

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 dates for lettuce, endive, and escarole.

Planting Region	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

Table 2. Planting information for lettuce, endive, and escarole.

Planting Parameters	Measurements				
	Crisphead	Butterhead	Romaine	Endive	Escarole
Distance between rows (in)	18–30	18–30	18–30	18–30	18–30
Distance between plants (in)	8–12	9	12	14–16	14–16
Seeding depth (in)	0.25	0.25	0.25	0.25	0.25
Seed per acre (lb)	1–3	1–3	2–4	3–4	3–4
Days to maturity from seed	70–95	60–80	60–80	60–80	60–80
Plant populations (acre)	43,560	38,720	29,040	24,891	24,891

Cultivars

Table 3. Lettuce, endive, and escarole cultivars.

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

Table 4. 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 5. Planting dates for spinach.

Planting Region	Dates
North and central Florida	Sept–Mar
South Florida	Oct–Feb

Table 6. Planting information for spinach.

Parameter	Measurements
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

Cultivars

Table 7. Spinach cultivars.

Spinach	Cultivars
Smooth Leaf	A+C #30 (H) Space (H)
Semi-savoy Leaf	Ashley (H) Chinook II (H) Gladiator (H) Melody (H) Seaside Skookum (H) Tyee (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 8. Herbicides approved for managing weeds in lettuce. **Labels change frequently. Be sure to read a current product label before applying any chemical.**
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
PREEMERGENCE	Benefin 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 2–3 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) 2EC 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. No more than 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. No more than 2 applications per crop. No more than 4 oz/A 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. No 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 1–2 in. following applications. Observe rotational restrictions to other crops. Not recommended for soils with high organic matter. PHI 55 days.
	Pyraflufen ethyl 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 incorporated to mineral soils only.

	Active Ingredient lb a.i./Acre	Trade Name Product/Acre	MOA Code	Crops	Weeds Controlled/Remarks
POSTEMERGENCE	Carfentrazone up to 0.031	(Aim) 2 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 0.07–0.12	(Arrow) 2 EC 6–8 fl oz (Select Max) 1 EC 9–16 fl oz	1	Leafy vegetables	Emerged annual and perennial grass weeds. Reapplications at least 14 days apart. PHI 14 days.
	Imazethapyr 0.016–0.031	(Pursuit) 2 EC 1–2 fl oz	2	Lettuce, endive, escarole	Broadleaf weeds. Apply in fields with 40% organic matter or greater. Apply postemergence after 3–4 true leaf stage. No more than 2 applications per crop. No more than 4 oz/A 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; not all formulations are labeled for this use pattern. Include a NIS at 0.25% v/v. PHI 24 hr. 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. No more than 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 9. Herbicides approved for managing weeds in spinach. **Labels change frequently. Be sure to read a current product label before applying any chemical.**
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
REPLANT/ PREEMERGENCE	Carfentrazone up to 0.031	(Aim) 2 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. No more than 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 ethyl 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 EC up to 2 fl oz	14	Emerged broadleaf weeds. Apply as a 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) 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. No more than 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. No more than 3.0 pt/A per season. Include a crop oil concentrate. Unsatisfactory results may occur if applied to grasses under stress. PHI 15 days.

Table 10. Insecticides labeled for management of arthropod pests of lettuce and other leafy vegetables (non-brassica, including escarole and endive). **Labels change frequently. Be sure to read a current product label before applying any chemical. Please refer to chapter 19 for information on biopesticides, including materials labeled for certified organic production.** Contact: Julien Beuzelin, UF/IFAS Everglades Research and Education Center.

Pest	MOA Code ¹	Trade Name (Active Ingredient)	Max Rate/Acre		REI (Hours)	Days to Harvest	Remarks ³
			Appl.	Season ²			
Aphids	1A	*Lannate LV *Lannate SP (methomyl)	LV: 1.5–3 pt SP: 0.5–1.0 lb	Head varieties: 24 pt (LV) or 8 lb (SP) Leaf varieties and endive (escarole), dandelions, Swiss chard: 12 pt (LV) or 4 lb (SP)	48	10, or 7 for lowest rates for lettuce only	–
	1B	*Diazinon AG500 *Diazinon 50W (diazinon)	AG500: 0.5–1 pt 50W: 0.5–1 lb	–	72	14	No more than 1 application. Head and leaf lettuce only.
	1B	Dimethoate 4 EC (dimethoate)	0.5 pt	1.5 pt per year	48	14	Leaf lettuce only; not for head lettuce. Also for endive (escarole) and Swiss chard.
	1B	Malathion 5EC Malathion 8F (malathion)	Endive: 1.5–2.0 pt (5EC) or 1.25 pt (8F) Lettuce: 2–3 pt (5EC) Head and leaf lettuce: 1.88 pt (8F)	–	24	Endive: 7 Head and leaf lettuce: 14	No more than 2 applications per year.
	1B	Orthene 97 (acephate)	0.5–1.0 lb	2.125 lb	24	21	Crisphead head lettuce only. Other brands available with same active ingredient.
	3A	*Brigade 2EC (bifenthrin)	2.1–6.4 fl oz	32 fl oz	12	7	Head lettuce only. Other brands available with same active ingredient.
	3A	*Fastac CS (alpha-cypermethrin)	3.2–3.8 fl oz	11.4 fl oz	12	1	–
	3A	*Mustang Maxx (zeta-cypermethrin)	2.24–4.0 fl oz	24 fl oz	12	1	–
	3A	*Pounce 25 WP (permethrin)	6.4–12.8 oz	51.2 oz per year	12	1	–
	3A	*Warrior II (lambda-cyhalothrin)	1.28–1.92 fl oz	19.2 fl oz	24	1	Head and leaf lettuce only. Other brands available with same active ingredient.
	4A	Actara (thiamethoxam)	1.5–3.0 oz	11 oz	12	7	–

Pest	MOA Code ¹	Trade Name (Active Ingredient)	Max Rate/Acre		REI (Hours)	Days to Harvest	Remarks ³
			Appl.	Season ²			
	4A	Admire Pro (imidacloprid)	Foliar: 1.3 fl oz Soil: 4.4–10.5 fl oz	Foliar: 6.5 fl oz Soil: 10.5 fl oz	12	Foliar: 7 Soil: 21	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	30SG : 20.0 oz per year 70WP : 8.5 oz per year	12	7	Other brands available with same active ingredient.
	4A	Belay (clothianidin)	Foliar: 3–4 fl oz Soil: 9–12 fl oz	12 fl oz per year	12	Foliar: 7 Soil: 21	–
	4A	Belay 50 WDG (clothianidin)	Foliar: 1.6–2.1 oz Soil: 4.8–6.4 oz	6.4 oz	12	7	–
	4A	Platinum 75 SG (thiamethoxam)	1.66–3.67 oz	3.67 oz	12	30	–
	4A	Scorpion 35 SL (dinotefuran)	Foliar: 2–5.25 fl oz Soil: 9–10.5 fl oz	Foliar: 10.5 fl oz Soil: 21 fl oz	12	Foliar: 7 Soil: 21	–
	4A + 28	Durivo (thiamethoxam + chlorantraniliprole)	10–13 fl oz	13 fl oz	12	30	Soil application.
	4A + 28	Voliam Flexi (thiamethoxam + chlorantraniliprole)	4.0–7.0 oz	14 oz	12	7	–
	4D	Sivanto Prime (flupyradifurone)	7.0–14.0 fl oz	28 fl oz	4	1	–
	6 + 28	*Minecto Pro (abamectin + cyantraniliprole)	10 fl oz	20 fl oz per year	12	7	–
	9B	Fulfill (pymetrozine)	2.75 oz	5.5 oz	12	7	–
	9B	PQZ (pyrifluquinazon)	2.4–3.2 fl oz	4.8 fl oz	12	1	–
	9D	Versys (afidopyrophen)	1.5 fl oz	14 fl oz	12	0	–
	21A	Torac (tolfenpyrad)	17–21 fl oz	42 fl oz	12	1	Do not apply until at least 14 days after emergence.
	23	Movento (spirotetramat)	4.0–5.0 fl oz	10 fl oz	24	3	–
	28	Exirel (cyantraniliprole)	13.5–20.5 fl oz	0.4 lb a.i. per year	12	1	

Pest	MOA Code ¹	Trade Name (Active Ingredient)	Max Rate/Acre		REI (Hours)	Days to Harvest	Remarks ³
			Appl.	Season ²			
	28	Harvanta 50SL (cyclaniliprole)	10.9–16.4 fl oz	49.2 fl oz per year	4	1	–
	28	Verimark (cyantraniliprole)	6.75–13.5 fl oz	13.5 fl oz at planting or 0.4 lb a.i. per year	4	at planting	–
	29	Beleaf 50 SG (flonicamid)	2.0–2.8 oz	8.4 oz	12	0	–
Beetles (includes cucumber beetles, flea beetles) and weevils	1A	Sevin 4F Sevin XLR Plus (carbaryl)	0.5–1.0 qt	6 qt per year	12	14	–
	3A	*Baythroid XL (beta-cyfluthrin)	0.8–3.2 fl oz	12.8 fl oz	12	0	–
	3A	*Brigade 2EC (bifenthrin)	2.1–6.4 fl oz	32 fl oz	12	7	Head lettuce only. Other brands available with same active ingredient.
	3A	*Fastac CS (alpha-cypermethrin)	2.2–3.8 fl oz	11.4 fl oz	12	1	–
	3A	*Mustang Maxx (zeta-cypermethrin)	2.24–4.0 fl oz	24 fl oz	12	1	–
	3A	*Warrior II (lambda-cyhalothrin)	1.28–1.92 fl oz	19.2 fl oz	24	1	Head and leaf lettuce only. Other brands available with same active ingredient.
	3A + 28	*Besiege (lambda-cyhalothrin + chlorantraniliprole)	6–9 fl oz	31 fl oz per year	24	1	Head and leaf lettuce only.
	4A	Actara (thiamethoxam)	1.5–3.0 oz	11 oz	12	7	Flea beetles only.
	4A	Admire Pro (imidacloprid)	1.3 fl oz	6.5 fl oz per year	12	7	Flea beetles only. Other brands available with same active ingredient.
	4A	Belay (clothianidin)	Foliar: 3–4 fl oz Soil: 9–12 fl oz	12 fl oz per year	12	Foliar: 7 Soil: 21	Flea beetles only.
	4A	Belay 50 WDG (clothianidin)	Foliar: 1.6–2.1 oz Soil: 4.8–6.4 oz	6.4 oz	12	7	Flea beetles only.
	4A	Platinum 75 SG (thiamethoxam)	1.66–3.67 oz	3.67 oz	12	30	Flea beetles only.
	4A	Scorpion 35 SL (dinotefuran)	Foliar: 2–5.25 fl oz Soil: 9–10.5 fl oz	Foliar: 10.5 fl oz Soil: 21 fl oz	12	Foliar: 7 Soil: 21	–
	4A	Venom (dinotefuran)	Foliar: 1.0–3.0 oz Soil: 5.0–6.0 oz	Foliar: 6 oz Soil: 12 oz	12	Foliar: 7 Soil: 21	–

Pest	MOA Code ¹	Trade Name (Active Ingredient)	Max Rate/Acre		REI (Hours)	Days to Harvest	Remarks ³
			Appl.	Season ²			
	4A + 28	Durivo (thiamethoxam + chlorantraniliprole)	10–13 fl oz	13 fl oz	12	30	Soil application.
	4A + 28	Voliam Flexi (thiamethoxam + chlorantraniliprole)	4.0–7.0 oz	14 oz	12	7	–
	21A	Torac (tolfenpyrad)	17–21 fl oz	42 fl oz	12	1	Do not apply until at least 14 days after emergence. Flea beetles only.
	30	Incipio (isocycloseram)	2.1–4.1 fl oz	8.2 fl oz per year	12	1	Flea beetles only. No more than 2 applications per year.
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	Head varieties: 24 pt (LV) or 8 lb (SP) Leaf varieties and endive (escarole), dandelions, Swiss chard: 12 pt (LV) or 4 lb (SP)	48	10, or 7 for lowest rates for lettuce only	–
	1A	Sevin 4F Sevin XLR Plus (carbaryl)	1–2 qt	6 qt per year	12	14	–
	1B	*Diazinon AG500 *Diazinon 50W (diazinon)	Lettuce: 2 qt (AG500) or 4 lb (50W) Endive (escarole): 1 qt (AG500) or 1–2 lb (50W)	Lettuce: 4 qt per year (AG500) or 8 lb per year (50 W) Endive (escarole): 1 qt per year (AG500) or 2 lb per year (50W)	Lettuce: 72 Endive (escarole): 96	Preplant	Head and leaf lettuce, endive (escarole) only.
	1B	Orthene 97 (acephate)	1.0 lb	2.125 lb	24	21	Crisphead head lettuce only. Other brands available with same active ingredient.
	3A	*Asana XL (esfenvalerate)	4.8–9.6 fl oz	67.2 fl oz	12	7	Head lettuce only.
	3A	*Baythroid XL (beta-cyfluthrin)	0.8–3.2 fl oz	12.8 fl oz	12	0	–
	3A	*Brigade 2 EC (bifenthrin)	2.1–6.4 fl oz	32 fl oz	12	7	Head lettuce only. Other brands available with same active ingredient.
	3A	*Fastac CS (alpha-cypermethrin)	2.2–3.8 fl oz	11.4 fl oz	12	1	–

Pest	MOA Code ¹	Trade Name (Active Ingredient)	Max Rate/Acre		REI (Hours)	Days to Harvest	Remarks ³
			Appl.	Season ²			
	3A	*Mustang Maxx (zeta-cypermethrin)	2.24–4.0 fl oz	24 fl oz	12	1	–
	3A	*Pounce 25 WP (permethrin)	3.2–12.8 oz	51.2 oz per year	12	1	–
	3A	*Warrior II (lambda-cyhalothrin)	0.96–1.92 fl oz	19.2 fl oz	24	1	Head and leaf lettuce only.
	3A + 28	*Besiege (lambda-cyhalothrin + chlorantraniliprole)	5–9 fl oz	31 fl oz per year	24	1	Head and leaf lettuce only.
	4A + 28	Durivo (thiamethoxam + chlorantraniliprole)	10–13 fl oz	13 fl oz	12	30	Soil application.
	4A + 28	Voliam Flexi (thiamethoxam + chlorantraniliprole)	4.0–7.0 oz	14 oz	12	7	–
	5	Radiant SC (spinetoram)	5–10 fl oz	34 fl oz per year	4	1 Turnip greens and other leaves of root, tuber, legume vegetables: 3	–
	6	*Proclaim (emamectin benzoate)	2.4–4.8 oz	14.4 oz per year	12	7	–
	6 + 28	*Minecto Pro (abamectin + cyantraniliprole)	5.5–10.0 fl oz	20 fl oz per year	12	7	–
	18	Confirm 2F (tebufenozide)	6–8 fl oz	40 fl oz	4	7	–
	18	Intrepid 2F (methoxyfenozide)	4–10 fl oz	64 fl oz	4	1	–
	22	Avaunt Avaunt eVo (indoxacarb)	2.5–6.0 oz	Avaunt: 24 oz Avaunt eVo: 18 oz	12	3	–
	28	Coragen (chlorantraniliprole)	3.5–7.5 fl oz	15.4 fl oz	4	1	–
	28	Exirel (cyantraniliprole)	7–20.5 fl oz	0.4 lb a.i. per year	12	1	–

Pest	MOA Code ¹	Trade Name (Active Ingredient)	Max Rate/Acre		REI (Hours)	Days to Harvest	Remarks ³
			Appl.	Season ²			
	28	Harvanta 50SL (cyclaniliprole)	10.9–16.4 fl oz	49.2 fl oz per year	4	1	–
	28	Verimark (cyantraniliprole)	5.0–13.5 fl oz	13.5 fl oz at planting or 0.4 lb a.i. per year	4	At planting	–
	30	Incipio (isocycloseram)	2.1–4.1 fl oz	8.2 fl oz per year	12	1	No more than 2 applications.
	32	Spear-Lep (GS-omega/kappa-Hctx-Hv1a)	1–2 pt	10 gal per year	4	0	Must be tank-mixed with a <i>Bacillus thurigiensis</i> (Bt) product.
Grasshoppers, mole crickets	1B	*Diazinon AG500 *Diazinon 50W (diazinon)	AG500: 1 qt (lettuce, endive or escarole) 50W: 2 lb (lettuce, endive or escarole)	Lettuce: 4 qt per year (AG500) or 8 lb per year (50W) Endive (escarole): 1 qt per year (AG500) or 2 lb per year (50W)	AG500: 72 (lettuce) 50W: 96 (endive or escarole)	Preplant	Head and leaf lettuce, endive (escarole) only.
	3A	*Baythroid XL (beta-cyfluthrin)	0.8–3.2 fl oz	12.8 fl oz	12	0	–
	3A	*Fastac CS (alpha-cypermethrin)	3.2–3.8 fl oz	11.4 fl oz	12	1	–
	3A	*Warrior II (lambda-cyhalothrin)	0.96–1.92 fl oz	19.2 fl oz	24	1	Head and leaf lettuce only. Other brands available with same active ingredient.
	4A	Scorpion 35 SL (dinotefuran)	Foliar: 2–5.25 fl oz Soil: 9–10.5 fl oz	Foliar: 10.5 fl oz Soil: 21 fl oz	12	Foliar: 7 Soil: 21	–
	4A	Venom (dinotefuran)	Foliar: 1.0–3.0 oz Soil: 5.0–6.0 oz	Foliar: 6 oz Soil: 12 oz	12	Foliar: 7 Soil: 21	–
Leafhoppers	1A	*Lannate LV *Lannate SP (methomyl)	LV: 1.5–3 pt SP: 0.5–1.0 lb	Head varieties: 24 pt (LV) or 8 lb (SP) Leaf varieties and endive (escarole), dandelions, Swiss chard: 12 pt (LV) or 4 lb (SP)	48	10, or 7 for lowest rates for lettuce only	–
	1A	Sevin 4F Sevin XLR Plus (carbaryl)	0.5–1.0 qt	6 qt per year	12	14	–

Pest	MOA Code ¹	Trade Name (Active Ingredient)	Max Rate/Acre		REI (Hours)	Days to Harvest	Remarks ³
			Appl.	Season ²			
	1B	Dimethoate 4 EC (dimethoate)	0.5 pt	1.5 pt per year	48	14	Leaf lettuce only, not for head lettuce. Also for endive (escarole) and Swiss chard.
	1B	Malathion 5EC Malathion 8F (malathion)	Endive: 1.25 pt (8F) Lettuce: 2–3 pt (5EC) Head and leaf lettuce: 1.88 pt (8F)	–	24	Head and leaf lettuce: 14	No more than 2 applications per year.
	1B	Orthene 97 (acephate)	0.5–1.0 lb	2.125 lb	24	21	Crisphead head lettuce only. Other brands available with same active ingredient.
	3A	*Baythroid XL (beta-cyfluthrin)	0.8–3.2 fl oz	12.8 fl oz	12	0	–
	3A	*Brigade 2EC (bifenthrin)	2.1–6.4 fl oz	32 fl oz	12	7	Head lettuce only. Other brands available with same active ingredient.
	3A	*Fastac CS (alpha-cypermethrin)	2.2–3.8 fl oz	11.4 fl oz	12	1	–
	3A	*Mustang Maxx (zeta-cypermethrin)	2.24–4.0 fl oz	24 fl oz	12	1	–
	3A	*Warrior II (lambda-cyhalothrin)	0.96–1.92 fl oz	19.2 fl oz	24	1	Head and leaf lettuce only. Other brands available with same active ingredient.
	4A	Actara (thiamethoxam)	1.5–3.0 oz	11 oz	12	7	–
	4A	Admire Pro (imidacloprid)	Foliar: 1.3 fl oz Soil: 4.4–10.5 fl oz	Foliar: 6.5 fl oz Soil: 10.5 fl oz per year	12	Foliar: 7 Soil: 21	Other brands available with same active ingredient.
	4A	Belay (clothianidin)	Foliar: 3–4 fl oz Soil: 9–12 fl oz	12 fl oz per year	12	Foliar: 7 Soil: 21	–
	4A	Belay 50 WDG (clothianidin)	Foliar: 1.6–2.1 oz Soil: 4.8–6.4 oz	6.4 oz	12	7	–
	4A	Platinum 75 SG (thiamethoxam)	1.66–3.67 oz	3.67 oz	12	30	–
	4A	Scorpion 35 SL (dinotefuran)	Foliar: 2–5.25 fl oz Soil: 9–10.5 fl oz	Foliar: 10.5 fl oz Soil: 21 fl oz	12	Foliar: 7 Soil: 21	–
	4A	Venom (dinotefuran)	Foliar: 1.0–3.0 oz Soil: 5.0–6.0 oz	Foliar: 6 oz Soil: 12 oz	12	Foliar: 7 Soil: 21	–

Pest	MOA Code ¹	Trade Name (Active Ingredient)	Max Rate/Acre		REI (Hours)	Days to Harvest	Remarks ³
			Appl.	Season ²			
	4A + 28	Durivo (thiamethoxam + chlorantraniliprole)	10–13 fl oz	13 fl oz	12	30	Soil application.
	4D	Sivanto Prime (flupyradifurone)	7.0–14.0 fl oz	28 fl oz	4	1	–
	16	Courier 40SC (buprofezin)	9.0–13.6 fl oz	27.2 fl oz	12	7	–
	21A	Torac (tolfenpyrad)	14–21 fl oz	42 fl oz	12	1	Do not apply until at least 14 days after emergence.
	30	Incipio (isocycloseram)	2.1–4.1 fl oz	8.2 fl oz per year	12	1	No more than 2 applications.
Leafminers	1B	*Diazinon AG500 *Diazinon 50W (diazinon)	AG500: 0.5–1 pt 50W: 0.5–1 lb	–	72	14	No more than 1 application. Head and leaf lettuce only.
	1B	Dimethoate 4 EC (dimethoate)	0.5 pt	1.5 pt per year	48	14	Leaf lettuce only, not for head lettuce. Also for endive (escarole) and Swiss chard.
	5	Radiant SC (spinetoram)	5–10 fl oz	34 fl oz per year	4	1 Turnip greens and other leaves of root, tuber, legume vegetables: 3	–
	6	*Agri-Mek SC (abamectin)	1.75–3.50 fl oz	10.25 fl oz per year	12	7	Must be mixed with a nonionic activator-type wetting, spreading, or penetrating adjuvant. Do not use binder or sticker adjuvant. Other brands available with same active ingredient.
	6	*Proclaim (emamectin benzoate)	2.4–4.8 oz	14.4 oz per year	12	7	–
	6 + 28	*Minecto Pro (abamectin + cyantraniliprole)	5.5–10.0 fl oz	20 fl oz per year	12	7	–
	17	Trigard (cyromazine)	2.66 oz	–	12	7	No more than 6 applications for head lettuce and 5 applications for other leafy vegetables.

Pest	MOA Code ¹	Trade Name (Active Ingredient)	Max Rate/Acre		REI (Hours)	Days to Harvest	Remarks ³
			Appl.	Season ²			
	28	Coragen (chlorantraniliprole)	5.0–7.5 fl oz	15.4 fl oz	4	1	–
	28	Exirel (cyantraniliprole)	13.5–20.5 fl oz	0.4 lb a.i. per year	12	1	–
	28	Harvanta 50SL (cyclaniliprole)	10.9–16.4 fl oz	49.2 fl oz per year	4	1	–
	28	Verimark (cyantraniliprole)	6.75–13.5 fl oz	13.5 fl oz at planting or 0.4 lb a.i. per year	4	At planting	
	30	Incipio (isocycloseram)	2.1–4.1 fl oz	8.2 fl oz per year	12	1	No more than 2 applications.
Mites (includes carmine spider mite, two-spotted spider mite)	1B	Malathion 5EC Malathion 8F (malathion)	Endive: 1.5–2.0 pt (5EC) or 1.25 pt (8F) Lettuce: 2–3 pt (5EC) Head and leaf lettuce: 1.88 pt (8F)	–	24	Endive: 7 Head and leaf lettuce: 14	No more than 2 applications per year.
	3A	*Brigade 2EC (bifenthrin)	5.1–6.4 fl oz	32 fl oz	12	7	Head lettuce only. Other brands available with same active ingredient.
	3A	*Warrior II (lambda-cyhalothrin)	0.96–1.92 fl oz	19.2 fl oz	24	1	Head and leaf lettuce only. Other brands available with same active ingredient.
	6	*Agri-Mek SC (abamectin)	1.75–3.50 fl oz	10.25 fl oz per year	12	7	Must be mixed with a nonionic activator-type wetting, spreading, or penetrating adjuvant. Do not use binder or sticker adjuvant. Other brands available with same active ingredient.
	6 + 28	*Minecto Pro (abamectin + cyantraniliprole)	5.5–10.0 fl oz	20 fl oz per year	12	7	–
	30	Incipio (isocycloseram)	2.1–4.1 fl oz	8.2 fl oz per year	12	1	No more than 2 applications.
Stink bugs, plant bugs, meadow spittlebug	3A	*Brigade 2 EC (bifenthrin)	2.1–6.4 fl oz	32 fl oz	12	7	Head lettuce only. Other brands available with same active ingredient.
	3A	*Fastac CS (alpha-cypermethrin)	2.2–3.8 fl oz	11.4 fl oz	12	1	–
	3A	*Mustang Maxx (zeta-cypermethrin)	2.24–4.0 fl oz	24 fl oz	12	1	–

Pest	MOA Code ¹	Trade Name (Active Ingredient)	Max Rate/Acre		REI (Hours)	Days to Harvest	Remarks ³
			Appl.	Season ²			
	3A	*Warrior II (lambda-cyhalothrin)	0.96–1.92 fl oz	19.2 fl oz	24	1	Head and leaf lettuce only. Other brands available with same active ingredient.
	3A + 28	*Besiege (lambda-cyhalothrin + chlorantraniliprole)	6–9 fl oz	31 fl oz per year	24	1	–
	4A	Scorpion 35 SL (dinotefuran)	Foliar: 2–5.25 fl oz Soil: 9–10.5 fl oz	Foliar: 10.5 fl oz Soil: 21 fl oz	12	Foliar: 7 Soil: 21	–
	4A	Venom (dinotefuran)	Foliar: 1.0–3.0 oz Soil: 5.0–6.0 oz	Foliar: 6 oz Soil: 12 oz	12	Foliar: 7 Soil: 21	–
Thrips (check labels for species control)	1A	*Lannate LV *Lannate SP (methomyl)	LV: 1.5–3 pt SP: 0.5–1.0 lb	Head varieties: 24 pt (LV) or 8 lb (SP) Leaf varieties and endive (escarole), dandelions, Swiss chard: 12 pt (LV) or 4 lb (SP)	48	10, or 7 for lowest rates for lettuce only	–
	5	Radiant SC (spinetoram)	5–10 fl oz	34 fl oz per year	4	1 Turnip greens and other leaves of root, tuber, legume vegetables: 3	–
	21A	Torac (tolfenpyrad)	21 fl oz	42 fl oz	12	1	Do not apply until at least 14 days after emergence.
	28	Exirel (cyantraniliprole)	13.5–20.5 fl oz	0.4 lb a.i. per year	12	1	–
	30	Incipio (isocycloseram)	3.1–4.1 fl oz	8.2 fl oz per year	12	1	No more than 2 applications.

¹ Mode of Action (MOA) codes for plant pest insecticides from the Insecticide Resistance Action Committee (IRAC) Mode of Action Classification v. 11.1 January 2024. Number codes 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.

² Always double-check labels regarding maximum application limits. Many labels are changing from a maximum rate per season (or crop cycle) to a maximum rate per year.

³ 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

*Restricted use insecticide.

Table 11. Insecticides labeled for management of arthropod pests of spinach. **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.** Contact: Julien Beuzelin, UF/IFAS Everglades Research and Education Center.

Pest	MOA Code ¹	Trade Name (Active Ingredient)	Max Rate/Acre		REI (Hours)	Days to Harvest	Remarks ³
			Appl.	Season ²			
Aphids	1B	Malathion 5EC Malathion 8F (malathion)	5EC: 1.6 pt 8F: 1.0 pt	–	12	7	No more than 2 applications per year.
	3A	*Fastac CS (alpha-cypermethrin)	3.2–3.8 fl oz	11.4 fl oz	12	1	–
	3A	*Mustang Maxx (zeta-cypermethrin)	2.24–4.0 fl oz	24 fl oz	12	1	–
	3A	*Pounce 25 WP (permethrin)	6.4–12.8 oz	38.4 oz per year	12	1	–
	4A	Actara (thiamethoxam)	1.5–3.0 oz	11 oz	12	7	–
	4A	Admire Pro (imidacloprid)	Foliar: 1.3 fl oz Soil: 4.4–10.5 fl oz	Foliar: 6.5 fl oz Soil: 10.5 fl oz per year	12	Foliar: 7 Soil: 21	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	30SG: 20.0 oz per year 70WP: 8.5 oz per year	12	7	Other brands available with same active ingredient.
	4A	Belay (clothianidin)	Foliar: 3–4 fl oz Soil: 9–12 fl oz	12 fl oz per year	12	Foliar: 7 Soil: 21	–
	4A	Belay 50 WDG (clothianidin)	Foliar: 1.6–2.1 oz Soil: 4.8–6.4 oz	6.4 oz	12	7	–
	4A	Platinum 75 SG (thiamethoxam)	1.66–3.67 oz	3.67 oz	12	30	–
	4A	Scorpion 35 SL (dinotefuran)	Foliar: 2–5.25 fl oz Soil: 9–10.5 fl oz	Foliar: 10.5 fl oz Soil: 21 fl oz	12	Foliar: 7 Soil: 21	–
	4A	Venom (dinotefuran)	Foliar: 1.0–3.0 oz Soil: 5.0–6.0 oz	Foliar: 6 oz Soil: 12 oz	12	Foliar: 7 Soil: 21	–
	4A + 28	Durivo (thiamethoxam + chlorantraniliprole)	10–13 fl oz	13 fl oz	12	30	Soil application.
	4A + 28	Voliam Flexi (thiamethoxam + chlorantraniliprole)	4.0–7.0 oz	14 oz	12	7	–

Pest	MOA Code ¹	Trade Name (Active Ingredient)	Max Rate/Acre		REI (Hours)	Days to Harvest	Remarks ³
			Appl.	Season ²			
	4D	Sivanto Prime (flupyradifurone)	7.0–14.0 fl oz	28 fl oz per year	4	1	–
	9B	Fulfill (pymetrozine)	2.75 oz	5.5 oz	12	7	–
	9B	PQZ (pyrifluquinazon)	2.4–3.2 fl oz	4.8 fl oz	12	1	–
	9D	Versys (afidopyropen)	1.5 fl oz	14 fl oz	12	0	–
	23	Movento (spirotetramat)	4.0–5.0 fl oz	10 fl oz	24	3	–
	28	Exirel (cyantraniliprole)	13.5–20.5 fl oz	0.4 lb a.i. per year	12	1	–
	28	Harvanta 50SL (cyclaniliprole)	10.9–16.4 fl oz	49.2 fl oz per year	4	1	–
	28	Verimark (cyantraniliprole)	6.75–13.5 fl oz	13.5 fl oz at planting or 0.4 lb a.i. per year	4	At planting	–
	29	Beleaf 50 SG (flonicamid)	2.0–2.8 oz	8.4 oz	12	0	–
Beetles (includes cucumber beetle, flea beetles, darkling beetles) and weevils	1A	Sevin 4F Sevin XLR Plus (carbaryl)	0.5–1.0 qt	6 qt per year	12	14	–
	3A	*Baythroid XL (beta-cyfluthrin)	0.8–3.2 fl oz	12.8 fl oz	12	0	–
	3A	*Brigade 2EC (bifenthrin)	2.1–6.4 fl oz	25.6 fl oz	12	7	Other brands available with same active ingredient.
	3A	*Fastac CS (alpha-cypermethrin)	2.2–3.8 fl oz	11.4 fl oz	12	1	–
	3A	*Mustang Maxx (zeta-cypermethrin)	2.24–4.0 fl oz	24 fl oz	12	1	–
	4A	Actara (thiamethoxam)	1.5–3.0 oz	11 oz	12	7	Flea beetles only.
	4A	Admire Pro (imidacloprid)	1.3 fl oz	6.5 fl oz per year	12	7	Flea beetles only. Other brands available with same active ingredient.
	4A	Belay (clothianidin)	Foliar: 3–4 fl oz Soil: 9–12 fl oz	12 fl oz per year	12	Foliar: 7 Soil: 21	Flea beetles only.
	4A	Belay 50 WDG (clothianidin)	Foliar: 1.6–2.1 oz Soil: 4.8–6.4 oz	6.4 oz	12	7	Flea beetles only.

Pest	MOA Code ¹	Trade Name (Active Ingredient)	Max Rate/Acre		REI (Hours)	Days to Harvest	Remarks ³
			Appl.	Season ²			
	4A	Platinum 75 SG (thiamethoxam)	1.66–3.67 oz	3.67 oz	12	30	–
	4A	Scorpion 35 SL (dinotefuran)	Foliar: 2–5.25 fl oz Soil: 9–10.5 fl oz	Foliar: 10.5 fl oz Soil: 21 fl oz	12	Foliar: 7 Soil: 21	Flea beetles only.
	4A	Venom (dinotefuran)	Foliar: 1.0–3.0 oz Soil: 5.0–6.0 oz	Foliar: 6 oz Soil: 12 oz	12	Foliar: 7 Soil: 21	Flea beetles only.
	4A + 28	Durivo (thiamethoxam + chlorantraniliprole)	10–13 fl oz	13 fl oz	12	30	Soil application.
	4A + 28	Voliam Flexi (thiamethoxam + chlorantraniliprole)	4.0–7.0 oz	14 oz	12	7	–
	30	Incipio (isocycloseram)	2.1–4.1 fl oz	8.2 fl oz per year	12	1	No more than 2 applications.
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	LV: 12 pt SP: 4 lb	48	7	Do not apply to seedlings less than 3 in. diameter.
	1A	Sevin 4F Sevin XLR Plus (carbaryl)	1–2 qt	6 qt per year	12	14	–
	1B	*Diazinon AG500 *Diazinon 50W (diazinon)	AG500: 2.0–4.0 qt 50W: 4.0–8.0 lb	AG500: 4 qt per year 50W: 8 lb per year	72	preplant	–
	3A	*Baythroid XL (beta-cyfluthrin)	0.8–3.2 fl oz	12.8 fl oz	12	0	–
	3A	*Brigade 2EC (bifenthrin)	2.1–6.4 fl oz	25.6 fl oz	12	7	Other brands available with same active ingredient.
	3A	*Fastac CS (alpha-cypermethrin)	2.2–3.8 fl oz	11.4 fl oz	12	1	–
	3A	*Mustang Maxx (zeta-cypermethrin)	2.24–4.0 fl oz	24 fl oz	12	1	–
	3A	*Pounce 25 WP (permethrin)	3.2–12.8 oz	38.4 oz per year	12	1	–
	5	Radiant SC (spinetoram)	5–10 fl oz	34 fl oz per year	4	1	–
	6	*Proclaim (emamectin benzoate)	2.4–4.8 oz	14.4 oz	12	7	–

Pest	MOA Code ¹	Trade Name (Active Ingredient)	Max Rate/Acre		REI (Hours)	Days to Harvest	Remarks ³
			Appl.	Season ²			
	18	Confirm 2F (tebufenozide)	6–8 fl oz	40 fl oz	4	7	–
	18	Intrepid 2F (methoxyfenozide)	4–10 fl oz	64 fl oz per year	4	1	–
	28	Coragen (chlorantraniliprole)	3.5–7.5 fl oz	15.4 fl oz	4	1	–
	28	Exirel (cyantraniliprole)	7–20.5 fl oz	0.4 lb a.i. per year	12	1	Do not use an adjuvant.
	28	Harvanta 50SL (cyclaniliprole)	10.9–16.4 fl oz	49.2 fl oz per year	4	1	–
	28	Verimark (cyantraniliprole)	5.0–13.5 fl oz	13.5 fl oz at planting or 0.4 lb a.i. per year	4	At planting	–
	30	Incipio (isocycloseram)	2.1–4.1 fl oz	8.2 fl oz per year	12	1	No more than 2 applications.
	32	Spear-Lep (GS-omega/kappa-Hxtx-Hv1a)	1–2 pt	10 gal per year	4	0	Must be tank-mixed with a <i>Bacillus thuringiensis</i> (Bt) product.
Grasshoppers, mole crickets	3A	*Baythroid XL (beta-cyfluthrin)	0.8–3.2 fl oz	12.8 fl oz	12	0	–
	3A	*Fastac CS (alpha-cypermethrin)	3.2–3.8 fl oz	11.4 fl oz	12	1	–
	3A	*Mustang Maxx (zeta-cypermethrin)	2.24–4.0 fl oz	24 fl oz	12	1	–
	4A	Scorpion 35 SL (dinotefuran)	Foliar: 2–5.25 fl oz Soil: 9–10.5 fl oz	Foliar: 10.5 fl oz Soil: 21 fl oz	12	Foliar: 7 Soil: 21	–
	4A	Venom (dinotefuran)	Foliar: 1.0–3.0 oz Soil: 5.0–6.0 oz	Foliar: 6 oz Soil: 12 oz	12	Foliar: 7 Soil: 21	–
Leafhopper	1A	Sevin 4F Sevin XLR Plus (carbaryl)	0.5–1.0 qt	6 qt per year	12	14	–
	1B	Malathion 8F (malathion)	1.6 pt	–	12	7	No more than 2 applications per year.
	3A	*Baythroid XL (beta-cyfluthrin)	0.8–3.2 fl oz	12.8 fl oz	12	0	–
	3A	*Fastac CS (alpha-cypermethrin)	3.2–3.8 fl oz	11.4 fl oz	12	1	–
	3A	*Mustang Maxx (zeta-cypermethrin)	2.24–4.0 fl oz	24 fl oz	12	1	–

Pest	MOA Code ¹	Trade Name (Active Ingredient)	Max Rate/Acre		REI (Hours)	Days to Harvest	Remarks ³
			Appl.	Season ²			
	3A	*Pounce 25 W (permethrin)	3.2–12.8 oz	38.4 oz per year	12	1	–
	4A	Actara (thiamethoxam)	1.5–3.0 oz	11 oz	12	7	–
	4A	Admire Pro (imidacloprid)	Foliar: 1.3 fl oz Soil: 4.4–10.5 fl oz	Foliar: 6.5 fl oz Soil: 10.5 fl oz per year	12	Foliar: 7 Soil: 21	Other brands available with same active ingredient.
	4A	Belay (clothianidin)	Foliar: 3–4 fl oz Soil: 9–12 fl oz	12 fl oz per year	12	Foliar: 7 Soil: 21	–
	4A	Belay 50 WDG (clothianidin)	Foliar: 1.6–2.1 oz Soil: 4.8–6.4 oz	6.4 oz	12	7	–
	4A	Platinum 75 SG (thiamethoxam)	1.66–3.67 oz	3.67 oz	12	30	–
	4A	Scorpion 35 SL (dinotefuran)	Foliar: 2–5.25 fl oz Soil: 9–10.5 fl oz	Foliar: 10.5 fl oz Soil: 21 fl oz	12	Foliar: 7 Soil: 21	–
	4A	Venom (dinotefuran)	Foliar: 1.0–3.0 oz Soil: 5.0–6.0 oz	Foliar: 6 oz Soil: 12 oz	12	Foliar: 7 Soil: 21	–
	4A + 28	Durivo (thiamethoxam + chlorantraniliprole)	10–13 fl oz	13 fl oz	12	30	–
	4A + 28	Voliam Flexi (thiamethoxam + chlorantraniliprole)	4.0–7.0 oz	14 oz	12	7	–
	4D	Sivanto Prime (flupyradifurone)	7.0–14.0 fl oz	28 fl oz per year	4	1	–
	16	Courier 40SC (buprofezin)	9.0–13.6 fl oz	27.2 fl oz	12	7	
	30	Incipio (isocycloseram)	2.1–4.1 fl oz	8.2 fl oz per year	12	1	No more than 2 applications.
Leafminers	5	Radiant SC (spinetoram)	5–10 fl oz	34 fl oz	4	1	–
	6	*Agri-Mek SC (abamectin)	1.75–3.50 fl oz	10.25 fl oz per year	12	7	Must be mixed with a nonionic activator-type wetting, spreading, or penetrating adjuvant. Do not use binder or sticker adjuvant. Other brands available with same active ingredient.

Pest	MOA Code ¹	Trade Name (Active Ingredient)	Max Rate/Acre		REI (Hours)	Days to Harvest	Remarks ³
			Appl.	Season ²			
	6	*Proclaim (emamectin benzoate)	2.4–4.8 oz	14.4 oz	12	7	–
	17	Trigard (cyromazine)	2.66 oz	13.3 oz	12	7	–
	28	Coragen (chlorantraniliprole)	3.5–7.5 fl oz	15.4 fl oz	4	1	–
	28	Exirel (cyantraniliprole)	13.5–20.5 fl oz	0.4 lb a.i. per year	12	1	–
	28	Harvanta 50SL (cyclaniliprole)	10.9–16.4 fl oz	49.2 fl oz per year	4	1	–
	28	Verimark (cyantraniliprole)	6.75–13.5 fl oz	13.5 fl oz at planting or 0.4 lb a.i. per year	4	At planting	–
	30	Incipio (isocycloseram)	2.1–4.1 fl oz	8.2 fl oz per year	12	1	No more than 2 applications.
Mites (includes carmine spider mite, two-spotted spider mite)	3A	*Brigade 2EC (bifenthrin)	5.1–6.4 fl oz	25.6 fl oz	12	7	Other brands available with same active ingredient.
	6	*Agri-Mek SC (abamectin)	1.75–3.50 fl oz	10.25 fl oz per year	12	7	Must be mixed with a nonionic activator-type wetting, spreading, or penetrating adjuvant. Do not use binder or sticker adjuvant. Other brands available with same active ingredient.
	30	Incipio (isocycloseram)	2.1–4.1 fl oz	8.2 fl oz per year	12	1	No more than 2 applications.
Stink bugs, plant bugs, meadow spittlebug	1A	Sevin 4F Sevin XLR Plus (carbaryl)	1–2 qt	6 qt per year	12	14	–
	3A	*Brigade 2EC (bifenthrin)	5.1–6.4 fl oz	25.6 fl oz	12	7	Other brands available with same active ingredient.
	3A	*Fastac CS (alpha-cypermethrin)	3.2–3.8 fl oz	11.4 fl oz	12	1	–
	3A	*Mustang Maxx (zeta-cypermethrin)	2.24–4.0 fl oz	24 fl oz	12	1	–
	4A	Scorpion 35 SL (dinotefuran)	Foliar: 2–5.25 fl oz Soil: 9–10.5 fl oz	Foliar: 10.5 fl oz Soil: 21 fl oz	12	Foliar: 7 Soil: 21	–
	4A	Venom (dinotefuran)	Foliar: 1.0–3.0 oz Soil: 5.0–6.0 oz	Foliar: 6 oz Soil: 12 oz	12	Foliar: 7 Soil: 21	–

Pest	MOA Code ¹	Trade Name (Active Ingredient)	Max Rate/Acre		REI (Hours)	Days to Harvest	Remarks ³
			Appl.	Season ²			
	29	Beleaf 50 SG (flonicamid)	2.0–2.8 oz	8.4 oz	12	0	–
Thrips (check label for species controlled)	5	Radiant SC (spinetoram)	5–10 fl oz	34 fl oz per year	4	1	–
	28	Exirel (cyantraniliprole)	13.5–20.5 fl oz	0.4 lb a.i. per year	12	1	–
	30	Incipio (isocycloseram)	3.1–4.1 fl oz	8.2 fl oz per year	12	1	No more than 2 applications.
¹ Mode of Action (MOA) codes for plant pest insecticides from the Insecticide Resistance Action Committee (IRAC) Mode of Action Classification v. 11.1 January 2024. Number codes 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. ² Always double-check labels regarding maximum application limits. Many labels are changing from a maximum rate per season (or crop cycle) to a maximum rate per year. ³ 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. *Restricted use insecticide.							

Table 12. Escarole and endive fungicides ordered by disease and then FRAC group according to their mode of action. **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.** 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 ³
			Appl.	Season ²	Harvest	Reentry	
Alternaria leaf spot	3	Procure 480SC (triflumizole)	8 fl oz	16 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 4SC (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	–
	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	See individual label	1	Varies by product from 4 hr to 2 days	–
Basal rot, septoria, gray mold, sclerotinia	7	Fontelis (penthioopyrad)	24 fl oz	72 fl oz	3	0.5	–
	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.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ³
			Appl.	Season ²	Harvest	Reentry	
	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	–
Botrytis rot	7	Endura (boscalid)	9.0 oz	18 oz	14	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 + 12	Miravis Prime (pydiflumetofen + fludioxonil)	13.4 fl oz	36.5 fl oz	14	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	–
Cercospora leaf spot, septoria 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.
	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.
	11	Quadris (azoxystrobin)	15.4 fl oz	2.88 qt	0	4 hr	Alternate with fungicides of dissimilar modes of action.
Damping off	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	See individual label	1	Varies by product from 4 hrs to 2 days	–

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ³
			Appl.	Season ²	Harvest	Reentry	
	M2	(sulfur) Many brands available: Crusade DF, Microfine Sulfur, Micro Sulf, Microthiol Disperss, Sulfur 90W	See individual label	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.
	27 + 11	Tanos (cymoxanil + famoxadone)	8 oz	24 oz	3	0.5	–
	33	Aliette WDG Legion 80WDG Linebacker WDG (fosetyl-Al)	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	–
	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	No more than 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. No more than 2 sequential applications.
	45 + 40	Zampro (ametoctradin + dimethomorph)	14 fl oz	42 fl oz	0	0.5	No more than 2 sequential applications.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ³
			Appl.	Season ²	Harvest	Reentry	
	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	No more than 4 applications per crop. No 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	See individual label	1	1	Do not apply during periods of warm weather. Do not apply within 2 weeks of an oil spray.
	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 4SC (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)	11.0 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.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ³
			Appl.	Season ²	Harvest	Reentry	
	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 of seed	–	–	2	–
	4	Metastar 2E (metalaxyl)	8 pt	–	–	2	Apply as a broadcast soil application and incorporate into top 2 in.
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.
Sclerotinia diseases	7	Endura (boscalid)	10.0 oz	18 oz	14	0.5	–
	9 + 12	Switch 62.5 WDG (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 row ft	–	–	0	Soil incorporated. No more than 1 application per season.
	12	Maxim 4FSS (fludioxonil)	0.16 fl oz/100 lb of seed	–	–	0.5	Seed treatment only.

¹ FRAC code (fungicide group): Numbers and letters 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. Source: FRAC Code List; <https://www.frac.info/> (FRAC = Fungicide Resistance Action Committee).

² Always double-check labels regarding maximum application limits. Many labels are changing from a maximum rate per season (or crop cycle) to a maximum rate per year.

³ 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.

13. Table Lettuce fungicides ordered by disease and then FRAC group according to their mode of action. **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.** 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 ³
			Appl.	Season ²	Harvest	Reentry	
<i>Alternaria</i> spp.	3	Rhyme (flutriafol)	7 fl oz	28 fl oz	7	0.5	No more than 4 applications per season.
	3	Trionic (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	No 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.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemicals (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ³
			Appl.	Season ²	Harvest	Reentry	
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 label	See individual label	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	–
Botrytis rot	7	Endura (boscalid)	11 oz	22 oz	14	0.5	–
	7	Fontelis (penthioopyrad)	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 (penthioopyrad)	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.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemicals (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ³
			Appl.	Season ²	Harvest	Reentry	
	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 label	See individual label	1	Varies by product from 4 hr to 2 days	–
	M2	(sulfur) Many brands available: Cosavet DF, Kumulus DF, Microfine Sulfur, Micro Sulf, Microthiol Disperss, Sulfur 90W, That Flowable, Thiolux, Top Cop w/Sulfur	See individual label	See individual label	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 M45, Fortuna 75WDG, Koverall, Mankocide, Manzate Max, Manzate Pro-stick, Penncozeb 75 DF, Penncozeb 80 WP, Roper DF Rainshield	See individual label	See individual label	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, Tetraban, Willowood Azoxy	15.5 fl oz	2.88 qt	0	4 hr	Alternate with fungicides of dissimilar modes of action.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemicals (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ³
			Appl.	Season ²	Harvest	Reentry	
	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.
	21A	Toran (tolfenpyrad)	21 fl oz	42 fl oz	14	0.5	Also an insecticide. Suppression only.
	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.
	33	(mono- and dipotassium salts of phosphorous acid) Many brands available: Alude, Confine Extra, Fosphite, Fungiphite, K-Phite 7LP, Oxiphos, Phiticide, Prophyt, Phostrol, Rampart	3 qt	–	0	4 hr	See label for details.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemicals (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ³
			Appl.	Season ²	Harvest	Reentry	
	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	No more than 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. No more than 2 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. No 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	No 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 Disperss, Sulfur 90W, That Flowable, Thiolux, Top Cop w/Sulfur	See individual label	See individual label	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 ³
			Appl.	Season ²	Harvest	Reentry	
	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 label	See individual label	10	1	–
	3	Procure 480SC (fludioxinil)	8 fl oz	18 fl oz	0	0.5	–
	3	Rally 40WSP (myclobutanil)	5 oz	20 oz	3	1	Supplemental label.
	3	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	No 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.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemicals (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ³
			Appl.	Season ²	Harvest	Reentry	
	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.
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 in.
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 row ft	–	0	–	Soil incorporated. No more than 1 application.
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.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemicals (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ³
			Appl.	Season ²	Harvest	Reentry	
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	–
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.
	7 + 12	Miravis Prime (pydiflumetofen + fludioxonil)	13.4 fl oz	36.5 fl oz	14	0.5	No 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	–
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.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemicals (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ³
			Appl.	Season ²	Harvest	Reentry	
	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	No 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	–	–	0	Soil incorporated. No more than 1 application.
	12	Maxim 4FS Spirato 480 FS (fludioxonil)	0.16 fl oz/100 lb of seed	–	–	–	Seed treatment only.

¹ FRAC code (fungicide group): Numbers and letters 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. Source: FRAC Code List; <https://www.frac.info/> (FRAC = Fungicide Resistance Action Committee).

² Always double-check labels regarding maximum application limits. Many labels are changing from a maximum rate per season (or crop cycle) to a maximum rate per year.

³ 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 14. Spinach fungicides ordered by disease and then FRAC group according to their mode of action. **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.** 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 ³
			Appl.	Season ²	Harvest	Reentry	
<i>Alternaria</i> spp.	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	–
	11	Quadris (azoxystrobin)	6 fl oz	15.5 fl oz	0	4 hr	Alternate with fungicides of dissimilar modes of action.
Anthraco nose	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 label	See individual label	–	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.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ³
			Appl.	Season ²	Harvest	Reentry	
	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 to 12 in. 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.
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-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 label	See individual label	–	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 label	See individual label	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. No more than 2 applications.
	4 + M1	Ridomil Gold/Copper (mefenoxam + copper hydroxide)	2 lb	4 lb	21	2	Follow Ridomil Gold EC at planting. 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.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ³
			Appl.	Season ²	Harvest	Reentry	
	11	Cabrio EG (pyraclostrobin)	16 oz	48 oz	0	0.5	No more than 3 applications per crop and 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.
	21A	Torac (tolfenpyrad)	21 fl oz	42 fl oz	1	0.5	No more than 2 applications per crop cycle. Insecticide also controls aphids, thrips, etc. Suppression only.
	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	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.
	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. No more than 2 sequential applications.
	40	Revus (mandipropamid)	8 fl oz	32 fl oz	1	4 hr	No more than 2 sequential applications. See label for soil applications.
	40 + 45	Zampro (dimethomorph + ametoctradin)	14 fl oz	42 fl oz	0	0.5	No more than 2 sequential applications.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ³
			Appl.	Season ²	Harvest	Reentry	
	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 (penthioapyrad)	24 fl oz	72 fl oz	3	0.5	No 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	No more than 2 applications 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 of seed	–	–	2	Seed treatment only.
	4	Metastar (metalaxyl)	8 pt	–	–	2	Apply as a broadcast soil application and incorporate into top 2 in. See label for directions.
	4	Sebring 2.65ST (metalaxyl)	0.75 fl oz/100 lb of seed	–	–	1	Seed treatment only.
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 to 12 in. band on soil over seed furrow.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ³
			Appl.	Season ²	Harvest	Reentry	
	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	15.5 fl oz	2.88 qt	0	4 hr	Alternate with fungicides of dissimilar modes of action.
Various leaf spots	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, 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	See individual label	See individual label	–	Varies by product from 4 hr to 2 days	–
	M2	(sulfur) Many brands available: Microfine Sulfur, Micro Sulf, Microthiol Disperss, Sulfur 90W, Yellow Jacket Wettable Sulfur	See individual label	See individual label	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	No more than 2 sequential applications.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ³
			Appl.	Season ²	Harvest	Reentry	
	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	Switch 62.5WDG (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: 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	No more than 2 sequential applications before rotating with dissimilar modes of action.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ³
			Appl.	Season ²	Harvest	Reentry	
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 label	See individual label	–	Varies by product from 4 hr to 2 days	–
	4	Ridomil Gold SL (mefenoxam)	0.25 pt	0.5 pt	21	2	Shank application. No more than 2 applications.
	4 + M1	Ridomil Gold/Copper WP (mefenoxam + copper hydroxide)	2 lb	4 lb	21	2	Follow Ridomil Gold EC at planting. 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.
	21	Ranman (cyazofamid)	2.75 fl oz	13.75 fl oz	0	0.5	No more than 3 sequential applications.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ³
			Appl.	Season ²	Harvest	Reentry	
	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): Numbers and letters 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. P = host plant defense inducers. Source: FRAC Code List; https://www.frac.info/ (FRAC = Fungicide Resistance Action Committee). ² Always double-check labels regarding maximum application limits. Many labels are changing from a maximum rate per season (or crop cycle) to a maximum rate per year. ³ 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 15. 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 3.5–7 pt/A (56.0–80.0 fl oz/A) a minimum of 7 days before planting. Do not plant any unlisted crops into treated land for 365 days after application of the product. No more than 1 application per crop and no more than 112 fl oz/A 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 crops.
Biological nematicides	See chapter 19.

Table 16. 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 per Acre	fl oz/1000 ft/Chisel-Spaced 12" Apart	
Telone II ^{2,3}	9–12	26–35	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}	10.8–17.1	31.8–50.2	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}	13–20.5	38–60	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	19–31.5	57–90	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	–	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	–	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	–	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 ft 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.

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Use pesticides safely. Read and follow directions on the manufacturer's label.

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