PEST MANAGEMENT & CROP DEVELOPMENT

BULLETIN

FOR IMMEDIATE RELEASE
No. 22 / September 7, 2001

Executive editor: Kevin Steffey, Extension Entomologist

Available on the Web at http://www.ag.uiuc.edu/cespubs/pest/
For subscription information, phone 217.244.5166, or e-mail acesnews@uiuc.edu

In This Issue

Lock in the Dates for the 2002 Crop Protection Technology Conference and the Corn and Soybean Classics

Although most thoughts are on the upcoming harvest, don't forget to lock in the dates for the 2002 Crop Protection Technology Conference and the Corn and Soybean Classics. The dates for the Crop Protection Technology Conference are January 8 and 9, 2002, and it will be held at the Illini Union on the campus of the University of Illinois. Similar to last year's meeting, participants will be able to "tailor make" their individual schedules for the 2-day conference. To obtain registration information, please call Conferences and Institutes at (877)455-2687, or refer to the following Web site: http://nautilus.outreach.uiuc.edu/conted/.

Plan to attend the regional Corn and Soybean Classic meetings scheduled for January 2002. This next round of meetings will mark the fifth consecutive year that the Department of Crop Sciences has sponsored these increasingly popular educational sessions for growers and the agribusiness sector of Illinois. The meeting dates and locations for 2002 are as follows: January 15—Holiday Inn, Urbana; January 16—Hickory Grove Banquet Center, Rochelle; January 17—The Mark, Moline; January 24—Holiday Inn, Mt. Vernon; January 30—Holiday Inn, Collinsville; and January 31—Crowne Plaza, Springfield.—*Mike Gray*

INSECTS

European Corn Borer Fall Survey Under Way

As the 2001 growing season winds down, the severity of European corn borer injury across the state remains somewhat unclear. We've received scattered reports this season of impressive moth flights in some parts of central and western Illinois counties. To more accurately assess the level of crop injury and densities of the overwintering population of borers, the 2001 survey was initiated in early September. With the help of the crop systems and IPM Extension educators, we will assess the impact of European corn borers in well over 300 cornfields and offer our statewide population and injury reports in an upcoming issue of the *Bulletin*. Survey results from the past two years (1999 and 2000) revealed very low densities of European corn borers throughout much of the state. As producers make their seed-selection choices this winter, we hope our survey data on overwintering populations of borers can be of some value in the decision-making process. Because the harvest is already under way in some areas of east-central Illinois, don't be surprised to see Extension educators surveying fields in selected counties around the state.

From time to time, we're asked questions concerning how the survey is performed. Because the survey always has been conducted using the same sampling procedures, we are able to compare one year with the next. European corn borers are surveyed by selecting a cross section of 10 fields throughout a county. Within each field, 25 consecutive plants are checked for any signs of corn borer injury (frass, exit holes, broken stalks). Surveyors make sure that the 25 plants are not within border rows and try to check plants 25 to 30 paces away from these field margins. After the number of plants infested is determined, two infested stalks are split and the borers are counted. County and statewide averages are then calculated regarding the percentage of plants infested and the number of borers per plant.—*Mike Gray*

Corn Pith Weevil

As growers survey their corn crop this fall, they wonder why there is so much tip breakage. With a few exceptions, numbers have been low for both the European and southwestern corn borer. The majority of the breakage is above the ear; therefore, most growers probably won't get too excited until they notice that the damage is in both non-Bt and Bt hybrids. There are a number of things that can explain this type of tip breakage. This type of damage is usually a good indication that corn borers have been active, but diseases like anthracnose can cause tip dieback. Severe weather patterns and high winds can also cause localized damage. There is another cause that "old timers" tell me is common in southern Illinois, and that is the corn pith weevil.

The corn pith weevil is an interesting insect about which little has been written. It overwinters in its larval form buried in the soil. Adult weevils emerge from the soil in early July through early August. Eggs are laid during this period. Once hatched, the larvae feed in the upper parts of the cornstalk. Feeding continues until the first part of October, when the larvae leave the plant and enter the soil for the winter. There is only one generation per year.

This insect is not an economic factor in corn. The timing of the feeding coupled with the amount of tissue consumed makes any yield loss insignificant.—*Mark Hoard*

What More Will We Know About Soybean Aphids by the End of the Year?

As we have indicated at a number of field days this summer, the soybean aphid has been a rather elusive pest in Illinois in 2001. We have tried to initiate some research efforts in fields with large densities of the aphid, only to watch the densities "crash" because of the activities of natural enemies and the aphids dispersing from the field to recolonize other fields. However, entomologists in Michigan, Minnesota, and Wisconsin, where the population densities of soybean aphids were higher, have been more successful in following through with research that should provide us with a better working knowledge of this introduced pest.

Nonetheless, by the end of the season, we will have a lot of sampling data to sort through. The suction traps have generated data that should enable us to establish patterns of flight activity in Illinois throughout the summer. The survey team coordinated by David Onstad has collected an enormous amount of data regarding population dynamics in eastern and northeastern counties. And many other projects will offer up results that give us more insight regarding management of this pest for 2002 and beyond. As we interpret results from our efforts and the efforts of fellow entomologists in other states, we will make them available to you.

Although the soybean aphid was widespread again in 2001, we (in Illinois) escaped most of the serious infestations encountered in the northern states. So, as the soybean aphids return to buckthorn this fall, we will collect our thoughts, devise some more research plans, and determine how to prepare for this insect again next year.—*Kevin Steffey*

Planting Wheat? Remember the Hessian Fly

As the growing season for corn and soybeans comes to a close, the growing season for wheat begins. Wheat growers are preparing for the 2002 crop, getting ready to make decisions about planting for optimum yield and protecting the crop from pests. Although the recommendation of planting wheat after the (Hessian) fly-free date seems repetitive, it is a time-proven tactic for reducing the potential for infestations by this historically threatening pest. Planting wheat after the fly-free date in a given county also reduces the likelihood of the occurrence of Septoria leaf spot, which is favored by the excessive fall growth usually associated with early planting. Wheat planted after the fly-free date also is less susceptible to the barley yellow dwarf and wheat streak mosaic viruses vectored by aphids and mites, respectively. Finally, wheat planted on or after the fly-free date probably will suffer less from soilborne mosaic virus.

The Hessian fly has not caused significant problems in wheat in Illinois for many years, primarily because most of the commercial wheat varieties have had genes for resistance to the pest. However, biotypes of Hessian fly that overcome individual genes for resistance have developed over the years. These biotypes develop in response to selection pressure by exposure to wheat varieties that carry specific genes for resistance. The Hessian fly populations change, rendering resistance genes in wheat ineffective.

We have no recent data regarding the biotypes of Hessian fly present in Illinois wheat fields. As you may recall, USDA-ARS entomologists from West Lafayette, Indiana, have sampled wheat fields in Illinois in the past and have reported that Hessian fly populations collected from southwestern Illinois during 1995–1998 were largely biotype L. Biotype L has the ability to infest and injure wheat varieties that carry one or more of the four resistance genes available in soft winter wheat varieties. For more information about this situation, you can read an interpretive summary from Dr. Roger Ratcliffe's research at http://www.nps.ars.usda.gov/publications/publications.htm?lognum=0000101621.

Hessian fly adults emerge in late summer and early fall; the fly-free dates typically occur after peak emergence of the fly. By planting wheat after the fly-free date, the egg-laying females are not able to find a suitable host, so they die without laying a full complement of eggs. If the Hessian fly female finds wheat that has been planted early enough, she will lay her eggs. The destructive maggots will hatch and feed in the fall and then overwinter in puparia at the bases of the plants. Infested plants become weakened in the fall and fail to tiller.

We encourage all wheat growers to plant wheat in 2001 after the fly-free dates that are provided in Table 1 for all counties of Illinois. Implementation of this cultural practice in 2001 could prevent economic losses in 2002. Some seed treatments are labeled for control of Hessian flies in wheat (refer to the article "Wheat Seed Treatments for Fall 2001" in this issue of the *Bulletin*), but the economics of their use against unknown populations of Hessian flies have not been thoroughly explored in the Midwest.—*Kevin Steffey*

Table 1. Average dates of seeding wheat for the highest yield (fly-free dates).

County	*Average date of seeding wheat for the highest yield*	*County*	*Average date of seeding wheat for the highest yield*
Adams	Sep. 30–Oct. 1	Lee	Sep. 19–21
Alexander	Oct. 12	Livingston	Sep. 23–25
Bond	Oct. 7–9	Logan	Sep. 29–Oct. 3
Boone	Sep. 17–19	Macon	Oct. 1–3
Brown	Sep. 30–Oct. 2	Macoupin	Oct. 4–7
Bureau	Sep. 21–24	Madison	Oct. 7–9
Calhoun	Oct. 4–8	Marion	Oct. 8–10
Carroll	Sep. 19–21	Marshall-Putnam	Sep. 23–26
Cass	Sep. 30–Oct. 2	Mason	Sep. 29–Oct. 1
Champaign	Sep. 29–Oct. 2	Massac	Oct. 11–12
Christian	Oct. 2–4	McDonough	Sep. 29–Oct. 1
Clark	Oct. 4–6	McHenry	Sep. 17–20
Clay	Oct. 7–10	McLean	Sep. 27–Oct. 1
Clinton	Oct. 8–10	Menard	Sep. 30–Oct. 2
Coles	Oct. 3–5	Mercer	Sep. 22–25
Cook	Sep. 19–22	Monroe	Oct. 9–11
Crawford	Oct. 6–8	Montgomery	Oct. 4–7
Cumberland	Oct. 4–5	Morgan	Oct. 2–4
DeKalb	Sep. 19–21	Moultrie	Oct. 2–4
DeWitt	Sep. 29–Oct. 1	Ogle	Sep. 19–21
Douglas	Oct. 2–3	Peoria	Sep. 23–28
DuPage	Sep. 19–21	Perry	Oct. 10–11
Edgar	Oct. 2–4	Piatt	Sep. 29–Oct. 2
Edwards	Oct. 9–10	Pike	Oct. 2–4
Effingham	Oct. 5–8	Pope	Oct. 11–12
Fayette	Oct. 4–8	Pulaski	Oct. 11–12
Ford	Sep. 23–29	Randolph	Oct. 9–11
Franklin	Oct. 10–12	Richland	Oct. 8–10
Fulton	Sep. 27–30	Rock Island	Sep. 20–22
Gallatin	Oct. 11–12	St. Clair	Oct. 9–11
Greene	Oct. 4–7	Saline	Oct. 11–12
Grundy	Sep. 22–24	Sangamon	Oct. 1–5
Hamilton	Oct. 10–11	Schuyler	Sep. 29–Oct. 1
Hancock	Sep. 27–30	Scott	Oct. 2–4
Hardin	Oct. 11–12	Shelby	Oct. 3–5
Henderson	Sep. 23–28	Stark	Sep. 23–25
Henry	Sep. 21–24	Stephenson	Sep. 17–20
Iroquois	Sep. 24–29	Tazewell	Sep. 27–Oct. 1
Jackson	Oct. 11–12	Union	Oct. 11–12
Jasper	Oct. 6–8	Vermilion	Sep. 28–Oct. 2
Jefferson	Oct. 9–11	Wabash	Oct. 9–11
Jersey	Oct. 6–8	Warren	Sep. 23–27
JoDaviess	Sep. 17–20	Washington	Oct. 9–11
Johnson	Oct. 10–12	Wayne	Oct. 9–11
Kane	Sep. 19–21	White	Oct. 9–11
Kankakee	Sep. 22–25	Whiteside	Sep. 20–22
Kendall	Sep. 20–22	Will	Sep.21–24
Knox	Sep. 23–27	Williamson	Oct. 11–12
Lake	Sep. 17–20	Winnebago	Sep. 17–20
LaSalle	Sep. 19–24	Woodford	Sep. 26–28
Lawrence	Oct. 8–10		

PLANT DISEASES

Wheat Seed Treatments for Fall 2001

Many variables come into play when deciding whether or not seed treatments pay off, including seed cost, seed treatment cost, crop value, seed condition, seed bed condition, time of planting, anticipated disease and insect pressure, intended crop use, and options for disposal of excess treated seed. Because many of these variables are difficult to predict with much accuracy before planting, most folks looking for "cheap insurance" either plant a little heavier or use an inexpensive seed treatment. Just like car insurance, you buy the coverage you need based on product performance, your particular situation, and desired comfort level.

There are many different seed treatments registered for use on wheat. As with most pesticides, each active ingredient has strengths and weaknesses, which is why combination fungicide seed treatments are so common. In addition, an insecticide may be included or used alone to control insect pests. Typically seed treatments will last only about 10 to 14 days beyond planting. However, certain active ingredients can protect the seedlings considerably longer when applied at the highest labeled rate. For example, difenoconazole and triadimenol can protect against fall-season foliar disease such as powdery mildew and rust. In addition, imidacloprid may be included or used alone to control aphids that transmit the barley yellow dwarf virus. Although these long-lasting systemics offer a good deal of protection, they are relatively expensive.

Common seed treatment active ingredients and the fungi they control are listed in Table 2. Table 3 provides a current, but likely incomplete, list of seed treatment pesticides labeled for treating wheat seed. Check with local dealers to determine what products are available in your area and at what cost. Also, consult the *Illinois Agricultural Pest Management Handbook* for further information. Several of these products are only available to commercial seed treaters. Although there are many convenient combination products already available, should you decide to create your own combination, be sure to read and follow the labels of each product and contact the manufacturer(s) if you need clarification.

To learn more about the biology of seed and seedling pests, consider purchasing the current *Field Crop Scouting Manual*, available at your local University of Illinois Extension office. For a comprehensive seed treatment resource, consider purchasing *Illinois Pesticide Applicator Training Manual: Seed Treatment (SP 4)*, also available through your local University of Illinois Extension office. The revised seed treatment manual will be available in November 2001, and will address common seed and seedling pests, seed treatment active ingredients, safety issues, and seed treating equipment and calibration.—*Bruce Paulsrud and Wayne Pedersen*

WEEDS

Identifying the Enemy

Accurate identification of *Amaranthus* (pigweed) species can be very difficult, especially during early vegetative development because many of these species exhibit similar morphological characteristics (i.e., many look very similar). So if a pigweed plant has a red root, this does *not* always identify the plant as redroot pigweed! However, by late summer most pigweed species have initiated reproductive development ,and when flowering structures are present, accurate identification becomes much easier. So if you have "pigweeds" growing in fields and aren't quite certain which species they are, the following discussion will (hopefully) aid in the identification of various *Amaranthus* species. For those who have access to the web version of the *Bulletin*, pictures of the inflorescence (a picture is often worth a thousand words) of these six species are presented.

Table 2. Comparison of wheat seed treatment fungicide active ingredients.

						Fall foliar diseases	
Active ingredient	*General seed/seedling pathogens*	*Pythium*	*Loose smut*	*Common bunt*	*Seedborne scab*	*Powdery mildew*	*Rust*
captan	G-F	P	N	P	F	N	N
carboxin	F-P	P	G	N	P	N	N
difenoconazole	G	N	G	G	P	G	G
fludioxonil	G	P	N	N	G	N	N
imazalil	F	N	N	N	G	N	N
mefenoxam/ metalaxyl	N	G	N	N	N	N	N
PCNB	G-F	N	N	F-P	F	N	N
tebuconazole	G-F	N	G	G	G	G	N
thiabendazole (TBZ)	G-F	N	N	G	G	N	N
thiram	G	P	N	F	G-F	N	N
triadimenol	F	N	G	G	F-P	G	G

Ratings: G = Good; F = Fair; P = Poor; N = No activity.

Table 3. Incomplete list of common wheat seed treatment fungicides and insecticides.

Product	Application notes	Active ingredient(s)	Company
Allegiance Dry	dry, drill-box	metalaxyl	Trace
Allegiance FL, LS; Apron FL	mist or slurry	metalaxyl	Gustafson
Apron XL LS	mist or slurry	mefenoxam	Syngenta
Baytan 30[2]	mist or slurry[1]	triadimenol	Gustafson
Captan 30-DD, 400	slurry	captan	Gustafson
Cruiser 5FS	slurry	thiamethoxam*	Syngenta
Dividend XL, XL RTA	mist or slurry	difenoconazole, mefenoxam	Syngenta
Enhance	dry, drill-box	captan, carboxin	Trace
Enhance Plus	dry, drill-box	carboxin, lindane*, maneb	Trace
Flo-Pro IMZ	slurry	imazalil	Gustafson
Gaucho 75 ST	pelleting/coating[1]	imidacloprid*	Gustafson
Gaucho 480, 600; Prescribe	mist or slurry	imidacloprid*	Gustafson
Gaucho XT	liquid or slurry	imidacloprid*, metalaxyl, tebuconazole	Gustafson
Grain Guard	dry, drill-box	mancozeb	Trace
Grain Guard Plus	dry, drill-box	mancozeb, lindane*	Trace
Lindane 30C	liquid or slurry	lindane*	Gustafson
LSP	mist or slurry[1]	thiabendazole (TBZ)	Gustafson
Maxim 4FS	slurry	fludioxonil	Syngenta
Prevail	dry, drill-box	carboxin, metalaxyl, PCNB	Trace
Raxil MD, XT	mist or slurry	mefenoxam, tebuconazole	Gustafson
Raxil MD Extra	mist or slurry	imazalil, mefenoxam, tebuconazole	Gustafson
Raxil-Thiram	mist or slurry	tebuconazole, thiram	Gustafson
Rival Flowable	slurry[1]	captan, PCNB, TBZ	Gustafson
RTU Baytan-Thiram	mist or slurry[1]	triadimenol, thiram	Gustafson
RTU Flowable Fungicide	slurry	TBZ, thiram	Gustafson
RTU-PCNB; Terra-Coat LT-2N	mist or slurry[1]	PCNB	Gustafson
RTU-Vitavax Extra	mist or slurry	carboxin, imazalil, TBZ	Gustafson
RTU-Vitavax-Thiram	liquid, drill-box	carboxin, thiram	Gustafson
Thiram, many names	varies	thiram	many
Vitavax 34	mist or slurry[1]	carboxin	Gustafson
Vitavax 200; Vitaflo 280[1]	mist or slurry	carboxin, thiram	Gustafson
Vitavax-PCNB	slurry[1]	carboxin, PCNB	Gustafson
Vitavax T-L	liquid, drill-box	carboxin, thiram	Trace
Vitavax-Thiram-Lindane	mist or slurry	carboxin, lindane*, thiram	Gustafson

[1] For use by commercial seed treaters only.
[2] Treatment may result in slightly slower emergence—do not plant deeper than 1.5 inches.
* Insecticide.

Approximately 10 *Amaranthus* species are regarded as weedy pests across the Corn Belt. These are either monoecious (male and female flowers on the same plant) or dioecious (separate male and female plants) species. Monoecious species include redroot pigweed *(A. retroflexus),* smooth pigweed *(A. hybridus),* Powell amaranth *(A. powellii),* tumble pigweed *(A. albus),* prostrate pigweed *(A. blitoides),* and spiny amaranth *(A. spinosus).* Dioecious species are common waterhemp *(A. rudis),* tall waterhemp *(A. tuberculatus),* Palmer amaranth *(A. palmeri),* and sandhills amaranth *(A. arenicola).* Of these, redroot pigweed, smooth pigweed, Powell amaranth, common and tall waterhemp, and Palmer amaranth are most frequently encountered in Illinois agronomic production systems. We'll focus the discussion on these six species.

Although many people tend to identify weeds based on "how the plant looks," more accurate identification can be achieved by examining parts of the flowers. Historically, taxonomic separation of *Amaranthus* species has been based on differences in floral characteristics, but new methods using molecular biology techniques are also being employed. Instead of delving into molecular biology, we'll keep the following discussion restricted to separating the *Amaranthus* species based on floral characteristics.

We'll need to define some of the terms that will be used in the discussion, so we'll start with the outer parts of a flower and work inward to the seed.

Inflorescence—flowers collectively. Although many people associate the term "flower" with the colorful plants growing around the home, we'll use this term to refer to the reproductive structures of the plant. Male flowers produce pollen, while female flowers produce seed. So think of the flower (at least for the purpose of this article) as that part of the pigweed plant where the seed is produced.

Bract—a modified leaf associated with flowers. It differs from the foliage leaves in shape, color, size, texture, or some other feature.

Tepal—leaflike scales that encircle the outer flower parts. Some people refer to these structures as "sepals" when describing *Amaranthus* species flowers. When you brush the inflorescence of a mature pigweed plant against the palm of your hand, the tan-colored structures that fall into your hand are the tepals.

Utricle—a membranous bladderlike sac enclosing an ovary or fruit (seed). The utricle is contained with the tepals, and the seed is enclosed by the utricle. How the utricle fractures (breaks apart) has been the basis for differentiating between common and tall waterhemp.

Seed—small, hard, black, and often glossy.

Redroot Pigweed

Redroot pigweed has a highly branched but compact terminal (at the top of the plant) inflorescence. The branches of the inflorescence are about the size of your thumb and much thicker than the inflorescence branches of smooth pigweed. Female flowers have five tepals (the structures that surround the seed), which are spatulate-shaped with rounded tips that curve outward and are about twice the length of the fruit (the tiny black seed). When you rub the inflorescence against the palm of your hand, you'll see the ends of the tepals tend to reflex or bend back, hence the species name *retroflexus*. The tepals of redroot pigweed are about twice the length of smooth pigweed tepals.

Smooth Pigweed

Smooth pigweed has a highly branched terminal inflorescence (more branched than the inflorescence of redroot pigweed or Powell amaranth) that is frequently dull green or red in color. The branches of the inflorescence are generally about the thickness of a pencil or slightly thinner and much thinner but usually longer than the inflorescence branches of redroot pigweed. Female flowers have five tepals that do not curve outward, are about the same length as the seed, and are sharply pointed. When you rub the inflorescence against the palm of your hand, you'll see tepals that are straight and do not bend back. The seed just fits within the tepal, and the tepals are much shorter than those of redroot pigweed.

Powell Amaranth

The inflorescence of Powell amaranth is less branched than redroot pigweed or smooth pigweed. Branches are 4 to 10 inches in length and thicker than a pencil. Tepals (three to five total) are sharply pointed, and one or two are generally longer than the seed.

Palmer Amaranth

Female Palmer amaranth plants have a long terminal inflorescence (10 to 24 inches) with flowers containing five spatulate-shaped tepals. The tepals are about twice the length of the seed, and the seed capsule (utricle) breaks into two regular sections when fractured. Grabbing the inflorescence of a mature female Palmer amaranth plant with your bare hand is *not* recommended, as the bracts are very stiff and sharp. Palmer amaranth is an aggressively growing species that often grows larger than waterhemp.

Common and Tall Waterhemp

Flowering structures of common waterhemp are much more open and located near the top of the plant *and at tips of branches*. Pistillate (female) flowers generally have none or one tepal. Differentiation between common waterhemp and tall waterhemp has been based on how the utricle breaks apart. If the seed capsule (utricle) breaks into two regular sections, it is common waterhemp; if the utricle breaks into irregular sections, it is tall waterhemp. For all practical purposes, differentiation of common and tall waterhemp is not necessary, as no evidence exists to suggest these species respond differently to management practices. Indeed, some have recently proposed that in lieu of two discreet species, waterhemp exists as a single, widely variable species.

If you're still feeling some uncertainty about accurately identifying *Amaranthus* species, don't feel too bad. Weed scientists and plant taxonomists have also had difficulty identifying these species for many years. Hybridization among species has long been known to occur, and hybrid offspring from these crosses generally do not fit "neatly" into these categories. The following quote, taken from a paper (Uline, E.B. and W.L. Bray. 1894. A Preliminary Synopsis of the North American Species of Amaranthus. *Botanical Gazette* 19:267–272) published in 1894 illustrates the difficulty in identifying *Amaranthus* species:

"Likewise many of the species approach dangerously near to one another; and the complex question of adaptation and modification of adventive forms together with the still greater uncertainty which prevails in regard to hybridization among certain groups of species has rendered the question of specific limitation one of peculiar difficulty and uncertainty."

Two excellent pigweed identification guides can be viewed at the following Web pages:

http://www.weeds.iastate.edu/weed-id/waterhemp/default.htm

http://www.oznet.ksu.edu/library/crpsl2/welcome.htm#Weed Control in Crops

Additionally, Dr. Kenneth Robertson, of the Illinois Natural History Survey, a recognized expert in *Amaranthus* identification and taxonomy, has a picture of Powell amaranth, redroot pigweed, and smooth pigweed tepals that can be seen at

http://www.inhs.uiuc.edu/~kenr/Photos/Amaranthus.jpg

Although the characteristics and descriptions outlined in this article may seem like a lot to comprehend, they are very useful when attempting to identify these species. Pay close attention to the pictures of individual species included in the web version of the *Bulletin*, and perhaps putting all these species side by side will help you see the differences (at least the differences in appearance of the reproductive structures).—*Aaron Hager, Loyd Wax, and Christy Sprague*

CROP DEVELOPMENT

Pollination Problems in Corn

I know it's a bit late to talk about this because most of the corn in the state was finished pollinating more than a month ago, but it is a problem whose scope is just now being assessed. Without question, poor kernel set in corn is a problem in Illinois. Although it has been seen in most areas and on more than one hybrid, certain genetics and certain areas have experienced more of the problem. I'll address the problem using questions and answers.

Did weather during pollination cause this problem?

Little in the record of weather and crop development this year suggests that we should have anticipated this problem. It was warm in July, but the high temperatures were only in the mid-90s (at Urbana there was 1 day at 96 and 2 at 94, with an additional 9 days with the high temperature between 90 and 93), and the average high temperature, average low temperature, and growing degree-day accumulations were all about average for the month. Rainfall was spotty, but most areas received some in early July, and many areas got some later in the month as well. So it will hardly go in the record book as a poor month for pollination, especially where soil moisture was adequate.

What did cause it if not the weather?

Agronomists are still piecing this together, but we think that there was a rather unusual combination of genetic hybrid traits, timing and duration of pollination, and insect feeding that resulted in the severe lack of kernel set in some fields. Most of the worst fields are in areas where very large numbers of Western corn rootworn adults were actively feeding on silks and perhaps pollen. The earliest-pollinating hybrids were finished pollinating in many areas by the time of maximum pressure from WCR and Japanese beetle, and most of those fields have good kernel numbers. Where pollen shedding and silking were late for any reason—genetics, later planting, delayed or uneven emergence—then the insects gravitated to those fields and probably ate silks off before they could receive pollen. There is also some anecdotal evidence that pollen shed, especially if it took place just after mid-July, may have been speeded up, such that it had peaked before silk emergence began and may have ended before all silks emerged. Many observers noted that there seemed to be less pollen left on the plants after pollination than is normally the case. Because winds were generally light during much of July, this may indicate that there was less pollen production than normal. And in some cases there appear to be more than normal numbers of tassels that seem not to have "opened up" to release pollen.

Was there a genetic problem with pollen supply?

Rumors have been circulating rapidly about a "male sterility problem" with some hybrids. Mixing male-fertile and male-sterile versions of the same hybrid has been a common practice in the corn seed industry for years. While it would probably be easier to simply sell hybrids with all of the plants male-fertile (able to shed pollen), it has been known for many years that male-sterile plants will produce grain yields that are several percent greater than yields from male-fertile plants of the same hybrid. Reasons for this increase in yield potential are not well understood, but the fact that the plant does not have to spend energy to produce pollen and the slightly less shading from male-sterile tassels seem to boost the energy (sugar) supply to the ear and kernels at the time the plant is usually limited in its energy supply. The amount of mixing of male-sterile seed varies with hybrid, depending on how much pollen the fertile tassels shed and on other factors such as the general ability of the hybrid to pollinate well. But 50% male sterility is not uncommon. In the high-oil Topcross system, in fact, only 8 to 10% of the plants shed pollen for the other 90 to 92% of the plants, all of which are male-sterile. If by mistake all of the plants in a field were male-sterile, of course, then few kernels would develop. But because the hybrids most affected this year have pollinated successfully in other fields, it is clear that male sterility is not the problem.

Did herbicides cause some of this?

In general, the answer to this question is no. Bob Nielsen at Purdue pointed out in his article that he saw this problem in fields where Lightning had been applied, but the majority of fields with poor kernel set in Illinois were not Clearfield hybrids, and many did not have Lightning or related herbicides applied. In fields where early applications of herbicides may have stunted plants and delayed development even slightly, it is possible that the timing of pollination was delayed enough to contribute to the problem. We do not have evidence that herbicides directly affected tassel development or pollen-shedding ability.

What hybrids were most affected?

While this problem did occur in more than one genetic background, its incidence was considerably greater in one set of hybrids than in others. If you are unsure about the hybrids you planted, walk into your fields to see if you have a problem. In many cases, the companies who sold seed of the most-affected hybrids have already examined many of the fields to see if there is a problem. A different but related type of damage that we're seeing on a different group of hybrids is a rather unusual abortion of what look like large but empty kernels, often scattered on the ear. We have seen this before, and it appears that some genetic types may begin development of kernels even without pollination and fertilization. Such kernels develop a seed coat and may show a slight amount of starch deposition, and they usually are fluid filled soon after pollination. We think that the endosperm, which is diploid before pollination, might start to grow in these "kernels" but stops when no embryo is developing, leaving behind a "shell" that eventually empties of fluid and appears as an empty seedcoat.

What do we do now?

Scout! There is clearly no way to recoup lost kernels, but it is certainly better to know whether there is a kernel set problem before the combine pulls into the field. This problem is not uniformly distributed in most fields, and there may not be an obvious pattern to its severity across a field. Because WCR adults in some cases ate silks after pollination was completed, the lack of silks on the ear may not predict the severity of the problem. You simply need to peel back husks to see how many kernels there are. In some fields, there will be normal-looking rows of kernels, but they may be only 5 to 10 kernels long, with the rest of the cob blank. In other cases all of the kernels will be scattered; and I have seen some full-sized cobs with hardly any kernels at all. Keep in mind that scattered kernels get larger than normal, but they also tend to dry down more slowly, and they are often damaged during harvest due to their size and moisture. A final hint: as harvest approaches, leaves and leaf sheaths of plants that have few kernels developing almost always turn purple. This is due to the buildup of sugars that the plant generates but that have no place to go if there are few kernels.

In general, much of the crop in Illinois is in fairly good shape, and the crop is reaching physiological maturity (black layer) rapidly in central and southern Illinois. Harvest is getting under way in the southern half of the state, with average to above-average yields being reported. The slightly cooler weather of recent days will slow drydown some, but it appears that much of the crop will reach combine moisture without the lodging that was so widespread last year. This is not altogether positive—to some extent, we have better stalk quality this year because the ears are not as large and so did not draw on the stalk as much. Statewide, we expect a little better than average yields (the August crop report had Illinois at 146 bushels per acre), but as usual this will comprise yields that are higher than average in some places and lower than average in others.

Soybeans Near Maturity

Although soybean plant height is less than normal in many areas due to dryness during stem growth, in other areas where rainfall was plentiful the crop is of average height or taller than average. Height is not correlated well with yield in soybean, but where crop height was decreased more than 8 or 10 inches below expectation (which in my estimation is about 36 inches, give or take), it is likely that pod number is decreased as well. Dryness has probably reduced pod and seed number in some areas, but the crop overall looks fairly good.

I've answered some questions about yield estimation this year. While the "standard" method of counting pods and seeds and converting this to seeds per acre, then dividing by expected seed size (number of seeds per bushel) to give expected yield may work well in some cases, I tend to favor a less laborious and more subjective method. This consists of simply pushing a group of plants sideways and observing general podding density, seeing whether plants are in good condition to fill pods, and looking over the top of the crop before "guessing" final yield. If one assumes that an average expected yield for a field might be, say, 45 bushels per acre, one can also use that as a factor in the "guess." It may not be very scientific, but yield estimation in soybean is usually quite inexact, probably because plants are so variable and also because conditions during the last week or two of seed filling make so much difference in final yield.

Soybean harvest is just beginning in southern and central Illinois, and I have heard few yield estimates so far. A continuation of good weather will be a great boost to both corn and soybean and to wheat planting as that gets under way later this month.—*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

Some reports of lodged corn were received, but lodging does not appear to be as severe and widespread as last year. However, growers are encouraged to inspect all fields and identify any areas that may need to be harvested early. Corn silage harvest is now under way. In some areas near the Wisconsin state line, growers are concerned about potential nitrate levels in corn silage. Limited corn harvest is expected to begin this week in some sandy soils in parts of Grundy County.

Several weeks ago, soybean sudden death syndrome had become more evident throughout the region but will not have the same impact on yield as experienced across northern Illinois in 2000.

For alfalfa growers in the northern quarter of the state, a reminder that September 1 was the recommended date for final alfalfa hay harvest during the growing season.

Soybean cyst nematode screening clinics, sponsored by Extension, have been scheduled for September 13—JoDaviess County, September 21—Lee County, and September 21—Whiteside County. Interested participants are encouraged to call the host Extension office for program location and time.

Southern Illinois

The growing season and summer field days are winding down. Most areas have received rain showers, and in general soil moisture is good. Air temperature has been close to perfect for crop maturity and drydown.

Some corn harvest has been completed in early-planted areas. However, many farmers are patiently waiting for mid-20s moisture corn to dry a few more points. Soybeans (except double crops) are mostly R6–R7, with early varieties beginning to mature.

Maturing corn has exhibited gray leaf spot, anthracnose, and pith weevil damage, resulting in ragged appearance. Soybeans have struggled through early SDS symptoms and a little frogeye and now look more promising with improved soil moisture.

Late-season weed surveys remind us how competitive waterhemp, giant ragweed, lambsquarter, and pokeweed can prove to be.

Have a safe harvest season.

Contributing Authors

Mike Gray (m-gray4@uiuc.edu), Extension Entomology, (217)333-6652

Aaron Hager (hager@uiuc.edu), Extension Weed Science, (217)333-4424

Mark Hoard (hoardm@mail.aces.uiuc.edu), Mount Vernon Extension Center, (618)242-9310

Emerson Nafziger (ednaf@uiuc.edu), Crop Sciences, (217)333-4424

Bruce Paulsrud (paulsrud@uiuc.edu), Extension Specialist/Pesticide Applicator Training/ Plant Pathology, (217) 244-9646

Wayne Pedersen (wpederse@uiuc.edu) , Crop Sciences, (217)333-3847

Christy Sprague (lsprague@staff.uiuc.edu), Extension Weed Science, (217)333-4424

Kevin Steffey (ksteffey@uiuc.edu), Extension Entomology, (217)333-6652

Loyd Wax (l-wax@uiuc.edu), Crop Sciences, (217)333-4424

U of I Extension Newsletter Service
University of Illinois
at Urbana-Champaign
528 Bevier Hall, MC-184
905 S. Goodwin Avenue
Urbana, IL 61801

Return Service Requested

The *Pest Management & Crop Development Bulletin* is brought to you by University of Illinois Extension and Information Technology and Communication Services, College of Agricultural, Consumer and Environmental Sciences, University of Illinois at Urbana-Champaign. This newsletter is edited by Erin Cler and formatted by Oneda VanDyke, ACES/ITCS.

UNIVERSITY OF ILLINOIS EXTENSION

Helping You Put Knowledge to Work

University of Illinois
U.S. Department of Agriculture
Local Extension Councils Cooperating