

SOYBEAN INSECTS

Estimating Damage

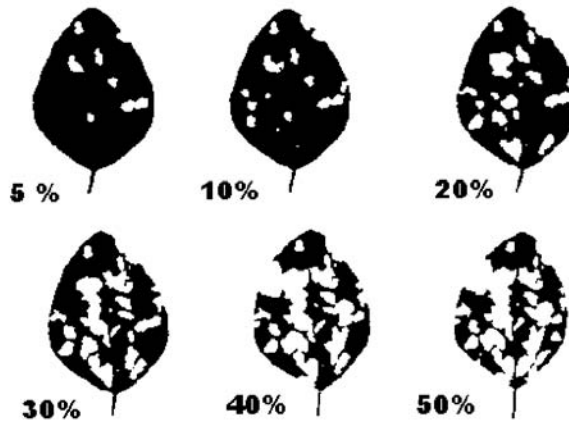
In soybeans, field scouting to assess insect populations is based on either the number of insects per foot of row, insects per plant, or the level of defoliation.

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.

Soybean Defoliation Levels



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, 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.

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
acephate Orthene 97 Pellets		0.75 - 1 lb	PHI = 14 days. Do not graze or cut vines for hay or forage. Do not apply more than 1.5 lbs per acre per season. For rates up to 0.5 lb per acre, at least 3 days must pass between applications. For rates up to 0.5 to 1 lb per acre, at least 7 days must pass between applications.
Bacillus thuringiensis DiPel DF For Organic Production		1 - 2 lb	No preharvest interval. Worker Restricted Entry Interval (REI) is 4 hours. Treat when larvae are young (early instars) before crop is damaged. Larvae must be actively feeding on treated, exposed plant surfaces. Under heavy pest population pressure, use the higher label rates, shorten the spray interval (3-14 days), and /or raise spray volume to improve spray coverage.
beta-cyfluthrin Baythroid XL <i>RUP</i>	0.0125 - 0.022	1.6 - 2.8 fl oz	PHI = 45 days. Maximum of 11.2 fl oz per acre per season. Maximum of 2.8 fl oz per acre between 7-day interval. Minimum application volume is 10 GPA by ground and 2 GPA by air.
bifenthrin Tundra EC <i>RUP</i>	0.033 - 0.10	2.1 - 6.4 fl oz	PHI = 18 days. Do not apply more than 0.3 lb active per acre per season.
bifenthrin + zeta-cypermethrin Hero <i>RUP</i>	0.04 - 0.10	4.0 - 10.3 oz	PHI = 21 days. Do not apply more than 0.4 lb ai per acre per season. Do not make applications less than 30 days apart. Do not graze or harvest treated soybean forage, straw, or hay for livestock feed.
carbaryl Sevin	1 - 1.5	rate varies by formulation	PHI = 21 days or 14 days of grazing or harvest for forage.
chlorpyrifos Chlorpyrifos 4E AG Lorsban 4E Lorsban Advanced Yuma 4E <i>RUP</i>	0.5 - 1	1 - 2 pts (1 - 1.5 pts for Chlorpyrifos 4E AG)	PHI = 28 days. Do not apply more than 6 pints of chlorpyrifos products per acre per season or more than 3 applications per year. Maximum single application rate is 1 lb ai per acre. Do not make a second application within 14 days of first application. Do not allow meat or dairy animals to graze in treated areas or otherwise feed treated soybean foliage, hay, and straw to meat or dairy animals.
chlorpyrifos + gamma-cyhalothrin Cobalt <i>RUP</i>	0.25 - 0.51 + 0.004 - 0.009	13 - 26 fl oz	PHI = 30 days. Do not make more than 3 applications or apply more than 85 fl oz per season. Do not make a second application within 14 days of the first application. Do not allow meat or dairy animals to graze in treated area or feed treated soybean forage, hay, and straw to animals.
cyfluthrin Tombstone Tombstone Helios <i>RUP</i>	0.025 - 0.044	1.6 - 2.8 fl oz	PHI = 45 days. Maximum of 11.2 fl oz per acre per season. Maximum of 2.8 fl oz per acre between 7-day interval. Minimum application volume is 10 GPA by ground and 2 GPA by air.
deltamethrin Delta Gold <i>RUP</i>	0.018 - 0.028	1.5 - 2.4 fl oz	Apply a minimum of 2 GPA of water by air and 5 GPA of water by ground. PHI = 21 days. Avoid application during heat of day. Do not apply more than 8.5 fl oz per acre per season. Do not allow livestock to graze treated forage or feed treated hay to livestock.
diflubenzuron Dimilin 2L <i>RUP</i>	0.062	4 fl oz	PHI = 21 days. Do not make more than 2 applications per season. Apply when larvae are small (<0.5 inches). Use 9 to 35 GPA total volume by ground, 3 to 5 GPA total volume by air.
esfenvalerate Adjourn Asana XL <i>RUP</i>	0.03 - 0.05	5.8 - 9.6 fl oz	PHI = 21 days. Do not feed or graze livestock on treated fields. Do not apply more than 0.2 lb active per acre per season.

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
gamma-cyhalothrin Proaxis <i>RUP</i>	0.0125 - 0.015	3.2 - 3.84 fl oz	PHI = 30 days. Do not graze or harvest treated soybean forage, straw or hay for livestock feed.
indoxacarb Steward EC	0.055 - 0.11	5.6 - 11.3 fl oz	PHI = 21 days. Minimum interval between treatments is 5 days. Do not apply more than 45 fl oz per acre per season. Do not feed or graze livestock on treated fields.
lambda-cyhalothrin Lambda-Cy Silencer Grizzly Z <i>RUP</i>	0.025 - 0.03	3.20 - 3.84 fl oz	PHI = 30 days for Silencer and Warrior. PHI = 45 days for Grizzly Z and Lambda-Cy. Do not allow graze or harvest treated soybean forage, straw or hay for livestock feed. Do not apply more than 0.06 lb ai (7.68 fl oz) per acre per season. Use higher rates for larger larvae. When applying by air, apply in a minimum of 2 gals of water per acre.
lambda-cyhalothrin Kaiso 24 WG <i>RUP</i>	0.025 - 0.03	1.67 - 2.0 oz	PHI = 45 days. See other notes on restrictions above.
lambda-cyhalothrin Warrior II <i>RUP</i>	0.025 - 0.03	1.60 - 1.92 fl oz	PHI = 30 days. Do not apply more than 0.06 lb ai per acre per season.
lambda-cyhalothrin + thiamethoxam Endigo ZC <i>RUP</i>	0.024 - 0.031 + 0.032 - 0.041	3.5 - 4.5 fl oz	PHI = 30 days. Do not apply more than 0.06 lb ai per acre per season of lambda-cyhalothrin containing products, or more than 0.125 lb ai per acre per season of thiamethoxam containing products. Minimum interval between applications = 7 days. Do not use less than 10 GPA for ground application or less than 3 GPA for aerial application. Do not graze or feed treated soybean for forage, straw or hay for livestock feed. Do not apply Endigo ZC within 45 days of planting soybean treated with a neonicotinoid.
methomyl Lannate LV <i>RUP</i>	0.225 - 0.3	0.75 - 1 pt	PHI = 14 days. Do not graze or harvest treated soybean within 3 days for forage, or 12 days for hay. Do not apply more than 1.35 lb ai per acre per season, or make more than 3 applications per crop. REI = 48 hours.
methoxyfenozide Intrepid (IGR)	0.06 - 0.12	4 - 8 fl oz	PHI = 7 days of harvest of hay and forage or within 14 days of harvest of seed. Do not apply more than 64 fl oz per acre per season. Apply at first sign of feeding injury or when infestations reach threshold levels.
spinetoram (microbial) Radiant SC	0.016 - 0.031	2 - 4 fl oz	PHI = 28 days. Do not apply more than 14 fl oz (0.109 lb ai) per acre per year. Do not make more than 4 applications per calendar year. Do not make applications less than 4 days apart.
spinosad (microbial) Tracer	0.047 - 0.062	1.5 - 2 fl oz	PHI = 28 days. Do not feed treated forage or hay to meat or dairy animals.
thiodicarb Larvin brand 3.2 <i>RUP</i>	0.25 - 0.75	10 - 30 fl oz	PHI = 28 days. Do not feed forage, hay or straw to livestock. Do not exceed 0.75 lb AI per acre per application or 3.0 lb AI per acre per season. Do not apply more than 0.75 lb AI per acre in any 7 day period.
zeta-cypermethrin Mustang Max Mustang Max EC <i>RUP</i>	0.020 - 0.025	3.2 - 4 fl oz	PHI = 21 days. Do not graze or harvest treated soybean forage, straw or hay for livestock feed. Do not apply more than 0.15 lb AI per acre per season including at-planting plus foliar applications. Do not make applications less than 7 days apart. Apply by air or by ground using sufficient water to obtain full coverage. Use a minimum of 2 gals per acre by air and 10 gals per acre by ground.

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
zeta-cypermethrin Respect	0.02 0- 0.025	3.2 - 4 fl oz	

RUP

RUP - Restricted use pesticide

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.

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
acephate Orthene 97 Pellets		0.75 - 1 lb	PHI = 14 days. Do not graze or cut vines for hay or forage. Do not apply more than 1.5 lbs per acre per season. For rates up to 0.5 lb per acre, at least 3 days must pass between applications. For rates up to 0.5 to 1 lb per acre, at least 7 days must pass between applications.
beta-cyfluthrin Baythroid XL	0.0125 - 0.022	1.6 - 2.8 fl oz	PHI = 45 days. Maximum of 11.2 fl oz per acre per season. Maximum of 2.8 fl oz per acre between 7-day interval. Minimum application volume is 10 GPA by ground and 2 GPA by air.
<i>RUP</i>			
bifenthrin Tundra EC	0.033 - 0.10	2.1 - 6.4 fl oz	PHI = 18 days. Do not apply more than 0.3 lb active per acre per season.
<i>RUP</i>			
bifenthrin + zeta-cypermethrin Hero	0.025 - 0.06	2.6 - 6.1 oz	PHI = 21 days. Do not apply more than 0.4 lb ai per acre per season. Do not make applications less than 30 days apart. Do not graze or harvest treated soybean forage, straw, or hay for livestock feed.
<i>RUP</i>			
carbaryl Sevin	0.5 - 1.5	rate varies by formulation	PHI = 21 days or 14 days of grazing or harvest for forage.
chlorpyrifos + gamma-cyhalothrin Cobalt	0.37 - 0.74 + 0.007 - 0.013	19 - 38 fl oz	PHI = 30 days. Do not make more than 3 applications or apply more than 85 fl oz per season. Do not make a second application within 14 days of the first application. Do not allow meat or dairy animals to graze in treated area or feed treated soybean forage, hay, and straw to animals.
<i>RUP</i>			
chlorpyrifos Chlorpyrifos 4E Ag Lorsban 4E Lorsban Advanced Yuma 4E	0.5 - 1	1 - 2 pt	PHI = 28 days. Do not apply more than 6 pints of chlorpyrifos products per acre per season or more than 3 applications per year. Maximum single application rate is 1 lb ai per acre. Do not make a second application within 14 days of first application. Do not allow meat or dairy animals to graze in treated areas or otherwise feed treated soybean foliage, hay, and straw to meat or dairy animals.
<i>RUP</i>			
cyfluthrin Tombstone Tombstone Helios	0.025 - 0.044 0.016 - 0.025	1.6 - 2.8 fl oz 1.0 - 1.6 fl oz*	PHI = 45 days. Maximum of 11.2 fl oz per acre per season. Maximum of 2.8 fl oz per acre between 7-day interval. Minimum application volume is 10 GPA by ground and 2 GPA by air. *Reduced rate for soybeans between the growth stages VC - V2 only.
<i>RUP</i>			

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
deltamethrin Delta Gold <i>RUP</i>	0.018 - 0.028	1.5 - 2.4 fl oz	Apply a minimum of 2 GPA of water by air and 5 GPA of water by ground. PHI = 21 days. Avoid application during heat of day. Do not apply more than 8.5 fl oz per acre per season. Do not allow livestock to graze treated forage or feed treated hay to livestock.
dimethoate Digon 400 Dimethoate 400 Dimethoate 2.67 EC	0.5 - 0.67	1 - 1 1/8 pt	PHI = 21 days. Do not feed or graze within 5 days of last application. Do not enter treated fields without protective clothing until sprays have dried.
esfenvalerate Adjourn Asana XL <i>RUP</i>	0.03 - 0.05	5.8 - 9.6 fl oz	PHI = 21 days. Do not feed or graze livestock on treated fields. Do not apply more than 0.2 lb active per acre per season.
gamma-cyhalothrin Proaxis <i>RUP</i>	0.0075 - 0.0125	1.92 - 3.2 fl oz	PHI = 30 days. Do not graze or harvest treated soybean forage, straw or hay for livestock feed.
imidacloprid Attendant 600 Dyna-Shield Imidacloprid 5 Senator 600	refer to recommended label rate	1.6 - 3.2 fl oz per cwt of seed	Apply as a commercial seed treatment only. Do not graze or feed livestock on soybean forage or hay. To suppress the spread of certain viruses by bean leaf beetle (control of overwintering population). Follow all applicable directions, restrictions and precautions on the EPA registered label.
imidacloprid Gaucho 600	refer to recommended label rate	1.6 - 3.2 fl oz per cwt of seed	Apply as an on-farm or commercial seed treatment at planting time. Do not graze or feed livestock on soybean forage or hay. To suppress the spread of certain viruses by bean leaf beetle (control of overwintering population). Follow all applicable directions, restrictions and precautions on the EPA registered label.
imidacloprid Enhance AW	refer to recommended label rate	5 oz per 100 lbs of seed	Apply as an on-farm seed treatment at planting time. Do not graze or feed livestock on soybean forage or hay. Follow all applicable directions, restrictions and precautions on the EPA registered label. For control of overwintering and early season bean leaf beetles.
imidacloprid Latitude	refer to recommended label rate	4 oz per cwt of seed	Apply as an on-farm seed treatment at planting time. Follow all applicable directions, restrictions and precautions on the EPA registered label. For control of overwintering and early season bean leaf beetles.
imidacloprid Mana Alias 4F	0.047	1.5 fl oz	PHI = 7 days. Minimum interval between applications = 7 days. Maximum of 4.5 fl oz per acre (0.14 lb ai per acre) per crop season.
imidacloprid Nuprid 1.6 F	0.047	3.75 fl oz	PHI = 7 days. Minimum interval between applications = 7 days. Maximum of 11.25 fl oz per acre (0.14 lb ai per acre) per crop season.
imidacloprid + cyfluthrin Leverage <i>RUP</i>	0.08	3.8 fl oz	PHI = 45 days for feeding of dry vines. Green forage may be fed 15 days after the last application. Do not apply more than 11.4 fl oz per season. Allow 7 days between applications. May be applied by ground, air, or chemigation.
lambda-cyhalothrin Lambda-Cy Silencer Grizzly Z <i>RUP</i>	0.015 - 0.025	1.92 - 3.2 fl oz	PHI = 30 days for Silencer and Warrior. PHI = 45 days for Grizzly Z and Lambda-Cy. Do not allow graze or harvest treated soybean forage, straw or hay for livestock feed. Do not apply more than 0.06 lb ai (7.68 fl oz) per acre per season. Use higher rates for larger larvae. When applying by air, apply in a minimum of 2 gals of water per acre.
lambda-cyhalothrin Kaiso 24 WG <i>RUP</i>	0.015 - 0.025	1.0 - 1.67 oz	PHI = 45 days. See other notes on restrictions above.
lambda-cyhalothrin Warrior II <i>RUP</i>	0.015 - 0.025	0.96 - 1.60 fl oz	PHI = 30 days. Do not apply more than 0.06 lb ai per acre per season.

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
lambda-cyhalothrin + thiamethoxam Endigo ZC <i>RUP</i>	0.024 - 0.031 + 0.032 - 0.041	3.5 - 4.5 fl oz	PHI = 30 days. Do not apply more than 0.06 lb ai per acre per season of lambda-cyhalothrin containing products, or more than 0.125 lb ai per acre per season of thiamethoxam containing products. Minimum interval between applications = 7 days. Do not use less than 10 GPA for ground application or less than 3 GPA for aerial application. Do not graze or feed treated soybean for forage, straw or hay for livestock feed. Do not apply Endigo ZC within 45 days of planting soybean treated with a neonicotinoid.
methomyl Lannate LV <i>RUP</i>	0.23 - 0.45	0.75 - 1.5 pts	PHI = 14 days. Do not graze or harvest treated soybean within 3 days for forage, or 12 days for hay. Do not apply more than 1.35 lb ai per acre per season, or make more than 3 applications per crop. REI = 48 hours.
methyl parathion PennCap-M <i>RUP</i>	0.5 - 0.75	2 - 3 pts.	PHI = 20 days of harvest or grazing. Do not apply more than twice per season. Do not enter treated fields within 48 hours after application.
permethrin Pounce 3.2 EC Arctic 3.2E Ambush Permethrin 3.2 EC Perm-Up 25 WP Perm-Up 3.2 EC <i>RUP</i>	0.05 to 0.1	2 - 4 fl oz 2 - 4 fl oz 3.2 - 6.4 fl oz 2 - 4 fl oz 3.2 - 6.4 fl oz 2 - 4 fl oz	PHI = 60 days. Do not apply more than 0.4 pounds ai per acre per season. Do not graze or feed soybean forage or hay. For Pounce, apply a minimum of 1 gal of finished spray per acre by air or 5 gals by ground. For Ambush, apply a minimum of 2 gals of finished spray/a by air or 10 gals by ground.
thiodicarb Larvin brand 3.2 <i>RUP</i>	0.45 - 0.75	18 - 30 fl oz	PHI = 28 days. Do not feed forage, hay or straw to livestock. Do not exceed 0.75 lb AI per acre per application or 3.0 lb AI per acre per season. Do not apply more than 0.75 lb AI per acre in any 7 day period.
zeta-cypermethrin Mustang Max Mustang Max EC Respect <i>RUP</i>	0.0175 - 0.025	2.8 - 4 fl oz	PHI = 21 days. Do not graze or harvest treated soybean forage, straw or hay for livestock feed. Do not apply more than 0.15 lb AI per acre per season including at-planting plus foliar applications. Do not make applications less than 7 days apart. Apply by air or by ground using sufficient water to obtain full coverage. Use a minimum of 2 gals per acre by air and 10 gals per acre by ground.

RUP - Restricted use pesticide

CUTWORMS

Several cutworm species affect regional crops. The dingy cutworm, *Feltia jaculifera*, overwinters as a partially grown larva and is one of the first cutworm species to cause problems during crop emergence from early to mid-May. The moth of the dingy cutworm is known to lay her eggs on sunflower heads from mid-July through September. 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.

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
beta-cyfluthrin Baythroid XL <i>RUP</i>	0.0065 - 0.0125	0.8 - 1.6 fl oz	PHI = 45 days. Maximum of 11.2 fl oz per acre per season. Maximum of 2.8 fl oz per acre between 7-day interval. Minimum application volume is 10 GPA by ground and 2 GPA by air.
bifenthrin Tundra EC <i>RUP</i>	0.033 - 0.10	2.1 - 6.4 fl oz	PHI = 18 days. Do not apply more than 0.3 lb active per acre per season.
bifenthrin + zeta-cypermethrin Hero <i>RUP</i>	0.025 - 0.06	2.6 - 6.1 oz	PHI = 21 days. Do not apply more than 0.4 lb ai per acre per season. Do not make applications less than 30 days apart. Do not graze or harvest treated soybean forage, straw, or hay for livestock feed.
carbaryl Sevin	1 - 1.5	rate varies by formulation	PHI = 21 days of harvest or 14 days of grazing or harvest for forage. For cutworm control, this product is effective against species which feed on the upper portions of the plants.
chlorpyrifos Chlorpyrifos 4E AG Lorsban 4E Lorsban Advanced Yuma 4E <i>RUP</i>	0.5 - 1	1 - 2 pts	PHI = 28 days. Do not apply more than 6 pints of chlorpyrifos products per acre per season or more than 3 applications per year. Maximum single application rate is 1 lb ai per acre. Do not make a second application within 14 days of first application. Do not allow meat or dairy animals to graze in treated areas or otherwise feed treated soybean foliage, hay, and straw to meat or dairy animals.
chlorpyrifos + gamma-cyhalothrin Cobalt <i>RUP</i>	0.37 - 0.74 + 0.007 - 0.013	19 - 38 fl oz	PHI = 30 days. Do not make more than 3 applications or apply more than 85 fl oz per season. Do not make a second application within 14 days of the first application. Do not allow meat or dairy animals to graze in treated area or feed treated soybean forage, hay, and straw to animals.
cyfluthrin Tombstone Tombstone Helios <i>RUP</i>	0.013 - 0.025	0.8 - 1.6 fl oz	PHI = 45 days. Maximum of 11.2 fl oz per acre per season. Maximum of 2.8 fl oz per acre between 7-day interval. Minimum application volume is 10 GPA by ground and 2 GPA by air.
deltamethrin Delta Gold <i>RUP</i>	0.012 - 0.018	1.0 - 1.5 fl oz	Apply a minimum of 2 GPA of water by air and 5 GPA of water by ground. PHI = 21 days. Avoid application during heat of day. Do not apply more than 8.5 fl oz per acre per season. Do not allow livestock to graze treated forage or feed treated hay to livestock.
esfenvalerate Adjourn Asana XL <i>RUP</i>	0.03 - 0.05	5.8 - 9.6 fl oz	PHI = 21 days. Do not feed or graze livestock on treated fields. Do not apply more than 0.2 lb active per acre per season.
gamma-cyhalothrin Proaxis <i>RUP</i>	0.0075 - 0.0125	1.92 - 3.2 fl oz	PHI = 30 days. Do not graze or harvest treated soybean forage, straw or hay for livestock feed.
lambda-cyhalothrin Lambda-Cy Silencer Grizzly Z <i>RUP</i>	0.015 - 0.025	1.92 - 3.2 fl oz	PHI = 30 days for Silencer and Warrior. PHI = 45 days for Grizzly Z and Lambda-Cy. Do not allow graze or harvest treated soybean forage, straw or hay for livestock feed. Do not apply more than 0.06 lb ai (7.68 fl oz) per acre per season. Use higher rates for larger larvae. When applying by air, apply in a minimum of 2 gals of water per acre.
lambda-cyhalothrin Kaiso 24 WG <i>RUP</i>	0.015 - 0.025	1.0 - 1.67 oz	PHI = 45 days. See other notes on restrictions above.
lambda-cyhalothrin Warrior II <i>RUP</i>	0.015 - 0.025	0.96 - 1.60 fl oz	PHI = 30 days. Do not apply more than 0.06 lb ai per acre per season.

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
lambda-cyhalothrin + thiamethoxam Endigo ZC <i>RUP</i>	0.017 - 0.024 + 0.023 - 0.032	2.5 - 3.5 fl oz	PHI = 30 days. Do not apply more than 0.06 lb ai per acre per season of lambda-cyhalothrin containing products, or more than 0.125 lb ai per acre per season of thiamethoxam containing products. Minimum interval between applications = 7 days. Do not use less than 10 GPA for ground application or less than 3 GPA for aerial application. Do not graze or feed treated soybean for forage, straw or hay for livestock feed. Do not apply Endigo ZC within 45 days of planting soybean treated with a neonicotinoid.
permethrin Pounce 3.2 EC Arctic 3.2E Ambush Permethrin 3.2 EC Perm-Up 25 WP Perm-Up 3.2 EC <i>RUP</i>	0.05 to 0.1	2 - 4 fl oz 2 - 4 fl oz 3.2 - 6.4 fl oz 2 - 4 fl oz 3.2 - 6.4 fl oz 2 - 4 fl oz	PHI = 60 days. Do not apply more than 0.4 pounds ai per acre per season. Do not graze or feed soybean forage or hay. For Pounce, apply a minimum of 1 gal of finished spray per acre by air or 5 gals by ground. For Ambush, apply a minimum of 2 gals of finished spray/a by air or 10 gals by ground.
thiodicarb Larvin brand 3.2 <i>RUP</i>	0.5 - 0.75	20 - 30 fl oz	PHI = 28 days. Do not feed forage, hay or straw to livestock. Do not exceed 0.75 lb AI per acre per application or 3.0 lb AI per acre per season. Do not apply more than 0.75 lb AI per acre in any 7 day period.
zeta-cypermethrin Mustang Max Mustang Max EC Respect <i>RUP</i>	0.008 - 0.025	1.28 - 4 fl oz	PHI = 21 days. Do not graze or harvest treated soybean forage, straw or hay for livestock feed. Do not apply more than 0.15 lb AI per acre per season including at-planting plus foliar applications. Do not make applications less than 7 days apart. Apply by air or by ground using sufficient water to obtain full coverage. Use a minimum of 2 gals per acre by air and 10 gals per acre by ground.

RUP - Restricted use pesticide

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 cloverworm.

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.

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
acephate Orthene 97 Pellets		0.75 - 1 lb	PHI = 14 days. Do not graze or cut vines for hay or forage. Do not apply more than 1.5 lbs per acre per season. For rates up to 0.5 lb per acre, at least 3 days must pass between applications. For rates up to 0.5 to 1 lb per acre, at least 7 days must pass between applications.
Bacillus thuringiensis DiPel DF For Organic Production		0.5 - 1 lb	No preharvest interval. Worker Restricted Entry Interval (REI) is 4 hours. Treat when larvae are young (early instars) before crop is damaged. Larvae must be actively feeding on treated, exposed plant surfaces. Under heavy pest population pressure, use the higher label rates, shorten the spray interval (3-14 days), and /or raise spray volume to improve spray coverage.
beta-cyfluthrin Baythroid XL <i>RUP</i>	0.0125 - 0.022	1.6 - 2.8 fl oz	PHI = 45 days. Maximum of 11.2 fl oz per acre per season. Maximum of 2.8 fl oz per acre between 7-day interval. Minimum application volume is 10 GPA by ground and 2 GPA by air.
bifenthrin Tundra EC <i>RUP</i>	0.033 - 0.10	2.1 - 6.4 fl oz	PHI = 18 days. Do not apply more than 0.3 lb active per acre per season.
bifenthrin + zeta-cypermethrin Hero <i>RUP</i>	0.025 - 0.06	2.6 - 6.1 oz	PHI = 21 days. Do not apply more than 0.4 lb ai per acre per season. Do not make applications less than 30 days apart. Do not graze or harvest treated soybean forage, straw, or hay for livestock feed.
carbaryl Sevin	0.5 to 1.5	rate varies by formulation	PHI = 21 days or 14 days of grazing or harvest for forage.
chlorpyrifos Chlorpyrifos 4E AG Lorsban 4E Lorsban Advanced Yuma 4E <i>RUP</i>	0.25 - 0.5	0.5 - 1 pt	PHI = 28 days. Do not apply more than 6 pints of chlorpyrifos products per acre per season or more than 3 applications per year. Maximum single application rate is 1 lb ai per acre. Do not make a second application within 14 days of first application. Do not allow meat or dairy animals to graze in treated areas or otherwise feed treated soybean foliage, hay, and straw to meat or dairy animals.
chlorpyrifos + gamma-cyhalothrin Cobalt <i>RUP</i>	0.25 - 0.51 + 0.004 - 0.009	13 - 26 fl oz	PHI = 30 days. Do not make more than 3 applications or apply more than 85 fl oz per season. Do not make a second application within 14 days of the first application. Do not allow meat or dairy animals to graze in treated area or feed treated soybean forage, hay, and straw to animals.
cyfluthrin Tombstone Tombstone Helios <i>RUP</i>	0.025 - 0.044	1.6 - 2.8 fl oz	PHI = 45 days. Maximum of 11.2 fl oz per acre per season. Maximum of 2.8 fl oz per acre between 7-day interval. Minimum application volume is 10 GPA by ground and 2 GPA by air.
deltamethrin Delta Gold <i>RUP</i>	0.012 - 0.018 (0.018 - 0.028 for cabbage looper)	1.0 - 1.5 fl oz (1.5 - 2.4 fl oz for cabbage looper)	Apply a minimum of 2 GPA of water by air and 5 GPA of water by ground. PHI = 21 days. Avoid application during heat of day. Do not apply more than 8.5 fl oz per acre per season. Do not allow livestock to graze treated forage or feed treated hay to livestock.
dimethoate Digon 400 Dimethoate 400 Dimethoate 2.67 EC	0.5 - 0.67	1 - 1 1/3 pt	PHI = 21 days. Do not feed or graze within 5 days of last application. Do not enter treated fields without protective clothing until sprays have dried.

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
esfenvalerate Adjourn Asana XL <i>RUP</i>	0.015 to 0.03	2.9 to 5.8 fl oz	PHI = 21 days. Do not feed or graze livestock on treated fields. Do not apply more than 0.2 lb active per acre per season.
diflubenzuron Dimilin 2L <i>RUP</i>	0.031 - 0.062	2 - 4 fl oz	PHI = 21 days. Do not make more than 2 applications per season. Allow 30 days between application intervals. Apply when larvae are small (<0.5 inches). Use 9 to 35 GPA total volume by ground, 3 to 5 GPA total volume by air.
gamma-cyhalothrin Proaxis <i>RUP</i>	0.0125 - 0.015	3.2 - 3.84 fl oz	PHI = 30 days. Do not graze or harvest treated soybean forage, straw or hay for livestock feed.
imidacloprid + cyfluthrin Leverage <i>RUP</i>	0.08	3.8	PHI = 45 days for feeding of dry vines. Green forage may be fed 15 days after the last application. Do not apply more than 11.4 fl oz per season. Allow 7 days between applications. May be applied by ground, air, or chemigation.
indoxacarb Steward EC	0.055 - 0.11	5.6 - 11.3 fl oz	PHI = 21 days. Minimum interval between treatments is 5 days. Do not apply more than 45 fl oz per acre per season. Do not feed or graze livestock on treated fields.
lambda-cyhalothrin Lambda-Cy Silencer Grizzly Z <i>RUP</i>	0.015 - 0.025	1.92 - 3.2 fl oz	PHI = 30 days for Silencer and Warrior. PHI = 45 days for Grizzly Z and Lambda-Cy. Do not allow graze or harvest treated soybean forage, straw or hay for livestock feed. Do not apply more than 0.06 lb ai per acre per season. Use higher rates for larger larvae. When applying by air, apply in a minimum of 2 gals of water per acre.
lambda-cyhalothrin Kaiso 24 WG <i>RUP</i>	0.015 - 0.025	1.0 - 1.67 oz	PHI = 45 days. See other notes on restrictions above.
lambda-cyhalothrin Warrior II <i>RUP</i>	0.015 - 0.025	0.96 - 1.60 fl oz	PHI = 30 days. Do not apply more than 0.06 lb ai per acre per season.
lambda-cyhalothrin + thiamethoxam Endigo ZC <i>RUP</i>	0.017 - 0.024 + 0.023 - 0.032	2.5 - 3.5 fl oz	PHI = 30 days. Do not apply more than 0.06 lb ai per acre per season of lambda-cyhalothrin containing products, or more than 0.125 lb ai per acre per season of thiamethoxam containing products. Minimum interval between applications = 7 days. Do not use less than 10 GPA for ground application or less than 3 GPA for aerial application. Do not graze or feed treated soybean for forage, straw or hay for livestock feed. Do not apply Endigo ZC within 45 days of planting soybean treated with a neonicotinoid.
methomyl Lannate LV <i>RUP</i>	0.11 to 0.45	0.4 to 1.5 pts	PHI = 14 days. Do not graze or harvest treated soybean within 3 days for forage, or 12 days for hay. Do not apply more than 1.35 lb ai per acre per season, or make more than 3 applications per crop. REI = 48 hours.
methoxyfenozide Intrepid	0.06 - 0.12	4 - 8 fl oz	PHI = 7 days of harvest of hay and forage or within 14 days of harvest of seed. Do not apply more than 64 fl oz per acre per season. Apply at first sign of feeding injury or when infestations reach threshold levels.
methyl parathion PennCap-M <i>RUP</i>	0.5	2 pts.	PHI = 20 days of harvest or grazing. Do not apply more than twice per season. Do not enter treated fields within 48 hours after application.

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
permethrin Pounce 3.2 EC Arctic 3.2E Ambush Permethrin 3.2 EC Perm-Up 25 WP Perm-Up 3.2 EC <i>RUP</i>	0.05 to 0.1	2 - 4 fl oz 2 - 4 fl oz 3.2 - 6.4 fl oz 2 - 4 fl oz 3.2 - 6.4 fl oz 2 - 4 fl oz	PHI = 60 days. Do not apply more than 0.4 pounds ai per acre per season. Do not graze or feed soybean forage or hay. For Pounce, apply a minimum of 1 gal of finished spray per acre by air or 5 gals by ground. For Ambush, apply a minimum of 2 gals of finished spray/a by air or 10 gals by ground.
spinetoram (microbial) Radiant SC	0.016 - 0.031	2 - 4 fl oz	PHI = 28 days. Do not apply more than 14 fl oz (0.109 lb ai) per acre per year. Do not make more than 4 applications per calendar year. Do not make applications less than 4 days apart.
spinosad (microbial) Tracer	0.031 - 0.062	1 - 2 fl oz	PHI = 28 days. Do not feed treated forage or hay to meat or dairy animals.
thiodicarb Larvin brand 3.2 <i>RUP</i>	0.25 - 0.75	10 - 30 fl oz	PHI = 28 days. Do not feed forage, hay or straw to livestock. Do not exceed 0.75 lb AI per acre per application or 3.0 lb AI per acre per season. Do not apply more than 0.75 lb AI per acre in any 7 day period.
zeta-cypermethrin Mustang Max Mustang Max EC Respect <i>RUP</i>	0.0175 - 0.025	2.8 - 4 fl oz	PHI = 21 days. Do not graze or harvest treated soybean forage, straw or hay for livestock feed. Do not apply more than 0.15 lb AI per acre per season including at-planting plus foliar applications. Do not make applications less than 7 days apart. Apply by air or by ground using sufficient water to obtain full coverage. Use a minimum of 2 gals per acre by air and 10 gals per acre by ground.

RUP - Restricted use pesticide

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.

Rating	Nymphs (young hoppers) per square yard		Adults per square yard	
	Margin	Field	Margin	Field
Light	25-35	15-23	10-20	3-7
Threatening	50-75	30-45	21-40	8-14
Severe	100-150	60-90	41-80	15-28
Very Severe	200+	120	80+	28+

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.

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
acephate Orthene 97 Pellets		0.25 - 0.5 lb	PHI = 14 days. Do not graze or cut vines for hay or forage. Do not apply more than 1.5 lbs per acre per season. For rates up to 0.5 lb per acre, at least 3 days must pass between applications. For rates up to 0.5 to 1 lb per acre, at least 7 days must pass between applications.
beta-cyfluthrin Baythroid XL <i>RUP</i>	0.0155 - 0.022	2.0 - 2.8 fl oz	PHI = 45 days. Maximum of 11.2 fl oz per acre per season. Maximum of 2.8 fl oz per acre between 7-day interval. Minimum application volume is 10 GPA by ground and 2 GPA by air.
bifenthrin Tundra EC <i>RUP</i>	0.033 - 0.10	2.1 - 6.4 fl oz	PHI = 18 days. Do not apply more than 0.3 lb active per acre per season.
bifenthrin + zeta-cypermethrin Hero <i>RUP</i>	0.025 - 0.06	2.6 - 6.1 oz	PHI = 21 days. Do not apply more than 0.4 lb ai per acre per season. Do not make applications less than 30 days apart. Do not graze or harvest treated soybean forage, straw, or hay for livestock feed.
carbaryl Sevin	1 - 1.5	rate varies by formulation	PHI = 21 days or 14 days of grazing or harvest for forage. Recommended use rates vary according the age of the grasshoppers.
chlorpyrifos Chlorpyrifos 4E AG Lorsban 4E Lorsban Advanced Yuma 4E <i>RUP</i>	0.25 - 0.5	0.5 - 1 pt	Low rate effective on 1st and 2nd instar nymphs. PHI = 28 days. Do not apply more than 6 pints of chlorpyrifos products per acre per season or more than 3 applications per year. Maximum single application rate is 1 lb ai per acre. Do not make a second application within 14 days of first application. Do not allow meat or dairy animals to graze in treated areas or otherwise feed treated soybean foliage, hay, and straw to meat or dairy animals.
Chlorpyrifos + gamma-cyhalothrin Cobalt <i>RUP</i>	0.14 - 0.25 + 0.003 - 0.004	7 - 13 fl oz	PHI = 30 days. Do not make more than 3 applications or apply more than 85 fl oz per season. Do not make a second application within 14 days of the first application. Do not allow meat or dairy animals to graze in treated area or feed treated soybean forage, hay, and straw to animals.
cyfluthrin Tombstone Tombstone Helios <i>RUP</i>	0.031 - 0.044	2.0 - 2.8 fl oz	PHI = 45 days. Maximum of 11.2 fl oz per acre per season. Maximum of 2.8 fl oz per acre between 7-day interval. Minimum application volume is 10 GPA by ground and 2 GPA by air.
deltamethrin Delta Gold <i>RUP</i>	0.018 - 0.028	1.5 - 2.4 fl oz	Apply a minimum of 2 GPA of water by air and 5 GPA of water by ground. PHI = 21 days. Avoid application during heat of day. Do not apply more than 8.5 fl oz per acre per season. Do not allow livestock to graze treated forage or feed treated hay to livestock.
diflubenzuron Dimilin 2L <i>RUP</i>	0.031	2 fl oz	PHI = 21 days. Do not make more than 2 applications per season. Allow 30 days between application intervals. For best results, apply when grasshoppers reach the 2 nd to 3 rd nymphal stage of development (not effective on adult grasshoppers). Use 9 to 35 GPA total volume by ground, 3 to 5 GPA total volume by air.
dimethoate Digon 400 Dimethoate 400 Dimethoate 2.67 EC	0.5 - 0.67	1 - 1 1/3 pt	PHI = 21 days. Do not feed or graze within 5 days of last application. Do not enter treated fields without protective clothing until sprays have dried.

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
esfenvalerate Adjourn <i>RUP</i>	0.03 - 0.05	5.8 - 9.6 fl oz	PHI = 21 days. Do not feed or graze livestock on treated fields. Do not apply more than 0.2 lb active per acre per season.
esfenvalerate Asana XL <i>RUP</i>	0.02 - 0.03	Low Rate: 3.9 - 5.8 fl oz	PHI = 21 days. A reduced rate has been issued as a state 2 (ee) label. These lower rates are for control of first- and second-stage grasshoppers, ONLY . The reduced-rate application has a range of 3.9 - 5.8 fl oz. The higher rates are for control of grasshopper nymphs larger than 2 nd instar. Do not apply more than 0.2 lb ai/acre per season. Do not feed or graze livestock on treated fields. Apply with a minimum of 2 GPA for air and 10 GPA for ground applications.
	0.03 - 0.05	High Rate: 5.8-9.6 fl oz	
gamma-cyhalothrin Proaxis <i>RUP</i>	0.0125 - 0.015	3.2 - 3.84 fl oz	PHI = 30 days. Do not graze or harvest treated soybean forage, straw or hay for livestock feed.
imidacloprid + cyfluthrin Leverage <i>RUP</i>	0.08	3.8	PHI = 45 days for feeding of dry vines. Green forage may be fed 15 days after the last application. Do not apply more than 11.4 fl oz per season. Allow 7 days between applications. May be applied by ground, air, or chemigation.
lambda-cyhalothrin Lambda-Cy Silencer Grizzly Z <i>RUP</i>	0.025 - 0.03	3.2 - 3.84 fl oz	PHI = 30 days for Silencer and Warrior. PHI = 45 days for Grizzly Z and Lambda-Cy. Do not allow graze or harvest treated soybean forage, straw or hay for livestock feed. Do not apply more than 0.06 lb ai per acre per season. Use higher rates for larger larvae. When applying by air, apply in a <u>minimum of 2 gals of water per acre.</u>
lambda-cyhalothrin Kaiso 24 WG <i>RUP</i>	0.0.25 - 0.03	1.67 - 2.0 oz	PHI = 45 days. See other notes on restrictions above.
lambda-cyhalothrin Warrior II <i>RUP</i>	0.025 - 0.03	1.60 - 1.92 fl oz	PHI = 30 days. Do not apply more than 0.06 lb ai per acre per season.
lambda-cyhalothrin + thiamethoxam Endigo ZC <i>RUP</i>	0.024 - 0.031 + 0.032 - 0.041	3.5 - 4.5 fl oz	PHI = 30 days. Do not apply more than 0.06 lb ai per acre per season of lambda-cyhalothrin containing products, or more than 0.125 lb ai per acre per season of thiamethoxam containing products. Minimum interval between applications = 7 days. Do not use less than 10 GPA for ground application or less than 3 GPA for aerial application. Do not graze or feed treated soybean for forage, straw or hay for livestock feed. Do not apply Endigo ZC within 45 days of planting soybean treated with a neonicotinoid.
methyl parathion PennCap-M <i>RUP</i>	0.5 - 0.75	2 - 3 pts	PHI = 20 days of harvest or grazing. Do not apply more than twice per season. Do not enter treated fields within 48 hours after application. Fields must be posted.
zeta-cypermethrin Mustang Max Mustang Max EC Respect <i>RUP</i>	0.02 - 0.025	3.2 - 4 fl oz	PHI = 21 days. Do not graze or harvest treated soybean forage, straw or hay for livestock feed. Do not apply more than 0.15 lb AI per acre per season including at-planting plus foliar applications. Do not make applications less than 7 days apart. Apply by air or by ground using sufficient water to obtain full coverage. Use a minimum of 2 gals per acre by air and 10 gals per acre by ground.

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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.

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
acephate Orthene 97 Pellets		0.5 - 1 lb	PHI = 14 days. Do not graze or cut vines for hay or forage. Do not apply more than 1.5 lbs per acre per season. For rates up to 0.5 lb per acre, at least 3 days must pass between applications. For rates up to 0.5 to 1 lb per acre, at least 7 days must pass between applications.
beta-cyfluthrin Baythroid XL <i>RUP</i>	0.0065 - 0.0125	0.8 - 1.6 fl oz	PHI = 45 days. Maximum of 11.2 fl oz per acre per season. Maximum of 2.8 fl oz per acre between 7-day interval. Minimum application volume is 10 GPA by ground and 2 GPA by air.
bifenthrin Tundra EC <i>RUP</i>	0.033 - 0.10	2.1 - 6.4 fl oz	PHI = 18 days. Do not apply more than 0.3 lb active per acre per season.
bifenthrin + zeta-cypermethrin Hero <i>RUP</i>	0.04 - 0.10	4.0 - 10.3 oz	PHI = 21 days. Do not apply more than 0.4 lb ai per acre per season. Do not make applications less than 30 days apart. Do not graze or harvest treated soybean forage, straw, or hay for livestock feed.
carbaryl Sevin	1	rate varies by formulation	PHI = 21 days or 14 days of grazing or harvest for forage.
chlorpyrifos Lorsban Advanced <i>RUP</i>	0.5 - 1	1 -2 pt	PHI = 28 days. Do not apply more than 6 pints of chlorpyrifos products per acre per season or more than 3 applications per year. Maximum single application rate is 1 lb ai per acre. Do not make a second application within 14 days of first application. Do not allow meat or dairy animals to graze in treated areas or otherwise feed treated soybean foliage, hay, and straw to meat or dairy animals.
Chlorpyrifos + gamma-cyhalothrin Cobalt <i>RUP</i>	0.37 - 0.74 + 0.007 - 0.013	19 - 38 fl oz	PHI = 30 days. Do not make more than 3 applications or apply more than 85 fl oz per season. Do not make a second application within 14 days of the first application. Do not allow meat or dairy animals to graze in treated area or feed treated soybean forage, hay, and straw to animals.
cyfluthrin Tombstone Tombstone Helios <i>RUP</i>	0.013 - 0.025	0.8 - 1.6 fl oz	PHI = 45 days. Maximum of 11.2 fl oz per acre per season. Maximum of 2.8 fl oz per acre between 7-day interval. Minimum application volume is 10 GPA by ground and 2 GPA by air.
deltamethrin Delta Gold <i>RUP</i>	0.012 - 0.018	1.0 - 1.5 fl oz	Apply a minimum of 2 GPA of water by air and 5 GPA of water by ground. PHI = 21 days. Avoid application during heat of day. Do not apply more than 8.5 fl oz per acre per season. Do not allow livestock to graze treated forage or feed treated hay to livestock.

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
dimethoate Digon 400 Dimethoate 400 Dimethoate 2.67 EC	0.5 - 0.67	1 - 1 ½ pt	PHI = 21 days. Do not feed or graze within 5 days of last application. Do not enter treated fields without protective clothing until sprays have dried.
esfenvalerate Adjourn Asana XL <i>RUP</i>	0.015 to 0.03	2.9 to 5.8 fl oz	PHI = 21 days. Do not feed or graze livestock on treated fields. Do not apply more than 0.2 lb active per acre per season.
imidacloprid Mana Alias 4F	0.047	1.5 fl oz	PHI = 7 days. Minimum interval between applications = 7 days. Maximum of 4.5 fl oz per acre (0.14 lb ai per acre) per crop season.
imidacloprid Nuprid 1.6 F	0.047	3.75 fl oz	PHI = 7 days. Minimum interval between applications = 7 days. Maximum of 11.25 fl oz per acre (0.14 lb ai per acre) per crop season.
imidacloprid + cyfluthrin Leverage <i>RUP</i>	0.06 - 0.08	3.0 - 3.8	PHI = 45 days for feeding of dry vines. Green forage may be fed 15 days after the last application. Do not apply more than 11.4 fl oz per season. Allow 7 days between applications. May be applied by ground, air, or chemigation.
gamma-cyhalothrin Proaxis <i>RUP</i>	0.0075 - 0.0125	1.92 - 3.2 fl oz	PHI = 30 days. Do not graze or harvest treated soybean forage, straw or hay for livestock feed.
lambda-cyhalothrin Lambda-Cy Silencer Grizzly Z <i>RUP</i>	0.015 - 0.025	1.92 - 3.2 fl oz	PHI = 30 days for Silencer and Warrior. PHI = 45 days for Grizzly Z and Lambda-Cy. Do not allow graze or harvest treated soybean forage, straw or hay for livestock feed. Do not apply more than 0.06 lb ai (7.68 fl oz) per acre per season. Use higher rates for larger larvae. When applying by air, apply in a minimum of 2 gals of water per acre.
lambda-cyhalothrin Kaiso 24 WG <i>RUP</i>	0.015 - 0.025	1.0 - 1.67 oz	PHI = 45 days. See other notes on restrictions above.
lambda-cyhalothrin Warrior II <i>RUP</i>	0.015 - 0.25	0.96 - 1.60 fl oz	PHI = 30 days. Do not apply more than 0.06 lb ai per acre per season.
lambda-cyhalothrin + thiamethoxam Endigo ZC <i>RUP</i>	0.017 - 0.024 + 0.023 - 0.032	2.5 - 3.5 fl oz	PHI = 30 days. Do not apply more than 0.06 lb ai per acre per season of lambda-cyhalothrin containing products, or more than 0.125 lb ai per acre per season of thiamethoxam containing products. Minimum interval between applications = 7 days. Do not use less than 10 GPA for ground application or less than 3 GPA for aerial application. Do not graze or feed treated soybean for forage, straw or hay for livestock feed. Do not apply Endigo ZC within 45 days of planting soybean treated with a neonicotinoid.
methyl parathion PennCap-M <i>RUP</i>	0.5 - 0.75	2 - 3 pts.	PHI = 20 days of harvest or grazing. Do not apply more than twice per season. Do not enter treated fields within 48 hours after application.
permethrin Pounce 3.2 EC Arctic 3.2E Ambush Permethrin 3.2 EC Perm-Up 25 WP Perm-Up 3.2 EC <i>RUP</i>	0.05 to 0.1	2 - 4 fl oz 2 - 4 fl oz 3.2 - 6.4 fl oz 2 - 4 fl oz 3.2 - 6.4 fl oz 2 - 4 fl oz	PHI = 60 days. Do not apply more than 0.4 pounds ai per acre per season. Do not graze or feed soybean forage or hay. For Pounce, apply a minimum of 1 gal of finished spray per acre by air or 5 gals by ground. For Ambush, apply a minimum of 2 gals of finished spray/a by air or 10 gals by ground.

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
zeta-cypermethrin Mustang Max Mustang Max EC Respect <i>RUP</i>	0.0175 - 0.025	2.8 - 4 fl oz	PHI = 21 days. Do not graze or harvest treated soybean forage, straw or hay for livestock feed. Do not apply more than 0.15 lb AI per acre per season including at-planting plus foliar applications. Do not make applications less than 7 days apart. Apply by air or by ground using sufficient water to obtain full coverage. Use a minimum of 2 gals per acre by air and 10 gals per acre by ground.

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SEED CORN MAGGOT

Seedcorn maggot attack 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.

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
imidacloprid Attendant 600 Dyna-Shield Imidacloprid 5 Senator 600	refer to recommended label rate	1.6 - 3.2 fl oz per cwt of seed	Apply as a commercial seed treatment only. Do not graze or feed livestock on soybean forage or hay. Follow all applicable directions, restrictions and precautions on the EPA registered label.
imidacloprid Enhance AW	refer to recommended label rate	5 oz per cwt of seed	Apply as an on-farm seed treatment at planting time. Do not graze or feed livestock on soybean forage or hay. Follow all applicable directions, restrictions and precautions on the EPA registered label.
imidacloprid Latitude	refer to recommended label rate	4 oz per cwt of seed	Apply as an on-farm seed treatment at planting time. Follow all applicable directions, restrictions and precautions on the EPA registered label.
permethrin	see specific labels for rates		Products currently available are: Assault 25®. Treated seed must not be used for, or mixed with, food or animal feed, or processed for oil.
thiamethoxam Cruiser 5FS	refer to recommended label rate	1.28 fl oz per cwt of seed	Use as a seed treatment only. May be applied through either open or closed systems. Do not apply a neonicotinoid insecticide within 45 days of planting soybean seed treated with Cruiser 5FS. Follow all applicable directions, restrictions and precautions on the EPA registered label.

SOYBEAN APHID

A new aphid pest feeding on soybeans was found in the Midwestern states of Michigan, Illinois, Wisconsin, Iowa, and Minnesota in late July and early August 2000. It was confirmed that this aphid was the **soybean aphid**, *Aphis glycines*, an aphid native to Asia but never reported in the United States prior to this discovery. Soybean aphid was found in North Dakota in August 2001. The aphid is generally established in the eastern half of the state, but there are still many questions about the population levels surviving through the winter.

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. Future observations will lead to a better understanding of what soybean aphid will do in the United States.

Threshold:

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 stage for making most soybean aphid treatment decisions appears 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 Thresholds** are based on the following growth stages:
 - R1 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 beyond stages.

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
acephate Orthene 97 Pellets		0.75 - 1 lb	PHI = 14 days. Do not graze or cut vines for hay or forage. Do not apply more than 1.5 lbs per acre per season. For rates up to 0.5 lb per acre, at least 3 days must pass between applications. For rates up to 0.5 to 1 lb per acre, at least 7 days must pass between applications.
beta-cyfluthrin Baythroid XL <i>RUP</i>	0.0065 - 0.0125	2.0 - 2.8 fl oz	PHI = 45 days. Maximum of 11.2 fl oz per acre per season. Maximum of 2.8 fl oz per acre between 7-day interval. Minimum application volume is 10 GPA by ground and 2 GPA by air.
bifenthrin Tundra EC <i>RUP</i>	0.033 - 0.10	2.1 - 6.4 fl oz	PHI = 18 days. Do not apply more than 0.3 lb active per acre per season.
bifenthrin + zeta-cypermethrin Hero <i>RUP</i>	0.04 - 0.10	4.0 - 10.3 oz	PHI = 21 days. Do not apply more than 0.4 lb ai per acre per season. Do not make applications less than 30 days apart. Do not graze or harvest treated soybean forage, straw, or hay for livestock feed.
chlorpyrifos Chlorpyrifos 4E AG Lorsban 4E Lorsban Advanced Yuma 4E <i>RUP</i>	0.5 - 1	1 - 2 pt	PHI = 28 days. Do not apply more than 6 pints of chlorpyrifos products per acre per season or more than 3 applications per year. Maximum single application rate is 1 lb ai per acre. Do not make a second application within 14 days of first application. Do not allow meat or dairy animals to graze in treated areas or otherwise feed treated soybean foliage, hay, and straw to meat or dairy animals.
Chlorpyrifos + gamma-cyhalothrin Cobalt <i>RUP</i>	0.37 - 0.74 + 0.004 - 0.009	19 - 38 fl oz	PHI = 30 days. Do not make more than 3 applications or apply more than 85 fl oz per season. Do not make a second application within 14 days of the first application. Do not allow meat or dairy animals to graze in treated area or feed treated soybean forage, hay, and straw to animals.
cyfluthrin Tombstone Tombstone Helios <i>RUP</i>	0.013 - 0.044	2.0 - 2.8 fl oz	PHI = 45 days. Maximum of 11.2 fl oz per acre per season. Maximum of 2.8 fl oz per acre between 7-day interval. Minimum application volume is 10 GPA by ground and 2 GPA by air.

Soybean

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
deltamethrin Delta Gold <i>RUP</i>	0.018 - 0.028	1.5 - 2.4 fl oz	Apply a minimum of 2 GPA of water by air and 5 GPA of water by ground. PHI = 21 days. Avoid application during heat of day. Do not apply more than 8.5 fl oz per acre per season. Do not allow livestock to graze treated forage or feed treated hay to livestock.
dimethoate Digon 400 Dimethoate 400 Dimethoate 2.67 EC	0.5 - 0.67	1 - 1 1/8 pt	PHI = 21 days. Do not feed or graze within 5 days of last application. Do not enter treated fields without protective clothing until sprays have dried.
esfenvalerate Adjourn Asana XL <i>RUP</i>	0.03 to 0.05	5.8 - 9.6 fl oz	PHI = 21 days. Do not feed or graze livestock on treated fields. Do not apply more than 0.2 lb active per acre per season.
gamma-cyhalothrin Proaxis <i>RUP</i>	0.0075 - 0.0125	1.92 - 3.2 fl oz	PHI = 30 days. Do not graze or harvest treated soybean forage, straw or hay for livestock feed.
imidacloprid Attendant 600 Dyna-Shield Imidacloprid 5 Senator 600	refer to recommended label rate	1.6 - 3.2 fl oz per cwt of seed	Apply as a commercial seed treatment. Do not graze or feed livestock on soybean forage or hay. Follow all applicable directions, restrictions and precautions on the EPA registered label.
imidacloprid Enhance AW	refer to recommended label rate	5 oz per 100 lbs of seed	Apply as an on-farm seed treatment at planting time. Do not graze or feed livestock on soybean forage or hay. Follow all applicable directions, restrictions and precautions on the EPA registered label. For protection against early season soybean aphid infestations.
imidacloprid Mana Alias 4F	0.047	1.5 fl oz	PHI = 7 days. Minimum interval between applications = 7 days. Maximum of 4.5 fl oz per acre (0.14 lb ai per acre) per crop season.
imidacloprid Nuprid 1.6 F	0.047	3.75 fl oz	PHI = 7 days. Minimum interval between applications = 7 days. Maximum of 11.25 fl oz per acre (0.14 lb ai per acre) per crop season.
imidacloprid + cyfluthrin Leverage <i>RUP</i>	0.08	3.8	PHI = 45 days for feeding of dry vines. Green forage may be fed 15 days after the last application. Do not apply more than 11.4 fl oz per season. Allow 7 days between applications. May be applied by ground, air, or chemigation.
lambda-cyhalothrin Lambda-Cy Silencer Grizzly Z <i>RUP</i>	0.015 - 0.025	1.92 - 3.2 fl oz	PHI = 30 days for Silencer and Warrior. PHI = 45 days for Grizzly Z and Lambda-Cy. Do not allow graze or harvest treated soybean forage, straw or hay for livestock feed. Do not apply more than 0.06 lb ai per acre per season. Use higher rates for larger larvae. When applying by air, apply in a minimum of 2 gals of water per acre.
lambda-cyhalothrin Kaiso 24 WG <i>RUP</i>	0.015 - 0.025	1.0 - 1.67 oz	PHI = 45 days. See other notes on restrictions above.
lambda-cyhalothrin Warrior II <i>RUP</i>	0.015 - 0.025	0.96 - 1.60 fl oz	PHI = 30 days. Do not apply more than 0.06 lb ai per acre per season.

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
lambda-cyhalothrin + thiamethoxam Endigo ZC <i>RUP</i>	0.017 - 0.024 + 0.023 - 0.032	2.5 - 3.5 fl oz	PHI = 30 days. Do not apply more than 0.06 lb ai per acre per season of lambda-cyhalothrin containing products, or more than 0.125 lb ai per acre per season of thiamethoxam containing products. Minimum interval between applications = 7 days. Do not use less than 10 GPA for ground application or less than 3 GPA for aerial application. Do not graze or feed treated soybean for forage, straw or hay for livestock feed. Do not apply Endigo ZC within 45 days of planting soybean treated with a neonicotinoid.
methomyl Lannate LV <i>RUP</i> 2(ee) EPA Reg. No. 352-384	0.23 - 0.3	0.75 - 1 pt	PHI = 14 days. Do not graze or harvest treated soybean within 3 days for forage, or 12 days for hay. Do not apply more than 1.35 lb ai per acre per season, or make more than 3 applications per crop. REI = 48 hours.
methyl parathion PennCap-M <i>RUP</i>	0.25 - 0.75	1 - 3 pts	PHI = 20 days. Do not make more than 2 applications per season.
permethrin Pounce 3.2 EC Arctic 3.2E <i>RUP</i>	0.1 - 0.2	4 - 8 fl oz	PHI = 60 days. Do not feed or graze livestock on treated plants.
zeta-cypermethrin Mustang Max Mustang Max EC Respect <i>RUP</i>	0.0175 - 0.025	2.8 - 4 fl oz	PHI = 21 days. Do not graze or harvest treated soybean forage, straw or hay for livestock feed. Do not apply more than 0.15 lb AI per acre per season including at-planting plus foliar applications. Do not make applications less than 7 days apart. Apply by air or by ground using sufficient water to obtain full coverage. Use a minimum of 2 gals per acre by air and 10 gals per acre by ground.

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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 ("stipples"). 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 soybean 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 soybean. 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. Lorsban, Dimethoate) over a pyrethroid insecticide to avoid flaring mite populations. Reasons for the increase in mite populations 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 soybeans 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) and application at high pressure to penetrate foliage. Edge treatments are not effective in controlling mites since mites have already moved throughout the field before visual symptoms are observed.

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
bifenthrin Tundra EC <i>RUP</i>	0.08 - 0.10	5.12 - 6.4 fl oz	PHI = 18 days. Do not apply more than 0.3 lb active per acre per season.
bifenthrin + zeta-cypermethrin Hero <i>RUP</i>	0.10	10.3 oz	PHI = 21 days. Do not apply more than 0.4 lb ai per acre per season. Do not make applications less than 30 days apart. Do not graze or harvest treated soybean forage, straw, or hay for livestock feed.
chlorpyrifos Chlorpyrifos 4E AG Lorsban 4E Lorsban Advanced Yuma 4E <i>RUP</i>	0.25 - 0.5	0.5 - 1 pt	PHI = 28 days. Do not apply more than 6 pints of chlorpyrifos products per acre per season or more than 3 applications per year. Maximum single application rate is 1 lb ai per acre. Do not make a second application within 14 days of first application. Do not allow meat or dairy animals to graze in treated areas or otherwise feed treated soybean foliage, hay, and straw to meat or dairy animals. If large numbers of newly hatched nymphs are present 3-5 days after application, make a follow-up application with a non-chlorpyrifos product that is effective against mites.
dimethoate Digon 400 Dimethoate 400, Dimethoate 2.67 EC	0.5 - 0.67	1 - 1.33 pt	PHI = 21 days. Do not feed or graze within 5 days of last application. Do not enter treated fields without protective clothing until sprays have dried.
lambda-cyhalothrin Lambda-Cy Silencer Grizzly Z <i>RUP</i>	0.03	3.84 fl oz (suppression only)	PHI = 30 days for Silencer and Warrior. PHI = 45 days for Grizzly Z and Lambda-Cy. Do not allow graze or harvest treated soybean forage, straw or hay for livestock feed. Do not apply more than 0.06 lb ai (7.68 fl oz) per acre per season. Use higher rates for larger larvae. When applying by air, apply in a minimum of 2 gals of water per acre.
lambda-cyhalothrin Kaiso 24 WG <i>RUP</i>	0.03	2.0 oz (suppression only)	PHI = 45 days. See other notes on restrictions above.
lambda-cyhalothrin Warrior II <i>RUP</i>	0.03	1.92 fl oz (suppression only)	PHI = 30 days. Do not apply more than 0.06 lb ai per acre per season.

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WIREWORMS

To decide whether wireworms are a potential problem, refer to the discussion in the corn insects section. Imidacloprid and thiamethoxam are labeled as active ingredients for commercial seed treatment and use decisions must be made at time of seed purchase. Please see the seed treatment section in the introduction for more information.

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
imidacloprid Gaucho 600	refer to recommended label rate		Follow all applicable directions, restrictions and precautions on the EPA registered label.
imidacloprid Enhance AW	refer to recommended label rate	5 oz per 100 lbs of seed	Apply as an on-farm seed treatment at planting time. Do not graze or feed livestock on soybean forage or hay. Follow all applicable directions, restrictions and precautions on the EPA registered label.
thiamethoxam Cruiser 5FS	refer to recommended label rate	1.28 fl oz per cwt of seed	Use as a seed treatment only. May be applied through either open or closed systems. Do not apply a neonicotinoid insecticide within 45 days of planting soybean seed treated with Cruiser 5FS. Follow all applicable directions, restrictions and precautions on the EPA registered label.