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AgriLIFE EXTENSION
Texas A&M System

Texas Guide for

Controlling Insects on Commercial Vegetable Crops

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The commercial vegetable market has low tolerances for insect and mite damage on edible foods. Such damage can reduce the yield and quality of produce. Sometimes a crop is rejected at market because of even small amounts of damage, cosmetic blemishes or the presence of insect parts. Another reason to control insect pests is that some of them are vectors of plant diseases, particularly viruses.

To meet stringent market requirements for vegetables, it is sometimes necessary to control insects before the crop is actually damaged. Therefore, pests must be detected early, as they enter a field. Vegetable crops should be inspected for insect pests two or three times per week to determine when to begin insecticide treatment and to properly time subsequent applications. Insecticide applications made too early may not provide the protection needed, while those made too late will not prevent crop damage. When pest problems are predictable because they occur every year, applying systemic insecticides, or spraying at susceptible crop stages, may be justified as a preventive measure.

Selecting a Pesticide

A pesticide should be chosen with knowledge of the specific pest problems and crop conditions. There is often more than one pesticide that will control a particular pest. In selecting a pesticide, consider:

- Product efficacy or effectiveness against the target pest, as well as impact on other pests in the field;
- Chemical class or mode of action; rotating among pesticide classes with different modes of action may help delay insecticide resistance in the pest;
- Target specificity and hazard to beneficials and other non-target organisms; broad spectrum insecticides generally provide only temporary protection and generally are more apt to harm non-target organisms;
- Application frequency needed or amount of residual control provided; broad spectrum insecticides that kill beneficial organisms can cause the resurgence of primary and secondary pests and make frequent insecticide application necessary;
- Cost per acre, factoring in the number of applications required to achieve control as well as the potential for pest resurgence and associated costs;
- Potential hazards to the applicator, mixer, farm workers and the environment; signal words on product labels indicate the hazards to humans; the label also describes environmental hazards;
- Use restrictions, including re-entry intervals, pre-harvest intervals, number of allowable applications, time required between applications, and restrictions on mixing with other products.

Using this Guide

This publication lists the insecticides and acaricides registered for control of selected pests of commercial, field-grown vegetable crops (home vegetable gardeners should refer to B-1300, "Managing Insect and Mite Pests in Vegetable Gardens"). It is written for comparison and educational purposes only, and is not intended to be a complete pest control manual. This list of insecticides was compiled from the most recent product labels available at the time of publication. The inclusion of an insecticide in this listing does not guarantee its effectiveness against a particular pest; it simply signifies that the pest is listed on the product's label. The registered rate(s) for pesticides in multiple crop listings (e.g., cole crops) and multiple pest listings (e.g., cutworms), or with more than one formulation, may vary with the specific crop-pest-formulation combination. Furthermore, the crops included on the label can vary with formulation and/or trade names. Therefore, THE PRODUCT LABEL MUST BE CONSULTED BEFORE USE.

Also, when using products with a special local need (24C) registration or specific exemption (Section 18 - not listed in this publication), a copy of the label must be in the possession of the user at the time of application.

Where there is sufficient research, products that have proved efficacious against selected pests are indicated by an asterisk following the rates labelled for that pest. These ratings are based on field tests conducted by Texas A&M University research and Extension faculty. Local conditions, pest pressure and pest species (for multiple pest list-

ings - e.g., aphids) may cause actual performance to vary. It is always important to monitor the performance of any pesticide. The lack of a rating in this guide does not imply that a product is not efficacious, but that there is no experimental data on the particular pest or crop.

pH effects of Spray Water

Water throughout much of Texas is alkaline, with pH readings ranging from 7.8 to 8.2. Use of high pH water (particularly above 8.0) for pesticide applications may affect the performance of many pesticides, particularly organophosphates and carbamates. Certain pesticides degrade more rapidly at higher pH, especially at temperatures higher than 95 degrees F. Little information is available on the degradation rate of specific pesticides in high pH water; some pesticides are relatively unaffected. It is a good idea to check pH levels regularly with a pH meter, and add a suitable acid buffer to spray water when needed.

When tank mixes of more than one pesticide are used, or when fertilizer is combined with a pesticide, the final spray solution should be checked to determine pH. Alkaline sprays should be buffered to a pH of approximately 7.0. However, even in a properly buffered solution, sprays should be applied as soon as possible to reduce possible chemical degradation.

Biological Control

Insect and mite infestations are often held below damaging levels by weather, inadequate food, and natural enemies such as predators, parasites and pathogens. It is important to recognize the impact of these natural control factors and, where possible, to encourage them. Biological control is the use of living organisms (parasites, predators and pathogens) to control pests. This approach does not present the human health and environmental concerns associated with some chemical pesticides. Important natural enemies of insect and mite pests attacking vegetables include lady beetles, green lacewings, syrphid fly larvae, spiders, several insect pathogens and a variety of tiny wasps that parasitize the eggs, larvae and pupae of many vegetable pests.

Biological control generally is most effective when used with other compatible control practices in an integrated pest management (IPM) program. These practices include cultural controls, planting resistant host plants, monitoring pests, and selectively using insecticides. The Texas A&M University System is committed to developing and encouraging the use of pest management practices which use biological control.

Biological control practices include the importation, conservation and augmentation of natural enemies. Classical biological control is the importation of natural enemies into areas where they do not occur. Importation has been most effective where an exotic pest has entered Texas without the natural enemies that control it in its native range. Conservation of natural enemies is generally achieved by avoiding the use of insecticides until they are needed to prevent the development of economically damaging pest infestations. The impact of insecticides also can be minimized by using products that are more toxic to the target pest than to natural enemies.

Augmentation usually involves the purchase and release of natural enemies that do not naturally occur in sufficient numbers to provide pest control. Natural enemies sold for pest control in vegetables include predators (green lacewings and lady beetles) and parasites (primarily nematodes and wasp parasites of caterpillars and eggs). Suggestions for the proper use rates, timing and methods of release to obtain cost-effective control with any of these predators or parasites have yet to be developed by researchers, but may be available from companies selling and supporting the use of their products.

Microbial Insecticides

There are a number of microbial products containing pathogens such as bacteria, fungi or viruses available for controlling pests. Most commercially available products are targeted at caterpillars and contain preparations of the bacterium *Bacillus thuringiensis* (B.t.). These vary in their spectrum of activity. There is one *B.t.* product for controlling beetles. Other microbials containing fungi or viruses are listed in Table 3.

In general, microbials control a single species or small group of related pests and do not destroy beneficial arthropods (predators and parasites), a characteristic that sets them apart from most conventional insecticides. An exception is the fungal pathogen *Beauvaria bassiana*, which controls more pests than most microbial insecticides, and also kills beneficial organisms. Even so, it protects beneficials better than most broad spectrum insecticides. In addition to their selectivity, most microbial products are exempt from residue tolerances, which allows greater flexibility in re-entry and pre-harvest intervals than with most insecticides. They are cleared for use on nearly all vegetable crops.

Microbial insecticides can be extremely effective against several pest species, but they must be applied correctly to be successful. Most perform much better when applied before the pests become too numerous or too large. Therefore, monitoring pest populations and developmental stages is essential to the proper timing of applications. Also, most microbial insecticides must be ingested by or come in direct contact with pests, and perform much better with thorough coverage of the crop. Many of their labels specify the use of higher spray volumes. Because even similar microbial insecticides (e.g., *B.t.* products) differ in use rates, target pests, activity ranges and

application requirements, the product's label must be consulted before use.

Cultural Control

Cultural controls reduce insect pest problems by making conditions less favorable to pests. Common cultural practices that can affect pest problems include variety selection, planting date, crop sequencing, crop residue destruction and sanitation. Crop damage often can be prevented or reduced by planting resistant varieties or planting on a date that will allow the crop to escape peak pest populations. Removing a pest's alternate hosts before a crop is planted, and avoiding sequential plantings of crops susceptible to the same pests, can delay or reduce pest infestations. Also, crop residues and culls should be destroyed to eliminate potential breeding sites for pests.

Insecticide Resistance Management

Insecticides can be grouped into classes according to their modes of action. Experience has shown that relying on a single group of insecticides may cause pests to develop resistance to the entire group. To prevent this, and to achieve better overall insect control, rotate the insecticide groups used, taking advantage of different modes of action. Ideally, rotations should be timed to expose each generation of a pest to only one insecticide class or mode of action. Consult Table 1 to determine the class to which a particular insecticide belongs.

Nerve-active insecticides with similar chemical structures affect insects in similar ways. For example, pyrethroids (esfenvalerate, permethrin, etc.) all act on an insect's nervous system in the same way. Organophosphates (methyl parathion, azinphos-methyl) and carbamates (carbaryl) also affect the insect's nervous system, but in a different way than the pyrethroids. Because organophosphates and carbamates have similar modes of action, these insecticides should be rotated with other insecticide classes rather than with each other. Thus, the idea is to rotate modes of action rather than just insecticide classes. Insect growth regulators and other non-nerve active insecticides also can be used in an insecticide rotation as alternatives to using nerve-active products alone.

Protecting Bees from Insecticides

Pollination by honeybees is extremely important in the production of vegetables and vegetable seed crops, especially squash, cucumber, pumpkin, watermelon, cantaloupe and muskmelon, and seed crops of asparagus, broccoli, onion and radish. Where bees are required for flower fertilization, the producer, insecticide applicator and beekeeper should cooperater closely to minimize bee losses and maximize pollination.

The following guidelines should reduce bee losses:

1. Apply insecticides, if practical, before bees are moved into fields or adjacent crops for pollination. When bees are in the vicinity, evening applications after bees have left the field are less hazardous than early morning applications.
2. Where insecticides are needed, consider their toxicity and time applications to minimize contact with foraging bees. Bees do not forage at night. "Highly toxic" insecticides should be applied only in late evening to delay possible contact with bees until the next morning. "Moderately toxic" or "Relatively non-toxic" insecticides should be applied in late evening or early morning to prevent direct spraying of foraging bees. For more information on the hazards of insecticides to honey bees, refer to Table 1.
3. To prevent heavy losses of bees, don't spray any insecticide directly on colonies or allow it to drift to colonies. Bees often cluster on the fronts of their hives on hot evenings. Pesticide drift or direct spray at this time generally kills many bees.

Pesticide Safety

The key to using pesticides safely is to be aware of potential hazards and take adequate precautions before, during and after use. Before using any pesticide, READ THE LABEL. In addition to application instructions, the label provides information on re-entry intervals, posting requirements, hazards to the environment and non-target organisms, endangered species restrictions, restrictions on application methods, worker protection requirements, practical first-aid treatment in case of exposure, storage and disposal procedures for containers, pre-harvest application intervals to prevent excessive residues, and the symptoms of poisoning. Users also should consult Texas Pesticides Laws and Regulations for state provisions that affect the application of pesticides to vegetables and which, in some cases, are more restrictive than federal laws.

Endangered Species Regulations

The Endangered Species Act is designed to protect and recover animals and plants that are in danger of becoming extinct. Under the provisions of this Act, the U.S. Fish and Wildlife Service assists the Environmental Protection Agency and the Food and Drug Administration in implementing pesticide programs by conducting biological analysis of the effects of pesticides on threatened

and endangered species. Many pesticide labels now carry restrictions on the use of products or application methods in areas designated as biologically sensitive. These restrictions continue to change. Refer to product labels and/or call your county Extension agent or U.S. Fish and Wildlife Service personnel to determine what restrictions apply to your area. Regardless of the law, pesticide users can be good neighbors by being aware of how their actions may affect people and the environment.

Policy Statement for Making Pest Management Suggestions

The management suggestions included in this publication reflect the opinions of Extension entomologists based on field tests or use experience, and are believed to be reliable. However, it is impossible to eliminate all risks. Conditions or circumstances that are unforeseen or unexpected may result in less than satisfactory results even when these suggestions are used. The Texas Agricultural Extension Service will not assume responsibility for such risks. Such responsibility shall be assumed by the user of this publication.

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

The USER is 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 pesticide label.

For additional information, contact your county Extension staff or write the Extension Entomologists, Department of Entomology, Texas A&M University, College Station, TX 77843, (409) 845-7026.

Symbols and Abbreviations Used in Table 2.

AP	=	at planting application
PP	=	pre-plant application
PPI	=	pre-plant incorporated
SD	=	side-dress application
SL	=	see label
ST	=	seed treatment
*	=	product has proved efficacious in experimental plots

Table 1. Product Information.

Common name	Trade name(s) (most common)[1]	Common formulations	Insecticide class[2]	Precaution status[3]	Re-entry interval[4]	Honeybee hazard[5]
Acephate	Orthene	75S	OP	C	24 hrs.	HT
Aldicarb	Temik	15G	CAR	D	48 hrs.	
Abamectin	Agrimek	0.15EC	BIO	W	12 hrs.	HT
Azadirachtin	Azatin	3% EC	BOT	C	4 hrs.	
Azinphos-methyl	Guthion, Sniper	2L, 50WP, 2E	OP	D	48-72 hrs.	HT
Bacillus thuringiensis	Many trade names	VARIOUS	BIO	C	4-12 hrs.	RNT
Beauveria bassiana	Mycotrol	21% WP	BIO	C	12 hrs.	
Carbaryl	Sevin	80S, 4L, 50W	CAR	W/C	12 hrs.	HT
Carbofuran	Furadan	4F	CAR	D	48 hrs.-14days	HT
Chlorethoxyfos	Fortress	2.5G, 5G	OP	D	48 hrs	
Chlorpyrifos	Lorsban	4E, 15G, 50W	OP	W/C	24 hrs.	HT
Cryolite	Kryocide, Cryolite	96% WP	IN	C	12 hrs.	RNT
Cyfluthrin	Baythroid	2EC	PYR	D	12 hrs.	HT
Cyromazine	Trigard	75W	IGR	C	12 hrs.	
Cypermethrin	Ammo	2.5EC	PYR	C	12 hrs.	HT
Diazinon	Diazinon	4E, 14G, 50W	OP	W/C	12-24 hrs.	HT
Dicofol	Kelthane/Dicofol	4E, 35WP, 50WP	OC	W/C	12 hrs.	RNT
Dimethoate	Dimethoate	4E, 2.67E, 5E	OP	W/D	48 hrs.	HT
Disulfoton	Disyston	15G, 8E	OP	D	48-72 hrs.	MT
Endosulfan	Thiodan, Endosulfan, Phaser	3EC, 50WP	OC	D	24 hrs.	MT
Esfenvalerate	Asana XL	.66EC	PYR	W	12 hrs.	HT
Ethoprop	Mocap	10G, 6EC	OP	D/W	48 hrs.	MT
Fonofos	Dyfonate	4E, 15G	OP	D/W	48-72 hrs.	MT
Hexakis	Vendex	50WP	OT	D	48 hrs.	
Insecticidal soap	M-Pede	49%	S[6]	W	12 hrs.	
Insecticidal viruses	Spod-X, Gemstar	.64%	BIO	C	12 hrs.	RNT
Imidacloprid	Admire, Provado	2F, 1.6F	CN	C	12 hrs.	HT
Lambda-cyhalothrin	Karate, Warrior	1EC	PYR	D	24 hrs.	HT
Lindane	Gamma Mean, Lindane	40F, 30F	OC	W	24 hrs.	HT
Malathion	Malathion, Fyfanon	5EC, 8EC, 9.9EC	OP	C	12 hrs.	HT

Table 1. Product Information (continued)

Common name	Trade name(s) (most common)[1]	Common formulations	Insecticide class[2]	Precaution status[3]	Re-entry interval[4]	Honeybee hazard[5]
Methamidophos	Monitor	4E	OP	D	48 hrs.	HT
Methomyl	Lannate	2.4E, 90WP	CAR	D	48 hrs.	HT
Methoxychlor	Methoxychlor	2EC	OC	C	12 hrs.	MT
Methyl parathion	Methyl Parathion	7.5E, 2E, 4E	OP	D/W	48 hrs.	HT
Naled	Dibrom	7.5E	OP	D	24 hrs.	HT
Oils	Many trade names	Various	Oil[7]	C	4-12 hrs.	MT
Oxamyl	Vydate	2L	CAR	D	48 hrs.	HT
Oxydemeton-methyl	Metasystox-R	2E	OP	W	48 hrs.	MT
Permethrin	Ambush, Pounce	2E, 3.2EC, 25W	PYR	W/C	12 hrs.	HT
Phorate	Thimet, Phorate	20G, 15G	OP	D	48-72 hrs.	MT
Phosmet	Imidan	70WP	OP	W	24 hrs.	HT
Pyrethrins	Pyrenone		BOT	C	12 hrs.	RNT
Sulfur	Thiolux, Microthiol Special	80%	IN	C	24 hrs.	
Tefluthrin	Force	3G, 1.5G	PYR	C	0 hrs.	HT
Terbufos	Counter	15G, 20CR	OP	D	48-72 hrs.	MT
Thiodicarb	Larvin	3.2EC, 80WSP	CAR	W	12 hrs.	MT
Tralomethrin	Scout X-tra	0.9EC	PYR	D	24 hrs.	HT
Zeta-cypermethrin	Fury	1.5EC	PYR	W	12 hrs.	HT

[1] All are registered trade names, ®.

[2] OP = Organophosphate; CAR = Carbamate; OC = Organochlorine; OT = Organotin; PYR = Pyrethroid; BOT = Botanical; BIO = Biological; IN = inorganic; CN = Chloronicotinyl.

[3] D = Danger (Toxicity Category I); W = Warning (Toxicity Category II); C = Caution (Toxicity Category III).

[4] *Texas Pesticide Laws and Regulations* should be consulted for specific information on re-entry intervals. Intervals may vary with formulation. Some intervals vary based on average yearly rainfall.

[5] HT = Highly Toxic; MT = Moderately Toxic; RNT = Relatively Non-Toxic.

[6] Consists of potassium salts of fatty acids

[7] Oils include petroleum distillate and botanical oils.

Table 2. Products for insect and mite control (listed by crop).

BEANS (Dry and Snap)

Pounds active ingredient/acre

Insecticide	Aphids	Cabbage looper	Corn earworm	Cowpea curculio	Cutworms	Flea beetles	Leaf-hoppers	Leaf-miners	Mexican bean beetle	Cucumber beetles	Mites	Beet armyworm
Acephate	.5-1	.5-1	.75-1		.5-1		.5-1		.5-1			
Aldicarb[a]	.75-1.05						1.05-2.1		1.05-2.1		1.05-2.1	
Azinphos-methyl	.25-.5						.375-.5	.375-.5	.5	.5		
Carbaryl			.5-1.5	2	.5-1.5[b]	1			.5-1	1		
Diazinon[c]	.5-.75				2-4 PPI		.5	.5-.75	.5-.75	.25-.375	.5	
Dicofol											.33-1.5	
Dimethoate	.25-.5						.25-.5	.25-.5	.25-.5		.25-.5	
Disulfoton	1-2 AP/SD[d]						1-2 AP/SD[d]		1-2 AP/SD[d]		1-2 AP/SD[d]	
Endosulfan	.5-1			.5-1	1	.5-1	.5-1		.5-1	.5-1		1
Esfenvalerate	.03-.05	.03-.05	.03-.05	.03-.05[a]	.03-.05	.03-.05[c]	.03-.05		.015-.03	.03-.05		.03-.05
Malathion	1.25-1.56						.61-1.56		.61-1.56	1.25-1.56	.94-1.5	
Methomyl	.45-.9	.45-.9	.45-.9		.45		.225-.9		.225-.9	.225-.45		.45-.9
Methoxychlor			1-3			1-3	1-3		1-3	1-3		
Methyl parathion	.5-1.5	1		.5-1.5	1-1.5	.5-1.5	.5-1.5		.5	.5	.5-1.5	.5-1.5
Naled	.94	.94-1.4					.94	.94			.94	
Oxydemeton-methyl							.5				.5	
Phorate	SL/AP						SL/AP		SL/AP		SL/AP	

Also see products with general vegetable labels (Table 3).

[a] Dry only.
[b] Also available in bait formulation.
[c] Snap only.
[d] Side dress on dry beans only.

BEETS (Table)

Pounds active ingredient/acre

Insecticide	Aphids	Armyworms	Beet leafhopper	Flea beetles	Stink bugs	Mites	Soil insects
Carbaryl		1-2[a]	.5-1	.5-1	1-2		
Diazinon	.25-.5						2-4 PPI
Fonofos							2 PPI
Malathion	.94-2.5	2.5		2.5			
Methomyl		.225-.9					
Methoxychlor		1-2.25	1-2.25	1-2.25			
Methyl parathion	.5-1.25	.5-1	.5-1	.5-1	1	.5-1	
Also see products with general vegetable labels (Table 3).							

[a] Also available in bait formulation.

CARROTS

Pounds active ingredient/acre

Insecticide	Aphids	Armyworms	Cutworms	Flea beetles	Leafhoppers	Carrot weevil	Wireworms	Mites
Carbaryl		1-2[a]	[a]	.5-1	.5-1.5			
Cyfluthrin			.025		.025-.044	.044		
Diazinon	.5		2-4 PPI				3-4 PPI	
Endosulfan	.5-1[a]	1		1	.5-1			
Esfenvalerate			.03-.05		.03-.05	.05*		
Lindane							ST	
Malathion	.94-2			2	1.56-2			
Methomyl		.225-.9	.225-.45		.45-.9			
Methoxychlor		1-2.25		1-2.25	1-2.25			
Methyl parathion	.5-1	.5-1	1	.5-1	.5-1	*[b]		.5-1
Oxamyl						.5-1*		
Also see products with general vegetable labels (Table 3).								

[a] Also available in bait formulation.

[b] Not labeled for this pest but provides control.

CELERY

Pounds active ingredient/acre

Insecticide	Aphids	Armyworm	Beet armyworm	Cabbage looper	Cutworms	Flea beetles	Leafhoppers	Leafminers	Carrot weevil	Mites	Wireworms
Abamectin								.01-.02*		.01-.02*	
Acephate	.5-1	1		1							
Azinphos-methyl	.5						.5	.5			
Carbaryl		1-2[a]			[a]	.5-1	.5-1.5				
Cyromazine								.125*			
Diazinon	.5				2-4 PPI	.5					3-4 PPI
Endosulfan	.5-1	1	1	.5-1		1	.5-1				
Lindane	.2-.4			.2-.4	.2-.8 PPI	.2-.4		.2-.4			.2-.8 PPI
Malathion	.94-1.5									.94-1.5	
Methomyl		.225-.45	.45-.9	.9	.45		.45-.9				
Methyl Parathion	.5-1	.5-1		1		.5-1	.5-1			.5-1	
Naled	.94-1.4	.94-1.4	.94-1.4	.94-1.4				.94-1.4			
Oxamyl								.5-1	1		
Permethrin	.1-.2	.1-.2	.1-.2	.05-.2	.1-.2		.05-.2	.1-.2			
Thiodicarb		.4-.75	.4-.75	.6-.75	.5-.75						

Also see products with general vegetable labels (Table 3).

[a] Also available in bait formulation.

CANTALOUPES, HONEYDEWS, CUCUMBERS AND WATERMELONS

Pounds active ingredient/acre

Insecticide	Aphids	Cucumber beetles	Cutworms	Cabbage looper	Leafhoppers	Leaf-miners	Melon-worm	Pickle-worm	Mites	Squash bug	Squash vine borer	Flea beetles	Thrips
Abamectin						.01-.02*			.01-.02				
Azinphos-methyl		.5			.375-.5[a]	.375-.5[a]	.5[a]	.5[a]					
Carbaryl		1	[b]		1		.5-1	.5-1		1		1	
Carbofuran (24C)		AP/SL											
Cryolite[c]		SL		SL			SL	SL				SL	
Cyromazine						.125*							
Diazinon	.25-.75[d]	.25-.75[d]	2-4 PPI		.5-.75[a]	.25-.75[d]	.25-.75[d]		.25-.75[a]				.25-.75[d]
Dicofol									.33-.66				
Dimethoate[ae]	.5*				.5	.5							.5[f]
Endosulfan	.5-1*	.5-1		1			.5-1	.5-1		.5-1	.5-1	.5-1	
Esfenvalerate		.03-.05	.03-.05	.03-.05	.03-.05		.03-.05	.03-.05		.03-.05	.03-.05		
Lindane	.2-.4	.2-.4	.8-1.5 PPI[d]			.2-.4	.2-.4	.2-.4		.2-.4	.2-.4		.2-.4
Malathion	.94-1.75	1.25-1.75	1.75		1.56-2[a]	1.25		.94-2	.94-1.75		1.75-1.87		1.75
Methamidophos (24C)[a]	.5-1*	.5-1		.5-1	.5-1	.5-1	.5-1	.5-1	.5-1				
Methomyl	.45-.9*	.45-.9	.45-.9	.45-.9			.45-.9	.45-.9				.45-.9	
Methoxychlor		1-3									1-3	1-3	
Naled[a]				.94-1.88	.94-1.88	.94-1.88			.94-1.88				
Oxamyl	.5-1					.5-1							
Oxydemeton-methyl	.375-.5*								.375-.5				
Permethrin	.2	.1-.2	.1-.2	.1-.2	.1-.2	.2	.1-.2	.1-.2		.2	.1-.2		

Also see products with general vegetable labels (Table 3).

[a] Except cucumbers.

[b] Also available in bait formulation.

[c] Suggested rates vary among labels.

[d] Cucumber rates lower

[e] Watermelon rates lower.

[f] Except watermelons.

COLE CROPS (Broccoli, Cauliflower, Cabbage, excluding Chinese Cabbage)

Pounds active ingredient/acre

Insecticide	Foliar aphids	Cabbage looper	Diamondback moth[a]	Imported cabbage worm	Beet armyworm	Cutworms	Flea beetles	Stink/ harlequin bug	Mites	Root maggot
Acephate[b]	.5-1*	1	1	1						
Azinphos-methyl	.5-.75	.5-.75	.5-.75	.5-.75						SL
Carbaryl			1-2	1-2		[c]	.5-1	.5-1		
Chlorpyrifos	1		1	1	1	1	1			SL/PPI
Cryolite[d]		SL	SL	SL		SL	SL			
Cypermethrin[e]	.05-.1	.075-.1*	.05-.1	.05-.1		.05-.1	.05-1	.05-.1		
Diazinon	.25-.5		.25-.5	.25-.5		2-4 PPI				2-3 PPI
Dimethoate	.25-.5*									
Disulfoton	1 AP/SD						1 AP/SD			
Endosulfan	.75-1*	.75-1	.75-1	.75-1	1	1	.75-1	.75-1		
Esfenvalerate		.03-.05*		.015-.03	.03-.05	.03-.05	.03-.05			
Fonofos										2-4 PPI
Imidacloprid - soil - foliar	.16-.375* .046*									
Lambda-cyhalothrin[f]	.02-.03	.015-.025*	.02-.03	.015-.025	.02-.03	.015-.025	.02-.03	.02-.03	.02-.03	
Lindane	.4	.4		.4		.4 PPI	.4			.8 PP
Malathion	.625-2.5	.625-2.5		.625-2.5			2.5			
Methamidophos	.5-1*	.5-1	.5-1	.5-1						
Methomyl		.225-.9	.225-.9	.225-.9		.45[g]				
Methoxychlor				1-2.25			1-2.25			
Methyl parathion	.25-1[h]	.94-1.5[i]		.94-1.5[i]	.25-1.5[h]		.5-1.5	1-1.5	.5-1.5	
Naled	.94	1.88	.94	.94						
Oxydemeton-methyl	.375-.5*[k]									
Permethrin	.05-.1[k]	.05-.1*[k]	.05-.1[k]	.05-.1[k]	.05-.1[k]	.1-.2[e]	.1-.2[e]			
Thiodicarb		.75-1	.75-1	.5-.75	.4-.8	.5-.75	.4-.8			
Tralomethrin		.016-.02*	.016-.02	.016-.02	.018-.024	.016-.02	.016-.02	.016-.02		
Also see products with general vegetable labels (Table 3).										

[a] Evidence of insecticide resistance has been observed in diamondback moth in some areas of Texas.
[b] Cauliflower only.
[c] Available in bait formulation.
[d] Rates vary among labels.
[e] Cabbage only.
[f] Except cauliflower.
[g] Except broccoli.
[h] Rates lower on broccoli.
[i] Highest rates on cauliflower.
[j] Broccoli only.
[k] Rates higher on cabbage.

EGGPLANT

Pounds active ingredient/acre

Insecticide	Aphids	Armyworms	Flea beetles	Corn earworm	Leaf-hoppers	Leaf-miners	Mites	Stink bug	Whitefly	Lace bugs	Colorado potato beetle
Azinphos-methyl			.5			.375-.5					
Carbaryl		1-2[a]	.5-1	1-2	.5-1			1-2		1-2	.5-1
Cryolite			7.7-15.4	7.7-15.4							7.7-15.4
Endosulfan	.5-1		.5-1					.5-1	1		.5-1
Esfenvalerate			.03-.05	.03-.05							.03-.05
Hexakis							1-2				
Imidacloprid - soil - foliar	.25-.375 .046		.25-.375						.25-.375 .046		.25-.375 .046
Lindane	.2-.4		.2-.4			.2-.4				.2-.4	
Malathion	.625-3.5						.625- 3.5			1.875-3.5	
Methomyl	.225-.9	.45-.9									
Methoxychlor		1-2.25	1-2.25		1-2.25						
Naled	.94-1.88		.94-1.88			.94- 1.88					
Oxamyl	.5-1					.5-1	.5-1				.5-1
Oxydemeton-methyl	.5						.5				
Permethrin			.1-.2			.1-.2					.2
Also see products with general vegetable labels (Table 3).											

[a] Also available in bait formulation.

KALE AND COLLARDS

Pounds active ingredient/acre

Insecticide	Aphids	Armyworms	Cabbage looper	Corn earworm	Diamondback moth	Flea beetles	Imported cabbage worm	Leaf-hoppers	Leaf-miners	Mites	Harlequin bug
Carbaryl		1-2[a]		1-2		.5-1	1-2	.5-1.5			.5-1
Chlorpyrifos	1	1			1	1	1				
Cryolite[bc]		SL	SL	SL	SL	SL	SL				
Diazinon	.25-.5			.25-.5	.25-.5		.25-.5				.25-.5
Dimethoate	.25							.25	.25	.25	
Endosulfan	.75-1[b]	.75-1[b]	.75-1[b]		.75-1[b]	.75-1[d]	.75-1[d]	.75-1[b]			.75-1[d]
Esfenvalerate[b]		.03-.05	.03-.05			.03-.05	.03-.05				
Imidacloprid - soil	.16-.375										
- foliar	.046										
Lindane	.4		.4			.4	.4		.4		
Malathion	.625-2.5		.625-2.5		1.75[b]	1.5-2.5	.625-2.5	.31[b]	.31[b]		.625[b]
Methomyl[e]		.45-.9	.45-.9[f]		.45-.9[f]		.45-.9				
Methoxychlor		1-2.25				1-2.25	1-2.25	1-2.25			
Methyl parathion	.25-1.5	.25-1.5	1-1.5			.5-1.5	1-1.5	.5-1.5		.5-1.5	
Naled	.94		1.88		.94		.94				
Permethrin[a]	.05-.1	.05-.1	.05-.1	.05-.1	.05-.1		.05-.1	.05-.1	.05-.1		
Also see products with general vegetable labels (Table 3).											

[a] Also available in bait formulation.
[b] Collards only.
[c] Rates vary among labels.
[d] Rates lower for Kale.
[e] Collards - fresh market only.
[f] Rates lower for collards.

LETTUCE (Head)

Pounds active ingredient/acre

Insecticide	Aphids	Cabbage looper	Imported cabbage worm	Corn earworm	Cutworms	Leaf-hoppers	Flea beetles	Leaf-miners	Mites	Armyworms
Abamectin								.01-.02		
Acephate	.5-1	1				.5-1				1
Carbaryl			1-2	1-2	[a]	.5-1.5	.5-1			1-2[a]
Cryolite[b]		SL		SL						SL
Cypermethrin		.075-.1	.05-.1	.05-.1	.05-.1	.05-.1	.05-.1			.075-.1
Cyromazine								.125		
Diazinon	.25-.5				2-4 PPI			.25-.5		
Dimethoate	.25					.25		.25		
Disulfoton	1-2 AP/SD					1-2 AP/SD			1-2 AP/SD	
Endosulfan	.75-1	.75-1	.75-1			.75-1				1
Imidacloprid - soil - foliar	.16-.375 .046									
Lambda-cyhalothrin	.02-.03	.015-.025	.015-.025	.02-.03		.02-.03	.02-.03		.02-.03	.02-.03
Lindane	.2-.4				.2-.4 PPI		.2-.4	.2-.4		
Malathion	1.25-2	1.56-1.88				1.25-2			1.56-2	
Methomyl	.45-.9	.225-.9		.45-.9	.45	.45-.9				.225-.9
Methoxychlor			1-2.25			1-2.25	1-2.25			1-2.25
Methyl Parathion	.5-1	1	.5-1			.5-1	.5-1		.5-1	.5-1
Oxydemeton-methyl	.375-.5								.375-.5	
Permethrin	.1-.2	.05-.2		.1-.2	.1-.2	.05-.2		.1-.2		.1-.2
Thiodicarb		.6-.75		.4-.75	.5-.75					.4-.75
Tralomethrin		.016-.02	.016-.02		.016-.02	.016-.02	.016-.02			.016-.02
Zeta-cypermethrin			.028-.05	.028-.05	.028-.05	.028-.05	.028-.05			.04-.05

Also see products with general vegetable labels (Table 3).

[a] Also available in a bait formulation.

[b] Rates vary among labels.

MUSTARD AND TURNIPS (Greens and Roots)

Pounds active ingredient/acre

Insecticide	Aphids	Armyworms	Cabbage looper	Corn earworm	Diamondback moth	Imported cabbage worm	Flea beetles	Harlequin bug	Leaf-hoppers	Leaf-miners	Mites
Carbaryl		1-2[a]		1-2		1-2	.5-1	.5-1	.5-1.5		
Diazinon	.25-.5				.25-.5[b]	.25-.5[b]	.25-.5[c]			.25-.5	
Dimethoate	.25								.25	.25	.25
Endosulfan[b]	.75-1	.75-1	.75-1		.75-1	.75-1	.75-1	.75-1	.75-1		
Esfenvalerate (24C)[c]		.03-.05				.03-.05	.03-.05				
Imidacloprid - soil - foliar	.16-.375 .046										
Malathion	625-1.25[c]		.625-1.25[d]			.625-1.25[d]	2.5[b]				
Methomyl[e]		.45-.9	.45-.9		.45-.9	.45-.9					
Methoxychlor[c]		1-2.25				1-2.25	1-2.25		1-2.25		
Methyl parathion[f]	.25-1.5	.25-1.5	1-1.5			1-1.5	.25-1.5		.25-1.5	.25-.75[c]	.25-1.5
Permethrin[c]	.05-.1	.05-.1	.05-.1	.05-.1	.05-.1	.05-.1			.05-.1	.05-.1	

Also see products with general vegetable labels (Table 3).

[a] Also available in bait formulation.
[b] Mustard only.
[c] Turnips only.
[d] Rate higher for mustard greens.
[e] Not labelled on roots.
[f] Rates lower for turnips.

OKRA

Pounds active ingredient/acre

Insecticide	Aphids	Corn earworm	Leafminers	Mites	Stink bugs
Carbaryl		1-2			1-2
Malathion	.94-1.5				
Also see products with general vegetable labels (Table 3).					

ONIONS

Pounds active ingredient/acre

Insecticide	Beet armyworm	Cutworm	Onion maggot	Wireworms	Thrips
Azinphos-methyl					.5-.75
Chlorpyrifos			AP/SL		
Cypermethrin[a]	.08-.1		.08-.1		.08-.1*[b]
Diazinon			2-4 PPI	3-4 PPI	.5*[c]
Fonofos[a]			AP/SL		
Lambda-cyhalothrin[a]	.02-.03	.015-.025	.015-.025		.02-.03*[b]
Lindane			.8 PP	ST	.2-.4
Malathion			1.56-2		.94-2
Methomyl	.45-.9	.9			.9*[c]
Methyl parathion					.25-.84
Oxamyl					.25-.5*[c]
Permethrin[a]	.15-.3	.1-.3	.1-.3		.15-.3
Also see products with general vegetable labels (Table 3).					

[a] Bulb onions only.
[b] Efficacious against onion thrips.
[c] Efficacious against western flower thrips.

PEAS (Dry and Green)
(For Cowpeas see Beans)

Pounds active ingredient/acre

Insecticide	Aphids	Armyworms	Cutworms	Cowpea curculio	Corn earworm	Loopers	Mites	Leafminers	Pea weevil
Azinphos-methyl				.75-1	.75-1			.375-.5	
Carbaryl		1-1.5[a]	1.5[a]			2.5			1.5
Diazinon[b]	.375-.5		2-4 PPI					.375-.5	
Dimethoate	.16								
Disulfoton	1-2.5 AP/SD								
Endosulfan[b]	.5-1	1	1	.5-1					
Esfenvalerate	.015-.05[c]	.03-.05	.03-.05	.03-.05[d]	.03-.05	.03-.05			
Malathion	.94-2.5								2.5
Methoxychlor									1.5-3
Methomyl[b]	.45-.9	.225-.9	.45-.9			.45-.9			
Methyl parathion	.5-1	.5-1	1	1			.5-1		.5
Naled	.94					.94-1.4	.94	.94	
Also see products with general vegetable labels (Table 3).									

[a] Also available in bait formulation.
[b] Succulent only.
[c] Lower rates on green peas.
[d] Dry only.

PEPPERS

Pounds active ingredient/acre

Insecticide	Aphids	Armyworms	Cutworms	Flea beetles	Corn earworm	Leafminers	Mites	Pepper weevil	Thrips	Wireworms
Abamectin						.01-.02*	.01-.02			
Acephate[a]	.5-1[b]									
Azinphos-methyl				.5		.375-.5				
Carbaryl		1-2[c]	2[c]	.5-1	1-2					
Chlorpyrifos (24C)								.5-1*		
Cryolite[d]								SL		
Cyfluthrin		.025-.044			.025-.044	.025-.044		.025-.044*	.025-.044	
Cyromazine						.125*				
Diazinon	.25-.5		2-4 PPI			.25-.5				3-4 PPI
Dicofol							.375-.75			
Dimethoate	.25-.33					.25-.33				
Disulfoton	1-2 AP									
Endosulfan	.5-1[b]	.5-1		.5-1						
Esfenvalerate		.03-.05		.03-.05	.03-.05			.03-.05*		
Fonofos										4 PPI
Imidacloprid - soil - foliar	.25- .5 .046			.25-.5					.25-.5	
Lindane	.2-.4	.2-.4	.8 PPI	.2-.4		.2-.4			.2-.4	.8 PPI
Malathion	.625-1.5									
Methamidophos (24C)	.5[b]			.5		.5			.5	
Methoxychlor		1-2.25		1-2.25						
Methomyl	.45[b]	.225-.45	.225-.45							
Naled	.94-1.88			.94-1.88		.94-1.88	.94-1.88			
Oxamyl[e]	.5-1[b]					.5-1		.5-1*		
Oxydemeton-methyl	.5									
Permethrin[a]			.1-.2	.1-.2	.1-.2	.1-.2		.1-.2*		

Also see products with general vegetable labels (Table 3).

[a] Bell pepper only.
[b] Labeled for use against green peach aphid.
[c] Also available in bait formulation.
[d] Rates vary among labels.
[e] 24C registration for non-bell type peppers, bell peppers on federal label.

POTATOES (Irish)

Pounds active ingredient/acre

Insecticide	Aphids	Colorado potato beetle	Flea beetles	Leafhoppers	Mites	Potato psyllid	Wireworms
Azinphos-methyl		.375	.5-.75	.5-.75			
Carbaryl		.5-1	.5-1	.5-1			
Cryolite		9.6-11.5					
Diazinon	.25-.375	.25-.375	.25-.375	.375-.5			3-4 PPI
Dimethoate	.25-.5			.25-.5			
Disulfoton	.375-1[a]	2-4 AP/SD	2-4 AP/SD	2-4 AP/SD		2-4 AP/SD	2-4 AP/SD
Endosulfan	.5-1	.5-1	.5-1	.5-1		.75-1	
Esfenvalerate	.03-.05	.03-.05	.03-.05	.03-.05		.015-.03	
Ethoprop							3-6 PPI/SL
Fonofos							SL/PPI/AP
Imidacloprid - soil - foliar	SL .046	SL .046	SL	SL .046		SL	
Malathion	.625-3			.625-1.25			
Methamidophos	.75-1	.75-1	.75-1	.75-1		.75-1	
Methoxychlor		1-2.25	1-2.25	1-2.25			
Methomyl	.45-.9		.45	.45-.9			
Methyl parathion	.25-1.5	.5-1.5	.25-1.5	.5-1.5	.5-1.5		
Oxamyl[a]	.5-1	.5-1	.5-1	.5-1			
Permethrin	.05-.2	.05-.2	.05-.2	.05-.2		.05-.2	
Phorate	SL	SL	SL/AP	SL		SL/AP	SL
Phosmet		.94	.94	.94			

Also see products with general vegetable labels (Table 3).

[a] Labeled for soil and foliar application; soil application rates higher.

PUMPKINS AND OTHER WINTER SQUASH

Pounds active ingredient/acre

Insecticide	Aphids	Armyworms	Cucumber beetles	Cutworms	Leaf-miners	Mites	Squash bug	Squash vine borer	Leaf-hoppers
Abamectin					.01-.02	.01-.02			
Carbaryl		[a]	1	[a]			1		1
Carbofuran (24C)			AP/SL						
Cryolite[b]			SL						
Cyromazine					.125				
Diazinon	.25-.75		.25-.75	2-4 PPI	.25-.75	.25-.75			.25-.75
Dicofol						.33-.66			
Endosulfan	.5-1		.5-1				.5-1	.5-1	
Esfenvalerate			.03-.05	.03-.05			.03-.05	.03-.05	.03-.05
Lindane[c]	.2-.4		.2-.4	.2-.8 PPI	.2-.4		.2-.4	.2-.4	
Malathion	.94-1.75		1.75	1.75		1.75		1.75	1.75
Methoxychlor		1-3	1-3					1-3	
Oxamyl	.5-1				.5-1				
Oxydemeton-methyl	.375-.5								
Permethrin	.2		.1-.2	.1-.2	.2		.2	.1-.2	.1-.2
Also see products with general vegetable labels (Table 3).									

[a] Also available in bait formulation.
[b] Rates vary among labels.
[c] Pumpkins only.

RADISHES

Pounds active ingredient/acre

Insecticide	Aphids	Armyworms	Flea beetles	Leafhoppers	Stink bug	Soil pests
Carbaryl		1-2[a]	.5-1	.5-1.5	1-2	
Chlorpyrifos						SL
Cyfluthrin			.025-.044			
Diazinon	.25-.5		.25-.5			2-4 PPI
Esfenvalerate		.03-.05	.03-.05			
Fonofos						2 PPI
Lindane						ST
Malathion	.625-2		2	2		
Methoxychlor		1-2.25	1-2.25	1-2.25		
Also see products with general vegetable labels (Table 3).						

[a] Also available in bait formulation.

SPINACH

Pounds active ingredient/acre

Insecticide	Aphids	Armyworms	Cabbage loopers	Cutworms	Leafhoppers	Mites	Flea beetles	Seed corn maggots
Azinphos-methyl	.375-.5					.375-.5		
Carbaryl		1-2[a]		[a]	.5-1.5		.5-1	
Diazinon	.25-.5			2-4 PPI				
Dimethoate	.25				.25	.25		
Endosulfan	.75-1	.75-1			.75-1	.75-1	.75-1	
Imidacloprid - soil - foliar	.16-.375 .046							
Lindane	.2-.4			.2-.4 PPI			.2-.4	
Malathion	1.25-1.5							
Methoxychlor		1-2.25			1-2.25		1-2.25	
Methomyl		.45-.9	.45-.9	.45				
Methyl parathion	.5-1	.5-1	1		.5-1	.5-1	.5-1	.5-1
Permethrin	.1-.2	.1-.2	.05-.2	.1-.2	.05-.2			
Thiodicarb		.4-.75	.6-.75	.5-.75				
Also see products with general vegetable labels (Table 3).								

[a] Also available in bait formulation.

SQUASH (Summer)

Pounds active ingredient/acre

Insecticide	Aphids	Armyworms	Cucumber beetles	Cutworms	Leaf-miners	Pickleworm/ Melonworm	Mites	Squash bug	Squash vine borer	Leaf-hoppers
Abamectin					.01-.02		.01-.02			
Carbaryl		[a]	1	[a]		.5-1		1		1
Carbofuran (24C)			AP/SL							
Cryolite[b]			SL			SL				
Cyromazine					.125					
Diazinon	.25-.75		.25-.75	2-4 PPI	.25-.75	.25-.75	.25-.75			.25-.75
Dicofol							.33-.66			
Endosulfan	.5-1		.5-1			.5-1		.5-1	.5-1	
Esfenvalerate			.03-.05	.03-.05		.03-.05		.03-.05	.03-.05	.03-.05
Lindane	.2-.4		.2-.4	.2-.8 PPI	.2-.4	.2-.4		.2-.4	.2-.4	
Malathion	.94-1.75		1.75	1.75		1.75	1.75		1.75	1.75
Methoxychlor		1-3	1-3						1-3	
Methomyl	.45-.9	.45-.9	.45-.9	.45-.9		.45-.9				
Naled	.94-1.88	.94-1.88	.94-1.88		1.4-1.88	1.4-1.88	.94-1.88			
Oxamyl	.5-1				.5-1					
Oxydemeton-methyl	.375-.5									
Permethrin	.2		.1-.2	.1-.2	.2	.1-.2		.2	.1-.2	.1-.2

Also see products with general vegetable labels (Table 3).

[a] Available in bait formulation.

[b] Rates vary among labels.

SWEET CORN

Pounds active ingredient/acre

Insecticide	Aphids	Corn earworm	Armyworms	Flea beetles	Soil pests[a]	Cutworms	Sap beetles	Chinch bugs
Carbaryl		1-2	1-2[b]	1-2			2-3[b]	1-2 1-2
Carbofuran			SL	SL	SL			
Chlorethoxyfos					SL	SL		
Chlorpyrifos	.5-1	.75-1	.5-1	1-1.5	2 AP/SL	1-2 AP/SL		.5-1 SL
Cyfluthrin		.025-.044	.025-.044			.0125-.025		.025-.044
Diazinon	.5-1	1-1.25		.5	2-4 PPI	2-4 PPI	1-1.25	
Endosulfan[c]	1	1.5						
Esfenvalerate	.03-.05	.03-.05	.03-.05	.03-.05		.03-.05	.03-.05	.03-.05
Ethoprop					SL	SL/PPI		
Fonofos			SL		SL[d]	SL		
Lambda-cyhalothrin	.02-.03	.02-.03	.02-.03	.02-.03		.02-.03	.02-.03	.02-.03
Malathion							.94	
Methoxychlor			1-2.25	1-2.25				
Methomyl	.225-.45	.225-.45	.225-.45	.225-.45		.45		
Methyl parathion	.5-.75		.5-.75	.5-.75		1	.5-1	
Oxydemeton-methyl	.375-.5							
Permethrin		.1-.2	.1-.2[e]	.1-.2		.1-.2[e]		
Phorate				SL/AP	SL			SL
Tefluthrin					SL	SL/AP		SL/AP
Terbufos[f]				SL/AP	SL	SL/AP		
Also see products with general vegetable labels (Table 3).								

[a] Including wireworms, rootworm larvae and seed corn maggot.
[b] Also available in bait formulation.
[c] Fresh market only.
[d] Do not place in direct contact with the seed.
[e] Also available in granular formulation.
[f] Note potential interactions with herbicides listed on label.

SWEET POTATOES

Pounds active ingredient/acre

Insecticide	White grubs	Wireworms	Fall armyworms	Flea beetles	Sweet potato weevil	Cucumber beetles	Corn earworm	Leafhopper
Carbaryl				1-2	1-2[a]	1-2	1-2	
Chlorpyrifos		2 PPI		2 PPI				
Diazinon		3-4 PPI		3-4 PPI				
Endosulfan				.5	.5			
Ethoprop	6-8 PPI	6-8 PPI		6-8 PPI		6-8 PPI		
Fonofos		4 PPI		4 PPI				
Malathion								.94-1.88
Methoxychlor			1-2.25	1-2.25				
Methyl parathion			.75	.75				.75
Also see products with general vegetable labels (Table 3).								

[a] Also labeled as a pre-plant dip for cuttings.

TOMATOES

Pounds active ingredient/acre

Insecticide	Aphids	Cutworms	Armyworms	Flea beetles	Fruit-worm[a]	Horn-worms	Leaf-hoppers	Leaf-miners	Mites	Stink bugs	Thrips	Tomato pinworm	Whitefly
Abamectin								.01-.02	.01-.02			.02	
Azinphos-methyl	.5-.75		.75-1.5	.5-.75	.75-1.5	.75-1.5	.5-.75	.375-.5		.375-.5	.5-.75	.75-1.5	.375-.5
Carbaryl		2[b]	1-2[b]	.5-1	1-2	1-2	.5-1			1-2		1-2	
Cryolite				SL	SL	SL						SL	
Cyfluthrin	.025-.044	.044	.044		.025-.044	.025-.044		.025-.044		.025-.044	.044	.044	
Cyromazine								.125					
Diazinon	.25	2-4 PPI	.375-.5					.25					
Dicofol									.375-.75				
Dimethoate	.25-.5						.25-.5	.25-.5					
Disulfoton	1-3 AP/SD			1-3 AP/SD			1-3 AP/SD	1-3 AP/SD	1-3 AP/SD				
Endosulfan	.5-1		1	.5-1	1	.5-1			1	.75-1			.5-1
Esfenvalerate	.03-.05	.03-.05	.03-.05	.03-.05	.03-.05	.015-.03		.05				.03-.05	.03-.05
Imidacloprid - soil - foliar	.25-.375 .046			.25-.375							.25-.375		.25-.375 .046
Lambda-cyhalothrin	.02-.03	.015-.025	.02-.03	.02-.03	.02-.03	.015-.025	.02-.03	.02-.03		.02-.03		.02-.03	.02-.03
Lindane	.2-.4	.2-.4 PPI		.2-.4				.2-.4			.2-.4		
Malathion	.625-1.88								.625-1.88				
Methamido-phos(24C)[c]	.75-1	.75-1	.75-1		.75-1			.75-1		.75-1	.75-1		.75-1
Methomyl	.45-.9	.45	.225-.9		.45-.9	.45-.9						.45-.9	
Methoxychlor			1-3	1-3			1-3						
Methyl parathion	.5-1	1	.5-1	.5-1	1	1	.5-1	.5-1		.5-.75	.25-.5	1	
Oxamyl	.5-1							.5-1					
Permethrin[d]		.05-.2	.05-.2		.05-.2	.05-.2		.05-.2				.05-.2	

Also see products with general vegetable labels (Table 3).

[a]Also known as corn earworm.

[b]Also available in bait formulation.

[c]Fresh market only.

[d]Not labelled for cherry tomatoes.

Table 3. Products with general vegetable labels. Before using, examine labels closely for variations in registered crops, pests, rates, use restrictions or other information.

Insecticide	PHI[a]	Registered crops[b]	Pests on label[c]
Azadirachtin	0	All except sweet corn	Whitefly, aphids, leafminers, armyworms, leafhoppers
Bacillus thuringiensis var. kurstaki and/or aizawai	0	All	Lepidopterous larvae[d]
var. san diego	0	Potato, tomato, eggplant	Colorado Potato Beetle
Beauveria bassiana	0	All	Whiteflies, aphids, thrips
Insecticidal soap	0	All except sweet corn	Soft-bodied insects including aphids, caterpillars, leafhoppers, leafminers, psyllids, mites, thrips, whiteflies[e]
Insecticidal viruses	0	Beans, beets, cole crops, celery, cucumber, lettuce, onions, peas, peppers, sweet corn, tomatoes	Varies with product: Spod-X - only beet armyworm GemStar - Corn earworm[f], tobacco budworm
Oils	0	All - varies with product	Varies with product - includes aphids, mites, beetle larvae, leafminers, whiteflies, psyllids, thrips, some caterpillars
Pyrethrins	0	All	All except mites and soil pests
Sulfur	0	All	Mites

[a] Pre-harvest interval in days.

[b] Of crops included in this guide (Table 2).

[c] Of pests included in this guide (Table 2).

[d] Activity on selected larvae varies among strains.

[e] Tank mix with a labeled companion insecticide is required for some pests.

[f] Also listed as Tomato fruitworm.

Table 4. Pre-harvest intervals (days) for insecticides on vegetable crops.*

Insecticide	Beans (Dry)	Beans (Snap)	Beets (Tops)	Broccoli	Cabbage	Cauliflower	Cantaloupe	Carrots	Celery	Collards	Cucumber	Eggplant	Kale	Lettuce (Head)	Mustard Greens	Okra
Acephate	14	14				14			21					21		
Aldicarb	90															
Abamectin							7		7		7			7		
Azinphos-methyl	30	7		15	21	15	7		14		1	ab				
Carbaryl	0	0	14[c]	3	3	3	0	0	14	14	0	0	14	3	14	0
Carbofuran							AP				AP					
Chlorpyrifos				21	21	21				21			21			
Cyfluthrin								0								
Cyromazine							0		7		0			7		
Cypermethrin					1									5		
Diazinon		7	14	7[a]	21[a]	7[a]	3	14[a]	10	10	7		10	14[a]	10	
Dicofol	21[a]	21[a]					2				2					
Dimethoate	7[a]	7[a]		7	7	7	3			14			14	7	14	
Disulfoton	60	AP		14	42	40								60		
Endosulfan	3	3		7	7	14	2	7	7[a]	21	2	1	21	14	21	
Esfenvalerate	21	3		3	3	3	3	7		7	3	7				
Fonofos	AP	AP	AP	AP	AP	AP										
Hexakis												3				
Imidacloprid				7	7	7				7		0	7	7	7	
Lambda-cyhalothrin				1	1									1		
Malathion	1	1	7	3	7	7	1	7	7	7	1	3	7	7	7	1
Methamidophos				21[a]	35	28	14									
Methoxychlor	7[a]	7[a]	14	14	3	7	7	14		14	7	7	14	14		
Methomyl	14	3[a]	14[a]	3	1	3	3[a]	1	7	10	3[a]	5	10	10[a]	10	
Methyl parathion	21[a]	21[a]	21[a]	21[a]	21[a]	21[a]		15[a]	15[a]	21[a]			21[a]	21	21[a]	
Naled	1	1		1	1	1	1		1	1		1	1			
Oxamyl							1	14			1	7[a]				
Oxydemeton-methyl	21	21		7	7	7	14				3	7		21		
Permethrin				1	1	1	0		1	1	0	3		1		
Phorate	AP/60															
Thiodicarb				7	7	7			14					14		
Tralomethrin				5										3		
Zeta-cypermethrin														5		

* Pre-harvest intervals for Lindane and Cryolite are based on plant growth stage or vary among labels (see label).

[a] PHI depends on rate, formulation or number of applications; see label for details; longest interval listed.

[b] Do not apply after fruit set

[c] PHI shorter when only roots are harvested.

AP = At planting application only.

SL = See label PHI variable.

AC = At cultivation application.

Table 4. Pre-harvest intervals (days) for insecticides on vegetable crops. (continued)

Insecticide	Onions		Peas		Peppers	Potatoes (Irish)	Pumpkin	Radish	Spinach	Summer squash	Sweet Corn	Sweet Potatoes	Tomatoes	Turnips		Watermelon
	(Dry)	(Green)	(Dry)	(Green)										(Tops)	(Root)	
Acephate					7											
Abamectin					7		7			7			7			7
Azinphos-methyl	28	14	7		7	7			14				14[a]			7
Carbaryl			3	3	0	0	0	3	14	0	0	0	0	14	3	0
Carbofuran						14	AP			AP	AP					AP
Chlorpyrifos	AP				14			AP			35	AP/125		AP/30	AP/30	
Cyfluthrin					7			0			0		0			
Cypermethrin	7															
Cyromazine					7		0		7	0			0			0
Diazinon	14[a]	14[a]	7[a]	7[a]	5	35	3	14[a]	14[a]	7	7[a]		1	14[a]	14[a]	3
Dicofol					2		2			2			2			2
Dimethoate			7[a]	7[a]	7[a]	7[a]			14				7	14	14	3
Disulfoton			50	50	90	75[a]							30			
Endosulfan				3	4[a]	1	2		21	2	1	1	2			2
Esfenvalerate			21	3	7	7	3	7		3	1		1	7	7	3
Ethoprop						AP					AP	AP				
Fonofos	AP				AP	AP		AP			45[a]	AP				
Imidacloprid					0	7			7				0			
Lambda-cyhalothrin	14										1		5			
Malathion	3	3	3	3	3	0	3	7	7	1	5	3	3[a]	3	3	1
Methamidophos					21	14							14			14
Methoxychlor			7	7	7	0	7	7	14	7	7	0	7	14	7	7
Methomyl	7	7		1	3	6			7	3[a]	0		1	10		3[a]
Methyl parathion	15[a]	15[a]	15[a]	15[a]	15	6[a]			21[a]		3	5	15	21	21[a]	
Naled			1	1	1					1						1
Oxamyl	14				7	7	1			1			1			1
Oxydemeton-methyl					3		14			3	21[a]					7
Permethrin	1				3	14[a]	0		1	0	1		0	1	1	0
Phorate						90					30					
Phosmet						7										
Tefluthrin											SL					
Terbufos											30					
Thiodicarb									14							

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