

Chapter 6. Cole Crop Production¹

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Botany and Planting

Broccoli—*Brassica oleracea* Italica group, Brassicaceae (Cruciferae).

Cabbage—*Brassica oleracea* Capitata group.

Cauliflower—*Brassica oleracea* Botrytis group.

Chinese broccoli—Gailan or gai lan/kalian or kai lan/flowering kale—*Brassica oleracea* var. *alboglabra*.

Chinese cabbage—Napa (tight headed), chi-hili (semi-loose headed)—*Brassica rapa* var. *pekinensis*.

Chinese mustard—Bok choy, shanghai choy, baby bok choy, yuchoi, yuchoy, u-choi, choy sum—*Brassica rapa* subsp. *chinensis*.

Collards—*Brassica oleracea* Acephala group.

Kohlrabi—*Brassica oleracea* var. *gongylodes*.

Mustard—*Brassica juncea*.

Oriental radish—Daikon (Japanese), lobok or lo bok (Chinese)—*Raphanus sativus* var. *longipinnatus*.

Turnip—*Brassica rapa* Rapifera group.

Table 1. Planting dates for cole crops.

Planting Region	Broccoli	Brussels Sprout	Cabbage	Cauliflower	Collards	Kale	Mustard	Turnip
North Florida	Sept–Feb	Aug–Feb	Sept–Feb	Aug–Feb	Aug–Feb	Aug–Feb	Aug–Feb	Aug–Feb
Central Florida	Sept–Feb	Sept–Feb	Sept–Feb	Sept–Feb	Sept–Feb	Sept–Feb	Sept–Feb	Sept–Feb
South Florida	Oct–Jan	Oct–Jan	Sept–Jan	Sept–Jan	Sept–Jan	Sept–Jan	Sept–Jan	Sept–Jan

Table 2. Planting information for cole crops.

Planting Information	Broccoli	Brussels Sprout	Cabbage ¹	Cauliflower ¹	Collards	Kale	Mustard	Turnip
Distance between rows (in)	24–40	24–40	24–40	24–40	24–36	18–24	12–36	12–36
Distance between plants (in)	10–15	16–24	8–16	12–18	12–24	8–12	5–10	2–6
Seeding depth (in)	0.25–0.5	0.25–0.5	0.25–0.5	0.25–0.5	0.25–0.5	0.25–0.5	0.25–0.5	0.25–0.5
Seeding per acre for field (lb)	1–2	1–2	1–2	1–2	2–4	2–4	3–5	2–3
Seeding per acre for transplant (lb)	1.25–1.5	1.25–1.5	1	1.25–1.5	1.25–1.5	N/A ²	N/A ²	N/A ²
Days to maturity from seed	75–90	120–140	85–110	75–90	70–90	50–70	40–50	40–60
Days to maturity from transplant	50–70	90–120	70–90	50–70	50–70	—	—	—
Plant populations (acre)	10,400–26,000	Up to 15,500	Up to 29,400	Up to 29,000	Up to 21,800	Up to 43,500	Up to 116,200	Up to 261,400

Planting Information	Broccoli	Brussels Sprout	Cabbage ¹	Cauliflower ¹	Collards	Kale	Mustard	Turnip
¹ Can be planted in double rows (15–24 inches between rows; 10–12 inches within rows; 40–60-inch bed centers).								
² Direct seeded.								

Cultivars

Table 3. Cabbage cultivars.

Cabbage	Cultivars
Green	Botran (H), Bravo (H), Bronco (H), Bruno (H), Capture (H), Cheers (H), Expat (H), Grand Vantage (H), Ramada (H), Superstar (H)
Red	Cairo (H), Garnet (H), Red Dynasty (H), Red Hawk (H), Red Jewel (H), Rio Grande (H)
Savoy	Clarissa (H), Melissa (H), Savoy Ace (H), Savoy King (H)

Table 4. Broccoli, brussels sprout, cauliflower, collards, kale, mustard, and turnip cultivars.

Crop	Cultivars
Broccoli	Abrams (H), Burney (H), DuraPak 19 (H)*, Eastern Crown (H), Emerald Crown (H), Green Magic (H), Imperial (H), Packman (H)
Brussels sprout	Dagan (H), Marte (H)
Cauliflower	Alcala (H), Bermeo (H), Flamenco (H), Majestic (H), Whistler (H), White Passion (H)
Collards	Bull Dog (H), Flash (H), Georgia, Hi Crop (H), Top Bunch (H), Vates
Kale	Blue Ridge (H), Darkibor (H), Oldenbor (H), Starbor (H), Vates, Winterbor (H)
Mustard	Florida Broad Leaf, Green Wave, Red Giant, Southern Giant Curled, Tendergreen
Turnip	Just Right (H), Purple Top, Royal Crown (H), Southern Green
Turnip greens	All Top (H), Top Star (H), Topper (H)
H = hybrid, * = for northeast Florida	

Asian Crucifers

The term “Asian crucifers” is a broad category that encompasses Asian crucifer vegetables grown in the countries that comprise Asia and those eaten mainly by people of Asian extraction or who like Asian cuisine. Many of the Asian crucifers described in this chapter belong to the crucifer family, which is covered in depth in chapter 5, “[Ethnic Vegetable Production](#).” However, there are still some overlaps between these two chapters.

This group of Asian crucifer vegetable species includes crops with edible leaves, like cabbage, broccoli, and bok choy, but also kohlrabi, which has edible swollen stems or tubers, and daikon, which is an edible root. These crops can be grown on raised beds with or without mulch and with drip, overhead, or subsurface irrigation. Fertilizer recommendations for these crops can be found in chapter 2, “[Fertilizer Management for Vegetable Production in Florida](#),” as general information. For pest-control products, these crops are included under this chapter, with the exception of daikon, for which refer to information on radish in chapter 15, “[Root Crop Production](#).”

Table 5. Planting dates for Asian crucifers.

Planting Region	Chinese Broccoli	Chinese Cabbage	Chinese Mustard	Daikon
North Florida	Aug–Feb	Aug–Feb	Aug–Feb	Sept–Mar
Central and south Florida	Sept–Apr	Sept–Apr	Sept–Apr	Sept–Apr

Table 6. Planting information for Asian crucifers.

Planting Information	Chinese Broccoli	Chinese Cabbage	Chinese Mustard	Daikon
Number of rows/44 in. wide beds (6 ft centers)	3–4	2–3	4	3 (fall/spring) 4 (winter)
Distance between rows (in)	11	14 or 24	14–mustard 11–others (below)	11
Distance between plants (in)	3–5	14–18	12–18 (mustard) 8–12 (Shanghai/choy sum) 6–10 (baby bok choy) 2–4 (u-choy)	6–9
Seeding depth (in)	0.25–0.5	0.25–0.5	0.25–0.5	0.25
Plant populations (acre)	116,160	18,671	29,040 (mustard) 43,560 (Shanghai/choy sum) 58,080 (baby bok choy) 174,240 (u-choy)	58,080

Table 7. Asian crucifer cultivars.

Asian Crucifer	Cultivars
Bok choy	Bopak, Joy choi
Chinese broccoli	Dark Green Gailan, Green Jade, Green Lance (H), Kaliburi, Kichi, Suiho, Te You
Chinese cabbage—Napa (tight head)	Blues Hybrid (H), China Express, China Pride, Emiko, Minuet, Pacifiko, SF-65, WR-70 days (H)
Chinese cabbage—Chihili (semi-loose head)	Green Rocket (H), Jade Pagoda, Michihili, Monument, Rubicon, Tainong Nanjing
Chinese mustard	Canton Choice, Ching-Chiang, Crown Jewel, Dwarf, Dynasty, Extra Dwarf, Fortune King, Long White, Lucky Choi, Mei Quing Choi, San Fran, Shanghai Green
Kohlrabi	Green Beauty, Kolibri, Kolibri Hybrid (H), Peking Purple, Purple Vienna, Winner
Oriental radish	April Cross, Daikon (Japanese), Everest, Green Meat, Mantanghong Hybrid (H), Mikura Cross, Mino Early, Minowase, Red Meat, Relish Lobok/Io bok (Chinese), Shunko
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 cole crops. **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: Peter Dittmar, UF/IFAS Department of Horticultural Sciences, Gainesville.

	Active Ingredient lb a.i./Acre	Trade Name Product/Acre	MOA Code	Crops	Weeds Controlled/Remarks
PREEMERGENCE/ PRETRANSPLANT	Bensulide 5.0–6.0	(Prefar) 4 E 5–6 qt	8	Head and stem and leafy brassica	Annual broadleaf and grass weeds. Fair to poor control of lambsquarter, purslane, and some amaranth. Mechanically incorporate 1–2 in. or irrigate 2–4 in. deep within 36 hr.
	Carfentrazone up to 0.031	(Aim) 2 EC up to 2 fl oz	14	Head and stem and leafy brassica	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.
	Clomazone 0.25 0.25–0.38	(Command) 3ME direct seeded: 0.67 pt transplanted: 0.67–1.0 pt	13	Cabbage	Annual broadleaf and grass weeds. On coarse soils, use lower rates. No more than 1 application per season. PHI 45 days.
	Flumioxazin 0.096	(Zaltus SX)	14	Broccoli, brussels sprout, cabbage, Chinese cabbage, napa cabbage, cauliflower	Broadleaf weeds. No more than 3 oz/A per application. No more than 6 oz per year. Row middles only between plastic-covered rows. Beds should be at least 4 inches tall and 24 inches wide. Apply with a covered sprayer to limit contact to the bottom inch of the bed prior to planting.
	Glyphosate	(various formulations) consult label	9	Head and stem and leafy brassica	Actively growing broadleaf and grass weeds. Use as a preplant burndown.
	Napropamide 2.0	(Devrinol DF-XT) 4 lb (Devrinol 2-XT) 4 qt	15	Broccoli, brussels sprout, cauliflower, cabbage	Annual broadleaf and grass weeds. Apply in transplanted crops. Irrigate within 24–72 hr to a soil depth of 4–8 in. No more than 2 lb a.i./A per season.
	Oxyfluorfen 0.25–0.5	(Galigan, Goal 2XL) 2 EC 1–2 pt (Galigan, GoalTender) 4 E 0.5–1.0 pt	14	Broccoli, cauliflower, cabbage	Certain annual broadleaf weeds. Transplants less than 5 weeks old or in containers less than 1 sq in. may result in more crop injury. Injury will occur as leaf cupping or crinkling. DO NOT apply in fields where acetanilide herbicides (Dual Magnum, Lasso, or Ramrod) have been applied in the same growing season.
	Paraquat 0.5–1.0	(Gramoxone) 2 SL 2.0–4.0 pt (Firestorm) 3 SL 1.3–2.7 pt	22	Broccoli, cabbage, cauliflower, cavolo broccoli, Chinese cabbage, turnip	Emerged broadleaf and grass weeds. Use as a preplant burndown. Crop plants that have emerged will be injured.

	Active Ingredient lb a.i./Acre	Trade Name Product/Acre	MOA Code	Crops	Weeds Controlled/Remarks
	Pelargonic acid	(Scythe) 4.2 EC 3%–10% v/v	27	Broccoli, cabbage, cauliflower, collards, kale, mustard/turnip greens	Emerged broadleaf and grass weeds. Use as a preplant burndown.
	Pyraflufen ethyl 0.0008–0.003	(ET Herbicide/Defoliant) 0.5–2.0 fl oz	14	Cole crops	Broadleaf and grass weeds. Burndown preplant application 1 day before planting. Include a NIS or COC in the spray solution. Allow 30 days between applications. No more than 3 applications or 5.5 fl oz/A per season.
	S-metolachlor mineral: 0.64–1.91 muck: 1.91	(Dual Magnum) 7.62 EC mineral: 0.80–4.0 pt muck: 4.0 pt	15	Head and stem brassica	Annual broadleaf and grass control. Apply immediately after planting. Label is a Third-Party Registration (TPR, Inc.), and grower must sign an indemnification agreement. Use a higher rate on fine-textured soils or high in organic matter. No more than 1.91 lb a.i./A of Dual Magnum per crop on sandy soils. Chinese varieties are more sensitive to Dual Magnum injury. PHI 60 days.
	Sulfentrazone 0.07–0.09	(Willowood sulfentrazone) 4SC 2.25–3.0 fl oz	14	Brassica head and stem (broccoli and cabbage), brassica leafy greens	Broadleaf and grass weed control, nutsedge suppression. Do not apply on sands with less than 1% organic matter. No more than 6.4 fl oz/A within a 12-month period. Should be trialed on a small area to find suitable rate for the soil type in your area.
	Trifluralin 0.5–0.75	(Treflan HFP, Trifluralin) 4 EC 1.0–1.5 pt (Treflan) 4 L 1.0–1.5 pt	3	Broccoli, brussels sprout, cabbage, cauliflower	Annual broadleaf and grass weeds. Incorporate or irrigate 4 in. within 8 hr. Results in Florida are erratic on soils with low organic matter and clay contents.
POSTEMERGENCE/ POSTTRANSPLANT	Carfentrazone up to 0.031	(Aim) 2 EC up to 2 fl oz (Aim) 1.9 EC up to 2 fl oz	14	Head and stem and leafy brassica	Emerged broadleaf weeds. Apply with a hooded sprayer to row middles. No more than 4.1 fl oz/A per season as a row-middle application. PHI 0 days.
	Clethodim 0.07–0.12	(Select Max) 1 EC 9–16 fl oz	1	Head and stem and leafy brassica	Emerged grass weeds. Include crop oil concentrate at 1% v/v in finished spray volume. Head and stem brassica PHI 30 days. Leafy brassica PHI 14 days.
	Clopyralid 0.09–0.19	(Stinger) 3 EC 0.25–0.5 pt	4	Cabbage, Chinese cabbage (bok choy, napa), Chinese mustard cabbage	Broadleaf weeds. No more than 0.5 pt/A per year. Check plant-back dates. PHI 30 days.
	Glyphosate	(various formulations) consult label	9	Head and stem and leafy brassica	Broadleaf and grass weeds. Use a hooded sprayer and direct to row middles only.

	Active Ingredient lb a.i./Acre	Trade Name Product/Acre	MOA Code	Crops	Weeds Controlled/Remarks
	Paraquat 0.3–0.5	(Gramoxone) 2 SL 1.2–1.9 pt	22	Cabbage	Emerged broadleaf and grass weeds. Direct spray solution to row middles only. Do not allow spray contact with crop because injury or excessive residues may result. Outer leaves should be stripped at the time of harvest. Do not apply where paraquat products have been used as preplant application.
	Pelargonic acid	(Scythe) 4.2 EC 3%–10% v/v	27	Broccoli, cabbage, cauliflower, collards, kale, mustard/turnip greens	Emerged broadleaf and grass weeds. Apply as hooded spray to row middles only. Include a residual herbicide to broaden the spectrum of weed control.
	Pendimethalin 0.48–0.71	(Prowl H2O) 3.8 1.0–1.5 pt	3	Broccoli, brussels sprout, cabbage, cauliflower	Broadleaf and grass weeds. Apply after crop emergence (2- to 4-leaf stage) or after transplanting (1–3 days) and prior to weed emergence. Direct the spray to the base of the plant to limit contact to the foliage. PHI 60 days. PHI 7 days for cabbage and head and stem brassica.
	Sethoxydim 0.28	(Poast) 1.5 EC 1.5 pt	1	Broccoli (including Chinese and raab), brussels sprout, cabbage (bok choy, Chinese mustard, napa), cauliflower, collards, kale, kohlrabi, mustard/rape greens	Annual and perennial weeds. Include a crop oil concentrate or methylated seed oil in spray solution. No more than 3.0 pt/A per season. PHI 30 days.

Table 9. Insecticides labeled for management of arthropod pests of cole crops. Contact: De-Fen Mou, UF/IFAS Everglades Research and Education Center.

Insect	MOA Code ¹	Trade Name (Active Ingredient)	Max Rate/Acre		REI (Hours)	Days to Harvest	Remarks ³
			Appl.	Season ²			
Aphids	1B	*Dibrom 8 EC (naled)	1 pt	10 pt	48	1	Broccoli, cabbage, cauliflower, brussels sprout, kale, and collards. Reapplications at least 7 days apart. Maximum 5 applications per season.
	1B	Dimethoate 4 EC (dimethoate)	Broccoli, cauliflower: 0.5–1 pt Kale, mustard greens, turnip: 0.5 pt	Broccoli, cauliflower: 3 pt per year Kale, mustard greens: 1 pt per year Turnip: 3.5 pt per year	48	Broccoli, cauliflower: 7 Kale, mustard greens, turnip: 14	Highly toxic to bees. Broccoli, cauliflower, kale, mustard greens, and turnip greens and roots only.
	1B	Malathion 5EC, 8F (malathion)	Broccoli, brussels sprout, cabbage, cauliflower: 1–2 pt (5EC) or 1.25 pt (8F) Collards, kale, mustard greens: 1.6 pt (5EC) or 1pt (8F)	Broccoli, brussels sprout, cabbage, cauliflower, turnip greens and roots: 32 fl oz Collards, kale, mustard greens: 25 fl oz	Broccoli, brussels sprout, cabbage, cauliflower: 48 Collards, kale, mustard greens, turnip greens and roots: 12	7 All except Broccoli: 3	See label for application limitations— varies by crop.
	1B	*MSR Spray Concentrate (oxydemeton-methyl)	1.5–2 pt Cabbage: 1.5–3	6 pt	7 days	7 Brussels sprout: 10	Broccoli, broccoflower, broccolini, brussels sprout, cauliflower, and cabbage only. Reapplications at least 7 days apart.
	3A	*Ambush 25W3 (permethrin)	Brussels sprout, cauliflower: 3.2–6.4 oz Broccoli, cabbage, Chinese broccoli, Chinese cabbage: 3.2–12.8 oz	Brussels sprout, cabbage, cauliflower, Chinese cabbage: 25.6 oz Broccoli, Chinese broccoli: 51.2 oz	12	1	Head and stem brassica crops only.

Insect	MOA Code ¹	Trade Name (Active Ingredient)	Max Rate/Acre		REI (Hours)	Days to Harvest	Remarks ³
			Appl.	Season ²			
	3A	*Brigade 2 EC (bifenthrin)	2.1–6.4 fl oz Turnip roots: 5.12–6.4 fl oz	Head and stem brassicas, turnip roots: 32 fl oz Leafy brassicas: 25.6 fl oz	12	7 Turnip roots: 21	Reapplications at least 7 days apart.
	3A	*Mustang (zeta-cypermethrin)	3.4–4.3 fl oz	25.8 fl oz	12	1	Reapplications at least 7 days apart.
	3A	Pyganic Crop Protection EC 5.0 (pyrethrins)	4.5–15.61 fl oz	15.61 fl oz	12	0	Highly toxic to bees. Can be used in greenhouses. OMRI-listed. ³
	3A + 28	*Besiege (lambda-cyhalothrin + chlorantraniliprole)	6–9 fl oz	31 fl oz per year	24	3	Highly toxic to bees. Reapplications at least 5 days apart. Head and stem brassica only.
	4A	Actara (thiamethoxam)	1.5–3.0 oz	11 oz	12	Head and stem: 0 Leafy: 7	Highly toxic to bees. Foliar application. Do not use if other 4A insecticide has been applied. Reapplication at least 7 days apart.
	4A	Admire Pro (imidacloprid)	Soil: 4.4–10.5 fl oz Foliar: 1.3 fl oz	Soil: 10.5 fl oz Foliar: 6.5 fl oz	12	Soil: 21 Foliar: 7	Most effective as a soil application. Do not apply to both soil and foliage.
	4A	Assail 30SG (acetamiprid)	Head and stem brassica: 2.0–4.0 fl oz Leafy brassica, turnip greens: 2.0–5.3 oz	20 oz per year	12	Head and stem: 7 Leafy brassica, turnip greens: 3	Turnip roots cannot be used for food/feed.
	4A	Belay Insecticide (clothianidin)	Foliar: 3–4 fl oz Soil: 9–12 fl oz	12 fl oz per year	12	Foliar: 7 Soil: 21	Do not use for seed production. Toxic to bees. Foliar applications at least 10 days apart. Exclude turnip.
	4A	Belay 50 WDG (clothianidin)	Foliar: 1.6–2.1 oz Soil: 4.8–6.4 oz	6.4 oz	12	7 Soil: apply at planting.	Foliar applications at least 10 days apart. Do not use adjuvant. Includes turnip greens.

Insect	MOA Code ¹	Trade Name (Active Ingredient)	Max Rate/Acre		REI (Hours)	Days to Harvest	Remarks ³
			Appl.	Season ²			
	4A	Platinum 75SG (thiamethoxam)	1.66–3.67 oz Turnip: 1.7–4.01 oz	3.67 oz Turnip: 4.01 oz	12	30	Soil application.
	4A + 28	Durivo (thiamethoxam + chlorantraniliprole)	10–13 fl oz	13 fl oz	12	30	Soil application. No more than 1 application per season.
	4A + 28	Voliam Flexi (thiamethoxam + chlorantraniliprole)	4–7 oz	14 oz	12	Head and stem: 3 Leafy brassica greens: 7	Toxic to bees. Reapplications at least 7 days apart.
	4D	Sivanto Prime (flupyradifurone)	7–14 fl oz	28 fl oz	4	1	Soil or foliar application. No more than 3 crop seasons per year.
	9B	Fulfill (pymetrozine)	2.75 oz	5.5 oz	12	7	Apply when aphids first appear. Reapplications at least 7 days apart. No more than 2 applications per crop.
	9B	PQZ (pyrifluquinazon)	Soil only: 2.4–3.2 fl oz	9.6 fl oz	12	7	Reapplications at least 7 days apart.
	23	Movento (spirotetramat)	4–5 fl oz	10 fl oz	24	1	Only use a spreading-penetrating adjuvant known to be safe for the target crop.
	28	Exirel (cyantraniliprole)	13.5–20.5 fl oz	0.4 lb a.i. of cyazypyr- or cyantraniliprole-containing products	12	1	Reapplications at least 5 days apart.
	28	Verimark (cyantraniliprole)	6.75–13.5 fl oz	0.4 lb a.i. of cyazypyr- or cyantraniliprole-containing products per year	4	Soil at planting: N/A Drip chemigation: 1	No more than 13.5 fl oz at planting. The pH should be pH 4–6. Drip chemigations at least 10 days apart.
	29	Beleaf 50 SG (flonicamid)	2.0–2.8 oz	8.4 oz per year	12	0	Begin applications before pests reach damaging levels. Reapplications at least 7 days apart.

Insect	MOA Code ¹	Trade Name (Active Ingredient)	Max Rate/Acre		REI (Hours)	Days to Harvest	Remarks ³
			Appl.	Season ²			
Caterpillars (including diamondback moth, cabbage looper, imported cabbageworm, corn earworm, cross-striped cabbageworm, cabbage webworm, armyworms)	1A	*Lannate LV; *SP (methomyl)	LV: 1.5–3.0 pt SP: 0.5–1 lb	LV: 15 pt SP: 5 lb	48	Cabbage: 1 Broccoli, cauliflower: 3 Others: 10	No more than 10 applications per crop (8 for collards, kale, and mustard and turnip greens). Broccoli, cabbage, cauliflower, Chinese cabbage, fresh market collards, kale, mustard and turnip greens.
	1A	Sevin 80S XLR Plus, 4F (carbaryl)	80S: 0.625–2.5 lb XLR, 4F: 0.5–2 qt	80S: 7.5 lb XLR, 4F: 6 qt	12	3 or 14, depending on specific crop	–
	1B	*Diazinon AG-500 *50 W (diazinon)	AG500 preplant: 1–4 qt 50W: 2–8 lb	–	96	preplant	Root maggot, cutworms only. Broccoli, cabbage, cauliflower, collards, kale, and mustard greens. See label for depth to incorporate. No more than 5 applications.
	1B	*Dibrom 8 EC (naled)	1 pt	10 pt	48	1	Broccoli, cabbage, cauliflower, brussels sprout, kale, and collards. Reapplications at least 7 days apart. No more than 5 applications per season.
	1B	Malathion 5EC, 8F (malathion)	Broccoli, brussels sprout, cabbage, cauliflower: 1–2 pt (5EC) or 1.25 pt (8F) Collards, kale, mustard greens: 1.6 pt (5EC) or 1pt (8F)	Broccoli, brussels sprout, cabbage, cauliflower, turnip greens and roots: 32 fl oz Collards, kale, mustard greens: 25 fl oz	Broccoli, brussels sprout, cabbage, cauliflower: 48 Collards, kale, mustard greens, turnip greens and roots: 12	7 All except broccoli: 3	See label for application limitations—varies by crop.

Insect	MOA Code ¹	Trade Name (Active Ingredient)	Max Rate/Acre		REI (Hours)	Days to Harvest	Remarks ³
			Appl.	Season ²			
	3A	*Ambush 25W3 (permethrin)	Brussels sprout, cauliflower: 3.2–6.4 oz Broccoli, cabbage, Chinese broccoli, Chinese cabbage: 3.2–12.8 oz	Brussels sprout, cabbage, cauliflower, Chinese cabbage: 25.6 oz Broccoli, Chinese broccoli: 51.2 oz	12	1	Head and stem brassica crops only.
	3A	*Asana XL (0.66 EC) (esfenvalerate)	Head and stem brassicas: 2.9–9.6 fl oz Collards: 5.8–9.6 fl oz	Head and stem brassicas: 0.4 lb a.i. Collards: 0.2 lb a.i.	12	Head and stem: 3 Collards, mustard greens: 7	–
	3A	*Baythroid XL (beta-cyfluthrin)	0.8–3.2 fl oz Mustard greens: 9.6 fl oz	12.8 fl oz	12	0	–
	3A	*Brigade 2 EC (bifenthrin)	2.1–6.4 fl oz Turnip roots: 5.12–6.4 fl oz	Head and stem brassicas, turnip roots: 32 fl oz Leafy brassicas: 25.6 fl oz	12	7 Turnip roots: 21	Reapplications at least 7 days apart.
	3A	*Capture LFR (bifenthrin)	3.4–8.5 fl oz	0.1 lb a.i. per year	12	At planting	For mixing directly with liquid fertilizer to control soil insect pests.
	3A	*Danitol (fenpropathrin)	10.67–16 fl oz	42.67 fl oz	24	7	Head and stem brassica only.
	3A	*Declare Insecticide (gamma-cyhalothrin)	0.77–1.54 fl oz	12.3 fl oz	24	1	First and second instars only. Head and stem brassica only.
	3A	*Mustang (zeta-cypermethrin)	Corn earworm, diamondback moth: 2.4–4.3 fl oz Cabbage looper, cabbage webworm, armyworm: 3.4–4.3 fl oz	25.8 fl oz	12	1	Reapplications at least 7 days apart. Diamondback moth populations in Florida have been found to be resistant to pyrethroids.
	3A	Pyganic Crop Protection EC 5.0 (pyrethrins)	4.5–15.61 fl oz	15.61 fl oz	12	0	Toxic to bees. Can be used in greenhouses. OMRI-listed. ³
	3A	*Warrior II (lambda-cyhalothrin)	0.96–1.92 fl oz	15.36 fl oz	24	1	1st and 2nd instar only. For head and stem brassica only.

Insect	MOA Code ¹	Trade Name (Active Ingredient)	Max Rate/Acre		REI (Hours)	Days to Harvest	Remarks ³
			Appl.	Season ²			
	3A + 28	*Besiege (lambda-cyhalothrin + chlorantraniliprole)	6–9 fl oz Cabbage looper, cabbage webworm: 5–8 fl oz	31 fl oz per year	24	3	Toxic to bees. Head and stem brassica only. Reapplications at least 5 days apart.
	4A + 28	Durivo (thiamethoxam + chlorantraniliprole)	10–13 fl oz	13 fl oz	12	30	Soil application. No more than 1 application per season.
	4A + 28	Voliam Flexi (thiamethoxam + chlorantraniliprole)	4–7 oz	14 oz	12	Head and stem brassicas: 3 Leafy brassicas: 7	Toxic to bees. Reapplications at least 7 days apart.
	5	Radiant SC (spinetoram)	6–10 fl oz	34 fl oz per year	4	1	Do not apply to seedlings grown for transplant. No more than 2 consecutive applications of Group 5 insecticides. Recommended to reserve for thrips where they are a problem.
	6	*Proclaim (emamectin benzoate)	3.2–4.8 oz	19.2 oz per year	12	Head and stem brassicas: 7 Leafy brassicas, turnip greens: 14	No more than 2 sequential applications. Reapplications at least 7 days apart. Do not apply by aircraft. Not for turnips grown for roots.
	15	Rimon 0.83 EC (novaluron)	6–12 fl oz	Head and stem brassicas: 24 fl oz per year Leafy brassicas, turnip greens: 36 fl oz per year	12	7	Not for turnip root or for livestock.
	18	Intrepid 2F (methoxyfenozide)	4–10 fl oz, depending on pest	64 oz	4	1	–
	22	Avaunt 30 WG (indoxacarb)	2.5–3.5 oz	14 oz	12	3	–
	22	Avaunt eVo (indoxacarb)	2.5–3.5 oz	14 oz	12	3	No more than 4 applications per year. Reapplications at least 3 days apart.

Insect	MOA Code ¹	Trade Name (Active Ingredient)	Max Rate/Acre		REI (Hours)	Days to Harvest	Remarks ³
			Appl.	Season ²			
	28	Coragen (rynaxypyr)	3.5–7.5 fl oz	15.4 fl oz	4	3	For best results, use an adjuvant when using as a foliar spray. Can be applied to soil at planting or by drip chemigation. See label for diamondback moth resistance management.
	28	Exirel (cyantraniliprole)	13.5–20.5 fl oz Diamondback moth: 7 fl oz	0.4 lb a.i. of cyazypyr- or cyantraniliprole-containing products	12	1	Reapplications at least 5 days apart.
	30	Incipio (isocycloseram)	2.1–4.1 fl oz Diamondback moth: 2.1 fl oz	8.2 fl oz per year	12	1	Reapplications at least 30 days apart. No more than 2 applications per year.
	7A	Extinguish (S-methoprene)	1.0–1.5 lb	–	4	0	Slow-acting IGR (insect growth regulator). Apply early spring and fall. May be applied by ground equipment or aerially.
	7C	Esteem Ant Bait (pyriproxyfen)	1.5–2.0 lb	0.134 lb a.i.	12	1	Apply when ants are actively foraging.
Flea beetles	1A	Sevin 80S XLR Plus, 4F (carbaryl)	80S: 0.625–2.5 lb XLR, 4F: 0.5–2 qt	80S: 7.5 lb XLR, 4F: 6 qt	12	3 or 14, depending on specific crop	See label for specific crops.
	1B	*Lorsban Advanced (chlorpyrifos)	Preplant, at-plant, postplant soil application: See label. Foliar: 1–2 pt	See label for crop and application method specifics.	24 Cauliflower: 72	Preplant: 30 Foliar: 21	Foliar: No more than 3 applications of products containing chlorpyrifos.
	1B	Malathion 5EC, 8F (malathion)	Broccoli, brussels sprout, cabbage, cauliflower: 1–2 pt (5EC) or 1.25 pt (8F) Collards, kale, mustard greens: 1.6 pt (5EC) or 1pt (8F)	Broccoli, brussels sprout, cabbage, cauliflower, turnip greens and roots: 32 fl oz Collards, kale, mustard greens: 25 fl oz	48 Collards, kale, mustard greens: 12	Head and stem brassicas except cabbage: 2 Turnip greens and cabbage: 7	See label for application limitations—varies by crop.

Insect	MOA Code ¹	Trade Name (Active Ingredient)	Max Rate/Acre		REI (Hours)	Days to Harvest	Remarks ³
			Appl.	Season ²			
	3A	*Asana XL (0.66 EC) (esfenvalerate)	Head and stem brassicas: 2.9–9.6 fl oz Collards: 5.8–9.6 fl oz Mustard greens: 9.6 fl oz	Head and stem brassicas: 0.4 lb a.i. Collards: 0.2 lb a.i.	12	Head and stem brassicas: 3 Collards, mustard greens: 7	–
	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 Turnip roots: 5.12–6.4 fl oz	Head and stem brassicas, turnip roots: 32 fl oz Leafy brassicas: 25.6 fl oz	12	7 Turnip roots: 21	Reapplications at least 7 days apart.
	3A	*Declare Insecticide (gamma-cyhalothrin)	0.77–1.54 fl oz	12.3 fl oz	24	1	First and second instars only. Head and stem brassicas only.
	3A	*Mustang (zeta-cypermethrin)	2.4–4.3 fl oz	25.8 fl oz	12	1	Reapplications at least 7 days apart.
	3A	Pyganic Crop Protection EC 5.0 (pyrethrins)	4.5–15.61 fl oz	15.61 fl oz	12	0	Toxic to bees. Can be used in greenhouses. OMRI-listed. ³
	3A	*Warrior II and generics (lambda-cyhalothrin)	0.96–1.92 fl oz	–	24	1	No more than 0.24 lb a.i./A or 15.36 fl oz/A per season. 1st and 2nd instar only. For head and stem brassica only.
	3A + 28	*Besiege (lambda-cyhalothrin + chlorantraniliprole)	6–9 fl oz	31 fl oz per year	24	3	Toxic to bees. Reapplications at least 5 days apart. Head and stem brassica only.
	4A	Actara (thiamethoxam)	1.5–3.0 oz	11 oz	12	Head and stem brassicas: 0 Leafy brassicas: 7	Toxic to bees. Do not use if other 4A insecticide has been applied. Reapplications at least 7 days apart.
	4A	Belay Insecticide (clothianidin)	Foliar: 3–4 fl oz Soil: 9–12 fl oz	12 fl oz per year	12	Foliar: 7 Soil: 21	Do not use for seed production. Toxic to bees. Foliar applications at least 10 days apart. Exclude turnip.

Insect	MOA Code ¹	Trade Name (Active Ingredient)	Max Rate/Acre		REI (Hours)	Days to Harvest	Remarks ³
			Appl.	Season ²			
	4A	Belay 50 WDG (clothianidin)	Foliar: 1.6–2.1 oz Soil: 4.8–6.4 oz	6.4 oz	12	7 Soil: apply at planting	Foliar applications at least 10 days apart. Do not use adjuvant. Includes turnip greens.
	4A	Platinum 75SG (thiamethoxam)	1.66–3.67 oz Turnip: 1.7–4.01 oz	3.67 oz Turnip: 4.01 oz	12	30	Soil application.
	4A	Scorpion 35SL (dinotefuran)	Foliar: 2–7 oz Soil: 9–13 oz	Foliar: 10.5 fl oz Soil: 21 fl oz	12	Foliar: 1 Soil: 21	Use only 1 application method. Head and stem brassicas only.
	4A	Venom (dinotefuran)	Foliar: 1–4 oz	6 oz	12	1	Head and stem brassicas only.
	4A + 28	Durivo (thiamethoxam + chlorantraniliprole)	10–13 fl oz	13 fl oz	12	30	Soil application. No more than 1 application per season.
	4A + 28	Voliam Flexi (thiamethoxam + chlorantraniliprole)	4–7 oz	14 oz	12	Head and stem brassicas: 3 Leafy brassica greens: 7	Toxic to bees. Reapplications at least 7 days apart.
	28	Exirel (cyantraniliprole)	13.5–20.5 fl oz	0.4 lb a.i. of cyazypyr- or cyantraniliprole-containing products	12	1	Reapplications at least 5 days apart.
	28	Verimark (cyantraniliprole)	6.75–13.5 fl oz	0.4 lb a.i. of cyazypyr- or cyantraniliprole-containing products per year	4	Soil at planting: N/A Drip chemigation: 1	No more than 13.5 fl oz at planting. The pH should be 4–6. Drip chemigations at least 10 days apart.
	30	Incipio (isocycloseram)	2.1–4.1 fl oz	8.2 fl oz per year	12	1	Reapplications at least 30 days apart. No more than 2 applications per year.
Grasshoppers	3A	*Asana XL (0.66 EC) (esfenvalerate)	Head and stem brassicas: 2.9–9.6 fl oz Collards: 5.8–9.6 fl oz Mustard greens: 9.6 fl oz	Head and stem brassicas: 0.4 lb a.i. Collards: 0.2 lb a.i.	12	Head and stem: 3 Collards, mustard greens: 7	No more than 0.4 lb a.i./A per season for head and stem brassica or 0.2 lb a.i./A per season for collards and mustard greens.
	3A	*Mustang (zeta-cypermethrin)	3.4–4.3 fl oz	25.8 fl oz	12	1	Reapplications at least 7 days apart.

Insect	MOA Code ¹	Trade Name (Active Ingredient)	Max Rate/Acre		REI (Hours)	Days to Harvest	Remarks ³
			Appl.	Season ²			
	3A + 28	*Besiege (lambda-cyhalothrin + chlorantraniliprole)	6–9 fl oz	31 fl oz per year	24	3	Highly toxic to bees. Head and stem brassicas only. Reapplications at least 5 days apart.
Harlequin bug, stink bug, plant bugs	1A	Sevin 80S XLR Plus, 4F (carbaryl)	80S: 0.625–2.5 lb XLR, 4F: 0.5–2 qt	80S: 7.5 lb XLR, 4F: 6 qt	12	3 or 14, depending on specific crop	See label for specific crops.
	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	Head and stem brassicas, turnip roots: 32 fl oz Leafy brassicas: 25.6 fl oz	12	7	Reapplications at least 7 days apart.
	3A	*Danitol (fenpropathrin)	10.67–16 fl oz	42.67 fl oz	24	7	Head and stem brassicas only.
	3A	*Declare Insecticide (gamma-cyhalothrin)	0.77–1.54 fl oz	12.3 fl oz	24	1	First and second instars only. Head and stem brassicas only.
	3A	*Mustang (zeta-cypermethrin)	3.4–4.3 fl oz	25.8 fl oz	12	1	Reapplications at least 7 days apart.
	3A	Pyganic Crop Protection EC 5.0 (pyrethrins)	4.5–15.61 fl oz	15.61 fl oz	12	0	Highly toxic to bees. Can be used in greenhouses. OMRI-listed. ³
	3A	*Warrior II (lambda-cyhalothrin)	0.96–1.92 fl oz	15.36 fl oz	24	1	First and second instar only. Head and stem brassica only.
	3A + 28	*Besiege (lambda-cyhalothrin + chlorantraniliprole)	6–9 fl oz	31 fl oz per year	24	3	Highly toxic to bees. Head and stem brassicas only. Reapplications at least 5 days apart.
	4A	Assail 30SG (acetamiprid)	4.0–5.3 oz	20 oz per year	12	3	Brassica leafy greens only. Turnip roots cannot be used for food/feed.

Insect	MOA Code ¹	Trade Name (Active Ingredient)	Max Rate/Acre		REI (Hours)	Days to Harvest	Remarks ³
			Appl.	Season ²			
	4A	Belay Insecticide (clothianidin)	Foliar: 3–4 fl oz Soil: 9–12 fl oz	12 fl oz per year	12	Foliar: 7 Soil: 21	Do not use for seed production. Toxic to bees. Foliar applications at least 10 days apart. Exclude turnip.
	4A	Belay 50 WDG (clothianidin)	Foliar: 1.6–2.1 oz Soil: 4.8–6.4 oz	6.4 oz	12	7 Soil: apply at planting	Foliar applications at least 10 days apart. Includes turnip greens.
	4A	Scorpion 35SL (dinotefuran)	2–7 oz	10.5 fl oz	12	1	Head and stem brassicas only.
	4A	Venom Insecticide (dinotefuran)	1–4 oz	6 oz	12	Foliar: 1 Soil: 21	Head and stem brassicas only.
	15	*Dimilin 2L (diflubenzuron)	2–4 fl oz	16 fl oz per year	12	7	Not effective against adult stage. No more than 4 applications per season. May be applied only to turnip varieties that do not produce a harvestable root.
	15	Rimon 0.83 EC (novaluron)	6–12 fl oz	Head and stem brassicas: 24 fl oz per year Leafy brassicas, turnip greens: 36 fl oz per year	12	7	No more than 2 applications for thrips or whiteflies. Head and stem brassicas only.
	30	Incipio (isocycloseram)	3.1–4.1 fl oz	8.2 fl oz per year	12	1	Reapplications at least 30 days apart. No more than 2 applications per year.

Insect	MOA Code ¹	Trade Name (Active Ingredient)	Max Rate/Acre		REI (Hours)	Days to Harvest	Remarks ³
			Appl.	Season ²			
Leafminers	1B	Dimethoate 4 EC (dimethoate)	0.5 pt	Kale, mustard greens: 1 pt per year Turnip greens and roots: 3.5 pt per year	48	14	Highly toxic to bees. Kale, mustard greens, turnip greens and roots only.
	4A	Belay Insecticide (clothianidin)	Foliar: 3–4 fl oz Soil: 9–12 fl oz	12 fl oz per year	12	Foliar: 7 Soil: 21	Do not use for seed production. Toxic to bees. Foliar applications at least 10 days apart. Exclude turnip.
	4A	Belay 50 WDG (clothianidin)	Foliar: 1.6–2.1 oz Soil: 4.8–6.4 oz	6.4 oz	12	7 Soil: apply at planting	Foliar applications at least 10 days apart. Do not use an adjuvant. Includes turnip greens.
	4A	Scorpion 35SL Insecticide (dinotefuran)	Foliar: 2–7 fl oz Soil: 9–13 fl oz	Foliar: 10.5 fl oz Soil: 21 fl oz	12	Foliar: 1 Soil: 21	Head and stem brassicas only. Use only 1 application method.
	4A	Venom Insecticide (dinotefuran)	Foliar: 1–4 oz Soil: 5–6 oz	Foliar: 6 fl oz Soil: 12 fl oz	12	Foliar: 1 Soil: 21	Head and stem brassicas only. Use only 1 application method.
	5	Radiant SC (spinetoram)	6–10 fl oz	34 fl oz per year	4	1	Do not apply to seedlings grown for transplant. No more than 2 consecutive applications of Group 5 insecticides. No more than 6 applications per year. Reapplications at least 4 days apart.
	6	*Proclaim (emamectin benzoate)	3.2–4.8 oz	19.2 oz per year	12	Head and stem brassicas: 7 Leafy brassicas, turnip greens: 14	No more than 2 sequential applications. Reapplications at least 7 days apart. Do not apply by aircraft. Not for turnips grown for roots.
	15	Rimon 0.83 EC (novaluron)	12 fl oz	Head and stem brassicas: 24 fl oz per year Leafy brassicas, turnip greens: 36 fl oz per year	12	7	Not for turnip root or for livestock.

Insect	MOA Code ¹	Trade Name (Active Ingredient)	Max Rate/Acre		REI (Hours)	Days to Harvest	Remarks ³
			Appl.	Season ²			
	17	Trigard (cyromazine)	2.66 oz	1 lb per year	12	7	No more than 6 applications. Reapplications at least 7 days apart. Includes turnip greens, not grown for roots.
	28	Exirel (cyantraniliprole)	13.5–20.5 fl oz	0.4 lb a.i.	12	1	Reapplications at least 5 days apart.
	28	Verimark (cyantraniliprole)	6.75–13.5 fl oz	0.4 lb a.i. of cyazypyr- or cyantraniliprole-containing products per year	4	Soil at planting: N/A Drip chemigation: 1	No more than 13.5 fl oz at planting. The pH should be 4–6. Drip chemigations at least 10 days apart.
	30	Incipio (isocycloseram)	2.1–4.1 fl oz	8.2 fl oz per year	12	1	Reapplications at least 30 days apart. No more than 2 applications per year.
Whiteflies	4A	Actara (thiamethoxam)	3.0–5.5 oz	11 oz	12	Head and stem brassicas: 0 Leafy brassicas: 7	Highly toxic to bees. Do not use if other 4A insecticide has been applied.
	4A	Admire Pro (imidacloprid) (see appropriate labels for other brands)	Soil: 4.4–10.5 fl oz Foliar: 1.3 fl oz	Soil: 10.5 fl oz Foliar: 6.5 fl oz	12	Foliar: 7 Soil: 21	Do not apply to both soil and foliage.
	4A	Assail 30SG (acetamiprid)	Head and stem brassicas: 2.0–4.0 oz Leafy brassicas, turnip greens: 2.5–5.3 oz	20 oz per year	12	Head and stem brassicas: 7 Leafy brassicas, turnip greens: 3	Turnip roots cannot be used for food/feed. Whiteflies have shown a tendency to develop resistance.
	4A	Belay Insecticide (clothianidin)	Foliar: 3–4 fl oz Soil: 9–12 fl oz	12 fl oz per year	12	Foliar: 7 Soil: 21	Do not use for seed production. Toxic to bees. Foliar applications at least 10 days apart. Exclude turnip.
	4A	Belay 50 WDG (clothianidin)	Foliar: 1.6–2.1 oz Soil: 4.8–6.4 oz	6.4 oz	12	7 Soil: apply at planting.	Foliar applications at least 10 days apart. Do not use an adjuvant. Includes turnip greens.
	4A	Platinum 75SG (thiamethoxam)	1.66–3.67 oz Turnip: 1.7–4.01 oz	3.67 oz Turnip: 4.01 oz	12	30	Soil application.

Insect	MOA Code ¹	Trade Name (Active Ingredient)	Max Rate/Acre		REI (Hours)	Days to Harvest	Remarks ³
			Appl.	Season ²			
	4A	Scorpion 35SL Insecticide (dinotefuran)	Foliar: 2–7 fl oz Soil: 9–13 fl oz	Foliar: 10.5 fl oz Soil: 21 fl oz	12	Foliar: 1 Soil: 21	Head and stem brassicas only. Use only 1 application method.
	4A	Venom Insecticide (dinotefuran)	Head and stem brassicas: 1–4 oz (foliar) and 5–7.5 oz (soil) Leafy brassica, greens, turnip greens: 2–3 oz	Foliar: 6 fl oz Soil: 12 fl oz	12	Foliar: 1 Soil: 21	Use only 1 application method. Soil application for head and stem brassicas only.
	4A + 28	Durivo (thiamethoxam + chlorantraniliprole)	10–13 fl oz	13 fl oz	12	30	Soil application. No more than 1 application per season.
	4A + 28	Voliam Flexi (thiamethoxam + chlorantraniliprole)	4–7 oz	14 oz	12	Head and stem brassicas: 3 Leafy brassica greens: 7	Toxic to bees. Reapplications at least 7 days apart.
	4D	Sivanto Prime (flupyradifurone)	7–14 fl oz	28 fl oz	4	1	No more than 3 crop seasons per year.
	7C	Knack (pyriproxyfen)	8–10 fl oz	20 fl oz per year	12	7	Immatures only. Apply when nymphs first appear. No more than 2 applications per year. Reapplications at least 14 days apart.
	9B	Fulfill (pymetrozine)	2.75 oz	5.5 oz	12	7	Apply when aphids first appear. Reapplications at least 7 days apart. No more than 2 applications per crop.
	9B	PQZ (pyrifluquinazon)	Soil only: 2.4 to 3.2 fl oz	9.6 fl oz	12	7	Reapplications at least 7 days apart.
	15	Rimon 0.83 EC (novaluron)	12 fl oz	Head and stem brassicas: 24 fl oz/A per year Leafy brassicas, turnip greens: 36 fl oz/A per year	12	7	No more than 2 applications for thrips or whiteflies. Not for turnip root or for livestock.

Insect	MOA Code ¹	Trade Name (Active Ingredient)	Max Rate/Acre		REI (Hours)	Days to Harvest	Remarks ³
			Appl.	Season ²			
	16	Courier SC (buprofezin)	9.0–13.6 fl oz	27.2 fl oz	12	1	Immatures only. No more than 2 applications per crop cycle or 4 applications per year.
	23	Movento (spirotetramat)	4–5 fl oz	10 fl oz	24	1	Only use a spreading-penetrating adjuvant known to be safe for the target crop. Reapplications at least 7 days apart.
	23	Oberon 2 SC (spiromesifen)	7.0–8.5 fl oz	25.5 fl oz	12	7	No more than 3 applications. Not for turnip greens.
	28	Exirel (cyantraniliprole)	13.5–20.5 fl oz	0.4 lb a.i.	12	1	Reapplications at least 5 days apart.
	28	Verimark (cyantraniliprole)	6.75–13.5 fl oz	0.4 lb a.i. of cyazypyr- or cyantraniliprole-containing products per year	4	Soil at planting: N/A Drip chemigation: 1	No more than 13.5 fl oz at planting. The pH should be 4–6. Drip chemigations at least 10 days apart.
	29	Beleaf 50 SG (flonicamid)	2.8 oz	8.4 oz per year	12	0	Suppression only. Reapplications at least 7 days apart.
Wireworms	1B	*Diazinon AG-500 *50 W (diazinon)	AG500 preplant: 3–4 qt 50W: 6–8 lb	AG500: 4 qt per year 50W: 8 lb per year	96	Preplant	No more than 1 soil application. Broccoli, cabbage, cauliflower, collard, kale, mustard greens. Preplant soil application and top 4–8 in. of soil.
	1B	Lorsban 75WG (chlorpyrifos)	Foliar: 0.67–1.33 lb Preplant soil: 2.66 lb for cauliflower, 3 lb for all others At plant or post planting: 0.8–2.15 oz/1000 row ft	See label for crop and application method specifics.	24 Cauliflower: 72	Foliar: 21 Pre- or at planting: 30	No more than 3 applications of products containing chlorpyrifos. Will not control organophosphate-resistant diamondback moth. Preplant: Incorporate preplant applications 2–4 in. deep.

Insect	MOA Code ¹	Trade Name (Active Ingredient)	Max Rate/Acre		REI (Hours)	Days to Harvest	Remarks ³
			Appl.	Season ²			
	3A	*Brigade 2 EC (bifenthrin)	2.1–6.4 fl oz	Head and stem brassicas, turnip roots: 32 fl oz Leafy brassicas: 25.6 fl oz	12	7	Wireworm adults. Reapplications at least 7 days apart.
	3A	*Capture LFR (bifenthrin)	At planting: 3.4–6.8 fl oz	0.1 lb a.i. per year	12	At planting	For mixing directly with liquid fertilizer to control soil insect pests.

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 the same active ingredient or similar mode of action. This information must be considered for the insecticide resistance management decisions. U = unknown, or a mode of action that has not been classified yet

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.

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

*Restricted use insecticide.

Table 10. Cole crop fungicides ordered by disease and FRAC group according to mode of action. Cole crops include head and stem crops (broccoli, brussels sprout, cauliflower, Chinese broccoli, and Chinese cabbage); leafy crops (collards, kale, mustard, and turnip); and watercress. **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: Nicholas S. Dufault, UF/IFAS Department of Plant Pathology, Gainesville.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ³
			Appl.	Season ²	Harvest	Reentry	
Alternaria blight (<i>Alternaria</i> spp.)	3 + 11	Quadris Top (azoxystrobin + difenoconazole)	14 fl oz	56 fl oz	1	0.5	No more than 1 sequential application.
	7	Endura (boscalid)	9 oz	18 oz	Head and stem: 0 Leafy: 14	0.5	Not labeled for watercress. No more than 2 applications per crop.
	7 + 12	Miravis Prime (pydiflumetofen + fludioxonil)	11.4 fl oz	34.2 fl oz	7	0.5	No more than 2 aerial applications in a year.
	9 + 12	Switch 62.5WG (cyprodinil + fludioxonil)	14 oz	56 oz	7	0.5	Can be applied as a preplant and surface application. Do not use in greenhouse crops or field-grown vegetable bedding plants.
Alternaria leaf spot (<i>Alternaria</i> spp.)	M1	(copper compounds) Many brands available: AmeriCop 40 DF, Badge SC, Badge X2, Basic Copper 53, Champ DP Dry Prill, Champ Formula 2 FL, Champion++, Champ WG, Copper-Count-N, Cueva, Cuprofix Ultra 40 Disperss, Cuproxat, Kentan DF, Kocide 2000, Kocide 3000, Kocide DF, Kop-Hydroxide, MasterCop, Nordox, Nordox 75WG, Nu-Cop 30 HB, Nu-Cop 3L, Nu-Cop 50DF, Nu-Cop 50 WP, Nu-Cop HB, Nu-Cop XLR, Previsto	See individual labels	See individual labels	1	Varies by product from 4 hr to 2 days	Mancozeb or maneb enhances bactericidal effect of fix copper compounds. Some reddening on older broccoli leaves at higher rates and flecking on wrapper leaves of cabbage may occur.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ³
			Appl.	Season ²	Harvest	Reentry	
	M5	(chlorothalonil) Many brands available: Bravo Ultrex, Bravo Weather Stik, Bravo ZN, Choloronil 720, Chlorothalonil 720SC, Echo 720, Echo 90 DF, Echo Zn, Equus 500 ZN, Equus 720 SST, Equus DF, Initiate 720, Initiate ZN, Praiz	See individual labels	See individual labels	7	1–2	See individual labels for crop subgrouping.
	2	Iprodione 4L AG Rovral 4F Enclosure 4 Nevado 4F (iprodione)	1 pt	4 pt	10	–	Only labeled for Chinese mustard. No more than 4 applications for mustard.
	3	Monsoon Orius 3.6F TebuStar 3.6L Tebuzol 3.6F Toledo 3.6F (tebuconazole)	4 fl oz	16 fl oz	7	0.5	Not labeled for watercress or head and stem cole crops. Apply prior to infection when environmental conditions are favorable.
	3	Procure 480 SC (triflumizole)	8 fl oz	18 fl oz	1	0.5	Not labeled for watercress or head and stem cole crops. Apply prior to infection and repeat sprays at a 14-day interval.
	3	Rhyme 2.08SC (flutriafol)	7 fl oz	–	7	0.5	Use of silicone- or oil-based additives may result in negative crop response. In situations where an adjuvant is necessary, use of a nonionic surfactant is recommended.
	7	Endura (boscalid)	9 oz	18 oz	Head and stem: 0 Leafy: 14	0.5	Not labeled for watercress. No more than 2 applications per crop.
	7	Fontelis 1.67SC (penthiopyrad)	30 fl oz	72 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	
	7 + 11	Luna Sensation 500 SC (fluopyram + trifloxystrobin)	7.6 fl oz	15.6 fl oz	0	0.5	No more than 2 sequential applications.
	7 + 12	Miravis Prime (pydiflumetofen + fludioxonil)	11.4 fl oz	34.2 fl oz	7	0.5	No more than 2 aerial applications per year.
	9 + 3	Inspire Super 2.82 SC (cyprodinil + difenoconazole)	20 fl oz	80 fl oz	7	0.5	Begin applications prior to disease development and continue on a 7- to 10-day interval. No more than 2 sequential applications before rotating to another effective fungicide with a different mode of action.
	9 + 12	Switch 62.5WG (cyprodinil + fludioxonil)	14 oz	56 oz	7	0.5	No more than 2 sequential applications before rotating to a different mode of action for at least 2 applications; 30-day plant-back for off-label crops.
	11	Cabrio EG (pyraclostrobin)	16 oz	64 oz	Head and stem: 0 Leafy: 3	4 hr	No more than 2 sequential applications per stem and head crop.
	11	Quadris Equation Satori (azoxystrobin)	15.5 fl oz	92.3 fl oz	0	4 hr	No more than 2 sequential applications. Different seasonal application limits for head and stem brassicas versus leafy green brassicas.
	11	Reason 500 SC (fenamidone)	8.2 fl oz	24.6 fl oz	2	0.5	No more than 1 sequential application.
	11 + 3	Quadris Top (azoxystrobin + difenoconazole)	14 fl oz	56 fl oz	1	0.5	No more than 1 sequential application. No more than 4 applications per season.
	11 + 3	Quilt (azoxystrobin + propiconazole)	14 fl oz	42 fl oz	7	0.5	–
	11 + 7	Priaxor (pyraclostrobin + fluxapyroxad)	8.2 fl oz	24.6 fl oz	3	0.5	No more than 2 sequential applications. No more the 3 applications in a season.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ³
			Appl.	Season ²	Harvest	Reentry	
	29	Omega 500F (fluazinam)	15.25 fl oz	See label	See label	0.5	The REI is 2 days for workers conducting handset irrigation activities.
	49 + M5	Orondis Opti (oxathiapiprolin + chlorothalonil)	40 fl oz	160 fl oz	7	0.5	No more than 2 sequential applications. No more than 4 applications per year.
Anthracnose (<i>Colletotrichum</i> spp.)	9 + 3	Inspire Super (cyprodinil + difenoconazole)	20 fl oz	80 fl oz	7	0.5	Begin applications prior to disease development and continue on a 7- to 10-day interval. No more than 2 sequential applications before rotating to another effective fungicide with a different mode of action.
	11	Cabrio EG (pyraclostrobin)	16 oz	64 oz	Head and stem: 0 Leafy: 3	4 hr	No more than 2 sequential applications per stem and head crop.
	11 + 3	Quadris Top (azoxystrobin + difenoconazole)	14 fl oz	56 fl oz	1	0.5	No more than 1 sequential application.
	11 + 3	Quilt (azoxystrobin + propiconazole)	14 fl oz	42 fl oz	7	0.5	–
	11 + 7	Priaxor (pyraclostrobin + fluxapyroxad)	8.2 fl oz	24.6 fl oz	3	0.5	No more than 2 sequential applications. No more than 3 applications in a season.
Black leg (<i>Leptosphaeria maculans</i>)	2	Iprodione 4L AG Rovral 4F Enclosure 4 Nevado 4F (iprodione)	2 pt	4 pt	0	–	Only labeled for broccoli. No more than 2 applications for broccoli.
	11	Cabrio EG (pyraclostrobin)	16 oz	64 oz	Head and stem: 0	4 hr	No more than 2 sequential applications per stem and head crop.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ³
			Appl.	Season ²	Harvest	Reentry	
	11 + 7	Priaxor (pyraclostrobin + fluxapyroxad)	8.2 fl oz	24.6 fl oz	3	12 hr	No more than 2 sequential applications. No more than 3 applications in a season. Do not apply to turnip greens or roots.
Black rot (<i>Xanthomonas campestris</i>)	M1	(copper compounds) Many brands available.	See individual labels	See individual labels	1	Varies by product from 4 hr to 2 days	Mancozeb or maneb enhances bactericidal effect of fixed copper compounds.
	P	Actigard 50 WG (acibenzolar-S-methyl)	1 oz	4 oz	7	0.5	Apply preventatively. No more than 4 applications at 1 oz rate per year. Reapplications at least 7 days apart. Suppression only.
Cercospora leaf spot (<i>Cercospora brassicola</i>)	3	Monsoon Orius 3.6F TebuStar 3.6L Tebuzol 3.6F Toledo 3.6F (tebuconazole)	4 fl oz	16 fl oz	7	0.5	Not labeled for watercress or head and stem cole crops. Apply prior to infection when environmental conditions are favorable.
	3	Rhyme 2.08SC (flutriafol)	7 fl oz	–	7	0.5	Use of silicone- or oil-based additives may result in negative crop response. In situations where an adjuvant is necessary, use of a nonionic surfactant is recommended.
	3	Tilt (propiconazole)	4 fl oz	12 fl oz	7	0.5	–
	7 + 11	Luna Sensation 500 SC (fluopyram + trifloxystrobin)	7.6 fl oz	15.6 fl oz	0	0.5	No more than 2 sequential applications.
	7 + 12	Miravis Prime (pydiflumetofen + fludioxonil)	11.4 fl oz	34.2 fl oz	7	0.5	No more than 2 aerial applications in a year.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ³
			Appl.	Season ²	Harvest	Reentry	
	9 + 3	Inspire Super (cyprodinil + difenoconazole)	20 fl oz	80 fl oz	7	0.5	Begin applications prior to disease development and continue on a 7- to 10- day interval. No more than 2 sequential applications before rotating to another effective fungicide with a different mode of action.
	9 + 12	Switch 62.5WG (cyprodinil + fludioxonil)	14 oz	56 oz	7	0.5	Can be applied as a preplant and surface application. Do not use in greenhouse crops or field-grown vegetable bedding plants. Suppression only.
	11	Cabrio EG (pyraclostrobin)	16 oz	64 oz	Head and stem: 0 Leafy: 3	4 hr	No more than 2 sequential applications per stem and head crop.
	11	Quadris Equation SC Satori (azoxystrobin)	15.5 fl oz	46 fl oz	0	4 hr	Labeled for leafy brassica. No more than 2 sequential applications.
	11	Reason 500SC (fenamidone)	8.2 oz	24.6 fl oz	2	0.5	No more than 1 sequential application. Suppression only.
	11 + 3	Quadris Top (azoxystrobin + difenoconazole)	14 fl oz	56 fl oz	1	0.5	No more than 1 sequential application.
	11 + 3	Quilt (azoxystrobin + propiconazole)	14 fl oz	42 fl oz	7	0.5	–
	11 + 3	Topguard EQ (azoxystrobin + flutriafol)	8 fl oz	–	7	0.5	Use of silicone- or oil-based additives may result in negative crop response. In situations where an adjuvant is necessary, use of a nonionic surfactant is recommended.
	11 + 7	Priaxor (pyraclostrobin + fluxapyroxad)	8.2 fl oz	24.6 fl oz	3	0.5	No more than 2 sequential applications. No more than 3 applications in a season.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ³
			Appl.	Season ²	Harvest	Reentry	
Club root (<i>Plasmodiophora brassicae</i>)	21	Ranman (cyazofamid)	SEE LABEL	SEE LABEL	–	0.5	Applied as a transplant soil drench.
	29	Omega 500F (fluazinam)	Soil: 41.6 fl oz Transplant drench: 6.45 fl oz/100 gal	3.85 pt	Leafy: 20 Head and stem: 50	2	Not labeled for watercress. Treated turnip roots are not fit for human or livestock consumption.
Downy mildew (<i>Peronospora parasitica</i>)	M1	(copper compounds) Many brands available: AmeriCop 40 DF, Badge SC, Badge X2, Basic Copper 53, Champ DP Dry Prill, Champ Formula 2 FL, Champion++, Champ WG, Copper-Count-N, Cueva, Cuprofix Ultra 40 Disperss, Cuproxat, Kentan DF, Kocide 2000, Kocide 3000, Kocide DF, Kop-Hydroxide, MasterCop, Nordox, Nordox 75WG, Nu-Cop 30 HB, Nu-Cop 3L, Nu-Cop 50DF, Nu-Cop 50 WP, Nu-Cop HB, Nu-Cop XLR, Previsto	See individual labels	See individual labels	1	Varies by product from 4 hr to 2 days	Mancozeb or maneb enhances bactericidal effect of fix copper compounds.
	M3	(mancozeb) Many brands available: Dithane F45 Rainshield, Dithane M45, Fortuna 75WDG, Koverall, Manzate Max, Manzate Pro-Stick, Penncozeb 75DF, Penncozeb 80WP, Protect DF, Roper DF Rainshield	See individual labels	See individual labels	10	1	Not labeled for collards, mustard, turnip, or watercress. See labels for restrictions and details.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ³
			Appl.	Season ²	Harvest	Reentry	
	M5	(chlorothalonil) Many brands available: Bravo Ultrex, Bravo Weather Stik, Bravo ZN, Choloronil 720, Chlorothalonil 720SC, Echo 720, Echo 90 DF, Echo Zn, Equus 500 ZN, Equus 720 SST, Equus DF, Initiate 720, Initiate ZN, Praiz	See individual labels	See individual labels	7	2	Not labeled for leafy cole crops or watercress.
	4	Ridomil Gold SL (mefenoxam)	Foliar: 0.25 pt	Foliar: 1 pt	7	2	Not labeled for watercress. Use only in a tank mix with another effective fungicide (non-FRAC code 4).
	4 + M5	Ridomil Gold Bravo Ridomil Gold Bravo SC (mefenoxam + chlorothalonil)	1.5 lb	See label	7	2	Not labeled for leafy cole crops or watercress. No more than 4 applications per crop.
	11	Cabrio EG (pyraclostrobin)	16 oz	64 oz	Head and stem: 0 Leafy: 3	4 hr	No more than 2 sequential applications per stem and head crop.
	11	Quadris Equation SC Satori (azoxystrobin)	15.5 fl oz	92.3 fl oz	0	4 hr	Labeled for head and stem brassicas. No more than 2 sequential applications.
	11	Reason 500SC (fenamidone)	8.2 oz	24.6 oz	2	0.5	No more than 1 sequential application.
	21	Actigard 50 WG (acibenzolar-S-methyl)	1 oz	4 oz	7	0.5	Apply preventatively. No more than 4 applications per crop on a 7-day schedule. Suppression only.
	21	Ranman (cyazofamid)	2.75 fl oz	39.5 fl oz	0	0.5	This product can be applied as a transplant soil drench. No more than 6 applications.
	29	Omega 500F (fluazinam)	15.25 fl oz	See label	See label	0.5	The REI is 2 days for workers conducting handset irrigation activities.
	33	Aliette (aluminum tris)	5 lb	–	3	–	No more than 7 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	
	40	Acrobat (dimethomorph)	6.4 oz	32 oz	0	0.5	Not labeled for head and stem cole crops. No more than 5 applications per season. See supplemental label for restrictions and details.
	40	Forum (dimethomorph)	6 oz	30 oz	0	0.5	Not labeled for turnip or watercress. No more than 5 applications per season.
	40	Revus (mandipropamid)	8 fl oz	32 fl oz	1	0.5	Not labeled for turnip or watercress. No more than 2 sequential applications or 4 total applications.
	43	Presidio (fluopicolide)	4 fl oz	16 fl oz	2	0.5	Not labeled for watercress. No more than 2 sequential applications or 4 total applications per season.
	45 + 40	Zapro (ametoctradin + dimthomorph)	14 fl oz	42 fl oz	0	0.5	No more than 2 sequential applications.
	49 + M5	Orondis Opti (oxathiapiprolin + chlorothalonil)	40 fl oz	160 fl oz	7	0.5	No more than 2 sequential applications. No more than 4 applications per year.
	49 + 40	Orondis Ultra (oxathiapiprolin + mandipropamid)	8 fl oz	32 fl oz	1	4 hr	No more than 2 sequential applications. No more than 4 applications per year.
Fusarium soilborne diseases (<i>Fusarium</i> spp.)	12	Maxim 4FS (fludioxonil)	0.08–0.16 fl oz/ 100 lb of seed	See label	–	0.5	Seed treatment only; not labeled for turnip or watercress.
Gray mold (<i>Botrytis cinerea</i>)	7	Endura (boscalid)	9 oz	18 oz	Head and stem: 0 Leafy: 14	0.5	Not labeled for watercress. No more than 2 applications per crop.
	7	Fontelis 1.67 SC (penthiopyrad)	30 fl oz	72 fl oz	0	0.5	No more than 2 sequential applications.
	7+11	Luna Sensation 500 SC (fluopyram + trifloxystrobin)	7.6 fl oz	15.6 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	
	9 + 3	Inspire Super (cyprodinil + difenoconazole)	20 fl oz	80 fl oz	7	0.5	Begin applications prior to disease development. No more than 2 sequential applications before rotating to another effective fungicide with a different mode of action.
Powdery mildew (<i>Erysiphe cruciferarum</i> [syn. <i>Erysiphe polygoni</i>])	M2	(sulfur) Many brands available: Cosavet DF, Cosavet DF Edge, Crusade DF, Kumulus DF, Microfine Sulfure, Micro Sulf, Microthiol Disperss, Suffa, Sulfur 90W, Thiolux	See individual labels	See individual labels	0	–	Products are available for most cole crops; see labels for restrictions and details.
	3	Monsoon Orius 3.6F TebuStar 3.6L Tebuzol 3.6F Toledo 3.6F (tebuconazole)	4 fl oz	16 fl oz	7	0.5	Not labeled for watercress or head and stem (tebuconazole) cole crops. Apply prior to infection when environmental conditions are favorable.
	3	Procure 480 SC (triflumizole)	8 fl oz	18 fl oz	Leafy: 0	0.5	Not labeled for watercress or head and stem brassicas. See label for restrictions and details.
	3	Rhyme 2.08SC (flutriafol)	7 fl oz	–	7	0.5	Use of silicone- or oil-based additives may result in negative crop response. In situations where an adjuvant is necessary, use of a nonionic surfactant is recommended.
	3	Tilt (propiconazole)	4 fl oz	12 fl oz	7	0.5	–
	7	Endura (boscalid)	9 oz	18 oz	Head and stem: 0 Leafy: 14	0.5	No more than 2 applications per crop. Suppression only.
	7	Fontelis 1.67 SC (penthiopyrad)	30 fl oz	72 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	
	7 + 11	Luna Sensation 500 SC (fluopyram + trifloxystrobin)	7.6 fl oz	15.6 fl oz	0	0.5	No more than 2 sequential applications.
	7 + 12	Miravis Prime (pydiflumetofen + fludioxonil)	11.4 fl oz	34.2 fl oz	7	0.5	No more than 2 aerial applications in a year.
	9 + 3	Inspire Super (cyprodinil + difenoconazole)	20 fl oz	80 fl oz	7	0.5	Begin applications prior to disease development and continue on a 7- to 10-day interval. No more than 2 sequential applications before rotating to another effective fungicide with a different mode of action.
	9 + 12	Switch 62.5WG (cyprodinil + fludioxonil)	14 oz	56 oz	7	0.5	No more than 2 sequential applications before rotating to a different mode of action for at least 2 applications; 30-day plant-back for off-label crops.
	11	Cabrio EG (pyraclostrobin)	16 oz	64 oz	Head and stem: 0 Leafy: 3	4 hr	No more than 2 sequential applications per stem and head crop.
	11 + 3	Quadris Top (azoxystrobin + difenoconazole)	14 fl oz	56 fl oz	1	0.5	No more than 1 sequential application.
	11 + 3	Quilt (azoxystrobin + propiconazole)	14 fl oz	42 fl oz	7	0.5	–
	11 + 3	Topguard EQ (azoxystrobin + flutriafol)	8 fl oz	–	7	0.5	Use of silicone- or oil-based additives may result in negative crop response. In situations where an adjuvant is necessary, use of a nonionic surfactant is recommended.
	11 + 7	Priaxor (pyraclostrobin + fluxapyroxad)	8.2 fl oz	24.6 fl oz	3	0.5	No more than 2 sequential applications. No more than 3 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	
Pythium and phytophthora diseases (soil)	4	Apron XL (mefenoxam)	See label	See label	–	2	Seed treatment only; not labeled for watercress. See label for details.
	4	Ridomil Gold SL (mefenoxam)	2 pt (soil)	2 pt (soil)	7	2	Not labeled for watercress; use only in a tank mix with another effective fungicide (non-FRAC code 4).
	4	Ultra Flourish (mefenoxam)	4 pt	4 pt	–	2	Soil applied as a preplant treatment or following transplanting.
Pythium damping-off (<i>Pythium</i> spp.)	4	Allegiance-FL (metalaxyl)	See label	See label	–	2	Seed treatment only. Primarily for commercial seed treatment.
	4	MetaStar 2E AG (metalaxyl)	See label	See label	–	2	Can be applied as a preplant and surface application. Do not use in greenhouse crops or field-grown vegetable bedding plants.
	4 + 11	Uniform (mefenoxam + azoxystrobin)	0.34 fl oz/100 row ft	1.0 lb a.i.	–	–	No more than 1 application per season.
	43	Presidio (fluopicolide)	4 fl oz	16 fl oz	2	–	Not labeled for watercress. No more than 2 sequential applications or 4 total applications per season.
Phytophthora spp.	4	MetaStar 2E AG (Metalaxyl)	See label	See label	–	2	Can be applied as a preplant and surface application. Do not use in greenhouse crops or field-grown vegetable bedding plants.
	43	Presidio (fluopicolide)	4 fl oz	16 fl oz	2	–	Not labeled for watercress. No more than 2 sequential applications or 4 total applications per season.
Rhizoctonia rot and blight (syn: Wirestem) (<i>Rhizoctonia solani</i>)	4 + 11	Uniform (mefenoxam + azoxystrobin)	0.34 fl oz/100 row ft	1.0 lb a.i.	–	–	Not labeled for leafy cole crops or watercress.
	7	Endura (boscalid)	9 oz	18 oz	Head and stem: 0 Leafy: 14	0.5	No more than 2 applications per crop. Suppression only.
	7	Moncut SC (flutolanil)	26 fl oz	52 fl oz	45	0.5	No more than 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	
	11	Cabrio EG (pyraclostrobin)	16 oz	64 oz	See label	4 hr	No more than 2 sequential applications per stem and head crop. Labeled only for suppression in leaf greens.
	11	Quadris EquationSC Satori (azoxystrobin)	0.40–0.80 fl oz/ 100 row feet	46 fl oz	0	4 hr	Labeled only for soilborne control on leafy green brassicas. See label for details on soilborne applications. Dynasty seed treatment is also available; check label for more information.
	11 + 7	Priaxor (pyraclostrobin + fluxapyroxad)	8.2 fl oz	24.6 fl oz	3	0.5	No more than 1 application per season.
	12	Maxim (fludioxonil)	0.08–0.16 fl oz/ 100 lb of seed	–	–	0.5	Seed treatment only. Not labeled for turnip or watercress.
	14	Blocker 4F Terraclor 400 Terraclor 75WP Terraclor FL (PCNB)	See label	30 lb a.i.	–	0.5	Not labeled for leafy cole crops or watercress.
Ring spot (<i>Mycosphaerella brassicicola</i>)	11	Cabrio EG (pyraclostrobin)	16 oz	64 oz	0	4 hr	Not labeled for collards, kale, mustard, or watercress. No more than 2 sequential applications per stem and head crop.
	11 + 3	Quilt (azoxystrobin + propiconazole)	14 fl oz	42 fl oz	7	0.5	–
	11 + 7	Priaxor (pyraclostrobin + fluxapyroxad)	8.2 fl oz	24.6 fl oz	3	0.5	No more than 2 sequential applications. No more the 3 applications in a season.
Sclerotinia rot (<i>Sclerotinia</i> spp.)	7	Endura (boscalid)	9 oz	18 oz	Head and stem: 0 Leafy: 14	0.5	Not labeled for watercress. No more than 2 applications per crop.
	7	Fontelis 1.67 SC (penthiopyrad)	30 fl oz	72 fl oz	0	0.5	No more than 2 sequential applications.
	7 + 11	Luna Sensation 500 SC (fluopyram + trifloxystrobin)	7.6 fl oz	15.6 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	
White leaf spot (<i>Psuedocercospora capsellae</i>)	11	Cabrio EG (pyraclostrobin)	16 oz	64 oz	0	4 hr	Not labeled for collards, kale, mustard, or watercress. No more than 2 sequential applications per stem and head crop.
	11 + 7	Priaxor (pyraclostrobin + fluxapyroxad)	8.2 fl oz	24.6 fl oz	3	0.5	No more than 2 sequential applications. No more than 3 applications in a season.
White rust (<i>Albugo candida</i>)	11	Cabrio EG (pyraclostrobin)	16 oz	64 oz	Head and stem: 0 Leafy: 14	4 hr	No more than 2 sequential applications.
	11	Quadris Equation SC Satori (azoxystrobin)	15.5 fl oz	46 fl oz	0	4 hr	Not labeled for watercress. No more than 1 sequential application.
	11	Reason (fenamidone)	8.2 oz	24.6 oz	2	0.5	No more than 1 sequential application.
	11 + 3	Topguard EQ (azoxystrobin + flutriafol)	8 fl oz	–	7	0.5	Use of silicone- or oil-based additives may result in negative crop response. In situations where an adjuvant is necessary, use of a nonionic surfactant is recommended.
	11 + 7	Priaxor (pyraclostrobin + fluxapyroxad)	8.2 fl oz	24.6 fl oz	3	0.5	No more than 2 sequential applications. No more than 3 applications per season.

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 11. Nonfumigant nematicides for crucifer/cole crops in Florida. Contact: Johan Desaegeer, UF/IFAS Gulf Coast Research and Education Center.

Product	Application Directions
Mocap 15G (a.i. ethoprop)	Apply 13 lb/A (36 in. row spacing) or 0.9 lb/1,000 linear row ft in a band of 15 in. wide on the row at-planting. Mix with the top 2–4 in. of soil with mechanical equipment right after application. If broadcast, apply 34 lb/A from 1 week before planting to at planting time and mix with 2–4 in. of soil. <i>Do not</i> use as a seed furrow treatment or allow granules to contact the seed. No more than 1 application per season.
Mocap EC (a.i. ethoprop)	Apply in 12 to 15 in. band on the row and incorporate 2–4 in. deep immediately following treatment. Do not use as a seed furrow treatment or allow spray to contact the seed because phytotoxicity may occur.
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 30 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.
Velum (a.i. fluopyram)	Apply max 6.84 fl oz/A using only chemigation into root-zone through low-pressure drip, trickle, microsprinkler, or equivalent equipment. Soil reapplications at least 5 days apart. No more than 13.7 fl oz/A of Velum (0.446 lb/A fluopyram) per year, regardless of formulation (Velum and/or Luna) or method of application (soil or foliar). For soil application, to limit the potential for development of disease resistance to this chemical class, the first foliar fungicide application after Velum should be a product from a different FRAC group.
Biological nematicides	See chapter 19.
Mocap is an insecticide/nematicide; Velum is a fungicide/nematicide; Nimitz is a true nematicide. Unlike fumigants, these products are not volatile and will move through the soil via water. Depending on the water solubility, these products will have different recommendations for how to best apply them (see specific label recommendations). When nematode pressure is high, they may not be as consistently effective against root nematodes as the fumigants.	

Table 12. Fumigant nematicides for crucifer/cole crops 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 proportionately reduced 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 product label details for additional use restrictions based on soil characteristics, buffer zones, requirements for personal protective equipment (PPE), mandatory good agricultural practices (GAPs), product and applicator training certification, and other rate-modifying recommendations.

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

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

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The use of trade names in this publication is solely for the purpose of providing specific information. UF/IFAS does not guarantee or warranty the products named, and references to them in this publication do not signify our approval to the exclusion of other products of suitable composition.

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

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