Located in DeKalb County, the Northern Illinois Agronomy Research Center is the Department of Crop Sciences’ northernmost research station conducting corn and soybean research. We have been more fortunate than many areas in the state this season in terms of precipitation. This week we received just less than 2 inches of rain collectively from storms on August 20 and August 23. Crops are responding to the moisture, with virtually our entire corn and soybean crops still green, with photosynthesis continuing to support grain fill.

This week we found our first signs of sudden death syndrome on a very limited area of soybean. Even with the arrival of SDS, Septoria brown spot appears to be the predominant disease; at this time the incidence seems to be low in most plots. Soybean aphids, still well below threshold levels, are now easier to find while scouting plots. Most of the soybean crop is at or near R5 (beginning seed).

Our corn plots have returned to vertical after windstorms earlier in the season, and despite the extended planting dates most of our crop is currently in the R4 (dough) to early R5 (dent) stages. Different from other areas of Illinois, we are supporting robust populations of both western and northern corn rootworm beetles.

This week we were visited by campus researchers who evaluated late-season post-applied herbicides and others who harvested switchgrass to evaluate as a biofuel. While some evaluations will still take place, for most of our plots the next step will be harvest.
Insects

Severe Root Damage to Bt Corn Observed in Northwestern Illinois

On August 16, I traveled to Henry and Whiteside counties in northwestern Illinois, responding to a request to verify severe corn rootworm pruning on some Bt hybrids that express the Cry3Bb1 protein. The fields have been in continuous corn production for many years, and the producers have relied on Bt hybrids that express the Cry3Bb1 protein as their primary protection against western corn rootworm injury. Lodged plants were common in many areas of the fields, and western corn rootworm adults were numerous and easy to collect. It was also easy to find plants with two to three nodes of roots completely destroyed. A shovel was not required for removing the plants from the soil.

Unfortunately, yield losses will be significant in these fields. In early July, severe storms swept through northern Illinois and caused significant lodging of many cornfields. Producers should take a close look at such fields, examining the roots for excessive pruning. If you find pruning greater than expected, notify your seed company representative. I also would be interested in hearing from you.

In issue 18 of the Bulletin (August 5), I reported that field-evolved resistance by western corn rootworm to the Cry3Bb1 protein has been confirmed by Dr. Aaron Gassmann of Iowa State University. He collected resistant western corn rootworm adults from continuous cornfields in northeastern Iowa where significant root damage had occurred in producers’ fields. The Iowa fields had been planted with Bt hybrids expressing the Cry3Bb1 protein. The situations in Iowa and Illinois share some common features. Adults were collected from the Illinois fields in question and will be further evaluated for potential resistance.

In light of the developments in Iowa and northwestern Illinois, I urge great caution in choosing hybrids offering corn rootworm protection as you make seed selections for 2012. If you encountered less-than-satisfactory root protection this season with your Bt hybrid, consider the following alternatives for 2012.

• Rotation to soybeans or another non-host crop.
• A corn rootworm soil insecticide at planting.
• A Bt hybrid expressing a different corn rootworm Cry protein than one that may have performed poorly in your fields in 2011.
• A pyramided Bt hybrid that expresses multiple Cry proteins targeted against corn rootworms.

Most important, though, for effective corn rootworm management is to consider a long-term, integrated approach that includes multiple tactics, such as adult suppression programs, use of soil insecticides at planting, rotation of Bt hybrids that express different Cry proteins, and rotation to nonhost crops. Many producers have relied on a single tactic for too many years, and unfortunate consequences are beginning to emerge.

As harvest gets under way this fall, I suspect that more producers in northwestern Illinois will encounter lodged corn that has been severely damaged by western corn rootworms. As I learn more about this evolving situation, I will keep you informed.—Mike Gray

Severe lodging caused by western corn rootworm larvae to Bt corn expressing the Cry3Bb1 protein (northwestern Illinois, August 16).

Severe pruning by western corn rootworm larvae to Bt (Cry3Bb1) corn root systems (northwestern Illinois, August 16).
ISA-Sponsored Surveys of Illinois Soybean Fields Reveal No Brown Marmorated, Red Banded, or Red Shouldered Stink Bugs

During the last week of July and second week of August, soybean fields in 47 Illinois counties were surveyed—thanks to financial support from the Illinois Soybean Association—for a variety of insect pests. Fortunately, we encountered no brown marmorated, red banded, or red shouldered stink bugs. I suspect that survey results will differ over the next several seasons, especially for the brown marmorated stink bug.

Within each county, five soybean fields were randomly selected, and 100 sweeps were taken in each field. Insects most commonly found were Japanese beetles and green cloverworms. Densities of Japanese beetles were greatest in Woodford and Bureau counties, with 48.2 and 33.2 beetles per 100 sweeps, respectively. Green cloverworms were numerous in Clay County (20 per 100 sweeps), Crawford (24.4), Douglas (43.4), Edwards (45.2), and Jasper (52.4). Green cloverworms are defoliators, and the economic defoliation threshold of 20% between bloom and pod fill used for a variety of soybean insects applies to treatment decisions for green cloverworms as well.

Western corn rootworm adult densities were very low in soybean fields across Illinois. Numbers were highest in Ford County (25 adults per 100 sweeps), the so-called epicenter of the variant western corn rootworm. In Iroquois and Vermilion counties, densities of western corn rootworm adults were 4.2 and 9.4 per 100 sweeps, respectively. Elsewhere in the state, densities were most often less than 1 adult per 100 sweeps. These data, along with those shared previously for cornfields (issue 18, August 5), further verify the overall low statewide population of the western corn rootworm in 2011. This should not diminish the fact, however, that severe corn rootworm damage has been observed in some fields located in northwestern Illinois planted to Bt hybrids expressing the Cry3Bb1 protein.

I offer my thanks to Ron Estes and Nick Tinsley, both with the Department of Crop Sciences, for their generous cooperation with this statewide survey.—Mike Gray

Weeds

Preharvest Herbicide Applications in Corn and Soybean

The list of herbicide active ingredients available for preharvest applications in corn or soybean is relatively short. In corn, glyphosate, paraquat, and some formulations of 2,4-D or premixes containing 2,4-D may be applied to suppress/control weeds before harvest, while glyphosate, paraquat, dicamba (Clarity), and carfentrazone are labeled for preharvest applications in soybean. Be sure to consult product labels for specific application details. For example, not every formulation of 2,4-D is labeled for preharvest application in corn, and specific application intervals, rates, and restrictions can vary by product. See Table 1 for a compilation of general guidelines by product.

Preharvest herbicide applications should be made soon enough before harvest to allow sufficient time for dry-down of treated weeds. Dry-down of weed vegetation may be slowed during periods of cool and wet weather. All products labeled for these applications specify a period that must elapse between application and harvest, but additional time may be needed for dry-down of large weeds. Contact herbicides usually provide faster dry-down than translocated herbicides. Application practices that increase spray coverage of the target vegetation can improve control.

Also, be very cautious not to make a preharvest herbicide application before the crop development stage indicated on the product label. Applying herbicide before the stated interval may reduce crop seed production or viability.—Aaron Hager

Crop Development

Lessons from Late-Season Stress in Corn

The condition of the corn crop continues to deteriorate as soils have continued to dry out. As of August 21, only about a third of the topsoil in Illinois was rated as having adequate moisture. There was some rain (even in Champaign-Urbana) this week, but much of the corn crop would have benefited a good deal more from rain a month ago than it will from rain now.

Whether rain now will benefit corn relates most closely to the amount of green leaf area still left on the plants. This varies considerably among and within fields. Growing degree-day accumulations since May 1 are some 150 to 200 GD ahead of normal, and corn planted in central Illinois in early April has accumulated about 2,700 GDD, enough to mature some hybrids. So some fields have lost their leaf area naturally. Kernels in this case should be of normal size.

More commonly this year, plants in fields and parts of fields have lost much, or even all, of their leaf area as a result of stress. Most of the stress is a lack of water, with contributions in many cases from lack of nitrogen related to inadequate water uptake. Nitrogen loss, or movement of N to beneath the root uptake zone, has also contributed in some cases. As the loss of leaf area moves up the plant past the ear leaf, the ability of the plant to intercept sunlight and so to photosynthesize diminishes quickly.
The other factor that affects the crop’s ability to continue filling kernels is the state of the kernels themselves and of the ear on which the kernels reside. The reduction in sugar supply caused by leaf damage or loss eventually causes kernels to lose their ability to take in more sugars, so it’s possible that some kernels that are still small won’t be able to fill any more even if the leaf area revives some late in the season.

Kernels that stop filling prematurely are typically small, with some starch in the crown but liquid at the base of kernels. This liquid eventually dries, and with little starch deposited late, kernels will be shrunken at the base. Such kernels often are light in weight, they tend not to fit together very well, and their starch density may be lower than normal; all of this means low test weights. Protein levels may be higher than normal due to lower starch deposition. The kernels may also have some sugars still present that darken during high-temperature drying. Dockage can be substantial, and in some cases animal feed may be the best use for such grain.

Another factor from which we might take a lesson this year is the very high variability to be found, both among and within fields. It is not unusual to find fields that might yield less than 100 bushels across the road from fields that will yield twice that. Causes for this phenomenon are not always obvious and will have many people scratching their heads long after the season. Let me enumerate some possible reasons.

- Corn following corn is taking a beating in many areas compared to corn following soybean. Some of the reasons I gave last year for this phenomenon also apply now: corn planted following corn had less favorable conditions than corn planted following soybeans; N loss took place under wet conditions in the spring, and N availability was less in corn following corn; and stress (lack of good roots in 2010, lack of rain in 2011) affected corn following corn earlier, and to a larger extent, than corn following soybean.
- Symptoms of water stress, often associated with symptoms of N deficiency, showed up much earlier in some fields than in others, sometimes without a clear reason. While there was loss of N, especially of fall-applied N or N applied more than a month before planting, I think that much of the water/N stress had to be linked to how well the

---

### Table 1. General guidelines for preharvest herbicide applications in corn and soybean.

<table>
<thead>
<tr>
<th>Product</th>
<th>Crop</th>
<th>Application rate</th>
<th>Application timing</th>
<th>Restrictions</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,4-D</td>
<td>Corn</td>
<td>1–2 pints/A</td>
<td>Apply after hard dough or dent.</td>
<td>Allow at least 7 days before harvest.</td>
<td>Consult the product label.</td>
</tr>
<tr>
<td>Rage D-Tech</td>
<td>Corn</td>
<td>Up to 31 fl oz/A</td>
<td>Apply after hard dough.</td>
<td>Allow at least 3 days before harvest.</td>
<td>Make only one preharvest application.</td>
</tr>
<tr>
<td>Glyphosate b</td>
<td>Com: glyphosate-sensitive</td>
<td>Ground: up to 64 fl oz/A Aerial: up to 44 fl oz/A</td>
<td>Apply when grain moisture is 35% or less and the plant is physiologically mature.</td>
<td>Allow at least 7 days before harvest.</td>
<td>Not recommended for glyphosate-sensitive corn grown for seed.</td>
</tr>
<tr>
<td>Soybean: glyphosate-sensitive</td>
<td>Ground: up to 3.3 qt/A Aerial: up to 44 fl oz/A</td>
<td>Apply after pods have lost all green color.</td>
<td>Allow at least 7 days before harvest.</td>
<td>Not recommended for glyphosate-sensitive soybean grown for seed.</td>
<td></td>
</tr>
<tr>
<td>Com: glyphosate-resistant</td>
<td>Up to 22 fl oz/A</td>
<td>Apply when grain moisture is 35% or less and the plant is physiologically mature.</td>
<td>Allow at least 7 days before harvest.</td>
<td>Application allowed if combined total of previous applications does not exceed 1.54 lb ae glyphosate/acre.</td>
<td></td>
</tr>
<tr>
<td>Soybean: glyphosate-resistant</td>
<td>Up to 22 fl oz/A</td>
<td>Apply after pods have lost all green color.</td>
<td>Allow at least 14 days before harvest.</td>
<td>Will not control glyphosate-resistant waterhemp.</td>
<td></td>
</tr>
<tr>
<td>Gramoxone</td>
<td>Corn</td>
<td>1.2–2 pt/A</td>
<td>Apply after black layer.</td>
<td>Allow at least 7 days before harvest.</td>
<td>Make only one application.</td>
</tr>
<tr>
<td>Inteon</td>
<td>Soybean</td>
<td>8–16 fl oz/A</td>
<td>Apply when at least 65% of pods are a mature brown color or when seed moisture is 30% or less.</td>
<td>Allow at least 15 days before harvest.</td>
<td>Do not graze or harvest for forage or hay.</td>
</tr>
<tr>
<td>Clarity</td>
<td>Soybean</td>
<td>8–32 fl oz/A</td>
<td>Apply after pods have reached a mature brown color and at least 75% leaf drop has occurred.</td>
<td>Allow at least 14 days before harvest.</td>
<td>Do not feed soybean fodder or hay.</td>
</tr>
<tr>
<td>Aim EW</td>
<td>Soybean</td>
<td>Up to 1.5 fl oz/A</td>
<td>Apply when crop is mature and grain has begun to dry down.</td>
<td>Allow at least 3 days before harvest.</td>
<td>Can help defoliate or desiccate velvetleaf, morning-glory, and pigweed.</td>
</tr>
</tbody>
</table>

---

bActual use rates can vary by product. Always consult the product label for information specific to that formulation.

Data taken from the Roundup WeatherMax label.
crop was tapped into the water in the soil. But many have observed stress in fields where it wasn’t expected.

• Soil was compacted after last year’s tillage by operations under wet conditions this spring. Such compaction may have contributed to early stress this year, but it may not have been a major cause. One diagnostic of the effects of compaction is to see if there is a pattern in the field, such as wheel tracks with reduced crop growth, at an angle following the tillage pattern. Many fields don’t really show this. In fact, given that roots have sometimes been known to be favored by better soil–water–root connections in firmer soil, it’s not impossible that compacted areas might show less stress than less-compacted areas.

• One of the more unusual things I’ve heard about this year is a pattern of uneven growth down the row. Most things like tillage effects or N application problems appear in strips as we move across the field, but in at least two cases I’ve seen aerial photos showing a ripple pattern of growth down the row. The pattern is not straight across the field, as it would be if tillage or spraying were done across the rows, but rather it seems to be in strips that might be the width of tillage equipment. The only explanation we could come up with is some sort of “bounce” of the tillage implement that would cause uneven soil conditions down the row. One photo showed less of this along the edge of the field, which might reflect slower tillage or repeated tillage there.

In a general sense, years like this, when lack and unevenness of rainfall define the season, we can expect more variability among and within fields. That’s because even small differences in soil conditions can cause a little more or a little less water to be available and make a big difference in how much growth and yield result. We always say that our soils in Illinois are “forgiving” – that they are good enough to let us do things like compaction and still get good yields. But in years like this, the amount of reprieve we can get from good soil may simply not be enough.—Emerson Nafziger

Contributing Authors

Mike Gray, megray@illinois.edu, 217-333-6652
Aaron Hager, hager@illinois.edu, 217-333-4424
Russ Higgins, rahiggin@illinois.edu, 815-274-1343
Emerson Nafziger, ednaf@illinois.edu, 217-333-4424