

Chapter 9. Leafy Vegetable Production¹

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Lettuce, Endive, and Escarole

Botany and Planting

Lettuce—*Lactuca sativa*, Asteraceae (Compositae)

Endive—*Cichorium endivia*

Escarole—*Cichorium endivia*

Table 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

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Cultivars

Table 2. Lettuce, endive, and escarole cultivars.

Green Saladbowl	Romaine (Green)	Red Leaf	Crisphead	Endive	Escarole
Green Star	Concept	Galactic	Gator	Markant	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		
Ermosa	Outredgeous	Ferrari	Cherokee		
Florida Butter Crisp	Rosalita	Royal Oak	Floribibb		
Margarita					

Table 3. Lettuce and escarole planted in south Florida.

Type	Cultivar	Planting
Iceberg	Belle Glade	Intermediate ¹
	Chosen	Early ²
	Cooper	Intermediate/Late ³
	Flagler	Throughout ⁴
	Lantana	Early
Romaine	1505	Intermediate/Late
	Desert Gold	Intermediate
	Hialeah	Throughout
	Homestead	Intermediate
	Manatee	Throughout
	Okeechobee	Intermediate
	Sawgrass	Intermediate/Late
	Solid King	Intermediate
Tammy	Intermediate	
Leaf	3SX739	Intermediate
	Big Star	Intermediate
	Cherokee	Throughout
	RSX743	Throughout
Boston	Odyssey	Throughout
	Palmetto	Throughout
Escarole	38100	Throughout
	39019	Throughout
	Forbes	Throughout
	Olmos	Throughout
	Siena	Throughout

¹ Planting starts in December

² Planting starts in October

³ Planting starts in January

⁴ Planting all season (October to March)

Spinach

Botany and Planting

Spinach—*Spinacia oleracea*

Table 4. 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 5. Spinach cultivars.

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

The following tables list registered pesticides that should be integrated with other pest management methods. Additional information on integrated management methods can be requested from UF/IFAS Extension horticulture or agriculture agents. A list of local UF/IFAS Extension offices is available at <https://sfyl.ifas.ufl.edu/find-your-local-office/>.

Table 6. Herbicides approved for managing weeds in lettuce. Contact: Ramdas Kanissery, UF/IFAS Southwest Florida Research and Education Center.

Active Ingredient lb a.i./Acre	Trade Name Product/Acre	MOA Code	Crops	Weeds Controlled/Remarks
Labels change frequently. Be sure to read a current product label before applying any chemical.				
*** PREEMERGENCE ***				
Benfin 1.2	(Balan) DF 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) 2.0 EC up to 2 fl oz	14	Leafy vegetables	Apply as a preplant burndown 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 label	9	Leafy vegetables	Emerged broadleaf and grass weeds. Apply as a preplant burndown. 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 acre 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 (Gramoxone) 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. Consult label for new restrictions.
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 W 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.
POSTEMERGENCE				
Carfentrazone up to 0.031	(Aim) 2.0 EC up to 2 fl oz	14	Leafy vegetables	Emerged broadleaf weeds. Apply as a preplant burndown 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.

Active Ingredient lb a.i./Acre	Trade Name Product/Acre	MOA Code	Crops	Weeds Controlled/Remarks
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 0.3–0.5	(Gramoxone) 2 SL 1.2–2.0 pt (Gramoxone) 3 SL 0.8–1.3 pt	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. Consult label for new restrictions.
Pelargonic acid	(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 days.

Table 7. Herbicides approved for managing weeds in spinach. Contact: Ramdas Kanissery, UF/IFAS Southwest Florida Research and Education Center.

Active Ingredient lb a.i./Acre	Trade Name Product/Acre	MOA Code	Weeds Controlled/Remarks
Labels change frequently. Be sure to read a current product label before applying any chemical.			
*** PREPLANT/PREEMERGENCE ***			
Carfentrazone up to 0.031	(Aim) 2.0 EC up to 2 fl oz	14	Apply as a preplant burndown 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 burndown treatment. Product is a contact, nonselective, 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 burndown treatment. Product is a contact, nonselective, 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) 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.
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.
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.
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 8. Insecticides labeled for management of arthropod pests of lettuce and other leafy vegetables (non-brassica, including escarole and endive). Contact: Julien Beuzelin, UF/IFAS Everglades Research and Education Center.

Pest	MOA Code ¹	Trade Name Active Ingredient *Restricted	Rate Product/Acre	REI (Hours)	Days to Harvest	Notes ²
Labels change frequently. Be sure to read a current product label before applying any chemical. Please refer to Chapter 19 for information on biopesticides, including materials labeled for certified organic production.						
Aphids	1A	*Lannate LV *Lannate 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 *Diazinon 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 Malathion 8F (malathion)	5EC: Endive: 1.5–2.0 pt Lettuce: 2–3 pt 8F: Endive: 1.25 pt Head and leaf lettuce: 1.88 pt	24	Endive: 7 Head and leaf lettuce: 14	Maximum of 2 applications 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. Other brands available with same active ingredient.
	3A	*Brigade 2EC (bifenthrin)	2.1–6.4 fl oz	12	7	Head lettuce only. Maximum of 32 fl oz/acre per season. Other brands available with same active ingredient.
	3A	*Fastac CS (alpha-cypermethrin)	3.2–3.8 fl oz	12	1	Maximum of 11.4 fl oz/acre per season.
	3A	*Mustang Maxx (zeta-cypermethrin)	2.24–4.0 fl oz	12	1	Maximum of 24 fl oz/acre per season.
	3A	*Pounce 25 WP (permethrin)	6.4–12.8 oz	12	1	Maximum of 0.8 lb a.i./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 crop. Many other brands with same active ingredient are available.
	3A + -	Azera (pyrethrins + azadirachtin)	16–56 fl oz	12	0	OMRI-listed. ²
	3A + -	BotaniGard Maxx (pyrethrins + <i>Beauveria bassiana</i> strain GHA)	Ground appl.: 0.25–2.00 qt Aerial appl.: 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.

Pest	MOA Code¹	Trade Name Active Ingredient *Restricted	Rate Product/Acre	REI (Hours)	Days to Harvest	Notes²
	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. Many other brands with same active ingredient are available.
	4A	Assail 30SG Assail 70WP (acetamiprid)	30SG: 2.0–4.0 oz 70WP: 0.8–1.7 oz	12	7	30SG: Maximum of 20.0 oz/acre or 0.375 lb a.i. per year. 70WP: Maximum of 8.5 oz/acre or 0.375 lb a.i. per year. Other brands available with same active ingredient.
	4A	Belay (clothianidin)	Foliar: 3–4 fl oz Soil: 9–12 fl oz	12	Foliar: 7 Soil: 21	Maximum of 12 fl oz/acre or 0.2 lb a.i./acre per year.
	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.
	4A	Platinum 75 SG (thiamethoxam)	1.66–3.67 oz	12	30	Maximum of 3.67 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.
	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 a.i. of thiamethoxam or 0.2 lb a.i. of chlorantraniliprole/acre per season.
	4C	Closer SC (sulfoxaflor)	1.5–2.0 fl oz	12	3	Maximum of 17 fl oz/acre per year.
	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 a.i./acre per year of cyantraniliprole-containing products and 0.056 lb a.i./acre per year of abamectin-containing products including all application types.
	9B	Fulfill (pymetrozine)	2.75 oz	12	7	Maximum of 5.5 oz/acre per season.
	9B	PQZ (pyrifluquinazon)	2.4–3.2 fl oz	12	1	Maximum of 4.8 fl oz/acre per crop cycle.
	9D	Versys (afidopyropen)	1.5 fl oz	12	0	Maximum of 14 fl oz/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 a.i./acre per year of cyantraniliprole-containing products (such as Verimark) including all application types. For best performance, use an adjuvant.

Pest	MOA Code ¹	Trade Name Active Ingredient *Restricted	Rate Product/Acre	REI (Hours)	Days to Harvest	Notes ²
	28	Harvanta 50SL (cyclaniliprole)	10.9–16.4 fl oz	4	1	Maximum of 49.2 fl oz/acre per year. 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 a.i./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	OMRI-listed. ²
	–	BotaniGard ES BoteGHA 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)	1–2 lb	4	0	OMRI-listed. ²
	–	Molt-X (azadirachtin)	10 fl oz	4	0	OMRI-listed. ²
	–	M-Pede 49% (soap, insecticidal)	1%–2% v/v	12	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. OMRI-listed. ²
Beetles (includes cucumber beetles, flea beetles) and weevils	1A	Sevin 4F Sevin 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. Other brands available with same active ingredient.
	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	*Fastac CS (alpha-cypermethrin)	2.2–3.8 fl oz	12	1	Maximum of 11.4 fl oz/acre per season.
	3A	*Mustang Maxx (zeta-cypermethrin)	2.24–4.0 fl oz	12	1	Maximum of 24 fl oz/acre per season.

Pest	MOA Code ¹	Trade Name Active Ingredient *Restricted	Rate Product/Acre	REI (Hours)	Days to Harvest	Notes ²
	3A	PyGanic Crop Protection EC 5.0 (pyrethrins)	4.5–15.6 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. Many other brands with same active ingredient are available.
	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 + -	Azera (pyrethrins + azadirachtin)	16–56 fl oz	12	0	OMRI-listed. ²
	3A + -	BotaniGard Maxx (pyrethrins + <i>Beauveria bassiana</i> strain GHA)	Ground appl.: 0.25–2.00 qt Aerial appl.: 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. 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. Other brands available with same active ingredient.
	4A	Belay (clothianidin)	Foliar: 3–4 fl oz Soil: 9–12 fl oz	12	Foliar: 7 Soil: 21	Maximum of 12 fl oz/acre or 0.2 lb a.i./acre per year. 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. Flea beetles only.
	4A	Platinum 75 SG (thiamethoxam)	1.66–3.67 oz	12	30	Maximum of 3.67 oz/acre per season. 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.
	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.
	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 a.i. of thiamethoxam or 0.2 lb a.i. of chlorantraniliprole/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. Flea beetles only.
	-	Aza-Direct (azadirachtin)	1–2 pt, up to 3.5 if needed	4	0	OMRI-listed. ²

Pest	MOA Code ¹	Trade Name Active Ingredient *Restricted	Rate Product/Acre	REI (Hours)	Days to Harvest	Notes ²
Caterpillars (includes armyworms, corn earworm, green cloverworm, tobacco budworm, lesser cornstalk borer, loopers, cutworms)	1A	* Lannate LV * Lannate 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 Sevin XLR Plus (carbaryl)	1–2 qt	12	14	Maximum of 6 qt/acre per year.
	1B	* Diazinon AG500 * Diazinon 50W (diazinon)	AG500: 1–2 qt Endive (escarole): 1–4 qt 50W: 2–4 lb Endive (escarole): 2–8 lb	Lettuce: 72 Endive (escarole): 96	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. Other brands available with same active ingredient.
	3A	* Ambush 25W (permethrin)	6.4–12.8 oz	12	1	Maximum of 128 oz/acre per season.
	3A	* Asana XL (esfenvalerate)	4.8–9.6 fl oz	12	7	Head lettuce only. Do not apply more than 0.35 lb a.i. 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.
	3A	* Brigade 2 EC (bifenthrin)	2.1–6.4 fl oz	12	7	Head lettuce only. Maximum of 32 fl oz/acre per season. Other brands available with same active ingredient.
	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	* Fastac CS (alpha-cypermethrin)	2.2–3.8 fl oz	12	1	Maximum of 11.4 fl oz/acre per season.
	3A	* Mustang Maxx (zeta-cypermethrin)	2.24–4.0 fl oz	12	1	Maximum of 24 fl oz/acre per season
	3A	* Pounce 25 WP (permethrin)	3.2–12.8 oz	12	1	Maximum of 0.8 lb a.i./acre per season.
	3A	PyGanic Crop Protection EC 5.0 (pyrethrins)	4.5–15.6 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. Many other brands with same active ingredient are available.
	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.

Pest	MOA Code ¹	Trade Name Active Ingredient *Restricted	Rate Product/Acre	REI (Hours)	Days to Harvest	Notes ²
	3A + -	Azera (pyrethrins + azadirachtin)	16–56 fl oz	12	0	OMRI-listed. ²
	3A + -	BotaniGard Maxx (pyrethrins + <i>Beauveria bassiana</i> strain GHA)	Ground appl.: 0.25–2.00 qt Aerial appl.: 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 Turnip greens: 3	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 Turnip greens and other leaves of root, tuber, legume vegetables: 3	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 a.i./acre per year of cyantraniliprole-containing products and 0.056 lb a.i./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	Confirm 2F (tebufenozide)	6–8 fl oz	4	7	Maximum of 40 fl oz/acre per season.
	18	Intrepid 2F (methoxyfenozide)	4–10 fl oz	4	1	Maximum of 64 fl oz/acre per year.
	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 a.i./acre per year of cyantraniliprole-containing products (such as Verimark) including all application types.

Pest	MOA Code ¹	Trade Name Active Ingredient *Restricted	Rate Product/Acre	REI (Hours)	Days to Harvest	Notes ²
	28	Harvanta 50SL (cyclaniliprole)	10.9–16.4 fl oz	4	1	Maximum of 49.2 fl oz/acre per year.
	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 a.i./acre per year of cyantraniliprole-containing products (such as Exirel), including all application types.
	32	Spear-Lep (GS-omega/kappa-Htxx-Hv1a)	1–2 pt	4	0	Must be tank-mixed with a <i>Bacillus thuringiensis (Bt)</i> product. Maximum of 10 gallons/acre per year.
	-	Aza-Direct (azadirachtin)	1–2 pt, up to 3.5 if needed	4	0	OMRI-listed. ²
	-	Grandevo (<i>Chromobacterium subtsugae</i> strain PRAA4-1)	1–2 lb	4	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
Fire ants	7	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 *Diazinon 50W (diazinon)	AG500: 1–2 qt Endive (escarole): 1–4 qt 50W: 2–4 lb Endive (escarole): 2–8 lb	AG500: Lettuce: 72 50W: Endive (escarole): 96	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	*Fastac CS (alpha-cypermethrin)	3.2–3.8 fl oz	12	1	Maximum of 11.4 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. Many other brands with same active ingredient are available.
	3A + -	Azera (pyrethrins + azadirachtin)	16–56 fl oz	12	0	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.
	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.

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Leafhoppers	1A	*Lannate LV *Lannate 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 Sevin 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 Malathion 8F (malathion)	5EC: Lettuce: 2–3 pt 8F: Endive: 1.25 pt Head and leaf lettuce: 1.88 pt	24	Head and leaf lettuce: 14	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. Other brands available with same active ingredient.
	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. Other brands available with same active ingredient.
	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	*Fastac CS (alpha-cypermethrin)	2.2–3.8 fl oz	12	1	Maximum of 11.4 fl oz/acre per season.
	3A	*Mustang Maxx (zeta-cypermethrin)	2.24–4.0 fl oz	12	1	Maximum of 24 fl oz/acre per season.
	3A	PyGanic Crop Protection EC 5.0 (pyrethrins)	4.5–15.6 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. Many other brands with same active ingredient are available.
	3A + -	Azera (pyrethrins + azadirachtin)	16–56 fl oz	12	0	OMRI-listed. ²
	3A + -	BotaniGard Maxx (pyrethrins + <i>Beauveria bassiana</i> strain GHA)	Ground appl.: 0.25–2.00 qt Aerial appl.: 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.

Pest	MOA Code ¹	Trade Name Active Ingredient *Restricted	Rate Product/Acre	REI (Hours)	Days to Harvest	Notes ²
	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. Other brands available with same active ingredient.
	4A	Belay (clothianidin)	Foliar: 3–4 fl oz Soil: 9–12 fl oz	12	Foliar: 7 Soil: 21	Maximum of 12 fl oz/acre or 0.2 lb a.i./acre per year.
	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.
	4A	Platinum 75 SG (thiamethoxam)	1.66–3.67 oz	12	30	Maximum of 3.67 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.
	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
	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 (tolfenpyrad)	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	OMRI-listed.
	-	JMS Stylet-Oil, Saf-T-Side, Suffoil-X, Sun Spray 98.8%, others (oil, insecticidal)	JMS: 3–6 qt/100 gal Others: 1–2 gal/100 gal	4	0	Organic Stylet-Oil, Saf-T-Side, and Suffoil-X are OMRI-listed. ²
	-	Molt-X (azadirachtin)	10 fl oz	4	0	OMRI-listed. ²
	-	M-Pede 49% (soap, insecticidal)	1%–2% v/v	12	0	OMRI-listed. ²
Leafminers	1B	*Diazinon AG500 *Diazinon 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.
	3A	PyGanic Crop Protection EC 5.0 (pyrethrins)	4.5–15.6 fl oz	12	0	Can be used in greenhouses. Thorough coverage is essential. Breaks down rapidly in sunlight. OMRI-listed. ²
	3A + -	Azera (pyrethrins + azadirachtin)	16–56 fl oz	12	0	OMRI-listed. ²

Pest	MOA Code ¹	Trade Name Active Ingredient *Restricted	Rate Product/Acre	REI (Hours)	Days to Harvest	Notes ²
	3A + -	BotaniGard Maxx (pyrethrins + <i>Beauveria bassiana</i> strain GHA)	Ground appl.: 0.25–2.00 qt Aerial appl.: 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 Turnip greens: 3	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 Turnip greens and other leaves of root, tuber, legume vegetables: 3	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	Maximum of 10.25 fl oz/acre per year. Must be mixed with a nonionic activator-type wetting, spreading, or penetrating adjuvant. Do not use binder or sticker adjuvant. Many other brands with same active ingredient are available.
	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 a.i./acre per year of cyantraniliprole-containing products and 0.056 lb a.i./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 (chlorantraniliprole)	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 (cyantraniliprole)	13.5–20.5 fl oz	12	1	Maximum of 0.4 lb a.i./acre per year of cyantraniliprole-containing products (such as Verimark), including all application types. For best performance, use an adjuvant.
	28	Harvanta 50SL (cyclaniliprole)	10.9–16.4 fl oz	4	1	Maximum of 49.2 fl oz/acre per year.
	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 a.i./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	OMRI-listed. ²
	-	Molt-X (azadirachtin)	10 fl oz	4	0	OMRI-listed. ²

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	-	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)	JMS: 3–6 qt/100 gal Others: 1–2 gal/100 gal	4	0	Organic Stylet-Oil and Saf-T-Side are OMRI-listed. ²
Mites (includes carmin spider mite, two-spotted spider mite)	1B	Malathion 5EC Malathion 8F (malathion)	5EC: Endive: 1.5–2.0 pt Lettuce: 2.5–3.0 pt 8F: Endive: 1.25 pt Head and leaf lettuce: 1.88 pt	24	Endive: 7 Head and leaf lettuce: 14	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. Other brands available with same active ingredient.
	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. Many other brands with same active ingredient are available.
	3A + -	Azera (pyrethrins + azadirachtin)	16–56 fl oz	12	0	OMRI-listed. ²
	3A + -	BotaniGard Maxx (pyrethrins + <i>Beauveria bassiana</i> strain GHA)	Ground appl.: 0.25–2.00 qt Aerial appl.: 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	Maximum of 10.25 fl oz/acre per year. Must be mixed with a nonionic activator-type wetting, spreading, or penetrating adjuvant. Do not use binder or sticker adjuvant. Many other brands with same active ingredient are available.
	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 a.i./acre per year of cyantraniliprole-containing products and 0.056 lb a.i./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	OMRI-listed. ²
	-	Grandevo (<i>Chromobacterium subtsugae</i> strain PRAA4-1)	1–3 lb	4	0	OMRI-listed. ²
	-	JMS Stylet-Oil, Saf- T-Side, Suffoil-X, Sun Spray 98.8%, others (oil, insecticidal)	JMS: 3–6 qt/100 gal Others: 1–2 gal/100 gal	4	0	Organic Stylet-Oil, Saf-T-Side, and Suffoil-X are OMRI-listed. ²

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	-	M-Pede 49% (soap, insecticidal)	1%–2% v/v	12	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. OMRI-listed. ²
Stink bugs, plant bugs, meadow spittlebug	3A	*Brigade 2 EC (bifenthrin)	2.1–6.4 fl oz	12	7	Head lettuce only. Maximum of 32 fl oz/acre per season. Other brands available with same active ingredient.
	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	*Fastac CS (alpha-cypermethrin)	2.2–3.8 fl oz	12	1	Maximum of 11.4 fl oz/acre per season.
	3A	*Mustang Maxx (zeta-cypermethrin)	2.24–4.0 fl oz	12	1	Maximum of 24 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. Many other brands with same active ingredient are available.
	3A + 28	*Besiege (lambda-cyhalothrin + chlorantraniliprole)	6–9 fl oz	24	1	Maximum of 31 fl oz/acre per year.
	3A + -	Azera (pyrethrins + azadirachtin)	16–56 fl oz	12	0	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.
	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.
	-	Aza-Direct (azadirachtin)	1–2 pt, up to 3.5 if needed	4	0	OMRI-listed.
	-	M-Pede 49% (soap, insecticidal)	1%–2% v/v	12	0	OMRI-listed. ²
Thrips (check labels for species control)	1A	*Lannate LV *Lannate 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 appl.: 0.25–2.00 qt Aerial appl.: 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 Turnip greens: 3	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

Pest	MOA Code ¹	Trade Name Active Ingredient *Restricted	Rate Product/Acre	REI (Hours)	Days to Harvest	Notes ²
	5	Radiant SC (spinetoram)	5–10 fl oz	4	1 Turnip greens and other leaves of root, tuber, legume vegetables: 3	Includes turnip greens. Maximum of 6 applications, no more than 2 consecutive applications before rotating to another MOA.
	21A	Torac (tolfenpyrad)	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 a.i./acre per year of cyantraniliprole-containing products (such as Verimark), including all application.
	-	Aza-Direct (azadirachtin)	1–2 pt, up to 3.5 if needed	4	0	OMRI-listed.
	-	BotaniGard ES BoteGHA 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</i> <i>subtsugae</i> strain PRAA4-1)	1–3 lb	4	0	OMRI-listed. ²
	-	JMS Stylet-Oil, Saf-T-Side, Suffoil-X, Sun Spray 98.8%, others (oil, insecticidal)	JMS: 3–6 qt/100 gal Others: 1–2 gal/100 gal	4	0	Organic Stylet-Oil, Saf-T-Side, and Suffoil-X are OMRI-listed. ²
	-	Molt-X (azadirachtin)	10 fl oz	4	0	OMRI-listed. ²
	-	M-Pede 49% (soap, insecticidal)	1%–2% v/v	12	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. 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. 10.2 March 2022. Number codes (1 through 29) are used to distinguish the main insecticide mode of action groups, with additional letters for certain subgroups 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 UF/IFAS Extension 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. Insecticides labeled for management of arthropod pests of spinach. Contact: Julien Beuzelin, UF/IFAS Everglades Research and Education Center.

Pest	MOA Code ¹	Trade Name Active Ingredient *Restricted	Rate Product/Acre	REI (hours)	Days to Harvest	Notes ²
Labels change frequently. Be sure to read a current product label before applying any chemical. Please refer to Chapter 19 for information on biopesticides, including materials labeled for certified organic production.						
Aphids	1B	Malathion 5EC Malathion 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 a.i./acre per season (5 applications at high rate).
	3A	*Fastac CS (alpha-cypermethrin)	3.2–3.8 fl oz	12	1	Maximum of 11.4 fl oz/acre per season.
	3A	*Mustang Maxx (zeta-cypermethrin)	2.24–4.0 fl oz	12	1	Maximum of 24 fl oz/acre per season.
	3A	*Pounce 25 WP (permethrin)	6.4–12.8 oz	12	1	Maximum of 0.6 lb a.i./acre per season (Maximum 3 applications at highest rate).
	3A	PyGanic Crop Protection EC 5.0 (pyrethrins)	4.5–15.6 fl oz	12	0	Pyrethrins degrade rapidly in sunlight. OMRI-listed. ²
	3A + -	Azera (pyrethrins + azadirachtin)	16–56 fl oz	12	0	OMRI-listed. ²
	3A + -	BotaniGard Maxx (pyrethrins + <i>Beauveria bassiana</i> strain GHA)	Ground appl.: 0.25–2.00 qt Aerial appl.: 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.
	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. Other brands available with same active ingredient.
	4A	Assail 30SG Assail 70WP (acetamiprid)	30SG: 2.0–4.0 oz 70WP: 0.8–1.7 oz	12	7	30SG: Maximum of 20.0 oz/acre or 0.375 lb a.i. per year. 70WP: Maximum of 8.5 oz/acre or 0.375 lb a.i. per year. Other brands available with same active ingredient.
	4A	Belay (clothianidin)	Foliar: 3–4 fl oz Soil: 9–12 fl oz	12	Foliar: 7 Soil: 21	Maximum of 12 fl oz/acre or 0.2 lb a.i./acre per year.
	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.
	4A	Platinum 75 SG (thiamethoxam)	1.66–3.67 oz	12	30	Maximum of 3.67 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.
	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.
	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 + 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.

Pest	MOA Code¹	Trade Name Active Ingredient *Restricted	Rate Product/Acre	REI (hours)	Days to Harvest	Notes²
	9B	Fulfill (pymetrozine)	2.75 oz	12	7	Maximum of 5.5 oz/acre per season.
	9B	PQZ (pyrifluquinazon)	2.4–3.2 fl oz	12	1	Maximum of 4.8 fl oz/acre per crop cycle.
	9D	Versys (afidopyropen)	1.5 fl oz	12	0	Maximum of 14 fl oz/acre per season.
	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 a.i./acre per year of cyantraniliprole-containing products (such as Verimark), including all application types. Do not use an adjuvant.
	28	Harvanta 50SL (cyclaniliprole)	10.9–16.4 fl oz	4	1	Maximum of 49.2 fl oz/acre per year. 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 a.i./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 (azadirachtin)	1–2 pt, up to 3.5 if needed	4	0	OMRI-listed. ²
	-	BotaniGard ES BoteGHA 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 is OMRI-listed. ²
	-	Grandevo (<i>Chromobacterium</i> <i>subtsugae</i> strain PRAA4-1)	1–2 lb	4	0	OMRI-listed. ²
	-	Molt-X (azadirachtin)	10 fl oz	4	0	OMRI-listed. ²
	-	M-Pede 49% (soap, insecticidal)	1%–2% v/v	12	0	OMRI-listed. ²
	-	Neemix 4.5 EC (azadirachtin)	4–16 fl oz	12	0	IGR and feeding repellent. 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. OMRI-listed. ²
Beetles (includes cucumber beetle, flea beetles, darkling beetles) and weevils	1A	Sevin 4F Sevin 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. Other brands available with same active ingredient.
	3A	*Fastac CS (alpha-cypermethrin)	2.2–3.8 fl oz	12	1	Maximum of 11.4 fl oz/acre per season.
	3A	*Mustang Maxx (zeta-cypermethrin)	2.24–4.0 fl oz	12	1	Maximum of 24 fl oz/acre per season.

Pest	MOA Code ¹	Trade Name Active Ingredient *Restricted	Rate Product/Acre	REI (hours)	Days to Harvest	Notes ²
	3A	PyGanic Crop Protection EC 5.0 (pyrethrins)	4.5–15.6 fl oz	12	0	Pyrethrins degrade rapidly in sunlight. OMRI-listed. ²
	3A + -	Azera (pyrethrins + azadirachtin)	16–56 fl oz	12	0	OMRI-listed. ²
	3A + -	BotaniGard Maxx (pyrethrins + <i>Beauveria bassiana</i> strain GHA)	Ground appl.: 0.25–2.00 qt Aerial appl.: 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. 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. Other brands available with same active ingredient.
	4A	Belay (clothianidin)	Foliar: 3–4 fl oz Soil: 9–12 fl oz	12	Foliar: 7 Soil: 21	Maximum of 12 fl oz/acre or 0.2 lb a.i./acre per year. 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. Flea beetles only.
	4A	Platinum 75 SG (thiamethoxam)	1.66–3.67 oz	12	30	Maximum of 3.67 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. 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. Flea beetles only.
	4A + 28	Durivo (thiamethoxam + chlorantraniliprole)	10–13 oz	12	30	
	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. Do not use an adjuvant.
	-	Aza-Direct (azadirachtin)	1–2 pt, up to 3.5 if needed	4	0	OMRI-listed. ²
Caterpillars (including armyworms, corn earworm, green cloverworm, tobacco budworm, lesser cornstalk borer, loopers, cutworms)	1A	*Lannate LV *Lannate 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 Sevin XLR Plus (carbaryl)	1–2 qt	12	14	Maximum of 6 qt/acre per year.
	1B	*Diazinon AG500 *Diazinon 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. Other brands available with same active ingredient.
	3A	*Fastac CS (alpha-cypermethrin)	2.2–3.8 fl oz	12	1	Maximum of 11.4 fl oz/acre per season.
	3A	*Mustang Maxx (zeta-cypermethrin)	2.24–4.0 fl oz	12	1	Maximum of 24 fl oz/acre per season.
	3A	*Pounce 25 WP (permethrin)	3.2–12.8 oz	12	1	Maximum of 0.6 lb a.i./acre per season (maximum 3 applications at highest rate).

Pest	MOA Code ¹	Trade Name Active Ingredient *Restricted	Rate Product/Acre	REI (hours)	Days to Harvest	Notes ²
	3A	PyGanic Crop Protection EC 5.0 (pyrethrins)	4.5–15.6 fl oz	12	0	Pyrethrins degrade rapidly in sunlight. OMRI-listed. ²
	3A + -	Azera (pyrethrins + azadirachtin)	16–56 fl oz	12	0	OMRI-listed. ²
	3A + -	BotaniGard Maxx (pyrethrins + <i>Beauveria bassiana</i> strain GHA)	Ground appl.: 0.25–2.00 qt Aerial appl.: 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. ²
	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.
	18	Confirm 2F (tebufenozide)	6–8 fl oz	4	7	Maximum of 40 fl oz/acre per season.
	18	Intrepid 2F (methoxyfenozide)	4–10 fl oz	4	1	Maximum of 64 fl oz/acre per year.
	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 a.i./acre per year of cyantraniliprole-containing products (such as Verimark), including all application types. Do not use an adjuvant.
	28	Harvanta 50SL (cyclaniliprole)	10.9–16.4 fl oz	4	1	Maximum of 49.2 fl oz/acre per year.
	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 a.i./acre per year of cyantraniliprole-containing products (such as Exirel), including all application types.

Pest	MOA Code ¹	Trade Name Active Ingredient *Restricted	Rate Product/Acre	REI (hours)	Days to Harvest	Notes ²
	32	Spear-Lep (GS-omega/kappa-Hctx-Hv1a)	1–2 pt	4	0	Must be tank-mixed with a <i>Bacillus thuringiensis</i> (Bt) product. Maximum of 10 gallons/acre per year.
	-	Aza-Direct (azadirachtin)	1–2 pt, up to 3.5 if needed	4	0	OMRI-listed. ²
	-	Grandevo (<i>Chromobacterium subtsugae</i> strain PRAA4-1)	1–3 lb	4	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
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	*Fastac CS (alpha-cypermethrin)	3.2–3.8 fl oz	12	1	Maximum of 11.4 fl oz/acre per season.
	3A	*Mustang Maxx (zeta-cypermethrin)	2.24–4.0 fl oz	12	1	Maximum of 24 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.
	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.
Leafhopper	1A	Sevin 4F Sevin 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 a.i./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.
	3A	*Fastac CS (alpha-cypermethrin)	3.2–3.8 fl oz	12	1	Maximum of 11.4 fl oz/acre per season.
	3A	*Mustang Maxx (zeta-cypermethrin)	2.24–4.0 fl oz	12	1	Maximum of 24 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 a.i./acre per season (no more than 3 applications at highest rate).
	3A	PyGanic Crop Protection EC 5.0 (pyrethrins)	4.5–15.6 fl oz	12	0	Pyrethrins degrade rapidly in sunlight. OMRI-listed. ²
	3A + -	BotaniGard Maxx (pyrethrins + <i>Beauveria bassiana</i> strain GHA)	Ground appl.: 0.25–2.00 qt Aerial appl.: 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.

Pest	MOA Code¹	Trade Name Active Ingredient *Restricted	Rate Product/Acre	REI (hours)	Days to Harvest	Notes²
	4A	Actara (thiamethoxam)	1.5–3.0 oz	12	7	Maximum of 11 oz/acre per growing season.
	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. Other brands available with same active ingredient.
	4A	Belay (clothianidin)	Foliar: 3–4 fl oz Soil: 9–12 fl oz	12	Foliar: 7 Soil: 21	Maximum of 12 fl oz/acre or 0.2 lb a.i./acre per year.
	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.
	4A	Platinum 75 SG (thiamethoxam)	1.66–3.67 oz	12	30	Maximum of 3.67 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.
	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.
	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 + 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 more than 4 per year. Allow 7 days between applications.
	-	Aza-Direct (azadirachtin)	1–2 pt, up to 3.5 if needed	4	0	OMRI-listed. ²
	-	Molt-X (azadirachtin)	10 fl oz	4	0	OMRI-listed. ²
	-	M-Pede 49% (soap, insecticidal)	1%–2% v/v	12	0	OMRI-listed. ²
	-	Neemix 4.5 EC (azadirachtin)	4–16 fl oz	12	0	OMRI-listed. ²
Leafminers	3A + -	BotaniGard Maxx (pyrethrins + <i>Beauveria bassiana</i> strain GHA)	Ground appl.: 0.25–2.00 qt Aerial appl.: 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	Maximum of 10.25 fl oz/acre per year. Must be mixed with a nonionic activator-type wetting, spreading, or penetrating adjuvant. Do not use binder or sticker adjuvant. Many other brands with same active ingredient are available.
	6	*Proclaim (emamectin benzoate)	2.4–4.8 oz	12	7	Do not apply more than 28.8 oz/A per season.

Pest	MOA Code ¹	Trade Name Active Ingredient *Restricted	Rate Product/Acre	REI (hours)	Days to Harvest	Notes ²
	17	Trigard (cyromazine)	2.66 oz	12	7	No more than 5 applications per crop.
	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 a.i./acre per year of cyantraniliprole-containing products (such as Verimark), including all application types. Do not use an adjuvant.
	28	Harvanta 50SL (cyclaniliprole)	10.9–16.4 fl oz	4	1	Maximum of 49.2 fl oz/acre per year.
	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 a.i./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	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
Mites (includes carmine spider mite, two- spotted spider mite)	3A	*Brigade 2EC (bifenthrin)	5.1–6.4 fl oz	12	7	Maximum of 25.6 fl oz/acre per season. Other brands available with same active ingredient.
	3A + -	BotaniGard Maxx (pyrethrins + <i>Beauveria bassiana</i> strain GHA)	Ground appl.: 0.25–2.00 qt Aerial appl.: 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	Maximum of 10.25 fl oz/acre per year. Must be mixed with a nonionic activator-type wetting, spreading, or penetrating adjuvant. Do not use binder or sticker adjuvant. Many other brands with same active ingredient are available.
Stink bugs, plant bugs, meadow spittlebug	1A	Sevin 4F Sevin 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. Other brands available with same active ingredient.
	3A	*Fastac CS (alpha-cypermethrin)	3.2–3.8 fl oz	12	1	Maximum of 11.4 fl oz/acre per season.
	3A	*Mustang Maxx (zeta-cypermethrin)	2.24–4.0 fl oz	12	1	Maximum of 24 fl oz/acre per season.
	3A	PyGanic Crop Protection EC 5.0 (pyrethrins)	4.5–15.6 fl oz	12	0	Pyrethrins degrade rapidly in sunlight. OMRI-listed. ²
	3A + -	Azera (pyrethrins + azadirachtin)	16–56 fl oz	12	0	OMRI-listed. ²
	3A + -	BotaniGard Maxx (pyrethrins + <i>Beauveria bassiana</i> strain GHA)	Ground appl.: 0.25–2.00 qt Aerial appl.: 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.

Pest	MOA Code ¹	Trade Name Active Ingredient *Restricted	Rate Product/Acre	REI (hours)	Days to Harvest	Notes 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.
	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.
	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	OMRI-listed. ²
	-	M-Pede 49% (soap, insecticidal)	1%–2% v/v	12	0	OMRI-listed. ²
Thrips (check label for species controlled)	3A, -	BotaniGard Maxx (pyrethrins + <i>Beauveria bassiana</i> strain GHA)	Ground appl.: 0.25–2.00 qt Aerial appl.: 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 a.i./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	OMRI-listed. ²
	-	BotaniGard ES BoteGHA 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 is OMRI-listed. ²
	-	Grandevo (<i>Chromobacterium subtsugae</i> strain PRAA4-1)	1–3 lb	4	0	OMRI-listed. ²
	-	Molt-X (azadirachtin)	10 fl oz	4	0	OMRI-listed. ²
	-	M-Pede 49% (soap, insecticidal)	1%–2% v/v	12	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. 10.2 March 2022. Number codes (1 through 29) are used to distinguish the main insecticide mode of action groups, with additional letters for certain subgroups 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 UF/IFAS Extension 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 10. Escarole and endive fungicides ordered by disease and then FRAC group according to their mode of action. Contact: Katia Viana Xavier, UF/IFAS Everglades Research and Education Center.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ²	
			Appl.	Season	Harvest	Reentry		
Labels change frequently. Be sure to read a current product label before applying any chemical. Please refer to Chapter 19 for information on biopesticides, including materials labeled for certified organic production.								
Alternaria leaf spot	3	Procure 480SC (triflumizole)	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 45C (triflumizole)	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	Luna Sensation (fluopyram + trifloxystrobin)	7.6 fl oz	15.3 fl oz	0	0.5	Alternate with fungicides of dissimilar modes of action.	
	7 + 11	Merivon (pyraclostrobin + fluxapyroxad)	11.0 fl oz	33 fl oz	1	0.5	Alternate with fungicides of dissimilar modes of action.	
	7 + 12	Miravis Prime (pydiflumetofen + fludioxonil)	13.4 fl oz	36.5 fl oz	14	0.5	See label for restrictions.	
	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 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.	
	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, Nu-Cop 3L, Nu-Cop 50WP, Nu-Cop D, Nu-Cop HB	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 WG (fludioxonil)	7 oz	28 oz	0	0.5		
	14	Botran 5F (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.	

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ²
			Appl.	Season	Harvest	Reentry	
Botrytis rot	7	Endura (boscalid)	9.0 oz	18 oz	14	0.5	See label for details.
	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.
	7 + 12	Miravis Prime (pydiflumetofen + fludioxonil)	13.4 fl oz	36.5 fl oz	14	0.5	See label for details.
	14	Botran 5F (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.
Cercospora leaf spot	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.
	7 + 11	Merivon (pyraclostrobin + fluxapyroxad)	11.0 fl oz	33 fl oz	1	0.5	Alternate with fungicides of dissimilar modes of action.
Septoria leaf spot	7 + 12	Miravis Prime (pydiflumetofen + fludioxonil)	13.4 fl oz	36.5 fl oz	14	0.5	See label for restrictions.
	11	Cabrio EG (pyraclostrobin)	16 oz	64 oz	0	0.5	Alternate with fungicides of dissimilar modes of action.
Damping off	11	Quadris (azoxystrobin)	15.4 fl oz	2.88 qt	0	4 hr	Alternate with fungicides of dissimilar modes of action.
	M3	Defiant 75 WP (thiram)	5.3 oz/100 lb 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, Nu-Cop 3L, Nu-Cop 50WP, Nu-Cop DF, Nu-Cop HB	SEE INDIVIDUAL LABEL		1	Varies by product from 4 hrs to 2 days	
	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.
	21	Ranman (cyazofamid)	2.75 fl oz	16.5 fl oz	0	0.5	Alternate with fungicides of dissimilar modes of action.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ²
			Appl.	Season	Harvest	Reentry	
	27 + 11	Tanos (cymoxanil + famoxadone)	8 oz	24 oz	3	0.5	
	33	Aliette WDG Legion 80WDG Linebacker WDG (fosetyl-AI)	5 lb	Aliette: 35 lb Legion, Linebacker: 20 lb	3	0.5	Caution should be used when applying in a management program including copper fungicides.
	33	(mono- and dipotassium salts of phosphorous acid) Many brands available: Alude, Confine Extra, Fosiphite, Fungi-phite, K-Phite 7LP, Oxiphos, Phiticide, Prophyt, Phostrol, 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	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 (ametoctradin + dimethomorph)	14 fl oz	42 fl oz	0	0.5	Do not exceed 2 sequential applications
	49 + 4	Orondis Gold (oxathiapiprolin + mefenoxam)	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 plant-back restrictions.
	49 + 40	Orondis Ultra (oxathiapiprolin + mandipropamid)	8 fl oz	32 fl oz	1	0.5	Do not exceed 4 applications per crop. Do not make more than 2 sequential applications. Do not exceed more than 33% of total foliar applications.
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.
	3	Procore 480SC (triflumizole)	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 45C (triflumizole)	8 fl oz	16 fl oz	0	0.5	No more than 2 applications per season.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ²
			Appl.	Season	Harvest	Reentry	
	3 + 11	Topguard EQ (flutriafol + azoxystrobin)	8 fl oz	32 fl oz	7	0.5	No more than 4 applications per season.
	7	Fontelis (penthiopyrad)	24 fl oz	72 fl oz	3	0.5	
	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.
	7 + 11	Merivon (pyraclostrobin + fluxapyroxad)	11.0 fl oz	33 fl oz	1	0.5	Alternate with fungicides of dissimilar modes of action.
	7 + 12	Miravis Prime (pydiflumetofen + fludioxonil)	13.4 fl oz	36.5 fl oz	14	0.5	See label for restrictions.
	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 of dissimilar modes of action.
Pythium damping off	4	Sebring (metalaxyl)	0.7 fl oz/100 lb of seed			2	Seed treatment only.
Pythium seedling blight	4	Acquire Allegiance FL (metalaxyl)	0.7 fl oz/100 lb of seed			1	Seed treatment only.
	4	Apron XL (mefenoxam)	0.64 fl oz/100 lb seed			2	
	4	Metastar 2E (metalaxyl)	8 pt			2	Apply as a broadcast soil application and incorporate into top 2 inches.
Pythium seedling disease	4	Ridomil Gold GR Ridomil Gold SL Ultra Flourish (mefenoxam)	GR: 40 lb SL: 2 pt Ultra Flourish: 4 pt			2	See label for specifics regarding preplant incorporated applications and surface applications at the time of planting.
Rhizoctonia bottom rot	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.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ²
			Appl.	Season	Harvest	Reentry	
Sclerotinia diseases	7	Endura (boscalid)	10.0 oz	18 oz	14	0.5	See label for details.
	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	Quadris (azoxystrobin)	15.2 fl oz	2.88 qt	0	4 hr	Alternate with fungicides of dissimilar modes of action.
Various seedling diseases	4 + 11	Uniform (azoxystrobin + mefenoxam)	0.34 fl oz/1000 fl of row	1 appl.		0	Soil incorporated.
	12	Maxim 4FSS (fludioxonil)	0.16 fl oz/100 lb of seed			0.5	Seed treatment only.

¹FRAC 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 2022; <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 UF/IFAS Extension nor discrimination against similar products or services not mentioned.

Table 11. Lettuce fungicides ordered by disease and then FRAC group according to their mode of action. Contact: Katia Viana Xavier, UF/IFAS Everglades Research and Education Center.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemicals (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ²	
			Appl.	Season	Harvest	Reentry		
Alternaria spp.	3	Rhyme (flutriafol)	7 fl oz	28 fl oz	7	0.5	No more than 4 applications per season.	
	3	Trionic (triflumizole)	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 (penthiopyrad)	24 fl oz	72 fl oz	3	0.5		
	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.	
	7 + 11	Merivon (pyraclostrobin + fluxapyroxad)	11 fl oz	33 fl oz	1	0.5	Alternate with fungicides with dissimilar modes of action.	
	7 + 12	Miravis Prime (pydiflumetofen + fludioxonil)	13.4 fl oz	36.5 fl oz	14	0.5	Do not make more than 2 sequential applications without rotating to different mode of action. No more than 2 applications at max rate.	
	9 + 12	Switch 62.5WG (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, Champ DP, Champ Formula 2, Champion++, Champ WG, Champ WP, C-O-C-S WDG, Cueva, Cuproxat, Kentan DF, Kocide 3000, Kop-hydroxide, Nordox 75 WG, NuCop 3L, NuCop 50WP, NuCop DF, NuCop HB, 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 62.5WG (cyprodinil + fludioxonil)	14 oz	56 oz	0	0.5	Alternate with fungicide with dissimilar modes of action after 2 applications.
12		Cannonball WG (fludioxonil)	7 oz	28 oz	0	0.5		

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemicals (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ²
			Appl.	Season	Harvest	Reentry	
Botrytis rot	7	Endura (boscalid)	11 oz	22 oz	14	0.5	
	7	Fontelis (penthiopyrad)	24 fl oz	72 fl oz	3	0.5	Alternate with fungicide with dissimilar modes of action after 2 applications.
	7 + 11	Merivon (pyraclostrobin + fluxapyroxad)	11 fl oz	33 fl oz	1	0.5	Alternate with fungicides with dissimilar modes of action.
	12	Cannonball WG (fludioxonil)	7 oz	28 oz	0	0.5	Alternate with fungicides with dissimilar modes of action.
	14	Botran 5F (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 (penthiopyrad)	24 fl oz	72 fl oz	3	0.5	
	7 + 11	Merivon (pyraclostrobin + fluxapyroxad)	11 fl oz	33 fl oz	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: Quadris, Satori, Willowood Azoxy	15.5 fl oz	2.88 qt	0	4 hr	Alternate with fungicides of dissimilar modes of action.
	12	Cannonball WG (fludioxonil)	0.5 oz	1.5 lb	14	0.5	
Damping off	M3	Defiant 75WP (thiram)	5.3 oz/100 lb of seed			1	Seed treatment only.
Downy mildew	M1	(copper compounds) Many brands available: Basic Copper 53, Champ DP, Champ Formula 2, Champ WG, Champ WP, C-O-C-S WDG, Cueva, Kocide 3000, Nordox 75 WG, Nu-Cop 3L, Nu-Cop 50WP, Nu-Cop DF, Nu-Cop HB, 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, Microfine Sulfur, Micro Sulf, Microthiol Dispers, 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.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemicals (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ²
			Appl.	Season	Harvest	Reentry	
	M3	(mancozeb) Many brands available: Dithane F45 Rainshield, Dithane M45, Fortuna 75WDG, Koverall, Mankocide, Manzate Max, Manzate Pro-stick, Penncozeb 75 DF, Penncozeb 80 WP, Roper DF Rainshield	SEE INDIVIDUAL LABELS		10	1	
	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	(azoxystrobin) Various brands available: Quadris, Satori, Tetraaban, 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 of dissimilar modes of action.
	11	Reason (fenamidone)	8.2 fl oz	24.6 fl oz	2	0.5	Alternate with fungicides of dissimilar modes of action.
	21	Actigard 50 WG (acibenzolar)	1 oz	4 oz	7	0.5	Apply preventatively. See label for details.
	21	Ranman (cyazofamid)	2.75 fl oz	16.5 fl oz	0	0.5	Alternate with fungicides of dissimilar modes of action.
(suppression only)	21A	Toran (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	
	33	Aliette WDG (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.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemicals (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ²
			Appl.	Season	Harvest	Reentry	
	33	(mono- and dipotassium salts of phosphorous acid) Many brands available: Alude, Confine Extra, Fosphite, Fungi-phite, K-Phite 7LP, Oxiphos, Phiticide, Prophyt, Phostrol, 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 (mandipropamid)	8 fl oz	32 fl oz	1	0.5	Do not exceed 2 sequential applications. See label for soil applications.
	43	Presidio (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 (ametoctradin + dimethomorph)	14 fl oz	42 fl oz	0	4 hr	
	49 + 40	Orondis Ultra (oxathiapiprolin + mandipropamid)	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.
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.
	7 + 12	Miravis Prime (pydiflumetofen + fludioxonil)	13.4 fl oz	36.5 fl oz	14	0.5	Do not make more than 2 sequential applications without rotating to different mode of action. No more than 2 applications at max rate.
	9 + 12	Switch 62.5WG (cyprodinil + fludioxonil)	14 oz	56 oz	0	0.5	Alternate with fungicide with dissimilar modes of action after 2 applications.
	12	Cannonball WG (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, Microfine Sulfur, Micro Sulf, Microthiol Dispers, 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 F45 Rainshield, Dithane M-45, Fortuna 75WDG, Koverall, Mankocide, Manzate Flowable, Manzate Pro-stick, Penncozeb 75 DF, Penncozeb 80 WP, Roper DF Rainshield	SEE INDIVIDUAL LABELS		10	1	

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemicals (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ²
			Appl.	Season	Harvest	Reentry	
	3	Procore 480SC (fludioxinil)	8 fl oz	18 fl oz	0	0.5	
	3	Rally 40WSP (myclobutanil)	5 oz	20 oz	3	1	Supplemental label.
	3	Rhyme (flutriafol)	7 fl oz	28 fl oz	7	0.5	No more than 4 applications per season.
	3	Sonoma 40WSP (myclobutanil)	5 oz	20 oz	3	1	
	3	Trionic (triflumizole)	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 (penthiopyrad)	24 fl oz	72 fl oz	3	0.5	Alternate with fungicide with dissimilar modes of action after 2 applications.
	7 + 11	Luna Sensation (fluopyram + trifloxystrobin)	7.6 fl oz	15.3 fl oz	0	0.5	Alternate with fungicides with dissimilar modes of action.
	7 + 11	Merivon (pyraclostrobin + fluxapyroxad)	11 fl oz	33 fl oz	1	0.5	Alternate with fungicides with dissimilar modes of action.
	7 + 12	Miravis Prime (pydiflumetofen + fludioxonil)	13.4 fl oz	36.5 fl oz	14	0.5	Do not make more than 2 sequential applications without rotating to different mode of action. No more than 2 applications at max rate. Alternate with fungicide with dissimilar modes of action after 2 applications.
	9 + 12	Switch 62.5WG (cyprodinil + fludioxonil)	14 oz	56 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 with dissimilar modes of action.
	11	Cabrio EG (pyraclostrobin)	16 oz	64 oz	0	0.5	Alternate with fungicides with 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	Ridomil Gold SL (mefenoxam)	2 pt	1 lb a.i.	7	2	
	4	Sebring 318FS Sebring 480FS (metalaxyl)	0.75 fl oz/100 lb of seed			1	Seed treatment only.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemicals (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ²
			Appl.	Season	Harvest	Reentry	
Pythium seedling blight	4	Acquire Allegiance FL (metalaxyl)	0.75 fl oz/100 lb of seed		1	Seed treatment only.	
	4	Apron XL (mefenoxam)	0.64 fl oz/100 lb seed				
	4	Metastar 2E (metalaxyl)	8 pt			Apply as a broadcast soil application and incorporate into top 2 inches.	
Pythium seedling diseases	4	Ridomil Gold Ridomil Gold GR Ultra Flourish (mefenoxam)	Gold: 2 pt GR: 40 lb Ultra Flourish: 4 pt		2	See label for specifics regarding preplant incorporated applications and surface applications at the time of planting.	
	4 + 11	Uniform (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 + trifloxystrobin)	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 (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 (boscalid)	11 oz	22 oz	14	0.5	
	7	Fontelis (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	Luna Sensation (fluopyram + trifloxystrobin)	7.6 fl oz	15.3 fl oz	0	0.5	Alternate with fungicides with dissimilar modes of action.
	7 + 11	Merivon (pyraclostrobin + fluxapyroxad)	11 fl oz	33 fl oz	1	0.5	Alternate with fungicides with dissimilar modes of action.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemicals (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ²
			Appl.	Season	Harvest	Reentry	
	7 + 12	Miravis Prime (pydiflumetofen + fludioxonil)	13.4 fl oz	36.5 fl oz	14	0.5	Do not make more than 2 sequential applications without rotating to different mode of action. No more than 2 applications at max rate.
	9 + 12	Switch 62.5WG (cyprodinil + fludioxonil)	14 oz	56 oz	0	0.5	Alternate with fungicide with dissimilar modes of action after 2 applications.
	12	Cannonball (fludioxonil)	7 oz	28 oz	0	0.5	Apply after emergence and after thinning.
	14	Botran 5F (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.
	7	Fontelis (penthiopyrad)	24 fl oz	72 fl oz	3	0.5	
	7 + 11	Merivon (pyraclostrobin + fluxapyroxad)	11 fl oz	33 fl oz	1	0.5	Alternate with fungicides with dissimilar modes of actions.
	7 + 12	Miravis Prime (pydiflumetofen + fludioxonil)	13.4 fl oz	13.4 fl oz	14	0.5	Do not make more than 2 sequential applications without rotating to different mode of action. No more than 2 applications at max rate.
	9 + 12	Switch 62.5WG (cyprodinil + fludioxonil)	14 oz	56 oz	0	0.5	Alternate with fungicide with dissimilar modes of action after 2 applications.
	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 with dissimilar modes of actions.
	11	Cabrio EG (pyraclostrobin)	16 oz	16 oz	0	0.5	Alternate with fungicides with dissimilar modes of actions.
Various seedling diseases	4 + 11	Uniform	0.34 fl oz/1000 lb of seed	1 appl.		0	Soil incorporated.
	12	Maxim 4FS Spirato 480 FS (fludioxonil)	0.16 fl oz/100 lb of seed				Seed treatment only.

¹FRAC 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 the 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 2022; <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 UF/IFAS Extension nor discrimination against similar products or services not mentioned.

Table 12. Spinach fungicides ordered by disease and then FRAC group according to their mode of action. Contact: Katia Viana Xavier, UF/IFAS Everglades Research and Education Center.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ²	
			Appl.	Season	Harvest	Reentry		
Alternaria	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 (fluopyram + trifloxystrobin)	7.6 fl oz	15.3 fl oz	0	0.5	Alternate with fungicides of dissimilar modes of action.	
	7 + 12	Miravis Prime (pydiflumetofen + fludioxonil)	13.4 fl oz	36.5 fl oz	14	0.5	No more than 2 sequential applications without moving to dissimilar mode of action. May cause leaf cupping.	
	9 + 12	Switch (cyprodinil + fludioxonil)	14 oz	56 oz	7	0.5	See label for details.	
	11	Quadris (azoxystrobin)	6 fl oz	15.5 fl oz	0	4 hr	Alternate with fungicides of dissimilar modes of action.	
	M1	(copper compounds) Many brands available: Badge SC, Badge X2, Basic Copper 53, Champ DP, Champ Formula 2, Champ WG, Champ WP, COC DF, C-O-C-S WDG, 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 3L, NuCop 50WP, NuCop DF, NuCop HB, 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.	
	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.	
	Damping-off	M3	Defiant 75WP (thiram)	5.3 oz/100 lb of seed			1	Seed treatment only.
		4	Ridomil Gold SL (mefenoxam)	2 pt			2	Apply at seeding in a 7"-12" band on soil over seed furrow.
4 + 11		Uniform (azoxystrobin + mefenoxam)	0.34 fl oz/1000 ft row			0	Make only 1 application per season at planting.	

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ²
			Appl.	Season	Harvest	Reentry	
Downy mildew	M1	(copper compounds) Many brands available: Badge SC, Badge X2, Basic Copper 53, Champ DP, Champ Formula 2, Champion++, Champ WG, Champ WP, COC DF, C-O-C-SWDG, 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 3L, NuCop 50WP, NuCop DF, NuCop HB, Top Cop w/Sulfur	SEE INDIVIDUAL LABELS			Varies by product from 4 hr to 2 days	
	M2	(sulfur) Many brands available: Microfine Sulfur, Micro Sulf, 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.
	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 (pyraclostrobin + fluxapyroxad)	11 fl oz	33 fl oz	1	0.5	Apply only in water with no adjuvants or tank mixtures. Alternate with dissimilar modes of action.
	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	Cabrio EG (pyraclostrobin)	16 oz	48 oz	0	0.5	Limit is 3 applications/crop + alternate chemistry.
	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)	0.75 oz	2.25 oz	7	0.5	See label for specific conditions.
(Suppression only)	21A	Torac (tofenpyrad)	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.
	33	Allette 80WDG Legion 80WDG Linebacker 80WDG (fosetyl-Al)	5 lb	35 lb	3	0.5	Caution should be used when applying in a management program including copper fungicides or adjuvants.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ²
			Appl.	Season	Harvest	Reentry	
	33	(mono- and dipotassium salts of phosphorous acid) Many brands available: Alude, Confine Extra, Fosiphite, Fungi-phite, K-Phite, Oxiphos, Phiticide, Prophyt, Phostrol, Rampart, Reveille	3 qt		0	4 hr	See label for details.
	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	Revus (mandipropamid)	8 fl oz	32 fl oz	1	4 hr	Do not exceed 2 sequential applications. See label for soil applications.
	40 + 45	Zampro (dimethomorph + ametoctradin)	14 fl oz	42 fl oz	0	0.5	Do not exceed 2 sequential applications.
	43	Presidio (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.
	49 + 4	Orondis Gold (oxathiapiprolin + mefenoxam)	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 plant-back restrictions.
	49 + 40	Orondis Ultra (oxathiapiprolin + mandipropamid)	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.
Powdery mildew	7	Fontelis (penthioopyrad)	24 fl oz	72 fl oz	3	0.5	Do not make more than 2 sequential applications.
	9 + 12	Switch 62.5WDG (fludioxonil)	14 oz	56 oz	7	0.5	See label for details.
	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.
Pythium seedling blight	4	Acquire Allegiance FL (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 (metalaxyl)	8 pt			2	Apply as a broadcast soil application and incorporate into top 2 inches. See label for directions.
	4	Sebring 2.65ST (metalaxyl)	0.75 fl oz/100 lb of seed			1	Seed treatment only.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ²
			Appl.	Season	Harvest	Reentry	
Pythium seedling diseases	4	Ridomil Gold GR (mefenoxam)	40 lb			2	
	4	Ridomil Gold SL (mefenoxam)	2 pt			2	Apply at seeding in a 7"–12" band on soil over seed furrow.
	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 (mefenoxam + azoxystrobin)	0.34 fl oz/1000 ft row			0	Make only 1 application per season at planting.
Stemphylium leaf spot	7 + 12	Miravis Prime (pydiflumetofen + fludioxonil)	13.4 fl oz	36.5 fl oz	14	0.5	No more than 2 sequential applications without moving to dissimilar mode of action.
	11	(azoxystrobin) Various brands available: Equation SC, Quadris, Satori, Willowood Azoxy (copper compounds) Many brands available: Badge SC, Badge X2, Basic Copper 53, Champ DP, Champ Formula 2, Champ WG, Champ WP, COC DF, C-O-C-S WDG, 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 3L, NuCop 50WP, NuCop DF, NuCop HB, Top Cop w/Sulfur	15.5 fl oz	2.88 qt	0	4 hr	Alternate with fungicides of dissimilar modes of action.
Various leaf spots	M1	(sulfur) Many brands available: Microfine Sulfur, Micro Sulf, Microthiol Disperss, Sulfur 90W, Yellow Jacket Wettable Sulfur	SEE INDIVIDUAL LABELS				Varies by product from 4 hr to 2 days
	M2		SEE INDIVIDUAL LABELS		1	1	Do not apply during periods of warm weather. Do not apply within 2 weeks of an oil spray.
	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 (penthiopyrad)	24 fl oz	72 fl oz	3	0.5	Do not make more than 2 sequential applications.
	7 + 11	Merivon (pyraclostrobin + fluxapyroxad)	11 fl oz	33 fl oz	1	0.5	Apply only in water with no adjuvants or tank mixtures. Alternate with dissimilar modes of action.
	7 + 12	Miravis Prime (pydiflumetofen + fludioxonil)	13.4 fl oz	36.5 fl oz	14	0.5	No more than 2 sequential applications without moving to dissimilar mode of action.
	9 + 12	Swthch 62.5WDG (cyprodinil + fludioxonil)	14 oz	56 oz	0	0.5	Alternate with fungicide with dissimilar modes of action after 2 applications.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ²
			Appl.	Season	Harvest	Reentry	
	11	(azoxystrobin) Various brands available: 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 of dissimilar modes of action.
	11	Quadris (azoxystrobin)	6 fl oz	15.5 fl oz	0	4 hr	Alternate with fungicides of dissimilar modes of action.
	11	Reason (fenamidone)	8.2 oz	24.6 fl oz	2	0.5	Alternate with fungicides of dissimilar modes of action.
	12	Cannonball (fludioxonil)	7 fl oz		7	0.5	Make no more than 2 sequential applications before rotating with dissimilar modes of action.
Various seedling diseases	12	Maxim 4FS (fludioxonil)	0.16 fl oz/100 lb of seed			0.5	Seed treatment only.
	21	Actigard 50WG (acibenzolar)	0.75 oz	2.25 oz	7	0.5	Do not apply to young seedlings.
White rust	M1	(copper compounds) Many brands available: Badge SC, Badge X2, Basic Copper 53, Champ DP, Champ Formula 2, Champion++, Champ WG, Champ WP, COC DF, C-O-C-S WDG, 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 3L, NuCop 50WP, NuCop DF, NuCop HB, 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 (pyraclostrobin + fluxapyroxad)	11 fl oz	33 fl oz	1	0.5	Apply only in water with no adjuvants or tank mixtures. Alternate with dissimilar modes of action.
	11	(azoxystrobin) Various brands available: Satori, Willowood Azoxy	15.5 fl oz	2.88 qt	0	4 hr	Alternate with fungicides of dissimilar modes of action.
	11	Quadris (azoxystrobin)	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.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ²
			Appl.	Season	Harvest	Reentry	
	21	Ranman (cyazofamid)	2.75 fl oz	13.75 fl oz	0	0.5	Do not make more than 3 sequential applications.
	33	Aliette 80WDG Legion 80WDG Linebacker 80WDG (fosetyl-Al)	5 lb	35 lb	3	0.5	Caution should be used when applying in a management program including copper fungicides or adjuvants.
	P	Actigard 50WG (acibenzolar)	0.75 oz	2.25 oz	7	0.5	See label for specific conditions.

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 the 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 2022; <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 UF/IFAS Extension nor discrimination against similar products or services not mentioned.

Table 13. Nonfumigant nematicides for leafy vegetables in Florida. Contact: Johan Desaegeer, UF/IFAS Gulf Coast Research and Education Center.

Product	Application Directions
Nimitz (a.i. fluensulfone)	All applications must be incorporated either physically or via drip or overhead irrigation. Make preplant applications at a rate of 3.5 to 7 pints, (56.0 to 80.0 fl oz) per acre, a minimum of seven days before planting. Do not plant any unlisted crops into treated land for 365 days after application of the product. Do not apply more than one application per crop and no more than 112 fl oz of product per acre per year (365 days). Provides control only for nematodes. Growers applying Nimitz must consult the product label to observe the plant-back (recropping) intervals for a variety of leafy vegetables and brassica crops, onions, bananas, sugarcane, and other crops.

Table 14. Fumigant nematicides for leafy vegetables in Florida. Contact: Johan Desaegeer, UF/IFAS Gulf Coast Research and Education Center.

Nematicide	Broadcast Application ¹		In-the-Row Applications
	Gallons or lb 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 (GAPs), product and applicator training certification, and other uses and rate 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.