

# Sunflower INSECT MANAGEMENT 2017



## How to Use This Guide

This publication was prepared to help producers manage insect populations with the best available methods proven practical under Kansas conditions. It is revised annually and intended for use during this calendar year. Pesticide label directions and restrictions are subject to change, and some may have changed since the date of publication. Economics should be considered in any pest management decision. Costs vary greatly over time and are influenced by factors beyond the scope of this publication. Product cost in general was not a consideration for including or omitting specific insecticide products. Always compare product price, safety, and availability when making treatment decisions. It is illegal to use a pesticide in a manner inconsistent with the label. Read label directions carefully before application. Proper use is the applicator's responsibility. For more information contact your local K-State Research and Extension office or visit [www.entomology.ksu.edu/extension](http://www.entomology.ksu.edu/extension). Kansas State University assumes no responsibility for product performance, personal injury, property damage, or other losses resulting from handling or use of pesticides listed.

## Using Insecticides Safely

All insecticides are capable of causing injury to man and animals. Injury or death can result from swallowing, inhalation, or skin absorption. Handle with care and use only when needed. Follow label directions and heed all precautions. Store in original containers away from food products in a dry place where children, unauthorized persons, livestock, and pets are not allowed.

Avoid getting insecticides on the skin, mucous membranes (mouth, nose, and eyes), and clothing when mixing or applying. If spilled on the body, wash immediately and change clothing. Wash face and hands thoroughly after applying any insecticide – especially before eating, drinking, or smoking. If in the eyes, flush with water for 15 minutes and seek prompt medical attention. If medical treatment is neces-

Perennial	Winter/Spring	Summer	Fall/Winter
Sunflower Moth (Head Moth)		Pg.4	
Occasional	Winter/Spring	Summer	Fall/Winter
Cutworm		Pg.2	
Grasshopper		Pg.2	
Loopers, Painted Lady and Woollybear Caterpillars		Pg. 2	
Dectes Stem Borer		Pg.2	
Gray Seed Weevils		Pg.3	
Red Seed Weevils		Pg.3	
Sunflower Stem Weevil		Pg.4	
Sunflower Beetle		Pg.4	
	Jan Feb Mar Apr	May Jun Jul Aug	Sep Oct Nov Dec

sary, take the insecticide container label with you. It contains valuable information the physician will need. For poison control information call 1-800-332-6633.

Wear protective equipment (respirators, clothing) as specified on the label. Bathe and change clothing after applying insecticides. Always wash clothes separately after applying pesticides and before wearing them again. Protect fish and wildlife. Do not contaminate streams, lakes, ponds, or marshes. Do not clean spray equipment or dump excess spray near such sites. Avoid drift of sprays or dusts. Do not allow poultry, dairy, or meat animals to feed on plants or drink insecticide-contaminated water.

Waiting intervals refer to the time that must elapse between application and

harvest. The waiting interval in no way signifies how long the insecticide will remain active in controlling insects. Re-entry intervals (REI) specify the minimum time that special protective gear (specified on the label) must be worn when entering the field after treatment.

## Insecticide Use Classification

Anyone can purchase and use general use pesticides. To to legally purchase or use restricted use pesticides an applicator must be certified by the Kansas Department of Agriculture. A business license is required to apply any pesticide commercially. Commercial applicators also must be certified in the appropriate commercial category to use restricted use pesticides.

## Rules For Sound Insect Management

- Accurately identify the pest and interpret the situation. Ask your local K-State Research and Extension agricultural agent for help if you have questions.
- Proper timing of control measures cannot be emphasized enough. Detect the problem before damage reaches an advanced stage (scout each field at least once a week, twice weekly during flowering).
- Realize that preventing all insect damage should not be your objective. Treatments are seldom justified unless expected losses equal or exceed the cost of control.
- In some situations pest problems can be prevented or alleviated without the use of insecticides.

## Sunflower Insects

Cultivated sunflowers in Kansas host a variety of insects. Most are not damaging, and many are beneficial. Harmful species may not be present in sufficient numbers to cause economic loss. Significant yield losses may occur when certain pests are abundant and when feeding on flowers and seeds is compounded by fungal infection. Significant losses also may occur as a result of lodging caused by stem weevils and stem girdlers. For more information on insects mentioned in this publication, visit [entomology.k-state.edu/extension/insect-information/crop-pests/sunflowers/](http://entomology.k-state.edu/extension/insect-information/crop-pests/sunflowers/)

### Cutworms

Several species of cutworms (dingy, dark-sided, sandhill, and black) can damage young sunflowers at or soon after emergence. Small, transparent windows appearing in young leaves may be caused by small larvae, which are not capable of eating through the entire leaf. Notches in the leaves or cotyledons may appear if sunflowers are planted into fields with existing infestations. Older larvae inflict more obvious damage in the form of wilted, sev-

ered, and dying seedlings. Excessively cool, wet soils slow plant development relative to pest feeding and allow cutworms to reduce stands.

Larger larvae of most cutworms feed nocturnally and remain concealed during the day, staying within a few inches of damaged plants. The discovery of cut plants and one or more larva per square foot warrants application of an insecticide if the majority of larvae are less than 1¼ inches long and continued feeding appears likely to diminish plant stands below 85 percent of recommended levels. Dry soil conditions will reduce the probability of achieving control by spraying.

### Grasshoppers

Several grasshopper species can defoliate sunflowers. Grasshopper populations exceeding eight per square yard probably justify control. Rarely is damage severe enough to justify field-wide controls, but the risk is higher for later plantings. Often damage can be reduced by treating border areas while nymphs are small and before they begin migrating to sunflower fields.

## Loopers, Painted Lady, and Woolly-bear Caterpillars

Various foliage-feeding caterpillars can cause economic damage if defoliation becomes significant. Insecticides may be warranted if defoliation reaches 25 percent during reproductive stages and larvae are still small.

### Dectes Stem Borer

This is a gray beetle with long antennae that commonly infests commercial sunflower plants and cannot be controlled with insecticides. The boring of stalks by larvae will not affect yield, but plants may lodge prior to harvest if larvae girdle stalks at their base. This problem is associated with high plant populations and dry soil conditions; under wet field conditions, many larvae may not girdle at all. Use lower plant populations to increase plant size and harvest promptly under dry conditions. More information on this pest is available in KSRE publication MF2581: Dectes Stem Borer, available on the web at <http://www.ksre.ksu.edu/bookstore/pubs/mf2581.pdf>.

## Grasshopper Management Options

Noncrop Area Treatments		
Insecticide	Rate	Special Instructions
Acephate (Bracket 90 Orthene 75S)	0.25 lb. a.i./acre	Apply in 10 to 20 gallons by ground, or in 1 to 5 gallons by air. Use as a treatment on ditch banks, roadsides, and field borders. Do not feed or graze treated forage.
Beta-cyfluthrin (Baythroid XL)	2.6 to 2.8 fl. oz./acre	Labeled for use in pastures, rangeland, grass for hay, and grass for seed. PHI is 0 days.
Diflubenzuron* (Dimilin 2L)	2 fl.oz/acre	Apply to manage grasshoppers in breeding areas before they move into crop land. Treat early instars (majority in the second to third nymphal stages). For use on field border, fence rows, roadsides, farmsteads, ditchbanks, wasteland, and CRP land. REI is 12 hours.
Esfenvalerate* (Asana XL)	0.015 to 0.03 lb. a.i./acre (2.9 to 5.8 fl. oz./acre of Asana XL).	This label is for noncrop use on land adjacent to tilled area to control migrating insects. Repeat as needed, but do not exceed 0.5 lb. a.i./acre per year. Do not feed the treated vegetation. Do not spray ditch banks or areas adjacent to water.
Gamma-cyhalothrin* (Proaxis)	0.0075 to 0.015 lb ai/acre, 1.92 to 3.84 fl.oz/acre	Spray non-cropland adjacent to agricultural areas to control migratory insects that may threaten crops. Use highest labeled rates for dense/tall foliage, high insect populations and/or larger insects. Do not graze livestock in treated area. REI is 24 hours

## Grasshopper Management Options

Noncrop Area Treatments		
Insecticide	Rate	Special Instructions
Zeta-cypermethrin* (Mustang MAXX, etc.)	0.0175 to 0.025 lb. a.i./acre (2.8 to 4.0 fl. oz. per acre)	Labeled for use on grass forage, fodder, pasture, and rangeland with a 12 hour REI and a 0-day harvest restriction on forage. Thus, this material may be used to treat these areas when grasshoppers are threatening to move from these areas into neighboring crop fields.

\* Restricted Use Pesticide

## Seed Weevils

Two weevil species attack sunflower seeds in Kansas and may reduce yields. The gray seed weevil, *Smicronyx sordidus*, is about ¼-inch long, and the red seed weevil, *Smicronyx fulvus*, is ⅛-inch long.

The gray seed weevil has an adult emergence peak five to 10 days earlier than the red seed weevil most seasons. Both weevils produce one generation per year and feed on plant tissue under bracts of developing flowers, causing little damage.

Gray seed weevils begin to oviposit (lay eggs) on sunflowers in the bud stage.

Larvae penetrate the seed at its base and destroy the ovary. Red seed weevil females must feed on pollen to mature their eggs and therefore do not oviposit in flowers before pollen release. Flowers at stage R-5.5 are preferred, and oviposition is concentrated in the developing seeds along the outer edges of flowers.

Larvae of both species feed within seeds. At maturity, an exit hole is cut and the larva drops to the ground, burrows into the soil, and overwinters. It pupates and emerges as an adult in the spring. Treatments targeting gray seed weevils

are normally not justified because larvae gall the seeds causing 'pops' and these are normally removed during threshing. In contrast, red seed weevil larvae do not significantly change seed weight and many may remain in seeds post-harvest, leading to downgrades.

Insecticide treatments for the red seed weevil must be timed to prevent adults from laying their eggs. Treatments should be timed early in the flowering period when about 30 percent of plants have reached the R-5.1 stage. Count the weevils on the heads of five of the most mature

## Cutworm Management Options

Insecticide	Rate
Beta-cyfluthrin (Baythroid XL)	0.0065 to 0.0125 lb. a.i./acre (0.8 to 1.6 fl. oz.)
Chlorpyrifos (Saurus)	8 oz./1,000 row ft. in 7-inch band at planting
Chlorpyrifos (numerous products)	Check label, but generally 2 pints/acre
Chlorpyrifos plus gamma-cyhalothrin (Cobalt Advanced)	16.0 to 38.0 fl. oz./acre
Chlorpyrifos plus zeta-cypermethrin (Stallion)	3.75 to 11.75 fl. oz./acre
Deltamethrin (Delta Gold)	0.012 to 0.018 lb. a.i./acre (1.0 to 1.5 fl. oz.)
Esfenvalerate (Asana XL)	0.03 to 0.05 lb. a.i./acre (5.8 to 9.6 fl. oz.)
Gamma-cyhalothrin (Proaxis)	0.0075 to 0.0125 lb. a.i./acre (1.92 to 3.20 fl. oz.)
Lambda-cyhalothrin (numerous products)	0.015 to 0.025 lb. a.i./acre (2.56 to 3.84 fl. oz.)
Lambda-cyhalothrin chlorantraniliprole (Besiege)	5.0 to 10.0 fl. oz./acre
Zeta-cypermethrin (Mustang MAXX, etc.)	0.014 to 0.025 lb. a.i./acre (2.24 to 4.0 fl. oz.)

## Grasshopper Management Options

Field Sprays	
Insecticide	Rate
Beta-cyfluthrin (Baythroid XL)	0.0155 to 0.022 lb. a.i./acre (2.0 to 2.8 fl. oz.)
Chlorantraniliprole (Prevathon)	8.0 to 20.0 fl oz/acre
Chlorpyrifos (numerous products)	Check label, but generally 1 pint/acre
Chlorpyrifos plus gamma-cyhalothrin (Cobalt Advanced)	6 to 13 fl. oz./acre
Chlorpyrifos plus zeta-cypermethrin (Stallion)	5.0 to 11.75 fl. oz./acre
Deltamethrin (Delta Gold)	0.012 to 0.018 lb. a.i./acre (1.0 to 1.5 fl. oz.)
Esfenvalerate (Asana XL)	0.03 to 0.05 lb. a.i./acre (5.8 to 9.6 fl. oz.)
Gamma-cyhalothrin (Proaxis)	0.01 to 0.015 lb. a.i./acre
Lambda-cyhalothrin (numerous products)	0.02 to 0.03 lb. a.i./acre (2.56 to 3.84 fl. oz.)
Lambda-cyhalothrin chlorantraniliprole (Besiege)	6.0 to 10.0 fl. oz./acre
Zeta-cypermethrin (Mustang MAXX, etc.)	0.014 to 0.025 lb. a.i./acre (2.24 to 4.0 fl. oz.)

## Looper Management Options

Insecticide	Rate
Bacillus thuringiensis (Dipel® 2X and other labeled products)	See label
Deltamethrin (Delta Gold)	0.012 to 0.018 lb. a.i./acre (1.0 to 1.5 fl. oz.)
Gamma-cyhalothrin (Proaxis)	0.01 to 0.015 lb. a.i./acre
Lambda-cyhalothrin (numerous products)	0.02 to 0.03 lb. a.i./acre (2.56 to 3.84 fl. oz.)

plants by spraying the face of the flower with an aerosol insect repellent containing a high DEET concentration. Repeat five times at different locations in the field and away from the margins. The treatment threshold can vary from 2 to 15 weevils per flower for oilseed varieties depending on the plant population, projected value, and cost of treatment. The threshold drops to one weevil per head for confection varieties because of the lower tolerance for larval contamination. Because adults emerge over an extended period, follow early treatment with continued scouting to determine the need for a second treatment. Treatments applied for sunflower moth also may provide some seed weevil control.

To learn more about this pest see MF3129, Sunflower Seed Weevils: *www.ksre.ksu.edu/bookstore/pubs/MF3129.pdf*.

### Stem Weevils

Two species of weevils occur in sunflower stems in Kansas. The most important of these is the sunflower stem weevil, *Cylindrocopturus adspersus*. It is 1/8- to 3/16-inch long and mottled gray-brown with irregular white spots. Antennae, snout, and eyes are black.

Emergence of sunflower stem weevil adults occurs mid-May to early June, and females begin laying eggs after two weeks. Adults feed on foliage, and females insert their eggs in the base of stalks.

Larger plants are preferred for oviposition, and single stalks may contain more than 200 larvae. Larvae feed among the vascular bundles of the stem matrix, descending to lower portions of the stalk as they mature, finally forming overwintering chambers in the lower stalk near ground level. Pupation occurs the following spring or early summer.

There is no direct impact of stem weevil feeding on yield, but heavy larval infestations can reduce stalk strength and cause pre-harvest lodging. These insects also vector the fungus causing Phoma black stem disease, which can cause premature ripening and exacerbate lodging problems.

Non-rotated fields, or fields planted next to where sunflowers were planted the previous year are more likely to have significant stem weevil populations, especially where infestations were serious the previous year. Double-crop sunflowers or those planted after the first week of June are not at risk. Some evidence suggests that plant resistance to stem weevil larval development is reduced under drought conditions, so stem weevil damage may be more of a concern under dryland production. In addition, several years of successive drought seem to favor the development of large populations.

Seed treatments do not appear to provide control. Economic thresholds

based on counts of adults are not well defined; adults are cryptic in appearance and behavior and difficult to observe, and numbers often do not correlate with larvae developing within stalks. Because stem weevils are relatively difficult to scout for but easy to control with most registered materials, consider treatment at the 8- to 10-leaf stage for fields planted before the first week of June in regions with a history of problems.

### Sunflower Beetle

Adults are slightly smaller, but similar in shape to Colorado potato beetles with a light yellow background and dark brown stripes on the wing covers. Larvae are yellowish and humpbacked. Adults occur in late May and early June. Adults and larvae chew holes in leaves. Economic damage is rare in Kansas. Treat if one adult is present per seedling or larvae reach 10 to 15 per plant on upper leaves, 25 percent defoliation occurs, and pupation has not begun.

### Sunflower Moth (Head Moth)

The sunflower moth, *Homoeosoma electellum*, is the most damaging sunflower pest in Kansas. Adults are whitish, 3/8 to 5/8 inch long and rest with wings clasped to the body, giving the moth a cigar shape.

Flowers in the early stages of bloom are favored for oviposition, and females lay eggs at the base of the florets. Newly hatched larvae are pale yellow, but darken

### Painted Lady Caterpillar Management Options

Insecticide	Rate
Chlorpyrifos plus gamma-cyhalothrin (Cobalt Advanced)	16.0 to 38.0 fl. oz./acre
Chlorpyrifos plus zeta-cypermethrin (Stallion)	3.75 to 11.75 fl. oz./acre
Gamma-cyhalothrin (Proaxis)	0.01 to 0.015 lb. a.i./acre
Lambda-cyhalothrin (numerous products)	0.02 to 0.03 lb. a.i./acre (2.56 to 3.84 fl. oz.)
Lambda-cyhalothrin chlorantraniliprole (Besiege)	6.0 to 10.0 fl. oz./acre

### Seed Weevil Management Options

Insecticide	Rate
Beta-cyfluthrin (Baythroid XL)	0.0155 to 0.022 lb. a.i./acre (2.0 to 2.8 fl. oz.)
Chlorpyrifos (numerous products)	Check label, but generally 1 to 1.5 pints/acre
Chlorpyrifos plus gamma-cyhalothrin (Cobalt Advanced)	16 to 38 fl. oz./acre
Chlorpyrifos plus zeta-cypermethrin (Stallion)	5.0 to 11.75 fl. oz./acre
Deltamethrin (Delta Gold)	0.012 to 0.018 lb. a.i./acre (1.0 to 1.5 fl. oz.)
Gamma-cyhalothrin (Proaxis)	0.01 to 0.015 lb. a.i./acre
Lambda-cyhalothrin (numerous products)	0.02 to 0.03 lb. a.i./acre (2.56 to 3.84 fl. oz.)
Lambda-cyhalothrin chlorantraniliprole (adult) (Besiege)	6.0 to 10.0 fl. oz./acre
Zeta-cypermethrin (Mustang MAXX, etc.)	0.014 to 0.025 lb. a.i./acre (2.24 to 4.0 fl. oz.)

to shades of brown or purple with longitudinal white stripes. Early instars feed on pollen and florets. Later instars bore into the head and consume receptacle tissue and seeds. This damage enables infection by *Rhizopus* fungus that can lead to even greater yield loss than larval feeding, especially under humid conditions.

Start scouting fields for head moth as the first flowers begin to open (stage R-4 to R-5.1). Scouting must be done frequently because migratory moths can appear in large numbers virtually overnight. When populations are high, moths may be detected by walking through fields at any time of day and watching for moths to fly up as plants are disturbed. When populations are low it may be best to scout fields after dark with a flashlight and look for moths resting on the opening blooms. Moth activity on flowers peaks around one hour after sunset. The treatment threshold is one to two moths per five plants, depending on the projected value of the crop. After treatment, scouting should continue every two to three days until plants reach the R5.9 stage.

Early planted fields typically suffer the most damage from sunflower moths. Fields planted in early July that bloom after August 10 are less likely to develop economic infestations, but should be monitored for later generation moths that can immigrate from wild sunflowers or earlier planted fields.

A preventive insecticide treatment is best applied as blooms begin to open. If moths are above the threshold, treatments should be applied as 20 to 40 percent of the plants begin to flower (stage R-5.1). When populations are low, treatments can be delayed until 90 to 100 percent of the plants have reached stage R-5.1. Most failures to obtain control result from delayed treatment. Flowers remain at risk until all pollen has been shed, so there is a need for continued scouting.

Early insecticide applications target adults and small larvae, and the objective is to kill females before eggs are laid in the flowers, or kill larvae in the earliest stages while they are feeding mostly on pollen and before they bore deep in the head. The exceptions are chlorantraniliprole and flubendiamide, which are not contact insecticides and therefore not active against adults. Additional applications, applied at five- to seven-day intervals, may be required to control heavy moth pressure.

Once flower disks are fully expanded, treatment will be more effective if it is applied directly into the face of the flowers. Various pyrethroids may irritate larvae and cause them to leave the heads, but only when deposited on the flower face. Factors such as gallage, wind direction, flight direction and height will probably all affect the success of later applications. Application with a ground rig permits

application of a larger volume to achieve better coverage.

For more information, see the K-State Research and Extension publication MF3108: <http://www.ksre.ksu.edu/bookstore/pubs/MF3108.pdf>.

## Endangered Species

EPA's Endangered Species Protection Program (ESPP) helps promote the recovery of endangered species. If limitations on pesticide use are necessary to protect listed species in a certain geographic area, the information is relayed through Endangered Species Protection bulletins. Pesticide labels may direct you to contact your local extension office. You can obtain bulletins directly from the EPA at [www.epa.gov/espp/bulletins.htm](http://www.epa.gov/espp/bulletins.htm).

## Bee Caution

With the exception of chlorantraniliprole, most of the insecticides used on sunflowers are highly toxic to bees and carry statements similar to the following: *This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops or weeds if bees are visiting the treatment area.*

Because many sunflower pests require treatment during bloom, producers should not apply chemicals while bees are actively visiting the flowers and warn local beekeepers before applying insecticide.

### Woollybear Caterpillar Management Options

Insecticide	Rate
Chlorpyrifos (numerous products)	Check label, but generally 1 to 1.5 pints/acre
Chlorpyrifos plus gamma-cyhalothrin (Cobalt Advanced)	16.0 to 38.0 fl. oz./acre
Chlorpyrifos plus zeta-cypermethrin (Stallion)	5.0 to 11.75 fl. oz./acre
Gamma-cyhalothrin (Proaxis)	0.01 to 0.015 lb. a.i./acre
Lambda-cyhalothrin chlorantraniliprole (Besiege)	6.0 to 10.0 fl. oz./acre
Zeta-cypermethrin (Mustang MAXX, etc.)	2.6 to 4.0 fl. oz./acre

### Stem Weevil Management Options

Insecticide	Rate
Beta-cyfluthrin (Baythroid XL)	0.0125 to 0.019 lb. a.i./acre (1.6 to 2.4 fl. oz.)
Chlorpyrifos (numerous products)	Check label, but generally 1 to 1.5 pints/acre
Chlorpyrifos plus gamma-cyhalothrin (Cobalt Advanced)	16.0 to 38.0 fl. oz./acre
Chlorpyrifos plus zeta-cypermethrin (Stallion)	5.0 to 11.75 fl. oz./acre
Deltamethrin (Delta Gold)	0.012 to 0.018 lb. a.i./acre (1.0 to 1.5 fl. oz.)
Esfenvalerate (Asana XL)	0.03 to 0.05 lb. a.i./acre (5.8 to 9.6 fl. oz.)
Gamma-cyhalothrin (Proaxis)	0.01 to 0.015 lb. a.i./acre
Lambda-cyhalothrin (numerous products)	0.02 to 0.03 lb. a.i./acre (2.56 to 3.84 fl. oz.)
Lambda-cyhalothrin chlorantraniliprole (Besiege)	6.0 to 10.0 fl. oz./acre
Zeta-cypermethrin (Mustang MAXX, etc.)	0.014 to 0.025 lb. a.i./acre (2.24 to 4.0 fl. oz.)

### Sunflower Beetle Management Options

Insecticide	Rate
Beta-cyfluthrin (Baythroid XL)	0.0065 to 0.0125 lb. a.i./acre (0.8 to 1.6 fl. oz.)
Carbaryl (Sevin XLR 80S, 50W or 4F)	1 to 1½ lb. a.i./acre
Chlorpyrifos (numerous products)	Check label, but generally 1 to 1.5 pints/acre
Chlorpyrifos plus gamma-cyhalothrin (Cobalt Advanced)	16.0 to 38.0 fl. oz./acre
Chlorpyrifos plus zeta-cypermethrin (Stallion)	5.0 to 11.75 fl. oz./acre
Deltamethrin (Delta Gold)	0.012 to 0.018 lb. a.i./acre (1.0 to 1.5 fl. oz.)
Esfenvalerate (Asana XL)	0.015 to 0.03 lb. a.i./a (2.9 to 5.8 fl. oz.)
Gamma-cyhalothrin (Proaxis)	0.0075 to 0.0125 lb. a.i./acre
Lambda-cyhalothrin (numerous products)	0.015 to 0.025 lb. a.i./acre (2.56 to 3.84 fl. oz.)
Lambda-cyhalothrin chlorantraniliprole (Besiege)	5.0 to 10.0 fl. oz./acre
Zeta-cypermethrin (Mustang MAXX, etc.)	0.014 to 0.025 lb. a.i./acre (2.24 to 4.0 fl. oz.)

### Sunflower Moth (Head Moth) Management Options

Insecticide	Rate
Beta-cyfluthrin (Baythroid XL)	0.0155 to 0.022 lb. a.i./acre (2.0 to 2.8 fl. oz.)
Chlorantraniliprole (Prevathon)	14.0 to 20.0 fl. oz./acre
Chlorpyrifos (numerous products)	Check label, but generally 1 to 1.5 pints/acre
Chlorpyrifos plus gamma-cyhalothrin (Cobalt Advanced)	16.0 to 38.0 fl. oz./acre
Chlorpyrifos plus zeta-cypermethrin (Stallion)	5.0 to 11.75 fl. oz./acre
Deltamethrin (Delta Gold)	0.012 to 0.018 lb. a.i./acre (1.0 to 1.5 fl. oz.)
Esfenvalerate (Asana XL)	0.03 to 0.05 lb. a.i./acre (5.8 to 9.6 fl. oz.)
Gamma-cyhalothrin (Proaxis)	0.01 to 0.015 lb. a.i./acre
Lambda-cyhalothrin (numerous products)	0.02 to 0.03 lb. a.i./acre (2.56 to 3.84 fl. oz.)
Lambda-cyhalothrin chlorantraniliprole (Besiege)	5.0 to 10.0 fl. oz./acre
Zeta-cypermethrin (Mustang MAXX, etc.)	0.014 to 0.025 lb. a.i./acre (2.24 to 4.0 fl. oz.)

## Sunflower Insecticide Use Instructions

Insecticide	Special Instructions
Bacillus thuringiensis (Dipel® 2X and other labeled products)	Larvae must be actively feeding. Only effective against certain caterpillars. No preharvest restriction. No use restriction.
Beta-cyfluthrin* (Baythroid XL)	A total of 0.0655 lb. a.i./a (8.4 fl. oz.) may be applied per season. 30-day preharvest interval. REI is 12 hours.
Carbaryl (Sevin XLR 80S, 50W or 4F)	Do not apply within 30 days of grazing or harvest for forage or within 60 days of harvest for seed. REI is 12 hours.
Chlorantraniliprole (Prevathon)	For best results apply at treatment threshold at R 5.0 to R 5.1 and applications may be required at 5 to 7 day intervals when moth pressure is high. Do not apply more than 60 fl. oz./acre. Do not make more than 4 applications/acre. Minimum interval between treatments is 5 days. PHI is 21 days. REI is 4 hours.
Chlorpyrifos (Saurus)	At planting T-band treatment using 7 inch wide band at a rate of 8 oz./1,000 ft. row. RET is 24 hours unless PPE for early entry is worn.
Chlorpyrifos* (numerous products, including Chlopyrifos, Eraser, Govern, Lorsban, Nufos, Pilot, Warhawk, Whirlwind and Yuma)	Broadcast spray by air or ground equipment. Do not make a second application of chlorpyrifos within 10 days of the first application. 42-day preharvest restriction. Do not graze or feed treated forage. REI is 24 hours.
Chlorpyrifos plus gamma-cyhalothrin* (Cobalt Advanced)	Do not apply within 45 days before harvest. Do not apply more than 114 fl. oz. of Cobalt per acre per season. Do not make more than 3 applications per season of Cobalt or other products containing chlorpyrifos. Do not make a second application of Cobalt or other product containing chlorpyrifos within 10 days of the first application. Do not allow meat or dairy animals to graze in treated areas. REI is 24 hours.
Chlorpyrifos plus zeta-cypermethrin (Stallion)	A new product registration that is a combination of chlorpyrifos (2.72 lb./gal.) plus zeta-cypermethrin (0.272 lb./gal.). REI is 24 hrs. PHI is 42 days.
Deltamethrin* (Delta Gold)	REI is 12 hours. Do not apply within 21 days of harvest. Do not graze or feed treated sunflower foliage to livestock.
Esfenvalerate* (Asana XL)	Repeat as necessary to maintain control. Do not exceed 0.2 lb. a.i./a per season. 28-day PHI. REI is 12 hours.
Gamma-cyhalothrin* (Proaxis)	Apply with ground or air equipment, using sufficient water and application methods to obtain full coverage of foliage. When applying by air, apply in a minimum of 2 gallons of water per acre. Do not apply more than 0.06 lb. a.i. (0.96 pint) per acre per season and do not apply more than 0.045 lb a.i. (0.72 pint) per acre preseason after bloom initiation. PHI is 45 days and REI is 24 hours.
Lambda-cyhalothrin* (Numerous products, including Lambda T, Silencer, Taiga Z, and Warrior II with Zeon Technology)	Apply by ground or air in sufficient gallonage to obtain full coverage. Use a minimum of 2 gallons of water per acre by air. Do not apply more than 0.12 lb. a.i. (0.96 pt.) per acre per season and do not apply more than 0.09 lb. a.i. (0.72 pt.) per acre per season after bloom initiation. PHI is 45 days. REI is 24 hours.
Lambda-cyhalothrin chlorantraniliprole (Besiege)	Minimum interval between applications is 5 days. PHI is 45 days. Do not use an adjuvant with applications of Besiege. Do not apply Besiege or allow it to drift to blooming crops or weeds while bees are foraging in or adjacent to the treatment area.
Zeta-cypermethrin* (Mustang MAXX)	Do not apply more than 0.125 pound active ingredient per acre per season. Do not make more than five applications at the maximum application rate per season. Do not graze livestock in treated areas or cut treated crops for feed. Avoid applications when honey bees are actively foraging by applying during the early morning or evening hours. PHI is 30 days. REI is 12 hours.

\* Restricted Use Pesticide

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