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NF599

Soybean Aphid Management in Nebraska

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The soybean aphid (*Aphis glycines*) is Nebraska's newest soybean insect pest, arriving in the United States in 2000 and in Nebraska in 2002. Yield losses of over 20 percent have been documented in some northeast Nebraska fields.

Description

The aphid is soft-bodied, light green to pale yellow, less than 1/16 inch long, and has two black-tipped cornicles (cornicles look like tailpipes) on the rear of the abdomen. It has piercing-sucking mouthparts and typically feeds on new tissue near the top of soybean plants on the undersides of leaves. Later in the season the aphids can be found on all parts of the plant. Currently, the soybean aphid is the only aphid in North America that forms colonies on soybean. Thus, if aphids are colonizing soybean, they can be expected to be soybean aphids.

Initial Observations of the Soybean Aphid in Nebraska

The pattern of soybean aphid colonization of soybean in 2002 and 2003 was similar. Very few aphids were found until mid July, with northeast Nebraska having the most fields per county infested. Mid July colonization coincided with summer storm patterns that had high northeast winds. In 2002 there were only two reports of fields being treated for soybean aphid. Population levels were much higher in 2003. In 2003 many fields in northeast Nebraska were treated, although it is likely that many did not require treatment or were treated after economic damage had been done. A possible explanation for higher numbers in 2003 may be that in 2003 temperatures in the second half of July through the first week of August were rather mild, which favors soybean aphid reproduction. In 2002 temperatures were high during this period. Aphid populations naturally declined in late August through early September.

In general, during 2003, if aphid populations reached the economic threshold (250 aphids per plant) and farmers treated in late July or early August, they benefitted from treatment. If treatment occurred in mid August, benefit was variable and depended on aphid population size, population dynamics, and predator levels (primarily lady beetles). Late August treatments likely resulted in no benefit, as aphid populations naturally declined.

Life Cycle and Injury to Soybean

The seasonal life cycle of the soybean aphid is complex with up to 18 generations a year. It requires two species of host plant to complete its life cycle — common buckthorn (*Rhamnus cathartica*) and soybean. Common buckthorn is a woody shrub or small tree and is the aphid's overwintering host plant. Soybean aphids lay eggs on buckthorn in the fall. These eggs overwinter and hatch in the spring, giving rise to wingless females. These females reproduce without mating, producing more females. After two or three generations on buckthorn, winged females are produced and migrate to soybean. Multiple generations of wingless female aphids are produced on soybeans until late summer or fall, when winged females and males are produced that migrate back to buckthorn, where they mate. The females then lay eggs on buckthorn, which overwinter, thus completing the seasonal cycle. It remains to be seen how successful the aphid will be at overwintering and colonizing soybean in Nebraska.

Soybean aphid populations can grow to extremely high levels under favorable environmental conditions. Reproduction and development is fastest when temperatures are 70-80°F. Aphid numbers can change rapidly, with populations sometimes doubling in two to three days. Aphids die when temperatures reach 95°F. When populations reach high levels during the summer, winged females are produced that migrate to other soybean fields. Like a number of other insect species (e.g. potato leafhoppers), these migrants can be caught up in weather patterns, moved great distances, and end up infesting fields far from their origin. These summer migrants were likely the major source of infestations in Nebraska during 2002 and 2003.

Soybean aphids injure soybeans by removing plant sap with their needle-like mouthparts. Plant symptoms may include yellowed, distorted leaves and stunted plants. A charcoal-colored residue also may be present on the plants. This is sooty mold that grows on the honeydew that aphids excrete. Honeydew in itself makes leaves appear shiny. Soybean plants appear to be most vulnerable to aphid injury during the early reproductive

stages. Heavy aphid infestations during these stages can cause reduced pod and seed counts. Soybean aphids also can transmit several viral diseases, including soybean mosaic.

Management

The soybean aphid is very new to North America and experience managing this insect is limited. As we gain more experience with it, recommendations will be refined and developed to better manage it under Nebraska conditions. Following are management recommendations:

1. Begin scouting soybean fields once or twice a week in late June to early July. Check 20 to 30 randomly selected plants per field. Aphids are most likely to concentrate at the very top of the plant, although they will move onto stems and within the canopy as populations grow and/or the plant reaches mid to late reproductive stages. If a tree line or woodlot is adjacent to the soybean field, make sure and include a few sampling locations near these areas. Soybean aphids often are found first in field sections near wooded areas.
2. Counting aphids is not as difficult as it may seem at first. First, walk to a random spot in the field. Pull a plant and turn it upside down and give it a quick scan to see where the aphids are. Get a feel for what 10 or 20 aphids look like and count by 10s or 20s.
3. The current threshold for late vegetative to R5 stage (beginning seed) soybeans with actively increasing aphid populations is 250 aphids per plant. This gives you about seven days to schedule treatment. (If populations do not increase during these seven days, you may be able to eliminate or delay treatment.) Determining if the aphid population is actively increasing requires several visits to the field. Factors favorable for aphid increase are relatively cool temperatures, plant stress (particularly drought), and lack of natural enemies. Thresholds for R6 (full seed) have yet to be determined, but are likely in the range of 500-1000 aphids per plant. Yield response to treatment has been documented during early R6, but not as consistently as when treatment occurs during R5 or earlier. Treatment after R6 has not been documented to increase yield.
4. Look for the presence of aphid natural enemies such as lady beetles, green lacewings, and other insect predators. Aphid "mummies" (light brown, swollen aphids) indicate the presence of parasitoids. These predators and parasitoids may keep low or moderate aphid populations in check. The presence of "fuzzy" aphid carcasses indicates fungal pathogens are present, which can lead to dramatic reductions of aphid populations.
5. Take note of winged aphids or "broad-shouldered" nymphs. Nymphs with broad or squared- off shoulders will become winged adults. A magnifying glass is helpful to see the "broad-shouldered" nymphs, but the winged adults are easy to see with the naked eye. If the majority of aphids are winged or developing wings, the aphids may soon leave the field and treatment can be avoided.
6. If the plants are covered with honeydew or sooty mold, or stunted, and aphids are still present at threshold levels, an insecticide treatment may still be of value but the optimum time of treatment is past.
7. If fields are treated, leave an untreated test strip to compare against sprayed sections. This also provides a refuge for beneficial insects.
8. Good insecticide coverage and penetration is required for optimal control of soybean aphid because aphids feed on the undersides of the leaves and within the canopy. Use high water volume and pressure. Aerial application works well when high water volume is used (5 gallons of water per acre is recommended).
9. Several insecticides are labeled for the soybean aphid ("Chinese aphid" on some labels). A list of registered insecticides, rates, preharvest intervals, etc. can be found at the University of Nebraska Department of Entomology Web site at: entomology.unl.edu/instabls/soyaphid.htm. Pyrethroids have a relatively long residual, and work best at temperatures below 90°F. Organophosphates have a fuming action and may work well in heavy canopies or high temperatures. Dimethoate is least effective.
10. Spraying flowering soybean poses a threat to honey bees. Communicate treatment plans to nearby beekeepers and follow label precautions to minimize honey bee kills. When there is concern about honey bees, spray late in the day and, if possible, use pyrethroids, which are generally safer for bees.

Resources

Additional sources of information can be accessed through the UNL Department of Entomology Web site at *entomology.unl.edu*, the *CropWatch* newsletter at *cropwatch.unl.edu*, or the North Central Soybean Research Program Plant Health Initiative at *www.planthealth.info/soyaphid.htm*.

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Index: Insects & Pests
Field Crops
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