UF UNIVERSITY of FLORIDA
IFAS Extension

Chapter 30.
Lettuce, Endive, Escarole Production in Florida

W.M. Stall, R.N. Raid, S.E. Webb

BOTANY

Nomenclature

Family - Asteraceae (Compositae)
Lettuce - *Lactuca sativa*
Endive - *Cichorium endiva*
Escarole - *Cichorium endiva*

Origin

Lettuce is native to the eastern Mediterranean basin. Endive is believed to have originated in Egypt.

Related Species

Other vegetable crops in the Asteraceae family are globe artichoke, Jerusalem artichoke, radicchio, witloof chicory, salsify, cardoon, and dandelion.

VARIETIES

Crop varieties for commercial production are shown in Table 1.

SEEDING AND PLANTING

Planting dates and seeding information are given in Table 2.

FERTILIZER AND LIME

On mineral soils with subsurface or sprinkler irrigation and no mulch, broadcast all P_2O_5, micronutrients and 25 to 50% of N and K_2O in bed. Band remaining N and K_2O in one or two applications during middle growth period. For mulched crops with subsurface irrigation, broadcast all P_2O_5, micronutrients, and 20 to 25% of N and K_2O in bed. Band remaining N and K_2O in grooves in bed surface (one band for twin row beds). For mulched, drip-irrigated crops, incorporate all P_2O_5, micronutrients and up to 20 to 25% of N and K_2O in bed. Inject remaining N and K_2O according to schedules in circular 1181 (Fla. Coop. Ext. Serv.). Soil test and fertilizer recommendations for lettuce, endive and escarole on mineral soils are given in Table 3.

For organic soils, band all P_2O_5 3 to 4 inches beneath rows in the bed. Broadcast all K_2O and micronutrients. About 50 lbs/A of supplemental N might be needed during cool, winter weather, or after leaching rain. Soil test results and fertilizer recommendations for lettuce, endive, and escarole on Histosol soils are given in Table 4.

PLANT TISSUE ANALYSIS

Plant tissue analysis information for lettuce, endive and escarole is given in Table 5. The analysis was done at the 8-leaf stage, using the oldest undamaged leaf.

IRRIGATION

Crops in the lettuce group require consistent levels of water for ET (see Chapter 8, *Principles and Practices of Irrigation Management for Vegetables,* Tables 4 to 6) near reference demand levels (see Chapter 8, Table 3) throughout the rapid growth and final development periods. Reductions in available water during these growth periods can result in reduced leaf development. Root systems may be very shallow, thus requiring frequent, steady applications of water during low rainfall, high demand periods.

Table 1. Lettuce, endive, and escarole varieties for commercial production.

Type	Variety
Lettuce	
Crisphead (Fig. 30-1)	Gator
	Raleigh
	Gulfstream
Romaine	Terrapin
	Snappy
Green Leaf (Fig. 30-2)	Two Star
Red Leaf	New Redfire
	Vulcan
Boston	Florida Butter Crisp (70882)
	Ermosa
	Margarita
Bibb	Floribibb
Endive	Frisan
	Marcant
	Salad King
Escarole (Fig. 30-3)	Full Heart NR 65
	Twinkle

This document is HS728, Horticultural Sciences Dept., UF/IFAS, Fla. Coop. Ext. Serv., November 2006

WEED MANAGEMENT

Herbicides labeled for weed control in lettuce, endive and escarole are listed in Table 6.

DISEASE MANAGEMENT

Chemicals approved for disease management are listed as follows:

Lettuce - Table 7
Endive and Escarole - Table 8.

INSECT MANAGEMENT

Insecticides approved for use on insects are listed as follows:

Lettuce - Table 9
Endive and Escarole - Table 10.

Table 2. Seeding and planting information for lettuce, endive, and escarole.

Planting dates	Crisphead	Butterhead	Romaine	Endive	Escarole
North Florida	Sept - Oct; Jan - Feb	Sept - Oct; Jan - Feb	Aug - Oct; Jan - Feb	Aug - Oct; Jan - Feb	Aug - Oct; Jan - Feb
Central Florida	Sept - Feb	Sept - Feb	Aug - Feb	Aug - Feb	Aug - Feb
South Florida	Sept - Feb	Sept - Feb	Sept - Mar	Sept - Mar	Sept - Mar
Seeding information					
Distance between rows (in)	18 - 30	18 - 30	18 - 30	18 - 30	18 - 30
Distance between plants (in)	8 - 12	9	12	14-16	14-16
Seeding depth (in)	0.25	0.25	0.25	0.25	0.25
Seed per acre (lb)	1-3	1-3	2-4	3-4	3-4
Days to maturity from seed[1]	70 - 95	60 - 80	60 - 80	60-80	60-80
Plant populations[2] (acre)	43,560	38,720	29,040	24,891	24,891

[1] These crops also can be transplanted and achieve faster maturity.
[2] Populations based on closest between and within row spacing.

Table 3. Soil test and fertilizer recommendations for lettuce, endive, and escarole on 4-foot beds on mineral soils.[1]

Target pH	N lb/A[2]	VL	L	M	H	VH	VL	L	M	H	VH
		P_2O_5[2] (lb/A/crop season)					K_2O (lb/A/crop season)				
Crisphead lettuce											
6.5	200	150	120	100	0	0	150	120	100	0	0
Leaf lettuce											
6.5	150	150	120	100	0	0	150	120	100	0	0
Endive, Escarole, Romaine											
6.5	200	150	120	100	0	0	150	120	100	0	0

[1] See Chapter 2 section on supplemental fertilizer application and best management practices, pg 11.

[2] Seeds and transplants may benefit from applications of a starter solution at a rate no greater than 10 to 15 lbs/acre for N and P_2O_5, and applied through the plant hole or near the seeds.

Table 4. Soil test and fertilizer recommendations for crisphead and leaf lettuce, endive, escarole, and romaine on Histosols. Target pH = 6.0 and N rate = 0 lb/A for all crops.

P and K index and fertilizer rates										
P index	3	6	9	12	15	18	21	24	27	30
P_2O_5 (lb/A)	200	175	150	125	100	75	50	25	0	0
K index	50	80	110	140	170	200				
K_2O (lb/A)	200	140	80	50	0	0				

Table 5. Plant tissue analysis at 8-leaf stage for lettuce, endive, escarole, and romaine. Dry wt. basis.

	N	P	K	Ca	Mg	S	Fe	Mn	Zn	B	Cu	Mo
Status	**Percent**						**Parts per million**					
Crisphead												
Deficient	<4.0	0.4	5.0	0.8	0.3	0.3	50	20	25	15	5	0.1
Adequate range	4.0 -5.0	0.4 -0.6	5.0 -7.0	0.8 -2.0	0.3 -0.5	0.3 -0.8	50 -150	20 -40	25 -50	15 -30	5 -10	0.1 -0.4
High	>5	0.6	7.0	2.0	0.5	0.8	150	40	50	30	10	0.4
Endive												
Deficient	<4.5	0.45	4.5	0.8	0.25	0.3	50	15	30	25	5	0.1
Adequate range	4.5 - 6.0	0.45-0.8	4.5 -6.0	0.8 - 4.0	0.25 -0.60	0.3 -0.8	50 - 150	15 -25	30 -50	25 -35	5 - 10	0.1 -0.4
High	>6.0	0.8	6.0	4.0	0.6	0.8	150	25	50	35	10	0.4
Escarole												
Deficient	<4.2	0.45	5.7	0.8	0.25	0.3	50	15	30	20	4	0.1
Adequate range	4.2 - 5.0	0.45 -0.6	5.7 -6.5	0.8 -2.2	0.25 -0.35	0.3 -0.8	50 -150	15 -25	30 -50	20 -30	4 - 6	0.1 -0.4
High	>5.0	0.6	6.5	2.2	0.35	0.8	150	25	50	30	6	0.4
Romaine												
Deficient	<5.0	0.35	5.0	0.8	0.25	0.3	50	15	20	30	5	0.1
Adequate range	5.0 - 6.0	0.35-0.8	5.0 -6.0	0.8 -3.0	0.25 -0.35	0.3 -0.8	50 -150	15 -25	20 -50	30 -45	5 -10	0.1 -0.4
High	>6.0	0.8	6.0	3.0	0.35	0.8	150	25	50	45	10	0.4

Table 6. Chemical weed controls: lettuce, endive and escarole.

Herbicide	Labeled crops	Time of application to crop	Rate (lbs. AI./Acre) Mineral	Muck
Benefin (Balan)	Lettuce (direct seeded)	Preplant incorporated	1.12 - 1.5	---
Remarks: Controls germinating annuals. Incorporate 2 to 3 inches within 8 hours. Not recommended for organic soils.				
Bensulide (Prefar 4E)	Leafy vegetables (Lettuce [head and leaf] endive, arugula, chervil, cress and [garden upland], dandelion, parsley, and radiccio)	Preplant Preemergence	5-6	--
Remarks: Preplant incorporate using power driven rotary cultivations or apply preemergence and incorporate with irrigation. Use pre-emergence only with lettuce to be irrigated up. Controls many grasses. Provides fair to good control of lambsquarter, purslane, and amaranths.				
Carfentrazone (Aim)	Leafy vegetables (All)	Preplant Directed-hooded Row-middles	0.031	0.031
Remarks: Aim may be applied as a preplant burndown treatment and/or as a post-directed hooded application to row middles for the burn-down of emerged broadleaf weeds. May be tank mixed with other registered herbicides. may be applied at up to 2 oz (0.031 lb ai). Use a quality spray adjuvant such as crop oil concentrate (coc) or non-ionic surfactant at recommended rates.				
Fluazifop (Fusilade DX)	Endive	Postemergence	0.188	0.188
Remarks: Controls actively growing grass weeds. A total of 48 oz. may be applied per season. Do not apply within 28 days of harvest for endive. Use a crop oil concentrate at 0.5 - 1% v/v or a non-ionic surfactant at 0.25 - 0.5% v/v in spray mixture. Consult the label for specific rates and grass growth stages for best control.				
Glyphosate (Roundup, Durango) Touchdown, Glyphomax)	Leafy vegetables	Chemical fallow Preplant, pre emergence, Pre transplant	0.3 - 1.0	
Remarks: Roundup, Glyphomax and Touchdown have several formulations. Check the label of each for specific labeling directions.				
Imazethapyr (Pursuit)	Lettuce, Endive, Escarole	Preemergence Postemergence	----- -----	0.015 - 0.03 0.015 - 0.03
Remarks: Third Party Registration (TPR, Inc.) only. Apply with ground equipment only at broadcast rates of 1 to 2 ounces material per acre preemergence and/or postemergence after 3-4 true leaf stage. Do not apply more than 2 applications per crop. A maximum of 4 ounces of product may be used per crop season and 6 ounces of product per acre per calendar year. Should be applied in 20 or more gallons of water per acre. Do not apply within 30 days of harvest. Potential for rotational crop damage is highly variable. Do not plant other crops within 45 days of application. Use of Pursuit on lettuce, endive, or escarole, without having a signed authorization and waiver and limitation of liability agreement is a misuse of the product.				

Table 6. Continued.

Herbicide	Labeled crops	Time of application to crop	Rate (lbs. AI./Acre) Mineral	Muck
Paraquat (Gramoxone Intron) (Firestorm)	Lettuce	Preemergence	0.63 - 0.94	0.63 - 0.94
Remarks: Controls emerged weeds. Apply prior to, during or after direct seeding, but before lettuce emerges. Use a non-ionic spreader.				
Paraquat (Gramoxone Intron)	Lettuce	Postemergence as a directed/ shielded spray	0.47	0.47
Remarks: A Special Local Needs 24(c) Label for Florida Only. Controls emerged weeds. Apply as a directed/shielded spray between rows when weeds are 1 to 6 inches tall, using 1.5 pts. per acre. Use a non-ionic spreader.				
Pelargonic Acid (Scythe)	Leafy vegetables (lettuce, endive, cilantio, cress)	Preplant Directed-Shielded	3-10% v/v	3-10% v/v
Remarks: Product is a contact non-selective, foliar applied herbicide. There is no residual activity. May be tank mixed with soil residual compounds. Consult the label for rates and other information.				
Pronamide (Kerb 50-W)	Lettuce, Endive, Escarole	Preemergence	1.0 - 1.5	---
Remarks: Controls germinating annuals. Overhead-irrigate briefly or incorporate 2 to 3 inches. Note precautions of planting non-registered or sensitive crops after application. Not recommended for organic soils.				
Sethoxydim (Poast)	Lettuce: Head, Leaf, Endive	Postemergence	0.188 - 0.28	0.188 - 0.28
Remarks: Controls actively growing grass weeds. A total of 3 pts. product per acre may be applied in one season. Do not apply within 30 days of harvest for head lettuce and 15 days of harvest for leaf lettuce and spinach. Apply in 5 to 20 gals. of water adding 2 pts. of crop oil concentrate per acre. Unsatisfactory results may occur if applied to grasses under stress. Use 0.188 lb. ai. (1 pt.) to seedling grasses and up to 0.28 lb. ai. (1.5 pts.) to perennial grasses emerging from rhizomes, etc. Consult label for grass species and growth stage for best control.				
Trifluralin (Treflan EC, Treflan 5) Treflan MFT, Trifluralin 4EC	Endive, Escarole, Radicchio	Preplant Incorporate	0.5	--
Remarks: Apply as a preplant incorporated treatment to mineral soils only. Consult label for application instructions.				

Table 7. Disease management for lettuce.

Chemical (a.i.)	FRAC Group[1]	Maximum Rate/Acre/ Application	Season	Min. Days to Harvest	Pertinent Diseases or Pathogens	Remarks[2]
Acrobat 50WP (Dimethomorph)	40	6.4 oz	32 oz	0	Downy mildew	Do not exceed 2 sequential and 5 total applications. Note rotational restrictions (see label)
Aliette 80WDG (Fosetyl Al)	33	5 lb	35 lb	3	Downy mildew	Do not mix with copper fungicides.
Amistar 80DF (Azoxystrobin)	11	5 oz	20 oz	0	Alternaria leaf spot, Cercospora leaf spot, Downy mildew, Powdery mildew, Septoria leaf spot	Do not exceed 1 sequential and 4 total applications of Amistar or other Qol fungicides.
Apron XL LS (Mefenoxam)	4	0.64 fl. oz./ 100 lb seed			Pythium seedling blight	Seed treatment only
Armicarb 100 (Potassium bicarbonate)		5 lb		0	Powdery mildew, Alternaria leaf spot, Septoria leaf spot, Gray mold	Do not exceed 5 lbs per 100 gallons of water. Spray solution within 12 hours of preparation.
Basic Copper 53 (Basic copper sulfate)	M1	3 lb			Downy mildew Bacterial leaf spot	

Table 7. Continued.

Chemical (a.i.)	FRAC Group[1]	Maximum Rate/Acre/ Application	Season	Min. Days to Harvest	Pertinent Diseases or Pathogens	Remarks[2]
Botran 75W (Dicloran)	14	5.33 lb	5.33 lb	14	Botrytis rot Sclerotinia diseases	Some leaf bronzing can occur but effect is temporary. See label for specifics on application timing and placement.
Cabrio EG (Pyraclostrobin)	11	16 oz	64 oz	0	Alternaria leaf spot, Cercospora leaf spot, Downy mildew, Powdery mildew, Septoria leaf spot	Do not exceed 2 sequential and 4 total applications of Cabrio or other QoI fungicides.
Champ 77 WP (Copper hydroxide)	M1	2 lb		2	Downy mildew Bacterial leaf spot	
Champ DP Dry Prill (Copper hydroxide)	M1	1.33 lb		1	Downy mildew Bacterial leaf spot	
Champ Formula 2 F (Copper hydroxide)	M1	1.33 pt		1	Downy mildew Bacterial leaf spot	
Contans WG (Coniothryium minitans)		6 lbs			Lettuce drop	Apply to soil surface and incorporate prior to, at planting, or at transplanting.
Dusting Sulfur – IAP (Sulfur)	M2	15 lb			Powdery mildew	Do not apply during periods of warm weather. Do not apply within 2 weeks of an oil spray.
Endura 70WG (Boscalid)	7	11 oz	22 oz	14	Lettuce drop, Rhizoctonia, Botrytis rot	Do not exceed 2 applications per crop. See label for timing of applications on direct-seeded and transplanted lettuce.
Fosphite (Potassium phosphite)	33	3 qt	18 qt		Downy mildew, Pythium, Rhizoctonia, Fusarium	Do not exceed 6 applications per crop. Caution should be used when applying in a management program including copper fungicides.
Helena Prophyt (Potassium phosphite)	33	4 pt	18 qt	0	Downy mildew, Pythium	Apply in a minimum spray volume of 30 GPA. Caution should be used when applying in a management program including copper fungicides.
Iprodione 4L AG (Iprodione)	2	2 pt	6 pt	14	Rhizoctonia bottom rot, Sclerotinia drop	Limit is 3 applications per crop. See label for timing and placement.
Kaligreen (Potassium bicarbonate)		3 lb		1	Powdery mildew	Apply in a minimum spray volume of 25 GPA.
Kumulus DF (Sulfur)	M2	6 lb			Powdery mildew	Avoid application when temperatures exceed 90 F, as phytotoxicity may result. Apply when disease first appears and at 14-day intervals or as needed.
Maneb 80WP (Maneb)	M3	2lb	12 lb	10	Downy mildew	
Maneb 75DF (Maneb)	M3	2lb	12.8 lb	10	Downy mildew	
Manex 4F (Maneb)	M3	1.6 qt	9.6 qt	10	Downy mildew	
Maxim 4FS (Fludioxonil)	12	0.16 fl oz/ 100 lbs of seed			Various seedling diseases	Seed treatment only.

Table 7. Continued.

Chemical (a.i.)	FRAC Group[1]	Maximum Rate/Acre/ Application	Season	Min. Days to Harvest	Pertinent Diseases or Pathogens	Remarks[2]
Micro Sulf (Sulfur)	M2	6 lb			Powdery mildew	Do not apply during periods of warm weather. Do not apply within 2 weeks of an oil spray.
Micronized Gold (Sulfur)	M2	5 lb			Powdery mildew, Rust	Do not apply during periods of warm weather. Do not apply within 2 weeks of an oil spray.
Microthiol Disperss (Sulfur)	M2	10 lb			Powdery mildew	Do not apply during periods of warm weather. Do not apply within 2 weeks of an oil spray.
Milstop (Potassium bicarbonate)		5 lb			Downy mildew Powdery mildew	Do not store unused spray solution. Apply in sufficient volume to get adequate crop coverage.
Nordox (Cuprous oxide)		2 lb			Downy mildew Bacterial leaf spot	
Nordox 75WG (Cuprous oxide)		2.5 lb			Downy mildew Bacterial leaf spot	
Nu-Cop 3L (Copper hydroxide)	M1	2.66 pt			Downy mildew Bacterial leaf spot	
Nu-Cop 50DF (Copper hydroxide)	M1	2.0 lb			Downy mildew Bacterial leaf spot	
Nu-Cop 50WP (Copper hydroxide)	M1	2.0 lb			Downy mildew Bacterial leaf spot	
Oxidate (Hydrogen dioxide)		128 fl oz		0		
Phostral (Potassium phospite)	33	5 pt	35 pt	0	Downy mildew	Do not exceed 7 applications per season. See label regarding cautions regarding conditions during application to avoid possible phytotoxicity.
PlantShield HC (Tricoderma harzianum)		5 oz				Foliar and root fungicide. Use as a drench. (see label for restrictions).
Previcur Flex (Propamacarb)	U	2 pt	8 pt	2	Downy mildew	Avoid sequential applications for same pathogen. Use in IPM program with fungicides of dissimilar group. Do not rotate to root or leafy vegetables within 30 days of harvest
Quadris (Azoxystrobin)	11	15.4 fl oz	2.88 qt	0	Alternaria leaf spot, Cercospora leaf spot, Downy mildew, Powdery mildew, Septoria leaf spot	Do not exceed 1 sequential and 4 total applications of Quadris or other QoI fungicides. See label for cautions regarding tank mixtures to avoid possible phytoxicity.
Reason 500SC (Fenamidone)	11	8.2 fl oz	24.6 fl oz	2	Downy mildew	Do not exceed 1 sequential application of Reason or other QoI fungicides before alternating to a different fungicide group. See label for crop rotation restrictions.
Rhapsody (Bacillus subtilis)		6 qt		0	Downy mildew Powdery mildew Sclerotinia drop	For suppression or use as a preventative in a program with other registered fungicides. For Sclerotinia, apply as a banded spray (see label for placement and timings).

Table 7. Continued.

Chemical (a.i.)	FRAC Group[1]	Maximum Rate/Acre/ Application	Season	Min. Days to Harvest	Pertinent Diseases or Pathogens	Remarks[2]
Ridomil Gold EC (Mefenoxam)	4	2 pts			Pythium seedling diseases	Apply at seeding in a 7-12" band on soil over seed furrow
Ridomil Gold GR (Mefenoxam)	4	40 lb			Pythium seedling diseases	See label for specifics regarding preplant incorporated applications and surface applications at the time of planting.
RootShield Granules (Tricoderma harzianum)		12 lb				Apply in-furrow.
Rovral 4F (Iprodione)	2	2 pt	6 pt	14	Rhizoctonia bottom rot Sclerotinia drop	Limit is 3 applications per crop. See label for details on application timing and placement.
Serenade Max (Bacillus subtilis)		3 lb		0	Downy mildew Powdery mildew Sclerotinia drop	For suppression or use as a preventative in a program with other registered fungicides. For Sclerotinia, apply as a banded spray (see label for placement and timings).
Sonata (Bacillus pumilus)		4 qt		0	Downy mildew Powdery mildew	For suppression or use as a preventative in a program with other registered fungicides.
Sporan (Clove, Rosemary, and Thyme Oil)		1.5 qt		0	Botrytis gray mold Powdery mildew	Sporan is a concentrated oil-based product. It requires the use of an approved adjuvant to improve spreading and sticking. OMRI listed.
Stretch (Copper hydroxide)	M1	4 pt			Downy mildew Bacterial leaf spot	
Sulfur 90W (Sulfur)	M2	6 lb			Powdery mildew	Do not apply during periods of warm weather. Do not apply within 2 weeks of an oil spray.
Tanos (Cymoxanil, Famoxadone)	27, 11	8 oz	24 oz	3	Downy mildew	Do not exceed 1 sequential and 3 total applications of Tanos or other QoI fungicides.
Telone EC (1,3, dichloropropene)		18 gal			Nematode and soilborne diseases	Apply as a soil fumigant. Restricted use pesticide. See label regarding specific application instructions.
Tenn-Cop 5E (Copper tallate)	M1	3 pt			Downy mildew Bacterial soft rot	Full season use at high rate may result in marginal yellowing. Do not apply in a solution with a pH of less than 6.5.
Topaz (Potassium phosphite)	33	3 qt	18 qt	0	Downy mildew	
Trilogy (Neem Oil)		2 gal				Apply at a rate of 0.5% - 1.0% in 25 to 100 gallons of water per acre or at 2 pt in a minimum of 5 GPA for low volume applications.
Ultra Flourish (Mefenoxam)	4	4 pt			Pythium seedling disease	See label for specifics regarding preplant incorporated applications and surface applications at the time of planting.

Table 7. Continued.

Chemical (a.i.)	FRAC Group[1]	Maximum Rate/Acre/ Application	Season	Min. Days to Harvest	Pertinent Diseases or Pathogens	Remarks[2]

[1] Fungicide group (FRAC Code): Numbers (1-37) and letters (M, U, P) are used to distinguish the fungicide mode of action groups. All fungicides within the same group (with same number or letter) indicate same active ingredient or similar mode of action. This information must be considered for the fungicide resistance management decisions. M = Multi site inhibitors, fungicide resistance risk is low; U = Recent molecules with unknown mode of action; P = host plant defense inducers. Source: http://www.frac.info/ (FRAC = Fungicide Resistance Action Committee). Be sure to read a current product label before applying any chemicals,

[2] Information provided in this table applies only to Florida. Be sure to read a current product label before applying any chemical. The use of brand names and any mention or listing of commercial products or services in the publication does not imply endorsement by the University of Florida Cooperative Extension Service nor discrimination against similar products or services not mentioned.

Table 8. Disease management for endive and escarole.

Chemical	Maximum Rate/Acre/ Application	Maximum Rate/Acre/ Crop	Minimum Days to Harvest	Pertinent Diseases	Select Remarks
Maneb 75DF	2 lbs	12.8 lbs		Downy mildew, Alternaria leaf spot	
Maneb 80WP	2 lbs	12 lbs	10	Downy mildew, Alternaria leaf spot	
Manex 4F	1.6 qts	9.6 qts	10	Downy mildew, Alternaria leaf spot	
Ridomil Gold 4EC	2 pts/trt A		10	Pythium blight	Apply at seeding in a 7-12" band on soil after seeding.
Botran 75W	2 2/3 lbs	5 1/3 lbs	14	Botrytis Sclerotinia	Some leaf bronzing may occur. Limit is 2 application/crop
Botran 5F	1.6 qts	3.2 qts	14	Botrytis Sclerotinia	Some leaf bronzing may occur. Limit is 2 applications/crop
Amistar 80 DF	5 ozs	20 ozs	0	Downy mildew Rhizoctonia others-see label	Limit is 1 sequential and 4 applications per crop
Champion Formula 2 4.6 F	1 1/3 pts			Bacterial disease	

Table 9. Insecticides approved for use on insects attacking lettuce.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code[1]	Notes
Admire 2 F (imidacloprid)	10-24 fl oz	12	21	aphids, whiteflies	4A	Do not apply more than 0.38 lb ai per acre per year.
Admire Pro	4.4-10.5 fl oz					
Agree WG (Bacillus thuringiensis subspecies aizawai)	0.5-2.0 lb	4	0	lepidopteran larvae (caterpillar pests)	11B1	Apply when larvae are small for best control. Can be used in greenhouse. OMRI-listed[2].
***Agri-Mek 0.15 EC** (abamectin)	8-16 fl oz	12	7	Liriomyza leafminers	6	No more than 2 sequential applications.
***Ambush 25W** (permethrin)	6.4-12.8 oz	12	1	beet armyworm, cabbage looper, corn earworm, cutworms, fall armyworm, leafhoppers, leafminers	3	Do not apply more than 2.0 lb ai/acre per season. (128 oz)
***Ammo 2.5 EC** (cypermethrin)	2.5-5 fl oz	12	5	armyworms, corn earworm, crickets, cucumber beetles, cutworms, flea beetles, leafhoppers, loopers, Lygus bug, saltmarsh caterpillar, stink bugs, thrips	3	Head lettuce only. Maximum of 30 oz/acre per season.
***Asana XL (0.66 EC)** (esfenvalerate)	4.8-9.6 fl oz	12	7	beet armyworm (aids in control), cabbage looper, Heliothis spp.	3	Head lettuce only. Do not apply more than 0.35 lb a.i. per acre per season.
Assail 70WP (acetamprid)	0.8-1.7 oz	12	7	aphids, whiteflies	4A	Begin applications for whiteflies when first adults are noticed. Do not apply more than 5 times per season or apply more often than every 7 days.
Assail 30 SG	2.0-4.0 oz					
Avaunt (indoxacarb)	2.5-6.0 oz	12	3	beet armyworm, cabbage looper, corn earworm	22	Do not apply more than 24 ounces of product per acre per crop.

Table 9. Continued.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code[1]	Notes
Aza-Direct (azadirachtin)	1-2 pts, up to 3.5, if needed	4	0	aphids, beetles, caterpillars, leafhoppers, leafminers, mites, stink bugs, thrips, weevils, whiteflies	26	Antifeedant, repellant, insect growth regulator. OMRI-listed.
Azatin XL (azadirachtin)	5-21 fl oz	4	0	aphids, beetles, caterpillars, leafhoppers, leafminers, thrips, weevils, whiteflies	26	Antifeedant, repellant, insect growth regulator.
***Baythroid 2** (cyfluthrin)	0.8-3.2 fl oz	12	0	beet armyworm (1st and 2nd instars), cabbage looper, corn earworm, cutworms, flea beetles, grasshoppers, potato leafhopper, saltmarsh caterpillar, thrips, vegetable weevil, yellowstriped armyworm	3	Apply no more than 4 times per season.
Biobit HP (Bacillus thuringiensis subspecies kurstaki)	0.5-2.0 lb	4	0	caterpillars (will not control large armyworms)	11B2	Treat when larvae are young. Good coverage is essential. Can be used in the greenhouse. OMRI-listed.
BotaniGard 22 WP, ES (Beauveria bassiana)	**WP:** 0.5-2 lb/100 gal **ES:** 0.5-2 qts/100 gal	4	0	aphids, thrips, whiteflies	--	May be used in greenhouses. Contact dealer for recommendations if an adjuvant must be used. Not compatible in tank mix with fungicides.
***Capture 2EC** (bifenthrin)	2.1-6.4 fl oz	12	7	aphids, armyworms, carmine mite, corn earworm, cucumber beetle, cutworms, flea beetles, leafhoppers, Lygus spp., saltmarsh caterpillar, stink bug spp., twospotted spider mite, whiteflies	3	Head lettuce only.
Confirm 2F (tebufenozide)	6-8 fl oz	4	7	armyworms, cabbage looper, garden webworm	18	Do not exceed 56 ounces of product per acre per season.
Courier 70WP, 40SC (buprofezin)	**70WP:** 6-9 oz **40SC:** 9-13.6 fl oz	12	7	whitefly nymphs	16	Insect growth regulator. Do not make more than 2 applications per season per crop. Allow 7 days between applications. Do not plant food crops except those on the label within 120 days following application.
Crymax WDG (Bacillus thuringiensis subspecies kurstaki)	0.5-2.0 lb	4	0	caterpillars	11B2	Use high rate for armyworms. Treat when larvae are young.
Deliver (Bacillus thuringiensis subspecies kurstaki)	0.25-1.5 lb	4	0	caterpillars	11B2	Use higher rates for armyworms. OMRI-listed[2].

Table 9. Continued.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code[1]	Notes
***Diazinon 4 E, *50W** (diazinon)	**foliar: AG500, 4E:** 0.5-1 pt **50W:** 0.5-1 lb	24	14 (foliar)	aphids, leafminers	1B	Do not apply more than 5 times.
	preplant: AG500, 4E: 1-4 qts **50W:** 2-8 lb	24	preplant	cutworms, mole crickets, wireworms	1B	See label.
Dimethoate 4 EC, 2.67 (dimethoate)	**4EC:** 0.5 pt **2.67:** 0.75	48	14 = leaf	aphids, leafhoppers, leafminers	1B	Leaf lettuce only, not for head lettuce.
DiPel DF (Bacillus thuringiensis subspecies kurstaki)	0.5-2.0 lb	4	0	caterpillars	11B2	Treat when larvae are young. Good coverage is essential. Can be used in greenhouse. OMRI-listed.
***Di-Syston 8 EC** (disulfoton)	1-2 pt	48	60	aphids, leafhoppers, mites, root aphids, thrips	1B	Do not apply to transplanted lettuce.
Endosulfan 3EC (endosulfan)	1-1.33 qts	24	14	aphids, armyworms, cabbage looper, leafhoppers, whiteflies	2	**Head lettuce** - no more than 3 applications after thinning. **Leaf lettuce** - no more than two applications per year.
Entrust (spinosad)	0.5-3 oz	4	1	armyworms, cabbage looper, leafminers, thrips	5	See label for resistance management recommendations. Do not apply more than 9 oz per acre per crop, or more than 3 times in 21 days. OMRI-listed[2].
Extinguish ((S)-methoprene)	1-1.5 lb	0	0	fire ants	7A	Slow-acting IGR (insect growth regulator). Best applied early spring and fall where crop will be grown. Colonies will be reduced after three weeks and eliminated after 8 to 10 weeks. May be applied by ground equipment or aerially.
Fulfill (pymetrozine)	2.75 oz	12	7	aphids, suppression of whiteflies	9B	Do not exceed 5.5 oz product per acre per season.
Intrepid 2F (methoxyfenozide)	4-16 fl oz	4	1	armyworms, cabbage looper, webworms	18	Do not apply more than 64 fl oz/ acre per season.
Javelin WG (Bacillus thuringiensis subspecies kurstaki)	0.12-1.5 lb	4	0	most caterpillars, but not Spodoptera species (armyworms)	11B2	Treat when larvae are young. Thorough coverage is essential. OMRI-listed[2].
Kryocide (cryolite)	8-20 lb	12	14	armyworms, cabbage looper, corn earworm, tobacco budworm	9A	Do not apply more than 160 1b/ acre/season.
***Lannate LV; *SP** (methomyl)	**LV:** 0.75-3 pt **SP:** 0.25-1.0 lb	48	7 or 10, depending on rate used	aphids, aster leafhopper, beet armyworm, cabbage looper, corn earworm, thrips, variegated cutworm	1A	

Table 9. Continued.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code[1]	Notes
***Larvin 3.2** (thiodicarb)	16-30 fl oz	48	14	armyworms, beet armyworm, cabbage looper, corn earworm, fall armyworm, tomato fruitworm, southern armyworm	1A	Do not exceed 1.5 lb active ingredient per acre per season (60 fl oz).
Lepinox WDG (Bacillus thuringiensis subspecies kurstaki)	1.0-2.0 lb	12	0	for most caterpillars, including beet armyworm (see label)	11B2	Treat when larvae are small. Thorough coverage is essential.
Malathion 8F (malathion)	2 pt	12	head - 7 leaf - 14	aphids, cabbage looper, leafhoppers, mites	1B	Can be used in greenhouse.
***MSR Spray Concentrate** (oxydemeton-methyl)	1.5-2 pt	48	21	aphids, mites	1B	For head lettuce only.
M-Pede 49% Soap, insecticidal	1-2% V/V	12	0	aphids, leafhoppers, mites, plant bugs, thrips, whiteflies	--	OMRI-listed[2].
***Mustang Max** (zeta-cypermethrin)	2.24-4.0 oz	12	5	armyworms, corn earworm, crickets, cucumber beetles, cutworms, flea beetles, leafhoppers, loopers, saltmarsh caterpillar, stink bugs	3	Head lettuce only.
Neemix 4.5 EC (azadirachtin)	4-16 fl oz	12	0	aphids, armyworms, cabbage looper, cutworms, leafminers, thrips, whiteflies	26	OMRI-listed[2].
Oberon 2SC (spiromesifen)	7.0-8.5 fl oz	12	7	whiteflies	23	Maximum amount per crop: 25.5 fl oz. No more than 3 applications.
Orthene 75 S (acephate)	0.67-1.33 lb	24	21	aphids, armyworms, aster leafhopper, cabbage looper	1B	Winter crops in Florida. Head lettuce only.
***Pounce 3.2 EC** (permethrin)	2-8 oz	12	1	aphids, armyworms, beet armyworm, cabbage looper, corn earworm, cutworms, fall armyworm, leafhoppers, leafminers, southern armyworm, tobacco budworm	3	
***Proaxis Insecticide** (gamma-cyhalothrin)	1.92-3.84 fl oz	24	1	Aphids(1), armyworm, beet armyworm(2), cabbage looper, corn earworm, cutworm, fall armyworm(2), flea beetles, grasshoppers, green cloverworm, leafhoppers, meadow spittlebug, southern armyworm, spider mites(1), stink bugs, tobacco budworm, vegetable weevil (adult), whiteflies(1)	3	(1) Suppression only. (2) First and second instars only. Do not apply more than 2.4 pints per acre per season.
***Proclaim** (emamectin benzoate)	2.4-4.8 oz	48	7	beet armyworm, corn earworm, fall armyworm, Liriomyza leafminers (suppression), loopers, tobacco budworm	6	Do not make more than 2 sequential applications without rotation to another product with a different mode of action.

Table 9. Continued.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code[1]	Notes
Provado 1.6 F (imidacloprid)	3.8 oz	12	7	aphids, flea beetles, whiteflies	4A	
Pyrellin EC (pyrethrin + rotenone)	1-2 pt	12	12 hours	aphids, beet webworm, cabbage looper, cucumber beetle, flea beetles, leafhoppers, leafminers, loopers, lygus bugs, mites, plant bugs, stink bugs, thrips, vegetable weevil, whiteflies	3, 21	
Sevin 80S, XLR, 4F (carbaryl)	**80S:** 0.63-2.5 lb **XLR, 4F:** 0.5-2.0 qt	12	14	armyworms, aster leafhopper, corn earworm, fall armyworm, flea beetles, leafhoppers, lygus bugs, spittlebugs, stink bugs, tarnished plant bug	1A	Repeat as needed, up to 5 times, at least 7 days apart.
SpinTor 2 SC (spinosad)	1.5-10 fl oz	4	1	armyworms, cabbage looper, leafminers (Liriomyza spp.), thrips	5	Do not apply more than 29 fl oz per acre per crop.
Sun Spray 98.8%, JMS Stylet-Oil, others Oil, insecticidal	3-6 qts (JMS)	4	0	leafhoppers, leafminers, mites, thrips, whiteflies	--	Organic Stylet-Oil is OMRI-listed[2].
***Telone C-35** (dichloropropene + chloropicrin)	See label	5 days - See label	preplant	symphylans, wireworms	--	See supplemental label for use restrictions in south and central Florida.
***Telone II** (dichloropropene)						
Trigard (cryomazine)	2.66 oz	12	7 days	leafminers	17	Limited to six applications for head lettuce and five applications for leaf lettuce.
Trilogy (extract of neem oil)	0.5-2.0% V/V	4	0	aphids, mites, suppression of thrips and whiteflies	26	Apply morning or evening to reduce potential for leaf burn. Toxic to bees exposed to direct treatment. OMRI-listed.
Venom (dinotefuran)	**foliar:** 1-3 oz **soil:** 5-6 oz	12	**foliar** - 7 **soil** - 21	green peach aphid, leafhoppers, leafminers, potato aphid, whiteflies	4A	Do not apply more than 6 oz per acre per season (foliar) or 12 oz per acre per season (soil). Do not use both application methods.
***Warrior** (lambda-cyhalothrin)	1.92-3.84 fl oz	24	1	aphids(1), armyworms, beet armyworm, cabbage looper, corn earworm, cutworms, fall armyworm, flea beetles, grasshoppers, leafhoppers, mites, plant bugs, saltmarsh caterpillar, southern armyworm, spittlebugs, stink bugs, tobacco budworm, vegetable weevil	3	Head and leaf. Do not apply more than 0.3 lb ai/acre per season. (1) Suppression only.
Xentari DF (Bacillus thuringiensis subspecies aizawai)	0.5-2.0 lb	4	0	caterpillars	11B1	Treat when larvae are young. Thorough coverage is essential. May be used in the greenhouse. Can be used in organic production.

Table 9. Continued.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code[1]	Notes

The pesticide information presented in this table was current with federal and state regulations at the time of revision. The user is responsible for determining the intended use is consistent with the label of the product being used. Use pesticides safely. Read and follow label instructions.

[1] Mode of Action codes for vegetable pest insecticides from the Insecticide Resistance Action Committee (IRAC) Mode of Action Classification v.3.3 October 2003. 1A. Acetylcholine esterase inhibitors, Carbamates 1B. Acetylcholine esterase inhibitors, Organophosphates

2A. GABA-gated chloride channel antagonists
3. Sodium channel modulators
4A. Nicotinic Acetylcholine receptor agonists/antagonists, Neonicotinoids
5. Nicotinic Acetylcholine receptor agonists (not group 4)
6. Chloride channel activators
7A. Juvenile hormone mimics, Juvenile hormone analogues
7D. Juvenile hormone mimics, Pyriproxifen
9A. Compounds of unknown or non-specific mode of action (selective feeding blockers), Cryolite
9B. Compounds of unknown or non-specific mode of action (selective feeding blockers), Pymetrozine
11B1. Microbial disruptors of insect midgut membranes, B.t. var aizawai
11B2. Microbial disruptors of insect midgut membranes, B.t. var kurstaki
12B. Inhibitors of oxidative phosphorylation, disruptors of ATP formation, Organotin miticide
15. Inhibitors of chitin biosynthesis, type 0, Lepidopteran
16. Inhibitors of chitin biosynthesis, type 1, Homopteran
17. Inhibitors of chitin biosynthesis, type 2, Dipteran
18. Ecdysone agonist/disruptor
20. Site II electron transport inhibitors
21. Site I electron transport inhibitors
22. Voltage-dependent sodium channel blocker
23. Inhibitors of lipid biosynthesis
25. Neuroactive (unknown mode of action)
26. Unknown mode of action, Azadirachtin

[2] OMRI listed: Listed by the Organic Materials Review Institute for use in organic production.

*** Restricted Use Only.**

Table 10. Selected insecticides approved for use on insects attacking endive and escarole.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code[1]	Notes
Admire 2F (imidacloprid)	10-24 fl oz	12	21	aphids, whiteflies	4A	Do not apply more than 0.38 lb ai per acre per year.
Admire Pro	4.4-10.5 fl oz					
Agree WG (Bacillus thuringiensis subspecies aizawai)	0.5-2.0 lb	4	0	lepidopteran larvae (caterpillar pests)	11B1	Apply when larvae are small for best control. OMRI-listed[2].
***Agri-Mek 0.15EC** (abamectin)	8-16 fl oz	12	7	Liriomyza leafminers, spider mites	6	No more than 2 sequential applications. Maximum of 48 oz per acre per season.
***Ambush 25W** (permethrin)	6.4-12.8 oz	12	1	beet armyworm, cabbage looper, corn earworm, cutworms, fall armyworm, leafhoppers, leafminers	3	Do not apply more than 2.0 lb ai/acre per season. (128 oz)
Assail 70WP (acetamiprid)	0.8-1.7 oz	12	7	aphids, whiteflies	4A	Do not apply more than 5 times per season or more often than every 7 days.
Assail 30 SG	2.0-4.0 oz					
Aza-Direct (azadirachtin)	1-2 pts, up to 3.5, if needed	4	0	aphids, beetles, caterpillars, leafhoppers, leafminers, mites, stink bugs, thrips, weevils, whiteflies	26	Antifeedant, repellent, insect growth regulator. OMRI-listed[2].
Azatin XL (azadirachtin)	5-21 fl oz	4	0	aphids, beetles, caterpillars, leafhoppers, leafminers, thrips, weevils, whiteflies	26	Antifeedant, repellent, insect growth regulator.
Baythroid 2 (cyfluthrin)	0.8-3.2 fl oz	12	0	beet armyworm (1st and 2nd instars), cabbage looper, corn earworm, cutworms, flea beetles, grasshoppers, potato leafhopper, saltmarsh caterpillar, thrips, vegetable weevil, yellowstriped armyworm	3	Apply no more than 4 times per season.
Biobit HP (Bacillus thuringiensis subspecies kurstaki)	0.5-2.0 lb	4	0	caterpillars (will not control large armyworms)	11B2	Treat when larvae are young. Good coverage is essential. Can be used in the greenhouse. OMRI-listed[2].
BotaniGard 22 WP, ES (Beauveria bassiana)	**WP:** 0.5-2 lb/100 gal **ES:** 0.5-2 qts/100 gal	4	0	aphids, thrips, whiteflies	--	May be used in greenhouses. Contact dealer for recommendations if an adjuvant must be used. Not compatible in tank mix with fungicides.
Confirm 2F (tebufenozide)	6-8 fl oz	4	7	armyworms, cabbage looper, garden webworm	18	Do not exceed 56 ounce of product per season.
Crymax WDG (Bacillus thuringiensis subspecies kurstaki)	0.5-2.0 lb	4	0	caterpillars	11B2	Use high rate for armyworms. Treat when larvae are young.

Table 10. Continued.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code[1]	Notes
Deliver (Bacillus thuringiensis subspecies kurstaki)	0.25-1.5 lb	4	0	caterpillars	11B2	Use higher rates for armyworms. OMRI-listed[2].
Dimethoate 4 EC, 2.67 (dimethoate)	**4EC:** 0.5 pt **2.67:** 0.75 pt	48	14	aphids, leafhoppers, leafminers	1B	
***Diazinon, * 4 EC, *50 W** (diazinon)	**AG500, 4EC:** 0.5-1 pt **50W:** 0.5-1 lb	24	14	aphids, leafminers	1B	Limited to 5 applications.
	preplant - AG500, 4EC: 1-4 qts **50W:** 2-8 lb	24	preplant	cutworms, mole crickets, wireworms	1B	See label.
DiPel DF (Bacillus thuringiensis subspecies kurstaki)	0.5-2.0 lb	4	0	caterpillars	11B2	Treat when larvae are young. Good coverage is essential. Can be used in greenhouse. OMRI-listed[2].
Entrust (spinosad)	0.5-3.0 oz	4	1	armyworms, cabbage looper, leafminers, thrips	5	Do not apply more than 9 oz per acre per crop. See label for resistance management recommendations. OMRI-listed[2].
Extinguish ((S)-methoprene)	1-1.5 lb	4	0	fire ants	7A	Slow-acting IGR (insect growth regulator). Best applied early spring and fall where crop will be grown. Colonies will be reduced after three weeks and eliminated after 8 to 10 weeks.
Fulfill (pymetrozine)	2.75 oz	12	7	aphids, suppression of whiteflies	9B	Do not exceed 5.5 oz product per acre per season.
Intrepid 2F (methoxyfenozide)	4-16 fl oz	4	1	armyworms, cabbage looper	18	Do not apply more than 64 fl oz/ acre per season.
Javelin WG (Bacillus thuringiensis subspecies kurstaki)	0.12-1.50 lb	4	0	most caterpillars, but not Spodoptera species (armyworms)	11B2	Treat when larvae are young. Thorough coverage is essential. OMRI-listed[2].
***Lannate LV; *SP** (methomyl)	**LV:** 1.5-3.0 pt **SP:** 0.5-1.0 lb	48	10	beet armyworm	1A	
***Larvin 3.2** (thiodicarb)	16-30 fl oz	48	14	armyworms, beet armyworm, cabbage looper, corn earworm, fall armyworm, tomato fruitworm, southern armyworm	1A	Do not exceed 1.5 lb active ingredient per acre per season. (60 fl oz)
Lepinox WDG (Bacillus thuringiensis subspecies kurstaki)	1.0-2.0 lb	12	0	most caterpillars, including beet armyworm (see label)	11B2	Treat when larvae are small. Thorough coverage is essential.
Malathion 8F (malathion)	2 pt	12	7	aphids, leafhoppers, mites	1B	Can be used in greenhouse.
M-Pede 49% EC Soap, insecticidal	1-2% V/V	12	0	aphids, leafhoppers, mites, plant bugs, thrips, whiteflies	--	OMRI-listed[2].

Table 10. Continued.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code[1]	Notes
Neemix 4.5 (azadirachtin)	4-16 fl oz	12	0	aphids, armyworms, cabbage looper, cutworms, leafminers, thrips, whiteflies	26	OMRI-listed[2].
Oberon 2SC (spiromesifen)	7.0-8.5 fl oz	12	7	whiteflies	23	Maximum amount per crop: 25.5 fl oz. No more than 3 applications.
***Pounce 3.2 EC** (permethrin)	2-8 oz	12	1	aphids, armyworms, beet armyworm, cabbage looper, corn earworm, cutworms, fall armyworm, leafhoppers, leafminers	3	
***Proclaim** (emamectin benzoate)	2.4-4.8 oz	48	7	beet armyworm, corn earworm, fall armyworm, loopers, tobacco budworm, suppression of leafminers	6	Do not apply more than 28.8 oz/acre per season.
Provado 1.6F (imidacloprid)	3.8 oz	12	7	aphids, flea beetles, whiteflies	4A	
Pyrellin EC (pyrethrin + rotenone)	1-2 pt	12	12 hours	aphids, flea beetles, leafhoppers, leafminers, loopers, Lygus bug, mites, plant bugs, stink bugs, thrips, whiteflies	3	
Sevin 80S, XLR, 4F (carbaryl)	**80S:** 0.63-2.5 lb **XLR, 4F:** 0.5-2.0 qt	12	14	armyworms, corn earworm, fall armyworm, flea beetles, harlequin bugs, leafhoppers, Lygus bug, spittlebugs, stink bugs, tarnished plant bug	1A	
SpinTor 2 SC (spinosad)	1.5-10 fl oz	4	1	armyworms, cabbage looper, leafminers (Liriomyza spp.), thrips	5	Do not apply more than 29 fl oz per acre per crop.
***Telone C-35** (dichloropropene + chloropicrin)	See label	5 days - See label	preplant	symphylans, wireworms	--	See supplemental label for use restriction in south and central Florida.
***Telone II** (dichloropropene)						
Trigard (cryomazine)	2.66 oz	12	7	leafminers	17	Do not apply more than 6 times per crop.
Trilogy (extract of neem oil)	0.5-2.0% V/V	4	0	aphids, mites, suppression of thrips and whiteflies	26	Apply morning or evening to reduce potential for leaf burn. Toxic to bees exposed to direct treatment. OMRI-listed[2].
Venom (dinotefuran)	**foliar:** 1-3 oz **soil:** 5-6 oz	12	**foliar** - 7 **soil** - 21	green peach aphid, leafhoppers, leafminers, potato aphid, whiteflies	4A	Do not apply more than 6 oz per acre per season (foliar) or12 oz per acre per season (soil). Do not use both methods of application.
Xentari DF (Bacillus thuringiensis subspecies aizawai)	0.5-2.0 lb	4	0	caterpillars	11B1	Treat when larvae are young. Thorough coverage is essential. May be used in the greenhouse. Can be used in organic production.

Table 10. Continued.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code[1]	Notes

The pesticide information presented in this table was current with federal and state regulations at the time of revision. The user is responsible for determining the intended use is consistent with the label of the product being used. Use pesticides safely. Read and follow label instructions.

[1] Mode of Action codes for vegetable pest insecticides from the Insecticide Resistance Action Committee (IRAC) Mode of Action Classification v.3.3 October 2003. 1A. Acetylcholine esterase inhibitors, Carbamates 1B. Acetylcholine esterase inhibitors, Organophosphates

2A. GABA-gated chloride channel antagonists
3. Sodium channel modulators
4A. Nicotinic Acetylcholine receptor agonists/antagonists, Neonicotinoids
5. Nicotinic Acetylcholine receptor agonists (not group 4)
6. Chloride channel activators
7A. Juvenile hormone mimics, Juvenile hormone analogues
7D. Juvenile hormone mimics, Pyriproxifen
9A. Compounds of unknown or non-specific mode of action (selective feeding blockers), Cryolite
9B. Compounds of unknown or non-specific mode of action (selective feeding blockers), Pymetrozine
11B1. Microbial disruptors of insect midgut membranes, B.t. var aizawai
11B2. Microbial disruptors of insect midgut membranes, B.t. var kurstaki
12B. Inhibitors of oxidative phosphorylation, disruptors of ATP formation, Organotin miticide
15. Inhibitors of chitin biosynthesis, type 0, Lepidopteran
16. Inhibitors of chitin biosynthesis, type 1, Homopteran
17. Inhibitors of chitin biosynthesis, type 2, Dipteran
18. Ecdysone agonist/disruptor
20. Site II electron transport inhibitors
21. Site I electron transport inhibitors
22. Voltage-dependent sodium channel blocker
23. Inhibitors of lipid biosynthesis
25. Neuroactive (unknown mode of action)
26. Unknown mode of action, Azadirachtin

[2] OMRI listed: Listed by the Organic Materials Review Institute for use in organic production.

* Restricted Use Only.