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# Resistance Management Plan for Soybean Aphid

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# Resistance Management Plan for Soybean Aphid

## **Abstract**

Soybean aphid remains the most important soybean insect pest in Iowa, and management over the last fifteen years has primarily relied on using foliar insecticides. The economic injury level was defined in 2007, and is approximately 675 aphids per plant or 5,560 cumulative aphid days. From that multi-state research, a conservative economic threshold was developed to protect yield: 250 aphids per plant with 80% of the plants infested through the seed set plant growth stage (R5.5). The odds of making a profitable treatment decision is increased with regular scouting and applications made after exceeding the economic threshold. The [economic threshold is validated annually](#) at Iowa State University and is recommended regardless of fluctuating market values.

## **Disciplines**

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Integrated Crop Management

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February 14, 2017

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Soybean aphid remains the most important soybean insect pest in Iowa, and management over the last fifteen years has primarily relied on using foliar insecticides. The economic injury level was defined in 2007, and is approximately 675 aphids per plant or 5,560 cumulative aphid days. From that multi-state research, a conservative economic threshold was developed to protect yield: 250 aphids per plant with 80% of the plants infested through the seed set plant growth stage (R5.5). The odds of making a profitable treatment decision is increased with regular scouting and applications made after exceeding the economic threshold. The economic threshold is validated annually at Iowa State University and is recommended regardless of fluctuating market values.

## **Insecticide resistance issue**

With any pest and pesticide interaction, exposures will eventually lead to resistance developing in the population. Insecticide resistance is common with aphids, which are asexual, multigenerational pests in many crops. Since 2015, farmers in parts of southern Minnesota experienced failures of *pyrethroid* insecticides to control soybean aphid. Using a vial assay, entomologists in Minnesota confirmed soybean aphid resistance to *bifenthrin* and *lambda-cyhalothrin*. *Pyrethroid* failures in southern Minnesota were also noted in the 2016 growing season.

In 2016, a commercial field in northwest Iowa was suspected to have *bifenthrin* resistance after being treated twice within two weeks and no response. Vial assays based on the Minnesota protocol also noted increased resistance ratios of a soybean aphid population collected from the problem field. A combination of integrated pest management (IPM) and insect resistance management (IRM) tactics will be needed to manage soybean aphid and prolong existing and emerging insecticide efficacy. Recent regulatory concerns may further complicate field crop pest management, especially soybean aphid.

## IPM and IRM management recommendations

Population fluctuations between locations and years are typical soybean aphid dynamics for Iowa. Regular scouting and timely use of foliar insecticides is still a reliable management tactic; however, recent changes in insecticide efficacy will make future management more complicated. My recommendation for sustainable soybean aphid management in Iowa is to:

- Consider using host plant resistant varieties if soybean aphid populations are persistent and the genetic traits are appropriate for the area. The use of a single resistant gene will result in lower cumulative aphid exposure, and the use of a resistant pyramid (i.e., two or more genes) will greatly reduce the likelihood of needing foliar insecticides.
- Plant early if the field is in an area with persistent soybean aphid populations.
- Scout for soybean aphid, especially during R1–R5, and use a foliar insecticide if aphids exceed the economic threshold of 250 per plant. Take note of natural enemies and other potential plant pests in addition to soybean aphid.
- Use a product labeled for soybean aphid, and use high volume and pressure so that droplets make contact with aphids on the undersides of leaves. Check aphid populations three days after application to assess product efficacy.
- Alternate the mode of action if soybean aphid populations need to be treated twice in a single growing season (e.g., *organophosphates* and *pyrethroids*).

- Understand that late-season accumulation of aphids, particularly after R5, may not impact yield like it does in early reproductive growth. A foliar insecticide applied after seed set may not be an economically profitable choice.

Before assuming insecticide resistance development in the field, rule out other possible factors, such as: misapplication of the product (incorrect rate, poor coverage, etc.), unfavorable weather conditions around the time of application (wind, rain, temperature), and pest recolonization. The overwintering and migratory behavior of soybean aphid is not fully understood. The magnitude of *pyrethroid* resistance for soybean aphid in the north central region is also not well characterized yet. In other words, the aphids that colonize soybean can come from different overwintering sites each year and the populations will have a range of susceptibility to insecticides.

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**Category:** Insects and Mites

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Dr. Erin Hodgson started working in the Department of Entomology at Iowa State University in 2009. She is an associate professor with extension and research responsibilities in corn and soybeans. She has a general background in integrated pest management (IPM) for field crops. Dr. Hodgson's curre...