

Chapter 12.

Lettuce, Endive, Escarole Production in Florida

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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.

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

Type	Variety		
Lettuce	Crisphead (Fig. 12-1)	Gator	Raleigh
		Gulfstream	
Romaine (green)	Concept		Terrapin
	Kalura		Snappy
	Meddallion		
Romaine (red)	Outredeous		Rosalita
Green Leaf (Fig. 12-1)	Green Saladbowl		Tropicana
	Green Star		Two Star
Red Leaf	Galactic		Red Saladbowl
	New Red Fire		Vulcan
Oakleaf (green)	Royal Oak		
Oakleaf (red)	Ferrari		
Summer Crisp (red)	Cherokee		
Boston	Florida Butter Crisp		Margarita
	Ermosa		
Bibb	Floribibb		
Endive	Frisan		Salad King
	Marcant		
Escarole (Fig. 12-3)	Full Heart NR 65		Twinkle

IRRIGATION

Crops in the lettuce group require consistent levels of water for ET (see Chapter 3, *Principles and Practices of Irrigation Management for Vegetables*, Tables 4 to 6) near reference demand levels (see Chapter 3, 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.

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	P ₂ O ₅ ²					K ₂ O				
		VL	L	M	H	VH	VL	L	M	H	VH
(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 P₂O₅, 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 ₂ O ₅ (lb/A)	200	175	150	125	100	75	50	25	0	0
K index	50	80	110	140	170	200				
K ₂ O (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.

Status	N	P	K	Ca	Mg	S	Fe	Mn	Zn	B	Cu	Mo
	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 (Prefer 4E)	Leafy vegetables (Lettuce [head and leaf] endive, arugula, chervil, cress and [garden upland], dandelion, parsley, and radicchio)	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.				

Table 6. Continued.

Herbicide	Labeled crops	Time of application to crop	Rate (lbs. AI./Acre)	
			Mineral	Muck
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.				
Paraquat (Gramoxone Inteon) (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 Inteon)	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, cilantro, 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/		Min. Days to Harvest	Pertinent Diseases	Select Remarks ²
		Application	Season			
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 AI)	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 QoI 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	
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 (Coniothyrium mini-tans)		6 lbs			Lettuce drop	Apply to soil surface and incorporate prior to, at planting, or at transplanting.
Curzate 60DF (Cymoxanil)	27	5 oz	30 oz	3	Downy mildew	Use only in combination with a protectant, such as Manex.
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.
Forum (Dimethomorph)	40	6 fl oz	30 fl oz	0	Downy mildew	Must be tank-mixed with a fungicide of dissimilar mode of action. Do not make more than 2 sequential applications.
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.

Table 7. Continued.

Chemical (a.i.)	FRAC Group ¹	Maximum Rate/Acre/		Min. Days to Harvest	Pertinent Diseases	Select Remarks ²
		Application	Season			
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.
Legion 80WDG (Fosetyl-Al)	33	5 lb	35 lb	3	Downy mildew	Do not mix with copper fungicides
Linebacker 80WDG (Fosetyl-Al)	33	5 lb	35 lb	3	Downy mildew	Do not mix with copper fungicides
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.
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	

Table 7. Continued.

Chemical (a.i.)	FRAC Group ¹	Maximum Rate/Acre/		Min. Days to Harvest	Pertinent Diseases	Select Remarks ²
		Application	Season			
Oxidate (Hydrogen dioxide)		128 fl oz		0		
Phostrat (Potassium phosphite)	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).
Presidio 4SC (Fluopicolide)	43	4 fl oz	16 fl oz	2	Downy mildew	A tank mix including a labeled rate of another labeled fungicide with a different mode of action must be used with Presidio for resistance management.
Previcur Flex (Propamocarb)	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 phytotoxicity.
Quintec 2.08SC (Quinoxifen)	13	6 fl oz	24 fl oz	1	Powdery mildew	Do not exceed 2 sequential and 4 total applications. If used more than once, at least one application must be a tank-mixture with a fungicide of dissimilar mode of action.
Rally 40W (Myclobutanil)	3	5 oz	20 oz	3	Powdery mildew	Tank mix or alternate with a fungicide of dissimilar mode of action.
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.
Revus (Mandipropamid)	40	8 fl oz	32 fl oz	1	Downy mildew	Do not exceed 2 sequential applications before rotating to a fungicide with a different mode of action.
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).
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.

Table 7. Continued.

Chemical (a.i.)	FRAC Group ¹	Maximum Rate/Acre/		Min. Days to Harvest	Pertinent Diseases	Select Remarks ²
		Application	Season			
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.
Switch 62.5WDG (Cyprodinil, fludioxonil)	9/12	14 oz	56 oz	0	Alternaria leaf spot Sclerotinia Powdery mildew Septoria leaf spot	Do not apply more than 2 sequential applications without rotating to a fungicide of dissimilar mode of action. Rotational restrictions. Ground application only.
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 soil-borne 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 phosphate)	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.

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/		Minimum Days to Harvest	Pertinent Diseases	Select Remarks
	Application	Crop			
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. Selected 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
Actara (thiamethoxam)	1.5-5.5 oz	12	7	aphids, flea beetles, leaf- hoppers, whiteflies	4A	Do not use if other 4A insecticides have been or will be used.
Admire Pro (imidacloprid)	4.4-10.5 fl oz	12	21	aphids, leafhoppers, thrips (foliage feeders), whiteflies	4A	Do not apply more than 0.38 lb ai per acre per year.
Agree WG (<i>Bacillus thuringiensis</i> subspecies <i>aizawai</i>)	0.5-2.0 lb	4	0	lepidopteran larvae (cat- erpillar pests)	11	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	<i>Liriomyza</i> leafminers, twospotted spider mite	6	No more than 2 sequential applications.
*Ambush 25W (permethrin)	6.4-12.8 oz	12	1	beet armyworm, cab- bage looper, corn ear- worm, cutworms, fall armyworm, leafhoppers, leafminers	3	Do not apply more than 2.0 lb ai/acre per season. (128 oz)
*Ammo 2.5 EC (cyper- methrin)	2.5-5 fl oz	12	5	armyworms, corn ear- worm, crickets, cucum- ber beetles, cutworms, flea beetles, leafhoppers, loopers, <i>Lygus</i> bug, salt- marsh caterpillar, stink bugs, thrips	3	Head lettuce only. Maximum of 30 oz/acre per season.

Table 9. Continued.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code ¹	Notes
*Asana XL (0.66 EC) (esfenvalerate)	4.8-9.6 fl oz	12	7	beet armyworm (aids in control), cabbage looper, <i>Heliothis</i> 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.
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	un	Antifeedant, repellent, insect growth regulator. OMRI-listed.
Azatin XL (azadirachtin)	5-21 fl oz	4	0	aphids, beetles, caterpillars, leafhoppers, leafminers, thrips, weevils, whiteflies	un	Antifeedant, repellent, insect growth regulator.
*Baythroid XL (beta-cyfluthrin)	0.8-3.2 fl oz	12	0	beet armyworm (1 st and 2 nd instars), cabbage looper, corn earworm, cutworms, flea beetles, grasshoppers, potato leafhopper, saltmarsh caterpillar, thrips, vegetable weevil, yellowstriped armyworm	3	Maximum amount per acre per season: 12.8 fl oz.
Beleaf 50 SG (flonicamid)	2.0-2.8 oz	12	0	aphids, plant bugs	9C	Do not apply more than 8.4 oz/acre per season. Begin applications before pests reach damaging levels.
Biobit HP (<i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i>)	0.5-2.0 lb	4	0	caterpillars (will not control large armyworms)	11	Treat when larvae are young. Good coverage is essential. Can be used in the greenhouse. OMRI-listed.
BotaniGard 22 WP, ES (<i>Beauveria bassiana</i>)	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.
*Brigade 2EC (bifenthrin)	2.1-6.4 fl oz	12	7	aphids, armyworms, carmine mite, corn earworm, cucumber beetle, cutworms, flea beetles, leafhoppers, loopers, <i>Lygus</i> spp., saltmarsh caterpillar, stink bug spp., twospotted spider mite, whiteflies	3	Head lettuce only. (Cilantro and Coriander)
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.

Table 9. Continued.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code ¹	Notes
Coragen (rynaxypyr)	3.5-7.5 fl oz	4	1	beet armyworm, cabbage looper, corn earworm, leafminers, suppression of whitefly nymphs	28	Can be applied by drip chemigation.
Courier 40SC (buprofezin)	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. See label for crop rotational restrictions.
Crymax WDG (<i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i>)	0.5-2.0 lb	4	0	caterpillars	11	Use high rate for armyworms. Treat when larvae are young.
Deliver (<i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i>)	0.25-1.5 lb	4	0	caterpillars	11	Use higher rates for armyworms. OMRI-listed ² .
*Diazinon 4 E, *50W (diazinon)	foliar: AG500, 4E: 0.5-1 pt 50W: 0.5-1 lb	72	14 (foliar)	aphids, leafminers	1B	Do not apply more than 5 times.
	preplant: AG500, 4E: 1-2 qt 50W: 2-4 lb	72	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 (<i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i>)	0.5-2.0 lb	4	0	caterpillars	11	Treat when larvae are young. Good coverage is essential. Can be used in greenhouse. OMRI-listed.
Durivo (thiamethoxam, chlorantraniliprole)	10-13 oz	12	30	aphids, beet armyworm, cabbage looper, corn earworm, fall armyworm, flea beetles, imported cabbageworm, leafhoppers, whiteflies	4A, 28	Apply via drip chemigation only.
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.

Table 9. Continued.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code ¹	Notes
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 (<i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i>)	0.12-1.5 lb	4	0	most caterpillars, but not <i>Spodoptera</i> species (armyworms)	11	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	un	Do not apply more than 160 lb/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	Head varieties: Do not apply more than 24 pt LV per acre per crop or 8 lb SP. Leaf varieties: Do not apply more than 12 pt LV per acre/crop or 4 lb SP.
*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 (<i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i>)	1.0-2.0 lb	12	0	for most caterpillars, including beet armyworm (see label)	11	Treat when larvae are small. Thorough coverage is essential.
Malathion 8F (malathion)	1-2 pt	12	head - 7 leaf - 14	aphids, cabbage looper, leafhoppers, mites	1B	Can be used in greenhouse.
Movento (spirotetramat)	4.0-5.0 fl oz	24	3	aphids, whiteflies	23	Do not apply more than 10 fl oz/acre/crop.
M-Pede 49% Soap, insecticidal	1-2% V/V	12	0	aphids, leafhoppers, mites, plant bugs, thrips, whiteflies	--	OMRI-listed ² .
*MSR Spray Concentrate (oxydemeton-methyl)	2 pt	72	21	aphids, mites	1B	For head lettuce only.
*Mustang Max EC, EW (zeta-cypermethrin)	2.24-4.0 oz	12	1	aphids, armyworms, corn earworm, crickets, cucumber beetles, cutworms, flea beetles, leafhoppers, loopers, saltmarsh caterpillar, stink bugs, whiteflies	3	A maximum of 0.15 lb ai/acre per season may be applied.
Neemix 4.5 EC (azadirachtin)	4-16 fl oz	12	0	aphids, armyworms, cabbage looper, cutworms, leafminers, thrips, whiteflies	un	OMRI-listed ² .
Oberon 2 SC (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, 97 (acephate)	75 S: 0.67-1.33 lb 97: 0.5-1.0 lb	24	21	aphids, armyworms (excluding beet armyworm), aster leafhopper, cabbage looper	1B	Head lettuce only.

Table 9. Continued.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code ¹	Notes
Platinum (thiamethoxam)	5.0-11 fl oz	12	30	aphids, flea beetles, leafhoppers, leafminers (suppression), whiteflies	4A	Maximum = 11 oz/acre per season. Do not use in con- junction with other 4A insect- icides.
*Pounce 25 W (per- methrin)	6.4-12.8 oz	12	1	aphids, beet armyworm, cabbage looper, corn earworm, cutworms, fall armyworm, leafhoppers, leafminers, southern armyworm, tobacco budworm	3	Do not apply more than 1.0 lb ai/acre per season (= 5 applications at high rate).
*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 bee- tles, grasshoppers, green cloverworm, leafhop- pers, 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. (Head and leaf)
*Proclaim (emamectin benzoate)	2.4-4.8 oz	12	7	beet armyworm, corn earworm, fall armyworm, <i>Liriomyza</i> 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.
Provado 1.6 F (imida- cloprid)	3.8 oz	12	7	aphids, flea beetles, leaf- hoppers, whiteflies	4A	Do not use in conjunction with other 4A insecticides.
Pyrellin EC (pyrethrin + rotenone)	1-2 pt	12	12 hours	aphids, beet webworm, cabbage looper, cucum- ber beetle, flea beetles, leafhoppers, leafminers, loopers, lygus bugs, mites, plant bugs, stink bugs, thrips, vegetable weevil, whiteflies	3, 21	
Radiant (spinetoram)	5-10 fl oz	4	1	armyworms (not yellow- striped), cabbage looper, corn earworm, <i>Liriomyza</i> leafminer, thrips	5	Maximum of 6 applications, no more than 2 consecutive applications before rotating to another MOA..
Requiem (extract of <i>Chenopodium</i> <i>ambrosioides</i>)	2-4 qts	4	0	green peach aphid, <i>Liriomyza</i> leafminers, potato aphid, turnip aphid, whiteflies	un	Lettuce and romaine only.
Sevin 80S, XLR, 4F (carbaryl)	80S: 0.63-2.5 lb XLR, 4F: 0.5- 2.0 qt	12	14	armyworms, aster leaf- hopper, corn earworm, fall armyworm, flea bee- tles, 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 (<i>Liriomyza</i> spp.), thrips	5	Do not apply more than 29 fl oz per acre per crop.

Table 9. Continued.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code ¹	Notes
Sun Spray 98.8%, JMS Stylet-Oil, Saf-T-Side, others Oil, insecticidal	3-6 qts/100 gal H ₂ O (JMS) 1-2 gal/100 gal	4	0	leafhoppers, leafminers, mites, thrips, whiteflies	--	Organic Stylet-Oil and Saf-T-Side are OMRI-listed ² .
Synapse WG (flubendiamide)	2.0-3.0 oz	12	1	armyworms, loopers	28	Do not apply more than 9.0 oz/acre per season.
*Telone C-35 (dichloro- propene + chloropicrin)	See label	5 days - See label	preplant	symphylans, wireworms	--	See supplemental label for use restrictions in south and central Florida.
*Telone II (dichloropropene)						
*Thionex 3EC *Thionex 50W (endosulfan)	1-1.33 qts 1-2 lb	24	14	armyworms, cabbage looper, green peach aphid, leafhoppers, whiteflies	2	Head lettuce - no more than 3 applications after thinning. Leaf lettuce - no more than two applications per year.
Trigard (cryomazine)	2.66 oz	12	7	leafminers	17	Limited to six applications for head lettuce and five applica- tions for leaf lettuce.
Trilogy (extract of neem oil)	0.5-2.0% V/V	4	0	aphids, mites, sup- pression of thrips and whiteflies	un	Apply morning or evening to reduce potential for leaf burn. Toxic to bees exposed to direct treatment. OMRI-listed.
Venom Insecticide (dinotefuran)	foliar: 1-3 oz soil: 5-6 oz	12	foliar - 7 soil - 21	leafhoppers, leafminers, 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 appli- cation methods.
*Warrior II (lamb- da-cyhalothrin)	1.28-1.92 fl oz	24	1	aphids ⁽¹⁾ , armyworms, beet armyworm ⁽²⁾ , cabbage looper, corn earworm, cutworms, fall armyworm ⁽²⁾ , flea beetles, grasshoppers, leafhoppers, mites, plant bugs, saltmarsh caterpil- lar, southern armyworm, spider mites ⁽¹⁾ , spittle- bugs, stink bugs, tobac- co budworm, vegetable weevil, whiteflies ⁽¹⁾	3	Head and leaf. Do not apply more than 0.3 lb ai/acre per season. (1) Suppression only. (2) 1 st and 2 nd instar larvae only.
Xentari DF (<i>Bacillus thuringiensis</i> subspecies <i>aizawai</i>)	0.5-2.0 lb	4	0	caterpillars	11	Treat when larvae are young. Thorough coverage is essen- tial. 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. 6.1 August 2008. 1A. Acetylcholinesterase inhibitors, Carbamates (nerve action) 1B. Acetylcholinesterase inhibitors, Organophosphates (nerve action) 2A. GABA-gated chloride channel antagonists (nerve action) 3. Sodium channel modulators (nerve action) 4A. Nicotinic acetylcholine receptor agonists (nerve action) 5. Nicotinic acetylcholine receptor allosteric activators (nerve action) 6. Chloride channel activators (nerve and muscle action) 7A. Juvenile hormone mimics (growth regulation) 7C. Juvenile hormone mimics (growth regulation) 9B and 9C. Selective homopteran feeding blockers 10. Mite growth inhibitors (growth regulation) 11. Microbial disruptors of insect midgut membranes 12B. Inhibitors of mitochondrial ATP synthase (energy metabolism) 15. Inhibitors of chitin biosynthesis, type 0, lepidopteran (growth regulation) 16. Inhibitors of chitin biosynthesis, type 1, homopteran (growth regulation) 17. Molting disruptor, dipteran (growth regulation) 18. Ecdysone receptor agonists (growth regulation) 22. Voltage-dependent sodium channel blockers (nerve action) 23. Inhibitors of acetyl Co-A carboxylase (lipid synthesis, growth regulation) 28. Ryanodine receptor modulators (nerve and muscle action) un. Compounds of unknown or uncertain mode of action						
² OMRI listed: Listed by the Organic Materials Review Institute for use in organic production.						

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
Actara (thiamethoxam)	1.5-5.5 oz	12	7	aphids, flea beetles, leafhoppers, whiteflies	4A	Do not use if other 4A insecticides have been or will be used.
Admire Pro (imidacloprid)	4.4-10.5 fl oz	12	21	aphids, leafhoppers, thrips (foliage feeders), whiteflies	4A	Do not apply more than 0.38 lb ai per acre per season.
Agree WG (<i>Bacillus thuringiensis</i> subspecies <i>aizawai</i>)	0.5-2.0 lb	4	0	lepidopteran larvae (caterpillar pests)	11	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. Field use only.
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 oz/acre per crop.
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	un	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	un	Antifeedant, repellent, insect growth regulator.
*Baythroid XL (beta-cyfluthrin)	0.8-3.2 fl oz	12	0	beet armyworm (1 st and 2 nd instars), cabbage looper, corn earworm, cutworms, flea beetles, grasshoppers, potato leafhopper, saltmarsh caterpillar, thrips, vegetable weevil, yellowstriped armyworm	3	Maximum of 12.8 fl oz per acre per season.
Beleaf 50 SG (flonicamid)	2.0-2.8 oz	12	0	aphids, plant bugs	9C	Do not apply more than 8.4 oz/acre per season. Begin applications before pests reach damaging levels.
Biobit HP (<i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i>)	0.5-2.0 lb	4	0	caterpillars (will not control large armyworms)	11	Treat when larvae are young. Good coverage is essential. Can be used in the greenhouse. OMRI-listed ² .
BotaniGard 22 WP, ES (<i>Beauveria bassiana</i>)	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.

Table 10. Continued.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code ¹	Notes
Confirm 2F (tebufenozide)	6-8 fl oz	4	7	armyworms, cabbage looper, garden webworm	18	Do not exceed 56 ounce of product per season.
Coragen (rynaxypyr)	3.5-7.5 fl oz	4	1	beet armyworm, cabbage looper, corn earworm, leafminers, suppression of whitefly nymphs	28	Can be applied by drip chemigation.
Crymax WDG (<i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i>)	0.5-2.0 lb	4	0	caterpillars	11	Use high rate for armyworms. Treat when larvae are young.
Deliver (<i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i>)	0.25-1.5 lb	4	0	caterpillars	11	Use higher rates for armyworms. OMRI-listed ² .
*Diazinon, * 4 EC, *50 W (diazinon)	AG500, 4EC: 0.5-1 pt 50W: 0.5-1 lb	72	14	aphids, leafminers	1B	Limited to 5 applications.
	preplant - AG500, 4EC: 1-2 qts 50W: 2-8 lb	72	preplant	cutworms, mole crickets, wireworms	1B	See label.
Dimethoate 4 EC, 2.67 (dimethoate)	4EC: 0.5 pt 2.67: 0.75 pt	48	14	aphids, leafhoppers, leaf- miners	1B	
DiPel DF (<i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i>)	0.5-2.0 lb	4	0	caterpillars	11	Treat when larvae are young. Good coverage is essential. Can be used in greenhouse. OMRI-listed ² .
Durivo (thiamethoxam, chloran- traniliprole)	10-13 oz	12	30	aphids, beet armyworm, cabbage looper, corn earworm, fall armyworm, flea beetles, imported cabbageworm, leafhop- pers, whiteflies	4A, 28	Apply via drip chemigation only.
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 resis- tance management recommenda- tions. 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 (<i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i>)	0.12-1.50 lb	4	0	most caterpillars, but not <i>Spodoptera</i> species (armyworms)	11	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	

Table 10. 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 (<i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i>)	1.0-2.0 lb	12	0	most caterpillars, including beet armyworm (see label)	11	Treat when larvae are small. Thorough coverage is essential.
Malathion 8F (malathion)	1-2 pt	12	7	aphids, leafhoppers, mites	1B	Can be used in greenhouse.
Movento (spirotetramat)	4.0-5.0 fl oz	24	3	aphids, whiteflies	23	Do not apply more than 10 fl oz/acre/crop.
M-Pede 49% EC Soap, insecticidal	1-2% V/V	12	0	aphids, leafhoppers, mites, plant bugs, thrips, whiteflies	--	OMRI-listed ² .
*Mustang Max EC (zeta-cypermethrin)	2.24-4.0 oz	12	1	aphids, armyworms, corn earworm, crickets, cucumber beetles, flea beetles, ground beetles, leafhoppers, loopers, <i>Lygus</i> bugs, saltmarsh caterpillar, stink bugs, tobacco budworm, whiteflies, wireworms	3	A maximum of 0.15 lb ai/acre per season may be applied. Do not make applications less than 7 days apart.
Neemix 4.5 (azadirachtin)	4-16 fl oz	12	0	aphids, armyworms, cabbage looper, cutworms, leafminers, thrips, whiteflies	un	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.
Platinum (thiamethoxam)	5.0-11 fl oz	12	30	aphids, flea beetles, leafhoppers, leafminers (suppression), whiteflies	4A	Maximum = 11 oz/acre per season. Do not use in conjunction with other 4A insecticides.
*Pounce 25 W (permethrin)	6.4-12.8 oz	12	1	aphids, beet armyworm, cabbage looper, corn earworm, cutworms, fall armyworm, leafhoppers, leafminers	3	Do not apply more than 1.0 lb ai/acre per season.
*Proclaim (emamectin benzoate)	2.4-4.8 oz	12	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, leafhoppers, whiteflies	4A	Maximum amount per season: 19 fl oz/acre. Do not use with other 4A insecticides.
Pyrellin EC (pyrethrin + rotenone)	1-2 pt	12	12 hours	aphids, flea beetles, leafhoppers, leafminers, loopers, <i>Lygus</i> bug, mites, plant bugs, stink bugs, thrips, whiteflies	3	

Table 10. Continued.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code ¹	Notes
Radiant (spinetoram)	5-10 fl oz	4	1	armyworms (not yellow-striped), cabbage looper, corn earworm, <i>Liriomyza</i> leafminer, thrips	5	Maximum of 6 applications, no more than 2 consecutive applications before rotating to another MOA.
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	Do not apply more than 6 qt (4F, XLR) or 7.5 lb (80S) per acre per crop.
SpinTor 2 SC (spinosad)	1.5-10 fl oz	4	1	armyworms, cabbage looper, leafminers (<i>Liriomyza</i> spp.), thrips	5	Do not apply more than 29 fl oz per acre per crop.
Synapse WG (flubendiamide)	2.0-3.0 oz	12	1	armyworms, loopers	28	Do not apply more than 9.0 oz/acre per season.
*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 5 times per crop.
Trilogy (extract of neem oil)	0.5-2.0% V/V	4	0	aphids, mites, suppression of thrips and whiteflies	un	Apply morning or evening to reduce potential for leaf burn. Toxic to bees exposed to direct treatment. OMRI-listed ² .
Venom Insecticide (dinotefuran)	foliar: 1-3 oz soil: 5-6 oz	12	foliar - 7 soil - 21	leafhoppers, leafminers, 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 methods of application.
Xentari DF (<i>Bacillus thuringiensis</i> subspecies <i>aizawai</i>)	0.5-2.0 lb	4	0	caterpillars	11	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
<p>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.</p>						
<p>¹ Mode of Action codes for vegetable pest insecticides from the Insecticide Resistance Action Committee (IRAC) Mode of Action Classification v. 6.1 August 2008.</p> <ul style="list-style-type: none"> 1A. Acetylcholinesterase inhibitors, Carbamates (nerve action) 1B. Acetylcholinesterase inhibitors, Organophosphates (nerve action) 2A. GABA-gated chloride channel antagonists (nerve action) 3. Sodium channel modulators (nerve action) 4A. Nicotinic acetylcholine receptor agonists (nerve action) 5. Nicotinic acetylcholine receptor allosteric activators (nerve action) 6. Chloride channel activators (nerve and muscle action) 7A. Juvenile hormone mimics (growth regulation) 7C. Juvenile hormone mimics (growth regulation) 9B and 9C. Selective homopteran feeding blockers 10. Mite growth inhibitors (growth regulation) 11. Microbial disruptors of insect midgut membranes 12B. Inhibitors of mitochondrial ATP synthase (energy metabolism) 15. Inhibitors of chitin biosynthesis, type 0, lepidopteran (growth regulation) 16. Inhibitors of chitin biosynthesis, type 1, homopteran (growth regulation) 17. Molting disruptor, dipteran (growth regulation) 18. Ecdysone receptor agonists (growth regulation) 22. Voltage-dependent sodium channel blockers (nerve action) 23. Inhibitors of acetyl Co-A carboxylase (lipid synthesis, growth regulation) 28. Ryanodine receptor modulators (nerve and muscle action) un. Compounds of unknown or uncertain mode of action <p>² OMRI listed: Listed by the Organic Materials Review Institute for use in organic production.</p> <p>* Restricted Use Only.</p>						