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gging Insect and Mite Pests of Texas Corn



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Managing Insect and Mite Pests of Texas Corn

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Corn is subject to insect attack throughout the growing season. Some insects may reach damaging levels in spite of natural predators and parasites and may require chemical control. However, plant damage is not always directly related to insect numbers. Other factors such as plant vigor, stage of growth, moisture conditions, time of year, parasite and predator abundance and crop rotation are equally important. Therefore, chemical treatments should be based on careful evaluation of economic and natural control factors. Wise use of insecticides requires that producers inspect their crops frequently to determine if damaging numbers of insect or mite pests are present. Methods for determining insect counts and guides for determining the need for pesticides are given in this publication.

A few insect and mite pests attacking corn in Texas show some resistance to once-effective pesticides. Generally, the more extensively an insecticide is used, the more rapidly resistance develops. Therefore, insecticides should be used only when needed. The actual need can be determined only by frequent inspections of the crop to determine pest numbers. The present status of resistance in specific pests is discussed in this publication.

NOTE: This guide discusses insect pests in the approximate seasonal order that they damage corn: pre-plant, seedling to pre-tassel and pre-tassel to hard dough.

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PRE-PLANT INSECT CONTROL

Soil Pest Control

White grubs, corn rootworms, cutworms, wireworms, sod webworms, seedcorn beetles and seedcorn maggots are the most common soil insects attacking corn in Texas. Cultural practices are very important in reducing damage by these soil pests. The continued growth of corn on the same land year after year increases damage by certain soil insects. For example, losses from corn rootworms may be reduced, or in some cases eliminated, by a crop rotation scheme including soybeans or other crops that are not fed upon by rootworms. In most areas of Texas, corn has been rotated successfully with sorghum without damage from the Northern and Western corn rootworm. This appears to be an acceptable rotation plan. Another cultural practice that reduces soil insect pests is to maintain weedfree fields throughout the year, since weeds serve as host plants for certain soil insects.

There are no effective insecticide application methods for soil pests once a crop has been planted and newly emerged seedlings are attacked. Therefore, producers should sample their fields for soil pests before bed formation. If chemical treatment is necessary, soil or seed treatment methods are available. One method may be more effective for a particular soil pest than another.

With the soil-treatment method there are two application techniques: (1) the pre-plant broadcast or row band, and (2) in-furrow at planting. There are also two application techniques for treating seeds: (1) direct treatment of seed before planting, and (2) planter box treatment at seeding time. The pre-plant seed treatment usually has been done by the seed company; however, because of restrictions on chemicals used on seeds, many commercial seed companies are not treating seeds. Planter box treatments have been used by growers where commercially treated seeds are not available.

Seed Treatment

Light populations of wireworms, seedcorn maggots, seedcorn beetles and Southern corn rootworm may be effectively controlled by treating seeds with lindane or heptachlor. When treating the seeds, the insecticide should coat each seed evenly. Use a concrete mixer, commercial or homemade seed treater to treat seeds. Sprinkle 1 pint of water on each 100 pounds of seed and mix this to coat the seeds with moisture. Slowly add the correct amount of insecti-

cide while mixing the seed, and mix thoroughly until the insecticide is evenly distributed on all seeds. Treated seed should be planted within 20 days of treatment, since long exposure to the chemical will affect germination in some varieties. Do not use treated seed for human consumption or livestock feed.

Planter Box Treatment

Some insecticides are made to be applied to seed in the planter box. This method is effective only against wireworms, seed corn beetles and seed corn maggots when their population levels are low. Use this soil insect control technique as directed on the insecticide label.

Soil Treatment

Insecticide for controlling some soil pests must be applied before the crop is planted or at planting time. Granular or liquid formulations may be used. The formulation used usually depends on the producer's equipment and the target insect. Granular forms of insecticide are generally safer and more convenient.

Preplant Insecticide Application. A broadcast application generally provides the best protection against soil insects and is the only means of controlling heavy infestations of white grubs. Unfortunately, broadcast applications require more insecticide and are more expensive than row band or in-furrow treatments and, therefore, are usually not recommended. However, when broadcast applications are necessary, the insecticide should be applied uniformly to the field and incorporated to a depth of 3 to 5 inches immediately after application.

When corn is planted on a bed, special equipment is required to incorporate the insecticide to a depth of 3 to 5 inches. This is called row treatment. Row treatments must be made after or during bed formation, since further cultivation or bed shaping will alter the position of the insecticide in the row. A treated band of soil 7 to 10 inches wide and 3 to 5 inches deep, with the seed placed in the center of the treated band, is necessary to obtain the best control.

At Plant Insecticide Application. Insecticides may be applied to the soil at planting time by the in-furrow technique. This method is less applicable where a bed planter is used, since insecticide incorporation within the root zone may defeat major objectives of bed planting. Where bed planting is to be used, soil insecticides may be incorporated in a band

at the time bed shaping is done, as previously described.

With lister or conventional planters, mount the granular application equipment on the planter with the spout just behind the opening plow and in front of the covering shovels. Adjust the spouts so that the treatment band is about 7 to 10 inches wide and so that the seed furrow, as well as covering soil, is treated. Incorporation of the insecticide by covering shovels is adequate. *Do not* apply insecticides directly on the seed, since doing so usually results in poor seed germination. Poor control usually results from in-furrow application where pest populations are high.

White Grubs and Cutworms

If a historical cutworm problem exists and cutworms are present, see below. For cutworm control on seedling corn, see pages 8 and 9.

White grubs are the larval stage of May and June beetles. Damage to plants results from larvae feeding on the roots. Small plants often are killed and larger plants are stunted and may lodge prior to harvest. To determine the need for white grub control, *examine a one-square-foot soil sample for each 5 to 10 acres before planting. An average of one white grub per square foot is enough to cause significant stand loss.*

Suggested Insecticide Control for Cutworm and White Grub

A broadcast application of Diazinon 14G (14-28 lbs. per acre) incorporated 1 to 2 inches into the soil will control surface cutworms. For subterranean cutworms and white grubs incorporate insecticide 3 to 6 inches into soil. Incorporation must be done immediately after application.

A band application of Amaze 20G or Lorsban 15G at planting time will usually control corn rootworms and white grubs. When treating for rootworms, and white grubs are present in damaging numbers, consider the use of Amaze or Lorsban. This will eliminate the need for a broadcast application of Diazinon. See page 8 for insecticide rates under rootworms.

Wireworms, Seedcorn Maggots and Seedcorn Beetles

Seed treatment with heptachlor or lindane is generally effective in controlling these soil pests. See seed treatment procedures on pages 4-5. Where large populations of wireworms are present, follow the recommendation for rootworm control. Producers should check their soil closely during land preparation to determine the need for seed treatment or soil applications to control these pests.

Corn Rootworms

Three kinds of corn rootworms occur in Texas: the Western, the Northern and the Southern. Where it occurs, the Western corn rootworm is by far the most destructive of the three. The most damaging Western corn rootworm populations exist in South Texas; however, this insect is also found in the High Plains.

Western and Northern corn rootworm beetles lay eggs in the soil during the summer and fall, shortly after silking time. Eggs are usually laid within the corn field in the upper 2 to 8 inches of the soil, where they remain until they hatch the following year. Time of hatching depends to some extent on soil temperatures; however, eggs usually begin to hatch about mid-April and continue to hatch for several weeks. If corn roots are not available for the newly hatched Western and Northern corn rootworms to feed on, they will die. There is only one generation per year; *therefore, the best method of controlling the Western and Northern corn rootworm is to rotate corn with any other crop.*

Fields planted to corn year after year in rootworm problem areas usually require a soil insecticide at planting time. Damage from the Western corn rootworm usually occurs from mid-April through mid-June and all corn roots may be attacked and destroyed. Extensive damage to the brace roots and fibrous roots may cause plants to lodge. A "goose necking" appearance occurs when lodged plants continue to grow.

The southern corn rootworm deposits eggs in the corn field after the corn is in the seedling stage; therefore, crop rotation will not provide adequate control of this insect. Unlike the Western and Northern corn rootworms, more than one generation of Southern corn rootworm may occur per year. This species is considered a minor corn pest in most areas of Texas where corn is planted in fields that were not grassy or weedy the previous year.

SUGGESTED INSECTICIDE CONTROL FOR ROOTWORMS

Insecticide	Amount Per/Acre	When Applied
Row Band,		at planting
Amaze® (20G)	*	at planting
Counter® (15G)	**	at planting
Dyfonate® (10G)	10 lb.	at planting
Dyfonate® (20G)	5 lb.	at planting
Furadan® (10G)	10 lb.***	at planting
Lorsban® (15G)	7½ lb.	at planting

*Amaze® - 6 oz./1,000 feet of row for any row spacing.
Minimum 20-inch spacing.

**Counter® - Row Band or In-Furrow - 8 oz./1,000 row feet.
For any row spacing (minimum 20-inch).

***Furadan® - In-Furrow - 10 lbs./13,000 linear feet.
(40-inch row spacing)

Remarks

For all band applications, apply in 6 to 7 inch band just behind seed drop or seed press wheel and in front of covering shovels and press wheel or chain drag. Soil incorporation to a depth of about 1 inch is important.

IMPORTANT: The use of the same soil insecticide year after year in the same field is not a good practice. Producers are encouraged to rotate soil insecticides each year for best results.

SEEDLING TO PRE-TASSEL STAGE INSECT CONTROL

Corn Leaf Aphid

Although heavy populations of corn leaf aphids may cause damage to seedling corn plants, fields in the seedling stage *rarely* require treatment for this insect. Pre-tassel and later growth stages can tolerate large numbers of aphids without economic damage. Yield losses have occurred *only* where corn leaf aphids cause stand loss to seedling plants.

Soil Cutworms

Cutworms are dingy, grayish-black, smooth "worms" that are the larval stage of several different moths. Cutworms are active at night and damage seedling corn by cutting the stalk just above ground level. Large numbers of cutworms may be found in fields where grass and weeds are a problem.

When cutworms are damaging plant stand, an application of insecticide applied by air or ground usually will give adequate control. Best results are obtained when insecticides are applied in the late afternoon.

**SUGGESTED INSECTICIDE CONTROL
FOR CUTWORMS**

Insecticide	Amount Per/Acre	Waiting Period/ (days)	
		Harvest	Grazing
Toxaphene (6 lbs.)	1 1/3 to 2 qt.	0	See remarks.
Toxaphene + parathion (6 lbs. + 4 lbs.)	1 qt. + 2/3 pt.	12	See remarks.
Toxaphene + methyl parathion (6 lbs. + 4 lbs.)	1 qt. + 1/2 pt.	12	See remarks.
Trichlorfon (Dylox®) (4.0 lbs.)	1-2 pt.	1	0
(80% SP)	1 1/4 lb.	1	0

Remarks

Toxaphene. Apply thoroughly to soil and seedling plants when cutworms are causing damage. Do not feed treated forage or ensilage to dairy animals or animals being finished for slaughter.

Trichlorfon. Apply only once per season. In areas where water is alkaline, add buffering agent to make water slightly acid.

Lesser Cornstalk Borer

The lesser cornstalk borer is the major insect pest of peanuts in Texas, but also attacks seedling corn. The small, slender larva remains in the soil in a silken tube and injures plants by feeding on the stem and root.

These insects occur in damaging numbers on sandy soils and become more numerous under dry conditions. Rainfall and irrigation will kill many of the larvae, so timing and amount of water applied at each irrigation may help control the larvae. Where this insect has been a problem, careful inspection during the seedling stage is important. Larger corn plants usually are not affected by this insect.

**SUGGESTED INSECTICIDE CONTROL
FOR LESSER CORNSTALK BORER**

Insecticide	Amount Per/Acre	Waiting Period/ (days)	
		Harvest	Grazing
Diazinon® (14.3G)	3 1/4 - 7 lb.	0	10
Dyfonate® (10G)	10 lb.	30	30
Dyfonate® (20G)	5 lb.	30	30

Remarks

Base treatments on plant damage and the presence of larvae. Apply granules in a band 10 inches wide over plant row, then incorporate.

Corn Earworm and Fall Armyworm

Corn earworm and fall armyworm moths deposit eggs on leaves and the newly hatched larvae begin to feed in the whorl. Larvae feeding will cause the leaves to appear ragged; however, *insecticide treatments are not recommended.*

True Armyworm

True armyworms occasionally cause heavy damage to corn in the High Plains, and they also may occur in other areas of Texas. True armyworm activity is usually heaviest in fields with water grass and Johnson grass in the furrows, or fields that have hail damaged leaves. True armyworms may go unnoticed as populations build up on the weeds in the furrows. Then, when the weeds are consumed and larvae increase in size, they begin feeding on corn leaves. Large larvae can defoliate corn plants rapidly. When defoliation is excessive, yield reductions will occur, and premature drying of the stalk may lead to lodging problems. *Chemical treatments should be applied when an average of three leaves per plant are destroyed by larval feeding.*

SUGGESTED INSECTICIDE CONTROL FOR TRUE ARMYWORM

Insecticide	Amount Per/Acre	Waiting Period/ (days)	
		Harvest	Grazing
Carbaryl (Sevin®) (50% WP)	2-4 lb.	See remarks.	
(80% WP)	2 lb.	0	0
(4 oil)	1 1/4 qt.	See remarks.	
Trichlorfon (Dylox®)		See remarks.	
(80% SP)	1 1/4 lb.	1	0
(4 lbs.)	1-2 pt.	1	0
Methomyl Lannate®	1/4-1/2 lb.	0	3
Methyl parathion (4 lbs.)	1/2 pt.	12	12
Parathion (4 lbs.)	1/2 pt.	12	12
Toxaphene (8 lbs.)	2-6 pt.	See remarks.	

Remarks

Toxaphene. Do not graze dairy animals or animals being finished for slaughter in treated fields. Do not ensile treated forage.

Dylox®. In areas where water is alkaline, add buffering agent to make water slightly acid.

Carbaryl. Applications of carbaryl during pollen shed will seriously reduce bee populations.

Flea Beetles

Flea beetles are very tiny, shiny black or greenish black insects that will jump when disturbed. They range in size from a little smaller than a pinhead to several times as large. They damage corn plants up to 18 inches high primarily by feeding on the leaves, giving the leaves a whitened, bleached appearance. Plant growth is retarded as the leaves wilt and hang limp.

Keeping fields free from weeds is important, since fields kept clean the previous season are seldom injured by flea beetles. When sufficient numbers of flea beetles are damaging corn, an application of insecticide may be necessary.

SUGGESTED INSECTICIDE CONTROL FOR FLEA BEETLE

Insecticide	Amount	Waiting Period/ (days)	
	Per/Acre	Harvest	Grazing
Carbaryl (Sevin®) (80% WP)	1¼-2½ lb.	0	0
Methyl parathion (4 lbs.)	½ pt.	12	12

Chinch Bug

Adult chinch bugs are about 1/6 inch in length with black bodies and reddish-yellow legs. When fully developed, the white wings are marked with a triangular black spot near the middle of the back on the outer wing margin. Viewed from above, the insect appears to have a white "X" or white hour glass on the back.

Adult and immature chinch bugs suck plant juices and cause reddening of the leaves. Damage by chinch bugs normally occurs during seedling emergence until the plants are 18-inches high. Chinch bugs can move into a corn field in large numbers by crawling or flying from wild bunch grasses or small grains. Once in the field, they congregate and feed behind the sheaves of the corn plant.

Make at least five random checks in the field. *Insecticide treatments should be applied when two or more adult chinch bugs are found on 20 percent of the seedlings less than 6-inches high. On taller plants apply insecticides when immature and adult bugs are found on 75 percent of the plants.* When using ground application equipment, insecticide treatments should be applied through nozzles directed at the infested portion of the plants. Control is difficult on larger plants.

**SUGGESTED INSECTICIDE CONTROL
FOR CHINCH BUG**

Insecticide	Amount	Waiting Period/ (days)	
	Per/Acre	Harvest	Grazing
Parathion (4 lbs.)	1 pt.	12	12
Toxaphene + parathion (6 lbs. + 4 lbs.)	1/3 gal. + 1 pt.	See remarks.	
	or 1/2 gal. + 1/2 pt.	See remarks.	

Remarks

Apply spray mix thoroughly to the lower parts of plants where chinch bugs congregate.

Toxaphene. Do not feed treated forage or ensilage to dairy animals or animals being finished for slaughter.

PRE-TASSEL TO HARD DOUGH STAGE INSECT CONTROL

Southwestern Corn Borer

The Southwestern corn borer is a major corn pest on the High Plains. It also occurs in far West Texas, Northeast Texas and the Lower Rio Grande Valley. Damage is caused by larvae tunneling in the stalk and later girdling the plant, which results in lodging. Moths emerge from corn stubble and weed hosts in the spring to lay eggs in the whorl of corn plants. Eggs laid in an overlapping manner give a fish scale or shingle appearance. Freshly laid eggs are creamy white. Two to three days later, three red bands appear across each egg. Small larvae hatch from the eggs, begin feeding in the whorl and later tunnel into the stalk. First generation eggs and larvae are difficult to detect since infestation seldom exceeds 1 to 4 percent. Mature corn borer larvae reach 1 to 1½ inches in length. They are dull white and have a regular pattern of raised black dots over the body. When mature, larvae pupate and emerge as moths to start the cycle again.

Second generation eggs are usually laid after tasselling has occurred. These larvae feed on leaf collars, ear shoots and ear shucks of the primary ear. After feeding in one of these locations, they bore into the stalk and continue feeding. As plant maturity is reached, larvae prepare for overwintering in the base of the stalk by girdling the plant from 1 to 12 inches above the ground. Wind can easily lodge girdled plants. Lodged plants are difficult to harvest and yields are reduced.

Since Southwestern corn borer larvae overwinter in the stalk base, the best control method for this pest is area-wide stalk destruction during the winter. Double disking and deep plowing are effective methods if soil erosion is not a problem. Shredding stalks at the soil surface disrupts and exposes the overwintering larvae. The earlier these practices are used, the longer the larvae are exposed to winter conditions. Disking, plowing or shredding should be done by February 1.

Early planted corn is less susceptible to corn borer plant lodging. A reasonable plant population to insure large, healthy stalks, combined with proper fertilization and adequate irrigation, help prevent lodging of corn borer-infested stalks. Crop rotation, use of early-maturing varieties and an early harvest with equipment designed to pick up lodged stalks aid in reducing yield losses.

Insecticide treatments usually are directed toward second generation larvae. *Control should be applied when 20 to 25 percent of the plants are infested with eggs or newly hatched larvae.* Egg masses can be observed to determine potential infestation and timing of insecticide application.

**SUGGESTED INSECTICIDE CONTROL
FOR SOUTHWESTERN CORN BORER AND OTHER BORERS**

Insecticide	Amount Per/Acre	Waiting Period/ (days)	
		Harvest	Grazing
Carbaryl (Sevimol®)	1½ qt.	0	0
Carbofuran (Furadan® 10G) (Furadan® 4F)	10 lb. 1-2 pt.	0 30	0 See remarks.
Diazinon® (14.3G)	7-14 lb.	0	10
Sevin XLR®	1-2 qt.	0	0

Remarks

Furadan® 4F. Use a maximum of 4 applications at the 1 pint/acre rate. Use a maximum of 2 applications at 2 pints/acre rate. Do not enter treated fields within 14 days of application unless full protective equipment is worn.

Spider Mites

High numbers of spider mites may occur on corn after tassels appear. Mites first appear on the lower leaves, but may move upwards until all the leaves and, in extreme cases, the entire plant is killed. Heavy infestations cause extensive webbing on the leaves and may be associated with stalk rot and lodging. Periods of hot, dry weather favor rapid mite

population increase. Perhaps the most important factor triggering mite increases is the use of insecticide during silking stage to control other pests. Insecticides kill beneficial insects that usually keep spider mite numbers low. Mite numbers may increase also when excessive amounts of fertilizer are used; therefore, it is important to test soil and apply only the amount of fertilizer needed. Proper irrigation timing will help plants withstand mite-feeding damage. The most important time to prevent water stress is during tassel and early grain filling. *When mite colonies are found on leaves in the middle 1/3 of the plant and before the dent stage is reached, control is justified.* Economic damage has not been observed when infestations reach this level or higher after the dent stage.

SUGGESTED INSECTICIDE CONTROL FOR SPIDER MITE

Insecticide	Amount	Waiting Period / (days)	
		Harvest	Grazing
Carbophenothion (Trithion® 4 lb.)	1 pt.	See remarks. 21	21
Diazinon® (4 lb.)	1 pt.	0	0
Dimethoate (Cygon 4 lb.)	2/3 - 1 pt.	See remarks.	
Disulfoton (Di-Syston®) (8 lb.) (15% G)	1 pt.	28	28
	3½-4 lb.	40	40
Ethion® (4 lb.)	1 qt.	See remarks. 50	
Metasystox-R® (2 lb.)	1½-2 pt.	7	7
Phorate (Thimet® 15% G)	5-6 lb.	30	30
Propargite (Comite® 6.55 lb.)	2 pt.	See remarks. 30	
Sulfur (50% dust) (6 lb. flowable)	30-35 lb. 1 gal.	0	0

Remarks

Carbophenothion and Phorate. Apply only once per season.

Dimethoate. Make no more than three applications per year. Not labeled for Trans-Pecos area of Texas.

Disulfoton. Do not apply more than twice per season regardless of method of application. Use granular formulation as whorl application only. Rates based on 40-inch rows.

Ethion®. Do not apply more than once after ears form. Do not feed treated forage to livestock. Has been effective only in South Texas and Gulf Coast areas.

Phorate. One application per season. Do not apply under prolonged drought conditions.

Propargite. Apply only one time per season. Use a minimum of 20 gallons of spray solution if applying by ground and a minimum of 2 gallons of spray solution if applying by air.

Sulfur. This is the only material which has been partially effective in the Trans-Pecos area of Texas. Thorough plant coverage is required.

Adult Rootworm Beetles

Adult rootworms (beetles) emerge during the silking stage of the corn plant. Beetles feed on the leaves and pollen tassels but prefer silks. When adults are numerous during the green silk stage and the silks are chewed back to within $\frac{1}{2}$ inch of the shuck, poorly filled ears may result from the poor pollination. When this occurs, or if excessive leaf damage occurs, it is profitable to control the beetles.

Controlling adult beetles usually will reduce the number of eggs laid in the field; however, insecticides can result in an outbreak of spider mites by destroying beneficial insects in the field. The Banks grass mite can be very damaging to corn and is difficult to control. Insecticide treatments for adult beetle control should only be used when necessary.

SUGGESTED INSECTICIDE CONTROL FOR WESTERN CORN ROOTWORM BEETLE

Insecticide	Amount	Waiting Period/ (days)	
	Per/Acre	Harvest	Grazing
Diazinon (4 lb.)	$\frac{1}{2}$ -1 pt.	See remarks. 0	
Malathion (5 lb.)	1 $\frac{1}{2}$ pt.	0	
Carbaryl (Sevin®) (80% WP)	1 $\frac{1}{2}$ lb.	See remarks. 0	

Remarks

Diazinon. Temporary spotting of leaves may occur following application.

Carbaryl. Applications during pollen shed will seriously reduce honey bee population.

Western Bean Cutworm

Economic damage from the western bean cutworm is restricted to the extreme northwest corner of the Texas Panhandle. Moth activity begins in early July, with egg lay following shortly thereafter. Eggs are laid on the upper surface of the corn leaves in masses of 5 to 200. They turn from a pearly-white at egg lay to bluish-black at hatching time. At hatching time the young cutworms will feed on the egg shell and then move to one of two sites on the corn, de-

pending on stage of corn development. If the corn has not tasseled, the young cutworms will feed in the whorl on the developing tassel. If the corn has tasseled, the young cutworms will feed in the whorl or the developing tassel. If the corn has tasseled, the young cutworms will move to the developing ear and feed on the silk. As the larvae mature, they begin feeding on the developing grain. *Insecticide treatments should be made when 14 percent of the plants are infested with eggs or larvae and corn is 95 percent tasseled.*

SUGGESTED INSECTICIDE CONTROL FOR WESTERN BEAN CUTWORM

Insecticide	Amount Per/Acre	Waiting Period/ (days)	
		Harvest	Grazing
Carbaryl (Sevin®) (Sevin 4 oil ®) (Sevimol®) (Sevin XLR®)	2 qt. 2 qt. 2 lb.	0 0 0	0 0 0
Penncap-M®	3-4 pt.	12	12
Trichlorfon (Dylox®) (80% SP) (4 lb.)	1¼ lb. 1-2 pt.	See remarks. 1 0 1 0	

Remarks

Trichlorfon. In areas where water is alkaline, add buffering agent to make water slightly acid.

Grasshoppers

Grasshoppers occasionally cause damage to corn. Damaging infestations need to be controlled early while grasshoppers are small and still in crop border areas. *Ten or more nymphs per square yard in crop margins warrant control measures.*

SUGGESTED INSECTICIDE CONTROL FOR GRASSHOPPER

Insecticide	Amount Per/Acre	Waiting Period/ (days)	
		Harvest	Grazing
Carbaryl (Sevin®) (Sevimol®) (Sevin 4 oil ®) (5% bait) (50% WP) (80% SP) (XLR)	½-1½ qt. ½-1½ qt. 40 lb. 1-3 lb. 2/3 - 1 7/8 lb. ½ - 1½ qt.	0 0 0 0 0 0	0 0 0 0 0 0
Malathion (ULV) (57%)	8 oz. 1-1½ pt.	5 5	
Diazinon® (AG 500)	1 pt.	0	
Methoxychlor + Diazinon® (Alfa-tox®)	2 2/5 qt. 2 2/5 qt.	7 7	7 7
Toxaphene (6EC)	2 2/3 - 4 pt.	See remarks.	

Remarks

Toxaphene. Do not graze dairy animals or animals being finished for slaughter in treated fields. Do not ensile treated forage.

Insecticide Application Methods

Ground machines or aircraft may be used to apply most insecticides. For best aerial application results, flag the swaths so that they meet or overlap. Spray applications are more effective and drift is reduced when wind velocity does not exceed 10 miles per hour. Avoid spraying when plants are wet. For broadcast crops, No. 3 cone nozzles set 20 inches apart on a rear-mounted tractor sprayer boom are satisfactory. A pump pressure of 40 to 60 pounds per square inch is recommended.

Nozzle size and number, ground speed and pressure influence the rate of spray solution output per acre; therefore, calibrate the sprayer carefully and often to insure application of recommended insecticide amounts. One nozzle per row usually is adequate for young row crops, but two or three nozzles per row may be desirable on larger plants to obtain adequate coverage. See L-764 *Pesticide Application Ground Equipment Calibration Guide* for additional information.

PROTECTING BEES AND OTHER POLLINATORS FROM INSECTICIDES

Pollination is extremely important in producing many seed crops. This is particularly true for legumes such as alfalfa, clovers and vetch. Most grass-type plants are wind or self-pollinated and do not require insect pollinators. Where pollen collecting insects are required for flower fertilization, the producer, insecticide applicator and beekeeper should cooperate closely to minimize bee losses. The following guidelines will reduce bee losses:

1. If practical, apply insecticides before bees are moved into fields for pollination.
2. Where insecticides are needed, use materials least toxic to bees.
3. Make all applications when bees are away from the field. Evening or early morning treatments between the hours of 7 p.m. and 6 a.m. generally are most satisfactory. Evening applications after bees have left the field are less hazardous than early morning.
4. Use spray or granular formulations rather than dusts.
5. When necessary to use an insecticide in Groups 1 or 2 in the following list, notify the



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beekeeper so that he can make necessary arrangements to protect his bees.

6. Avoid drifting or spraying any insecticide directly on colonies. Heavy losses generally occur in these situations. On hot evenings, bees often cluster on the front of the hives. Pesticide drift or direct spray at this time results in heavy bee kill.

HONEY BEE HAZARDS

Insecticides	Remarks
Group 1. Highly Toxic Carbaryl (Sevin®) Carbofuran (Furadan®) Diazinon Dimethoate Malathion (wettable powder of ULV) Methomyl (Lannate®) Methyl parathion Naled (Dibrom®) Parathion	This group includes materials that kill bees on contact during application or for several days following application. Remove bees from the area if these are used on plants being visited by the bees (with some exceptions). Because of short residual activity, apply naled and mevinphos to the crops when bees are not foraging. Malathion occasionally causes heavy bee losses, particularly during periods of extremely high temperatures. Apply malathion in the evening after all the bees have completed foraging. Avoid ultra-low-volume malathion after blooms appear.
Group 2. Moderately Toxic Carbophenothion (Trithion®) Disulfoton (Di-Syston®) Malathion (EC) Phorate (Thimet®)	Do not apply when bees are working in field. Apply in late evening.
Group 3. Relatively Non-Toxic Ethion® Sulfur Toxaphene Trichlorfon (Dylox®) Methoxychlor	Apply in late evening or early morning when bees are not foraging.

POLICY STATEMENT FOR MAKING CHEMICAL CONTROL SUGGESTIONS

Suggestions on pesticide use made by the Texas Agricultural Extension Service and the Texas Agricultural Experiment Station are based upon:

- Effectiveness under Texas conditions.
- Avoidance of residues in excess of allowable tolerances.
- Avoidance of toxicity to desirable vegetation, animals and humans.
- Avoidance of adverse side effects upon beneficial predators, parasites, honeybees, fish and other wildlife, plants, animals and humans.

Suggested pesticides must be registered and labeled for use by the Environmental Protection Agency and the Texas Department of Agriculture. The status of pesticide label clearances is subject to change and may have changed since this publication was printed. County Extension agents and appropriate specialists are advised of changes as they occur.

The *user* is responsible for the effects of pesticide residues on his livestock and crops, as well as problems that could arise from drift or movement of the pesticide from his property to that of others. *ALWAYS READ AND FOLLOW CAREFULLY THE INSTRUCTIONS ON THE CONTAINER LABEL.*

Proper disposal of waste pesticides and "empty" or used containers is an essential step in safe pesticide use. For additional information see L-1008 *Disposal - Pesticide and Pesticide Containers.*

The information given herein is for educational purposes only. Reference to commercial products or trade names is made with the understanding that no discrimination is intended and no endorsement by the Cooperative Extension Service is implied.

Educational programs conducted by the Texas Agricultural Extension Service serve people of all ages regardless of socioeconomic level, race, color, sex, religion or national origin.

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