

Chapter 15.

Minor Vegetable Crops: Beets, Carrots, Celery, and Parsley

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BEETS BOTANY

Nomenclature

Family - Chenopodiaceae

Beet - *Beta vulgaris*

Origin

Beet is native to areas of Europe, the Near East, and Africa adjacent to the Mediterranean Sea. Leaves and roots (enlarged hypocotyl) are the consumed plant parts.

Related Species

Spinach and Swiss chard are the only other vegetables of significance in the Chenopodiaceae family. The most important crop plant in this family is sugar beet.

Present day use is as a garnish rather than as a primary component of the diet.

Related Species

Other common vegetables in the Apiaceae family are celeriac and parsnip. This family also contains many important herbs and spices including cilantro and fennel as well as some ornamentals.

VARIETIES

Common Florida beet, carrot, celery, and parsley varieties are listed in Table 1.

CARROTS, CELERY, AND PARSLEY BOTANY

Nomenclature

Family - Apiaceae (Umbelliferae)

Carrot - *Daucus carota*

Celery - *Apium graveolens*

Parsley - *Petroselinum crispum*

Origin

The origin of carrot is believed to be in central Asia, perhaps in present-day Afghanistan. Celery is native to marshy sites that may be somewhat saline in areas of southern Europe and North Africa that border the Mediterranean Sea. Parsley is believed to be native to the Mediterranean area as well. Its early use was medicinal.

SEEDING AND PLANTING

Seeding and planting information for minor vegetables is listed in Table 2.

FERTILIZER AND LIME

Beet - Broadcast all P₂O₅, micronutrients, and 25 to 50% of N and K₂O before planting. Sidedress remaining N and K₂O four to five weeks after planting when plants are four to six inches tall. Soil test and fertilizer recommendations for beet grown on mineral soil are described in Table 3.

Carrot - For mineral soils, broadcast all P₂O₅, micronutrients, and 25% of N and K₂O prior to forming beds. Sidedress remaining N and K₂O in two or three applications during the early growth period (see Table 3).

Table 1. Common minor vegetable crop varieties.

Beets	Carrots	Celery	Parsley
Asgrow Wonder	Apache	Floribelle - M9	Forest Green (CL)
Bulls Blood (tops)	Choctaw	June Belle	Jade (CL, H)
Golden Beets (yellow)	Navajo	Florida 683	Improved Market Gardeners (CL)
Green Top	Top Notch		Dark Green Italian (PL)
Pacemaker III			
Red Ace			

CL=Curley Leaf; PL=Plain Leaf; H=hybrid

On Histosol soils, broadcast all fertilizer prior to bed forming. Better P₂O₅ efficiency might result on alkaline mucks from banding. Supplemental N (40 lb/A) might be needed in cool winter weather or after leaching rains (see Table 4).

Celery - On mineral soils, broadcast all P₂O₅, micro-nutrients, and 20 to 25% N and K₂O before transplanting. Apply the remaining N and K₂O in 40 to 60 lb side dressings through the early part of the growing season (once at 2 to 3 weeks after planting and the second one at 6 to 8 weeks after planting) (see Table 3).

On Histosol soils, broadcast and incorporate all P₂O₅ and micronutrient fertilizers (Fig. 15-5) prior to planting. On high-pH soil, there might be benefit from banding P₂O₅. Potassium should be applied in three applications (at planting and at 1 and 2 months after planting) to reduce soluble salt burn and minimize leaching losses. For crops harvested before December 1, make two applications of 40 lbs N each at 1 and 2 months after transplanting. For crops harvested between December 1 and March 31, make two applications of 60 lbs each. For crops, harvested after April 1, make two applications of 30 lbs each (see Table 4).

Parsley - For mineral soils with subsurface or sprinkler irrigation, broadcast all P₂O₅, micronutrients, and 20 to 25% of N and K₂O before seeding. Top dress or band remaining N and K₂O at rates up to 30 lbs/A each several times during growing season for single cutting. For multiple cuttings apply 30 lbs/A each of N and K₂O after each cutting. Soil test and fertilizer recommendations for parsley on mineral soils are given in Table 3.

For Histosol soils, broadcast all fertilizer prior to seeding. Supplemental N might be needed during cool, winter periods or after leaching rain. For more than one cutting, apply additional 20 to 30 lbs K₂O/A after each cutting. Soil test and fertilizer recommendations for parsley grown on Histosols are given in Table 4.

PLANT TISSUE ANALYSIS

Plant tissue analysis data for all minor crops are listed in Table 5.

IRRIGATION

Beet - Irrigation is critical if rainfall is low during the rapid growth period of root (hypocotyl) development. Crop water requirements (see Chapter 3, *Principles and Practices of Irrigation Management for Vegetables*, Tables 4-6) will equal ETo (see Chapter 3, Table 3) during this stage of growth, and decrease to 90% of ETo during the final stage of production. Overhead (sprinkler) irrigation might be needed to aid seedling emergence, especially on crusting soils in dry periods. Sprinkler irrigation might also be needed at harvest to refresh plants when beets leaves are sold separately or when bunched beets are harvested.

Carrots - Carrots have a high demand for water during rapid growth and root development, 105% of ETo (see Chapter 3, *Principles and Practices of Irrigation Management for Vegetables*, Table 4-6). However, rates will decrease to 75% of ETo during the final stages of growth.

Table 2. Seeding and planting information for Beet, Carrots, Celery, and Parsley.

	Beets	Carrots	Celery	Parsley
Planting Dates				
North Florida	Aug - Feb	Aug-Mar	Aug - Feb	Sept - Mar
Central Florida	Sept - Feb	Aug-Mar	Sept - Mar	Sept - Mar
South Florida	Oct - Jan	Sept-Mar	Oct - Mar	All year
Planting Information				
Distance between rows (in)	12 - 30	10 - 12	18-40	6 - 12
Distance between plants (in) ²	2 - 4	1 - 3	6-12	drilled ⁴
Seeding depth (in)	0.5 - 1.0	1/4	on surface ²	0.25
Seed per acre (lb)	10 - 15	2 - 4	1 - 2 ³	6 - 8
Days to maturity from seed	50 - 70	70 - 120	75 - 90 ³	70 - 80
Plant population (per acre) ¹	261,360	630,000	58,080	1 million+

¹ Population based on closest between and within row spacing

² Seed pressed in beds, not buried, and kept moist for transplant production. Transplant production takes three months in seedbed.

³ For celery, column one should read "Seed per acre from transplants (lb)" and "Days to maturity from transplant".

⁴ Cut and bunched via ratoon system.

Celery - Celery water requirements (see Chapter 3, *Principles and Practices of Irrigation Management for Vegetables*, Tables 4-6) during rapid growth are similar to carrots (105% of ETo) with a slightly lower demand for water during the final stages of growth and development (95% of ETo). (See also Chapter 3, Table 3)

Parsley - Because parsley is produced for its vegetative growth, initial water requirements (see Chapter 3, *Principles and Practices of Irrigation Management for Vegetables*, Table 4 to 6) will increase from 20% to 30% of ETo to 100% of ETo (see Chapter 3, *Principles and Practices of Irrigation Management for Vegetables*, Table 3) at complete canopy or foliar coverage through harvest. Water stress will reduce leaf growth and development resulting in reduced yields.

WEED MANAGEMENT

Herbicides labeled for weed control in beets are listed in Table 6.

Herbicides labeled for weed control in carrots are listed in Table 7.

Herbicides labeled for weed control in celery are listed in Table 8.

Herbicides labeled for weed control in parsley are listed in Table 9.

DISEASE MANAGEMENT

Information on managing diseases affecting beet is given in Table 10.

Information on managing diseases affecting carrots is given in Table 11.

Information on managing diseases affecting celery is given in Table 12.

Information on managing diseases affecting parsley is given in Table 13.

INSECT MANAGEMENT

Table 14 outlines the insecticides approved for use on insects attacking carrot.

Table 15 outlines the insecticides approved for use on insects attacking celery.

Table 16 outlines the insecticides approved for use on insects attacking parsley.

Table 3. Soil test and fertilizer recommendations for mineral soils for minor crops.

Target pH	N lb/A	P ₂ O ₅					K ₂ O				
		VL	L	M	H	VH	VL	L	M	H	VH
Beet											
6.5	120	120	100	80	0	0	120	100	80	0	0
Carrot											
6.5	175	150	120	100	0	0	150	120	100	0	0
Celery											
6.5	200	200	150	100	0	0	250	150	100	0	0
Parsley											
6.5	120	150	120	100	0	0	150	120	100	0	0

See Chapter 2 section on supplemental fertilizer application and best management practices

Table 4. Soil test and fertilizer recommendations for Histosol soils for carrot, celery, and parsley with target pH = 6.5 and N rate = 0 lb/A.

Crop	P and K indexes and fertilizer rates							
Carrot	P index	3	6	9	12	15	18	21
	P ₂ O ₅ (lb/A)	260	200	140	80	20	0	0
	K index	50	80	110	140	170		
	K ₂ O (lb/A)	200	140	80	20	0		
Celery	P index	3	6	9	12	15	18	21
	P ₂ O ₅ (lb/A)	260	200	170	100	60	30	0
	K index	50	80	110	140	170	200	
	K ₂ O (lb/A)	300	240	180	120	60	0	
Parsley	P index	3	6	9	12	15	18	
	P ₂ O ₅ (lb/A)	200	140	80	20	0	0	
	K index	50	80	110	140	170	200	
	K ₂ O (lb/A)	200	140	80	50	0	0	

Table 5. Plant tissue analysis for beet, carrot, and celery. Dry weight basis.

Status	N	P	K	Ca	Mg	S	Fe	Mn	Zn	Bo	Cu	Mo
	Percent (%)						Parts per million (ppm)					
Beet												
Deficient	<3.0	0.22	2.0	0.7	0.25	0.2	40	30	15	30	5	0.05
Adequate Range	3.0-5.0	0.25-0.4	2.0-6.0	0.7-2.0	0.25-1.0	0.2-0.5	40-200	30-200	15-30	30-80	5-10	0.2-0.6
High	>5.0	0.40	6.0	2.0	1.0	0.5	200	200	30	80	10	0.06
Carrot												
Deficient	<1.8	0.2	2.0	1.0	0.15	0.2	30	30	20	20	4	-
Adequate Range	1.8-2.5	0.2-0.4	2.0-4.0	1.0-2.0	0.2-0.5	0.2-0.4	30-60	30-60	20-60	20-40	4-10	-
High	>2.5	0.4	4.0	2.0	0.5	0.4	60	100	60	40	10	-
Celery												
Deficient	<1.5	0.3	6.0	1.3	0.3	-	20	5	20	15	4	-
Adequate Range	1.5-1.7	0.3-0.6	6.0-8.0	1.3-2.0	0.3-0.6	-	20-30	5-10	20-40	15-25	4-6	-
High	>1.7	0.6	8.0	2.0	0.6	-	100	20	60	25	6	-

Note: No plant tissue analysis available for Parsley.

Table 6. Chemical weed control in beet..

Active Ingredient lb. a.i./A	Trade name Formulation/A	Weeds Controlled / Remarks
PREEMERGENCE		
Carfentrazone up to 0.031	(Aim) 2 EC or 1.9 EW up to 2 fl. oz.	Emerged broadleaf weeds. Apply as a preplant burn down for emerged broad-leaf weeds. Use crop oil concentrate or nonionic surfactant at recommended rates. May be tank mixed with other herbicides.
Ethofumisate 1.88	(Nortron) 4 SC 60 fl. oz	Annual broadleaf and grass weeds. No more than 96 fl. oz./A should be applied in a single growing season.
Glyphosate	(various formulations) consult labels	Emerged broadleaf and grass weeds. Apply as a preplant burn down. Consult label for individual product directions.
Pelargonic acid	(Scythe) 4.2 EC 3 – 10%	Emerged broadleaf and grass weeds. Apply as a preplant burn down treatment. Scythe is a contact and nonresidual and can be tank mixed residual preemer- gence herbicides to lengthen control.
Pyrazon 1.95 – 2.28	(Pyramin DF) 65 DF 3.0 - 3.5 lb.	Use lower rate on lighter soils. If rain doesn't fall in 10 days irrigate or cultivate.
Pyraflufen 0.0008 – 0.003	(ET Herbicide) 0.208 EC 0.5 – 2.0 fl. oz.	Emerged broadleaf weeds. Apply as a preplant burndown treatment.
*** POSTEMERGENCE ***		
Carfentrazone up to 0.31	(Aim) 2 EC or 1.9 EW up to 2 oz.	Emerged broadleaf weeds. Apply as hooded application to row middles only. Use crop oil concentrate or nonionic surfactant at recommended rates. May be tank mixed with other herbicides. Do not exceed 6.1 fl. oz. per cropping season. PHI 0 days.
Clethodim 0.09 – 0.13	(Select, Arrow) 2 EC 6 – 8 fl. oz.	Perennial and annual grass weeds. In fields with heavy grass pressure or larger grass weeds, use higher rates or repeat applications 14 days apart. Use a crop oil concentrate at 1% v/v in the finished spray volume. Nonionic surfactant with Select Max. PHI 30 days.
0.07 - 0.13	(Select Max) 1 EC 9 - 16 fl. oz	
Ethofumisate 0.16 - 0.33	(Nortron) 4 SC 5.25 – 10.5 fl. oz.	Annual broadleaf and grass weeds. Consult label for rate based on table beet stage of growth. Do not exceed 96 fl. oz./A in a single growing season.
Pelargonic Acid	(Scythe) 4.2 EC 3 – 10%	Emerged broadleaf and grass weeds. Direct spray to row middles. Product is a contact, nonselective, foliar applied herbicide with no residual control. May be tank mixed with several soil residual compounds.
Phenmedipham 0.5 – 1.0	(Spin-aid) 1.3 EC 3 – 6 pt.	Apply after the 4 to 6 true-leaf stage of beet. May be applied as a split applica- tion. PHI 60 days.
Phenmedipham + desmedipham 0.24 – 0.73	(Betamix) 1.3 EC 1.5 – 4.5	Sequential application should be used at 5 to 7 day intervals. Consult label for rate based on weed size. Do not exceed 0.96 lb. ai/A per season of deme- dipham and phenmedipham. PHI 14 days for tops. PHI 50 days for roots.
Pyrazon 1.95 – 2.28	(Pyramin DF) 65 DF 3.0 - 3.5 lb.	Apply after beets have 2 expanded true leaves and before any weeds have more than 2 true leaves.
Sethoxydim 0.28 – 0.47	(Poast) 1.5 EC 1.5 to 2.5 pt.	Emerged grass weeds. A maximum of 5 pt./A applied in one season. Include a crop oil concentrate. Unsatisfactory results may occur if applied to grasses under stress. PHI 60 days.

Table 7. Chemical weed control in carrot.

Active Ingredient lb. a.i./A	Trade name Formulation/A	Weeds Controlled / Remarks
PREPLANT / PREEMERGENCE		
Carfentrazone up to 0.031	(Aim) 2 EC or 1.9 EW up to 2 fl. oz.	Emerged broadleaf weeds. Apply as a preplant burn down for emerged broadleaf weeds. Use crop oil concentrate or nonionic surfactant at recommended rates. May be tank mixed with other herbicides.
Glyphosate	(various formulations) consult labels	Emerged broadleaf and grass weeds. Apply as a preplant burn down. Consult label for individual product directions.
Linuron 0.5 – 1.0	(Lorox DF) 50 DF 1 - 2 lb.	A single application after planting and before crop emergence. Plant seed at least 0.5 inch deep. Preemergence and postemergence applications should not exceed 4 lb./A per season.
Paraquat 0.5 – 1.0	(Gramoxone Inteon) 2 SL 2.0 - 4.0 pt. (Firestorm) 3 SL 1.3 - 2.7 pt.	Emerged broadleaf and grass weeds. Apply as a preplant burn down treatment. Apply before crop emergence. Use a nonionic surfactant.
Pelargonic Acid	(Scythe) 4.2 EC 3 – 10%	Emerged broadleaf and grass weeds. Apply as a preplant burn down treatment. Scythe is a contact and nonresidual and can be tank mixed residual preemergence herbicides to lengthen control.
Pendimethalin 0.95	(Prowl H ₂ O) 3.8 2.0 pt.	Broadleaf and grass control. Apply within 2 days of planting before the emergence of the crop. PHI 60 days.
Prometryn 1 – 2	(Caparol) 4 L 2 – 4 pt.	Most annual broadleaf and grass weeds. Do not exceed one application. Consult label for rotational crop restrictions.
Pyraflufen 0.0008 – 0.003	(ET Herbicide) 0.208 EC 0.5 – 2.0 fl. oz.	Emerged broadleaf and grass weeds. Apply as a preplant burndown treatment.
Trifluralin 0.5	(Treflan, Trifluralin) 4EC 1 pt. (Treflan TR-10) 5 lb.	Annual broadleaf and grass weeds. Do not apply to muck soils. Mineral soils with 2 – 5% organic material, apply 0.75 lb ai/A. Incorporate 4 inches or less within 8 hours of application. PHI 60 days.
*** POSTEMERGENCE ***		
Carfentrazone up to 0.31	(Aim) 2 EC or 1.9 EW up to 2 oz.	Emerged broadleaf weeds. Apply as hooded application to row middles only. Use crop oil concentrate or nonionic surfactant at recommended rates. May be tank mixed with other herbicides. Do not exceed 6.1 fl. oz. per cropping season. PHI 0 days.
Clethodim 0.09 – 0.13 0.07 - 0.13	(Select, Arrow) 2 EC 6 – 8 fl. oz. (Select Max) 1 EC 9 - 16 fl. oz	Perennial and annual grass weeds. In fields with heavy grass pressure or larger grass weeds, use higher rates or repeat applications 14 days apart. Use a crop oil concentrate at 1% v/v in the finished spray volume. Nonionic surfactant with Select Max. PHI 30 days.
Fluazifop 0.188	(Fusilade DX) 12 fl. oz.	Actively growing grass weeds. Maximum is 48 fl. oz./A per growing season. Withhold field flooding 45 to 60 days following application. In Palm Beach and Hendry counties a 60 day interval must be observed for flooding. PHI 45 days.
Linuron 0.5 – 1.0	(Lorox DF) 50 DF 1 - 2 lb.	Apply after carrots are 3 inches tall. Repeat applications may be made but do not exceed 4 lb./A. Can be applied following Stoddard Solvent provided that the applications are at least one day apart. Do not tank mix with Stoddard Solvent.
Metribuzin 0.25	(Metribuizn, Metri DF, Tricor DF) 75 DF 0.3 lb. (Metri, Tricor) 4 F 0.5 pt	Broad leafTotal amount applied in a season should not exceed 0.5 lb. ai/A. Apply after carrots have 5-6 true leaves and weeds are less than 1 inch in height. If needed, a second application may be made after an interval of at least 3 weeks. PHI 60 days.
Pelargonic Acid	(Scythe) 4.2 EC 3 – 10%	Emerged broadleaf and grass weeds. Direct spray to row middles. Product is a contact, nonselective, foliar applied herbicide with no residual control. May be tank mixed with several soil residual compounds.
Prometryn 1 – 2	(Caparol) 4 L 2 – 4 pt.	Most annual broadleaf and grass weeds. Apply up to through 6 leaf stage of carrot. One application of 4 pt./A or two applications of 2 pt./A. For POST control of weeds, include NIS or COC. Consult label for rotational crop restrictions. PHI 30 days.
Sethoxydim 0.28 – 0.38	(Poast) 1.5 EC 1.5 to 2.0 pt.	Emerged grass weeds. A maximum of 5 pt./A applied in one season. Include a crop oil concentrate. Unsatisfactory results may occur if applied to grasses under stress. PHI 30 days.

Table 8. Chemical weed control in celery.

Active Ingredient lb. a.i./A	Trade name Formulation/A	Weeds Controlled / Remarks
PREPLANT / PREEMERGENCE		
Bensulide 5 – 6	(Prefar) 4 E 5 – 6 qt.	Broadleaf and grass weeds. Incorporate mechanically 1-2 inches deep or with irrigation 2-4 inches deep.
Carfentrazone up to 0.031	(Aim) 2 EC or 1.9 EW up to 2 fl. oz.	Emerged broadleaf weeds. Apply as a preplant burn down for emerged broadleaf weeds. Use crop oil concentrate or nonionic surfactant at recommended rates. May be tank mixed with other herbicides.
Glyphosate	(various formulations) consult labels	Emerged broadleaf and grass weeds. Apply as a preplant burn down. Consult label for individual product directions.
S-metolachlor 0.95 – 1.26	(Dual Magnum) 1.0 – 1.33	Broadleaf and grass weeds and nutsedge. Label is a third party registration (TPR, Inc.) and authorization and waiver agreements must be obtained prior to use. Rates are based on organic matter.
Pelargonic acid	(Scythe) 4.2 EC 3 – 10%	Emerged broadleaf and grass weeds. Apply as a preplant burn down treatment. Scythe is a contact and nonresidual and can be tank mixed residual preemergence herbicides to lengthen control.
Trifluralin 0.5	(Treflan, Trifluralin) 4EC 1 pt. (Treflan, Trifluralin) 10 G 5 lb.	Annual broadleaf and grass weeds. Do not apply to muck soils. Mineral soils with 2 – 5% organic material, apply 0.75 lb ai/A. Incorporate 4 inches or less within 8 hours of application.
*** POSTTRANSPLANT ***		
Carfentrazone up to 0.31	(Aim) 2 EC or 1.9 EW up to 2 oz.	Emerged broadleaf weeds. Apply as hooded application to row middles only. Use crop oil concentrate or nonionic surfactant at recommended rates. May be tank mixed with other herbicides. Do not exceed 6.1 fl. oz. per cropping season. PHI 0 days.
Clethodim 0.09 – 0.13	(Select, Arrow) 2 EC 6 – 8 fl. oz.	Perennial and annual grass weeds. In fields with heavy grass pressure or larger grass weeds, use higher rates or repeat applications 14 days apart. Use a crop oil concentrate at 1% v/v in the finished spray volume. Nonionic surfactant with Select Max. PHI 30 days.
0.07 - 0.13	(Select Max) 1 EC 9 - 16 fl. oz	
Linuron 0.5 – 1.0	(Lorox DF) 50 DF 1 - 2 lb.	Broadleaf and grass weeds. Apply after transplanting but before celery is 8 inches tall. Do not apply when temperatures exceed 85°F nor as a tank mix with surfactants, nitrogen, or fertilizer solution. PHI 45 days.
Pelargonic acid	(Scythe) 4.2 EC 3 – 10%	Emerged broadleaf and grass weeds. Direct spray to row middles with hooded or shielded sprayer. Product is a contact, nonselective herbicide with no residual control. May be tank mixed with several soil residual compounds.
Prometryn 0.8 – 1.6	(Caparol) 4 L 1.6 – 3.2 pt.	Broadleaf weeds. Apply one application during the 2 to 6 week period after transplanting. Weeds should not exceed 2 inches.
S-metolachlor 0.95 – 1.26	(Dual Magnum) 1.0 – 1.33	Broadleaf and grass weeds and nutsedge. Label is a third party registration (TPR, Inc.) and authorization and waiver agreements must be obtained prior to use. Rates are based on organic matter.
Sethoxydim 0.28	(Poast) 1.5 EC 1.5 pt.	Emerged grass weeds. A maximum of 3 pt./A per season. Include a crop oil concentrate. Unsatisfactory results may occur if applied to grasses under stress. PHI 30 days.
*** CELERY SEEDBEDS ***		
Prometryn 0.6 – 0.8	(Caparol) 4 L 1.2 – 1.6 pt.	Broadleaf weeds. Apply once per year to seedbeds. Apply after celery has 2-5 true leaves. Apply after seedbed covers have been removed for at least one week.

Table 9. Chemical weed control in parsley and cilantro.

Active Ingredient lb. a.i./A	Trade name Product/A	Crops	Weeds Controlled / remarks
*** PRETRANSPLANT AND PREEMERGENCE ***			
Bensulide 5 - 6	(Prefar) 4 E 5 – 6 qt.	Parsley, cilantro	Annual broadleaf and grass weeds. Incorporate or irrigate 1 to 2 inches deep within 36 hours of applications. Consult label for rotation restrictions.
Glyphosate	(various formulations) consult label	Parsley, cilantro	Control emerged broadleaf and grass weeds. Consult individual labels for restrictions.
Linuron 0.5 -1.5	(Lorox DF) 50 DF 1 – 3 lb.	Parsley	Mineral and muck soils. Apply after planting and before crop emergence. Use lower rates on coarse soils.
Pelargonic acid	(Scythe) 4.2 EC 3 – 10%	Parsley, cilantro	Controls emerged weeds. Apply before emergence of crop. Product is a contact, nonselective, foliar applied herbicide. There is no residual activity.
Prometryn 0.5	(Caparol) 4 L 1.0 pt	Parsley	A single preemergence application can be applied up to 14 days after planting. A second application can be made up to 30 days prior to harvest. Do not apply on sand or loamy sand. Read label for rotation restrictions.
Prometryn 1 – 1.6	(Caparol) 4 L 2 – 3.2 pt.	Cilantro	Make one application after planting, but before crop emergence. Do not use on sand or loamy sand soil.
Pyraflufen 0.0008 – 0.003	(ET Herbicide/Defoliant) 0.5 – 2.0 fl. oz.	Parsley	Emerged broadleaf and grass weeds. Plant 1 day after application. Apply as a preplant burndown treatment.
*** POSTEMERGENCE ***			
Carfentrazone up to 0.031	(Aim) 2 EC, 1.9 EW up to 2 fl. oz. mineral and muck soil	Parsley, cilantro	Emerged broadleaf control. Post-direct hooded application to row middles for burndown of emerged broadleaf weeds. Include COC or NIS at recommended rates. PHI 0 days.
Clethodim 0.094 – 0.125	(Arrow) 2 EC 6 – 8 fl. oz.	Parsley, cilantro	Annual and perennial grass control. Select max is not registered in cilantro. PHI 14 days.
0.07 – 0.125	(Select Max) 1 EC 9 – 16 fl. oz.		
Linuron 0.5	(Lorox DF) 50 DF 1 lb	Parsley	Apply after crops has a minimum of 3 true leaves or crop injury may result. Apply when weeds are in the 1 to 3 true leaf stage. Do not exceed 3 lb. of Lorox / acre per season. PHI 30 days.
Pelargonic acid	(Scythe) 4.2 EC 3 – 10%	Parsley, cilantro	Controls emerged weeds. Row middles only. Use a shielded sprayer directed to the row middles to reduce drift to the crop.
Prometryn 0.5	(Caparol) 4 L 1.0 pt	Parsley	An application can be made up to 30 days prior to harvest. Another application can be applied after harvest to the new regrowth. Do not use on sand or loamy sands. Read label for rotation restrictions.
Sethoxydim 0.19 – 0.28	(Poast) 1.5 EC 1.0 – 1.5 pt.	Parsley, cilantro	Growing grass weeds. Decreased efficacy if weeds are under stress. Do not exceed 3.0 pt./A per season. Include a COC in the spray solution. PHI 15 days.

Table 10. Beet fungicides and other disease management products.

Fungicide Group ¹	Chemical (active ingredient)	Maximum Rate/Acre/		Minimum Days to		Pertinent Diseases or Pathogens	Remarks ²
		Applic.	Season	Harvest	Reentry		
M1	(copper compounds) Many brands available: Badge SC, Badge X2, Basic Copper 53, C-O-C-S WDG, Champ DP, Champ WG, Champ Formula 2, Champ WP, COC DF, COC WP, Copper Count N, Cueva, Cuprofix Ultra, Kentan DF, Kocide DF, Kocide 2000, Kocide 3000, Kocide 4.5 LF, Nordox 75 WG, NuCop 50WP, NuCop 3L, NuCop HB, NuCop DF, Top Cop w/ Sulfur	-	-	1	Varies by product from 4 hrs to 2 days	Cercospora	See individual labels for more details.
M2	(sulfur) Many brands available: Kumulus DF, Micro Sulf, Microthiol Disperss, Sulfur 90W, Top Cop w/ Sulfur, Wetttable Sulfur	-	-	1	1	Cercospora	Do not apply during periods of warm weather. Do not apply within 2 weeks of an oil spray.
M3	Defiant 75WP (thiram)	5.3 oz/ 100 lbs of seed			1	Damping off	Seed treatment only
3	Bumper 41.8EC (propiconazole)	4.0 fl oz	16.0 fl oz	7	0.5	Cercospora	Do not apply more than 4 appl/season
3	Folicur 3.6 F (tebuconazole)	7.2 fl oz	28.8 fl oz	7	0.5	Cercospora	Do not apply more than 4 appl/season
3	Monsoon 3.6 F (tebuconazole)	7.2 fl oz	28.8 fl oz	7	0.5	Cercospora	Do not apply more than 4 appl/season
3	Orius 3.6 F (tebuconazole)	7.2 fl oz	28.8 fl oz	7	0.5	Cercospora	Do not apply more than 4 appl/season
3	Toledo 3.6 F (tebuconazole)	7.2 fl oz	28.8 fl oz	7	0.5	Cercospora	Do not apply more than 4 appl/season
3	Tebuzol 3.6F (tebuconazole)	7.2 fl oz	28.8 fl oz	7	0.5	Cercospora	Do not apply more than 4 appl/season
3	Tebustar 3.6L (tebuconazole)	7.2 fl oz	28.8 fl oz	7	0.5	Cercospora	Do not apply more than 4 appl/season
3	Tilt 3.6E (propiconazole)	4.0 fl oz	16.0 fl oz	7	0.5	Cercospora	Do not apply more than 4 appl/season
4	Allegiance FL (metalaxyl)	0.75 fl oz/ 100 lb seed			0.5	Pythium seedling blight	Seed treatment only. See label for details.
4	Apron XL LS (mefenoxam)	0.64 fl. oz./ 100 lb seed			2	Pythium seedling blight	Seed treatment only
4	Metastar 2E AG (metalaxyl)	8 pt			1	Pythium seedling blight	Apply as a broadcast soil application and incorporate into top 2 inches. See label for directions.
4	Ridomil Gold EC (mefenoxam)	2 pt			2	Pythium seedling diseases	Apply at seeding in a 7-12" band on soil over seed furrow
4	Ridomil Gold GR (mefenoxam)	40 lb			2	Pythium seedling diseases	See label for specifics regarding preplant incorporated applications and surface applications at the time of planting.

Table 10. Continued.

Fungicide Group ¹	Chemical (active ingredient)	Maximum Rate/Acre/		Minimum Days to		Pertinent Diseases or Pathogens	Remarks ²
		Applic.	Season	Harvest	Reentry		
4	Sebring 2.65 ST (metalaxyl)	0.7 fl oz/ 100 lb seed			1	Pythium seedling blight	Seed treatment only
4	Ultra Flourish (mefenoxam)	4 pt			2	Pythium seedling diseases	See label for specifics regarding preplant incorporated applications and surface applications at the time of planting.
9 & 12	Switch 62.5WDG (cyprodinil/fludioxonil)	14 oz	56 oz	7	0.5	Alternaria Powdery mildew	See label.
11	Amistar 80DF (azoxystrobin)	5 oz	2.5 lb	0	4 hrs	Cercospora	See label for Rhizoctonia control .
11	Cabrio EG (pyraclostrobin)	16 oz	48 oz	0	0.5	Cercospora	Limit is 3 appl./crop & alternate chemistry.
11	Flint (trifloxystrobin)	3 oz	12 oz	7	0.5	Cercospora	Alternate every other application with a fungicide of dissimilar mode of action.
11	Gem 500SC (trifloxystrobin)	2.9 fl oz	11.6 fl oz	7	0.5	Cercospora	Alternate every other application with a fungicide of dissimilar mode of action.
11	Quadris (azoxystrobin)	15.4 fl oz	3.75 qt	0	4 hrs	Cercospora	Alternate with a fungicide of dissimilar mode of action.
11	Reason (fenamidone)	8.2 fl oz	24.6 fl oz	2	0.5	Cercospora	Alternate every other application with a fungicide of dissimilar mode of action.
12	Maxim 4FS (fludioxonil)	0.16 fl oz/ 100 lb of seed			0.5	Various seedling diseases	Seed treatment only
33	Mono- and di-Potassium salts of phosphorous acid (See individual labels) including: Fosphite, Fungi-Phite, Prophyt, Phostrol, Rampart, Topaz (potassium phosphite) Phorcephite (potassium phosphate /potassium phosphate)	-	-		4 hrs	<i>Pythium</i> , <i>Rhizoctonia</i> , <i>Fusarium</i>	Do not exceed 6 appl/ crop. Caution should be used when applying in a management program including copper fungicides. See label for foliar, root dip and irrigation application details.
43	Presidio (fluopicolide)	4 fl oz	12 fl oz	7	0.5	Downy mildew	Do not exceed more than 2 sequential applications.
P	Regalia (Extract of <i>Reynoutria sachalinensis</i>)	1% v/v	12 qt	7	4 hrs	Bacterial blight	Begin applications preventatively. Spray volumes should be 50-100 GPA.
NC	Actinovate AG (<i>Streptomyces lydicus</i>)	12 oz	12 oz	0	1 hr	Alternaria Antracnose Botrytis Fusarium Pythium Phytophthora Rhizoctonia Sclerotinia	Apply to soil through irrigation, as a seed treatment, to foliage as a spray. See label for details.

Table 10. Continued.

Fungicide Group ¹	Chemical (active ingredient)	Maximum Rate/Acre/		Minimum Days to		Pertinent Diseases or Pathogens	Remarks ²
		Applic.	Season	Harvest	Reentry		
NC	Cease (<i>Bacillus subtilis</i> strain QST 713)	6 qt/100 gal mix		0	4 hrs		Apply to soil through irrigation, or to foliage as a spray. See label for details.
NC	Companion L (<i>Bacillus subtilis</i> GB03)	1 gal		0	4 hrs	Alternaria Fusarium Soft rot Pythium Rhizoctonia	Can be applied in field, greenhouse, or hydroponically. See label for details.
NC	Kaligreen (potassium bicarbonate)	3 lb		1	4 hrs	Powdery mildew	Apply in a minimum spray volume of 25 GPA.
NC	Oxidate (hydrogen dioxide)	1:100 dilution		0	0	Bacterial blight Botrytis Powdery mildew	See label for details.
NC	Rhapsody (<i>Bacillus subtilis</i> strain QST 713)	6 qt		0	4 hrs	Powdery mildew	See labels for details.
NC	Serenade Max (<i>Bacillus subtilis</i> strain QST 713)	3 lb		0	4 hrs	Sclerotinia	See labels for details.
NC	Serenade Soil (<i>Bacillus subtilis</i> strain QST 713)	6 qt		0	4 hrs	Rhizoctonia Pythium Fusarium Verticillium Phytophthora	See label for details. Soil treatment.
NC	Sil-Matrix (potassium silicate)	4 qts	10 gal	0	4 hrs	Powdery mildew	Apply at a rate of 2-4 qt/100 gal water
NC	Soilgard 12G (<i>Gliocladium virens</i> strain GL-21)				4 hrs	Damping off Root diseases	See label for details.
NC	Sonata (<i>Bacillus pumilis</i> strain QST 2808)	4 qt		0	4 hrs	Powdery mildew	For suppression or use as a preventative in a program with other registered fungicides.
NC	Sporatec (Clove Oil, Rosemary Oil, and Thyme Oil)	1.5 qt		0	0 hrs	Powdery mildew	Sporatec is a concentrated oil-based product. It requires the use of an approved adjuvant to improve spreading and sticking. OMRI listed
NC	Tenet WP (<i>Trichoderma asperellum</i> and <i>T. gamsii</i>)	3 oz/ 1000 ft of row			1 hr	Various soil-borne diseases	Apply up to 7 days before planting. For organic production.
NC	TerraClean (Hydrogen dioxide)	1 gal/ 1000 gal of water			0 hrs	Various soil-borne diseases	Apply as a soil treatment prior to or after planting
NC	Trilogy (Neem Oil)	2 gal			4 hrs		Apply at a rate of 0.5% - 1.0% in 25 to 100 gall water/acre or at 2 pt in a minimum of 5 GPA for low volume appls.

Table 11. Carrot fungicides and other disease management products.

Fungicide Group ¹	Chemical (active ingredient)	Maximum Rate/Acre/		Minimum Days to		Pertinent Diseases or Pathogens	Remarks ²
		Applic.	Season	Harvest	Reentry		
M1	(copper compounds) Many brands available: Badge SC, Badge X2, Basic Copper 53, COCS WDG, Champ DP, Champ WG, Champ Formula 2, Champ WP, COC DF, COC WP, Copper Count N, Cuerva, Cuprofix Ultra, Kentan DF, Kocide DF, Kocide 2000, Kocide 3000, Kocide 4.5 LF, Nordox, Nordox 75 WG, NuCop 50WP, NuCop 3L, NuCop HB, NuCop DF, Stretch, Tenn-Cop 5E, Top Cop w/ Sulfur	-	-	1	Varies by product from 4 hrs to 2 days	Alternaria blight, Cercospora leaf spot	
M2	(sulfur) Many brands available: Dusting Sulfur – IAP, Kumulus DF, Micro Sulf, Microfine Sulfur, Microthiol Disperss, Sanction, Sulfur 90W, Super-Six, Top Cop w/ Sulfur, Yellow Jacket Wetttable Sulfur	-	-	1	1	Powdery mildew	Do not apply during periods of warm weather. Do not apply within 2 weeks of an oil spray.
M3	Defiant 75WP (thiram)	5.3 oz/100 lbs of seed			1	Damping off	Seed treatment only.
4	Sebring 2.65ST (metalaxyl)	0.7 fl oz/100 lbs of seed			1	Pythium damping off	Seed treatment only.
M5	(chlorothalonil) Many brands available: Bravo Ultrex, Bravo Weather Stik, Bravo ZN, Chloronil 720, Chlorothalonil 720 SC, Echo 720, Echo 90DF, Echo ZN, Equus 500 ZN, Equus 720SST, Equus DF, Initiate 720, Initiate ZN	-	-	7	0.5		
1	Mertect 340F (thiabendazole)	41 fl oz/100 gal water			0.5	Botrytis rot, Sclerotinia white mold	Apply as a post-harvest dip. See label for details.
2	Iprodione fungicides (See individual labels) including: Iprodione 4L AG, Enclosure 4F, Nevado 4F, Rovral 4F	2 pt	8 pt	0	1	Alternaria blight, Black crown rot	See label for details.
3	Propiconazole fungicides (See individual labels) including: Amtide Propiconazole, Bumper 41.8EC, Propimax EC, Tilt 3.6E	4 fl oz	16 fl oz	14	0.5	Alternaria blight, Cercospora leaf spot, Powdery mildew	Do not exceed 4 total appls.
4	Apron XL LS (mefenoxam)	0.64 fl. oz./100 lb seed			2	Pythium seedling blight	Seed treatment only.
4	Metastar 2E AG (metalaxyl)	8 pt			2	Pythium seedling blight, cavity spot	Apply as a broadcast soil application and incorporate into top 2 inches. See label for directions.

Table 11. Continued.

Fungicide Group ¹	Chemical (active ingredient)	Maximum Rate/Acre/		Minimum Days to		Pertinent Diseases or Pathogens	Remarks ²
		Applic.	Season	Harvest	Reentry		
4	Ridomil Gold EC (mefenoxam)	2 pt			2	Pythium seedling diseases, cavity spot	Apply at seeding in a 7-12" band on soil over seed furrow.
4	Ridomil Gold SL (mefenoxam)	2 pt			2	Pythium seedling diseases, cavity spot	See label for specifics regarding preplant incorporated applications and surface applications at the time of planting.
4 & M1	Ridomil Gold Copper	2 lb	8 lb	7	2	Cavity spot	See label for details.
4 & M5	Ridomil Gold Bravo WP (mefenoxam/chlorothalonil)	2 lbs		7	2	Cavity spot, Alternaria blight, Cercospora leaf spot	See label for details.
4 & M5	Ridomil Gold Bravo SC (mefenoxam/chlorothalonil)	2.5 pt		7	2	Cavity spot, Alternaria blight, Cercospora leaf spot	See label for details.
7	Endura (boscalid)	4.5 oz	22.5 oz	0	0.5	Alternaria blight	Alternate with non-FRAC code 7 fungicide. See label for directions.
7 & 11	Pristine (boscalid/pyraclostrobin)	10.5 oz	63 oz	0	0.5	Various (see label)	Limit is 6 appl/crop and alternate chemistry.
9 & 12	Switch 62.5WDG (cyprodinil/fludioxonil)	14 oz	56 oz	7	0.5	Alternaria blight, Powdery mildew	See label.
11	Amistar 80DF (azoxystrobin)	5 oz or 0.25 oz/1000 row ft	20 oz	0	4 hrs	Various (see label)	Do not exceed 1 sequential and 4 total appl. of Amistar or other QoI fungicides. See label for soil appl.
11	Cabrio EG (pyraclostrobin)	12 oz	48 oz	0	0.5	Alternaria blight, Cercospora leaf spot	Do not exceed 2 sequential and 4 total appls. of Cabrio or other QoI fungicides.
11	Flint (trifloxystrobin)	3 oz	12 oz	7	0.5	Various (see label)	Alternate every other application with a fungicide of dissimilar mode of action.
11	Gem 500SC (trifloxystrobin)	2.9 fl oz	11.6 fl oz	7	0.5	Various (see label)	Alternate every other application with a fungicide of dissimilar mode of action.
11	Heritage (azoxystrobin)	10.5 oz	4 lb	0	4 hrs	Various (see label)	Do not apply more than 3 sequential applications without alternating to a fungicide of dissimilar mode of action.
11	Quadris (azoxystrobin)	15.4 fl oz or 0.8 fl oz/1000 row ft	3.75 qt	0	4 hrs	Various (see label)	Do not exceed 1 sequential and 4 total appl. of Quadris or other QoI fungicides. See label for soil applications.
11 & M5	Quadris Opti (azoxystrobin/ chlorothalonil)	2.4 pt	14.4 pt	0	0.5	Early blight (<i>Cercospora</i>) Powdery mildew Alternaria	Do not exceed 2 sequential and 6 total appl. of Quadris Opti. Rotate with non QoI fungicides.

Table 11. Continued.

Fungicide Group ¹	Chemical (active ingredient)	Maximum Rate/Acre/		Minimum Days to		Pertinent Diseases or Pathogens	Remarks ²
		Applic.	Season	Harvest	Reentry		
11/3	Quilt (azoxystrobin/ Propiconazole)	14 fl oz	55 fl oz	14	0.5	Early blight (<i>Cercospora</i>) Powdery mildew Alternaria	Alternate every other appli- cation with a fungicide of dissimilar mode of action.
11/3	Quilt XCEL (azoxystrobin/ propiconazole)	14 fl oz	56 fl oz	14 days	0.5	Early blight (<i>Cercospora</i>) Powdery mildew Alternaria	Alternate every other appli- cation with a fungicide of dissimilar mode of action.
11	Reason (fenamidone)	8.2 fl oz	24.6 fl oz	14	0.5	Cavity spot	Alternate every other appli- cation with a fungicide of dissimilar mode of action.
12	Maxim 4FS (fludioxonil)	0.16 fl oz/ 100 lb of seed			0.5	Various seedling diseases	Seed treatment only.
21	Ranman (cyazofamid)	6 fl oz	30 fl oz	14	0.5	Cavity spot, Pythium	Alternate with fungicides of dissimilar chemistry.
33	Mono- and di-Potassium salts of phosphorous acid (See individual labels) including: Alude, Fosphite, Fungi-Phite, Prophyt, Phostrol, Rampart, Topaz (potassium phosphite) Phorcephite (potassium phosphate/potassium phosphite)	-	-		4 hrs	<i>Pythium</i> , <i>Rhizoctonia</i> , <i>Fusarium</i>	Do not exceed 6 appl/ crop. Caution should be used when applying in a manage- ment program including copper fungicides. See label for foliar, root dip and irri- gation application details.
33/M2	Sanction (Potassium phosphate and sulfur)	6 pts			2	Powdery mildew	See label for details.
P	Regalia (Extract of <i>Reynoutria sachalinensis</i>)	1% v/v	12 qt	7	4 hrs	Bacterial blight, Powdery mildew	Begin applications preven- tatively. Spray volumes should be 50-100 GPA.
NC	Actinovate AG (<i>Streptomyces lydicus</i>)	12 oz	12 oz	0	1 hr	Alternaria Antracnose Botrytis Fusarium Pythium Phytophthora Rhizoctonia Sclerotinia Verticillium	Apply to soil through irri- gation, as a seed treatment, to foliage as a spray. See label for details.
NC	Cease (<i>Bacillus subtilis</i> strain QST 713)	6 qt/100 gal mix		0	4 hrs	Black root Black crown rot Alternaria	Apply to soil through irri- gation, or to foliage as a spray. See label for details.
NC	Companion L (<i>Bacillus subtilis</i> GB03)	1 gal		0	4 hrs	Damping off Botrytis Fusarium Powdery Mildew Pythium Rhizoctonia Sclerotinia	Can be applied in field, greenhouse, or hydroponi- cally. See label for details.

Table 11. Continued.

Fungicide Group ¹	Chemical (active ingredient)	Maximum Rate/Acre/		Minimum Days to		Pertinent Diseases or Pathogens	Remarks ²
		Applic.	Season	Harvest	Reentry		
NC	Contans WG (<i>Coniothyrium minitans</i> strain CON/M/91-08)	6 lbs			4 hrs	Sclerotinia diseases	Apply to soil surface and incorporate prior to, at planting, or at transplanting.
NC	Kaligreen (potassium bicarbonate)	3 lb		1	4 hrs	Powdery mildew	Apply in a minimum spray volume of 25 GPA.
NC	Oxidate (hydrogen dioxide)	1:100 dilution		0	0	See label	See label for details.
NC	PlantShield HC (<i>Trichoderma harzianum</i> Rifai strain KRL-22)	5 oz		0	0	Damping off	Apply in-furrow or in transplant starter solution.
NC	Rhapsody (<i>Bacillus subtilis</i> strain QST 713)	6 qt		0	4 hrs	Various (see label)	See labels for details.
NC	Serenade Max (<i>Bacillus subtilis</i> strain QST 713)	3 lb		0	4 hrs	Various (see label)	See label for details.
NC	Serenade Soil (<i>Bacillus subtilis</i> strain QST 713)	6 qt		0	4 hrs	Rhizoctonia Pythium Fusarium Verticillium Phytophthora	See label for details. Soil treatment.
NC	Sil-Matrix (Potassium silicate)	4 qts	10 gal	0	4 hrs	Powdery mildew	Apply at a rate of 2-4 qt/100 gal water
NC	Soilgard 12G (<i>Gliocladium virens</i> strain GL-21)				0	Damping off Root diseases	See label for details.
NC	Sonata (<i>Bacillus pumilis</i> strain QST 2808)	4 qt		0	4 hrs	Powdery mildew	For suppression or use as a preventative in a program with other registered fungicides.
NC	Sporatec (Clove oil, Rosemary oil, and Thyme oil)	1.5 qt		0	0	Powdery mildew	Sporatec is a concentrated oil-based product. It requires the use of an approved adjuvant to improve spreading and sticking. OMRI listed.
NC	Tenet WP (<i>Trichoderma asperellum</i> and <i>T. gamsii</i>)	3 oz/ 1000 ft of row			1 hr	Various soil-borne diseases	Apply up to 7 days before planting. For organic production.
NC	TerraClean (Hydrogen dioxide)	1 gal/ 1000 gal of water			0	Various soil-borne diseases	Apply as a soil treatment prior to or after planting
NC	Trilogy (Neem oil)	2 gal			4 hrs		Apply at a rate of 0.5% - 1.0% in 25 to 100 gal water/acre or at 2 pt in a minimum of 5 GPA for low volume appls.

Table 12. Celery fungicides and other disease management products.

Fungicide Group ¹	Chemical (active ingredient)	Maximum Rate/Acre/		Minimum Days to		Pertinent Diseases or Pathogens	Remarks ²
		Applic.	Season	Harvest	Reentry		
M1	(copper compounds) Many brands available: Badge SC, Badge X2, Basic Copper 53, C-O-C-S WDG, Champ DP, Champ WG, Champ Formula 2, Champ WP, COC DF, COC WP, Copper Count N, Copper-Z, Cueva, Cuprofix Ultra, Kentan DF, Kocide DF, Kocide 2000, Kocide 3000, Kocide 4.5 LF, Nordox 75 WG, NuCop 50WP, NuCop 3L, NuCop HB, NuCop DF, Stretch, Top Cop w/ Sulfur	-	-	1	Varies by product from 4 hrs to 2 days	Bacterial blight	
M2	(sulfur) Many brands available: Cosavet DF, Dusting Sulfur – IAP, Kumulus DF, Micro Sulf, Microthiol Disperss, Proganic Micronized Sulfur, Sulfur 90W, Top Cop w/ Sulfur	-	-	1	1	Early blight Late blight Powdery mildew	Do not apply during periods of warm weather. Do not apply within 2 weeks of an oil spray.
M5	(chlorothalonil) Many brands available: Bravo Ultrex, Bravo Weather Stik, Chloronil 720, Chlorothalonil 720 SC, Echo 720, Echo 90DF, Echo ZN, Equus 500 ZN, Equus 720, Equus DF, Initiate 720, Initiate ZN	-	-	7	0.5	Early blight (<i>Cercospora</i>) Late blight (<i>Septoria</i>) Stalk rot (<i>Rhizoctonia</i>)	
3	(propiconazole) Many brands available: Amtide Propiconazole, Bumper 41.8EC, Fitness, Propiconazole E-AG 41.8EC, Propimax EC, Tilt 3.6E	4 fl oz	16 fl oz	14	0.5	Early blight (<i>Cercospora</i>) Late blight (<i>Septoria</i>) Stalk rot (<i>Rhizoctonia</i>)	Do not apply more than 4 appl/season.
4	Apron XL LS (mefenoxam)	0.64 fl. oz./ 100 lb seed			2	Pythium seedling blight	Seed treatment only.
4	Metastar 2E AG (metalaxyl)	8 pt			2	Pythium seedling blight	Apply as a broadcast soil application and incorporate into top 2 inches. See label for directions.
4	Ridomil Gold EC (mefenoxam)	2 pt			2	Pythium seedling diseases	Apply at seeding in a 7-12" band on soil over seed furrow.
4	Ridomil Gold GR (mefenoxam)	40 lb			2	Pythium seedling diseases	See label for specifics regarding preplant incorporated applications and surface applications at the time of planting.
4	Ultra Flourish (mefenoxam)	4 pt			2	Pythium seedling diseases	See label for specifics regarding preplant incorporated applications and surface applications at the time of planting.
7	Endura (boscalid)	9 oz	18 oz	0	0.5	Alternaria Botrytis Sclerotinia	Alternate with non-FRAC code 7 fungicide. See label for directions.

Table 12. Continued.

Fungicide Group ¹	Chemical (active ingredient)	Maximum Rate/Acre/		Minimum Days to		Pertinent Diseases or Pathogens	Remarks ²
		Applic.	Season	Harvest	Reentry		
11	Aftershock (fluoxastrobin)	5.7 fl oz	22.8 fl oz	3	0.5	Early blight (<i>Cercospora</i>) Late blight (<i>Septoria</i>) Stalk rot (<i>Rhizoctonia</i>)	Alternate every other application with a fungicide of dissimilar mode of action.
11	Cabrio EG (pyraclostrobin)	16 oz	64 oz	0	0.5	Various (see label)	Do not exceed 2 sequential and 4 total appls. of Cabrio or other QoI fungicides.
11	Evito 480SC (fluoxastrobin)	5.7 fl oz	22.8 fl oz	3	0.5	Early blight (<i>Cercospora</i>) Late blight (<i>Septoria</i>) Stalk rot (<i>Rhizoctonia</i>)	Alternate every other application with a fungicide of dissimilar mode of action.
11	Flint (trifloxystrobin)	3 oz	12 oz	7	0.5	Early blight (<i>Cercospora</i>) Late blight (<i>Septoria</i>) Stalk rot (<i>Rhizoctonia</i>)	Alternate every other application with a fungicide of dissimilar mode of action.
11	Gem 500SC (trifloxystrobin)	2.9 fl oz	11.6 fl oz	7	0.5	Early blight (<i>Cercospora</i>) Late blight (<i>Septoria</i>) Stalk rot (<i>Rhizoctonia</i>)	Alternate every other application with a fungicide of dissimilar mode of action.
11	Quadris (azoxystrobin)	15.4 fl oz or 0.8 fl oz/1000 row ft	2.88 qt	0	4 hrs	Various (see label)	Do not exceed 1 sequential and 4 total appl. of Quadris or other QoI fungicides. See label for soil applications.
11/M5	Quadris Opti (azoxystrobin/ chlorothalonil)	3.7 pt	22.2 pt	7	0.5	Early blight (<i>Cercospora</i>) Late blight (<i>Septoria</i>) Stalk rot (<i>Rhizoctonia</i>)	Do not exceed 2 sequential and 6 total appl. of Quadris Opti. Rotate with non QoI fungicides.
11/3	Quilt (azoxystrobin/ propiconazole)	14 fl oz	56 fl oz	14 days	0.5	Early blight (<i>Cercospora</i>) Late blight (<i>Septoria</i>)	Alternate every other application with a fungicide of dissimilar mode of action.
11/3	Quilt XCEL (azoxystrobin/ propiconazole)	14 fl oz	56 fl oz	14 days	0.5	Early blight (<i>Cercospora</i>) Late blight (<i>Septoria</i>)	Alternate every other application with a fungicide of dissimilar mode of action.
11	Reason (fenamidone)	8.2 fl oz	24.6 fl oz	2	0.5	Late blight	Alternate every other application with a fungicide of dissimilar mode of action.
12	Maxim 4FS (fludioxonil)	0.16 fl oz/ 100 lb of seed			0.5	Various seedling diseases	Seed treatment only.

Table 12. Continued.

Fungicide Group ¹	Chemical (active ingredient)	Maximum Rate/Acre/		Minimum Days to		Pertinent Diseases or Pathogens	Remarks ²
		Applic.	Season	Harvest	Reentry		
14	Botran 5F (dichloran)	3.2 pt	4 qt	7	0.5	Pink rot (<i>Sclerotinia</i>)	Direct spray to base of plant.
25	Agri-mycin 17 (streptomycin)	200 ppm			0.5	Bacterial blight	See label for details. For transplant production.
25	Bac-Master (streptomycin)	200 ppm			0.5	Bacterial blight	See label for details. For transplant production.
25	Firewall 17 WP (streptomycin)	200 ppm			0.5	Bacterial blight	See label for details. For transplant production.
27/11	Tanos (cymoxanil/famoxadone)	8 oz	72 oz	3	0.5	Early blight Late blight	Do not alternate or tank mix with another FRAC group 11 fungicide.
33	Aliette WDG (fosetyl-AI)	5 lb	20 lb		0.5	Pythium	
33	Legion 80WDG (fosetyl-AI)	5 lb	20 lb		0.5	Pythium	
33	Linebacker WDG (fosetyl-AI)	5 lb	20 lb		0.5	Pythium	
33	Mono- and di-Potassium salts of phosphorous acid (See individual labels) including: Fosphite, Fungi-Phite, Prophyt, Phostrol, Rampart, Reveille, Topaz (potassium phosphite) Phorcephite (potassium phosphite/Potassium phosphate)	-	-		4 hrs	<i>Pythium</i> , <i>Rhizoctonia</i> , <i>Fusarium</i>	Do not exceed 6 appl/ crop. Caution should be used when applying in a management program including copper fungicides. See label for foliar, root dip and irrigation application details.
40	Revus (mandipropamid)	8 fl oz	32 fl oz	1	4 hrs	Downy mildew	Do not exceed 2 sequential applications. See label for soil applications.
43	Presidio (fluopicolide)	3-4 fl oz	12 fl oz	2	0.5	Downy mildew White rust	Must be tank-mixed with a fungicide of different mode of action. Do not exceed two sequential applications. See label for soil applications.
P	Regalia (Extract of <i>Reynoutria sachalinensis</i>)	1% v/v	12 qt	7	4 hrs	Bacterial blight	Begin applications preventatively. Spray volumes should be 50-100 GPA.
NC	Actinovate AG (<i>Streptomyces lydicus</i>)	12 oz	12 oz	0	1 hr	Alternaria Antracnose Botrytis Fusarium Pythium Phytophthora Rhizoctonia Sclerotinia Verticillium	Apply to soil through irrigation, as a seed treatment, to foliage as a spray. See label for details.
NC	Cease (<i>Bacillus subtilis</i> strain QST 713)	6 qt/100 gal mix		0	4 hrs	Sclerotinia	Apply to soil through irrigation, or to foliage as a spray. See label for details.

Table 12. Continued.

Fungicide Group ¹	Chemical (active ingredient)	Maximum Rate/Acre/		Minimum Days to		Pertinent Diseases or Pathogens	Remarks ²
		Applic.	Season	Harvest	Reentry		
NC	Companion L (<i>Bacillus subtilis</i> GB03)	1 gal		0	4 hrs	Damping off Botrytis Fusarium Powdery Mildew Pythium Rhizoctonia Sclerotinia	Can be applied in field, greenhouse, or hydroponically. See label for details.
NC	Contans WG (<i>Coniothyrium minitans</i> strain CON/M/91-08)	6 lbs			4 hrs	Sclerotinia diseases	Apply to soil surface and incorporate prior to, at planting, or at transplanting.
NC	Kaligreen (potassium bicarbonate)	3 lb		1	4 hrs	Powdery mildew	Apply in a minimum spray volume of 25 GPA.
NC	Oxidate (hydrogen dioxide)	1:100 dilution		0	0 hrs	Bacterial blight Botrytis Early blight Late blight Powdery mildew	See label for details.
NC	PlantShield HC (<i>Trichoderma harzianum</i> Rifai strain KRL-22)	5 oz		0	0 hrs	Damping off	Apply in-furrow or in transplant starter solution.
NC	RootShield Granules (<i>Trichoderma harzianum</i> Rifai strain KRL-22)	12 lb/A field 1.5 lb/cu yd greenhouse			0 hrs	Damping off	Apply in-furrow in field or incorporate in soil mix for greenhouse. See label for details.
NC	Rhapsody (<i>Bacillus subtilis</i> strain QST 713)	6 qt		0	4 hrs	Pink rot (<i>Sclerotinia</i>)	See labels for details.
NC	Serenade Max (<i>Bacillus subtilis</i> strain QST 713)	3 lb		0	4 hrs	Pink rot (<i>Sclerotinia</i>)	Begin application approx. 8 wks prior to harvest and repeat on 14 day interval. Direct spray at base of plants and surrounding soil surface.
NC	Sil-Matrix (Potassium silicate)	4 qts	10 gal	0	4 hrs	Powdery mildew	Apply at a rate of 2-4 qt/100 gal water
NC	Soilgard 12G (<i>Gliocladium virens</i> strain GL-21)					Damping off Root diseases	See label for details.
NC	Sonata (<i>Bacillus pumilis</i> strain QST 2808)	4 qt		0	4 hrs	Powdery mildew	For suppression or use as a preventative in a program with other registered fungicides.
NC	Sporatec (Clove oil, Rosemary oil, and Thyme oil)	1.5 qt		0	0	Powdery mildew	Sporatec is a concentrated oil-based product. It requires the use of an approved adjuvant to improve spreading and sticking. OMRI listed.

Table 12. Continued.

Fungicide Group ¹	Chemical (active ingredient)	Maximum Rate/Acre/		Minimum Days to		Pertinent Diseases or Pathogens	Remarks ²
		Applic.	Season	Harvest	Reentry		
NC	Tenet WP (<i>Trichoderma asperellum</i> and <i>T. gamsii</i>)	3 oz/ 1000 ft of row			1 hr	Various soil-borne diseases	Apply up to 7 days before planting. For organic production.
NC	TerraClean (Hydrogen dioxide)	1 gal/ 1000 gal of water			0	Various soil-borne diseases	Apply as a soil treatment prior to or after planting
NC	Trilogy (Neem oil)	2 gal			4 hrs		Apply at a rate of 0.5% - 1.0% in 25 to 100 gal water/acre or at 2 pt in a minimum of 5 GPA for low volume appls.

Table 13. Parsley fungicides and other disease management products.

Fungicide Group ¹	Chemical (active ingredient)	Maximum Rate/Acre/		Minimum Days to		Pertinent Diseases or Pathogens	Remarks ²
		Applic.	Season	Harvest	Reentry		
M1	(copper compounds) Many brands available: Badge SC, Badge X2, Basic Copper 53, C-O-C-S WDG, Champ DP, Champ WG, Champ Formula 2, Champ WP, COC DF, COC WP, Copper Count N, Cueva, Cuprofix Ultra, Kentan DF, Kocide DF, Kocide 101, Kocide 2000, Kocide 3000, Kocide 4.5 LF, Nordox, Nordox 75 WG, NuCop 50WP, NuCop 3L, NuCop HB, NuCop DF, Stretch	-	-	1	Varies by product from 4 hrs to 2 days	Bacterial blight	
M2	(sulfur) Many brands available: Sulfur 90W, Super Six, Top Cop w/ Sulfur	-	-	1	1	Powdery mildew	Do not apply during periods of warm weather. Do not apply within 2 weeks of an oil spray.
3	Bumper 41.8EC (propiconazole)	4 fl oz	16 fl oz	14	0.5	Alternaria Cercospora Powdery mildew	Do not apply more than 2 sequential appl. without alternating to different mode of action.
3	Procure 480SC (triflumizole)	8 fl oz	18 fl oz	0	0.5	Alternaria Powdery mildew	Repeat applications at 14 day intervals.
3	Tilt 3.6E (propiconazole)	4 fl oz	16 fl oz	14	0.5	Alternaria Powdery mildew Septoria	Do not exceed 2 sequential and 4 total applications.
4	Allegiance FL (metalaxyl)	0.75 fl oz/	100 lb seed		1	Pythium seedling blight	Seed treatment only
4	Apron XL LS (mefenoxam)	0.64 fl. oz./	100 lb seed		2	Pythium seedling blight	Seed treatment only.
4	Metastar 2E AG (metalaxyl)	8 pt			2	Pythium seedling blight	Apply as a broadcast soil application and incorporate into top 2 inches. See label for directions.
4	Ridomil Gold EC (mefenoxam)	2 pt			2	Pythium seedling diseases	Apply at seeding in a 7-12" band on soil over seed furrow.
4	Ridomil Gold GR (mefenoxam)	40 lb			2	Pythium seedling diseases	See label for specifics regarding preplant incorporated applications and surface applications at the time of planting.
4	Ultra Flourish (mefenoxam)	4 pt			2	Pythium seedling diseases	See label for specifics regarding preplant incorporated applications and surface applications at the time of planting.
9 & 12	Switch 62.5WDG (cyprodinil/fludioxonil)	14 oz	56 oz	7	0.5	Alternaria Powdery mildew	See label.
11	Cabrio EG (pyraclostrobin)	16 oz	64 oz	0	0.5	Various (see label)	Do not exceed 2 sequential and 4 total appls. of Cabrio or other QoI fungicides.
11	Heritage (azoxystrobin)	10.5 oz	4 lb	0	4 hrs	Various (see label)	Do not apply more than 2 sequential applications without alternating to a fungicide of dissimilar mode of action.

Table 13. Continued.

Fungicide Group ¹	Chemical (active ingredient)	Maximum Rate/Acre/		Minimum Days to		Pertinent Diseases or Pathogens	Remarks ²
		Applic.	Season	Harvest	Reentry		
11	Quadris (azoxystrobin)	15.4 fl oz or 0.8 fl oz/1000 row ft	2.88 qt	0	4 hrs	Various (see label)	Do not exceed 1 sequential and 4 total appl. of Quadris or other QoI fungicides. See label for soil applications.
11	Reason (fenamidone)	8.2 fl oz	24.6 fl oz	2	0.5	Various (see label)	Alternate every other application with a fungicide of dissimilar mode of action.
12	Maxim 4FS (fludioxonil)	0.16 fl oz/ 100 lb of seed			0.5	Various seedling diseases	Seed treatment only.
4	Sebring 2.65ST (metalaxyl)	0.75 fl oz/ 100 lb of seed			2	Pythium damping off	Seed treatment only.
27 & 11	Tanos (cymoxanil/famoxadone)	8 oz	72 oz	3	0.5		Do not alternate or tank mix with another FRAC group 11 fungicide.
33	Aliette WDG (fosetyl-Al)	5 lb	35 lb		0.5	Damping off	Caution should be used when applying in a management program including copper fungicides.
33	Legion 80WDG (fosetyl-Al)	5 lb	35 lb		0.5	Damping off	Caution should be used when applying in a management program including copper fungicides.
33	Linebacker WDG (fosetyl-Al)	5 lb	35 lb		0.5	Damping off	Caution should be used when applying in a management program including copper fungicides.
33	Mono- and di-Potassium salts of phosphorous acid (See individual labels) including: Alude, Fosphite, Fungi-Phite, Prophyt, Phostrol, Rampart, Reveille, Topaz (potassium phosphite) Phorcephite (potassium phosphate/Potassium phosphite)	-	-		4 hrs	<i>Pythium</i> , <i>Rhizoctonia</i> , <i>Fusarium</i>	Caution should be used when applying in a management program including copper fungicides. See label for foliar, root dip and irrigation application details.
40	Revus (mandipropamid)	8 fl oz	32 fl oz	1	4 hrs	Downy mildew	Do not exceed 2 sequential applications. See label for soil applications.
43	Presidio (fluopicolide)	3-4 fl oz	12 fl oz	2	0.5	Downy mildew	Must be tank-mixed with a fungicide of different mode of action. Do not exceed two sequential applications. See label for soil applications.
P	Regalia (extract of <i>Reynoutria sachalinensis</i>)	1% v/v	12 qt	7	4 hrs	Bacterial blight	Begin applications preventatively. Spray volumes should be 50-100 GPA.
NC	Actinovate AG (<i>Streptomyces lydicus</i>)	12 oz	12 oz	0	1 hr	<i>Alternaria</i> <i>Antracnose</i> <i>Botrytis</i> <i>Fusarium</i> <i>Pythium</i> <i>Phytophthora</i> <i>Rhizoctonia</i> <i>Sclerotinia</i> <i>Verticillium</i>	Apply to soil through irrigation, as a seed treatment, to foliage as a spray. See label for details.

Table 13. Continued.

Fungicide Group ¹	Chemical (active ingredient)	Maximum Rate/Acre/		Minimum Days to		Pertinent Diseases or Pathogens	Remarks ²
		Applic.	Season	Harvest	Reentry		
NC	Cease (<i>Bacillus subtilis</i> strain QST 713)	6 qt/100 gal		0	4 hrs	Soil-borne fungi	Apply to soil through irrigation, or to foliage as a spray. See label for details.
NC	Companion L (<i>Bacillus subtilis</i> GB03)	1 gal		0	4 hrs	Alternaria Damping off Botrytis Fusarium Powdery Mildew Pythium Rhizoctonia Sclerotinia	Can be applied in field, greenhouse, or hydroponically. See label for details.
NC	Kaligreen (potassium bicarbonate)	3 lb		1	4 hrs	Powdery mildew	Apply in a minimum spray volume of 25 GPA.
NC	Oxidate (hydrogen dioxide)	1:100 dilution		0	0	Various (see label)	See label for details.
NC	RootShield Granules (<i>Trichoderma harzianum</i> Rifai strain KRL-22)	12 lb/A field 1.5 lb/cu yd greenhouse			0	Damping off	Apply in-furrow in field or incorporate in soil mix for greenhouse. See label for details.
NC	PlantShield HC (<i>Trichoderma harzianum</i> Rifai strain KRL-22)	5 oz		0	0	Damping off	Apply in-furrow or in transplant starter solution.
NC	Rhapsody (<i>Bacillus subtilis</i> strain QST 713)	6 qt		0	4 hrs	Powdery mildew Sclerotinia	For suppression or use in a preventative program with other fungicides.
NC	Serenade Max (<i>Bacillus subtilis</i> strain QST 713)	3 lb		0	4 hrs	Powdery mildew Sclerotinia	For suppression or use in a preventative program with other fungicides.
NC	Sil-Matrix (Potassium silicate)	4 qts	10 gal	0	4 hrs	Powdery mildew	Apply at a rate of 2-4 qt/100 gal water
NC	Soilgard 12G (<i>Gliocladium virens</i> strain GL-21)				0	Damping off Root diseases	See label for details.
NC	Sonata (<i>Bacillus pumilis</i> strain QST 2808)	4 qt		0	4 hrs	Powdery mildew	For suppression or use as a preventative in a program with other registered fungicides.
NC	Sporatec (clove oil, rosemary oil, and thyme oil)	1.5 qt		0	0	Powdery mildew	Sporatec is a concentrated oil-based product. It requires the use of an approved adjuvant to improve spreading and sticking. OMRI listed
NC	Tenet WP (<i>Trichoderma asperellum</i> and <i>T. gamsii</i>)	3 oz/ 1000 ft of row			1 hr	Various soil-borne diseases	Apply up to 7 days before planting. For organic production.
NC	TerraClean (Hydrogen dioxide)	1 gal/ 1000 gal of water			0	Various soil-borne diseases	Apply as a soil treatment prior to or after planting
NC	Trilogy (Neem oil)	2 gal			4 hrs		Apply at a rate of 0.5% - 1.0% in 25 to 100 gall water/acre or at 2 pt in a minimum of 5 GPA for low volume appls.

Table 14. Selected insecticides approved for use on insects attacking carrots and garden beets

Chemical	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code ¹	Notes
Actara (thiamethoxam)	1.5-4.0 oz	12	7	aphids, flea beetles, leafhoppers, whiteflies	4A	Do not exceed 8 oz product/acre/season.
Admire Pro (imidacloprid)	4.4-10.5 fl oz-soil 1.2 fl oz-foliar	12	21-soil 5-foliar	aphids, flea beetles, leafhoppers, whiteflies	4A	Limited to one soil application. If applied as a foliar spray, use no more than 3.7 fl oz per acre per season. Leaves may be used for food.
Agree WG <i>(Bacillus thuringiensis</i> subspecies <i>aizawai</i>)	0.5-2.0 lb	4	0	lepidopteran larvae (caterpillar pests)	11	Apply when larvae are small for best control. Leaves and roots. OMRI-listed ² .
*Asana XL (0.66EC) (esfenvalerate)	5.8-9.6 fl oz	12	7	aster leafhopper, cutworms, leafhoppers, carrot weevil	3	Do not apply more than 0.5 lb ai/acre per season. Carrots only.
Avaunt	3.5-6.0 oz	12	7	Beet armyworm	22	Do not use adjuvants. Do not apply more than 24 oz per acre per crop. Beets only.
Aza-Direct (azadirachtin)	1-2 pts, (max 3.5 pts)	4	0	aphids, beetles, caterpillars, leafhoppers, leafminers, mites, stink bugs, thrips, weevils, whiteflies	un	Antifeedant, repellent, insect growth regulator. OMRI-listed ² .
Azatin XL (azadirachtin)	5-21 fl oz	4	0	aphids, beetles, caterpillars, leafhoppers, leafminers, thrips, weevils, whiteflies	un	Antifeedant, repellent, insect growth regulator.
*Baythroid XL (beta-cyfluthrin)	1.6-2.8 fl oz	12	0	aster leafhopper, carrot weevil, cutworms, flea beetles, potato leafhopper	3	Do not exceed 14 oz/acre per season. Carrots only.
Beleaf 50 SG (flonicamid)	2.0-2.8 oz	12	3	aphids, plant bugs	9C	Do not apply more than 3 times at high rate.
Biobit HP <i>(Bacillus thuringiensis</i> subspecies <i>kurstaki</i>)	0.5-2.0 lb	4	0	caterpillars (will not control large armyworms)	11	Treat when larvae are young. Good coverage is essential. Can be used in the greenhouse. OMRI-listed ² .
BotaniGard 22 WP, ES <i>(Beauveria bassiana)</i>	WP: 0.5-2 lb/100 gal ES: 0.5-2 qts/100 gal	4	0	aphids, thrips, whiteflies	--	May be used in greenhouses. Contact dealer for recommendations if an adjuvant must be used. Not compatible in tank mix with fungicides.
*Brigade 2EC (bifenthrin)	5.12-6.4 fl oz	12	21 – carrots, 1 – beets	aphids, beet armyworm, celery leafminer, corn earworm, cutworms, fall armyworm, fire ants, flea beetles, loopers, southern armyworm, spider mites, yellowstriped armyworm, whitefly	3	Do not apply more than 0.5 lb ai/acre per season for carrots or 0.4 lb ai/acre per season for beets. Apply no more than once every seven days
Coragen (chlorantraniliprole)	3.5-5.0 fl oz	4	1	beet armyworm	28	Do not apply more than 15.4 fl oz product per acre per year. Make no more than 4 applications.
Crymax WDG <i>(Bacillus thuringiensis</i> subspecies <i>kurstaki</i>)	0.5-2.0 lb	4	0	caterpillars	11	Use high rate for armyworms. Treat when larvae are young.
Deliver <i>(Bacillus thuringiensis</i> subspecies <i>kurstaki</i>)	0.25-1.5 lb	4	0	caterpillars	11	Use higher rates for armyworms. OMRI-listed ² .
*Diazinon AG500, *50W (diazinon)	AG500: 1-4 qt 50W: 2-8 lb	72	preplant	cutworms, mole crickets, wireworms	1B	Do not make more than one application per year.

Table 14. Continued.

Chemical	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code ¹	Notes
DiPel DF (<i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i>)	0.5-2.0 lb	4	0	caterpillars	11	Treat when larvae are young. Good coverage is essential. Can be used for organic production.
Entrust (spinosad)	1-2 oz	4	3	armyworms, dipteran leafminers, flea beetle, loopers, thrips	5	Do not apply more than a total of 7 oz/acre per crop or apply more than 4 times. OMRI-listed ² .
Extinguish Fire Ant Bait ((S)-methoprene)	1.0-1.5 lb	4	0	fire ants	7A	Slow-acting IGR (insect growth regulator). Best applied early spring and fall where crop will be grown. Colonies will be reduced after three weeks and eliminated after 8 to 10 weeks.
Intrepid 2F (methoxyfenozide)	6-16 fl oz	4	14	armyworms, loopers, saltmarsh caterpillar, webworms	18	Do not apply more than 64 fl oz per acre per season.
Javelin WG (<i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i>)	0.12-1.50 lb	4	0	most caterpillars, but not <i>Spodoptera</i> species (armyworms)	11	Treat when larvae are young. Thorough coverage is essential. OMRI-listed ² .
Knack IGR (pyriproxyfen)	8 fl oz	12	3	whiteflies	7D	Do not apply more than twice. Wait at least 14 days between applications.
*Lannate LV, *SP (methomyl)	LV: 0.75-3.0 pts SP: 0.25-1.0 lb	48	1 — carrots 0 — beets, roots 10 — beets, tops	armyworms, aster leafhopper, beet armyworm, variegated cutworm	1A	Carrots: Do not apply more than 21 pt LV or 7 lb SP per acre per crop. Garden beets: Do not apply more than 12 pt LV or 4 lb SP per acre per crop.
Malathion 8F (malathion)	2.5 pt	12	7	aphids, beet armyworm, blister beetles, flea beetles	1B	Beets only.
M-Pede (potassium salts of fatty acids)	1-2% V/V	12	0	leafminers, aphids, thrips, whiteflies	--	OMRI-listed ² .
*Mustang (zeta-cypermethrin)	1.4-4.3 oz	12	1	cabbage looper, cucumber beetles, cutworms, flea beetles, grasshoppers, leafhoppers, tarnished plant bug, vegetable weevil, whitefringed beetle (adult), yellowstriped armyworm; aids in control of aphids and beet armyworm	3	A maximum of 0.3 lb ai/acre per season may be applied. Leaves cannot be used for food or feed.
Neemix 4.5 (azadirachtin)	4-16 fl oz	12	0	aphids, armyworms, cabbage looper, cutworms, leafminers, whiteflies	un	Acts as IGR and feeding repellent. OMRI-listed ² .
Platinum Platinum 75SG (thiamethoxam)	5.0-12.0 fl oz 1.7-4.0 oz	12	at planting	aphids, flea beetles, leafhoppers, whiteflies	4A	Do not exceed 12 oz Platinum or 4.0 oz Platinum 75SG per acre per season.
Provado 1.6F (imidacloprid)	3.5 oz	12	7	aphids, flea beetles, leafhoppers, whiteflies	4A	Maximum of 3 applications or 10.5 fl oz/acre per season. Tops or greens may be used for food.
Pyronyl Crop Spray (pyrethrins + piperonyl butoxide)	1-12 fl oz	12	0	ants, aphids, armyworms, cabbage looper, corn earworm, crickets, flea beetles, leafhoppers, thrips, whiteflies	3	
Radiant SC (spinetoram)	6-8 fl oz	4	3	armyworms (except yellowstriped armyworm), dipterous leafminers, loopers, thrips	5	Maximum of 4 applications per year.

Table 14. Continued.

Chemical	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code ¹	Notes
Sevin 80S; XLR; 4F (carbaryl)	80S: 0.63-2.5 lb XLR, 4F: 0.5-2 qt	12	7	armyworms, aster leafhopper, corn earworm, cutworms, fall armyworm, flea beetles, leafhoppers, Lygus bug, spittlebugs, stink bugs, tarnished plant bug	1A	Highly toxic to bees. Repeat applications, as needed up to 6 times, at least 7 days apart.
*Telone C-35 (dichloropropene + chloropicrin)	See label	5 days - See label	preplant	symphylans, wireworms	--	See supplemental label for use restriction in south and central Florida.
*Telone II (dichloropropene)						
*Thionex 3EC (endosulfan)	0.66-1.33 qt	48	7	armyworms, flea beetles, green peach aphid, leafhoppers, whiteflies	2	Carrots only. Do not make more than 1 application per season. Do not use tops for food or feed. This use is not on current label. Product with an older label can be used until July 31, 2012.
Trilogy (extract of neem oil)	0.5-2.0% v/v	4	0	aphids, mites, suppression of thrips and whiteflies	un	Apply morning or evening to reduce potential for leaf burn. Toxic to bees exposed to direct treatment. OMRI-listed ² .
Xentari DF (<i>Bacillus thuringiensis</i> subspecies <i>aizawai</i>)	0.5-2.0 lb	4	0	caterpillars	11	Treat when larvae are young. Thorough coverage is essential. May be used in the greenhouse. Can be used in organic production.

The pesticide information presented in this table was current with federal and state regulations at the time of revision. The user is responsible for determining the intended use is consistent with the label of the product being used. Use pesticides safely. Read and follow label instructions.

¹Mode of Action codes for vegetable pest insecticides from the Insecticide Resistance Action Committee (IRAC) Mode of Action Classification v. 6.1 August 2008.

- 1A. Acetyl cholinesterase inhibitors, Carbamates (nerve action)
- 1B. Acetyl cholinesterase inhibitors, Organophosphates (nerve action)
- 2A. GABA-gated chloride channel antagonists (nerve action)
- 3. Sodium channel modulators (nerve action)
- 4A. Nicotinic acetylcholine receptor agonists (nerve action)
- 5. Nicotinic acetylcholine receptor allosteric activators (nerve action)
- 6. Chloride channel activators (nerve and muscle action)
- 7A. Juvenile hormone mimics (growth regulation)
- 7C. Juvenile hormone mimics (growth regulation)
- 9B and 9C. Selective homopteran feeding blockers
- 10. Mite growth inhibitors (growth regulation)
- 11. Microbial disruptors of insect midgut membranes
- 12B. Inhibitors of mitochondrial ATP synthase (energy metabolism)
- 15. Inhibitors of chitin biosynthesis, type 0, lepidopteran (growth regulation)
- 16. Inhibitors of chitin biosynthesis, type 1, homopteran (growth regulation)
- 17. Molting disruptor, dipteran (growth regulation)
- 18. Ecdysone receptor agonists (growth regulation)
- 22. Voltage-dependent sodium channel blockers (nerve action)
- 23. Inhibitors of acetyl Co-A carboxylase (lipid synthesis, growth regulation)
- 28. Ryanodine receptor modulators (nerve and muscle action)
- un. Compounds of unknown or uncertain mode of action

² OMRI-listed: Listed by the Organic Materials Review Institute for use in organic production.

*** Restricted Use Pesticide**

Table 15. Insecticides approved for use on insects attacking celery.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code ¹	Notes
Actara (thiamethoxam)	1.5-5.5 oz	12	7	aphids, flea beetles, leafhoppers, whiteflies	4A	Do not use if other 4A insecticides have been or will be used.
Admire Pro (imidacloprid)	4.4-10.5 fl oz	12	45	aphids, leafhoppers, whiteflies, foliage feeding thrips	4A	Do not apply more than 0.38 lb ai per acre per year.
Agree WG (<i>Bacillus thuringiensis</i> subspecies <i>aizawai</i>)	0.5-2.0 lb	4	0	lepidopteran larvae (caterpillar pests)	11	Apply when larvae are small for best control. OMRI-listed ² .
*Agri-Mek SC (abamectin)	1.75-3.5 fl oz	12	7	<i>Liriomyza</i> leafminers, spider mites	6	No more than 2 sequential applications. Must be used with an adjuvant (but not binder sticker types). Not for use on leafy vegetables grown for transplant.
*Ambush 25W (permethrin)	6.4-12.8 oz	12	1	beet armyworm, cabbage looper, corn earworm, cutworms, fall armyworm, leafminers	3	Do not apply more than 128 oz/acre per season.
Assail 30SG (acet-amiprid)	2.0-4.0 oz	12	7	aphids, whiteflies	4A	Begin applications for whiteflies when first adults are noticed. Do not apply more than 5 times per season or apply more often than every 7 days.
Avaunt (indoxacarb)	3.5 oz	12	3	beet armyworm, cabbage looper,	22	Do not apply more than 14 ounces of product per acre per crop.
Aza-Direct (azadirachtin)	1-2 pts, up to 3.5 pts	4	0	aphids, beetles, caterpillars, leafhoppers, leafminers, thrips, weevils, whiteflies	un	Antifeedant, repellent, insect growth regulator. OMRI-listed ² .
Azatin XL (azadirachtin)	5-21 fl oz	4	0	aphids, beetles, caterpillars, leafhoppers, leafminers, thrips, weevils, whiteflies	un	Antifeedant, repellent, insect growth regulator.
*Baythroid XL (beta-cyfluthrin)	0.8-3.2 fl oz	12	0	beet armyworm (1 st and 2 nd instars), cabbage looper, corn earworm, cutworms, flea beetles, grasshoppers, potato leafhopper, saltmarsh caterpillar, thrips, vegetable weevil, yellowstriped armyworm, suppression of adult whitefly	3	Maximum of 12.8 fl oz per acre per season.
Belay 50 WDG (clothianidin)	1.6-3.2 oz	12	7	aphids, flea beetles, leafhoppers, leafminers (suppression), whiteflies (suppression)	4A	Do not apply more than 6.4 oz per acre per season. Do not use an adjuvant. Toxic to bees. Supplemental label for rates over 2.1 oz.
Belay 50 WDG (clothianidin)	4.8 -6.4 oz (soil application)	12	Apply at planting	aphids, flea beetles, leafhoppers, leafminers (suppression), whiteflies (suppression)	4A	Do not apply more than 6.4 oz per acre per season. See label for application instructions.
Beleaf 50 SG (flonicamid)	2.0-2.8 oz	12	0	aphids, plant bugs	9C	Do not apply more than 8.4 oz/acre per season. Begin applications before pests reach damaging levels.
Biobit HP (<i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i>)	0.5-2.0 lb	4	0	caterpillars (will not control large armyworms)	11	Treat when larvae are young. Good coverage is essential. Can be used in the greenhouse. OMRI-listed ² .
BotaniGard 22 WP, ES (<i>Beauveria bassiana</i>)	WP: 0.5-2 lb/100 gal ES: 0.5-2 qts/100 gal	4	0	aphids, thrips, whiteflies	--	May be used in greenhouses. Contact dealer for recommendations if an adjuvant must be used. Not compatible in tank mix with fungicides.
Confirm 2F (tebufenozide)	6.0-8.0 fl oz	4	7	armyworms, cabbage looper, garden webworm	18	Do not exceed 56 ounces of product per acre per season.

Table 15. Continued.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code ¹	Notes
Coragen (rynaxypyr)	3.5-7.5 fl oz	4	1	beet armyworm, cabbage looper, corn earworm, leafminers, suppression of whitefly nymphs	28	May be applied via drip chemigation in addition to foliar and various soil application methods.
Courier 40SC (buprofezin)	9.0-13.6 fl oz	12	7	leafhoppers, planthoppers, whiteflies	16	Do not make more than 2 applications per crop cycle. IGR targets immatures.
Crymax WDG (<i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i>)	0.5-2.0 lb	4	0	caterpillars	11	Use high rate for armyworms. Treat when larvae are young.
Deliver (<i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i>)	0.25-1.5 lb	4	0	caterpillars	11	Use higher rates for armyworms. OMRI-listed ² .
Dimethoate 4EC (dimethoate)	1 pt	48	7	leafminers, mites	1B	Use ground equipment. Florida only.
DiPel DF (<i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i>)	0.5-2.0 lb	4	0	caterpillars	11	Treat when larvae are young. Good coverage is essential. OMRI-listed ² .
Durivo (thiamethoxam, chlorantraniliprole)	10.0-13.0 fl oz	12	30	aphids, beet armyworm, cabbage looper, corn earworm, fall armyworm, flea beetles, leafhoppers, whiteflies	4A, 28	Do not exceed more than 13 fl oz per acre per season.
Entrust (spinosad)	0.5-3 oz	4	1	armyworms, cabbage looper, leafminers, thrips	5	See label for resistance management recommendations. Apply no more than 9 oz per acre per year. OMRI-listed ² .
Extinguish ((S)-methoprene)	1-1.5 lb	4	0	fire ants	7A	Slow-acting IGR (insect growth regulator). Best applied early spring and fall where crop will be grown. Colonies will be reduced after three weeks and eliminated after 8 to 10 weeks. May be applied by ground equipment or aerially.
Fulfill (pymetrozine)	2.75 oz	12	7	aphids, suppression of whiteflies	9B	Apply when aphids first appear, before populations build to damaging levels. Two applications (maximum allowed) may be needed to control persistent aphid populations.
Intrepid 2F (methoxyfenozide)	4-10 fl oz	4	1	armyworms, cabbage looper, webworms	18	Do not apply more than 64 fl oz per acre per season.
Javelin WG (<i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i>)	0.12-1.5 lb	4	0	most caterpillars, but not Spodoptera species (armyworms)	11	Treat when larvae are young. Thorough coverage is essential. OMRI-listed ² .
*Lannate LV, *SP (methomyl)	LV: 0.75-3 pt SP: 0.25-1.0 lb	48	7	armyworms, aster leafhopper, beet armyworm, loopers, variegated cutworm	1A	Do not apply more than 24 pt of LV or 8 lb SP per acre per season.
*Larvin 3.2 (thiodi-carb)	16-30 fl oz	48	14	armyworms, beet armyworm, cabbage looper, corn earworm, fall armyworm, southern armyworm	1A	Do not exceed 60 fluid ounces of Larvin per acre per season.
Lepinox WDG (<i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i>)	1.0-2.0 lb	12	0	most caterpillars, including beet armyworm (see label)	11	Treat when larvae are small. Thorough coverage is essential.
Malathion 8F (malathion)	1-1.5 pt	12	7	aphids, mites	1B	

Table 15. Continued.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code ¹	Notes
Movento (spirotetramat)	4.0-5.0 fl oz	24	3	aphids, whiteflies	23	Do not apply more than 10 fl oz/acre/crop.
M-Pede 49% EC (Soap, insecticidal)	1-2% V/V	12	0	whiteflies	--	OMRI-listed ² .
*Mustang (zeta-cypermethrin)	2.4-4.3 oz	12	1	corn earworm, cucumber beetles, cutworms, flea beetles, leafhoppers, saltmarsh caterpillar, tobacco budworm, aphids, whiteflies, armyworms, ground beetles, crickets, loopers, <i>Lygus</i> bugs, stink bugs, wireworm adults	3	A maximum of 0.3 lb ai/acre per season may be applied. Do not make applications less than 7 days apart.
Neemix 4.5 EC (azadirachtin)	4-16 fl oz	12	0	aphids, armyworms, cabbage looper, cutworms, leafminers, webworms, whiteflies	un	IGR and feeding repellent. OMRI-listed ² .
Orthene 97 (acephate)	97: 0.5-1.0 lb	24	21	cabbage looper, fall armyworm, green peach aphid	1B	Do not use more than 2 lb active ingredient per acre per season.
Platinum Platinum 75SG (thiamethoxam)	97: 0.5-1.0 lb 1.66-3.67 oz	12	30	aphids, flea beetles, leafhoppers, leafminers (suppression), whiteflies	4A	Maximum = 11 oz/acre or 3.67 oz/acre (75SG) per season. Do not use in conjunction with other 4A insecticides.
*Pounce 25 WP (permethrin)	3.2-12.8 oz	12	1	aphids, beet armyworm, cabbage looper, corn earworm, cutworms, fall armyworm, leafhoppers, leafminers, loopers, southern armyworm, tobacco budworm	3	Do not apply more than 1.0 lb active ingredient per acre per season.
*Proclaim (emamectin benzoate)	2.4-4.8 oz	12	7	beet armyworm, corn earworm, fall armyworm, <i>Liriomyza</i> leafminers, loopers, tobacco budworm	6	Provides suppression of leafminers. Rotate with other products with different modes of action.
PyGanic Crop Protection EC 5.0 (pyrethrins)	4.5-18 fl oz	12	0	Aphids, beetles, caterpillars, leafhoppers, leafminers, thrips, whiteflies, others	3	Can be used in greenhouses. Thorough coverage is essential. Breaks down rapidly in sunlight. OMRI-listed ² .
Pyronyl Crop Spray (pyrethrins + piperonyl butoxide)	1-12 fl oz	12	0	ants, aphids, armyworms, cabbage looper, corn earworm, flea beetles, leafhoppers, leafminers, webworms, whiteflies	3	
Radiant SC (spinetoram)	5-10 fl oz	4	1	armyworms (not yellowstriped), cabbage looper, corn earworm, <i>Liriomyza</i> leafminer, thrips	5	Maximum of 6 applications, no more than 2 consecutive applications before rotating to another MOA.
Requiem 25EC (extract of <i>Chenopodium ambrosioides</i>)	2.0-4.0 qt	4	0	green peach aphid, suppression of <i>Liriomyza</i> leafminers, potato aphid, turnip aphid, whiteflies	un	
Sevin XLR; 4F; 80S (carbaryl)	XLR; 4F: 0.5-2 qt 80S: 0.63-2.5 lb	12	14	armyworms, aster leafhopper, corn earworm, fall armyworm, flea beetles, leafhoppers, <i>Lygus</i> bug, spittlebugs, stink bugs, tarnished plant bug	1A	Repeat, as needed, up to 5 times, with at least 7 days between applications.
SunSpray 98.8%, JMS Stylet-Oil, Saf-T-side, others (Oils, insecticidal)	3-6 qt/100 gal (JMS) 1-2 gal/100 gal	4	0	aphids, beetle larvae, leafhoppers, leafminers, mites, thrips, whiteflies (pests controlled vary by product)	--	See label for cautions on tank mixes. Organic Stylet-Oil and Saf-T-Side are OMRI-listed ² .

Table 15. Continued.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code ¹	Notes
Synapse WG (flubendiamide)	2.0-3.0 oz	12	1	armyworms, loopers	28	Do not apply more than 9.0 oz/acre per season.
*Telone C-35 (dichloropropene + chloropicrin)	See label	5 days - See label	preplant	symphylans, wireworms	--	See supplemental label for use restrictions in south or central Florida.
*Telone II (dichloropropene)						
Thionex 50W (endosulfan)	1-2 lb	96	4 or 7	armyworms, cabbage looper, flea beetles, green peach aphid, leafhoppers, whiteflies	2	If two applications at lowest rate used against aphids, then PHI is 7 days. This use is not allowed after July 31, 2012 and only with old label—not on new product label.
Trigard (cyromazine)	2.66 oz	12	7	leafminers	17	Do not make more than six applications per crop.
Trilogy (extract of neem oil)	0.5-2.0% V/V	4	0	aphids, mites, suppression of thrips and whiteflies	un	Apply morning or evening to reduce potential for leaf burn. Toxic to bees exposed to direct treatment. OMRI-listed ² .
Venom Insecticide (dinotefuran)	foliar: 1-3 oz soil: 5-7.5 oz	12	7	Foliar: brown stink bug, cucumber beetle, flea beetle, grasshopper, green stink bug, suppression of green peach aphid and potato aphid, southern green stink bug, whiteflies Soil: suppression of green peach aphid and potato aphid, leafhoppers, leafminers, whiteflies	4A	Do not apply more than 6 oz per acre per season (foliar) or 12 oz per acre per season (soil). Do not use both methods of application. See supplemental label.
Vetiva (flubendiamide and buprofezin)	12.0-17.0 fl oz	12	7	armyworms, cabbage looper, corn earworm, cutworms, green cloverworm, imported cabbage-worm, suppression of leafhoppers, saltmarsh caterpillar, tobacco budworm, suppression of whitefly	28, 16	Do not apply more than three times per season or apply more than 38 fl oz per acre per season. Same active ingredients as Synapse, Coragen, and Courier.
Voliam Flexi (thiamethoxam, chlorantraniliprole)	4.0-7.0 oz	12	7	aphids, beet armyworm, cabbage looper, corn earworm, fall armyworm, flea beetles, leafhoppers, southern armyworm, tobacco budworm, whiteflies	4A, 28	Do not apply more than 14 oz per acre per growing season. An adjuvant may be used when applying to celery.
*Vydate L (oxamyl)	2-4 pt	48	21	leafminers (except <i>Liriomyza trifolii</i>)	1A	

Table 15. Continued.

The pesticide information presented in this table was current with federal and state regulations at the time of revision. The user is responsible for determining the intended use is consistent with the label of the product being used. Use pesticides safely. Read and follow label instructions.

¹Mode of Action codes for vegetable pest insecticides from the Insecticide Resistance Action Committee (IRAC) Mode of Action Classification v. 6.1 August 2008.

- 1A. Acetyl cholinesterase inhibitors, Carbamates (nerve action)
- 1B. Acetyl cholinesterase inhibitors, Organophosphates (nerve action)
- 2A. GABA-gated chloride channel antagonists (nerve action)
- 3. Sodium channel modulators (nerve action)
- 4A. Nicotinic acetylcholine receptor agonists (nerve action)
- 5. Nicotinic acetylcholine receptor allosteric activators (nerve action)
- 6. Chloride channel activators (nerve and muscle action)
- 7A. Juvenile hormone mimics (growth regulation)
- 7C. Juvenile hormone mimics (growth regulation)
- 9B and 9C. Selective homopteran feeding blockers
- 10. Mite growth inhibitors (growth regulation)
- 11. Microbial disruptors of insect midgut membranes
- 12B. Inhibitors of mitochondrial ATP synthase (energy metabolism)
- 15. Inhibitors of chitin biosynthesis, type 0, lepidopteran (growth regulation)
- 16. Inhibitors of chitin biosynthesis, type 1, homopteran (growth regulation)
- 17. Molting disruptor, dipteran (growth regulation)
- 18. Ecdysone receptor agonists (growth regulation)
- 22. Voltage-dependent sodium channel blockers (nerve action)
- 23. Inhibitors of acetyl Co-A carboxylase (lipid synthesis, growth regulation)
- 28. Ryanodine receptor modulators (nerve and muscle action)
- un. Compounds of unknown or uncertain mode of action

² OMRI-listed: Listed by the Organic Materials Review Institute for use in organic production.

*** Restricted Use Pesticide**

Table 16. Selected insecticides approved for use on insects attacking parsley.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code ¹	Notes
Actara (thiamethoxam)	1.5-5.5 oz	12	7	aphids, flea beetles, leafhoppers, whiteflies	4A	Do not use if other 4A insecticides have been or will be used.
Admire Pro (imidacloprid)	4.4-10.5 fl oz	12	21	aphids, leafhoppers, thrips (foliage feeders), whiteflies	4A	Limited to 10.5 fl oz per acre per season.
Agree WG (<i>Bacillus thuringiensis</i> subspecies <i>aizawai</i>)	0.5-2.0 lb	4	0	lepidopteran larvae (caterpillar pests)	11	Apply when larvae are small for best control. OMRI-listed ² .
*Agri-Mek SC (abamectin)	1.75-3.5 fl oz	12	7	<i>Liriomyza</i> leafminers, spider mites	6	No more than 2 sequential applications. Must be used with an adjuvant (but not binder sticker types). Not for use on leafy vegetables grown for transplant.
*Ambush 25W (permethrin)	6.4-12.8 oz	12	1	beet armyworm, cabbage looper, corn earworm, cutworms, fall armyworm, leafhoppers, vegetable leafminer	3	Do not apply more than 2 lb ai/acre per season.
Assail 30SG (acetamiprid)	2.0-4.0 oz	12	7	aphids, whiteflies	4A	Begin applications for whiteflies when first adults are noticed. Do not apply more than 5 times per season or apply more often than every 7 days.
Avaunt (indoxacarb)	2.5-6.0 oz	12	3	beet armyworm, cabbage looper, corn earworm	22	Do not apply more than 24 ounces of product per acre per crop.
Aza-Direct (azadirachtin)	1-2 pts, to 3.5 pts if needed	4	0	aphids, beetles, caterpillars, leafhoppers, leafminers, mites, stink bugs, thrips, weevils, whiteflies	un	Antifeedant, repellent, insect growth regulator. OMRI-listed ² .
Azatin XL (azadirachtin)	5-21 fl oz	4	0	aphids, beetles, caterpillars, leafhoppers, leafminers, thrips, weevils, whiteflies	un	Antifeedant, repellent, insect growth regulator.
*Baythroid XL (beta-cyfluthrin)	0.8-3.2 fl oz	12	0	beet armyworm (1 st and 2 nd instars), cabbage looper, corn earworm, cutworms, flea beetles, grasshoppers, potato leafhopper, saltmarsh caterpillar, thrips, vegetable weevil, yellowstriped armyworm, suppression of adult whitefly	3	Maximum of 12.8 fl oz per acre per season.
Belay 50 WDG (clothianidin)	1.6-3.2 oz	12	7	aphids, flea beetles, leafhoppers, leafminers (suppression), whiteflies (suppression)	4A	Do not apply more than 6.4 oz per acre per season. Do not use an adjuvant. Toxic to bees. Supplemental label for rates above 2.1 oz.
Belay 50 WDG (clothianidin)	4.8 -6.4 oz (soil application)	12	Apply at planting	aphids, flea beetles, leafhoppers, leafminers (suppression), whiteflies (suppression)	4A	Do not apply more than 6.4 oz per acre per season. See label for application instructions.
Beleaf 50 SG (flonicamid)	2.0-2.8 oz	12	0	aphids, plant bugs	9C	Do not apply more than 8.4 oz/acre per season. Begin applications before pests reach damaging levels.
Biobit HP (<i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i>)	0.5-2.0 lb	4	0	caterpillars (will not control large armyworms)	11	Treat when larvae are young. Good coverage is essential. Can be used in the greenhouse. OMRI-listed ² .

Table 16. Continued.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code ¹	Notes
BotaniGard 22 WP, ES (<i>Beauveria bassiana</i>)	WP: 0.5-2 lb/100 gal ES: 0.5-2 qts/100 gal	4	0	aphids, thrips, whiteflies	--	May be used in greenhouses. Contact dealer for recommendations if an adjuvant must be used. Not compatible in tank mix with fungicides.
Confirm 2F (tebufenozide)	6.0-8.0 fl oz	4	7	armyworms, cabbage looper, garden webworm	18	Do not exceed 56 ounces of product per acre per season.
Coragen (rynaxypyr)	3.5-7.5 fl oz	4	1	beet armyworm, cabbage looper, corn earworm, leafminers, suppression of whitefly nymphs	28	May be applied by drip chemigation, in addition to foliar and various soil application methods.
Courier 40SC (buprofezin)	9.0-13.6 fl oz	12	7	leafhoppers, planthoppers, whiteflies	16	Do not make more than 2 applications per crop cycle. IGR targets immatures.
Crymax WDG (<i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i>)	0.5-2.0 lb	4	0	caterpillars	11	Use high rate for armyworms. Treat when larvae are young.
Deliver (<i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i>)	0.25-1.5 lb	4	0	caterpillars	11	Use higher rates for armyworms. OMRI-listed ² .
DiPel DF (<i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i>)	0.5-2.0 lb	4	0	caterpillars	11	Treat when larvae are young. Good coverage is essential.
Durivo (thiamethoxam, chlorantraniliprole)	10-13 oz	12	30	aphids, beet armyworm, cabbage looper, corn earworm, fall armyworm, flea beetles, imported cabbageworm, leafhoppers, whiteflies	4A, 28	May be applied by one of several soil application methods.
Entrust (spinosad)	0.5-3 oz	4	1	armyworms, cabbage looper, leafminers, thrips	5	Use no more than 9 oz per acre per crop. OMRI-listed ² .
Extinguish ((S)-methoprene)	1.0-1.5 lb	4	0	fire ants	7A	Slow-acting IGR (insect growth regulator). Best applied early spring and fall where crop will be grown. Colonies will be reduced after three weeks and eliminated after 8 to 10 weeks. May be applied by ground equipment or aerially.
Fulfill (pymetrozine)	2.75 oz	12	7	aphids, suppression of whiteflies	9B	Apply when aphids first appear, before populations build to damaging levels. Two applications (maximum allowed) may be needed to control persistent aphid populations.
Intrepid 2F (methoxyfenozide)	4-10 fl oz	4	1	armyworms, cabbage looper, webworms	18	Do not apply more than 64 fl oz per acre per season.
Javelin WG (<i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i>)	0.12-1.5 lb	4	0	most caterpillars, but not <i>Spodoptera</i> species (armyworms)	11	Treat when larvae are young. Thorough coverage is essential. OMRI-listed ² .
*Larvin 3.2 (thiodicarb)	16-30 fl oz	48	14	armyworms, beet armyworm, cabbage looper, corn earworm, fall armyworm, southern armyworm	1A	Do not exceed 60 fl oz per acre per season.
Lepinox WDG (<i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i>)	1.0-2.0 lb	12	0	for most caterpillars, including beet armyworm (see label)	11B2	Treat when larvae are small. Thorough coverage is essential.

Table 16. Continued.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code ¹	Notes
Malathion 8 F (malathion)	1-2 pt	12	21	aphids	1B	
Movento (spirotetramat)	4.0-5.0 fl oz	24	3	aphids, whiteflies	23	Do not apply more than 10 fl oz/acre/crop.
M-Pede 49% EC Soap, insecticidal	1-2% V/V	12	0	aphids, leafhoppers, mites, plant bugs, whiteflies	--	OMRI-listed ² .
*Mustang (zeta-cypermethrin)	2.4-4.3 oz	12	1	aphids, armyworms, corn earworm, crickets, cucumber beetles, cutworms, flea beetles, ground beetles, leafhoppers, loopers, <i>Lygus</i> bugs, saltmarsh caterpillar, stink bugs, tobacco budworm, whiteflies, wireworm adults	3	A maximum of 0.3 lb ai/acre per season may be applied. Do not make applications less than 7 days apart.
Neemix 4.5 (azadirachtin)	4-16 fl oz	12	0	aphids, armyworms, leafhoppers, leafminers, loopers, whiteflies	un	IGR and feeding repellent. OMRI-listed ² .
Oberon 2SC (spiromesifen)	7.0-8.5 fl oz	12	7	whiteflies	23	Maximum amount per crop: 25.5 fl oz/acre. No more than three applications.
Platinum Platinum 75SG (thiamethoxam)	5.0-11 fl oz 1.66-3.67 oz	12	30	aphids, flea beetles, leafhoppers, leafminers (suppression), whiteflies	4A	Maximum = 11 oz/acre or 3.67 oz/acre (75SG) per season. Do not use in conjunction with other 4A insecticides.
*Pounce 25 WP (permethrin)	3.2-12.8 oz	12	1	aphids, armyworms, beet armyworm, cabbage looper, corn earworm, cutworms, fall armyworm, leafhoppers, loopers, southern armyworm, tobacco budworm, vegetable leafminer	3	Do not apply more than 1.0 lb ai/acre per season.
*Proclaim (emamectin benzoate)	2.4-4.8 oz	12	7	beet armyworm, corn earworm, fall armyworm, loopers, tobacco budworm, suppression of leafminers	6	Do not apply more than 28.8 oz/A per season.
Provado 1.6 F (imidacloprid)	3.8 oz	12	7	aphids, flea beetles, leafhoppers, whiteflies	4A	Maximum of 19.0 fl oz per acre per season. Do not use with other 4A insecticides.
PyGanic Crop Protection EC 5.0 (pyrethrins)	4.5-18 fl oz	12	0	Aphids, beetles, caterpillars, leafhoppers, leafminers, thrips, whiteflies, others	3	Can be used in greenhouses. Thorough coverage is essential. Breaks down rapidly in sunlight. OMRI-listed ² .
Radiant SC (spinetoram)	5-10 fl oz	4	1	armyworms (not yellowstriped), cabbage looper, corn earworm, <i>Liriomyza</i> leafminer, thrips	5	Maximum of 6 applications, no more than 2 consecutive applications before rotating to another MOA..
Requiem 25EC (extract of <i>Chenopodium ambrosioides</i>)	2.0-4.0 qt	4	0	green peach aphid, suppression of <i>Liriomyza</i> leafminers, potato aphid, turnip aphid, whiteflies	un	
Sevin 80S; XLR; 4F (carbaryl)	80S: 0.63-2.5 lb XLR; 4F: 0.5-2.0 qt	12	14	armyworms, aster leafhopper, corn earworm, fall armyworm, flea beetles, leafhoppers, <i>Lygus</i> bug, spittlebugs, stink bug, tarnished plant bug	1A	Do not apply more than a total of 7.5 lb or 6 qt per acre per crop.
Synapse WG (flubendiamide)	2.0-3.0 oz	12	1	armyworms, loopers	28	Do not apply more than 9.0 oz/acre per season.
*Telone C-35 (dichloropropene + chloropicrin)	See label	5 days - See label	preplant	symphylans, wireworms	--	See supplemental label for use restrictions in south and central Florida.
*Telone II (dichloropropene)						

Table 16. Continued.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code ¹	Notes
Trigard (cyromazine)	2.66 oz	12	7	leafminers	17	No more than 5 applications per crop.
Trilogy (extract of neem oil)	0.5-2.0% V/V	4	0	aphids, mites, suppression of thrips and whiteflies	un	Apply morning or evening to reduce potential for leaf burn. Toxic to bees exposed to direct treatment. OMRI-listed ² .
Venom Insecticide (dinotefuran)	foliar: 1-3 oz soil: 5-7.5 oz	12	foliar: 7 soil: 21	Foliar: brown stink bug, cucumber beetle, flea beetle, grasshopper, green stink bug, suppression of green peach aphid and potato aphid, southern green stink bug, whiteflies Soil: suppression of green peach aphid and potato aphid, leafhoppers, leafminers, whiteflies	4A	Use only one application method (soil or foliar, not both). Do not apply more than 6 oz/acre (foliar) or 12 oz/acre (soil) per season. See supplemental label.
Vetiva (flubendiamide and buprofezin)	12.0-17.0 fl oz	12	7	armyworms, cabbage looper, corn earworm, cutworms, green cloverworm, imported cabbage-worm, leafhoppers (14-17 oz rate), saltmarsh caterpillar, tobacco bud-worm, whitefly (14-17 oz rate)	28, 16	No more than 3 applications per season or 38 fl oz per acre per season. Same active ingredients as Synapse, Coragen, and Courier.
Voliam Flexi (thiamethoxam, chlorantraniliprole)	4.0-7.0 oz	12	7	aphids, beet armyworm, cabbage looper, corn earworm, fall army-worm, flea beetles, leafhoppers, southern armyworm, tobacco bud-worm, whiteflies	4A, 28	Do not apply more than 14 oz per acre per growing season. Do not use an adjuvant.
Xentari DF (<i>Bacillus thuringiensis</i> subspecies <i>aizawai</i>)	0.5-2 lb	4	0	caterpillars	11	Treat when larvae are young. Thorough coverage is essential. May be used in the greenhouse. Can be used in organic production.

The pesticide information presented in this table was current with federal and state regulations at the time of revision. The user is responsible for determining the intended use is consistent with the label of the product being used. Use pesticides safely. Read and follow label instructions.

¹Mode of Action codes for vegetable pest insecticides from the Insecticide Resistance Action Committee (IRAC) Mode of Action Classification v. 6.1 August 2008.

- 1A. Acetyl cholinesterase inhibitors, Carbamates (nerve action)
- 1B. Acetyl cholinesterase inhibitors, Organophosphates (nerve action)
- 2A. GABA-gated chloride channel antagonists (nerve action)
- 3. Sodium channel modulators (nerve action)
- 4A. Nicotinic acetylcholine receptor agonists (nerve action)
- 5. Nicotinic acetylcholine receptor allosteric activators (nerve action)
- 6. Chloride channel activators (nerve and muscle action)
- 7A. Juvenile hormone mimics (growth regulation)
- 7C. Juvenile hormone mimics (growth regulation)
- 9B and 9C. Selective homopteran feeding blockers
- 10. Mite growth inhibitors (growth regulation)
- 11. Microbial disruptors of insect midgut membranes
- 12B. Inhibitors of mitochondrial ATP synthase (energy metabolism)
- 15. Inhibitors of chitin biosynthesis, type 0, lepidopteran (growth regulation)
- 16. Inhibitors of chitin biosynthesis, type 1, homopteran (growth regulation)
- 17. Molting disruptor, dipteran (growth regulation)
- 18. Ecdysone receptor agonists (growth regulation)
- 22. Voltage-dependent sodium channel blockers (nerve action)
- 23. Inhibitors of acetyl Co-A carboxylase (lipid synthesis, growth regulation)
- 28. Ryanodine receptor modulators (nerve and muscle action)
- un. Compounds of unknown or uncertain mode of action

² OMRI listed: Listed by the Organic Materials Review Institute for use in organic production.

* Restricted Use Only.