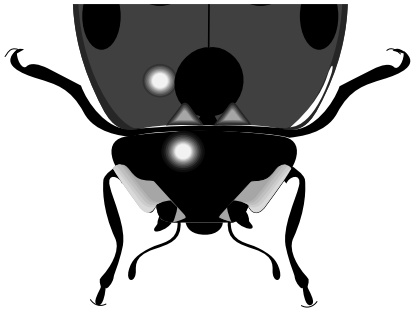

PEST MANAGEMENT & CROP DEVELOPMENT

BULLETIN

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Executive editor: Kevin Steffey, Extension Entomologist

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INSECTS

Soybean Aphid Update

Since the most recent issue (no. 17, July 18, 2003) of the *Bulletin* was printed and mailed, there has been considerable telephone and e-mail traffic regarding soybean aphids in northern Illinois. We have received numerous reports regarding insecticide applications to control the aphids in soybean fields. Although some fields still do not have densities of aphids large enough to warrant control, the densities in a fairly large number of fields have exceeded economic thresholds. In addition, some people are finding very few natural enemies in some fields, so aphid population densities have increased rapidly.

Drs. David Voegtlin (Illinois Natural History Survey) and David Onstad (Department of Natural Resources and Environmental Sciences) recently visited several soybean fields in Kendall County. They have been studying soybean aphid populations there since 2001. In fact, one of the first fields of soybeans Dave Voegtlin visited in 2000 was in Kendall County. They have provided an overview of the soybean aphid situation and have reiterated our soybean aphid management guidelines. Following is an article they wrote upon their return from northern Illinois last week.—*Kevin Steffey*

Fourteen fields in Kendall Township, Kendall County were sampled for soybean aphids on Wednesday, July 16 by David Onstad, David Voegtlin, Ramie Wells, Doris Lagos, Mike White, and Mike Just. Each field was sampled by counting all the aphids on each of 50 plants, noting the presence of winged aphids as well as predators and parasite mummies. This is the third year of the intensive sampling program in the same township.

The numbers of aphids seen were dramatically larger than in previous years for the same time period. The mean number of aphids per plant was 276, compared to 16 in 2001 and 5 in 2002, already exceeding the mean peaks observed in the last 2 years in August. All plants sampled were infested, and the mean number of aphids per plant ranged from 110 to 636. Aphids were observed throughout the plants: on stems and lower trifoliates as well as the growing tips. Ignoring lower populations in severely hail-damaged fields, the mean density in Kendall Township rose 100 times since the first observations 3 weeks ago. (Note that in a similar effort in Champaign County, the team found virtually no aphids in 14 fields.)

One of the surprising observations was the presence of many winged individuals (alates). It was uncommon to find a plant without the presence of alates. We believe that the alates that develop on any plant will leave that plant and fly before settling on another soybean plant for feeding and reproduction. It was common to see winged aphids feeding on the plants with a few first-instar nymphs around them. It seems that even plants that already have quite large populations have winged individuals landing on them and producing offspring. In addition, teneral (newly molted) alates were seen on

most of the plants, with populations in the hundreds, and on many of these plants large numbers of alatoid nymphs were observed. These will molt and disperse from the field, moving in whatever direction the wind will take them.

We have also found winged aphids for the first time this year in three of the nine suction traps around the state (Freeport, DeKalb, and Joliet). This is another indication that aphid flight is much greater and earlier this year than in the past. Much of central Illinois could be infested if we have a moderate north wind carrying the large number of winged aphids being produced in the northern part of the state.

(Fun with numbers: Let's assume that in an 80-acre field, 100,000 plants per acre, with 100% of the plants infested at an average of 500 aphids per plant, 10% of the population will become winged and emigrate each day. So, 80 x 100,000 x 500 = 4 billion aphids per field. Ten percent would mean that 400 million alate aphids emigrate from one 80-acre field daily.)

The most abundant predator group noted was syrphid adults. These were abundant in every field, often landing on the counter's hand or on the plant where the aphids were being counted. Syrphid larvae were the most abundant predators on the plants. Relatively few *Harmonia axyridis* were observed; probably not even half of the plants examined had either adults or larval coccinellids on them. Eggs of chrysopids were common. Parasitized aphids were seen on maybe 20% of the plants (Aphidiidae, Braconidae) in fields with the greatest aphid densities. We don't believe there were enough predators or parasites present in any of the fields to have any significant impact on the aphid numbers.

What do we recommend? First, we suggest rereading the soybean aphid fact sheet prepared in 2002 (online at http://www.ipm.uiuc.edu/fieldcrops/insects/soybean_aphids/nsrl_4.pdf; portions are reprinted at the end of this article). We plan to send a team back to Kendall County on Monday, July 21 to measure changes in aphid populations and in particular to document the percentage of the population that is alatoid nymphs. With the moderate densities of natural enemies and potential emigration of newly formed winged aphids, it is possible that the aphid population in a field may decrease.

For fields with an average of over 625 aphids per plant or of 25 aphids per leaflet on 25 randomly sampled leaflets (fact-sheet sampling protocol), an insecticide may be worthwhile. However, we strongly recommend sampling the field twice over 4 to 5 days to note increases or decreases. Don't spray if the population is declining by the second sampling. The problem with using an insecticide is the potential for the aphid population to rebound after all the natural enemies have been killed in a field. Remember, other fields in the area are sending out winged aphids that may reinfest your field. The best insecticide application is not likely to kill more than 90% of the aphids, while at the same time it will kill most of the natural enemies. With dozens of aphids surviving per plant and more flying in, a rebounding population is likely several weeks following an insecticide application.

The decision is not an easy one. According to past research, pod set is the critical stage that should be protected. Researchers at the University of Illinois, Illinois Natural History Survey, and USDA are trying to develop better guidelines and predictive tools. For research and extension purposes, you may want to set aside a strip without insecticide for later harvesting and comparison to treated areas.

From the Soybean Aphid Fact Sheet

The need to treat soybean aphids with an insecticide should be based on information gathered from regular and thorough scouting procedures. The combination of predators, weather, and aphid biology often causes soybean aphid populations to "crash" within given fields. Therefore, we strongly encourage appropriate assessment of the situation in each field before making a control decision. Consider the following as guidelines for a soybean aphid management program.

Natural control. Intense rainfall may kill many aphids by knocking them off the soybean plants. In addition, higher humidity increases the potential for fungal disease organisms to infect soybean aphids.

Naturally occurring predators, parasitoids, and pathogens can suppress soybean aphid populations. Lacewings, predatory bugs, and the multicolored Asian lady beetle are particularly important predators of soybean aphids. For example, each lady beetle can consume several hundred aphids during its lifetime. Thus, if you see one lady beetle on every plant, then biological control may effectively suppress soybean aphid populations.

Soybean aphid populations also may decline rapidly because stresses on the crop and crowding by the aphids cause a generation of winged aphids to form. Subsequently, almost all aphids fly away from the field. This dispersal from a field can be predicted by monitoring for the percentage of alatoid nymphs in the population. A high percentage of alatoid nymphs (nymphs with "shoulder pads") within a field indicates the forthcoming occurrence of winged adults that will leave in search of other fields.

Insecticide application. Before considering use of an insecticide, determine whether natural enemies or the presence of alatoid nymphs will cause a population "crash" within the week. Also, note that because an aphid population can increase 10-fold in one week, especially without predators to control them, the pest may rebound after an insecticide application to levels similar to those before the application.

To protect pod set, sample the aphid population at least twice during late V and early R stages. An application of

an approved insecticide may be justified if these conditions prevail:

- Density of aphids is above 25 per leaflet on average.
- Density of aphids increases from first to second sample.
- Percentage of alatoid nymphs is less than 50%.
- Soybean stage is R1 or R2.

Another Soybean Aphid Update

Echoing Kevin's thoughts, I note that from time to time updates of pest situations or crop development occur right before issues of the *Bulletin* go to print, and even when he and Mike are out of town. Doris Lagos of Dr. David Voegtlin's lab, Illinois Natural History Survey, reported a soybean aphid catch of 131 aphids in the Dekalb suction trap last week. As stated earlier in this issue, aphid densities in soybean fields have been very high in northern Illinois. The capture of winged adults (alates) is an indication of aphid dispersal. A flight such as this is another reminder to continue monitoring soybean aphid densities and keep an eye on previously uninfested soybean fields.—*Kelly Cook*

Start Thinking About Second-Generation European Corn Borers

It's just about that time of year when European corn borer moth flights start to increase. Light and pheromone traps need to be monitored for increasing numbers of these insects, indicating the need to scout fields for egg masses. For those who are monitoring light traps for second-generation corn borers, we're still looking for volunteers to submit counts to the Insect Monitoring Network. If you are interested, please contact me (217-333-6652; kcook8@uiuc.edu).

Scouting for second-generation corn borers can be a very challenging task for a couple of reasons. First, an extended moth flight is associated with this second generation. Because the flight lasts a couple of weeks, it is entirely possible to find multiple stages on a single plant. Second, there is a potential to find mixed ecotypes of the European corn borer here in Illinois. Entomologists have determined that three ecotypes of European corn borers are found in North America. The ecotypes are determined by the number of generations that are completed each season: univoltine (completes one generation), bivoltine (completes two generations), and multivoltine (completes three or more generations). We generally have two generations of European corn borers in Illinois, but some of the southern counties experience three generations. There is some evidence that we occasionally find both univoltine and bivoltine ecotypes here in Illinois. The single peak of the univoltine ecotype will fit right between the first and second generations of the bivoltine ecotype. A single generation is usually found in the northern states (Michigan, Wisconsin, Minnesota, South Dakota) and north into Canada.

Second-generation moths are attracted to pollinating cornfields that have fresh silks. However, they will lay egg masses in any cornfields or other hosts if pollinating cornfields are unavailable. Late-planted corn still in the whorl stages also attracts these moths, but don't forget to scout any early-planted or early-maturing varieties, either. Potential yield loss from second-generation corn borers is generally less that that from the first generation but will depend on the time of infestation. If infestation occurs during pollen shed or when kernels are initiated, the percentage or loss per borer per plant is 4% or 3%, respectively. Please note that these figures do not include any yield loss attributable to broken stalks and dropped ears.

Scouting second-generation European corn borers starts with scouting for egg masses. Egg masses are laid on the undersides of leaves near the midribs; they are usually concentrated on leaves in the ear zone (the ear leaf and the three ears above and below the ear leaf). Moths can lay eggs anywhere on the plant, but if eggs are concentrated in that area, scouting time can be reduced by focusing on the ear zone.

Management decisions can best be made with the use of the second-generation management worksheet (p. 164). The worksheet offers some average numbers based on research data over many years and from multiple states. However, these are just suggestions, and if you have experience that suggests other numbers suitable to your area, use your own information. For example, we suggest an average larval survival rate of 20% (approximately four larvae per egg mass). Survival rates may decrease in extremely dry areas, so you may want to use a survival rate of 10%. Heavy storms may also reduce the survival rate of the corn borers.

Timely and frequent scouting is the key to managing second-generation European corn borer. Unfortunately, it is difficult to control all second-generation borers with only one insecticide application because of the extended egg-laying period. If the application is made just after the peak moth flight, while larvae are still feeding in the leaf collar region, results are satisfactory. Missing later borers usually results in less yield loss because larvae cause more injury when they attack during pollen shed rather than during kernel initiation. We estimate that insecticide treatments to control second-generation corn borers provide approximately 75% control.

Insecticides recommended for control of second-generation corn borers are included in Table 1. Products preceded by an asterisk are restricted use insecticides and may be applied only by certified applicators. Please read and follow all product labels for more complete application instructions.

Keep us informed of any observations associated with second-generation corn borers.—*Kelly Cook*

Management Worksheet for Second-Generation European Corn Borer

	Egg masses found[1]	÷	0.91	(if only ear zone sampled)	=		adjusted egg masses
	Adjusted egg masses	÷		plants examined	=		egg masses/plant
	Egg masses/plant	×	4	larvae/egg mass[2]	=		larvae/plant
	Larvae/plant	×		yield loss/larva[3,4]	=		yield loss
	Yield loss	×		expected yield (bu/A)	=		loss (bu/A)
	Loss (bu/A)	×	$	price/bu	=	$	loss/A
$	Loss/A	×	0.75	control	=	$	preventable loss/A
$	Preventable loss/A	–	$	cost of control/A	=	$	gain (+) or loss (–) per acre if control applied

NOTES:
[1]Counts may be cumulative if taken a few days apart.
[2]Four larvae/egg mass assumes 20% survival of 20 eggs/mass; increase if environmental conditions are favorable for borer survival.
[3]Record all percentages as decimals (for example, 20% = 0.2).
[4]Yield loss per borer per plant at two corn stages:

Average number of egg masses	*Pollen shed*	*Blister stage*
Two or fewer per plant	0.04	0.03
More than two per plant	0.03	0.02

As plants mature beyond the blister stage, the economic benefits of treatment rapidly decrease.

Table 1. Insecticides and rates recommended for control of European corn borer.

Insecticide	*Rate*
*Ambush	6.4 to 12.8 oz
Capture 2EC	2.1 to 6.4 oz
*Lorsban 4E	1.5 to 2 pt
Lorsban 15G	6.5 lb
*Mustang Max	2.72 to 4.0 oz
*Penncap-M	2 to 4 pt
*Pounce 1.5G	6.7 to 13.3 lb
*Pounce 3.2EC	4 to 8 oz
Tracer 4SC	1 to 3 oz
*Warrior	2.56 to 3.84 oz

CROP DEVELOPMENT

Leaning Corn and Suffering Soybeans

On July 22, the governor declared several Illinois counties disaster areas, in part because of crop damage. This probably surprised some people, including some who have heard glowing reports on crop conditions from this and other news sources. But there are places where wind, excessive rain, and/or hail have caused crop damage, and questions remain about how much effect on yield such damage will cause. Even though the areas of damage tend to be smaller than a county in most cases, being in such areas is especially painful in a year when most fields in the state are in good shape.

Heavy rains and winds in early July caused extensive "leaning" in many cornfields in different parts of central Illinois and some in northern Illinois. Rains softened the soil, and roots, which we thought were probably deeper than normal, proved inadequate to keep the plants from leaning over. The "degree of down" ranged from almost flat to barely off the vertical. Most of the corn at that time was about to tassel, which is the prime stage for greensnap, or lower stalk breakage at a node. Corn with greensnap can no longer produce yield, or only very little yield (lower nodes can shoot an ear, but there's not enough leaf area to fill much). It is not clear why more corn did not snap instead of leaning over, but I expect that windspeed may have been lower than in the major greensnap events we have had in the past, and the drier weather in June might also have resulted in slightly smaller plants and slightly less brittleness in the nodes. In any case, while flattened corn looked bad, it was much better that it blew over instead of snapping off.

Before plants tassel, the lower stalk has enough flexibility to bend upward and to bring the upper stem and most of the leaves back to a more normal orientation. The main problem in such fields is that the root system was partly pulled out of the ground, and plants had to use energy to regrow some roots. Energy is in short supply anyway as the plant approaches pollination, and so we expect slightly smaller

ears in such fields. In some cases the root system is compromised, such that the plant may suffer more quickly from drying soils—if we ever *get* drying soils this year.

The prognosis for corn flattened during the past week, at or after pollination, is less favorable than for corn flattened in early July. Stalks develop lignin (become woody) as they get older, which is helpful for standability later but also means that plants are less able to grow back up toward the vertical when they are blown over this late. If stalks broke (stalk-lodged) rather than pulled out roots (root-lodged) from the wind, then the "plumbing" of the lower stalks is compromised, water and nutrient flow is reduced, and the plants have little chance to grow back much toward upright. If this happens at or just after pollination, we expect such plants to yield little. Most stalks did not break, but root systems that pulled out of the ground now will regenerate active roots more slowly than if the plants were younger, and doing so will detract from grainfilling ability. There just aren't enough sugars to go around.

A decrease in the sugar supply of lodged plants is probably a more serious problem than too much demand. Leaves lying on the ground or under the plant do not photosynthesize (produce sugars) very well, partly because they are more shaded and also because the air movement around them is restricted. Mud on the leaves is another problem, and diseases usually have an easier time infecting leaves that are near the ground, especially when those leaves are already beat up. Root systems of root-lodged plants are usually compromised so that water supply to the plant can become limiting, especially if the soils start to dry out. With frequent rainfall, I would expect plants that root-lodged to 30˚ or less from horizontal at about the end of pollination to yield perhaps half to two-thirds of normal. If it dries out or diseases take over, then this figure will drop quickly.

In fields that have lodged and in most fields that haven't, this will be a year to watch stalk quality closely. When there is not enough sugar to go around, whether that's because of low supply from lodging, disease or other problems, or high demand by a lot of kernels on the ear, then the stalk is the first to suffer. As sugar content of the stalk drops, disease organisms come in, and stalk weakness results. There's not much to do about this if it happens, but earlier harvest and special equipment might be called for if you know the problem exists.

Besides the disease problems outlined elsewhere in the *Bulletin*, soybean plants that are standing in water or in saturated soils are struggling greatly. On a trip north on July 19, I saw large portions of fields with such soggy soils, especially in Livingston, Iroquois, and Ford counties. Crop color is less than ideal in many of these fields, even in places where the soils weren't visibly saturated. Other fields in the same vicinity had good color and better growth. I think the differences are mostly related to drainage, perhaps some to planting date and some to variety. In any case, the prognosis for some of the fields I saw cannot be very positive. Some drying weather will help, but with what are probably compromised root systems on affected plants, they will suffer from water shortage about as soon as soils start to dry out.

Soybean plants are mostly in R2 (full flower) to R3 (beginning pod) stages, with some earlier varieties planted early perhaps in full pod (R4) by now. The crop continues to lag a bit in its development because of cool temperatures. This should not be a problem if water supply remains adequate through August, but unless the crop dries up with large yield losses, we cannot expect harvest to start early. Normal August temperatures and relatively warm weather into mid-September should help yields.—*Emerson D. 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

Much of the corn crop throughout the region is fully tasseled, and overall the corn crop looks very good. However, there is concern over rootworm beetles and Japanese beetles potentially clipping silks, and producers are encouraged to monitor fields. We have received one report of a field edge treated for Japanese beetles because of silk clipping. Numerous reports of hail injury and wind damage over the past three weeks have been received. As

mentioned in last week's report, it has been confirmed that rootworm larvae injury has occurred on corn roots in first-year corn treated with a granular insecticide at planting.

Lyle Paul, area agronomist at the Research Center in Dekalb County, reports soybean aphids in Dekalb and Kane counties, with a few fields treated with an insecticide. Gary Bretthauer, Kendall County Extension, reports that producers are concerned about increasing soybean aphid populations, as well, but has not reported any treated fields. Lyle also reports that 100-bushel-plus wheat yields are common in Dekalb County, with the Research Center wheat variety trials averaging 127 bushels per acre.

Contributing Authors

Kelly Cook (kcook8@uiuc.edu), Extension Entomology, (217)333-6651

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

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

U of I Extension Newsletter Service
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