneling may be so severe that the plant lodges.

Implications of insect–weed interactions. The effectiveness of certain translocated herbicides was compromised in 2002 in certain areas because of insect-infested weeds. Although this interaction has happened in the past, it seemed to be on a much larger scale last year. These interactions raise a number of questions on how we will approach postemergence herbicide applications: (1) Will we continue to see these insect–weed interactions occurring that reduce effectiveness of translocated postemergence herbicides? (2) If these interactions occur, what are the implications of not controlling these insect-infested weeds? (3) What may be some of the approaches to control these insect-infested weeds?

At this time, we don't know whether these interactions were rare occurrences in 2002 or whether they will continue to be a problem in the future. Implications of not controlling these weeds on a larger scale may relate to competition for yield and future weed problems because of seed production. For example, *Lixus* species such as *L. cardui* have been reported to reduce plant vigor and size but not seed production (Woodburn and Briese 1996).

Although glyphosate continues to be a convenient, efficacious, and economical herbicide, it seems that most of the insect-infested weed escapes occurred on larger plants. If these weeds are targeted for applications at smaller stages, they may be more easily controlled and less attractive to stem-boring insects. Many questions still remain related to these insect–weed interactions that need to be answered.—*Christy Sprague, Matt Montgomery, and Aaron Hager*

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PPO-Resistant Waterhemp in Illinois

At the 2002 Illinois Crop Protection Technology Conference, Dallas Peterson (Kansas State University, KSU) reported on work conducted by KSU researchers on a PPO-resistant waterhemp biotype identified in Kansas. At the 2003 Illinois Crop Protection Technology Conference, we reported that the phenomena of PPO resistance is no longer confined to the Kansas waterhemp biotype. At least one (and most likely several more) waterhemp population in Illinois is now confirmed to be resistant to PPO inhibitors. This population is located in western Illinois, but we have received other anecdotal reports of PPO inhibitors (that is, diphenylether herbicides such as Ultra Blazer, Flexstar, Cobra, and Phoenix) failing to control waterhemp. Not all of these reports have emanated from western Illinois, however, and we are concerned that PPO-inhibitor resistance in Illinois waterhemp populations may be more widespread than initially perceived.

Before going any further, let's also say it is unlikely that every instance of PPO inhibitors' failing to provide complete control of waterhemp is attributable to resistance. Less than complete control of waterhemp with PPO-inhibiting herbicides is not something unique to the 2002 growing season. For many years, we (and many others) have observed waterhemp control range from complete to much less than satisfactory with these herbicides. Regrowth of susceptible waterhemp plants occurs more frequently when postemergence applications are made to plants larger than 5 inches in height or under adverse growing conditions (primarily extended periods of dry soils). Late-season applications of these herbicides, usually made when waterhemp plants are very large and nearing the reproductive stage, also can result in poor control. Please note that instances of poor waterhemp control such as these are *not* necessarily attributable to herbicide resistance.

In 2002, we initiated field experiments on the producer's field in western Illinois to determine the resistance characteristics of the waterhemp biotype. Each experiment (soil-applied and postemergence) included several PPO-inhibiting herbicides, as well as herbicides with other sites of action. No crop was planted in the study area because of adverse weather conditions. The soil-applied experiment was evaluated 30 days after application, whereas the postemergence experiment was evaluated 7 and 21 days after application.

Results from the soil-applied experiment indicated all herbicides, other than acetolactate synthase (ALS) inhibitors, provided excellent waterhemp control 30 days after application. Soil applications of Authority, Valor, and Flexstar (all PPO inhibitors) provided from 86 to 99% waterhemp control. Soil applications of Pursuit, Classic, and FirstRate did not provide any waterhemp control, compared with a untreated check. The fact that soil-applied PPO inhibitors controlled the waterhemp biotype was not terribly surprising, given that KSU researchers also have reported good control of the Kansas PPO-resistant waterhemp biotype with soil-applied PPO inhibitors.

Results from the postemergence experiment indicated all ALS inhibitors did not provide any waterhemp control and that control with PPO inhibitors ranged from 13 to 53%. Each PPO inhibitor was applied at four rates, representing a 1/2x 1, 1.5, and 2x rate. The 2x rates of Cobra, Flexstar, Ultra Blazer, and Aim provided only 28, 46, 53, and 23% waterhemp control, respectively, 21 days after application.

These results are similar to those reported by the KSU researchers.

We are currently conducting additional experiments (greenhouse and laboratory) with this waterhemp biotype. In particular, Patrick Tranel and his graduate student William Patzoldt are attempting to determine the resistance mechanism and how the resistance trait is inherited. Stay tuned in future issues for additional information on PPO-resistant waterhemp.—*Aaron Hager and Christy Sprague*

CROP DEVEOPMENT

Notes on the Wheat Crop

Travels in southern and northern Illinois over the past 2 weeks have shown the 2003 wheat crop to be in mostly good condition, after a rather slow start last fall. Though winter conditions were relatively cold and snow cover was limited, the crop survived to spring green-up quite well, though with fewer tillers and less vegetative growth than we would like to see. In many fields, rows were easily visible, and ground cover was probably less than 50% throughout dormancy. But over the past month, we have had more than average amounts of the relatively dry, cool, and sunny conditions that we need for such a crop to produce more tillers and thus boost its yield potential. Nitrogen has been applied to almost the entire crop, and crop color is good. Crop growth has been rapid in the past 2 weeks, though the crop is only about average in its developmental stages. Even the frosty conditions a few mornings have probably helped reduce pressure from insects that might spread disease. Wheat does not suffer from temperatures in the upper 20s, at least until it's in boot stage or beyond.

One problem that has been noted in several fields, mostly in northern Illinois, is that of injury from nitrogen application. While we can usually put solution N (UAN or dilute ammonium sulfate) on the crop during dormancy without much problem, the limited growth of the crop last fall and some unpredictable temperature fluctuations before and after application have in some fields resulted in loss of leaf area and even some death of plants, especially in overlap areas. Such injury seems to require that the wheat plants be a certain size, such that leaves do not intercept all of the solution but rather allow it to run down into the whorl, where it can injure the growing point and kill the plant. Smaller plants, with less leaf area and leaves more upright, may intercept little of the solution and hence escape injury. The surest way to prevent such damage is to use dry forms of nitrogen. If solution N is used, it might be best to wait to put it on until plant growth is adequate to more or less cover the soil surface, even if that means waiting to apply N until there has been some spring growth. Applying all of the N at planting works for some people, but warmer fall weather can cause excessive growth and there is more time for such N to be lost under wet conditions.

As the crop enters the jointing stage and moves toward heading, yield potential will start to become clearer. Maximum tiller number is set by the time plants joint (when we can feel the first node at the base of the plant, usually about the time plant height reaches 10 inches or so), but the number of tillers that form heads can change. Cool, dry conditions will favor head numbers, which are usually associated with yield. Still, guessing at wheat yield before heading is about as accurate as guessing yields of a corn crop that's 3 feet tall in the middle of June; most of the problems that cause yield loss are yet to come.

Corn Planting Under Way

Although cool temperatures have limited the urge to plant, the past 2 days in the 80s have a lot of equipment moving now. Soil moisture conditions are generally good for planting, with more worry in some places about lack of rainfall over the past months than about its being too wet. Corn that we planted here on March 24 to test the polymer seed coating began to emerge on April 15 from uncoated seed but not yet from the coated seed. One of the "features" of soils worked and planted when they are dry enough is that they do not tend to form crusts easily, though they can if heavy rains are followed by dry, warm, windy conditions. After 3 weeks, there was no soil crusting in our early planted plots. Three weeks is not an excessive amount of time for corn seed to lie in the (cool) soil before emergence, as long as soil conditions are not excessively wet.

Of course, planting this early still carries the risk of a return to cold, wet conditions, which can affect not only emergence but can also, as we saw last year, result in some physiological effects on corn plants that may limit yield potential. One advantage this year has been the dry soil conditions, which mean that soil structure in planted fields will be better in most fields than it was last year. Even with a return to normal rainfall amounts, seeds planted in soil with good structure are better able to access air, less likely to suffer from crusting, and thus much better able to germinate and emerge from wet soils after planting than is corn planted into soils that were worked or planted when it was wet. While we can't know what's ahead for this crop, we have had better planting conditions so far in 2003 than we ever had in 2002.

The most common concern that I hear is from those areas where it has been much drier than normal over the past several months. Although figures from the Illinois State Water Survey show that soil water content across the state is not much lower than normal, there are pockets where soils are not fully recharged. Still, most of the water that has fallen since last fall is stored in the soil now, and crop use is only a few inches more than normal rainfall amounts from May through August. Hence a return to more normal rainfall amounts during the growing season

should provide enough water for the crop, at least in most areas of the state.—*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

Field activity started up again over the weekend focusing on tillage, anhydrous ammonia application, and herbicide application. Also some producers were seeding oats and alfalfa and applying dry fertilizer. Some corn has been planted.

Extension educators and volunteer cooperators are monitoring more than 20 black cutworm moth traps scattered throughout the region. As of April 14, most trap monitors have yet to catch their first black cutworm moth.

Southern Illinois

With the return to drier conditions late last week, fieldwork rapidly resumed. Tillage, nitrogen applications, spraying, and planting are progressing at a rapid rate as farmers try to cover as much acreage as possible before the next series of storm fronts move through this week. The amount of fieldwork completed varies widely across the south, with some areas making major progress while other areas are just getting started.

We have received reports of some alfalfa fields being sprayed for control of alfalfa weevil, as well as reports of fields being harvested early, either due to weevils or the desire to make high-quality hay before starting on corn planting.

Wheat is in the jointing stage and progressing rapidly because of excellent growing conditions.

Ron Hines at Dixon Springs reported his first trap capture of a true armyworm moth but had no intense captures of black cutworm moths this week. Expect this situation to change as intense storm fronts move through.

The SIUC Belleville Research Center held its annual fall-applied herbicide tour last week. Many herbicide combinations worked well, with some interesting differences across weed species and application timings. With this year's winter and spring temperatures being more "normal" than in the past couple of years, the data should prove useful for those considering fall applications.

West-Central Illinois

Fieldwork in most parts of the region resumed last Friday and Saturday and has been uninterrupted for five days. As of this past Wednesday, ideal soil conditions are being reported across the region, but rain is expected for most of the latter part of the week. The status of corn planting varies somewhat across the region and ranges from 25% complete in the northwest and west to nearly two-thirds complete in the southeast.

Intense captures of black cutworm moths have been reported near Camp Point in Adams County within the past week. To the north, around Macomb and Carthage, numbers of moths observed in traps have increased (average of two to three per day), but no intense captures have been reported as of Wednesday morning.

Wheat looks very good in most areas and has put on substantial growth within the past week. To date, we have not received many reports of disease problems in the field.

Alfalfa is 3 to 6 inches in height in many fields and is progressing well. In most of the region, enough GDDs have been accumulated to initiate alfalfa weevil hatch, so producers are being encouraged to begin scouting soon.

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