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INSECT PEST MANAGEMENT FOR FIELD AND FORAGE CROPS

This publication addresses pest management guidelines for insects that attack Illinois field and forage crops. Practical, *nonchemical control* measures that have proven effective are strongly encouraged. However, *insecticides* often are the only efficient tool for responding to insect pest outbreaks. We recommend that insecticides be used only to supplement a completely *integrated pest management* (IPM) program that also includes the use of host-plant resistance and cultural, mechanical, and biological control tactics.

IPM has been defined as a comprehensive approach to pest control that uses combined methods to reduce pest densities to tolerable levels while maintaining a quality environment. In this context, insecticides should be used only after all other effective insect control alternatives have been considered. Furthermore, insecticides should be used only when an insect population has reached or exceeded an *economic threshold*—that level of a pest population at which control should be implemented to prevent economic loss (that is, the projected cost of damage is greater than the cost of control). Then, before one makes a decision to use an insecticide, potential *risks and benefits* should be evaluated. Risks to human health and safety as well as environmental risks, such as the potential for contaminating surface water or groundwater and destroying wildlife or natural enemies, should be compared carefully with the economic benefits of using an insecticide.

The insect management guidelines provided in this publication are based upon research results from the University of Illinois College of Agricultural, Consumer and Environmental Sciences, other land-grant universities, and the U.S. Department of Agriculture. Insecticides suggested for use have been registered by

the U.S. Environmental Protection Agency (US EPA). The information in the handbook is revised annually and is intended for use during the current calendar year only. This chapter and the other chapters in the current version of this *Handbook* also can be viewed on the Web at [http://www .ag.uiuc.edu/~vista/abstracts/aIAPM.html](http://www.ag.uiuc.edu/~vista/abstracts/aIAPM.html).

RELATED PUBLICATIONS

The scope of this chapter is limited primarily for individuals who make insect-control decisions during the growing season, which usually means application of an insecticide after scouting suggests the density of an insect has reached or exceeded an economic threshold. The guidelines in this chapter are complemented during the growing season with information published weekly in the *Pest Management & Crop Development Bulletin*. The *Bulletin* also can be found on the Web at <http://spectre.ag.uiuc.edu/cespubs/pest/>.

Descriptions and life cycles of the major pests, scouting procedures, and nonchemical control tactics also are important for development of a completely integrated insect management program. More detailed discussions of scouting procedures and economic thresholds are published in the 1999 revision of the *Field Crop Scouting Manual* (University of Illinois) and in *Corn Insect Pests—A Diagnostic Guide* (University of Missouri and University of Illinois). Both of these publications include color photographs and discussions of life cycles. The *Field Crop Scouting Manual* is available in both print and CD format, and *Corn Insect Pests—A Diagnostic Guide* can be viewed on the Web at <http://www.aces.uiuc.edu/ipm/field/corn/cip.pdf>. The Entomological Society of America (ESA) has published comprehensive handbooks about soy-

The information in this chapter is provided for educational purposes only. Product trade names have been used for clarity, but reference to trade names does not imply endorsement by the University of Illinois; discrimination is not intended against any product. The reader is urged to exercise caution in making purchases or evaluating product information.

Label registrations can change at any time. Thus the recommendations in this chapter may become invalid. The user must read carefully the entire, most recent label and follow all directions and restrictions. Purchase only enough pesticide for the current growing season.

bean and corn insects. For information about the *Handbook of Soybean Insect Pests* and *Handbook of Corn Insects*, call April Gower, (301)731-4535, ext. 3021, at ESA headquarters, or e-mail her at april@entsoc.org. You can also order the handbooks by using ESA's secure order form on the Web, <https://www.entsoc.org:20282/catalog/order.html>. Nonchemical control tactics are discussed in detail in Chapter 17, "Management of Field Crop Insect Pests," in the *1999–2000 Illinois Agronomy Handbook*.

Information about most of the aforementioned publications is available from your nearest Extension office or from Information Technology and Communication Services, Marketing and Distribution, 1917 S. Wright St., Champaign, IL 61820; (217)333-2007 or (800)345-6087.

INSECTICIDES SPECIFIED IN THIS CHAPTER

The insecticides discussed here are registered by the US EPA. However, not all insecticides registered for control of crop insect pests are included. *Effective insecticides that do not present an undue hazard to the user or the environment are suggested whenever possible.*

When this publication was prepared, only currently registered insecticides were included. New registrations and changes in registration, labels, and recommendations will be announced through the *Pest Management & Crop Development Bulletin*, appropriate media sources, and Extension educators.

The chemical names used here may be unfamiliar to you. These are the common, coined chemical names and as such are not capitalized (for example, carbaryl). Trade names are capitalized (for example, Sevin). In the tables of suggestions for control (Tables 1 to 8), only the trade name is listed.

Some generic insecticides are formulated or sold by numerous pesticide formulators and distributors. These include carbaryl, chlorpyrifos, dimethoate, malathion, and phorate. However, names and formulations of these generic insecticides are diverse, so their inclusion in this chapter is limited. The most commonly available trade name and formulation of each insecticide are included in this chapter. This practice does not represent discrimination against other trade names and formulations of the same product. Producers are advised to discuss the availability of generic products with a pesticide dealer.

Insecticides suggested for use in field corn, soybeans, alfalfa, grain sorghum, small grains, grass pasture, and noncrop areas are listed in Tables 2, 3, 4, 5, 6, 7 and 8, respectively. Information regarding use rates and placement and timing of applications, as well as

supportive comments, also are provided in the tables. Table 9 shows the relative toxicities of commonly used insecticide to mammals, birds, fish, and bees. More complete information about insecticides (including chemical class; action/use; and environmental, safety, and emergency guidelines) can be found in the current edition of *Farm Chemicals Handbook* published by Meister Publishing Company, Willoughby, OH. Complete label information for many pesticides can be viewed on the Web at <http://www.greenbook.net/>, the electronic version of the *Crop Protection Reference* published annually by C & P Press, Inc. Web sites for many pesticide-manufacturing and -distributing companies can be found at <http://crop-net.com/industry.html>.

MANAGING CORN ROOTWORMS

The potential for rootworm damage is greatest in the northern two-thirds of the state. However, moderate to severe damage to corn roots may occur in any field where corn is planted after corn or where corn is planted after soybeans in east-central Illinois. A management plan for corn rootworms should be long range (not a year at a time) and include crop rotation, judicious use of insecticides, and scouting to determine the need for rootworm control. Soil insecticides applied at planting or cultivation time usually protect roots from severe rootworm larval damage. Aerially applied insecticides to control rootworm adults also may be used to prevent significant egg laying, eliminating the need for a soil insecticide the following year. This management approach should be utilized only in continuous corn-production systems (corn following corn) and not for the prevention of egg laying in soybean fields. Consider the following for a long-range rootworm management program.

- Alternate corn with another crop when possible, particularly in fields where the average number of rootworm beetles was 0.75 or more per plant, or if the soil insecticide did not adequately protect the roots in 1999.
- If you intend to grow corn after corn and if the average number of rootworm beetles was 0.75 or more per plant in corn after corn or 0.5 per plant in first-year corn last summer, apply a rootworm soil insecticide at planting time.
- Another alternative is controlling rootworm adults in corn to prevent them from laying eggs. If the number of beetles reaches or exceeds 0.75 per plant, apply an insecticide when 10 percent of the

females are gravid (with eggs). Continue to monitor fields weekly after treatment for rootworm beetles. A second application of an insecticide may be necessary if the number of beetles reaches or exceeds 0.5 per plant.

- Controlling rootworm beetles to prevent egg laying and controlling beetles to prevent silk clipping do not overlap in time. Most eggs are laid in August, well after the time when treatments to prevent silk clipping would be necessary. Densities of at least five beetles per plant are typically required to reduce pollination in commercial fields. Seed-production fields and high-oil corn may be more susceptible to economic losses caused by corn rootworm adults clipping silks.
- Consider a cultivation-time application of a rootworm soil insecticide if you intend to plant in early April or if your planting-time insecticide does not provide adequate root protection.
- Scout for rootworm beetles in corn from mid-July through early September 2000 to determine the potential for rootworm larval damage in 2001.
- Producers in east-central Illinois should scout their soybean fields in 2000 for the presence of western corn rootworm adults. We recommend the use of 12 Pherocon AM traps evenly distributed throughout a given soybean field. Traps should be used the last week of July and the first 3 weeks of August. Each week, new traps should be placed just above the soybean canopy. If an average of 2 beetles per trap per day is caught for the 4-week period, producers should consider the use of a soil insecticide when planting the field to corn during the spring of 2001.
- People who use traps to scout for western corn rootworm adults in soybeans can report their results to entomologists in the Department of Crop Sciences to contribute to a database that will be used to improve decision-making thresholds. Submit scouting results electronically at <http://www.aces.uiuc.edu/~ipm/field/corn/imr/wcrscout/wcrscout.html>.
- Trapping and root-rating data from an on-farm research project in 1998–1999 suggested that the problem with western corn rootworm adults laying eggs in soybeans may have expanded from east-central Illinois counties into counties to the north and west. The potential for the occurrence of rootworm larval damage in corn planted after soy-

beans exists in the following 28 Illinois counties: Champaign, Coles, DeKalb, DeWitt, Douglas, Edgar, Ford, Grundy, Iroquois, Kane, Kankakee, Kendall, LaSalle, Lee, Livingston, Logan, Macon, Marshall, McLean, Moultrie, Ogle, Peoria, Piatt, Putnam, Tazewell, Vermilion, Will, and Woodford.

- More detailed information about western corn rootworms is provided in *Insect Information 1: Western Corn Rootworm*, a fact sheet published by the Department of Crop Sciences at the University of Illinois. The fact sheet also is available on the Web at <http://www.aces.uiuc.edu/~ipm/field/corn/insect/wcr.html>.

MANAGING EUROPEAN CORN BORERS

Both first- and second-generation European corn borers cause yield losses in many areas of Illinois. The trend toward planting long-season corn varieties very early has contributed to larger populations of corn borers. When planted early, long-season hybrids can be attacked by the first generation and may still be attractive to the second generation. In addition, most reduced-tillage systems, especially those that do not include plowing, permit increased survival of the overwintering populations of borers.

Planning a management program for European corn borers is difficult because the potential for occurrence of economic infestations during any given year is difficult to predict. In 1997, producers in Illinois experienced a widespread outbreak of corn borers, and economic losses were substantial. However, in 1998 and 1999, densities of corn borers in most areas of the state were extremely low. Densities of corn borer populations in 2000 will depend largely upon their survival or mortality during the winter, the time of planting in 2000, and prevailing weather conditions when adults are laying eggs and young larvae are trying to establish themselves on corn plants.

Managing Corn Borers with *Bt* Corn. As a first step in managing European corn borers, growers should consider selecting a hybrid that is resistant or tolerant. Some “conventional” hybrids are resistant to first-generation corn borers, and others have some degree of tolerance to corn borer injury. Genetically transformed hybrids expressing the *Bt* gene (*Bt* corn) that produces a toxic protein should provide season-long control of European corn borers. However, the decision to plant *Bt* corn hybrids should be based upon long-term economic benefits, accompanied by considerations for managing the potential for the development of corn borer resistance to the *Bt* gene.

Economic benefits of *Bt* corn will be realized only during years when densities of corn borers are large enough to cause economic yield loss. In years when corn borers occur in subeconomic numbers, producers will not realize an economic return on their investment in *Bt* corn. Therefore, growers must base their decision to manage corn borers with *Bt* corn upon the frequency of economic infestations of corn borers in their area. In areas where economic infestations of corn borers are relatively frequent (for example, 7 or 8 years out of 10), *Bt* corn is probably a wise investment. In areas where economic infestations of corn borers are relatively infrequent (for example, 2 or 3 years out of 10), growers should question whether purchasing and planting *Bt* corn is necessary.

If corn hybrids containing a *Bt* protein are planted widely, European corn borer populations eventually will develop resistance to this very specific insect toxin. Consequently, producers who grow *Bt* corn should implement a resistance-management plan to slow down the potential onset of resistance. Refuges where corn borers are not exposed to the *Bt* toxin are the most practical resistance-management tactic. In theory, high doses of the *Bt* toxin in *Bt* corn will kill virtually 100 percent of the corn borers. However, if any borers survive in *Bt* corn, you want to ensure that the surviving adults will mate with adults from areas in which the borers are still susceptible to the *Bt* toxin. These refuges should provide the source of susceptible corn borers.

Refuges include all fields of non-*Bt* corn and the more than 200 species of plants (including several crops and weeds) on which corn borers can develop. However, resistance-management strategies most often are based upon managed refuges, including entire fields planted to non-*Bt* corn specifically to provide a source of susceptible corn borers. Alternatives include planting a block of non-*Bt* corn within a field of *Bt* corn or planting non-*Bt* corn in a designated percentage of rows throughout the field.

Refuge fields should be adjacent to fields of *Bt* corn and an in-field refuge should make up at least 20 percent of the field. Consult current published insect-management recommendations and newsletters to obtain more specific recommendations for implementing resistance-management tactics. A detailed discussion about the management of corn borers with *Bt* corn is provided in North Central Regional Extension Publication NCR-602, *Bt Corn & European Corn Borer—Long-Term Success Through Resistance Management*, available from ITCS (address and telephone number on page 2). This publication also can be

viewed on the Web at <http://www.extension.umn.edu/Documents/D/C/DC7055.html>. A supplement to this publication can be viewed on the Web at <http://ent.agri.umn.edu/ecb/nc205doc.htm>.

Managing Corn Borers with Insecticides. Scout for first-generation corn borers and injury during June. The average number of larvae per plant is critical. Borers can be located by unrolling the whorls of several plants. Examine a minimum of 50 plants (10 plants from each of five areas of the field), selecting them randomly to avoid sampling only plants that show larval damage.

Scout for second-generation corn borers by counting egg masses. Start checking when moth flight is under way, usually from July through mid-August. Female corn borers lay most of their eggs in the ear zone (middle seven leaves of the plant). If you examine only the leaves in the ear zone, you need to divide the number of eggs found by 0.91 to adjust for egg masses deposited elsewhere on the plant.

Management worksheets for both first- and second-generation corn borers (provided on pages 6 and 7) aid in making decisions about control. The level of infestation (obtained from scouting), the expected yield, the anticipated value of the grain, and the cost of control are required to complete the worksheet. Enter these data into the worksheet to calculate the gain or loss if an insecticide is applied.

For example, assume you find 225 second instars in 50 whorls of stage-V10 corn. Assuming approximately 40 percent of the larvae will survive, you can anticipate 90 larvae to survive. Therefore, you can anticipate an average of 1.8 larvae per plant. Expected yield is 140 bushels per acre, and the corn price is \$2.00 per bushel. Also assume 80 percent control with granules and cost of control is \$14 per acre. Enter this information into the worksheet for first-generation corn borers. In this example, a treatment is warranted (\$24.19 per acre preventable yield loss minus \$14 per acre control cost = \$10.19 per acre, a gain if the field is treated). However, if you found only 100 second instars in 50 whorls, the same calculations with a different number of corn borers indicate that control would not be economically justified (\$10.75 per acre preventable yield loss minus \$14 per acre control cost = -\$3.25 per acre, a loss). Typically, if expected yield, price per bushel of corn, or anticipated percentage control increases, economic justification for control is more likely. Conversely, if expected yield or price per bushel of corn decreases, or if cost of control increases, economic justification for control is less likely.

Much of the information and suggested guidelines on the worksheets were derived from research trials conducted over many years in numerous locations throughout the Corn Belt. However, if your experience or environmental conditions in your area suggest that other figures might be more accurate, use them instead.

For the most effective corn borer control, apply treatments soon after egg hatch to kill the young larvae before they bore into the plant. The larvae begin tunneling into stalks about 10 days after hatching.

ISSUES ASSOCIATED WITH *Bt* CORN

Low commodity prices, low densities of European corn borers in 1998 and 1999, and issues associated with *Bt* corn might decrease farmers' interest in planting *Bt* corn for management of European and southwestern corn borers in 2000. Low value for corn (\$ per bushel) and low densities of corn borers reduce the likelihood that farmers will realize a return on their investment in *Bt* corn.

In addition, issues associated with *Bt* corn that materialized in 1999 make the decision to plant *Bt* corn more complex. Results of studies conducted at Cornell University and Iowa State University suggested that monarch butterfly caterpillars feeding on *Bt* corn pollen might be killed. Although the overall impact of *Bt* corn pollen on monarch butterfly populations has not been determined, the results of the two studies have been used by opponents of transgenic crops to slow down acceptance of the technology, es-

pecially in Europe. The reluctance of European and Asian countries to accept exports of transgenic crops from the United States has resulted in recommendations for segregation of transgenic and nontransgenic crops at some grain elevators. Unfortunately, growers who segregate *Bt* corn and non-*Bt* corn by planting them far apart will not be able to implement insect resistance-management strategies that have been recommended by university and industry scientists throughout the United States.

Studies regarding the safety of transgenic crops, pest resistance-management strategies, and effects of transgenic crops on nontarget organisms are ongoing throughout the United States. As results from scientifically valid studies become available, the potential for use of transgenic crops in pest management programs will become more clear.

Management Worksheet for First-Generation European Corn Borer

<input type="text"/>	Larvae found	×	<input type="text"/>	expected survival ^{1,2}	=	<input type="text"/>	surviving larvae
<input type="text"/>	Surviving larvae	÷	<input type="text"/>	plants examined	=	<input type="text"/>	larvae/plant
<input type="text"/>	Larvae/plant	×	<input type="text"/>	yield loss/larva ³	=	<input type="text"/>	yield loss
<input type="text"/>	Yield loss	×	<input type="text"/>	expected yield (bu/A)	=	<input type="text"/>	loss (bu/A)
<input type="text"/>	Loss (bu/A)	×	<input type="text"/>	\$ price/bu	=	<input type="text"/>	\$ loss/A
<input type="text"/>	\$ Loss/A	×	<input type="text"/>	control ⁴	=	<input type="text"/>	\$ preventable loss/A
<input type="text"/>	\$ Preventable loss/A	-	<input type="text"/>	\$ cost of control/A	=	<input type="text"/>	\$ gain (+) or loss (-) per acre if control applied

NOTES:

¹Record all percentages as decimals (for example, 20% = 0.2).

²If larvae are newly hatched (first instar), it is likely that only about 20% will survive to maturity, depending on environmental stresses. If larvae are second instar (about $\frac{3}{16}$ of an inch) or larger the survival rate may increase to 50%. Adjust this number accordingly.

³Use 0.06 for V10 corn, or 0.05 for V16 (green-tassel) corn. When borer numbers reach or exceed three per plant, the loss caused by each additional borer will decrease. Therefore, use 0.035 loss per borer for each additional borer above three per plant.

⁴80% control with granules (aerial or ground application) and with sprays directed over the whorls (ground application); the more effective insecticides provide comparable control when applied as broadcast sprays (aerial application).

Sample Worksheet Completed for First-Generation European Corn Borer

<input type="text" value="225"/>	Larvae found	×	<input type="text" value="0.4"/>	expected survival ^{1,2}	=	<input type="text" value="90"/>	surviving larvae
<input type="text" value="90"/>	Surviving larvae	÷	<input type="text" value="50"/>	plants examined	=	<input type="text" value="1.8"/>	larvae/plant
<input type="text" value="1.8"/>	Larvae/plant	×	<input type="text" value="0.06"/>	yield loss/larva ³	=	<input type="text" value="0.108"/>	yield loss
<input type="text" value="0.108"/>	Yield loss	×	<input type="text" value="140"/>	expected yield (bu/A)	=	<input type="text" value="15.12"/>	loss (bu/A)
<input type="text" value="15.12"/>	Loss (bu/A)	×	<input type="text" value="\$2.00"/>	price/bu	=	<input type="text" value="\$30.24"/>	loss/A
<input type="text" value="\$30.24"/>	Loss/A	×	<input type="text" value="0.8"/>	control ⁴	=	<input type="text" value="\$24.19"/>	preventable loss/A
<input type="text" value="\$24.19"/>	Preventable loss/A	-	<input type="text" value="\$14.00"/>	cost of control/A	=	<input type="text" value="\$10.19"/>	gain (+) or loss (-) per acre if control applied

Management Worksheet for Second-Generation European Corn Borer

<input type="text"/>	Egg masses found ¹	÷	<input type="text" value="0.91"/>	(if only ear zone sampled) =	<input type="text"/>	adjusted egg masses
<input type="text"/>	Adjusted egg masses	÷	<input type="text"/>	plants examined =	<input type="text"/>	egg masses/plant
<input type="text"/>	Egg masses/plant	×	<input type="text" value="4"/>	larvae/egg mass ² =	<input type="text"/>	larvae/plant
<input type="text"/>	Larvae/plant	×	<input type="text"/>	yield loss/larva ^{3,4} =	<input type="text"/>	yield loss
<input type="text"/>	Yield loss	×	<input type="text"/>	expected yield (bu/A) =	<input type="text"/>	loss (bu/A)
<input type="text"/>	Loss (bu/A)	-	<input type="text" value="\$"/>	price/bu =	<input type="text" value="\$"/>	loss/A
<input type="text" value="\$"/>	Loss/A	×	<input type="text" value="0.75"/>	control =	<input type="text" value="\$"/>	preventable loss/A
<input type="text" value="\$"/>	Preventable loss/A	-	<input type="text" value="\$"/>	cost of control/A =	<input type="text" value="\$"/>	gain (+) or loss (-) per acre if control applied

NOTES:

¹Counts may be cumulative if taken a few days apart.²Four larvae/egg mass assumes 20% survival of 20 eggs/mass; increase if environmental conditions are favorable for borer survival.³Record all percentages as decimals (for example, 20% = 0.2).⁴Yield loss per borer per plant at two corn stages:

<i>Average number of egg masses</i>	<i>Pollen shed</i>	<i>Blister stage</i>
Two or fewer per plant	0.04	0.03
More than two per plant	0.03	0.02

As plants mature beyond the blister stage, the economic benefits of treatment rapidly decrease.

Table 1. Soil insecticides for rootworm control in Illinois, 2000

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 ^b	At planting	3	2.5 lb	2.6 lb	2.75 lb	3.25 lb
*Furadan 4F	At cultivation	2.5	2 pt	2½ pt	2¼ pt	2¾ 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	4.2oz
*Thimet 20G	At planting or cultivation	6	4.9 lb	5.2 lb	5.4 lb	6.5 lb

*Use restricted to certified applicators.

^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.

Table 2. Insecticides for field corn

Insect	Insecticide ^a	Amount of product per acre ^a	Placement	Timing of application, comments
Armyworm	*Ambush	6.4 to 12.8 oz	Broadcast	<i>Seedling corn:</i> Control is justified when 25% of the plants are being damaged. <i>After pollen shed:</i> Control is justified when armyworms are eating leaves above ear level.
	*Asana XL	5.8 to 9.6 oz		
	Lorsban 4E	1 to 2 pt		
	*PennCap-M	2 to 3 pt		
	*Pounce 3.2EC	4 to 8 oz		
	Sevin XLR Plus	1 to 2 qt		
Billbug	Lorsban 4E	2 to 3 pt	Spray at base of plant or over row	Apply as a postemergence rescue treatment. Use only ground equipment, and apply 20 to 40 gal of finished spray per acre.
Chinch bug	*Asana XL	5.8 to 9.6 oz	Spray at base of plant	Treat border rows at the start of migration from small grains. Use only ground equipment.
	Lorsban 4E	1 to 2 pt		
	Sevin XLR Plus	1 to 2 qt		
	*Warrior T or 1E	3.84 oz		
Corn earworm	*Ambush	6.4 to 12.8 oz	Overall spray or directed toward ear zone	Treatment is justified only in seed-corn fields. Treatments are rarely effective for the control of earworms after worms enter ear tips.
	*Asana XL	5.8 to 9.6 oz		
	*Capture 2EC	2.1 to 6.4 oz		
	*Pounce 3.2EC	4 to 8 oz		
	*Warrior T or 1E	1.92 to 3.2 oz		

Table 2. Insecticides for field corn (cont.)

Insect	Insecticide ^a	Amount of product per acre ^a	Placement	Timing of application, comments
Corn leaf aphid	dimethoate Lorsban 4E *PennCap-M	See product label. 1 to 2 pt 2 to 3 pt	Broadcast	Apply during late whorl to early tassel when 50% of plants have light to moderate infestations (50 to 400 aphids per plant) and plants are under drought stress. If soil moisture is adequate, treatment may be warranted if there are more than 400 aphids per plant. Do not apply dimethoate to corn during the pollen-shed period.
Corn rootworm adults	*Ambush *Asana XL *Capture 2EC Lorsban 4E *PennCap-M *Pounce 3.2EC Sevin XLR Plus *Warrior T or 1E	6.4 to 12.8 oz 5.8 to 9.6 oz 2.1 to 6.4 oz 1 to 2 pt 1 to 2 pt 4 to 8 oz 1 qt 2.56 to 3.84 oz	Overall spray or directed toward ear zone	To protect pollination, treat if there are 5 or more beetles per plant, pollination is not complete, and silk clipping is observed.
Corn rootworm larvae	*Aztec 2.1G *Counter CR *Force 3G *Fortress 5G ^b *Furadan 4F Lorsban 15G *Regent 4SC *Thimet 20G	6.7 oz/1,000 ft row 6 oz /1,000 ft row 4 to 5 oz/1,000 ft row 3 oz /1,000 ft row 2.5 fl oz/1,000 ft row 8 oz/1,000 ft row 0.24 oz/1,000 ft row 6 oz/1,000 ft row	Band, furrow Band, furrow Band, furrow Furrow At cultivation only Band Furrow Band	See Table 1. To minimize potential adverse effects to wildlife, incorporate insecticide granules or apply the insecticide in-furrow (if labeled) and shut off insecticide units in turn rows.
Cutworms	*Ambush *Asana XL Lorsban 4E *Pounce 3.2EC *Warrior T or 1E *Ambush *Asana XL Lorsban 4E *Pounce 3.2EC *Warrior T or 1E *Aztec 2.1G *Force 3G *Fortress 5G ^b Lorsban 4E Lorsban 15G *Pounce 1.5G	6.4 to 12.8 oz 5.8 to 9.6 oz 1 to 2 pt 4 to 8 oz 1.92 to 3.2 oz 6.4 to 12.8 oz 5.8 to 9.6 oz 1 to 2 pt 4 to 8 oz 1.92 to 3.2 oz 6.7 oz/1,000 ft row 4 to 5 oz/1,000 ft row 3 oz/1,000 ft row 2 to 4 pt 8 oz/1,000 ft row 8 to 16 oz/1,000 ft row	PE ^c PE ^c PE ^c PE ^c PE ^c PRE ^d PRE ^d PRE ^d PRE ^d PRE ^d Band, furrow Band, furrow Band BC-PPI ^e Band Band	Apply as a postemergence rescue treatment when 3% or more of the plants are cut and larvae are present. These preventive treatments are suggested for no-till corn where vegetation was plentiful during the cutworms' egg-laying period or in fields that have to be replanted because cutworm damage to the original stand was severe. To minimize potential adverse effects to wildlife, incorporate insecticide granules or apply the insecticide in-furrow (if labeled) and shut off insecticide units in turn rows.

Table 2. Insecticides for field corn (cont.)

Insect	Insecticide ^a	Amount of product per acre ^a	Placement	Timing of application, comments
European corn borer, first generation	*Ambush	6.4 to 12.8 oz	Broadcast	See "Management Worksheet for First-Generation European Corn Borer" (page 6). Granular formulations are more effective than sprays when applied by air for control of first-generation borers. Sprays are most effective when directed by ground equipment over the row, rather than broadcast.
	<i>Bacillus thuringiensis</i>	See product label.	See product label.	
	*Capture 2EC	2.1 to 6.4 oz	Broadcast	
	Lorsban 4E	1½ to 2 pt	Over whorls	
	Lorsban 15G	3.5 to 8 oz per 1,000 ft row	Over whorls	
	Lorsban 15G	5 to 6.5 lb	Broadcast	
	*Pennacp-M	2 pt	Over whorls	
	*Pennacp-M	3 to 4 pt	Broadcast	
	*Pounce 1.5G	6.7 to 13.3 lb	Broadcast	
*Pounce 3.2EC	4 to 8 oz	Broadcast		
*Warrior T or 1E	2.56 to 3.84 oz	Broadcast		
European corn borer, second generation	*Ambush	6.4 to 12.8 oz	Broadcast	See "Management Worksheet for Second-Generation European Corn Borer" (page 7).
	*Capture 2EC	2.1 to 6.4 oz		
	Lorsban 4E	1½ to 2 pt		
	Lorsban 15G	6.5 lb		
	*Pennacp-M	2 to 4 pt		
	*Pounce 1.5G	6.7 to 13.3 lb		
	*Pounce 3.2EC	4 to 8 oz		
*Warrior T or 1E	2.56 to 3.84 oz			
Fall army-worm	*Ambush	6.4 to 12.8 oz	Broadcast	Treat when 75% of plants have whorl damage and if worms are present. Ground sprays directed over the row are more effective than broadcast sprays. Treatments to control worms in ear tips are not effective.
	Lorsban 4E	1 to 2 pt		
	*Pounce 3.2EC	4 to 8 oz		
Flea beetles	*Ambush	6.4 to 12.8 oz	Over row as spray	Treat when leaves on seedling plants are severely damaged and plants are being killed. For Lorsban, use only ground equipment and apply 20 to 40 gal of finished spray per acre.
	*Asana XL	5.8 to 9.6 oz		
	Lorsban 4E	2 to 3 pt		
	*Pennacp-M	2 to 3 pt		
	*Pounce 3.2EC	4 to 8 oz		
	Sevin XLR Plus	1 qt		
*Warrior T or 1E	2.56 to 3.84 oz			
Grass-hoppers	*Asana XL	5.8 to 9.6 oz	Broadcast	Treatment may be warranted when there are 7 or more grasshoppers per sq yd. After pollen shed, control is justified when grasshoppers are feeding on leaves above ear level. Do not apply dimethoate to corn during the pollen-shed period.
	dimethoate	See product label.		
	Lorsban 4E	½ to 1 pt		
	*Pennacp-M	2 to 3 pt		
	Sevin XLR Plus	½ to 1½ qt		
*Warrior T or 1E	2.56 to 3.84 oz			
Hop vine borer	*Ambush	6.4 to 12.8 oz	Broadcast	Apply postemergence sprays when young larvae are moving from weed hosts into corn.
	*Pounce 3.2EC	4 to 8 oz		
	*Warrior T or 1E	2.56 to 3.84 oz		

Table 2. Insecticides for field corn (cont.)

Insect	Insecticide ^a	Amount of product per acre ^a	Placement	Timing of application, comments
Japanese beetle	*Penncap-M	2 to 4 pt	Broadcast	Treat during the silking period to protect silks if there are 3 or more beetles per ear and pollination is not complete.
	Sevin XLR Plus	1 to 2 qt		
	*Warrior T or 1E	2.56 to 3.84 oz		
Picnic, sap beetles	Sevin XLR Plus	1 qt	Broadcast	Treatment is justified only in seed-corn fields when beetles are causing significant injury to ear tips.
	*Warrior T	2.56 to 3.84 oz		
Seedcorn maggot	diazinon diazinon + lindane	See product label. See product label.	On seed	Use formulations that are prepared as seed treaters. Seed treatments should be considered for fields that do not receive a soil insecticide at planting. See label for proper disposal of treated seeds.
Spider mites	*Capture 2EC dimethoate	5.12 to 6.4 oz See product label.	Broadcast	Begin control if the majority of plants are infested with mites severely enough to cause some yellowing or browning of the lower leaves before dent stage. Do not apply dimethoate to corn during the pollen-shed period.
Southwestern corn borer, second generation	*Ambush	6.4 to 12.8 oz	Broadcast	Treatment may be warranted when 20 to 25% of the plants are infested with eggs or newly hatched larvae.
	*Capture 2EC	2.1 to 6.4 oz		
	Lorsban 4E	1 ½ to 2 pt		
	Lorsban 15G	6.5 lb		
	*Penncap-M	2 to 4 pt		
	*Pounce 1.5G	6.7 to 13.3 lb		
	*Pounce 3.2EC	4 to 8 oz		
*Warrior T or 1E	2.56 to 3.84 oz			
Stalk borer	*Ambush	6.4 to 12.8 oz	Broadcast	Apply postemergence sprays when young larvae are moving from weed hosts to corn. See labels for more specific instructions about effective control.
	*Asana XL	5.8 to 9.6 oz		
	Lorsban 4E	2 to 3 pt		
	*Pounce 3.2EC	4 to 8 oz		
	*Warrior T or 1E	2.56 to 3.84 oz		
Stink bugs	*Penncap-M	1 to 3 pt	Broadcast	Apply as postemergence rescue treatment.
	*Warrior T or 1E	2.56 to 3.84 oz		
Webworms	Lorsban 4E	1 to 2 pt	Broadcast	For Lorsban, shallow incorporation using a rotary hoe or other suitable equipment immediately before or soon after treatment is necessary.
	*Pounce 3.2EC	4 to 8 oz		
	*Warrior T or 1E	2.56 to 3.84 oz		

Table 2. Insecticides for field corn (cont.)

Insect	Insecticide ^a	Amount of product per acre ^a	Placement	Timing of application, comments	
White grubs	*Aztec 2.1G	6.7 oz/1,000 ft row	Band, furrow	Treat at planting if crop history and previous crop losses can be directly linked to a repeated history of grub problems. To minimize potential adverse effects to wildlife, incorporate insecticide granules or apply the insecticide in-furrow (if labeled) and shut off insecticide units in turn rows.	
	*Counter CR	6 oz/1,000 ft row	Band, furrow		
	*Force 3G	4 to 5 oz/1,000 ft row	Furrow		
	*Fortress 5G ^b	3 oz/1,000 ft row	Furrow		
	Lorsban 15G	12 oz/1,000 ft row	Furrow		
	Lorsban 4E	4 pt	BC-PPI ^e		
	*Regent 4SC	0.24 oz/1,000 ft row	Furrow		
	*Thimet 20G	6 oz/1,000 ft row	Band		
Wireworms	*Aztec 2.1G	6.7 oz/1,000 ft row	Band, furrow	Treat at planting if crop history or bait stations or both indicate a potential for wireworm damage. To minimize potential adverse effects to wildlife, incorporate insecticide granules or apply the insecticide in-furrow (if labeled) and shut off insecticide units in turn rows.	
	*Counter CR	6 oz/1,000 ft row	Band, furrow		
	*Force 3G	4 to 5 oz/1,000 ft row	Furrow		
	*Fortress 5G ^b	3 oz/1,000 ft row	Furrow		
	Lorsban 4E	4 pt	BC-PPI ^e		
	Lorsban 15G	12 oz/1,000 ft row	Furrow		
	*Regent 4SC	0.24 oz/1,000 ft row	Furrow		
	*Thimet 20G	6 oz/1,000 ft row	Band		
	lindane	See product label.	On seed		Use formulations that are prepared as seed treaters. See label for proper disposal of treated seeds.
	diazinon + lindane	See product label.	On seed		

*Use restricted to certified applicators.

^aThe formulation of the product most commonly used in Illinois is listed. If you use another formulation, *read the label* to determine the amount of product per acre. Also, read the product label for precautions and restrictions.

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

^cPE = postemergence application.

^dPRE = preemergence application.

^eBC-PPI = broadcast-preplant incorporated.

Table 3. Insecticides for soybeans

Spraying blossoming soybeans can be extremely hazardous to bees. Coordinate with local beekeepers before applying sprays. Beekeepers' names and colony locations may be obtained from your local Extension office.

Insect	Insecticide ^a	Amount of product per acre ^a	Placement	Timing of application, comments
Bean leaf beetle	*Ambush	3.2 to 6.4 oz	On foliage	<i>Seedlings</i> : An insecticide treatment for seedling soybeans is rarely justified. Densities of 16 per foot of row in the early seedling stage or 39 per foot of row at stage V2+ are necessary for economic injury. <i>Before bloom</i> : Treat when defoliation reaches 30% and there are 5 or more beetles per foot of row. <i>Bloom to pod fill</i> : Treat when defoliation reaches 20% and there are 4 to 10 beetles per foot of row (30-inch rows) or 1 to 2.5 beetles per foot of row (7-inch rows), depending on the value of soybeans and the cost of control. <i>Seed maturation</i> : Treat when 5 to 10% of the pods are damaged, the leaves are green, and there are 10 or more beetles per foot of row.
	*Asana XL	5.8 to 9.6 oz		
	dimethoate	See product label.		
	Lorsban 4E	1 to 2 pt		
	*PennCap-M	2 to 3 pt		
	*Pounce 3.2EC	2 to 4 oz		
	Sevin XLR Plus	½ to 1 qt		
*Warrior T or 1E	1.92 to 3.2 oz			
Blister beetles	Sevin XLR Plus	½ to 1 qt	On foliage	Treat when defoliation reaches 30% before bloom and 20% between bloom and pod fill.
	*Warrior T or 1E	3.2 to 3.84 oz		
Corn earworm	*Ambush	6.4 to 12.8 oz	On foliage	Damage occurs when larvae feed on pods. Apply control if populations exceed 1 per foot of row and 5 to 10% of the pods are damaged.
	*Asana XL	5.8 to 9.6 oz		
	*Pounce 3.2EC	4 to 8 oz		
	*Warrior T or 1E	1.92 to 3.2 oz		
Cutworms	*Ambush	3.2 to 6.4 oz	Broadcast	Scout as plants are emerging. Treat if 20% of plants are cut, stand has gaps of 1 foot or more, and cutworms are present.
	*Asana XL	5.8 to 9.6 oz		
	Lorsban 4E	1 to 2 pt		
	*Pounce 3.2EC	2 to 4 oz		
	*Warrior T or 1E	1.92 to 3.2 oz		
Grasshoppers	*Asana XL	5.8 to 9.6 oz	On foliage	Treat when migration into fields begins and defoliation or pod feeding reaches economic levels; when defoliation reaches 30% before bloom and 20% between bloom and pod fill; when 5 to 10% of the pods are damaged.
	dimethoate	See product label.		
	Lorsban 4E	½ to 1 pt		
	*PennCap-M	2 to 3 pt		
	Sevin XLR Plus	½ to 1 ½ qt		
*Warrior T or 1E	3.2 to 3.84 oz			
Green cloverworm	*Ambush	3.2 to 6.4 oz	On foliage	Treat when defoliation occurs during blooming, pod set, and pod fill. Usually requires 12 or more half-grown worms per foot of row and 20% defoliation to justify treatment.
	*Asana XL	2.9 to 5.8 oz		
	Lorsban 4E	½ to 1 pt		
	*PennCap-M	2 to 3 pt		
	*Pounce 3.2EC	2 to 4 oz		
	Sevin XLR Plus	½ to 1 qt		
	*Warrior T or 1E	1.92 to 3.2 oz		

Table 3. Insecticides for soybeans (cont.)

Insect	Insecticide ^a	Amount of product per acre ^a	Placement	Timing of application, comments
Japanese beetle adults	*Ambush	6.4 to 12.8 oz	On foliage	Treat when defoliation reaches 30% before bloom and 20% between bloom and pod fill.
	*Asana XL	5.8 to 9.6 oz		
	*PennCap-M	3 to 4 pt		
	*Pounce 3.2EC	2 to 4 oz		
	Sevin XLR Plus	½ to 1 qt		
	*Warrior T or 1E	3.2 to 3.84 oz		
Mexican bean beetle	*Ambush	3.2 to 6.4 oz	On foliage	Treat when defoliation reaches 30% before bloom and 20% between bloom and pod fill.
	*Asana XL	2.9 to 5.8 oz		
	dimethoate	See product label.		
	Lorsban 4E	1 to 1½ pt		
	*PennCap-M	2 to 3 pt		
	*Pounce 3.2EC	2 to 4 oz		
	Sevin XLR Plus	½ to 1 qt		
	*Warrior T or 1E	1.92 to 3.2 oz		
Potato leafhopper	*Ambush	3.2 to 6.4 oz	On foliage	Treat when leafhoppers are numerous and the edges of the leaves appear burned. For susceptible varieties, control in blooming soybeans may be warranted when 6 or more leafhoppers are found per plant. During early seed formation, control may be warranted if 13 or more leafhoppers are found per plant.
	*Asana XL	2.9 to 5.8 oz		
	dimethoate	See product label.		
	*PennCap-M	2 to 3 pt		
	*Pounce 3.2EC	2 to 4 oz		
	Sevin XLR Plus	1 qt		
	*Warrior T or 1E	1.92 to 3.2 oz		
Seedcorn maggot	lindane	See product label.	On seed	Treat at planting. Use formulations that are prepared as seed treaters. See label for proper disposal of treated seeds.
Spider mites	dimethoate	See product label.	On foliage	Treat when 20 to 25% discoloration is noted before pod set, or 10 to 15% discoloration after pod set.
	Lorsban 4E	½ to 1 pt		
Stink bugs	*PennCap-M	1 to 3 pt	On foliage	Treat when adult bugs or large nymphs reach one per foot of row during pod fill.
	*Warrior T or 1E	3.2 to 3.84 oz		
Thistle caterpillar	*Pounce 3.2EC	2 to 4 oz	On foliage	When defoliation reaches 30% before bloom and 20% between bloom and pod fill.
	Sevin XLR Plus	½ qt		
	*Warrior T	1.92 to 3.2 oz		
Thrips	*PennCap-M	2 to 3 pt	On foliage	Treat if seedlings are being seriously damaged and some plants are being killed.
	Sevin XLR Plus	1 qt		
	*Warrior T or 1E	1.92 to 3.2 oz		

Table 3. Insecticides for soybeans (cont.)

Insect	Insecticide ^a	Amount of product per acre ^a	Placement	Timing of application, comments
Woollybear caterpillars	*Ambush	3.2 to 6.4 oz	On foliage	Treat when defoliation reaches 30% before bloom and 20% between bloom and pod fill.
	*Asana XL	2.9 to 5.8 oz		
	Lorsban 4E	1 to 2 pt		
	*Pounce 3.2EC	2 to 4 oz		
	Sevin XLR Plus	1½ qt		
	*Warrior T or 1E	1.92 to 3.2 oz		

*Use restricted to certified applicators.

^aThe formulation of the product most commonly used in Illinois is listed. If you use another formulation, *read the label* to determine the amount of product per acre. Also, read the product label for precautions and restrictions.

Table 4. Insecticides for alfalfa

Spraying blossoming alfalfa can be extremely hazardous to bees. Coordinate with local beekeepers before applying sprays. Beekeepers' names and colony locations may be obtained from your local Extension office.

Insect	Insecticide ^a	Amount of product per acre ^a	Placement	Timing of application, comments
Alfalfa caterpillar	*Ambush	3.2 to 12.8 oz	On foliage	Treat when damage to foliage is obvious and there are at least 10 non-parasitized larvae per sweep.
	*Baythroid 2	1.6 to 2.8 oz		
	Lorsban 4E	1 to 2 pt		
	*Pounce 3.2EC	2 to 8 oz		
	Sevin XLR Plus	1 qt		
	*Warrior T	1.92 to 3.2 oz		
Alfalfa weevil larvae	*Ambush	12.8 oz	On foliage	When 25 to 50% of tips are being skeletonized and there are 3 or more larvae per stem, treat immediately. Do not apply sprays during bloom. Instead, cut and remove the hay. Two treatments may be necessary on first cutting. Control also may be warranted after a cutting when larvae and adults are feeding on more than 50% of the crowns and regrowth is prevented for 3 to 6 days.
	*Baythroid 2	1.6 to 2.8 oz		
	*Furadan 4F	½ to 2 pt		
	Imidan 70W	1 to 1½ lb		
	Lorsban 4E	1 to 2 pt		
	*Pennacap-M	2 to 3 pt		
	*Pounce 3.2EC	8 oz		
	*Warrior T	2.56 to 3.84 oz		
Alfalfa weevil adults	*Furadan 4F	1 to 2 pt	On foliage	Control may be warranted after a cutting when larvae and adults are feeding on more than 50% of the crowns and regrowth is prevented for 3 to 6 days.
	Imidan 70W	1 to 1½ lb		
	Lorsban 4E	1 to 2 pt		
	*Pennacap-M	2 to 3 pt		
Blister beetles	Sevin XLR Plus	½ to 1 qt	On foliage	Although blister beetles rarely cause economic damage to alfalfa, their presence in hay could injure horses if the horses ingest the beetles.
	*Warrior T	2.56 to 3.84 oz		
Cutworms	*Ambush	3.2 to 12.8 oz	On foliage	Control may be warranted when larvae reduce the stand of a new seeding or prevent regrowth after harvest.
	*Baythroid 2	0.8 to 1.6 oz		
	Lorsban 4E	1 to 2 pt		
	*Pounce 3.2EC	2 to 8 oz		
	*Warrior T	1.92 to 3.2 oz		
Fall armyworm	Lorsban 4E	1 to 2 pt	On foliage	Control may be warranted when larvae reduce the stand of a new seeding, when there are 2 or more larvae per sweep, or when there are 1 to 2 half-grown larvae per square foot.
	*Pounce 3.2EC	2 to 8 oz		
Grasshoppers	*Baythroid 2	2 to 2.8 oz	On foliage	Treat when grasshoppers are small, before damage is severe, and when there are 15 to 20 per square yard.
	dimethoate	See product label.		
	Imidan 70W	½ to 1½ lb		
	Lorsban 4E	½ to 1 pt		
	*Pennacap-M	½ to 1½ qt		
	Sevin XLR Plus	½ to 1½ qt		
	*Warrior T	2.56 to 3.84 oz		

Table 4. Insecticides for alfalfa (cont.)

Insect	Insecticide ^a	Amount of product per acre	Placement	Timing of application, comments	
Meadow spittlebug	*Ambush	6.4 to 12.8 oz	On foliage	Treat when spittle masses are found and nymphs average more than one per stem.	
	*Baythroid 2	0.8 to 1.6 oz			
	Imidan 70W	1 to 1½ lb			
	Lorsban 4E	1 to 2 pt			
	*Pennacp-M	2 to 3 pt			
	*Pounce 3.2EC	4 to 8 oz			
	*Warrior T	2.56 to 3.84 oz			
Plant bugs	*Ambush	6.4 to 12.8 oz	On foliage	Treat when tip damage is obvious and nymphs and adults average 3 per sweep on alfalfa less than 3 inches tall, or 5 per sweep on alfalfa taller than 3 inches.	
	*Baythroid 2 dimethoate	1.6 to 2.8 oz See product label.			
	Imidan 70W	1 to 1½ lb			
	Lorsban 4E	1 to 2 pt			
	*Pennacp-M	2 to 3 pt			
	*Pounce 3.2EC	4 to 8 oz			
	Sevin XLR Plus	1 to 1½ qt			
	*Warrior T	2.56 to 3.84 oz			
Potato leafhoppers	*Ambush	3.2 to 12.8 oz	On foliage	Treatment is justified at these combinations of alfalfa height and leafhopper numbers:	
	*Baythroid 2 dimethoate	0.8 to 1.6 oz See product label.			
	Imidan 70W	1 to 1½ lb			
	Lorsban 4E	½ to 1 pt			
	*Pennacp-M	2 to 3 pt		Alfalfa height (inches)	Leafhoppers per sweep
	*Pounce 3.2EC	4 to 8 oz			
	Sevin XLR Plus	1 qt		Under 3	0.2
	*Warrior T	1.92 to 3.2 oz		3 to 6	0.5
		6 to 12	1.0		
		12 or taller	2.0		
Webworms	*Ambush	3.2 to 12.8 oz	On foliage	Control may be warranted when larvae reduce the stand of a new seeding.	
	*Baythroid 2	1.6 to 2.8 oz			
	*Pounce 3.2EC	2 to 8 oz			
	Sevin XLR Plus	1 to 1½ qt			
	*Warrior T	1.92 to 3.2 oz			

*Use restricted to certified applicators.

^aThe formulation of the product most commonly used in Illinois is listed. If you use another formulation, *read the label* to determine the amount of product per acre. Also, read the product label for precautions and restrictions.

Table 5. Insecticides for grain sorghum

Insect	Insecticide ^{a,b}	Amount of product per acre ^{a,b}	Placement	Timing of application, comments
Chinch bug	*Baythroid 2 Lorsban 4E Sevin XLR Plus *Warrior T or 1E	1.3 to 2.8 oz 1 to 2 pt 1 to 2 qt 3.84 oz	At plant base	Direct spray toward base of plant. Use only ground equipment.
Corn earworm	*Baythroid 2 Lorsban 4E *Warrior T or 1E	1.3 to 2.8 oz 2 pt 2.56 to 3.84 oz	Over row	Treat when worms average 2 or more per head.
Corn leaf aphid	dimethoate Lorsban 4E	See product label. ½ to 1 pt	Over row	Corn leaf aphids rarely cause economic damage unless populations are heavy and drought conditions exist.
Cutworms	*Baythroid 2 Lorsban 4E *Warrior T or 1E	1 to 1.3 oz 1 to 2 pt 1.92 to 2.56 oz	Broadcast	Treat when seedling plants are being cut.
Fall armyworm	*Baythroid 2 Lorsban 4E	1.3 to 2.8 oz 1 to 2 pt	Over row	Treat when worms average 2 or more per head. Leaf feeding or whorl damage seldom has an economic effect.
Grasshoppers	*Baythroid 2 dimethoate Lorsban 4E Sevin XLR Plus *Warrior T or 1E	2 to 2.8 oz See product label. ½ to 1 pt ½ to 1½ qt 2.56 to 3.84 oz	Broadcast	Treatment may be warranted when there are 7 or more per square yard.
Greenbug	dimethoate Lorsban 4E	See product label. ½ to 2 pt	Over row	Treat when greenbug damage is sufficient to cause death of more than 2 normal-sized leaves before the hard-dough stage.
Sorghum midge	*Baythroid 2 dimethoate Lorsban 4E *Warrior T or 1E	0.9 to 1.3 oz See product label. ½ pt 1.92 to 2.56 oz	Over row	Apply during bloom when 50% of heads have begun to bloom and there is one or more midge adults (flies) per head.
Webworms	*Baythroid 2 Lorsban 4E Sevin XLR Plus *Warrior T or 1E	1.3 to 2.8 oz 1 pt 1 to 2 qt 2.56 to 3.84 oz	Over row	Treat when 5 or more larvae per head are found.
White grubs	*Counter CR	6 oz/1,000 ft row	Band	Treat at planting if crop history and previous crop losses can be directly linked to a repeated history of grub damage.

Table 5. Insecticides for grain sorghum (cont.)

Insect	Insecticide ^{a,b}	Amount of product per acre ^{a,b}	Placement	Timing of application, comments
Wireworms	*Counter CR	6 oz /1,000 ft row	Band	Treat at planting if crop history or bait stations or both indicate a potential for wireworm damage.
	lindane	See product label.	On seed	Use seed treatment formulations. See label for proper disposal of treated seeds.
Yellow sugarcane aphid	dimethoate Lorsban 4E	See product label. ½ to 1 pt	Over row	Sprays should be applied at first sign of damage to seedling sorghum; 5 to 10 aphids per leaf.

*Use restricted to certified applicators.

^aThe formulation of the product most commonly used in Illinois is listed. If you use another formulation, *read the label* to determine the amount of product per acre. Also, read the product label for precautions and restrictions.

^bSome sorghum varieties are sensitive to organophosphate insecticides.

Table 6. Insecticides for small grains (barley, oats, rye, wheat)

Insect	Insecticide ^a	Amount of product per acre ^a	Placement	Timing of application, comments
Aphids (English grain aphid, greenbug, oat bird-cherry aphid)	dimethoate	See product label.	On foliage	Treat when there are 12 to 15 aphids per tiller during seedling to boot stage. Use dimethoate and Warrior on wheat only. Do not apply Pennncap-M to rye.
	*Pennncap-M	2 to 3 pt		
Armyworm	*Warrior T or 1E	2.56 to 3.84 oz	On foliage	Treat when there are 6 or more nonparasitized armyworms (¾ to 1¼ inch long) per linear foot of row and before extensive head cutting occurs. Do not use Pennncap-M on rye. Sevin and Warrior are labeled for use only in wheat.
	*Pennncap-M	2 to 3 pt		
	Sevin XLR Plus	1 to 1½ qt		
Cereal leaf beetle	*Warrior T or 1E	2.56 to 3.84 oz	On foliage	Treat when the combination of eggs and larvae average 3 or more per stem. Sevin and Warrior are labeled for use only in wheat.
	Sevin XLR Plus	1 qt		

Table 6. Insecticides for small grains (barley, oats, rye, wheat) (cont.)

Insect	Insecticide ^a	Amount of product per acre ^a	Placement	Timing of application, comments
Grasshoppers	dimethoate	See product label.	On foliage	During fall when damage is apparent, treat field borders and noncrop areas to stop migration. Do not apply Pennacap-M to rye. Dimethoate, Sevin, and Warrior are labeled for use only in wheat.
	*Pennacap-M	2 to 3 pt		
	Sevin XLR Plus	½ to 1½ qt		
	*Warrior T or 1E	2.56 to 3.84 oz		

*Use restricted to certified applicators.

^aThe formulation of the product most commonly used in Illinois is listed. If you use another formulation, *read the label* to determine the amount of product per acre. Also, read the product label for precautions and restrictions.

Table 7. Insecticides for grass pasture

Insect	Insecticide ^a	Amount of product per acre ^a	Placement	Timing of application, comments
Armyworm	malathion	See product label	On foliage	Do not apply when weeds are blooming.
	*Pennacap-M	2 to 3 pt		
	Sevin XLR Plus	1 to 1½ qt		
Grasshoppers	malathion	See product label.	On foliage	Treat when there are 15 to 20 per square yard. Do not apply when weeds are blooming.
	*Pennacap-M	2 to 3 pt		
	Sevin XLR Plus	½ to 1½ qt		

*Use restricted to certified applicators.

^aThe formulation of the product most commonly used in Illinois is listed. If you use another formulation, *read the label* to determine the amount of product per acre. Also, read the product label for precautions and restrictions.

Table 8. Insecticides for noncrop areas

To avoid injury to bees, do not apply sprays to noncrop areas if weeds are blooming.

Insect	Insecticide ^a	Amount of product per acre ^a	Placement	Timing of application, comments
Grasshoppers	*Asana XL	2.9 to 5.8 oz	On foliage	Treat when grasshopper nymphs average 15 to 20 per square yard along roadsides and fencerows. Apply treatments while hoppers are small and before they migrate into row crops. Do not spray areas adjacent to water or where runoff is likely to occur. Do not spray ditch banks.
	Imidan 70W	2½ to 2¾ lb		
	malathion	See product label.		
	*Pennacap-M	2 to 3 pt		
	Sevin XLR Plus	½ to 1½ qt		

*Use restricted to certified applicators.

^aThe formulation of the product most commonly used in Illinois is listed. If you use another formulation, *read the label* to determine the amount of product per acre. Also, read the product label for precautions and restrictions.

Table 9. Relative toxicities of commonly used agricultural insecticides

Always read the label before applying insecticides.

Trade name	Chemical class ^b	Chemical name	Toxicity to mammals ^a		Toxicity to other wildlife		
			Acute oral	Acute dermal	Birds	Fish	Bees
*Ambush	P	permethrin	Low	Low	Very low	High	High
*Asana	P	esfenvalerate	Moderate	Low	Low	High	High
*Aztec	OP, P	cyfluthrin and tebu- pirimphos	High	High	High	Moderate	— ^c
*Baythroid	P	cyfluthrin	Low	Low	Low	High	High
*Capture	P	bifenthrin	Low	Low	Very low	High	High
*Counter	OP	terbufos	High	High	High	Very high	Moderate
Diazinon	OP	diazinon	Moderate	Moderate	High	High	High
Dimethoate	OP	dimethoate	Moderate	Moderate	High	High	High
DiPel ^d	. . . ^e	<i>Bacillus thuringiensis</i>	Very low	Very low	Very low	Very low	Low
*Force	P	tefluthrin	Low	Low	Low	High	High
*Fortress	OP	chlorethoxyfos	High	High	High	High	— ^c
*Furadan	C	carbofuran	High	Moderate	Very high	High	High
Imidan	OP	phosmet	Moderate	Low	Low	High	High
Lorsban	OP	chlorthrifos	Moderate	Moderate	High	Very high	High
Malathion	OP	malathion	Low	Low	Moderate	High	High
*PennCap-M	OP	microencapsulated methyl parathion	Moderate	Low	High	Very low	High
*Pounce	P	permethrin	Low	Low	Very low	High	High
*Regent	PP	fipronil	Moderate	Moderate	Moderate	High	— ^c
Sevin	C	carbaryl	Low	Low	Low	Moderate	High
*Thimet	OP	phorate	High	High	Very high	Low	Moderate
*Warrior	P	lambda-cyhalothrin	Moderate	Moderate	Low	High	High

*Use restricted to certified applicators.

^aRelative toxicities based on acute oral and acute dermal LD₅₀ values of technical insecticide. Toxicities of formulated materials vary.^bOP = organophosphate, P = pyrethroid, C = carbamate, PP = phenyl pyrazole.^c— = information not available.^dMany additional trade names.^e. . . = microbial insecticide, not a chemical.

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RECOMMENDED WEB RESOURCES

<http://ext.agn.uiuc.edu/extension/>

University of Illinois field crops Extension resources.

<http://www.ag.uiuc.edu/cespubs/pest/>

Pest management information throughout the growing season for insects, weeds, and diseases. Searchable.

<http://www.ag.uiuc.edu/~stratsoy/expert/insect.html>

This site can be used to raise questions and seek answers for insect management problems in soybeans. FAQs on common problems.

<http://www.greenbook.net>

Excellent site for current pesticide labels and material safety data sheets.

<http://crop-net.com/industry.html>

An excellent index of most major chemical and seed companies involved in agriculture, links to the companies' web sites. Searchable by key word.

<http://www.ipm.iastate.edu/ipm/icm/>

Iowa State University's Integrated Crop Management newsletter. Excellent source for IPM information; outstanding photographs of pests and their damage.