

# Scouting for Soybean Aphid

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## IDENTIFICATION

Soybean aphids are small (1/16 inch or less), soft-bodied insects that use piercing-sucking mouthparts to remove plant sap. Both winged and wingless forms can occur in the field. Their bodies are yellowish-green, pear-shaped and have a pair of dark cornicles ("tailpipes") at the end of the abdomen. Winged aphids have a dark colored head and thorax. During soybean pod fill, a small, pale-colored aphid form (referred to as "white dwarves") may occur on leaves in the lower and middle canopy.

The presence of lady beetles or ants on soybeans is often an indicator of aphid infestation and can be particularly useful in finding small, isolated early-season aphid colonies. While feeding, aphids excrete unneeded plant sugars as waste. Accumulation of this sticky waste, known as "honeydew," can make leaves appear shiny. It also encourages the growth of sooty mold fungus, which creates a black, powdery coating on leaves. As the season progresses, the presence of honeydew and cast aphid skins indicate high soybean aphid populations.



**Severe soybean aphid damage. Distorted leaves and sooty mold.**

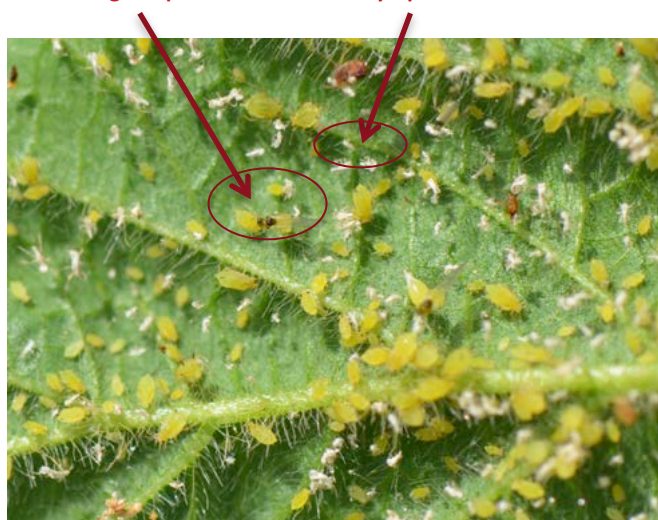
Some infestations can cause potassium deficiency symptoms on upper leaves. While inspecting plants for soybean aphids, be on the lookout for dead aphids, which may be indicators of beneficial organisms working to suppress aphid populations. Aphid mummies are the dried, brown or black remains of an aphid body after it has been fed on from the inside by tiny parasitic wasps. Diseased aphids are discolored and fuzzy-looking.

## WHEN TO SCOUT

In Minnesota, colonization of soybean by aphids can occur as soon as soybean emerges, and aphid populations can persist until soybean leaf drop. Scouting for soybean aphid on soybean should begin in mid- to late June and continue until R6.5 (pods and leaves begin to yellow), regardless of calendar date. If scouting is stopped too early, late-season infestations can build to economically damaging levels. Yield loss can occur into early R6 (pod cavity filled by seed). Because aphid populations can grow rapidly, infested fields should be scouted on a weekly basis.

**Winged Aphid**

**Cast Nymph Skins**



## WHAT FIELDS ARE AT MOST RISK?

Yield damaging soybean aphid populations can occur in any field. However, some fields tend to have more consistent problems with aphid infestations each year. Several factors increase the likelihood of aphid problems. In spring, aphids are often found first in geographic areas with abundant buckthorn. Smaller fields with wooded borders are often the first to develop high populations. In addition, early-planted

fields and fields with coarser textured or lower potassium testing soils often have aphid populations develop sooner. Later in the season, full-maturity soybean or late-planted soybean, such as beans following peas, are often reported to have higher populations. Rigorous and possibly more frequent scouting of high-risk "indicator" fields can provide valuable information on when aphid populations are beginning to increase in an area, which should trigger scouting of other fields being managed.



Whitefly

Aphid



Potato Leafhopper (Nymph)



Ant tending aphids

## SCOUTING METHODS AND THRESHOLDS

Scouting requires entry into the fields and inspection of plants. By the time soybean aphid populations can be detected from the road, significant yield loss has already likely occurred. Through timely and thorough field scouting, significant soybean aphid populations can be identified and treated before economic yield loss occurs.

### Whole-plant counts

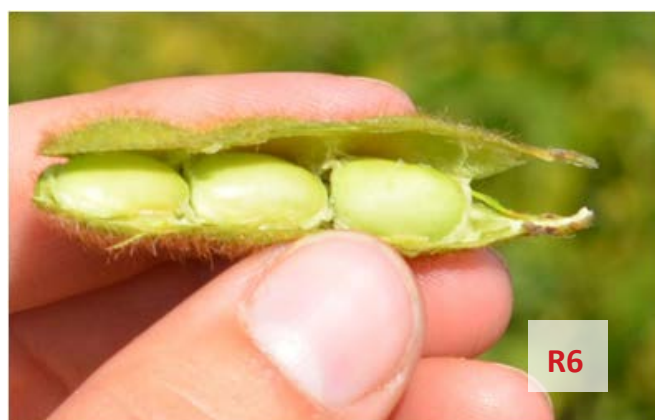
The number of aphids per plant should be estimated from a representative number of plants. Plants should be selected from throughout the area being scouted. The average number of aphids per plant should then be calculated. **Through R5 (seeds developing, but pod cavity not filled), use the economic threshold of an average of 250 aphids/plant AND more than 80% of plants having aphids AND aphid populations increasing.** Count both adults and nymphs, including any white dwarves. However, avoid counting soybean aphid look-a-likes, such as potato leafhoppers and whiteflies, as well as cast soybean aphid skins and dead aphids.

The above-mentioned economic threshold is based on the average of multiple plants selected from throughout the field and not just hotspots or field borders. Avoid making treatment decisions based on field borders. Small aphid hotspots often collapse from predation, parasitism or emigration. On the other hand, once a high percentage of the plants in the field have aphid colonies, rapid increases in aphid numbers (aphids per plant) can occur. Though an economic threshold has not been developed for R6, infestations in early R6 may require treatment if aphid populations are very large and plants are experiencing other stresses.



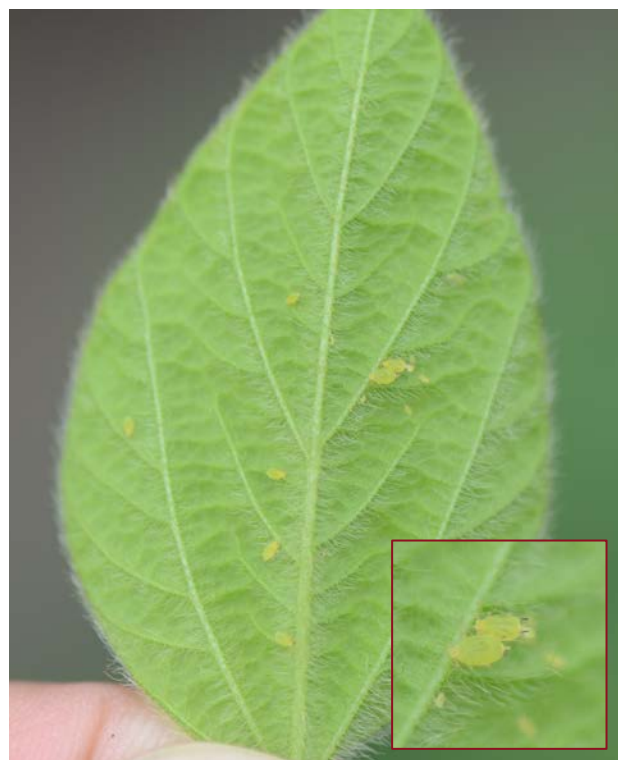
**Table 1: Soybean Growth Stages**

REPRODUCTIVE GROWTH STAGE	DESCRIPTION
<b>R1</b> (BEGINNING BLOOM)	PLANTS HAVE AT LEAST 1 FLOWER ON ANY NODE
<b>R2</b> (FULL FLOWER)	THERE IS AN OPEN FLOWER AT 1 OF THE 2 UPPERMOST NODES
<b>R3</b> (BEGINNING POD)	PODS ARE 3/16 INCH (5 MM) AT 1 OF THE 4 UPPERMOST NODES
<b>R4</b> (FULL POD)	PODS ARE ¼ INCH (2 CM) AT 1 OF THE 4 UPPERMOST NODES
<b>R5</b> (BEGINNING SEED)	SEED IS 1/8 INCH LONG (3 MM) IN THE POD AT 1 OF THE 4 UPPERMOST NODES ON THE MAIN STEM
<b>R6</b> (FULL SEED)	POD CONTAINING A GREEN SEED THAT FILLS THE POD CAPACITY AT 1 OF THE 4 UPPERMOST NODES ON THE MAIN STEM
<b>R7</b> (BEGINNING MATURITY)	1 NORMAL POD ON THE MAIN STEM HAS REACHED ITS MATURE POD COLOR
<b>R8</b> (FULL MATURITY)	95% OF THE PODS HAVE REACHED THEIR FULL MATURE COLOR



### Speed scouting

This method can save time and is relatively easy to use; however, less information is obtained about the dynamics of the population and this method can over-recommend treatment. With this method, the entire number of aphids on each plant does not need to be estimated. Plants are considered “infested” if they have 40 or more aphids and “uninfested” if they have less than 40 aphids. In each 50-acre area of soybean, 11 plants are initially inspected in this manner and the numbers of “infested” and “uninfested” plants are tallied. From those results, a decision is made to treat the field, not to treat the field, or to inspect 5 additional plants. When a treat or no-treat decision cannot be made, this process will continue up to a maximum of 31 plants, at which point the decision is made to resample in 3-4 days. To account for the tendency to over recommend treatment, a decision to treat a field should be confirmed by resampling the field in 3 to 4 days. Worksheets for tallying results can be found at: [goo.gl/UC9vus](https://goo.gl/UC9vus). This method is based on the same economic injury data as the 250 aphid per plant threshold used in the whole-plant sampling method. In other words, this is NOT a new economic threshold of 40 aphids per plant. The time savings with this method may be reduced later in the season when aphids are distributed lower in the canopy.



Early-season infestation on new growth

## MANAGEMENT

Many of the foliar insecticides labeled for soybean aphid are effective. However, there is no guarantee of a return on the insecticide investment, because soybean aphid populations may crash at any time. Use of the economic threshold of 250 aphids per plant (with 80% of plants with aphids and aphid populations increasing) to trigger insecticide applications should minimize this risk. Detectable soybean yield loss does not occur at densities of aphids below the economic threshold of 250 aphids per plant (for a short period). Application of insecticide at aphid densities below this threshold, such as 5, 50 or 100 aphids per plant, are unlikely to save yield and may result in treating a large percentage of fields where aphids would never develop into yield threatening problems. Treatment below the economic threshold also increases the risk of negative impacts on beneficial insects (predators, pollinators) and the risk of aphids developing resistance to insecticides.

The longer large soybean aphid populations are allowed to persist on soybean the greater the chance for an unacceptable yield loss. Signs of soybean stress (nutrient deficiency symptoms, stunting or puckered leaves) indicate that some yield loss has probably already occurred and it is not advisable to wait until symptoms appear in large areas of the field.

The economic threshold of 250 aphids per plant remains valid despite changes in soybean and input prices. These changes in prices adjust the economic injury level (EIL), which is the point at which losses are sufficient to justify insecticide application. However, the economic threshold of 250 aphids per plant is still sufficiently below the EIL to allow several days to make an insecticide application before losses occur. A lower economic threshold for soybean aphid is not justified at this time.

Soybean aphid populations can rapidly increase during the late R5 through R6 soybean growth stages and very high populations can sometimes be seen at the end of the season. Yield loss can occur as late as the early R6 growth stage. However, regular scouting of fields and use of the threshold of 250 aphids per plant through the R5 stage should prevent most, if not all, yield-limiting aphid populations in R6. While the economic injury level for R6 soybean is not known, it is believed to be higher than earlier stages. Late-season treatment decisions are complicated by the uncertainty of the

timing of aphid movement back to buckthorn, which can occur as early as mid-August and as late as soybean leaf drop in October. Finally, particular attention should be paid to insecticide pre-harvest intervals (PHI – the amount of time required between pesticide application and harvest as stated on the label) as they can remove fields from insecticide consideration.

## OTHER CONSIDERATIONS

### Seasonal effects on aphids

Over time and soybean growth stages, the position of soybean aphid populations change within the soybean canopy as the aphids track changing nutrient levels in the plants. Early in the season, aphids tend to be located on new growth in the upper canopy. During this time, examining upper leaves is a quick way to determine the percentage of plants with aphids.

As soybeans near the R5 stage, the production of new leaves slows. When vegetative growth at the top of the plant ceases, aphids tend to move down the plant toward pods, stems and lower leaves. At this later time of year, it is often easier to find aphids on new leaves on lower canopy branches, non-senescing leaves (especially the undersides), stems, and pods. Large numbers of aphids on the stems and pods generally indicates populations approaching, if not exceeding, 250 aphids per plant.



Severe soybean aphid infestation at R3 stage

The presence of winged (alate) aphids may indicate the arrival or departure of aphids. Large numbers of winged aphids can be produced during late R4 and early R5 soybean growth stages, particularly if populations on individual plants are high. These winged aphids can redistribute within the field or neighboring fields, but they may also move long distances with weather systems. When most of the aphid movement is out of an early-infested field, populations can decline up to 90%. A very high percentage of aphid nymphs with wing pads is an indicator of a potential migration event. If such a field is close to the economic threshold of 250 aphids per plant, it should be sampled again in a couple days to determine if the aphids stayed or left the field. With typical planting dates and adapted maturity varieties in Minnesota, this migration or redistribution event usually occurs in the last few days of July or early August. As the winged aphids settle in new fields, populations can rapidly increase. Previously uninfested fields can quickly reach the economic threshold. The presence of winged aphids alone or with only small nymphs are signs that aphids are arriving rather than leaving.



**Winged aphids leaving soybean plant.**

**Nymph with wing pads**

### High temperatures

Laboratory studies exposing aphids to constant temperatures have shown that temperatures above 90°F are stressful to soybean aphids. However, translating this to aphid population growth in the field is complicated by the facts that temperatures fluctuate throughout the day and temperatures within the soybean canopy may differ from the above-canopy air temperature. Therefore, you should not assume that high summer temperatures will stop aphid population growth.

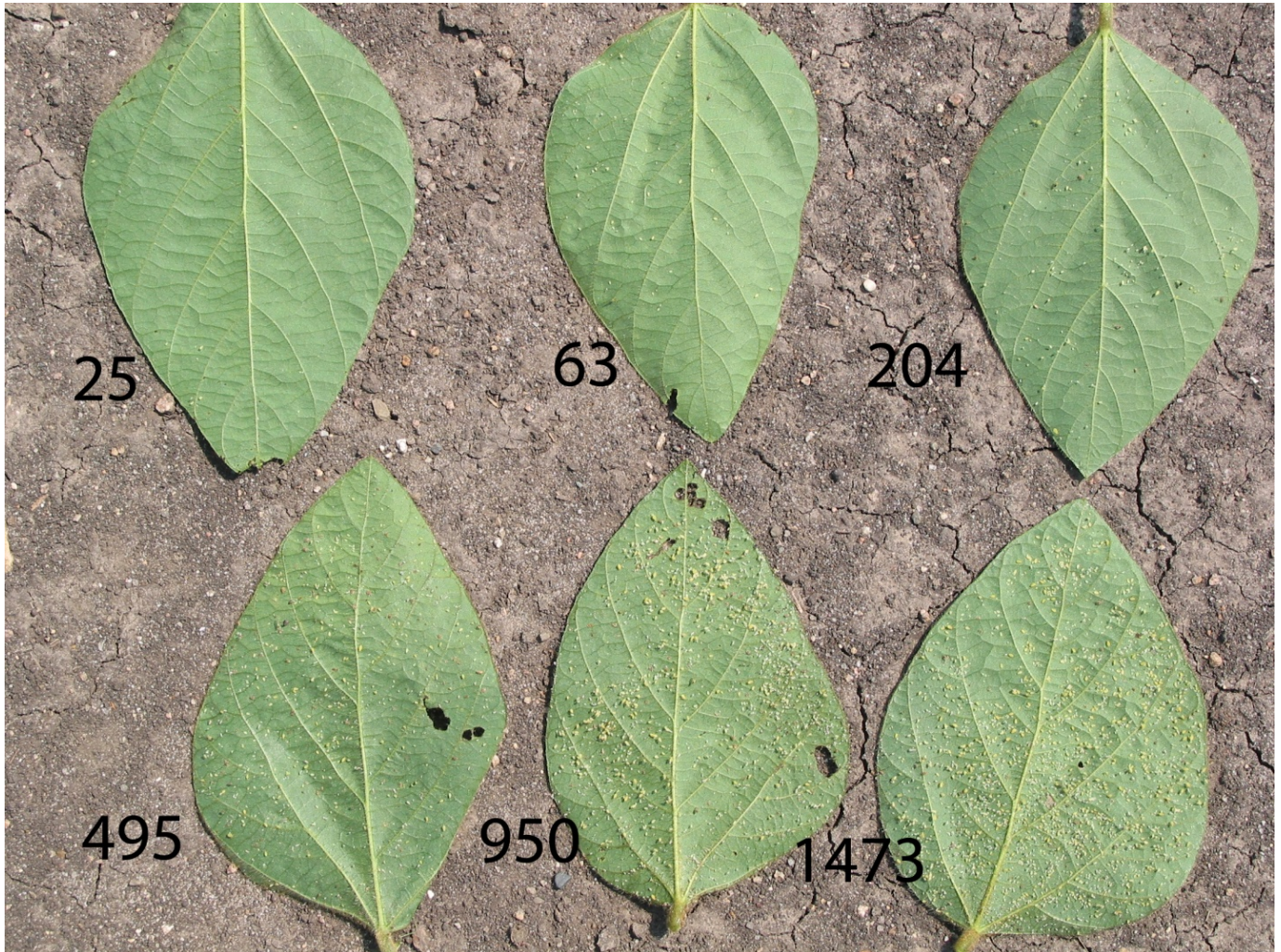
### Treated fields

Fields planted with aphid-resistant soybean and/or insecticide-treated seed still require scouting because aphid populations can reach economically damaging levels. In addition, fields should be scouted after application of a foliar insecticide to monitor for resurgence of the aphid population or outbreak of a secondary pest, such as two-spotted spider mites. Pay particular attention to two-spotted spider mites under hot, dry conditions and choose insecticides accordingly, because many pyrethroid insecticides can flare mite populations. If a field must be retreated within a season, consider switching to different insecticide mode of action. Rotation of modes of action will prevent the development of pest resistance to insecticides. For additional information on insecticide resistance management, see

<http://www.extension.umn.edu/agriculture/soybean/pest/insecticide-resistance-management-in-soybean/>.



## APPROXIMATE SOYBEAN APHID NUMBERS ON R5 SOYBEAN LEAFLETS



These numbers are the results of several counts of each leaf but because the counts were made from the photo they may not be absolutely accurate, particularly at the higher numbers. Aphids showing symptoms of fungal disease are present but were not counted.

Soybean aphid numbers can be deceiving. Economic threshold levels may be present but not be obvious without close inspection. The small white dwarves and nymphs, as shown on these leaves can make accurate estimates difficult. Fortunately, absolute counts of soybean aphid populations are not needed to make sound treatment decisions.



## SOYBEAN APHID PREDATORS AND PARASITES



**Convergent Lady Beetle Adults**



**Lady Beetle Larva**



**Lady Beetle Pupa**



**Minute Pirate Bug (Adult)**



**Minute Pirate Bug (Nymph)**



**Aphid Midge Larvae**



**Green Lacewing (Adult)**



**Green Lacewing (Eggs)**



**Lacewing Larvae (Aphid lion)**  
Photo: Joseph Berger, Bugwood.org



**Long Legged Fly**



Aphids parasitized by:  
*Aphelinidae* (top, black mummies) and  
*Braconidae* (lower, tan mummies) wasps.



The fuzzy, off-colored aphids were  
killed by a fungal parasite.



**Damsel Bug (Adult)**

Photo: Frank Peairs, Colorado State  
University, Bugwood.org



**Syrphid (Hover Fly) Adult**



**Syrphid larva**

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