SOYBEAN INSECTS

Other Resources Available Through NDSU Extension Service:

<table>
<thead>
<tr>
<th>Publication</th>
<th>Title</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1172</td>
<td>Soybean Production Field Guide for North Dakota</td>
<td>2019</td>
</tr>
<tr>
<td>E268</td>
<td>The Effectiveness of Neonicotinoid Seed Treatments in Soybean</td>
<td>2015</td>
</tr>
<tr>
<td>E830</td>
<td>The Armyworm and the Army Cutworm (revised 2018)</td>
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<tr>
<td>E1878</td>
<td>Management of Insecticide-resistant Soybean Aphids</td>
<td>2019</td>
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<tr>
<td>CSI-0060</td>
<td>Soybean Aphid Field Guide - NCSRP</td>
<td>2013</td>
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Estimating Damage Caused by Defoliating Insects

In soybeans, field scouting to assess insect populations is based on either the number of insects per foot of row, insects per plant, or the level of defoliation. Insects per foot of row is determined by shaking plants over the inter-row space, on which a strip of cloth has been laid. Count the total number of insect pests per foot of row that fall on the cloth. If sampling a narrow row or drilled soybeans, the use of a “Texas vertical beat sheet” should be considered. The vertical beat sheet is made from a piece of galvanized metal flashing or similar stiff material, 36 inches wide, 32 inches tall and crimped at the bottom to form a collecting trough 4 inches wide. Place the device next to the row and shake the plants against the vertical surface. Insects dislodged from plants collect in the trough where they can be counted or collected. Percent defoliation is determined by estimating the amount of leaf loss based on visual inspection of randomly selected plants. The growth stage of the soybean plant is important. Under most conditions, moderate defoliation early in the season has little effect on final bean yield. As plants reach the flowering and pod filling stages, then defoliation poses a greater threat to yield. For example, research indicates that the soybean plant can sustain a 35% leaf loss prior to the pre-bloom period. From pod-set to maturity, the plant can tolerate only a 20% defoliation level.

ARMYWORMS

Armyworms are greenish-brown with longitudinal stripes. Full grown larvae are smooth, striped and almost hairless. Armyworms feed for three to four weeks. When full grown, larvae are 1½ to 2 inches in length. Armyworm larvae have six growth stages, or instars. The armyworm’s final instar lasts about 10 days and they consume large amounts of plant material during that time. Armyworms are inactive during the day, resting under plant trash, and clumps of grass or lodged plants. They feed at night or on cloudy days, crawling up on plants and consuming foliage. Due to their habit of feeding at night, armyworms may go undetected until significant damage has occurred. Armyworms do not overwinter in the region. The moths migrate from Southern states in late spring and early summer. This helps explain the sporadic infestations that occur. When moths arrive, they prefer to lay their eggs in moist, shady areas, usually where grasses have lodged. Infestations that develop within soybean fields are often due to grassy weed problems. Armyworms are more of a problem in small grains and corn. Damage to soybeans can occur when the armyworm’s usual host plants become exhausted due to feeding or dry conditions. When their food is depleted in the hatching site, the armyworms may move in large numbers, or “armies,” eating and destroying plants or crops in their path.

Threshold: Control of armyworms is recommended when 25% to 30% of the foliage is destroyed or if significant injury to pods is evident. Most often in soybeans, infestations are due to migrating armyworms. Under these circumstances, treatment of a couple of swaths ahead of the migrating armyworms to establish a barrier strip is suggested to prevent further migration and injury.

BEAN LEAF BEETLE

Bean leaf beetles have been increasing in North Dakota over the past years. Adult bean leaf beetles emerge from overwintering sites and moving into soybean or dry bean fields. The adults are yellow to reddish-brown and three to four black spots with a black border on wing covers. Adults emerge from overwintering, moving into bean fields as the seedlings emerge. The white larvae develop in the soil,
feeding on the roots and nodules. New adults emerging in August feed on foliage and pods. Feeding injury to leaves appears as small round holes between the leaf veins. Injury to pods appears as lesions similar in size and shape to leaf-feeding holes. The injury to pods results in secondary infections by fungi and bacteria, causing rotting and discoloration.

**Threshold:** Treatment thresholds from other regions are 3 to 7 beetles per sweep or based on defoliation: 50% defoliation during early vegetative, 40% defoliation during pre-bloom, 35% defoliation during bloom and 20-25% defoliation or 10% pod feeding (or the presence of clipped pods) or 0.5 beetle/plant during pod set to fill. Late season feeding on the foliage and pods by the new adults that emerge in August appears to be more important than early season feeding. This may increase the risk of virus transmission and cause secondary infections (rotting and discoloration) from fungi and bacteria.

**GRASSHOPPERS**

Grasshoppers will feed upon leaves and pods, chewing holes in them. A result of these migrations is soybean fields become sites for significant egg laying. Small grain fields. Grasshoppers will feed upon leaves and pods, chewing holes in them. A result of these migrations is soybean fields become sites for significant egg laying. Soybeans and other crops following sunflowers in rotation are at greatest risk of injury by this cutworm. Other cutworms, the red-backed, *Exoa ochregaster*, and the dark-sided, *Exoa messoria*, overwinter as eggs which hatch in mid to late May. Eggs are laid in the fall and survive in weedy, wet and reduced tillage areas. Feeding injury by these cutworms normally occurs in late May to early June. Most damage by cutworms occurs when soybean plants are in the early stage of development. Damage consists of young plants being chewed off slightly below or at ground level. Some cutworm feeding injury may occur on foliage. Cutworms primarily feed at night. When checking soybean fields for cutworms during the day, dig down into soil an inch or two around recently damaged plants; there you can find the gray to gray-brown larva.

**Threshold:** Economic thresholds for cutworm treatment decisions are not well established. Treatment guidelines used over the years include when one cutworm or more is found per 3 feet of row and the larvae are small (<3/4 inch long). Another guideline is when 20% of plants are cut or when gaps of 1 foot or more exist in the plant row. When making a final decision, consider that surviving soybeans are able to compensate for early stand reductions because of the plant's long growth period.

**FOLIAGE FEEDING CATERPILLARS**

Green Cloverworm, Cabbage Looper, Velvetbean Caterpillar, Thistle Caterpillar and Alfalfa Webworm

- Populations of these caterpillars have been negligible in North Dakota and little treatment to control them has been required. Sampling for these insects is accomplished through the use of a drop cloth or a vertical beat sheet, placed between two rows of plants. The larvae are dislodged from the plants and counted on the cloth or collection tray to arrive at an estimate of the number per row feet.

**Green cloverworm:** These caterpillars are green with two narrow, white stripes down the side. When mature, the worms are 1 ¼ inches long. These caterpillars have only three pairs of fleshy prolegs on the abdomen, plus a pair of prolegs on the back segment. When moving, the worms move by arching the middle of the body, or “looping.” Young worms scrape leaf tissue creating a transparent skin, or “window,” on the leaf surface. Older cloverworms eat holes in the leaves.

**Cabbage looper:** These caterpillars are light to dark green, with lighter colored stripes along the side and on the top, running the length of the body. When mature, the worms are 1 ½ inches long. These caterpillars have only two pairs of fleshy prolegs on the abdomen, plus the pair on the back tip. When moving, the caterpillars move by arching the middle of the body, or “looping.” These worms feed on leaves in the interior and lower portion of the plant. As defoliation occurs, worms feed higher in the plant. Feeding injury is similar to the looper.

**Velvetbean caterpillar:** This insect does not overwinter in the region; instead, moths migrate from Southern locations. These caterpillars have dark lines bordered by lighter colored, narrower lines running the length of the body. The background color ranges from a pale yellow-green to brown or black. These larvae have four pairs of fleshy prolegs to distinguish them from the cloverworm and the looper. Young velvetbean caterpillars feed on the underside of leaves in the upper portion of the plant. Older larvae consume the entire leaf, except for the leaf veins.

**Thistle caterpillar:** This insect is the larva of the butterfly known as the Painted Lady. This butterfly does not overwinter in the region, but migrates from Southern locations each spring. These caterpillars are brown to black in color with yellow stripes along each side of the body. They are covered with spiny hairs that give the caterpillar a prickly appearance. Full grown larvae are about 1 ½ inches long. The caterpillars feed on the leaves, webbing them together at the feeding site.

**Alfalfa webworm:** These larvae are 1 inch when full grown. They are greenish to nearly black with a light stripe that runs down the middle of the back. There are three dark spots, each with hairs, on the side of each segment. These larvae feed for about 3+ weeks. Infestations are characterized by light webbing over the leaves. Beneath the web is where the larvae feed, consuming the leaves. These larvae move very rapidly, forward or backward, when disturbed.

**Threshold:** Rather than using thresholds for individual defoliating insect species present in the field consider total leaf area lost as a threshold when defoliators are actively feeding: vegetative 50%, bloom 40%, bloom-pod fill 20% and pod fill-harvest 35%. An average infestation of 4 to 8 larvae per row foot typically caused 20-30% defoliation.

**GRASSHOPPERS**

In the Northern Plains, grasshopper egg hatch normally begins in late April to early May. Most grasshoppers emerge from eggs deposited in uncultivated ground. Soybean growers should expect to find grasshoppers feeding first along bean field margins adjacent to non-crop sites where the nymphs are hatching. Later infestations may develop when grasshopper adults migrate from harvested small grain fields. Grasshoppers will feed upon leaves and pods, chewing holes in them. A result of these migrations is soybean fields becoming sites for significant egg laying.

**Threshold:** The threatening rating is considered the action threshold for grasshoppers. For example, grasshopper control is advised whenever 50 or more small nymphs per square yard can be found in adjacent, non-crop areas, or when 30 or more nymphs per square yard can be found within the field. When 20 or more adults per square yard are found in field margins or 8 to 14 adults per square yard are occurring in the crop, treatment would be justified. Since it is difficult to estimate the number of...
grasshoppers per square yard when population densities are high, pest managers can use four 180-degree sweeps with a 15-inch sweep net, which is equivalent to the number of adult (or nymph) grasshoppers per square yard.

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<th>Rating</th>
<th>Nymphs per square yard</th>
<th>Adults per square yard</th>
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<td>Light</td>
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<td>Margin 10-20, Field 3-7</td>
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<td>Threatening</td>
<td>Margin 50-75, Field 30-45</td>
<td>Margin 21-40, Field 8-14</td>
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<tr>
<td>Severe</td>
<td>Margin 100-150, Field 60-90</td>
<td>Margin 41-80, Field 15-28</td>
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<tr>
<td>Very Severe</td>
<td>Margin 200+, Field 120+</td>
<td>Margin 80+, Field 28+</td>
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Many of the grasshopper infestations in soybeans will be the heaviest on the field margins. Treating these areas may lessen the total numbers of grasshoppers successfully entering a field. Soybeans are most sensitive to defoliation during pod development (growth stages R4 to R6). During this time, plants can only tolerate up to 20% defoliation. Of greater concern would be direct feeding damage to pods and seeds. Grasshoppers are able to chew directly through the pod walls and damage seed directly. If more than 5% to 10% of the pods are injured by grasshoppers, an insecticide application would be recommended.

**POTATO LEAFHOPPER**

The adult is wedge-shaped and pale green in color. Adults are very active, jumping or flying when disturbed. Nymphs are wingless. Both adults and nymphs run backwards or sideways rapidly when disturbed. Nymphs feed on the underside of the leaf, usually completing their growth on the leaves near where they hatched. Large numbers of adults may appear early in the season, but their presence is dependent on migration from the eastern United States. Soybeans with moderate to dense pubescence, or plant hairs, are tolerant to leafhopper infestations. The short plant hairs form a barrier that discourages leafhoppers from feeding and ovipositing eggs on plant tissue. When feeding does occur, damage by leafhoppers is referred to as hopper-burn. Foliage becomes dwarfed, crinkled and curled. Small triangular brown areas appear at the tips of leaves, gradually spreading around the entire leaf margin. Potential damage to soybeans by potato leafhopper is based on very limited research data. Damage would be more likely when drier growing conditions occur.

**Threshold:** The threshold for basing spray decisions is when an average of 5 leafhoppers (adults + nymphs) per plant are found in the vegetative stages, and 9 leafhoppers (adults + nymphs) per plant in early bloom stages. A treatment should be considered when visible injury symptoms are combined with large leafhopper populations.

**SEED CORN MAGGOT**

Seedcorn maggot attacks soybean seed, preventing sprouting or weakening the seedlings. The yellowish white maggot is found burrowing in the seed, emerging stem or the cotyledon leaves. Damage to the seedlings results in a condition called “snakeheads,” or plants without cotyledon leaves. The adult flies emerge in spring when soil temperatures reach 50°F. They deposit eggs in soil where there is abundant organic matter and decaying crop residue, or on the seed or seedling. Injury from seedcorn maggots is usually most severe during wet, cold springs and in fields with high organic matter soils. When cool, wet conditions occur during planting, the slow emergence of the seedling extends the period of time it is vulnerable to feeding by the maggot.

**Threshold:** When conditions are wet and cool, or when planting into high crop residue conditions, seed treatments provide the best defense against injury. For additional information on seed treatments, refer to page 7.

**SOYBEAN APHID**

The soybean aphid is light yellow with black cornicles (“tail-pipes”) and a pale colored cauda (tail projection). As with other aphids, the soybean aphid is small, about the size of a pinhead. Nymphs are smaller. Aphids suck fluid from plants. When infestations are large, infested leaves are wilted or curled. The aphids excrete honeydew, a sweet substance that accumulates on surfaces of lower leaves and promotes the growth of sooty mold. This aphid colonizes tender leaves and branches from seedling to blooming. Later, as the growing point slows, the aphids slow their reproductive rate, move down to the middle and lower part of the plant, and feed on the undersides of leaves. Toward the end of the season, the colonies begin to rapidly increase in number again. These increases are followed by a migration to the overwintering, alternate host, buckthorn.

**Scouting:** Currently, the guidelines for making soybean aphid treatment decisions are:

- Begin scouting soybean fields at the V3 to V4 stage to determine if soybean aphids are present in fields. No treatment is recommended at this time and is discouraged so insecticides do not reduce the presence of predators and parasites. The critical growth stages for making most soybean aphid treatment decisions in North Dakota appear to be the late vegetative to early reproductive stages (Vn to R3). Assessing aphid populations at this time is critical. Typically aphid treatments occur from mid-July to mid-August.

**Economic Threshold:**

- R1 (beginning of flowering) to R5 (beginning seed) = 250 aphids/plant when populations are actively increasing in 80% of field
- R6 (full seed) = No treatment necessary. Research trials throughout the north central states have not demonstrated a yield benefit to treating soybean for soybean aphid management at the R6 and later stages.
Aphids Resistant to Pyrethroid Insecticide.

Pyrethroid resistance was documented in North Dakota, Minnesota, and South Dakota in 2017. In Figure 1, highlighted counties show where pyrethroid performance issues occurred for soybean aphid management in 2017. A total of nine counties were reported in eastern ND. Soybean aphids were collected from six soybean fields with reported pyrethroid failure, and these aphids were evaluated for bifenthrin and lambda-cyhalothrin resistance using the glass vial bioassay. Aphid populations from Casselton, Hope, Emerado, Lodema and Osnabrock had significantly less mortality than the laboratory population for bifenthrin; and Grafton (2 fields), Lodema and Osnabrock for lambda-cyhalothrin. These populations are considered resistant in ND soybean fields.

To reduce development of insecticide resistance in soybean aphids, Extension Entomology recommends:

- Scout fields regularly.
- Use the Economic Threshold to aid in decision-making, prevent unnecessary insecticide applications and conserve natural enemies.
- Rotate mode of action (or insecticide class) if more than one application is necessary in a season.
- Do not use the same mode of action (or insecticide class) repeatedly year after year.
- Avoid using the lowest rate of insecticide on label. Use high rates.
- Do not use premix insecticides containing two insecticides of the same or two different modes of action, because premixes have lower amounts of active ingredient per insecticide.

SPIDER MITES

Mites are small and magnification is required to see them. A quick sampling procedure to determine whether mites are present is to hold a piece of white paper below leaves then slap them to dislodge the mites. Or, pulling plants and examining the underside of the leaves from the bottom of plants upwards. The mites appear as tiny dust specks; however, they will move after being knocked off the leaf. Feeding damage by mites first appears as small yellow spots (“stippling”). As feeding activity increases, leaves become yellow, bronzed or brown, and eventually shed from the plant. Be sure to scout during full pod (R4) through beginning seed (R5) stages since these crop stages are the most important contributors to yield.

Mites usually become a problem when hot, dry weather occurs. Infestations typically are first noted near field edges. These environmental conditions stress the plant, whether mites are present or not. If conditions continue, treating for mites is no guarantee plants will recover. In addition, products labeled for mite control often do not give adequate control and the population of mites may rebound quickly to pretreatment levels or higher. When rain and humidity are present, natural reductions in mite populations occur due to infection by a fungal pathogen. Conditions that are good for the development of the pathogen are temperatures cooler than 85°F, with at least 90% R.H. for 12 to 24 hours.

Threshold: Deciding whether to treat is difficult. There is no specific threshold that has been developed for two-spotted spider mite in soybeans. Sample plants at least 100 feet into the field and walk in a “U” pattern sampling two plants per location at 20 different locations. Assess mite damage using the following scale from the University of Minnesota:

0 - No spider mites or injury observed.
1 - Minor stippling on lower leaves, no premature yellowing observed.
2 - Stippling common on lower leaves, small areas or scattered plants with yellowing.
3 - Heavy stippling on lower leaves with some stippling progressing into middle canopy. Mites present in middle canopy with scattered colonies in upper canopy. Lower leaf yellowing common. Small areas with lower leaf loss
(Spray Threshold)
4 - Lower leaf yellowing readily apparent. Leaf drop common. Stippling, webbing and mites common in middle canopy. Mites and minor stippling present in upper canopy.
(Economic Loss)
5 - Lower leaf loss common, yellowing or browning moving up plant into middle canopy, stippling and distortion of upper leaves common. Mites present in high levels in middle and lower canopy.

Remember to use an organophosphate insecticide (e.g. Dimethoate) over a pyrethroid insecticide to avoid flaring mite populations. However, the active ingredient, bifenthrin (pyrethroid) does not flare mite populations. Reasons for the increase in mite populations from some pyethroids include: disruption of the natural enemies that control spider mites (predatory mites); increased movement of mites out of fields, and increased reproductive rates of female mites. Early detection facilitates timely and effective rescue treatments. Current insecticides for corn provide short-term protection, maybe 7 days, from the pest. Fields will need to be re-monitored continually for resurging populations. The efficacy of an insecticide can be improved significantly with sufficient coverage >18 GPA of water by ground and 3-5 GPA by air and application at high pressure to penetrate foliage. For insecticide resistance management of mites, do not apply the same class of insecticide (or mode of action) more than twice and alternate the class of the insecticides (or mode of action) to prevent buildup of resistant mite strains.
**WIREWORMS**

To decide whether wireworms are a potential problem, refer to the discussion in the corn insects section. For commercial seed treatment, use decisions must be made at time of seed purchase. Please the seed treatment section in the introduction for more information.

### INSECTICIDES REGISTERED FOR USE IN SOYBEAN

<table>
<thead>
<tr>
<th>INSECTICIDE</th>
<th>PRODUCT PER ACRE</th>
<th>PHI</th>
<th>Armyworms</th>
<th>Bean Leaf Beetle</th>
<th>Cutworms</th>
<th>Foliage Caterpillars</th>
<th>Grasshoppers</th>
<th>Potato Leafhopper</th>
<th>Seed Corn Maggot</th>
<th>Soybean Aphid</th>
<th>Spider Mites</th>
<th>Wireworms</th>
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<td></td>
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<tr>
<td>Bifender FC</td>
<td>Broadcast to soil</td>
<td>None listed</td>
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Broadcast to soil (armyworm and cutworm): 2.9 – 5.9 fl oz

At-plant: 0.17 - 0.34 fl oz per 1000 linear feet

PPI, PRE: 2.9 - 4.6 fl oz
<table>
<thead>
<tr>
<th>INSECTICIDE</th>
<th>PRODUCT PER ACRE</th>
<th>PHI</th>
<th>Armyworms</th>
<th>Bean Leaf Beetle</th>
<th>Cutworms</th>
<th>Foliage Caterpillars</th>
<th>Grasshoppers</th>
<th>Potato Leafhopper</th>
<th>Seed Corn Maggot</th>
<th>Soybean Aphid</th>
<th>Spider Mites</th>
<th>Wireworms</th>
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<tr>
<td></td>
<td>Sniper LFR</td>
<td>RUP</td>
<td>At-plant: 0.2 - 0.39 fl oz per 1,000 linear feet</td>
<td>None</td>
<td>●</td>
<td>●</td>
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<td></td>
<td></td>
<td></td>
<td>PPI: 4 - 5.3 fl oz</td>
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<tr>
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<td>Ethos XB</td>
<td>RUP</td>
<td>PRE: 3.4 fl oz</td>
<td>None</td>
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<td>2.1 - 6.4 fl oz</td>
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<td>Discipline 2EC</td>
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<td>Fanfare 2EC</td>
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<td>Sniper</td>
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<td>2.1 - 6.4 fl oz</td>
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<td>Sniper Helios</td>
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<td>bifenthrin + chlorpyrifos</td>
<td>Tundra Supreme</td>
<td>RUP</td>
<td>5.6 – 16.8 fl oz</td>
<td>28 days</td>
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<td>Do not graze or harvest for hay, straw, forage or feed</td>
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<td>bifenthrin + imidacloprid</td>
<td>Brigadier</td>
<td>RUP</td>
<td>3.8 - 6.1 fl oz</td>
<td>45 days for feeding dry vines</td>
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<td>18 days for feeding green vines</td>
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<td>bifenthrin + imidacloprid</td>
<td>Skyraider</td>
<td>RUP</td>
<td>2.1 - 6 fl oz</td>
<td>18 days</td>
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<td>Swagger</td>
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<td>7.6 - 12.2 fl oz</td>
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<tr>
<td>bifenthrin + zeta-cypermethrin</td>
<td>Hero</td>
<td>RUP</td>
<td>2.6 - 10.3 fl oz</td>
<td>21 days</td>
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<td>Do not graze or harvest for hay, straw, forage or feed</td>
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<td>carbaryl</td>
<td>Sevin 4F</td>
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<td>0.5 - 1.5 qts</td>
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<td>Sevin XLR Plus</td>
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<td>chlorantraniliprole</td>
<td>Coragen</td>
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<td>3.5 - 5 fl oz</td>
<td>1 day</td>
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<td>Prevathon</td>
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<td>14 - 20 fl oz</td>
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<tr>
<td>chlorantraniliprole + lambda-cyhalothrin</td>
<td>Besiege</td>
<td>RUP</td>
<td>5 - 10 fl oz</td>
<td>30 days</td>
<td>●</td>
<td>●</td>
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<tr>
<td>chlorpyrifos</td>
<td>Lorsban 15G</td>
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<td>8 oz per 1,000 row-feet</td>
<td>28 days</td>
<td>●</td>
<td>●</td>
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87
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<thead>
<tr>
<th>INSECTICIDE</th>
<th>PRODUCT PER ACRE</th>
<th>PHI</th>
<th>Armyworms</th>
<th>Bean Leaf Beetle</th>
<th>Cutworms</th>
<th>Foliage Caterpillars</th>
<th>Grasshoppers</th>
<th>Potato Leafhopper</th>
<th>Seed Corn Maggot</th>
<th>Soybean Aphid</th>
<th>Spider Mites</th>
<th>Wireworms</th>
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<tbody>
<tr>
<td>chlorpyrifos</td>
<td>At Plant¹: 1 - 2 pts</td>
<td>28 days</td>
<td>● ● ● ● ● ●</td>
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<tr>
<td>chlorpyrifos + bifenthrin</td>
<td>Match-Up</td>
<td>28 days</td>
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<tr>
<td>chlorpyrifos + lambda-cyhalothrin</td>
<td>At Plant¹: 11 - 38 fl oz</td>
<td>30 days</td>
<td>● ● ● ● ● ●</td>
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<td>chlorpyrifos + zeta-cypermethrin</td>
<td>Stallion</td>
<td>28 days</td>
<td>● ● ● ● ● ●</td>
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<td>Belay</td>
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<td>clothianidin</td>
<td>Intego Suite Soybeans</td>
<td>Commercial Seed Treatment Only 3.37 fl oz per cwt</td>
<td>Do not graze or feed soybean forage and hay to livestock</td>
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<td>clothianidin + Bacillus firmus</td>
<td>Poncho Votivo</td>
<td>Commercial Seed Treatment Only 0.13 mg ai per seed</td>
<td>Do not graze or feed forage and hay</td>
<td>● ● ● ● ● ●</td>
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<td>Inovate System (NipsIt Inside + fungicides)</td>
<td>Consult individual product labels for rates</td>
<td>Consult individual product labels</td>
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<td>Fortenza</td>
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<td>INSECTICIDE</td>
<td>PRODUCT PER ACRE</td>
<td>PHI</td>
<td>Armyworms</td>
<td>Bean Leaf Beetle</td>
<td>Cutworms</td>
<td>Foliage Caterpillars</td>
<td>Grasshoppers</td>
<td>Potato Leafhopper</td>
<td>Seed Corn Maggot</td>
<td>Soybean Aphid</td>
<td>Spider Mites</td>
<td>Wireworms</td>
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<td>RUP</td>
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<td>Do not graze or harvest for hay or forage</td>
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<tr>
<td>Zeal SC</td>
<td>2 - 6 fl oz</td>
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<td>flupyradifurone</td>
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<tr>
<td>Sivanto Prime</td>
<td>7 - 10.5 fl oz</td>
<td>7 days for forage, leaves, vines and hay</td>
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<tr>
<td>gamma-cyhalothrin</td>
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<tr>
<td>Declare</td>
<td>0.77 - 1.54 fl oz</td>
<td>30 days for seed</td>
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<td>Senator 600</td>
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<tr>
<td>Enhance AW</td>
<td>5 oz per cwt</td>
<td>7 days</td>
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<td>ADAMA Alias 4F</td>
<td>0.75 fl oz</td>
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<tr>
<td>AmTide Imidacloprid 2F</td>
<td>1.3 fl oz</td>
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<td>Admire Pro</td>
<td>1.5 fl oz</td>
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<tr>
<td>Wrangler</td>
<td>1.5 fl oz</td>
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<tr>
<td>Nuprid 2SC</td>
<td>3.75 fl oz</td>
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<td>Nuprid 4F Max</td>
<td>3 fl oz</td>
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<tr>
<td>Prey 1.6</td>
<td>3.75 fl oz</td>
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<tr>
<td>Sherpa</td>
<td>3.75 fl oz</td>
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<tr>
<td>Steward EC</td>
<td>4.6 - 11.3 fl oz</td>
<td>21 days for seed</td>
<td>●</td>
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<tr>
<td>lambda-cyhalothrin</td>
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<td>●</td>
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<tr>
<td>Grizzly Too</td>
<td>0.96 - 1.92 fl oz</td>
<td>30 days for seed</td>
<td>●</td>
<td>●</td>
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<tr>
<td>Kendo</td>
<td>1.92 - 3.84 fl oz</td>
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<tr>
<td>Lambda-Cy EC</td>
<td>1.92 - 3.84 fl oz</td>
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<td>●</td>
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<tr>
<td>LambdaStar</td>
<td>1.92 - 3.84 fl oz</td>
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<tr>
<td>Lambda-T</td>
<td>1.92 - 3.84 fl oz</td>
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<tr>
<td>Lamicap</td>
<td>1.92 - 3.84 fl oz</td>
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<td>Cyhalothrin 1EC</td>
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<td>Paradigm VC</td>
<td>1.92 - 3.84 fl oz</td>
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<tr>
<td>Province</td>
<td>1.92 - 3.84 fl oz</td>
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<tr>
<td>Silencer</td>
<td>1.92 - 3.84 fl oz</td>
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<td>Silencer VXN</td>
<td>1.92 - 3.84 fl oz</td>
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<tr>
<td>Warrior II</td>
<td>0.96 - 1.92 fl oz</td>
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<tr>
<td>lambda-cyhalothrin +</td>
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<td>●</td>
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<tr>
<td>thiamethoxam</td>
<td>3 - 4.5 fl oz</td>
<td>30 days for seed</td>
<td>●</td>
<td>●</td>
<td>●</td>
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<tr>
<td>Endigo ZC</td>
<td>RUP</td>
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<td>†</td>
<td></td>
<td>Do not graze or harvest for hay, straw, forage or feed</td>
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<tr>
<td>INSECTICIDE</td>
<td>PRODUCT PER ACRE</td>
<td>PHI</td>
<td>Armyworms</td>
<td>Bean Leaf Beetle</td>
<td>Cutworms</td>
<td>Foliage Caterpillars</td>
<td>Grasshoppers</td>
<td>Potato Leafhopper</td>
<td>Seed Corn Maggot</td>
<td>Soybean Aphid</td>
<td>Spider Mites</td>
<td>Wireworms</td>
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<tr>
<td>methomyl</td>
<td>Lannate LV</td>
<td>RUP</td>
<td>0.4 - 1.5 pts</td>
<td>14 days for seed</td>
<td>12 days for hay</td>
<td>3 days for forage</td>
<td>● ● ● ●</td>
<td>●</td>
<td>●</td>
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<tr>
<td>methoxyfenozide</td>
<td>Intrepid 2F</td>
<td>4 - 8 fl oz</td>
<td>14 days for seed</td>
<td>7 days for hay and forage</td>
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<tr>
<td>permethrin</td>
<td>Ambush 25W</td>
<td>3.2 - 6.4 oz</td>
<td>60 days for seed</td>
<td>Do not graze or harvest for hay or forage</td>
<td>● ● ● ●</td>
<td>●</td>
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<tr>
<td>permethrin</td>
<td>Ambush</td>
<td>3.2 - 6.4 fl oz</td>
<td>12 days for hay</td>
<td>●</td>
<td>●</td>
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<tr>
<td>permethrin</td>
<td>Arctic 3.2EC</td>
<td>2 - 4 fl oz</td>
<td>60 days for seed</td>
<td>Do not graze or harvest for hay or forage</td>
<td>●</td>
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<tr>
<td>permethrin</td>
<td>Permethrin</td>
<td>2 - 4 fl oz</td>
<td>60 days for seed</td>
<td>Do not graze or harvest for hay or forage</td>
<td>●</td>
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<tr>
<td>permethrin</td>
<td>Perm-UP 3.2 EC</td>
<td>2 - 4 fl oz</td>
<td>60 days for seed</td>
<td>Do not graze or harvest for hay or forage</td>
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<tr>
<td>permethrin</td>
<td>Arctic 3.2EC</td>
<td>4 - 8 fl oz (2ee recommendation for soybean aphid)</td>
<td>60 days for seed</td>
<td>Do not graze or harvest for hay or forage</td>
<td>●</td>
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<tr>
<td>permethrin</td>
<td>Kernel Guard Supreme</td>
<td>Planter Box: 1.5 oz per 50 lbs of seed</td>
<td>45 days for grazing or feeding</td>
<td>●</td>
<td>●</td>
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<tr>
<td>phorate</td>
<td>Thimet 20G</td>
<td>9 oz per 1,000 row-feet</td>
<td>Do not place granules in direct contact with seed</td>
<td>Do not graze or feed foliage</td>
<td>●</td>
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<tr>
<td>phorate</td>
<td>Lock n Load Thimet 20G SmartBox</td>
<td>9 oz per 1,000 row-feet</td>
<td>Do not place granules in direct contact with seed</td>
<td>Do not graze or feed foliage</td>
<td>●</td>
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<tr>
<td>spinetoram</td>
<td>Radiant SC</td>
<td>2 - 4 fl oz</td>
<td>28 days</td>
<td>‡</td>
<td>‡</td>
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<tr>
<td>spinosad</td>
<td>Blackhawk</td>
<td>1.1 - 2.2 oz</td>
<td>28 days for seed</td>
<td>Do not graze or harvest for hay or forage</td>
<td>‡</td>
<td>‡</td>
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<tr>
<td>spinosad</td>
<td>Entrust</td>
<td>0.75 - 1.25 oz</td>
<td>28 days for seed</td>
<td>Do not graze or harvest for hay or forage</td>
<td>‡</td>
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<tr>
<td>spinosad</td>
<td>Tracer</td>
<td>1 - 2 fl oz</td>
<td>7 days</td>
<td>●</td>
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<tr>
<td>sulfoxaflor</td>
<td>Transform WG</td>
<td>0.75 - 1 oz</td>
<td>7 days</td>
<td>●</td>
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<tr>
<td>thiamethoxam</td>
<td>Cruiser 5FS</td>
<td>1.28 fl oz per cwt</td>
<td>None</td>
<td>●</td>
<td>●</td>
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<tr>
<td>thiamethoxam</td>
<td>Clariva Elite Beans</td>
<td>5.6 fl oz per cwt or 2.6 fl oz per 140,000 seeds</td>
<td>Clariva Elite Beans, Cruiser Maxx Vibrance and Warden CX: Do not graze or feed livestock on treated areas for 45 days after planting</td>
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<tr>
<td>thiamethoxam</td>
<td>Cruiser Maxx</td>
<td>2.95 fl oz per cwt or 1.38 fl oz per 140,000 seeds</td>
<td>●</td>
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<tr>
<td>thiamethoxam</td>
<td>Cruiser Maxx Vibrance</td>
<td>3.22 fl oz per cwt or 1.5 fl oz per 140,000 seeds</td>
<td>●</td>
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<tr>
<td>thiamethoxam</td>
<td>Upshot Soybeans</td>
<td>2.95 fl oz per cwt or 1.38 fl oz per 140,000 seeds</td>
<td>●</td>
<td>●</td>
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</tr>
<tr>
<td>thiamethoxam</td>
<td>Warden CX</td>
<td>3.38 fl oz per cwt or 1.58 fl oz per 140,000 seeds</td>
<td>●</td>
<td>●</td>
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<tr>
<td>zeta-cypermethrin</td>
<td>Mustang Maxx</td>
<td>RUP</td>
<td>1.28 - 4 fl oz</td>
<td>21 days for seed</td>
<td>Do not graze or harvest for hay, straw, forage or feed</td>
<td>●</td>
<td>●</td>
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</tr>
</tbody>
</table>

RUP = Restricted Use Pesticide

1 = At-plant applications of chlorpyrifos products for control of cutworm spp. only
* = Seed treatments may provide protection against early-season soybean aphids, but may not against later season aphids
† = Suppression only
‡ = Control of first and second instar larvae and nymphs only