

Soybean Aphids: Identification, Scouting and Management

Soybean aphids (*Aphis glycines*) are an insect pest specific to soybean crops and one of about 840 aphid species found in Canada. They were first detected in Manitoba at low levels in 2001. High populations of soybean aphids are erratic and do not occur every year. It is not known if soybean aphids can overwinter in Manitoba. However, winter survival is likely low due to cold temperatures that prevent survival of exposed eggs.¹ Soybean aphids arrive in Manitoba predominantly by southern winds, with detectable levels normally noticed as early as July.

IDENTIFICATION

Soybean aphids are small, soft-bodied insects that are light yellow with black cornicles (*tailpipes*). Both winged and wingless aphids may be present in fields. Winged adults have a black head and thorax. Soybean aphids cause damage by piercing plant tissues and removing the sap. Only 10% of the nutrients they consume are digested. The rest is excreted as honeydew. This causes sticky, shiny and even blackened leaves under heavy infestation, especially in the absence of rain.

SCOUTING

Timing

Scout for soybean aphids on a weekly basis from the R1 (beginning bloom) to R5 (beginning pod) stages. This corresponds with July to mid-August in Manitoba. Severe infestations of soybean aphids can reduce pod and seed development. By the R6 (full seed) stage, yield loss from soybean aphid feeding should be minimal and insecticide application would generally no longer be economical. Soybean aphid scouting requires at least two field visits from the time they are first detected. Populations can change in response to environmental conditions and presence of natural enemies. From the time aphids are first detected, scout the field again in approximately five days to assess whether the population has increased or decreased. Revisit the field in less than five days if aphid numbers are high or nearing threshold.

Method

Count the number of soybean aphids per plant on at least 30 plants per field (e.g., six plants in five areas).² The sweep-net method is not recommended, as soybean aphids are not easily dislodged from plants. Ensure that plants selected for aphid counts are random and representative of the field. Avoid making treatment decisions based on field borders and aphid hot spots. Examine the entire plant, including upper and lower leaf surfaces, newly-expanding trifoliate leaves, stems (Figure 1) and pods. Exclude castings (i.e., shed aphid skins) from counts, which appear as white flecks (Figure 2).

Estimating Populations

When aphid populations are high, it is difficult and time-consuming to count the exact number of aphids. It is encouraged to visually estimate populations after gaining experience with aphid assessments. One method is to count the number of aphids on one leaf or stem section and multiply by the number of leaves or stem sections with similar aphid dispersion. For a visual reference, refer to Figure 1. Another method is to assess the population per plant according to categories, in increments of 50 or 100 aphids.

MANAGEMENT

Threshold

The action threshold (AT), also known as the economic threshold, is the average number of soybean aphids per plant in which insecticide application is recommended to prevent economic loss. The AT for soybean aphids is 250 aphids per plant on average and increasing.³ Insecticide should not be applied at populations lower than 250 per plant, as early application can cause a population to rebound. The AT is a conservative value that allows a seven-day lead time for control before populations with little natural control are expected to reach the economic injury level (EIL).³ The EIL value is 674 aphids per plant and defined as the point in which yield loss from aphid feeding is equal to the cost of control. Beyond 674 aphids per plant, economic loss will occur. The EIL overall can be affected by crop value, but the AT cannot.³ Consider other plant stressors that may exacerbate the impact of aphid damage (e.g., drought) and crop yield potential in management decisions. It is possible for populations to remain at or near threshold. If this is the case, control may not be necessary, especially if natural enemies are present.



Figure 1. Soybean trifoliate leaf with 159 soybean aphids (left leaflet), 69 aphids (top leaflet), and 88 soybean aphids (right leaflet).



Figure 2. Winged and wingless soybean aphids, and shed skins.

Natural Enemies

Natural enemies can significantly reduce the population of aphids. There are many natural enemies of the soybean aphid in Manitoba, including insect predators, parasitoids and fungal pathogens. Methods are available to include natural enemies into aphid management decisions. An app called Aphid Advisor (aphidapp.com) calculates a dynamic action threshold based on soybean aphid and natural enemy counts, growth stage of soybeans and average air temperature. The inner workings of this app also factor in the AT, EIL and insect growth rates into this calculation.⁴ Key natural enemies to scout for and enter into the app include lady beetle adults and larvae, green lacewing larvae, hover fly (Syrphid) larvae, minute pirate bugs (Orius), Aphidoletes

larvae and aphid mummies caused by parasitic wasps. Aphids infected with fungal pathogens appear fuzzy and pink, white or tan in colour. Although not included in Aphid Advisor, pathogens can at times result in considerable reductions in aphid numbers. Exclude infected aphids from population counts, as they are no longer causing harm to the plant.

Estimating Yield Loss

A unit of measure that can be used to estimate yield loss from aphid feeding is called cumulative aphid-days. One aphid-day equals one aphid feeding for one day. Ten aphid-days could be 10 aphids feeding for one day or one aphid feeding for 10 days. According to research, soybean yield is reduced by 6.88% for every 10,000 aphid-days accumulated.³ Therefore, 500 soybean aphids per plant on average feeding for 20 days would incur approximately 7% yield loss.

Insecticide Seed Treatments

Some seed treatments contain a neonicotinoid insecticide component and are registered for soybean aphids. However, these seed treatments are not recommended for soybean aphid management, given the timing of aphid arrival and peak populations in Manitoba. The residual activity of systemic neonicotinoid seed treatment breaks down by 35 to 42 days after planting,⁵ at which time soybeans are typically in the late V-stages and outside the window of control.

Foliar Insecticides

If control is necessary, consider leaving an unsprayed check area to determine the performance of the insecticide. See Table 1 for registered

foliar insecticides in Manitoba. Pyrethroid-resistant soybean aphids were verified in some areas of Manitoba in 2017 and have also been reported in Minnesota, North Dakota, South Dakota and Iowa in recent years. Pyrethroid-resistant soybean aphids in Manitoba may have originated from more southern regions where applications occur more frequently. Assess product efficacy after application to ensure aphid populations are controlled. Refer to the *Guide to Field Crop Protection* and product label for more information. As soybeans can also be a source of nectar for honeybees, follow guidelines for protection of bees if soybean fields are still flowering.

TABLE 1. FOLIAR INSECTICIDES REGISTERED FOR CONTROL OF SOYBEAN APHIDS

TRADE NAME (ACTIVE INGREDIENT)	CHEMICAL GROUP
Matador/Silencer (lambda-cyhalothrin)	3A Pyrethroids
Lagon/Cygon (dimethoate)	1B Organophosphates
Movento (spirotetramat)*	23 Tetrionic and tetramic acid derivatives
Voliam Xpress (lambda-cyhalothrin + chlorantraniliprole)	3A, 28 Pyrethroids + diamides
Concept (deltamethrin + imidacloprid)	3A, 4A Pyrethroids + neonicotinoids

*Movento is not harmful to many beneficial insects. Aphid death may be slightly delayed, as it prevents aphids from progressing to the next development stage.

- A** Multicoloured Asian lady beetle (*Harmonia axyridis*) third instar larvae can consume up to 107 aphids per day. Sevenspotted lady beetle (*Coccinella septempunctata*) consume up to 118 aphids per day.
- B** Hover fly (*Syrphidae*) larvae consume up to 17 aphids per day.
- C** Minute pirate bugs (*Orius insidiosus*) nymphs consume up to 8 aphids per day and adult females up to 11 per day.
- D** Green lacewing (*Chrysopidae*) larvae can consume up to 36 aphids per day.



Photos: John Gavloski

References

- ¹ McCornack, B.P., M. A. Carrillo, R.C. Venette, and D. W. Ragsdale. 2005. Physiological constraints on the overwintering potential of the soybean aphid (Homoptera: Aphididae). *Environ. Entomol.* 34(2): 235-240.
- ² Hodgson E.W., E.C. Burkness, W.D. Hutchison, and D.W. Ragsdale. 2004. Enumerative and binomial sequential sampling plans for soybean aphid (Homoptera: Aphididae) in soybean. *J. Econ. Entomol.* 97(6): 2127-2136.
- ³ Ragsdale, D.W., B. P. McCornack, R. C. Venette, B. D. Potter, I. V. MacRae, E. W. Hodgson, M. E. O'Neal, K. D. Johnson, R. J. O'Neil, C. D. DiFonzo, T. E. Hunt, P. A. Glogoza, and E. M. Cullen. 2007. Economic threshold for soybean aphid (Hemiptera: Aphididae). *J. Econ. Entomol.* 100: 1258-1267.
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- ⁵ McCornack, B.P. and D.W. Ragsdale. 2006. Efficacy of thiamethoxam to suppress soybean aphid populations in Minnesota soybean. *Crop Manage?* 5(1).