

Leafy Vegetables

Endive, Herbs, Lettuce, Parsley, and Spinach

Varieties		
Salad Greens	Endive	Full Heart Batavian, Green Curled Ruffoc
	Leaf Lettuce	Tiara, Glossy Green, Green Wave, New Red Fire, Sierra, Vulcan, Tango (oakleaf), Lolla Rossa
	Butterhead	Buttercrunch, Esmeralda, Ermosa (for trial)
	Head Lettuce	Ithaca, Maverick (for trial), Montello (for trial)
	Spinach	Bloomsdale Long Standing (spring), Early Hybrid No. 7 (fall), Early Hybrid No. 10 (fall), Old Dominion (fall), Virginia Savoy (fall), Tyee, Melody, Decatur, Unipak 151 (semi-savoy)

Spacing

These crops can have a common between-row spacing for convenience in cultivating.

Spinach: Rows 12 to 18 inches apart. Plants 4 to 6 per foot of row. Seed 12 to 20 pounds per acre.

Lettuce and Endive: Rows 12 to 15 inches apart. Plants 10 to 16 inches apart in row. Seed 1 to 2 pounds per acre.

Fertilizing

Lime: To maintain soil pH of 6.5 to 6.8. Spinach is particularly sensitive to soil acidity.

Preplant: N: 60 pounds per acre. P₂O₅: 0 to 150 pounds per acre. K₂O: 0 to 200 pounds per acre. Adjust according to soil type, previous management, and soil test results for your state.

Sidedress N: for soils with more than 3 percent organic matter and following soybeans, alfalfa, or a grass-legume hay crop, apply 30 pounds N per acre. For soils with less than 3 percent organic matter and the above rotation, apply 45 pounds N per acre. Following corn, rye, oats, wheat, or a vegetable crop, apply 60 pounds N per acre. Use a total of 90 to 120 pounds N per acre for culinary herbs. For herbs grown for seeds, such as coriander, fennel, and dill, use 60 to 90 pounds N acre.

Disease Control

Botrytis Gray Mold

In greenhouse production, avoid condensation on foliage by providing adequate ventilation within the enclosure and avoiding overcrowding plants.

Recommended Products

Botran 75W® or **Botran 5F®** at planting. Rate depends on crop and application method. *Lettuce and endive only.*

Cannonball WG® at 7 oz. per acre. 0-day PHI.

RR Endura® 8-11 oz. per acre. 14-day PHI. *Lettuce only.*

Fontelis® at 14-24 fl. oz. per acre. 3-day PHI.

Merivon® at 8-11 fl. oz. per acre. 1-day PHI.

Switch 62.5WG® at 11-14 oz. per acre. 0-day PHI.

Damping-off

Conditions that favor rapid germination limit damping-off severity. Avoid excessive irrigation and poorly drained soils. Good sanitation is critical to avoiding damping-off.

Recommended Products

Previcur Flex® See label for rates and greenhouse uses. *For damping-off of lettuce caused by Pythium and Phytophthora.*

Ridomil Gold SL® at 1-2 pts. per acre applied pre-plant, to control damping-off.

Downy Mildew, White Rust

Plant downy mildew-resistant varieties.

Recommended Products

Actigard® at the following rates:

Spinach: 0.5-0.75 oz. per acre.

Lettuce: 0.75-1 oz. per acre. *Downy mildew only.*

Not for herbs. 7-day PHI.

Agri-Fos 50WP® See label for rates. *Not for herbs. Downy mildew only.* 0-day PHI.

Dithane F-45® at 1.2-1.6 qts. per acre. *Downy mildew on lettuce only.* 10-day PHI for head lettuce. 14-day PHI for leaf lettuce.

RR This is a reduced-risk pesticide. See page 37 for details.

Merivon® at 4-11 fl. oz. per acre. *Downy mildew suppression only.* 1-day PHI.

Phostrol® at 2.5-5 pts. per acre. *Downy mildew only.* 0-day PHI.

Presidio 4SC® at 3-4 fl. oz. per acre. 2-day PHI.

Previcur Flex® at 2 pts. per acre. *Lettuce and downy mildew only.* 2-day PHI.

RR **Quadris**® at the following rates:

Downy mildew: 12.0-15.5 fl. oz. per acre.

White rust: 6.2-15.4 fl. oz. per acre.

0-day PHI.

Ranman® at 2.75 fl. oz. per acre. 0-day PHI.

RR **Revus 2.09SC**® at 8 fl. oz. per acre. *Downy mildew on lettuce and spinach only.* 1-day PHI.

Ridomil Gold SL® at 0.25 pt. per acre. *Spinach only.* 7-day PHI.

Satori® at the following rates:

Downy mildew: 12.0-15.5 fl. oz. per acre.

White rust: 6.2-15.4 fl. oz. per acre.

0-day PHI.

Tanos 50WP® at 8-10 oz. per acre. *Not for herbs.* 1-day PHI.

Zampro® at 14 fl. oz. per acre. *Downy mildew only.* Do not use with herbs except for fennel. 0-day PHI.

Bottom Rot and Drop (lettuce)

Bottom rot is caused by *Rhizoctonia*. Lettuce drop is caused by *Sclerotinia*. Avoid poorly drained fields with a history of the disease.

Recommended Products

Botran 75W® or **Botran 5F**®. Rate varies by application method. *Lettuce drop only.*

Contans®. See label for rate and application instructions. *Lettuce drop only.*

Cannonball WG®. at 7 oz. per acre. See label for soil application instructions. *Lettuce drop only.* 0-day PHI.

RR **Endura 70WG**® at 8-11 oz. per acre. *Lettuce only.* Bottom rot is suppression. 14-day PHI.

Fontelis® at 16-24 fl. oz. per acre. *Lettuce drop only.* 3-day PHI.

Merivon® at 8-11 fl. oz. per acre. *Lettuce drop only.* 1-day PHI.

Royal 4FL® at 1.5-2 pts. per acre. 14-day PHI.

Switch 62.5WG® at 11-14 oz. per acre. *Lettuce drop only.* 0-day PHI.

Fusarium Wilt (basil)

Basil varieties with Fusarium wilt resistance are available.

Powdery Mildew

Recommended Products

Fontelis® at 14-24 fl. oz. per acre. 3-day PHI.

Merivon® at 4-11 fl. oz. per acre. 1-day PHI.

Lettuce Mosaic Virus (LMV)

This virus can be carried in infested seed and is spread by aphids. Sow only mosaic-free indexed seed (sold as MTO). Control aphids and weeds near to production areas. Keep new lettuce planting as far as possible from old lettuce plantings. Disk under lettuce fields as soon as possible after final harvest.

Weed Control

Weed control in leafy vegetables often relies heavily on cultivation and hand weeding. These operations are most efficient when planting arrangement is designed with weed control in mind, and is designed to work with available weed control equipment. Specialized weeding equipment for leafy vegetables includes basket weeders, narrow-bladed hoes, and others. Using a stale seedbed is helpful to reduce weed pressure in the crop. For direct-seeded crops, a carefully timed weed-killing operation after the crop is seeded and just before emergence will buy a few weeks of time before cultivation or hand weeding is necessary. Just before the crop emerges, weeds could be killed with a flame weeder, or an approved nonselective herbicide. Using transplants is helpful for weed control because the size difference between weeds and crop early in the season make mechanical control easier. Plastic and paper mulches have been used with success for transplanted crops.

For specific weeds controlled by each herbicide, check Table 25 on page 66.

Rates provided in the recommendations below are given for overall coverage. For band treatment, reduce amounts according to the portion of acre treated.

We provide general recommendations for herbs and lettuce (general) and then specific crops (including herbs).

Weed Control for Herbs and Lettuce (General)

Recommendations for specific crops are provided below.

Preemergence Broadleaves and Grasses

Recommended Products

Devrinol® at 2-4 lbs. per acre. *Basil, marjoram, rosemary, and savory only.* Apply before or after seeding and incorporate into soil, or water-in with 0.2-0.4 inch of water. 0-day PHI.

Prefar 4E® at 5-6 qts. per acre. *Endive, escarole, cress, fennel, lettuce, and parsley only.* Mineral soils only. Apply and incorporate before seeding or apply after seeding and incorporate with irrigation.

Postemergence Broadleaves

Recommended Product

Aim 2EC® at 1-2 fl. oz. per acre. *Basil, chive, dill, fennel, parley, and rosemary only.* Apply as a burndown treatment at least 7 days before seeding. Apply to row middles with a hooded sprayer to control weeds up to 4 inches tall. Add COC, NIS, or MSO. AMS will improve weed control. Do not exceed 6.1 fl. oz. per acre per year. 0-day PHI.

Postemergence Grasses

Recommended Product

Select Max 0.97E® at 9-16 fl. oz. per acre. *Basil, borage, chive, dill, coriander, parsley, tarragon, and thyme only.* Apply to actively growing grasses. Try on a small area before spraying field. 14-day PHI.

Postemergence Broadleaves and Grasses

Recommended Product

Scythe 4.2L® at 5-10 gals. per acre. *Basil, chive, dill, fennel, oregano, savory, tarragon, and thyme only.* Apply as a directed or hooded spray between rows in 75-200 gals. of water per acre. Use higher rate for large and mature weeds.

Weed Control for Basil

Recommended Products

Aim® at 2-4 fl. oz. per acre. *Postemergence broadleaves.* Apply to area between rows with a hooded sprayer. Do not exceed 6 fl. oz. per acre per year. 0-day PHI.

Devrinol 50DF-XT® at 2-4 lbs. per acre. *Preemergence annual grasses and some small-seeded broadleaves.* Apply before or after seeding and incorporate into soil, or water-in with 0.2-0.4 inch irrigation. 0-day PHI.

Roundup 4L® at 0.5-1 qt. per acre. *Postemergence annual and perennial weeds.* Apply before planting.

Scythe 4.2L® at 5-10 gals. per acre. *Postemergence grasses and broadleaves.* Apply as a directed or hooded spray between rows in 75-200 gals. of water per acre. Use higher rate for large weeds.

Select Max® at 9-16 fl. oz. per acre. *Apply to actively growing grasses.* Include nonionic surfactant at 0.25%. Do not exceed 64 fl. oz. per acre per year. 14-day PHI.

Weed Control for Celeriac

Recommended Products

Caparol 4L® at 1.6-4 pts. per acre. *Preemergence.* Apply after transplanting to crop with 6-8 leaves. Use low rate on light soil. 60-day PHI.

Lorox 50DF® at 1.5-3 lbs. per acre. *Postemergence grasses and broadleaves.* Apply after transplanting as a broadcast spray. Do not add surfactants, nitrogen (or other fertilizers), or other pesticides to the spray mix. 60-day PHI.

Weed Control for Chive

Recommended Products

Dual Magnum 7.62EC® at 0.67-1.33 pts. per acre. *Preemergence. Growers in Michigan must have a 24(c) label.* Make broadcast application at 2-3crop leaf stage. Do not exceed 1 application and 1.33 pts. per acre per season. 21-day PHI.

Prowl H2O 3.8ACS® at 2-4 pts. per acre. *Preemergence annual grasses and broadleaves. Growers in Michigan must have a 24(c) label.* Use high rate pre on high-organic soil. Apply to chives after seeding, or at the 2-3 leaf stage to control germinating annual grasses and weeds. Will not control emerged weeds. Do not exceed 4 pts. per acre per year. 30-day PHI.

Select Max 0.97E® at 9-16 fl. oz. per acre. *Postemergence grasses.* Apply to actively growing grasses and include an adjuvant. Use high rate on annual bluegrass. 14-day PHI.

Weed Control for Cilantro

Recommended Products

Caparol 4L® at 1-3.2 pts. per acre. *Preemergence. Do not use on sand or loamy sand soil.* Make 1 application after seeding. Higher rates may reduce crop stand. 30-day PHI.

Dual Magnum 7.62E® at 0.67-1 pt per acre. *Preemergence annual grasses and broadleaves. Growers in Michigan must have a 24(c) label.* Apply to soil surface after seeding. Do not exceed 1 pt. per acre per year. 30-day PHI.

Lorox 50DF® at 1-2 lbs. per acre.

Preemergence: Apply after seeding and before crop emergence. Use lower rate on sandy soil. Do not apply to soil <1% organic matter.

Postemergence: Make up to 2 postemergence applications at 1-2 lbs. per acre after cilantro has 3 true leaves.

Do not exceed 4 lbs. per acre per year. 21-day PHI.

Select Max 0.97E® at 9-16 fl oz per acre. *Postemergence grasses.* Apply to actively growing grasses. Include NIS at 0.25% v.v of spray solution. Do not exceed 64 fl. oz. per acre per year. 14-day PHI.

Weed Control for Dill

Recommended Products

Caparol 4L® at 1.6-3.2 pts. per acre. *Preemergence or postemergence.* Use a lower rate on sandy soil. 30-day PHI.

Lorox 50DF® at 1-2 lbs. per acre.

Preemergence: Apply to damp soil after planting and before dill emerges. Do not apply to sandy soils or soils with <1% organic matter.

Postemergence: Apply to dill with at least 3 true leaves.

Do not exceed 4 lbs. per acre per year. Do not spray when temperature exceeds 85°F. Some varieties may be sensitive to Lorox®. 21-day PHI.

Poast 1.5E® at 1-2.5 pts. per acre. *Postemergence grasses.* Apply to actively growing grasses. Include 0.25% nonionic surfactant v/v spray solution per acre. Do not exceed 5 pts. per acre per year. 14-day PHI

Select Max 0.97E® at 9-16 fl. oz. per acre. Include 0.25% NIS v/v spray solution per acre. Do not exceed 4 pts. per acre per year. 14-day PHI.

Weed Control for Endive, Escarole, and Chicory

Recommended Products

Aim® at 2 fl. oz. per acre. *Postemergence broadleaves* Apply between rows with a hooded sprayer. Apply to weeds up to 3 inches. Add an adjuvant and nitrogen

source. Do not exceed 2 applications per crop per year.

Kerb 3.3SC® at 2.5-5 pts. per acre. *Preemergence grasses and small-seeded broadleaves.* Apply before or after seeding. Must be incorporated or irrigated into soil. Can be applied postemergence, but weed control will be marginal on muck soil. 55-day PHI. RUP.

Poast 1.5E® at 1-1.5 pts. per acre. *Postemergence grasses.* Apply to actively growing grasses. Include 1 qt. COC per acre. Do not exceed 3 pts. per acre per season. 5-day PHI.

Prefar 4E® at 5-6 qts. per acre. *Preemergence grasses. Endive, florence fennel, and radicchio only.* Apply before planting and incorporate or water in.

Roundup 4L® at 2-3 qts. per acre. *Postemergence perennials.* Apply before planting in the spring or after harvest in the fall. Check label for best time of year, stage of growth, and rate for each weed. Include 1 pt. NIS per acre.

Select Max 0.97E® at 9-16 fl. oz. per acre. Include 0.25% NIS v/v of spray solution per acre. Do not exceed 64 fl. oz. per acre per year. 14-day PHI.

Treflan 4EC® at 1-2 pts. per acre. *Preemergence grasses and small-seeded broadleaves. Belgian endive, endive, escarole, chicory, and radicchio only.* Incorporate before seeding.

Weed Control for Lettuce (Leaf and Head)

Preemergence Annual Broadleaves and Grasses Recommended Products

Balan 60DF® at 2-2.5 lbs. per acre. Apply and incorporate before seeding or transplanting.

Kerb 3.3SC® at the following rates:

Muck soils with >20% organic matter: 4.8-7.2 qts. per acre

All other soils: 1.25-5 pts. per acre.

All lettuce. Growers in Michigan must have a 24(c) label. Apply before or after seeding but before weeds emerge. Incorporate or irrigate into the soil. Can be applied postemergence to lettuce. 55-day PHI. RUP.

Prefar® at 5-6 qts. per acre. Apply preplant and incorporate or premerge and water in. Not effective on muck soil.

Postemergence Grasses

Recommended Products

Poast 1.5E® at 1-1.5 pts. per acre. Apply to actively growing grasses. Include 1 qt. COC per acre. Do not exceed 3 pts. per acre per year. 30-day PHI for head lettuce. 15-day PHI for leaf lettuce.

Select Max® at 9-16 fl. oz. per acre. Include 0.25% NIS/acre. Do not exceed 64 fl. oz. per acre per year. 14-day PHI.

Postemergence Broadleaves

Recommended Product

Aim 2EC® at 2 fl. oz. per acre. Apply between rows with a hooded sprayer. Apply to weeds up to 3 inches tall. Add an adjuvant and nitrogen source. Do not exceed 2 applications per crop per year.

Weed Control for Parsley

Recommended Products

Aim® at 1-2 fl. oz. per acre. *Postemergence broadleaves.* Apply as a burndown treatment at least 7 days before seeding. Apply to row middles with a hooded sprayer to control weeds up to 4 inches tall. Add COC, NIS, or MSO. Adding AMS will improve weed control. Do not exceed 6.1 fl. oz. per acre per year. 0-day PHI.

Caparol 4L® at 1-4 pts. per acre. *Preemergence and postemergence broadleaves and grasses.* Make 1 application up to 14 days after planting, a second application of 1 pt. per acre up to 30 days before harvest, and a third application up to 30 days before second harvest. Do not exceed 3 applications per year on all cuttings.

Lorox 50DF® at the following rates:

Preemergence on mineral or muck soils: 1-3 lbs. per acre. Use low rate on coarse soils

Postemergence on muck soils only: 1 lb. per acre. Do not apply after parsley has 3 true leaves.

Poast 1.5E® at 1-1.5 pts. per acre. *Postemergence grasses.* Apply to actively growing grasses. Include 1 qt. of COC per acre. Grasses. Do not exceed 3 pts. per acre per year. 15-day PHI.

Prefar 4E® at 5-6 qts. per acre. *Preemergence grasses.* Apply preplant or preemergence. Incorporate or water in. Not effective on muck soil.

Roundup 4L® at 2-3 qts. per acre. *Postemergence broadleaves and grasses.* Apply to emerged perennials before planting in the spring or after harvest in the fall. Check label for best time of year, stage of growth, and rate for each weed.

Select Max 0.97E® at 9-16 fl. oz. per acre. Include 0.25% NIS v/v spray solution per acre. Do not exceed 64 fl. oz. per acre per year. 14-day PHI.

Weed Control for Spinach

Preemergence Broadleaves and Grasses

Recommended Products

Dual Magnum 7.62E® at 0.33-1.0 pt. per acre. *Indiana, Ohio, and Michigan only.* Apply to soil surface after planting. Do not incorporate. Use low rate on sandy soil. 50-day PHI.

Ro-Neet 6E® at 1.4-2 qts. per acre. *Mineral soil only. Growers in Michigan must have a 24(c) label.* Apply before planting and immediately incorporate 2-3 inches. 45-day PHI.

Postemergence Broadleaves

Recommended Products

Spin-Aid® at 3-4 pts. per acre. Apply to spinach with 4-6 leaves when temperature is below 75°F. Do not spray when dew is present. Apply in 11-22 gals. per acre. May cause crop stunting. 40-day PHI. *RUP.*

Stinger 3L® at 2.7-5.3 fl. oz. per acre. Apply to spinach in the 2-5 leaf stage. Kills composite weeds, legumes, and nightshade. Do not exceed 2 applications and 8 fl. oz. per acre per year. 21-day PHI.

Postemergence Grasses

Recommended Product

Poast 1.5E® at 1-1.5 pts. per acre. Apply to actively growing grasses. Include 1 qt. of COC per acre. Do not exceed 3 pts. per acre per season. 15-day PHI.

Select Max 0.97E® at 9-16 fl. oz. per acre. Apply to small grasses. Include 0.25% NIS per acre in spray mix. Do not exceed 64 fl. oz. per acre per year. 14-day PHI.

Weed Control for Swiss Chard

Recommended Products

Dual Magnum 7.62E® at 0.5-1 pts. per acre. *Preemergence. Michigan only.* Apply after seeding. Use lowest rate on light soils. Do not exceed 64 fl. oz. per acre per year. 62-day PHI.

Poast 1.5E® at 1-1.5 pts. per acre. *Postemergence grasses.* Apply to actively growing grasses. Include 1 qt. of COC per acre. Do not exceed 3 pts. per acre per year. 30-day PHI.

Select Max 0.97E® at 9-16 fl. oz. per acre. Include 0.25% NIS v/v spray solution per acre. Do not exceed 64 fl. oz. per acre per year. 14-day PHI.

Insect Control

Aphids, Leafminers, Mites

Treat when insects reach the economic thresholds described below.

Seedlings

Aphids

2 per plant

Leafminers

50% of plants infested

Established Plants

Aphids

7 per plant

Near Harvest

Leafminers

5% of leaves infested

Recommended Products

Acramite[®] (4SC) at 12-24 fl. oz. per acre, or **Acramite**[®] (50WS) at 0.75-1.5 lb. per acre. 7-day PHI.

RR **Actara**[®] (25WDG) at 1.5-3 oz. per acre. *Aphids only*. Do not exceed 11 oz. per acre per season. 7-day PHI.

Admire PRO[®] (4.6F) at the following rates:

Soil applications for aphids only: 4.4-10.5 fl. oz. per acre. Do not exceed 10.5 fl. oz. per acre per season. See label for application methods. 21-day PHI.

Foliar applications for aphids only: 1.3 fl. oz. per acre. Do not exceed 6.5 fl. oz. per acre per season. 7-day PHI.

Agri-Mek[®] (0.15EC) at 8-16 fl. oz. per acre, or **Agri-Mek**[®] (SC) at 1.75 to 3.5 fl. oz. per acre. *Leafminers and mites only*. Do not exceed 2 applications and 48 fl. oz. per acre per season. Use with NIS adjuvant. Do not use binder or sticker-type surfactants. 14-day PHI for all herbs except chives. 7-day PHI for chives and all other crops. *RUP*.

Ambush[®] (25W) at 6.4-12.8 oz. per acre. *Leafminers only*. *Spinach:* Do not exceed 1 lb. a.i. per acre per season. *All others:* Do not exceed 2 lbs. per acre per season. 1-day PHI. *RUP*.

RR **Assail**[®] (30SG) at 2-4 oz. per acre, or **Assail**[®] (70WP) at 0.8-1.7 oz. per acre. *Aphids only*. Do not exceed 20 oz. of 30SG per acre per season. Do not exceed 8.5 oz. of 70WP per acre per season. 7-day PHI.

Belay[®] (2.13SC) at the following rates:

Soil applications: 9-12 fl. oz. per acre. *Aphid and leafminer suppression only*. Do not exceed 10.5 fl. oz. per acre per season. See label for application methods. 21-day PHI.

Foliar applications: 3-4 fl. oz. per acre. *Aphids only*. Do not exceed 12 fl. oz. per acre per season. 7-day PHI.

Belay[®] (50WDG) at the following rates:

Soil applications: 4.8-6.4 fl. oz. per acre. *Aphid and leafminer suppression only*. Do not exceed 6.4 fl. oz. per acre per season. See label for application methods.

Foliar applications: 1.6-2.1 fl. oz. per acre. Aphids and leafminers (suppression only). Do not exceed 6.4 fl. oz. per acre per season. 7-day PHI.

Beleaf[®] (50SG) at 2-2.8 oz per acre. *Aphids only*. Do not exceed 8.4 oz. (0.267 lbs. a.i.) per acre per season. 0-day PHI.

Brigade[®] (2EC) at the following rates

Aphids on head lettuce, cilantro, coriander: 2.1-6.4 fl. oz. per acre. 3-day PHI for cilantro and coriander. 7-day PHI for lettuce.

Mites on lettuce and spinach: 5.12-6.4 fl. oz. per acre. 7-day PHI for lettuce. 40-day PHI for spinach.

Do not exceed 2 1/8 lbs. a.i. per acre per season. *RUP*.

Brigadier[®] (50SG) (*RUP*) at the following rates:

Aphids on coriander and cilantro only: 4.24-5.5 fl. oz. per acre. Do not exceed 16.64 fl. oz. (0.13 lb. a.i.) per acre per acre of Imidacloprid and 0.13 lb active ingredient per acre of bifenthrin) per season. 7-day PHI.

Aphids on head lettuce only: 3.8-6.1 fl. oz. per acre. Do not exceed 30.72 fl. oz. per acre per season (0.24 lb. a.i. of imidacloprid and 0.24 lb. a.i. of bifenthrin). 7-day PHI.

Aphids on spinach only: 3.8-6.14 fl. oz. per acre. Do not exceed 30.72 fl. oz. per acre per season (0.24 lb. a.i. of imidacloprid and 0.24 lb. a.i. of bifenthrin). 40-day PHI.

Leafminers (suppression only): 5.1-6.14 fl. oz. per acre. Do not exceed 30.72 fl. oz. per acre per season (0.24 lb. a.i. of imidacloprid and 0.24 lb. a.i. of bifenthrin). 40-day PHI.

Capture[®] (LFR) at 3.4-6.8 fl. oz per acre. *Lettuce root aphid and bulb mites on head lettuce only.* See label for application methods. Do not exceed 0.1 lb. a.i. per acre per season as an at-plant application. Do not exceed 0.5 lb. a.i. per acre per season including at-plant plus foliar applications of other bifenthrin products (such as Brigade[®] 2EC). RUP.

Dimethoate[®] (4E) at 0.5 pt. per acre. *Not for parsley, spinach, celery, or head lettuce.* 14-day PHI for endive, swiss chard, and leaf lettuce.

 **Entrust**[®] (2SC) at 6-10 fl. oz. per acre. *Leafminers only.* Do not exceed 29 fl. oz. per acre per season. Observe resistance management restrictions. 1-day PHI.

 **Fulfill**[®] (50WDG) at 2.75 oz. per acre. *Aphids only.* Do not exceed 5.5 oz. per acre per season. 7-day PHI.

Hero[®] at the following rates:

Aphids and leafminers (adults): 4-10.3 oz. per acre.

Carmine mite, Pacific spider mite, and two-spotted spider mite on head lettuce only: 10.3 oz. per acre.

Do not exceed 46.35 oz. (0.45 lb. a.i.) per acre per season. Observe resistance management restrictions. 7-day PHI. RUP.

Hero EW[®] at the following rates:

Aphids and leafminers (adults): 4.5-11.2 oz. per acre.

Carmine mite and two-spotted spider mite on head lettuce only: 11.2 oz. per acre.

Do not exceed 50.5 oz. (0.45 lb. a.i.) per acre per season. Observe resistance management restrictions. 7-day PHI. RUP.

Malathion[®] (5EC) at 1-3 pts. per acre depending on crop and pest (see label for rates). *Aphids and mites only.* 14-day PHI for leaf and head lettuce and Swiss chard. 7-day PHI for endive and spinach.

 **Movento**[®] (2SC) at 4-5 fl. oz. per acre. *Aphid and leafminer suppression only.* Must be tank-mixed with a spray adjuvant/additive that has spreading and penetrating properties to maximize leaf uptake and systemicity of the active ingredient within treated plants. 3-day PHI.

 **M-Pede**[®] at 1-2% by volume. *Leafminer suppression on herbs or aphids only.* Must contact aphids to be effective. Avoid spraying under hot conditions to minimize potential for plant injury. 0-day PHI.

 **Neemix 4.5**[®] at 4-7 fl. oz. per acre. *Leafminers only.* 0-day PHI.

Orthene[®] (97S) at 8-16 oz. per acre. *Aphids on head lettuce (crisphead type) only.* Do not exceed 2 1/8 lbs. a.i. per acre per season. 21-day PHI.

 **Platinum**[®] (2SC) at 5-11 fl. oz. per acre in-soil applications. *Aphid and leafminer suppression only.* See label for application methods. Do not exceed 11 fl. oz. a.i. per acre per season. 30-day PHI.

Permethrin[®] (3.2EC) at 4-8 fl. oz. per acre. *Leafminers on spinach:* Do not exceed 24 fl. oz. per acre per season. *Lettuce:* Do not exceed 32 fl. oz. per acre per season. 1-day PHI. RUP.

 **Radiant**[®] (1SC) at 6-10 fl. oz. per acre. *Leafminers only.* Do not exceed 34 fl. oz. (0.266 lb. a.i. spinetoram) per acre per season. 1-day PHI.

Sivanto[®] (200SL) at 10.5-12 fl. oz. per acre. *Aphids only.* Do not exceed 28 fl. oz. per acre per season. 1-day PHI.

Torac[®] (1.29EC) at 17-21 fl. oz. per acre. *Aphids only.* Do not exceed 2 applications per season. 1-day PHI.

Trigard[®] (75WP) at 2.66 oz. per acre. *Leafminers only.* Do not exceed 6 applications per acre per season. 7-day PHI.

Venom[®] (70SG) for green peach aphid and potato aphid suppression only at the following rates:

Foliar applications: 1-3 fl. oz. per acre. 7-day PHI.

Soil applications: 5-6 fl. oz. per acre. 21-day PHI.

Carrot Weevil

For parsley, scout plants at the 4-leaf stage, looking for ovipunctures (egg-laying scars) on the stems. Treat if ovipunctures are found on at least 1% of plants.

Recommended Products

Baythroid XL[®] (1EC) at 3.2 fl. oz. per acre. 0-day PHI.

Malathion 5EC[®] at 1.5-2.4 pts. per acre. 7-day PHI for parsley.

 This is a reduced-risk pesticide. See page 37 for details.

 This is a biopesticide. See page 37 for details.

 May be acceptable for use in certified organic production. Check with your certifier before use.

Caterpillars (including cutworms and armyworms), Loopers

Treat when 5% of plants are infested.

Recommended Products

Ambush® (25W) at 6.4-12.8 oz. per acre. *Spinach*: Do not exceed 1 lb. a.i. per acre per season. *All others*: Do not exceed 2 lbs. a.i. per acre per season. 1-day PHI. RUP.

RR **Avaunt**® (30WDG) at the following rates:

Spinach: 3.5 oz. per acre. Do not exceed 14 oz. per acre per season.

Other labeled crops: 2.5-6.0 oz. per acre. Do not exceed 24 oz. per acre per season.

3-day PHI.

BP Various *Bacillus thuringiensis* products (Agree®, Bio-bit®, Dipel®, Javelin®, Xentari®) are available in various formulations. Follow label instructions for rates and use. 0-day PHI.

Baythroid XL® (1EC) at the following rates:

Cutworms: 0.8-1.6 fl. oz per acre.

Cabbageworm and loopers: 1.6-2.4 fl. oz. per acre.

Armyworms, corn earworm, and European corn borer: 2.4-3.2 fl. oz. per acre.

Do not exceed 12.8 fl. oz. per acre per season. Allow 7 days between applications. 0-day PHI. RUP.

Brigade® (2EC) at 2.1-6.4 fl. oz. per acre, or **Brigade**® (WSB) at 5.3-16 oz. per acre. *Head lettuce and spinach only*. *Head lettuce*: Do not exceed 1 qt. of 2EC per acre per season. Do not exceed 80 oz. of WSB per acre per season. 7-day PHI. *Spinach*: Do not exceed 25.6 fl. oz. of 2EC per acre per season. Do not exceed 64 oz. WSB per acre per season. 40-day PHI. RUP.

Brigadier® (50SG) at the following rates:

Cabbage looper and cutworm on coriander and cilantro: 4.24-5.5 fl. oz. per acre. Do not exceed 16.64 fl. oz. (0.13 lb. a.i. of imidacloprid and 0.13 lb. a.i. of bifenthrin) per acre per season. 7-day PHI.

Imported cabbageworm, armyworms, cutworms, loopers, and corn earworm on head lettuce: 5.1-6.1 fl. oz. per acre. Do not exceed 30.72 fl. oz. (0.24 lb. a.i. of imidacloprid and 0.24 lb. a.i. of bifenthrin) per acre per season. 7-day PHI.



These parsley transplants will have an advantage over plants that are direct seeded.

Imported cabbageworm, armyworms, cutworms, loopers, corn earworm, and European corn borer on spinach: 5.1-6.14 fl. oz. per acre. Do not exceed 30.72 fl. oz. (0.24 lb. a.i. of imidacloprid and 0.24 lb. a.i. of bifenthrin) per acre per season. 40-day PHI.

RUP.

Capture® (LFR) at 3.4-6.8 fl. oz. per acre. See label for application methods. Do not exceed 0.1 lb. a.i. per acre per season as an at-plant application. Do not exceed 0.5 lb. a.i. per acre per season including at-plant plus foliar applications of other bifenthrin products (such as Brigade® 2EC). RUP.

Confirm® (2F) at the following rates:

Early season applications to young crop and small plants only: 6-8 fl. oz. per acre.

Mid- to late-season applications (and to heavier infestations and under conditions in which thorough coverage is more difficult): 8 fl. oz. per acre.

Do not apply more than 8 fl. oz. per application. Do not exceed 56 fl. oz. of product per season. 7-day PHI.

RR **Coragen**® (1.67SC) at 3.5-5 fl. oz. per acre. 1-day PHI.

RR **Entrust**® (2SC) at 3-6 fl. oz. per acre. Do not exceed 29 oz. per acre per season. Observe resistance management restrictions. 1-day PHI.

RR **Exirel**® (0.83SE) at the following rates:

Armyworms, diamondback moth, and corn earworm: 7-13.5 fl. oz. per acre. Observe resistance management restrictions for diamondback moth.

Cabbage looper: 10-17 fl. oz. per acre.

Do not use adjuvants in tank mix in spinach. Do not exceed 0.4 lb. a.i. per acre per season. 1-day PHI.

Hero® at 4-10.3 oz. per acre. *Head lettuce only.* Do not exceed 46.35 oz. (0.45 lb. a.i.) per acre per season. Observe resistance management restrictions for some of the target pests. 7-day PHI. *RUP.*

Hero EW® at 4.5-1.2 oz. per acre. *Head lettuce only.* Do not exceed 50.5 oz. (0.45 lb. a.i.) per acre per season. Observe resistance management restrictions for some of the target pests. 7-day PHI. *RUP.*

RR **Intrepid**® (2F) at the following rates:

Early season applications: 4-8 fl. oz. per acre.

Mid- to late-season applications: 8-10 fl. oz. per acre.

Do not exceed 64 fl. oz. per acre per season. 1-day PHI.

Lannate LV® (2.4WSL) at 0.75-3 pts. per acre. Maximum application amounts and PHIs vary among vegetables. Read and follow label directions. *RUP.*

Larvin® (3.2F) at 16-30 fl. oz. per acre. Do not exceed 60 fl. oz. per acre per season. 14-day PHI. *RUP.*

Mustang Maxx® (0.8EC) at 2.24-4.0 fl. oz. per acre. Do not exceed 24 fl. oz. per acre per season. 1-day PHI. *RUP.*

Orthene® (97S) at 1 lb. per acre. *Head lettuce only.* Do not exceed 2.2 lbs. per acre per season. 21-day PHI.

Permethrin® (3.2EC) at 2-8 fl. oz. per acre. *Spinach:* Do not exceed 24 fl. oz. per acre per season. *Lettuce:* Do not exceed 32 fl. oz. per acre per season. 1-day PHI. *RUP.*

RR **Radiant**® (1SC) at 5-10 fl. oz. per acre. *Not for yellowstriped armyworm or western yellowstriped armyworm.* Do not exceed 34 fl. oz. (0.266 lb. a.i. of spinetoram) per acre per season. 1-day PHI.

Flea Beetles, Leafhoppers

Flea Beetle Threshold

Seedlings: >50% plants infested and defoliation > 30%

Recommended Products

RR **Actara**® (25WDG) at 1.5-3.0 oz. per acre. Do not exceed 11 oz. per acre per season. 7-day PHI.

Admire PRO® (4.6F) at the following rates:

Soil applications for leafhoppers only: 4.4-10.5 fl. oz. per acre. See label for application methods. Do not exceed 10.5 fl. oz. (0.38 lb. a.i.) per acre per season. 21-day PHI.

Foliar applications: 1.3 fl. oz. per acre. Do not exceed 6.5 fl. oz. (0.23 lb. a.i.) per acre per season. 7-day PHI.

Ambush® (25W) at 6.4-12.8 oz. per acre. *Leafhoppers only.* *Spinach:* Do not exceed 4 lbs. per acre per season. *All others:* Do not exceed 8 lbs. per acre per season. 1-day PHI. *RUP.*

Ammo® (2.5EC) at 2.5-5.0 fl. oz. per acre. *Head lettuce only.* Do not exceed 30 fl. oz. per acre per season. 5-day PHI. *RUP.*

Baythroid XL® (1EC) at the following rates:

Flea beetles: 2.4-3.2 fl. oz. per acre.

Potato leafhoppers: 0.8-1.6 fl. oz. per acre.

Do not exceed 12.8 fl. oz. per acre per season. Must wait 7 days between applications. 0-day PHI. *RUP.*

Belay® (2.13SC) at 3-4 fl. oz. per acre. 7-day PHI.

Brigade® (2EC) at 2.1-6.4 fl. oz. per acre, or **Brigade**® (WSB) at 5.3-16 oz. per acre. *Head lettuce and spinach only.* 7-day PHI for head lettuce. 40-day PHI for spinach. *RUP.*

RR This is a reduced-risk pesticide. See page 37 for details.

BP This is a biopesticide. See page 37 for details.

 May be acceptable for use in certified organic production. Check with your certifier before use.

Brigadier[®] (50SG) at the following rates:

Coriander and cilantro: 4.24-5.5 fl. oz. per acre. Do not exceed 16.64 fl. oz. (0.13 lb. a.i. of imidacloprid and 0.13 lb. a.i. of bifenthrin) per acre per season. 7-day PHI.

Leafhoppers on head lettuce: 3.8-6.1 fl. oz. per acre.

Flea beetles: 5.1-6.1 fl. oz. per acre. Do not exceed 30.72 fl. oz. (0.24 lb. a.i. of imidacloprid and 0.24 lb. a.i. of bifenthrin) per acre per season. 7-day PHI.

Flea beetles on spinach only: 5.1-6.14 fl. oz. per acre. Do not exceed 30.72 fl. oz. (0.24 lb. a.i. of imidacloprid and 0.24 lb. a.i. of bifenthrin) per acre per season. 40-day PHI.

RUP.

Capture[®] (LFR) at the following rates:

Soil applications: See label for application methods.

Flea beetle larvae on cilantro and coriander only: 3.4-6.8 fl. oz. per acre.

Do not exceed 0.1 lb. a.i. per acre per season as an at-plant application. Do not exceed 0.5 lb. a.i. per acre per season including at-plant plus foliar applications of other bifenthrin products (such as Brigade[®] 2EC). RUP.

Dimethoate[®] (4E) at 0.5 pt. per acre. *Leafhoppers only*.

Not for parsley, spinach, celery, or head lettuce. 14-day PHI for endive, swiss chard, and leaf lettuce.

Hero[®] at 4-10.3 oz. per acre. *Head lettuce only*. Do not exceed 46.35 oz. (0.45 lb. a.i.) per acre per season. Observe resistance management restrictions for some of the target pests. 7-day PHI. RUP.

Hero EW[®] at 4.5-11.2 oz. per acre. *Head lettuce only*. Do not exceed 50.5 oz. (0.45 lb. a.i.) per acre per season. Observe resistance management restrictions for some of the target pests. 7-day PHI. RUP.

Mustang Maxx[®] (0.8EC) at 2.24-4.0 fl. oz. per acre. Do not exceed 24 fl. oz. per acre per season. 5-day PHI. RUP.

BP **Neemix 4.5**[®] at 7-16 fl. oz. per acre. *Leafhopper nymphs only*. 0-day PHI.

RR **Platinum**[®] (2SC) at 5-11 fl. oz. per acre. 30-day PHI.

Orthene[®] (97S) at 8-16 oz. per acre. *Aster leafhopper only on head lettuce (crisphead type) only*. Do not exceed 2 1/8 lbs. a.i. per acre per season. 21-day PHI.

Permethrin[®] (3.2EC) at 2-8 fl. oz. per acre. *Leafhoppers only*. *Spinach*: Do not exceed 24 fl. oz. per acre per season. *Lettuce*: Do not exceed 32 fl. oz. per acre per season. 1-day PHI. RUP.

RR **Platinum**[®] (2SC) at 5-11 fl. oz. per acre in soil applications. See label for application methods. Do not exceed 11 fl. oz. (0.172 lb. a.i. of thiamethoxam) per acre per season. 30-day PHI.

Sevin XLR PLUS[®] (4F) at 0.5-2 qts. per acre. Do not exceed 6 qts. per acre per season. 14-day PHI.

Sivanto[®] (200SL) at 7-10.5 fl. oz. per acre. *Leafhoppers only*. Do not exceed 28 fl. oz. per acre per season. 1-day PHI.

Torac[®] (1.29EC) at 14-21 fl. oz. per acre. Do not exceed 2 applications per season. 1-day PHI.

Venom[®] (70SG) for leafhoppers only at the following rates:

Foliar applications: 1-3 fl. oz. per acre. 7-day PHI.

Soil applications: 5-6 fl. oz. per acre. 21-day PHI

Warrior II[®] (2.08CS) at 1.28-1.92 fl. oz. per acre. *Lettuce only*. Do not exceed 19.2 fl. oz. per acre per season. 1-day PHI. RUP.

Slugs

Prevent infestation by scattering bait products to the soil surface around the perimeter of the planting. Make a rescue treatment by scattering the bait products on the soil as a band between rows.

Recommended Products

Deadline M-Ps[®] (4B) at 25 lbs. per acre. Do not exceed 3 applications of product per crop cycle. 0-day PHI.

Durham[®] (metaldehyde 3.5 G). Apply up to 40 pounds per acre. Do not exceed 86 lbs. (3 lbs. a.i.) per acre per crop cycle. Do not allow bait granules to come in contact with plants. Never apply to dry soil.

Sluggo Plus (1B) at 22-44 lbs. per acre, or at 0.5-1 lb. per 1,000 square ft. *Lettuce and spinach only*. 0-day PHI.

Tarnished Plant Bug

Tarnished plant bug (TPB) damage to lettuce and spinach can reduce the marketability of these crops and can make them more susceptible to bacterial diseases. TPB adults and nymphs also feed on the youngest growth in the heart of the plant, which may lead to symptoms similar to blackheart.

No formal economic thresholds have been developed for this insect pest in leafy vegetables. However, in Canada, the thresholds used in celery have proven to be a suitable guideline for management decisions. Insecticide treatment is recommended whenever a threshold of 0.2 TPB per plant is reached from transplanting until three weeks before harvest. Note that in many cases, TPB damage is observed before large numbers of TPB nymphs and/or adults are detected.

Recommended Products

Ambush® (25W) at 6.4-12.8 oz. per acre. *Leafminers only.*

Spinach: Do not exceed 1 lb. a.i. per acre per season.

All others: Do not exceed 2 lbs. per acre per season. 1-day PHI. *RUP.*

Athena® at the following rates:

Head lettuce: 13.5-17 fl. oz. per acre. Do not exceed 50 fl. oz. per acre per season after transplanting. 7-day PHI.

Spinach: 13.5-17 fl. oz. per acre. Do not exceed 62 fl. oz. per acre per season after transplanting. 40-day PHI.

RUP.

Baythroid XL® (1EC) at 2.4-3.2 fl. oz. per acre. 0-day PHI.

Do not exceed 12.8 fl. oz. (0.1 lb a.i.) per acre per season. *RUP.*

Beleaf® (50SG) at 2-2.8 oz per acre. Do not exceed 8.4 oz. (0.267 lb. a.i.) per acre per season. 0-day PHI.

Brigade® (2EC) at 5.12-6.4 fl. oz. per acre. *Head lettuce and spinach only.* *Head lettuce:* Do not exceed 0.5 lb. a.i. per acre per season. 7-day PHI. *Spinach:* Do not exceed 0.4 lb. a.i. per acre per season. 40-day PHI for spinach. *RUP.*

Brigadier® (50SG) at the following rates:

Head lettuce: 3.8-6.1 fl. oz. per acre. 7-day PHI.

Spinach: 3.8-6.14 fl. oz. per acre. 40-day PHI.

Do not exceed 30.72 fl. oz. (0.24 lb. a.i. of imidacloprid and 0.24 lb. a.i. of bifenthrin) per acre per season. *RUP.*

Hero® at 10.3 oz. per acre. *Head lettuce only.* Do not exceed 46.35 oz. (0.45 lb. a.i.) per acre per season. 7-day PHI. *RUP.*

Hero EW® at 11.2 oz. per acre. *Head lettuce only.* Do not exceed 50.5 oz. (0.45 lb. a.i.) per acre per season. 7-day PHI. *RUP.*

Mustang Maxx® (0.8EC) at 3.2-4 fl. oz. per acre. Do not exceed 24 fl. oz. (0.15 lb. a.i.) per acre per season. 1-day PHI. *RUP.*

Sevin XLR PLUS® (4F) at 1-2 qts. per acre. Do not exceed 6 qts. per acre per season. 14-day PHI.