DEPARTMENT OF AGRICULTURE

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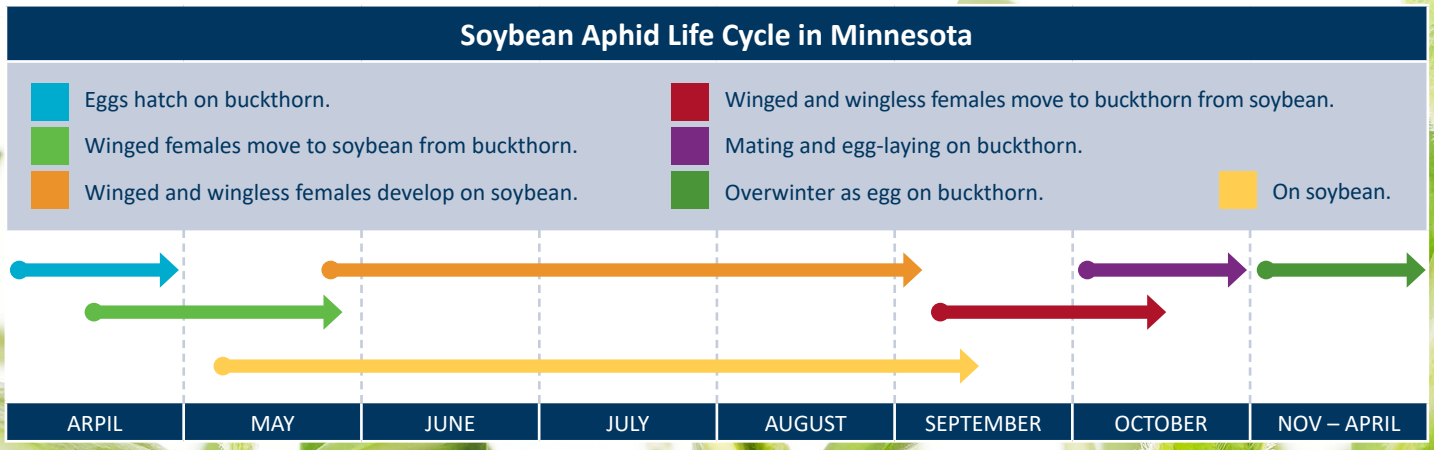
# Recommended IPM Approach and Treatment Threshold for Soybean Aphid Control in Soybean

Soybean aphids (*Aphis glycines)* are major pests of soybeans (*Glycines max*) in Minnesota. Soybean aphids injure soybean plants by piercing the plants with tiny needle-like mouth parts and sucking out sap, which can reduce soybean yield. Due to their small size, aphids must occur in high numbers on soybean plants to result in yield loss. Such damaging populations occur yearly in Minnesota (but not necessarily the same regions every year), resulting in the need for an Integrated Pest Management (IPM) approach to successfully control this pest.

## Scouting

Not all soybean fields are likely to have soybean aphid problems. Early aphid infestations in spring are often found in smaller fields near buckthorn, their primary overwintering plant, and migrate to soybean (See soybean aphid life-cycle in MN below). These infestations are often more abundant on tender and young leaves. Active scouting should be carried out from Mid-June through growth stage R6.5 (pods and leaves begin to yellow). As soybean progresses through reproductive growth stages, aphid populations move to leaves, stems and pods lower on the plants. The presence of lady beetles or ants are often indicative of soybean aphid populations. Sample 20-30 plants from throughout the entire field. Consider sampling at least 1x / week during active scouting period. Count both adults and nymphs (see picture on page 4).

An alternative method to scouting is “speed scouting” or sequential sampling method. Speed scouting can be used to save time, however, this method provides less information and can slightly over-recommend treatment of fields. See U of M Extension publication “Scouting for Soybean Aphid” for more information on scouting and how it relates to the soybean growth stage.



## Recommended economic thresholds for soybean aphid

To avoid threat of significant crop loss from the soybean aphid, the MDA recommends following the economic threshold developed and validated by the University of Minnesota (U of M):

The economic threshold for soybean aphid is as follows:

1. 250 aphids per plant;
2. More than 80% of plants infested with aphids; and
3. Aphid populations increasing should be followed through reproductive growth stage 5 (R5) (full seed) of soybean growth.

This economic threshold is sufficiently below the economic injury level (EIL) (point at which aphid feeding will result in a financial loss in the crop) to allow several days to make an insecticide application before losses occur. The threshold is also sufficiently low to account for changes in soybean market and input prices. However, lower economic thresholds may be needed if plants are under severe stress from other causes (drought, other pests, etc.).

Aphid feeding may cause yield loss into the early reproductive growth stage 6 (early R6) (full seed pod at maximum weight); however, an economic threshold has not been developed for this plant stage. Recommendations for managing aphids in early R6 are to treat populations that are large (considerably larger than 250 aphids per plant), particularly if other stresses occur. Regular scouting and use of the threshold of 250 aphids per plant through growth stage R5 should prevent large populations of aphids in the R6 growth stage. Treatment of aphid infestations beyond the early R6 growth stage will not be economically beneficial.

See U of M Extension publication "Just the facts: A review of the biology and economics behind soybean aphid insecticide recommendations" for more information on economics behind soybean aphid economic thresholds, economic injury levels, and insecticide recommendations.

Why follow economic thresholds?

Application of an insecticide at aphid densities below the MDA's recommended threshold are not shown to result in significantly higher yields and may result in treating a large percentage of fields where aphid populations would never develop into yield-threatening problems. Treatment below the economic threshold:

- increases the risk of negative impacts on beneficial insects;
- increases risk of aphids developing resistance to insecticides;
- may result in secondary pest outbreaks;
- reduces profitability; and
- increases the risk of not getting a return on investment, because that population is less likely to reach the EIL.

## Beneficial Insects

Beneficial insects, or insects that act as predators of soybean aphids, can provide effective control to aphid populations that are below the threshold of 250 aphids per plant, by suppressing populations to prevent them from reaching threshold status. By relying on beneficial insects when aphid populations are below the recommended economic threshold, the grower can save on input costs, due to not having to treat with an insecticide, and maintain the same yield level as when aphids are not present. Many insecticides used to control soybean aphids will also kill beneficial insects, so this control tactic has little to no benefit after spraying insecticides has occurred.

## Management

The decision to treat soybean aphid infestations with insecticides should be based on the economic threshold developed and validated through research by the U of M and other Midwest Universities. Use of appropriate economic thresholds provides a chance for beneficial insects (lady beetles, parasitic wasps, etc.) to suppress aphid populations and possibly prevent them from reaching economically damaging levels (see page 2).

Many foliar insecticides are labelled for soybean aphid (Table 1). See labels for additional information on use of these insecticides. Always read and follow a product label carefully. In general, one timely, full-rate, application is enough to control soybean aphid; however, if more applications are required within the season, switch to different modes of action to prevent development of insecticide resistance. Take caution using synthetic pyrethroids because of reported insecticide resistance in Minnesota. See U of M Extension publication "Insecticide resistance management in soybean" and "Pyrethroid resistant soybean aphids: What are your control options?" for more information on insecticide resistance management on soybeans.

**Table 1. Foliar Insecticides Labelled for Soybean Aphid**

| IRAC Group | Class | Active Ingredient | Products with Standalone Active Ingredient | Formulated Mixtures |
|---|---|---|---|---|
| 1A | Carbamates | methomyl | Lannate, Nudrin LV | |
| 1B | Organophosphates | acephate | Acephate, Orthene 97 | |
| | | dimethoate | Dimethoate, Dimate | |
| 3A | Synthetic pyrethroids* | alpha-cypermethrin | Fastac | Renestra |
| | | beta-cyfluthrin | Baythroid | Leverage |
| | | bifenthrin | Tundra, Sniper, Fanfare, Discipline, Brigade, Bifenture, Bifen, Bifender, Capture | Brigadier, Swagger, Skyraider, Hero, Steed, Triple Crown, Ridgeback |
| | | cyfluthrin | Tombstone, Tombstone Helios | |
| | | deltamethrin | Delta Gold, Batallion | |
| | | esfenvalerate | Asana XL | |
| | | gamma-cyhalothrin | Declare, Proaxis | |
| | | lambda-cyhalothrin | Warrior II, Grizzly Too, LambdaStar, Lambda-Cy, Lamcap, Province, Silencer VC, Kendo, Paradigm, Lambda T-2, Nufarm Lambda-Cyhalothrin | Besiege, DoubleTake, Endigo, |
| | | permethrin | Arctic | |
| | | zeta-cypermethrin | Mustang Maxx | Hero, Steed, Triple Crown |
| 4A | Neonicotinoids | clothianidin | Belay | |
| | | imidacloprid | Prey, Admire Pro, Alias 4F, Wrangler, Nuprid, Sherpa | Leverage, Brigadier, Swagger, Skyraider, Triple Crown |
| | | thiamethoxam | | Endigo |
| 4C | Sulfoximines | sulfoxaflor | Transform, Closer | Ridgeback |
| 4D | Butenolides | flupyradifurone | Sivanto Prime | |
| 9D | Pyropenes | afidopyropen | Sefina Inscalis | Renestra |
| 23 | Tetronic and Tetramic acid derivatives | spirotetramat | Movento** | |
| 28 | Anthranilic diamides | chlorantraniliprole | | Besiege |

*Cross resistance is a concern, because aphids resistant to bifenthrin and lambda-cyhalothrin have been detected throughout much of Minnesota.*

***Registered only for immature seed, not for dry seed production. See label for details.*

This list is not all-inclusive and can change with the introduction of new products; always check the product label, consult with a qualified individual (such as an MDA-approved licensed applicator, a certified crop advisor, or a crop consultant) or consult the MDA. References to commercial products or trade names are made with the understanding that no discrimination is intended and no endorsement is implied. A current, full list of pesticide products registered for soybean aphid in MN can be accessed at www.kellysolutions.com/MN/searchbychem.asp. or www2.mda.state.mn.us/webapp/lis/productsdefault.jsp. Pesticide products sold and distributed for use in Minnesota must be registered with the MDA annually. Make sure that the product you are using is registered for sale and use in Minnesota.

The MDA encourages use of an IPM Plan for every Minnesota farm. Consult your soybean extension entomologist or crop consultant for more information on other IPM practices such as biological control, habitat manipulation, modification of cultural practices, and use of resistant varieties to manage soybean aphid.

## Contacts

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*Soybean aphid adult*

## Additional Resources

Soybean aphid in Minnesota soybean
https://extension.umn.edu/soybean-pest-management/soybean-aphid

Scouting for soybean aphid
https://extension.umn.edu/soybean-pest-management/scouting-soybean-aphid

Insecticide resistance management in soybean
https://extension.umn.edu/soybean-pest-management/insecticide-resistance-management-soybean

Aphid-resistant soybean varieties for Minnesota
https://extension.umn.edu/soybean-variety-selection/aphid-resistant-soybean-varieties-minnesota

Iowa Department of Entomology, Soybean Research Laboratory
https://www.ent.iastate.edu/soybeanresearch/content/extension

Illinois soybean pathology and entomology research, Soybean aphid
https://ipm.illinois.edu/fieldcrops/insects/soybean_aphids/nsrl_4.pdf

Aphid Speed Scout App
http://ianrmedia.unl.edu/aphid-speed-scout-app

Pyrethroid resistant soybean aphids: What are your control options?
https://blog-crop-news.extension.umn.edu/2017/07/pyrethroid-resistant-soybean-aphids.html

*Soybean aphid adults and nymphs in a colony*

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E.W Hodgson, E.C. Burkness, W.D. Hutchison, and D.W. Ragsdale (2004). Enumerative and binomial sequential sampling plans for soybean aphid (Homoptera: Aphididae) in soybean. Journal of Economic Entomology 97: 2127–2136.

R.C. Venette and D.W. Ragsdale (2004). Assessing the invasion by soybean aphid (Homoptera Aphididae)". Annals of the Entomological Society of America. 97 (2): 219–226.

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