1981 Insect Pest Management Guide

FIELD and FORAGE CROPS

You must be certified as a pesticide applicator to use restricted-use pesticides. See your county Extension adviser in agriculture for information.

FEDERAL AND STATE LAWS

The U.S. Environmental Protection Agency is classifying pesticides for "general" or "restricted" use. Anyone applying a restricted-use pesticide must be certified. Only a few pesticides have been classified.

Commercial applicators who apply restricted-use pesticides must be certified. Commercial applicators include not only persons applying a pesticide for hire but also governmental personnel, chemical company representatives, and others involved in demonstrational, regulatory, and public health pest control. Certification as a commercial applicator requires passing a written examination administered either by the Illinois Department of Agriculture or the Department of Public Health.

Private applicators who use restricted-use pesticides "for the purpose of producing any agricultural commodity on property owned or rented by him or as exchange labor (no compensation) on the property of another" must also be certified, either by attending an educational training program or by passing an examination.

Educational training programs for farmers (private applicators) and commercial pesticide applicators are conducted by the Cooperative Extension Service to prepare persons for certification. For additional information, consult your county Extension adviser in agriculture. The actual certification and the issuing of permits or licenses are handled by the Illinois Department of Agriculture or the Illinois Department of Public Health.

Special Local Need Registrations

Section 24(c) of the amendments to the Federal Insecticide, Fungicide, and Rodenticide Act of 1972 allows states the right to register pesticides for use within the state to meet special local needs (SLN). The authority for state registration of pesticides is the Illinois Department of Agriculture. A special label, which lists the new 24(c) uses, is printed by the formulator. A copy of this label must be in the possession of the operator during application of the pesticides.

In the following pages, all SLN, or 24(c), registrations are indicated by this sign: †.

Insecticides and Classifications

At the time this publication was in preparation, only a few of the insecticides listed below had been classified for either "restricted" or "general" use by the EPA. Additional insecticides are expected to be classified before the

Table 1. Insecticide Classifications

Common name	*Trade name*	*Classification*
acephate	Orthene	unclassified
azinphos-methyl	*Guthion	restricted[a]
Bacillus thuringiensis	Dipel, Thuricide, Bactur	unclassified
carbaryl	Sevin, Savit	unclassified
carbofuran	*Furadan	restricted[a]
carbophenothion	Trithion	unclassified
chlorpyrifos	Lorsban	unclassified
diazinon	Diazinon	unclassified
dimethoate	Cygon, De-Fend	unclassified
disulfoton	*Di-Syston	restricted[a]
endosulfan	Thiodan, Tiovel	unclassified
ethion	Ethion	unclassified
ethoprop	*Mocap	restricted[a]
fonofos	*Dyfonate	restricted[a]
isofenphos	*Amaze	restricted[b]
malathion	Cythion, malathion	unclassified
methidathion	*Supracide	restricted[b]
methomyl	*Lannate, *Nudrin	restricted[c]
methoxychlor	methoxychlor	unclassified
methyl parathion	*Methyl parathion	restricted[b]
methyl parathion (microencapsulated)	*Penncap-M	restricted[b]
oxydemeton-methyl	Metasystox-R	unclassified
phorate	*Thimet	restricted[a]
phosmet	Imidan	unclassified
terbufos	Counter	unclassified
toxaphene	Toxaphene	unclassified
trichlorfon	Dylox, Proxol	unclassified

[a] Liquid formulations are restricted.
[b] All formulations are restricted.
[c] All formulations except water-soluble packages, 25% wettable powder, and granulars are restricted.

Asterisks (*) are used throughout this circular to indicate insecticides classified for "restricted" use by the U.S. Environmental Protection Agency.

Consider all grain fumigants as restricted-use insecticides.

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN COLLEGE OF AGRICULTURE COOPERATIVE EXTENSION SERVICE
In cooperation with ILLINOIS NATURAL HISTORY SURVEY CIRCULAR 899 (revised annually) November, 1980

1981 planting season. Your county Extension adviser will have additional information on insecticide restrictions.

The chemical names used in this circular may be unfamiliar to you. These names are the common, coined chemical names and as such are not capitalized (for example, terbufos). Trade names are capitalized (for example, Counter). In the table of limitations (Table 14), the trade names are listed first, with the common name in parentheses following the trade name. In the tables of suggestions, the trade name is also listed first and the common name is in parentheses. For questions, refer to Table 1 or to Table 14.

POLICY STATEMENT

The *Illinois Insect Pest Management Guide: Field and Forage Crops* (Circular 899) is revised annually and is intended for use during the current calendar year only. Not all registered insecticides for crop pests are included in this circular. Insecticides that are effective and do not present an undue hazard to the user are suggested whenever possible.

Trade names have been used for simplicity, but their usage does not imply endorsement of one product over another, nor is discrimination intended against any product.

This guide for insect control is based on research results from the Illinois Natural History Survey, the University of Illinois Agricultural Experiment Station, other experiment stations, and the U.S. Department of Agriculture.

Requested label clearances for a few uses of some insecticides, carriers, and solvents are uncertain for 1981 because many requests have not yet been officially cleared. Be sure to check with your county Extension adviser in agriculture if you are in doubt about an insecticide you plan to use. We will make announcements of label changes through the news media to keep you up to date.

REFERENCES

This circular lists only suggested uses of insecticides for the control of many pests in Illinois field crops and is not designed to discuss other methods of control. Fact sheets discussing nonchemical control methods, descriptions of specific insects, and their life history and biology (designated by NHE numbers) can be obtained from the office of the county Extension adviser in agriculture or by writing to Entomology Extension, 172 Natural Resources Building, Champaign, IL 61820.

PEST-MANAGEMENT SCOUTING PROGRAMS

In recent years, "pest-scouting" programs have been initiated by several pest-management consulting firms to serve growers. Scouts monitor fields for outbreaks of pests and keep a close watch on potential problems. Identifying and controlling pest outbreaks through scouting programs could save a farmer thousands of dollars. The scout's observations can also be used to determine the need for applying a rootworm soil insecticide the following year.

PESTICIDE SAFETY

Certain precautionary steps should be taken when handling insecticides. Some of the insecticides suggested in this publication can be poisonous to the applicator. The farmer is expected to protect himself, his workers, and his family from needless exposure.

When using insecticides, apply all the scientific knowledge available to make sure that there will be no illegal residue on the marketed crop. Such knowledge is condensed on the label. READ THE LABEL CAREFULLY AND FOLLOW THE INSTRUCTIONS. The label should be recent and not from a container several years old. Do not exceed the maximum rates suggested. Observe the interval between application and harvest. Apply only to crops for which use has been approved. Keep records of pesticide use for each field. Record the product used, the trade name, the percentage content of the insecticide, the dilution, the rate of application per acre, and the date or dates of application.

Always handle insecticides with respect. The persons most likely to suffer ill effects from insecticides are the applicator and his family. Accidents and careless, needless overexposure can be avoided. Following these rules will prevent most insecticide accidents:

1. Wear rubber gloves when handling insecticide concentrates.
2. Do not smoke while handling or using insecticides.
3. Keep your face turned to one side when opening, pouring from, or emptying insecticide containers.
4. Leave unused insecticides in their original containers with the labels on them.
5. Store insecticides out of the reach of children, irresponsible persons, or animals; store preferably in a locked building. Do not store near livestock feeds. Better yet, buy no more pesticide than you will use, thus eliminating a pesticide storage and disposal problem.
6. Triple rinse, bury, or burn all empty insecticide containers or take them to an appropriate sanitary landfill.
7. Do not put the water-supply hose directly into the spray tank or blow out clogged nozzles or spray lines with your mouth.
8. Wash with soap and water exposed parts of the body and clothes contaminated with insecticides.
9. Do not apply to fish-bearing or other waters.
10. Do not leave puddles of spray on impervious surfaces or apply insecticides near dug wells or cisterns.
11. Do not apply insecticides, except in an emergency, to areas with abundant wildlife.
12. Do not spray or dust when weather favors drift.
13. To avoid bee kill, apply insecticides after bee activity has been completed for the day; use the least toxic materials. *Warn beekeepers that you are applying insecticides.*

PREDICTING THE NEED FOR SOIL INSECTICIDES ON CORN

The type of crop rotation greatly influences whether a soil insect problem will occur and what kind it will be. Some guidelines follow for predicting soil insect problems in corn and for determining the need to use a soil insecticide at planting time. Exceptions can be expected occasionally because soil insect problems are influenced by a variety of things unrelated to crop rotation, such as the weather, soil type, planting date, hybrid, tillage, and natural enemies. Knowledge about soil insect damage in a particular field during previous years is also helpful because infestations tend to occur in the same fields and in the same area.

Corn After Soybeans. The potential for soil insect problems in corn after soybeans is generally low, and the use of soil insecticides rarely pays. In most fields, a diazinon planter-box seed treatment will be adequate to protect against attack by seedcorn beetles and seedcorn maggots. *Corn rootworms* rarely cause damage to corn after soybeans. An exception may occur when corn rootworm beetles are attracted to, and deposit their eggs in, soybean fields that are weedy or contain volunteer corn. When such fields are planted to corn the following year, economic damage may occur. Good weed control will reduce the attractiveness of soybean fields to rootworm beetles and permit soybean-corn rotations with noneconomic damage from corn rootworms.

White grubs are an occasional problem in east-central Illinois in corn after soybeans.

Corn After Corn. The potential for rootworm damage is moderate to severe in the northern two-thirds of Illinois. A rootworm insecticide may be needed in most fields of corn after corn. Wireworms are occasionally a problem in the southern part of Illinois.

Corn After Grass Sod. Wireworms and white grubs are potential problems. Apply a labeled soil insecticide at planting time.

Corn After Legumes. Grape colaspis, grubs, wireworms, and cutworms are potential problems in corn after clover and alfalfa. In northern Illinois, rootworms are occasionally a problem in corn following clover or alfalfa. Apply a soil insecticide at planting time.

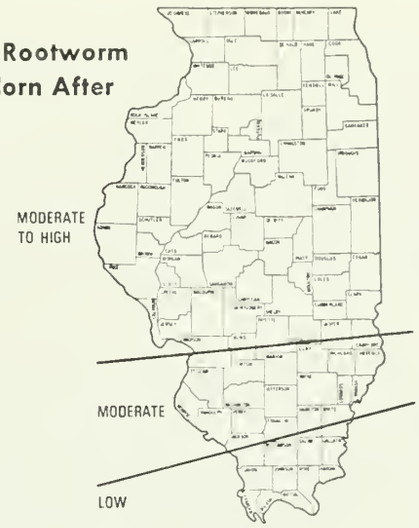
Corn After Small Grain. There is a slight potential for damage by wireworms, seedcorn beetles, and seedcorn maggots in corn after small grain. In most instances, a diazinon planter-box seed treatment will be adequate. If wireworms are present, use a soil insecticide at planting time.

CORN ROOTWORM SITUATION

Problem Area

The number of western and northern corn rootworm beetles was considerably larger throughout most areas of Illinois during 1980 than in the previous two seasons. In general, the larger the number of rootworm beetles, the greater the potential for economic damage by rootworms in corn following corn. Moderate to severe damage by western and northern corn rootworms may occur in the northern two-thirds of Illinois, north of a line from Collinsville in Madison County to Robinson in Crawford County (see map). The potential for damage in continuous corn south of this line is low to moderate, although an occasional field may sustain economic damage. These predictions are based on a survey of rootworm beetle populations made in 41 counties in August, 1980.

Potential for Rootworm Damage in Corn After Corn, 1981



Determining Potential

Corn growers should base the need for using a rootworm soil insecticide in 1981 on the abundance of rootworm beetles in cornfields during late summer of 1980. If beetle numbers reached or exceeded one per plant at any time during late July, August, or September, 1980, plan to apply a rootworm soil insecticide if the field is to be replanted to corn in 1981.

Fields of corn planted in late May or June, 1980, may have extensive rootworm damage if replanted to corn in 1981. During August and September, rootworm beetles are especially attracted to late planted or late maturing fields. Seeking fresh pollen and silks to feed on, the beetles lay millions of eggs in these fields. The heavy infestations may overwhelm even the most effective soil insecticide. Consequently, planting the fields to a crop other than corn in 1981 is suggested to reduce the overall rootworm population.

Rootworm Control Problems, 1980

Some soil insecticides used to control rootworm larvae in corn did not perform as well as expected in 1980. Failures were reported with all commercially available products, but failures with carbofuran (Furadan) and phorate (Thimet) were more numerous.

Many factors interacting with one another affect the performance of a soil insecticide. Heavy rains immediately following planting hasten the decomposition of soil

insecticides and reduce control. Lack of rainfall may prevent the activation and movement of the insecticide from the soil surface to the area where rootworm larvae are feeding. Early planting is another problem, because soil insecticides applied in early to mid-April may have lost much of their potency by the time rootworm eggs hatch in late May and June. Hence, late hatching larvae have a high survival rate, and ultimately the number of beetles is large. These factors, coupled with insecticide rates that are too low, often result in poor or marginal rootworm control.

Other causes of poor performance, particularly with Furadan, can be attributed to rapid breakdown of the insecticide by soil microorganisms and increased tolerance of the rootworm larvae to the insecticide. Laboratory tests indicate a 30- to 50-fold increase in the tolerance of rootworm beetles to Furadan, compared with toxicity levels five years ago.

SUGGESTIONS FOR ROOTWORM CONTROL, 1981

Crop Rotation

Crop rotation is an extremely effective way to prevent damage by northern and western corn rootworm larvae. If feasible, do not grow corn two years in succession in the same field. First-year corn following soybeans will generally *not* require a soil insecticide for corn rootworm control. Researchers at the Illinois Natural History Survey and University of Illinois have confirmed that a soybean-corn-soybean-corn rotation is still effective in suppressing corn rootworms in Illinois.

Although rootworm beetles can be found in "clean" or weed-free soybean fields, and may even lay a few eggs there, the number of eggs is not great enough to warrant the use of a soil insecticide on corn the following season. In a few instances, rootworm larval damage has occurred to corn planted after soybeans when the bean field had been heavily infested with volunteer corn or weeds during August. Adult northern and western corn rootworms were attracted to these weedy soybean fields to deposit eggs. As a result, root damage by larvae occurred the following season. Good weed control in soybeans will prevent rootworm damage in corn following soybeans. Soybean fields with 4,000 or more volunteer corn plants per acre will usually warrant treatment for rootworm control the following year if planted to corn.

Corn rootworm beetles deposit the vast majority of their eggs in cornfields. The larvae cannot survive on the roots of broadleaf crops (soybeans or alfalfa) or broadleaf weeds. Consequently, when a crop other than corn, soybeans for example, is planted in a field with soil containing millions of rootworm eggs, the rootworm larvae die before becoming egg-laying beetles.

Corn following alfalfa may benefit from a soil insecticide treatment, because rootworm beetles may be attracted into blooming alfalfa fields and lay eggs there during August and September.

Soil Insecticides

During the past five years, instances of erratic rootworm control with soil insecticides have increased. Several factors are involved, including early planting, too much rain, too little rain, and combinations of all three. In addi-

Table 2. Soil Insecticides Suggested For Rootworm Control, Illinois, 1981

Insecticide[a]	Class	Ounces of product per 1,000 ft. of row	Amount of product needed per acre			
			40″ rows	38″ rows	36″ rows	30″ rows
At planting						
Amaze 20G	organophosphate	6	5.0 lb.	5.3 lb.	5.6 lb.	6.7 lb.
Amaze 6E	organophosphate	1.6 fl. oz.	1⅓ pints	1⅜ pints	1½ pints	1¾ pints
Counter 15G	organophosphate	8	6.7 lb.	7.0 lb.	7.4 lb.	8.7 lb.
Dyfonate 20G	organophosphate	6	5.0 lb.	5.3 lb.	5.6 lb.	6.7 lb.
Dyfonate 4E	organophosphate	2.4 fl. oz.	2 pints	2⅛ pints	2¼ pints	2¾ pints
Dyfonate 4E	organophosphate	Broadcast	3 quarts	3 quarts	3 quarts	3 quarts
Furadan 10G	carbamate	12	10.0 lb.	10.5 lb.	11.1 lb.	13.3 lb.
Furadan 4F	carbamate	2.4 fl. oz.	2 pints	2⅛ pints	2¼ pints	2¾ pints
Lorsban 15G	organophosphate	8	6.7 lb.	7.0 lb.	7.4 lb.	8.7 lb.
Mocap 10G	organophosphate	12	10.0 lb.	10.5 lb.	11.1 lb.	13.3 lb.
Mocap 6EC	organophosphate	1.6 fl. oz.	1⅓ pints	1⅜ pints	1½ pints	1¾ pints
Thimet 15G	organophosphate	8	6.7 lb.	7.0 lb.	7.4 lb.	8.7 lb.
At cultivation						
Amaze 20G	organophosphate	6	5.0 lb.	5.3 lb.	5.6 lb.	6.7 lb.
Amaze 6E	organophosphate	1.6 fl. oz.	1⅓ pints	1⅜ pints	1½ pints	1¾ pints
Counter 15G	organophosphate	8	6.7 lb.	7.0 lb.	7.4 lb.	8.7 lb.
Dyfonate 20G	organophosphate	6	5.0 lb.	5.3 lb.	5.6 lb.	6.7 lb.
Furadan 10G	carbamate	12	10.0 lb.	10.5 lb.	11.1 lb.	13.3 lb.
Mocap 10G	organophosphate	12	10.0 lb.	10.5 lb.	11.1 lb.	13.3 lb.
Thimet 15G	organophosphate	8	6.7 lb.	7.0 lb.	7.4 lb.	8.7 lb.

[a] Consult text for more information. LIQUID FORMULATIONS ARE HIGHLY TOXIC.

Table 3. Labeled Uses of Soil Insecticides on Corn

Insecticide	Field corn	Popcorn	Sweet corn	silage	Harvest interval
Amaze	yes	yes	yes	yes	75
Counter	yes	yes	yes	yes	*
Dyfonate	yes	yes	yes	yes	45
Furadan	yes	no	no	yes	*
Lorsban	yes	no	no	yes	*
Mocap	yes	no	yes	yes	*
Thimet	yes	no	yes	yes	30

* No restriction when used according to label.

tion, some research indicates that the erratic performance is due to microbial degradation of the soil insecticide and to increasing tolerance of rootworm larvae to the insecticide.

Consequently, there is some uncertainty about how well a soil insecticide will control corn rootworm larvae in a particular field or area. The suggestions for rootworm control that follow are based on research conducted by entomologists in Illinois and other states. For more information refer to the section on rootworm control research.

At Planting. Apply isofenphos (Amaze 20G, 6E), terbufos (Counter 15G), fonofos (Dyfonate 20G, 4EC), carbofuran (Furadan 10G, 4F), chlorpyrifos (Lorsban 15G), ethoprop (Mocap 10G, 6EC), or phorate (Thimet 15G) in a 7-inch band ahead of the planter press wheel at the suggested rate (see Table 2). IMPORTANT: **Note the suggestions in the sections on using Furadan and on alternating insecticides.**

Soil insecticides will give 50- to 70-percent control of corn rootworm larvae. This degree of control is adequate to prevent economic levels of larval damage in most fields. But in some heavily infested fields, enough larvae may survive to cause economic levels of root damage, and beetle populations may be large enough to interfere with pollination.

Planting-time treatments applied in early April may provide only marginal control. Consider a cultivator application in late May or early June in such fields, rather than a treatment at planting time.

Liquid formulations: Isofenphos (Amaze 6E), fonofos (Dyfonate 4E), or carbofuran (Furadan 4F) may be mixed with water and applied as a spray in a 7-inch band ahead of the press wheel. They may also be mixed with liquid fertilizer and used with a split-boot applicator at planting. Ethoprop (Mocap EC) is labeled only as a band spray mixed with water.

Incompatibility or crop injury may be a problem in treatments using a liquid insecticide with a liquid fertilizer at planting. The insecticide *must* be compatible with the fertilizer. Conduct a test before planting to make certain that the two are physically compatible. Maintain agitation in the tank after mixing and during application to prevent separation. **Use caution when handling liquid insecticide formulations.**

At Cultivation. Apply isofenphos (Amaze 20G, 6E), terbufos (Counter 15G), fonofos (Dyfonate 20G), ethoprop (Mocap 10G), carbofuran (Furadan 10G), or phorate (Thimet 15G) on both sides of the row at the base of the plants just ahead of the cultivator shovels. Cover the insecticides with soil. The best time to apply a basal treatment of a soil insecticide by cultivator is in late May or early June, near the beginning of egg hatch. Such treatments may be more effective than treatments at planting time in early April.

Suggestions For Using Furadan. Rootworm control with carbofuran (Furadan) has been erratic in recent years. Problems with Furadan in Illinois were first reported in 1975, and have continued to occur since then. Practically all instances of poor control have occurred in fields or areas where Furadan has been used intensively. Research indicates that poor control may be caused by a combination of microbial degradation of the insecticide and insect resistance. Laboratory research in 1980 indicates a 30- to 50-fold increase in the beetles' tolerance to Furadan, compared with toxicity levels five years ago. In addition, the breakdown or disappearance of Furadan applied at planting time is generally more rapid in fields where the product has been used previously. Preliminary research suggests that soil microbes may be responsible for the degradation.

There is some uncertainty about Furadan's place in current rootworm control programs. Furadan has performed effectively at some research locations and has been marginal or ineffective at others in recent years, including 1980.

Consider the following suggestions for using Furadan in rootworm control:

1. If Furadan was used in 1980, switch to an organophosphate (Amaze, Counter, Dyfonate, Mocap, Lorsban, or Thimet) in 1981.
2. Do not use Furadan if rootworm control with Furadan was poor or marginal in recent years. In tests conducted in fields where Furadan failures were observed in 1975 and where organophosphate insecticides were used in the intervening years, rootworm control with Furadan was still erratic in 1980.
3. Rootworm control with Furadan should be satisfactory in fields where it has never been used before.

Suggestions For Alternating Insecticides. The suggestions that follow might help to improve control.

1. Consider alternating an organophosphate with a carbamate. Keep in mind, however, that growers generally have had no advance warning of poor control where problems with Furadan (a carbamate) have occurred.
2. The advantages of switching from an organophosphate to a carbamate are not apparent from the research, even where an organophosphate has been used for several consecutive years. But switching from one organophosphate to another may have some merit. The continuous use

of any one insecticide may create problems with insect resistance. To avoid this possibility, consider switching rootworm insecticides occasionally rather than using one product year after year. A word of caution, however, about rotating soil insecticides: in some instances, rotation of soil insecticides has not given good results. The performance of an insecticide that gives only fair control of rootworms will not be improved by rotation with other insecticides.

Rootworm Control Research

The relative effectiveness and consistency of rootworm control with various soil insecticides is investigated each year in approximately seven or eight replicated tests to keep abreast of any changes that might be taking place. The results of these tests have been published in the proceedings contained in the 30th, 31st, 32nd, and 33rd "Illinois Custom Spray Operators Training School Handbook," which is available at each county Extension office. The tests from 1977 to 1980 indicate that Amaze and Counter have given the most consistently effective control of corn rootworms.

In general, rootworm control with Furadan and Thimet was erratic in the 1980 research tests, and neither product performed according to expectations. Although mediocre or poor control has been noted with organophosphate insecticides in some fields each year, the cause does not seem to be related to insect resistance or microbial degradation.

Control of Rootworm Beetles

Use insecticides to control rootworm beetles where pollination damage may occur because of silk clipping. Research on spraying the beetles to prevent egg laying, thereby eliminating the need for a soil insecticide the next spring, has produced varying results. A single soil-insecticide treatment has usually been as effective as treating to control beetles in late July or early August and applying a soil treatment the following spring.

Some growers may choose to experiment with the management concept of spraying rootworm beetles with carbaryl (Sevin 4-Oil) to prevent egg laying. In this case, the objective is to eliminate next year's larval infestation and the need for a soil insecticide. We encourage growers who make this decision to use the scouting services of a pest management consultant to monitor fields. A properly managed adult-suppression program will require weekly scouting during July and August. Even proper timing and application of an adult-suppression spray do not guarantee success. Factors beyond the control of the operator, such as weather and beetle migration, may minimize the treatment's effectiveness.

Scouting to Determine Rootworm Potential

The abundance of rootworm beetles in a cornfield in July and August is an excellent indicator of future rootworm problems. Corn growers can determine the potential for rootworm damage in 1982 by counting western and northern corn rootworm beetles from mid-July through August, 1981, in this way:

1. Make 3 or more counts for western and northern corn rootworm beetles at 7- to 10-day intervals between mid-July and late August in fields to be replanted to corn.
2. Examine 10 plants selected at random in each of 5 areas of the field. Count all of the western and northern corn rootworm beetles on 50 plants each time. The counts take about 45 minutes in a 40-acre field.
3. As you approach a plant, move quietly to avoid disturbing the beetles. Count the beetles on the entire plant, including the ear tip, tassel, leaf surface, and behind the leaf axils.
4. Record the number of beetles you find per plant. If the average is more than one beetle per plant for any sampling date, plan to apply a rootworm soil insecticide in 1982. If average populations range from ½ to 1 beetle per plant, the probability of economic damage the following year is low, and a soil insecticide is likely to be unnecessary. If populations do not exceed an average of ½ beetle per plant for any sampling date, a soil insecticide will not be needed the following season.

Rootworm Life Cycle

Western and northern corn rootworm beetles deposit their eggs in the soil at the base of the corn plants or between rows during August and September. The eggs overwinter in the soil and begin hatching in late May. Egg hatch usually takes place over a period of 3 to 5 weeks. Consequently, in July and August all stages of the corn rootworm — egg, larva, pupa, and adult — may be found. The rootworm larvae feed on the roots of corn plants during June, July, and August. When a larva is fully grown (½ inch), it builds a cavity in the soil and goes into the pupal or resting stage. After 5 to 10 days, the beetle emerges from the soil. The development from egg hatch to adult emergence takes 27 to 40 days. After the females emerge from the soil and mate, 14 days or more elapse before they begin laying eggs. Rootworm beetles may deposit as many as 1,000 eggs; an average of 500 per female is probably common. Most egg laying in Illinois occurs after August 1.

CORN CUTWORMS

Black cutworm infestations were negligible in most areas of Illinois in 1980, compared with infestation levels of 1978 and 1979. Very few acres of corn required replanting or "rescue" insecticide treatments. Only a few growers who have problems every year reported black cutworm damage in southern and western Illinois.

Sandhill, dingy, and *claybacked cutworms* caused some damage, according to several scattered reports. Although these cutworms were not widespread, some fields were heavily infested. All three species overwinter in Illinois as partly grown larvae, so the damage they caused occurred

early in the season. Sandhill cutworms were a problem in sandy areas, where they cause damage almost every year. Dingy and claybacked cutworm infestations occurred more frequently in corn planted after sod or forage legumes than in other crop rotations.

Predicting cutworm outbreaks is still a guessing game. Sandhill cutworms, which are a problem in sandy soils, can be expected to cause damage each year. Dingy and claybacked cutworm infestations are influenced to a large extent by crop rotation and tillage practices. Black cutworms, however, do not overwinter in Illinois, so it is impossible to forecast what the situation might be in 1981. A statewide program of monitoring black cutworm pheromone traps provides information about the intensity of spring moth flights. But this program is still in the preliminary stage, and predicting infestations from moth catches is risky.

Certain factors favor black cutworm outbreaks, however. These factors include late planting, infestations of broadleaf weeds before planting, excess crop residue, and corn following soybeans. The most important factors may be late planting and preplant weed infestations. Fields that are planted late are more likely to develop a preplant weed infestation than fields that are planted early. These late planted fields with weeds are more attractive to cutworm moths as a site on which to deposit their eggs. Early spring tillage operations and early planting in 1980 were the key reasons for the apparent reduction in black cutworm outbreaks.

Currently, three options are available for cutworm control: preplant or planting-time applications of soil insecticides to prevent damage and rescue treatments after the infestation appears. All have limitations.

Because of the uncertainty in predicting which fields will have light, moderate, or heavy infestations of cutworms, it may be more feasible to use rescue treatments for cutworm outbreaks rather than to use a preplant or planting-time treatment unnecessarily.

Based on the relatively low incidence of cutworm problems over the past 25 years, a grower may find an economic advantage to the wait-and-see system, which involves field scouting, rather than a costly always-apply program in which the soil insecticide is routinely applied at or before planting for a problem that may not exist.

Rescue (or emergency) treatments to control outbreaks of cutworms include sprays of chlorpyrifos (Lorsban), carbaryl (Sevin), or trichlorfon (Dylox), or carbaryl pelletized bait. Broadcast the pelletized bait on the surface, but do not incorporate. Chlorpyrifos sprays should also be broadcast. Sprays of carbaryl may be banded over the row or broadcast, but the rates per acre need to be increased if the sprays are broadcast. Trichlorfon sprays should be banded.

The keys to effective cutworm control with the rescue treatments are the amount of surface moisture and the movement of the worms. Control may be poor, regardless of the insecticide used, if the topsoil is dry and crusted and the worms are working below the soil surface. Cutworm control under hot, dry soil conditions may be enhanced by cultivating or running a rotary hoe over the field soon after spraying. This disruption may cause the worms to move around and come into contact with the insecticide.

To determine the need for rescue treatments, scout the fields during plant emergence, particularly those fields considered to be high-risk. **Early detection of leaf-feeding or of cutting by cutworms is vital.** When the corn plants are beginning to emerge, check the fields for leaf-feeding, cutting, wilting, or missing plants. Small cutworm larvae (less than ½ inch) feed on the leaves and do not begin cutting plants until they are about half grown.

A control measure is needed on corn in the 2-leaf stage if 3 percent or more of the plants are cut and if there are 2 or more cutworms per 100 plants. At the 4-leaf stage, control is justified if 3 percent or more of the plants are cut and if there are 4 or more worms per 100 plants. A single cutworm will cut fewer of the 4-leaf plants than those in the 2-leaf stage.

Planting-time treatments of chlorpyrifos (Lorsban 15G), ethoprop (Mocap 10G), and fonofos (Dyfonate 20G) are registered for the control of cutworms in corn. The Mocap label states that Mocap will "control light to moderate infestations of cutworms"; Dyfonate is labeled for "suppression of black cutworms." Some growers may want to use one of these products in fields with a history of cutworm problems or in high-risk fields. Lorsban has provided the best cutworm control in research trials during the past few years. Research also indicates that planting-time treatments are relatively effective in controlling light to moderate infestations, but control may be unsatisfactory for heavy infestations.

Preplant broadcast treatments of chlorpyrifos (Lorsban 4E) and fonofos (Dyfonate 4E) are also registered for corn cutworm control. Lorsban is labeled at rates of 2 to 4 quarts per acre; the higher rate is suggested. Dyfonate is labeled for "suppression of black cutworms" at 4 quarts per acre. Both insecticides should be incorporated into the top 2 to 4 inches of soil immediately after application.

WIREWORMS

Wireworm problems in corn were more frequent in 1980, particularly in the southern half of Illinois, than for the previous 15 years. Wireworms may attack the seed or drill into the base of the stem below ground level, damaging or killing the growing point. Damage will show up as wilted, dead, or weakened plants and spotty stands. Wireworm larvae are yellowish-brown and wirelike; several species are known to attack corn. They live for two to five years in a field in the larval stage, feeding on the roots of

grasses and crops. There is often a relationship between crops that were in the field two to four years before damage to the corn. Most reports of damage to corn have been in fields where corn follows soybeans or where there has been a corn-soybean-small-grain rotation.

Presumably the adult (a click beetle) prefers to deposit its eggs in small-grain stubble or in grassy fields of soybeans. Attempts to control wireworms with an insecticide rescue treatment after the damage appears are usually not very successful. Therefore, if an infestation is known to be present, insecticides must be applied at planting.

Wireworms are usually most damaging in bottomlands or in poorly drained areas on upland soils. Low spots in the field often have the heaviest populations.

The proportion of fields of corn affected by wireworms in Illinois is small (less than 1 percent) and does not justify the widespread use of a soil insecticide on first-year corn after soybeans. A diazinon planter-box seed treatment at planting may help deter the wireworms from attacking the seed, but this treatment will not protect the seedling.

Checking for Wireworms

A technique using baits has been developed for evaluating wireworm potential before planting. The bait stations should be established 2 to 3 weeks before the anticipated planting date. Fields where small grain or grasses have been grown the preceding 2 or 3 years are the best candidates for bait stations.

Since wireworm infestations are often localized within a field, it will be necessary to place the bait stations randomly throughout the field. One bait station per acre is desirable. As a minimum, place 2 bait stations at the highest elevation in a field, 2 on a slope, and 2 in the lowest area.

Follow this procedure for baiting:

1. Use a mixture of 1 cup of untreated wheat and 1 cup of untreated shelled corn at each station.
2. Bury the bait about 4 inches deep. It is also desirable to cover the ground over each bait station with an 18-inch square of black plastic. The plastic collects solar heat and speeds germination of the corn and wheat, which entices overwintering wireworms.
3. Mark each station with a flag or stake.
4. Dig up the bait stations in 10 to 14 days and count the number of wireworms.

Need for Treatment

If you find an average of one wireworm per bait station, use a labeled soil insecticide. In some instances, several wireworms may be found in one bait station and none in others. Wireworm infestations tend to concentrate in some locations. It may be possible to limit treatment to areas of the field where the concentration is heaviest.

WHITE GRUBS

White grub problems in cornfields were more frequent in 1980 than during the previous couple of years. The species causing most of the damage in 1980 was *Phyllophaga implicita.* Two other species, *P. futilis* and *P. rugosa,* were less common, but they, too, occasionally damage corn and soybeans.

All three species of economically important white grubs have 3-year life cycles. Peak years of damage usually occur during the year following large flights of May beetles, the adult stage of white grubs. The beetles prefer to lay their eggs in ground covered with vegetation, such as weedy soybean fields and sod.

The C-shaped white grub larvae chew on the roots and root hairs of corn seedlings. During peak years of damage, the grubs feed all season long. Damage to a cornfield is most apparent in the spring. Symptoms of white grub injury visible aboveground are irregular emergence, reduced stands, and stunted or wilted plants. The damage is usually spotty throughout the field.

There are no established thresholds for white grub damage and no effective rescue treatments after the damage appears. However, if plants show symptoms of injury, dig around the root system of several corn plants. If white grubs are causing the problem and replanting is warranted, a soil insecticide should be applied. Terbufos (Counter 15G) is registered for the reduction of white grubs at the rate of 2 pounds of active ingredient per acre. In high-risk fields, such as corn following sod, a soil insecticide is justified. Although not registered for white grub control, isofenfos (Amaze 20G), fonofos (Dyfonate 20G), ethoprop (Mocap 10G), or phorate (Thimet 15G) may give partial control.

PLANTER-BOX SEED TREATMENTS

Corn. A planter-box seed treatment with diazinon will protect germinating corn against attack by seedcorn beetles and maggots. Chlorpyrifos (Lorsban 50-SL) is labeled as a slurry treatment on seed before planting to protect germinating seed against injury by seedcorn maggots. Use a seed treatment in fields that do not receive a soil insecticide at planting time, or when carbofuran (Furadan) is applied at planting time. The diazinon planter-box seed treatment is not needed if terbufos (Counter), fonofos (Dyfonate), chlorpyrifos (Lorsban), ethoprop (Mocap), or phorate (Thimet) is applied at planting. NOTE: Excess dust from the seed treater may interfere with the electronic monitor in air planters.

Soybeans. Use a diazinon seed protectant to prevent damage to germinating soybeans from seedcorn maggots. Follow the label directions for application. The potential for damage is greatest during cool, wet springs when germination is slow.

EUROPEAN CORN BORERS

Overwintering larval populations in the fall of 1980 were larger than in the fall of 1979. Although this situation was reflected by the statewide average number of borers per 100 corn stalks, regional averages were more significant. The differences in the numbers of overwintering larvae among regions were large, but variability in larval counts from county to county and from field to field was even more dramatic. Numbers of larvae per 100 stalks ranged from as few as 21 in the east to as many as 502 in the southwest.

Generally, the overwintering population in southern Illinois is much larger than in the northern half of the state. The potential for first-generation infestations in 1981 is moderate to high throughout most of the state, and very high in southern Illinois. The overwintering borer population, however, should be affected to some degree by the incidence of disease organisms. Spring weather in 1981 will also affect the population of first-generation borers.

Corn borer moths begin to emerge in late May in southern Illinois and mid- to late June in the central and northern regions. The females lay most of their eggs in the evening. They spend the daylight hours in fencerows and other protected areas.

The eggs, which are laid in masses, are usually deposited near the midrib on the underside of the lower corn leaves. Calm nights favor egg deposition by the moths. The absence of hard, beating rains during moth emergence also increases the potential for infestations.

Corn that is planted early (the fields with the tallest corn) should be monitored closely for signs of whorl-feeding by corn borer larvae from mid-June to early July. The fields with the tallest corn are the most attractive for egg laying by first-brood moths. Control is warranted if 50 percent or more of the plants have fresh whorl-feeding, if live borers are present, and if plants are 24 or more inches tall (with the leaves extended).

First-generation borers reduce yields by stalk-tunneling, which weakens the plant and destroys the tissue used to transport food within the plant.

Some hybrids have varying degrees of tolerance or resistance to leaf-feeding by first-generation borers. Consider this trait when selecting varieties for 1981.

Corn planted late is most attractive to moths laying eggs for the second generation. Fields should be monitored from mid-July to mid-August for egg masses or newly hatched larvae of the second brood. Control measures are warranted if there are 100 or more egg masses per 100 corn plants. For best results, treatments should be applied soon after egg hatch to kill the young larvae before they bore into the plant. Because egg-laying for the second generation extends over a 3- to 4-week period, timing of insecticide application should be precise. Occasionally two treatments may be necessary for satisfactory control.

Yield losses caused by second-generation borers are a result of stalk breakage and ear drop (physical damage), as well as physiological damage. Corn-borer entrance holes also provide avenues for stalk rot organisms.

CORN LEAF APHIDS

Many fields of corn in east central Illinois had heavy infestations of corn leaf aphids in 1980. The effect of these large populations on yield is not known, but they undoubtedly placed additional stress on plants that were already suffering from lack of soil moisture.

Corn leaf aphids are small, soft-bodied, greenish-blue plant lice about the size of a pinhead. They do not overwinter in Illinois, and it is impossible to predict what the situation will be in 1981. Winged corn leaf aphids, blown into Illinois on southwesterly winds during mid- to late June, become established within the whorl leaves of the corn plant. These aphids give birth to living young. In the absence of predators, parasites, diseases, and hard beating rains, aphid populations may increase very rapidly; that was the situation in 1980.

Corn leaf aphids have sucking mouthparts and cause damage by sucking moisture from the corn plant. Soil moisture stress and heavy infestations on the upper leaves and tassel may result in barren plants or reduced ear size. The critical period for damage is during tassel emergence through pollination. If aphids are allowed to cover the tassel and upper two or three leaves, yield losses are likely to occur.

Fields should be scouted for aphids beginning about one week before tassel emergence. Pull and unroll the whorl leaves of plants selected at random to check for aphids. Treatment is suggested if 50 percent of the plants have 100 or more corn leaf aphids per plant during tassel emergence and if *plants are under drouth stress.* Aphid populations usually decline after pollination is complete. However, treatment may be warranted following pollination if aphid populations continue to cover the tassel and one or two of the upper leaves.

REDUCED TILLAGE AND NO-TILL INSECT PESTS

Concern about insect problems should not keep growers from adopting conservation tillage practices. The soil-insect complex in corn, which is similar in many ways for conventional and reduced-tillage systems, can be readily controlled by applying soil insecticides at planting time. With a few exceptions, outbreaks of insects feeding on foliage can be controlled with properly timed treatments of insecticides. **Close monitoring of fields to detect insect outbreaks is very important, regardless of the tillage system.**

Weather conditions and the type of crop rotations determine to a great extent whether a soil insect problem will occur and what kind it will be. In some instances, tillage

may also influence the kind and abundance of an insect pest. Some tillage operations favor specific pests. Others tend to reduce pest problems. The general expectation is that insect infestations will be more pronounced where no-tillage is used in corn than where conventional or reduced-tillage systems are used.

No-Till Pests

Insect problems occur more frequently in no-till corn than in any other conservation tillage system and are often more serious. Crop residue left by the use of no-till practices provides a stable environment for pest survival and development. Pest problems occurring under these conditions include European corn borer, cutworms, armyworm, common stalk borer, wireworms, seedcorn maggots, billbugs, slugs, and mice. Soil insecticides may be needed on no-till corn following corn (in rootworm area), grass sod, legumes, or following any crop in which grasses and broadleaf weeds are prevalent.

Soil Insect Control

Select a soil insecticide that will control the anticipated soil insect pest. Consult Table 4 for suggestions. If a soil insecticide is not applied at planting, a diazinon planter-box seed protectant will give protection against seedcorn maggots and seedcorn beetles.

Surface residues from no-till and reduced-tillage systems may present some problems with the placement and incorporation of granular soil insecticides applied at planting. To be most effective, the soil insecticide should be incorporated into the upper ½ inch of soil, and not just broadcast on the surface. Granules remaining on the soil surface are degraded by sunlight, resulting in erratic or poor control. Furadan 10G is the only soil insecticide labeled specifically at planting for no-till conditions.

NOTE: Before using Mocap, Dyfonate, or Thimet on no-till corn, be sure that soil moisture is low enough to ensure closing of the seed furrow to prevent the insecticide granules from contacting the seed. Crop injury may occur with these products.

Aboveground Insect Pests

Aboveground insects will be more of a problem in no-till corn than under reduced or conventional tillage. Corn planted in grass sod or fall-seeded rye is vulnerable to attack by *armyworms*. The moths lay eggs on the grasses during April or early May. After vegetation is killed by a herbicide, the larvae move to the young corn seedlings and feed on them. Control is justified when 25 percent of the plants are being damaged. Rescue treatments are effective, but a spray volume of 15 to 20 gallons per acre will improve coverage and control.

Instances of damage to corn by the *common stalk borer* have been greater in no-till corn than with other tillage systems. Moths of this insect deposit their eggs on weeds in late August and September. When a herbicide is applied in the spring to no-till corn in fields previously infested with host weeds, the newly hatched stalk borer larvae move from the dead vegetation and attack newly emerging corn plants. Control of common stalk borer with insecticides is generally poor because the worms do not have access to the chemical.

Noninsect pests in no-till corn include *slugs* and *mice*. There are no effective control measures for slugs. Mouse damage may be a severe problem, particularly in corn following sod. To reduce or prevent mouse damage to corn, use a hopper-box seed treatment of methiocarb (Mesurol 50% bird repellent) at the rate of 1 pound per 100 pounds of seed corn. This product has a state label.

FORAGE INSECTS

In 1981, we expect *alfalfa weevils* to cause moderate to severe damage to the first cutting of alfalfa in most areas of Illinois. Populations of overwintering weevils in southern Illinois are the largest they have been in several years. In the southern counties, where a lot of egg laying takes place in the fall, alfalfa-weevil larval damage occurs early in the spring. Damage to the first cutting in northern Illinois is more likely to occur if hay harvest is delayed. Otherwise, the injury to alfalfa in the northern counties will occur on the stubble and new growth of the second cutting.

Numbers of alfalfa weevils are regulated to a large extent by winter weather. During a cold, open winter the mortality rate is high in overwintering weevil populations; during mild winters the mortality rate is low. The large, damaging numbers that occurred in the spring of 1980 were primarily a result of last year's mild winter.

A parasitic wasp and a fungal disease organism that attacks alfalfa weevil larvae sometimes regulate weevil numbers in the spring. The fungal disease, which was first found in Illinois in 1979, was not a significant factor in 1980, so weevil larvae were not held in check. The effect that natural enemies and diseases have on alfalfa weevil populations is still unknown. Although the wasp and the fungus will be present in alfalfa fields in 1981, we cannot yet predict their effect on weevil numbers.

Alfalfa growers in southern and central Illinois should inspect their fields closely in April, May, and June. Early larval damage appears as pinholes in the growing terminals. As the larvae grow, they skeletonize the leaves, and damaged fields appear tattered. Growers in northern Illinois should look carefully for larval damage in late May and June. All growers should examine the stubble after the first cutting, because larval and adult feeding can slow or halt new growth. Follow the suggestions in Circular 1136, "Alfalfa Weevil Pest Management Program," to determine the need and proper timing of a treatment. If this circular is unavailable, a rule of thumb is to treat when 25 percent of the tips are being skeletonized. This threshold

may be as high as 40 percent in northern Illinois, where damage occurs later in the season.

Potato leafhoppers may cause moderate to severe damage to the second and third cuttings of alfalfa in all areas of Illinois in 1981. Damage first appears as a yellow, wedge-shaped area at the tip of the leaf and is more evident during dry weather. However, population levels are difficult to predict because the leafhoppers do not survive the winter in Illinois. They migrate from southern states into Illinois during May and June.

Potato-leafhopper damage may begin on the new growth as soon as the first hay crop is removed. (Stunting and yellowing are signs of leafhopper injury.) A swarm of leafhoppers at the time of the first cutting indicates that there may be a problem in the new growth. If you use a sweep net to monitor fields, apply treatments when there are one or more leafhoppers per sweep.

BEAN LEAF BEETLES

Bean leaf beetles occurred in very large numbers throughout southern and central Illinois during August, 1980. The unusually large population was the result of several factors that enhanced the survival and development of the beetles. The 1979-80 winter was mild, so many of the overwintering beetles survived and emerged during the spring of 1980. The beetles, which were able to colonize successfully on early planted soybeans, laid large numbers of eggs. Finally, the hot weather throughout the summer accelerated beetle development. As a result, more beetles than usual were present in August.

The beetles caused considerable leaf-feeding injury to double-cropped soybeans and late maturing soybean varieties. Insecticide treatments were recommended during the critical pod-set and pod-fill stages, when defoliation exceeded 15 to 20 percent. The greatest concern, however, was caused by the beetles' pod-feeding damage, which left scars on many pods. These scars predisposed the pods to fungal infections. We are still uncertain how much pod-feeding affects yields.

Bean leaf beetles overwinter as adults under debris in fencerows, wooded areas, and other protected sites. The overwintering population of beetles is large, so there is a potential for large numbers of beetles emerging in the spring of 1981. However, the survival of the overwintering beetles will depend on the winter weather. Another mild winter will increase the chances for a large population in the spring. In addition, if soybeans are planted early in 1981, the beetles will establish themselves early. The availability of soybeans during the early part of the season is essential for the survival of bean leaf beetles. The survival of large numbers early in the season generally means an even larger population in August. On the other hand, a severe winter and later planted soybeans will reduce the number of bean leaf beetles in the spring.

CHEMICAL INJURY TO SOYBEANS

There have been instances of phytotoxicity to soybeans when organic phosphate soil insecticides were used. The problems have occurred where growers started planting soybeans without first emptying the insecticide boxes. Organic phosphate soil insecticides applied in soybean fields treated with metribuzin (Sencor or Lexone) may result in injury to a soybean crop, according to information on the labels.

CALIBRATION FOR SOIL INSECTICIDES

Calibrate the applicators for granular soil insecticides before the planting season begins. In some instances, poor control is caused by applying rates that are too low. Proper calibration will help avoid this problem. Most soil insecticide bags have a list of suggested settings for the particular model of applicator. The settings are based on planting speed. The *beginning settings* are helpful, but be sure to check your actual application rate under your own operating conditions.

Follow these steps for calibrating the applicator:

1. Calibration of granular applicators for soil insecticides is usually based on determining how many ounces of product are needed per 1,000 feet of row. Consult the insecticide label or Table 2 for labeled rates for rootworm control. These rates are expressed in ounces per 1,000 feet of row and pounds of product per acre.

2. Consult the label or manufacturer's recommendation for an approximate application setting. Adjust the setting on each hopper.

3. Select an area for a test run, preferably in the field, so that speed and traction conditions are constant. Measure off 1,000 feet.

4. Fill the hoppers and attach a plastic bag or container to each delivery tube to catch the granules from each hopper.

5. Drive the premeasured distance (1,000 feet) at the same speed to be used during the planting operation.

6. Weigh the material collected from each hopper. Use a scale that weighs in ounces (e.g., a postal scale or a diet scale).

7. Compare the quantity (ounces) per bag against those given in Table 2. To obtain one pound of active ingredient per acre the following amounts of material should be collected:

Formulation, percent	Oz. collected per 1,000 ft.
10	12
15	8
20	6

8. Recalibrate if the difference in quantity applied during the calibration process is more than 10 percent over or under the rate suggested on the label.

Table 4. Field Corn

Insect	Time of attack	Insecticide[a]	Pounds of active ingredient per acre	Placement	Timing of application
Corn rootworm larvae	June-August	**Amaze (isofenphos)	1[b]	7-inch band	(See text on soil insecticides at planting time.) Basal treatments during cultivation with Amaze, Furadan, Dyfonate, Thimet, Counter, or Mocap are effective in late May or early June.
		Counter (terbufos)	1[b]	7-inch band	
		**Dyfonate (fonofos)	1[b]	7-inch band	
		**Dyfonate (fonofos)	3	Broadcast -PPI[c]	
		**Furadan (carbofuran)	1[b]	7-inch band	
		Lorsban (chlorpyrifos)	1[b]	7-inch band	
		**Mocap (ethoprop)	1[b]	7-inch band	
		Thimet (phorate)	1[b]	7-inch band	
Seedcorn maggot	At germination	Counter (terbufos)	1[b]	Furrow	At planting.
		diazinon	1½ oz. a.i. per bu.	On seed	
		**Dyfonate (fonofos)	1[b]	7-inch band	
		Lorsban (chlorpyrifos)	1 oz. a.i. per 100 lb. of seed	On seed	Slurry formulation used to treat seed before planting.
Seedcorn beetles	At germination	diazinon	1½ oz. a.i. per bu.	On seed	At planting.
		**Dyfonate (fonofos)	1[b]	7-inch band	
		Thimet (phorate)	1[b]	7-inch band	
Wireworms	May-June	Counter (terbufos)	1[b]	Furrow	Thimet and Dyfonate applied in a 7-inch band are labeled for suppression of wireworms.
		Counter (terbufos)	1-2[b]	7-inch band	
		**Dyfonate (fonofos)	1[b]	7-inch band	
		**Dyfonate (fonofos)	4	Broadcast-PPI[c]	
		**Furadan (carbofuran)	2-3[b]	Furrow, band	
		**Mocap (ethoprop)	1[b]	7-inch band	
		Thimet (phorate)	1[b]	7-inch band	
Cutworms	May-June	Lorsban granules (chlorpyrifos)	1[b]	7-inch band	At planting.
		Lorsban spray (chlorpyrifos)	1-2	Broadcast-PPI[c]	
		**Dyfonate (fonofos)	1[b]	7-inch band	Suppresses cutworms.
		**Dyfonate (fonofos)	4	Broadcast-PPI[c]	
		**Mocap (ethoprop)	1[b]	7-inch band	At planting. Controls light or moderate infestations.
		Lorsban spray (chlorpyrifos)	1-1½	Broadcast	Apply as a post emergence rescue treatment when damage appears.
		Sevin spray (carbaryl)	2[b]	Plant base	
		Sevin bait (carbaryl)	1-2	Broadcast	
		Dylox, Proxol spray (trichlorfon)	1[b]	Plant base	
White grubs	May-October	Counter (terbufos)	2[b]	7-inch band	Counter is labeled for reduction of white grubs at planting.
Garden symphylan	May-July	Counter (terbufos)	1-2[b]	7-inch band	At planting.
		**Dyfonate (fonofos)	2	Broadcast-PPI[c]	
Billbug	May-June	toxaphene	2[b]	At plant base	When damage first appears.
Flea beetles	May-June	Sevin, Savit (carbaryl)	1[b]	Over row	When leaves on seedling plants are severely damaged and some plants are being killed.
		diazinon	½[b]	as spray	
Sod webworm	May-June	toxaphene	2[b]	At base of plant	At time of initial attack.
Common stalk borer	May-June	None labeled	..	...	Postemergence sprays of carbaryl (Sevin), methomyl (Nudrin, Lannate), chlorpyrifos (Lorsban) may give some control if applied when damage first appears.
Hop vine borer	May-June	None labeled	..	...	Postemergence sprays of carbaryl (Sevin), methomyl (Nudrin, Lannate), chlorpyrifos (Lorsban) may give some control if applied when damage first appears.

Table 4. Field Corn (continued)

Insect	Time of attack	Insecticide[a]	Pounds of active ingredient per acre	Placement	Timing of application
Thrips	May-June	malathion	1[b]	On foliage as spray	When severe wilting and yellowing of leaves are noticed.
		Metasystox-R (oxydemeton-methyl)	½[b]		
Armyworms	May-August	Sevin (carbaryl)	1½	Over row as spray	At first migration, or when worms are eating leaves above ear level.
		Dylox, Proxol (trichlorfon)	1		
		*Lannate, *Nudrin (methomyl)[d]	½		
		malathion	1		
Chinch bug	June-August	Sevin (carbaryl)†	2[b]	Spray at base of plant	At start of migration from small grains. Use only ground equipment and apply 25 to 40 gallons per acre.
European corn borer, first generation	June-July	Sevin granules (carbaryl)	1½-2	On upper ⅓ of plant and into whorl	When 50% or more of the plants have fresh whorl feeding, live borers present, and extended leaf height is 24 inches or greater.
		diazinon granules	1-2		
		Furadan granules (carbofuran)	1		
		Dyfonate granules (fonofos)	1		
		*Penncap-M spray (microencapsulated methyl parathion)†	1		
		Thuricide granules (*Bacillus thuringiensis*)	see label		For suppression. A second application may be needed.
European corn borer, second generation	Late July, mid-August	Sevin granules (carbaryl)	1½-2	Over row	Apply at first hatch when there are 100 or more egg masses per 100 plants. Two treatments may be necessary because of the extended egg-laying period.
		diazinon granules	1-2		
		Furadan granules (carbofuran)	1		
		Dyfonate granules (fonofos)	1		
		*Penncap-M (microencapsulated methyl parathion)†	1		
		Thuricide granules (*Bacillus thuringiensis*)	see label		
Woollybear caterpillars	July	None labeled	..	...	Silk clipping caused by caterpillars does not generally warrant control.
Grasshoppers	June-September	Sevin (carbaryl)	1-1½	Over row as spray	As needed. For ensilage corn use Sevin, diazinon, or malathion.
		diazinon	½		
		Cygon (dimethoate)†	½		
		malathion	1		
Spider mites	July-August	Di-Syston 15G (disulfoton)	1	On foliage	Begin control if the majority of plants are infested with mites severe enough to cause some yellowing or browning of the lower leaves before dent stage.
		Meta-Systox-R (oxydemetonmethyl)	½		
		Thimet 15G (phorate)	1		
		Trithion (carbophenothion)	1		
		ethion	1		
		diazinon	½		
Japanese beetle	July-August	Sevin, Savit (carbaryl)	1-2	Over plant	During the silking period to protect pollination if less than 75% of plants are silked and three or more beetles are present per ear.
Corn leaf aphid	July-August	malathion	1	On foliage	Apply during late whorl to early tassel when 50% of plants have light to moderate infestations and plants are under drouth stress.
		diazinon	1		

Table 4. Field Corn (continued)

Insect	Time of attack	Insecticide[a]	Pounds of active ingredient per acre	Placement	Timing of application
Corn rootworm beetles	July-August	Sevin, Savit (carbaryl) malathion diazinon Imidan (phosmet) *Penncap-M (microencapsulated methyl parathion)†	1 1 ½ ½ ¼-½	Overall spray or directed toward ear zone	Before 75% of plants have silked, if there are 5 or more beetles per plant and if silk clipping is observed. Only to protect pollination.
Southwestern corn borer	August	Furadan granules (carbofuran) diazinon granules	1 1-2	Over row	Direct granules over row. Apply when 25% of the plants have egg masses or larvae on leaves. Early-planted corn usually escapes damage.
Corn earworm	August	Sevin (carbaryl) *Lannate, *Nudrin (methomyl)[d]	1-2 ¼-½	Directed toward ears	Insecticide applications are rarely effective for the control of earworms in commercial field corn.
Fall armyworm	July-September	Sevin, Savit sprays (carbaryl) diazinon granules Dylox. Proxol spray (trichlorfon) *Lannate, *Nudrin (methomyl)[d]	1½ 1 1 ½	Over row	Granules are more effective if worms are deep in whorl. If worms are small and out on leaves, sprays are effective. Treat when 20% of plants have whorl damage and if worms are present. Treatments to control worms in ear tips are not generally effective.

* Use restricted to certified applicators only.
** Liquid formulations of Dyfonate, Furadan, Mocap, and Amaze are restricted. Amaze 20G is also restricted.
† State labeled insecticide. Applicator must have Illinois label in possession when applying.
[a] See Table 14 for insecticide restrictions.
[b] Based on 40-inch row spacing. Increase rates for narrow rows.
[c] PPI Pre-plant incorporated.
[d] To be applied only by experienced operators or those wearing protective clothing.

Table 5. Soybeans

Insect	Time of attack	Insecticide[a]	Pounds of active ingredient per acre	Placement	Timing of application
Seedcorn maggot	Germination	diazinon	¾ oz. a.i. per bu.	On seed	At planting time.
Bean leaf beetle	May-June, August	Sevin, Savit (carbaryl) Orthene (acephate) *Penncap-M (microencapsulated methyl parathion)[b]	½-1 ½-1 1	On foliage	When defoliation reaches 30% before bloom or 15% during blooming and pod fill and if beetles are present in the field. If 10% of pods are damaged and leaves are green.
Cutworms	May-June	Sevin bait, Sevin XLR (carbaryl) diazinon	1½ 2-4	Broadcast Broadcast PPI	During plant emergence if stand has gaps of one foot or more.
Thistle caterpillar	June	Sevin (carbaryl)	2	On foliage	When defoliation reaches 30% before bloom and 15% between bloom and pod fill.
Mexican bean beetle	May-July	*Penncap-M (microencapsulated methyl parathion)[b] Orthene (acephate) *Nudrin, *Lannate (methomyl)[c] Sevin (carbaryl) malathion Cygon (dimethoate)	½-¾ ½-1 ¼-½ ½-1 1½ ½	On foliage	See bean leaf beetle (above) for defoliation threshold.

Table 5. Soybeans (continued)

Insect	Time of attack	Insecticide[a]	Pounds of active ingredient per acre	Placement	Timing of application
Grasshoppers	June-September	Cygon (dimethoate)† Sevin, Savit (carbaryl)	½ 1	On foliage	When migration into fields begins and defoliation or pod feeding reaches economic levels. See bean leaf beetle (above).
Japanese beetle	June-July	Sevin (carbaryl)	1	On foliage	When defoliation reaches 15% during bloom and pod fill.
Green cloverworm	July-August	Sevin (carbaryl) *Lannate, *Nudrin (methomyl)[c] Orthene (acephate) malathion Dipel, Thuricide, Bactur (*Bacillus thuringiensis*) *Penncap-M (microencapsulated methyl parathion)[b]	½-1 ¼-½ ½-1 1½ (See label) ½-¾	On foliage	When defoliation occurs during blooming, pod set, and pod fill. Usually requires 12 or more half-grown worms per foot of row and 15% defoliation to justify treatment.
Webworms	June-August	Sevin, Savit (carbaryl)	1	On foliage	Requires 15% or more defoliation between bloom and pod fill to justify treatment.
Spider mite	June-August	Trithion (carbophenothion) Cygon (dimethoate)	½-¾ ½	On foliage	As needed on field margins or entire field.
Stink bugs	July-August	Orthene (acephate) *Penncap-M (microencapsulated methyl parathion)[b] *Guthion (azinphos-methyl)[c] Sevin (carbaryl)	¾-1 ½-¾ ½ 1	On foliage	When adult bugs or large nymphs reach 1 per foot of row during pod-fill.
Thrips	June-August	Sevin, Savit (carbaryl)	1	On foliage	If seedlings are being seriously damaged and some plants are being killed.
Blister beetles	July-August	Sevin (carbaryl)	½-1	On foliage	See bean leaf beetle (above) for defoliation threshold.
Saltmarsh caterpillar	August	Sevin (carbaryl)	2	On foliage	See bean leaf beetle (above) for defoliation threshold.
Loopers	August	Orthene (acephate) Thuricide, Dipel, Bactur (*Bacillus thuringiensis*) *Lannate, *Nudrin (methomyl)[c]	½-1 (See label) ½-1	On foliage	See bean leaf beetle (above) for defoliation threshold.
Woollybear caterpillar	August	None labeled	..	...	Infestations are rarely economic.
Whitefly	August-September	None labeled	..	...	High infestations are occasionally present on double-crop soybeans, but are rarely economic.
Corn earworm	August-September	Orthene (acephate) Sevin (carbaryl) *Lannate, *Nudrin (methomyl)[c] *Penncap-M (microencapsulated methyl parathion)[b]	1 ¾ ¼-½ 1	On foliage	Damage occurs when larvae feed on pods. Apply control if populations exceed 1 per foot of row.

* Use restricted to certified applicators only.
[a] See Table 14 for insecticide restrictions.
[b] This product is highly toxic to bees.
[c] To be applied only by experienced operators or those wearing protective clothing.
† State-labeled insecticide. Applicator must have Illinois label in possession at time of application.

Table 6. Alfalfa and Clover

Insect	Time of attack	Insecticide[a, b]	Pounds of active ingredient per acre	Placement	Timing of application
Clover leaf weevil	March-April	malathion	1	On foliage	When larvae are numerous and leaf feeding is noticeable, usually in early to mid-April. Usually requires 5 or more healthy larvae per crown to justify treatment.
Alfalfa weevil (spring treatment for larvae)	March-June	*Furadan (carbofuran)[c, d]	¼	On foliage	Refer to circular 1136. Or when 25% of tips are being skeletonized and if 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. Watch regrowth of second crop for signs of damage, and apply a treatment if feeding damage is apparent. **Do not spray alfalfa with Penncap-M during bloom to avoid injury to bees.**
		*Guthion (azinphos-methyl)[c]	½		
		*methyl parathion[c]	½		
		*Supracide (methidathion)[c]	½		
		malathion plus methoxychlor	2 qt. per acre		
		Alfa-tox (diazinon plus methoxychlor)	2 qt. per acre		
		Imidan (phosmet)	1		
		*Penncap-M (microencapsulated methyl parathion)[e]	½		
		*Lannate, *Nudrin (methomyl)[c]	0.9		
Alfalfa weevil adults	June	*Furadan (carbofuran)[c, d]	½-1	On foliage	As a stubble spray. Technically, Guthion, Supracide, Imidan, and Penncap-M could be used, since the labels do not distinguish between alfalfa weevil larvae and adults.
		*methyl parathion	½		
Spittlebug	Late April, May	malathion plus methoxychlor	2 qt. per acre	On foliage	When spittle masses are found and nymphs average more than 1 per stem.
		malathion	1		
		Alfa-tox (diazinon plus methoxychlor)	2 qt. per acre		
Variegated cutworm	May-June	Sevin (carbaryl)	1½	On foliage	As needed on regrowth of second cutting.
		Dylox, Proxol (trichlorfon)	1		
Aphids	April-August	Cygon, De-Fend (dimethoate)	½	On foliage	When aphids are abundant and lady beetle larvae and adults, parasites, and diseases are low.
		diazinon	½		
		malathion	1		
		*Furadan (carbofuran)[c, d]	¼-½		
		*Penncap-M (microencapsulated methyl parathion)[e]	½		
		*Supracide (methidathion)[c]	½-1		
Leafhoppers	June-August	Sevin, Savit (carbaryl)	1	On foliage	When second-growth alfalfa is 4 to 5 inches tall, apply a treatment where there are one or more leafhoppers per sweep.
		diazinon	½		
		*Penncap-M (microencapsulated methyl parathion)[e]	½		
		Cygon, De-Fend (dimethoate)	½		
		Dylox, Proxol (trichlorfon)	½-1		
		*Supracide (methidathion)[c]	½-1		
		Imidan (phosmet)	1		
		*Furadan (carbofuran)[c, d]	1		
Grasshoppers	June-September	Cygon, De-Fend (dimethoate)	½	On foliage	When grasshoppers are small and before damage is severe. Avoid treatments when plants are blooming. Cut the hay and remove the crop.
		Sevin, Savit (carbaryl)	1		
		*Furadan (carbofuran)[c, d]	¼		
		diazinon	½		

Table 6. Alfalfa and Clover (continued)

Insect	Time of attack	Insecticide[a]	Pounds of active ingredient per acre	Placement	Timing of application
Webworms	July-August	Sevin, Savit (carbaryl)	1	On foliage	If damage appears.
		Dylox, Proxol (trichlorfon)	1		
		malathion plus methoxychlor	2 qt. per acre		
Fall armyworm	August-September	Sevin (carbaryl)	1½	On foliage	Usually in late summer or early fall on new seedings or established stands.
		Dylox (trichlorfon)	1		
		*Lannate, *Nudrin (methomyl)[c]	½		
		Alfa-tox (diazinon plus methoxychlor)	2 qt. per acre		

* Use restricted to certified applicators only.
[a] See Table 14 for insecticide restrictions.
[b] Before applying insecticides, be certain to clean all herbicides out of equipment. During pollination, apply very late in day or, if possible, avoid application during bloom.
[c] To be applied only by experienced operators or those wearing protective clothing.
[d] Only for pure stands of alfalfa. When using no more than ¼ pound per acre, allow 7 days between application and harvest. If you use ¼ to ½ pound per acre, allow 14 days to elapse between application and harvest.
[e] This product is highly toxic to bees exposed to direct treatment or residues on crops.

Table 7. Non-Crop Areas

Insect	Time of attack	Insecticide[a]	Pounds of active ingredient per acre	Placement	Timing of application
Grasshoppers	June-July	Sevin (carbaryl)	1	On foliage	When grasshopper nymphs average 15 to 20 per square yard along roadsides, ditch banks, and fencerows. Apply treatments while hoppers are small and before they migrate into row crops.
		Cygon (dimethoate)†	½		
		diazinon	½		
		malathion	1		

[a] See Table 14 for insecticide restrictions.
† State labeled insecticide. Applicator must have Illinois label in possession at time of application.

Table 8. Grass Pasture

Insect	Time of attack	Insecticide[a]	Pounds of active ingredient per acre	Placement	Timing of application
Grasshoppers	June-July	*Penncap-M (microencapsulated methyl parathion)[b]	½	On foliage	As needed.
		diazinon	½		
		malathion	1		
		Sevin (carbaryl)	1		
Armyworms	June-July	Dylox, Proxol (trichlorfon)	1	On foliage	As needed.
		malathion	1		
		Sevin (carbaryl)	1		

* Use restricted to certified applicators only.
[a] See Table 14 for insecticide restrictions.
[b] This product is highly toxic to bees.

Table 9. Stored Grain (Corn, Wheat, Oats)[a, b]

Insect	Time of attack	Insecticide and dilution	Dosage	Placement	Suggestions (See Table 14)
Angoumois grain moth (earcorn)	April-October (southern ⅓ of Illinois only)	malathion 57% E.C. 3 oz. per gal. water	Apply to runoff	Spray surface and sides about May 1 and August 1	Plant tight husk varieties. Store as shelled corn to avoid all but surface damage by angoumois moth.
Indian meal moth[c]	April-October	dichlorvos 20% (DDVP, Vapona) plastic resin strip[d]	1 strip per 1,000 cubic feet of space above grain mass	Attach to ceiling or side wall	Clean and spray bin with 1.5% malathion to runoff before storage. Store only clean, dry grain. Install strips on May 15 or at storage. Replace strips every 6 weeks between May and October. Apply *Bacillus thuringiensis* (B.t.) at the auger as the grain is binned.[f] **Note: Level the grain after treatment.** For emergency treatment use B.t. raked in and the dichlorvos resin strip. Follow label directions for top dressing the grain with B.t.
		Bacillus thuringiensis[e] dust 4,000 units per mg.	½ oz. per bu.	Apply to top 4 inches of grain	
		Bacillus thuringiensis[e] WP 16,000 units per mg. 1 lb. in 10 gal. water	0.6 pt. per bu.	Apply to top 4 inches of grain	
GENERAL Internal and external feeders Rice and granary weevils Flat grain beetle Saw-toothed grain beetle Rusty grain beetle Foreign grain beetle Cadelle beetle Flour beetles	April-October	malathion 57% E.C. 1 pt. per 3-5 gal. water[g]	3-5 gal. per 1,000 bu.	Spray uniformly as grain is binned	Clean and spray bin with 1.5% malathion to runoff before storage. Store only clean, dry grain. Protect surface with dichlorvos resin strips or B.t. as recommended for meal moths.
		liquid fumigant [h, i]	3-5 gal. per 1,000 bu.	On surface; repeat if necessary	Clean and spray bin with 1.5% malathion to runoff before storage. Store only clean, dry grain. Apply in late July and September in the southern half of Illinois; apply in mid-August in the northern half of Illinois. Protect surface with dichlorvos resin strips or B.t. as recommended for meal moths.
		*methyl bromide + *ethylene dibromide [i, j]	As directed	On surface	
		*aluminum phosphide[k]	180 tablets or 300 pellets per 1,000 bu.	Uniformly throughout	Fumigants are best used for emergency control of existing infestations.

Table 9. Stored Grain (Corn, Wheat, Oats) [a, b] (continued)

*Use restricted to certified applicators only.
[a] Corn need not be treated if harvested after October 1 unless it is to be carried over after May 15 the following year. Wheat and oats should be treated if they are to be held for one month or more in storage after harvest. Soybeans stored at safe moisture levels are attacked only by Indian meal moth.
[b] Grain carried over after May 15 of the following year should receive a surface spray of 1.5% malathion at 2 gal. per 1,000 sq. ft. for general feeders and either a B.t. or dichlorvos resin strip application for Indian meal moth control.
[c] Remove webbing before treatment.
[d] Effective only in enclosed bins. Kills adult moths but not the eggs or larvae. A week or two is required to control effectively an existing infestation. Fumigate the grain if immediate control is desired. Also cleared for use in bins of stored soybeans.
[e] Kills larvae only. A week or two is required to control an existing infestation. Fumigate the grain if immediate control is desired. Cleared for use on soybeans.
[f] We do not recommend the raked-in method of application for B.t. on grain just going into storage.
[g] Use only the grade of malathion labeled for use on stored grain. Apply after drying, because malathion vaporizes and is lost rapidly when grain is heat dried.
[h] Some common liquid fumigants are *carbon bisulfide + *carbon tetrachloride, *ethylene dichloride + *carbon tetrachloride, *ethylene dichloride + *ethylene dibromide + *carbon tetrachloride, etc.
[i] Use with extreme caution. Apply only under calm conditions and when grain temperature is 70°F or above. Grain should be 8 inches below the lip of the bin and should be leveled before fumigating. Cover the surface with a plastic tarp for 24 hours, then air out.
[j] Called the 73 mixture.
[k] Called *Phostoxin or *Detia. Slow vaporization with a 3-day exposure period. Can be used at grain temperature of 60°F or above. Grain should be 8 inches below the lip of the bin and should be leveled before fumigating. Cover the surface with a plastic tarp for 3 days, then air out.

Table 10. Small Grains (Barley, Oats, Rye, Wheat)

Insect	Time of attack	Insecticide[a]	Pounds of active ingredient per acre	Placement	Timing of application
Armyworm	May-June	toxaphene[b] Dylox, Proxol (trichlorfon)	1½ ½-1	On foliage	When there are 6 or more armyworms per linear foot of row and before extensive head cutting occurs. Do not use trichlorfon on rye.
Greenbug, English grain aphid	May-June	Cygon (dimethoate) malathion *Penncap-M (microencapsulated methyl parathion)[c]	¼ 1 ¼	On foliage	Aphids damage plants indirectly by transmitting disease. Once yellowing is noticeable, it is usually too late to treat. Use dimethoate and Penncap-M on wheat only.
Fall armyworm	October-November	toxaphene[b] Dylox, Proxol (trichlorfon)	2 ½-1	On foliage	During fall when damage to new growth is apparent.
Variegated cutworm	May-June	Dylox, Proxol (trichlorfon)	½-1		As needed.
Wheat stem maggot	May-June	None	..	...	No chemical control. Damage shows as white heads when field is still green.
Grasshoppers	Fall	malathion toxaphene[b] Cygon (dimethoate) *Penncap-M (microencapsulated methyl parathion)[c]	1 2 ½ ½	On foliage	During fall when damage is apparent, treat field borders and noncrop areas to stop migration.

* Use restricted to certified applicators only.
[a] See Table 14 for insecticide restrictions.
[b] For use on dairy farms only when alternate material is not available and when insect emergency exists. Do not apply as foliage sprays or dusts to, or adjacent to, dairy pasture, hay, or forage crops.
[c] This product is highly toxic to bees.

Table 11. Grain Sorghum

Insect	Time of attack	Insecticide[a]	Pounds of active ingredient per acre	Placement	Timing of application
Cutworms	May-June	Sevin (carbaryl)	2	Over row	When seedling plants are being cut.
Yellow sugarcane aphid	May-June	Metasystox-R (oxydemeton-methyl)	¼-½	Over row	Treatment should be applied at first sign of damage to seedling sorghum; 5 to 10 aphids per leaf.
Greenbug	June-July	Cygon, De-Fend (dimethoate) malathion diazinon Meta-Systox-R (oxydemetonmethyl)	¼-½ 1 ½ ¼-½	Over row	When greenbug damage is sufficient to cause death of more than 2 normal-sized leaves before the hard-dough stage.
Grasshoppers	June-August	Cygon (dimethoate)	½	Over row	As needed.
Fall armyworm	July-August	Sevin (carbaryl) *Lannate, *Nudrin (methomyl)[b]	1½ ¼-½	Over row	When there is an average of 2 worms per head. Leaf feeding or whorl damage is seldom economic.
Webworms	After heads form	Sevin, Savit (carbaryl) *Lannate, *Nudrin (methomyl)[b]	1-2 ½	Over row	When 10 to 25% of the heads are infested with 5 or more larvae per head.
Corn earworm	After heads form	Sevin, Savit (carbaryl) *Lannate, *Nudrin (methomyl)[b]	1-2 ¼-½	Over row	When there is an average of 2 worms per head.
Sorghum midge	August-September	Cygon (dimethoate) diazinon Sevin (carbaryl) *Lannate, *Nudrin (methomyl)[b]	¼ ¼-½ 1½ ¼-½	Over row	Apply during bloom when 50% of heads have begun to bloom and there are 1 or more midge adults (flies) per head.
Corn leaf aphid	July-September	Cygon (dimethoate) malathion	¼ 1	Over row	Corn leaf aphids rarely cause economic damage unless populations are heavy and drouth conditions exist.

* Liquid formulations are restricted to certified applicators only.
[a] See Table 14 for insecticide restrictions.
[b] To be applied only by experienced operators or those wearing protective clothing.

Table 12. Sunflowers

Insect	Time of attack	Insecticide[a]	Pounds of active ingredient per acre	Placement	Timing of application
Cutworms	May-June	toxaphene	1½-2	Over row	When 10% of the seedlings are damaged.
Sunflower beetle	May-June	toxaphene	1½-2	Over row	When defoliation reaches 25%. Do not apply toxaphene after yellow ray petals have formed.
Thistle caterpillar	June	toxaphene	1½-2	Over row	When defoliation reaches 25%.
Grasshoppers	June-August	toxaphene	1½-2	Over row	When defoliation reaches 25%.
Sunflower moth larvae	July	Thiodan, Tiovel (endosulfan) *Supracide (methidathion)[b]	1 ½	Over row	Apply first treatment when a field has reached 20 to 25% bloom and moths are present.

* Use restricted to certified applicators only.
[a] See Table 14 for insecticide restrictions.
[b] To be applied only by experienced operators or those wearing protective clothing.

Spraying blossoming sunflowers can be extremely hazardous to bees. Coordinate with local beekeepers before applying sprays.

Table 13. Relative Toxicities of Commonly Used Agricultural Insecticides

Trade name	Chemical name	Toxicity to mammals[a]		Toxicity to		
		Acute oral	Acute dermal	Birds	Fish	Bees
Amaze	isofenphos	high	high	high	high	...
Counter	terbufos	high	high	high	very high	...
Cygon, De-Fend	dimethoate	moderate	moderate	moderate	very low	high
Diazinon	diazinon	moderate	moderate	high	high	high
Dipel, Bactur, Thuricide	*Bacillus thuringiensis*	very low	very low	very low	very low	very low
Di-Syston	disulfoton	high	high	moderate	...	moderate
Dyfonate	fonofos	high	moderate	moderate	...	...
Dylox, Proxol	trichlorfon	low	low	low	very low	low
Ethion	ethion	high	high	low	...	very low
Furadan	carbofuran	high	moderate	moderate	moderate	high
Guthion	azinphosmethyl	high	moderate	moderate	very high	high
Imidan	phosmet	moderate	low	low	...	high
Lannate, Nudrin	methomyl	high	moderate	low	...	high
Lorsban	chlorpyrifos	moderate	moderate	moderate	very high	high
Malathion	malathion	low	low	low	moderate	high
Metasystox-R	oxydemetonmethyl	moderate	moderate	moderate	...	moderate
Methoxychlor	methoxychlor	low	low	very low	very high	low
Methyl parathion	methyl parathion	high	high	moderate	very low	high
Mocap	ethoprop	moderate	high	moderate	...	moderate
Orthene	acephate	moderate	moderate	moderate	low	high
Penncap-M	microencapsulated methyl parathion	moderate	low	moderate	very low	high
Sevin	carbaryl	low	low	very low	very low	high
Supracide	methidathion	high	moderate	moderate	high	high
Thimet	phorate	high	high	moderate	very high	moderate
Thiodan	endosulfan	high	high	low	...	moderate
Toxaphene	toxaphene	moderate	moderate	low	very high	low
Trithion	carbophenothion	high	high	...	...	moderate

[a] Relative toxicities based on acute oral and acute dermal LD_{50} values of technical insecticide.

Table 14 follows on pages 22 and 23.

Table 14. Limitations in Days Between Application of the Insecticide and Harvest of Crop and Restrictions on Use of Insecticides for Field Crop Insect Control

(Blanks denote that the product is not suggested for that specific use in Illinois)

	Worker re-entry time (hours)[a]	Field corn		Sorghum	Forage crops		
		Grain	Ensilage and stover		Alfalfa	Clover	Pasture
*Amaze (isofenfos)[b]	...	75,A	75,A	...	...	...	...
Counter (terbufos)	...	B	B	...	...	...	...
Cygon, De-Fend (dimethoate)	...	14	14	28	10,C	...	...
Diazinon	...	B	10	7	7	7	0
**Di-Syston (disulfoton)[a, b]	...	40	40	...	...	...	...
**Dyfonate (fonofos)[b]	...	45	45	...	...	...	...
Dylox, Proxol (trichlorfon)	...	D	D	...	0	0	0
Ethion	24	50,E	50,E	...	...	...	...
**Furadan (carbofuran)[b]	...	B,F	F,G	...	7,H	...	...
*Guthion (azinphos-methyl)[a, b]	24	...	...	...	16,C	16,C	...
Imidan (phosmet)	...	14	14	...	7,C	...	...
**Lannate (methomyl)[a, b]	...	0	3	14	7	...	...
Lorsban (chlorpyrifos)	...	50	50	...	...	...	...
Malathion	...	5	5	7	0	0	0
Metasystox-R (oxydemeton-methyl)	48	7	7	45	...	...	...
Methoxychlor	...	...	...	...	7	7	...
*Methyl parathion[a, b]	48	...	...	...	15	15	...
**Mocap (ethoprop)[b]	...	B	B	...	...	...	...
**Nudrin (methomyl)[a, b]	...	B	3	14	7	...	...
*Penncap-M (microencapsulated methyl parathion)[a, b]	...	12	12	...	15	...	15
Sevin, Savit (carbaryl)	...	B,I	B,I	21	0	0	0
*Supracide (methidathion)[b]	...	...	...	...	10,J	...	...
Thimet (phorate)	...	30,K	30,K	...	...	...	...
Thuricide (*Bacillus thuringiensis*)	...	B	B	...	...	...	...
Toxaphene	...	B	L	...	...	...	...
Trithion (carbophenothion)	48	21	21	...	...	...	...

		Barley	Oats	Rye	Wheat	Soybeans	Sun-flowers
Cygon (dimethoate)	...	...	...	...	60	21	...
Dipel, Thuricide, Bactur (*Bacillus thuringiensis*)	...	...	...	...	...	0	...
Diazinon	...	...	...	...	...	M	...
Dylox (trichlorfon)	...	21	21	...	21	...	...
*Guthion (azinphos-methyl)[a, b]	24	...	...	...	...	45,N	...
**Lannate (methomyl)[a, b]	...	...	...	...	...	14	...
Malathion	...	7	7	7	7	3	...
**Nudrin (methomyl)[a, b]	...	...	...	...	...	14	...
Orthene (acephate)	...	...	...	...	...	14,N	...
*Penncap-M (microencapsulated methyl parathion)[a, b]	...	...	...	...	15	20,P	...
Sevin (carbaryl)	...	...	...	...	...	0	...
*Supracide (methidathion)[b]	...	...	...	...	...	...	50,N
Thiodan, Tiovel (endosulfan)	...	...	...	...	...	...	0,Q
Toxaphene	...	R	R	R	R	...	S
Trithion (carbophenothion)[a, b]	48	...	...	...	...	7,N	...

Table 14. Limitations (continued)

A. Do not use for forage, fodder, or ensilage or harvest fresh corn (including sweet corn) or corn grain within 75 days of last application. Do not make a second application to sweet corn. Crops other than corn should not be planted in fields within 18 months of the last application of Amaze.

B. No specific restriction when used as recommended.

C. Apply only once per cutting, and do not apply during bloom.

D. Three applications may be made per season. Can be applied up to harvest.

E. Do not make more than 1 application after ear formation. Do not feed treated forage to livestock.

F. Do not plant crops other than alfalfa, corn, peanuts, peppers, potatoes, rice, sorghum, strawberries, sugar beets, sugarcane, and tobacco within 18 months of last application. Soybeans and oats may be planted the following season. Any other crop may be planted, if it is not harvested or grazed.

G. Do not make a foliar application if Furadan 10 granules were applied at more than 10 pounds per acre at planting. Do not make more than two foliar applications per season.

H. Make no more than one application per season.

I. Do not apply granules within 7 days of harvest.

J. Make no more than one foliage and one stubble application per cutting.

K. Besides treatment at planting, one more application can be made at cultivation or over the corn later in the season.

L. Do not feed treated forage to dairy animals. Do not feed sprayed forage or granular-treated corn silage to livestock fattening for slaughter. Do not graze meat animals on granular-treated stover within 28 days of slaughter.

M. Diazinon is labeled only as a preplant broadcast treatment.

N. Do not graze or feed treated vines to livestock.

P. Do not apply more than 2 applications per season.

Q. Do not feed treated forage to livestock. Do not exceed 3 applications.

R. Do not graze or feed treated forage to dairy animals or to animals being finished for slaughter.

S. Do not apply after the yellow petals have formed on the flower heads. Do not feed forage to livestock. Do not apply more than 2 times per season.

* Use restricted to certified applicators only.

** Liquid formulations are restricted.

[a] Workers should be warned in advance of treatments. Workers may not enter fields treated with the insecticides without wearing protective clothing for the intervals indicated. They may not enter a field treated with other insecticides without protective clothing until the spray has dried or the dust has settled. Protective clothing includes a hat, long-sleeved shirt, long-legged pants, and shoes and socks.

[b] Sprays to be applied only by experienced operators wearing proper protective clothing.

The suggestions given in this circular are revised annually by entomologists of the College of Agriculture and the Illinois Natural History Survey.

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