Insects

Soybean Aphids Colonizing Buckthorn: Establishment Appears Solid

Soybean aphids are successfully colonizing buckthorn, their primary host, across central Illinois. Dr. David Voegtlin, longtime entomologist with the Illinois Natural History Survey and well-known authority on soybean aphids, indicates that establishment on buckthorn has been very good over the past 10 days. On September 27, he and some of his colleagues sampled a regional buckthorn grove in central Illinois and found soybean aphids on nearly all buckthorn plants. No multicolored Asian lady beetles were observed. Without the pressure of this natural enemy, we should anticipate a greater level of establishment of soybean aphids this fall.
As autumn sets in, winged soybean aphid females (gynoparae) are produced on soybeans (secondary host) as the photoperiod shortens and temperatures become cooler. These winged females must secure buckthorn plants to complete the sexual phase of the pest’s life cycle. The overwintering hosts in North America include common buckthorn (*Rhamnus cathartica* L.) and the less-abundant alderleaf buckthorn (*Rhamnus alnifolia* L’Hér). After the winged females reach buckthorn plants in the fall, they feed and produce offspring that develop into oviparae. Winged males that have developed on soybeans also search out buckthorn plants, where the males mate with the oviparae. Eggs are subsequently produced and deposited on buckthorn plants and serve as the overwintering stage.

Dr. Voegtlin indicated that this year’s colonization, while impressive, is still not at the level of 2009, when buckthorn was inundated with soybean aphids. A fungal disease swept through the overcrowded aphid colonies, resulting in a very low overwintering density. This scenario seems unlikely for 2011 because the colonies on buckthorn are not quite as dense, and the overall relative humidity this fall has not been conducive to the development of fungal diseases. So despite the low densities of soybean aphids experienced by most producers this season, this insect appears to be setting the stage for a potential comeback in 2012. We obviously have a long way to go before the scenario unfolds.

I thank Dr. Voegtlin for sharing his observations and look forward to offering further reports on soybean aphids this fall and spring.—Mike Gray

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**Weeds**

**Weed Control After Harvest**

Several questions related to fall application of herbicides have been posed over the past couple of weeks. The following article appeared last year in *the Bulletin*, but it seemed beneficial to republish it to address some of the common questions.

Fall herbicide applications have become a relatively common practice for farmers in many areas of Illinois. Much recent interest has focused on applying herbicides after harvest to control winter annual weed species, such as common chickweed, henbit, and various mustard species. If not controlled before the onset of winter, these and other winter annual species can create dense mats of vegetation prior to spring planting. Controlling these weeds and preventing them from producing seeds are important objectives of fall herbicide applications.

Before applying fall herbicide to control winter annual species, it might be worth considering some of the following aspects of fall application:

- Which weeds are present? Scout fields before making any application to determine what weeds are present and whether their densities warrant treatment this fall. With the wide range in precipitation across the state, emergence of some winter annuals might be reduced in dry areas compared with areas where precipitation was higher in late summer and fall. Five common species are pictured on page 138 to help with identification.

- Which product(s) are you considering? Many herbicides used before or after crop planting and emergence can be applied in the fall, but not all herbicides are labeled for fall application. Atrazine, for example, is widely used before and after corn emergence but is not labeled for fall application. Be sure to check the label of every product you are considering to determine if fall application is allowed.

- When do you want to apply the herbicide(s)? Some farmers are close to completing harvest of the 2011 crop and may be considering applying a fall herbicide very soon. Keep in mind that some herbicides approved for fall application have timing restrictions. For example, the Dual II Magnum label indicates that fall applications should be made after October 31 and when the sustained soil temperature at the 4-inch depth is less than 55 degrees and falling. If you are considering a treatment without much soil-residual activity (for example, 2,4-D or glyphosate), time the application to be made after most

Winter annual weed species, such as common chickweed, can form dense populations prior to spring planting. Scout and identify which species have emerged before making a fall herbicide application.
winter annual species have emerged. Instead of early October, an application in mid- to late October might provide better results. If, on the other hand, your fall application will include a herbicide with soil-residual activity, the application could be made sooner.

- Combinations of herbicides can broaden the weed control spectrum. This can be very important if winter annuals have emerged before the application is made. Combining 2,4-D and/or glyphosate with soil-residual products can improve control of emerged species and help control biennial or perennial species (discussed later). Be sure to include the appropriate spray additives with all applications.

- Location in the state can influence fall herbicide applications, which seem to “fit” better in areas of central and southern Illinois, perhaps because of generally milder average winter temperatures the farther south one ventures (contributing to better winter survival of fall-emerged weeds), as well as earlier resumption of weed growth in the spring. Also, herbicide labels may indicate that fall applications can be made only in certain geographical regions of the state.

- Fall applications that include soil-residual herbicides may not always result in a clean field by planting time. Delays in spring fieldwork may allow fields to green-up before the crop can be planted. We have occasionally observed that if the suite of winter annual weed species is successfully controlled, summer annual species (such as common lambsquarters and smartweed) have emerged sooner than if winter annuals were still present. (See page 139 for an example.)

- Fall herbicide application is not suggested as a way to provide residual control of summer annual weed species, such as waterhemp. Control of summer annual species is improved when applications of soil-residual herbicides are made closer to planting rather than several weeks (or months) before. If a soil-residual herbicide will be part of your fall application, we suggest using a rate that will control winter annuals through the remainder of 2011, and we recommend not increasing the rate in hopes of controlling summer annual species next spring.

- Horseweed (*Conyza canadensis*) has become a challenging broadleaf weed in minimum-till and no-till cropping systems across much of the southern half of Illinois. Horseweed completes its life cycle in one year, but unlike many other annual species, it may exist as a winter or a summer annual. Populations of winter annual horseweed typically emerge in the fall, within a few days or weeks after seed is dispersed from the parent plant. In northern Illinois, most horseweed demonstrates a winter annual life cycle, whereas a substantially higher proportion of spring emergence occurs in areas south of (approximately) Interstate 70. Both winter and summer annual life cycles can be found across central Illinois. With the increasing prevalence of horseweed, including glyphosate-resistant populations, fall herbicide applications may prove more efficacious than spring applications. Glyphosate alone may not provide adequate control when applied in either fall or spring, but application in fall provides an opportunity to use higher application rates of products (such as 2,4-D) than are feasible in spring.

Fall months may offer a good opportunity to apply herbicides for improved control of certain biennial and perennial weed species as well as winter annual species. Biennial and perennial species often become established in reduced-till or no-till fields and can be difficult to
control with herbicides once populations are established.

Biennials are species that complete their life cycle over two seasons. In the first year of growth, they form a rosette of leaves (a dense cluster growing close to the ground), whose size can vary greatly in diameter by species. The rosette represents the overwintering stage of the biennial. Sometime the following spring, the biennial plant produces a flowering stalk (it bolts) that branches and gives rise to flowers and seed production. Once bolting has initiated, biennial species can be increasingly difficult to control with herbicides. Control of biennial species that remain green into the fall months after their first season of growth, such as wild carrot and poison hemlock, can be substantially improved with fall herbicide applications as compared with spring applications. For the most effective control, consider using herbicides that translocate within the plant following absorption (such as glyphosate and 2,4-D).

Perennial weed species can be difficult to control because they store substantial food reserves in their root systems. Controlling the aboveground part of perennial species is usually not sufficient to achieve satisfactory, long-term control; the root system must be controlled as well. Translocated herbicides are usually the most effective chemical options to control perennial weed species, but the time of year they are applied can influence the control achieved.

In the spring, perennial species rely on stored food reserves to initiate new growth, so most food is moving upward from the roots to support new vegetative development. This movement means it is often difficult to get sufficient herbicide into the root when applications are made in the spring. Good control can be achieved when postemergence translocated herbicides are applied as food reserves are moving downward in the plant; this coincides with about the time that perennial broadleaf species begin to flower and during fall months, as day length shortens and temperatures cool.

Be sure to apply herbicides while the target perennial species still have ample viable leaf surface area. Warm-season species, such as hemp dogbane and common pokeweed, typically lose their leaves after the first frost; treat these types of perennials before the first fall frost. Cool-season species, such as dandelion and Canada thistle, often survive one or more frosts before losing their leaves; translocated herbicides can be more effective on these types of perennials if applied after a light frost. Before making any herbicide application, take the time to scout fields to determine which perennial species are present and to confirm that the plants are still actively growing.—Aaron Hager

**Plant Diseases**

**More Strobilurin Fungicide-Resistant Strains of the Causal Agent of Frogeye Leaf Spot of Soybean**

As I reported a year ago in *the Bulletin* (issue 23, October 8), identification of strains of the soybean frogeye leaf spot fungus (*Cercospora sojina*) resistant to strobilurin fungicides were documented for the first time in western Tennessee in 2010. Since then, similar findings in southern Illinois and western Kentucky have been confirmed from samples also collected in 2010. Additional samples were collected from soybean fields this year, and isolates of *C. sojina* were recovered and tested for strobilurin fungicide resistance. The counties in Illinois and Tennessee that were found to have
fungicide-resistant strains of *C. sojina* in 2010 also had fungicide-resistant strains present in 2011. In addition, new counties in Tennessee, Kentucky, and Missouri have been confirmed to have strobilurin fungicide-resistant strains of *C. sojina* (Table 1).

Strobilurin fungicide active ingredients currently registered on soybean include azoxystrobin (found in Quadris, Quilt, and Quilt Xcel), fluoxastrobin (Evito), pyraclostrobin (Headline), and trifloxystrobin (Stratego, Stratego YLD). The Fungicide Resistance Action Committee (FRAC; www.frac.info) classifies the strobilurin fungicides as being at high risk for having resistance develop in targeted fungi. Any time a fungicide is applied to a crop, a selection pressure takes place, and individuals in the fungal pathogen population with reduced sensitivity to that fungicide are selected out. With additional applications of fungicides in the same fungicide class, a greater selection pressure is applied, and the risk increases for selecting out fungicide-resistant strains of plant pathogenic fungi.

To reduce this risk, the following tactics are recommended for managing frogeye leaf spot:

- First and foremost, plant a variety with high resistance to frogeye leaf spot, particularly in areas with a history of damaging levels of the disease. Resistant varieties are the best way to manage frogeye leaf spot.

If you have planted a susceptible variety in a risk-prone area and plan to apply fungicide, choose fungicides from different classes. Preliminary results from greenhouse and field studies at the University of Illinois with strobilurin fungicide–resistant strains of *C. sojina* indicate that many triazole fungicides (Proline, Top-Guard, Domark, etc.) and thiophanate methyl fungicide (Topsin and other trade names) were effective in reducing frogeye leaf spot severity compared with strobilurin fungicides and the nontreated control.

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**Table 1. Locations of confirmed strobilurin fungicide–resistant strains of Cercospora sojina.**

<table>
<thead>
<tr>
<th>State</th>
<th>County</th>
<th>When resistance was identified</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illinois</td>
<td>Gallatin</td>
<td>2010, 2011</td>
</tr>
<tr>
<td></td>
<td>Pope</td>
<td>2010, 2011</td>
</tr>
<tr>
<td>Kentucky</td>
<td>Caldwell</td>
<td>2010 (no samples from 2011)</td>
</tr>
<tr>
<td></td>
<td>Calloway</td>
<td>2011</td>
</tr>
<tr>
<td></td>
<td>Carlisle</td>
<td>2011</td>
</tr>
<tr>
<td></td>
<td>Hickman</td>
<td>2011</td>
</tr>
<tr>
<td></td>
<td>Livingston</td>
<td>2011</td>
</tr>
<tr>
<td></td>
<td>Marshall</td>
<td>2011</td>
</tr>
<tr>
<td>Missouri</td>
<td>Pemiscot</td>
<td>2011</td>
</tr>
<tr>
<td>Tennessee</td>
<td>Dyer</td>
<td>2011</td>
</tr>
<tr>
<td></td>
<td>Gibson</td>
<td>2010, 2011</td>
</tr>
<tr>
<td></td>
<td>Lauderdale</td>
<td>2010, 2011</td>
</tr>
<tr>
<td></td>
<td>Lawrence</td>
<td>2011</td>
</tr>
</tbody>
</table>

- Apply a foliar fungicide only to control plant diseases. Every time a fungicide application is made, pressure is applied that selects out individuals in the fungal pathogen population that may have reduced sensitivity to fungicides. Applying a fungicide only when it is needed—based on disease risk and scouting observations—reduces selection pressure and slows the development and spread of fungicide-resistant isolates.

My thanks to the Illinois Soybean Association for funding much of this research. In addition, I thank Melvin Newman (University of Tennessee), Don Hershman (University of Kentucky), and others for sending samples to my laboratory for testing.—*Carl A. Bradley*

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**Crop Development**

**A Few Tips on Strip-Till**

Strip-till is relatively new in the Midwest, so many are still wondering what it is and how it differs from other tillage systems. I will provide some definitions, offer guidance on timing and nutrient applications, and compare strip-till to no-till and conventional tillage.

I have probably heard as many definitions of tillage as people talking about it. I think this is the result of great diversity in equipment and methods of use. All these differences make it difficult to try to define tillage by what it does to the soil, so instead I would like to define it by what it does to crop residue.

Three main tillage categories are described by the Conservation Technology Information Center: conventional (or intensive) tillage, reduced tillage, and conservation tillage. *Conventional tillage* is a full-width system that disturbs the entire soil surface before and/or during planting and results in less than 15% residue cover after planting. *Reduced tillage*, also a full-width system, involves one or more tillage trips that disturb the entire soil surface, is performed before and/or during planting, and results in 15% to 30% residue cover after planting. *Conservation tillage* is any tillage and planting system that results in at least 30% residue cover after planting.

Both strip-till and no-till fall in the category of conservation tillage. Strip-till can be considered a form of no-till, which is defined as a system where the soil is left undisturbed from harvest to planting except for strips up to 1/3 of the row width. Strip tillage is typically done for crops planted in 30-inch rows. The strip, or berm, that is plowed is normally less than 10 inches wide and 3 to 4 inches tall; the space between the strips is left undisturbed.

*When to do strip-till.* Strip tillage is typically done soon after harvest. The middle of October is considered the best time to begin operations; starting too early can risk excessive flattening of the strips after the large rain events that are more typical in September and early October. When that occurs there is often a reduction in the warming and drying potential of the strips the following spring.

Strip-tilling in the spring can create challenges whether conditions are wet or dry. Strip tillage done in a wet spring can result in smearing of soil, hard soil clods in the seedbed, and soil compac-
tion between rows. In a dry spring it can result in excessively dry seedbed conditions and an uneven surface for planting.

**Nitrogen applications with strip-till.** You can apply nitrogen with strip-till, but typically it is not the best idea, for at least two reasons. First, when soil conditions are adequate for strip-till operations, soil temperatures are typically too warm to apply nitrogen. While combining these activities can save time, it is important to wait until soil temperatures 4 inches below the surface are 50°F and falling. Doing the application earlier poses too high a risk of nitrogen loss.

Using strip-till does not justify changing the current recommendations for fall nitrogen application. A potential drawback of trying to combine anhydrous ammonia application with strip-till is that by the time fall conditions are adequate to apply nitrogen, the soil might be getting a little too wet for strip-till operations.

The second reason I don’t recommend combining anhydrous ammonia applications with strip-till is the potential for seedlings to be injured by free ammonia. Of course, this concern is greatest when anhydrous ammonia is spring-applied in the strips. While injury might not result every year, I consider the practice riskier than applying nitrogen in the row middles or in some other way that increases the distance between the seedlings and the concentrated nitrogen band.

**Phosphorus and potassium applications with strip-till.** Under no-till systems, slowly mobile nutrients such as P and K are typically broadcast on the surface. This technique creates a vertical stratification of the nutrients, with higher concentrations in the surface compared with the subsurface. The stratification can have negative effects if the high-nutrient surface becomes too dry or if crop roots are not actively growing in that fraction of the soil volume. Strip-till offers more flexibility than no-till because it is easy to combine deep placement of nutrients with the tillage operation to make the soil berms. Combining these activities helps spread the workload and can result in fewer trips across the field.

It is important to realize, however, that deep placement of nutrients is not required. In fact, studies under way in Illinois and other locations have shown that the more expensive and time-consuming deep placement of P and K typically does not improve grain yield, and if it does the gain is not sufficient to pay for the added costs. Further, band application of fertilizers can make it more difficult than with broadcast placement to obtain a representative soil sample to determine fertilization needs. On the other hand, shallower placement of dry P and K fertilizers in the strip can have a starter fertilizer effect that can be more cost-efficient than applying liquid starter fertilizers. In a wet spring, better growing conditions in the strip can also reduce the need for starter fertilizers.

**Strip tillage pros and cons.** Strip-till can be considered a compromise of sorts between no-till and conventional tillage, combining certain benefits of each system. You need to consider strip-till’s various benefits and drawbacks before deciding whether it is right for your farming operation.

**Advantages of strip-till compared with no-till**

Strip-tillage for continuous corn has been shown to improve yields compared with no-till and to produce similar yields compared with other tillage systems. The response of corn to tillage following soybean is inconsistent. Similarly, soybean response to strip-till compared with no-till has been inconsistent.

One of the major drawbacks of no-till is the wetter and cooler soil conditions that tend to persist in spring compared with conventional tillage systems, especially where crop residue is high. These conditions can delay planting; restrict hybrid selection; reduce stand uniformity, germination, and development of seedlings; and cause temporary nutrient unavailability due to a reduced ability of the root system to take up nutrients. These conditions can reduce yield or reduce corn dry-down in the field and have deterred many corn farmers from adopting continuous no-till; most prefer to do tillage before corn and plant no-till soybean.

One of the strongest advantages of strip-till compared with no-till is that it helps overcome the obstacles just described while retaining similar soil and water conservation benefits. The strip that is tilled in the fall dries out and warms up faster than the rest of the soil in early spring, creating more favorable conditions for planting and early plant development. Studies have reported temperatures between 2 and 4 °F higher in the seedbed for strip-till compared with no-till.

Another benefit of strip-till is that the creation of the strip can break up the surface compaction that is sometimes present with no-till.

Since the strip is created in the fall, precipitation helps mellow the strip and provides a uniform seedbed, which provides ease of planting compared with no-till’s high surface residue. The residue-free strip also allows for the use of older planting equipment that was not designed to handle high surface residue, making for an easier transition from conventional tillage to conservation tillage.

**Disadvantages of strip-till compared with no-till**

While strip-till can help solve many of the drawbacks of no-till, certain challenges could make strip-till less attractive. For one, strip tillage is more costly. There is need for specialized equipment, and more tractor horsepower, fuel consumption is higher, and extra time and labor are required.

Doing strip tillage correctly is another challenge, given time constraints in the fall when harvest takes priority. Potential problems include the possibility of wet soil conditions, snow, or freezing of the soil; the need for an additional trip across the field; and difficulty creating the strip due to high surface residue.
Strip tillage can cause problems with soil erosion, especially if done under wet soil conditions or in the direction of the slope on a sloping field. When strip-till is done with wet soil, smearing of soil surfaces can create a channel for water to move and erode soils and transport nutrients into waterways.

Other concerns with strip-till include crusting of the soil surface, destruction of natural soil structure and greater weed exposure in the strip, faster loss of fragile residue, dry conditions in the seedbed in dry springs, and performance of unnecessary tillage when spring conditions are suitable for no-till.

Some field operations can be more difficult in strip-till than in no-till. Planting in a strip-till system the following spring can be more difficult if an RTK guidance system is not used. Strip-tillage can make it more difficult to spread manure or to perform other field operations without interfering with the strip zone, and it creates a constraint in the case of narrow planting rows.

Advantages of strip-till compared with conventional tillage

Strip tillage maintains high surface-residue coverage compared with conventional tillage (and it maintains as much residue as no-till in the undisturbed areas between strips). The higher residue reduces soil erosion, improves soil health (by increasing organic matter content and populations of earthworms and other soil organisms and improving soil structure, penetrability, and soil stability), and helps preserve natural resources.

Water availability is typically a major limiting factor for agriculture in Illinois. Strip tillage offers an advantage over conventional tillage because it reduces soil-water evaporation by covering approximately 2/3 of the soil surface with residue. Further, in contrast with conventional tillage, where the entire surface is disrupted, the undisturbed soil in strip-till typically contains more macropores, earthworm channels, and other forms of preferential flow paths that can increase rainwater penetration into the soil and reduce the potential for runoff of surface water, nutrients, and chemicals.

Disadvantages of strip-till compared with conventional tillage

Conventional tillage is easier to perform than strip-till and makes it easier to manage fields with high residue content. Farmers typically already have the equipment they need for conventional tillage, which can be performed when soils might be getting too wet for strip-till.—Fabián G. Fernández

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