Pest & Crop

http://www.entm.purdue.edu/Entomology/ext/targets/newslett.htm

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In This Issue

Insects, Mites, and Nematodes

Soybean Aphid in Indiana – (*John Obermeyer and Larry Bledsoe*) -

- Aphids are moving from winter to summer host
- Information on biology and damage given
- Indicators to consider before treating
- Be certain that insecticide applications are necessary

Soybean aphid, *Aphis glycines* Matsumura, was first found this year on June 11 at the Agronomy Center for Research and Education, Tippecanoe County, on V1 soybean plants. This was our first indication these aphids moved from their winter host, buckthorn, to their summer host, soybean. This is significant because it confirms that this aphid can survive a relatively harsh winter, something debated among entomologists. States in the northern Corn Belt observed this movement to soybean about one week earlier than we did, which has been the trend since 2001. Since our first observation of soybean aphid this year, numbers have been increasing in our research plots.

Winged and wingless soybean aphid

Soybean aphid has a very complicated lifecycle. Simply put, female aphids feed-on and reproduce on soybean in the summer. Females give birth to female offspring, so aphid numbers can increase quickly (it is estimated that populations can double every 2-1/2 days). In the fall, as temperatures drop and days grow shorter, a generation of winged females and males are produced. Both migrate from soybean to their overwintering host plant *Rhamnus*, a shrubby tree also known as buckthorn. Eggs are laid on buckthorn, which overwinter and hatch in the spring. Aphids emerging in the spring are females. After several generations on the overwintering host, winged spring migrants fly to soybean to establish new colonies.

The soybean aphid feeds by using a needle-like, sucking mouthpart to remove plant sap. Plant damage occurs from large numbers of aphids removing a significant amount of water and nutrients as they feed on leaves and stems. Plants with aphids are often stunted when compared to plants from other parts of the field. In some cases, heavily infested plants show dramatic leaf yellowing. This yellowing may be associated with potassium (K) deficiency, because symptoms can be more pronounced in fields where both high numbers of aphids and deficient levels of K are found. Aphids can become so numerous that plants are covered with shed aphid skins (resembling white powder) and honeydew, both of which are signs of aphid presence. Gray sooty mold growing on the honeydew can also cover leaves with a black, sticky film.

Yellowing of foliage from soybean aphid feeding

It is too early to speculate on how severe the infestations will be in the Midwest, much less Indiana, for this season. Considerable time and effort has been and will be devoted to this pest throughout the Corn Belt because of its potential economic impact on soybeans. Indiana has had minimal crop damage due to this aphid since its discovery in 2000. At this point there is no standardized treatment threshold for this insect. However, the following conditions may indicate when insecticides may or may not be needed.

Populations are becoming significant when there are at least 25 aphids per leaflet (3 leaflets for each trifoliolate leaf) and they are beginning to move from the undersides of leaves onto stems. Aphids on stems generally are easy to see without a hand lens. Honeydew is a sugary substance secreted by aphids as they feed and is a sign aphid numbers are large. The presence of ants will become quite apparent throughout the soybean canopy when honeydew is present. Leaves will darken as sooty mold increases.

Leaflet with over 100 aphids

Ants tending the soybean aphid for honeydew

Beneficial fungi already exist in your fields, in the soil and on plant surfaces. These fungi infect aphids and can drastically reduce the aphid population in a field in a matter of days. Infected aphids are pinkish, white, or tan, and fuzzy from the growth of fungi out of their bodies. When weather conditions are warm and humid, the infection rate is rapid. Once a fungal infection starts, an insecticide spray may not be needed.

Flowering and early pod fill during July seem to be critical times for aphid control. Large numbers of aphids feeding on the plant may cause flowers and pods to abort. Also, there are Minnesota data showing that node number was reduced by large numbers of aphids. Spraying too late in the season, once pods are formed, is probably too late to get the most yield advantage from treatment.

Predatory insects, especially lady beetle adults and larvae, lacewing larvae, pirate bugs, and syrphid fly larvae, have been very abundant in infested fields and should provide some control, if present. Parasitic wasps, which lay eggs directly into aphids, have been less abundant, but still present. Parasitized aphids will be tan colored and stiff. There may be a small round hole in the skin of the aphid where the adult parasite escaped. In addition to the pathogenic fungi mentioned earlier, these biocontrol agents have the potential to dramatically reduce aphid numbers in Indiana to below economic levels.

Lady beetle larva feeding on soybean aphid

Diseased aphid among healthy ones

Efficacy trials have demonstrated that many products control aphids in soybean. The difficulty is in knowing if and when one should treat. Once an insecticide is used, predators are also controlled and aphids are able to quickly repopulate if left unchecked. Many experienced this type of phenomena with spider mites in 1988. Our caution is one should be absolutely certain that soybean aphid are threatening yield throughout a field and aware of extended weather forecasts before considering treatment.

Further information with many color pictures can be found in extension publication E-217, *Soybean Aphid* (May 2001). This electronic publication can be viewed at <http://www.entm.purdue.edu/entomology/ext/targets/e-series/e-list.htm>.

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Black Light Trap Catch Report
(Ron Blackwell)

County/Cooperator	6/10/03 - 6/16/03							6/17/03 - 6/23/03						
	VC	BCW	ECB	SWCB	CEW	FAW	AW	VC	BCW	ECB	SWCB	CEW	FAW	AW
Dubois/SIPAC	0	0	1	1	0	0	0	2	0	0	0	0	0	7
Jennings/SEPAC	0	0	21	0	0	0	2	0	0	5	0	0	0	0
Knox/SWPAC	0	0	2	1	2	0	2	1	1	2	0	0	0	7
LaPorte/Pinney Ag Center	0	0	103	0	0	0	9	0	0	38	0	0	0	5
Lawrence/Feldun Ag Center	0	0	0	0	0	0	1	3	0	0	0	0	0	10
Randolph/Davis Ag Center	0	0	33	0	0	0	0	0	0	13	0	0	0	0
Tippecanoe/Throckmorton Ag Center	0	0	1	0	0	0	0	0	0	19	0	0	0	1
Whitley/NEPAC	0	0	135	0	0	0	14	0	0	26	0	0	0	1

BCW = Black Cutworm ECB = European Corn Borer SWCB = Southwestern Corn Borer CEW = Corn Earworm
AW = Armyworm FAW = Fall Armyworm VC = Variegated Cutworm

Sightings From the Field

Potato Leafhopper Update - (*Ron Blackwell*) – As mentioned in last week's newsletter, potato leafhopper populations are increasing. Sampling done in alfalfa (with fresh regrowth) in Tippecanoe County on June 26 revealed some threatening populations. The number of potato leafhoppers collected per sweep ranged from 1.6 to 8.7 in fields sampled. Regrowth was between 1 and 1.5 inches. The management threshold for alfalfa under 2 inches is 0.2 leafhoppers per sweep. Now is the time to get out there and scout those alfalfa fields! Refer to P&C #12 for sampling and management guidelines.

Weeds

Weed Control Timing Issues in Roundup Ready Soybeans - (*Bill Johnson, Glenn Nice, and Tom Bauman*) -

Postemergence weed control operations in soybean should be well underway in most of Indiana. With over 85% of our soybean acres planted to Roundup Ready soybean, we have seen the use of postemergence weed control products shift from photosynthetic inhibitors (Basagran), diphenylethers (Cobra, Blazer/Status, Reflex/Flexstar) and ALS inhibitors (Scepter, Pursuit, Classic, Synchrony, etc.) to glyphosate-based products. Although we are shifting use patterns, we must still use sound judgment in selection of controllable spray application variables.

As with most herbicides, the labels of glyphosate-based products contain information designed to maximize the efficacy of this product on target weeds. With contact herbicides such as diphenylethers and photosynthetic inhibitors, we typically recommended spraying weeds when they were small (3 inches or less) and using higher pressure (psi) and spray volume (gpa) to ensure thorough coverage. This is done since foliage that is not contacted by these herbicides will not be effectively controlled. Since the glyphosate (Roundup) products are translocated to active sites in the plant, complete foliage coverage is less important, and success with lower spray volumes has been achieved on a regular basis in the scientific literature and in the real world.

Obviously, weed management strategies have shifted with the use of the Roundup Ready technology. Before Roundup Ready soybean, weed control programs consisted of utilizing either 1) soil-applied herbicides plus early-post (weeds less than 3 inches tall) treatments for broadleaves and/or mid-post (weeds 3 to 6 inches tall) treatments for grasses or 2) utilizing total-post programs targeted at a mid-post application timing.

Broad adaptation of the Roundup Ready soybean system has resulted in a shift in weed management philosophy. Most glyphosate labels state that the "best" results will be obtained with a 1-quart application (or 22 oz/A of Roundup Weathermax) on 4- to 8-inch-tall weeds, with sequential applications as needed. While we feel that as a general rule, this strategy will be successful, it will be tempting to push the technology envelope and allow weeds to get larger than 8 inches before the first application is made. For that reason, we would suggest targeting the first application to 4- to 6-inch-tall weeds, regardless if one is in a total-post system or a soil-applied followed by post system, and make sequential applications as needed. This strategy will help reduce early season weed competition and result in fewer nonperformance issues.

Unfortunately, my observations are that we are pushing the limits of the technology by making the first glyphosate application on weeds 8 to 16 inches tall (or taller – see photo). In discussing this with growers and consultants, it appears that the mindset is to make the application as close to crop canopy as possible to take advantage of the crop canopy in suppressing additional weed regrowth. When the herbicide is effective at controlling the large weeds, these programs have resulted in very clean fields. However, a clean field in August doesn't mean that it will yield as high as it could have if the weeds had been controlled in a more timely manner early in the season. Our research has repeatedly shown that in a total postemergence Roundup Ready soybean system with moderate to heavy weed infestations, an initial weed control operation must be done according to one of the three criteria to minimize yield losses due to weed competition. These criteria consist of either 1) controlling weeds by 4 to 5 weeks after planting, 2) controlling weeds before they reach 6 to 9 inches in height, or 3) controlling weeds before soybean reaches the V3 stage of growth. Environmental conditions and weed densities and variety can slightly shift optimal management times in either direction for any of the criteria, but using one of these as a general rule of thumb will be the best way to minimize risk of yield loss.

VC stage soybean and big giant ragweed. Although these weeds have just been sprayed (see yellowing in terminals), the timing of this spray application was a bit off in our estimation. We recommend against using this strategy. Photo was taken this year in Indiana by Dr. Bob Nielsen, Department of Agronomy. The name and location of the area are not given to protect the innocent.

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Investigate Giant Ragweed and Marestail for the Presence of Stalk Boring Insects - (*Bill Johnson, Eric Ott, John Obermeyer, Tom Bauman, and Glenn Nice*) -

A lot of attention is being devoted to weeds that appear to be escaping glyposate (Roundup, Touchdown, Glyphomax, others) treatments. While we do have pockets of glyphosate-resistant marestail in southeast IN, we are becoming more concerned about giant ragweed plants that do not appear to be controlled by glyphosate. In some cases, when the plant stems are split open with a knife, stalk boring insects and their tunnels are observed, particularly on plants 18 inches tall or larger. In some cases, I have split open small (less than 12 inch tall plants) and have not been able to find insect boring. By and large though, most of the escapes are large plants and in almost every instance, a stalk boring insect is present.

In response to this issue, we initiated greenhouse studies to look at the influence of stalk boring insects on glyphosate efficacy in giant ragweed. We have completed a couple of runs of this experiment and I wanted to share some of our findings to date.

Methods:

Giant ragweed seedlings (cotyledon to 2-leaf stage) were collected from the Purdue University ACRE Farm near West Lafayette and brought into the greenhouse. Individual plants were placed in plastic pots and watered as needed to bring them back to health after transplanting. European corn borer larvae were obtained from a commercial source and 2-4 larvae were placed on the plant leaves when the plants were 4 inches tall. When the plants were either 6 or 18 inches tall, Roundup Weathermax was applied at 16, 22, or 44 oz/A to these plants with a track sprayer. At 3 weeks after herbicide treatment, plants were harvested at the soil surface and the length of tunnels measured and dry weights recorded.

Preliminary Results:

Insect tunneling was observed in all plants infested with ECB larvae. Unfortunately, these insects are somewhat mobile and tunneling was also observed in non-infested plants. So, we made the decision to plot plant dry weight versus the length of tunnel on a graph. On plants treated with glyphosate when they were 6 inches tall, we observed no correlations between tunnel length and glyphosate efficacy. On plants treated with glyphosate when they were 18 inches tall, we observed a negative correlation between tunnel length and glyphosate efficacy on plants treated with 16 oz/A of Roundup Weathermax. We did not observe any relationships between tunneling and herbicide efficacy on plants treated with higher rates of Roundup Weathermax.

We are planning to continue to work on this issue and have also initiated field studies to study this interaction with natural insect infestations. Stay tuned for more details.

In the meantime we are interested in these interactions in production fields and developing an informal database. If you are interested in how to collect data for this database, contact Bill Johnson, John Obermeyer, or Ron Blackwell. We would like to get a feel for both the number of escapes and plants controlled by glyphosate that contain stalk boring insects.

Stalk borer and giant ragweed tunneling (*photo credit: Dan Childs*)

Agronomy Tips

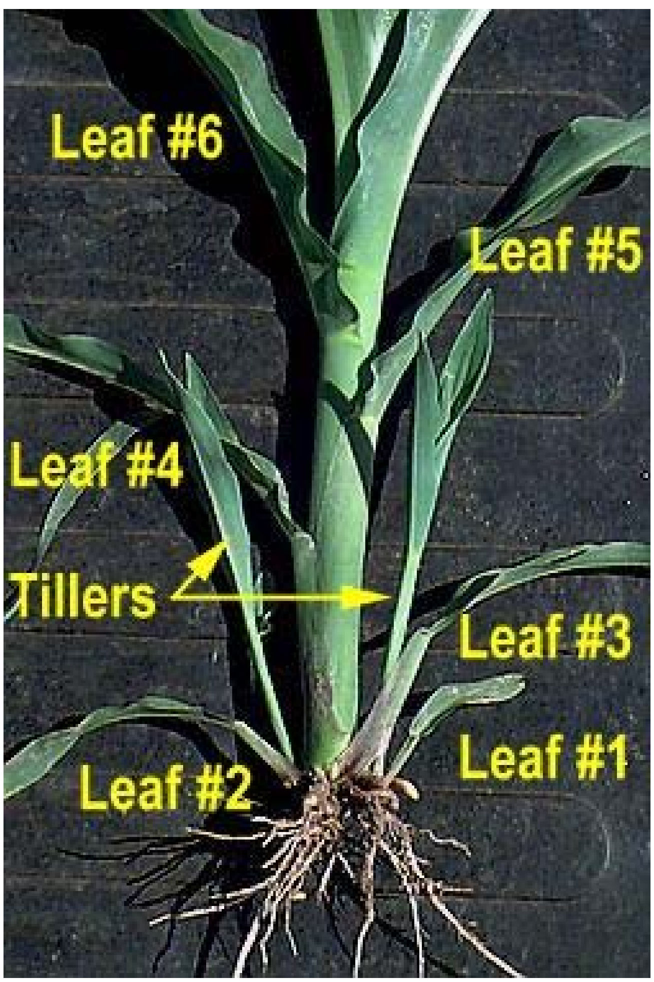
Tillers or "Suckers" in Corn: Good or Bad? - (*Bob Nielsen*) -

- Tiller development is a normal part of corn physiology
- Tillers in "normal" corn generally signal favorable growing conditions
- Tillers often develop following early-season injury to the main stalk
- Tillers are not generally detrimental to the main stalk

Some of the guys over at the B&B Pitstop Cafe were arguing the other day about "suckers" in corn. The older fellows remember being sent to the fields as kids to pull "suckers" off the corn plants because their fathers believed that "suckers" were bad for the corn; although some suspected that the real purpose may have been to simply keep them out of their father's hair on hot, muggy summer days. Well, what are "suckers" and are they bad for corn?

"Suckers" Are Tillers

Tillers are basically branches that develop from axillary buds at the lower five to seven stalk nodes of a corn plant. Tillers are morphologically identical to the main stalk and are capable of forming their own root system, nodes, internodes, leaves, ears, and tassels.



Similar axillary buds at nodes higher up on the main stalk initiate ear shoots rather than tillers. Ear shoots differ morphologically from tillers in that internode elongation (within the ear shank) is less, leaves (husk) are shorter, and the stalk (ear shank) terminates in an ear (female inflorescence) rather than a tassel (male inflorescence). Sometimes, however, a tiller becomes "confused" during its development and generates a terminal inflorescence that is partially male and female (aka "tassel-ear").

Tillers on Normal Plants

Most agronomists agree that tiller development in field corn represents a signal that growing conditions are quite favorable, with ample available levels of nutrients, water, or sunlight. Such favorable growing conditions may exist simply due to favorable weather conditions or because the field's plant population is low relative to the yield potential of the field. With favorable growing conditions, the corn plant has ample energy and nutrients to "invest" in tiller development. Some hybrids are also genetically prone to developing tillers, even at adapted plant populations. Tillers may compete somewhat with the main stalks, but given their usual late developmental start they usually lose out in the competition for water, nutrients, and light.

Tillering In Response to Damage

One or more tillers commonly form if the main stalk is injured or killed by hail, frost, insects, wind, tractor tires, little kids' feet, deer hooves, etc. early in the season. If the damage occurs early enough in the growing season, tillers may actually develop harvestable ears. Late developing tillers, however, usually don't have enough time to develop ears that mature before a killing fall frost. An example of late tillering occurred in some Indiana fields severely damaged by the late June frost of 1992. The apparent "recovery" of these fields looked promising from "windshield surveys", but little if any grain yield was obtained from these damaged fields.

Bottom Line

As a rule, the net effect of tiller development in an undamaged field is neutral. Most recent research suggests that removal of tillers has little, if any, effect on corn grain yield. Usually, the main stalk will "outcompete" the tillers and the tillers eventually wither away. Tiller development in a field that was damaged or simply planted too thin MAY result in harvestable ears and thus contribute to grain yield.

Related References

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- Thomison, Peter. 1995. **Does Tillering Affect Hybrid Performance?** Ohio State Univ., Columbus, Ohio. Available online at: <http://ohioline.osu.edu/agf-fact/0121.html> [URL verified 6/22/03].

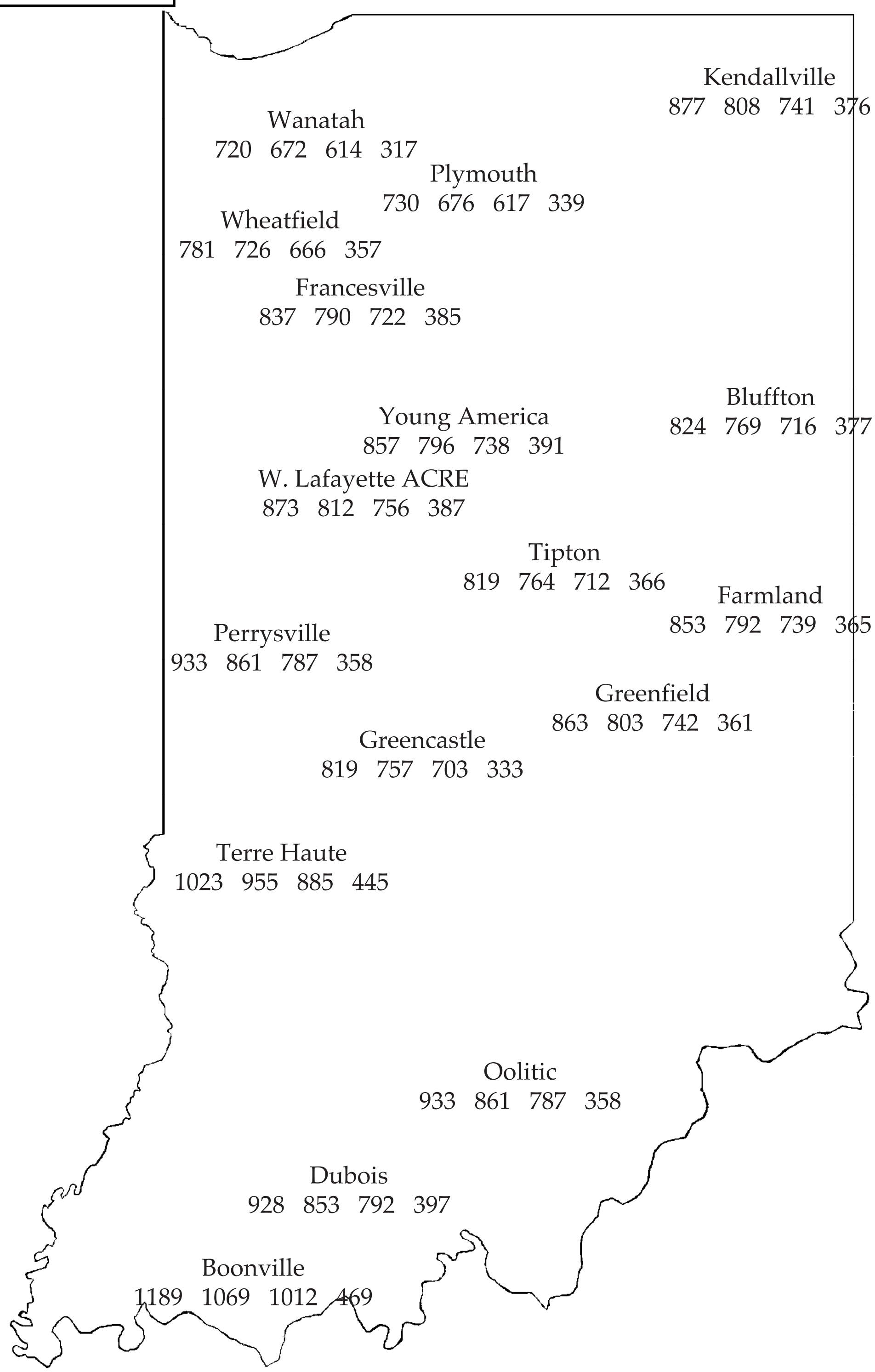
Don't forget, this and other timely information about corn can be viewed at the Chat 'n Chew CafÈ on the Web at <http://www.kingcorn.org/cafe>. For other information about corn, take a look at the Corn Growers' Guidebook on the Web at <http://www.kingcorn.org>.

Weather Update

Temperatures as of June 25, 2003

GDD(9) = Growing Degree Days from April 16 (9% of Indiana's corn planted), for corn growth and development
GDD(26) = Growing Degree Days from April 25 (26% of Indiana's corn planted), for corn growth and development
GDD(50) = Growing Degree Days from April 30 (50% of Indiana's corn planted), for corn growth and development
GDD(85) = Growing Degree Days from June 4 (85% of Indiana's corn planted), for corn growth and development

MAP KEY
Location
GDD(9) GDD(26) GDD(50) GDD(85)



4" Bare Soil Temperatures 6/25/03

Location	Max.	Min.
Wanatah	90	71
Columbia City	88	69
Winamac	93	70
Bluffton	73	71
W Laf Agro	87	72
Tipton	85	71
Farmland	84	68
Perrysville	78	69
Crawfordsville	84	71
Terre Haute	85	70
Vincennes	82	67
Oolitic	86	66
Dubois	94	68

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