

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.

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Table 1. Planting dates for cole crops.

Planting Region	Broccoli	Brussels Sprouts	Cabbage ¹	Cauliflower ¹	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 Sprouts	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

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, brussel sprout, cauliflower, collard, 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 in Florida](#).”

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-inch-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 choy
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/lo 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 & stem and leafy brassica	Annual broadleaf and grass weeds. Fair to poor control of lambsquarter, purslane, and some amaranth. Mechanically incorporate 1–2 inches or irrigate 2–4 inches deep within 36 hr.
	Carfentrazone up to 0.031	(Aim) 2 EC up to 2 fl oz	14	Head & 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 sprouts, 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 & 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 sprouts, 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 acenitanilide 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.
	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.

	Active Ingredient lb a.i./Acre	Trade Name Product/Acre	MOA Code	Crops	Weeds Controlled/Remarks
	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 & 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 & 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 sprouts, cabbage, cauliflower	Annual broadleaf and grass weeds. Incorporate or irrigate 4 inches 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 & steam and leafy brassica	Emerged broadleaf weeds. Apply with a hooded sprayer to row middles. No more than 4.1 fl oz/A in season as a row-middle application. PHI 0 days.
	Clethodim 0.07–0.12	(Select Max) 1 EC 9–16 fl oz	1	Head & steam and leafy brassica	Emerged grass weeds. Include crop oil concentrate at 1% v/v in finished spray volume. Head & 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 & steam and leafy brassica	Broadleaf and grass weeds. Use a hooded sprayer and direct to row middles only.
	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 spectrum of weed control.

	Active Ingredient lb a.i./Acre	Trade Name Product/Acre	MOA Code	Crops	Weeds Controlled/Remarks
	Pendimethalin 0.48–0.71	(Prowl H20) 3.8 1.0–1.5 pt	3	Broccoli, brussels sprouts, 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 & stem brassica.
	Sethoxydim 0.28	(Poast) 1.5 EC 1.5 pt	1	Broccoli (including Chinese and raab), brussels sprouts, cabbage (bok choy, Chinese mustard, napa), cauliflower, collards, kale, kohlraabi, 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 pests of cole crops. Contact: De-Fen Mou, UF/IFAS Everglades Research and Education Center.

Insect	MOA Code ¹	Trade Name (Active Ingredient)	Rate Product/Acre	REI (Hours)	Days to Harvest	Remarks ²
Aphids	1B	*Dibrom 8 EC (naled)	1 pt	48	1	No more than 10 pt/A per season. Broccoli, cabbage, cauliflower, brussels sprouts, kale, and collards.
	1B	Dimethoate 4 EC (dimethoate)	Broccoli, cauliflower: 0.5–1 pt Kale, mustard greens, turnip: 0.5 pt	48	Broccoli, cauliflower: 7 Kale, mustard greens, turnip: 14	Highly toxic to bees. Broccoli, cauliflower, kale, turnip greens and roots, and mustard greens only.
	1B	Malathion 5EC, 8F (malathion)	5EC: 1–2 pt Collards, kale, mustard greens: 1.6 pt 8F: 1.25 pt Collards, kale, mustard greens: 1 pt	48 Collards, kale, and mustard greens: 12	Head and stem brassica except cabbage: 2 Greens and cabbage: 7	See label for limitations on number of applications per season—varies by crop.
	1B	*MSR Spray Concentrate (oxydemeton-methyl)	1.5–2 pt	7 days	7	Broccoli, broccolini, broccoflower, cabbage, cauliflower only
	3A	*Ambush 25W3 (and generics)	3.2–6.4 oz Cabbage and Chinese cabbage only: 3.2–12.8 oz	12	1	No more than 51.2 oz/A. Head and stem brassica crops only.
	3A	*Brigade 2 EC (bifenthrin)	2.1–6.4 fl oz	12	7	No more than 0.4 lb a.i./A for leafy or 0.5 lb a.i./A for head and stem.
	3A	*Mustang (zeta-cypermethrin)	2.4–4.3 fl oz	12	1	No applications less than 7 days apart.
	3A	Pyganic 5.0 (pyrethrins)	4.5–18 oz	12	0	Harmful to bees. Can be used in greenhouses. OMRI-listed. ²
	3A + 28	*Besiege (lambda-cyhalothrin + chlorantraniliprole)	5–9 fl oz	24	3	Highly toxic to bees exposed to direct treatment or residues on blooming crops. Head and stem brassica only.
	4A	Actara (thiamethoxam)	1.5–5.5 oz	12	Head and stem: 0 Leafy: 7	Foliar application. 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	12	Soil: 21 Foliar: 7	Most effective as a soil application. No more than 10.5 fl oz/A per crop season as a soil application or 6.5 fl oz as foliar applications. Do not apply to both soil and foliage.

Insect	MOA Code ¹	Trade Name (Active Ingredient)	Rate Product/Acre	REI (Hours)	Days to Harvest	Remarks ²
	4A	Assail 30SG (acetamiprid)	Head and stem cole crops: 2.0–4.0 oz Leafy cole crops and turnip greens: 2.0–5.3 oz	12	Head and stem: 7 Leafy cole crops and turnip greens: 3	Susceptibility may vary with aphid species. No more than 5 applications for head and stem cole crops or 4 times per season for leafy cole crops. Reapplications at least 7 days apart. Turnip roots cannot be used for food/feed.
	4A	Belay Insecticide Belay 50 WDG (clothianidin)	Insecticide: Soil: 9–12 fl oz Foliar: 3–4 fl oz 50 WDG: Soil: 4.8–6.4 oz Foliar: 1.6–2.1 oz	12	Insecticide: Soil: apply at planting Foliar: 7 50 WDG: 7	Insecticide: Soil: No more than 6.4 oz/A per season. Foliar: No more than 6.4 oz/A per season. Do not use an adjuvant. Toxic to bees. 50 WDG: Includes turnip greens. No more than 0.2 lb a.i./A regardless of application method (or a total of 12 fl oz of this formulation).
	4A	Platinum Platinum 75SG (thiamethoxam)	Platinum: 5.0–11 fl oz Platinum 75SG: 1.66–3.67 oz	12	30	Soil application.
	4A	Venom Insecticide Scorpion 35SL Insecticide (dinotefuran)	Soil and foliar rates differ; check label.	12	Foliar: 1 Soil: 21	Use 1 application method, not both (soil or foliar). For head and stem brassica only. Foliar: No more than 0.268 lb a.i./A.
	4A + 28	Durivo (thiamethoxam + chlorantraniliprole)	10–13 fl oz	12	30	Soil application. May be applied via one of several different applications methods. No more than 1 application per season within 28 days of plant emergence or transplanting.
	4A + 28	Voliam Flexi (thiamethoxam + chlorantraniliprole)	4–7 oz	12	Head and stem: 3 Leafy brassica greens: 7	Foliar application. Highly toxic to bees exposed to direct treatment or residues on blooming crops.
	4D	Sivanto Prime (flupyradifurone)	7–14 fl oz	4	1	Soil or foliar application. No more than 28 fl oz/A per crop season. No more than 3 crop season per year.
	9B	Fulfill (pymetrozine)	2.75 oz	12	7	Apply when aphids first appear. No more than 2 applications per crop.
	9B	PQZ (pyrifluquinazon)	Soil only: 2.4 to 3.2 fl oz	12	7	Reapplications at least 7 days apart. No more than 9.6 fl oz per season.

Insect	MOA Code ¹	Trade Name (Active Ingredient)	Rate Product/Acre	REI (Hours)	Days to Harvest	Remarks ²
	23	Movento (spirotetramat)	4–5 fl oz	24	1	No more than 10 oz/A per season. Only use a spreading-penetrating adjuvant known to be safe for the target crop.
	28	Exirel (cyazypyr)	13.5–20.5 fl oz	12	1	No more than 0.4 lb a.i./A of cyazypyr- or cyantraniliprole-containing products per crop whether applications are made to foliage or soil.
	28	Verimark (cyazypyr)	6.75–13.5 fl oz	4	N/A—applied at planting	–
	29	Beleaf 50 SG (flonicamid)	2.0–2.8 oz	12	0	No more than 8.4 oz/A per season. Begin applications before pests reach damaging levels.
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	48	Cabbage: 1 Broccoli and cauliflower: 3 Others: 10	No more than 10 applications per crop (8 for collards, kale, 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	12	3 or 14, depending on specific crop	No more than 7.5 lb/A of 80S or 6 qt of 4F or Plus per 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, collard, kale, mustard greens. See label for depth to incorporate.
	1B	*Dibrom 8 EC (naled)	1 pt	48	1	No more than 1 pt/A in Florida. No more than 5 pt/A per season. Broccoli, cabbage, cauliflower, Brussels sprouts, kale, and collards.
	1B	Malathion 5EC, 8F (malathion)	5EC: 1–2 pt Collards, kale, mustard greens: 1.6 pt 8F: 1.25 pt Collards, kale, mustard greens: 1 pt	48 Collards, kale, and mustard greens: 12	Head and stem brassica except cabbage: 2 Greens and cabbage: 7	Limitations on number of applications per season; varies by crop.
	3A	*Ambush 25W (permethrin)	3.2–6.4 oz Cabbage and Chinese cabbage only: 3.2–12.8 oz	12	1	No more than 51.2 oz/A per season. Head and stem brassica crops only.

Insect	MOA Code ¹	Trade Name (Active Ingredient)	Rate Product/Acre	REI (Hours)	Days to Harvest	Remarks 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	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 for collards and mustard greens.
	3A	*Baythroid XL (beta-cyfluthrin)	0.8–3.2 fl oz Mustard greens: 9.6 fl oz	12	0	No more than 12.8 fl oz/A per season
	3A	*Brigade 2 EC (bifenthrin)	2.1–6.4 fl oz	12	7	No more than 0.4 lb a.i./A for leafy or 0.5 lb a.i./A for head and stem.
	3A	*Capture LFR (bifenthrin)	3.4–8.5 fl oz	12	at planting	For mixing directly with liquid fertilizer to control soil insect pests.
	3A	*Danitol (fenpropathrin)	10.67–16 fl oz	24	7	No more than 42.67 fl oz/A per season. Head and stem brassica only.
	3A	*Declare Insecticide (gamma-cyhalothrin)	0.77–1.54 fl oz	24	1	First and second instars only. Head and stem brassica only. No more than 12.3 fl oz/A per season.
	3A	*Mustang (zeta-cypermethrin)	2.4–4.3 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 5.0 (pyrethrins)	4.5–18 oz	12	0	Harmful to bees. Can be used in greenhouses. OMRI-listed. ²
	3A	*Warrior II (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.
	4A + 28	Durivo (thiamethoxam + chlorantraniliprole)	10–13 fl oz	12	30	May be applied via one of several different soil application methods. No more than 1 application per season within 28 days of plant emergence or transplanting.
	4A + 28	Voliam Flexi (thiamethoxam + chlorantraniliprole)	4–7 oz	12	Head and stem: 3 Leafy brassica greens: 7	Highly toxic to bees exposed to direct treatment or residues on blooming crops.
	5	Radiant SC (spinetoram)	5–10 fl oz	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.

Insect	MOA Code ¹	Trade Name (Active Ingredient)	Rate Product/Acre	REI (Hours)	Days to Harvest	Remarks ²
	6	*Proclaim (emamectin benzoate)	2.4–4.8 oz	12	Head and stem: 7 Leafy: 14	No more than 2 sequential applications without rotating to another product with a different mode of action. Do not apply by aircraft. Not for turnips grown for roots.
	11A	DiPel DF and other products (<i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i>)	0.5–2.0 lb	4	0	Treat when larvae are young. See label for rates for specific pests. Good coverage is essential. OMRI-listed. ² Can be used in greenhouses.
	11A	Xentari DF and other products (<i>Bacillus thuringiensis</i> subspecies <i>aizawai</i>)	0.5–2.0 lb	4	0	Treat when larvae are young. Thorough coverage is essential. May be used in the greenhouse. For organic production.
	15	Rimon 0.83 EC (novaluron)	6–12 fl oz	12	7	No more than 3 applications or 24 fl oz/A per season. No more than 2 applications for thrips or whiteflies. Head and stem brassica only.
	18	Intrepid 2F (methoxyfenozide)	4–10 fl oz, depending on pest.	4	1	No more than 64 oz/A per season.
	22	Avaunt 30 WG (indoxacarb)	2.5–3.5 oz	12	3	No more than 14 oz/A per crop. Add a wetting agent to improve coverage. Do not use in greenhouse or in crops grown for transplant.
	22	Avaunt eVo (indoxacarb)	2.5–3.5 oz	12	3	No more than 4 applications per year.
	28	Coragen (rynaxypyr)	3.5–7.5 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 (cyazypyr)	13.5–20.5 fl oz	12	1	No more than 0.4 lb a.i./A of cyazypyr- or cyantraniliprole-containing products per crop whether applications are made to foliage or soil. See label for diamondback moth resistance management.

Insect	MOA Code ¹	Trade Name (Active Ingredient)	Rate Product/ Acre	REI (Hours)	Days to Harvest	Remarks ²
Fire ants	3A	Pyganic 5.0 (pyrethrins)	4.5–18 oz	12	0	Harmful to bees. Can be used in greenhouses. OMRI-listed. ²
	7A	Extinguish (S-methoprene)	1.0–1.5 lb	4	0	Slow-acting IGR (insect growth regulator). Best applied early spring and fall where crop will be grown. Colonies will be reduced after 3 weeks and eliminated after 8–10 weeks. May be applied by ground equipment or aerially.
	7C	Esteem Ant Bait (pyriproxyfen)	1.5–2.0 lb	12	1	Apply when ants are actively foraging. No more than 0.134 lb a.i./A per season.
Flea beetles	1A	Sevin 80S XLR Plus, 4F (carbaryl)	80S: 0.625–2.5 lb XLR, 4F: 0.5–2 qt	12	3 or 14, depending on specific crop.	No more than 7.5 lb/A of 80S or 6 qt of 4F or XLR Plus per crop. See label for specific crops.
	1B	*Lorsban Advanced (chlorpyrifos)	Preplant, at-plant, postplant soil application: See label. Foliar: 1–2 pt	24 Cauliflower: 72	Preplant: 30 Foliar: 21	Foliar: No more than 3 applications of products containing chlorpyrifos.
	1B	Malathion 5EC, 8F (malathion)	5EC: 1–2 pt Collards, kale, mustard greens: 1.6 pt 8F: 1.25 pt Collards, kale, mustard greens: 1 pt	48 Collards, kale, and mustard greens: 12	Head and stem brassica except cabbage: 2 Greens and cabbage: 7	–
	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	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	*Baythroid XL (beta-cyfluthrin)	0.8–3.2 fl oz	12	0	No more than 12.8 fl oz/A per crop season.
	3A	*Brigade 2 EC (bifenthrin)	2.1–6.4 fl oz	12	7	No more than 0.4 lb a.i./A for leafy or 0.5 lb a.i./A for head and stem.
	3A	*Declare Insecticide (gamma-cyhalothrin)	0.77–1.54 fl oz	24	1	First and second instars only. Head and stem brassica only. No more than 12.3 fl oz/A per season.
	3A	*Mustang (zeta-cypermethrin)	2.4–4.3 fl oz	12	1	Reapplications at least 7 days apart..
	3A	Pyganic 5.0 (pyrethrins)	4.5–18 oz	12	0	Harmful to bees. Can be used in greenhouses. OMRI-listed. ²

Insect	MOA Code ¹	Trade Name (Active Ingredient)	Rate Product/Acre	REI (Hours)	Days to Harvest	Remarks ²
	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)	5–9 fl oz	24	3	Highly toxic to bees exposed to direct treatment or residues on blooming crops. Head and stem brassica only.
	4A	Actara (thiamethoxam)	1.5–5.5 oz	12	Head and stem: 0 Leafy: 7	Do not use if other 4A insecticide has been applied.
	4A	Belay Insecticide 50 WDG (clothianidin)	Insecticide: Soil: 9–12 fl oz Foliar: 3–4 fl oz 50 WDG: Soil: 4.8–6.4 oz Foliar: 1.6–2.1 oz	12	Insecticide: Soil: apply at planting Foliar: 7 50 WDG: 7	Insecticide: Soil: No more than 6.4 oz/A per season. Foliar: No more than 6.4 oz/A per season. Do not use an adjuvant. Toxic to bees. 50 WDG: Includes turnip greens. No more than 0.2 lb a.i./A regardless of application method (or a total of 12 fl oz of this formulation).
	4A	Platinum Platinum 75SG (thiamethoxam)	5.0–11 fl oz 75G: 1.66–3.67 oz	12	30	Soil application.
	4A	Venom Scorpion Insecticide (dinotefuran)	Soil and foliar rates differ; check label.	12	Foliar: 1 Soil: 21	Use 1 application method, not both (soil or foliar). For head and stem brassica only. Foliar: No more than 0.268 lb a.i./A per season.
	4A + 28	Durivo (thiamethoxam + chlorantraniliprole)	10–13 fl oz	12	30	May be applied via one of several different soil application methods. No more than 1 application per season within 28 days of plant emergence or transplanting.
	4A + 28	Voliam Flexi (thiamethoxam + chlorantraniliprole)	4–7 oz	12	Head and stem: 3 Leafy brassica greens: 7	Highly toxic to bees exposed to direct treatment or residues on blooming crops.
	15	Rimon 0.83 EC (novaluron)	6–12 fl oz	12	7	No more than 3 applications or 24 fl oz/A per season. No more than 2 applications for thrips or whiteflies. Head and stem brassica only.
	28	Exirel (cyazypyr)	13.5–20.5 fl oz	12	1	No more than 0.4 lb a.i./A of cyazypyr- or cyantraniliprole-containing products per crop whether applications are made to foliage or soil.

Insect	MOA Code ¹	Trade Name (Active Ingredient)	Rate Product/ Acre	REI (Hours)	Days to Harvest	Remarks ²
	28	Verimark (cyazypyr)	5–13.5 fl oz	4	N/A—applied at planting	–
	U	Azatin XL (azadirachtin)	5–21 fl oz	4	0	Antifeedant, repellent, IGR.
	U	Prokil Cryolite (cryolite)	8–16 lb	12	7	For broccoli, brussels sprouts, and cauliflower only. No more than 96 lb per season or more often than every 7 days.
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	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)	2.4–4.3 fl oz	12	1	Reapplications at least 7 days apart.
	3A + 28	*Besiege (lambda-cyhalothrin + chlorantraniliprole)	5–9 fl oz	24	3	Highly toxic to bees exposed to direct treatment or residues on blooming crops. Head and stem brassica only.
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	12	3 or 14, depending on specific crop	No more than 7.5 lb/A of 80S or 6 qt of 4F or XLR Plus per crop. See label for specific crops.
	3A	*Baythroid XL (beta-cyfluthrin)	0.8–3.2 fl oz	12	0	No more than 12.8 fl oz/A per crop season.
	3A	*Brigade 2 EC (bifenthrin)	2.1–6.4 fl oz	12	7	No more than 0.4 lb a.i./A for leafy or 0.5 lb a.i./A for head and stem.
	3A	*Danitol (fenpropathrin)	10.67–16 fl oz	24	7	No more than 42.67 fl oz/A per season. Head and stem brassica only.
	3A	*Declare Insecticide (gamma-cyhalothrin)	0.77–1.54 fl oz	24	1	First and second instars only. Head and stem brassica only. No more than 12.3 fl oz/A per season.
	3A	*Mustang (zeta-cypermethrin)	2.4–4.3 fl oz	12	1	Reapplications at least 7 days apart.
	3A	Pyganic 5.0 (pyrethrins)	4.5–18 oz	12	0	Harmful to bees. Can be used in greenhouses. OMRI-listed. ²
	3A	*Warrior II (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. First and second instar only. For head and stem brassica only.

Insect	MOA Code ¹	Trade Name (Active Ingredient)	Rate Product/Acre	REI (Hours)	Days to Harvest	Remarks ²
	3A + 28	*Besiege (lambda-cyhalothrin + chlorantraniliprole)	5–9 fl oz	24	3	Highly toxic to bees exposed to direct treatment or residues on blooming crops. Head and stem brassica only.
	4A	Assail 30SG (acetamiprid)	Head and stem cole crops: 2.0–4.0 oz Leafy cole crops and turnip greens: 2.0–5.3 oz	12	Head and stem: 7 Leafy cole crops and turnip greens: 3	Begin applications for whiteflies when first adults noticed. No more than 5 applications per season for head and stem cole crops or 4 times per season for leafy cole crops. Reapplications at least 7 days apart. Turnip roots cannot be used for food/feed.
	4A	Belay Insecticide 50 WDG (clothianidin)	Insecticide: Soil: 9–12 fl oz Foliar: 3–4 fl oz 50 WDG: Soil: 4.8–6.4 oz Foliar: 1.6–2.1 oz	12	Insecticide: Soil: apply at planting Foliar: 7 50 WDG: 7	Insecticide: Soil: No more than 6.4 oz/A per season. Foliar: No more than 6.4 oz/A per season. Do not use an adjuvant. Toxic to bees. 50 WDG: Includes turnip greens. No more than 0.2 lb a.i./A regardless of application method (or a total of 12 fl oz of this formulation).
	4A	Scorpion 35SL Insecticide (dinotefuran)	Foliar: 2–7 fl oz Soil: 9–10.5 fl oz	12	Foliar: 1 Soil: 21	Head and stem brassica only. No more than 10.5 fl oz when applying to foliage or 21 fl oz when applying to soil. Use only 1 application method.
	4A	Venom Insecticide (dinotefuran)	Foliar: 1–4 oz Soil: 5–6 oz	12	Foliar: 1 Soil: 21	Use 1 application method, not both (soil or foliar). For head and stem brassica only. Foliar: No more than 0.268 lb a.i./A per season.
	15	*Dimilin 2L (diflubenzuron)	2–4 fl oz	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	12	7	No more than 3 applications or 24 fl oz/A per season. No more than 2 applications for thrips or whiteflies. Head and stem brassica only.

Insect	MOA Code ¹	Trade Name (Active Ingredient)	Rate Product/Acre	REI (Hours)	Days to Harvest	Remarks ²
Leafminers	4A	Belay Insecticide 50 WDG (clothianidin)	Insecticide: Soil: 9–12 fl oz Foliar: 3–4 fl oz 50 WDG: Soil: 4.8–6.4 oz Foliar: 1.6–2.1 oz	12	Insecticide: Soil: apply at planting Foliar: 7 50 WDG: 7	Insecticide: Soil: No more than 6.4 oz/A per season. Foliar: No more than 6.4 oz/A per season. Do not use an adjuvant. Toxic to bees. 50 WDG: Includes turnip greens. No more than 0.2 lb a.i./A regardless of application method (or a total of 12 fl oz of this formulation).
	4A	Scorpion 35SL Insecticide (dinotefuran)	Foliar: 2–7 fl oz Soil: 9–10.5 fl oz	12	Foliar: 1 Soil: 21	Head and stem brassica only. Do not use more than 10.5 fl oz when applying to foliage or 21 fl oz when applying to soil. Use only 1 application method.
	4A	Venom Insecticide (dinotefuran)	Foliar: 1–4 oz Soil: 5–6 oz	12	Foliar: 1 Soil: 21	Use 1 application method, not both (soil or foliar). For head and stem brassica only. Foliar: No more than 0.268 lb a.i./A per season.
	5	Radiant SC (spinetoram)	5–10 fl oz	4	1	Do not apply to seedlings grown for transplant. No more than 2 consecutive applications of Group 5 insecticides.
	6	*Proclaim (emamectin benzoate)	2.4–4.8 oz	12	Head and stem: 7 Leafy: 14	No more than 2 sequential applications without rotating to another product with a different mode of action. Do not apply by aircraft. Not for turnips grown for roots.
	15	Rimon 0.83 EC (novaluron)	6–12 fl oz	12	7	No more than 3 applications or 24 fl oz/A per season. No more than 2 applications for thrips or whiteflies. Head and stem brassica only.
	17	Trigard (cyromazine)	2.66 oz	12	7	No more than 6 applications. Includes turnip greens, not grown for roots.
	28	Exirel (cyazypyr)	13.5–20.5 fl oz	12	1	No more than 0.4 lb a.i./A of cyazypyr- or cyantraniliprole-containing products per crop whether applications are made to foliage or soil. See label for diamondback moth resistance management.

Insect	MOA Code ¹	Trade Name (Active Ingredient)	Rate Product/Acre	REI (Hours)	Days to Harvest	Remarks ²
	28	Verimark (cyazypyr)	6.75–13.5 fl oz	4	N/A—applied at planting	See label for diamondback moth resistance management.
Whitefly	4A	Actara (thiamethoxam)	1.5–5.5 oz	12	Head and stem: 0 Leafy: 7	Do not use if other 4A insecticide has been applied.
	4A	Admire Pro (imidacloprid) (see appropriate labels for other brands)	Foliar: 1.3 fl oz Soil: 4.4–10.5 fl oz	12	Foliar: 7 Soil: 21	No more than 10.5 fl oz/A per crop season as a soil application or 6.5 fl oz as foliar applications. Do not apply to both soil and foliage.
	4A	Assail 30SG (acetamiprid)	Head and stem cole crops: 2.0–4.0 oz Leafy cole crops and turnip greens: 2.0–5.3 oz	12	Head and stem: 7 Leafy cole crops and turnip greens: 3	Begin applications for whiteflies when first adults are noticed. No more than 5 times per season for head and stem cole crops or 4 times per season for leafy cole crops. No more often than every 7 days. Turnip roots cannot be used for food/feed.
	4A	Belay Insecticide 50 WDG (clothianidin)	Insecticide: Soil: 9–12 fl oz Foliar: 3–4 fl oz 50 WDG: Soil: 4.8–6.4 oz Foliar: 1.6–2.1 oz	12	Insecticide: Soil: apply at planting Foliar: 7 50 WDG: 7	Insecticide: Soil: No more than 6.4 oz/A per season. Foliar: No more than 6.4 oz/A per season. Do not use an adjuvant. Toxic to bees. 50 WDG: Includes turnip greens. No more than 0.2 lb a.i./A regardless of application method (or a total of 12 fl oz of this formulation).
	4A	Platinum Platinum 75SG (thiamethoxam)	5.0–11 fl oz 75G: 1.66–3.67 oz	12	30	Soil application.
	4A	Scorpion 35SL Insecticide (dinotefuran)	Foliar: 2–7 fl oz Soil: 9–10.5 fl oz	12	Foliar: 1 Soil: 21	Head and stem brassica only. No more than 10.5 fl oz when applying to foliage or 21 fl oz when applying to soil. Use only 1 application method.
	4A	Venom Insecticide (dinotefuran)	Foliar: 1–4 oz Soil: 5–6 oz	12	Foliar: 1 Soil: 21	Use 1 application method, not both (soil or foliar). For head and stem brassica only. Foliar: No more than 0.268 lb a.i./A per season.
	4A + 28	Durivo (thiamethoxam + chlorantraniliprole)	10–13 fl oz	12	30	May be applied via one of several different soil application methods. No more than 1 application per season within 28 days of plant emergence or transplanting.

Insect	MOA Code ¹	Trade Name (Active Ingredient)	Rate Product/Acre	REI (Hours)	Days to Harvest	Remarks ²
	4A + 28	Voliam Flexi (thiamethoxam + chlorantraniliprole)	4–7 oz	12	Head and stem: 3 Leafy brassica greens: 7	Highly toxic to bees exposed to direct treatment or residues on blooming crops.
	4D	Sivanto Prime (flupyradifurone)	7–14 fl oz	4	1	No more than 28 fl oz/A per crop season. No more than 3 crop seasons per year.
	7C	Knack (pyriproxyfen)	8–10 fl oz	12	7	Immatures only. Apply when nymphs first appear. No more than 2 applications per season.
	9B	Fulfill (pymetrozine)	2.75 oz	12	7	Apply when aphids and whiteflies first appear. Provides suppression of whiteflies. No more than 2 applications per crop.
	9B	PQZ (pyrifluquinazon)	Soil only: 2.4 to 3.2 fl oz	12	7	Reapplications at least 7 days apart. No more than 9.6 fl oz rate per season.
	15	Rimon 0.83 EC (novaluron)	6–12 fl oz	12	7	No more than 3 applications or 24 fl oz/A per season. No more than 2 applications for thrips or whiteflies. Head and stem brassica only.
	16	Courier 40SC (buprofezin)	9.0–13.6 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	24	1	No more than 10 oz/A per season. Only use a spreading-penetrating adjuvant known to be safe for the target crop.
	23	Oberon 2 SC (spiromesifen)	7.0–8.5 fl oz	12	7	No more than 25.5 fl oz/A per crop. No more than 3 applications. Not for turnip greens.
	28	Exirel (cyazypyr)	13.5–20.5 fl oz	12	1	No more than 0.4 lb a.i./A of cyazypyr- or cyantraniliprole-containing products per crop whether applications are made to foliage or soil. See label for diamondback moth resistance management.
	28	Verimark (cyazypyr)	6.75–13.5 fl oz	4	N/A—applied at planting	See label for diamondback moth resistance management.
	29	Beleaf 50 SG (flonicamid)	2.8 oz	12	0	Suppression only.

Insect	MOA Code ¹	Trade Name (Active Ingredient)	Rate Product/Acre	REI (Hours)	Days to Harvest	Remarks ²
Wireworms	1B	*Diazinon AG-500 *50 W (diazinon)	AG500 preplant: 1–4 qt 50W: 2–8 lb	96	preplant	Broccoli, cabbage, cauliflower, collard, kale, mustard greens. See label for depth to incorporate.
	1B	Lorsban 75WG (chlorpyrifos)	Foliar: 0.67–1.33 lb Preplant soil: 2.66 lb for cauliflower, 3.00 lb for all others At plant or post planting: 0.8–2.15 oz/1000 ft of row. Specific rate depends on the crop.	24 Cauliflower: 72	21; pre- or at planting	No more than 3 applications of products containing chlorpyrifos. Will not control organophosphate-resistant diamondback moth. Preplant: Incorporate preplant applications 2–4 inches deep.
	3A	*Capture LFR (bifenthrin)	3.4–8.5 fl oz	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 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 sprouts, cauliflower, Chinese broccoli, and Chinese cabbage); leafy crops (collard, 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 ²
			Appl.	Season	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.
	M5	(chlorothalonil) Many brands available: Bravo Ultrex, Bravo Weather Stik, Bravo ZN, Chloronil 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.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ²
			Appl.	Season	Harvest	Reentry	
	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 (penthioopyrad)	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.
	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.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ²
			Appl.	Season	Harvest	Reentry	
	11	Quadris Equaton 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, and leafy green brassica subgroups.
	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 than 3 applications in a season.
	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.
	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. No more than 80 fl oz per season.
	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.
Anthrachnose (<i>Colletotrichum</i> spp.)	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.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ²
			Appl.	Season	Harvest	Reentry	
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.
	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 fix copper compounds.
	P	Actigard 50 WG (acibenzolar-S-methyl)	1 oz	4 oz	7	0.5	Apply preventatively. Maximum annual application: 4 applications at 1 oz rate. Minimum application Interval: 7 days. Suppression only.
Cercospora leaf spot (<i>Cercospora brassicicola</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 ²
			Appl.	Season	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	Labelled 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.
	21	Ranman (cyazofamid)	SEE LABEL	SEE LABEL	–	0.5	Applied as a transplant soil drench.
Club root (<i>Plasmodiophora brassicae</i>)	29	Omega 500F (fluzinam)	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.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ²
			Appl.	Season	Harvest	Reentry	
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.
	M5	(chlorothalonil) Many brands available: Bravo Ultrex, Bravo Weather Stik, Bravo ZN, Chloronil 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	Labelled 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.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ²
			Appl.	Season	Harvest	Reentry	
	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.
	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 (oxathiapirolin + 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 (oxathiapirolin + 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 to 0.16 fl oz/100 lb of seed	See label	-	0.5	Seed treatment only; not labeled for turnip or watercress.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ²
			Appl.	Season	Harvest	Reentry	
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 (penthioopyrad)	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.
	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.
	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.
Powdery mildew (<i>Erysiphe cruciferarum</i> [syn. <i>Erysiphe polygoni</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 (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 (penthioopyrad)	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 ²
			Appl.	Season	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 in a season.
	4	Apron XL (mefenoxam)	SEE LABEL	SEE LABEL	-	2	Seed treatment only; not labeled for watercress. See label for details.
Pythium & phytophthora diseases (soil)	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).

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ²
			Appl.	Season	Harvest	Reentry	
Pythium damping-off (<i>Pythium</i> spp.)	4	Ultra Flourish (mefenoxam)	4 pt	4 pt	-	2	Soil applied as a preplant treatment or following transplanting.
	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 ft of row	1.0 lb a.i.	-	-	No more than 1 application per season.
Phytophthora spp.	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.
	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.
	4 + 11	Uniform (mefenoxam + azoxystrobin)	0.34 fl oz/100 ft of row	1.0 lb a.i.	-	-	Not labeled for leafy cole crops or watercress.
Rhizoctonia rot and blight (syn: Wirestem) (<i>Rhizoctonia solani</i>)	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.
	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 to 0.80 fl oz/100 row feet	46 fl oz	0	4 hr	Labeled only for the soilborne control on leaf green brassicas. See label for details on soilborne applications. Dynasty seed treatment is also available; check label for more information.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ²
			Appl.	Season	Harvest	Reentry	
	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 to 0.16 fl oz/100 lb of seed	–	–	0.5	Seed treatment only. Not labeled for turnip or watercress.
	14	Blocker 4F Terrador 400 Terrador 75WP Terrador FL (PCNB)	See label	30 lb a.i.	–	0.5	Not labeled for leafy cole crops or watercress.
	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 than 3 applications in a season.
	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 (penthioopyrad)	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.
	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.
	11	Cabrio EG (pyraclostrobin)	16 oz	64 oz	Head and stem: 0 Leafy: 14	4 hr	No more than 2 sequential applications.
White rust (<i>Albugo candida</i>)	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.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ²
			Appl.	Season	Harvest	Reentry	
	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): Number (1–54) 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 2024; <http://www.frac.info/> (FRAC = Fungicide Resistance Action Committee).

² Information provided in this table applies only to Florida. Be sure to read a current product label before applying any chemical. The use of brand names and any mention or listing of commercial products or services in the publication does not imply endorsement by UF/IFAS Extension nor discrimination against similar products or services not mentioned.

Table 11. 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-inch row spacing) or 0.9 lb/1,000 linear ft of row in a band of 15 inches wide on the row at-planting. Mix with the top 2–4 inches 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 inches 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 12–15-inch band on the row and incorporate 2–4 inches 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 leafy vegetables and brassica crops, onions, bananas, sugarcane, and other 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.

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

²All 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.

³Higher 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.