



# PEST MANAGEMENT & CROP DEVELOPMENT

## BULLETIN

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## INSECTS

### Be Alert for Cutting of Corn Plants by Black Cutworms in Southern Illinois

As indicated in last week's issue of the *Bulletin* (no. 4, April 20), we projected that cutting of corn seedlings in southern Illinois counties could begin as early as April 20. For central Illinois counties, cutting of corn plants is possible by the first week of May. In troubleshooting fields for suspected cutworm problems, it is helpful to assess the stage of black cutworm development. This will enable you to determine the number of days that cutworms are likely to continue feeding within a field and estimate the potential number of plants that may be cut. Figure 1 is a true-to-scale guide that can be used to improve your cutworm-management decisions.

To use this guide, grasp a cutworm larva tightly behind the head. Hold the head flat against the card. Look only at the width of the head capsule. Move the head down the scale until it matches the width of a bar. The number corresponding to that bar is the instar of that cutworm. After determining the instar (larval-growth stage), use the chart to estimate the approximate days left to feed and the potential number of plants that may be cut. For example, if the average size of cutworm larvae in a field is sixth instar, these cutworms will feed for about 14 more days and may cut one to four plants each, depending on the stage of corn-plant development. This information should help you determine the need for a rescue treatment.

Insecticides that are labeled for use as rescue treatments for black cutworms include Ambush (6.4 to 12.8 oz. of product per acre), Asana XL (5.8 to 9.6 oz.), Capture 2EC (1.47 to 2.2 oz.), Lorsban 4E (1 to 2 pt.), Pounce 3.2 EC (4 to 8 oz.) and Warrior (1.92 to 3.2 oz.). Each of these products is a restricted-use insecticide, and applicators must be certified.—*Mike Gray*

Larval instar	Head capsule width	Approximate days left to feed	Potential number of plants that may be cut		
			1 leaf	2 leaf	4 leaf
4	■	25	4	3	1
5	■	21	4	3	1
6	■	14	4	3	1
7	■	5	1	1	1

Figure 1. Guide to black cutworm development and damage in corn.

## Correct Identification of Cutworm Species Is Important Each Spring

The claybacked cutworm is often confused with its close relative, the black cutworm. However, the skin granules of claybacked cutworm larvae are very small, slightly convex, and set contiguously like blocks in pavement. The skin granules of black cutworms vary in size and are more isolated. These differences in the cuticle (skin) create a smoother appearance for claybacked cutworms. Additionally, the dorsal (upper) surface of claybacked cutworms is usually paler (gray to pale orange) than the lateral portions of the body. Claybacked cutworms overwinter as half-grown larvae in the soil. In essence, they get a “jump” on black cutworms when it comes to cutting each spring. Large infestations of claybacked cutworms can cause economic losses in some cornfields each year. They are most often observed in fields that were planted to clover or alfalfa the preceding year. There are no established thresholds for claybacked cutworms, but the thresholds used for black cutworms are probably reliable. Keep in mind that claybacked cutworms, because of their larger size earlier in the spring, often cause damage to very young corn plants, so a quick diagnosis is important. If an insecticide is warranted, consider the use of a product suggested for control of black cutworms.

The sandhill cutworm is whitish to tan to pale gray, with seven faint, chalky white stripes along the length of the body. Its head is tan, and its skin is translucent. Unlike the black cutworm, the sandhill cutworm overwinters in Illinois as a partially grown larva. Sandhill cutworms feed almost entirely beneath the surface of the soil, so they usually cut the seedlings off below the growing point. The end result is dead plants and a reduced stand. Although economic thresholds have not been established specifically for sandhill cutworms, the standard guideline is the same as for the black

cutworm. Because sandhill cutworms overwinter as larvae in sandy soils, many producers who have had a history with these cutworms choose to apply a preventive treatment. Another species of cutworms, glassy cutworms, also overwinters as partially grown larvae. Glassy cutworms are greasy white, with reddish brown heads, and are usually found in cornfields planted after sod.

Dingy and variegated cutworms are two other species of cutworms that are often noticed by producers each spring. Both of these species are regarded primarily as leaf feeders and do not present a significant economic threat. Dingy and variegated cutworms are frequently present in cornfields planted after clover or alfalfa. Like the claybacked cutworm, the dingy cutworm resembles the black cutworm, but again the skin textures differ. The dingy cutworm has smooth skin; the black cutworm has rough skin. The four dark tubercles (bumps) on the top center of the dingy cutworm are about the same size. On the black cutworm, the inside pair of tubercles is about one-third to one-half the size of the outside pair. Variegated cutworms vary in color from green-yellow to tan to nearly black and are characterized by a row of four to seven pale-yellow spots along the center of the dorsum (back). The sides of the body are paler than the top of the body, and there may be a pale orange-brown longitudinal stripe along the row of spiracles. Fully grown larvae may reach 2 inches in length.

Bottom line—identify your cutworm species properly. Mistaking dingy cutworms for black cutworms could cost a corn producer a needless expense if a field is treated. On the other hand, not reacting to an infestation of black, claybacked, glassy, or sandhill cutworms could be a costly mistake. Also, as Kevin Steffey mentioned in issue no. 3 of the *Bulletin*, don't mistake crane fly larvae for cutworms. Because crane fly maggots are not pests of corn, proper identification is important.—*Mike Gray and Kevin Steffey*

## Moths in Pheromone Traps or Blacklight Traps

In last week's *Bulletin* (issue no. 4, April 20, 2001), I wrote an article about the types of moths that Ron Hines, senior research specialist, Dixon Springs Ag Center, Pope County, is capturing in pheromone traps. People who operate either pheromone traps or blacklight traps expect to capture moths at this time of year, but only a few of them create any economic concerns. Obviously we all want to know about the activity of black cutworms when they begin to fly into Illinois from southern states at this time of year. However, wheat growers might be interested particularly in armyworm activity.

Armyworm moths fly into Illinois at the same time as black cutworm moths; who knows, maybe they fly “tarsus in tarsus” (the entomological version of hand in hand). Ron has captured armyworm moths in some of his traps in southern Illinois, so wheat producers can anticipate finding armyworm larvae in their fields soon. The first few instars cause very little obvious feeding damage, but the larger instars can defoliate plants very quickly. In next week's issue of the *Bulletin*, we'll offer an overview of armyworms—biology, scouting tips, and thresholds.

We'll keep our eyes on other moths early in the year, including corn earworm, European corn borer, and southwestern corn borer. If conditions favor their survival this spring, all of these pests could cause significant damage in some areas. We'll keep you apprised of developments over the next few weeks.—*Kevin Steffey*

## Wireworms Have Been Found in Some Fields

We've mentioned wireworms in a couple of previous issues of the *Bulletin*, and now we have received our first confirmed report of wireworms attacking planted corn seeds and young seedlings.

As most people know, wireworms cannot be controlled with “rescue” treatments. If wireworms are discovered damaging corn seeds and seedlings and reducing the plant population, the only consideration is whether the field or parts of the field need to be replanted. If a producer decides to replant because wireworms have caused significant stand loss, application of a soil insecticide during replanting is appropriate at this time of year. Refer to issue no. 1 (March 16, 2001) of the *Bulletin* to examine the list of insecticides suggested for control of wireworms in corn.

This is only the beginning of reports of subterranean insects that damage corn. We’ll keep generating reports when we learn about infestations.—  
*Kevin Steffey*

### Alfalfa Weevils Are Still Busy

In last week’s issue of the *Bulletin* (issue no. 4, April 20, 2001), I indicated that some people were applying insecticides to control economic infestations of alfalfa weevil larvae in southern Illinois. According to a report from Kevin Black (Growmark) and Alan Mosler (agronomist; Twin County Service Company; Perry, Franklin, Jackson, and Williamson counties), population densities of weevils have “exploded” in many fields, with economic damage obvious. However, so many producers are busy planting corn and so many applicators are spraying herbicides that the alfalfa might be ignored.

This is fair warning for alfalfa producers and others in central and northern Illinois. We often learn our earliest lessons in southern counties, providing ample opportunity to be prepared elsewhere. Economic infestations of alfalfa weevils are likely in central Illinois soon. John Shaw, coordinator of the Insect Management and Insecticide Evaluation Program, Illinois Natural History Survey, reported finding a mixture of second- and third-instar alfalfa weevils in a plot area in Champaign County on April 23. He

also found adults that are still laying eggs, so the density of larvae in the plot area will increase. Damage to the alfalfa was already evident, so John intends to apply insecticides for his efficacy trial soon.

The topsy-turvy weather is not allowing alfalfa weevils to develop at the same rate as they would if temperatures were consistently warm. Figure 2 shows actual degree-days (base 48°F) that have accumulated from January 1 through April 22. Approximately 100 degree-days have accumulated within the past week in the southern half of the state, but only about 50 degree-days accumulated during the same period in northern Illinois. Following are the numbers of degree-days above 48°F required for an alfalfa weevil to complete development through each of its four instars: 71 degree-days for first instar, 67 degree-days for second instar, 66 degree-days for third instar, and 91 degree-days for fourth instar. From egg hatch to pupation requires approximately 295 degree-days.

Figure 3 shows the projected accumulation of degree-days (base 48°F) from January 1 through May 6, 2001 (actual

data from January 1 through April 22, projected data from April 23 through May 6). If temperatures between now and May 6 are equivalent to the 40-year averages, we should expect the peak of third instars to have occurred throughout most of the southern third of the state. Damage to the alfalfa will be evident and weevil densities could be near economic levels in northern Illinois by May 6.

Insecticides suggested for control of alfalfa weevils were listed in issue no. 3 (April 13, 2001) of the *Bulletin*. With insecticide applications ongoing, it’s appropriate at this time to provide harvest intervals for these products. Table 1 shows the products suggested for control of alfalfa weevil larvae, recommended rates of application, and numbers of days between application of a given product and harvest of hay. When alfalfa weevils reach economic levels, always keep harvest intervals in mind before selecting the product to be applied.

Here’s another reminder to look for discolored alfalfa weevil larvae when scouting alfalfa fields. Larger larvae that appear yellow probably are in-



Figure 2. Actual degree-day accumulations (48°F) from January 1 through April 22, 2001. (Map courtesy of Bob Scott, Illinois State Water Survey.)

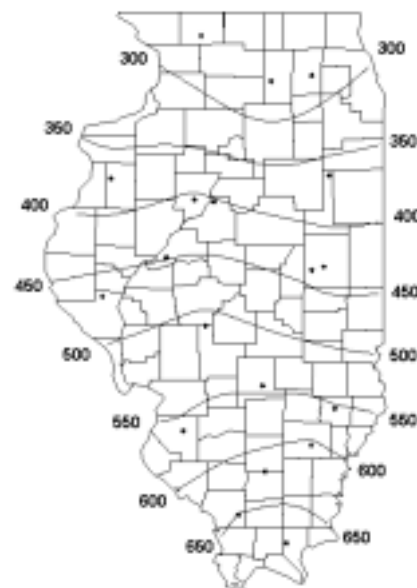


Figure 3. Projected degree-day accumulations (48°F) from January 1 through May 6, 2001. (Map courtesy of Bob Scott, Illinois State Water Survey.)

**Table 1. Insecticides suggested for control of alfalfa weevil larvae.**

<i>Insecticide</i>	<i>Amount of product per acre</i>	<i>Days between application and harvest of hay<sup>a</sup></i>
*Ambush	12.8 oz	14
*Baythroid 2	1.6 to 2.8 oz	7
*Furadan 4F	1/2 to 2 pt	7 (1/2 pt) 14 (1 pt) 21 (2 pt)
Imidan 70W	1 to 1 1/3 lb	7
*Lorsban 4E	1 to 2 pt	14 (1 pt) 21 (2 pt)
*Pounce 3.2EC	8 oz	14
*Warrior	2.56 to 3.84 oz	7

\* Use restricted to certified applicators.

<sup>a</sup> Days between application and grazing may be different from days between application and harvest for hay. Please refer to the label.

fectured with the fungus *Zoophthora phytonomi*. As the infection takes hold, the larvae turn brown and die. Spores from dead larvae are “show-ered” from the cadavers, and these spores infect other larvae. If the infection rate is high and environmental conditions are ideal, the disease spreads through the population rapidly and can reduce weevil densities to below economic levels within a matter of days. The presence of many infected and dead larvae may offset the need for an insecticide.

For several reasons, scouting alfalfa fields early in the season can pay major dividends. Avoid surprises, but don’t treat fields in which alfalfa weevils are causing only light to moderate injury.—*Kevin Steffey*

the spring of 2000, it’s hard to predict whether either of these insects will cause any significant problems. We’ve already offered an overview of flea beetles in the *Bulletin* (issue no. 3, April 13, 2001). We’ll provide more details about the now-infamous southern corn leaf beetles in next week’s issue of the *Bulletin*. In the meantime, for all of you who are scouting in the few fields that have emerged, keep your eyes peeled. Southern corn leaf beetles are small and hard to find at first. But watch carefully and you will discover them eventually. I learned this firsthand last year with the master observer himself, Dale Burmester, Gateway FS, Red Bud (Randolph County). And if I have enough patience to find these small insects, anyone does.—*Kevin Steffey*

## PLANT DISEASES

### Maybe the Plant Clinic Can Help!

There are plant clinics located at most of the larger land-grant universities in the country. This generally amounts to one per state. Over time the clinics have evolved to handle most plant problems or to refer clients to specialty labs, such as those handling virus identification, chemical residue testing, and tissue analyses. The University of Illinois Plant Clinic services include plant and insect identification;

diagnosis of disease, insect, weed, and chemical injury symptoms (chemical residue testing not available); nematode assays; and help with nutrient-related problems, as well as management recommendations involving these diagnoses. The clinic cannot handle herbicide injury problems on ornamental plants, nor can it assess nutrient levels in tissue or soil samples. If you have specific needs, call first and we can determine whether we can be of help or whether you would be wise to use another lab. The purpose of the Plant Clinic is to provide an unbiased analysis of your plant problem at an affordable price.

The University of Illinois plant clinic operates from May 1 through September 15. The clinic budget is supported in part by user fees, and these fees have not changed since 1999. A check made payable to the University of Illinois must accompany each sample. Contrary to popular belief, there is no discount or free service for university employees or alumni. Without the fees we would have to close our doors.

General diagnosis (including cultures)	\$12.50
Specialty tests (SCN, PWN, ELISA)*	\$18.75
Other nematodes (usually corn)	\$40.00

\*SCN indicates the test for soybean cyst nematode. PWN indicates pine-wood nematode analysis. ELISA is a technique used to obtain quick and accurate assays for a few specific pathogens. If you are in doubt as to the charge, call the Plant Clinic at (217)333-0519 and discuss your needs with one of our staff. Samples forwarded to other labs will require client approval.

A specimen data form or equivalent information should always accompany a plant sample. In a few cases the exact cause of the problem may be obvious, but usually it is necessary to perform microscopic work, culturing, and consulting with specialists to complete a diagnosis. The ability to provide a thorough diagnosis is di-

### Flea Beetles and Southern Corn Leaf Beetles in Southern Illinois

During the week of April 16, Bill Tarter, Alvey Labs, Breese, Illinois, reported finding some corn leaf beetles and southern corn leaf beetles causing minor feeding injury in a cornfield in St. Clair County. Both of these insects have figured prominently in our early-season hand-wringing during the past few years, so people will want to know about their presence. However, because the spring of 2001 is unfolding a bit differently than

rectly related to the quality of the sample and the type of information provided. Take the time to include as much information as possible to avoid additional sampling. Each of the University of Illinois Extension offices should have a copy of the clinic specimen data form. You can also find the form in the *Master Gardener Manual* at the back of the disease section and in the *Field Crop Scouting Manual*, or you can access the form on the clinic website at <http://www.cropsci.uiuc.edu/research/clinic/clinic.html>. Pictures (either tangible photos or electronic versions) are extremely helpful as additional information.

The most limiting factor in accurate diagnosis is probably the quality of the sample itself. Try to imagine what will happen to a plant when it is sealed in moist toweling, wrapped in plastic, and incubated in a mail truck for a few days in 100° temperatures. The result can be a moldy mess. When submitting plant samples, prepare them to survive a rough ride in a very hot mail truck. When sending whole plants, wrap them as you would if you intended them to be planted on arrival. Wrap soil and roots in plastic to keep them moist and to keep foliage clean. *Do not wrap foliage in plastic.* If only leaves are sent, keep these dry and between cardboard. We can always rehydrate dry material, but it is not possible to remove mold from rotted tissue. Send as much of the plant as possible, including affected as well as healthy tissue, carefully labeled. When in doubt as to how to package a sample or what to send, call the clinic or consult the “How to Submit a Sample” section of the webpage. The mailing address is:

Plant Clinic  
1401 W. St. Mary's Rd.  
Urbana, IL 61802

Business hours are 8:00 a.m. to noon and 1:00 to 4:30 p.m., weekdays only. Arrangements can be made to drop off samples at other times. Opening day is May 1.

If you have a diagnostic need that we do not offer, call and discuss this with me or send a message to [npataky@uiuc.edu](mailto:npataky@uiuc.edu).—*Nancy Pataky*

### Comprehensive Website for Soybean Varietal Information

The Varietal Information Program for Soybeans (VIPS) is a great tool for the analysis of the performance of soybean varieties. The URL is <http://web.aces.uiuc.edu/vips>. VIPS enables the user to compare selected attributes of individual varieties with ease. VIPS has recently been redesigned to be more user-friendly and comprehensive. VIPS was developed by researchers at the University of Illinois and Iowa State University and was initially funded by the Soybean Research and Development Council. The Illinois Soybean Program Operating Board is providing continuing funding.

VIPS offers valuable information on the production attributes of soybean varieties. It integrates information on yield and protein and oil content with data on disease susceptibility. Information is available for soybean varieties that were grown in all 12 locations of the University of Illinois field trials in 2000.

An additional component of VIPS is designed for users interested in in-depth analysis of soybean composition. This component, VIPS-Composition, provides information on 31 end-use attributes of soybean composition for more than 2,000 varieties. In addition to yield and disease information, the VIPS-Composition database includes values for attributes such as fatty acids, amino acids, and isoflavones. Information is currently available from the 1998 and 1999 soybean trials by the University of Illinois, Iowa State University, Soy Capital Bank, and Mycogen (now a part of Dow Agrosciences).

To use VIPS-Composition, click on the VIPS-Composition link from the VIPS homepage. Use of VIPS-Com-

position entails a simple, one-time, free registration process to obtain a user name and password. To register, click on the Access Request Form near the bottom of the VIPS-Composition page. Immediately after you complete and submit the registration form, you will receive a confirmation by e-mail with your chosen user name and password. Users may then access the VIPS-Composition database immediately. A brief tour of VIPS-Composition is available by clicking on “Introduction to VIPS-Composition Capabilities.”

### VIPS Highlights

*Data for 2000 soybean crop:* Analysis of results from all 12 University of Illinois field trials, ranging from Dekalb to Dixon Springs. *Soybean variety comparison:* Compare varieties from one or more locations. Rank them from highest to lowest based on yield, protein, or oil content, or disease resistance. Evaluate performance of Roundup Ready or conventional varieties. *Trial location information:* Identify the trial locations where varieties of particular interest are planted, and compare their trial outcomes. Display specific information regarding the environmental and agronomic conditions for all trial locations. *Disease information:* Disease resistance data for white mold, SDS, SCN, rhizoctonia and seed mottling are now available for many varieties.

### VIPS-Composition Highlights

*Comprehensive 1998-1999 data on more than 2000 different soybean varieties:* Includes information from the University of Illinois Variety Testing Program, SRDC Yields Project, Iowa Performance Test Program, Mycogen, and Soy Capital Bank trials. *Performance information:* Results for yield and more than 30 other end-use attributes, including protein, fatty acids, amino acids, and isoflavones. *Master list of all soybean varieties:* Users can easily pick a variety and go directly to the variety's trial results.

The VIPS website can be a valuable in-season tool for you to know what to expect from a variety and, of course, a useful tool for variety selection in coming seasons.—*Suzanne Bissonnette*

### Sampling for SCN—There Is Still a Little Time

Predictive soil sampling and analysis for the soybean cyst nematode (SCN) can provide timely information for growers, especially those considering planting soybeans this growing season. Growers can use the analysis to select SCN-management strategies and tactics that will minimize losses. Fields to sample might include those with an unexplained drop in yields of the last soybean crop. You may also want to sample to check nematode populations following 3- to 4-year rotations involving the use of nonhost crops and SCN-resistant varieties. This check is especially important when the initial population was determined to be at a moderate-to-high level (6 to above 25 cysts per 100 cc of soil).

Although a fall sampling may be preferable, samples can still be collected in early spring. However, you may find SCN for the first time and thus need to quickly change the crop or variety of soybean to be planted. So time is limited for this growing season.

*Sampling procedures:* For best results, take 12 to 24 subsamples (probes) in a zigzag pattern through each 10 to 20 acres to be sampled. Collect soil to a depth of 6 to 8 inches. Mix the soil and place approximately 1 quart in a sturdy plastic bag; repeat for each 10- to 20-acre set.

Next, complete a nematode soil sample form (available at your nearest Extension office) and submit it with the packaged samples. If no form is available, include an attached letter with (1) your name, address, county, and phone number; (2) any symptoms observed during previous plantings of soybeans and the patterns of the symp-

toms in the field (scattered, clustered in spots, or uniform); (3) the approximate size of the area sampled; (4) the cropping history for at least three years; (5) herbicides or other pesticides used the previous year; and (6) the crop or crops to be grown this season. Send them to Plant Pathology, N-533 Turner Hall, 1102 S. Goodwin Ave., Urbana, IL 61801. After May 1 send samples to the Plant Clinic, 1401 W. St. Mary's Road, Urbana, IL 61802.

For more information on sampling, refer to the *Report on Plant Disease* Nos. 1100 and 1107, available at Extension centers or from the Department of Crop Sciences (at the cost of \$1.00 per copy) at the above address.—*Dale I. Edwards*

### IPM Approach for Managing Soybean Cyst Nematode

An ideal program to manage soybean cyst nematode (SCN) infestations should integrate the following: detection through scouting and sampling procedures and crop rotations utilizing nonhost crops and SCN-resistant soybean varieties. Maintaining proper soil fertility and pH, managing other soybean diseases and pests, and proper planting methods also help to keep plants vigorous and better able to buffer the effects of SCN. The most effective management systems have and will continue to involve integrated approaches. No single method will manage SCN as effectively.

The success story of managing SCN has been the use of resistant varieties. Twenty years ago, only a small number of varieties that resisted SCN were available. Today, through the efforts of public and private soybean breeders, this list has expanded to approximately 700 lines, adaptable to Illinois and available for the 2001 growing season. Marion Shier, crops systems educator, Livingston County, compiles yearly a list of public and private varieties resistant to SCN titled "Soybean Varieties with Soybean Cyst Nematode Resistance." All varieties

are listed by maturity group and relative maturity within the groupings, a coding system is used that designates companies making the variety available, and a listing of race resistance and source of resistance for each variety is included. The Illinois Checkoff Board has published this listing in booklet form, and free copies may be obtained by contacting:

The Illinois Soybean Checkoff Board  
1605 Commerce Parkway  
Bloomington, IL 61704  
Telephone: (309)663-7692  
FAX: (309)663-6981  
E-mail: [ilsoy@ilsoy.org](mailto:ilsoy@ilsoy.org)

Limited numbers of the booklet are available also by contacting the author of this article.

Resistant varieties are the foundation for IPM approaches in managing SCN as well as other plant diseases. Some distinct advantages of using host resistance are that the pest control is purchased with the seed, is compatible with other management practices, and has few adverse effects on the environment, and the cost is minimal in most cases.—*Dale I. Edwards*

### Aphanomyces Root Rot Can Be a Serious Disease for Alfalfa

Poor growth of seedling alfalfa in wet or slowly drained fields may be due to several diseases. *Aphanomyces* root rot causes death and stunting of seedlings as well as more subtle disease of established plants that can result in significant yield reduction. Other diseases that occur in wet or poorly drained soils include *Phytophthora* root rot and *Pythium* seed and root rot.

Plants infected with *Aphanomyces* usually become stunted and chlorotic (yellow) before they wilt and die, whereas *Phytophthora* and *Pythium* tend to kill seedlings quickly before plants become severely chlorotic. Another clue to a problem with *Aphanomyces* is root rot of an alfalfa cultivar that is highly resistant to *Phytophthora*.

Although not much is known about *Aphanomyces* root rot in Illinois, it is known to be a serious problem in nearby states including Wisconsin, Iowa, and Kentucky. We suspect this disease is also a problem in many Illinois fields. This disease is caused by the soilborne fungal-like pathogen *Aphanomyces euteiches*. *Aphanomyces* root rot has been recognized as a serious disease of processing pea for almost 80 years. Perhaps because alfalfa disease that occurred in wet soil was attributed to *Phytophthora*, *Aphanomyces* root rot of alfalfa was not recognized as a serious problem until the early 1980s.

*Aphanomyces* root rot can best be managed by avoiding poorly drained soils and using *Aphanomyces*-resistant alfalfa varieties. Fungicides are not available for control of *Aphanomyces* root rot of alfalfa. *Phytophthora* and *Pythium* root rots of seedlings can be controlled with fungicidal seed treatments, such as Allegiance-FL, ApronXL, or Apron-FL, but these seed treatments are not effective against *Aphanomyces*.

Alfalfa varieties rated highly resistant (HR) or resistant (R) to *Aphanomyces* root rot should be planted where slowly drained soils occur and where *Aphanomyces* may be a problem. Control of *Aphanomyces* root rot became more challenging when different races of this pathogen were discovered. Many commercial alfalfa cultivars are now available that have resistance to race 1, the first race discovered. Another race (race 2) of *Aphanomyces* was identified in the early 1990s that overcomes race 1 resistance. Alfalfa cultivars developed for resistance to race 1 are killed by the aggressive race 2 isolates. Race 2 isolates have been identified in a number of states including Wisconsin, Iowa, and Kentucky. Race 2 has not yet been confirmed in Illinois. Alfalfa varieties with resistance only to race 1 may be genetically vulnerable to *Aphanomyces* root rot in many regions due to the presence of race 2. Several commercial alfalfa varieties are now available that have resistance

to both races of *Aphanomyces*. If resistance to race 2 is not specified for an *Aphanomyces*-resistant alfalfa cultivar, then you can assume it is resistant only to race 1. The overall distribution and impact of races 1 and 2 of *Aphanomyces* are uncertain, but *Aphanomyces* root rot should be considered as a potential problem in many parts of Illinois. —Dean Malvick

## WEEDS

### Waterhemp—Biology, Identification, and Management Considerations

Waterhemp will likely continue to be a problematic weed species during the 2001 growing season. In recent memory, few weed species have caused so many headaches for Illinois corn and soybean producers as waterhemp. This weed represents a prime example of why an understanding of weed biology/ecology is needed to implement effective management strategies. Simply stated, waterhemp doesn't always "behave" like other, more familiar summer annual weed species.

#### Waterhemp Biology

Waterhemp belongs to the botanical *Amaranth* family, which also includes the other pigweed species found in Illinois. The Latin, or scientific name, of each pigweed includes the genus name *Amaranthus*; each respective species name differentiates among the genus members. Many taxonomic references recognize common (*Amaranthus rudis*) and tall (*Amaranthus tuberculatus*) waterhemp as discrete waterhemp species, although differentiation between the two species is based on minute floral characteristics. Specifically, the only way to accurately differentiate between tall and common waterhemp is to examine how the thin membrane surrounding the seed (utricle) fractures when separated. Common and tall waterhemp can be found in Illinois, but from a management standpoint, there is little reason to differentiate between these

two species. We are not aware of any data that suggest these two species respond differently to any herbicide.

Tall and common waterhemp (hereafter referred to collectively as waterhemp) are two of nine pigweed species that can be found in Illinois. Prior to the rapid expansion of waterhemp, smooth pigweed (*Amaranthus hybridus*) was probably the most prevalent pigweed across much of Illinois. During early vegetative stages, smooth pigweed is nearly impossible to distinguish from redroot pigweed (*Amaranthus retroflexus*), another commonly encountered pigweed species. Palmer amaranth (*Amaranthus palmeri*) may be the most aggressive pigweed species with respect to growth rate and competitive ability. Palmer amaranth can be found in the southern one-quarter of Illinois and from personal observations, appears to be moving northward in Illinois. Powell amaranth (*Amaranthus powellii*) is usually found in the northern portions of Illinois but can also be found in central regions of the state. Spiny amaranth (*Amaranthus spinosus*) is rapidly identifiable by grabbing the stem with bare hands. As the name accurately implies, sharp spines are present where leaves attach to the stem. Although not very common in agronomic cropping systems, spiny amaranth can be found in pastures and around cattle feedlots. The two other pigweeds, tumble (*Amaranthus albus*) and prostrate (*Amaranthus blitoides*), are generally regarded not to be as troublesome as other *Amaranthus* species.

Waterhemp plants are either male or female (dioecious). Thus, male plants produce only pollen, while female plants produce only seed. This type of biology leads to cross-pollination, or the fertilization of female plants with pollen from one or more male plants. Cross-pollination can greatly increase the genetic diversity of a population, and with genetic diversity comes a wide range of morphological and biological characteristics. Seeds produced by female waterhemp plants are small and usually germinate from very

shallow depths in the soil (1/2 inch or less). The number of seeds produced by female waterhemp plants can vary depending on numerous factors, but waterhemp is generally considered to be a prolific seed producer.

It has been known for many years that certain *Amaranthus* species are able to cross-pollinate and produce fertile hybrids. It is more likely that two dioecious species will cross, but crosses between monoecious and dioecious species can also occur. Hybrid plants produced from monoecious by dioecious crosses are less fertile than their parents, but they may produce some seed. Recently, research at the University of Illinois has demonstrated that not only can waterhemp and smooth pigweed hybridize but also herbicide-resistance characteristics can be transferred to hybrid progeny. For example, if a male waterhemp plant that is resistant to ALS-inhibiting herbicides crosses with a smooth pigweed that is susceptible to ALS-inhibiting herbicides, some of the resulting progeny can carry the ALS-resistance trait. While waterhemp in Illinois is generally not effectively controlled by ALS-inhibiting herbicides any longer, smooth pigweed (for the most part) remains susceptible to this herbicide family. If cross-pollination between waterhemp and smooth pigweed occurs substantially under field conditions, additional difficulty controlling *Amaranthus* species might result due to increased rates of herbicide resistance evolution.

One of the most important factors to effectively managing waterhemp is to understand its germination and emergence characteristics. The germination and emergence patterns of waterhemp are characteristics that contribute significantly to management problems. While the peak emergence of other, more familiar summer annual weed species generally occurs during the early portion of the growing season, waterhemp emergence can easily occur during the middle to late portions of the growing season. Research

at Iowa State University has indicated that while velvetleaf emergence is nearly complete by early June, a significant number of waterhemp plants can emerge well into July. Soil-applied herbicides may not have sufficient soil-residual activity to control late-emerging flushes of waterhemp. Conversely, certain postemergence herbicides can control waterhemp present at the time of application but may not provide sufficient residual control of plants that emerge following application.

### Identification

Accurate identification of the various *Amaranthus* species can be very challenging, especially when the plants are in early vegetative stages. While each of the pigweeds previously described is recognized as a distinct species and has unique identification characteristics, hybridization among some of these species may produce offspring possessing characteristics of each parent, further complicating identification. The best time to accurately identify the various *Amaranthus* species is when the plants are at the reproductive stage with flowering structures present.

Waterhemp plants typically have no hairs (pubescence) on their stem and leaf surfaces. In contrast, smooth and redroot pigweed have small, fine hairs on stem and leaf surfaces that make the plant feel rough to the touch. The leaves of waterhemp plants are often glossy and more elongated (lanceolate) compared to redroot or smooth pigweed. Stem color of waterhemp can vary from light green to dark red, with multiple shades sometimes on the same plant. There does not appear to be a strong correlation between stem color and sex of the plant. Female plants may be completely red, completely green, or some combination of red and green. Male plants may exhibit a similar color pattern. Table 2 contains information for identification of the various *Amaranthus* species.

### Management Considerations

What is the best way to manage waterhemp in corn or soybean production systems? While there may not be any one “best” way, there are some methods that may be much more consistent than others. Whereas waterhemp may, in some instances, be adequately controlled by a single soil-applied or postemergence herbicide, this is generally not considered the most consistent method to manage this weed. *The most consistent waterhemp management programs in either corn or soybean production systems consist of a sequential management approach.* By sequential, we are referring to utilization of multiple control options, including tillage, cultivation, soil-applied herbicides, and postemergence herbicides. While a single postemergence herbicide application may sometimes provide acceptable waterhemp control, this is the exception rather than the rule. Waterhemp may well be the “poster weed” for an integrated weed-management program.

### Considerations with Soil-Applied Herbicide Programs

There are numerous soil-applied herbicides that possess good activity on waterhemp and other small-seeded species. Time of application can have a significant impact on the success of soil-applied herbicides for waterhemp control. A common practice in no-till systems is to apply a herbicide several weeks prior to planting in order to receive sufficient precipitation to incorporate the herbicide. Keep in mind, however, that the earlier a herbicide is applied, the earlier within the growing season the level of weed control begins to decline. Waterhemp can emerge much later in the growing season than is common for other summer annual species. If the herbicide was applied several weeks prior to planting, it may not have sufficient residual activity remaining to control a late-emerging species such as waterhemp.

**Table 2. Pigweed identification characteristics.**

Species	Hairs	Leaves	Flowers	Seed head
Redroot	Small, fine	Rounded	Monoecious	Highly branched, compact
Smooth	Small, fine	Rounded	Monoecious	Highly branched, < compact
Waterhemp				
Tall	None	Lanceolate	Dioecious	Top of plant and at leaf tips
Common	None	Lanceolate	Dioecious	Top of plant and at leaf tips
Palmer Amaranth	Few to none	Poinsettia-like, "V" variegation	Dioecious	Non-branched, 1 to 2 feet long
Powell Amaranth	Small, fine	Tapered and slightly pinched at end	Monoecious	Branched, < RR or smooth, 4 to 8 inches long
Spiny Amaranth	None	"V" variegation, spines at nodes	Monoecious	Male towards top Female towards bottom
Tumble		Egg-shaped, wavy edges, olive green	Monoecious	No distinct flowering structure, flowers at nodes
Prostrate		Spatulate, cotyledons longer than others	Monoecious	No distinct flowering structure, flowers at nodes

Note: Each of these species may have a reddish-colored root.

Redroot vs smooth: Differentiate only when seed head is present.

Redroot/smooth vs. waterhemp: Differentiate by hairs, leaf shape, and waxy leaves of waterhemp.

Tall vs. common waterhemp: Differentiate by fracture of seed capsule (utricle): common = two sections, tall = irregular.

What can be done to extend the length of control afforded by soil-applied herbicides? Three possible options include:

1. If allowed by label, increase the rate when applications are to be made several weeks prior to planting.
2. Apply the herbicide in a split application (generally two-thirds early with the remaining one-third at planting).
3. Apply the herbicide closer to planting time.

In our research, we have had better and more consistent results with soil-applied herbicides that were applied within 1 to 2 weeks of planting or at planting compared to the same herbicides applied several weeks (up to 5 weeks) prior to planting. It's not reasonable to assume that all soil-applied herbicides can be applied immediately before planting due to time and equipment constraints, but fields with a significant waterhemp problem would be excellent candidates for soil-applied herbicide applications immediately before planting.

**Considerations with Postemergence Herbicides**

Similar to soil-applied programs, there are several postemergence herbicides that are very effective on waterhemp. The factors governing the effectiveness of postemergence herbicides are critically important when dealing with waterhemp. Herbicide rate, application timing, and spray additive influence how well postemergence herbicides perform against waterhemp.

Often, producers like to wait as long as possible to apply postemergence herbicides, especially those that lack any significant soil-residual activity, to have as many weeds emerged as possible. Because waterhemp can germinate and emerge for an extended time, there typically exists a wide range of plant sizes by the time postemergence herbicides are applied. This can present problems with spray interception by smaller plants under the protective canopy of larger plants. Adjustments in spray volume and pressure can help to overcome some of the problem with coverage. Spray volumes of 20 gallons per acre with application pressures of 40 to 50 pounds per square inch generally provide a very uniform coverage of the target vegetation.

The next issue of the *Bulletin* will contain more information about waterhemp management in corn and soybean production systems.—Aaron Hager and Christy Sprague

**CROP DEVELOPMENT**

**Too Early or Too Late?—Cold Injury and Planting Date**

The below-freezing temperatures on April 18 had minor effects on Illinois crops but only because the crops—especially soybean—were not emerged on very many acres. My suggestions in last week's *Bulletin* that soybean might escape serious injury turned out to be too optimistic. The first planting of a planting-date study went in here at Urbana on April 5 and started to emerge on April 14. By the morning of April 18, some plants had their cotyledons opened, and the first leaves starting to expand, while others were just emerging. Those that were just emerging were most badly damaged by the freeze; the hypocotyl hook tissue was killed on these plants, and the plants died rapidly. The most advanced plants had the tissue above the cotyledons killed, and many of those will die due to lack of buds from

which to grow back. Other plants in this stage retained one or both cotyledonary buds, and these will grow back but not always normally.

Emergence of the April 5–planted soybeans was good—close to 80%. But I estimate that less than 50% of the emerged plants from this planting will survive to produce seed. We have the next planting date scheduled for this week and so should get some interesting data on the effect of “re-planting.” One lesson we can certainly take away is that while soybeans may be good survivors of early-season cold weather, young plants can still be killed if they happen to be at a vulnerable stage when the cold hits.

While some corn was planted in late March and early April, the only corn I have seen that was emerged a week ago is some volunteer corn. Leaves that were above the soil surface froze off in many cases, and those leaves might be gone now or the ends of the leaf might be crinkled from freeze injury if the leaf wasn't fully emerged. In this area, it does not appear that corn plants were killed by the freeze—appearance of new leaf tissue has resumed. But low-lying fields and those that were emerged a week or more before the frost should still be checked to see if the cold might have penetrated the soil enough to cause injury 3/4 to 1 inch deep.

Despite concerns a week ago about freeze injury to wheat, the crop seems to have come through the low temperatures with little or no effect. The dry weather in the southern half of the state has been positive for the crop, and it is entering boot stage in good conditions in most areas. Development of the crop is about average for this time of year; heading usually starts in the last week of April in the southern tip of the state and moves north at about 20 miles per day with average temperatures, reaching Urbana around May 10. Tiller numbers and leaf color are good, and if we get through the next 3 weeks without a lot of warm, wet weather, crop potential should be very good.

Corn planting has once again made rapid progress in April this year; the official estimate is that 19% of the state's crop had been planted by Sunday, April 22. The most rapid progress has been in central and southern Illinois, and showers have missed much of this area this week, so it is likely that many areas are more than 75% planted by now. Progress north of I-80 is still limited by wetness, but it appears that we will have more than half of the state's corn crop planted by the end of April, meaning that this will be another early planting year. By most accounts, soils are working up very well—from the looks of some “powdery” fields I have seen, perhaps a little too well. That should not be a problem if we don't get heavy rain and crusting before emergence. Current weather patterns suggest that we might get lucky on that score.

Because planting has been early the past few years, many people start to get nervous if their whole crop isn't planted by April 30, if not earlier. While it is true that planting much after May 1 in 2000 reduced yields considerably in many areas due to the weather pattern, on average we expect corn yield decreases due to late planting to be very modest up to May 10 or so, after which they begin to accelerate. The cold-hot-cold weather we have had in April this year has not allowed corn to grow as quickly as it did last year, and thus it is likely that early planting will not be quite as beneficial this year since corn planted in mid-April may not have much more growth a month from now than corn planted the last week of April, or even the first week of May.

With soybean, there is even less reason to worry if planting is delayed into May. We are doing more research to define the planting date response in different parts of Illinois, but for now we have little reason to think that soybeans planted by mid-May will have lower yield potential than those planted in early May. April planting might in fact be negative for soybean, depending on whether it freezes after emergence and on whether the condi-

tions are favorable for development of diseases such as SDS.—*Emerson Nafziger*

## Estimating Alfalfa Quality in the Field

When to take the first cutting is an important decision for those desiring to harvest high-quality alfalfa. Estimating the relative feed value (RFV) of standing alfalfa can be accomplished by using PEAQ (predictive equations for alfalfa quality), a system developed at the University of Wisconsin and used in Illinois.

PEAQ is a function of plant height (soil surface to stem tip) and stage of maturity (vegetative, bud, or flower). From these two factors, the estimated RFV and neutral detergent fiber of standing alfalfa is obtained. PEAQ can be determined by using a yardstick and a table, or a PEAQ measuring stick, available from many alfalfa seed dealers or companies.

You are encouraged to check the Illini PEAQ Website at <http://peaq.outreach.uiuc.edu/>. At this website you can see how to calculate PEAQ, view PEAQ values for Illinois (by region and by county), enter and track your own PEAQ values, and so on.

As a general guide, if 150 RFV alfalfa hay is desired, harvest when PEAQ indicates 170 RFV. Many times RFV will drop three to five points per day.

PEAQ is designed for 16- to 42-inch-tall alfalfa, but it is not intended to balance rations. It does not account for quality changes during harvest and storage. The procedure is most accurate for good stands of pure alfalfa with healthy growth.—*Jim Morrison*

## 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 South-west districts, and Peoria, Woodford, Tazewell, Mason, Menard, and Logan counties from the Central district)
- East central (East and East South-east 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 was observed in most areas the last half of last week until scattered showers occurred on Saturday evening and Sunday. Showers resumed again on Wednesday morning. Fieldwork focused on seed-bed preparation, anhydrous ammonia application, and corn planting.

Average alfalfa height is 4 to 6 inches, with no alfalfa weevil activity observed to date.

Extension educators monitoring black cutworm moth traps did not report any "intense" captures during the past week.

### **Southern Illinois**

Dry conditions continue with 0.1 to 0.5 inch of precipitation this past week. Cooler temperatures have

slowed growth somewhat. Wheat is generally approaching full flag leaf.

Cressleaf groundsel is in bloom. Dixon Springs reports giant ragweed has reached 6 to 8 inches in height, and rhizome johnsongrass is now over 6 inches tall.

A significant number of farmers have completed corn planting. Some have started to grab for the soybean bags. Concern is beginning to be expressed over dry soil conditions.

Alfalfa weevil has been the only major agricultural pest problem to date.

### **West-Central Illinois**

Rain fell in some areas, which interrupted planting. Other areas remain dry. Many farmers have finished planting corn.

Color of the early-planted corn has improved with warmer temperatures. Stands look very good, and few pest problems have been reported.

Soybean planting is just beginning.

Wheat fields look excellent, with no disease symptoms evident at this time.

Alfalfa and pastures are growing rapidly. Alfalfa weevils are present, but major feeding damage is not yet apparent.

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