

# Leafy greens: lettuce, chicory, endive, escarole, and others

## Planting

Make successive plantings from April to mid-July. Irrigate after seeding in dry weather. Choose deep, fertile soils with an abundance of available moisture during the growing season. Rotate leafy greens with other vegetable crops. Break up fresh leafy greens residue and allow it to dry for several days before plowing or working the residue into the soil. Crisp-head-lettuce types are difficult to grow in Wisconsin. Some varieties will not germinate in warm soils (above 40–50°F).

**Rows:** 12–36 inches.

**Plants in row:** 2–12 inches. Use 0.5–1.0 lb seed/a (use only mosaic-free seed).

## Lime and fertilizer

**Lime:** Use dolomitic limestone to maintain a pH of 5.6 or higher in organic soils and at least 5.8 in other soils.

**Fertilizer rates:** Apply  $P_2O_5$  and  $K_2O$  according to soil test recommendations. Use annual nitrogen,  $P_2O_5$ , and  $K_2O$  recommendations in table below. Take credits for previous legume crops and manure.

**Application:** Broadcast and work in before planting. For most efficient use of nitrogen, split the recommendation into two or more applications during the season.

**Micronutrients:** Leafy greens need relatively high amounts of manganese, molybdenum, and copper. Use soil and plant analyses to check for deficiencies of these nutrients.

## Annual nitrogen, phosphate, and potash recommendations for leafy greens

Nitrogen		Phosphate and potash		
Organic matter (%)	Amount to apply (lb/a)	Yield goal (t/a)	Amount $P_2O_5$ to apply* (lb/a)	Amount $K_2O$ to apply* (lb/a)
<2	120	15–20	40	160
2.0–9.9	100			
10–20	60			
>20	40			

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

Eggplant

Hops

Horse radish

Leafy greens

Melon

Mint

Onion

## Disease control in leafy greens

Disease	Active ingredient	Rate/a of commercial product	Days to harvest	Remarks and suggestions
<b>Aster yellows</b>	<i>Control aster leafhopper (see Insect Control table); also see "Aster Yellows Index" section on page 16.</i>			
<b>Bottom rot (Rhizoctonia) and drop (Sclerotinia)</b>	<i>Use long rotations with resistant crops such as corn, grasses, or small grains. Good weed control is important because these disease pathogens attack a wide range of plants. Maintain good soil fertility—healthy plants will be more resistant to disease. Also improve soil aeration at the base of plants by pairing the rows on raised beds and thinning plants to allow optimum growth. Chop debris with Rotobeater or flail-type machine. This will encourage rapid breakdown of plant materials and reduce potential of pathogens overwintering.</i>			
	azoxystrobin	<i>Rhizoctonia:</i> 0.4–0.8 fl oz Aframe, AzoxyStar, Quadris, Willowood Azoxy2SC/1,000 ft row	0	Do not apply more than 92.3 fl oz/a per season. See label for details on use for soilborne disease control.
	boscalid	8.0–11.0 oz Endura	14	Do not apply more than 22.0 oz/a per year. Only 2 applications can be made per season.
	<i>Coniothyrium minitans</i> strain CON/M/91-08	<i>drop caused by Sclerotinia:</i> 2.0 lb Contans WG	0	Incorporate in top 2 inches of soil by light mechanical incorporation or by irrigation. See label for specific application program post lettuce thinning. Approved for use on certified organic farms.
	cyprodinil + fludioxonil	<i>drop caused by Sclerotinia:</i> 11.0–14.0 oz Switch 62.5WG	0	Do not apply more than 56.0 oz/a per year. For lettuce, make first application at thinning and 2 weeks later.
	fludioxonil	<i>drop caused by Sclerotinia:</i> 7.0 oz Cannonball WP	0	Do not apply more than 28.0 oz/a per year. Do not apply more than two times before alternating to an effective fungicide with a different mode of action.
	fluxapyroxad + pyraclostrobin	8.0–11.0 fl oz Merivon	1	Follow resistance management guidelines on label.
	iprodione	1.5–2.0 pt Iprodione 4L AG, Nevado 4F, Rovral 4FL	14	Lettuce only. Spray at the three-leaf stage and again 10 days later. Use a tractor-mounted boom with hollow cone or flat fan nozzles. Direct spray to the base of plants.
	isofetamid	12.3 fl oz Kenja 400SC	14	Do not make more than 2 sequential applications of Kenja or other group 7 fungicides before rotating to a different mode of action.
	penthiopyrad	<i>drop caused by Sclerotinia:</i> 16.0–24.0 fl oz Fontelis	3	Do not apply more than 72.0 fl oz/a per year. Do not apply more than two times before alternating to an effective fungicide with a different mode of action.
<b>Damping-off (Pythium)</b>	<i>Avoid growing lettuce on wet, poorly drained soil.</i>			
	mefenoxam	1.0–2.0 pt Ridomil Gold SL 1.0–2.0 lb Ridomil Gold WSP		Lettuce and endive only. Preplant-incorporated application or surface application after planting.
	propamocarb hydrochloride	2.0 pt Previcur Flex	2	Do not apply more than 8.0 pt/a per season. Apply when conditions become favorable for disease. Can be applied in transplant water, through drip irrigation, or directed nozzles to lower plant parts and surrounding soil.
<b>Downy mildew</b>	ametoctradin + dimethomorph	14.0 fl oz Zampro	0	Apply with a spreading/penetrating adjuvant. Do not make more than 3 applications/a per year.
	azoxystrobin	12.0–15.5 fl oz Aframe, AzoxyStar, Quadris, Satori, Willowood Azoxy 2SC	0	Do not apply more than 92.3 fl oz/a per season.

(continued)

## Disease control in leafy greens *(continued)*

Disease	Active ingredient	Rate/a of commercial product	Days to harvest	Remarks and suggestions
<b>Downy mildew</b> <i>(cont.)</i>	cyazofamid	2.75 fl oz Ranman	0	Do not apply more than 16.5 fl oz/a per growing season.
	cymoxanil	3.2–5.0 oz Curzate	3	Use high rate for severe disease pressure and for spinach downy mildew. Do not apply more than 30.0 oz/a per year.
	cymoxanil + femoxadone	8.0–10.0 oz Tanos	1	Must be tank mixed with an appropriate contact fungicide such as chlorothalonil, mancozeb, or copper. Do not make more than 1 application without alternating to an effective fungicide with a different mode of action.
	dimethomorph	6.0 fl oz Forum	0	Do not make more than 5 applications per season. Do not exceed 30.0 fl oz per season.
	fenamidone	5.5–8.2 fl oz Reason 500 SC	2	Do not apply more than 24.6 oz/a per year. Do not make more than 1 application without alternating to an effective fungicide with a different mode of action.
	fixed copper	1.0–2.0 lb Champion 77WP 0.6–1.3 pt Champ Formula 2 Flowable	0 0	Lettuce, endive, and escarole only.
	fluopicolide	3.0–4.0 fl oz Presidio	2	Lettuce, chicory, endive, and escarole. May be applied through sprinkler or drip irrigation system. Tank mix with another fungicide having different mode of action for resistance management.
	fosetyl-al	2.0–5.0 lb Aliette WDG, Linebacker WDG	3	Lettuce, arugula, celery, cress, endive, spinach, Swiss chard, fennel, escarole, and chicory only.
	mancozeb	1.2–1.6 qt Dithane F-45 1.6–2.1 lb Manzate Pro-Stick, Penncozeb (lettuce) 2.0 lb Dithane M45, Koverall	10	Begin application prior to disease development. Minimum re-treatment interval is 7 days.
	mandipropamid	8.0 fl oz Revus	1	Lettuce and endive. Make no more than 2 consecutive applications before switching to another effective non-Group 40 fungicide. The addition of an adjuvant is recommended.
	oxathiapiprolin	2.0–4.8 fl oz Orondis Ultra A (for <i>Bremia lactucae</i> ) 2.4–4.8 fl oz Orondis Ultra A (for <i>Peronospora farinosa</i> )	0	Make no more than 2 sequential applications before rotating to a fungicide with a different mode of action. Do not exceed 19.2 fl oz/a per year. Begin foliar applications prior to disease development and continue on a 3- to 14-day interval.
	propamocarb hydrochloride	2.0 pt Previcur Flex or 1.33–2.0 pt Previcur Flex with tank-mix partner	2	Do not apply more than 8.0 pt/a per season. Apply when conditions become favorable for disease.
	pyraclostrobin	12.0–16.0 oz Cabrio EG	0	Do not apply more than 64.0 oz/a per year. Do not apply more than two times before alternating to an effective fungicide with a different mode of action.
	<b>Lettuce mosaic</b>	<i>Use seed certified mosaic free.</i>		
<b>Root rot</b>	<i>Thoroughly work old plant refuse into the soil. Only grow one lettuce crop per season on a field.</i>			

Eggplant

Hops

Horse radish

Leafy greens

Melon

Mint

Onion

## Scouting calendar for insect pests of leafy greens

	April			May			June			July			August			September		
	early	mid	late	early	mid	late	early	mid	late	early	mid	late	early	mid	late	early	mid	late
			Flea beetles															
			Leafminers													Leafminers		
			Aster leafhopper															
					Aphids													
								Loopers										

## Insect control in leafy greens

Insect	Rate/a of active ingredient	Rate/a of commercial product	Days to harvest	Remarks and suggestions
<b>Aphids</b>	<i>Treat seedlings if one or more aphids per plant; treat established plants if 10 or more aphids per plant.</i>			
	0.5–1.0 lb acephate	0.5–1.0 lb Orthene 97	14	Head lettuce only. Do not exceed 2.66 lb ai/a per season.
	acetamiprid	0.8–1.2 oz Assail 70WP 2.0–4.0 oz Assail 30 SG	7 7	Begin treatment when thresholds are reached. Apply every 7 days as needed. Do not exceed 5 applications or 0.375 lb ai/a per season.
	alpha-cypermethrin	2.2–3.8 fl oz *Fastac	1	Apply when pests reach or exceed established thresholds. Do not apply more than 11.4 fl oz of Fastac per acre per crop season.
	0.033–0.10 lb bifenthrin	2.1–6.4 fl oz *Brigade 2EC	7	Apply to head lettuce every 7 days as needed. Do not exceed 0.5 lb ai/a per season.
	0.066–0.095 lb bifenthrin + imidacloprid	4.24–6.1 fl oz *Brigadier	7	Do not apply more than 30.72 fl oz/a (0.48 lb ai/a) per season. No more than 0.5 lb ai/a bifenthrin and 0.24 lb ai/a imidacloprid are allowed per season.
	clothianidin	<i>foliar:</i> 3.0–4.0 fl oz Belay	21	Do not apply more than 12.0 fl oz/a per season and allow at least 7 days between applications.
		<i>soil:</i> 9.0–12.0 fl oz Belay	—	Do not apply more than 12.0 fl oz/a per season. Apply as a narrow band centered on the plant row; as an in-furrow spray at planting; as a side-dress to both sides of the row; as a transplant water drench; or as chemigation into root zone through drip, trickle or micro-sprinkler, or similar equipment.
	0.088–0.176 lb cyantraniliprole ( <i>soil</i> )	6.75–13.5 fl oz Verimark	—	Do not apply more than 13.5 fl oz/a Verimark per crop per season. Do not apply more than 0.4 lb ai/a cyantraniliprole-containing products per crop whether applied as soil or foliar applications. The pH of the application solution should be adjusted to between pH 4 and 6.
	0.088–0.133 lb cyantraniliprole ( <i>foliar</i> )	13.5–20.5 fl oz Exirel	1	Minimum application interval between foliar sprays is 5 days. Do not use adjuvants in foliar tank mix with spinach.
	0.25–0.5 lb diazinon	several formulations	14	
	0.25 lb dimethoate	0.5 pt Dimethoate EC	7 (head) 14 (leaf)	
	0.062–0.089 lb flonicamid	2.0–2.8 oz Beleaf SG	0	Begin applications before aphid populations build. Do not exceed 2.8 oz/a Beleaf per application and do not apply more than 8.4 oz/a (0.267 lb ai/a) per season.

\*Restricted-use pesticide.

(continued)

## Insect control in leafy greens *(continued)*

Insect	Rate/a of active ingredient	Rate/a of commercial product	Days to harvest	Remarks and suggestions
<b>Aphids</b> <i>(cont.)</i>	flupyradifurone	10.5–12.0 fl oz Sivanto	1	Foliar application. Apply when pests reach or exceed established thresholds. Do not apply more than 28.0 fl oz of Sivanto per acre per crop season.
	imidacloprid	4.4–10.5 fl oz Admire Pro	21	Systemic at planting. Do not exceed 24.0 fl oz/a Admire per season.
		3.75 fl oz Provado F	7	Foliar spray. Apply before populations become damaging. Do not exceed 18.75 fl oz/a Provado per season.
	imidacloprid + beta-cyfluthrin	3.0 fl oz *Leverage 360	7	Do not apply more than 12.8 fl oz/a per season and allow at least 7 days between applications.
	0.02–0.03 lb lambda-cyhalothrin	1.28–1.92 fl oz *Warrior II	4	Do not apply more than 0.3 lb ai/a per season. Do not feed treated foliage to animals.
	lambda-cyhalothrin + chlorantraniliprole	6.0–9.0 fl oz *Voliam Xpress	1	Do not exceed 31.0 fl oz/a of Voliam Xpress or 0.3 lb ai/a of products containing lambda-cyhalothrin or 0.2 lb ai/a of products containing chlorantraniliprole per growing season.
	1.25–1.9 lb malathion	several formulations	7–14	Apply twice a week. Check label for crop.
	0.1–0.2 lb permethrin	*Pounce (several formulations)	1	Apply every 3–5 days as needed. Do not exceed 2.0 lb ai/a per season; for spinach do not apply more than 1.0 lb ai/a per season.
	0.086 lb pymetrozine	2.75 oz Fulfill 50WDG	0	Apply before aphids reach damaging levels. Do not exceed 5.5 oz/a per season.
	0.06–0.08 lb spirotetramat	4.0–5.0 fl oz Movento	1	Do not apply more than 10.0 fl oz/a (0.16 lb ai/a) per season.
	thiamethoxam	1.5–3.0 oz Actara 25WDG	7	Do not apply more than 11.0 oz of Actara 25WDG or Platinum 2SC and no more than 3.67 oz Platinum 75SG per acre per crop season and apply sufficient water volume after in-ground application to ensure incorporation into the seed zone. Actara is applied as a foliar spray.
		5.0–11.0 fl oz Platinum 2SC 1.66–3.67 oz Platinum 75SG	30 30	
	0.198–0.257 lb thiamethoxam + chlorantraniliprole	10.0–13.0 fl oz Durivo	30	Do not exceed a total of 13.0 fl oz/a Durivo (0.257 lb ai/a) per growing season. Do not exceed 0.172 lb ai/a of thiamethoxam-containing products or 0.2 lb ai/a of chlorantraniliprole-containing products per season.
0.014–0.025 lb zeta-cypermethrin	2.24–4.0 oz *Mustang Maxx	1	Apply at thresholds and do not exceed 24.0 oz/a Mustang Maxx per season.	
<b>Aster leafhopper and tarnished plant bug</b>	0.5–1.0 lb acephate	0.5–1.0 lb Orthene 97	21	Head lettuce only. See label for feeding restrictions. Do not exceed 2.66 lb ai/a per season.
	alpha-cypermethrin	2.2–3.8 fl oz *Fastac	1	Apply when pests reach or exceed established thresholds. Do not apply more than 11.4 fl oz of Fastac per acre per crop season.
	<i>leafhopper</i> : 0.033–0.10 lb bifenthrin	2.1–6.4 fl oz *Brigade 2EC	7	Apply to head lettuce every 7 days as needed. Do not exceed 0.5 lb ai/a per season.
	<i>tarnished plant bug</i> : 0.08–0.10 lb bifenthrin	5.12–6.4 fl oz *Brigade 2EC	7	

\*Restricted-use pesticide.

*(continued)*

Eggplant

Hops

Horse radish

Leafy greens

Melon

Mint

Onion

## Insect control in leafy greens *(continued)*

Insect	Rate/a of active ingredient	Rate/a of commercial product	Days to harvest	Remarks and suggestions
<b>Aster leafhopper and tarnished plant bug</b> <i>(cont.)</i>	0.066–0.095 lb bifenthrin + imidacloprid	4.24–6.1 fl oz *Brigadier	7	Do not apply more than 30.72 fl oz/a (0.48 lb ai/a) per season. No more than 0.5 lb ai/a bifenthrin and 0.24 lb ai/a imidacloprid are allowed per season.
	1.0–2.0 lb carbaryl	Sevin (several formulations)	3	Apply at 5- to 7-day intervals.
	clothianidin	<i>foliar</i> : 3.0–4.0 fl oz Belay	21	Do not apply more than 12.0 fl oz/a per season and allow at least 7 days between applications.
		<i>soil</i> : 9.0–12.0 fl oz Belay	—	Do not apply more than 12.0 fl oz/a per season. Apply as a narrow band centered on the plant row; as an in-furrow spray at planting; as a side-dress to both sides of the row; as a transplant water drench; or as chemigation into root zone through drip, trickle or micro-sprinkler, or similar equipment.
	0.25 lb dimethoate	0.5 pt Dimethoate EC	7 (head) 14 (leaf)	Apply weekly as needed.
	flubendiamide + buprofezin	12.0–17.0 fl oz Vetica	7	Do not apply more than 38.0 fl oz/a per season and allow at least 7 days between applications. Do not apply more than 3 applications per crop season.
	imidacloprid + beta-cyfluthrin	3.0 fl oz *Leverage 360	7	Do not apply more than 12.8 fl oz/a per season and allow at least 7 days between applications.
	0.02–0.03 lb lambda-cyhalothrin	1.28–1.92 fl oz *Warrior II	4	Do not apply more than 0.3 lb ai/a per season. Do not feed treated foliage to animals.
	lambda-cyhalothrin + chlorantraniliprole	6.0–9.0 fl oz *Voliam Xpress	1	Do not exceed 31.0 fl oz/a of Voliam Xpress or 0.3 lb ai/a of products containing lambda-cyhalothrin or 0.2 lb ai/a of products containing chlorantraniliprole per growing season.
	0.225–0.9 lb methomyl	0.75–3.0 pt *Lannate LV 0.25–1.0 lb *Lannate SP	10 (lettuce) 80 (chicory)	Refer to label for application limits.
0.1–0.2 lb permethrin	*Ambush (several formulations)	1	See label for specific restrictions.	
zeta-cypermethrin	2.24–4.0 fl oz *Mustang Maxx	1	Apply every 7 days as needed. Do not exceed 24.0 oz/a Mustang Maxx per season.	
0.04–0.1 lb zeta-cypermethrin + bifenthrin	4.0–10.3 fl oz *Hero	7	Do not apply more than 0.45 lb ai/a per season. Wait at least 7 days between applications.	
<b>Leafhoppers only</b>	alpha-cypermethrin	2.2–3.8 fl oz *Fastac	1	Apply when pests reach or exceed established thresholds. Do not apply more than 11.4 fl oz of Fastac per acre per crop season.
	0.066–0.095 lb bifenthrin + imidacloprid	4.24–6.1 fl oz *Brigadier	7	Do not apply more than 30.72 fl oz/a (0.48 lb ai/a) per season. No more than 0.5 lb ai/a bifenthrin and 0.24 lb ai/a imidacloprid are allowed per season.
	clothianidin	<i>foliar</i> : 3.0–4.0 fl oz Belay	21	Do not apply more than 12.0 fl oz/a per season and allow at least 7 days between applications.
	<i>soil</i> : 9.0–12.0 fl oz Belay	—	Do not apply more than 12.0 fl oz/a per season. Apply as a narrow band centered on the plant row; as an in-furrow spray at planting; as a side-dress to both sides of the row; as a transplant water drench; or as chemigation into root zone through drip, trickle or micro-sprinkler, or similar equipment.	

\*Restricted-use pesticide.

*(continued)*

### Insect control in leafy greens *(continued)*

Insect	Rate/a of active ingredient	Rate/a of commercial product	Days to harvest	Remarks and suggestions
<b>Leafhoppers only</b> <i>(cont.)</i>	0.05–0.1 lb cypermethrin	2.5–5.0 fl oz *Ammo EC	5	Apply no more than 0.6 lb ai/a per season.
	0.045–0.268 lb dinotefuran	<i>foliar</i> : 1.0–4.0 oz Venom 70SG <i>soil</i> : 5.0–6.0 oz Venom 70SG	1	Do not follow soil applications with foliar application of any other neonicotinoid insecticide. Use only one application method. Do not apply more than 12.0 oz/a per season using soil applications. See product label for application directions.
			21	
	0.05–0.13 lb dinotefuran ( <i>foliar</i> )	2.0–5.25 oz Scorpion 35SL	1	Can repeat at 7-day intervals. Do not apply more than 10.5 oz per year. Use only one application method.
	0.23–0.27 lb dinotefuran ( <i>soil</i> )	9.0–10.5 oz Scorpion 35SL	21	Do not apply more than 21.0 oz per year. Use only one application method.
	flubendiamide + buprofezin	12.0–17.0 fl oz Vetica	7	Do not apply more than 38.0 fl oz/a per season and allow at least 7 days between applications. Do not apply more than 3 applications per crop season.
	flupyradifurone	7.0–10.5 fl oz Sivanto	1	Foliar application. Apply when pests reach or exceed established thresholds. Do not apply more than 28.0 fl oz of Sivanto per acre per crop season.
	imidacloprid	4.4–10.5 fl oz Admire Pro	21	Systemic at planting. Do not exceed 24.0 fl oz/a Admire per season.
	imidacloprid + beta-cyfluthrin	3.0 fl oz *Leverage 360	7	Do not apply more than 12.8 fl oz/a per season and allow at least 7 days between applications.
	0.02–0.03 lb lambda-cyhalothrin	1.28–1.92 fl oz *Warrior II	4	Do not apply more than 0.3 lb ai/a per season. Do not feed treated foliage to animals.
	lambda-cyhalothrin + chlorantraniliprole	6.0–9.0 fl oz *Voliam Xpress	1	Do not exceed 31.0 fl oz/a of Voliam Xpress or 0.3 lb ai/a of products containing lambda-cyhalothrin or 0.2 lb ai/a of products containing chlorantraniliprole per growing season.
	0.25–0.5 lb malathion	several formulations	7–14	Apply twice a week.
	0.1–0.2 lb permethrin	*Ambush, *Pounce	1	Several formulations; see label for rate. Do not exceed 2.0 lb ai/a per season.
	thiamethoxam	1.5–3.0 oz Actara 25WDG 5.0–11.0 fl oz Platinum 2SC 1.66–3.67 oz Platinum 75SG	7	Do not follow applications of Platinum 2SC with foliar applications of any other neonicotinoid insecticide. Platinum 2SC may be applied to direct seeded crops in-furrow at seeding or transplant depth, or as a narrow surface band above the seedling and followed by irrigation. Do not apply more than 11.0 oz of Actara 25WDG or Platinum 2SC and no more than 3.67 oz Platinum 75SG per acre per crop season and apply sufficient water volume after in-ground application to ensure incorporation into the seed zone. Actara is applied as a foliar spray.
30				
30				
0.04–0.1 lb zeta-cypermethrin + bifenthrin	4.0–10.3 fl oz *Hero	7	Do not apply more than 0.45 lb ai/a per season. Wait at least 7 days between applications.	
<b>Loopers</b>	<i>For damage-free produce in mass-harvested crops, treat when 5% of the plants are infested. If selectively harvesting only healthy plants, more damage can be tolerated; treat when 15% of plants are infested.</i>			
0.5–1.0 lb acephate	0.5–1.0 lb Orthene SP, 97	21	Head lettuce only. Do not exceed 2.66 lb ai/a per season.	

\*Restricted-use pesticide.

*(continued)*

Eggplant

Hops

Horse radish

Leafy greens

Melon

Mint

Onion

## Insect control in leafy greens *(continued)*

Insect	Rate/a of active ingredient	Rate/a of commercial product	Days to harvest	Remarks and suggestions
<b>Loopers</b> <i>(cont.)</i>	alpha-cypermethrin	2.2–3.8 fl oz *Fastac	1	Apply when pests reach or exceed established thresholds. Do not apply more than 11.4 fl oz of Fastac per acre per crop season.
	<i>Bacillus thuringiensis</i>	Biobit FL, WP; Cutlass; DiPel 2DF; Javelin; MVP	0	Rates vary with formulation; check the label.
	1.0–2.0 lb <i>Bacillus thuringiensis</i> subsp. <i>kurstaki</i>	1.0–2.0 lb Lepinox WDG	0	Treat early instar larvae before noticeable feeding damage occurs. Repeat as needed.
	0.033–0.10 lb bifenthrin	2.1–6.4 fl oz *Brigade 2EC	7	Apply to head lettuce every 7 days as needed. Do not exceed 0.5 lb ai/a per season.
	0.066–0.095 lb bifenthrin + imidacloprid	4.24–6.1 fl oz *Brigadier	7	Do not apply more than 30.72 fl oz/a (0.48 lb ai/a) per season. No more than 0.5 lb ai/a bifenthrin and 0.24 lb ai/a imidacloprid are allowed per season.
	chlorantraniliprole	3.5–7.5 fl oz Coragen	1	Do not make more than 4 applications per crop season and allow at least 3 days between applications. Do not apply more than 15.4 fl oz/a Coragen per season.
	0.088–0.176 lb cyantraniliprole ( <i>soil</i> )	6.75–13.5 fl oz Verimark	—	Do not apply more than 13.5 fl oz/a Verimark per crop per season. Do not apply more than 0.4 lb ai/a cyantraniliprole-containing products per crop whether applied as soil or foliar applications. The pH of the application solution should be adjusted to between pH 4 and 6.
	0.065–0.11 lb cyantraniliprole ( <i>foliar</i> )	10.0–17.0 fl oz Exirel	1	Minimum application interval between foliar sprays is 5 days. Do not use adjuvants in foliar tank mix with spinach.
	0.025–0.1 lb cypermethrin	*Ammo WSB, EC	5	Do not exceed 0.6 lb ai/a per season.
	0.0075–0.015 lb emamectin benzoate	3.2–4.8 oz *Proclaim	7	Apply when larvae first appear. Use higher rate for larger larvae or severe outbreaks. Do not exceed 28.8 oz ai/a per season. Highly toxic to bees.
	0.03–0.045 lb flubendiamide	2.0–3.0 oz Synapse WG	1	Do not exceed 3.0 oz/a (0.045 lb ai/a) in a 7-day period or more than 9.0 oz/a per season.
	flubendiamide + buprofezin	12.0–17.0 fl oz Vetica	7	Do not apply more than 38.0 fl oz/a per season and allow at least 7 days between applications. Do not make more than 3 applications per crop season.
	imidacloprid + beta-cyfluthrin	3.0 fl oz *Leverage 360	7	Do not apply more than 12.8 fl oz/a per season and allow at least 7 days between applications.
	0.045–0.065 lb indoxacarb	2.5–3.5 oz Avaunt	3	For use on head and leaf lettuces only. Apply when insect populations reach threshold levels. Do not exceed 0.25 lb ai/a per crop.
	0.015–0.025 lb lambda-cyhalothrin	0.96–1.6 fl oz *Warrior II	4	Do not apply more than 0.3 lb ai/a per season. Do not feed treated foliage to animals.
	lambda-cyhalothrin + chlorantraniliprole	5.0–8.0 fl oz *Voliam Xpress	1	Do not exceed 31.0 fl oz/a of Voliam Xpress or 0.3 lb ai/a of products containing lambda-cyhalothrin or 0.2 lb ai/a of products containing chlorantraniliprole per growing season.
	1.25–1.9 lb malathion	several formulations	7–14	
	0.45–0.9 lb methomyl	1.5–3.0 pt *Lannate LV 0.5–1.0 lb *Lannate SP		See label for days to harvest.

\*Restricted-use pesticide.

*(continued)*

**Insect control in leafy greens** *(continued)*

Insect	Rate/a of active ingredient	Rate/a of commercial product	Days to harvest	Remarks and suggestions
<b>Loopers</b> <i>(cont.)</i>	0.06–0.16 lb methoxyfenozide	early season: 4.0–8.0 fl oz Intrepid 2F	1	Do not exceed 64.0 fl oz/a per season. Use the higher rates with higher populations or when spray coverage is difficult. See label for use restrictions in some Wisconsin counties.
		mid- to late season: 8.0–16.0 fl oz Intrepid 2F	1	
	0.1–0.2 lb permethrin	*Ambush, *Pounce (several formulations)	1	Do not exceed 1.0 lb ai/a for spinach and 2.0 lb ai/a for all other leafy greens per season.
	0.039–0.078 lb spinetoram	5.0–10.0 oz Radiant SC	1	Do not apply more than 34.0 oz/a Radiant (0.266 lb ai/a) per crop and do not exceed 6 applications per year.
	spinosad	3.0–6.0 fl oz Entrust SC	1	Use higher rate for larger larvae. Apply in adequate spray volume to get good coverage for best control. Do not exceed 0.45 lb ai/a per season. Do not apply to seedlings grown for transplant.
	0.09–0.12 lb tebufenozide	6.0–8.0 fl oz Confirm 2F	7	Apply per label directions every 10–14 days as needed. Do not exceed 56.0 oz/season or 8.0 oz/application. There is a 1- to 12-month plantback restriction depending on the crop.
	0.198–0.257 lb thiamethoxam + chlorantraniliprole	10.0–13.0 fl oz Durivo	30	Do not exceed a total of 13.0 fl oz/a Durivo (0.257 lb ai/a) per growing season. Do not exceed 0.172 lb ai/a of thiamethoxam-containing products or 0.2 lb ai/a of chlorantraniliprole-containing products per season.
	zeta-cypermethrin	2.24–4.0 fl oz *Mustang Maxx EC	1	Apply every 7 days as needed. Do not exceed 24.0 oz/a Mustang Maxx per season.
0.04–0.1 lb zeta-cypermethrin + bifenthrin	4.0–10.3 fl oz *Hero	7	Do not apply more than 0.45 lb ai/a per season. Wait at least 7 days between applications.	

\*Restricted-use pesticide.

**Weed control in leafy greens** (See label for specific crop species.)

Weed	Rate/a of active ingredient	Rate/a of commercial product	Days to harvest	Remarks and suggestions
<b>Annual weeds</b>	1.0–2.0 lb *pronamide	2.5–5.0 pt Kerb SC	55	Rate depends on soil texture and method of irrigation. Not recommended for high organic (muck) soils. Application can be made before or after planting, but prior to emergence of weeds. Do not apply to leaf lettuce. See label for rate restrictions for use on certain varieties of crisp lettuce or endive, escarole, or radicchio greens. Kerb should be incorporated mechanically or with rainfall or irrigation within 2–3 days of application.
		2.0–4.0 lb Kerb 50W		
	trifluralin	several manufacturers		See label for allowable leafy greens and rates. Controls annual grasses and some broadleaf weeds, but is weak on wild mustard, smartweed, common ragweed, velvetleaf, and black nightshade. Rate varies with soil texture and organic matter. Follow recommended soil preparation, application, and incorporation procedures. Must be incorporated within 24 hours. See label for plantback restrictions. Ineffective on peat and muck soils.

\*Restricted-use pesticide.

*(continued)*

Eggplant

Hops

Horse radish

Leafy greens

Melon

Mint

Onion

## Weed control in leafy greens *(continued)*

Weed	Rate/a of active ingredient	Rate/a of commercial product	Days to harvest	Remarks and suggestions
<b>Annual broad-leaves</b>	0.094–0.187 lb clopyralid	rate varies by type of leafy green	21 (spinach) 30 (brassica leafy greens)	Apply to spinach in the two- to five-leaf growth stage, making 1–2 broadcast applications per crop year, not to exceed a total of 0.5 pt/a. Some leaf curling may be observed.
	0.49–0.98 lb *phenmedipham	3.0–6.0 pt Spin-Aid	21	Processing spinach only. Apply when spinach is at the four-leaf stage or later. Consult label for split application rates and environmental conditions that may cause injury.
<b>Annual grasses</b>	5.0–6.0 lb bensulide	5.0–6.0 qt Prefar 4E		See label for allowable leafy greens. Apply before planting. Incorporate 1–2 inches deep to avoid loss due to volatilization. Use on mineral soils only.
<b>Annual grasses and some broad-leaves</b>	4.5–10.5 lb DCPA	6.0–14.0 lb Dacthal W-75 6.0–14.0 pt Dacthal FL		Make preemergence applications to weed-free soil at seeding. Can be preplant incorporated. Use only on soils with 5% or less organic matter.
<b>Emerged weeds</b>	glyphosate	several manufacturers and formulations		See manufacturer's label to assure that the formulation is labeled for this crop and for specific instructions. Glyphosate may be applied anytime before crop emerges. Apply before crop seed germination in coarse sandy soils. If weeds have been mowed or tilled, do not treat until they have resumed active growth and reached the recommended stage on the label. Unless otherwise stated, allow 7 or more days before tilling treated fields. Do not tank mix with soil-residual herbicides unless otherwise specified.
	*paraquat	several manufacturers and formulations, not all are registered for this use		Prepare seedbed early to allow for maximum weed emergence. Application can be made as a banded or broadcast treatment before, during, or after planting, but before crop emergence. In preplant and preemergence (to the crop) uses, do not apply to soils lacking clay minerals (i.e., muck, pure sand). Use the higher rate for heavy weed infestations. Seeding and transplanting should be performed with minimal soil disturbance. Always add crop oil concentrate or non-ionic surfactant to spray mixture. Follow precautions on label.
<b>Emerged grasses</b>	0.068–0.12 lb clethodim	9.0–16.0 oz Select Max	14 (leaf lettuce) 30 (chicory)	Apply to actively growing grasses. Repeat treatments may be made at 14-day intervals up to the maximum annual use rate. Do not cultivate grasses within 7 days before or after application. Include appropriate surfactant as required by product label. Do not apply if rain is expected within 1 hour.
	0.094–0.125 lb clethodim	6.0–8.0 oz Select 2EC		
	0.094–0.28 lb sethoxydim	0.5–1.5 pt Poast	30 (head lettuce) 15 (leaf lettuce, endive, escarole)	

\*Restricted-use pesticide.

Eggplant

Hops

Horseradish

Leafy greens

Melon

Mint

Onion