

Soybean Aphid in Michigan

Update from the 2001 season

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Soybean aphid (SBA), *Aphis glycines*, is a pest of soybean in Asia. This aphid was first identified in North America in July of 2000. By the end of 2000, aphids were found in soybean fields throughout Michigan, but populations were heaviest in southwest counties, along Lake Michigan. Little data was collected that year on impact and management.

In the fall of 2000, we found SBA on a potential wintering host, a shrub called buckthorn. However, we did not find SBA eggs on buckthorn. This was not a surprise because aphid eggs are very small and difficult to find.



Spring 2001

Buckthorn tagged with pink flagging in a treeline.

Close up of buckthorn.

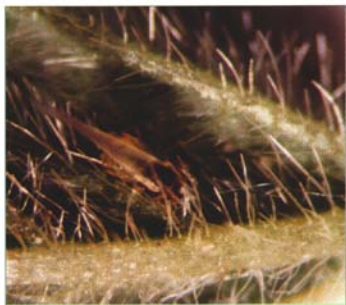


Aphid colony on underside of curled leaf.



Colonization of Soybean

Buckthorn shrubs were sampled in the spring of 2001 to find aphids hatching from eggs. In mid-May aphid colonies were found on the undersides of curled leaves. This was likely soybean aphid, although a related species (*Aphis nasturtii*) also infests buckthorn. By the end of May, no aphids remained on buckthorn. In mid-June, winged aphids and nymphs were found on newly emerged soybean plants in central Michigan.



Winged SBA colonizing newly emerged soybean, June 2001.

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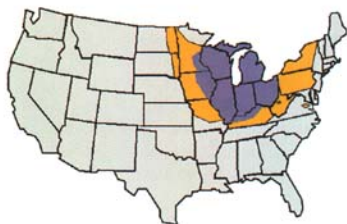
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Distribution

Soybean aphid is moving out in all directions from the Great Lakes region. SBA distribution reported by the end of the 2000 field season is in blue; distribution reported by November 2001 is in yellow (map based on information from the University of Minnesota). In 2001, SBA was also found in the provinces of Ontario and Quebec in Canada.

SBA Distribution in the USA



In Michigan, SBA was present throughout the state in all soybean fields sampled by our laboratory. The heaviest aphid populations (in red) shifted from the southwest in 2000 to the east in 2001. The outbreak in the Thumb may have been due to the expansion of SBA into new areas, and/or to the severe drought conditions in June into August.

SBA Distribution in Michigan

(red=heavy SBA infestations)



Sampling for Soybean Aphid

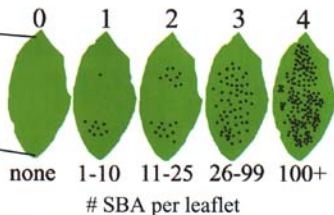
Early in the season, SBA is found on the undersides of leaves, particularly at tops of plants on new growth. As the season progresses, aphids move to stems and pods. As populations increased in 2001, we decided that the easiest way to sample for SBA was to evaluate individual leaflets on a 0 to 4 scale, shown below. This

sampling method was useful for evaluating fields before and after spraying. Using this scale, leaflets can usually be quickly rated without counting individual aphids. The leaflet below is clearly a "4" on the scale. In the future, the leaflet scale may be replaced with a different sampling method based on further research.

Soybean Aphid Leaflet Rating Scale



Soybean Leaf



Impact of Soybean Aphid

Little data was gathered on the impact of SBA on soybeans in 2000. In 2001, trials in the Thumb were sprayed and evaluated for aphid numbers as well as yield.

In heavily infested fields in Saginaw County, the greatest yield benefit occurred when on-farm trials were sprayed in mid-July. Yield differences in sprayed versus unsprayed strips dropped off into August. Extension agents report that on-farm strips sprayed later in August had no yield benefit, or a yield loss from damaging beans.

In replicated research plots at the Saginaw Valley Research Farm, there was also a yield benefit from spraying in mid-July. The SBA population before spraying averaged 6,800 SBA per plant (range 1,700 – 13,400 SBA/ plant), and leaves were covered with honeydew and sooty mold. Replicated plots were sprayed with various insecticides at 25 GPA and 50 psi. After treatment, leaflets were evaluated for aphids.

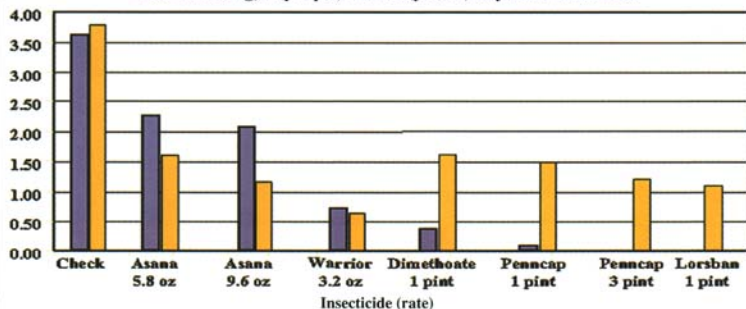


Sprayed

Unsprayed

On-farm strip trial in Saginaw, MI. The unsprayed strip (right) is shorter and darker from sooty mold compared to the sprayed strip (left).

Leaflet Rating, 3 (purple) and 10 (yellow) days after treatment



All treatments significantly reduced the number of soybean aphids per leaflet 3 days after treatment (purple bars), but 10 days after treatment aphid numbers rebounded in the best treatments (yellow bars). Twenty-one days after treatment, the aphid population crashed due to poor host plant quality.

Yield, plant height, and other measures were taken at the end of the season. In untreated compared to treated plots:

- Plant height was significantly (16%) less.
- Number of pods per plant was significantly (21%) less.
- Yield was significantly (40%) less

A checklist for Soybean Aphid Spray Decision

After one full field season, we have a better understanding of the impact of SBA on soybean, especially under drought conditions, but we do not yet have a specific threshold. Instead, we propose making spray decisions in 2002 using a 'checklist'. The checklist describes what a field will look like as aphid populations increase, and incorporates the potential for further increase in aphids based on dry weather/ absence of aphid pathogens.

✔ **Aphid number** - Leaflet rating of at least 3.0. The leaflet rating is fairly quick and easy to do, and will allow you to assess aphid numbers before and after treatment.

✔ **Aphid appearance** - Healthy (not fungus-infested). Spores of pathogenic fungi are present in the soil and on plant surfaces. These fungi specifically infect aphids, and can crash an aphid population in a matter of days. Infected aphids are pinkish, white, or tan, fuzzy from the growth of fungi out of their bodies. When weather conditions are favorable, the fungi produce spores, which infect and kill other aphids. Once a fungal outbreak starts, an insecticide spray may not be needed.

✔ **Plant appearance** - Honeydew on leaves. Honeydew is a sugary substance secreted by aphids as they feed. It is mainly an annoyance, although it promotes the growth of gray sooty mold on leaf surfaces. Honeydew is a sign that aphid numbers are large.

✔ **Timing** - July. June is likely too early to assess aphid populations and make a spray decision. August is probably too late to get the most yield advantage from treatment.

✔ **Weather conditions** - Dry. Fungal pathogens are most active, and reduce aphid numbers best, in warm, humid weather. Under dry conditions, fungal infection will be low.

✔ **Plant stage** - flowering/ early pod development. Flowering and early pod fill seem to be critical times for aphid control. Large numbers of aphids feeding on soybean may cause flowers and pods to abort. Spraying later in the season, once pods are formed, may be too late to gain yield equal to the cost of treatment.



Top left: SBA on stem. Top right: sooty mold & honeydew.
Bottom left: healthy SBA. Bottom right: fungus-infected SBA.

Hints if you decide to treat in 2002:

- Begin scouting for SBA in late June.
- Use the checklist to assess SBA numbers and health, as well as the field condition.
- Asana, Lorsban, PennCap, and Warrior were all effective at reducing aphid numbers.
- Good coverage (= spraying with high pressure and high gallons per acre) is critical.
- Note that aphid numbers may increase again after treatment; it is unclear at this time if spraying twice is a sound practice.
- If possible, leave unsprayed strips to harvest for yield comparison.