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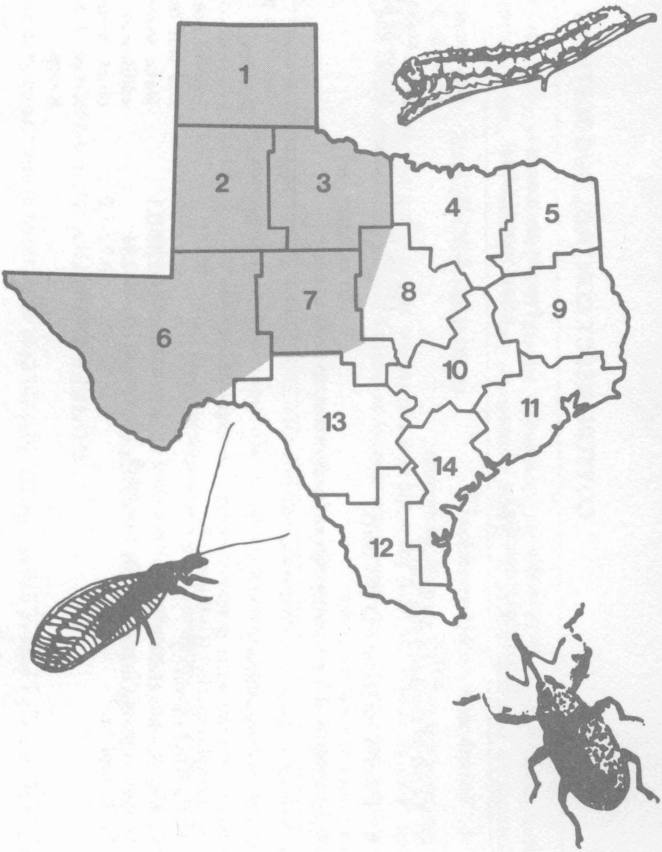
SUGGESTIONS
for controlling
Cotton Insects
in the High Plains, Rolling Plains and Trans-Pecos Areas of Texas



TEXAS AGRICULTURAL EXTENSION SERVICE
THE TEXAS A&M UNIVERSITY SYSTEM
DANIEL C. PFANNSTIEL, DIRECTOR, COLLEGE STATION, TEXAS

Suggestions for Controlling Cotton Insects in the High Plains, Rolling Plains and Trans-Pecos Areas of Texas

Suggestions in this publication are based on results of continuing research conducted throughout the state by the Texas Agricultural Experiment Station and the Agricultural Research Service, U.S. Department of Agriculture. Research results from other cotton producing states for some of the minor cotton pests have been evaluated carefully and utilized in developing these suggestions. A committee of state and federal research personnel and specialists of the Texas Agricultural Extension Service meets annually to review research results and to develop suggestions for the safest, most profitable insect control practices for Texas producers.

At least 12 insect and mite species attacking Texas cotton show some resistance to once-effective chemicals. Evidence indicates that the more extensively a material is used, the more rapidly resistance develops. Therefore, use of insecticides should be restricted to actual need, based on field inspections.

For information on identification of major cotton insects, their life history and the kind of damage they cause, see *Cotton Insects* (B-933, Texas Agricultural Extension Service).

INSECT CONTROL PROGRAM

Precise timing and execution of each production operation is extremely important in reducing insect injury and maximizing profits. In planning an insect control program, the cotton producer should consider effective use of both natural and cultural control. Major factors to be considered include insecticide resistance, the importance of protecting natural enemies of cotton insects, resurgence of primary pests and increased numbers of secondary pests following insecticide applications, environmental contamination with pesticides and increasing restrictions on pesticide use. Therefore, insecticides should be applied only when necessary, as determined by frequent field inspections, to prevent economic losses from damaging pests. *This approach to cotton pest management is preferred over other alternatives available to cotton producers.* (See table of suggestions for cotton insect control for further information.)

Early Season (Plant emergence to first ⅓-grown squares)

Thrips damage and population buildups vary from season to season and area to area. They normally cause heaviest damage from plant emergence until early squaring begins. Heavy infestations may reduce stands, stunt plants, reduce fruiting and delay maturity.

The *cotton fleahopper*, which damages small squares, commonly occupies a key position in a cotton insect management program. Base chemical applications not only on fleahopper numbers but also upon fruiting rate and excessive small square loss. Potential for fleahopper damage is greatest

during the first 3 weeks of squaring, beginning with "pinhead" square stage. Carefully evaluate the decision to apply the first application, because conditions may be favorable for outbreaks of bollworm-tobacco budworm by destroying beneficial insects.

Midseason and Late Season

Midseason is the 6-week fruiting period following the appearance of first ⅓-grown squares. The major concern during this period is insuring adequate fruit set. Proper crop management and frequent field inspection often can prevent premature insecticide applications during this period.

Late season is the remainder of the production season when the major concern is boll protection. In fields where insecticide applications were initiated during the midseason and late-season periods, boll protection should be a primary concern as long as immature bolls are present which can be expected to mature before the average frost date for the area or before crop termination through the use of desiccants or defoliants.

Since cotton grown under irrigation or on high-yielding land is subject to insect damage later in the season than dryland production, any management practice which prolongs plant growth (particularly late irrigation and excessive nitrogen use) should be avoided during the late season.

Insecticides may be required at application intervals of not more than 5 days for effective control of the boll weevil, bollworm, tobacco budworm and pink bollworm.

Bollworms normally cause more damage to cotton in the High Plains and Trans-Pecos counties than any other insect. Eggs generally are laid on the tender growth of the plant's terminal area. Eggs hatch in about 3 days and the small worms begin working their way down the plants, feeding on the squares and bolls.

Tobacco budworm and *beet armyworm* infestations may accompany bollworms. These species attack cotton in a manner similar to that of bollworms. Apply insecticides when worms are small.

Boll weevils are a serious threat to cotton production in most of these counties. See the table for discussion of infestation counts and control recommendations. Overwintered weevils often are confined after emergence to small areas of the field. Spot treatment of infested areas at first ⅓-grown squares will slow and sometimes prevent the spread of weevils throughout the field. The beneficial insect population in the field is less affected when treatment is confined only to spots where weevils exist.

Begin *pink bollworm* field inspections as soon as the first bolls are 3 weeks old. Continue inspections weekly. Walk diagonally across the field and collect at least 100 bolls (⅔-grown or larger). Crack the bolls and examine the inside of the hull for tunnels made by small worms. Where tunneling is not found, check lint and seed for evidence of feeding or worms. This is particularly important in determining infestation in Pima cotton.

Begin treatment when 10 to 15 percent of the bolls are infested during midseason. Continue treatment until 70 percent are open. Where infestations occur late in the season, 40

to 50 percent of the top bolls may be infested without economic loss.

For additional information, see *Ways to Fight the Pink Bollworm in Texas* (L-219, Texas Agricultural Extension Service).

EARLY STALK DESTRUCTION AND FARM CLEANUP

Early harvest, stalk destruction and plowing under debris immediately after harvest reduce boll weevil, pink bollworm, bollworm and tobacco budworm populations. Pay particular attention to the destruction of green or cracked bolls and other plant debris left at the ends of rows following stripper harvest. Do not allow stubble regrowth or development of volunteer seedlings.

These practices force the boll weevil into starvation before time to enter winter quarters, prevent late-season buildup of weevils, pink bollworms, bollworms and tobacco budworms and reduce the number surviving the winter. The addition of 0.5 lb. methyl parathion or 0.25 lb. azinphosmethyl (Guthion®) to arsenic acid or phosphate-type defoliants has proved effective in reducing potential overwintering boll weevil populations. *Do not add methyl parathion or azinphosmethyl to chlorate-type defoliants.* See *Cotton Defoliation Guide for Texas* (L-145, Texas Agricultural Extension Service) for a list of chlorate-type defoliants. *Growers and applicators are cautioned to use combinations of phosphate-type defoliants (Folex® and Def®) and phosphate insecticides with extreme care.* These combinations may pose a greater toxicity hazard than either of the compounds used alone.

BENEFICIAL INSECTS

Natural populations of beneficial insects often can effectively control cotton pests such as the bollworm, tobacco budworm, cotton aphid and spider mite. However, use of released beneficial insects in cotton fields has not proved practical. Because most insecticides are highly injurious to the populations of beneficial insects, applications should be avoided unless frequent field inspections reveal economically damaging levels of injurious insects.

GENERAL INSTRUCTIONS

In the late-season program, dusts and sprays are equally effective when applied properly. Where chemicals are applied, thorough plant coverage is required to achieve control. If showers occur within 24 hours following an application, fields should be checked to determine possible need for repeating the applications. When infestations are heavy, increase dosages to the maximum recommended.

For detailed information on using sprays and spray machinery, see *Insecticidal Spraying of Field Crops With Ground Machinery* (L-486, Texas Agricultural Extension Service), and *Pesticide Application Ground Equipment Calibration Guide* (L-764, Texas Agricultural Extension Service).

Dusts should be applied when the air is calm, but the presence of dew is not necessary. Place dust nozzles on ground machines 4 to 6 in. above plants. Dusts and wettable powders are washed off by light showers more easily than sprays.

Ground machines and airplanes are equally effective for application of insecticides for control of some insect pests. For best results with airplanes, flag swaths so that they overlap.

Conversion Table — Pounds of actual insecticide in different quantities of spray concentrate*

Insecticide	Gal.	2 Qt.	1 Qt.	1 Pt.
Azinphosmethyl (Guthion®)	2.0	1.0	0.5	0.25
Carbophenothion (Trithion®)	4.0	2.0	1.0	0.5
Demeton (Systox®)	2.0	1.0	0.5	0.25
Dicrotophos (Bidrin®)	8.0	4.0	2.0	1.0
Dimethoate (Cygon® or De-Fend®)	2.67	1.33	0.67	0.33
Ethion	4.0	2.0	1.0	0.5
Methyl parathion	4.0	2.0	1.0	0.5
Monocrotophos (Azodrin®)	5.0	2.5	1.25	0.625
Parathion	2.0	1.0	0.5	0.25
Toxaphene	6.0	3.0	1.5	0.75

	Pounds actual acephate (Orthene®), carbaryl (Sevin®) or trichlorfon (Dylox®) per acre				
	3.0	2.0	1.0	0.5	.025
Pounds of acephate (Orthene®), carbaryl (Sevin®) or trichlorfon (Dylox®) required:					
75% wettable or soluble powder	—	—	1.33	0.66	0.33
80% wettable or soluble powder	3.75	2.5	1.25	0.625	0.312
50% wettable or soluble powder	6.0	4.0	2.0	1.0	0.5

*Certain formulations may differ in the amount of actual insecticide per gallon. Refer to the manufacturer's labels for specific concentrations, and adjust spray mixtures accordingly.

PRECAUTIONS

All insecticides are poisonous. *Follow carefully all precautions on the label.* Take special precautions when handling azinphosmethyl (Guthion®), monocrotophos (Azodrin®), dicrotophos (Bidrin®), demeton, disulfoton (Di-Syston®), methyl parathion, parathion and phorate (Thimet®). Avoid skin contact. Do not breathe vapors or drift from sprays or dusts.

Workers reentering treated fields should observe specific waiting periods. Refer to "Worker Reentry Intervals" on the last page.

Do not graze livestock in cotton fields or feed gin trash treated with insecticides, except those with no label restrictions.

Prevent drift from contaminating neighboring crops such as fruits, vegetables and animal feeds. Continued excessive use of persistent insecticides results in soil residues which jeopardize the use of fields for growing certain forage, vegetable or root crops.

Follow recommended procedures in disposing of "empty" pesticide containers and discarding unneeded pesticides. See *Disposal — Pesticides and Pesticide Containers* (L-1008, Texas Agricultural Extension Service) for recommended procedures.

Most insecticides are destructive to honeybees. Since bees help pollinate many agricultural crops, make every effort to prevent their destruction.

For additional information, contact your county Extension staff or write the Extension entomologists, Entomology Department, Texas A&M University, College Station, Texas 77843 (713/845-1661).

POLICY FOR MAKING INSECT CONTROL SUGGESTIONS

Suggestions on use of pesticides 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 humans, animals and desirable vegetation
- 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 U.S. 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 staff and appropriate specialists are advised of changes as they occur.

The USER is always 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.*

For further information, contact your county Extension staff or:

Project Leader in Pesticide Chemicals,
Texas A&M University (713/845-1353)

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COTTON INSECT CONTROL SUGGESTIONS

Insects	Insecticides (listed alphabetically)	Pounds per acre of actual insecticide(s)	Remarks
Cutworms	A. Toxaphene + methyl parathion[1,2]	2.0+1.0	May cause damage during seedling stage. Keep fields as weed-free as possible 3 weeks before planting to minimize cutworm problems. Plow under cover crops at least 3 weeks before planting. Insecticide sprays or baits are recommended for applications over the drill.
	Baits		
	A. Carbaryl (Sevin®) (5% bait)[5]	1.5 (30 lb. bait/acre)	
	B. Trichlorfon (Dylox®) (5% bait)[7]	1.5 (30 lb. bait/acre)	
	(See below for control of beet armyworm and yellow-striped armyworm.)		
Garden webworm	A. Methyl parathion[2]	0.25-0.5	Can be a problem on seedling to 6-leaf stage. Apply treatment as needed.
Thrips	A. Azinphosmethyl (Guthion®)[3]	0.125	Inspect cotton as soon as it emerges to a stand. If thrips are present and leaf buds between the cotyledons are affected, treat at once. Make second application 7 days later if infestation persists. Base additional applications on 4-leaf or older cotton on the extent of plant damage. Silvering of the lower leaf surface is commonly observed, followed by wilted, deformed and bronzed or blackened leaves.
	B. Carbaryl (Sevin®)[5]	0.5	
	C. Dicrotophos (Bidrin®)[4]	0.05-0.1	
	D. Dimethoate (Cygon® or De-Fend®)[6]	0.11	
	E. Toxaphene[1]	0.75-1.0	
Cotton fleahopper	A. Carbaryl (Sevin®)[5]	0.5-1.0	Base all treatments on 15 to 25% damaged pinhead-size squares as well as numbers of fleahoppers. During the first 3 weeks of squaring, 25 to 50 cotton fleahoppers (nymphs and adults) per 100 terminals may cause damage. As plants increase in size and fruit load, larger populations may be tolerated without yield reduction. Insecticides applied early in the blooming period may result in outbreaks of bollworm and tobacco budworm due to the destruction of beneficial insects. *Use suggested higher application rates only when infestations are severe.*
	B. Dicrotophos (Bidrin®)[4]	0.05-0.1	
	C. Dimethoate (Cygon® or De-Fend®)[6]	0.11	
	D. Methyl parathion[2]	0.1	
	E. Trichlorfon (Dylox®)[7]	0.25-0.5	
Lygus bugs	A. Carbaryl (Sevin®)[5]	1.0-2.0	Lygus bugs are attracted to succulent growth where their feeding causes shedding of squares and young bolls, stunted growth and deformed bolls. The need for lygus bug control is regulated by the abundance of lygus in relation to the fruiting condition of the cotton plants. During the period of prebloom to 2 weeks after bloom initiation, begin treatment when 10 lygus are found per 50 sweeps (count each nymph as two) of a 15- to 16-inch net. Make sweeps at several locations in the field by *sweeping across the top of one row only* in such a way that the top 10 in. of the plants are struck. After the early fruiting period, begin treatment when lygus counts exceed 20 to 30 per 50 sweeps. These populations can be tolerated without causing yield or quality loss *provided the plants have retained squares and set bolls normally during the first 4 to 5 weeks of fruiting.*
	B. Dimethoate (Cygon® or De-Fend®)[6]	0.223	
	C. Methyl parathion[2]	0.5	
	D. Parathion[2]	0.5	
	E. Trichlorfon (Dylox®)[7]	1.0-1.5	
Overwintered boll weevil	A. Azinphosmethyl (Guthion®)[3] (EC or ULV)	0.25	Where weevils are found, apply at the first 1/3-grown square stage to prevent egg laying. Where fields are reinfested a second application should be made 3 to 5 days after the first. Base additional treatment on economic damage levels shown under "boll weevils" below. These insecticides also control cotton fleahoppers.
	B. Carbaryl (Sevin®)[5]	1.25-1.5	
	C. Malathion (ULV only)[8]	8-12 fluid oz.	
	D. Methyl parathion[2]	0.25-0.5	
	E. Toxaphene + methyl parathion[1,2]	1.0+0.25	
Cotton aphid	A. Demeton (Systox®)[9]	0.125-0.25	Generally beneficial insects will effectively hold cotton aphid populations below damaging levels. Therefore, give careful consideration before beginning applications.
	B. Dicrotophos (Bidrin®)[4]	0.1	
	C. Methyl parathion[2]	0.25-0.375	
	D. Parathion[2]	0.25-0.375	
Bollworm Tobacco budworm	A. Acephate (Orthene®)[13]	1.0	FIELD INSPECTION PRIOR TO INITIAL CHEMICAL APPLICATION: Check fields at least twice weekly. Examine 100 green squares (½-grown or larger) at random throughout the field for worm damage. *Before bloom,* begin treatment when 15 to 25 percent of the green squares are worm damaged. *After bolls are present,* begin treatment when 8 to 10 percent of the green squares are worm damaged. Avoid flared or yellowed squares in field sampling. Chemical control is seldom effective after worms are ¼ in. long.
	B. Carbaryl (Sevin®) + methyl parathion[5,2]	2.0+0.5 to 2.0+0.75	
	C. Methyl parathion[2]	1.25-2.0	
	D. Monocrotophos (Azodrin®)[12]	0.8-1.0	
	E. Toxaphene + methyl parathion[1,2]	0.5+1.0 to 0.5+1.[illegible]	
	Under most conditions, avoid treating cotton for early budworm infestations until after blooms are observed in the field. Where moderately resistant tobacco budworms are noted, treatment interval may need shortening to 3 days and methyl parathion dosage increased to 2 lb. per acre. WHERE HIGH RESISTANCE LEVELS OCCUR, EFFECTIVE CHEMICAL CONTROLS ARE NOT AVAILABLE.		FIELD INSPECTION AFTER INITIATION OF INSECTICIDE APPLICATIONS: Check fields closely 2 to 3 days following each application. Where control has not been obtained, repeat application immediately. Apply insecticide at intervals as determined by infestations. *Method A:* Examine the terminal buds of cotton plants and a total of 100 green squares and small bolls taken from several points in the field. Repeat treatment when bollworm eggs and four to five young worms are found per 100 terminals and 5 percent of the squares and small bolls have been injured by small bollworms. *Method B:* Make a whole plant examination (terminals, squares, flowers and bolls) of all plants on 10 feet of row in at least five locations in the field. When counts average two or more larvae per 10 feet of row or exceed 10 in 50 feet, repeat treatment.
Boll weevil*	A. Azinphosmethyl (Guthion®)[3] (EC or ULV)	0.25	FIELD INSPECTION – Examine cotton weekly. Examine 100 squares, at least 1/3-grown, at random, taking a few squares at several representative places in the field and from various portions of the plant. From the time of squaring up to peak bloom, begin treatment when 15 to 25 percent of the green squares have weevil punctures. Apply insecticides at 5-day intervals. Under extremely heavy buildups, it may be necessary to shorten the interval to 3 days. As the boll load increases, higher square damage can be tolerated. However, additional applications may be necessary to protect smaller bolls. *Malathion* – 16 oz. restricted use in fall diapause application only.
	B. Carbaryl (Sevin®)[5]	1.6-2.0	
	C. Malathion (ULV only)[8]	12-16 fluid oz.	
	D. Methyl parathion[2]	0.375-1.0	
	E. Toxaphene + methyl parathion[1,2]	0.5+0.25 to 0.5+0.5	
	*Refer to overwintered boll weevil control section above before 1/3-grown square stage.		
Beet armyworm Yellow-striped armyworm	A. Methyl parathion[2]	1.0-1.5	Examine cotton for presence of these pests. Apply treatment as needed. Insecticides are most effective if applied when worms are small.
	B. Monocrotophos (Azodrin®)[12]	0.5-0.75	
Spider mites	A. Carbophenothion (Trithion®)[10]	0.375-0.75	Treat when mites begin to cause noticeable leaf damage. Two applications at 5-day intervals may be necessary with all materials except demeton. Spot treatment of fields is encouraged when population distribution is restricted. In certain locations some mite species are highly resistant to miticides and are difficult to control with available materials. Use 0.6 to 1.0 lb. of Azodrin® for control of resistant carmine mite.
	B. Demeton (Systox®)[9]	0.25	
	C. Ethion[11]	0.375-0.75	
	D. Methyl parathion[2]	0.25-0.375	
	E. Monocrotophos (Azodrin®)[12]	0.25-1.0	
	F. Parathion[2]	0.25	
Cotton leafworm	A. Azinphosmethyl (Guthion®)[3]	0.25	Apply dusts or sprays when cotton leafworms first appear and at 5-day intervals until under control. Young worms are easier to kill than old worms. The BROWN COTTON LEAFWORM can be controlled effectively with parathion at 0.125-0.25 lb. per acre or malathion at 0.35 lb. per acre.
	B. Carbaryl (Sevin®)[5]	1.0	
	C. Methyl parathion[2]	0.125-0.25	
	D. Parathion[2]	0.125-0.25	
Cabbage looper Soybean looper	A. Monocrotophos (Azodrin®)[12]	1.0	Cabbage looper infestations usually are reduced or eliminated by disease agents before excessive leaf damage occurs. If Azodrin® is used, several applications may be necessary for effective control.
Grasshoppers	A. Carbaryl (Sevin®)[5]	1.5	Apply insecticides when damaging infestations appear.
	B. Malathion (ULV only)[8]	8 fluid oz.	
	C. Toxaphene[1]	1.5-3.0	

SELECTED INSECTICIDE USE RESTRICTIONS*

[1]TOXAPHENE – do not graze treated cotton or feed gin waste to dairy animals or animals being finished for slaughter.

[2]METHYL PARATHION and PARATHION – do not handpick or harvest within 7 days of application.

[3]AZINPHOSMETHYL – do not apply EC within 1 day of picking or ULV within 2 days of handpicking. Cotton may be machine harvested any time after application of ULV. Where ULV or late season EC applications are made, do not graze livestock on treated areas or feed gin waste.

[4]DICROTOPHOS – do not apply within 30 days of harvest. Do not graze livestock on treated fields or feed treated gin trash.

[5]CARBARYL – no time limitations. Problems may be encountered in spraying wettable powder with low-volume farm sprayers. Follow manufacturer's directions carefully.

[6]DIMETHOATE – do not apply within 14 days of harvest. Repeat applications should not be made at intervals closer than 14 days. Do not feed treated forage or graze livestock on treated fields.

[7]TRICHLORFON – do not apply within 7 days of picking. Do not graze livestock in treated fields within 14 days of application.

[8]MALATHION ULV – no time limitations.

[9]DEMETON – do not apply within 21 days of harvest. Do not graze livestock on treated fields. Do not feed gin waste to livestock.

[10]CARBOPHENOTHION – do not graze dairy or meat animals in treated fields.

[11]ETHION – do not apply after bolls open. Do not graze dairy or meat animals in treated fields.

[12]MONOCROTOPHOS – do not apply within 21 days of harvest. Do not apply more frequently than every 5 days. Do not graze livestock on treated fields or feed gin waste to livestock.

[13]ACEPHATE – do not apply within 21 days of harvest. Do not feed gin trash to livestock or allow animals to graze on treated areas.

WORKER REENTRY INTERVALS

AZINPHOSMETHYL – workers should not enter fields within 24 hours after application.

CARBOPHENOTHION – workers should not enter fields within 48 hours after application.

DEMETON – workers should not enter fields within 48 hours after application.

DICROTOPHOS – workers should not enter fields within 48 hours after application.

ETHION – workers entering fields within 24 hours after application should wear protective clothing.

METHYL PARATHION and PARATHION – workers should not enter fields within 48 hours after application.

MONOCROTOPHOS – workers should not enter fields within 48 hours after application.

For other reentry intervals refer to pesticide labels.

*Only selected restrictions are listed here, principally those relating to waiting periods between application and harvest or field reentry and grazing or feeding limitations. Every applicator should carefully review the label for additional restrictions prior to each use. Source – "EPA Compendium of Registered Pesticides. Volume III: Insecticides, Acaricides, Molluscicides and Antifouling Compounds."

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