

2000 Insect Pest Management Guide for Iowa Field and Forage Crops

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Trade names of products are used in this publication to simplify information. No criticism is intended of similar products not named.

Pest Management

Producing high-quality crops and livestock requires a pest management program to prevent or reduce damage caused by insects. Pest management programs include frequent inspection; correct identification of pests; evaluation of existing and potential damage based on knowledge of the pest life cycle and habits; use of pest preventive measures, where possible; and integration of nonchemical and chemical control methods.

Using cultural, biological, and physical control methods such as those included in this guide can reduce our dependence on pesticides. However, appropriate use of pesticides is sometimes essential to a pest management program.

Pesticide Safety

Read the label. Safe and proper use of pesticides starts when you read, understand, and follow all label directions. The label provides important directions, such as crops that can or cannot be treated; insect pests that can or cannot be treated; insect pests that can be controlled; safety precautions and equipment to use; rates for diluting and mixing the material; application instructions; allowed frequency or number of repeat

applications; and the waiting period required between treatment and harvest. You must understand each of these items to use pesticides responsibly.

- **Keep pesticides in original containers**, tightly closed, and in a locked storage facility that is not accessible to children or pets.

- **Follow all personal safety precautions** when mixing and applying pesticides. Do not eat, drink, or smoke while mixing and applying pesticides. Wash your hands and face immediately after spraying. Wear protective clothing, goggles, and gloves as specified. Do not inhale dust, vapors, or mists from pesticides, and do not allow concentrate, dilute spray, or dusts to remain in contact with your skin.

- **Mix only the amount of spray to be used right away**; do not store excess spray material. Apply pesticides safely. Treat only crops listed on the label, at the time and rate specified. Do not repeat applications more than the total number of times allowed or at shorter intervals than allowed.

- **Protect honeybees**; do not spray when plants are in bloom. Spray pesticides only on calm days or when wind is light. Guard against drift of sprays and dusts.

- **After spraying, promptly empty and rinse the sprayer with clean water.** At the end of the season take the sprayer apart, lubricate its moving parts, and replace worn ones.

Pesticide Spills

Even when you follow proper procedures, pesticide spills can occur. Know what steps to take in the event of a pesticide spill so you can respond quickly and properly. Remember: Always wear proper protective clothing when you deal with pesticide spills, and clean your equipment and clothing when you are finished.

- **Control the spill.** Immediately after a spill occurs, identify and control the source of the spill to prevent further spillage. As soon as possible, call the authorities for help and information.

- **Contain the spill.** Contain the spill with a dike of soil or sand. Do not allow the chemical to get into any body of water, including storm sewers or sanitary sewers. Never hose down spills because the chemical will spread.

- **Clean up the spill.** Use an absorbent material such as dirt or kitty litter to soak up the spill. Shovel all contaminated material into a leakproof container for proper disposal. Once the spill has been cleaned up, you may need to decontaminate the area. Common household bleach is usually an effective chemical for decontamination; however, read the label for specific decontamination directions. Additional information is available at the emergency telephone number listed on the label or call Chemtrec at 1-800-424-9300.

- **Call the authorities.** You must report pesticide spills in Iowa to the Iowa Department of Natural Resources (IDNR) at 1-515-281-5385 within 6 hours of occurrence or discovery. Your initial report must be followed by a written report to the IDNR within 30 days.

Federal law requires you to immediately notify the appropriate agency of the U.S. government if oil or hazardous substances are discharged. If you fail to immediately notify the agency, upon conviction, you will be fined not more than \$10,000 or imprisoned for not more than 1 year, or both. Report all major spills immediately to the Environmental Protection Agency (EPA). The telephone number to call in the four-state area of Iowa, Missouri, Kansas, and Nebraska is 1-800-223-0425. Include the following information:

- Name, address, and telephone number of persons reporting;
- Exact location of spill;
- Name of company involved and location;
- Specific pesticide spilled;
- Estimated quantity of pesticide spilled;
- Source of spill;
- Cause of spill;
- Name of body of water involved, or nearest body of water to the spill area; and
- Action taken for containment and cleanup.

Pesticide Container Disposal

Pesticide labels usually provide some information on container disposal. Always comply with the label directions, as well as state and federal regulations. Triple rinse all empty pesticide containers (other than paper bags) before you dispose of them, regardless of the disposal method you choose. Triple rinse all noncombustible containers in the following manner:

- Empty the container in the spray tank and let it drain for 30 seconds.
- Fill the container one-fifth to one-fourth full of water.
- Replace the closure and rotate the container. Upend the container so the rinse reaches all the side surfaces.
- Drain the rinse water from the container into the spray tank, and let it drain 30 seconds after emptying.
- Repeat this procedure at least two more times.

Never reuse a pesticide container. Even rinsed containers contain some pesticide residues.

To prevent unauthorized salvaging and conversion to other uses, do not discard empty containers or allow them to accumulate in an easily accessible area. Some pesticide containers may be returned to the dealer. You may bury properly rinsed containers in any sanitary landfill that accepts pesticide containers. Consult the IDNR for additional information regarding pesticide container disposal.

Restricted use Pesticides

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) of 1972 classifies pesticides as restricted or general use. Restricted use insecticides are indicated by an asterisk (*) where they appear in these recommendations.

Only certified pesticide applicators may use pesticides classified for restricted use. A complete listing of restricted products is available at www.pme.iastate.edu/info/new.htm and is updated as necessary.

Certification is issued by the Iowa Department of Agriculture and Land Stewardship (IDALS). Certification training is provided by Iowa State University Extension. If you need certification training, contact your county extension office for additional information.

Special Local Need (SLN) Registrations

Section 24(C) of the amendments to FIFRA allows states to register pesticides that are formulated for distribution and use within the state to meet special local needs. A special label, listing the new 24(C) uses, is printed by the formulator. A copy of this label must be present when a 24(C) application is being made. Special 24(C) labels are available from chemical dealers.

Bee Rule

The Application of Pesticides Toxic to Bees Pesticide Act of Iowa 30-10.31 (206) states: All pesticide applicators who use any pesticide labeled "toxic to bees" are now required to notify beekeepers if the field to be treated is within a 2-mile radius of any registered bee yard. Notification must be given at least 24 hours and no more than 72 hours before an application. A list of bee yard locations is available at IDALS apiculture office. Call 515-281-5736.

Notify beekeepers before spraying.

Effect of Water pH on Insecticides

Several factors may influence the effectiveness of insecticide sprays. Three major factors are the pH of the spray mixture water, the length of time a spray mixture has remained in the tank, and the environmental conditions during and shortly after application.

A solution's pH, the measure of its acidity or alkalinity, ranges from 0 to 14. A pH of 7 is neutral, 7 to 14 is alkaline, and 0 to 7 is acidic. The higher the pH, the shorter the residual life and tank life of organophosphate and carbamate insecticide mixtures. Even mildly alkaline water can cause pesticides to degrade in the spray tank. Spray water should be around pH 6.0 for best results.

Adjuvants called acidifying agents, acidifiers, or buffers can be added to spray mixtures to lower the pH of alkaline water. Check the pH of all spray water sources and take corrective procedures if needed. Apply insecticides as soon as possible after mixing them in the spray tank. Never leave mixed sprays overnight or for an extended period of time.

High temperatures can reduce the residual activity of some insecticides and miticides. If possible, avoid midday applications during hot weather.

Corn Insects

Seedcorn Beetles and Seedcorn Maggots

Apply a seed treatment to corn if cover crops are plowed under before planting and the seedcorn maggot or seedcorn beetle is the only insect of concern. Fields that have crop residue remaining on the surface from the previous year or that are no-tilled should not have problems from seedcorn maggots.

Wireworms, True White Grubs, Sod Webworms, Bronze/Glassy/Sandhill Cutworms

One or more of these insect species may be present in sufficient numbers to cause economic damage where corn follows grass or legume-grass sod.

If wireworm problems have occurred during the last 3 years, or if the cultivated field follows grass, apply an insecticide in-furrow or T-banded, or use a seed treatment that contains lindane.

Use a soil insecticide for true white grubs only if you detect them before planting, if stand loss occurred last year, or if corn is planted following sod.

If corn stand loss occurred in previous years on sandy soils, apply a soil insecticide in-furrow at planting to control sandhill cutworms.

Planter Application

Use Aztec, Counter, Force, Fortress, Lorsban, or Regent as an in-furrow application. All are labeled for wireworm control. Although they are not labeled for sod webworms, corn billbugs, and glassy cutworms, they also should suppress these insects. White grubs are difficult to control; a high rate of registered material is usually necessary.

Aztec, Counter, Force, Furadan, Lorsban, or Thimet also are labeled to be applied in a 7-inch band for wireworm control. Treating sod fields with any of these insecticides in a 7-inch band generally adequately protects only against wireworms, though Force and Lorsban also give cutworm control.

Broadcast Application

Broadcast Lorsban and disk before planting.

Western and Northern Corn Rootworms

Crop rotation is the most effective way to avoid yield losses from corn rootworm larvae. Rootworm eggs usually are laid in cornfields and larvae hatch there the following spring. The larvae have a very limited host range and can only survive on the roots of corn and several species of grasses. A corn and soybean rotation usually disrupts the rootworm life cycle by denying the larvae a suitable host during soybean planting.

Analyses of field data suggest that there is no reliable economic benefit from treating first-year corn, unless an extended-diapause problem from northern corn rootworms is present. A small percentage of summer-laid northern corn rootworm eggs remain dormant in the soil the following spring and larvae hatch the second year. Since 1985, the large northern corn rootworm population plus the percentage of extended (2-year) diapausing eggs have caused economic damage in some northwestern and central Iowa corn–soybean rotations. We anticipate similar infestations will occur.

Growers within western, north central, and central Iowa whose corn following soybeans had lodging from corn rootworms should plant a crop other than corn for at least two successive years or protect corn following soybeans with a rootworm insecticide. Application can be made either at planting or first cultivation. Growers who do not have insecticide boxes may spray and incorporate Furadan 4F or Lorsban 4E at planting or cultivation.

Growers in other areas of the state are at little or no risk from extended-diapausing northern corn rootworms. We do not recommend using a rootworm insecticide on corn following soybeans in these areas.

Corn Following Corn

If rootworm control is poor, growers are urged to plant soybeans the next year. If rotation to soybeans is not practical, consider one of three alternatives.

1. Use a rootworm insecticide at planting, or
2. Arrange your management program to include digging roots and searching for rootworm larvae and damage. Make a cultivator application of insecticide where necessary by early June, or
3. Apply a rootworm insecticide at cultivation (by early June) on all continuous corn acres.

Soil insecticides may be applied one of three ways at planting: in-furrow, banded, or T-banded over the open seed furrow. Aztec, Counter, Force, Furadan, Lorsban,

and Thimet are recommended for a 7-inch band incorporated at the time of planting. Aztec, Counter, Force, Fortress, and Furadan also are registered for in-furrow application.

Under normal germination and emergence conditions, granule insecticides recommended for application over the open seed furrow do not damage germinating corn. But on rare occasions, under cold, moist soil conditions, Thimet injury has been reported. Therefore, choose an insecticide other than Thimet for planting-time applications on corn before May 5. Any soil insecticides could be used after May 5.

Use either granule or liquid formulations for cultivation-time applications. Apply the insecticide at the base of the plant, and lightly cover it with soil. Cultivation-time applications may not be successful if the soil is dry, and wet soil may delay or prevent application of the insecticide.

Whenever possible, apply granule rootworm insecticides in a 7-inch band. When reduced tillage or plant residue makes adequate incorporation difficult, use a product recommended for in-furrow application.

Calibrate insecticide application equipment at least annually, preferably between fields. Several factors, including equipment wear and relative humidity, can affect the rate of granule flow and application, resulting in inadequate protection of corn roots.

Late-planted Corn

Except when soils remain abnormally cold during May and early June, you need not use a rootworm insecticide on continuous corn planted after June 5.

Enhanced Biodegradation

Enhanced biodegradation occurs when a soil-applied pesticide is rapidly broken down by microorganisms, primarily bacteria. As a result, the pesticide fails to adequately control the target pest because persistence in the soil decreases. The problem usually first appears in fields where carbamates were used year after year. Of the products currently on the market, the carbamates (Furadan) biodegrade most rapidly. All insecticides have failed to prevent corn rootworm injury at one time or another, but we have no evidence of decreased rootworm control and enhanced biodegradation for any of the currently used organophosphates (Counter, Lorsban, and Thimet).

Strategies to manage the enhanced biodegradation problem are as follows:

1. Rotate from corn to a different crop if possible.

Soil Insects for Corn Rootworm

| Insecticide | Time of application | Oz. of product/ 1,000 ft of row | Amount of product per acre ^a | | | |
|---------------------------|----------------------------|------------------------------------|---|------------|------------|------------|
| | | | 40" rows | 38" rows | 36" rows | 30" rows |
| Aztec 2.1G* | At planting | 6.7 | 5.5 lb | 5.8 lb | 6.1 lb | 7.3 lb |
| Counter CR* | At planting or cultivation | 6 | 4.9 lb | 5.2 lb | 5.4 lb | 6.5 lb |
| Force 3G* | At planting or cultivation | 4–5 | 3.3–4.1 lb | 3.4–4.3 lb | 3.6–4.5 lb | 4.4–5.5 lb |
| Fortress 5G ^{ab} | At planting | 3 | 2.5 lb | 2.6 lb | 2.75 lb | 3.25 lb |
| Furadan 4F* | At cultivation | 2.5 | 2 pt | 2 ⅛ pt | 2 ¼ pt | 2 ¾ pt |
| Lorsban 4E | At cultivation | 2.4 | 2 pt | 2.1 pt | 2.2 pt | 2.6 pt |
| Lorsban 15G | At planting or cultivation | 8 | 6.5 lb | 6.9 lb | 7.3 lb | 8.7 lb |
| Regent 4SC* | At planting | 0.24 | 3.1 oz | 3.3 oz | 3.5 oz | 4.2 oz |
| Thimet 20G* | At planting or cultivation | 6 | 4.9 lb | 5.2 lb | 5.4 lb | 6.5 lb |

*Use restricted to certified applicators only.

^aDo not exceed the following amounts of specific products per acre per season: 7.3 lb of Aztec 2.1G; 6.5 lb of Counter CR; 13.5 lb of Lorsban 15G; 4.2 oz of Regent 4SC; 6.5 lb of Thimet 20G. The minimum row spacing of corn to which Thimet 20G can be applied is 30 in.

^bFortress 5G is available only in the SMARTBOX®, a closed handling and application system.

2. If you use a soil insecticide, do not use a carbamate (Furadan) in successive years or immediately following a problem with a carbamate. Consider using one of the organophosphates (Counter, Dyfonate, Lorsban, or Thimet) or a pyrethroid (Force).

3. Scout for adult beetles this summer, and avoid using insecticide unnecessarily the following year.

Black Cutworm

Black cutworm adults are attracted primarily to weeds and, to a lesser extent, soybean residue where females lay their eggs in late April and May. Cutworms are more likely to be found on low, poorly drained fields because these fields are usually the last to be planted. Weed growth before tillage operations attracts the cutworm adults.

Dingy cutworm moths emerge in August and lay eggs on vegetation in late August and September. This insect overwinters as a partially grown larva. Dingy cutworms usually do more leaf feeding and rarely cut corn plants. Dingy cutworms are more likely to be found on corn following soybeans or hay than on corn following corn.

Emergency Treatment

When black cutworm larvae average between ½ to ¾ inch in length, consider treatment if 2 to 3 percent of the plants are wilted or cut. If larvae average 1 inch in length, treat if 5 percent of the plants are cut. If the surface soil is dry, rotary hoe, just after applying Lorsban, to increase the effectiveness of the spray application. If Ambush, Asana, Pounce, or Warrior are used, do not rotary hoe after application because this may reduce performance.

Preventive Treatment

Cutworms are an occasional pest that occurs an average of once in 5 years in southern Iowa, and only very rarely in northern Iowa. Preventive treatments for black cutworms are not recommended. Contact your county extension office for current information on black cutworm trap catches, or check the *ICM* newsletter at www.ipm.iastate.edu/ipm/icm

Force and Lorsban granules applied in a 7-inch band for rootworm control also are effective against black cutworms. Experience indicates effectiveness except under dry soil conditions or extreme cutworm pressure.

Corn Rootworm Beetles

Beetle emergence during silking may cause sufficient silk cutting to prevent adequate pollination. When silk clipping occurs within 1/2 inch of the husk during pollination, apply one of the labeled liquid insecticides. Late-planted or replanted corn is more likely to pollinate later and is, therefore, more attractive to beetles. Watch these fields closely.

Spray carefully—don't allow chemicals to drift onto hives.

Beetle Scouting

It is a good idea to monitor adult beetles to decide whether a rootworm insecticide is necessary for continuous corn the following year. Scout during silking. If beetle counts exceed 0.7 beetle per plant, protect next year's corn with either an at-planting or a cultivation application of insecticide. Use the sequential sampling method, based on sampling only enough plants to provide a statistically sound decision, to minimize your

scouting efforts. Begin sampling when the first adult beetles appear in late July, and continue weekly until you reach a management decision or until populations decline in late August or September.

European Corn Borer

A complete description of how to determine thresholds for European corn borer control requires more space than is available herein. Refer to ISU Extension publication IPM 37, *Integrated Pest Management of First Generation European Corn Borer - Economic Threshold (Estimator)*, for details.

Thresholds for treating second-generation European corn borers in field corn are difficult to determine. If you anticipate yields of 125 bushels or more per acre, consider treatment when egg masses and/or small larvae occur on 50 percent of the plants. Second-generation eggs are usually laid between July 25 and September 1. Two insecticide applications may be needed.

Research data and field experience have shown that granule insecticides control first-generation European corn borers more effectively than do liquid formulations. Recent research suggests that granule formulations of some products prevent corn injury from second generation European corn borers as well as or better than liquid insecticides.

Overhead Sprinkler

Lorsban, PennCap-M, Pounce, and Sevin are registered specifically for application through center pivot systems. Groundwater contamination is a serious threat if the center pivot shuts down while you are insectigating. Before you attempt insectigation, outfit your system to prevent siphoning or backflush. If you use Lorsban, you must understand and follow label directions exactly. If you use a product without specific label instructions, seek the assistance of a knowledgeable person before you begin.

Armyworm

Severe early-season losses from armyworms can occur when corn is no-tilled into grass. During late April or early May, females lay their eggs on grass. If this grass is consumed by armyworms or killed by herbicides, severe damage can occur quickly when the larvae move to small corn plants. Observe no-tilled fields daily, and treat them with an insecticide if armyworms are found on the grass or on small corn plants.

Stalk Borer

The stalk borer, a native insect, is a minor pest of conventional-tillage corn. In minimum-tillage or no-till corn, it can be a serious problem.

Adult stalk borer adults are active in late August and September. Females deposit eggs on stems and blades of grasses where they overwinter. Larvae emerge in May and usually attack the first plant they encounter. A single larva usually kills its initial host plant and may move to one or more additional plants.

If stalk borer infestations in reduced tillage are associated with perennial grass infestations, following the application of a burndown herbicide with an insecticide spray may provide effective control. Spray after the herbicide turns the grass completely brown but before corn emerges. Tank-mixing the insecticide with a fast-acting herbicide has succeeded in ISU tests. Do not apply insecticides before May 10. See IPM 41, *Stalk Borer Ecology and Pest Management Options in Corn and Soybean*.

Grasshoppers

Economically damaging populations of grasshoppers could occur in Iowa. Populations often develop in ditches and fencerows, then gradually spread into adjacent crops. Grasshoppers along field margins or fencerows are not necessarily a cause for alarm. The greatest reductions in potential yield occur when leaf area is destroyed during the tassel and silking stages. A 20 percent leaf loss during these stages can result in a 7 percent yield reduction. Lesser amounts of leaf feeding during any other crop growth stages probably will not justify an insecticide treatment. Grasshopper nymphs are easily controlled with insecticides. But don't spray grasshoppers until they approach a level that might cause economic yield loss. If this occurs when the grasshoppers become adults, a pyrethroid or carbamate can provide excellent control.

Corn Leaf Aphid

Large numbers of aphids are sometimes present, especially after tassel emergence. Treat infestations on whorl or pretassel-stage corn if large colonies are present and the crop is under drought stress. In the past, the threshold has been 50 percent infestation, but some research indicates that 20 percent infestation can cause serious yield reductions. Hybrid seedcorn producers should observe inbreds that are sparse pollen producers and be prepared to treat if aphids are present before tassels emerge and upper leaves begin to dry.

Spider Mites

Mites are not normally a pest of corn in Iowa. When conditions are very dry, populations of mites may appear in some fields. Usually, populations begin at the base of the plant and gradually work their way upward. By the time the mites reach the leaves at the ear zone, the corn usually has dented and will not benefit from control applications. Treat if mites are present on the lower leaf surfaces at or above the ear zone when corn

has not yet dented.

Chinch Bug

Chinch bugs may attack sorghum or corn at any time during the growing season. Seedling plants are especially vulnerable to damage. Fields next to maturing small grain fields are at greater risk; damage often begins along field margins. For rescue applications, use a minimum of 30 gallons finished spray per acre with drop nozzles directed at the base of the plants. Sprays will not give residual control against continued migration from nearby unsprayed areas. Repeated applications are often necessary.

Corn Insecticides

| Insect | Insecticide | Amount of product per acre | Remarks |
|-----------------|--------------------------------|----------------------------|---|
| Armyworm | Ambush 2E* | 6.4–12.8 oz | Apply prior to brown silk stage |
| | Asana XL* | 5.8–9.6 oz | |
| | Lorsban 4E | 1–2 pt | |
| | Malathion 57%EC | 2 pt | |
| | Pennacap-M* | 2–3 pt | |
| | Pounce 3.2EC* | 4–8 oz | |
| | Sevin XLR+ Warrior T or 1E* | 2–4 pt 2.56–3.84 oz | |
| Billbug | Lorsban 4E | 2–3 pt | |
| Chinch bug | Asana XL* | 5.8–9.6 oz | Apply by ground only in 20–30 gal of water per acre |
| | Furadan 4F* | 0.5–1 pt | |
| | Lorsban 4E | 2–3 pt | |
| | Sevin XLR+ Warrior T or 1E* | 2–4 pt 3.84 oz | |
| Corn earworm | Ambush 2E* | 6.4–12.8 oz | |
| | Asana XL* | 5.8–9.6 oz | |
| | Pounce 3.2 EC* | 4–8 oz | |
| | Warrior T or 1E* | 1.92–3.2 oz | |
| Corn leaf aphid | Asana XL* | 5.8–9.6 oz | |
| | Di-Syston 8EC* | 8–16 oz | |
| | Lorsban 4E | 1–2 pt | |
| | Pennacap-M* | 2–3 pt | |
| | Thimet 15G* | 6.7 lb | |
| | Thimet 20G* | 5.0 lb | |

*Restricted use pesticide.

Corn Insecticides, continued

| Insect | Insecticide | Amount of product per acre | Remarks | |
|-----------------------|--|----------------------------|--|---------------------------------|
| Corn rootworm larvae | Aztec 2.1G* | 6.7 oz per 1,000 | Broadcast postemergent | |
| | Counter CR* | 6 oz per 1,000 row ft | | |
| | Force 3G* | 4–5 oz per 1,000 row ft | | |
| | Fortress 5G* | 3 oz per 1,000 row ft | | |
| | Furadan 4F* | 2.5 oz per 1,000 row ft | | |
| | Lorsban 15G | 8 oz per 1,000 row ft | | |
| | Lorsban 4E | 6 pt | | Broadcast, preplant incorporate |
| | Regent 4SC* | 0.24 oz per 1,000 row ft | | |
| Thimet 20G* | 6 oz per 1,000 row ft | | | |
| Corn rootworm beetles | Ambush 2EC* | 6.4–12.8 oz | Apply prior to brown silk | |
| | Asana XL* | 5.8–9.6 oz | | |
| | Lorsban 4E | 1–2 pt | | |
| | Malathion 57%EC | 1.5 pt | | |
| | Pennncap-M* | 1–2 pt | | |
| | Pounce 3.2EC* | 4–8 oz | Apply prior to brown silk | |
| | Sevin XLR+ | 2–4 pt | | |
| | Warrior T or 1E* | 2.56–3.84 oz | | |
| Cutworms | Lorsban 4E | 2–4 pt | Broadcast, preplant incorporate | |
| | Lorsban 15G | 6.75–13.5 lb | Broadcast, preplant incorporate | |
| | Ambush 2EC* | 6.4–12.8 oz | At planting, do not incorporate | |
| | Asana XL* | 5.8–9.6 oz | At planting, do not incorporate | |
| | Force 1.5G* | 8 oz per 1,000 row ft | At planting | |
| | Force 3G* | 4 oz per 1,000 row ft | | |
| | Lorsban 15G | 8 oz per 1,000 row ft | At planting | |
| | Pounce 1.5G* | 8–16 oz per 1,000 row ft | At planting | |
| | Pounce 3.2EC* | 4–8 oz | At planting, do not incorporate | |
| | Warrior T or 1E* | 1.92–3.2 oz | At planting, do not incorporate | |
| | Ambush 2EC* | 6.4–12.8 oz | Rescue, do not cultivate | |
| | Asana XL* | 5.8–9.6 oz | Rescue, do not cultivate | |
| | Lorsban 4E | 1–2 pt | Rescue, rotary hoe to increase effectiveness | |
| | Pounce 3.2EC* | 4–8 oz | Rescue, do not cultivate | |
| | Warrior T or 1E* | 1.92–3.2 oz | Rescue, do not cultivate | |
| European corn borer | Ambush 2EC* | 6.4–12.8 oz | Apply prior to brown silk | |
| | Asana XL* | 7.8–9.6 oz | | |
| | Lorsban 4E | 1.5–2 pt | | |
| | Lorsban 15G | 5–6.5 lb | | |
| | Pennncap-M* | 2–4 pt | Consult Iowa Bee Law | |
| | Pounce 1.5G* | 6.7–13.3 lb | | |
| | Pounce 3.2EC* | 4–8 oz | Apply prior to brown silk | |
| | Warrior T or 1E* | 2.56–3.84 oz | | |
| | <i>Bacillus thuringiensis</i> (several different trade names, including Condor, Dipel, M-Peril) | See labels for rates | | |
| | Overhead Sprinkler Application | | | |
| | Ambush 2EC* | 6.4–12.8 oz | Apply prior to brown silk | |
| | Asana XL* | 7.8–9.6 oz | | |
| | Lorsban 4E | 2 pt + 2 pt crop oil | | |
| | Pennncap-M* | 4 pt | | |
| | Flea beetles | Ambush 2EC* | 6.4–12.8 oz | |
| Asana XL* | | 5.8–9.6 oz | | |
| Lorsban 4E | | 2 pt | | |
| Pennncap-M* | | 2–3 pt | | |
| Pounce 3.2EC* | | 4–8 oz | | |
| Sevin XLR+ | | 2 pt | | |

*Restricted use pesticide.

Corn Insecticides, continued

| Insect | Insecticide | Amount of product per acre | Remarks |
|-----------------|--------------------------------|-------------------------------|--|
| Grasshoppers | Asana XL* | 5.8–9.6 oz | |
| | Cygon 400 | 1 pt | |
| | Furadan 4F* | 0.25–0.5 pt | |
| | Lorsban 4E | 0.5–1 pt | |
| | Penncap-M* | 2–3 pt | |
| | Sevin XLR+ Warrior T or 1E* | 2–3 pt 2.56–3.84 oz | |
| Hop vine borer | None labeled | | |
| Seedcorn maggot | Agrox DL+ | Check label. | |
| | Counter CR* | 6 oz per 1,000 row ft | |
| | Force 3G* | 4 oz per 1,000 row ft | |
| | Furadan 4F* | 2.5 oz per 1,000 row ft | |
| | Lorsban 15G Lorsban 4E | 8 oz per 1,000 row ft 4 pt | |
| Sod webworms | Lorsban 4E | 1–2 pt | Rotary hoe before or after application |
| Spider mites | Di-Syston 8EC* | 8–16 oz | |
| Stalk borer | Ambush 2EC* | 6.4–12.8 oz | |
| | Asana XL* | 5.8–9.6 oz | |
| | Lorsban 4E | 2–3 pt | |
| | Pounce 3.2EC* | 4–8 oz | |
| | Warrior T or 1E* | 2.56–3.84 oz | |
| Stink bugs | Penncap-M* | 1–3 pt | |
| White grubs | Aztec 2.1G* | 6.7 oz | |
| | Counter CR* | 6 oz per 1,000 row ft | |
| | Force 3G* | 5 oz per 1,000 row ft | |
| | Fortress 5G* | 3 oz per 1,000 row ft | |
| | Lorsban 15G | 8–16 oz per 1,000 row ft | Broadcast, preplant incorporate |
| | Lorsban 4E | 4 pt | |
| | Regent 4SC* | 0.24 oz per 1,000 row ft | |
| Thimet 20G* | 6 oz per 1,000 row ft | | |
| Wireworms | Agrox DL* | See label | |
| | Aztec 21.G* | 6.7 oz per 1,000 | |
| | Counter CR* | 6 oz per 1,000 row ft | |
| | Force 3G* | 4–5 oz per 1,000 row ft | |
| | Fortress 5G* | 3 oz per 1,000 row ft | |
| | Furadan 4F* | 2.5 oz per 1,000 row ft | |
| | Lorsban 15G | 8 oz per 1,000 row ft | Broadcast, preplant incorporate |
| | Lorsban 4E | 4 pt | |
| | Thimet 20G* | 6 oz per 1,000 row ft | |
| | Regent 80 WG* | 0.149 oz per 1,000 row ft | |

*Restricted use pesticide.

Sorghum Insects

Chinch Bug

See corn insects section.

Greenbug

Routine planting-time applications for greenbug prevention have not been necessary in Iowa. Rescue treatment is warranted if there is more than one greenbug per leaf on sorghum less than 6 inches in height; on 6- to 18-inch sorghum if two bottom leaves are brown and greenbugs are present on the upper leaves; and on heading sorghum if four bottom leaves are brown and greenbug colonies are still present.

Sorghum Insecticides

| Insect | Insecticide | Amount of product per acre | Remarks |
|-------------|-----------------------|----------------------------|---|
| Chinch bug | Furadan 15G* | 8 oz per 1,000 row ft | Apply in seed furrow See drought statement on label Apply at plant base and cover with soil |
| | Lorsban 4E | 1–2 pt | |
| Thimet 20G* | 6 oz per 1,000 row ft | | |
| Sevin XLR+ | 2–4 pt | | |
| Greenbug | Cygon 400 | 0.5–1 pt | See drought statement on label |
| | Lorsban 4E | 0.5–1 pt | |
| | Malathion 57%EC | 1.5 pt | |

*Restricted use pesticide.

Soybean Insects

Seedcorn Maggot

Seedcorn maggot injury to germinating soybeans is most likely in mid- to late May but can occur throughout soybean planting. Use a seed treatment if soybeans are planted into high-risk areas such as tilled sod or alfalfa, manured soils, or any soil with high levels of decomposing organic matter. Use diazinon or lindane treatments along with graphite in the planter box. However, graphite treatments may interfere with air planters or electronic seed counters. Commercial seed treatments, which usually include diazinon, lindane, and captan, provide excellent protection. Don't use treated seed for anything other than planting. Some band treatments are acceptable alternatives for seedcorn maggot control.

Cutworms

Cutting problems in soybeans are very uncommon. Preventive insecticide treatments are unnecessary because cutworms are sporadic and unusual pests of soybeans. However, if substantial injury occurs and

seedling soybeans are still at risk of being cut, rescue treatments may be justified. At present, economic thresholds are not available for cutworms on soybeans.

Green Cloverworm

The green cloverworm migrates into Iowa, and populations do not develop until mid- to late June. Insufficient migration and the action of a fungal disease usually keep green cloverworm numbers below economic levels. However, with favorable conditions, outbreaks do occur. A sampling program using a shake cloth is used to monitor green cloverworm populations. Economic losses can occur but not until populations reach 12 to 20 larvae per row foot.

Thistle Caterpillar

The adult form of the thistle caterpillar is the painted lady butterfly. Thistle caterpillar injury to soybeans is uncommon but can occur after large populations of the butterflies migrate into Iowa during the spring. The economic threshold is 10 thistle caterpillars per row foot in blooming-stage soybeans. If infestations are limited to a small area of a field, spot treatments are appropriate.

Bean Leaf Beetle

Bean leaf beetles feed on both soybean seedlings and soybean plants filling pods. Young soybean plants may be partially defoliated by bean leaf beetles; however, soybeans in early growth stages can recover from considerable injury without sustaining economic loss. ISU researchers have developed new economic thresholds that consider beetle density, crop row width, insecticide costs, and projected soybean market value before applying a pesticide. Consult ISU Extension publication IPM 38, *Integrated Pest Management of the Bean Leaf Beetle-Economic Threshold (Estimator)*, for economic thresholds and scouting procedures.

Grasshoppers

Economically damaging populations of grasshoppers may occur in Iowa during drought years or the year after a drought. Populations often develop in ditches and fencerows, then gradually spread into adjacent crops. Grasshoppers along field margins or fencerows are not necessarily cause for alarm. Reductions in yield can occur during any crop growth stage, but plants in the seedling stage and pod forming and pod filling stages are at greater risk than during other plant stages. A 40 percent leaf loss during any vegetative stage will result in only a 3 to 7 percent yield reduction. Defoliation of 20 percent during the pod forming and filling stages will result in similar yield reductions. Grasshopper nymphs are easily controlled with insecticides. But grasshoppers should not be sprayed until they approach a level that could cause economic yield loss. This may not occur until the grasshoppers become adults; fortunately some of the pyrethroids and carbamates provide excellent control of adult grasshoppers.

Potato Leafhopper

Economic damage to soybeans is rare. Ordinarily, leaf pubescence protects soybeans from leafhopper injury; however, young soybean plants have lower levels of pubescence and may be injured. Potato leafhoppers migrate into Iowa in June. If soybean planting is delayed or soybean development is slow, potato leafhoppers can arrive while soybeans are still susceptible. Leafhoppers moving into soybeans from adjacent alfalfa at cutting can be a problem. We recommend that you avoid planting alfalfa next to soybeans, leave an uncut alfalfa strip near soybean borders, or treat soybean borders if plants are at stage V3 or less. Economic thresholds for potato leafhopper on soybeans are one leafhopper per plant at V1 and five leafhoppers per plant at V3.

Twospotted Spider Mite

Twospotted spider mites are a threat whenever hot, dry conditions persist. In most years, mite populations are controlled by a fungal disease that requires prolonged high humidity and cooler temperatures to be effective. Infested plants initially have yellow stippled leaves, followed by yellow and bronze leaves, and finally, completely lose their leaves. Early-season infestations can kill soybeans. Late-season infestations cause premature senescence, shattering, and yield reductions of 40 to 50 percent. Infestations often begin near adjacent alfalfa fields (where mites are thought to overwinter) and infestations spread downwind. So, closely scout soybeans next to alfalfa during hot, dry weather. If conditions seem favorable for mites (prolonged hot, dry weather), mites are present, and plants have stippled leaves, we recommend treatment. Remember that rain alone will not reduce mite populations. Consider spot or border treatments if infestations are detected very early. However, if you find mites throughout the field, we recommend treating the entire field. Reinfestations are possible, so monitor soybeans carefully during outbreak conditions.

Yellow Woollybear

Yellow woollybear caterpillars often are found in soybeans in August, but they rarely occur in economic numbers. Economic thresholds are not well established for yellow woollybears, but 10 woollybears per row foot at stage R4 is an appropriate economic threshold.

Soybean Insecticides

| Insect | Insecticide | Amount of product per acre | Harvest interval (days) |
|--|--------------------|----------------------------|-------------------------|
| Bean leaf beetle | Ambush 2EC* | 3.2–6.4 oz | 60 |
| | Asana XL* | 4.8–9.6 oz | 21 |
| | Cygon 400 | 1 pt | 21 |
| | Lorsban 4E | 1–2 pt | 28 |
| | Pennacap-M* | 2–3 pt | 20 |
| | Pounce 3.2EC* | 2–4 oz | 60 |
| | Sevin XLR+ | 1–2 pt | 0 |
| | Warrior T or 1E* | 1.92–3.2 oz | 45 |
| Cutworms | Asana XL* | 4.8–9.6 oz | |
| | Lorsban 4E | 1–2 pt | |
| | Pounce 3.2EC* | 2–4 oz | |
| | Warrior T or 1E* | 1.92–3.2 oz | 45 |
| Grasshoppers | Asana XL* | 4.8–9.6 oz | 21 |
| | Cygon 400 | 1 pt | 21 |
| | Furadan 4F* | 0.25–0.5 pt | 21 |
| | Lorsban 4E | 0.5–1 pt | 28 |
| | Pennacap-M* | 2–3 pt | 20 |
| | Sevin XLR+ | 1–3 pt | 0 |
| | Warrior T or 1E* | 3.2–3.84 oz | 45 |
| | Green cloverworm | Ambush 2EC* | 3.2–6.4 oz |
| Asana XL* | | 2.4–4.8 oz | 21 |
| Dipel <i>Bacillus thuringiensis</i> | | See label | |
| Lorsban 4E | | 0.5–1 pt | 28 |
| Malathion 57%EC | | 3 pt | 3 |
| Pennacap-M* | | 2–3 pt | 20 |
| Pounce 3.2EC* | | 2–4 oz | 60 |
| Sevin XLR+ | | 1–2 pt | 0 |
| Warrior T or 1E* | | 1.92–3.2 oz | 45 |
| Potato leafhopper | | Ambush 2EC* | 3.2–6.4 oz |
| | Asana XL* | 2.4–4.8 oz | 21 |
| | Pennacap-M* | 2–3 pt | 20 |
| | Pounce 3.2EC* | 2–4 oz | 60 |
| | Sevin SLR+ | 2 pt | 0 |
| | Warrior T or 1E* | 3.2–3.84 oz | 45 |
| Seedcorn maggot | Agrox DL+ | Check label | |
| | Diazinon | Check label | |
| | Diazinon + Lindane | Check label | |
| Thistle caterpillar | Ambush 2E* | 6.4 oz | 60 |
| | Pounce 3.2EC* | 4 oz | 60 |
| | Sevin XLR+ | 3–4 pt | 0 |
| | Warrior T or 1E* | 1.92–3.2 oz | 45 |
| Twospotted spider mite | Cygon 400 | 1 pt | 21 |
| | Lorsban 4E | 0.5–1 pt | 28 |
| Yellow woollybear | Asana XL* | 2.4–4.8 oz | 21 |
| | Lorsban 4E | 1–2 pt | 28 |
| | Pounce 3.2EC* | 2–4 oz | 60 |
| | Sevin XLR+ | 3–4 pt | 0 |
| | Warrior T or 1E* | 1.92–3.2 oz | 45 |

*Restricted use pesticide.

Alfalfa Insects

Alfalfa Caterpillar

Alfalfa caterpillars commonly occur in alfalfa, but economically damaging populations have not been reported in Iowa. Established economic thresholds are 10 larvae per sweep.

Alfalfa Weevil and Clover Leaf Weevil

Alfalfa weevils and clover leaf weevils damage first cutting alfalfa and may delay regrowth after first cutting. Fields throughout Iowa are at risk, so timely monitoring in the spring is very important. A comprehensive sampling plan and economic thresholds are available for alfalfa weevil management in Iowa. The Integrated Crop Management newsletter contains economic thresholds and scouting hints. As a general guideline for bud-stage alfalfa, if control costs are \$10 per acre and the forage value is \$75 per ton, the economic threshold is 3.4 alfalfa weevil larvae per stem.

Aphids, Plant Bugs, Spittlebugs, and Webworms

Aphids, plant bugs, spittlebugs, and webworms rarely cause economic losses in Iowa alfalfa. If they occur in large numbers, insecticides may be warranted. The following economic thresholds indicate when to spray.

Aphids: When populations exceed 100 per sweep during cool, wet weather and beneficial predators, parasites, and diseases are not abundant.

Plant Bugs: When bud and leaf distortion is apparent, and plant bugs average more than five per sweep.

Spittlebugs: When spittle masses average more than one mass per stem.

Webworms: When webbing and defoliation are abundant, and larvae are still present in the webs.

Blister Beetles

Blister beetles feed on alfalfa, but they are most threatening when they are killed and baled with alfalfa at harvest. If cattle and horses ingest the dead beetles with hay, livestock illness or death may result. Blister beetles contain a toxin called cantharidin that is somewhat toxic to cattle and extremely toxic to horses. Blister beetles are unlikely to occur in Iowa alfalfa before the fourth week of June. Beginning the last week of June and through September, many blister beetles may be present. Populations are often the largest during August. If blister beetles are found, do not spray insecticides on the field. Killing beetles with an insecticide does not remove them from the field; they

can still be raked up and baled into the hay. The most effective way to reduce the risk of blister beetle contamination is to cut the hay with a self-propelled swather, on a wide-set wheel base, and with the crimping mechanism removed.

Set aside hay cut during May and June specifically for horse consumption. Feeding horses hay from July, August, and early September cuttings increases the risk of poisoning the horses with blister beetle-contaminated hay.

Cutworms

Cutworms are likely to injure alfalfa regrowth after the first cutting. Brown or bare patches and regrowth delay are symptoms of variegated cutworm damage. The economic threshold for variegated cutworm in alfalfa stubble differs depending on harvesting scheme: for harvests according to plant stage (e.g., cutting at first bloom), the threshold is 3.4 cutworm larvae per square foot, and for harvests according to the calendar date, the threshold is 2 larvae per square foot.

Grasshoppers

Very large numbers of grasshoppers may cause economic damage in Iowa forage crops and pastures if weather or natural enemies do not suppress the population. Watch for grasshoppers in June, especially during dry summers; the available insecticides are more effective against the small nymphs.

Potato Leafhopper

Potato leafhoppers migrate into Iowa each spring. Most years, migration is late enough that first cutting is not threatened. However, regrowth and second and third cuttings can be seriously injured. Economic thresholds for potato leafhoppers on nonglandular haired varieties of alfalfa are 2 leafhoppers per 10 sweeps in 3-inch tall alfalfa; 5 leafhoppers per 10 sweeps in 6-inch tall alfalfa; and 10 leafhoppers per 10 sweeps in 8- to 10-inch tall alfalfa. See the *ICM* newsletter at www.ipm.iastate.edu/ipm/icm for new economic thresholds for glandular-haired varieties. Early harvesting can be an acceptable alternative to insecticides, and it avoids problems of harvest intervals. Recolonizations from adjacent fields are possible after early cutting, so monitor cut fields closely. Details on potato leafhopper management are available in extension publication IC-433, *Improving Alfalfa Forage Quality-How to Detect and Manage the Potato Leafhopper Problem*.

Sweet Clover Weevil

Adult weevils can be devastating to seedling stands of alfalfa. Treatment is justified when damage is evident on seedling plants and adult weevils are still present in the field.

Alfalfa Insecticides

| Insect | Insecticide | Amount of product per acre | Harvest interval (days) | Remarks |
|-----------------------|--|----------------------------|-------------------------|--|
| Alfalfa caterpillar | Ambush 2E* | 3.2–12.8 oz | | Several formulations may be available under different brand names Days to harvest: 4 oz or less (0), more than 4 oz (14) |
| | Dipel <i>Bacillus thuringiensis</i> | See label | | |
| | Pounce 3.2EC* | 2–8 oz | 0–14 | |
| | Sevin XLR+ Warrior T or 1E* | 2 pt 1.92–3.2 oz | 7 | |
| Alfalfa weevil larvae | Ambush 2E* | 6.4–12.8 oz | | Phytotoxicity may appear on young, tender foliage Low rates may not be effective against large populations Phytotoxicity may appear on young, tender foliage |
| | Baythroid 2* | 1.6–7.8 oz | 7–28 | |
| | Furadan 4F* | 0.5–2 pt | 14–21 | |
| | Lorsban 4E | 1–2 pt | 15 | |
| | Pennacap-M* | 2–3 pt | 0–14 | |
| | Pounce 3.2EC* | 4–8 oz | 7 | |
| | Sevin XLR+ Warrior T or 1E* | 2–3 pt 2.56–3.84 oz | | |
| Alfalfa weevil adults | Ambush 2E* | 6.4–12.8 oz | | |
| | Furadan 4F* | 1–2 pt | 14–28 | |
| | Lorsban 4E | 1–2 pt | 14–21 | |
| | Pennacap-M* | 2–3 pt | 15 | |
| | Warrior T or 1E* | 2.56–3.84 oz | | |
| Aphids | Ambush 2E* | 6.4–12.8 oz | | |
| | Cygon 400 | 0.5–1 pt | 10 | |
| | Furadan 4F* | 0.5 pt | 7 | |
| | Lorsban 4E | 0.5 pt | 7 | |
| | Malathion 57%EC | 1.5 pt | 0 | |
| | Pennacap-M* | 2–3 pt | 15 | |
| | Pounce 3.2EC* | 2–8 oz | 0–14 | |
| Clover leaf weevil | See alfalfa weevil section. | | | |
| Cutworms | Ambush 2E* | 3.2–12.8 oz | | Phytotoxicity may appear on young, tender foliage |
| | Lorsban 4E* | 1 pt | 14 | |
| | Pounce 3.2EC* | 2–8 oz | 0–14 | |
| | Sevin XLR+ Warrior T or 1E* | 2–3 pt 1.92–3.2 oz | 7 | |
| Grasshoppers | Cygon 400 | 0.5–1 pt | 10 | Phytotoxicity may appear on young, tender foliage |
| | Furadan 4F* | 0.25–0.5 pt | 7 | |
| | Lorsban 4E | 0.5–1 pt | 7–14 | |
| | Pennacap-M* | 2–3 pt | 15 | |
| | Sevin XLR+ Warrior T or 1E* | 1–3 pt 2.56–3.84 oz | 7 | |
| | | | | |
| Potato leafhopper | Ambush 2E* | 3.2–12.8 oz | | Harvest interval is variable, see label |
| | Baythroid 2* | 0.8–1.6 oz | | |
| | Cygon 400 | 0.5–1 pt | 10 | Phytotoxicity may appear on young, tender foliage |
| | Furadan 4F* | 1–2 pt | 14–28 | |
| | Lorsban 4E | 1–2 pt | 14–21 | |
| | Pennacap-M* | 2–3 pt | 15 | |
| | Pounce 3.2EC* | 4–8 oz | 0–14 | Days to harvest: 4 oz or less (0), more than 4 oz (14) |
| | Sevin XLR+ | 2 pt | 7 | |

*Restricted use pesticide.

Alfalfa Insecticides, continued

| Insect | Insecticide | Amount of product per acre | Harvest interval (days) | Remarks |
|---------------------|------------------|----------------------------|-------------------------|---|
| Plant bugs | Ambush 2E* | 6.4–12.8 oz | | Phytotoxicity may appear on young, tender foliage |
| | Baythroid 2* | 0.8–1.6 oz | | |
| | Cygon 400 | 0.5–1 pt | 10 | |
| | Furadan 4F* | 1–2 pt | 14–28 | |
| | Lorsban 4E | 1–2 pt | 14–21 | |
| | Pennacap-M* | 2–3 pt | 15 | |
| | Pounce 3.2EC* | 4–8 oz | 0–14 | |
| | Sevin XLR+ | 2 pt | 7 | |
| Spittlebugs | Ambush 2E* | 6.4–12.8 oz | | Phytotoxicity may appear on young, tender foliage |
| | Lorsban 4E | 1–2 pt | 14–21 | |
| | Malathion 57%EC | 1.5 pt | 0 | |
| | Pennacap-M* | 2–3 pt | 15 | |
| | Pounce 3.2EC* | 4–8 oz | 0–14 | |
| | Warrior T or 1E* | 2.56–3.84 oz | | |
| Sweet clover weevil | Malathion 57%EC | 1.5 pt | 0 | |
| Webworms | Ambush 2E* | 3.2–12.8 oz | | |
| | Dylox 80SP | 20 oz | 0 | |
| | Pounce 3.2EC* | 2–8 oz | 0–14 | |
| | Sevin XLR+ | 2 pt | 7 | |
| | Warrior T or 1E* | 1.92–3.2 oz | | |

Grass Pasture Insecticides

| Insect | Insecticide | Amount of product per acre | Harvest interval (days) | Remarks |
|--------------|-----------------|----------------------------|-------------------------|-------------------------------------|
| Armyworms | Malathion 57%EC | 2 pt | 0 | Pastures may be grazed the same day |
| | Pennacap-M* | 2–3 pt | 15 | Do not graze for 15 days |
| | Sevin XLR+ | 2–3 pt | 14 | See label for grazing restrictions |
| Grasshoppers | Malathion 57%EC | 2 pt | 0 | Pastures may be grazed the same day |
| | Pennacap-M* | 1–3 pt | 15 | Do not graze for 15 days |
| | Sevin XLR+ | 2–3 pt | 14 | See label for grazing restrictions |

Small Grain Insecticides

| Insect | Insecticide | Amount of product per acre | Harvest interval (days) |
|--------------|------------------|----------------------------|-------------------------|
| Armyworms | Malathion 57%EC | 2 pt | 7 |
| | Pennacap-M* | 2–3 pt | 15 |
| | Sevin XLR+ | 2–3 pt | |
| | Warrior T or 1E* | 2.56–3.84 oz | |
| Grasshoppers | Cygon 400 | 0.75 pt | 60 |
| | Furadan 4F* | 0.25–0.5 pt | |
| | Pennacap-M* | 2–3 pt | 15 |
| | Warrior T or 1E* | 2.56–3.84 oz | |
| Greenbugs | Cygon 400 | 0.5–0.75 pt | 60 |
| | Malathion 57%EC | 1.5 pt | 7 |
| | Pennacap-M* | 2–3 pt | 15 |

*Restricted use pesticide.

Prepared by Marlin E. Rice, extension entomologist.

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... and justice for all

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