

Soybeans

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Essentials of a Good Soybean Insect Pest Management Program

Know Soybean Insect Pests

It is very important that you know how to identify common soybean insect pests, and when they are most likely to occur. Different pest species have different economic thresholds and can require different insecticides for effective control. Various Virginia Cooperative Extension publications are available that can be useful in identifying insect pests. Also, consult your local Extension agent.

Know Pest Economic Thresholds

An economic threshold is the number of a particular insect pest that must be controlled to prevent economic loss to the crop. Thresholds have been established through many scientific studies. A treatment before a pest has reached its economic threshold usually will not pay and may cause an increase in other pests, requiring a second insecticide treatment.

Know What Crop Growth Stages Are Most Susceptible to Insect Attack

Leaf feeding insects can attack soybeans at almost any time during the season. Usually leaf feeding occurs continually throughout the season resulting in cumulative leaf damage. New research is showing that full-season and double-crop planting systems may react differently to this leaf damage. Soybean yield appears to be highly related to total leaf area, as measured by LAI (leaf area index). To achieve maximum yield potential, soybeans must develop an LAI of 3.5 to 4.0 or above. An easy way to visualize LAI is to think of a field with an LAI of 4 and having 4 acres of leaf area for every acre of ground. Any leaf canopy above that can be removed (for example: by insect leaf feeders) without reducing the yield potential. Most full-season plantings achieve larger leaf canopies and LAIs, regardless of the climatic conditions (temperature, cloud cover, or rainfall), during the season and are much more tolerant of leaf feeding. However, double-crop plantings do not always achieve as large a leaf canopy and therefore can be more sensitive to defoliation by insects. Until our research is completed, we feel that the “traditional” percent defoliation thresholds (40% prior to bloom, 15% from flowering to pod fill, 35% after pod fill) should only be applied to full-season plantings, or double-crop plantings that, because of good growing conditions, achieve large canopies. Be more conservative with double-crop plantings that do not achieve large canopies due to very late planting, dry conditions, poor soil, or other factors that result in less than optimal growth. With these plantings, allow lower levels of leaf loss before making insecticide treatments. Suggested thresholds for poor growth double-crop plantings are: 20% prior to bloom, 10% from flowering to pod fill, 15% after pod fill.

Know What Conditions Predispose Soybeans to Insect Injury

Corn earworm damage is typically most severe in fields with open leaf canopies, ones having flowers or young pods, or fields under some degree of drought or nematode stress. Therefore, soybeans planted late after small grain or planted in fields affected by drought or nematodes should be watched more closely. In dry seasons, all fields should be watched more closely.

Stay Informed of Current Pest Status

A corn earworm advisory is issued weekly to Virginia Cooperative Extension agents and to some local newspapers from August through September when most soybeans in Virginia are in stages susceptible to corn earworm attack. These advisories summarize current moth activity as monitored by a system of blacklight and pheromone traps. Earworm infestations, if they occur, will most likely follow peak moth activity periods by 8 to 10 days. Stay informed about the moth situation in your area and intensify your scouting efforts during critical periods.

Scout Field Regularly

Scouting (described below) is an essential part of successful economic management of insect pests. You must know what kind and how many insects are in your fields before making treatment decisions. **Do not apply insecticides unless you have confirmed that a real problem exists in your fields.**

Mexican Bean Beetle, Green Cloverworm, Bean Leaf Beetle

Sampling

Check for overwintered Mexican bean beetles as soon as the plants emerge, and first examine the field margins next to overwintering areas. Determine the extent of the infestation because feeding injury usually is not evenly distributed during the early season. Count the number of beetles over a 3-foot section of row in at least five locations in the infested area. Estimate the level of stand reduction if seedlings are killed, or estimate the percentage of defoliation on older plants. Bean leaf beetles also may cause damage to young soybean plants. These insects prefer tender plant tissue and leave rounded holes on leaves. This type of leaf injury is distinguishable from the lacelike injury caused by Mexican bean beetles.

Mexican bean beetle and green cloverworm infestations usually do not reach economic levels before August. Early-planted, full-season soybeans usually attract more colonizing beetles than do later fields. However, double-crop fields may become infested with adults that are moving out of maturing fields late in the season in search for more succulent foliage. Start scouting for both insect pests at least weekly during late July through September. Examine the entire field because larval populations may be localized. Check the undersides of leaves on plants and keep a tally of the number of egg masses, young larvae, older larvae, pupae, and adults. When possible, use a drop cloth to determine numbers in fields with wide rows. Estimate defoliation to the nearest 10 percent on 20 to 30 plants selected throughout the field. Each plant should be pulled up to examine the total leaf area; not just the upper canopy leaves.

When sampling, remember to check for diseased or parasitized larvae because the natural enemies play an important role in controlling these pests. Mexican bean beetles may be suppressed if you release parasitic wasps. The State Departments of Agriculture and grower cooperatives sponsor parasite release programs in several states in the mid-Atlantic area. These tiny parasites, released at carefully managed nursery plots each year, attack the older larvae and help to keep Mexican bean beetle populations below damaging levels. Clover worms are killed by a fungal disease which causes larvae to become hard, mummified, and covered with powdery white to light green spores. The presence of diseased worms usually signals the decline of the pest population.

Decision Making

Spray only when Mexican bean beetles and/or leaf-feeding caterpillars are actively feeding. At seedling, spray when defoliation reaches 40 percent with 2 to 3 beetles per plant throughout the field. At prebloom, spray when defoliation exceeds 30 percent, with 20 or more adults and/or larvae per 3-foot row. At bloom and podset, spray when defoliation exceeds 15 percent, with 16 or more adults and/or larvae per 3-foot of row. Consider the relative size and age composition of the population. If eggs and pupae of the Mexican bean beetle are the predominant stages it is advisable to wait until egg hatch or adult emergence before treating. Also consider the presence of natural controls, such as cloverworms infected with fungal disease or parasitized Mexican bean beetle larvae (mummies).

Table 4.45 - Recommended Insecticides for Mexican Bean Beetle, Green Cloverworm, and Bean Leaf Beetle Control

Insecticide (Formulation)	Amount active ingredient per acre	Amount product per acre	Time limits: days before harvest	Remarks
permethrin (Pounce 3.2 EC)	0.05-0.1 lb	2.0-4.0 oz	60	RESTRICTED USE. Do not make more than two applications per season. Do not graze or harvest for forage. Extremely toxic to fish.
(Pounce 25 WP)	0.05-0.1 lb	3.2-6.4 oz	60	
(Ambush 25WP)	0.05-0.1 lb	3.2-6.4 oz	60	
esfenvalerate (Asana XL)	0.015-0.03 lb	2.9-5.8 oz	21	RESTRICTED USE. Do not feed or graze livestock on treated plants. Do not exceed 0.2 lb ai per acre per season. Extremely toxic to fish.
(bean leaf beetle)	0.03-0.05 lb	5.8-9.6 oz		
lambda-cyhalothrin (Warrior T)	0.015-0.025 lb	1.92-3.2 oz	45	RESTRICTED USE. Do not apply more than 7.68 oz per acre per season. Do not graze or harvest treated soybean forage, straw or hay for livestock feed.
(Karate Z)	0.015-0.025 lb	0.96-1.6 oz	45	

Table 4.45 - Recommended Insecticides for Mexican Bean Beetle, Green Cloverworm, and Bean Leaf Beetle Control (cont.)

Insecticide (Formulation)	Amount active ingredient per acre	Amount product per acre	Time limits: days before harvest	Remarks
lambda-cyhalothrin (Kaiso 24WG)	0.015-0.025 lb	1.0-1.67 oz	45	RESTRICTED USE. Do not graze or harvest treated soybean forage, straw, or hay for livestock feed.
bifenthrin (Brigade 2EC)	0.033-0.1 lb	2.1-6.4 oz	18	RESTRICTED USE.
tralomethrin (Scout X-Tra)	0.012-0.016 lb	1.71-2.28 oz	28	RESTRICTED USE. Do not graze or harvest treated soybean forage, straw, or hay for livestock feed.
zeta-cypermethrin (Mustang Max)	0.0175-0.025 lb	2.8-4.0 oz	21	RESTRICTED USE. Do not graze or harvest treated soybean forage, straw, or hay for livestock feed.
beta-cyfluthrin (Baythroid XL) (Mexican bean and bean leaf beetle) (green cloverworm)	0.0125-0.022 lb 0.0065-0.0125 lb	1.6-2.8 oz 0.8-1.6 oz	45	RESTRICTED USE. Green forage may be fed 15 days after last application.
gamma-cyhalothrin (Proaxis) (Prolex)	0.0075-0.0125 lb 0.0075-0.0125 lb	1.92-3.2 oz 0.77-1.28 oz	30 30	RESTRICTED USE. Do not graze or harvest treated soybean forage, straw, or hay for livestock feed.
indoxacarb (Steward EC) (green cloverworm)	0.045-0.11 lb	4.6-11.3 oz	21	
acephate (Orthene 97)	0.73-0.97 lb	0.75-1.0 lb	14	
microencapsulated methyl parathion (PennCap-M 2F)	0.5-0.75 lb	2.0-3.0 pt	20	RESTRICTED USE. Do not make more than two applications per year. Do not apply within 20 days of harvest or grazing.
<i>Bacillus thuringiensis</i> (Lepinox WDG) green cloverworm	0.15-0.3 lb	1.0-2.0 lb	0	Use for cloverworms and other caterpillar pests. More effective with small larvae, is slower acting, but one of the safest options—oral LD ₅₀ is 20,000 milligrams/kilogram. Will not control beetles or sucking insects.
Malathion 57EC	1.9 lb	3.0 pt	0	
methomyl (Lannate LV) (green cloverworm and Mexican bean beetle) (Lannate SP) (green cloverworm and Mexican bean beetle) (Lannate LV) (bean leaf beetle) (Lannate SP) (bean leaf beetle)	0.12-0.225 lb 0.11-0.225 lb 0.225-0.3 lb 0.225-0.34 lb	0.4-0.75 pt 0.125-0.25 lb 0.75-1.0 pt 0.25-0.375 lb	14 14 14 14	RESTRICTED USE. Wait 3 days to feed or graze as forage or 7 days for hay. Up to 2 applications may be used/

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Table 4.45 - Recommended Insecticides for Mexican Bean Beetle, Green Cloverworm, and Bean Leaf Beetle Control (cont.)

Insecticide (Formulation)	Amount active ingredient per acre	Amount product per acre	Time limits: days before harvest	Remarks
carbaryl (Sevin XLR PLUS)	0.5-1.0 lb	1.0-2.0 pt	0	Bee caution. Application to wet foliage or during periods of high humidity may cause injury to tender foliage.
(Sevin 80S)	0.5 lb	0.66 lb	0	
(Sevin 4F)	0.5-1.0 lb	1.0-2.0 pt	0	
chlorpyrifos + gamma-cyhalothrin (Cobalt)				RESTRICTED USE. Do not allow meat or dairy animals to graze in treated areas or otherwise feed treated soybean forage, hay, or straw to meat or dairy animals.
(Mexican bean and bean leaf beetle)	0.37-0.74 lb	19.0-38.0 oz	30	
(green cloverworm)	0.006-0.013 lb 0.13-0.25 lb 0.002-0.004 lb	7.0-13.0 oz		
thiodicarb (Larvin 3.2)	0.45-0.75 lb	18.0-30.0 oz	28	Use lower rates for maximum protection of beneficials where moderate pest populations exist. Do not feed forage, hay, or straw to livestock.
(green cloverworm)	0.25-0.4 lb	10.0-16.0 oz		
(Larvin DF WSP)	0.45-0.75 lb	0.6-0.9 lb	28	
(green cloverworm)	0.25-0.4 lb	0.3-0.5 lb		
chlorpyrifos (Lorsban 4E)			28	Do not feed or graze livestock on treated plants.
(Mexican bean beetle)	0.5-0.75 lb	1.0-1.5 pt		
(bean leaf beetle)	0.5-1.0 lb	1.0-2.0 pt		
(green cloverworm)	0.25-0.5 lb	0.5-1.0 pt		
methoxyfenozide (Intrepid 2F)	0.06-0.12 lb	4.0-8.0 oz	7 (hay/forage) 14 (seed)	
(green cloverworm)				
spinetoram (Radiant SC)	0.15-0.31 lb	2.0-4.0 oz	28	

Thrips

Sampling/Decision Making

Thrips rarely require treatment; however, early season injury to drought-stressed plants may occasionally reduce yields. Both nymphs and adults feed on the undersides of the leaves, causing small, silvery streaks and whitish or yellowish discoloration. Treatment may be required when injury appears on drought-stressed plants and more than eight thrips per leaflet are found. Treatment is not recommended in non-stressed fields because soybeans can tolerate thrips injury.

Table 4.46 - Recommended Insecticides for Thrips Control

Insecticide (Formulation)	Amount active ingredient per acre	Amount product per acre	Time limits: days before harvest	Remarks
acephate (Orthene 97)	0.24-0.49 lb	0.25-0.5 lb	14	
imidacloprid (Gaucho 600)	1.0 oz/cwt	1.6 oz/cwt	N/A	Seed treatment.
thiamethoxam (Cruiser 5FS)	0.8 oz/cwt	1.28 oz/cwt	N/A	Seed treatment.

Table 4.46 - Recommended Insecticides for Thrips Control (cont.)

Insecticide (Formulation)	Amount active ingredient per acre	Amount product per acre	Time limits: days before harvest	Remarks
methomyl (Lannate LV) (Lannate SP)	0.225-0.3 lb 0.225-0.34 lb	0.75-1.0 pt 0.25-0.375 lb	14 14	RESTRICTED USE. Wait 3 days to feed or graze as forage or 7 days for hay. Up to two applications may be used per season.
microencapsulated methyl parathion (PennCap-M 2F)	0.5-0.75 lb	2.0-3.0 pt	20	RESTRICTED USE. Do not make more than two applications per year. Do not apply within 20 days of harvest or grazing.
lambda-cyhalothrin (Warrior T) (Karate Z)	0.015-0.025 lb 0.015-0.025 lb	1.92-3.2 oz 0.96-1.6 oz	45 45	RESTRICTED USE. Do not apply more than 7.68 oz per acre per season. Do not graze or harvest treated soybean forage, straw or hay for livestock feed.
lambda-cyhalothrin (Kaiso 24WG)	0.015-0.025 lb	1.0-1.67 oz	45	RESTRICTED USE. Do not graze or harvest treated soybean forage, straw, or hay for livestock feed.
bifenthrin (Brigade 2EC)	0.033-0.1 lb	2.1-6.4 oz	18	RESTRICTED USE.
zeta-cypermethrin (Mustang Max)	0.02-0.025 lb	3.2-4.0 oz	21	RESTRICTED USE. Aids in control. Do not graze or harvest treated soybean forage, straw, or hay for livestock feed.
beta-cyfluthrin (Baythroid XL)	0.0065-0.0125 lb	0.8-1.6 oz	45	RESTRICTED USE. Green forage may be fed 15 days after last application.
gamma-cyhalothrin (Proaxis) (Prolex)	0.0075-0.0125 lb 0.0075-0.0125 lb	1.92-3.2 oz 0.77-1.28 oz	30 30	RESTRICTED USE. Do not graze or harvest treated soybean forage, straw, or hay for livestock feed.
chlorpyrifos + gamma-cyhalothrin (Cobalt)	0.37-0.74 lb 0.006-0.013 lb	19.0-38.0 oz	30	RESTRICTED USE. Do not allow meat or dairy animals to graze in treated areas or otherwise feed treated soybean forage, hay, or straw to meat or dairy animals.

Potato Leafhopper

Sampling/Decision Making

Leafhoppers attack soybeans during late June through July but rarely reach population levels that affect yields. Using a standard 15-in sweep net, take five sweeps in each of five locations in the field. Count the number of leafhoppers and empty the net before proceeding to the next location. A single sweep consists of a swath of the net along the row in the top one-third of the plant in one direction only.

The symptoms of leafhopper injury include localized stippling, curling, and yellowing of leaf margins. Treatment is suggested when injury appears and infestations exceed four leafhoppers per sweep in stressed beans or eight leafhoppers per sweep in normal growing fields. Dense pubescent varieties are less susceptible.

Table 4.47 - Recommended Insecticides for Potato Leafhopper Control

Insecticide (Formulation)	Amount active ingredient per acre	Amount product per acre	Time limits: days before harvest	Remarks
acephate (Orthene 97)	0.49-0.97 lb	0.5-1.0 lb	14	
permethrin (Pounce 3.2 EC)	0.05-0.1 lb	2.0-4.0 oz	60	RESTRICTED USE. Do not make more than two applications per season. Do not graze or harvest for forage. Extremely toxic to fish.
(Pounce 25 WP)	0.05-0.1 lb	3.2-6.4 oz	60	
(Ambush 25WP)	0.05-0.1 lb	3.2-6.4 oz	60	
esfenvalerate (Asana XL)	0.015-0.03 lb	2.9-5.8 oz	21	RESTRICTED USE. Do not feed or graze livestock on treated plants. Do not exceed 0.2 lb ai per acre per season. Extremely toxic to fish.
lambda-cyhalothrin (Warrior T)	0.015-0.025 lb	1.92-3.2 oz	45	RESTRICTED USE. Do not apply more than 7.68 oz per acre per season. Do not graze or harvest treated soybean forage, straw or hay for livestock feed.
(Karate Z)	0.015-0.025 lb	0.96-1.6 oz	45	
lambda-cyhalothrin (Kaiso 24WG)	0.015-0.025 lb	1.0-1.67 oz	45	RESTRICTED USE. Do not graze or harvest treated soybean forage, straw, or hay for livestock feed.
tralomethrin (Scout X-Tra)	0.012-0.016 lb	1.71-2.28 oz	28	RESTRICTED USE. Do not graze or harvest treated soybean forage, straw, or hay for livestock feed.
zeta-cypermethrin (Mustang Max)	0.0175-0.025 lb	2.8-4.0 oz	21	RESTRICTED USE. Do not graze or harvest treated soybean forage, straw, or hay for livestock feed.
bifenthrin (Brigade 2EC)	0.033-0.1 lb	2.1-6.4 oz	18	RESTRICTED USE.
beta-cyfluthrin (Baythroid XL)	0.0065-0.0125 lb	0.8-1.6 oz	45	RESTRICTED USE. Green forage may be fed 15 days after last application.
gamma-cyhalothrin (Proaxis)	0.0075-0.0125 lb	1.92-3.2 oz	30	RESTRICTED USE. Do not graze or harvest treated soybean forage, straw, or hay for livestock feed.
(Prolex)	0.0075-0.0125 lb	0.77-1.28 oz	30	
microencapsulated methyl parathion (PennCap-M 2F)	0.5-0.75 lb	2.0-3.0 pt	20	RESTRICTED USE. Do not make more than two applications per year. Do not apply within 20 days of harvest or grazing.
chlorpyrifos + gamma-cyhalothrin (Cobalt)	0.37-0.74 lb 0.006-0.013 lb	19.0-38.0 oz	30	RESTRICTED USE. Do not allow meat or dairy animals to graze in treated areas or otherwise feed treated soybean forage, hay, or straw to meat or dairy animals.

Spider Mites

Sampling/Decision Making

Mite outbreaks usually are associated with hot, dry weather, which accelerates reproduction and development. During periods of high humidity and field moisture, a fungal disease can reduce populations but high temperatures can nullify these effects. Outbreaks also are associated with the application of certain insecticides that kill natural enemies and/or seem to make the soybean plant more nutritionally suitable for mites.

Check weekly for mites, starting in early July through August, especially during a hot, dry season. Concentrate on the field borders and look for the early signs of white stippling at the bases of the leaves. Do not confuse mite damage with dry weather injury, mineral deficiencies, and herbicide injury. If feeding injury is evident, press the undersides of a few damaged leaves on white paper to reveal any crushed mites. Determine the extent of the infestation and assess the level of injury by examining 20 to 30 plants in the infested area. Field infestations often show defoliated or injured plants at some localized point, with injury becoming less evident and extending in a widening arc into the field.

If isolated spots of mite activity are confined to the perimeter of the field, spot-treatment using ground equipment is recommended to prevent further spread of mites into the field. If the infestation is distributed throughout the interior of the field, treatment of the entire field is suggested if live mites are numerous (20 to 30 per leaflet) and more than 50 percent of the plants show stippling, yellowing, or defoliation over more than one-third of the leaves. If rains come, mite development and survival will decrease but may not drop to economic levels if heavy populations are developing under high temperatures.

Table 4.48 - Recommended Insecticides for Spider Mite Control

Insecticide (Formulation)	Amount active ingredient per acre	Amount product per acre	Time limits: days before harvest	Remarks
dimethoate (Dimethoate 4EC) (Dimethoate 2.67EC)	0.5 lb 0.5 lb	1.0 pt 1.5 pt	21 21	Do not feed or graze within 5 days of the last application. Do not store above 90° F or below 32° F.
chlorpyrifos (Lorsban 4E)	0.25-0.5 lb	0.5-1.0 pt	28	RESTRICTED USE. May need second spray 4 to 5 days after initial treatment to control newly hatched mites. Do not graze or feed forage within 14 days after application. Use of vegetable oil as an adjuvant may improve control during hot weather.
lambda-cyhalothrin (Warrior T)) (Karate Z)	0.03 lb 0.03 lb	3.84 oz 1.92 oz	45 45	RESTRICTED USE. Suppression only. Do not apply more than 7.68 oz per acre per season Do not graze or harvest treated soybean forage, straw or hay for livestock feed.
bifenthrin (Brigade 2EC)	0.08-0.1 lb	5.12-6.4 oz	18	RESTRICTED USE.

Corn Earworm

Sampling

Outbreaks often follow a midsummer drought, which causes the corn to ripen earlier and become less attractive to the moths. Female moths prefer to lay eggs in open-canopied, late-blooming soybean fields. Drought conditions also delay soybean maturity and prevent normal canopy growth, so peak moth activity is more coincidental with blooming of open-canopied fields.

Sampling for corn earworm should be done on a weekly basis from mid-August through September. If row spacing is 30 inches or greater any of the techniques described below can be used to sample for insects. Narrow-row beans, 21 inches or less, are best sampled with either the sweep net or rigid beat cloth. Concentrate on high-risk fields, such as ones that have open canopies, are late flowering or were previously treated with insecticides.

Standard Beat or Ground Cloth

For each sample, place a standard 3-foot ground cloth on the ground between rows and shake the plants bordering both sides vigorously. The number of insects shaken onto the cloth will be the number per 6 feet of row, so divide by 6 to get the number per Row-Foot. About ten samples should be taken in each 40 acre area. Thresholds are based on number of earworms per Row-Foot.

Rigid Beat Cloth

The RBC works on the same principle as a standard beat cloth but the RBC is not flexible. Samples are taken by placing the sampler on its side between two rows of plants (plants cannot be seriously lodged) and beating or vigorously shaking adjacent plants into the sampler while it is leaned away from those plants at about a 45° angle. Two 7-inch rows are beaten and one 14-inch or 21-inch row is beaten per sample. Thresholds are based on the number of earworms *per sample*.

Sweep Net

Each sample should consist of 15 net sweeps with a 15-inch diameter sweep net done continuously one after the other. Each sweep consists of swinging the net in one direction through the foliage so that the top of the net passes 2 or 3 inches below the tops of plants. Fifteen consecutive sweeps are done from one side to the other while walking down a middle row. Swing the net with enough force to dislodge insects into the net. If some leaves are not broken off and in the net after the sample, the sampler is not using enough force. Each swing should pass through the tops of 5, 3, or 2 rows in 7-inch, 14-inch, or 21-inch row-space plantings, respectively. After each sample, stop and count how many earworms are in the net. Thresholds are based on the number of earworms *per sample*.

Decision Making

Treatment is suggested if sample counts exceed economic thresholds. Thresholds are presented at the end of this chapter. Visit the website <http://www.ipm.vt.edu/cew/> for access to the new threshold calculator.

Table 4.49 - Recommended Insecticides for Corn Earworm Control

Insecticide (Formulation)	Amount active ingredient per acre	Amount product per acre	Time limits: days before harvest	Remarks
permethrin (Pounce 3.2 EC)	0.1-0.2 lb	4.0-8.0 oz	60	RESTRICTED USE. Do not make more than two applications per season. Do not graze or harvest for forage. Use high rates when the majority of infestations is composed of older larvae. Extremely toxic to fish.
(Pounce 25 WP)	0.1-0.2 lb	6.4-12.8 oz	60	
(Ambush 25WP)	0.1-0.2 lb	6.4-12.8 oz	60	
esfenvalerate (Asana XL)	0.02-0.03 lb	5.8-9.6 oz	21	RESTRICTED USE. Do not feed or graze livestock on treated plants. Do not exceed 0.2 lb per acre per season. Extremely toxic to fish.

Table 4.49 - Recommended Insecticides for Corn Earworm Control (cont.)

Insecticide (Formulation)	Amount active ingredient per acre	Amount product per acre	Time limits: days before harvest	Remarks
tralomethrin (Scout X-Tra)	0.012-0.016 lb	1.71-2.28 oz	21	RESTRICTED USE. Do not graze or harvest treated soybean forage, straw or hay for livestock feed.
lambda-cyhalothrin (Warrior T)	0.015-0.025 lb	1.92-3.2 oz	45	RESTRICTED USE. Do not apply more than 7.68 oz per acre per season Do not graze or harvest treated soybean forage, straw or hay for livestock feed.
lambda-cyhalothrin (Karate Z)	0.015-0.025 lb	0.96-1.6 oz	45	
lambda-cyhalothrin (Kaiso 24WG)	0.015-0.025 lb	1.0-1.67 oz	45	RESTRICTED USE. Do not graze or harvest treated soybean forage, straw, or hay for livestock feed.
zeta-cypermethrin (Mustang Max)	0.0175-0.025 lb	2.1-6.4 oz	18	RESTRICTED USE. Do not graze or harvest treated soybean forage, straw, or hay for livestock feed.
bifenthrin (Brigade 2EC)	0.033-1.0 lb	2.1-6.4 oz	18	RESTRICTED USE.
beta-cyfluthrin (Baythroid XL)	0.0125-0.022 lb	1.6-2.8 oz	45	RESTRICTED USE. Green forage may be fed 15 days after last application.
gamma-cyhalothrin (Proaxis)	0.0075-0.0125 lb	1.92-3.2 oz	30	RESTRICTED USE. Do not graze or harvest treated soybean forage, straw, or hay for livestock feed.
gamma-cyhalothrin (Prolex)	0.0075-0.0125 lb	0.77-1.28 oz	30	
thiodicarb (Larvin 3.2)	0.25-0.4 lb	10.0-16.0 oz	28	RESTRICTED USE. Use lower rates for maximum protection of beneficials where moderate pest populations exist. Do not feed forage, hay, or straw.
thiodicarb (Larvin DF WSP)	0.25-0.4 lb	0.3-0.5 lb	28	
chlorpyrifos + gamma-cyhalothrin (Cobalt)	0.37-0.74 lb 0.006-0.013 lb	19.0-38.0 oz	30	RESTRICTED USE. Do not allow meat or dairy animals to graze in treated areas or otherwise feed treated soybean forage, hay, or straw to meat or dairy animals.
methomyl (Lannate LV)	0.12-0.225 lb	0.4-0.75 pt	14	RESTRICTED USE. Wait 3 days to feed or graze as forage or 7 days for hay. Up to two applications may be used/season.
methomyl (Lannate SP)	0.11-0.225 lb	0.125-0.25 lb	14	
indoxacarb (Steward EC)	0.045-0.11 lb	4.6-11.3 oz	21	
chlorpyrifos (Lorsban 4E)	0.5-1.0 lb	1.0-2.0 pt	28	RESTRICTED USE. Do not feed or graze livestock on treated plants.
<i>Bacillus thuringiensis</i> (Lepinox WDG)	see labels 0.15-0.3 lb	1.0-2.0 lb	0	More effective with small larvae. Suppression only of large larvae. Is slower acting, but one of the safest options—oral LD ₅₀ is 20,000 mg/kg.
spinosyn (Tracer 4SC)	0.047-0.062 lb	1.5-2.0 oz	0	
spinetoram (Radiant SC)	0.15-0.31 lb	2.0-4.0 oz	28	

Grasshopper**Table 4.50 - Recommended Insecticides for Grasshopper Control**

Insecticide (Formulation)	Amount active ingredient per acre	Amount product per acre	Time limits: days before harvest	Remarks
acephate (Orthene 97)	0.24-0.49 lb	0.25-0.5 lb	14	
carbaryl (Sevin XLR PLUS) (Sevin 4F)	0.5-1.5 lb 0.5-1.5 lb	1.0-3.0 pt 1.0-3.0 pt	0 0	Bee caution. Applications to wet foliage or during periods of high humidity may cause injury to tender foliage.
chlorpyrifos + gamma-cyhalothrin (Cobalt)	0.13-0.25 lb 0.002-0.004 lb	7.0-13.0 oz	30	RESTRICTED USE. Do not allow meat or dairy animals to graze in treated areas or otherwise feed treated soybean forage, hay, or straw to meat or dairy animals.
chlorpyrifos (Lorsban 4E)	0.25-0.5 lb	0.5-1.0 pt	28	RESTRICTED USE. Do not feed or graze livestock on treated plants.
dimethoate (Dimethoate 4EC) (Dimethoate 2.67EC)	0.5 lb 0.5 lb	1.0 pt 1.5 pt	21 21	RESTRICTED USE. Do not feed or graze within 5 days of the last application. Do not store above 90°F or below 32°F.
esfenvalerate (Asana XL)	0.03-0.05 lb	5.8-9.6 oz	21	RESTRICTED USE. Do not feed or graze livestock on treated plants. Do not exceed 0.2 lb ai per acre per season. Extremely toxic to fish.
lambda-cyhalothrin (Warrior T) (Karate Z)	0.025-0.03 lb 0.025-0.03 lb	3.2-3.84 oz 1.6-1.92 oz	45 45	RESTRICTED USE. Do not apply more than 7.68 oz per acre per season Do not graze or harvest treated soybean forage, straw or hay for livestock feed.
lambda-cyhalothrin (Kaiso 24WG)	0.025-0.03 lb	1.67-2.0 oz	45	RESTRICTED USE. Do not graze or harvest treated soybean forage, straw, or hay for livestock feed.
tralomethrin (Scout X-Tra)	0.016-0.024 lb	2.28-3.41 oz	28	RESTRICTED USE. Do not graze or harvest treated soybean forage, straw, or hay for livestock feed.
gamma-cyhalothrin (Proaxis) (Prolex)	0.0125-0.015 lb 0.0125-0.015 lb	3.2-3.84 oz 1.28-1.54 oz	30 30	RESTRICTED USE. Do not graze or harvest treated soybean forage, straw, or hay for livestock feed.
zeta-cypermethrin (Mustang Max)	0.02-0.025 lb	3.2-4.0 oz	21	RESTRICTED USE. Do not graze or harvest treated soybean forage, straw, or hay for livestock feed.
bifenthrin (Brigade 2EC)	0.033-1.0 lb	2.1-6.4 oz	18	RESTRICTED USE.
beta-cyfluthrin (Baythroid XL)	0.0155-0.022 lb	2.0-2.8 oz	45	RESTRICTED USE. Green forage may be fed 15 days after last application.
microencapsulated methyl parathion (PennCap-M 2F)	0.5-0.75 lb	2.0-3.0 pt	20	RESTRICTED USE. Do not make more than two applications/year. Do not apply within 20 days of harvest or grazing.

Armyworms

Table 4.51 - Recommended Insecticides for Fall, Yellowstriped, and Beet Armyworm

Insecticide (Formulation)	Amount active ingredient per acre	Amount product per acre	Time limits: days before harvest	Remarks
thiodicarb (Larvin 3.2)	0.25-0.4 lb	10.0-16.0 oz	28	Use lower rates for maximum protection of beneficials where moderate pest populations exist. Do not feed forage, hay, or straw.
(Larvin DF WSP)	0.25-0.4 lb	0.3-0.5 lb	28	
methomyl (Lannate LV)	0.225-0.3 lb	0.75-1.0 pt	14	RESTRICTED USE. Wait 3 days to feed or graze as forage or 7 days for hay. Up to two applications may be used per season.
(Lannate SP)	0.225-0.34 lb	0.25-0.375 lb	14	
permethrin (beet armyworm only)				RESTRICTED USE. Do not make more than two applications/season. Do not graze or harvest for forage. Use high rates when the majority of infestations is composed of older larvae. Extremely toxic to fish.
(Pounce 3.2)	0.1-0.2 lb	4.0-8.0 oz	60	
(Pounce 25 WP)	0.1-0.2 lb	6.4-12.8 oz	60	
(Ambush 25WP)	0.1-0.2 lb	6.4-12.8 oz	60	
chlorpyrifos + gamma-cyhalothrin (Cobalt)				RESTRICTED USE. Do not allow meat or dairy animals to graze in treated areas or otherwise feed treated soybean forage, hay, or straw to meat or dairy animals.
(yellowstriped)	0.25-0.5 lb	13.0-26.0 oz	30	
(beet)	0.004-0.009 lb 0.5-0.74 lb 0.009-0.013 lb	26.0-38.0 oz		
zeta-cypermethrin (Mustang Max)			21	RESTRICTED USE. Do not graze or harvest treated soybean forage, straw, or hay for livestock feed.
(yellowstriped)	0.0175-0.025 lb	2.8-4.0 oz		
(beet and fall)	0.02-0.025 lb	3.2-4.0 oz		
bifenthrin (Brigade 2EC)	0.033-0.10 lb	2.1-6.4 oz	18	RESTRICTED USE.
tralomethrin (Scout X-Tra)	0.016-0.024 lb	2.28-3.41 oz	28	RESTRICTED USE. Do not graze or harvest treated soybean forage, straw, or hay for livestock feed.
beta-cyfluthrin (Baythroid XL)	0.0125-0.022 lb	1.6-2.8 oz	45	RESTRICTED USE. Green forage may be fed 15 days after last application.
(fall armyworm and beet armyworm - 1st and 2nd instars only)				
gamma-cyhalothrin (Proaxis)	0.0125-0.0125 lb	3.2-3.84 oz	30	RESTRICTED USE. Do not graze or harvest treated soybean forage, straw, or hay for livestock feed.
(Prolex)	0.0125-0.0125 lb	1.28-1.54 oz	30	
lambda-cyhalothrin (Kaiso 24WG)				RESTRICTED USE. Do not graze or harvest treated soybean forage, straw, or hay for livestock feed.
(yellowstriped and fall)	0.025-0.03 lb	1.67-2.0 oz	45	
(beet)	0.03 lb	2.0 oz		
spinosyn (Tracer 4SC)	0.047-0.062 lb	1.5-2.0 oz	28	
spinetoram (Radiant SC)	0.15-0.31 lb	2.0-4.0 oz	28	
indoxacarb (Steward 1.25SC)	0.045-0.11 lb	4.6-11.3 oz	21	

Table 4.51 - Recommended Insecticides for Fall, Yellowstriped, and Beet Armyworm (cont.)

Insecticide (Formulation)	Amount active ingredient per acre	Amount product per acre	Time limits: days before harvest	Remarks
methoxyfenozide (Intrepid 2F)	0.06-0.12 lb	4.0-8.0 oz	7 (hay/forage) 14 (seed)	
acephate (Orthene 97) (except beet)	0.73-0.97 lb	0.75-1.0 lb	14	

Stinkbugs

Table 4.52 - Recommended Insecticides for Stinkbug Control

Insecticide (Formulation)	Amount active ingredient per acre	Amount product per acre	Time limits: days before harvest	Remarks
acephate (Orthene 97)	0.49-0.97 lb	0.5-1.0 lb	14	
esfenvalerate (Asana XL)	0.03-0.05 lb	5.8-9.6 oz	21	RESTRICTED USE. Do not feed or graze livestock on treated plants. Do not exceed 0.2 lb ai/A/ season. Extremely toxic to fish.
tralomethrin (Scout X-Tra)	0.016-0.024 lb	2.28-3.41 oz	21	RESTRICTED USE. Do not graze or harvest treated soybean forage, straw or hay for livestock feed.
microencapsulated methyl parathion (PennCap-M 2F)	0.25-0.75 lb	1.0-3.0 pt	20	RESTRICTED USE. Do not make more than two applications per year. Do not apply within 20 days of harvest or grazing.
chlorpyrifos (Lorsban 4E)	1.0 lb	2.0 pt	28	RESTRICTED USE. Do not feed or graze livestock on treated plants.
chlorpyrifos + gamma-cyhalothrin (Cobalt)	0.37-0.74 lb 0.006-0.013 lb	19.0-38.0 oz	30	RESTRICTED USE. Do not allow meat or dairy animals to graze in treated areas or otherwise feed treated soybean forage, hay, or straw to meat or dairy animals.
lambda-cyhalothrin (Warrior T)	0.025-0.03 lb	3.2-3.84 oz	45	RESTRICTED USE. Do not apply more than 7.68 oz/A per season. Do not graze or harvest treated soybean forage, straw or hay for livestock feed.
(Karate Z)	0.025-0.03 lb	1.6-1.92 oz	45	
lambda-cyhalothrin (Kaiso 24WG)	0.025-0.03 lb	1.67-2.0 oz	45	RESTRICTED USE. Do not graze or harvest treated soybean forage, straw, or hay for livestock feed.
zeta-cypermethrin (Mustang Max)	0.02-0.025 lb	3.2-4.0 oz	21	RESTRICTED USE. Do not graze or harvest treated soybean forage, straw, or hay for livestock feed.
bifenthrin (Brigade 2EC)	0.033-0.1 lb	2.1-6.4 oz	18	RESTRICTED USE.
beta-cyfluthrin (Baythroid XL)	0.0125-0.022 lb	1.6-2.8 oz	45	RESTRICTED USE. Green forage may be fed 15 days after last application.
gamma-cyhalothrin (Proaxis)	0.0125-0.015 lb	3.2-3.84 oz	30	RESTRICTED USE. Do not graze or harvest treated soybean forage, straw, or hay for livestock feed.
(Prolex)	0.0125-0.015 lb	1.28-1.54 oz	30	

Soybean Looper

Table 4.53 - Recommended Insecticides for Soybean Looper Control

Insecticide (Formulation)	Amount active ingredient per acre	Amount product per acre	Time limits: days before harvest	Remarks
spinosyn (Tracer 4SC)	0.047-0.062 lb	1.5-2.0 oz	28	
spinetoram (Radiant SC)	0.15-0.31 lb	2.0-4.0 oz	28	
beta-cyfluthrin (Baythroid XL)	0.022 lb	2.8 oz	45	RESTRICTED USE. Green forage may be fed 15 days after last application.
gamma-cyhalothrin (Proaxis)	0.015 lb	3.84 oz	30	RESTRICTED USE. Do not graze or harvest treated soybean forage, straw, or hay for livestock feed.
(Prolex)	0.015 lb	1.54 oz	30	
thiodicarb (Larvin 3.2)	0.45-0.75 lb	18.0-30.0 oz	28	RESTRICTED USE. Use lower rates for maximum protection of beneficials where moderate pest populations exist. Do not feed forage, hay, or straw.
(Larvin DF WSP)	0.45-0.75 lb	0.6-0.9 lb	28	
indoxacarb (Steward 1.25SC)	0.055-0.11 lb	5.6-11.3 oz	21	
methoxyfenozide (Intrepid 2F)	0.06-0.12 lb	4.0-8.0 oz	7 (hay/forage) 14(seed)	

Soybean Aphid

Table 4.54 - Recommended Insecticides for Soybean Aphid Control

Insecticide (Formulation)	Amount active ingredient per acre	Amount product per acre	Time limits: days before harvest	Remarks
imidacloprid (Gaucho 600)	1.0 oz/cwt	1.6 oz/cwt	N/A	Seed treatment.
thiamethoxam (Cruiser 5FS)	0.8 oz/cwt	1.28 oz/cwt	N/A	Seed treatment.
esfenvalerate (Asana XL)	0.03-0.05 lb	5.8-9.6 oz	21	RESTRICTED USE. Do not feed or graze livestock on treated plants. Do not exceed 0.2 lb per acre per season. Extremely toxic to fish.
lambda-cyhalothrin (Warrior T)	0.015-0.025 lb	1.92-3.2 oz	45	RESTRICTED USE. Do not apply more than 7.68 oz per acre per season. Do not graze or harvest treated soybean forage, straw, or hay for livestock feed.
(Karate Z)	0.015-0.025 lb	0.96-1.6 oz	45	
lambda-cyhalothrin (Kaiso 24WG)	0.015-0.025 lb	1.0-1.67 oz	45	RESTRICTED USE. Do not graze or harvest treated soybean forage, straw, or hay for livestock feed.
cyfluthrin (Baythroid XL)	0.044 lb	2.0-2.8 oz	45	RESTRICTED USE. Green forage may be fed 15 days after last application.
zeta-cypermethrin (Mustang Max)	0.0175-0.025 lb	2.8-4.0 oz	21	RESTRICTED USE. Do not graze or harvest treated soybean forage, straw, or hay for livestock feed.

Table 4.54 - Recommended Insecticides for Soybean Aphid Control (cont.)

Insecticide (Formulation)	Amount active ingredient per acre	Amount product per acre	Time limits: days before harvest	Remarks
bifenthrin (Brigade 2EC)	0.033-0.1 lb	2.1-6.4 oz	18	RESTRICTED USE.
gamma-cyhalothrin (Proaxis)	0.0075-0.0125 lb	1.92-3.2 oz	30	RESTRICTED USE. Do not graze or harvest treated soybean forage, straw, or hay for livestock feed.
chlorpyrifos (Lorsban 4E)	0.5-1.0 lb	1.0-2.0 pt	28	RESTRICTED USE. Do not feed or graze livestock on treated plants.
chlorpyrifos + gamma-cyhalothrin (Cobalt)	0.25-0.5 lb 0.004-0.009 lb	13.0-26.0 oz	30	RESTRICTED USE. Do not allow meat or dairy animals to graze in treated areas or otherwise feed treated soybean forage, hay, or straw to meat or dairy animals.
acephate (Orthene 90S) (Orthene 97)	0.5 -1.0 lb 0.73-0.97 lb	0.56-1.1 lb 0.75-1.0 lb	14 14	Do not graze or cut vines for hay or forage.

Pest Thresholds

Table 4.55 - Corn Earworm Thresholds in Soybeans¹

Sampling Tool	Row Width	Rows Sampled	Threshold
Sweep Net ²	7"	5	2.5
	14"	3	2.4
	21"	2	3.1
	36"	1	3.1
	7"	2	0.9
Rigid Beat Cloth ³	14"	1	0.7
	21"	1	1.2
Beat Cloth	30"	1 or 2	1.0
Standard or Rigid ⁴	36"	1 or 2	1.2

¹ Only count worms 3/8 inch or longer.

² Based on a 15-sweep sample.

³ Number per sample.

⁴ Number per row foot rather than number per sample.

The timing strategy is to wait until most of the larvae are three-eighths of an inch or more in length and then treat when pod damage is first evident. This allows for most egg laying and hatching to occur before treatment and thus reduces the chances of a second spray being needed later. Some defoliation may occur before it is time to treat and this injury should be evaluated just like that of any defoliator. If other defoliating pests are present when pod damage is first evident, then adjustments should be made in the treatment thresholds for earworms. For example, if green cloverworms are actively feeding and have already caused 15 percent defoliation, then insecticide treatment would be justified at lower earworm infestations, about one-half the normal threshold. Finally, treatment may not be necessary if the majority of worms are infected with the fungus disease. This white to greenish white fungus can have a significant impact on earworm populations. Access the web (www.ipm.vt.edu/cew) to calculate thresholds based on your estimated cost of control (product cost plus application cost) and today's bushel value.

Table 4.56 - Other Soybean Insect Pest Thresholds

Pest species	# per row-foot row-spacing		# per 15 sweeps row-spacing		Other comments
	7"-21"	above 21"	7"-21"	above 21"	
<i>Full-season plantings</i>					
Mexican bean beetle	4	6	24	36	40% defoliation - pre-bloom, 15% defoliation - pod-fill, 35+% defoliation - fully developed seeds.
Stinkbugs	1	1	2.4	3.6	Little damage after beans are fully formed.
Spider mite	Damage occurring and live mites present				Live mites on 50% of leaves and 50% leaves showing white spotting or premature leaf drop.
Other defoliators ¹					40% defoliation - pre-bloom, 15% defoliation - pod-fill, 35+% defoliation - fully developed seeds.
<i>Double-crop plantings with poor growth</i>					
Mexican bean beetle	2	4	12	24	20% defoliation - pre-bloom, 15% defoliation - fully developed seeds.
Stinkbugs	1	1	2.4	3.6	Little damage after beans are fully formed.
Spider mite	Damage occurring and live mites present				Live mites on 50% of leaves and 50% leaves showing white spotting or premature leaf drop.
Other defoliators ¹					20% defoliation - pre-bloom, 10% defoliation - pod-fill, 15% defoliation - fully developed seeds.
¹ Other defoliators include any combinations of green cloverworm, bean leaf beetle, blister beetle, Japanese beetle, soybean looper, yellowstriped armyworm, grasshoppers, or fall armyworm.					

