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# Soybean Aphid

## in South Dakota

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Although it is a new pest of soybeans in the U.S., the soybean aphid is common and widespread in Asia. Both the soybean aphid (*Aphis glycines*), and the soybean plant (*Glycine max*) are of Asian origin.

The first record of soybeans in the U.S. is from 1765 when a seaman brought seeds from China via England. Over two centuries later, in 2000, the soybean aphid was detected on U.S. soybeans. First seen in Wisconsin during summer 2000, the aphid found its way into South Dakota in August 2001.

That summer the aphid appeared in three South Dakota counties: Brookings, Moody, and Minnehaha. By September 2002, soybean aphids had been confirmed in 20 South Dakota counties (Fig. 1).

The soybean aphid is now probably present wherever soybeans are grown in South Dakota. South Dakota produces about 145 million bushels of soybeans yearly and currently ranks eighth in the top ten soybean-producing states in the U.S.

## Identification

The soybean aphid is currently the only aphid species that infests and multiplies on South Dakota soybeans.

It is small but still can be seen with the naked eye. The wingless form is about 1/16 inch long when fully grown and may be yellow to yellow-green in color (Fig. 2). A newborn soybean aphid is about 1/4 the parent's size.

The soybean aphid has two black-tipped "tailpipes" or cornicles that can be seen easily under a hand lens. The winged form of the aphid has two pairs of delicate transparent wings and a general blackish coloration (Fig. 3). Once on buckthorns, soybean aphids take on a more bluish color but can still be identified by their black-tipped "tailpipes" (Fig. 4).

Soybean aphids assume several different forms, depending on season and plant condition. Winged aphids are commonly seen in late summer or early spring as aphids migrate between soybeans and buckthorns. Once on a soybean plant, overcrowding also may force the soybean aphid to produce winged forms, perhaps to enable it to colonize other less-infested soybean plants in the field.

Figure 2. Soybean aphid adults and nymphs on a soybean leaf. Notice the black-tipped "tailpipes" that are characteristic of soybean aphids in general.

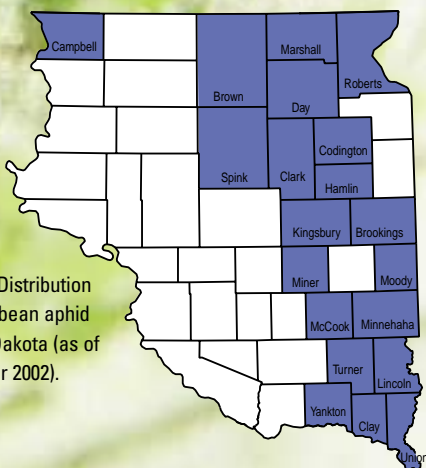


Figure 1. Distribution of the soybean aphid in South Dakota (as of September 2002).



Figure 3. A winged adult soybean aphid that migrated from soybean to buckthorn in the fall. The two young aphids to the right will eventually lay the eggs that will overwinter on the twigs.



Figure 4. A wingless soybean aphid on a buckthorn leaf in the spring.



## Life Cycle

The life cycle of a soybean aphid begins on a buckthorn. Buckthorns (*Rhamnus cathartica*) are very common shrubs in the South Dakota landscape (Fig. 5). They grow underneath trees in shelterbelts as shrubs or as small trees along fencelines or field margins of open fields. Some homeowners grow buckthorns as ornamental or shelter plants around the house and buildings.

Winged female soybean aphids return to buckthorns during the fall to give birth to a generation of egg-laying wingless females. Male soybean aphids develop on soybeans and fly into the buckthorns in search of the wingless females. The eggs laid beside buds on the buckthorn twigs survive the winter but the aphids themselves are killed off by freezing temperatures. In the spring, the overwintered eggs hatch into nymphs, and after two generations of wingless aphids on buckthorns a generation of winged females migrates from buckthorns to soybeans as soon as the soybeans emerge from the soil.

Once on soybeans, the winged aphids give birth to numerous wingless female aphids that, in turn, give birth to numerous other wingless aphids. A newborn aphid grows by molting several times and can start bearing live young aphids within a week. Winged aphids are only produced if there is a need for long distance migration such as when the host soybean plant become overcrowded, or when it is time to go back to buckthorns in the fall.

Soybean aphids can potentially produce 15 generations of aphids on soybeans per growing season.

## Injury

The soybean aphid has syringe-like mouthparts (Fig. 4) and sucks out the sap of soybeans. Plant injury may be more subtle and harder to detect than injuries caused by insects with chewing mouthparts, such as grasshoppers and bean leaf beetles. Soybean aphids may be small but when they multiply in large numbers during the season, their collective feeding can potentially cause severe damage on soybeans.

Sap feeding can cause yellowing, cupping, and wilting of soybean leaves. Plant growth may also be stunted. Leaf yellowing can be confused with symptoms of potassium or iron deficiencies in the soil where the soybeans were planted.

Soybean aphids are capable of transmitting mosaic viruses that can cause soybean diseases, such as soybean mosaic virus, bean yellow mosaic virus, and alfalfa mosaic virus. Although able to spread these diseases, however, the soybean aphid currently has not been implicated in transmitting disease-causing viruses in the U.S.

During the 2002 growing season, SDSU research near Beresford indicated that soybean fields sprayed for the soybean aphid had yield advantages of between 4 and 11 bushels per acre, or 10-27%, over unsprayed soybeans. However, bean leaf beetles were also present in the field in addition to the soybean aphids. It is quite difficult to attribute yield advantages due to control of just one insect.

During the 2000 and 2001 growing seasons, some soybean fields in Minnesota and Wisconsin were sprayed for soybean aphids and had an average yield advantage of 15% (or about 7 bushels per acre) over unsprayed soybeans.

## Scouting

Scouting for soybean aphids should start as soon as the soybean plants produce two trifoliate leaves (V2) and be continued until the beginning seed (R5) stage of soybean development.



Figure 5. Common buckthorn (*Rhamnus cathartica*) showing leaves, berries, twigs, and thorn in early fall in South Dakota.



Figure 6. Colony of soybean aphids on a newly-unfurled soybean leaf.





Figure 7. Colony of soybean aphids on soybean stem and flower.



Figure 8. Colony of aphids on the underside of a soybean leaf.

Soybean aphids can be found mainly on the young leaves and stems of the soybean plants early in the season (Figs. 6-7). As the plants mature, the aphids tend to be found mainly underneath the lower leaves (Fig. 8) and on the developing pods.

The presence of numerous ants and lady beetles in the soybean field are signs that soybean aphids may also be present. Ants (Fig. 9) feed on the honeydew excreted by the aphids; lady beetles utilize the aphids as food (Fig. 10).

Soybean leaves that look “sticky” or “sooty” are also signs of aphid infestations. This “look” is possibly due to the honeydew excreted by the aphids as they continuously feed on the soybean sap.

As with any insects, the distribution of soybean aphids in the field will not be uniform, and there may be more aphids in the field borders early in the season. Thus, to estimate the average number of aphids per plant, sample the field from the border to the middle.

Count soybean aphids from at least 10 plants at 10 representative locations in the field (for a total of at least 100 plants inspected). The entire plant must be examined because the aphids could be in the stems, growing points, flowers, pods, or underneath the leaves.

## Economic Threshold

An average of 200 or more soybean aphids per plant is currently considered economically damaging to soybeans.

Soybean aphids can potentially infest any of the growth stages of the soybean plant. However, the plant appears to be most susceptible to soybean aphid injuries if aphid infestations start early in the vegetative stage (V2) of the plant and continue on through the flowering and beginning seed stages (R1-R5) of the soybean.

Spraying with an insecticide during the flowering stages of the soybean plant (R1-R2) appears to produce the most benefit or yield advantage, according to early research from states that have already experienced damaging populations of the soybean aphid. However, SDSU research in 2002 revealed that spraying at beginning seed stage (R5) may still result in significant yield advantages if economic numbers of soybean aphids are present in the field.

Spraying too early may result in re-infestation of the sprayed field, while spraying too late may be unnecessary because the aphid population tends to decline during the pod-fill stages. Natural enemies usually catch up with the aphids later in the season.

Because the soybean aphid is a new pest of South Dakota soybeans, there are still many variables that need to be investigated before we can fully understand the injuries that these insects cause at any given time or plant stage. Some of these variables are soybean variety, plant population, row spacing, and location in the state. Eventually, soybean aphid management will need to be adjusted for the diverse soybean growing conditions in South Dakota.



Figure 9. An ant tending a soybean aphid.



Figure 10. An Asian lady beetle feeding on soybean aphids.

# Insecticides

Insecticides labeled for use against the soybean aphid, *Aphis glycines*, in South Dakota during the 2003 season.

Brand name	Active ingredient	Product per acre	Pre-harvest interval (days)
Asana *	esfenvalerate	5.8-9.6 fluid ounces	21
Dimate	dimethoate	0.5-0.75 pint	21
Furadan 4 F *	carbofuran	0.5 pint	21
Lorsban 4E *	chlorpyrifos	1-2 pints	28
Mustang *	zeta-cypermethrin	3.0-4.3 fluid ounces	21
Penncap-M *	methyl parathion	1-3 pints	20
Pounce 3.2EC *	permethrin	4-8 fluid ounces	60
Warrior *	lambda-cyhalothrin	1.92-3.20 fluid ounces	45

\* A restricted use insecticide. A valid applicator's license is required to apply any insecticide (restricted or not) on South Dakota crops.

For information on how to obtain an applicator's license, call the South Dakota Department of Agriculture at (605) 773-3724 or SDSU at (605) 688-4752.

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Gary Erickson (Brown County agronomy educator), John Gille (Union County agronomy educator), and Dr. Walt Riedell (USDA-ARS supervisory plant physiologist) reviewed the manuscript; many thanks. This publication is made possible through research and Extension funding and a grant from the South Dakota Soybean Research and Promotion Council. Visit us on the Internet at <http://plantsci.sdstate.edu/ent>

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## General Guidelines

This publication is intended for use by county Extension educators, pesticide dealers, consultants, commercial applicators, and producers in South Dakota.

Recommendations are current at the time of printing.

Mention of trade names does not imply endorsement of any product over another or discrimination against a similar product. Always read and follow label directions and precautions.

Most insecticides are capable of causing injury to applicators if not handled properly. Always wear protective gear as specified on the product label. Avoid contact of the insecticide with the skin, mouth, nose, eyes, and clothing. Bathe and wash clothing after exposure to any insecticides. Wash clothing on which insecticide residues may have accumulated before wearing again. Wash contaminated clothing separately from other household laundry.

In case of accidental poisoning call: 1-800-222-1222 (Sioux Valley Poison Control Center).

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