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## INSECT PEST MANAGEMENT FOR COMMERCIAL VEGETABLE CROPS

### IMPORTANT UPDATES FOR 1999

- Two organophosphate insecticides are no longer labeled for use on vegetable crops, and their listings have been deleted from this chapter. Dylox (trichlorfon) is no longer labeled for use on pumpkins (where it was used for squash bug control); Monitor (methamidaphos) is no longer labeled for use on crucifers or potatoes.
- SpinTor (spinosad) is a new insecticide now labeled for use on cole crops, crucifer greens, and several other leafy vegetables for the control of diamondback moth, imported cabbageworm, cabbage looper, armyworm, and leafminer. It is also labeled for use on eggplant, peppers, tomatoes, and tomatillos for the control of Lepidopterous larvae (armyworm, corn borer, and others), Colorado potato beetle larvae, thrips, and leafminers. Spinosad acts primarily as an acetylcholine mimic in much the same way as nicotine and imidacloprid (Admire and Provado) do.
- Worker protection standards require that pesticide labels bear specific information on personal protective equipment, restricted-entry intervals, and mandatory training for farm workers. Pesticide users are legally obligated to comply with the worker protection standards (and all other directions) on the label of the pesticide being used.
- Current laws require that pesticide applicators record the following information for each application of any restricted-use pesticide: (1) the pesticide brand or product name and U.S. Environmental Protection Agency (US EPA) registration number; (2) the total amount of the formulated product

(not active ingredient) applied; (3) the location of the application; (4) the size of the treated area; (5) the crop, commodity, or site treated; (6) the month, day, and year of application; and (7) the name and certification or license number of the applicator. Although these rules cover only restricted-use pesticides, we strongly urge applicators to keep complete records on all pesticide applications.

- Wherever possible, Table 1 lists a botanical or microbial insecticide if one is reasonably effective against the target pest. The use of microbial and botanical insecticides is allowed by most certification programs that cover organic production.
- *Vegetable Insect Management—with Emphasis on the Midwest*, an illustrated 200-page book published in 1995, should be particularly useful to Illinois vegetable growers. For information or to order, contact Meister Publishing, (800)572-7740.

Insect control is a major concern for commercial vegetable producers. Processors, grocers, and most consumers do not purchase insect-damaged or insect-contaminated produce. At the same time, processors, distributors, and consumers are concerned about pesticide residues; they want to know that the health benefits provided by eating vegetables are not offset by any possible risks posed by pesticides that remain on fresh produce. To meet simultaneous demands for maximum pest control and minimum pesticide residues, careful selection and use of insecticides are essential steps in commercial vegetable production.

The guidelines in this chapter are not intended for use by home gardeners. Commercial producers should be trained and equipped to handle a variety

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

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

of pesticides, including some that are highly toxic. Because few home gardeners are similarly trained or equipped, and because yield and cosmetic standards are not rigorous for the backyard garden, home gardeners are advised to choose among insecticides that are generally less hazardous to store, mix, and apply. A guide to insecticides for yard and garden use is presented in a separate publication. Call or write ACES/ITCS Marketing and Distribution, 1917 S. Wright Street, Champaign, IL 61820; (800)345-6087.

Most of the information contained here is presented in table format. Table 1 lists the registered insecticides that are most likely to control specific target pests in specific commodities in Illinois. Information on the safety and effectiveness of individual insecticides was evaluated to develop these lists; not all registered and legal uses are presented in Table 1. Fact sheets on individual insects are also listed by NHE numbers in parentheses. Contact the Department of Crop Sciences, AW-101 Turner Hall, 1102 South Goodwin Avenue, Urbana, IL 61801, to obtain copies at 25 cents each.

Table 3 provides a more complete list of insecticides registered for use on vegetables; it also summarizes mandatory preharvest intervals (the time that must elapse between final application and harvest) for applications to specific crops. Check individual product labels for additional restrictions, such as the use of crop residues (tops, trimmings, stalks, and so forth) for livestock feed. Certain insecticides listed in Table 2 are not among the best choices for the control of Illinois vegetable pests, but they are registered and may be used legally. Consequently, the information in Table 2 may be useful where drift, overspray, or other contamination is a concern.

Pesticides may be identified by common chemical names (not capitalized) or by trade names (capitalized). Because one or more manufacturers may assign different trade names to products containing the same active ingredient, two or more commercial insecticides may be virtually identical. The tables in this chapter list insecticides by common chemical name with trade names in parentheses.

Where insecticides must be used, several important steps help to ensure safety and effectiveness. Applicators must read and follow label instructions. Labels specify maximum application rates, maximum number of applications, and the preharvest interval. Labels also specify the crops on which an insecticide may be applied; application to crops or sites not specified on the label is illegal and can result in fines or imprisonment or both. To document the legal use of insecticides, producers should keep records of insecticide applications for every field. For re-

stricted-use pesticides, these records must include (1) the brand or product name and US EPA registration number for the pesticide applied; (2) the total amount of the product (formulated product, not active ingredient) applied; (3) the location of the application; (4) the size of the treated area; (5) the crop, commodity, or site treated; (6) the month, day, and year of application; and (7) the name and certification or license number of the applicator. Although these record-keeping rules cover only restricted-use pesticides, we strongly urge applicators to keep complete records on all pesticide applications.

Pesticides classified for restricted use (identified in the tables by asterisks) may be purchased only by a licensed private or commercial pesticide applicator and applied only by or under the direct supervision of a licensed applicator. The Illinois Department of Agriculture (IDA) is responsible for testing and licensing pesticide applicators; contact an IDA or Extension office for information on training and examination programs. Farmers may apply general-use pesticides (not restricted) according to label directions without obtaining a private applicator's license. Whenever any pesticide is used, applicators must take proper safety precautions to prevent excessive or unnecessary exposures that might endanger themselves, other workers, or family members. After pesticides are applied, reentry restrictions must be observed.

The list of insecticides registered for use on specific crops may change at any time during the year. Label changes are announced through newsletters and other media. Producers should also check with an Extension office for information updates.

In addition to the use of insecticides, integrated pest management programs for vegetable insects should include appropriate cultural practices (such as the selection of resistant varieties, the purchase of insect-free transplants, and the destruction of crop residues after harvest) and the use of alternatives to chemical insecticides when possible. Although using effective cultural and biological control options does not eliminate the need for conventional insecticides, the application of such products can be reduced on farms where an integrated approach is practiced.

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**Table 1. Insecticides Recommended for the Control of Insects in Commercial Vegetable Crops**

Crop, pest	Insecticide	Rate (a.i./acre)	Preharvest interval (PHI), comments
<b>ASPARAGUS</b>			
Asparagus beetle (NHE-49)	Treat spears during the harvest season if infestations exceed 5 to 10 adults per 100 crowns or if eggs are present on more than 2% of the spears. Treat ferns postharvest if infestations exceed 5 to 10 adults per 10 crowns.		
	carbaryl (Sevin)	1 to 2 lb	1 day.
	chlorpyrifos (Lorsban)	1 lb	1 day.
	malathion	1 lb	1 day.
	*methomyl (Lannate)	0.45 to 0.90 lb	1 day.
	methoxychlor	1 to 2 lb	3 days.
	*permethrin (Ambush or Pounce)	0.05 to 0.1 lb	1 day. Do not exceed 0.4 lb a.i./acre/season.
	rotenone	Follow label directions	1 day.
Cutworms (NHE-38)	Treat spears when infestations exceed 1 larva per 10 crowns.		
	chlorpyrifos (Lorsban)	1 lb	1 day.
	*methomyl (Lannate)	0.45 to 0.90 lb	1 day.
	*permethrin (Ambush or Pounce)	0.1 lb	1 day. Do not exceed 0.4 lb a.i./acre/season.
Asparagus aphid	Rarely a serious pest in the Midwest. Treat ferns with chlorpyrifos, malathion, or rotenone as listed for asparagus beetle or with azadirachtin (Align or Neemix) according to product labels.		
<b>BEANS</b>			
Seed maggots (NHE-27)	chlorpyrifos (Lorsban 50SL)	2 oz/100 lb seed	Seed treatment.
	diazinon 50WP	0.5 oz/bu seed	Apply as a planter-box treatment. Alternatively, purchase seed that has been pre-treated. Seed treatments should not be applied earlier than 90 days before planting.
Bean leaf beetle (NHE-67)	Peak numbers of beetles occur in late May to early June, then again in August to September. Treat seedlings if defoliation is severe. After establishment, plants withstand moderate defoliation and suffer no loss in yield. Control even light infestations after pods form to prevent cosmetic damage from feeding scars.		
	acephate (Orthene)	0.5 to 1.0 lb	14 days. (0 days for lima beans.) Do not use treated vines for feed.
	carbaryl (Sevin)	1 lb	3 days.
	dimethoate	0.25 to 0.5 lb	0 days. Do not use treated vines for feed.
	methoxychlor	0.5 to 1.5 lb	3 days. 7-day PHI for feeding treated vines to livestock.
	rotenone	0.4 lb	1 day.
Potato leafhopper (NHE-22)	Treat if populations exceed 1 adult per sweep or 1 nymph per 10 leaves. For plants smaller than the 2-true-leaf stage, treat if counts exceed 1 adult per 2 sweeps.		

**Table 1. Insecticides Recommended for the Control of Insects in Commercial Vegetable Crops (cont.)**

Crop, pest	Insecticide	Rate (a.i./acre)	Preharvest interval (PHI), comments
<b>BEANS (CONT.)</b>			
Potato leafhopper (cont.)	carbaryl (Sevin)	1 lb	3 days.
	dimethoate	0.25 to 0.5 lb	0 days. Do not use treated vines for feed.
	endosulfan (Thiodan)	0.5 to 1 lb	3 days. Do not use treated vines for feed.
	*esfenvalerate (Asana)	0.03 lb	3 days. Do not exceed 0.2 lb a.i./acre/season. Do not use treated vines for feed.
	malathion	1 lb	1 day.
	*methomyl (Lannate)	0.45 lb	3 days. 7-day PHI for feeding treated vines to livestock.
	methoxychlor	0.5 to 1 lb	3 days. 7-day PHI for feeding treated vines to livestock.
Mexican bean beetle (NHE-151)	*methyl parathion (PennCap-M)	0.5 to 1 lb	3 days.
	acephate (Orthene)	0.5 to 1 lb	14 days. (0 days for lima beans.) Do not use treated vines for feed.
	carbaryl (Sevin)	1 lb	3 days.
Aphids (NHE-47)	malathion	0.5 to 1 lb	1 day.
	acephate (Orthene)	0.5 to 1 lb	14 days. (0 days for lima beans.) Do not use treated vines for feed.
	dimethoate	0.25 to 0.5 lb	0 days. Do not use treated vines for feed.
	malathion	1 lb	1 day.
Corn earworm (NHE-33)	*methomyl (Lannate)	0.45 lb	3 days. 7-day PHI for feeding treated vines to livestock.
	Treat if pheromone-baited cone traps consistently capture earworm moths (more than 5 to 10 per night) and egg laying in beans is likely. Moths are most likely to deposit eggs in beans if surrounding corn fields are not silking.		
	carbaryl (Sevin)	1.5 lb	3 days.
	*esfenvalerate (Asana)	0.03 to 0.05 lb	3 days. Do not exceed 0.2 lb a.i./acre/season. Do not use treated vines for feed.
European corn borer (NHE-140)	*methomyl (Lannate)	0.45 lb	3 days. 7-day PHI for feeding treated vines to livestock.
	Operate one or more light traps beginning 1 to 2 weeks before bloom and until 1 week before harvest. If light traps capture more than 25 moths per night, begin insecticide applications when the first inch-long beans are present. Apply Lannate at 2- to 3-day intervals, Orthene or PennCap-M at 5- to 7-day intervals. Larvae that hatch in the last 2 or 3 days before harvest will not mature enough to enter pods.		
	acephate (Orthene)	1 lb	14 days. Do not use treated vines for feed.
	*methomyl (Lannate)	0.45 lb	3 days. 7-day PHI for feeding treated vines to livestock. Must be applied at 2- to 3-day intervals.
	*methyl parathion (PennCap-M)	0.5 lb to 1 lb	3 days.

**Table 1. Insecticides Recommended for the Control of Insects in Commercial Vegetable Crops (cont.)**

Crop, pest	Insecticide	Rate (a.i./acre)	Preharvest interval (PHI), comments
<b>BEANS (CONT.)</b>			
Spider mites	Mite outbreaks are rare in beans under sprinkler irrigation; outbreaks may occur late in the season during prolonged dry periods.		
	dimethoate	0.25 to 0.5 lb	0 days. Do not use treated vines for feed.
Whiteflies	azadirachtin (Align, Neemix)	10 to 20 g (See labels.)	0 days.
	insecticidal soap (M-Pede)	1.25 fl oz 49% concentrate/50 gal water (see comments)	0 days. Use sufficient spray to wet all infested plant surfaces. Rotate sprays or rinse foliage to avoid more than 3 consecutive sprays. Must contact whiteflies to be effective.
Sprays of dimethoate, endosulfan (Thiodan), esfenvalerate (Asana), or methomyl (Lannate) as listed for leafhopper or aphid control may also control whiteflies. Efficacy is likely to vary according to specific insecticide resistance levels in separate whitefly populations.			
<b>PEAS</b>			
Caterpillars, including loopers (NHE-76)	In peas grown for processing, check for loopers and other larvae 10 days before harvest. Treat if counts exceed 1 larva per 25 sweeps during the period 10 to 21 days before harvest to prevent contamination.		
	*esfenvalerate (Asana)	0.03 to 0.05 lb	3 days. Do not exceed 0.1 lb a.i./acre/season. Do not use treated vines for feed.
	*methomyl (Lannate)	0.45 to 0.9 lb	1 day. 5-day PHI for livestock forage; 14-day PHI for pea-vine hay.
Aphids, including pea aphid (NHE-14, -47)	Treat if counts exceed 1 pea aphid per pod or 10 per sweep during the period 15 to 35 days before harvest.		
	dimethoate	0.17 lb	0 days. 21-day PHI if treated vines are to be used for livestock feed. Limit of 1 application per season.
	*esfenvalerate (Asana)	0.015 to 0.03 lb	3 days. Do not exceed 0.1 lb a.i./acre/season. Do not use treated vines for feed.
	*methomyl (Lannate)	0.45 to 0.90 lb	1 day. 5-day PHI for livestock forage; 14-day PHI for pea-vine hay.
<b>BROCCOLI, BRUSSELS SPROUTS, CABBAGE, AND CAULIFLOWER</b>			
Cabbage maggot (NHE-44)	Use in-furrow or broadcast applications of diazinon or Dyfonate at or just before planting. Use drenches of diazinon or Lorsban during transplanting. Diazinon resistance has been observed in some areas.		
	chlorpyrifos (Lorsban)	1.6 to 2.4 fl oz 4EC in 50 gal water/1,000 row ft of broccoli, Brussels sprouts, or cabbage 1.6 to 2.8 fl oz 4EC in 50 gal water/1,000 row ft cauliflower	30 days. Apply to soil at base of transplants immediately after setting.

**Table 1. Insecticides Recommended for the Control of Insects in Commercial Vegetable Crops (cont.)**

Crop, pest	Insecticide	Rate (a.i./acre)	Preharvest interval (PHI), comments
<b>BROCCOLI, BRUSSELS SPROUTS, CABBAGE, AND CAULIFLOWER (CONT.)</b>			
Cabbage maggot (NHE-44) (cont.)	diazinon	0.25 to 0.5 pt AG500 or 0.25 to 0.5 lb 50WP in 50 gal water. Use 0.5 to 1 cup per plant.	Apply to soil at base of transplants immediately after setting.
	diazinon	3 lb	Broadcast and incorporate before planting.
	*fonofos (Dyfonate)	2 lb	Broadcast and incorporate before planting.

**Scouting for aphids and foliage-feeding caterpillars:** Check 5 to 10 randomly selected plants in each of 5 to 10 or more areas per field. For each plant, record the presence of any live larvae of diamondback moth, cabbage looper, or imported cabbage worm; classify each plant as infested or uninfested (note which pest species); for each plant also record whether or not aphids are present. Sample fields once or twice per week. Treat if the percent of plants infested by caterpillars exceeds the following levels for specific stages of development:

<b>Broccoli and cauliflower:</b>		<b>Cabbage:</b>	
Seedbed	10%	Seedbed	10%
Transplant to first flower or first curd	50%	Transplant to cupping	30%
Flower bud or curd to harvest	10%	Cupping to early head	20%
		Mature head	10%

Other scouting guidelines have also been proposed; contact the University of Illinois Department of Crop Sciences at (217)333-6651 for more information. Aphid control is recommended for cabbage whenever aphid colonies are detected. Control often can be delayed in broccoli and cauliflower until "clean-up" is necessary just before heading to prevent contamination at harvest. Aphid control in seedbeds is especially important for all these crops.

Aphids (NHE-47)	diazinon	0.5 lb	7 days broccoli, Brussels sprouts, and cauliflower; 21 days cabbage. Do not exceed 5 applications per season
	dimethoate	0.25 to 0.5 lb	7 days for broccoli and cauliflower; 3 days for cabbage. Do not use on Brussels sprouts.
Cabbage looper	endosulfan (Thiodan)	1 lb	7 days for broccoli and cabbage; 14 days for Brussels sprouts and cauliflower. Do not exceed 2 applications per season.
	imidacloprid (Provado)	0.05 lb	7 days. Allow at least 7 days between applications. Do not exceed 0.24 lb a.i./acre/season.
	insecticidal soap (M-Pede)	1.25 fl oz 49% concentrate/50 gal water (See comments.)	0 days. Use sufficient spray to wet all infested plant surfaces. Rotate sprays or rinse foliage to avoid more than 3 consecutive sprays. Must contact aphids to be effective.
	naled (Dibrom)	1 lb	1 day.

**Table 1. Insecticides Recommended for the Control of Insects in Commercial Vegetable Crops (cont.)**

Crop, pest	Insecticide	Rate (a.i./acre)	Preharvest interval (PHI), comments
<b>BROCCOLI, BRUSSELS SPROUTS, CABBAGE, AND CAULIFLOWER (CONT.)</b>			
Cabbage looper (NHE-45); diamondback moth; imported cabbage worm	Thorough coverage is important; some labels recommend wetting agents. In some areas, diamondback moth has become resistant to endosulfan, methomyl, permethrin, and other compounds; resistance levels vary within the state and locally. Use <i>Bt</i> products, especially before heading, to preserve natural enemies of caterpillars and aphids and to minimize problems from diamondback moth resistance to other insecticides.		
	*azinphosmethyl (Guthion)	0.5 to 0.75 lb	15 days for broccoli and cauliflower; 7 days for Brussels sprouts; 21 days for cabbage. Do not exceed 3 applications per season. WP formulations are not restricted use.
	<i>Bacillus thuringiensis kurstaki</i> or <i>aizawai</i> ( <i>Bt</i> ) (Agree, Biobit, Cutlass, Dipel, Javelin, MVP, XenTari, and others)	Follow label directions.	0 days. Kills only the caterpillar stage; must be eaten by larvae to be effective. <i>Bt</i> products are less effective against large (older) cabbage loopers than against younger loopers and other caterpillars.
	cypermethrin (Ammo)	0.05 to 0.1 lb	1 day. Do not exceed 0.6 lb a.i./acre/season. 7 days for broccoli and cabbage; 14 days for Brussels sprouts and cauliflower. Do not exceed 2 applications per season.
	endosulfan (Thiodan)	1 lb	
	*esfenvalerate (Asana)	0.03 to 0.05 lb	3 days. Do not use on Brussels sprouts. Do not exceed 0.4 lb a.i./acre/season. Not labeled for diamondback moth.
	lambda-cyhalothrin (Warrior)	0.015 to 0.03 lb	1 day for broccoli and cabbage. Do not exceed 0.24 lb a.i./acre/season. Do not apply to Brussels sprouts or cauliflower.
	*methamidophos (Monitor)	0.5 to 1 lb	14 or 21 days for broccoli; 14 days for Brussels sprouts; 28 days for cauliflower; 35 days for cabbage.
	*methomyl (Lannate)	0.23 to 0.9 lb	3 days for broccoli, Brussels sprouts, cauliflower; 1 day for cabbage. Also aids in aphid control.
	*permethrin (Ambush, Pounce)	0.05 to 0.1 lb for broccoli, Brussels sprouts, and cauliflower; 0.05 to 0.2 lb for cabbage.	1 day. Do not exceed 0.8 lb a.i./acre/season on broccoli, Brussels sprouts, and cauliflower. Do not exceed 1 lb a.i./acre/season on cabbage.
	spinosad (SpinTor)	0.023 to 0.125 lb	1 day. Do not exceed 0.45 lb/acre/crop. See label for further restrictions for resistance management.
	thiodicarb (Larvin)	0.4 to 1 lb	7 days. Do not use on Brussels sprouts. Do not exceed 6 lb a.i./acre/season.
	*tralomethrin (Scout Xtra)	0.016 to 0.024 lb	5 days. Broccoli only; do not apply to cabbage, Brussels sprouts, or cauliflower. Do not exceed 0.2 lb a.i./acre/season.
*zeta-cypermethrin (Mustang)	0.03 to 0.05 lb	1 day. Cabbage only; do not apply to broccoli, Brussels sprouts, or cauliflower. Do not exceed 0.3 lb a.i./acre/season.	

**Table 1. Insecticides Recommended for the Control of Insects in Commercial Vegetable Crops (cont.)**

Crop, pest	Insecticide	Rate (a.i./acre)	Preharvest interval (PHI), comments
<b>BROCCOLI, BRUSSELS SPROUTS, CABBAGE, AND CAULIFLOWER (CONT.)</b>			
Cutworms	chlorpyrifos (Lorsban)	1 lb	21 days. Do not exceed 6 applications per season. Use 50W formulation. Do not mix with other pesticides or apply in extreme heat or drought.
	*esfenvalerate (Asana)	0.03 to 0.05 lb	3 days. Apply as basal spray after planting if cutworm damage occurs. Do not use on Brussels sprouts. Do not exceed 0.4 lb a.i./acre/season.
	*lambda-cyhalothrin (Warrior)	0.015 to 0.025 lb	1 day for broccoli and cabbage. Do not exceed 0.24 lb a.i./acre/season. Do not apply to Brussels sprouts or cauliflower.
Flea beetles	Critical stages for control: seedlings and transplants. Except for <i>Bacillus thuringiensis</i> , insecticides used to control cabbage looper and other caterpillars also control flea beetles.		
	carbaryl (Sevin)	0.5 to 1 lb	3 days.
	imidacloprid (Provado)	0.05 lb	7 days. Allow at least 7 days between applications. Do not exceed 0.24 lb a.i./acre/season.
	rotenone	0.4 lb	1 day.
Onion thrips (NHE-48)	Thrips control may be necessary in cabbage as heads begin to form. Cygon or Monitor as used for aphid control also gives some control of thrips. See Table 3 for varietal susceptibility to thrips damage.		
	cypermethrin (Ammo)	0.075 to 0.1 lb	1 day. Do not exceed 0.6 lb a.i./acre/season.
	*zeta-cypermethrin (Mustang)	0.04 to 0.05 lb	1 day. Cabbage only; do not apply to broccoli, Brussels sprouts, or cauliflower. Do not exceed 0.3 lb a.i./acre/season.
<b>RADISHES AND TURNIPS (ROOTS)</b>			
Cabbage maggot (NHE-44)	Use in-furrow applications at planting for radishes and turnips. Also apply a diazinon drench to turnips 30 days after planting.		
	chlorpyrifos (Lorsban)	1 fl oz 4E or 3.3 oz 15G /1,000 row ft	Apply only at planting. Use 4E as a drench (minimum of 40 gal water/acre); place 15G in seed furrow.
	diazinon	0.5 lb	14 days. For turnips, apply as a drench over the row 30 days after planting. Also controls flea beetles.
	diazinon	2.5 oz 14G /1,000 row ft	Apply only at planting; place in seed furrow.
Aphids (NHE-47) and flea beetles	carbaryl (Sevin)	1 lb	7 days. Does not control aphids.
	*cyfluthrin (Baythroid)	0.025 to 0.044 lb	0 days for radishes. Allow at least 7 days between applications. Do not exceed 5 applications per season. Not for aphid control. Do not apply to turnips.
	diazinon dimethoate	0.5 lb 0.25 lb	14 days. 14 days. Turnips only. May not control flea beetles.

**Table 1. Insecticides Recommended for the Control of Insects in Commercial Vegetable Crops (cont.)**

Crop, pest	Insecticide	Rate (a.i./acre)	Preharvest interval (PHI), comments
<b>RADISHES AND TURNIPS (ROOTS) (CONT.)</b>			
Aphids (NHE-47) and flea beetles (cont.)	insecticidal soap (M-Pede)	1.25 fl oz 49% concentrate/50 gal water (See comments.)	0 days. Use sufficient spray to wet all infested plant surfaces. Rotate sprays or rinse foliage to avoid more than 3 consecutive sprays. Must contact aphids to be effective.
	malathion	1 lb	7 days. Not labeled against flea beetles.
<b>COLLARDS, KALE, MUSTARD GREENS, AND TURNIP GREENS</b>			
Aphids (NHE-47)	Treat seedlings if aphid densities exceed 1 per plant; treat established plants if aphid densities exceed 4 to 10 per plant.		
	azadirachtin (Align, Neemix)	10 to 20 g (See labels.)	0 days.
	diazinon	0.5 lb	10 days for collards, kale, and mustard greens. 14 days for turnip. Do not exceed 5 applications per season.
	dimethoate	0.25 lb	14 days.
	endosulfan (Thiodan)	0.75 lb	21 days. Use 2EC formulation. Apply only once a season. Do not use on turnips grown for roots.
	imidacloprid (Admire)	See label for rates per linear foot of row based on row spacings.	21 days. Apply to soil as a band or in-furrow treatment at bedding or seeding, as a post-seeding drench, as a sidedress, or in trickle irrigation. Do not use on turnips grown for tops or roots.
	imidacloprid (Provado)	0.05 lb	7 days for collards, kale, and mustard greens. Allow at least 5 days between applications. Do not exceed 0.24 lb a.i./acre/season. Do not apply to turnips grown for tops or roots.
	insecticidal soap (M-Pede)	1.25 fl oz 49% concentrate/50 gal water (See comments.)	0 days. Use sufficient spray to wet all infested plant surfaces. Rotate sprays or rinse foliage to avoid more than 3 consecutive sprays. Must contact aphids to be effective.
	naled (Dibrom)	1 lb	1 day for collards and kale. Do not apply to mustard greens or turnip greens.
Cutworms	carbaryl (Sevin)	2 lb	14 days.
	chlorpyrifos (Lorsban)	1 lb	21 days. Collards and kale only. Use 50W formulation. Do not exceed 6 applications per season. Do not mix with other pesticides or apply in extreme heat or drought.
Leafhoppers	azadirachtin (Align, Neemix)	10 to 20 g (See labels.)	0 days.
	carbaryl (Sevin)	0.5 to 1 lb	14 days.
	dimethoate	0.25 lb	14 days.

**Table 1. Insecticides Recommended for the Control of Insects in Commercial Vegetable Crops (cont.)**

Crop, pest	Insecticide	Rate (a.i./acre)	Preharvest interval (PHI), comments
<b>COLLARDS, KALE, MUSTARD GREENS, AND TURNIP GREENS (CONT.)</b>			
Leafhoppers (cont.)	malathion	1 lb	7 days.
	methoxychlor	0.5 to 1 lb	14 days for collards, kale, and turnip greens. 7 days for turnip roots. Do not apply to mustard greens.
(NHE-45); cabbage looper, diamondback moth; imported cabbage worm	For most commercial markets, treat if 5% of plants are infested with larvae of any of these species. Higher infestation levels may be tolerated, depending on market demands. Thorough coverage is necessary; some labels recommend wetting agents. In some areas, diamondback moth has become resistant to endosulfan, methomyl, permethrin, and other compounds; resistance levels vary within the state and locally. Use <i>Bt</i> products, especially when plants are small, to preserve natural enemies of caterpillars and aphids and to minimize problems from diamondback moth resistance to other insecticides.		
	azadirachtin (Align, Neemix)	10 to 20 g (See labels.)	0 days.
	<i>Bacillus thuringiensis</i> <i>kurstaki</i> or <i>aizawai</i> ( <i>Bt</i> ) (Agree, Biobit, Cutlass, DiPel, Javelin, MVP, XenTari, and others)	Follow label directions.	0 days. Kills only the caterpillar stage; must be eaten by larvae to be effective. <i>Bt</i> products are less effective against large (older) cabbage loopers than against younger loopers and other caterpillars.
	diazinon	0.5 lb	10 days for collards, kale, and mustard greens. 14 days for turnip greens (and roots). Do not exceed 5 apps. /season.
	endosulfan (Thiodan)	0.75 lb	21 days. Use 2EC formulation. Apply only once per season. Do not use on turnips grown for roots.
	*methomyl (Lannate)	0.45 to 0.9 lb	10 days. Also aids in aphid control.
	methoxychlor	0.5 to 1 lb	14 days for collards, kale, and turnip greens. 7 days for turnip roots. Do not apply to mustard greens.
	naled (Dibrom)	1 to 2 lb	1 day. Do not apply to mustard greens or turnip greens.
	*permethrin (Ambush, Pounce)	0.05 to 0.1 lb	1 day for collards and turnip greens. Do not apply to kale or mustard greens. Do not exceed 8 applications to collards or 4 applications to turnip greens per season.
	spinosad (SpinTor)	0.023-0.125 lb	1 day. Do not exceed 0.45 lb/acre/crop. Label does not include turnips grown for roots. See label for further restrictions for resistance management.
Flea beetles	Except for <i>Bacillus thuringiensis</i> , insecticides used to control cabbage looper and other caterpillars also kill flea beetles.		
	carbaryl (Sevin)	1 lb	14 days.
	imidacloprid (Provado)	0.05 lb	7 days. Allow at least 5 days between applications. Do not exceed 0.24 lb a.i./acre/season. Do not use on turnips grown for tops or roots.
	rotenone	See product label.	1 day for collards. Do not apply to kale, mustard greens, or turnip greens.

**Table 1. Insecticides Recommended for the Control of Insects in Commercial Vegetable Crops (cont.)**

Crop, pest	Insecticide	Rate (a.i./acre)	Preharvest interval (PHI), comments
<b>HORSERADISH</b>			
Diamondback moth	Populations build in late summer but rarely warrant control. Horseradish tolerates substantial feeding (removal of greater than 30% of leaf tissue) by diamondback moth without reduction in yield (root growth). If treatment is warranted, thorough coverage is necessary; some labels recommend wetting agents. In some areas, diamondback moth has become resistant to endosulfan, methomyl, permethrin, and other compounds; resistance levels vary within the state and locally. Use <i>Bt</i> products to preserve natural enemies of caterpillars and aphids and to minimize problems from diamondback moth resistance to other insecticides.		
	<i>Bacillus thuringiensis</i> <i>kurstaki</i> or <i>aizawai</i> ( <i>Bt</i> ) (Agree, Biobit, Cutlass, DiPel, Javelin, MVP, XenTari, and others)	Follow label directions.	0 days. Kills only the caterpillar stage; must be eaten by larvae to be effective.
	*permethrin (Pounce, Ambush)	0.1 lb	22 days. Do not exceed 3 foliar applications per season.
Beet leafhopper	Beet leafhopper transmits the brittleroot pathogen. Treat if more than a few beet leafhoppers are collected in the area before mid-August.		
	*methomyl (Lannate)	0.45 lb	65 days.
	*permethrin (Ambush, Pounce)	0.1 lb	22 days. Do not exceed 3 foliar applications per season.
Imported crucifer weevil	*permethrin (Ambush, Pounce)		
	0.1% a.i. solution	At planting. Treat if sets are infested or fields have a history of weevil damage. Soak sets 30 minutes and air dry before planting.	
	*permethrin (Ambush, Pounce)	0.2 lb	22 days. Examine crowns in early August. Apply foliar spray if adult weevil populations exceed 1 to 3 per 10 plants, or use weevil history to determine potential for damage. Do not exceed 3 foliar applications per season.
<b>LEAF LETTUCE, SPINACH, AND SWISS CHARD</b>			
Aphids and leafminers	Treat seedlings if aphid densities exceed 1 per plant; treat established plants if aphid densities exceed 4 to 10 per plant. Treat seedlings for leafminer control if eggs or mines are present on 50% of the plants; as plants near harvest, treat to limit mines to no more than 5% of the leaves.		
	azadirachtin (Align, Neemix)	10 to 20 g (See labels.)	0 days.
	diazinon	0.25 to 0.5 lb	14 days.
	dimethoate	0.25 lb	14 days.
		0.75 to 1 lb	14 days for leaf lettuce; 21 days for spinach. Do not apply to Swiss chard. Do not exceed 6 lb a.i./acre/season on lettuce or 1 app. /season on spinach.

**Table 1. Insecticides Recommended for the Control of Insects in Commercial Vegetable Crops (cont.)**

Crop, pest	Insecticide	Rate (a.i./acre)	Preharvest interval (PHI), comments
<b>LEAF LETTUCE, SPINACH, AND SWISS CHARD (CONT.)</b>			
Aphids and leafminers (cont.)	endosulfan (Thiodan)	See label for rates per linear row ft based on row spacings.	21 days. Apply to soil as a band or in-furrow treatment at bedding or seeding, as a post-seeding drench, as a sidedress, or in trickle irrigation. Do not use on Swiss chard.
	imidacloprid (Admire)		
	imidacloprid (Provado)	0.05 lb	7 days leaf lettuce. Allow at least 5 days between applications. Do not exceed 0.24 lb a.i./acre/season. Do not use on Swiss chard.
	insecticidal soap (M-Pede)	1.25 fl oz 49% concentrate/50 gal water (See comments.)	0 days. For aphid control. Use sufficient spray to wet all infested plant surfaces. Rotate sprays or rinse foliage to avoid more than 3 consecutive sprays. Must contact aphids to be effective.
	spinosad (SpinTor)	0.094 to 0.156 lb	1 day. For leafminer control (not aphids). Do not exceed 0.45 lb/acre/crop. See label for further resistance management restrictions.
Leafhoppers	azadirachtin (Align, Neemix)	10 to 20 g (See labels.)	0 days.
	carbaryl (Sevin)	0.5 to 1 lb	14 days.
	dimethoate	0.25 lb	14 days.
	malathion	1 lb	14 days for leaf lettuce; 7 days for spinach and Swiss chard.
	methoxychlor	0.5 to 1 lb	14 days for lettuce and spinach. Do not use on Swiss chard.
Caterpillars, including loopers	See comments under " <b>BROCCOLI. . .</b> " regarding diamondback moth resistance to endosulfan, methomyl, and permethrin.		
	<i>Bacillus thuringiensis kurstaki</i> or <i>aizawai</i> (Bt) (Agree, Biobit, Cutlass, DiPel, Javelin, MVP, XenTari, and others)	Follow label directions.	0 days. Kills only the caterpillar stage; must be eaten by larvae to be effective.
	*methomyl (Lannate)	0.45 to 0.9 lb	7 days for spinach; 10 days for lettuce and Swiss chard. Also aids in aphid control.
	*permethrin (Ambush, Pounce)	0.1 to 0.2 lb	1 day. Do not exceed 2.0 lb a.i./acre/season. Do not feed or graze treated plants.
	spinosad (SpinTor)	0.062 to 0.125 lb	1 day. Do not exceed 0.45 lb/acre/crop. See label for further resistance management restrictions.
	thiodicarb (Larvin)	0.4 to 0.75 lb	14 days. Do not exceed 1.5 lb a.i./acre/season.
Flea beetles	azadirachtin (Align, Neemix)	10 to 20 g (See labels.)	0 days.
	carbaryl (Sevin)	1 lb	14 days.
	methoxychlor	0.5 to 1 lb	14 days for lettuce and spinach. Do not apply to Swiss chard.
	rotenone	See product label.	1 day lettuce and spinach. Do not apply to Swiss chard.

**Table 1. Insecticides Recommended for the Control of Insects in Commercial Vegetable Crops (cont.)**

Crop, pest	Insecticide	Rate (a.i./acre)	Preharvest interval (PHI), comments
<b>CARROTS</b>			
Cutworms	*cyfluthrin (Baythroid)	0.025 lb	0 days. Allow at least 7 days between applications. Do not exceed 5 applications per season.
	diazinon	2 to 4 lb	Broadcast and incorporate just before planting in fields that have a history of frequent cutworm damage.
	*esfenvalerate (Asana)	0.03 to 0.05 lb	7 days. Do not exceed 0.5 lb a.i./acre/season.
Control aster leafhoppers only to reduce aster yellows, the disease that they transmit. Contact the Department of Crop Sciences, University of Illinois, (217)333-6651, for information on leafhopper infectivity and varietal susceptibility to aster yellows and guidelines on treatment thresholds.			
Aster Leafhopper	carbaryl (Sevin)	1 to 1.5 lb	7 days.
	*cyfluthrin (Baythroid)	0.025 to 0.044 lb	0 days. Allow at least 7 days between applications. Do not exceed 5 applications per season.
	*esfenvalerate (Asana)	0.03 to 0.05 lb	7 days. Do not exceed 0.5 lb a.i./acre/season.
	*methomyl (Lannate) methoxychlor	0.45 to 0.9 lb 2 lb	1 day. 7 days for roots; 14 days for tops.
Aphids	azadirachtin (Align, Neemix)	10 to 20 g (See labels.)	0 days.
	diazinon	0.5 lb	14 days.
Carrot weevil adults	*cyfluthrin (Baythroid)	0.044 lb	0 days. Allow at least 7 days between applications. Do not exceed 5 applications per season.
	*esfenvalerate (Asana)	0.03 to 0.05 lb	7 days. Do not exceed 0.5 lb a.i./acre/season.
<b>CUCUMBERS, MELONS, PUMPKINS, AND SQUASH</b>			
To reduce bee kill in vine crops, apply insecticides only late in the day after blossoms have closed.			
Striped and spotted cucumber beetles (NHE-46)	Control striped and spotted cucumber beetles to prevent bacterial wilt in cucumbers and muskmelon. In these crops, treat if beetle infestations exceed 0.1 to 1 per plant. In squash and pumpkins, treat if infestations exceed 5 beetles per plant.		
	carbaryl (Sevin)	1 lb	3 days. Sevin XLR is the formulation of carbaryl that is least toxic to honey bees.
	carbaryl plus feeding attractants (Adios, SLAM)	0.065 lb carbaryl	3 days. Low toxicity to honey bees.
	*carbofuran (Furadan)	Use 2.4 oz Furadan 4F /1,000 row ft	Band-apply to soil at planting.
	methoxychlor	0.5 to 1.5 lb	7 days; 1 day if less than 0.875 lb a.i./acre is applied.
	*permethrin (Ambush, Pounce)	0.1 to 0.2 lb	0 days. Do not exceed 1.6 lb a.i./acre/season.
	rotenone	See product label.	1 day.

**Table 1. Insecticides Recommended for the Control of Insects in Commercial Vegetable Crops (cont.)**

Crop, pest	Insecticide	Rate (a.i./acre)	Preharvest interval (PHI), comments
<b>CUCUMBERS, MELONS, PUMPKINS, AND SQUASH (CONT.)</b>			
Aphids (NHE-47)	diazinon	0.5 lb	7 days for cucumbers and summer squash; 3 days for melons and winter squash. Do not apply to pumpkins.
	dimethoate	0.25 lb	3 days, melons only. Do not apply to cucumbers, pumpkins, or squash.
	endosulfan (Thiodan)	0.5 to 1 lb	2 days for cucumbers, melons, and squash; 1 day for pumpkins. Do not exceed 3 lb a.i./acre/year. Also controls cucumber beetles; aids in controlling squash bug and squash vine borer.
	insecticidal soap (M-Pede)	1.25 fl oz 49% concentrate/50 gal water (See comments.)	0 days. Use sufficient spray to wet all infested plant surfaces. Rotate sprays or rinse foliage to avoid more than 3 consecutive sprays. Must contact aphids to be effective.
	malathion	1 lb	1 day for cucumbers, melons, and squash; 3 days for pumpkins.
Squash bug (NHE-51)	Treat when first eggs begin to hatch (around June 15 to July 15) if infestations exceed 1 to 1.5 egg masses per plant. Treat when squash bug nymphs are young because registered insecticides are not very effective against older nymphs or adults.		
	*esfenvalerate (Asana)	0.03 to 0.05 lb	3 days. Do not exceed 0.25 lb a.i./acre/season.
	*permethrin (Ambush, Pounce)	0.2 lb	0 days. Do not exceed 1.6 lb a.i./acre/season.
	sabadilla	5 lb, or see product label.	1 day.
Leafhoppers	dimethoate	0.25 lb	3 days, melons only. Do not apply to cucumbers, pumpkins, or squash.
	*esfenvalerate (Asana)	0.03 to 0.05 lb	3 days. Do not exceed 0.25 lb a.i./acre/season.
	*permethrin (Ambush, Pounce)	0.2 lb	0 days. Do not exceed 1.6 lb a.i./acre/season.
Squash vine borer (NHE-8)	When vines begin to run, scout twice weekly for red and black clear-winged moths and for entrance holes and frass. Treat as soon as early damage occurs and again 5 to 7 days later. Then continue scouting; treat as soon as new damage is noted.		
	carbaryl (Sevin)	1 lb	3 days. Use Sevin XLR to minimize bee kill.
	endosulfan (Thiodan)	0.5 to 1.5 lb	2 days. Do not exceed 3 lb a.i./acre/season.
	*esfenvalerate (Asana)	0.03 to 0.05 lb	3 days. Do not exceed 0.25 lb a.i./acre/season.
	methoxychlor	0.5 to 1 lb	7 days. 1 day if less than 0.875 lb a.i./acre.
	*permethrin (Ambush, Pounce)	0.1 to 0.2 lb	1 day. Do not exceed 1.6 lb a.i./acre/season.
	rotenone	See product label.	1 day.

**Table 1. Insecticides Recommended for the Control of Insects in Commercial Vegetable Crops (cont.)**

Crop, pest	Insecticide	Rate (a.i./acre)	Preharvest interval (PHI), comments
<b>CUCUMBERS, MELONS, PUMPKINS, AND SQUASH (CONT.)</b>			
Pickleworm	Begin weekly sprays in mid-August if damage begins to occur. Not a common problem.		
	carbaryl (Sevin)	1 lb	3 days. Use Sevin XLR to minimize bee kill.
	endosulfan (Thiodan)	0.5 to 1 lb	2 days for cucumbers, melons, and squash; 1 day for pumpkins. Do not exceed 3 lb a.i./acre/season. Also controls cucumber beetles; aids in controlling squash bug and squash vine borer.
	*esfenvalerate (Asana)	0.03 to 0.05 lb	3 days. Do not exceed 0.25 lb a.i./acre/season.
Mites	*abamectin (Agri-Mek)	0.01 to 0.02 lb	7 days. Do not exceed 0.056 lb a.i./acre/season.
	dicofol (Kelthane)	0.35 to 0.6 lb	2 days. Apply in 40 to 100 gal water/acre.
	dimethoate	0.25 lb	3 days, melons only. Do not apply to cucumbers, pumpkins, or squash.
Cutworms	Treat young plants if infestations exceed 1 to 2 larvae per 100 plants.		
	*esfenvalerate (Asana)	0.05 lb	3 days. Do not exceed 0.25 lb a.i./acre/season.
	*permethrin (Ambush, Pounce)	0.1 to 0.2 lb	0 days. Do not exceed 1.6 lb a.i./acre/season.
Whiteflies	azadirachtin (Align, Neemix)	10 to 20 g (See labels.)	0 days.
	insecticidal soap (M-Pede)	1.25 fl oz 49% concentrate/50 gal water (See comments.)	0 days. Use enough spray to wet all infested plant surfaces. Rotate sprays or rinse foliage to avoid more than 3 consecutive sprays. Must contact whiteflies to be effective.
	Sprays of dimethoate (for melons only), endosulfan (Thiodan), or esfenvalerate (Asana) as listed for leafhopper or aphid control also may control whiteflies. Efficacy is likely to vary according to specific insecticide resistance levels in separate whitefly populations.		
<b>ONIONS</b>			
Onion maggot (NHE-50)	Practice crop rotation to reduce onion maggot attack. Use soil insecticides at planting as furrow or broadcast applications. Populations in some areas may be resistant to diazinon. Foliar sprays for adult suppression are not effective.		
	chlorpyrifos (Lorsban)	1 lb	In furrow at planting (granular or EC formulations).
	diazinon	1 lb	Preplant broadcast. Incorporate 1 to 2 in. by disking.
	*fonofos (Dyfonate)	2 to 4 lb	In furrow at planting.
Thrips (NHE-48)	Check for thrips as bulbs begin to form. Thresholds vary from 10 to 25 per plant for susceptible varieties to as many as 45 per plant for more tolerant varieties. Onion varieties that are more susceptible to thrips injury include Brown Beauty 20, Colorado 6, Early Red Stockton, Mambo, Red Baron, Redman, Sweet Perfection, Tango, Valdez, and White Delight. Moderately tolerant varieties include El Charro, Snow White, Vega, X 201, and Zapotec. A more tolerant variety is White Keeper. Where insecticides are needed, treat during early bulb stage. Infestations are greatest in hot, dry weather. Direct ground-applied sprays to the center of plants. Wetting agents are recommended.		

**Table 1. Insecticides Recommended for the Control of Insects in Commercial Vegetable Crops (cont.)**

Crop, pest	Insecticide	Rate (a.i./acre)	Preharvest interval (PHI), comments
<b>ONIONS (CONT.)</b>			
Thrips (NHE-48) (cont.)	*azinphosmethyl (Guthion)	0.5 lb	28 days for dry onions. 14 days for green onions. Do not exceed 3 applications per season. 25W and 2S formulations are not restricted use. Some thrips populations are resistant.
	*cypermethrin (Ammo)	0.08 to 0.1 lb	7 days. Dry bulb onions only. Do not exceed 0.5 lb a.i./acre/season.
	diazinon	0.5 lb	14 days.
	*lambda-cyhalothrin (Warrior)	0.02 to 0.03 lb	14 days. Do not exceed 0.24 lb a.i./acre/season.
	malathion	1 lb	3 days.
	*methomyl (Lannate)	0.45 lb	7 days.
	*methyl parathion (PennCap-M)	0.5 lb	15 days.
	*permethrin (Ambush, Pounce)	0.15 to 0.3 lb	1 day. Dry bulb onions only. Do not exceed 2.4 lb a.i./acre/season.
	*zeta-cypermethrin (Mustang)	0.04 to 0.05 lb	7 days. Bulb onions only. Do not exceed 0.25 lb a.i./acre/season.
<b>PEPPERS</b>			
Aphids (NHE-47)	Use the insecticides below to control aphids where colonies are building. Insecticides are not effective for preventing or controlling aphid-borne viral diseases in peppers.		
	acephate (Orthene)	0.5 to 1 lb	7 days.
	dimethoate	0.25 lb	0 days.
	endosulfan (Thiodan)	0.5 to 1 lb	1 day at low rate; 4 days at high rate. Do not exceed 2 applications per season.
	imidacloprid (Admire)	See label for rates based on row spacings.	21 days. Apply to soil as a band or in-furrow treatment at bedding or seeding, as a post-seeding drench, as a sidedress, or in trickle irrigation.
	imidacloprid (Provado)	0.05 lb	0 days. Allow at least 5 days between applications. Do not exceed 0.24 lb a.i./acre/season.
	insecticidal soap (M-Pede)	1.25 fl oz 49% concentrate/50 gal water (See comments.)	0 days. Use sufficient spray to wet all infested plant surfaces. Rotate sprays or rinse foliage to avoid more than 3 consecutive sprays. Must contact aphids to be effective.
	*methomyl (Lannate)	0.45 lb	3 days.
European corn borer	Treat at about 5-day intervals when peppers are fruiting if light traps are capturing more than 5 to 10 European corn borer moths per night. Likelihood of damage is reduced if nearby corn is suitable for corn borer egg laying.		
	acephate (Orthene)	1 lb	7 days.
	*cyfluthrin (Baythroid)	0.025 to 0.044 lb	7 days. Allow at least 7 days between applications. Do not exceed 0.26 lb a.i./acre/season.
	*permethrin (Ambush, Pounce)	0.2 lb	3 days. Do not exceed 1.6 lb a.i./acre/season.

**Table 1. Insecticides Recommended for the Control of Insects in Commercial Vegetable Crops (cont.)**

Crop, pest	Insecticide	Rate (a.i./acre)	Preharvest interval (PHI), comments
<b>PEPPERS (CONT.)</b>			
European corn borer (cont.)	spinosad (SpinTor)	0.062 to 0.125 lb	1 day. Do not exceed 0.45 lb/acre/crop. See label for further resistance management restrictions.
Flea beetle	acephate (Orthene)	0.5 lb	7 days.
	*esfenvalerate (Asana)	0.03 to 0.05 lb	7 days. Do not exceed 0.35 lb a.i./acre/season. Early season pest.
	imidacloprid (Admire)	See label for rates based on row spacings.	21 days. Apply to soil as a band or in-furrow treatment at bedding or seeding, as a post-seeding drench, as a sidedress, or in trickle irrigation.
	rotenone	See product label.	1 day.
Whiteflies	azadirachtin (Align, Neemix)	10 to 20 g (See labels.)	0 days.
	imidacloprid (Admire)	See label for rates based on row spacings.	21 days. Apply to soil as a sidedress or in trickle irrigation in late season as whiteflies appear.
	imidacloprid (Provado)	0.05 lb	0 days. Allow at least 5 days between applications. Do not exceed 0.24 lb a.i./acre/season.
	insecticidal soap (M-Pede)	1.25 fl oz 49% concentrate/50 gal water (See comments.)	0 days. Use sufficient spray to wet all infested plant surfaces. Rotate sprays or rinse foliage to avoid more than 3 consecutive sprays. Must contact whiteflies to be effective.
Sprays of dimethoate, endosulfan (Thiodan), esfenvalerate (Asana), or methomyl (Lannate) as listed for aphid or flea beetle control also may control whiteflies. Efficacy is likely to vary according to specific insecticide resistance levels in separate whitefly populations.			

**POTATOES**

Colorado potato beetle; cutworms; flea beetles; potato leafhopper (NHE-22)

Populations of Colorado potato beetle are resistant to one or more insecticides in most areas. Field kits for detecting insecticide resistance are available from Michigan State University. Contact the University of Illinois Department of Crop Sciences at (217)333-6651 for information. If registered insecticides fail to give control, switch to another insecticide class. Rotate crops to delay infestations.

**Suggested thresholds for potato pests:**

Colorado potato beetle—For spring adults on young plants, 20 to 30% defoliation or, more conservatively, 2 adults per plant. Summer larvae and summer adults, during bloom, 5 to 10% defoliation, 5 larvae per plant, or 3 to 5 adults per plant.  
 Cutworms and loopers—For summer foliage feeding, prebloom, 4 per foot of row; postbloom, 8 per foot of row.  
 Green peach aphid—30 per 100 leaves.  
 Potato aphid—50 per 100 leaves.  
 Potato leafhopper—2 adults per sweep or 1 adult per sweep plus 15 nymphs per 25 leaves.  
 Tarnished plant bug (Lygus bug)—1 per sweep.  
 Miscellaneous defoliators—20% defoliation at flowering; more damage is tolerable before and after bloom.

**Table 1. Insecticides Recommended for the Control of Insects in Commercial Vegetable Crops (cont.)**

Crop, pest	Insecticide	Rate (a.i./acre)	Preharvest interval (PHI), comments
<b>POTATOES (CONT.)</b>			
Colorado potato beetle; cutworms; flea beetles; potato leafhopper (NHE-22) (cont.)	*abamectin (Agri-Mek)	0.01 to 0.02 lb	14 days. Do not exceed 2 applications per crop. Use at least 20 gal water per acre. Do not feed or graze treated foliage.
	<i>Bacillus thuringiensis san diego</i> (= <i>Bt tenebrionis</i> ) (Foil, M-Trak, Novodor)	Follow label directions.	0 days. For Colorado potato beetle only. These strains of <i>Bt</i> kill only the early larval stages; they will not kill adults.
	carbaryl (Sevin)	2 lb (cutworms: 4 lbs)	0 days.
	*carbofuran (Furadan)	0.5 to 1 lb	14 days. Do not apply more than 8 times per season. Not labeled for cutworms.
	cryolite (Kryocide and others)	10 to 12 lb	0 days. Do not exceed 96 lb/acre/season.
	endosulfan (Thiodan)	0.5 to 1 lb	1 day. Do not exceed 6 applications or 6 lb a.i./acre/season.
	*esfenvalerate (Asana)	0.03 to 0.05 lb	7 days. Do not exceed 0.35 lb a.i./acre/season.
	imidacloprid (Admire)	0.18 to 0.31 lb	Apply at planting to seed pieces in seed furrow or according to label as a bedding, sidedress, or hilling application. Rate varies with row spacing.
	imidacloprid (Provado)	0.05 lb	7 days. Allow at least 7 days between applications. Do not exceed 0.2 lb a.i./acre/season. Do not use Provado as a foliar spray if Admire was used at planting.
	methoxychlor	0.5 to 1 lb	0 days.
	*oxamyl (Vydate)	2 to 4 lb	In seed furrow at planting in a minimum of 20 gal water/acre.
	*permethrin (Ambush, Pounce)	0.5 to 1 lb 0.05 to 0.2 lb	7 days. Foliar spray.
	*phorate (Thimet G)	2 to 3 lb	7 days. Do not exceed 2.4 lb a.i./acre/season.
	Aphids (NHE-47)	phosmet (Imidan)	1 lb
rotenone		1 lb Follow label directions.	7 days. For machine-harvested fields only. 1 day. For Colorado potato beetle and flea beetles.
Aphids (NHE-47)	dimethoate	0.25 to 0.5 lb	0 days. Also controls leafhoppers.
	endosulfan (Thiodan)	0.5 to 1 lb	1 day. Do not exceed 6 applications or 6 lb a.i./acre/season.
	imidacloprid (Provado)	0.05 lb	7 days. Allow at least 7 days between applications. Do not exceed 0.2 lb a.i./acre/season. Do not use Provado as a foliar spray if Admire was used at planting.
	insecticidal soap (M-Pede)	1.25 fl oz 49% concentrate/50 gal water (See comments.)	0 days. Use sufficient spray to wet all infested plant surfaces. Rotate sprays or rinse foliage to avoid more than 3 consecutive sprays. Must contact aphids to be effective.

**Table 1. Insecticides Recommended for the Control of Insects in Commercial Vegetable Crops (cont.)**

Crop, pest	Insecticide	Rate (a.i./acre)	Preharvest interval (PHI), comments
<b>POTATOES (CONT.)</b>			
Aphids (NHE-47) (cont.)	*methomyl (Lannate)	0.45 to 0.9 lb	6 days. Also controls leafhoppers and flea beetles.
	*oxamyl (Vydate)	0.5 to 1 lb	7 days. Foliar spray.
Blister beetles (NHE-72)	carbaryl (Sevin)	0.5 to 1 lb	0 days.
	rotenone	Follow label directions.	1 day.
Wireworms (NHE-43) and white grubs (NHE-23)	*phorate (Thimet G)	2 to 3 lb	90 days. Place at side(s) of row at planting but not in direct contact with seed pieces. Low rate on light soils; high rate on heavier soils; do not use on muck soils.
	Dyfonate and Mocap also are labeled for wireworm control but not for white grubs.		
<b>SWEET CORN</b>			
Corn rootworms (NHE-26)	Crop rotation (with corn following any crop except corn) prevents root damage from corn rootworms. (See Chapter 1 for exceptions to this rule. Apply a soil insecticide if corn is planted in the same field as last year <i>and</i> no earworm/corn-borer control programs were followed. (Where foliar insecticides were used fairly often for earworms or corn borers in sweet corn, they also controlled rootworm beetles and prevented egg laying.)		
	chlorpyrifos (Lorsban G)	1 lb	In furrow or band at planting.
	*cyfluthrin plus tebupirimphos (Aztec)	See label.	In furrow or band at planting.
	*ethoprop (Mocap G)	1 lb	In furrow or band at planting.
	fonofos (Dyfonate G)	1 lb	In furrow or band at planting.
	*phorate (Thimet G)	1 lb	In furrow or band at planting.
	*tefluthrin (Force 1.5G and 3G)	See label for rates based on row spacings.	In furrow or band at planting.
	*terbufos (Counter G)	1 lb	In furrow or band at planting.
Cutworms (NHE-38)	Use postemergence sprays at the 3- to 5-leaf stage if 3% of plants are cut and cutworms are still feeding. Ground applications to the base of plants are most effective.		
	chlorpyrifos (Lorsban)	1 to 1.5 lb	35 days.
	*cyfluthrin (Baythroid)	0.0125 to 0.025 lb	0 days. No more than 10 applications /crop.
	*esfenvalerate (Asana)	0.03 to 0.05 lb	1 day.
	*lambda-cyhalothrin (Warrior)	0.02 to 0.03 lb	1 day. Do not exceed 0.48 lb a.i./acre/season.
	*permethrin (Ambush, Pounce)	0.1 to 0.2 lb	1 day. Do not exceed 1.2 lb a.i./acre/season.
Flea beetles (NHE-36)	Use varieties that are resistant to Stewart's wilt to reduce the threat of flea beetles.		
	carbaryl (Sevin)	1 to 2 lb	2 days.
	*carbofuran (Furadan)	2.5 fl oz Furadan 4F / 1,000 row ft	Apply in furrow at planting. Apply if overwintering flea beetle populations are high and varieties that are susceptible to Stewart's wilt must be used.

**Table 1. Insecticides Recommended for the Control of Insects in Commercial Vegetable Crops (cont.)**

Crop, pest	Insecticide	Rate (a.i./acre)	Preharvest interval (PHI), comments
<b>SWEET CORN (CONT.)</b>			
Flea beetles (cont.)	chlorpyrifos (Lorsban)	1 to 1.5 lb	35 days.
	*esfenvalerate (Asana)	0.03 to 0.05 lb	1 day.
	*lambda-cyhalothrin (Warrior)	0.02 to 0.03 lb	1 day. Do not exceed 0.48 lb a.i./acre/season.
	*permethrin (Ambush, Pounce)	0.1 to 0.2 lb	1 day. Do not exceed 1.2 lb a.i./acre/season.
Japanese beetle (NHE-32)	Control beetles if silk clipping threatens pollination. Ground-applied sprays directed to the ear zone are most effective. Sprays (except <i>Bt</i> ) used for corn earworm or European corn borer also control Japanese beetle if it is present.		
	carbaryl (Sevin)	1 lb	2 days.
European corn borer (NHE-140)	Because sweet corn planting dates vary over a period of several weeks, a range of plant stages may be attacked by first- and second-generation borers (usually in June, then late July to August, respectively). Plant maturity at the time of attack (not the generation of corn borer) determines the type of damage and the appropriate insecticides for control. See also the insecticides listed for corn earworm control if applications are to be made during silking.		
<i>Whorl-stage corn</i>	Scout for "shot-hole" feeding on leaves and for larvae in whorls. Treat during late whorl if more than 15% of plants show larval feeding. Treat before larvae bore from the whorl into the stalk.		
	<i>Bacillus thuringiensis kurstaki</i> ( <i>Bt</i> ) (Biobit, Cutlass, DiPel, Javelin, MVP, and others)	Follow label directions.	0 days. Apply granules by air or ground and liquids by ground sprays with nozzles directly over the whorl. <i>Bt</i> kills only larvae, not adult moths; <b><i>Bt</i> does not adequately protect sweet corn if attack occurs during tasseling and ear formation.</b>
	carbaryl (Sevin)	2 lb	2 days. Not as effective as other insecticides listed here.
	cyfluthrin (Baythroid)	0.025 to 0.044 lb	0 days. Not more than 10 applications per crop.
	*lambda-cyhalothrin (Warrior)	0.02 to 0.03 lb	1 day. Do not exceed 0.48 lb a.i./acre/season.
	*permethrin (Ambush, Pounce)	0.1 to 0.2 lb	1 day. Do not exceed 1.2 lb a.i./acre/season. Apply every 5 days as needed.
	<i>Tassel emergence through harvest</i>	Observe light traps for corn borer moths. Treat if counts exceed 50 moths per trap per night. Treat every 5 to 7 days until 10 to 12 days before harvest.	
*cyfluthrin (Baythroid)		0.025 to 0.044 lb	0 days. Not more than 10 applications /crop.
*lambda-cyhalothrin (Warrior)		0.02 to 0.03 lb	1 day. Do not exceed 0.48 lb a.i./acre/season.
*methomyl (Lannate)		0.23 to 0.45 lb	0 days. 3 days for forage or grazing. Re-treat at 1- to 3-day intervals. Apply by ground with sprays directed to ear zone.

**Table 1. Insecticides Recommended for the Control of Insects in Commercial Vegetable Crops (cont.)**

Crop, pest	Insecticide	Rate (a.i./acre)	Preharvest interval (PHI), comments
<b>SWEET CORN (CONT.)</b>			
European corn borer (NHE-140) <i>Tassel emergence through harvest</i> (cont.)	*methyl parathion (PennCap-M)	0.5 to 1 lb	3 days. 12 days forage or grazing. Avoid treating during pollen shed to reduce bee injury. (Not highly effective against corn earworm.)
	*permethrin (Ambush, Pounce)	0.1 to 0.2 lb	1 day. Do not exceed 1.2 lb a.i./acre/season. Apply every 5 days as needed.
Corn earworm (NHE-33)	<i>Fresh-market corn:</i> If traps are capturing earworm moths, treat at 2- to 5-day intervals from first silk until 90% or more of the silks are brown (usually 4 to 6 applications). <i>Processing corn:</i> If pheromone traps capture more than 10 moths/trap/night, treat at 3- to 6-day intervals from first silk until 90% of the silks are brown.		
	carbaryl (Sevin)	2 lb	2 days. Apply by ground to ear zone. During pollen shed, apply late in the day to reduce bee kill. Sevin XLR is less hazardous to bees than Sevin wettable powder.
	*cyfluthrin (Baythroid)	0.025 to 0.044 lb	0 days. Not more than 10 applications per crop.
	*esfenvalerate (Asana)	0.03 to 0.05 lb	1 day. Do not exceed 0.5 lb a.i./acre/season. Apply by ground to ear zone.
	*lambda-cyhalothrin (Warrior)	0.02 to 0.03 lb	1 day. Do not exceed 0.48 lb a.i./acre/season.
	*methomyl (Lannate)	0.23 to 0.45 lb	0 days. 3 days for forage or grazing. Apply by ground to ear zone.
	*permethrin (Ambush, Pounce)	0.1 to 0.2 lb	1 day. Do not exceed 1.2 lb a.i./acre/season. Apply by ground to ear zone.
Sap beetles (NHE-40) and picnic beetle	carbaryl (Sevin)	2 lb	2 days. During pollen shed, apply late in the day to reduce bee kill. Sevin XLR is less hazardous to bees than Sevin wettable powder.
	diazinon malathion	1 lb 1 lb	7 days. 5 days.
Corn leaf aphid (NHE-29)	malathion	1 lb	5 days.
Fall armyworm (NHE-34)	*cyfluthrin (Baythroid)	0.044 lb	0 days. Not more than 10 applications per crop.
	*lambda-cyhalothrin (Warrior)	0.03 lb	1 day. Do not exceed 0.48 lb a.i./acre/season.
	*methomyl (Lannate)	0.45 lb	0 days. 3 days for forage or grazing. Apply by ground to ear zone.

**Table 1. Insecticides Recommended for the Control of Insects in Commercial Vegetable Crops (cont.)**

Crop, pest	Insecticide	Rate (a.i./acre)	Preharvest interval (PHI), comments
<b>SWEET POTATOES</b>			
Wireworms	chlorpyrifos (Lorsban)	2 lb	Broadcast and immediately incorporate before planting.
	diazinon	3 to 4 lb	Broadcast and immediately incorporate before planting.
Flea beetles	carbaryl (Sevin)	1 to 2 lb	0 days. See label for notes on sweet potato weevil control.
	endosulfan (Thiodan)	0.5 lb	1 day. Do not exceed 3 applications or 3 lb a.i./acre/season. See label for notes on sweet potato weevil control.
Sweet potato weevil	Notify the University of Illinois Department of Crop Sciences, (217)333-6651, if the sweet potato weevil, a serious pest in southern states, is detected in Illinois fields.		
<b>TOMATOES AND EGGPLANTS</b>			
Cutworms (NHE-47)	Treat transplants if infestations exceed 1 larva per 10 plants.		
	carbaryl (Sevin)	2 lb	3 days.
	*cyfluthrin (Baythroid)	0.044 lb	0 days. Allow 7 days between applications. Do not exceed 6 applications per season. Do not apply to eggplant.
	*esfenvalerate (Asana)	0.03 to 0.05 lb	1 day for tomato; 7 days for eggplant. Do not feed or graze treated vines. Do not exceed 0.5 lb a.i./acre/season.
	*lambda-cyhalothrin (Warrior)	0.015 to 0.025 lb	5 days for tomato and tomatillo. Do not exceed 0.36 lb a.i./acre/season. Do not apply to eggplant.
	*methomyl (Lannate) spinosad (SpinTor)	0.45 lb 0.023 to 0.125 lb	1 day for tomato; 5 days for eggplant. 1 day. Do not exceed 0.45 lb/acre/crop. See label for further resistance management restrictions.
Flea beetles	Treat if infestations exceed 2 beetles per 10 leaves.		
	carbaryl (Sevin)	2 lb	3 days.
	*esfenvalerate (Asana)	0.03 to 0.05 lb	1 day for tomato; 7 days for eggplant. Do not feed or graze treated vines. Do not exceed 0.5 lb a.i./acre/season.
	*lambda-cyhalothrin (Warrior)	0.015 to 0.025 lb	5 days tomato and tomatillo. Do not exceed 0.36 lb a.i./acre/season. Do not apply to eggplant.
	methoxychlor	0.5 to 1.5 lb	7 days; 1 day if less than 0.875 lb a.i./acre is applied.
rotenone	See product label.	1 day.	

**Table 1. Insecticides Recommended for the Control of Insects in Commercial Vegetable Crops (cont.)**

Crop, pest	Insecticide	Rate (a.i./acre)	Preharvest interval (PHI), comments
<b>TOMATOES AND EGGPLANTS (CONT.)</b>			
Aphids (NHE-47)	Treat if 25 to 50% of plants are infested by wingless aphids; count only wingless aphids that indicate colonies have started.		
	*cyfluthrin (Baythroid)	0.025 to 0.044 lb	0 days. Allow 7 days between applications. Do not exceed 6 applications per season. Do not apply to eggplant.
	diazinon	0.25 lb	1 day for tomato. Do not apply to eggplant.
	dimethoate	0.25 lb	7 days for tomato. Do not apply to eggplant.
	imidacloprid (Provado)	0.05 lb	0 days. Allow at least 5 days between applications. Do not exceed 0.24 lb a.i./acre/season.
	insecticidal soap (M-Pede)	1.25 fl oz 49% concentrate/50 gal water (See comments.)	0 days. Use sufficient spray to wet all infested plant surfaces. Rotate sprays or rinse foliage to avoid more than 3 consecutive sprays. Must contact aphids to be effective.
	malathion	1 lb	1 day for tomato; 3 days for eggplant.
	*methomyl (Lannate)	0.45 to 0.9 lb	1 day for tomato; 5 days for eggplant.
Corn earworm (NHE-33); European corn borer (NHE-140); hornworm (NHE-130); cabbage looper	Treat to control corn earworm (tomato fruitworm) when tomatoes are fruiting and pheromone-baited cone traps capture 20 or more moths per night. Treatment may be delayed if no eggs are present on leaves. Moths deposit few eggs in tomatoes if nearby corn is silking.		
	<i>Bacillus thuringiensis kurstaki</i> or <i>aizawai</i> (Bt) (Agree, Biobit, Cutlass, DiPel, Javelin, MVP, XenTari, and others)	Follow label directions.	0 days. Kills caterpillar stage (larvae) only, not adult moths; larvae must eat treated foliage.
	carbaryl (Sevin)	2 lb	3 days.
	*cyfluthrin (Baythroid)	0.025 to 0.044 lb	0 days for tomato. Allow at least 7 days between applications. Do not exceed 0.26 lb a.i./acre/season. Do not use on eggplant.
	*esfenvalerate (Asana)	0.03 to 0.05 lb	1 day for tomato; 7 days for eggplant. Do not feed or graze treated vines. Do not exceed 0.5 lb a.i./acre/season.
	*lambda-cyhalothrin (Warrior)	0.015 to 0.025 lb	5 days for tomato and tomatillo. Do not exceed 0.36 lb a.i./acre/season. Do not use on eggplant.
	*methomyl (Lannate)	0.45 to 0.9 lb	1 day for tomato; 5 days for eggplant.
spinosad (SpinTor)	0.062 to 0.125 lb	1 day. Do not exceed 0.45 lb/acre/crop. See label for further restrictions for resistance management.	

**Table 1. Insecticides Recommended for the Control of Insects in Commercial Vegetable Crops (cont.)**

Crop, pest	Insecticide	Rate (a.i./acre)	Preharvest interval (PHI), comments
<b>TOMATOES AND EGGPLANTS (CONT.)</b>			
Colorado potato beetle	*abamectin (Agri-Mek)	0.01 to 0.02 lb	7 days for tomato Do not exceed 0.056 lb a.i./acre/season. Do use on eggplant.
	carbaryl (Sevin)	1 to 2 lb	3 days.
	cyfluthrin (Baythroid)	0.025 to 0.044 lb	0 days. Allow 7 days between applications. Do not exceed 6 applications per season. Do not use on eggplant.
	diazinon	0.5 lb	1 day for tomato. Do not use on eggplant.
	*esfenvalerate (Asana)	0.03 to 0.005 lb	1 day for tomato; 7 days for eggplant. Do not feed or graze treated vines. Do not exceed 0.5 lb a.i./acre/season.
	imidacloprid (Provado)	0.05 lb	0 days. Allow at least 5 days between applications. Do not exceed 0.24 lb a.i./acre/season.
	*lambda-cyhalothrin (Warrior)	0.02 to 0.03 lb	5 days for tomato. Do not exceed 0.36 lb a.i./acre/season. Do not use on eggplant.
	spinosad (SpinTor)	0.035 to 0.070 lb	1 day. Use against larvae. Do not exceed 0.45 lb/acre/crop. See label for further resistance management restrictions .
Spider mites	*abamectin (Agri-Mek)	0.01 to 0.02 lb	7 days for tomato. Do not use on eggplant.
	dicofol (Kelthane MF)	0.5 to 0.75 lb	2 days for tomato. Do not exceed 2 applications per season. Do not use on eggplant.
	dimethoate	0.25 lb	7 days for tomato. Do not use on eggplant.
Fruit flies and picnic beetles	Late-season pests (August to October). Treat to prevent fruit damage if pests are present.		
	carbaryl (Sevin)	2 lb	3 days.
	diazinon	0.5 lb	1 day for tomato. Do not apply to eggplant.
Whiteflies	azadirachtin (Align, Neemix)	10 to 20 g (See labels.)	0 days.
	endosulfan (Thiodan)	0.5 to 1 lb	2 days. Do not exceed 6 applications or 3 lb a.i./acre/season.
	imidacloprid (Admire)	See label for rates based on row spacings.	21 days. Apply to soil as a sidedress or in trickle irrigation in late season as whiteflies appear.
	imidacloprid (Provado)	0.5 lb	0 days. Allow at least 5 days between applications. Do not exceed 0.24 lb a.i./acre/season.
	insecticidal soap (M-Pede)	1.25 fl oz 49% concentrate/50 gal water (See comments.)	0 days. Use sufficient spray to wet all infested plant surfaces. Rotate sprays or rinse foliage to avoid more than 3 consecutive sprays. Must contact whiteflies to be effective.
	Sprays of dimethoate, esfenvalerate (Asana), or methomyl (Lannate) as listed for aphid or flea beetle control also may control whiteflies. Efficacy is likely to vary according to specific insecticide resistance levels in separate whitefly populations.		

\*Use restricted to certified (licensed) applicators only.

**Table 2. Cabbage Variety Selection Guidelines for Thrips Tolerance**

<i>Fresh-Market Varieties' Tolerance</i>				
Minimum	Minimum to moderate	Moderate	Maximum	
Charmont	Conquest	Field Rocket <sup>a</sup>	Izalso <sup>a</sup>	
Market Prize	Grand Prize	Ruby Ball (red)	Rio Verde	
Princess	Showboat	Solid Blue 780	Ruby Perfection	
Protector (Quisto, Safekeeper)	Superette	Superelite	(red)	
Solid Blue 690	Superpack <sup>a</sup>	Super Red 80 <sup>b</sup>	Solid Blue 770 <sup>a</sup>	
SuperDane <sup>b</sup>				
Supergreen				
<i>Storage Varieties' Tolerance</i>				
Minimum	Minimum to moderate	Moderate	Moderate to maximum	Maximum
Dakota	Straton	Autoro (red)	Pennant	Arana <sup>a</sup>
Excel		Bingo	Picus	Bantly
Lannox		Bislet <sup>a</sup>		Brutus
President		Dacama Extra		Galaxy <sup>a</sup>
Reeds Storage		Ergon		Horizon <sup>a</sup>
Hyb 4		Fidello		Lotus <sup>a</sup>
		Green Winter		Manrico <sup>a</sup>
		Hinova		Provita <sup>a</sup>
		Multiton <sup>a</sup>		Starski
		Poldark		Stonar
		Polinius		Zerlina
		Strukton		
<i>Kraut and Slaw Varieties' Tolerance</i>				
Minimum	Minimum to moderate	Moderate	Moderate to maximum	Maximum
Hitoma	Atria	Cacile <sup>a</sup>	Falcon	Bravo
Marvelton	Carlton	Grand Prize		Ferry Morse 356 <sup>a</sup>
Predena	Orbit	Hinova		Grand SLAM <sup>a</sup>
Superdane	Rodolfo			Izaico <sup>a</sup>
	Roundup			King Cole
	Sagitta			Little Rock
	Superatta			Pete 63880
				Reed's Hybrid 14
				Rio Granda
				Royal Vantage <sup>a</sup>
				Superkraut
				Titanic 90

NOTE: Information adapted from Cornell University, Ithaca, NY, and the University of Minnesota.

<sup>a</sup>Based on one trial.

<sup>b</sup>Based on field observations in Minnesota.

**Table 3. Minimum Preharvest Intervals (in Days) of Common Insecticides Registered for Use on Vegetable Crops**

	*abamectin (Agri-Mek)	acephate (Orthene)	azadirachtin (Align, Neemix)	*azinphosmethyl (Guthion)	<i>Bacillus thuringiensis aizawai</i>	<i>Bacillus thuringiensis kurstaki</i>	<i>Bacillus thuringiensis san diego</i>	carbaryl (Sevin)	*carbofuran (Furadan)	chlorpyrifos (Lorsban)	cryolite (Kryocide)	*cyfluthrin (Baythroid)	*cypermethrin (Ammo)	diazinon (D-Z-N)	dicofol (Kelthane)	dimethoate	disulfoton (Di-Syston)	endosulfan (Thiodan)	*esfenvalerate (Asana)	*ethoprop (Mocap)
Asparagus	...	...	0	...	0	0	...	1	...	1	...	...	...	...	...	...	...	...	...	...
Beans (snap)	...	14	0	...	0	0	...	3	...	...	...	...	...	7	7	0	P	3	3	...
Beets	...	...	0	...	0	0	...	3	...	...	...	...	...	14	...	...	...	...	...	...
Broccoli	...	...	0	15	0	0	...	3	...	21	S	...	...	7	...	7	P	7	3	...
Brussels sprouts	...	14	0	7	0	0	...	3	...	21	...	...	...	7	...	...	P	14	...	...
Cabbage	...	...	0	21	0	0	...	3	...	21	S	...	1	21	...	3	P	7	3	...
Carrots	...	...	0	...	0	0	...	7	...	...	...	0	...	14	...	...	...	7	7	...
Cauliflower	...	14	0	15	0	0	...	3	...	21	S	...	...	7	...	7	P	14	3	...
Celery	7	21	0	14	0	0	...	14	...	...	...	...	...	...	...	...	...	4	...	...
Chinese cabbage	...	...	0	...	0	0	...	14	...	21	...	...	...	10	...	...	P	...	3	...
Collards	...	...	0	...	0	0	...	14	...	21	S	...	...	10	...	14	...	21	7	...
Cucumber	7	...	0	1	0	0	...	3	P	...	X	...	7	7	...	...	...	2	3	...
Eggplant	...	...	0	21	0	0	0	3	...	...	...	...	...	...	...	...	...	1	7	...
Endive, escarole	...	...	0	...	0	0	...	14	...	...	...	...	...	14	...	14	...	...	...	...
Horseradish	...	...	0	...	0	0	0	3	...	...	...	...	...	...	...	...	...	...	...	...
Kale	...	...	0	...	0	0	...	14	...	21	...	...	...	10	...	14	...	21	...	...
Kohlrabi	...	...	0	...	0	0	...	3	...	21	...	...	...	...	...	...	...	...	...	...
Lettuce (leaf)	...	...	0	...	0	0	...	14	...	...	S	...	15	14	...	14	P	14	...	...
Melons	7	...	0	7	0	0	...	3	P	...	X	...	...	3	2	3	...	2	3	...
Mustard greens	...	...	0	...	0	0	...	14	...	...	S	...	...	10	...	14	...	21	...	...
Onion, bulb	...	...	0	28	0	0	...	...	...	P	...	...	7	14	...	...	...	...	...	...
Onion, green	...	...	0	14	0	0	...	...	...	...	...	...	...	14	...	...	...	...	...	...
Parsley	...	...	0	...	0	0	...	14	...	...	...	...	...	X	...	...	...	...	...	...
Parsnip	...	...	0	...	0	0	...	3	...	...	...	...	...	14	...	...	...	...	...	...
Peas	...	...	0	...	0	0	...	21	...	...	...	...	0	7	0	...	...	...	3	...
Pepper	7	7	0	...	0	0	...	3	...	...	X	7	...	5	2	0	...	1	7	...
Potato	14	...	0	7	0	0	0	0	14	...	...	...	...	35	...	0	30	1	7	P
Pumpkin	...	...	0	...	0	0	...	3	P	...	...	...	...	...	2	...	...	1	3	...
Radish	...	...	0	...	0	0	...	7	...	P	...	0	...	14	...	...	...	...	7	...
Rhubarb	...	...	0	...	0	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Rutabaga	...	...	0	...	0	0	...	3	...	P	...	...	...	...	...	...	...	...	...	...
Spinach	...	...	0	...	0	0	...	14	...	...	...	...	...	14	...	14	...	21	...	...
Squash, summer	7	...	0	...	0	0	...	3	P	...	X	...	...	7	2	...	...	2	3	...
Squash, winter	7	...	0	...	0	0	...	3	P	...	...	...	...	3	2	...	...	2	3	...
Sweet corn	...	...	...	...	...	0	...	2	7	35	...	0	...	7	...	...	...	1	1	P
Sweet potato	...	...	0	...	0	0	...	0	...	P	...	...	...	P	...	...	...	1	...	P
Swiss chard	...	...	0	...	0	0	...	14	...	...	...	...	...	14	...	14	...	...	...	...
Tomato	7	...	0	0	0	0	0	3	...	...	X	0	...	1	2	7	P	2	1	...
Turnip, roots	...	...	0	...	0	0	...	7	...	P	...	...	...	14	...	...	...	...	...	...
Turnip, tops	...	...	0	...	0	0	...	14	...	P	...	...	...	14	...	14	...	21	...	...

Preharvest intervals (PHI) listed are minimums; at maximum application rates, the PHI for some products is greater than the period indicated here. Additional restrictions (limiting the total number of applications or restricting the use of treated plants for livestock feed) also may apply. S = apply to seeds or seedlings only; P = apply at or before planting or as early season sidedress according to label; X = preharvest interval not specified; ... = not registered for use on this crop.

\*Use restricted to certified (licensed) applicators.

	*fonofos (Dyfonate)	imidacloprid (Admire, Provado)	*lambda-cyhalothrin (Warrior)	lindane (Isotox)	malathion (Cythion)	metaldehyde	methomyl (Lannate)	methoxychlor	*methyl parathion (Penncap-M)	naled (Dibrom)	*oxamyl (Vydate)	*permethrin (Ambush, Pounce)	*phorate (Thimet)	potassium salt soap (M-Pede)	pyrethrins plus PBO	rotenone	spinosad (SpinTor)	*tefluthrin (Force)	*terbufos (Counter)	thiodicarb (Larvin)	*tralomethrin (Scout X-tra)	*zeta-cypermethrin (Mustang)
...	...	...	...	1	X	1	3	...	...	...	1	...	0	0	1	...	...	...	...	...	...	...
P	...	...	S	1	X	3	3	3	1	...	...	P	0	0	1	...	...	...	...	...	...	...
P	...	...	...	7	X	0	14	15	...	...	...	...	0	0	1	...	...	...	...	...	...	...
P	7	1	S	3	X	3	14	7	1	...	1	...	0	0	...	1	...	...	...	7	5	...
P	7	...	S	7	X	3	14	7	1	...	1	...	0	0	...	1	...	...	...	...	...	...
P	7	1	S	7	X	1	3	...	1	...	1	...	0	0	1	1	...	...	...	7	...	1
...	...	...	...	7	X	1	14	15	...	P	...	...	0	0	1	...	...	...	...	...	...	...
P	7	...	S	7	X	3	7	7	1	...	1	...	0	0	...	1	...	...	...	7	...	...
...	...	...	S	7	X	7	...	15	1	14	1	...	0	0	1	1	...	...	...	...	...	...
...	7	...	...	...	...	10	...	...	...	...	1	...	0	0	...	1	...	...	...	14	...	...
...	7	...	S	7	X	10	14	...	1	...	1	...	0	0	1	1	...	...	...	...	...	...
...	...	...	S	1	X	1	7	...	...	1	0	...	0	0	1	...	...	...	...	...	...	...
...	0	...	...	3	X	5	7	...	...	1	3	...	0	0	1	1	...	...	...	...	...	...
...	7	...	...	7	X	10	...	...	...	...	1	...	0	0	...	1	...	...	...	14	...	...
...	...	...	...	7	X	65	...	...	...	...	22	...	0	0	...	...	...	...	...	...	...	...
...	7	...	S	7	X	10	14	...	1	...	...	...	0	0	...	1	...	...	...	...	...	...
...	7	...	...	7	X	...	7	...	...	...	...	...	0	0	...	1	...	...	...	...	...	...
...	7	...	P	14	X	...	14	21	...	...	1	...	0	0	1	1	...	...	...	14	...	...
...	...	...	S	1	X	1	7	...	...	1	0	...	0	0	1	...	...	...	...	...	...	...
...	7	...	...	7	X	10	...	...	...	...	...	...	0	0	...	1	...	...	...	...	...	...
P	...	1	...	3	X	7	...	15	...	...	1	...	0	0	1	...	...	...	...	...	...	7
...	...	...	...	3	X	7	...	15	...	...	...	...	0	0	0	...	...	...	...	...	...	...
...	7	...	...	21	...	10	...	...	...	...	1	...	0	0	...	1	...	...	...	...	...	...
...	...	...	...	7	X	...	...	...	...	...	...	...	0	0	...	...	...	...	...	...	...	...
...	...	...	...	3	X	1	7	10	1	...	...	...	0	0	1	...	...	...	...	...	...	...
P	0	...	...	3	X	3	7	...	...	7	3	...	0	0	1	1	...	...	...	...	...	...
P	7	...	...	0	X	6	0	5	...	7	7	P	0	0	1	...	...	...	...	...	...	...
...	...	...	S	3	X	...	7	...	...	...	0	...	0	0	...	...	...	...	...	...	...	...
P	...	...	...	7	X	...	7	...	...	...	...	...	0	0	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	1	...	0	0	...	1	...	...	...	14	...	...
...	...	...	...	3	X	...	7	...	...	...	...	...	0	0	...	...	...	...	...	...	...	...
...	7	...	S	7	X	7	14	14	...	...	1	...	0	0	1	1	...	...	...	14	...	...
...	...	...	S	1	X	1	7	...	...	1	0	...	0	0	1	...	...	...	...	...	...	...
...	...	...	S	1	X	...	7	...	...	...	0	...	0	0	...	...	...	...	...	...	...	...
P	...	1	...	5	X	0	7	3	...	...	1	P	...	...	1	...	P	P	...	...	...	...
...	...	...	...	...	X	...	0	...	...	P	...	...	0	0	...	...	...	...	...	...	...	...
...	...	...	...	7	X	10	...	...	...	...	1	...	0	0	...	1	...	...	...	14	...	...
P	0	5	P	1	X	1	7	10	...	...	1	...	0	0	1	1	...	...	...	...	...	...
...	...	...	...	7	X	10	14	...	...	...	...	...	0	0	...	...	...	...	...	...	...	...
...	...	...	...	7	X	...	7	...	...	...	1	...	0	0	1	1	...	...	...	...	...	...