

Cole crops: broccoli, brussels sprouts, cabbage, cauliflower

Cauliflower is relatively difficult to grow compared to cabbage. Failure to head properly and poor curd quality are common problems. Curds need to be protected from sunlight to ensure good color and quality. For success, cauliflower needs a fertile, moist soil relatively high in organic matter and nitrogen. Good soil drainage and a cool, humid climate are essential. If producing cauliflower on a light-textured soil, it must be irrigated to keep moisture continuously available to the crop. Broccoli and brussels sprouts are not as exacting in their requirements as cauliflower and, therefore, can be produced over a wider range of soil and climatic conditions. Cabbage is the most easily grown of the cole crops. It is adaptable but does best under a temperate climate, ample moisture, and good fertility with a relatively high nitrogen supply.

Planting

From mid-April through mid-June. Cole crops grow best on well-drained, fertile, loam soils with adequate organic matter. Sandy loams are better for early crops. Harrow to control weeds. Do not over-work seedbed.

Transplants

Plant spacing	Between rows (in.)	Between plants (in.)
Broccoli and cauliflower	18–36	12–24
Brussels sprouts	24–30	12–18
Cabbage	24–36	12–24

Transplants: 8,300–29,000/a; depends upon row spacing, variety, soil fertility, pest control methods, irrigation, crop use, and harvesting.

Direct seeding

Plant no deeper than 1/2 inch. Use size-graded seed and select size to fit planter.

Single seeding

Plant single seed 3–4 inches apart. After emergence, remove excess plants by thinning.

Cluster seeding

Plant three seeds per cluster, spacing seed 2 inches apart. Thin to remove all but one plant per cluster. Thin when plants are 2 inches high.

Lime and fertilizer

Lime: Use dolomitic limestone to maintain a pH of 6.0 or higher on mineral soils and 5.6 on organic soils.

Fertilizer rates: Determine fertilizer needs by soil test. Use annual nitrogen, P₂O₅, and K₂O recommendations in table on next page. Take credits for previous legume crops and manure.

Application: Broadcast and work in fertilizer before planting.

Nitrogen: Apply preplant or sidedress early in growing season. On sandy soils, split the nitrogen into two or more applications during the season. Excessive nitrogen can promote tipburn occurrence in susceptible cabbage varieties.

Micronutrients: Cole crops have relatively high or medium boron requirements and medium requirements for copper and manganese. Use soil and plant analyses to check for deficiencies of these nutrients. If boron soil test is very low (VL) or low (L), apply 2–3 lb/a of boron with fertilizer each year cauliflower is grown and 1–2 lb/a of boron for each broccoli, cabbage, or brussels sprouts crop. Omit these applications if the boron soil test is in the excessively high (EH) range. Apply 1–3 lb Mn/a or 1–12 lb Cu/a, depending on soil and application method.

Annual nitrogen, phosphate, and potash recommendations for cole crops

Crop	Nitrogen		Yield goal (t/a)	Phosphate and potash	
	Organic matter (%)	Amount to apply (lb/a)		Amount P ₂ O ₅ to apply* (lb/a)	Amount K ₂ O to apply* (lb/a)
Broccoli	<2	100	4–6	10	20
	2.0–9.9	80			
	10–20	60			
	>20	25			
Brussels sprouts	<2	100	4–6	15	45
	2.0–9.9	80			
	10–20	60			
	>20	25			
Cabbage	<2	180	8–12	15	70
	2.0–9.9	140	12.1–20	25	115
	10–20	100	20.1–30	40	180
	>20	40	30.1–40		
Cauliflower	<2	120	6–8	20	50
	2.0–9.9	100			
	10–20	80			
	>20	40			

*Amounts shown are for optimum (O) soil test levels. Apply 50% of this rate if soil test is high (H) and omit if soil test is excessively high (EH). If soil test is low (L) or very low (VL), increase rates according to soil test recommendations.

Disease control in cole crops—broccoli, brussels sprouts, cabbage, and cauliflower

Disease	Active ingredient	Rate/a of commercial product	Days to harvest	Remarks and suggestions	
Alternaria leaf spot	azoxystrobin	6.0–15.5 fl oz Aframe, AzoxyStar, Equation, Quadris Flowable, Satori, Willowood Azoxy 2SC	0	Equation, Quadris, Satori, and Cabrio belong to the Group 11 (strobilurin) fungicide category. Do not exceed 1 application of any of these products before alternating with a fungicide having a different mode of action. Do not exceed 3 applications of strobilurin fungicides per crop per year. Do not exceed 1.44 qt/a Equation, Quadris Flowable, or Satori, or 64.0 oz/a Cabrio per crop per season.	
	pyraclostrobin	12.0–16.0 oz Cabrio EG	0		
	azoxystrobin + difenoconazole	12.0–14.0 fl oz Quadris Top	1		Do not apply more than 56.0 fl oz/a per year. Make no more than 1 application before alternating to a non-strobilurin fungicide.
	boscalid	6.0–9.0 oz Endura WDG	0		Endura belongs to the Group 7 fungicide category. Do not exceed 1 application of Endura before alternating to a labeled fungicide with a different mode of action. Do not exceed 2 applications or 18.0 oz/a Endura per season.
	cyprodinil + difenoconazole	16.0–20.0 fl oz Inspire Super	7	Begin application prior to disease onset. Apply on a 7- to 10-day interval. Make no more than 2 sequential applications before alternating to a fungicide with a different mode of action.	
	cyprodinil + fludioxonil	11.0–14.0 Switch 62.5WG	7	Do not apply more than 56.0 fl oz/a per year. Make no more than 2 applications before alternating to an effective fungicide with a different mode of action.	
	fluxapyroxad + pyraclostrobin	6.0–8.2 fl oz Priaxor	3	Make no more than 3 applications per season. Follow resistance management guidelines.	

(continued)

Pest management

Asparagus

Bean

Carrot

Celery

Cole crops

Cucumber

Disease control in cole crops—broccoli, brussels sprouts, cabbage, and cauliflower *(continued)*

Disease	Active ingredient	Rate/a of commercial product	Days to harvest	Remarks and suggestions
Alternaria leaf spot <i>(cont.)</i>	mancozeb	2.0 lb Dithane M45	7	Do not apply more than 12.0 lb/a product. Minimum re-treatment period is 7 days. For broccoli and cabbage.
	penthiopyrad	14.0–30.0 fl oz Fontelis	0	Do not apply more than 2 sequential applications of Fontelis before alternating to an effective fungicide with a different mode of action. Do not exceed 72.0 fl oz/a per year.
	triflumizole	6.0–8.0 fl oz Procure 480SC	1	Do not apply more than 18.0 fl oz/a Procure per season. Use higher rates for higher disease pressure.
Alternaria leaf spot and downy mildew	chlorothalonil	1.5 pt Bravo Weather Stik, Echo 720, Equus 720	7	Apply as foliar spray when conditions favor disease. Do not apply more than 11.7 pt/a (8.8 lb ai/a) during one season.
		1.4 lb Bravo Ultrex 82.5WDG, Equus DF	7	
		1.25 lb Echo 90DF	7	
	fenamidone	5.5–8.2 fl oz Reason (rate for downy mildew)	2	Do not apply more than 24.6 fl oz per season. Do not use Reason more than one time before alternating to a fungicide of a different resistance management group.
	mancozeb	1.6–2.1 lb Koverall, Manzate Pro-Stick	7	Do not apply more than 12.8 lb/a. For broccoli and cabbage.
		2.0 lb Dithane M45	7	
	mefenoxam/ chlorothalonil	1.5 lb Ridomil Gold Bravo	7	Consult the label for crop rotation restrictions before using this product. You may make up to 4 applications of Ridomil Gold Bravo per crop per season.
Black rot (bacterial), blackleg (fungal)	<p>☐ Use seed grown in western United States. ☐ Use hot water seed treatment (details below). ☐ Use plant bed sanitation. ☐ Do not use compost from diseased plants or manure from animals that have eaten diseased plants. ☐ Use care in purchase and handling of plants. ☐ Rotate crops (3-year rotation). ☐ Select black-rot resistant cultivars. ☐ Use disease-free soil or treat soil with an approved soil fumigant.</p> <p>Hot water seed treatment: Place the seed in a mesh bag and dip it into water heated to 122°F. Treat cauliflower and broccoli seed for 20 minutes; treat cabbage and brussels sprouts seeds for 25 minutes. Transfer the bag to cold water immediately to cool the seed. There will be some reduction in the germination rate of treated seed. You may wish to sow additional seed to compensate.</p>			
	fixed coppers	various: Champ WG, Champ Formula 2, Kocide 2000, Kocide 3000	0	Spraying with copper fungicides can be expected to reduce spread in field. However, in some instances application may cause black spots on outer leaves.
Clubroot	cyazofamid	<i>transplant soil drench:</i> 12.9–25.75 fl oz/100 gal Ranman <i>soil incorporation:</i> 20.0 fl oz Ranman	0	Do not apply more than 39.5 fl oz/a Ranman per year. See label for specific transplant and soil incorporation specifications.
	fluazinam	<i>transplant:</i> 6.45 fl oz/100 gal Omega 500F <i>soil incorporation:</i> 2.6 pt Omega 500F	20 (leafy greens) 50 (cabbage, broccoli)	Transplant: Soil drench immediately after transplanting. Apply Omega in transplant water. Soil incorporation: Apply in a 9-inch band along the planting row and incorporate 6–8 inches. This product may cause a delay in the start of harvest by up to 8 days, cause stunting, and shorten the length of harvest with no impact on final yield.
	PCNB	2.0–6.0 lb PCNB 75% WP/100 gal transplant water; use 0.5–0.75 pt/plant		Add hydrated lime in spring to reach a soil pH of 7.2. PCNB may also be applied as a band or broadcast.
		3.0 pt/100 gal water, 5.87 gal/a/apply in 25 gal of water/a Blocker 4F	—	May be applied as a transplant solution, banded application, or broadcast application.

(continued)

Disease control in cole crops—broccoli, brussels sprouts, cabbage, and cauliflower *(continued)*

Disease	Active ingredient	Rate/a of commercial product	Days to harvest	Remarks and suggestions
Downy mildew <i>(see also Alternaria leaf spot and downy mildew)</i>	ametoctradin + dimethomorph	14.0 fl oz Zampro	0	Do not make more than 3 applications per season.
	dimethomorph	6.0 oz Forum	0 (leafy greens) 7 (cabbage, broccoli)	Must be applied as a tank mix with another fungicide that has a different mode of action. Do not exceed 30.0 oz/a per growing season.
	fluopicolide	3.0–4.0 fl oz Presidio	2	Tank mix with another labeled fungicide of a different mode of action on the target pathogen to manage resistance.
	mandipropamid	8.0 fl oz Revus	1	Do not apply more than 2 consecutive applications of this product before switching to another effective non-Group 40 fungicide. Do not exceed 32.0 fl oz/a of product per season.
	mono- and dipotassium salts of phosphorous acid	1.25 qt in 25 gal water/a to 2.5 qt in 250 gal water/a Alude 2.5–5.0 pt Phostrol	0	Apply at 1- to 3-week intervals. Use higher rates and shorter intervals when disease pressure increases.
	oxathiapiprolin	2.0–4.8 fl oz Orondis Ultra A	0	Make no more than 2 sequential applications before rotating to a fungicide with a different mode of action. Do not exceed 19.2 fl oz/a per year. Begin foliar applications prior to disease development and continue on a 5- to 14-day interval.
Internal tipburn	<i>Avoid overfertilizing, especially with nitrogen. Plant tolerant or resistant cultivars. If you find tipburn, harvest crop before full maturity to reduce losses.</i>			
Pythium damping-off	mefenoxam	0.085–0.64 fl oz Apron XL/100 lb seed	—	If a seed treatment is utilized, do not apply this active ingredient again as an in-furrow, at-plant treatment.
		0.25–0.50 pt Ridomil Gold SL	—	Preplant-incorporated application or surface application at planting. Incorporate in top 2 inches. For banded applications, a 7-inch band is recommended.
		0.5–1.0 pt Ultra Flourish	—	
	metalaxyl	0.75–1.5 fl oz Acquire/100 lb seed	—	Label includes most cole crops, including cabbage, broccoli, brussels sprouts, and cauliflower.
		0.75 fl oz Allegiance-FL/100 lb seed	—	
0.5–1.0 fl oz Sebring 480 FS/100 lb seed		—		
		4.0–8.0 pt MetaStar 2E	—	Broadcast, soil-incorporated, or banded applications.
Rhizoctonia basal stem and root rot, wirestem	azoxystrobin	0.4–0.8 fl oz Quadris Flowable/1,000 ft row	0	Use at planting. Follow manufacturer's directions.
	flutolanil	1.1 lb Moncut		Make 1 application per acre to the row of planting as an in-furrow treatment or as a directed spray at the base of transplants. Use a minimum of 3 gal of spray volume per acre.
	PCNB	15.0–20.0 lb Blocker 75% WP in 50 gal water/a or 1.0 level tablespoon/gal water/50 sq ft of seedbed 2.8–3.75 gal Blocker 4F in 50 gal water/a		Broadcast drench application.
Seed rot	<i>Maintain a disease-free plant bed and use sanitation measures listed for black rot.</i>			

Pest management

Asparagus

Bean

Carrot

Celery

Cole crops

Cucumber

Insect control

Caterpillars cause varying amounts of damage depending on the maturity of the plant, so thresholds change as the crop grows through the different developmental stages (see following table). The three caterpillars—imported cabbage worm, cabbage looper, and diamondback moth

larvae—are considered together as a single caterpillar complex. Weekly crop scouting and treatment based on larval infestation threshold levels provides the most effective management of this pest complex. To monitor, walk along a W-shaped path through the field and examine

randomly-selected plants every few yards; examine 25–50 plants, depending on the field size, and record the percentage of infestation. A plant is infested if the eggs or caterpillars of any species are present.

Treatment thresholds for the caterpillar complex on major cole crops

Crop	Growth stage	Threshold (% infestation)
Cabbage	Seedbed	10
	Transplant to cupping	30
	Cupping to early head	20
	Mature head	10
Broccoli	Seedbed	10
	Transplant to first flower	50
	Flower bud to harvest	10
Cauliflower	Seedbed	10
	Transplant to first curd	50
	Curd present	10

Note: Diamondback moths have developed resistance to insecticides and Bt in areas of the southern United States. Be cautious when using transplants from the South, which may harbor this insect. Bt resistance has been found only in southern Florida so far.

Scouting calendar for insect pests of cole crops

	April			May			June			July			August			September		
	early	mid	late	early	mid	late	early	mid	late	early	mid	late	early	mid	late	early	mid	late
Seed maggot																		
Cabbage maggot																		
Flea beetles																		
Diamondback moth																		
Imported cabbageworm																		
Cabbage looper																		
Cabbage aphid and turnip aphid																		
Onion thrips																		

Insect control in cole crops—broccoli, brussels sprouts, cabbage, and cauliflower

Insect	Rate/a of active ingredient	Rate/a of commercial product	Days to harvest**	Remarks and suggestions
Cabbage aphid	<i>Natural enemies will often eliminate this insect, especially if Bacillus thuringiensis (which does not kill beneficial insects) is used for caterpillar control. Treat broccoli and cauliflower before heading if there are more than 100 aphids per plant; after heading, treat if there are more than 5 aphids per plant. Treat cabbage if 1–2% of the plants are infested.</i>			
	acetamiprid	0.8–1.2 oz Assail 70WP 2.0–3.0 oz Assail 30 SG	7	Begin treatment when thresholds are reached. Apply every 7 days as needed. Do not exceed 5 applications or 0.375 lb ai/a per season.
			7	
	alpha-cypermethrin	3.2–3.8 fl oz *Fastac	1	Apply when pests reach or exceed established thresholds. Do not apply more than 11.4 fl oz of Fastac per acre per crop season.
	azadirachtin	1.0–3.5 pt Aza-Direct 10.0–21.0 oz Azatin XL, XL Plus 0.5–2.0 gal Neemix 0.25EC 0.25–1.0 pt Neemix 4.5EC	0	Apply every 7 days as needed.
	bifenthrin	2.1–6.4 fl oz *Brigade 2EC 3.4–6.8 fl oz *Capture LFR	7	Do not exceed 0.5 lb/a bifenthrin or make more than 5 applications per year following bloom. Wait at least 7 days between treatments.
			16	Do not apply more than 0.1 lb ai/a per season as an at-plant application. Do not apply more than 0.5 lb ai/a per season including other bifenthrin products (e.g., Brigade 2EC).
	0.06–0.095 lb bifenthrin + imidacloprid	3.8–6.1 fl oz *Brigadier	7	Do not apply more than 30.72 fl oz/a (0.48 lb ai/a) per season. A total of 0.24 lb ai/a imidacloprid and 0.5 lb ai/a bifenthrin allowed per season.
	1.0 lb chlorpyrifos	2.0 lb Lorsban 50W 1.33 lb Lorsban 75WG	21	Apply to foliage as insects appear. Repeat as needed but do not exceed more than 6 applications per season.
	clothianidin	<i>foliar:</i> 3.0–4.0 fl oz Belay <i>soil:</i> 9.0–12.0 fl oz Belay	21	Do not apply more than 12.0 fl oz/a per season and allow at least 7 days between applications.
			—	Do not apply more than 12.0 fl oz/a per season. Apply as a narrow band centered on the plant row; as an in-furrow spray at planting; as a sidedress to both sides of the row; as a transplant water drench; or as chemigation into root zone through drip, trickle or micro-sprinkler, or similar equipment.
	0.088–0.176 lb cyantraniliprole (<i>soil</i>)	6.75–13.5 fl oz Verimark	—	Do not apply more than 13.5 fl oz/a Verimark per crop per season. Do not apply more than 0.4 lb ai/a cyantraniliprole-containing products per crop whether applied as soil or foliar applications. The pH of the application solution should be adjusted to between pH 4 and 6.
	0.088–0.133 lb cyantraniliprole (<i>foliar</i>)	13.5–20.5 fl oz Exirel	1	Minimum application interval between foliar sprays is 5 days.
	0.25–0.5 lb diazinon	several formulations	5–14	
0.25–0.5 lb dimethoate	0.5–1.0 pt Dimethoate EC	7–14		
0.045–0.268 lb dinotefuran	<i>foliar:</i> 1.0–4.0 oz Venom 70SG <i>soil:</i> 5.0–6.0 oz Venom 70SG	21	Do not follow applications with foliar application of any other neonicotinoid insecticide. Use only one application method. Do not apply more than 12.0 oz/a per season using soil applications. See product label for application directions.	

*Restricted-use pesticide.

(continued)

**Where ranges are given, check product label for specific number of days between insecticide application and harvest of a particular crop.

Pest management

Asparagus

Bean

Carrot

Celery

Cole crops

Cucumber

Insect control in cole crops—broccoli, brussels sprouts, cabbage, and cauliflower *(continued)*

Insect	Rate/a of active ingredient	Rate/a of commercial product	Days to harvest**	Remarks and suggestions
Cabbage aphid <i>(cont.)</i>	0.2–0.3 lb fenpropathrin	10.66–16.0 fl oz *Danitol 2.4EC	7	For use on brussels sprouts and cauliflower only. Treat when pests first appear. May repeat every 7 days as needed. Do not exceed 0.8 lb ai/a per season.
	0.062–0.089 lb flonicamid	2.0–2.8 oz Beleaf SG	0	Begin applications before aphid populations build. Do not exceed 2.8 oz/a Beleaf per application and do not apply more than 8.4 oz/a (0.267 lb ai/a) per season.
	flupyradifurone	7.0–12.0 fl oz Sivanto	1	Apply when pests reach or exceed established thresholds. Do not apply more than 28.0 fl oz of Sivanto per acre per crop season.
	0.0075–0.015 lb gamma-cyhalothrin	1.92–3.84 oz *Proaxis	1	For suppression only. Apply every 5 days as needed. Do not exceed 1.92 pt/a (0.12 lb ai/a) per season.
	imidacloprid	4.4–10.5 fl oz Admire Pro 3.75 fl oz Provado F	21 7–21	Also controls whitefly. Soil application. Apply Admire in a narrow band centered on the row. Treat within 14 days before planting. Apply Provado every 5 days as needed. Do not exceed 18.75 fl oz/a Provado per season and do not apply more than a total of 0.5 lb/a imidacloprid in any formulation.
	imidacloprid + beta-cyfluthrin	3.0 fl oz *Leverage 360	7	Do not apply more than 12.8 fl oz/a per season and allow at least 7 days between applications.
	0.02–0.03 lb lambda-cyhalothrin	1.28–1.92 fl oz *Warrior II	4	For suppression only. Do not use on brussels sprouts, kale, collards, chard, or mustard.
	lambda-cyhalothrin + chlorantraniliprole	6.0–9.0 fl oz *Voliam Xpress	3	Do not exceed 31.0 fl oz/a of Voliam Xpress or 0.24 lb ai/a of products containing lambda-cyhalothrin or 0.2 lb ai/a of products containing chlorantraniliprole per growing season.
	lambda-cyhalothrin + thiamethoxam	4.0–4.5 fl oz *Endigo ZC	1	Apply when pests reach or exceed established thresholds. Do not apply more than 19.0 fl oz/a Endigo ZC per crop season and allow at least 7 days between applications.
	0.32–1.0 lb malathion	Malathion EC, WP, D	3–7	See label for rate.
	1.0 lb naled	1.0 pt Dibrom 8E	1	Not for use on kale, collards, chard, or mustard.
	0.023 lb pymetrozine	2.75 oz Fulfill 50WDG	7	
	0.06–0.08 lb spirotetramat	4.0–5.0 fl oz Movento 2SC	7	Do not exceed 10.0 fl oz/a per season.
	thiamethoxam	1.5–3.0 oz Actara 25WDG	5	Do not follow applications of Platinum with foliar applications of any other neonicotinoid insecticide. Platinum may be applied to direct seeded crops in-furrow at the seeding or transplant depth, or as a narrow surface band above the seedling and followed by irrigation. Do not apply more than 11.0 oz of Actara 25WDG or Platinum 2SC and no more than 3.67 oz Platinum 75SG per acre per crop season and apply sufficient water volume after in-ground application to ensure incorporation into the seed zone. Actara is applied as a foliar spray.
		5.0–11.0 fl oz Platinum 2SC	30	
		1.66–3.67 oz Platinum 75SG	30	

*Restricted-use pesticide.

(continued)

**Where ranges are given, check product label for specific number of days between insecticide application and harvest of a particular crop.

Insect control in cole crops—broccoli, brussels sprouts, cabbage, and cauliflower *(continued)*

Insect	Rate/a of active ingredient	Rate/a of commercial product	Days to harvest**	Remarks and suggestions
Cabbage aphid <i>(cont.)</i>	0.198–0.257 lb thiamethoxam + chlorantraniliprole	10.0–13.0 fl oz Durivo	30	Do not exceed a total of 13.0 fl oz/a Durivo (0.257 lb ai/a) per growing season. Do not exceed 0.172 lb ai/a of thiamethoxam-containing products or 0.2 lb ai/a of chlorantraniliprole-containing products per season.
	zeta-cypermethrin	3.2–4.0 oz *Mustang Maxx	1	Apply every 7 days as needed. Use a minimum of 15 gal/a of finished spray. Do not exceed 24.0 oz/a Mustang Maxx per season.
	0.04–0.1 lb zeta-cypermethrin + bifenthrin	4.0–10.3 fl oz *Hero	7	Do not apply more than 0.45 lb ai/a per season. Wait at least 7 days between applications.
Cabbage maggot	0.04–0.08 lb bifenthrin	3.4–6.8 oz *Capture LFR	—	Apply as a 5- to 7-inch band over an open furrow or in-furrow with the seed. Do not apply more than 0.1 lb/a Capture LFR per season as an at-plant application.
	chlorpyrifos <i>(see label for rate limits)</i>	1.6–3.3 oz/1,000 ft row *Lorsban-4E	30	For direct-seeded crops, apply dosage in minimum of 20 gal/a as banded spray over row. Apply ahead of press wheel or planter shoe. For transplants, direct spray at plant base immediately after setting.
		4.6–9.2 oz/1,000 ft row Lorsban 15G		Apply as a 2- to 4-inch band over seed row ahead of planter shoe or in front of press wheel. Not for use on greens.
	0.13–0.176 lb cyantraniliprole <i>(soil)</i>	10.0–13.5 fl oz Verimark	—	Do not apply more than 13.5 fl oz/a Verimark per crop per season. Do not apply more than 0.4 lb ai/a cyantraniliprole-containing products per crop whether applied as soil or foliar applications. The pH of the application solution should be adjusted to between pH 4 and 6.
	0.125–0.25 lb diazinon	several formulations		Apply in transplant water. See label for rate.
	2.0–3.0 lb diazinon	several formulations		See label for rate. Broadcast and incorporate 3–4 inches deep before planting.
	imidacloprid + beta-cyfluthrin	3.0 fl oz *Leverage 360	7	Do not apply more than 12.8 fl oz/a per season and allow at least 7 days between applications.
Caterpillar pests (imported cabbageworm, cabbage looper, diamondback moth larvae)	<i>Apply insecticides only when thresholds are exceeded (see treatment threshold table on page 82).</i>			
	0.5–1.0 lb acephate	0.5–1.0 lb Orthene 97S	14	Cauliflower and brussels sprouts only. Do not exceed 2.0 lb ai/a per season.
	acetamiprid	4.0 oz Assail 30 SG	7	To provide suppression of diamondback moth.
	alpha-cypermethrin	3.2–3.8 fl oz *Fastac	1	Apply when pests reach or exceed established thresholds. Do not apply more than 11.4 fl oz of Fastac per acre per crop season.
	<i>Bacillus thuringiensis</i> subsp. <i>aizawai</i>	1.0–2.0 lb Agree 0.5–1.5 lb Xentari	0	Use lower rate for light infestations and small larvae; use higher rate for heavy infestations and larger larvae.
<i>Bacillus thuringiensis</i> subsp. <i>kurstaki</i>	Biobit, Cutlass, DiPel, Javelin, MVP, Thuricide, and others		0	Rates vary with formulation, check the label. Most effective against young larvae; use other insecticides if larvae are large. Does not kill beneficial insects.
	1.0–2.0 lb Lepinox WDG		0	Treat early instar larvae before noticeable feeding damage occurs. Repeat as needed.

*Restricted-use pesticide.

(continued)

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Pest management

Asparagus

Bean

Carrot

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Insect control in cole crops—broccoli, brussels sprouts, cabbage, and cauliflower *(continued)*

Insect	Rate/a of active ingredient	Rate/a of commercial product	Days to harvest**	Remarks and suggestions
Caterpillar pests <i>(cont.)</i>	beta-cyfluthrin	1.6–3.2 fl oz *Baythroid XL	0	Maximum Baythroid XL allowed per 7-day interval is 3.2 fl oz/a and season total allowed per crop season is 12.8 fl oz/a.
	0.033–0.10 lb bifenthrin	2.1–6.4 fl oz *Brigade 2EC	7	Do not exceed 0.5 lb ai/a or 5 applications per season. Wait at least 7 days between applications.
	0.06–0.095 lb bifenthrin + imidacloprid	3.8–6.1 fl oz *Brigadier	7	Do not apply more than 30.72 fl oz/a (0.48 lb ai/a) per season. A total of 0.24 lb ai/a imidacloprid and 0.5 lb ai/a bifenthrin allowed per season.
Asparagus	chlorantraniliprole	3.5–7.5 fl oz Coragen	3	Do not make more than 4 applications per crop season and allow at least 3 days between applications. Do not apply more than 15.4 fl oz/a Coragen per season.
	0.065–0.13 lb cyantraniliprole (soil)	5.0–10.0 fl oz Verimark	—	Do not apply more than 13.5 fl oz/a Verimark per crop per season. Do not apply more than 0.4 lb ai/a cyantraniliprole-containing products per crop whether applied as soil or foliar applications. The pH of the application solution should be adjusted to between pH 4 and 6.
	0.045–0.088 lb cyantraniliprole (foliar)	7.0–13.5 fl oz Exirel	1	Minimum application interval between foliar sprays is 5 days.
Bean	0.05–0.1 lb cypermethrin	2.5–5.0 fl oz *Ammo 2.5EC 1–2 bags *Ammo WSB	1	Cabbage only.
	0.0075–0.015 lb emamectin benzoate	2.4–4.8 oz *Proclaim	7	Use higher rate for loopers or larger larvae. Apply when larvae first appear and repeat as necessary for control. Do not exceed 28.8 oz/a per season. Highly toxic to bees.
Carrot	0.015–0.03 lb esfenvalerate	2.9–5.8 fl oz *Asana XL	3	Imported cabbage worm. Do not exceed 0.4 lb ai/a per season.
	0.2–0.3 lb fenpropathrin	10.66–16.0 fl oz *Danitol 2.4EC	7	Do not exceed 2.66 pt/a (42.7 oz/a) per season. Apply in spray volume of 25 to 50 gal/a. Adding non-ionic surfactant may improve control.
	0.03–0.045 lb flubendiamide	2.0–3.0 oz Synapse WG	1	Do not apply more than 3.0 oz/a (0.045 lb ai/a) in a 7-day period or more than 9.0 oz/a per season.
Celery	flubendiamide + buprofezin	11.0–13.0 fl oz Vetica	1	Do not apply more than 38.0 fl oz/a per season and allow at least 7 days between applications. Do not make more than 2 applications per crop season.
	0.0075–0.015 lb gamma-cyhalothrin	1.92–3.84 oz *Proaxis	1	Apply every 5 days as needed. Use the high rate for diamondback moth. Do not exceed 1.92 pt/a (0.12 lb ai/a) per season.
Cole crops	imidacloprid + beta-cyfluthrin	3.0 fl oz *Leverage 360	7	Do not apply more than 12.8 fl oz/a per season and allow at least 7 days between applications.
	0.045–0.065 lb indoxacarb	2.5–3.5 oz Avaunt	3	Treat when populations reach threshold levels. For diamondback moth control, use higher rate. May repeat every 3 days as needed. Do not exceed 14.0 oz/a per crop.
	0.015–0.02 lb lambda-cyhalothrin	0.96–1.6 fl oz *Warrior II	4	Apply every 5 days as needed. Use 0.02–0.03 lb ai/a for diamondback moth larvae.

*Restricted-use pesticide.

(continued)

**Where ranges are given, check product label for specific number of days between insecticide application and harvest of a particular crop.

Pest management

Asparagus

Bean

Carrot

Celery

Cole crops

Cucumber

Insect control in cole crops—broccoli, brussels sprouts, cabbage, and cauliflower *(continued)*

Insect	Rate/a of active ingredient	Rate/a of commercial product	Days to harvest**	Remarks and suggestions
Caterpillar pests <i>(cont.)</i>	lambda-cyhalothrin + chlorantraniliprole	5.0–8.0 fl oz *Voliam Xpress	3	Do not exceed 31.0 fl oz/a of Voliam Xpress or 0.24 lb ai/a of products containing lambda-cyhalothrin or 0.2 lb ai/a of products containing chlorantraniliprole per growing season.
	lambda-cyhalothrin + thiamethoxam	4.0–4.5 fl oz *Endigo ZC	1	Apply when pests reach or exceed established thresholds. Do not apply more than 19.0 fl oz/a Endigo ZC per crop season and allow at least 7 days between applications.
	0.225–0.9 lb methomyl	0.75–3.0 pt *Lannate LV 0.25–1.0 lb *Lannate SP	1–10	Do not exceed 10 applications per season.
	0.06–0.16 lb methoxyfenozide	<i>early season:</i> 4.0–8.0 fl oz Intrepid 2F <i>mid- to late season:</i> 8.0–16.0 fl oz Intrepid 2F	1	Will not control diamondback moth. Do not exceed 64.0 fl oz/a per season. Use the higher rates with higher populations or when spray coverage is difficult. See label for use restrictions in some Wisconsin counties.
			1	
	0.039–0.078 lb novaluron	6.0–12.0 fl oz Rimon 0.83EC	7	Apply when the majority of the population has hatched up to the second instar larvae stage. Use higher rates and volumes when larvae are large, when populations are at least double the threshold amount, and when the foliage canopy is dense. Do not apply more than three times per crop per season or more than 24.0 oz/a per season.
	0.05–0.2 lb permethrin	*Ambush, *Pounce	1	See label for rate. Do not exceed 0.8 lb ai/a per season. Do not graze or feed treated foliage.
	0.039–0.078 lb spinetoram	5.0–10.0 oz Radiant SC	1	Do not apply more than 34.0 oz/a Radiant (0.266 lb ai/a) per crop and do not exceed 6 applications per year.
	spinosad	1.5–10.0 fl oz Entrust SC	1	See product label for specific rates. Use higher rates for larger larvae. Apply in adequate spray to get good coverage for best control. Do not exceed 0.45 lb ai/a per season. Do not use a buffering agent.
	0.09–0.12 lb tebufenozide	6.0–8.0 fl oz Confirm	7	Apply per label directions every 10–14 days as needed. Do not exceed 8.0 oz/a per application or 56.0 oz/a per season. There is a 1- to 12-month plantback restriction depending on the crop.
	0.198–0.257 lb thiamethoxam + chlorantraniliprole	10.0–13.0 fl oz Durivo	30	Do not exceed a total of 13.0 fl oz/a Durivo (0.257 lb ai/a) per growing season. Do not exceed 0.172 lb ai/a of thiamethoxam-containing products or 0.2 lb ai/a of chlorantraniliprole-containing products per season.
	0.4–1.0 lb thiodicarb	16.0–40.0 fl oz Larvin 3.2	7	Do not exceed 4.0 lb ai/a per season for broccoli, cabbage, and cauliflower only. There is a 30-day plantback restriction.
0.014–0.025 lb zeta-cypermethrin	2.24–4.0 oz *Mustang Maxx	1	Use higher rates for cabbage looper. Apply every 7 days as needed. Use a minimum of 15 gal/a of finished spray. Do not exceed 24.0 oz/a Mustang Maxx per season.	
0.04–0.1 lb zeta-cypermethrin + bifenthrin	4.0–10.3 fl oz *Hero	7	Do not apply more than 0.45 lb ai/a per season. Wait at least 7 days between applications.	

*Restricted-use pesticide.

(continued)

**Where ranges are given, check product label for specific number of days between insecticide application and harvest of a particular crop.

Pest management

Asparagus

Bean

Carrot

Celery

Cole crops

Cucumber

Insect control in cole crops—broccoli, brussels sprouts, cabbage, and cauliflower *(continued)*

Insect	Rate/a of active ingredient	Rate/a of commercial product	Days to harvest**	Remarks and suggestions
Flea beetles	alpha-cypermethrin	2.2–3.8 fl oz *Fastac	1	Apply when pests reach or exceed established thresholds. Do not apply more than 11.4 fl oz of Fastac per acre per crop season.
	beta-cyfluthrin	1.6–3.2 fl oz *Baythroid XL	0	Maximum Baythroid XL allowed per 7-day interval is 3.2 fl oz/a and season total allowed per crop season is 12.8 fl oz/a.
	0.033–0.10 lb bifenthrin	2.1–6.4 fl oz *Brigade 2EC	7	Do not exceed 0.5 lb ai/a or 5 applications per season. Wait at least 7 days between applications.
	0.5–2.0 lb carbaryl	Sevin WP	—	Can only be applied within 30 days of crop emergence. See label for rate. Do not use on kale or collards.
	clothianidin	<i>foliar</i> : 3.0–4.0 fl oz Belay <i>soil</i> : 9.0–12.0 fl oz Belay	21	Do not apply more than 12.0 fl oz/a per season and allow at least 7 days between applications.
			—	Do not apply more than 12.0 fl oz/a per season. Apply as a narrow band centered on the plant row; as an in-furrow spray at planting; as a sidedress to both sides of the row; as a transplant water drench; or as chemigation into root zone through drip, trickle or micro-sprinkler, or similar equipment.
	0.088–0.176 lb cyantraniliprole (<i>soil</i>)	6.75–13.5 fl oz Verimark	—	Do not apply more than 13.5 fl oz/a Verimark per crop per season. Do not apply more than 0.4 lb ai/a cyantraniliprole-containing products per crop whether applied as soil or foliar applications. The pH of the application solution should be adjusted to between pH 4 and 6.
	0.088–0.133 lb cyantraniliprole (<i>foliar</i>)	13.5–20.5 fl oz Exirel	1	Minimum application interval between foliar sprays is 5 days.
	0.045–0.268 lb dinotefuran	<i>foliar</i> : 1.0–4.0 oz Venom 70SG <i>soil</i> : 5.0–6.0 oz Venom 70SG	1	Do not follow soil applications with foliar application of any other neonicotinoid insecticide. Use only one application method. Do not exceed 12.0 oz/a per season using soil applications. See product label for application directions.
			21	
0.015–0.05 lb esfenvalerate	2.9–9.6 fl oz *Asana XL	3–7	Do not exceed 0.4 lb ai/a per season (0.2 lb ai/a for greens).	
0.0075–0.015 lb gamma-cyhalothrin	1.92–3.84 oz *Proaxis	1	Apply every 5 days as needed. Do not exceed 1.92 pt/a (0.12 lb ai/a) per season.	
imidacloprid + beta-cyfluthrin	3.0 fl oz *Leverage 360	7	Do not apply more than 12.8 fl oz/a per season and allow at least 7 days between applications.	
0.02–0.03 lb lambda-cyhalothrin	1.28–1.92 fl oz *Warrior II	4	Apply every 5 days as needed. Do not exceed 0.96 pt/a per season.	
lambda-cyhalothrin + chlorantraniliprole	6.0–9.0 fl oz *Voliam Xpress	3	Do not exceed 31.0 fl oz/a of Voliam Xpress or 0.24 lb ai/a of products containing lambda-cyhalothrin or 0.2 lb ai/a of products containing chlorantraniliprole per growing season.	
lambda-cyhalothrin + thiamethoxam	4.0–4.5 fl oz *Endigo ZC	1	Apply when pests reach or exceed established thresholds. Do not apply more than 19.0 fl oz/a Endigo ZC per crop season and allow at least 7 days between applications.	

*Restricted-use pesticide.

(continued)

**Where ranges are given, check product label for specific number of days between insecticide application and harvest of a particular crop.

Pest management

Asparagus

Bean

Carrot

Celery

Cole crops

Cucumber

Insect control in cole crops—broccoli, brussels sprouts, cabbage, and cauliflower *(continued)*

Insect	Rate/a of active ingredient	Rate/a of commercial product	Days to harvest**	Remarks and suggestions	
Flea beetles <i>(cont.)</i>	0.05–0.2 lb permethrin	*Pounce	1	See label for rate. Apply as needed for flea beetle control on cabbage and Chinese cabbage. Do not exceed 1.0 lb ai/a per season.	
	thiamethoxam	1.5–3.0 oz Actara 25WDG	5	Do not follow applications of Platinum with foliar applications of any other neonicotinoid insecticide. Platinum may be applied to direct-seeded crops in-furrow at seeding or transplant depth, or as a narrow surface band above the seedling and followed by irrigation. Do not apply more than 11.0 oz of Actara 25WDG or Platinum 2SC and no more than 3.67 oz Platinum 75SG per acre per crop season and apply sufficient water volume after in-ground application to ensure incorporation into the seed zone. Actara is applied as a foliar spray.	
		5.0–11.0 fl oz Platinum 2SC	30		
		1.66–3.67 oz Platinum 75SG	30		
		0.198–0.257 lb thiamethoxam + chlorantraniliprole	10.0–13.0 fl oz Durivo	30	Do not exceed a total of 13.0 fl oz/a Durivo (0.257 lb ai/a) per growing season. Do not exceed 0.172 lb ai/a of thiamethoxam-containing products or 0.2 lb ai/a of chlorantraniliprole-containing products per season.
		0.4–0.8 lb thiodicarb	16.0–32.0 fl oz Larvin F	7–14	Do not exceed 4.0 lb ai/a per season for broccoli, cabbage, and cauliflower only. Do not exceed 1.5 lb ai/a per season for greens.
	0.14–0.25 lb zeta-cypermethrin	2.24–4.0 oz *Mustang Maxx	1	Apply every 7 days as needed. Use a minimum of 15 gal/a of finished spray. Do not exceed 24.0 oz/a Mustang Maxx per season.	
	0.04–0.1 lb zeta-cypermethrin + bifenthrin	4.0–10.3 fl oz *Hero	7	Do not apply more than 0.45 lb ai/a per season. Wait at least 7 days between applications.	
Onion thrips	<i>Thrips attack only cabbage and brussels sprouts. Plant resistant cabbage varieties to avoid the problem.</i>				
	acetamiprid	4.0 oz Assail 30 SG	7	Apply as part of a resistance management program for control of immature thrips.	
	alpha-cypermethrin	3.2–3.8 fl oz *Fastac	1	Apply when pests reach or exceed established thresholds. Do not apply more than 11.4 fl oz of Fastac per acre per crop season.	
	0.06–0.095 lb bifenthrin + imidacloprid	3.8–6.1 fl oz *Brigadier	7	Do not apply more than 30.72 fl oz/a (0.48 lb ai/a) per season. A total of 0.24 lb ai/a imidacloprid and 0.5 lb ai/a bifenthrin allowed per season.	
	0.13–0.176 lb cyantraniliprole (soil)	10.0–13.5 fl oz Verimark	—	Do not apply more than 13.5 fl oz/a Verimark per crop per season. Do not apply more than 0.4 lb ai/a cyantraniliprole-containing products per crop whether applied as soil or foliar applications. The pH of the application solution should be adjusted to between pH 4 and 6.	
	0.088–0.133 lb cyantraniliprole (foliar)	13.5–20.5 fl oz Exirel	1		
	0.05–0.1 lb cypermethrin	2.5–5.0 fl oz *Ammo 2.5EC	1	Apply when thrips enter cabbage head. There is a 30-day plantback restriction.	
	0.0075–0.015 lb gamma-cyhalothrin	1.92–3.84 oz *Proaxis	1	For suppression only. Apply every 5 days as needed beginning when thrips enter cabbage head. Do not exceed 1.92 pt/a (0.12 lb ai/a) per season.	

*Restricted-use pesticide.

(continued)

**Where ranges are given, check product label for specific number of days between insecticide application and harvest of a particular crop.

Pest management

Asparagus

Bean

Carrot

Celery

Cole crops

Cucumber

Insect control in cole crops—broccoli, brussels sprouts, cabbage, and cauliflower *(continued)*

Insect	Rate/a of active ingredient	Rate/a of commercial product	Days to harvest**	Remarks and suggestions
Onion thrips <i>(cont.)</i>	imidacloprid + beta-cyfluthrin	3.0 fl oz *Leverage 360	7	Do not apply more than 12.8 fl oz/a per season and allow at least 7 days between applications.
	0.02–0.03 lb lambda-cyhalothrin	1.28–1.92 fl oz *Warrior II	4	Apply every 5 days as needed. Do not exceed 0.96 pt/a per season. For suppression only. Apply when thrips enter cabbage head.
	lambda-cyhalothrin + chlorantraniliprole	6.0–9.0 fl oz *Voliam Xpress	3	Do not exceed 31.0 fl oz/a of Voliam Xpress or 0.24 lb ai/a of products containing lambda-cyhalothrin or 0.2 lb ai/a of products containing chlorantraniliprole per growing season. For suppression only.
	lambda-cyhalothrin + thiamethoxam	4.5 fl oz *Endigo ZC	1	Apply when pests reach or exceed established thresholds. Do not apply more than 19.0 fl oz/a Endigo ZC per crop season and allow at least 7 days between applications.
	0.039–0.078 lb novaluron	6.0–12.0 fl oz Rimon 0.83EC	7	For suppression only. Apply when thrips first appear and when they begin to enter the cabbage head. Reapply at 7- to 14-day intervals to protect new growth. Do not apply more than three times per crop per season or more than 24.0 oz/a per season.
	0.004–0.05 lb pyrethrin	1.0–12.0 fl oz Pyrethrin	0	Apply as needed.
	0.047–0.078 lb spinetoram	6.0–10.0 fl oz Radiant SC	1	Do not apply more than 30.0 fl oz/a or make more than 5 applications per year. Do not exceed 2 consecutive applications.
	spinosad	4.0–10.0 fl oz Entrust SC	1	Apply when thrips first appear. Do not make more than 3 applications to a single generation or within a 30-day period.
	thiamethoxam	3.0–5.5 oz Actara 25WDG 5.0–11.0 fl oz Platinum 2SC 1.66–3.67 oz Platinum 75SG	0–7 30 30	Do not follow applications of Platinum with foliar applications of any other neonicotinoid insecticide. Platinum may be applied to direct-seeded crops in-furrow at seeding or transplant depth, or as a narrow surface band above the seedling and followed by irrigation. Do not apply more than 11.0 oz of Actara 25WDG or Platinum 2SC and no more than 3.67 oz Platinum 75SG per acre per crop season and apply sufficient water volume after in-ground application to ensure incorporation into the seed zone. Actara is applied as a foliar spray.
	0.198–0.257 lb thiamethoxam + chlorantraniliprole	10.0–13.0 fl oz Durivo	30	Do not exceed a total of 13.0 fl oz/a Durivo (0.257 lb ai/a) per growing season. Do not exceed 0.172 lb ai/a of thiamethoxam-containing products or 0.2 lb ai/a of chlorantraniliprole-containing products per season.
0.2–0.25 lb zeta-cypermethrin	3.2–4.0 oz *Mustang Maxx	1	Apply when thrips enter cabbage head. Treat every 7 days as needed. Use a minimum of 15 gal/a of finished spray. Do not exceed 24.0 oz/a Mustang Maxx per season.	
0.1 lb zeta-cypermethrin + bifenthrin	10.3 fl oz *Hero	7	Do not apply more than 0.45 lb ai/a per season. Wait at least 7 days between applications.	

*Restricted-use pesticide.

** Where ranges are given, check product label for specific number of days between insecticide application and harvest of a particular crop.

Pest management

Asparagus

Bean

Carrot

Celery

Cole crops

Cucumber

Weed control in cole crops—broccoli, brussels sprouts, cabbage, and cauliflower

Weed	Rate/a of active ingredient	Rate/a of commercial product	Days to harvest	Remarks and suggestions
Annual weeds	0.25–0.50 lb clomazone	<i>direct seeded:</i> 0.67 pt Command 3ME <i>transplant:</i> 0.67–1.3 pt Command 3ME	45	Cabbage only. For suppression and control of annual grasses and broadleaves. Make a single application before seeding or transplanting or after seeding but before crop emergence. Place seed or roots of transplants below the chemical barrier when planting. Strictly follow all precautions and restrictions on the label to minimize offsite movement and carryover. Read the vegetable disclaimer section of the label—the end user assumes all liability for failure to perform and crop injury.
	1.0 lb napropamide	2.0 lb Devrinol DF-XT 2.0 qt Devrinol 2-XT		Apply and shallowly incorporate before planting or apply after seeding or transplanting and sprinkler irrigate within 24 hours. Use lower rate on light soil. Do not use on soil with more than 10% organic matter.
	0.475–1.0 lb pendimethalin	1.0–2.1 pt Prowl H ₂ O	60 (broccoli) 70 (other cole crops)	Prowl H ₂ O may only be applied as a postemergence-directed spray between the rows to broccoli, brussels sprouts, cabbage, and cauliflower. Apply postemergence-directed to two- to four-leaf transplants at 1–3 days after transplanting or to the two- to four-leaf stage of direct-seeded plants.
	trifluralin	several manufacturers		Apply before transplanting. Trifluralin is also registered at lower rates for direct-seeded cole crops. Controls annual grasses and some broadleaves, but is weak on wild mustard, smartweed, common ragweed, velvetleaf, and black nightshade. Rate varies with soil texture and organic matter. Follow recommended soil preparation, application, and incorporation procedures. Must be incorporated within 24 hours. See label for plantback restrictions. Ineffective on peat and muck soils.
Annual grasses	5.0–6.0 lb bensulide	5.0–6.0 qt Prefar 4E		Apply before planting. Incorporate 1–2 inches deep to avoid loss due to volatilization. Use on mineral soils only.
Annual broadleaves	0.25–0.5 lb oxyfluorfen	1.0–2.0 pt Goal 2XL 0.5–1.0 pt GoalTender		For use on transplanted broccoli, cabbage, and cauliflower only. Apply after final tillage but before transplanting. Do not use on direct-seeded cole crops. Use low rate on coarse-textured soils with less than 1% organic matter. If plants contact treated soil, some foliar burn may occur but plants generally outgrow symptoms rapidly. For wider-spectrum weed control, use Goal following preplant-incorporated Treflan. Do not apply if an acetanilide herbicide such as Dual Magnum has been applied during the current growing season.
Annual grasses and some broadleaves	4.5–10.5 lb DCPA	6.0–14.0 lb Dacthal W-75 6.0–14.0 pt Dacthal FL		Make preemergence applications to weed-free soil at seeding or immediately after transplanting. Can be preplant-incorporated. Use only on soils with 5% or less organic matter.
	0.07–0.375 lb sulfentrazone	2.25–12.0 fl oz Spartan 4F		For transplanted processing cabbage only. May be surface-applied in spring before transplanting. It may also be preplant incorporated or applied as a preemergent treatment. When used as a preemergent treatment, Spartan should be applied before transplanting. Banded application to row middles may be made within 72 hours after transplanting. Rate is based on soil texture and organic matter. Do not apply more than 12.0 oz/a per 12-month period.

*Restricted-use pesticide.

(continued)

Pest management

Asparagus

Bean

Carrot

Celery

Cole crops

Cucumber

Weed control in cole crops—broccoli, brussels sprouts, cabbage, and cauliflower *(continued)*

Weed	Rate/a of active ingredient	Rate/a of commercial product	Days to harvest	Remarks and suggestions
Emerged weeds	glyphosate	several manufacturers and formulations		See manufacturer's label to assure that the formulation is labeled for this crop and for specific instructions. Glyphosate may be applied any time before crop emerges. Apply before crop germination in coarse sandy soils. If weeds have been mowed or tilled, wait until they have resumed active growth and reached the recommended stage on the label. Allow 7 or more days before tilling treated fields. Do not tank mix with soil-residual herbicides unless otherwise specified.
	*paraquat	several manufacturers and formulations, not all are registered for this use		Prepare seedbed early to allow for maximum weed emergence. Band or broadcast apply before, during, or after planting, but before crop emergence. In preplant and preemergence (to the crop) uses, do not apply to soils lacking clay minerals (i.e., muck, pure sand). Use the higher rate for heavy weed infestations. Seed and transplant with minimal soil disturbance. Always add crop oil concentrate or non-ionic surfactant to spray mixture. Follow precautions on label.
Emerged broadleaves	0.094–0.187 lb clopyralid	0.25–0.5 pt Stinger	30	Controls many broadleaf weeds including common ragweed, nightshade species, and galinsoga. Suppresses Canada thistle and annual sowthistle. Do not exceed 0.5 pt/a per year. Note rotational crop interval restrictions before use. Consult label for allowable brassica leafy vegetables.
Emerged grasses	0.068–0.12 lb clethodim	9.0–16.0 oz Select Max	30	Apply to actively growing grasses. Repeat treatments may be made at 14-day intervals up to the maximum annual use rate. Do not cultivate grasses within 7 days before or after application. Include appropriate surfactant as required by product label. Do not apply if rain is expected within 1 hour.
	0.094–0.125 lb clethodim	6.0–8.0 oz Select 2EC	30	
	0.094–0.28 lb sethoxydim	0.5–1.5 pt Poast	30	Make postemergence applications to actively growing grasses within the size ranges indicated on the label. Check the label for wild proso millet or rescue treatment rates. Do not apply more than 3.0 pt/a Poast in one crop season. Always add 2.0 pt/a of oil concentrate. Check the label for additional precautions and restrictions.

*Restricted-use pesticide.

Pest management

Asparagus

Bean

Carrot

Celery

Cole crops

Cucumber