

Chapter 9. Leafy Vegetable Production

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I. Lettuce, Endive, and Escarole Botany and Planting

Lettuce - *Lactuca sativa*, Asteraceae (Compositae)

Endive - *Cichorium endiva*

Escarole - *Cichorium endive*

Table 9.1. 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
Planting 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	70 - 95	60 - 80	60 - 80	60 - 80	60 - 80
Plant populations (acre)	43,560	38,720	29,040	24,891	24,891

Cultivars

Table 9.2. Lettuce, endive and escarole cultivars.

Green Saladbowl	Romaine (green)	Red Leaf	Crisphead	Endive	Escarole
Green Star	Concept	Galatic	Gator	Marcant	Full Heart NR 65
Tropicana	Fusion	New Red Fire	Gulfstream	Salad King	Twinkle
Two Star	Kalura	Red Saladbowl	Raleigh		
	Medallion	Vulcan	Summer Crisp (red)		
	Snappy				
	Solid King				
	Terrapin				
Boston	Romaine (red)	Oakleaf (green)	Bibb		
Florida Butter Crisp	Outredeous	Royal Oak	Cherokee		
Ermosa	Rosalita	Ferrari	Floribibb		
Margarita					

II. Spinach Botany and Planting

Spinach - *Spinacia oleracea*

Table 9.3. Planting information for spinach.

Planting dates	
North and Central Florida	Sept - Mar
South Florida	Oct - Feb
Planting information	
Distance between rows (in)	12 - 36
Distance between plants (in)	2 - 6
Seeding depth (in)	0.5
Seed per acre (lb)	10 - 15
Days to maturity from seed	45 - 60
Plant population (acre)	261,136

Cultivars

Table 9.4. Spinach cultivars.

Smooth leaf	
A&C #30 (H)	Space (H)
Semi-savoy leaf	
Chinook II (H)	Gladiator (H)
Melody (H)	Skookum (H)
Tyee (H)	Ashley (H)
Seaside	
Savoy leaf	
Ambassador (H)	Hybrid 612 (H)

H = hybrid

Table 9.5. Herbicides approved for managing weeds in lettuce.

Labels change frequently. Be sure to read a current product label before applying any chemical.					
Active ingredient lb. a.i./A	Trade name product/A	MOA code	Crops	Weeds controlled / remarks	
*** PREEMERGENCE ***					
Benefin 1.2	(Balan) 2 lb.	3	Lettuce	Annual broadleaf and grass weeds. Apply before seeding or transplanting. Incorporate with cultivation or irrigation into the top 2 to 3 in. of the final bed	
Bensulide 5.0 - 6.0	(Prefar) 4 E 5 - 6 qt.	8	Leafy vegetables	Annual broadleaf and grass weeds. Incorporate with cultivation or irrigation. Do not use on spinach or Swiss chard.	
Carfentrazone up to 0.031	(Aim) 1.9 EW up to 2 fl. oz (Aim) 2.0 EC up to 2 fl. oz.	14	Leafy vegetables	Apply as a preplant burn down for emerged broadleaf weeds. Use crop oil concentrate, methylated seed oil, or nonionic surfactant at recommended rates. Maximum rate of 0.096 lb. a.i./A per season. No pretransplant interval.	
Glyphosate	(various formulations) consult labels	9	Leafy vegetables	Emerged broadleaf and grass weeds. Apply as a preplant burn down. Consult label for individual product directions.	
Imazethapyr 0.016 - 0.031	(Pursuit) 2 EC 1 - 2 fl. oz.	2	Lettuce, endive, escarole	Broadleaf weeds. Apply in fields with 40% organic matter or greater. Do not apply more than 2 applications per crop. A maximum of 4 oz. of product per crop season. Should be applied in 2 or more gallons of water per acre. Potential for rotational crop injury is highly variable. Label is a Third-Party registration (TPR, Inc.). Use without having a signed authorization and waiver of liability agreement is a misuse of the product. PHI 30 days.	
Paraquat 0.5 - 1.0	(Gramoxone) 2 SL 2 - 4 pt. (Firestorm) 3 SL 1.3 - 2.7 pt.	22	Lettuce, endive, escarole	Emerged broadleaf and grass weeds. Apply as a preplant burndown. Do not make more than 3 applications per year.	
Pelargonic acid	(Scythe) 4.2 EC 3 - 10% v/v	27	Leafy vegetables	Emerged broadleaf and grass weeds. Apply as a preplant burndown before planting.	
Pronamide 1.0 - 2.0	(Kerb) 50 WP 2.0 - 4.0 lb.	3	Head lettuce, endive, escarole	Certain annual broadleaf and grass weeds. Overhead irrigate with 1 to 2 in. following applications. Observe rotational restrictions to other crops. Not recommended for soils with high organic matter. PHI 55 days.	
Pyraflufen 0.001 - 0.003	(ET Herbicide/Defoliant) 0.5 - 2.0 fl. oz.	14	Leafy vegetables	Emerged broadleaf weeds. Apply as a preplant burndown 1 day prior to planting. Include an NIS at 0.25% or COC at 1.0% to the spray solution	
Trifluralin 0.5	(Treflan, Trifluralin) 4 EC 1.0 pt. (Trifluralin) 10 G 5 lb.	3	Endive, escarole, radicchio	Annual broadleaf and grass weeds. Apply as preplant incorporate to mineral soils only.	

Table 9.5. Herbicides approved for managing weeds in lettuce. (continued)

Labels change frequently. Be sure to read a current product label before applying any chemical.				
Active ingredient lb. a.i./A	Trade name product/A	MOA code	Crops	Weeds controlled / remarks
*** POSTEMERGENCE ***				
Carfentrazone up to 0.031	(Aim) 1.9 EW up to 2 fl. oz. (Aim) 2.0 EC up to 2 fl. oz.	14	Leafy vegetables	Emerged broadleaf weeds. Apply as a preplant burn down for emerged broadleaf weeds. Use crop oil concentrate or nonionic surfactant at recommended rates. May be tank mixed with other herbicides.
Clethodim 0.09 - 0.13 0.07 - 0.13	(Select, Arrow) 2 EC 6 - 8 fl. oz. (Select Max) 1 EC 9 - 16 fl. oz.	1	Leafy vegetables	Emerged annual and perennial grass weeds. For repeat application, minimum of 14 days between applications. PHI 14 days
Imazethapyr 0.016 - 0.031	(Pursuit) 2 EC 1 - 2 fl. oz.	2	Lettuce, endive, escarole	Broadleaf weeds. Apply in fields with 40% organic matter or greater. Apply postemergence after 3 - 4 true leaf stage. Do not apply more than 2 applications per crop. A maximum of 4 oz. per crop season. Potential for rotational crop damage is highly variable. Label is a Third-Party registration (TPR, Inc.). Use without having a signed authorization and waiver for liability agreement is a misuse of the product. PHI 30 days.
Paraquat	(Gramoxone) 2 SL	22	Lettuce	Emerged broadleaf and grass weeds. Row middles only. Consult individual labels for not all formulations are labeled for this use pattern. Include a NIS at 0.25% v/v. PHI 24 hrs.
0.3 - 0.5 Pelargonic acid	1.2 - 1.9 pt. (Scythe) 4.2 EC 3 - 10% v/v	27	Leafy vegetables	Emerged broadleaf and grass weeds. Apply as a directed or shielded spray to row middles.
Sethoxydim 0.19 - 0.28	(Poast) 1.5 EC 1.0 - 1.5 pt.	1	Head/leaf lettuce, endive, radicchio	Emerged grass weeds. Do not exceed 3.0 pt./A. per season. Include a crop oil concentrate. Head lettuce and radicchio PHI 30 days. Leaf lettuce and endive PHI 15 day.

Table 9.6. Herbicides approved for managing weeds in spinach.

Labels change frequently. Be sure to read a current product label before applying any chemical.				
Active ingredient lb. a.i./A	Trade name product/A	MOA code	Weeds controlled / remarks	
*** PREPLANT / PREEMERGENCE ***				
Carfentrazone up to 0.031	(Aim) 1.9 EW up to 2 fl. oz. (Aim) 2.0 EC up to 2 fl. oz.	14	Apply as a preplant burn down for emerged broadleaf weeds. Use crop oil concentrate, methylated seed oil, or nonionic surfactant at recommended rates. Maximum rate of 0.096 lb. a.i./A per season. No pretransplant interval.	
Glyphosate	(various formulations) consult labels	9	Emerged broadleaf and grass weeds. Apply as a preplant burn down treatment. Product is a contact, non-selective, foliar applied herbicide with no residual control. May be tank mixed with soil residual compounds.	
Pelargonic acid	(Scythe) 4.2 EC 3 - 10% v/v	27	Emerged broadleaf and grass weeds. Apply as a preplant burn down treatment. Product is a contact, non-selective, foliar applied herbicide with no residual control. May be tank mixed with soil residual compounds.	
Pyraflufen 0.001 - 0.003	(ET Herbicide) 0.208 EC 0.5 - 2.0 fl. oz.	14	Emerged broadleaf weeds. Apply as a preplant burndown treatment.	
*** POSTEMERGENCE ***				
Carfentrazone up to 0.031	(Aim) 1.9 EW up to 2 fl. oz. (Aim) 2.0 EC up to 2 fl. oz.	14	Emerged broadleaf weeds. Apply as hooded application to row middles only. Use crop oil concentrate or nonionic surfactant at recommended rates. May be tank mixed with other herbicides. PHI 0 days.	
Clopyralid 0.06 - 0.12	(Clopyr Ag) 3 EC 0.17 - 0.33 pt.	4	Certain broadleaf weeds. Do not exceed a total of 0.5 pt./A per growing season. Apply in the 2- to 5-leaf stage of crop growth. PHI 21 days.	
Clethodim 0.09 - 0.13 0.07 - 0.25	(Arrow, Select) 2 EC 6 - 8 fl. oz. (Select Max) 1 EC 9 - 16 fl. oz.	1	Perennial and annual grass weeds. Use higher rates under heavy grass pressure or larger grass weeds. Read the label for required surfactant. PHI 14 days.	

Table 9.6. Herbicides approved for managing weeds in spinach. (continued)

Labels change frequently. Be sure to read a current product label before applying any chemical.			
Active ingredient lb. a.i./A	Trade name product/A	MOA code	Weeds controlled / remarks
Pelargonic acid	(Scythe) 4.2 EC 3 - 10% v/v	27	Emerged broadleaf and grass weeds. Direct spray to row middles. Product is a contact, nonselective, foliar applied herbicide with no residual control. may be tank mixed with several soil residual compounds.
Sethoxydim 0.19 - 0.28	(Poast) 1.5 EC 1.0 - 1.5 pt.	1	Controls emerged grass weeds. A total of 3.0 pt./A. applied in one season. Include a crop oil concentrate. Unsatisfactory results may occur if applied to grasses under stress. PHI 15 days.

Table 9.7. Insecticides labeled for management of arthropod pests of lettuce and other leafy vegetables (non-Brassica, including escarole and endive).

Labels change frequently. Be sure to read a current product label before applying any chemical.						
Also refer to Table 19.2 for biopesticide and other alternative products labeled for disease management.						
Insect or mite pest	MOA Code ¹	Trade Name Active Ingredient	Rate (Product/acre)	REI (hours)	Days to Harvest	Remarks ²
Aphids	1A	*Lannate LV, *SP (methomyl)	LV: 1.5-3 pt; SP: 0.5-1.0 lb	48	10, or 7 for lowest rates for lettuce only	Head varieties: Maximum of 24 pt (LV) or 8 lb (SP) /acre per crop. Leaf varieties and endive (escarole), dandelions, Swiss chard: Maximum of 12 pt (LV) or 4 lb (SP) /acre per crop.
	1B	*Diazinon AG500, *50W (diazinon)	AG500: 0.5-1 pt; 50W: 0.5-1 lb	72	14	Do not apply more than once. Head and leaf lettuce only.
	1B	Dimethoate 4 EC (dimethoate)	0.5 pt	48	14	Leaf lettuce only, not for head lettuce. Also for endive (escarole) and Swiss chard.
	1B	Malathion 5EC, 8F (malathion)	5EC: 1.5-2.0 pt for endive, 2-3 pt for lettuce; 8F: 1.25 pt for endive, 1.88 pt for leaf and head lettuce	24	7 for endive, 14 for head and leaf lettuce	Do not apply more than twice per year.
	1B	Orthene 97 (acephate)	0.5-1.0 lb	24	21	Crisphead head lettuce only. Maximum of 2.125 lb/acre per crop cycle.
	3A	*Brigade 2EC (bifenthrin)	2.1-6.4 fl oz	12	7	Head lettuce only. Maximum of 32 fl oz/acre per season.
	3A	*Mustang (zeta-cypermethrin)	2.4-4.3 fl oz	12	1	Maximum of 25.8 fl oz/acre per season.
	3A	*Pounce 25 WP (permethrin)	6.4-12.8 oz	12	1	Maximum of 0.8 lb ai/acre per season.
	3A	PyGanic Crop Protection EC 5.0 (pyrethrins)	4.5-18 fl oz	12	0	Can be used in greenhouses. Thorough coverage is essential. Breaks down rapidly in sunlight. OMRI-listed ² .
	3A, -	BotaniGard Maxx (pyrethrins, <i>Beauveria bassiana</i> strain GHA)	Ground app.: 0.25-2.00 qt; Aerial app.: 0.25-1.00 qt	12	0	Apply in sufficient water to cover foliage. Compatible in tank mix with some fungicides. May not be compatible with adjuvants.
	4A	Actara (thiamethoxam)	1.5-3.0 oz	12	7	Maximum of 11 oz/acre per growing season. Highly toxic to foraging bees.
	4A	Admire Pro (imidacloprid)	Foliar: 1.3 fl oz; Soil: 4.4-10.5 fl oz	12	Foliar: 7; Soil: 21	Maximum of 6.5 fl oz (foliar) or 10.5 fl oz (soil) /acre per year.
	4A	Assail 30SG (acetamiprid)	2.0-4.0 oz	12	7	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.
	4A	Belay (clothianidin)	Foliar: 3-4 fl oz, Soil: 9-12 fl oz	12	Foliar: 7, Soil: 21	Regardless of application method, do not apply more than 0.2 lb ai/acre per year (12 fl oz). Do not apply at intervals of less than 10 days. Highly toxic to bees.
	4A	Belay 50 WDG (clothianidin)	Foliar: 1.6-2.1 oz, Soil: 4.8-6.4 oz	12	7	Maximum of 6.4 oz/acre per season. Do not use an adjuvant. Toxic to bees.
	4A	Platinum 75 SG (thiamethoxam)	1.66-3.67 oz	12	30	Maximum of 3.67 oz/acre per season. Do not use in conjunction with other 4A insecticides.
	4A	Scorpion 35 SL (dinotefuran)	Foliar: 2-5.25 fl oz; Soil: 9-10.5 fl oz	12	Foliar: 7; Soil: 21	Maximum of 10.5 fl oz (foliar) or 21 fl oz (soil) /acre per season. See pollinator protection restrictions on label.
4A, 28	Durivo (thiamethoxam, chlorantraniliprole)	10-13 fl oz	12	30	May be applied using one of several soil application methods.	

Table 9.7. Insecticides labeled for management of arthropod pests of lettuce and other leafy vegetables (non-Brassica, including escarole and endive). (continued)

Labels change frequently. Be sure to read a current product label before applying any chemical.

Also refer to Table 19.2 for biopesticide and other alternative products labeled for disease management.

Insect or mite pest	MOA Code ¹	Trade Name Active Ingredient *Restricted	Rate (Product/acre)	REI (hours)	Days to Harvest	Remarks ²
	4A, 28	Voliam Flexi (thiamethoxam, chlorantraniliprole)	4.0-7.0 oz	12	7	Do not exceed a total of 14 oz/acre per season or 0.172 lb ai of thiamethoxam or 0.2 lb ai of chlorantraniliprole /acre per season.
	4C	Closer (sulfoxaflor)	1.5-2.0 fl oz	12	3	Maximum of 17 fl oz/acre per year. See pollinator protection restrictions on label.
	4D	Sivanto Prime (flupyradifurone)	7.0-14.0 fl oz	4	1	Maximum of 28 fl oz/acre per crop season. Maximum crop seasons per year of 3.
	6, 28	*Minecto Pro (abamectin, cyantraniliprole)	10 fl oz	12	7	Maximum of 20 fl oz/acre per year, or 0.4 lb ai/acre per year of cyantraniliprole-containing products and 0.056 lb ai/acre per year of abamectin-containing products including all application types.
	9B	Fulfill (pymetrozine)	2.75 oz	12	7	Do not exceed 5.5 oz product per acre per season.
	21A	Torac (tolfenpyrad)	17-21 fl oz	12	1	Do not apply until at least 14 days after emergence. Maximum of 42 fl oz/acre per crop cycle.
	23	Movento (spirotetramat)	4.0-5.0 fl oz	24	3	Do not apply more than 10 fl oz/acre per crop. See label for information about the use of adjuvants.
	28	Exirel (cyantraniliprole)	13.5-20.5 fl oz	12	1	Maximum of 0.4 lb ai/acre per year of cyantraniliprole-containing products (such as Verimark) including all application types. For best performance, use an adjuvant.
	28	Verimark (cyantraniliprole)	6.75-13.5 fl oz	4	N/A: applied at planting	Maximum of 13.5 fl oz at planting or 0.4 lb ai/acre per year of cyantraniliprole-containing products (such as Exirel) including all application types.
	29	Beleaf 50 SG (flonicamid)	2.0-2.8 oz	12	0	Do not apply more than 8.4 oz/acre per season. Begin applications before pests reach damaging levels.
	-	Aza-Direct (azadirachtin)	1-2 pt, up to 3.5, if needed	4	0	Antifeedant, repellent, insect growth regulator. OMRI-listed ² .
	-	Azatin XL (azadirachtin)	5-21 fl oz	4	0	Antifeedant, repellent, insect growth regulator.
	-	BotaniGard ES, Mycotrol ESO (<i>Beauveria bassiana</i> strain GHA)	0.25-1 qt	4	0	Apply in sufficient water to cover foliage, typically 5-100 gallon/acre. Compatible in tank mix with some fungicides. Mycotrol ESO OMRI-listed ² .
	-	Grandevo (<i>Chromobacterium subtsugae</i> strain PRAA4-1)	1-3 lb	4	0	Can be used in organic production. OMRI-listed ² .
	-	M-Pede 49% Soap, insecticidal	1-2% v/v	12	0	OMRI-listed ² .
	-	Molt-X (azadirachtin)	10 fl oz	4	0	OMRI-listed ² .
	-	Neemix 4.5 EC (azadirachtin)	4-16 fl oz	12	0	OMRI-listed ² .
	-	Requiem EC (extract of <i>Chenopodium ambrosioides</i>)	2.0-4.0 qt	4	0	
	-	Suffoil-X (mineral oil)	1-2 gal/100 gal	4	0	OMRI-listed ² .
	-	Trilogy (extract of neem oil)	0.5-2.0% v/v	4	0	Apply morning or evening to reduce potential for leaf burn. Toxic to bees exposed to direct treatment. OMRI-listed.
Beetles (includes cucumber beetles, flea beetles) and weevils	1A	Sevin 4F, XLR Plus (carbaryl)	0.5-1.0 qt	12	14	Maximum of 6 qt/acre per year.
	3A	*Baythroid XL (beta-cyfluthrin)	0.8-3.2 fl oz	12	0	Maximum of 12.8 fl oz/acre per season.
	3A	*Brigade 2EC (bifenthrin)	2.1-6.4 fl oz	12	7	Head lettuce only. Maximum of 32 fl oz/acre per season.
	3A	*Declare (gamma-cyhalothrin)	1.02-1.54 fl oz	24	1	Head and leaf lettuce only. Maximum of 15.4 fl oz/acre per season.

Table 9.7. Insecticides labeled for management of arthropod pests of lettuce and other leafy vegetables (non-Brassica, including escarole and endive). (continued)

Labels change frequently. Be sure to read a current product label before applying any chemical.
Also refer to Table 19.2 for biopesticide and other alternative products labeled for disease management.

Insect or mite pest	MOA Code ¹	Trade Name Active Ingredient <i>*Restricted</i>	Rate (Product/acre)	REI (hours)	Days to Harvest	Remarks ²
	3A	*Mustang (zeta-cypermethrin)	2.4-4.3 fl oz	12	1	Maximum of 25.8 fl oz/acre per season.
	3A	PyGanic Crop Protection EC 5.0 (pyrethrins)	4.5-18 fl oz	12	0	Can be used in greenhouses. Thorough coverage is essential. Breaks down rapidly in sunlight. OMRI-listed ² .
	3A	*Warrior II (lambda-cyhalothrin)	1.28-1.92 fl oz	24	1	Head and leaf lettuce only. Maximum of 19.2 fl oz/acre per season.
	3A, 28	*Besiege (lambda-cyhalothrin, chlorantraniliprole)	6-9 fl oz	24	1	Head and leaf lettuce only. Maximum of 31 fl oz/acre per year.
	3A, -	BotaniGard Maxx (pyrethrins, <i>Beauveria bassiana</i> strain GHA)	Ground app.: 0.25-2.00 qt; Aerial app.: 0.25-1.00 qt	12	0	Apply in sufficient water to cover foliage. Compatible in tank mix with some fungicides. May not be compatible with adjuvants.
	4A	Actara (thiamethoxam)	1.5-3.0 oz	12	7	Maximum of 11 oz/acre per growing season. Highly toxic to foraging bees. Flea beetles only.
	4A	Admire Pro (imidacloprid)	1.3 fl oz	12	7	Maximum of 6.5 fl oz/acre per year. Flea beetles only.
	4A	Belay (clothianidin)	Foliar: 3-4 fl oz, Soil: 9-12 fl oz	12	Foliar: 7, Soil: 21	Regardless of application method, maximum of 0.2 lb ai/acre per year (12 fl oz). Highly toxic to bees. Flea beetles only.
	4A	Belay 50 WDG (clothianidin)	Foliar: 1.6-2.1 oz, Soil: 4.8-6.4 oz	12	7	Maximum of 6.4 oz/acre per season. Do not use an adjuvant. Toxic to bees. Flea beetles only.
	4A	Platinum 75 SG (thiamethoxam)	1.66-3.67 oz	12	30	Maximum of 3.67 oz/acre per season. Do not use in conjunction with other 4A insecticides. Flea beetles only.
	4A	Scorpion 35 SL (dinotefuran)	Foliar: 2-5.25 fl oz; Soil: 9-10.5 fl oz	12	Foliar: 7; Soil: 21	Maximum of 10.5 fl oz (foliar) or 21 fl oz (soil) /acre per season. See pollinator protection restrictions on label.
	4A	Venom (dinotefuran)	Foliar: 1.0-3.0 oz; Soil: 5.0-6.0 oz	12	Foliar: 7; Soil: 21	Maximum of 6 oz (foliar) or 12 oz (soil) /acre per season. See pollinator protection restrictions on label.
	4A, 28	Durivo (thiamethoxam, chlorantraniliprole)	10-13 fl oz	12	30	May be applied using one of several soil application methods.
	4A, 28	Voliam Flexi (thiamethoxam, chlorantraniliprole)	4.0-7.0 oz	12	7	Do not exceed a total of 14 oz/acre per season or 0.172 lb ai of thiamethoxam or 0.2 lb ai of chlorantraniliprole /acre per season.
	21A	Torac	17-21 fl oz	12	1	Do not apply until at least 14 days after emergence. Maximum of 42 fl oz/acre per crop cycle. Flea beetles only.
	-	Aza-Direct (azadirachtin)	1-2 pt, up to 3.5, if needed	4	0	Antifeedant, repellent, insect growth regulator. OMRI-listed ² .
	-	Azatin XL (azadirachtin)	5-21 fl oz	4	0	Antifeedant, repellent, insect growth regulator.
Caterpillars (includes armyworms, corn earworm, green cloverworm, tobacco budworm, lesser cornstalk borer, loopers, cutworms).	1A	*Lannate LV, *SP (methomyl)	LV: 1.5-3 pt; SP: 0.5-1.0 lb	48	10, or 7 for lowest rates for lettuce only	Head varieties: Maximum of 24 pt (LV) or 8 lb (SP) /acre per crop. Leaf varieties and endive (escarole), dandelions, Swiss chard: Maximum of 12 pt (LV) or 4 lb (SP) /acre per crop.
	1A	Sevin 4F, XLR Plus (carbaryl)	1-2 qt	12	14	Maximum of 6 qt/acre per year.
	1B	*Diazinon AG500, *50W (diazinon)	AG500: 1-2 qt, 1-4 qt for endive (escarole); 50W: 2-4 lb, 2-8 lb for endive (escarole)	AG500: 72 - lettuce; 50W: 96 - endive (escarole)	preplant	Head and leaf lettuce, endive (escarole) only.
	1B	Orthene 97 (acephate)	1.0 lb	24	21	Crisphead head lettuce only. Maximum of 2.125 lb/acre per crop cycle.
	3A	*Ambush 25W (permethrin)	6.4-12.8 oz	12	1	Maximum of 128 oz/acre per season.
	3A	*Asana XL (0.66 EC) (esfenvalerate)	4.8-9.6 fl oz	12	7	Head lettuce only. Do not apply more than 0.35 lb ai. per acre per season.
	3A	*Baythroid XL (beta-cyfluthrin)	0.8-3.2 fl oz	12	0	Maximum amount per acre per season: 12.8 fl oz.

Table 9.7. Insecticides labeled for management of arthropod pests of lettuce and other leafy vegetables (non-Brassica, including escarole and endive). (continued)

Labels change frequently. Be sure to read a current product label before applying any chemical. Also refer to Table 19.2 for biopesticide and other alternative products labeled for disease management.						
Insect or mite pest	MOA Code ¹	Trade Name Active Ingredient	Rate (Product/acre)	REI (hours)	Days to Harvest	Remarks ²
	3A	*Brigade 2EC (bifenthrin)	2.1-6.4 fl oz	12	7	Head lettuce only. Maximum of 32 fl oz/acre per season.
	3A	*Declare (gamma-cyhalothrin)	0.77-1.54 fl oz	24	1	Head and leaf lettuce only. Maximum of 15.4 fl oz/acre per season. Armyworms: 1st and 2nd instar larvae only.
	3A	*Mustang (zeta-cypermethrin)	2.4-4.3 fl oz	12	1	Maximum of 25.8 fl oz/acre per season.
	3A	*Pounce 25 WP (permethrin)	3.2-12.8 oz	12	1	Maximum of 0.8 lb ai/acre per season.
	3A	PyGanic Crop Protection EC 5.0 (pyrethrins)	4.5-18 fl oz	12	0	Can be used in greenhouses. Thorough coverage is essential. Breaks down rapidly in sunlight. OMRI-listed ² .
	3A	*Warrior II (lambda-cyhalothrin)	0.96-1.92 fl oz	24	1	Head and leaf lettuce only. Maximum of 19.2 fl oz/acre per season. 1st and 2nd instar larvae only.
	3A, 28	*Besiege (lambda-cyhalothrin, chlorantraniliprole)	5-9 fl oz	24	1	Head and leaf lettuce only. Maximum of 31 fl oz/acre per year.
	3A, -	BotaniGard Maxx (pyrethrins, <i>Beauveria bassiana</i> strain GH4)	Ground app.: 0.25-2.00 qt; Aerial app.: 0.25-1.00 qt	12	0	Apply in sufficient water to cover foliage. Compatible in tank mix with some fungicides. May not be compatible with adjuvants.
	4A, 28	Durivo (thiamethoxam, chlorantraniliprole)	10-13 fl oz	12	30	May be applied using one of several soil application methods.
	4A, 28	Voliam Flexi (thiamethoxam, chlorantraniliprole)	4.0-7.0 oz	12	7	Do not exceed a total of 14 oz of Voliam Flexi per acre per season.
	5	Entrust SC (spinosad)	1.5-10.0 fl oz	4	1, except 3 for turnip greens	See label for resistance management recommendations. Do not apply more than 29 oz per acre per crop, or more than twice in succession. OMRI-listed ² .
	5	Radiant SC (spinetoram)	5-10 fl oz	4	1, 3 for turnip greens and other leaves of root, tuber, legume vegetables	Maximum of 6 applications, no more than 2 consecutive applications before rotating to another MOA.
	6	*Proclaim (emamectin benzoate)	2.4-4.8 oz	12	7	Do not make more than 2 sequential applications without rotation to another product with a different mode of action.
	6, 28	*Minecto Pro (abamectin, cyantraniliprole)	5.5-10.0 fl oz	12	7	Maximum of 20 fl oz/acre per year, or 0.4 lb ai/acre per year of cyantraniliprole-containing products and 0.056 lb ai/acre per year of abamectin-containing products including all application types.
	11A	Xentari DF (<i>Bacillus thuringiensis</i> subspecies <i>aizawai</i>)	0.5-2.0 lb	4	0	Treat when larvae are young. Thorough coverage is essential. May be used in the greenhouse. Can be used in organic production.
	18	Intrepid 2F (methoxyfenozide)	4-10 fl oz	4	1	Do not apply more than 64 fl oz/acre per season.
	22	Avaunt, Avaunt eVo (indoxacarb)	2.5-6.0 oz	12	3	Maximum of 24 oz/acre per crop and 96 oz/acre per year (Avaunt) or 18 oz/acre per crop and 72 oz/acre per year (Avaunt eVo).
	28	Coragen (chlorantraniliprole)	3.5-7.5 fl oz	4	1	Can be applied by drip chemigation to soil at planting or used as a foliar spray.
	28	Exirel (cyantraniliprole)	7-20.5 fl oz	12	1	Maximum of 0.4 lb ai/acre per year of cyantraniliprole-containing products (such as Verimark) including all application types.
	28	Verimark (cyantraniliprole)	5.0-13.5 fl oz	4	N/A: applied at planting	Maximum of 13.5 fl oz at planting or 0.4 lb ai/acre per year of cyantraniliprole-containing products (such as Exirel) including all application types.
	-	Aza-Direct (azadirachtin)	1-2 pt, up to 3.5, if needed	4	0	Antifeedant, repellent, insect growth regulator. OMRI-listed ² .
	-	Azatin XL (azadirachtin)	5-21 fl oz	4	0	Antifeedant, repellent, insect growth regulator.

Table 9.7. Insecticides labeled for management of arthropod pests of lettuce and other leafy vegetables (non-Brassica, including escarole and endive). (continued)

Labels change frequently. Be sure to read a current product label before applying any chemical.
Also refer to Table 19.2 for biopesticide and other alternative products labeled for disease management.

Insect or mite pest	MOA Code ¹	Trade Name Active Ingredient *Restricted	Rate (Product/acre)	REI (hours)	Days to Harvest	Remarks ²
	-	Grandevo (Chromobacterium subtsugae strain PRAA4-1)	1-3 lb	4	0	Can be used in organic production. OMRI-listed ² .
	-	Kryocide (cryolite)	8-20 lb	12	14	Do not apply more than 160 lb/acre/season. For leaf and head varieties of lettuce.
	-	Molt-X (azadirachtin)	10 fl oz	4	0	OMRI-listed ² .
	-	Neemix 4.5 EC (azadirachtin)	4-16 fl oz	12	0	OMRI-listed ² .
Stink bugs, plant bugs, meadow spittlebug	3A	*Brigade 2EC (bifenthrin)	2.1-6.4 fl oz	12	7	Head lettuce only. Maximum of 32 fl oz/acre per season.
	3A	*Declare (gamma-cyhalothrin)	1.02-1.54 fl oz	24	1	Head and leaf lettuce only. Maximum of 15.4 fl oz/acre per season.
	3A	*Mustang (zeta-cypermethrin)	2.4-4.3 fl oz	12	1	Maximum of 25.8 fl oz/acre per season.
	3A	*Warrior II (lambda-cyhalothrin)	0.96-1.92 fl oz	24	1	Head and leaf lettuce only. Maximum of 19.2 fl oz/acre per season.
	3A, 28	*Besiege (lambda-cyhalothrin, chlorantraniliprole)	6-9 fl oz	24	1	Maximum of 31 fl oz/acre per year.
	4A	Scorpion 35 SL (dinotefuran)	Foliar: 2-5.25 fl oz; Soil: 9-10.5 fl oz	12	Foliar: 7; Soil: 21	Maximum of 10.5 fl oz (foliar) or 21 fl oz (soil) /acre per season. See pollinator protection restrictions on label.
	4A	Venom (dinotefuran)	Foliar: 1.0-3.0 oz; Soil: 5.0-6.0 oz	12	Foliar: 7; Soil: 21	Maximum of 6 oz (foliar) or 12 oz (soil) /acre per season. See pollinator protection restrictions on label.
	-	Aza-Direct (azadirachtin)	1-2 pt, up to 3.5, if needed	4	0	Antifeedant, repellent, insect growth regulator. OMRI-listed.
	-	M-Pede 49% Soap, insecticidal	1-2% v/v	12	0	OMRI-listed ² .
Fire ants	7A	Extinguish (S)-methoprene)	1-1.5 lb	0	0	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.
Grasshoppers, Mole crickets	1B	*Diazinon AG500, *50W (diazinon)	AG500: 1-2 qt, 1-4 qt for endive (escarole); 50W: 2-4 lb, 2-8 lb for endive (escarole)	AG500: 72 - lettuce; 50W: 96 - endive (escarole)	preplant	See label. Head and leaf lettuce, endive (escarole) only.
	3A	*Baythroid XL (beta-cyfluthrin)	0.8-3.2 fl oz	12	0	Maximum amount per acre per season: 12.8 fl oz.
	3A	*Declare (gamma-cyhalothrin)	1.02-1.54 fl oz	24	1	Head and leaf lettuce only. Maximum of 15.4 fl oz/acre per season.
	3A	*Warrior II (lambda-cyhalothrin)	0.96-1.92 fl oz	24	1	Head and leaf lettuce only. Maximum of 19.2 fl oz/acre per season.
	4A	Scorpion 35 SL (dinotefuran)	Foliar: 2-5.25 fl oz; Soil: 9-10.5 fl oz	12	Foliar: 7; Soil: 21	Maximum of 10.5 fl oz (foliar) or 21 fl oz (soil) /acre per season. See pollinator protection restrictions on label.
	4A	Venom (dinotefuran)	Foliar: 1.0-3.0 oz; Soil: 5.0-6.0 oz	12	Foliar: 7; Soil: 21	Maximum of 6 oz (foliar) or 12 oz (soil) /acre per season. See pollinator protection restrictions on label.
Leafhoppers	1A	*Lannate LV, *SP (methomyl)	LV: 1.5-3 pt; SP: 0.5-1.0 lb	48	10, or 7 for lowest rates for lettuce only	Head varieties: Maximum of 24 pt (LV) or 8 lb (SP) /acre per crop. Leaf varieties and endive (escarole), dandelions, Swiss chard: Maximum of 12 pt (LV) or 4 lb (SP) /acre per crop.
	1A	Sevin 4F, XLR Plus (carbaryl)	0.5-1.0 qt	12	14	Maximum of 6 qt/acre per year.
	1B	Dimethoate 4 EC (dimethoate)	0.5 pt	48	14	Leaf lettuce only, not for head lettuce. Also for endive (escarole) and Swiss chard.
	1B	Malathion 5EC, 8F (malathion)	5EC: 2-3 pt for lettuce; 8F: 1.25 pt for endive, 1.88 pt for leaf and head lettuce	24	14 for head and leaf lettuce	Do not apply more than twice per year.

Table 9.7. Insecticides labeled for management of arthropod pests of lettuce and other leafy vegetables (non-Brassica, including escarole and endive). (continued)

Labels change frequently. Be sure to read a current product label before applying any chemical. Also refer to Table 19.2 for biopesticide and other alternative products labeled for disease management.						
Insect or mite pest	MOA Code ¹	Trade Name Active Ingredient *Restricted	Rate (Product/acre)	REI (hours)	Days to Harvest	Remarks ²
	1B	Orthene 97 (acephate)	0.5-1.0 lb	24	21	Crisphead head lettuce only. Maximum of 2.125 lb/acre per crop cycle.
	3A	*Ambush 25W (permethrin)	6.4-12.8 oz	12	1	Maximum of 128 oz/acre per season.
	3A	*Baythroid XL (beta-cyfluthrin)	0.8-3.2 fl oz	12	0	Maximum amount per acre per season: 12.8 fl oz.
	3A	*Brigade 2EC (bifenthrin)	2.1-6.4 fl oz	12	7	Head lettuce only. Maximum of 32 fl oz/acre per season.
	3A	*Declare (gamma-cyhalothrin)	1.02-1.54 fl oz	24	1	Head and leaf lettuce only. Maximum of 15.4 fl oz/acre per season.
	3A	*Mustang (zeta-cypermethrin)	2.4-4.3 fl oz	12	1	Maximum of 25.8 fl oz/acre per season.
	3A	PyGanic Crop Protection EC 5.0 (pyrethrins)	4.5-18 fl oz	12	0	Can be used in greenhouses. Thorough coverage is essential. Breaks down rapidly in sunlight. OMRI-listed ² .
	3A	*Warrior II (lambda-cyhalothrin)	0.96-1.92 fl oz	24	1	Head and leaf lettuce only. Maximum of 19.2 fl oz/acre per season.
	3A, -	BotaniGard Maxx (pyrethrins, <i>Beauveria bassiana</i> strain GHA)	Ground app.: 0.25-2.00 qt; Aerial app.: 0.25-1.00 qt	12	0	Apply in sufficient water to cover foliage. Compatible in tank mix with some fungicides. May not be compatible with adjuvants.
	4A	Actara (thiamethoxam)	1.5-3.0 oz	12	7	Maximum of 11 oz/acre per growing season. Highly toxic to foraging bees.
	4A	Admire Pro (imidacloprid)	Foliar: 1.3 fl oz; Soil: 4.4-10.5 fl oz	12	Foliar: 7; Soil: 21	Maximum of 6.5 fl oz (foliar) or 10.5 fl oz (soil) /acre per year.
	4A	Belay (clothianidin)	Foliar: 3-4 fl oz, Soil: 9-12 fl oz	12	Foliar: 7, Soil: 21	Regardless of application method, do not apply more than 0.2 lb ai/acre per year (12 fl oz). Do not apply at intervals of less than 10 days. Highly toxic to bees.
	4A	Belay 50 WDG (clothianidin)	Foliar: 1.6-2.1 oz, Soil: 4.8 -6.4 oz	12	7	Maximum of 6.4 oz/acre per season. Do not use an adjuvant. Toxic to bees.
	4A	Platinum 75 SG (thiamethoxam)	1.66-3.67 oz	12	30	Maximum of 3.67 oz/acre per season. Do not use in conjunction with other 4A insecticides.
	4A	Scorpion 35 SL (dinotefuran)	Foliar: 2-5.25 fl oz; Soil: 9-10.5 fl oz	12	Foliar: 7; Soil: 21	Maximum of 10.5 fl oz (foliar) or 21 fl oz (soil) /acre per season. See pollinator protection restrictions on label.
	4A	Venom (dinotefuran)	Foliar: 1.0-3.0 oz; Soil: 5.0-6.0 oz	12	Foliar: 7; Soil: 21	Maximum of 6 oz (foliar) or 12 oz (soil) /acre per season. See pollinator protection restrictions on label.
	4A, 28	Durivo (thiamethoxam, chlorantraniliprole)	10-13 fl oz	12	30	May be applied using one of several soil application methods.
	4D	Sivanto Prime (flupyradifurone)	7.0-14.0 fl oz	4	1	Maximum of 28 fl oz/acre per crop season. Maximum crop seasons per year of 3.
	16	Courier 40SC (buprofezin)	9.0-13.6 fl oz	12	7	Insect growth regulator. Do not make more than 2 applications per season per crop or 4 per year. Allow 7 days between applications.
	21A	Torac	14-21 fl oz	12	1	Do not apply until at least 14 days after emergence. Maximum of 42 fl oz/acre per crop cycle.
	-	Aza-Direct (azadirachtin)	1-2 pt, up to 3.5, if needed	4	0	Antifeedant, repellent, insect growth regulator. OMRI-listed ² .
	-	Azatin XL (azadirachtin)	5-21 fl oz	4	0	Antifeedant, repellent, insect growth regulator.
	-	M-Pede 49% Soap, insecticidal	1-2% v/v	12	0	OMRI-listed ² .
	-	Molt-X (azadirachtin)	10 fl oz	4	0	OMRI-listed ² .
	-	JMS Stylet-Oil, Saf-T-Side, Suffoil-X, Sun Spray 98.8%, others Oil, insecticidal	3-6 qt/100 gal (JMS), 1-2 gal/100 gal	4	0	Organic Stylet-Oil, Saf-T-Side, and Suffoil-X are OMRI-listed ² .
Leafminers	1B	*Diazinon AG500,* 50W (diazinon)	AG500: 0.5-1 pt; 50W: 0.5-1 lb	72	14	Do not apply more than once. Head and leaf lettuce only.
	1B	Dimethoate 4 EC (dimethoate)	0.5 pt	48	14	Leaf lettuce only, not for head lettuce. Also for endive (escarole) and Swiss chard.

Table 9.7. Insecticides labeled for management of arthropod pests of lettuce and other leafy vegetables (non-Brassica, including escarole and endive). (continued)

Labels change frequently. Be sure to read a current product label before applying any chemical.
Also refer to Table 19.2 for biopesticide and other alternative products labeled for disease management.

Insect or mite pest	MOA Code ¹	Trade Name Active Ingredient <i>*Restricted</i>	Rate (Product/acre)	REI (hours)	Days to Harvest	Remarks ²
	3A	PyGanic Crop Protection EC 5.0 (pyrethrins)	4.5-18 fl oz	12	0	Can be used in greenhouses. Thorough coverage is essential. Breaks down rapidly in sunlight. OMRI-listed ² .
	3A, -	BotaniGard Maxx (pyrethrins, <i>Beauveria bassiana</i> strain GHA)	Ground app.: 0.25-2.00 qt; Aerial app.: 0.25-1.00 qt	12	0	Apply in sufficient water to cover foliage. Compatible in tank mix with some fungicides. May not be compatible with adjuvants.
	5	Entrust SC (spinosad)	1.5-10.0 fl oz	4	1, except 3 for turnip greens	See label for resistance management recommendations. Do not apply more than 29 oz per acre per crop, or more than twice in succession. OMRI-listed ² .
	5	Radiant SC (spinetoram)	5-10 fl oz	4	1, 3 for turnip greens and other leaves of root, tuber, legume vegetables	Maximum of 6 applications, no more than 2 consecutive applications before rotating to another MOA.
	6	*Agri-Mek SC (abamectin)	1.75-3.50 fl oz	12	7	No more than 2 sequential applications. Must be mixed with an adjuvant-see label. Highly toxic to foraging bees.
	6	*Proclaim (emamectin benzoate)	2.4-4.8 oz	12	7	Do not make more than 2 sequential applications without rotation to another product with a different mode of action.
	6, 28	*Minecto Pro (abamectin, cyantranilprole)	5.5-10.0 fl oz	12	7	Maximum of 20 fl oz/acre per year, or 0.4 lb ai/acre per year of cyantranilprole-containing products and 0.056 lb ai/acre per year of abamectin-containing products including all application types.
	17	Trigard (cyromazine)	2.66 oz	12	7	Limited to six applications for head lettuce and five applications for other leafy vegetables.
	28	Coragen (chlorantranilprole)	5.0-7.5 fl oz	4	1	May be applied by drip chemigation, in addition to foliar and various soil application methods.
	28	Exirel (cyantranilprole)	13.5-20.5 fl oz	12	1	Maximum of 0.4 lb ai/acre per year of cyantranilprole-containing products (such as Verimark) including all application types. For best performance, use an adjuvant.
	28	Verimark (cyantranilprole)	6.75-13.5 fl oz	4	N/A-applied at planting	Maximum of 13.5 fl oz at planting or 0.4 lb ai/acre per year of cyantranilprole-containing products (such as Exirel) including all application types.
	-	Aza-Direct (azadirachtin)	1-2 pt, up to 3.5, if needed	4	0	Antifeedant, repellent, insect growth regulator. OMRI-listed.
	-	Azatin XL (azadirachtin)	5-21 fl oz	4	0	Antifeedant, repellent, insect growth regulator.
	-	Molt-X (azadirachtin)	10 fl oz	4	0	OMRI-listed ² .
	-	Neemix 4.5 EC (azadirachtin)	4-16 fl oz	12	0	OMRI-listed ² .
	-	Requiem EC (extract of <i>Chenopodium ambrosioides</i>)	2.0-4.0 qt	4	0	
	-	Sun Spray 98.8%, JMS Stylet-Oil, Saf-T-Side, others Oil, insecticidal	3-6 qt/100 gal (JMS); 1-2 gal/100 gal	4	0	Organic Stylet-Oil and Saf-T-Side are OMRI-listed ² .
Mites (includes carmine spider mite, twospotted spider mite)	1B	Malathion 5EC, 8F (malathion)	5EC: 1.5-2.0 pt for endive, 2.5-3.0 pt for lettuce; 8F: 1.25 pt for endive, 1.88 pt for leaf and head lettuce	24	7 for endive, 14 for head and leaf lettuce	Do not apply more than twice per year.
	3A	*Brigade 2EC (bifenthrin)	5.1-6.4 fl oz	12	7	Head lettuce only. Maximum of 32 fl oz/acre per season.
	3A	*Warrior II (lambda-cyhalothrin)	0.96-1.92 fl oz	24	1	Head and leaf lettuce only. Maximum of 19.2 fl oz/acre per season.
	3A, -	BotaniGard Maxx (pyrethrins, <i>Beauveria bassiana</i> strain GHA)	Ground app.: 0.25-2.00 qt; Aerial app.: 0.25-1.00 qt	12	0	Apply in sufficient water to cover foliage. Compatible in tank mix with some fungicides. May not be compatible with adjuvants.

Table 9.7. Insecticides labeled for management of arthropod pests of lettuce and other leafy vegetables (non-Brassica, including escarole and endive). (continued)

Labels change frequently. Be sure to read a current product label before applying any chemical.
Also refer to Table 19.2 for biopesticide and other alternative products labeled for disease management.

Insect or mite pest	MOA Code ¹	Trade Name Active Ingredient	Rate (Product/acre)	REI (hours)	Days to Harvest	Remarks ²
	6	*Agri-Mek SC (abamectin)	1.75-3.50 fl oz	12	7	No more than 2 sequential applications. Must be mixed with an adjuvant. Highly toxic to foraging bees.
	6, 28	*Minecto Pro (abamectin, cyantraniliprole)	5.5-10.0 fl oz	12	7	Maximum of 20 fl oz/acre per year, or 0.4 lb ai/acre per year of cyantraniliprole-containing products and 0.056 lb ai/acre per year of abamectin-containing products including all application types.
	-	Aza-Direct (azadirachtin)	1-2 pt, up to 3.5, if needed	4	0	Antifeedant, repellent, insect growth regulator. OMRI-listed ² .
	-	Grandevo (Chromobacterium subsugae strain PRAA4-1)	1-3 lb	4	0	Can be used in organic production. OMRI-listed ² .
	-	M-Pede 49% Soap, insecticidal	1-2% v/v	12	0	OMRI-listed ² .
	-	JMS Stylet-Oil, Saf-T-Side, Suffoil-X, Sun Spray 98.8%, others Oil, insecticidal	3-6 qt/100 gal (JMS), 1-2 gal/100 gal	4	0	Organic Stylet-Oil, Saf-T-Side, and Suffoil-X are OMRI-listed ² .
	-	Trilogy (extract of neem oil)	0.5-2.0% v/v	4	0	Apply morning or evening to reduce potential for leaf burn. Toxic to bees exposed to direct treatment. OMRI-listed ² .
Thrips (check labels for species controlled)	1A	*Lannate LV, *SP (methomyl)	LV: 1.5-3 pt; SP: 0.5-1.0 lb	48	10, or 7 for lowest rates for lettuce only	Head varieties: Maximum of 24 pt (LV) or 8 lb (SP) /acre per crop. Leaf varieties and endive (escarole), dandelions, Swiss chard: Maximum of 12 pt (LV) or 4 lb (SP) /acre per crop.
	3A, -	BotaniGard Maxx (pyrethrins, <i>Beauveria bassiana</i> strain GHA)	Ground app.: 0.25-2.00 qt; Aerial app.: 0.25-1.00 qt	12	0	Apply in sufficient water to cover foliage. Compatible in tank mix with some fungicides. May not be compatible with adjuvants.
	5	Entrust SC (spinosad)	1.5-10.0 fl oz	4	1, except 3 for turnip greens	See label for resistance management recommendations. Do not apply more than 29 oz per acre per crop, or more than twice in succession. OMRI-listed ² .
	5	Radiant SC (spinetoram)	5-10 fl oz	4	1, 3 for turnip greens and other leaves of root, tuber, legume vegetables	Includes turnip greens. Maximum of 6 applications, no more than 2 consecutive applications before rotating to another MOA.
	21A	Torac	21 fl oz	12	1	Do not apply until at least 14 days after emergence. Maximum of 42 fl oz/acre per crop cycle.
	28	Exirel (cyantraniliprole)	13.5-20.5 fl oz	12	1	Maximum of 0.4 lb ai/acre per year of cyantraniliprole-containing products (such as Verimark) including all application types.
	-	Aza-Direct (azadirachtin)	1-2 pt, up to 3.5, if needed	4	0	Antifeedant, repellent, insect growth regulator. OMRI-listed.
	-	Azatin XL (azadirachtin)	5-21 fl oz	4	0	Antifeedant, repellent, insect growth regulator.
	-	BotaniGard ES, Mycotrol ESO (<i>Beauveria bassiana</i> strain GHA)	0.25-1 qt	4	0	Apply in sufficient water to cover foliage, typically 5-100 gallon/acre. Compatible in tank mix with some fungicides. Mycotrol ESO OMRI-listed ² .
	-	Grandevo (Chromobacterium subsugae strain PRAA4-1)	1-3 lb	4	0	Can be used in organic production. OMRI-listed ² .
	-	M-Pede 49% Soap, insecticidal	1-2% v/v	12	0	OMRI-listed ² .
	-	Molt-X (azadirachtin)	10 fl oz	4	0	OMRI-listed ² .
	-	JMS Stylet-Oil, Saf-T-Side, Suffoil-X, Sun Spray 98.8%, others Oil, insecticidal	3-6 qt/100 gal (JMS), 1-2 gal/100 gal	4	0	Organic Stylet-Oil, Saf-T-Side, and Suffoil-X are OMRI-listed ² .

Table 9.7. Insecticides labeled for management of arthropod pests of lettuce and other leafy vegetables (non-Brassica, including escarole and endive). (continued)

Labels change frequently. Be sure to read a current product label before applying any chemical.
Also refer to Table 19.2 for biopesticide and other alternative products labeled for disease management.

Insect or mite pest	MOA Code ¹	Trade Name Active Ingredient *Restricted	Rate (Product/acre)	REI (hours)	Days to Harvest	Remarks ²
	-	Trilogy (extract of neem oil)	0.5-2.0% v/v	4	0	Apply morning or evening to reduce potential for leaf burn. Toxic to bees exposed to direct treatment. OMRI-listed.

¹ Mode of Action (MOA) codes for plant pest insecticides from the Insecticide Resistance Action Committee (IRAC) Mode of Action Classification v. 8.2 March 2017. Number codes (1 through 29) are used to distinguish the main insecticide mode of action groups, with additional letters for certain sub-groups within each main group. All insecticides within the same group (with same number) indicate same active ingredient or similar mode of action. This information must be considered for the insecticide resistance management decisions. - = unknown, or a mode of action that has not been classified yet.

² Information provided in this table applies only to Florida. Be sure to read a current product label before applying any product. 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. OMRI listed: Listed by the Organic Materials Review Institute for use in organic production.

*** Restricted use insecticide.**

Table 9.8. Insecticides labeled for management of arthropod pests of spinach.

Labels change frequently. Be sure to read a current product label before applying any chemical.
Also Refer to Table 19.2 for biopesticide and other alternative products labeled for disease management.

Pest	MOA Code ¹	Trade Name Active Ingredient *Restricted	Rate Product/acre	REI (hours)	Days to Harvest	Notes ²
Aphids	1B	Malathion 5EC, 8F (malathion)	5EC: 1.6 pt; 8F: 1.0 pt	12	7	Maximum of 2 applications per year.
	3A	*Ambush 25W (permethrin)	6.4-12.8 oz	12	1	Do not apply more than 1.0 lb ai/acre per season (5 applications at high rate).
	3A	*Mustang (zeta-cypermethrin)	2.4-4.3 fl oz	12	1	Maximum of 25.8 fl oz/acre per season.
	3A	*Pounce 25 WP (permethrin)	6.4-12.8 oz	12	1	Maximum of 0.6 lb ai/acre per season (Maximum 3 applications at highest rate).
	3A	PyGanic Crop Protection EC 5.0 (pyrethrins)	4.5-18 fl oz	12	0	Pyrethrins degrade rapidly in sunlight, but still may be harmful to bees. OMRI-listed ² .
	3A, -	BotaniGard Maxx (pyrethrins, <i>Beauveria bassiana</i> strain GHA)	Ground app.: 0.25-2.00 qt; Aerial app.: 0.25-1.00 qt	12	0	Apply in sufficient water to cover foliage. Compatible in tank mix with some fungicides. May not be compatible with adjuvants.
	4A	Actara (thiamethoxam)	1.5-3.0 oz	12	7	Maximum of 11 oz/acre per growing season. Highly toxic to foraging bees.
	4A	Admire Pro (imidacloprid)	Foliar: 1.3 fl oz, Soil: 4.4-10.5 fl oz	12	Foliar: 7, Soil: 21	Maximum of 6.5 fl oz (foliar) or 10.5 fl oz (soil)/acre per year. Toxic to bees.
	4A	Assail 30SG (acetamiprid)	2.0-4.0 oz	12	7	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.
	4A	Belay (clothianidin)	Foliar: 3-4 fl oz Soil: 1: 9-12 fl oz	12	Foliar: 7, Soil: 21	Regardless of application method, do not apply more than 0.2 lb ai/acre per year (12 fl oz). Do not apply at intervals of less than 10 days. Highly toxic to bees.
	4A	Belay 50 WDG (clothianidin)	Foliar: 1.6-2.1 oz Soil: 1: 4.8 -6.4 oz	12	7	Maximum of 6.4 oz/acre per season. Do not use an adjuvant. Toxic to bees. Do not allow drift to flowering weeds or nearby crops in bloom.
	4A	Platinum 75 SG (thiamethoxam)	1.66-3.67 oz	12	30	Maximum of 3.67 oz/acre per season. Do not use in conjunction with other 4A insecticides.
	4A	Scorpion 35 SL (dinotefuran)	Foliar: 2-5.25 fl oz; Soil: 9-10.5 fl oz	12	Foliar: 7; Soil: 21	Maximum of 10.5 fl oz (foliar) or 21 fl oz (soil) /acre per season. See pollinator protection restrictions on label.
4A	Venom (dinotefuran)	Foliar: 1.0-3.0 oz; Soil: 5.0-6.0 oz	12	Foliar: 7; Soil: 21	Maximum of 6 oz (foliar) or 12 oz (soil) /acre per season. See pollinator protection restrictions on label.	

Table 9.8. Insecticides labeled for management of arthropod pests of spinach. (continued)

Labels change frequently. Be sure to read a current product label before applying any chemical.
Also Refer to Table 19.2 for biopesticide and other alternative products labeled for disease management.

Pest	MOA Code ¹	Trade Name Active Ingredient *Restricted	Rate Product/acre	REI (hours)	Days to Harvest	Notes ²
	4A, 28	Durivo (thiamethoxam, chlorantraniliprole)	10-13 oz	12	30	May be applied using one of several soil application methods. One application per season.
	4A, 28	Voliam Flexi (thiamethoxam and chlorantraniliprole)	4.0-7.0 oz	12	7	Do not exceed a total of 14 oz of Voliam Flexi per acre per season. Do not use an adjuvant.
	4D	Sivanto Prime (flupyradifurone)	7.0-14.0 fl oz	4	1	Maximum of 28 fl oz/acre per year.
	9B	Fulfill (pymetrozine)	2.75 oz	12	7	Apply when aphids first appear, before populations build to damaging levels. Two applications may be needed to control persistent aphid populations.
	23	Movento (spirotetramat)	4.0-5.0 fl oz	24	3	Do not apply more than 10 fl oz/acre/crop. See label for information about the use of adjuvants.
	28	Exirel (cyantraniliprole)	13.5-20.5 fl oz	12	1	Maximum of 0.4 lb ai/acre per year of cyantraniliprole-containing products (such as Verimark) including all application types. Do not use an adjuvant.
	28	Verimark (cyantraniliprole)	6.75-13.5 fl oz	4	N/A: applied at planting	Maximum of 13.5 fl oz at planting or 0.4 lb ai/acre per year of cyantraniliprole-containing products (such as Exirel) including all application types.
	29	Beleaf 50 SG (flonicamid)	2.0-2.8 oz	12	0	Maximum of 8.4 oz/acre per season. Begin applications before pests reach damaging levels.
	-	Aza-Direct, Azatin XL, Neemix 4.5 EC (azadirachtin)	Aza-Direct: 1-2 pt, up to 3.5, if needed; Azatin XL: 5-21 fl oz; Neemix 4.5 EC: 4-16 fl oz	Aza-Direct, Azatin XL: 4; Neemix 4.5 EC: 12	0	Antifeedant, repellent, insect growth regulator. OMRI-listed ² .
	-	BotaniGard ES, Mycotrol ESO (<i>Beauveria bassiana</i> strain GHA)	0.25-1 qt	4	0	Apply in sufficient water to cover foliage, typically 5-100 gallon/acre. Compatible in tank mix with some fungicides. Mycotrol ESO OMRI-listed ² .
	-	Grandevo (<i>Chromobacterium subtsugae</i> strain PRAA4-1)	1-3 lb	4	0	Can be used in organic production. OMRI-listed ² .
	-	M-Pede 49% Soap, insecticidal	1-2% V/V	12	0	OMRI-listed ² .
	-	Molt-X (azadirachtin)	10 fl oz	4	0	OMRI-listed ² .
	-	Trilogy (extract of neem oil)	1.0-2.0% V/V	4	0	Apply morning or evening to reduce potential for leaf burn. Toxic to bees exposed to direct treatment. OMRI-listed.
Beetles (includes cucumber beetle, flea beetles, darkling beetles) and weevils.	1A	Sevin 4F, XLR Plus (carbaryl)	0.5-1.0 qt	12	14	Maximum of 6 qt/acre per year.
	3A	*Baythroid XL (beta-cyfluthrin)	0.8-3.2 fl oz	12	0	Maximum of 12.8 fl oz/acre per season.
	3A	*Brigade 2EC (bifenthrin)	2.1-6.4 fl oz	12	7	Maximum of 25.6 fl oz/acre per season.
	3A	*Mustang (zeta-cypermethrin)	2.4-4.3 fl oz	12	1	Maximum of 25.8 fl oz/acre per season.
	3A	PyGanic Crop Protection EC 5.0 (pyrethrins)	4.5-18 fl oz	12	0	Pyrethrins degrade rapidly in sunlight, but still may be harmful to bees. OMRI-listed ² .
	3A, -	BotaniGard Maxx (pyrethrins, <i>Beauveria bassiana</i> strain GHA)	Ground app.: 0.25-2.00 qt; Aerial app.: 0.25-1.00 qt	12	0	Apply in sufficient water to cover foliage. Compatible in tank mix with some fungicides. May not be compatible with adjuvants.
	4A	Actara (thiamethoxam)	1.5-3.0 oz	12	7	Maximum of 11 oz/acre per growing season. Highly toxic to foraging bees. Flea beetles only.
	4A	Admire Pro (imidacloprid)	1.3 fl oz	12	7	Maximum of 6.5 fl oz/acre per year. Toxic to bees. Flea beetles only.
	4A	Belay (clothianidin)	Foliar: 3-4 fl oz, Soil: 9-12 fl oz	12	Foliar: 7, Soil: 21	Regardless of application method, do not apply more than 0.2 lb ai/acre per year (12 fl oz). Highly toxic to bees. Flea beetles only.
	4A	Belay 50 WDG (clothianidin)	Foliar: 1.6-2.1 oz, Soil: 4.8 -6.4 oz	12	7	Maximum of 6.4 oz/acre per season. Do not use an adjuvant. Toxic to bees. Flea beetles only.

Table 9.8. Insecticides labeled for management of arthropod pests of spinach. (continued)

Labels change frequently. Be sure to read a current product label before applying any chemical.
Also Refer to Table 19.2 for biopesticide and other alternative products labeled for disease management.

Pest	MOA Code ¹	Trade Name Active Ingredient *Restricted	Rate Product/acre	REI (hours)	Days to Harvest	Notes ²
	4A	Platinum 75 SG (thiamethoxam)	1.66-3.67 oz	12	30	Maximum of 3.67 oz/acre per season. Do not use in conjunction with other 4A insecticides.
	4A	Scorpion 35 SL (dinotefuran)	Foliar: 2-5.25 fl oz; Soil: 9-10.5 fl oz	12	Foliar: 7; Soil: 21	Maximum of 10.5 fl oz (foliar) or 21 fl oz (soil) /acre per season. See pollinator protection restrictions on label. Flea beetles only.
	4A	Venom (dinotefuran)	Foliar: 1.0-3.0 oz; Soil: 5.0-6.0 oz	12	Foliar: 7; Soil: 21	Maximum of 6 oz (foliar) or 12 oz (soil) /acre per season. See pollinator protection restrictions on label. Flea beetles only.
	4A, 28	Durivo (thiamethoxam, chlorantraniliprole)	10-13 oz	12	30	
	4A, 28	Voliam Flexi (thiamethoxam and chlorantraniliprole)	4.0-7.0 oz	12	7	Do not exceed a total of 14 oz of Voliam Flexi per acre per season. Do not use an adjuvant.
	-	Aza-Direct (azadirachtin)	1-2 pt, up to 3.5, if needed	4	0	Antifeedant, repellent, insect growth regulator. OMRI-listed.
	-	Azatin XL (azadirachtin)	5-21 fl oz	4	0	Antifeedant, repellent, insect growth regulator.
Caterpillars (includes armyworms, corn earworm, green cloverworm, tobacco budworm, lesser cornstalk borer, loopers, cutworms)	1A	*Lannate LV; *SP (methomyl)	LV: 1.5-3 pt; SP: 0.5-1.0 lb	48	7	Do not use more than 4 lb of SP, or 12 pt of LV per acre/season. Do not apply to seedlings less than 3" diameter.
	1A	Sevin 4F, XLR Plus (carbaryl)	1-2 qt	12	14	Maximum of 6 qt/acre per year.
	1B	*Diazinon AG500, 50W (diazinon)	AG500: 2.0-4.0 qt; 50W: 4.0-8.0 lb	72	preplant	Do not make more than one soil application per year
	3A	*Baythroid XL (beta-cyfluthrin)	0.8-3.2 fl oz	12	0	Maximum of 12.8 fl oz/acre per season.
	3A	*Brigade 2EC (bifenthrin)	2.1-6.4 fl oz	12	7	Maximum of 25.6 fl oz/acre per season.
	3A	*Mustang (zeta-cypermethrin)	2.4-4.3 fl oz	12	1	Maximum of 25.8 fl oz/acre per season.
	3A	*Pounce 25 WP (permethrin)	3.2-12.8 oz	12	1	Maximum of 0.6 lb ai/acre per season (Maximum 3 applications at highest rate).
	3A	PyGanic Crop Protection EC 5.0 (pyrethrins)	4.5-18 fl oz	12	0	Pyrethrins degrade rapidly in sunlight, but still may be harmful to bees. OMRI-listed ² .
	3A, -	BotaniGard Maxx (pyrethrins, <i>Beauveria bassiana</i> strain GHA)	Ground app.: 0.25-2.00 qt; Aerial app.: 0.25-1.00 qt	12	0	Apply in sufficient water to cover foliage. Compatible in tank mix with some fungicides. May not be compatible with adjuvants.
	5	Entrust SC (spinosad)	1.5-10.0 fl oz	4	1	Use no more than 29 oz per acre per crop. OMRI-listed ² .
	5	Radiant SC (spinetoram)	5-10 fl oz	4	1	Maximum of 6 applications, no more than 2 consecutive applications before rotating to another MOA.
	6	*Proclaim (emamectin benzoate)	2.4-4.8 oz	12	7	Do not apply more than 28.8 oz/A per season.
	11A	Biobit HP (<i>Bacillus thuringiensis</i> ssp. <i>kurstaki</i>)	0.5-2.0 lb	4	0	Treat when larvae are young. Good coverage is essential. Can be used in the greenhouse. OMRI-listed.
	11A	Crymax WDG (<i>Bacillus thuringiensis</i> ssp. <i>kurstaki</i>)	0.5-2.0 lb	4	0	Use high rate for armyworms. Treat when larvae are young.
	11A	Deliver (<i>Bacillus thuringiensis</i> ssp. <i>kurstaki</i>)	0.25-1.5 lb	4	0	Use higher rates for armyworms. OMRI-listed ² .
	11A	DiPel DF (<i>Bacillus thuringiensis</i> ssp. <i>kurstaki</i>)	0.5-2.0 lb	4	0	Treat when larvae are young. Good coverage is essential. See label for rates for specific pests. For organic production.
	11A	Javelin WG (<i>Bacillus thuringiensis</i> ssp. <i>kurstaki</i>)	0.12-1.5 lb	4	0	Treat when larvae are young. Thorough coverage is essential. OMRI-listed ² .
	11A	Xentari DF (<i>Bacillus thuringiensis</i> ssp. <i>aizawai</i>)	0.5-2.0 lb	4	0	Treat when larvae are young. Thorough coverage is essential. May be used in the greenhouse. Can be used in organic production.
	28	Coragen (chlorantraniliprole)	3.5-7.5 fl oz	4	1	Can be applied by drip chemigation to soil at planting or used as a foliar spray.

Table 9.8. Insecticides labeled for management of arthropod pests of spinach. (continued)

Labels change frequently. Be sure to read a current product label before applying any chemical. Also Refer to Table 19.2 for biopesticide and other alternative products labeled for disease management.						
Pest	MOA Code ¹	Trade Name Active Ingredient *Restricted	Rate Product/acre	REI (hours)	Days to Harvest	Notes ²
	28	Exirel (cyantraniliprole)	7-20.5 fl oz	12	1	Maximum of 0.4 lb ai/acre per year of cyantraniliprole-containing products (such as Verimark) including all application types. Do not use an adjuvant.
	28	Verimark (cyantraniliprole)	5.0-13.5 fl oz	4	N/A: applied at planting	Maximum of 13.5 fl oz at planting or 0.4 lb ai/acre per year of cyantraniliprole-containing products (such as Exirel) including all application types.
	-	Azatin XL (azadirachtin)	5-21 fl oz	4	0	Antifeedant, repellent, insect growth regulator.
	-	Aza-Direct (azadirachtin)	1-2 pt, up to 3.5, if needed	4	0	Antifeedant, repellent, insect growth regulator. OMRI-listed.
	-	Grandevo (<i>Chromobacterium subtsugae</i> strain PRAA4-1)	1-3 lb	4	0	Can be used in organic production. OMRI-listed ² .
	-	Kryocide (cryolite)	8-20 lb	12	14	Do not apply more than 160 lb/acre/season.
	-	Molt-X (azadirachtin)	10 fl oz	4	0	OMRI-listed ² .
	-	Neemix 4.5 EC (azadirachtin)	4-16 fl oz	12	0	IGR and feeding repellent. OMRI-listed ² .
Stink bugs, plant bugs, meadow spittlebug	1A	Sevin 4F, XLR Plus (carbaryl)	1-2 qt	12	14	Maximum of 6 qt/acre per year.
	3A	*Brigade 2EC (bifenthrin)	5.1-6.4 fl oz	12	7	Maximum of 25.6 fl oz/acre per season.
	3A	*Mustang (zeta-cypermethrin)	2.4-4.3 fl oz	12	1	Maximum of 25.8 fl oz/acre per season.
	3A	PyGanic Crop Protection EC 5.0 (pyrethrins)	4.5-18 fl oz	12	0	Pyrethrins degrade rapidly in sunlight, but still may be harmful to bees. OMRI-listed ² .
	3A, -	BotaniGard Maxx (pyrethrins, <i>Beauveria bassiana</i> strain GHA)	Ground app.: 0.25-2.00 qt; Aerial app.: 0.25-1.00 qt	12	0	Apply in sufficient water to cover foliage. Compatible in tank mix with some fungicides. May not be compatible with adjuvants.
	4A	Scorpion 35 SL (dinotefuran)	Foliar: 2-5.25 fl oz; Soil: 9-10.5 fl oz	12	Foliar: 7; Soil: 21	Maximum of 10.5 fl oz (foliar) or 21 fl oz (soil) /acre per season. See pollinator protection restrictions on label.
	4A	Venom (dinotefuran)	Foliar: 1.0-3.0 oz; Soil: 5.0-6.0 oz	12	Foliar: 7; Soil: 21	Maximum of 6 oz (foliar) or 12 oz (soil) /acre per season. See pollinator protection restrictions on label.
	29	Beleaf 50 SG (flonicamid)	2.0-2.8 oz	12	0	Maximum of 8.4 oz/acre per season. Begin applications before pests reach damaging levels.
	-	Aza-Direct (azadirachtin)	1-2 pt, up to 3.5, if needed	4	0	Antifeedant, repellent, insect growth regulator. OMRI-listed.
	-	M-Pede 49% Soap, insecticidal	1-2% V/V	12	0	OMRI-listed ² .
Fire ants	7A	Extinguish ((S)-methoprene)	1-1.5 lb	4	0	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.
Grasshoppers, mole crickets	3A	*Baythroid XL beta-cyfluthrin)	0.8-3.2 fl oz	12	0	Maximum of 12.8 fl oz/acre per season.
	3A	PyGanic Crop Protection EC 5.0 (pyrethrins)	4.5-18 fl oz	12	0	Pyrethrins degrade rapidly in sunlight, but still may be harmful to bees. OMRI-listed ²
	4A	Scorpion 35 SL (dinotefuran)	Foliar: 2-5.25 fl oz; Soil: 9-10.5 fl oz	12	Foliar: 7; Soil: 21	Maximum of 10.5 fl oz (foliar) or 21 fl oz (soil) /acre per season. See pollinator protection restrictions on label.
	4A	Venom (dinotefuran)	Foliar: 1.0-3.0 oz; Soil: 5.0-6.0 oz	12	Foliar: 7; Soil: 21	Maximum of 6 oz (foliar) or 12 oz (soil) /acre per season. See pollinator protection restrictions on label.
Leafhopper	1A	Sevin 4F, XLR Plus (carbaryl)	0.5-1.0 qt	12	14	Maximum of 6 qt/acre per year.
	1B	Malathion 8F (malathion)	1.6 pt	12	7	Maximum of 2 applications per year.
	3A	*Ambush 25W (permethrin)	6.4-12.8 oz	12	1	Do not apply more than 1.0 lb ai/acre per season (5 applications at high rate).
	3A	*Baythroid XL (beta-cyfluthrin)	0.8-3.2 fl oz	12	0	Maximum amount per acre per season: 12.8 fl oz.

Table 9.8. Insecticides labeled for management of arthropod pests of spinach. (continued)

Labels change frequently. Be sure to read a current product label before applying any chemical.
Also Refer to Table 19.2 for biopesticide and other alternative products labeled for disease management.

Pest	MOA Code ¹	Trade Name Active Ingredient <i>*Restricted</i>	Rate Product/acre	REI (hours)	Days to Harvest	Notes ²
	3A	*Mustang (zeta-cypermethrin)	2.4-4.3 fl oz	12	1	Maximum of 25.8 fl oz/acre per season.
	3A	*Pounce 25 W (permethrin)	3.2-12.8 oz	12	1	Do not apply more than 0.6 lb ai/acre per season (no more than 3 applications at highest rate).
	3A	PyGanic Crop Protection EC 5.0 (pyrethrins)	4.5-18 fl oz	12	0	Pyrethrins degrade rapidly in sunlight, but still may be harmful to bees. OMRI-listed ² .
	3A, -	BotaniGard Maxx (pyrethrins, <i>Beauveria bassiana</i> strain GHA)	Ground app.: 0.25-2.00 qt; Aerial app.: 0.25-1.00 qt	12	0	Apply in sufficient water to cover foliage. Compatible in tank mix with some fungicides. May not be compatible with adjuvants.
	4A	Actara (thiamethoxam)	1.5-3.0 oz	12	7	Maximum of 11 oz/acre per growing season. Highly toxic to foraging bees.
	4A	Admire Pro (imidacloprid)	Foliar: 1.3 fl oz Soil I: 4.4-10.5 fl oz	12	Foliar: 7, Soil: 21	Maximum of 6.5 fl oz (foliar) or 10.5 fl oz (soil)/acre per year. Toxic to bees.
	4A	Belay (clothianidin)	Foliar: 3-4 fl oz Soil I: 9-12 fl oz	12	Foliar: 7, Soil: 21	Regardless of application method, do not apply more than 0.2 lb ai/acre per year (12 fl oz). Do not apply at intervals of less than 10 days. Highly toxic to bees.
	4A	Belay 50 WDG (clothianidin)	Foliar: 1.6-2.1 oz Soil I: 4.8-6.4 oz	12	7	Maximum of 6.4 oz/acre per season. Do not use an adjuvant. Toxic to bees.
	4A	Platinum 75 SG (thiamethoxam)	1.66-3.67 oz	12	30	Maximum of 3.67 oz/acre per season. Do not use in conjunction with other 4A insecticides.
	4A	Scorpion 35 SL (dinotefuran)	Foliar: 2-5.25 fl oz; Soil: 9-10.5 fl oz	12	Foliar: 7; Soil: 21	Maximum of 10.5 fl oz (foliar) or 21 fl oz (soil) /acre per season. See pollinator protection restrictions on label.
	4A	Venom (dinotefuran)	Foliar: 1.0-3.0 oz; Soil: 5.0-6.0 oz	12	Foliar: 7; Soil: 21	Maximum of 6 oz (foliar) or 12 oz (soil) /acre per season. See pollinator protection restrictions on label.
	4A, 28	Durivo (thiamethoxam, chlorantraniliprole)	10-13 oz	12	30	May be applied using one of several soil application methods. One application per season.
	4A, 28	Voliam Flexi (thiamethoxam and chlorantraniliprole)	4.0-7.0 oz	12	7	Do not exceed a total of 14 oz of Voliam Flexi per acre per season. Do not use an adjuvant.
	4D	Sivanto Prime (flupyradifurone)	7.0-14.0 fl oz	4	1	Maximum of 28 fl oz/acre per year.
	16	Courier 40SC (buprofezin)	9.0-13.6 fl oz	12	7	Insect growth regulator. Do not make more than 2 applications per season per crop or 4 per year. Allow 7 days between applications.
	-	Aza-Direct (azadirachtin)	1-2 pt, up to 3.5, if needed	4	0	Antifeedant, repellent, insect growth regulator. OMRI-listed.
	-	Azatin XL (azadirachtin)	5-21 fl oz	4	0	Antifeedant, repellent, insect growth regulator.
	-	M-Pede 49% Soap, insecticidal	1-2% V/V	12	0	OMRI-listed ² .
	-	Molt-X (azadirachtin)	10 fl oz	4	0	OMRI-listed ² .
	-	Neemix 4.5 EC (azadirachtin)	4-16 fl oz	12	0	IGR and feeding repellent. OMRI-listed ² .
Leafminers	3A, -	BotaniGard Maxx (pyrethrins, <i>Beauveria bassiana</i> strain GHA)	Ground app.: 0.25-2.00 qt; Aerial app.: 0.25-1.00 qt	12	0	Apply in sufficient water to cover foliage. Compatible in tank mix with some fungicides. May not be compatible with adjuvants.
	5	Entrust SC (spinosad)	1.5-10.0 fl oz	4	1	Use no more than 29 oz per acre per crop. OMRI-listed ² .
	5	Radiant SC (spinetoram)	5-10 fl oz	4	1	Maximum of 6 applications, no more than 2 consecutive applications before rotating to another MOA.
	6	*Agri-Mek SC (abamectin)	1.75-3.50 fl oz	12	7	No more than 2 sequential applications. Maximum of 10.25 fl oz per acre per season. Must be mixed with a non-ionic activator type wetting, spreading, and/or penetrating adjuvant, but not a binder sticker type adjuvant.
	6	*Proclaim (emamectin benzoate)	2.4-4.8 oz	12	7	Do not apply more than 28.8 oz/A per season.
	17	Trigard (cyromazine)	2.66 oz	12	7	No more than 5 applications per crop.

Table 9.8. Insecticides labeled for management of arthropod pests of spinach. (continued)

Labels change frequently. Be sure to read a current product label before applying any chemical.
Also Refer to Table 19.2 for biopesticide and other alternative products labeled for disease management.

Pest	MOA Code ¹	Trade Name *Restricted Active Ingredient	Rate Product/acre	REI (hours)	Days to Harvest	Notes ²
	28	Coragen (chlorantraniliprole)	3.5-7.5 fl oz	4	1	May be applied by drip chemigation, in addition to foliar and various soil application methods.
	28	Exirel (cyantraniliprole)	13.5-20.5 fl oz	12	1	Maximum of 0.4 lb ai/acre per year of cyantraniliprole-containing products (such as Verimark) including all application types. Do not use an adjuvant.
	28	Verimark (cyantraniliprole)	6.75-13.5 fl oz	4	N/A- applied at planting	Maximum of 13.5 fl oz at planting or 0.4 lb ai/acre per year of cyantraniliprole-containing products (such as Exirel) including all application types.
	-	Aza-Direct (azadirachtin)	1-2 pt, up to 3.5, if needed	4	0	Antifeedant, repellent, insect growth regulator. OMRI-listed.
	-	Azatin XL (azadirachtin)	5-21 fl oz	4	0	Antifeedant, repellent, insect growth regulator.
	-	Molt-X (azadirachtin)	10 fl oz	4	0	OMRI-listed ² .
	-	Neemix 4.5 EC (azadirachtin)	4-16 fl oz	12	0	IGR and feeding repellent. OMRI-listed ² .
Mites (includes carmine spider mite, twospotted spider mite)	3A	*Brigade 2EC (bifenthrin)	5.1-6.4 fl oz	12	7	Maximum of 25.6 fl oz/acre per season.
	3A, -	BotaniGard Maxx (pyrethrins, <i>Beauveria bassiana</i> strain GHA)	Ground app.: 0.25-2.00 qt; Aerial app.: 0.25-1.00 qt	12	0	Apply in sufficient water to cover foliage. Compatible in tank mix with some fungicides. May not be compatible with adjuvants.
	6	*Agri-Mek SC (abamectin)	1.75-3.50 fl oz	12	7	No more than 2 seNo more than 2 sequential applications. Maximum of 10.25 fl oz per acre per season. Must be mixed with a non-ionic activator type wetting, spreading, and/or penetrating adjuvant, but not a binder sticker type adjuvant.
Thrips (check label for species controlled)	3A, -	BotaniGard Maxx (pyrethrins, <i>Beauveria bassiana</i> strain GHA)	Ground app.: 0.25-2.00 qt; Aerial app.: 0.25-1.00 qt	12	0	Apply in sufficient water to cover foliage. Compatible in tank mix with some fungicides. May not be compatible with adjuvants.
	5	Entrust SC (spinosad)	1.5-10.0 fl oz	4	1	Use no more than 29 oz per acre per crop. OMRI-listed ² .
	5	Radiant SC (spinetoram)	5-10 fl oz	4	1	Maximum of 6 applications, no more than 2 consecutive applications before rotating to another MOA.
	28	Exirel (cyantraniliprole)	13.5-20.5 fl oz	12	1	Maximum of 0.4 lb ai/acre per year of cyantraniliprole-containing products (such as Verimark) including all application types. Do not use an adjuvant.
	-	Aza-Direct (azadirachtin)	1-2 pt, up to 3.5, if needed	4	0	Antifeedant, repellent, insect growth regulator. OMRI-listed.
	-	Azatin XL (azadirachtin)	5-21 fl oz	4	0	Antifeedant, repellent, insect growth regulator.
	-	BotaniGard ES, Mycotrol ESO (<i>Beauveria bassiana</i> strain GHA)	0.25-1 qt	4	0	Apply in sufficient water to cover foliage, typically 5-100 gallon/acre. Compatible in tank mix with some fungicides. Mycotrol ESO OMRI-listed ² .
	-	Grandevo (<i>Chromobacterium subtsugae</i> strain PRAA4-1)	1-3 lb	4	0	Can be used in organic production. OMRI-listed ² .
	-	M-Pede 49% Soap, insecticidal	1-2% V/V	12	0	OMRI-listed ² .
	-	Molt-X (azadirachtin)	10 fl oz	4	0	OMRI-listed ² .

¹ Mode of Action (MOA) codes for plant pest insecticides from the Insecticide Resistance Action Committee (IRAC) Mode of Action Classification v. 8.2 March 2017. Number codes (1 through 29) are used to distinguish the main insecticide mode of action groups, with additional letters for certain sub-groups within each main group. All insecticides within the same group (with same number) indicate same active ingredient or similar mode of action. This information must be considered for the insecticide resistance management decisions. - = unknown, or a mode of action that has not been classified yet.

² Information provided in this table applies only to Florida. Be sure to read a current product label before applying any product. 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. OMRI listed: Listed by the Organic Materials Review Institute for use in organic production.

* Restricted use insecticide.

Table 9.9. Escarole and Endive fungicides ordered by disease and then FRAC group according to their mode of action.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (active ingredients)	Max. Rate/Acre		Min. Days to		Remarks ²
			Applic.	Season	Harvest	Reentry	
Labels change frequently. Be sure to read a current product label before applying any chemical. Refer to Table 19.2 for biopesticide and other alternative products labeled for disease management.							
Alternaria leaf spot	3	Procure 480SC (triflumazole)	8 fl oz	18 fl oz	0	0.5	
	3	Rhyme (flutriafol)	7 fl oz	28 fl oz	7	0.5	No more than 4 applications per season.
	3	Trionic (triflumazole)	8 fl oz	16 fl oz	0	0.5	No more than 2 applications per season.
	3 & 11	Topguard EQ (flutriafol + azoxystrobin)	8 fl oz	32 fl oz	7	0.5	No more than 4 applications per season.
	7 & 11	Merivon SC (pyraclostrobin + fluxapyroxad)	11.0 fl oz	33 fl oz	1	0.5	Alternate with fungicides of dissimilar modes of action
	7 & 11	Luna Sensation (fluopyram + trifloxystobin)	7.6 fl oz	15.3 fl oz	0	0.5	Alternate with fungicides of dissimilar modes of action.
	11	Quadris (azoxystrobin)	15.4 fl oz	2.88 qt	0	4 hr	Alternate with fungicides of dissimilar modes of action.
	11	Cabrio EG (pyraclostrobin)	16 oz	64 oz	0	0.5	Alternate with fungicides of dissimilar modes of action.
9 & 12	Switch 62.5WDG (cyprodinil + fludioxonil)	14 oz	56 oz	0	0.5	Alternate with fungicide with dissimilar modes of action after 2 applications.	
Bacterial blight	M1	(copper compounds) Many brands available: Badge SC, Badge X2, Basic Copper 53, Champ DP, Champ Formula 2, Champion++, Cueva, Cuproxat, Kentan DF, Kocide 3000, Kop-hydroxide, NuCop 50WP, NuCop 3L, NuCop HB, NuCop DF	SEE INDIVIDUAL LABEL		1	Varies by product from 4 hr to 2 days	
Basal rot Septoria Gray mold Sclerotinia	9 & 12	Switch 62.5WDG (cyprodinil + fludioxonil)	14 oz	56 oz	0	0.5	Alternate with fungicide with dissimilar modes of action after 2 applications.
	12	Cannonball WP (fludioxonil)	7 oz	28 oz	0	0.5	
	14	Botran 75W (dichloran)	5.33 lb	5.33 lb	14	0.5	
	19	OSO 5%SC (polyoxin D zinc salt)	13 fl oz	84 fl oz	0	4 hr	See label for details.
Botrytis rot	7	Endura (boscalid)	9.0 oz	18 oz	14	0.5	See label for details.
	7 & 11	Luna Sensation (fluopyram + trifloxystobin)	7.6 fl oz	15.3 fl oz	0	0.5	Alternate with fungicides of dissimilar modes of action.
	14	Botran 75W (dichloran)	5.33 lb	5.33 lb	14	0.5	
Cercospora leaf spot Septoria leaf spot	7 & 11	Merivon SC (pyraclostrobin + fluxapyroxad)	11.0 fl oz	33 fl oz	1	0.5	Alternate with fungicides of dissimilar modes of action.
	7 & 11	Luna Sensation (fluopyram + trifloxystobin)	7.6 fl oz	15.3 fl oz	0	0.5	Alternate with fungicides of dissimilar modes of action.
	11	Cabrio EG (pyraclostrobin)	16 oz	64 oz	0	0.5	Alternate with fungicides with dissimilar modes of action.
	11	Quadris (azoxystrobin)	15.4 fl oz	2.88 qt	0	4 hr	Alternate with fungicides with dissimilar modes of action.
Damping off	M3	Defiant 75WP (thiram)	5.3 oz/ 100 lbs of seed			1	Seed treatment only.
Downy mildew	M1	(copper compounds) Many brands available: Badge SC, Badge X2, Basic Copper 53, Champ DP, Champ Formula 2, Champion++, Cueva, Cuproxat, Kentan DF, Kocide 3000, Kop-hydroxide, NuCop 50WP, NuCop 3L, NuCop HB, NuCop DF	SEE INDIVIDUAL LABEL		1	Varies by product from 4 hr to 2 days	

Table 9.9. Escarole and Endive fungicides ordered by disease and then FRAC group according to their mode of action. (continued)

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (active ingredients)	Max. Rate/Acre		Min. Days to		Remarks ²
			Applic.	Season	Harvest	Reentry	
Labels change frequently. Be sure to read a current product label before applying any chemical. Refer to Table 19.2 for biopesticide and other alternative products labeled for disease management.							
	M2	(sulfur) Many brands available: Crusade DF, Microfine Sulfur, Micro Sulf, Microthiol Disperss, Sulfur 90W	SEE INDIVIDUAL LABEL		1	1	Do not apply during periods of warm weather. Do not apply within 2 weeks of an oil spray.
	11	(azoxystrobin) Various brands available: Quadris, Satori, Willowood Azoxy	15.5 fl oz	2.88 qt	0	4 hr	Alternate with fungicides of dissimilar modes of action.
	11	Cabrio EG (pyraclostrobin)	16 oz	64 oz	0	0.5	Alternate with fungicides with dissimilar modes of action.
	11	Reason (fenamidone)	8.2 fl oz	24.6 fl oz	2	0.5	Alternate with fungicides with dissimilar modes of action.
	U15	Orondis Gold 200 (oxathiapiprolin)	19.2 fl oz	38.4 fl oz	0	4 hr	Do not make foliar applications with Orondis Ultra if applied using soil applicatins. Be aware of plantback restrictions.
	U15	Orondis Ultra (oxathiapiprolin)	4.8 fl oz	19.2 fl oz	0	4hr	Do not make foliar applications with Orondis Ultra if Orondis Gold was applied using soil applications. Do not make more than 2 sequential applications and do not exceed more than 33% of all fungicide applications with Orondis.
	U15 & 4	Orondis Gold 200 + Orondis Gold B (oxathiapiprolin + mefenoxam)	19.2	19.2	0	4 hr	Must tank mix Orondis Gold 200 and Gold B before application. Apply at planting, in furrow, by drip, or in transplant water. Make no more than 2 sequential applications before alternating with fungicides with dissimilar modes of action.
	U15 & 40	Orondis Ultra + Orondis Ultra B (oxathiapiprolin + mandipropamid)	4.8	4.8	0	4 hr	Must tank mix Orondis Ultra and Ultra B before application. Apply prior to disease development. Make no more than 2 sequential applications before alternating with fungicides with dissimilar modes of action.
	21	Ranman SC (cyazofamid)	2.75 fl oz	16.5 fl oz	0	0.5	Alternate with fungicides with dissimilar modes of action.
	27 & 11	Tanos (cymoxanil + famoxadone)	8 oz	24 oz	3	0.5	
	33	Aliette 80WDG Legion 80WDG Linebacker WDG (fosetyl-Al)	5 lb 5 lb 5 lb	35 lb 20 lb 20 lb	3 3 3	0.5 0.5 0.5	Caution should be used when applying in a management program including copper fungicides.
	33	(mono- and di-potassium salts of phosphorous acid) Many brands available: Alude, Confine Extra, Fosiphite, Fungi-phite, K-Phite, Oxiphos, Phiticide, Phostrol, Prophyt, Rampart, Reveille	3 qt		0	4 hr	See label for details.
	40	Forum (dimethomorph)	6.0 fl oz	30 fl oz	0	0.5	Do not apply sequentially.
	40	Orondis Ultra B (mandipropamid)	8 fl oz	32 fl oz	1	0.5	Do not exceed 4 appl. per crop. Do not make more than 2 seq. applications. Do not exceed more than 33% of total foliar applications.
	40	Revus (mandipropamid)	8 fl oz	32 fl oz	1	4 hr	Do not exceed 2 sequential applications. See label for soil applications.
	43	Presidio (fluopicolide)	4 fl oz	12 fl oz	2	0.5	Must be tank-mixed with a fungicide of different mode of action. Do not exceed two sequential applications.
	45/40	Zampro SC (ametocradin + dimethomorph)	14 fl oz	42 fl oz	0	0.5	Do not exceed 2 sequential appl.
Powdery mildew	M2	(sulfur) Many brands available: Microfine Sulfur, Micro Sulf, Microthiol Disperss, Suffa, Sulfur 90W	SEE INDIVIDUAL LABEL		1	1	Do not apply during periods of warm weather. Do not apply within 2 weeks of an oil spray.

Table 9.9. Escarole and Endive fungicides ordered by disease and then FRAC group according to their mode of action. (continued)

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (active ingredients)	Max. Rate/Acre		Min. Days to		Remarks ²
			Applic.	Season	Harvest	Reentry	
Labels change frequently. Be sure to read a current product label before applying any chemical. Refer to Table 19.2 for biopesticide and other alternative products labeled for disease management.							
	3	Procuire 480SC (triflumazole)	8 fl oz	18 fl oz	0	0.5	
	3	Trionic (triflumazole)	8 fl oz	16 fl oz	0	0.5	No more than 2 applications per season.
	3	Rhyme (flutriafol)	7 fl oz	28 fl oz	7	0.5	No more than 4 applications per season.
	3 & 11	Topguard EQ (flutriafol + azoxystrobin)	8 fl oz	32 fl oz	7	0.5	No more than 4 applications per season.
	7	Fontelis 1.67SC (penthiopyrad)	24 fl oz	72 fl oz	3	0.5	
	7 & 11	Merivon SC (pyraclostrobin + fluxapyroxad)	11.0 fl oz	33 fl oz	1	0.5	Alternate with fungicides of dissimilar modes of action.
	7 & 11	Luna Sensation (fluopyram + trifloxystobin)	7.6 fl oz	15.3 fl oz	0	0.5	Alternate with fungicides of dissimilar modes of action.
	9 & 12	Switch 62.5WDG (cyprodinil + fludioxonil)	14 oz	56 oz	0	0.5	Alternate with fungicide with dissimilar modes of action after 2 applications. See label for details.
	11	(azoxystrobin) Various brands available: Equation, Quadris, Satori, Willowood Azoxy	15.5 fl oz	2.88 qt	0	4 hr	Alternate with fungicides of dissimilar modes of action.
	11	Cabrio EG (pyraclostrobin)	16 oz	64 oz	0	0.5	Alternate with fungicides with dissimilar modes of action.
Pythium damping off	4	Sebring 2.65ST (metalaxyl)	0.7 fl oz/ 100 lbs of seed			2	Seed treatment only.
Pythium seedling blight	4	Acquire Allegiance FL (metalaxyl)	0.75 fl oz/ 100 lb seed			1	Seed treatment only.
	4	Metastar 2E AG (metalaxyl)	8 pt			2	Apply as a broadcast soil application and incorporate into top 2 inches.
	4	Apron XL LS (mefenoxam)	0.64 fl. oz./100 lb seed			2	
Pythium seedling diseases	4	Ridomil Gold SL	2 pt			2	See label for specifics regarding preplant incorporated applications and surface applications at the time of planting.
		Ridomil Gold GR	40 lb			2	
		Ultra Flourish (mefenoxam)	4 pt			2	
Rhizoctonia bottom rot	7 & 11	Luna Sensation (fluopyram + trifloxystobin)	7.6 fl oz	15.3 fl oz	0	0.5	Alternate with fungicides of dissimilar modes of action.
Sclerotinia diseases	7	Endura (boscalid)	10.0 oz	18 oz	14	0.5	See label for details.
	11	Quadris (azoxystrobin)	15.2 fl oz	2.88 qt	0	4 hr	Alternate with fungicides with dissimilar modes of action.
	9 & 12	Switch 62.5WDG (cyprodinil + fludioxonil)	14 oz	56 oz	0	0.5	Alternate with fungicide with dissimilar modes of action after 2 applications.
Various seedling diseases	4 & 11	Uniform SC (azoxystrobin + mefenoxam)	0.34 fl oz/1000 ft of row	1 appl.		0	Soil incorporated.
	12	Maxim 4FS (fludioxonil)	0.16 fl oz/ 100 lb of seed			0.5	Seed treatment only.

¹ FRAC code (fungicide group): Number (1 through 46) and letters (U and 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. U = unknown, or a mode of action that has not been classified yet and is typically associated with another number; P = host plant defense inducers. Source: FRAC Code List 2018; <http://www.frac.info/> (FRAC = Fungicide Resistance Action Committee).

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 9.10. Lettuce fungicides ordered by disease and then FRAC group according to their mode of action.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (active ingredients)	Max. Rate/Acre		Min. Days to		Remarks ²
			Applic.	Season	Harvest	Reentry	
Labels change frequently. Be sure to read a current product label before applying any chemical. Refer to Table 19.2 for biopesticide and other alternative products labeled for disease management.							
<i>Alternaria</i> spp.	3	Rhyme (flutriafol)	7 fl oz	28 fl oz	7	0.5	No more than 4 applications per season.
	3	Trionic (triflumazole)	8 fl oz	16 fl oz	0	0.5	No more than 2 applications per season.
	3 & 11	Topguard EQ (flutriafol + azoxystrobin)	8 fl oz	32 fl oz	7	0.5	No more than 4 applications per season.
	7	Fontelis 1.67SC (penthiopyrad)	24 fl oz	72 fl oz	3	0.5	
	7 & 11	Merivon SC (pyraclostrobin + fluxapyroxad)	11	33	1	0.5	Alternate with fungicides with dissimilar modes of action.
	7 & 11	Luna Sensation (fluopyram + trifloxystrobin)	7.6 fl oz	15.3 fl oz	0	0.5	Alternate with fungicides of dissimilar modes of action.
	9 & 12	Switch 62.5WDG (cyprodinil + fludioxonil)	14 oz	56 oz	0	0.5	Alternate with fungicide with dissimilar modes of action after 2 applications.
	11	Cabrio EG (pyraclostrobin)	16 oz	64 oz	0	0.5	Alternate with fungicides with dissimilar modes of action.
	11	Quadris (azoxystrobin)	15.4 fl oz	2.88 qt	0	4 hr	Alternate with fungicides with dissimilar modes of action.
Bacterial blight	M1	(copper compounds) Many brands available: Basic Copper 53, C-O-C-S WDG, Champ DP, Champ WG, Champ Formula 2, Champ WP, Champion+, Cueva, Cuproxat, Kentan DF, Kocide 3000, Kop-hydroxide, Nordox 75 WG, NuCop 50WP, NuCop 3L, NuCop HB, NuCop DF, Stretch, Tenn Cop, Top Cop w/ Sulfur	SEE INDIVIDUAL LABELS		1		Varies by product from 4 hr to 2 days
Basal rot	9 & 12	Switch 62.5WDG (cyprodinil + fludioxonil)	14 oz	56 oz	0	0.5	Alternate with fungicide with dissimilar modes of action after 2 applications.
	12	Cannonball WP (fludioxonil)	7 oz	28 oz	0	0.5	
Botrytis rot	7	Endura 70WG (boscalid)	11 oz	22 oz	14	0.5	
	7	Fontelis 1.67 SC (penthiopyrad)	24 fl oz	72 fl oz	3	0.5	Alternate with fungicide with dissimilar modes of action after 2 applications.
	7 & 11	Merivon SC (pyraclostrobin + fluxapyroxad)	11	33	1	0.5	Alternate with fungicides with dissimilar modes of action.
	12	Cannonball WP (fludioxonil)	7 oz	28 oz	0	0.5	Alternate with fungicides of dissimilar modes of action.
	14	Botran 75W (dichloran)	5.33 lb	5.33 lb	14	0.5	
Cercospora leaf spot	3	Rhyme (flutriafol)	7 fl oz	28 fl oz	7	0.5	No more than 4 applications per season.
	3 & 11	Topguard EQ (flutriafol + azoxystrobin)	8 fl oz	32 fl oz	7	0.5	No more than 4 applications per season.
	7	Fontelis 1.67SC (penthiopyrad)	24 fl oz	72 fl oz	3	0.5	
	11	Cabrio EG (pyraclostrobin)	16 oz	64 oz	0	0.5	Alternate with fungicides with dissimilar modes of action.
	11	(azoxystrobin) Various brands available: Quadris, Satori, Willowood Azoxy	15.5 fl oz	2.88 qt	0	4 hr	Alternate with fungicides of dissimilar modes of action.
	7 & 11	Merivon SC (pyraclostrobin + fluxapyroxad)	11	33	1	0.5	Alternate with fungicides with dissimilar modes of action.
	12	Cannonball WP (fludioxonil)	0.5 oz	1.5 lb	14	0.5	

Table 9.10. Lettuce fungicides ordered by disease and then FRAC group according to their mode of action. (continued)

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (active ingredients)	Max. Rate/Acre		Min. Days to		Remarks ²	
			Applic.	Season	Harvest	Reentry		
Labels change frequently. Be sure to read a current product label before applying any chemical. Refer to Table 19.2 for biopesticide and other alternative products labeled for disease management.								
Damping off	M3	Defiant 75WP (thiram)	5.3 oz/100 lbs of seed			1	Seed treatment only.	
Downy mildew	M1	(copper compounds) Many brands available: Basic Copper 53, C-O-C-S WDG, Champ DP, Champ WG, Champ Formula 2, Champ WP, Cueva, Kocide 3000, Nordox 75 WG, NuCop 50WP, NuCop 3L, NuCop HB, NuCop DF, Stretch, Tenn Cop, Top Cop w/ Sulfur	SEE INDIVIDUAL LABELS			1	Varies by product from 4 hr to 2 days	
	M2	(sulfur) Many brands available: Cosavet DF, Kumulus DF, Micro Sulf, Microfine Sulfur, Microthiol Disperss, Sulfur 90W, That Flowable, Thiolux, Top Cop w/ Sulfur	SEE INDIVIDUAL LABELS			1	1	Do not apply during periods of warm weather. Do not apply within 2 weeks of an oil spray.
	M3	(mancozeb) Many brands available: Dithane M45, Dithane F45 Rainshield, Fortuna, Koverall, Mankocide, Manzate Flowable, Manzate Pro-stick, Penncozeb 75 DF, Penncozeb 80 WP, Roper DF Rainshield,	SEE INDIVIDUAL LABELS			10	1	
	U15	Orondis Ultra (oxathiapiprolin)	4.8 fl oz	19.2 fl oz	0	4 hr	Do not make foliar applications with Orondis Ultra if Orondis Gold was applied using soil applications. Do not make more than 2 sequential applications and do not exceed more than 33% of all fungicide applications with Orondis.	
	U15 & 4	Orondis Gold 200 + Orondis Gold B (oxathiapiprolin + mefenoxam)	2 pt			7	2	Do not make foliar applications with Orondis Ultra if applied using soil applications. Be aware of plantback restrictions.
	4	Ridomil Gold SL (mefenoxam)	0.25 pt	1.0 pt	7	2	Must be applied in a tank-mixture with full rate of another downy mildew registered product.	
	11	Cabrio EG (pyraclostrobin)	16 oz	64 oz	0	0.5	Alternate with fungicides with dissimilar modes of action.	
	11	(azoxystrobin) Various brands available: Quadris, Satori, Tetraban, Willowood Azoxy	15.5 fl oz	2.88 qt	0	4 hr	Alternate with fungicides of dissimilar modes of action.	
	11	Reason (fenamidone)	8.2 fl oz	24.6 fl oz	2	0.5	Alternate with fungicides with dissimilar modes of action.	
	15	Acrobat 50WP (dimethomorph)	6.4 oz	32 oz	0	0.5		
	15	Forum (dimethomorph)	6 fl oz	30 fl oz	0	0.5	Must be applied as a tank-mix with a fungicide of dissimilar mode of action.	
	21	Ranman SC (cyazofamid)	2.75 fl oz	16.5 fl oz	0	0.5	Alternate with fungicides with dissimilar modes of action.	
	21	Actigard 50WG (acibenzolar)	1 oz	4 oz	7	0.5	Apply preventatively. See label for details.	
(Suppression only)	21A	Torac (tolfenpyrad)	21 fl oz	42 fl oz	14	0.5	Also an insecticide.	
	27	Curzate (cymoxanil)	5 oz	30 oz	3	0.5	Must be applied as a tank-mix with a fungicide of dissimilar mode of action.	
	27 & 11	Tanos (cymoxanil + famoxadone)	8 oz	24 oz	3	0.5		
	28	Previcur Flex (propamocarb)	2 pt	8 pt	2	0.5		
	28	Promess (propamocarb)	2 pt	8 pt	2	0.5		

Table 9.10. Lettuce fungicides ordered by disease and then FRAC group according to their mode of action. (continued)

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (active ingredients)	Max. Rate/Acre		Min. Days to		Remarks ²
			Applic.	Season	Harvest	Reentry	
Labels change frequently. Be sure to read a current product label before applying any chemical. Refer to Table 19.2 for biopesticide and other alternative products labeled for disease management.							
	33	Aliette 80WDG (fosetyl AI)	5 lb	35 lb	3	0.5	Caution should be used when applying in a management program including copper fungicides.
	33	Legion 80WDG (fosetyl-AI)	5 lb	20 lb	3	0.5	Caution should be used when applying in a management program including copper fungicides.
	33	Linebacker WDG (fosetyl-AI)	5 lb	20 lb	3	0.5	Caution should be used when applying in a management program including copper fungicides.
	33	(mono- and di-potassium salts of phosphorous acid) Many brands available: Alude, Confine Extra, Fosphite, Fungi-phite, K-Phite, Oxiphos, Phiticide, Phostrol, Prophyt, Rampart	3 qt		0	4 hr	See label for details.
	40	Forum (dimethomorph)	6 fl oz	30 fl oz	0	0.5	Do not apply alone in sequential applications.
	40	Revus 250SC (mandipropamid)	8 fl oz	32 fl oz	1	0.5	Do not exceed 2 sequential applications. See label for soil applications.
	43	Presidio 4L (fluopicolide)	3-4 fl oz	12 fl oz	2	0.5	Must be tank-mixed with a fungicide of different mode of action. Do not exceed two sequential applications. See label for soil applications.
	45 & 40	Zampro SC (ametoctradin + dimethomorph)	14 fl oz	42 fl oz	0	0.5	
Gray mold	7 & 11	Luna Sensation (fluopyram + trifloxystrobin)	7.6 fl oz	15.3 fl oz	0	0.5	Alternate with fungicides of dissimilar modes of action.
	9 & 12	Switch 62.5WDG (cyprodinil + fludioxonil)	14 oz	56 oz	0	0.5	Alternate with fungicide with dissimilar modes of action after 2 applications.
	12	Cannonball WP (fludioxonil)	7 oz	28 oz	0	0.5	Alternate with fungicides of dissimilar modes of action.
Powdery mildew	M2	(sulfur) Many brands available: Cosavet DF, Kumulus DF, Micro Sulf, Microfine Sulfur, Microthiol Disperss, Sulfur 90W, That Flowable, Thiolux, Top Cop w/ Sulfur	SEE INDIVIDUAL LABELS		1	1	Do not apply during periods of warm weather. Do not apply within 2 weeks of an oil spray.
	M3	(mancozeb) Many brands available: Dithane M-45, Dithane F45 Rainshield, Fortuna, Koverall, Mankocide, Manzate Flowable, Manzate Pro-stick, Penncozeb 75 DF, Penncozeb 80 WP, Roper DF Rainshield	SEE INDIVIDUAL LABELS		10	1	
	3	Procure 480SC (fludioxinil)	8 fl oz	18 fl oz	0	0.5	
	3	Rally 40WSP (myclobutanil)	5 oz	20 oz	3	1	Supplemental label.
	3	Sonoma 40WSP (myclobutanil)	5 oz	20 oz	3	1	
	3	Trionic (triflumazole)	8 fl oz	16 fl oz	0	0.5	No more than 2 applications per season.
	3	Rhyme (flutriafol)	7 fl oz	28 fl oz	7	0.5	No more than 4 applications per season.
	3 & 11	Topguard EQ (flutriafol + azoxystrobin)	8 fl oz	32 fl oz	7	0.5	No more than 4 applications per season.
	7	Fontelis 1.67 SC (pentiopyrad)	24 fl oz	72 fl oz	3	0.5	Alternate with fungicide with dissimilar modes of action after 2 applications.
	7 & 11	Merivon SC (pyraclostrobin + fluxapyroxad)	11 fl oz	33	1	0.5	Alternate with fungicides with dissimilar modes of action.

Table 9.10. Lettuce fungicides ordered by disease and then FRAC group according to their mode of action. (continued)

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (active ingredients)	Max. Rate/Acre		Min. Days to		Remarks ²
			Applic.	Season	Harvest	Reentry	
Labels change frequently. Be sure to read a current product label before applying any chemical. Refer to Table 19.2 for biopesticide and other alternative products labeled for disease management.							
	7 & 11	Luna Sensation (fluopyram + trifloxystobin)	7.6 fl oz	15.3 fl oz	0	0.5	Alternate with fungicides of dissimilar modes of action.
	9 & 12	Switch 62.5WDG (cyprodinil + fludioxonil)	14 oz	56 oz	0	0.5	Alternate with fungicide with dissimilar modes of action after 2 applications.
	11	Cabrio EG (pyraclostrobin)	16 oz	64 oz	0	0.5	Alternate with fungicides with dissimilar modes of action.
	11	(azoxystrobin) Various brands available: Equation SC, Quadris, Satori, Tetraban, Willowood Azoxy	15.5 fl oz	2.88 qt	0	4 hr	Alternate with fungicides of dissimilar modes of action.
	13	Quintec (quinoxifen)	6 fl oz	24 fl oz	1	0.5	Alternate with fungicides with dissimilar modes of action.
Pythium damping off	4	Sebring 2.65ST	0.75 fl oz/ 100 lb of seed			1	Seed treatment only.
	4	Ridomil Gold SL					
Pythium seedling blight	4	Acquire, Allegiance FL (metalaxyl)	0.75 fl oz/ 100 lb seed			1	Seed treatment only.
	4	Apron XL LS (mefenoxam)	0.64 fl. oz./ 100 lb seed				
	4	Metastar 2E AG (metalaxyl)	8 pt				Apply as a broadcast soil application and incorporate into top 2 inches.
Pythium seedling diseases	4	Ridomil Gold SC	2 pt			2	See label for specifics regarding preplant incorporated applications and surface applications at the time of planting.
		Ridomil Gold GR	40 lb			2	
		Ultra Flourish (mefenoxam)	4 pt			2	
	4 & 11	Uniform SC (fludioxonil)	0.34 fl oz/ 1000 ft of row	1 appl.		0	Soil incorporated.
Rhizoctonia bottom rot	2	(iprodione) Many brands available: Enclosure 4F, Iprodione 4L AG, Meteor, Nevado 4F, Rovral 4F	2 pt	6 pt	14	1	
	7 & 11	Luna Sensation (fluopyram + trifloxystobin)	7.6 fl oz	15.3 fl oz	0	0.5	Apply at critical timing for disease suppression. See extension guidelines for best application.
Rhizoctonia	7	Endura 70WG (boscalid)	11 oz	22 oz	14	0.5	
	19	OSO 5%SC (polyoxin D zinc salt)	13 fl oz	84 fl oz	0	4 hr	See label for details.
Sclerotinia drop	2	(iprodione) Many brands available: Enclosure 4F, Iprodione 4L AG, Meteor, Nevado 4F, Rovral 4F	2 pt	6 pt	14	1	
	7	Endura 70WG (boscalid)	11 oz	22 oz	14	0.5	
	7	Fontelis 1.67SC (penthiopyrad)	24 fl oz	72 fl oz	3	0.5	
	7	Kenja 400 SC (isofetamid)	12.3 fl oz	24.6 fl oz	14	0.5	Make first application after emergence and second at thinning.
	7 & 11	Merivon SC (pyraclostrobin + fluxapyroxad)	11	33	1	0.5	Alternate with fungicides with dissimilar modes of action.
	7 & 11	Luna Sensation (fluopyram + trifloxystobin)	7.6 fl oz	15.3 fl oz	0	0.5	Alternate with fungicides of dissimilar modes of action.
	9 & 12	Switch 62.5WDG (cyprodinil + fludioxonil)	14 oz	56 oz	0	0.5	Alternate with fungicide with dissimilar modes of action after 2 applications.

Table 9.10. Lettuce fungicides ordered by disease and then FRAC group according to their mode of action. (continued)

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (active ingredients)	Max. Rate/Acre		Min. Days to		Remarks ²
			Applic.	Season	Harvest	Reentry	
Labels change frequently. Be sure to read a current product label before applying any chemical. Refer to Table 19.2 for biopesticide and other alternative products labeled for disease management.							
	12	Cannonball WP (fludioxonil)	7 oz	28 oz	0	0.5	Apply after emergence and after thinning.
	14	Botran 75W (dichloran)	5.33 lb	5.33 lb	14	0.5	
	19	OSO 5%SC (polyoxin D zinc salt)	13 fl oz	84 fl oz	0	4 hr	See label for details.
Septoria	3	Rhyme (flutriafol)	7 fl oz	28 fl oz	7	0.5	No more than 4 applications per season.
	3 & 11	Topguard EQ (flutriafol + azoxystrobin)	8 fl oz	32 fl oz	7	0.5	No more than 4 applications per season.
	9 & 12	Switch 62.5WDG (cyprodinil + fludioxonil)	14 oz	56 oz	0	0.5	Alternate with fungicide with dissimilar modes of action after 2 applications.
	7	Fontelis 1.67SC	24 fl oz	72 fl oz	3	0.5	
	7 & 11	Merivon SC (pyraclostrobin + fluxapyroxad)	11	33	1	0.5	Alternate with fungicides with dissimilar modes of action.
	11	Cabrio EG (pyraclostrobin)	16 oz	64 oz	0	0.5	Alternate with fungicides with dissimilar modes of action.
	11	(azoxystrobin) Various brands available: Equation SC, Quadris, Satori, Tetraban, Willowood Azoxy	15.5 fl oz	2.88 qt	0	4 hr	Alternate with fungicides of dissimilar modes of action.
Various seedling diseases	12	Maxim 4FS (fludioxonil)	0.16 fl oz/ 100 lb of seed			0.5	Seed treatment only.
	4 & 11	Uniform SC	0.34 fl oz/ 1000 ft of row	1 appl.		0	Soil incorporated.

¹ FRAC code (fungicide group): Number (1 through 46) and letters (U and 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. U = unknown, or a mode of action that has not been classified yet and is typically associated with another number; P = host plant defense inducers. Source: FRAC Code List 2018; <http://www.frac.info/> (FRAC = Fungicide Resistance Action Committee).

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 9.11. Spinach fungicides ordered by disease and then FRAC group according to their mode of action.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (active ingredients)	Max. Rate/Acre		Min. Days to		Remarks ²
			Applic.	Season	Harvest	Reentry	
Labels change frequently. Be sure to read a current product label before applying any chemical. Refer to Table 19.2 for biopesticide and other alternative products labeled for disease management.							
Anthraco	M1	(copper compounds) Many brands available: Badge SC, Badge X2, Basic Copper 53, C-O-C-S WDG, Champ DP, Champ WG, Champ Formula 2, Champ WP, COC DF, COC WP, Copper Count N, Cueva, Cuprofix Ultra, Kentan DF, Kocide DF, Kocide 2000, Kocide 3000, Kocide 4.5 LF, Mastercop, Nordox, Nordox 75 WG, NuCop 50WP, NuCop 3L, NuCop HB, NuCop DF, Previsto, Top Cop w/ Sulfur	SEE INDIVIDUAL LABELS				Varies by product from 4 hr to 2 days
	3	Rhyme (flutriafol)	7 fl oz	28 fl oz	7	0.5	No more than 4 applications per season

Table 9.11. Spinach fungicides ordered by disease and then FRAC group according to their mode of action. (continued)

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (active ingredients)	Max. Rate/Acre		Min. Days to		Remarks ²	
			Applic.	Season	Harvest	Reentry		
Labels change frequently. Be sure to read a current product label before applying any chemical. Refer to Table 19.2 for biopesticide and other alternative products labeled for disease management.								
Alternaria	3 & 11	Topguard EQ (flutriafol + azoxystrobin)	8 fl oz	32 fl oz	7	0.5	No more than 4 applications per season	
	11	Quadris (azoxystrobin)	6 fl oz	15.5 fl oz	0	4 hr	Alternate with fungicides of dissimilar modes of action.	
	3	Rhyme (flutriafol)	7 fl oz	28 fl oz	7	0.5	No more than 4 applications per season	
	3 & 11	Topguard EQ (flutriafol + azoxystrobin)	8 fl oz	32 fl oz	7	0.5	No more than 4 applications per season	
	7 & 11	Luna Sensation (flupyram + trifloxystrobin)	7.6 fl oz	15.3 fl oz	0	0.5	Alternate with fungicides of dissimilar modes of action.	
	9 & 12	Switch (cyprodinil + fludioxonil)	14 oz	56 oz	7	0.5	See label for details.	
Downy mildew	M1	(copper compounds) Many brands available: Badge SC, Badge X2, Basic Copper 53, C-O-C-S WDG, Champ DP, Champ WG, Champ Formula 2, Champ WP, Champion++, COC DF, COC WP, Copper Count N, C-erva, Cuprofix Ultra, Kentan DF, Kocide DF, Kocide 2000, Kocide 3000, Kocide 4.5 LF, Kop-hydroxide, Mastercop, Nordox, Nordox 75 WG, NuCop 50WP, NuCop 3L, NuCop HB, NuCop DF, Top Cop w/ Sulfur	SEE INDIVIDUAL LABELS				Varies by product from 4 hr to 2 days	
	M2	(sulfur) Many brands available: Micro Sulf, Microfine Sulfur, Microthiol Disperss, Suffa, Sulfur 90W, Yellow Jacket Wettable Sulfur	SEE INDIVIDUAL LABELS		1	1	Do not apply during periods of warm weather. Do not apply within 2 weeks of an oil spray.	
	U15	Orondis Gold 200 (oxathiapiprolin)	19.2 fl oz	38.4 fl oz	0	4 hr	Do not make foliar applications with Orondis Ultra if applied using soil applications. Be aware of plantback restrictions.	
	U15	Orondis Ultra (oxathiapiprolin)	4.8 fl oz	19.2 fl oz	0	4 hr	Do not make foliar applications with Orondis Ultra if Orondis Gold was applied using soil applications and do not exceed more than 33% of all fungicide applications with Orondis.	
	4	Ridomil Gold SL (mefenoxam)	0.25 pt	0.5 pt	21	2	Shank application. A total of two applications may be made.	
	4 & M1	Ridomil Gold/Copper (mefenoxam + copper hydroxide)	2 lb	4 lb	21	2	Follow Ridomil Gold EC at planting. Apply no more than 2 foliar applications.	
	7 & 11	Merivon Xemium (pyraclostrobin + fluxapyroxad)	11 fl oz	33	1	0.5	Apply only in water with no adjuvants or tank-mixtures. Alternate with dissimilar modes of action.	
	11	Cabrio EG (pyraclostrobin)	16 oz	48 oz	0	0.5	Limit is 3 appl./crop & alternate chemistry.	
	11	(azoxystrobin) Various brands available: Equation SC, Quadris, Satori, Willowood Azoxy	15.5 fl oz	2.88 qt	0	4 hr	Alternate with fungicides of dissimilar modes of action.	
	11	Reason (fenamidone)	8.2 fl oz	24.6 fl oz	2	0.5	Alternate every other application with a fungicide of dissimilar mode of action.	
	21	Actigard 50WG (acibenzolar S-methyl)	0.75 oz	2.25 oz	7	0.5	See label for specific conditions.	
	(Suppression only)	21A	Torac (tolfenpyrad)	21 fl oz	42 fl oz	1	0.5	2 applications allowed per crop cycle. Insecticide also controls aphids, thrips, etc.
		27	Curzate 60DF (cymoxanil)	5 oz	30 oz	1	0.5	Use only in combination with a broad spectrum protectant such as copper fungicides
	27 & 11	Tanos 50DF (cymoxanil + famoxadone)	8 oz	72 oz	3	0.5	Do not alternate or tank mix with another FRAC group 11 fungicide.	

Table 9.11. Spinach fungicides ordered by disease and then FRAC group according to their mode of action. (continued)

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (active ingredients)	Max. Rate/Acre		Min. Days to		Remarks ²
			Applic.	Season	Harvest	Reentry	
Labels change frequently. Be sure to read a current product label before applying any chemical. Refer to Table 19.2 for biopesticide and other alternative products labeled for disease management.							
	33	Aliette 80WDG Legion 80WDG Linebacker 80WDG (fosetyl-AI)	5 lbs	35 lb	3	0.5	Caution should be used when applying in a management program including copper fungicides or adjuvants.
	33	(mono- and di-potassium salts of phosphorous acid) Many brands available: Alude, Confine Extra, Fosiphite, Fungi-phite, K-Phite, Oxiphos, Phiticide, Phostrol, Prophyt, Rampart, Reveille	3 qt		0	4 hr	See label for details.
	40	Revus 2.08F (mandipropamid)	8 fl oz	32 fl oz	1	4 hr	Do not exceed 2 sequential applications. See label for soil applications.
	40	Forum (dimethomorph)	6 fl oz	18 fl oz	0	0.5	Must be tank mixed with another fungicide when used against downy mildew. Do not make more than 2 sequential applications.
	40 & 45	Zampro SC (dimethomorph + ametoctradin)	14 fl oz	42 fl oz	0	0.5	Do not exceed 2 sequential appl.
	43	Presidio 4L (fluopicolide)	4 oz	1 pt	2	0.5	Must be tank-mixed with a fungicide of a different mode of action. See label for rotational restrictions.
White rust	M1	(copper compounds) Many brands available: Badge SC, Badge X2, Basic Copper 53, C-O-C-S WDG, Champ DP, Champ WG, Champ Formula 2, Champ WP, Champion++, COC DF, COC WP, Copper Count N, Cuerva, Cuprofix Ultra, Kentan DF, Kocide DF, Kocide 2000, Kocide 3000, Kocide 4.5 LF, Kop-hydroxide, Mastercop, Nordox, Nordox 75 WG, NuCop 50WP, NuCop 3L, NuCop HB, NuCop DF, Top Cop w/ Sulfur	SEE INDIVIDUAL LABELS			Varies by product from 4 hr to 2 days	
	4	Ridomil Gold SL (mefenoxam)	0.25 pt	0.5 pt	21	2	Shank application. A total of two applications may be made.
	4 & M1	Ridomil Gold/Copper WP (mefenoxam + copper hydroxide)	2 lb	4 lb	21	2	Follow Ridomil Gold EC at planting. Apply no more than 2 foliar applications.
	7 & 11	Merivon SC (pyraclostrobin + fluxapyroxad)	11 fl oz	33	1	0.5	Apply only in water with no adjuvants or tank-mixtures. Alternate with dissimilar modes of action.
	11	Quadris	6 fl oz	15.5 fl oz	0	4 hr	Alternate with fungicides of dissimilar modes of action.
	11	Reason (fenamidone)	8.2 fl oz	24.6 fl oz	2	0.5	Alternate every other application with a fungicide of dissimilar mode of action.
	11	(azoxystrobin) Various brands available: Quadris, Satori, Willowood Azoxy	15.5 fl oz	2.88 qt	0	4 hr	Alternate with fungicides of dissimilar modes of action.
	21	Ranman (cyazofamid)	2.75 fl oz	13.75 fl oz	0	0.5	Do not make more than 3 sequential applications.
	33	Aliette80WDG Legion 80WDG Linebacker 80WDG (fosetyl-AI)	5 lbs	35 lb	3	0.5	Caution should be used when applying in a management program including copper fungicides or adjuvants.
	43	Presidio 4L (fluopicolide)	4 oz	1 pt	2	0.5	Must be tank-mixed with a fungicide of a different mode of action. See label for rotational restrictions.
	P	Actigard 50WG (acibenzolar S-methyl)	0.75 oz	2.25 oz	7	0.5	See label for specific conditions.

Table 9.11. Spinach fungicides ordered by disease and then FRAC group according to their mode of action. (continued)

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (active ingredients)	Max. Rate/Acre		Min. Days to		Remarks ²
			Applic.	Season	Harvest	Reentry	
Labels change frequently. Be sure to read a current product label before applying any chemical. Refer to Table 19.2 for biopesticide and other alternative products labeled for disease management.							
Cercospora spot	M1	(copper compounds) Many brands available: Badge SC, Badge X2, Basic Copper 53, C-O-C-S WDG, Champ DP, Champ WG, Champ Formula 2, Champ WP, COC DF, COC WP, Copper Count N, Cuerva, Cuprofix Ultra, Kentan DF, Kocide DF, Kocide 2000, Kocide 3000, Kocide 4.5 LF, Nordox, Nordox 75 WG, NuCop 50WP, NuCop 3L, NuCop HB, NuCop DF, Top Cop w/ Sulfur	SEE INDIVIDUAL LABELS				Varies by product from 4 hr to 2 days
	3	Rhyme (flutriafol)	7 fl oz	28 fl oz	7	0.5	No more than 4 applications per season
	3 & 11	Topguard EQ (flutriafol + azoxystrobin)	8 fl oz	32 fl oz	7	0.5	No more than 4 applications per season
	7 & 11	Merivon SC (pyraclostrobin + fluxapyroxad)	11 fl oz	33	1	0.5	Apply only in water with no adjuvants or tank-mixtures. Alternate with dissimilar modes of action.
	11	Quadris	6 fl oz	15.5 fl oz	0	4 hr	Alternate with fungicides of dissimilar modes of action.
	11	(azoxystrobin) Various brands available: Quadris, Satori, Willowood Azoxy	15.5 fl oz	2.88 qt	0	4 hr	Alternate with fungicides of dissimilar modes of action.
	M2	(sulfur) Many brands available: Micro Sulf, Microfine Sulfur, Microthiol Disperss, Sulfur 90W, Yellow Jacket Wettable Sulfur	SEE INDIVIDUAL LABELS		1	1	Do not apply during periods of warm weather. Do not apply within 2 weeks of an oil spray.
	7	Fontelis (penthiopyrad)	24 fl oz	72 fl oz	3	0.5	Do not make more than 2 sequential applications.
Damping-off	M3	Defiant 75WP (thiram)	5.3 oz/100 lb of seed			1	Seed treatment only.
	4	Ridomil Gold SL (mefenoxam)	2 pts			2	Apply at seeding in a 7-12" band on soil over seed furrow
	4 & 11	Uniform (azoxystrobin + mefenoxam)	0.34 fl oz/1000' row			0	Make only 1 application per season at planting.
Pythium seedling blight	4	Acquire, Allegiance FL (metalaxyl)	0.75 fl oz/100 lb of seed			1	Seed treatment only.
	4	Sebring 2.65ST (metalaxyl)	0.75 fl oz/100 lb of seed			1	Seed treatment only.
	4	Apron XL LS (mefenoxam)	0.64 fl oz/100 lb seed			2	Seed treatment only.
	4	Metastar 2E AG (metalaxyl)	8 pt			2	Apply as a broadcast soil application and incorporate into top 2 inches. See label for directions.
Pythium seedling diseases	4	Ridomil Gold SL (mefenoxam)	2 pts			2	Apply at seeding in a 7-12" band on soil over seed furrow
	4	Ridomil Gold GR (mefenoxam)	40 lb			2	
	4	Ultra Flourish (mefenoxam)	4 pt			2	See label for specifics regarding preplant incorporated applications and surface applications at the time of planting.
	4 & 11	Uniform (azoxystrobin + mefenoxam)	0.34 fl oz/1000' row			0	Make only 1 application per season at planting.
Powdery Mildew	7	Fontelis (penthiopyrad)	24 fl oz	72 fl oz	3	0.5	Do not make more than 2 sequential applications.
	9 & 12	Switch 62.5WDG (cyprodinil + fludioxonil)	14 oz	56 oz	7	0.5	See label for details.

Table 9.11. Spinach fungicides ordered by disease and then FRAC group according to their mode of action. (continued)

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (active ingredients)	Max. Rate/Acre		Min. Days to		Remarks ²
			Applic.	Season	Harvest	Reentry	
Labels change frequently. Be sure to read a current product label before applying any chemical. Refer to Table 19.2 for biopesticide and other alternative products labeled for disease management.							
	19	OSO 5%SC (polyoxin D zinc salt)	13 fl oz	84 fl oz	0	4 hr	See label for details.
	21A	Torac (tolfenpyrad)	21 fl oz	42 fl oz	1	0.5	2 applications allowed per crop cycle. Insecticide also controls aphids, thrips, etc.
Stemphylium leaf spot	11	(azoxystrobin) Various brands available: Equation SC, Quadris, Satori, Willowood Azoxy	15.5 fl oz	2.88 qt	0	4 hr	Alternate with fungicides of dissimilar modes of action.
Various seedling diseases	12	Maxim 4FS (fludioxonil)	0.16 fl oz/ 100 lbs of seed			0.5	Seed treatment only.
	21	Actigard 50WG (acibenzolar S-methyl)	0.75 oz	2.25 oz	7	0.5	Do not apply to young seedlings.

¹ FRAC code (fungicide group): Number (1 through 46) and letters (U and 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. U = unknown, or a mode of action that has not been classified yet and is typically associated with another number; P = host plant defense inducers. Source: FRAC Code List 2018; <http://www.frac.info/> (FRAC = Fungicide Resistance Action Committee).

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 9.12. Fumigant nematicides for crucifer / cole crops in Florida.

Nematicide	Broadcast Application ¹		In the Row Applications
	Gallons or Lbs Per acre	Fl oz /1000 ft / chisel spaced 12" apart	
Telone II ^{2,3}	9 to 12 gal	26 to 35	For any row spacing, application rates given may be concentrated in the row, but shall never exceed the labeled maximum for broadcast applications. Consult the product label for additional detail.
Telone C-17 ^{2,3}	10.8 to 17.1 gal	31.8 to 50.2	For any row spacing, application rates given may be concentrated in the row, but shall never exceed the labeled maximum for broadcast applications. Consult the product label for additional detail.
Telone C-35 ^{2,3}	13 to 20.5 gal	38 to 60	For any row spacing, application rates given may be concentrated in the row, but shall never exceed labeled maximum for broadcast applications. Consult the product label for additional detail.
Pic-Clor 60	19 to 31.5 gal	57 to 90	For any row spacing, application rates should never exceed the labeled maximum for broadcast applications. Consult the product label for additional detail.
Vapam HL	75 gal	-	For drip or in-row chisel fumigation, consult product label for proportionately reduced overall rates, drip concentration and flow modifying directions and procedures.
KPam HL	60 gal	-	For drip or in-row chisel fumigation, consult product label for proportionately reduced overall rates, drip concentration and flow modifying directions.
Allyl Isothiocyanate (AITC) Dominus	40 gal	-	For drip or in-row fumigation and crop termination, consult product label for overall rates, drip concentration and flow modifying directions

¹ Gallons /acre and Fl oz / 1000 feet provided only for mineral soils. Higher rates may be possible for heavier textured (loam, silt, clay) or highly organic soils.

² All of the fumigants mentioned are for retail sale and use only by state certified applicators or persons under their direct supervision. New supplemental labeling for the Telone products must be in the hands of the user at the time of application. See new label details for additional use restrictions based on soil characteristics, buffer zones, requirements for Fumigant Management Plans (FMP) and Personal Protective Equipment (PPE), mandatory good agricultural practices (GAP's), product and applicator training certification, and other use and rate modifying recommendations.

³ Higher application rates are possible in the presence of cyst-forming nematodes.

Rates are believed to be correct for products named, and similar products of other brand names, when applied to mineral soils. Higher rates are required for muck (organic) soils. However, the grower has the final responsibility to see that each product is used legally; **read the label** of the product to be sure that you are using it properly.