IOWA STATE UNIVERSITY
University Extension

Soybean

APHID MANAGEMENT

FIELD GUIDE

A visual aid for identifying, sampling and managing your soybean fields for soybean aphid.

Since 2000, soybean aphid has become the primary soybean pest in Iowa. This insect can cause significant injury and economic loss if left untreated. This publication reviews what is currently known about soybean aphid and suggests management strategies to protect yield.

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Cover photo by Marlin Rice

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Soybean Growth Stages

Several growth stages can overlap within a soybean field. A growth stage begins when the majority (>50 percent) of the plants in a field are at or beyond that stage.

Vegetative stages

VE: Emergence
VC: Unrolled unifoliolate leaves
V1: First unrolled trifoliolate leaf
V2: Second unrolled trifoliolate leaf
V(n): n-th unrolled trifoliolate leaf

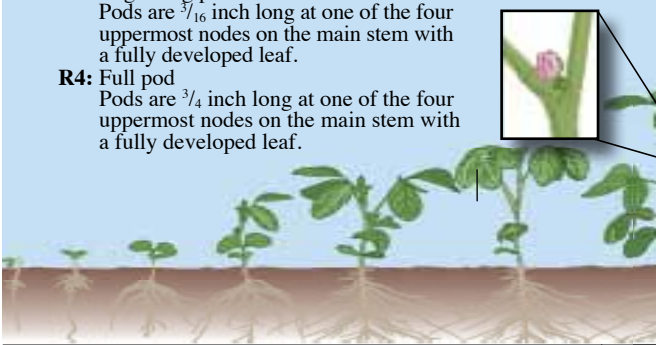
Reproductive stages

Bloom – R1 and R2

R1: Beginning bloom
Plants have at least one open flower at any node.
R2: Full bloom
Plants have an open flower at one of the two uppermost nodes on the main stem.

Pod development – R3 and R4

R3: Beginning pod
Pods are $^{3}/_{16}$ inch long at one of the four uppermost nodes on the main stem with a fully developed leaf.
R4: Full pod
Pods are $^{3}/_{4}$ inch long at one of the four uppermost nodes on the main stem with a fully developed leaf.



VE	VC	V1	V2	V3	

Seed development – R5 and R6

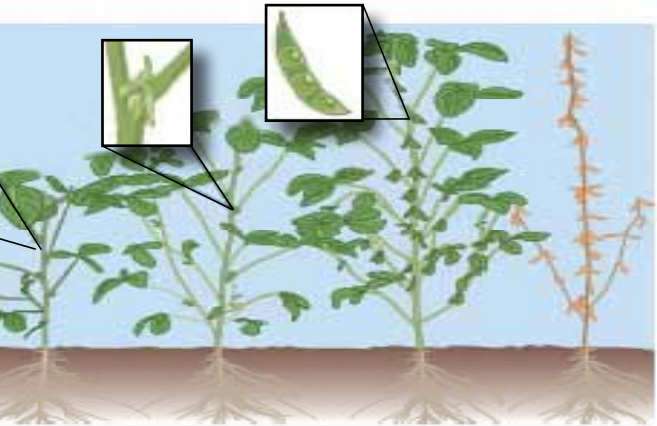
R5: Beginning seed
Seeds are $^{1}/_{8}$ inch long in the pod at one of the four uppermost nodes on the main stem.

R6: Full seed
Pods contain green seeds that fill the pod to capacity at one of the four uppermost nodes on the main stem.

Maturity – R7 and R8

R7: Beginning maturity
One pod on the main stem has reached its mature color (tan or brown).

R8: Full maturity
Ninty-five percent of the pods have reached their mature pod color.



R1	R3	R5	R8

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Origin of Soybean Aphid

Soybean aphid, *Aphis glycines*, is native to eastern Asia, including China, Indonesia and Japan, where it is an infrequent soybean pest. It was first detected in North America in Wisconsin in July 2000 and now occurs throughout all Midwestern soybean producing states and southern Canada. It is not known how this insect entered the United States, but historical records of other aphid interceptions by the U.S. Department of Agriculture suggest that soybean aphid was most likely accidentally introduced from Asia.

Life History

Since its discovery in northeastern Iowa in August 2000, the soybean aphid quickly spread across Iowa. Twelve months later, the aphid was detected in western Iowa in Woodbury County, and found statewide by the end of 2002. Soybean aphid is now a major pest for soybean growers in Iowa. Several outbreaks have occurred since the aphid invaded the state (2003, 2005, 2007, 2008), where aphid populations easily exceeded several thousand per plant. Such high populations require an insecticide application to minimize yield loss. Correspondingly,

in 2003 approximately 2.9 million acres in Iowa were sprayed with insecticides to reduce aphid populations and a survey of 2,400 Iowa farmers indicated that soybean yield losses reached 57.7 million bushels. In contrast, only 50,000 acres were treated for soybean aphid in 2004. The sporadic nature of these outbreaks may continue into the future, making predictions about future aphid management difficult.

Description of Soybean Aphid

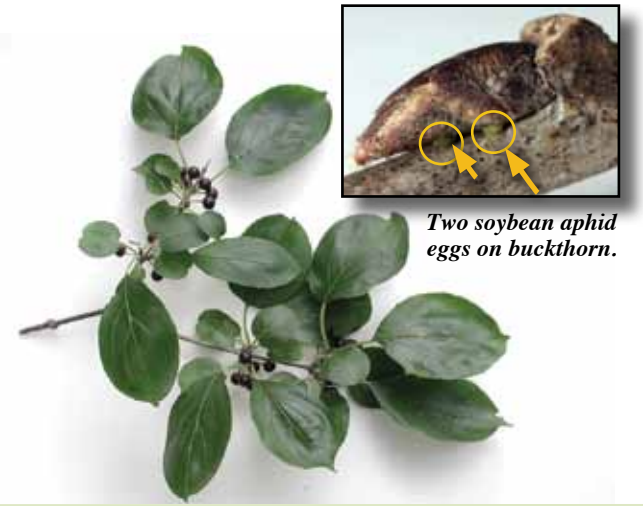
The soybean aphid is the only aphid in North America that will develop large, persistent colonies on soybean. However, other common soybean arthropods may be confused with soybean aphid, so it is important to correctly distinguish beneficial and harmful species to prevent unnecessary insecticide applications. As with most aphids, there are wingless and winged forms. Wingless soybean aphid adults are pear-shaped, about $^{1}/_{16}$-inch long, pale yellow or green, and have dark cornicles (tail pipes) near the end of the abdomen. The winged form has a shiny black head and thorax with a dark green abdomen and black cornicles. Aphids feed on phloem (plant sap) through a piercing-sucking stylet mouthpart that is tucked under the body while not feeding.

Aphids found on underside of leaf

Winged aphid

Host Plants

Buckthorn, a small woody plant, is the primary host for soybean aphid. Buckthorn grows widely across Iowa in wooded areas and river bottoms, and has been planted in shelterbelts as windbreaks. Eliminating buckthorn might seem to be a logical approach to reducing overwintering soybean aphid populations, but this is impractical. If all the buckthorn in a county could be eliminated, winged aphids could still fly in from other counties or states to infest soybean fields.



Two soybean aphid eggs on buckthorn.

Soybean is the secondary host because the aphids do not sexually reproduce on this plant. Crimson clover and red clover are suitable hosts for soybean aphid and will support large colonies. Berseem clover and kura clover will support aphid reproduction to a lesser extent. White clover, white sweet clover and yellow sweet clover are extremely poor hosts and only can support low levels of aphids.

Soybean Aphid Life Cycle

The seasonal cycle of soybean aphid is complex. Eggs are laid on buckthorn in the fall and are the overwintering, cold-hardy stage. Wingless, asexual females (sometimes called stem mothers) hatch in the spring when buckthorn buds burst. The stem mother gives live birth to several generations of asexual clones on newly expanded leaves. A winged generation is then produced and capable of long distance flight.

Wingless forms are deposited on soybean and are highly reproductive. Very small colonies of aphids occasionally can be found from late May to mid June on V1-V2 plants. Despite this early

occurrence, it takes several weeks for populations to spread across a field. Soybean aphids can produce 15 to 18 generations on soybean. The optimum temperatures for reproduction and longevity are 72 to 77°F with the relative humidity below 78 percent. Field based estimates of aphid population growth in Iowa suggest that a population can double in size every 5 1/2 to 7 days. When temperatures exceed 81°F, the developmental time is lengthened; at 95°F, the lifespan is greatly shortened and no nymphs are produced.

Based on food availability and quality, the presence of natural enemies and crowding, soybean aphids will produce flushes of winged forms throughout the season. Winged forms produced in the summer can cause late-season infestations. In late summer, when soybean plants start to mature seed, winged females and males are produced. They migrate to buckthorn and the male mates with the wingless sexual female. The female lays overwintering eggs on buckthorn buds that will burst the following spring.

Population Variation

Since 2000, aphid populations have gone through dramatic high and low cycles. Generally, high populations exceeding 2,000 aphids per plant occurred in the majority of fields in 2001, 2003, 2005 and 2007. In other years, overall populations were lower and highly patchy. Our understanding of this insect is still incomplete and it would be premature to say that the soybean aphid population oscillates through predictable high and low cycles.

Data analysis from suction traps across the Midwest may provide insight into these high and low cycles. Winged soybean aphids are collected in these traps as they fly between soybean fields in the summer and then in the early fall as they migrate to buckthorn.

In high aphid years, large numbers of winged aphids are trapped in July and early August, but by late August, the capture of winged aphids drops off dramatically.

Very few, if any, male and female winged aphids are collected in the early fall migrating back to buckthorn to lay their eggs. Low numbers

of overwintering eggs lead to low numbers of aphids colonizing soybeans the following spring. However, in 2009, record-breaking numbers of fall migrants were captured in suction traps. We don't fully understand how extremely high numbers of fall migrants might influence spring migration in Iowa.

In contrast, for low aphid years, very small numbers of winged aphids are trapped during July and August, but in September significantly more aphids (nearly 40 times more) are trapped. Large numbers of winged aphids captured in the fall suggest that large numbers of eggs will probably be laid on buckthorn, followed by large populations of aphids the following spring.

Injury Symptoms in Soybean

Soybean aphid feeds on phloem (plant sap) from the leaves and stems of soybean. Heavily-infested plants may have yellow or distorted leaves. As aphids feed, they excrete sticky, sugar-rich honeydew that can accumulate on leaves, stems and pods. Excessive honeydew promotes the growth of black sooty mold, turning the leaves grey and ashy and interfering with photosynthesis. Less than optimal photosynthesis can stunt plants and reduce seed counts, resulting in lower yields.

Probing and feeding by soybean aphid can cause flowers and small pods to abort, reducing overall pods per plant. Aphid feeding also competes with the soybean plant for nutrients, which reduces the number of soybeans per pod and, less frequently, the size of soybeans. Therefore, protecting plants during the flowering stages (R1-R2) and pod-fill growth stages (R3-R4) helps protect soybean yield. These soybean stages typically occur from mid July into early August in Iowa.

Black sooty mold on soybean can result from aphid honeydew.

Virus Transmission

Soybean aphid can transmit several viruses including alfalfa mosaic virus, bean yellow mosaic virus and soybean mosaic virus. Soybean aphid is an efficient transmitter of soybean mosaic virus, requiring less than 30 seconds of feeding for efficient transmission. Soybean mosaic virus is of primary concern because it can cause significant yield loss, although yield losses from this disease have not yet been documented in the state. Plant-expressed symptoms of these two viruses are similar and cannot be separated visually from each other in the field.

Insecticides are ineffective in preventing aphid-transmitted viruses. Soybean mosaic virus may be more important when it occurs in plants that also are infected with bean pod mottle virus transmitted by the bean leaf beetle. Growers may want to consider a bean leaf beetle management program that interrupts bean pod mottle virus transmission.

Natural Enemies

Soybean aphid is a food source for several predatory and parasitic insects, including beetles, true bugs, flies and wasps. The multicolored Asian ladybeetle is one of the most common predators in Iowa soybean, and is capable of eating up to 200 aphids per day as a larva or adult. Other ladybeetles, lacewings and predatory bugs can be seen feeding on soybean aphid. These predators help suppress soybean aphid population growth in June and early July when fields have small aphid populations. Once aphids fully infest a field (>80 percent of plants with aphids) and populations reach 100 to 200 aphids per plant, the impact of these predators is limited and aphid populations are likely to increase. Ladybeetles move to buckthorn with aphids and continue to prey on aphids during the fall. This predation may significantly reduce the overwintering soybean aphid population and be partly responsible for variations in population cycles.

Stingless, parasitic wasps also attack soybean aphids and lay eggs inside them. The wasp larva hatches inside the aphid and eventually kills it. A parasitized aphid looks bloated and black or

tan, and is often referred to as a "mummy." An adult wasp eventually emerges from the mummy. A female wasp may parasitize up to 180 aphids during her one-week life span. Currently, parasitic wasps are not a major source of soybean aphid mortality in Iowa. However, in their native China, these wasps significantly reduce aphid populations. In 2007, an Asian species, *Binodoxys communis*, was released in the Midwest. It is too early to know the impact introduced parasitic wasps will have in reducing soybean aphid outbreaks. Successful establishment of parasitic wasps can only be a practical management tool if area-wide insecticides are reduced.

Naturally occurring fungal pathogens also have been observed to reduce soybean aphid populations in Iowa, Minnesota and Wisconsin. These fungal outbreaks can cause a very quick (less than one week) decline in aphid numbers, and are believed to be partly responsible for the reduction in late season aphid densities in 2007. Several species are known to occur in Iowa, but environmental conditions must be right for them to become active and attack aphids. Infected aphids look white or pink and fuzzy; eventually infected aphids die and shrivel.

A parasitic wasp lays eggs inside soybean aphids.

Economic Threshold

The *economic injury level* and *economic threshold* are two important concepts that help us understand soybean aphid and yield loss relationships. The economic injury level is the lowest number of insects that will cause economic damage; that is, yield loss that equals the cost of control. University research has determined the economic injury level to be 654 aphids per plant during the R1 to R5 growth stages for 30-inch row soybeans.

The economic threshold is a similar concept, but it is a *lower pest density* at which management action should be taken to prevent an increasing pest population from reaching the economic injury level. The economic threshold has been set at **250 aphids per plant**. The economic threshold guidelines provide a 5 to 7 day lead time before the aphid population would be expected to exceed the economic injury level – and cause economic damage. Field populations that average less than 250 aphids per plant should not be sprayed, even with increasing commodity prices. Research shows that yield losses can rarely be detected when populations are smaller than 250 aphids per plant. Therefore, we recommend an insecticide be applied when the economic threshold is reached and aphid populations are increasing.

Field Sampling

One of the most important tactics of any IPM program is sampling. Looking for and estimating soybean aphid density is essential for determining aphid presence and abundance for every field. Begin scouting the last week of June, especially in northeastern Iowa. Check for aphids on the youngest two or three trifoliolate leaves and stems. Scout 30 plants for every 20 acres, looking at several locations within a field to ensure coverage. Also look for ants or ladybeetles on the soybean plant – they often indicate the presence of aphids. Ladybeetles feed on aphids while ants tend to the aphids and "milk" them for honeydew. Scout fields weekly until plant reach the mid-seed stage (R5.5), even if insecticides have been applied.

Remember to include zeros when estimating aphid densities. Develop a mental reference for gauging populations on other plants by first counting small colonies to establish what 100 aphids looks like, and then use this as a guide. As a point of reference, a colony that completely covers all sides of a stem for one inch will contain 250 to 300 aphids.

Speed Scouting

Speed Scouting can greatly decrease sampling time in a field because every insect is not counted. The binomial scouting cut-off point is 40 aphids per plant. If a plant has less than 40 aphids, it is considered to be non-infested. However, if the plant has 40 or more aphids (remember, counting additional aphids is not necessary after 40), the plant is infested. Based on the Speed Scouting sampling plan, three treatment decisions are possible:

1. Do not treat that field,
2. Treat that field, and
3. Resample that field in 3 to 4 days.

(See page 26 for details.)

Speed Scouting is NOT a new economic threshold! The economic threshold is 250 aphids per plant through seed set. Speed Scouting is simply an alternative scouting method that considers whether a plant is infested or not. If there are more than 40 aphids, then the plant is infested. This sampling plan uses the *percent infested plants* as an indicator of damaging soybean aphid populations.

Speed Scouting Directions

1. Select the first plant at random. If less than 40 aphids are on the entire plant, mark a minus [-] for that non-infested plant. If at least 40 aphids are on the plant (STOP COUNTING when you reach 40 – this is the speedy part), mark a plus [+] for that infested plant.
2. Choose a direction at random and walk 30 rows or paces to the next plant.
3. Repeat Step #1 until 11 plants are sampled in different areas of the field.
4. Make a decision using the total number of infested plants (the total number of pluses).
5. If you must 'continue sampling' (7 to 10 plants with a +), sample five more plants and use the new total number of plants (16) to make a decision.
6. If no decision is reached, sample additional sets of five plants until 31 plants are sampled. Remember, always use the total number of plants to make a decision.
7. If no decision can be made after sampling 31 plants, resample the same field in 3 to 4 days.
8. A 'TREAT' decision must be confirmed a second time 3 to 4 days later. If confirmed, apply an insecticide in 3 to 4 days.

Also available online at:
http://www.soybeans.umn.edu/pdfs/2007/aphid/speed_scouting_2007.pdf

Speed Scouting for Soybean Aphid

For blank forms and an interactive example, go to www.soybeanaphid.info

Directions for Speed Scouting:

1. Go to a plant at random and start counting aphids. If less than 40 aphids are on the ENTIRE plant, mark a minus [-] for that non-infested plant. If you reach 40 aphids, STOP COUNTING (this is the speedy part!) and mark a plus [+] for that infested plant.

2. Walk 30 rows or paces at random to find the next plant. Repeat Step #1 until 11 plants are sampled in different areas of the field. Total the number of infested plants [+] to make a treatment decision.

3. If you must 'CONTINUE SAMPLING' (7-10 plants with a [+]), sample 5 more plants and use the new total number of plants to make a decision.

4. If no decision is reached, sample additional sets of 5 plants until 31 plants are sampled. Remember, always use the total number of infested plants [+] to make a decision. If no decision can be made after sampling 31 plants, resample the same field in 3-4 days.

Field Location: _____

Average Plant Stage: _____

Date: _____

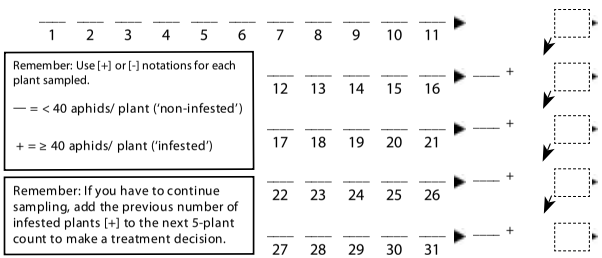
Treatment Decision: _____

Field Notes: _____

_____

_____

_____



DO NOT TREAT, resample in 7-10 days	CONTINUE SAMPLING 5 more plants	TREAT, confirm again in 3-4 days
6 or less	7 to 10	11 or more
10 or less	11 to 14	15 or more
14 or less	15 to 18	19 or more
18 or less	19 to 22	23 or more

Speed Scouting was originally developed by Erin Hodgson, Brian McCornack, and David Ragsdale, University of Minnesota Entomology

Beneficial Insects

Ladybeetles
Helps suppress soybean aphid populations early in the season as larvae and adults.

Orius bugs
Common predators in soybean.

Green lacewing
Larvae are voracious predators on soft-bodied insects like aphids.

Parasitic wasps
Wasps attack aphids and create bloated mummies.

Fungal pathogens
Fungi can infect aphids and cause them to die quickly in the field.

Developing aphid-resistant soybean varieties

Host plant resistance for soybean aphid is the newest management tool for protecting soybean yield. The *Rag1* gene was first identified by scientists at the U.S. Department of Agriculture. Soybean varieties expressing the *Rag1* gene have been evaluated throughout the North Central region. In Iowa, there was a significant difference in soybean aphid population growth when comparing resistant and susceptible plots. When not treated with an insecticide, aphid-resistant soybean had higher yields than aphid-susceptible soybean. Similar results were observed in other states (MN, MI, IL, WI). To date, at least four different genes have been isolated. Expect multiple genes of host plant resistance to be commercially available in the future.

What is host plant resistance?

Host plant resistance in soybean, specifically aphid-resistant soybean, works by suppressing aphid growth and reproduction on the plant. This is called ***antibiosis***. Other types of host plant resistance include ***antixenosis***, the

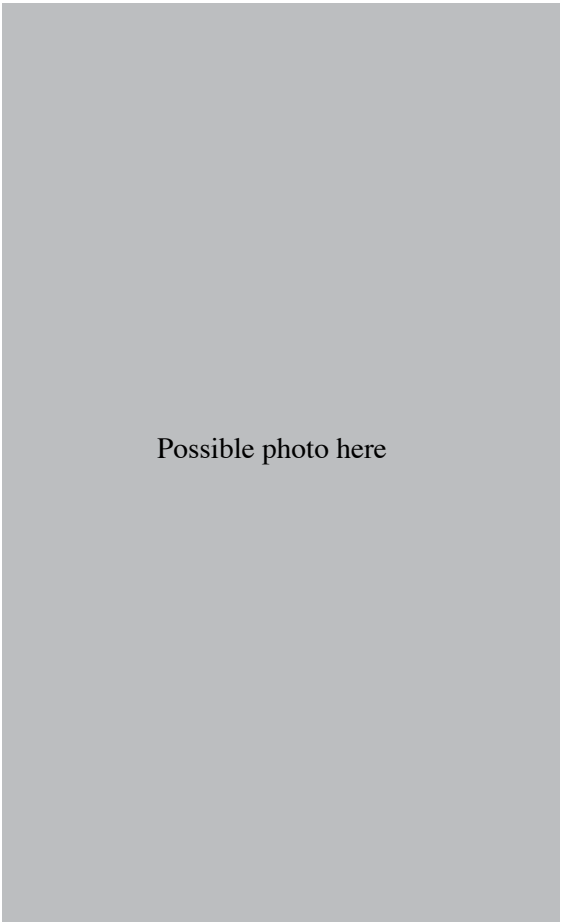
inability of an insect to find and/or feed on a plant and ***tolerance***, the ability of a plant to compensate for insect feeding and still produce comparable yields despite insect feeding. A single plant can express one or more types of resistance. Scientists have been searching for genetic resistance to the soybean aphid since it was discovered in the United States in 2000.

Will host plant resistant varieties be aphid free?

The *Rag1* gene has a moderate level of host plant resistance to soybean aphid. Resistant plants will have fewer aphids compared to susceptible plants, but do not expect fields to be aphid-free. Growers should still regularly scout fields to determine aphid population growth.

Is the economic threshold still applicable for resistant varieties? There is ongoing research to determine if the economic threshold of 250 aphids per plant is still appropriate for aphid-resistant soybean varieties. For now, continue to use the standard threshold, knowing that soybean aphid populations may not develop as quickly in fields planted with aphid-resistant varieties. Foliar insecticides are still necessary if aphid populations exceed the economic threshold of 250 per plant. Aphid population in Iowa research plots planted with aphid-resistant soybean varieties exceeded the economic threshold in 2007 and 2008, requiring an insecticide application for yield protection.

Will growers still need to treat aphid-resistant varieties with an insecticide for aphid control? Insecticide use may be necessary in some years. Aphid populations in Iowa research plots planted with aphid-resistant soybean varieties exceeded the economic threshold in 2007 and 2008, requiring an insecticide application for yield protection.


Possible photo here

Management Considerations

Do not use insecticides when small populations of soybean aphid occur in the field. Do not tank mix an insecticide with an early season herbicide when aphids are not present or below the economic threshold. Insecticides will kill beneficial insects and this often permits aphid populations to rebound quickly and increase in size in the absence of natural enemies. In some cases rebounding populations will require an additional insecticide treatment. Preserve early season natural enemies, like ladybeetles, that help suppress small aphid populations. Scout the field over several days to determine if the aphid population is increasing or decreasing. Conditions that favor an increase in aphids are:

- Plants under drought stress,
- Potassium deficient soils,
- Cool temperatures, and
- Absence of beneficial insects.

If most of the aphids are winged or will be winged as adults, they may leave the field; an insecticide may not be needed because the population will rapidly decline. Also check for aphid mummies and consider not spraying if the majority of aphids are parasitized.

Insecticide Selection

Optimal soybean aphid control and yield protection depends both on product selection and timing of the application. The best insecticide would be one that provided the greatest efficacy (percent of killed aphids), the most residual activity (extended control), the least environmental impact (mortality of beneficial insects), and the least cost to the producer. There are no perfect insecticides, but there are performance traits that may help determine product selection.

Several insecticides are labeled for soybean aphid (or Chinese aphid on some labels). These are listed on page 39. Read and follow all label directions, and take special note of the pre-harvest interval that determines how many days must pass between the insecticide application and legal harvest.

Photo by Mick Lane, ISA

Insecticide Timing

Insecticide applications made during bloom and pod development (R1-R4) have provided the largest and most consistent yield protection. After soybeans reach the R5.5 stage, the yield benefit of any insecticide application substantially decreases.

On-farm strip-trial data have shown that aphid-infested fields sprayed in early August had higher yields than fields sprayed in mid August. During 2003, for each day delay in spraying after August 1, an average of 0.5 to 0.6 bushel was lost daily. Fields sprayed in late August and early September often showed no yield response to the insecticide application because aphid damage had already occurred. In contrast, during 2002, aphid populations increased earlier in the season and some fields sprayed twice during mid and late July benefited from both treatments resulting in significant yield increases.

Fields should be sprayed before the economic injury level of 654 aphids per plant is reached. Using an economic threshold of 250 aphids per plant should give you time to schedule an

insecticide application before the population exceeds the economic injury level. If heavy honeydew, sooty mold and stunted plants appear in the field, then the optimum time for an insecticide application has passed.

Insecticide Application

Aphids can be effectively killed with either ground or aerial application. However, the following three elements are required for optimum control (>98 percent kill): increased application pressure, increased carrier (water) per acre, and small droplet size. Thorough coverage of a soybean plant is essential for optimum aphid control, especially because soybean aphids feed on the underside of leaves. If insect control is poor, expect the remaining aphid population to rebound and potentially reach the economic threshold again.

Insecticide Performance and Evaluation

Numerous insecticides, including seed treatments, have been evaluated for their capacity to manage soybean aphid. Generally, foliar-applied insecticides provide the best plant and yield protection against soybean aphid, with

Properly applied insecticides can provide control of aphids.

Photo by Mick Lane, ISA

organophosphate or pyrethroid classes providing effective control with thorough coverage. However, there may be conditions that favor one class over another.

Pyrethroid insecticides have provided consistent control in many university insecticide trials. Pyrethroid insecticide performance is enhanced during cool temperatures. Under drought conditions, growers are discouraged from using pyrethroids, as they tend to flair spider mites. Lorsban, an organophosphate insecticide, exhibits a vapor action, especially during high temperatures. This can improve coverage in tall plant canopies or narrow-row or drilled soybeans. Although organophosphates have activity against adult spider mites, growers should be aware that there is poor activity against spider mite eggs.

Consider leaving a small, unsprayed test strip in the field. Information gained from this strip will help determine the real value and performance of the insecticide treatment and yield gained. Regardless of the foliar product applied to suppress aphids, fields should be scouted within seven days to evaluate treatment efficacy.

Examples of Insecticides Labeled for Soybean Aphid

Product	Active ingredient	Chemical class	Rate	PHI[1]
Cruiser[2]	thiamethoxam	neonicotinoid	100 g/100 kg seed	---
Gaucho[2]	imidacloprid	neonicotinoid	62.5 g/100kg seed	---
Leverage[3]	imidacloprid+ cyfluthrin	neonicotinoid+ pyrethroid	3.8 fl oz/acre	45 days
Lorsban 4E[3]	chlorpyrifos	organophosphate	1-2 pts/acre	28 days
Nufos[3]	chlorpyrifos	organophosphate	1-2 pts/acre	28 days
Penncap M[3]	methyl parathion	organophosphate	1-3 pts/acre	30 days
Cobalt[3]	chlorpyrifos+ gamma-cyhalothrin	organophosphate+ pyrethroid	13-26 fl oz/acre	30 days
Asana XL[3]	esfenvalerate	pyrethroid	5.8-9.6 fl oz/acre	21 days
Baythroid XL[3]	cyfluthrin	pyrethroid	2.0-2.8 fl oz/acre	45 days
Decis[3]	deltamethrin	pyrethroid	1.5-1.9 fl oz/acre	21 days
Hero[3]	zeta-cypermethrin+ bifenthrin	pyrethroid	4.0-10.3 oz/acre	21 days
Mustang Max[3]	zeta-cypermethrin	pyrethroid	2.8-4 fl oz/acre	21 days
Proaxis[3]	gamma-cyhalothrin	pyrethroid	1.92-3.2 fl oz/acre	45 days
Warrior II[3]	lambda-cyhalothrin	pyrethroid	0.96-1.6 fl oz/acre	30 days

[1] **Pre-harvest interval**

[2] **Rate of seed treatments is given as grams product/kilogram seed (1 kg = 2.2 lbs)**

[3] **Restricted-use insecticide**

Seed Treatments

In Iowa trials, seed treatments were generally ineffective at keeping soybean aphids below the economic threshold of 250 aphids per plant because aphid numbers increase after the systemic product is no longer active. Cruiser (thiamethoxam) and Gaucho (imidicloprid) are systemic seed treatments that are absorbed into the plant during germination. These insecticides tend to concentrate in the actively growing areas on the plant (new leaves and root tips). Soybean aphid feed on phloem and ingest the product. Insecticide trials in Iowa have determined that seed treatments lack the residual activity necessary to suppress soybean aphid during July and August.

Tank Mixing with Insecticides

Tank mixing an insecticide with glyphosate for weed control may seem like a logical approach to reduce costs. However, it is impractical because of timing and application issues. The optimum time for glyphosate applications on soybean is when the weeds are less than 4 inches tall, most likely in June. The optimum time for controlling soybean aphid has been between mid/late July and early August. Insecticides applied in June do

not have the residual activity needed to significantly suppress soybean aphid. In July or August, early season insecticide applications also kill beneficial insects, which may allow aphids to recover more quickly and cause economic damage. In addition, glyphosate is typically applied with low pressure and large droplet size to prevent drift. Research shows that under such conditions, the insecticide performance is decreased and more aphids survive the application. Given these concerns, we recommend growers avoid applying tank mixtures of an insecticide and glyphosate in June.

Comparison of untreated (left) and treated (right) soybean plots with heavy soybean aphid populations.

The potential reoccurance of Asian soybean rust in Iowa has increased grower interest in fungicide applications to soybeans. The timing and application method of fungicides may overlap with the management of soybean aphid. Like insecticides, fungicides require high plant coverage and are applied at high pressure and small droplet size. Currently there are no known adverse interactions between fungicides and insecticides labeled for soybean aphid control in Iowa. However, many fungicides are toxic to naturally occurring fungi that attack aphids and their use could lead to an increasing aphid populations. Currently registered soybean fungicides (Bravo, Bumper, Folicur, Headline, Laredo, Quadris, Propimax, Stratego and Tilt) used in the laboratory have reduced the aphid-killing fungi by 28 to 100 percent. Farmers who apply fungicides to soybean should closely monitor aphid populations in their fields.

Preventive Tactics

In addition to insecticides, some preventive tactics may help reduce aphid problems. Early planting was thought to allow soybean to escape or delay aphid population buildup and virus disease. However, results have been inconsistent. Additionally, early planting encourages bean leaf beetle colonization and subsequent bean pod mottle virus infection, so adjusting planting date should be considered carefully before implementation.

Planting soybean aphid-resistant seed may also be a future option. Currently, there are very few varieties that are resistant to soybean aphid but more host plant resistant traits are being explored.

Soybean aphid colony with shed skins (white) and fungus-killed aphids (brown).

Although resistant varieties dramatically reduce soybean aphid populations, do not expect aphid-free plants. The resistance is plant-derived and only suppresses soybean aphid population growth. It is not yet clear if resistant plants can be left untreated with insecticides to achieve optimal yield. Field scouting for aphids is still suggested if growers decide to plant an aphid resistant soybean variety.

Aphid resistant varieties can be planted in certified organic production systems because the source of resistance does not originate from genetically modified plant material. Proactive field scouting for aphids is still recommended.

Prognosis for Iowa

Soybean aphid is firmly established as a pest of soybean in Iowa. After a decade of experience with this pest and observing its damage potential, it would seem reasonable to expect economic damage to occur somewhere in Iowa every year. The damage is likely to be greater during years when drought and other stresses occur in soybean. Proactive field scouting and the timely management tactics are necessary steps to successfully manage soybean aphid and protect yield.

Additional Information

For more information on soybean aphid, consult these Web sites:
www.soybeanaphid.info
www.planthealth.info/aphids_basics.htm

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Soybean Aphid Management
FIELD GUIDE

A visual aid for identifying, sampling and managing your soybean fields for soybean aphid.

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