RUTGERS
New Jersey Agricultural Experiment Station

This is a section from the

2022/2023
Mid-Atlantic Commercial Vegetable Production Recommendations

The recommendations are **NOT** for home gardener use.

The **full manual**, containing recommendations specific to New Jersey, can be found on the Rutgers NJAES website in the Publications section: *http://njaes.rutgers.edu/pubs/publication.asp?pid=E001*.

This manual will be revised biennially. **In January 2023, a Critical Update** with important updates to the 2022/2023 manual will be communicated through local Extension Agents and Vegetable Specialists.

The **label** is a legally-binding contract between the user and the manufacturer. The user must follow all rates and restrictions as per label directions. The use of any pesticide inconsistent with the label directions is a violation of federal law.

Cooperating Agencies: Rutgers, The State University of New Jersey, U.S. Department of Agriculture, and County Boards of Commissioners. Rutgers Cooperative Extension, a unit of the Rutgers New Jersey Agricultural Experiment Station, is an equal opportunity program provider and employer.

F. Commodity Recommendations

Pesticide Use Disclaimer

THE LABEL IS THE LAW

Before using a pesticide, check the labeling distributed with the product at the point of sale for legally enforceable rates and use restrictions and precautions. Although labels are available on the Internet from electronic label services such as CDMS (*http://www.cdms.net/*), Greenbook (*https://www.greenbook.net*), or Agrian (*https://www.agrian.com/labelcenter/results.cfm)* the information contained in these electronic labels may not be identical to the labeling distributed with the product. **Please be advised that these electronic label services provide use disclaimers, and in some cases legally binding *User Agreements* assigning all liability to user of service. (**See section D 3.1. Labels and Labeling for more detail.)

Guide to the Recommended Pesticide Tables in the Following Crop Sections:

1. Pesticides are listed by **group number or code based on chemical structure and mechanism of action**, as classified by the Herbicide Resistance Action Committee (**HRAC**, *https://hracglobal.com/*) for herbicides, the Insecticide Resistance Action Committee (**IRAC**, *https://irac-online.org/*) for insecticides, and the Fungicide Resistance Action Committee (**FRAC, *https***://www.frac.info/[β]) for fungicides.
   In this guide, if the group number or code is in bold font, there are resistance concerns for the product.

2. **Restricted use pesticides** are marked with a * in the Tables. These products may only be used by certified and/or licensed pesticide applicators, and when stated on the label, those making applications under their direct supervision. Some labels may restrict use solely to certified and/or licensed applicators. (See section D 3.2.1 Restricted Use Classification Statement for more detail).

3. **In addition to the pesticide products listed in the Commodity Recommendations below, other formulations or brands with the same active ingredient(s) may be commercially available. ALWAYS CHECK THE INDIVIDUAL PRODUCT LABELING:**
   a) to ensure a pesticide is labeled for the same intended use,
   b) to ensure the pesticide is labeled for the desired crop,
   c) for differences in application rates and % active ingredient(s), and
   d) additional restrictions.

4. All pesticide recommendations contained in this document are prescribed for spray applications to a **broadcast area of 1 acre** (43,560 square feet). **Adjust the rate accordingly for banded applications** (See section E 1.3. Calibrating Granular Applicators) **or for chemigation** (check labels for amounts per 1,000 feet).

5. Check the label for and do not exceed the maximum amount of pesticide per application and the maximum number of applications per year.

6. **Bee Toxicity Rating (Bee TR)**: N=nontoxic; L=minimum impact on bees; M=moderately toxic, can be used if dosage, timing, and method of application are correct, but should NOT be applied directly to the crop if bees are present; H=highly toxic, severe losses expected, -- = data not available.

7. In accordance with the USDA National Organic Program, the Organic Materials Research Institute (OMRI) maintains a directory of all products that OMRI has determined are allowed for use in organic production, processing, and handling. These products are catalogued online in the **OMRI Products List** (see *https://www.omri.org/omri-lists*).

Lettuce, Endive and Escarole

Recommended Varieties

Crop	Type	Color	Variety[1]	Season[2]		Disease Resistance[3]			Environment	
				Sp	LSF	DM	LMV	CR	Heat[4]	Tip[5]
Lettuce	Bibb	Green	Buttercrunch	X						
			Newham	X	X					
	Boston	Green	Nancy	X			X			
			Odyssey	X					X	
	Butterhead	Green	Adriana	X		X	X		X	X
			Harmony	X		X	X			X
			Merkurion	X	X					
			Milagro			X				
			Rex[6]	X	X	X			X	X
			Salanova® Green Butter	X	X	X			X	
			Santoro RZ	X	X	X				
		Red	Alkindus	X	X	X	X		X	X
			Pomegranate Crunch		X					
			Salanova® Red Butter	X	X	X			X	
			Skyphos	X	X	X	X		X	
	Crisp	Green	Muir	X	X	X	X		X	
			Nevada	X	X				X	X
		Red	Cherokee	X	X	X			X	
			Magenta	X	X	X	X			
	Iceberg	Green	Caretaker	X					X	X
			Crispino	X	X					
			Mighty Joe	X					X	
			Sun Devil	X					X	
	Leaf	Green	Bergams Green	X	X			X	X	X
			Green Star	X	X	X			X	X
			Starfighter	X	X	X			X	
			Tehama	X	X				X	X
			Tropicana	X	X				X	X
			Two Star	X	X				X	X
		Red	New Red Fire	X	X					
			Red Express	X	X					
	Romaine	Green	Arroyo	X	X	X			X	
			Coastal Star	X				X		
			Green Forest	X				X		X
			Green Towers	X	X					
			Monte Carlo	X		X				X
			Salvius	X	X	X		X	X	X
Endive	Endive	Green	Benefine	X						
			Curlesi	X						
			Salad King	X						
Escarole	Escarole	Green	Eros		X					
			Forbes		X					
			Full Heart	X						
			Natacha		X					

[1]**Listed alphabetically within leaf color**. [2]Sp=Spring, LSF=Late Summer and Fall.
[3]DM=Downy Mildew resistant, LMV=Lettuce Mosaic Virus resistant, CR=Corky Root resistant.
[4]Heat and bolting tolerant.
[5]Leaf tipburn resistant.
[6]Rex Variety: for high tunnel or greenhouse use only.

Recommended Nutrients Based on Soil Tests

In addition to using the table below, check the suggestions on rate, timing, and placement of nutrients in your soil test report and chapter B Soil and Nutrient Management. Your state's soil test report recommendations and/or your farm's nutrient management plan supersede recommendations found below.

Crop		Soil Phosphorus Level				Soil Potassium Level				
		Low	Med	High (Opt)	Very High	Low	Med	High (Opt)	Very High	
	N (lb/A)	P_2O_5 (lb/A)				K_2O (lb/A)				Nutrient Timing and Method
Leaf Lettuce, Endive, or Escarole[1]	100-125	200	150	100	0	200	150	100	0	Total nutrient recommended
	50-75	200	150	100	0	200	150	100	0	Broadcast and disk-in
	25-50	0	0	0	0	0	0	0	0	Sidedress 3-5 weeks after planting
Iceberg Lettuce[1]	60-80	200	150	100	0	200	150	100	0	Total nutrient recommended
	25-50	200	150	100	0	200	150	100	0	Broadcast and disk-in
	25-30	0	0	0	0	0	0	0	0	Sidedress 3-5 weeks after planting

[1]Apply 25-30 lb/A of sulfur (S) for most soils.

Lettuces for Salad Mixes See also section A 3. Specialty Vegetables.
Loose-, red-, and oakleaf, romaine and other lettuces are commonly used in baby or small leaf stages in salad mixes.

Growing Conditions

Lettuce, endive, and escarole are cool-season crops. Properly hardened lettuce transplants can tolerate temperatures as low as 20-25°F (-7 to -4°C). Temperatures above 85°F (29°C) for several days will cause seed stalk formation and bolting in lettuce. Temperatures below 70°F (21°C) during the seedling stage promote premature seed stalk formation in endive and escarole.

Seed Treatment Treat seeds to prevent disease. See Disease Control below.

Seeding and Transplanting

Spring Crop: The early endive and escarole crop is usually grown from transplants shipped into the region. Lettuce transplants are started in frames or greenhouses. Lettuce seed is sown in frames in November, in unheated greenhouses in December, and in heated greenhouses in January and February at the rate of 4-6 oz seed for 1 acre of plants. Plants are ready for field planting early March.

Direct-seeded lettuce is sown in prepared beds as early in the spring as the ground can be worked. Seeds require light to germinate so should be sown at shallow depth. Some of the seeds should actually be uncovered. Pelleted seed should be watered at night during high-temperature periods (soil temperatures above 80°F/27°C) until germination occurs. The spring lettuce crop can be field-seeded or transplanted through May. In the southern part of the region, planting after April results in seed stalk formation. Only leaf lettuce should be seeded as late as May. Successive plantings of endive can be made through the middle of August.

Seed Priming: Lettuce seeds enter physiological dormancy at temperatures above 85°F (29°C). This can make it difficult to establish a fall crop. Priming seeds in 1% potassium phosphate (K_3PO_4) for 20 hours at 75°F (24°C) prior to sowing will prevent thermo-dormancy. Many vendors offer primed lettuce seeds for fall production.

Fall Lettuce Crop: Seed in the field July 25 to August 10 in PA and other cool areas, and August 5-20 in warmer areas. When transplants are used, planting dates can be delayed 2-3 weeks.

Spacing

Lettuce: Head and Romaine lettuce is planted in rows 2 ft apart with plants 12-15 inches apart in the row. Leaf and Boston type lettuce are planted 3-4 rows per bed with beds spaced 66-72 inches on centers. Space plants 9-12 inches apart in the row. Lettuce for baby greens or salad mixes is direct seeded in close rows (3-6 inches apart) or broadcast across beds. Coated seed is recommended for precision seeding of heading types. Plant 1 coated seed every 2-3 inches, or 2 seeds spaced 1 inch apart every 12 inches. Direct-seeded plants should be thinned when 2 or 3 true leaves have formed.

Endive and Escarole: Plant 3-4 rows per bed and space beds 66-72 inches on centers. Space plants 9-15 inches apart in the row.

Irrigation Lettuce requires frequent irrigation with total seasonal water requirements of 10-12 inches.

Harvest and Post-Harvest Considerations

Lettuce is extremely perishable and needs to be handled delicately and marketed rapidly. Head lettuce is harvested when the heads are of good size (about 2 lb), well-formed and solid. Head lettuce is hand cut and trimmed (leave 3 undamaged wrapper leaves on each head) and placed in containers in the field. It is then vacuum cooled or hydrocooled. Specialty leaf lettuces and other greens for bag mixes are harvested by hand or mechanically. If the harvest is delayed or if the crop is over-mature, a strong bitter taste and toughness develop, and the product becomes unmarketable. Leaf, butterhead and cos/romaine types are cut, trimmed, and bundled before placing in cartons.

Lettuce should be precooled to 34°F (1°C) soon after harvest and stored at 32°F (0°C) and 98-100% relative humidity for retention of quality and shelf life. At 32°F, head lettuce can be held in good condition for 2-3 weeks. Leaf, cos/romaine, and butterhead lettuce have a shorter shelf life. Lettuce is easily damaged by freezing, so all parts of the storage room must be kept above the freezing point (31.7°F, -0.2°C).

Weed Control

THE LABEL IS THE LAW-see the Pesticide Use Disclaimer on the first page of chapter F.

Recommended Herbicides

1. Identify the weeds in each field and select recommended herbicides. More information is available in the "Herbicide Effectiveness on Common Weeds in Vegetables" (Table E-3) in chapter E Pest Management.

2. Minimize herbicide resistance development. Identify the herbicide mode of action group number and follow recommended good management practices; **bolded group numbers in tables below are herbicides at higher risk for selecting resistant weed populations.** Include non-chemical weed control whenever possible.

1. Soil-Applied (Pre-plant, Preemergence, or After Transplanting)

Group	Product Name (*=Restricted Use)	Product Rate	Active Ingredient	Active Ingredient Rate	PHI (d)	REI (h)
8	Prefar 4E	5 to 6 qt/A	**bensulide**	5 to 6 lb/A	--	12
-Labeled for pre-plant or preemergence applications. -Use on mineral soils only. If applied preemergence, irrigate within 36 h of application with ½ inch of water; if not incorporated with rainfall or within 36 h, weed control may be reduced. Provides control/suppression of some annual grass weeds and some broadleaves including pigweeds, purslane, and lambsquarters. **Do not** apply more than 6 qt/A per season.						
3	Kerb 50-W (WP) * Kerb 3.3SC*	2 to 4 lb/A, 1.25 to 5 pt/A	**pronamide**	1 to 2 lb/A 0.5 to 2 lb/A	25 to 55, see label	24
-**Kerb 50-W is labeled for head lettuce, endive, escarole, and radicchio greens.** -**Kerb 3.3SC is labeled for head lettuce, endive, escarole, and radicchio greens** at 1.5 to 5 pt/A; **leaf lettuce** rate is 1.25 to 5 pt/A. -Rate is dependent on weed susceptibility, soil texture, and expect duration of control. -Applications can be made pre-plant, preemergence, or after lettuce has emergence. -Kerb needs water after application for optimum performance; 0.5-1 inches of rainfall or 1-2 inches of irrigation is recommended. -Primarily controls annual grasses and certain broadleaf weeds. Kerb will not control emerged weeds. -The required dosage rate is dependent on soil texture, target weed size, and method of irrigation. Refer to label for specific instructions. -**Do not** use more than 1.5 lb ai/A pronamide on val temp, grande verde, and prima verde crisp head lettuce; or on endive (escarole). -**Do not** make more than 1 application of Kerb 50-W per crop. -Kerb SC application can be split so part of the maximum allowable rate can be applied initially and the balance up to 10 days later. -**Do not** apply more than 4 lb/A Kerb 50W or 5 pt/A Kerb SC per crop. -Crops that are not on the label should not be planted for 3 to 12 months, depending on herbicide rate used and crop.						

2. Postemergence

Group	Product Name (*=Restricted Use)	Product Rate	Active Ingredient	Active Ingredient Rate	PHI (d)	REI (h)
1	Select 2 EC, Select Max 0.97EC	6 to 8 fl oz 9 to 16 fl oz/A	**clethodim**	0.07 to 0.12 lb/A	14	24
	Fusilade DX 2EC	8 to 12 fl oz/A	**fluazifop**	0.125 to 0.19 lb/A	45	12
	Poast 1.5EC	1 to 1.5 pt/A	**sethoxydim**	0.2 to 0.28 lb/A	15/30	12
-**Select 2EC**: use crop oil concentrate (COC) at 1% v/v (1 gal/100 gal of spray solution). **Select Max**: use nonionic surfactant (NIS) at 0.25% v/v (1 qt/100 gal of spray solution). **Fusilade DX**: use COC at 1.0% v/v or NIS at 0.25% v/v. **Poast**: Apply with COC at 1.0% v/v. **The use of COC may increase the risk of crop injury when hot or humid conditions prevail.** To reduce the risk of crop injury, omit additives or switch to NIS when grasses are small and soil moisture is adequate. -Use lower labeled rates for annual grass control and higher labeled rates for perennial grass control.						

2. Postemergence Select, Select Max, Fusilade, Poast - continued next page

2. Postemergence Select, Select Max, Fusilade, Poast - continued

-Yellow nutsedge, wild onion, wild garlic, and broadleaf weeds will not be controlled. -Controls many annual and certain perennial grasses, including annual bluegrass, but Poast is preferred for goosegrass control. For best results, treat annual grasses when they are actively growing and before tillers are present. Control may be reduced if grasses are large or under hot or dry weather conditions.
-Repeated applications may be necessary to control certain perennial weeds. If repeat applications are necessary, allow 14 days between applications. Rainfastness is 1 h.
-**Do not** tank mix with or apply within 2 to 3 days of any other pesticide, unless labeled, as this may increase the risk of crop injury or reduce the control of grasses. **Do not** apply more than 8 fl oz of Select 2EC in a single application and **do not** exceed 2 pt/A for the season; **do not** apply more than 16 fl oz of Select Max in a single application and **do not** exceed 4 pt/A for the season.
-**Do not** apply more than 24 fl oz/A of Fusilade DX in a single application and **do not** exceed 3 pt/A per season.
-**Do not** apply more than 1.5 pt/A Poast in a single application and **do not** exceed 3 pt/A for the season.
-**Poast 1.5 EC labeled for leaf and head-type lettuces** (PHI=15 d for leaf types, 30 d for head types).

3. Postharvest

Group	Product Name (*=Restricted Use)	Product Rate	Active Ingredient	Active Ingredient Rate	PHI (d)	REI (h)
22	Gramoxone SL 2.0* Gramoxone SL 3.0*	2.25 to 3 pt/A 1.5 to 2 pt/A	**paraquat**	0.56 to 0.75 lb/A	--	24

-**A Supplemental Label in DE for the use of both Gramoxone formulations for postharvest application to desiccate the crop.**
-Apply after the last harvest for bareground or plasticulture. Always include an adjuvant.
-Spray coverage is essential for optimum effectiveness. See the label for additional information and warnings.
-Rainfastness 30 min. A maximum of 2 applications for crop desiccation are allowed.
-***Restricted-use pesticide***. Only certified applicators, who successfully complete the paraquat-specific training, can mix, load or apply paraquat. Application of paraquat "under the direct supervision" of a certified applicator is no longer allowed. Required training link (*http://usparaquattraining.com*); certified applicators must repeat training every three years.

4. Other Labeled Herbicides These products are labeled but limited local data are available; and/or are labeled but not recommended in our region due to potential crop injury concerns.

Group	Product Name (*=Restricted Use)	Active Ingredient
3	Treflan	**trifluralin**
14	Aim	**carfentrazone**
14	Vida	**pyraflufen**

Insect Control

THE LABEL IS THE LAW-see the Pesticide Use Disclaimer on the first page of chapter F. Recommended Insecticides

Aphids On fall crop, seedling protection from aphids is important. Spray if the aphid population reaches 1 aphid/seedling or > 4 aphids/plant beyond the seedling stage.

Apply one of the following formulations:

Group	Product Name (*=Restricted Use)	Product Rate	Active Ingredient(s) and Crop Restrictions	PHI (d)	REI (h)	Bee TR
1A	Lannate LV*	1.5 to 3.0 pt/A	methomyl (check the label for PHI)	7/10	48	H
1B	Acephate 97 UP	0.5 to 1.0 lb/A	acephate - **only labeled for head lettuce**	21	24	H
1B	Dimethoate 400	0.5 pt/A	dimethoate - **not labeled for head lettuce**	14	48	H
4A	Neonicotinoid insecticides registered for use on Lettuce types: see table at the end of Insect Control.					
4C	Closer SC	1.5 to 2 fl oz/A	sulfoxaflor	3	12	H
4D	Sivanto Prime	21 to 28 fl oz/A	flupyradifurone - **soil**	21	4	M
4D	Sivanto Prime or 200SL	7 to 14 fl oz/A	flupyradifurone - **foliar**	1	4	M
9B	Fulfill 50WDG	2.75 oz/A	pymetrozine	7	12	L
9B	PQZ	2.4 to 3.2 fl oz/A	pyrifluquinazon	1	12	L
9D	Versys	1.5 fl oz/S	afidopyropen	0	12	L
23	Movento	4.0 to 5.0 fl oz/A	spirotetramat	3	24	L
23 + 7C	Senstar	8.0 to 10.0 fl oz/A	spirotetramat + pyriproxyfen	14	24	L
28	Exirel	13.5 to 20.5 fl oz/A	cyantraniliprole	1	12	H
28	Verimark	6.75 to 13.5 fl oz/A	cyantraniliprole	n/a	4	H
28	Harvanta 50SL	10.9 to 16.4 fl oz/A	cyclaniliprole - **melon aphid**	1	4	H
28 + 6	Minecto Pro*	10.0 fl oz/A	cyantraniliprole + abamectin	7	12	H
29	Beleaf 50SG	2.0 to 2.8 oz/A	flonicamid	0	12	L

Caterpillar "Worm" Pests Including:
Cabbage Loopers (CL), Armyworms, and Corn Earworms (CEW)

Note: Head lettuce seedlings in the 7-18 leaf stage are vulnerable to CEW attack in August and September. Control must be achieved before center leaves start to form a head (15-18 leaf stage). Apply insecticides every 2-5 days or every 5-10 days according to CEW moth catch and pest management alerts. **Due to resistance development, pyrethroid insecticides (Group 3A) are not recommended for control of beet armyworms.**

Apply one of the following formulations:						
Group	**Product Name (*=Restricted Use)**	**Product Rate**	**Active Ingredient(s) and Crop Restrictions**	**PHI (d)**	**REI (h)**	**Bee TR**
1A	Lannate LV*	1.5 to 3.0 pt/A	methomyl (check the label for PHI)	7/10	48	H
3A	Pyrethroid insecticides registered for use on Lettuce types: see table at the end of Insect Control.					
5	Entrust SC (OMRI)	4.0 to 8.0 fl oz/A	spinosad	1	4	M
5	Radiant SC	5.0 to 10.0 fl oz/A	spinetoram	1	4	M
6	Proclaim 5SG*	2.4 to 4.8 oz/A	emamectin benzoate	7	12	H
11A	Dipel DF, others (OMRI)	0.5 to 2.0 lb/A	*Bacillus thuringiensis kurstaki*	0	4	N
11A	XenTari (OMRI)	0.5 to 2 lb/A	*Bacillus thuringiensis aizawai*	0	4	N
18	Intrepid 2F (early season)	4.0 to 8.0 fl oz/A	methoxyfenozide	1	4	L
18	Intrepid 2F (late season)	8.0 to 10.0 fl oz/A	methoxyfenozide	1	4	L
22	Avaunt, Avaunt eVo	2.5 to 6 oz/A	indoxacarb	3	12	H
28	Coragen 1.67SC	3.5 to 7.5 fl oz/A	chlorantraniliprole - **soil and foliar**	1	4	L
28	Exirel	7 to 17 fl oz/A	cyantraniliprole	1	12	H
28	Verimark	5 to 13.5 fl oz/A	cyantraniliprole - **soil**	n/a	4	H
28	Harvanta 50SL	10.9 to 16.4 fl oz/A	cyclaniliprole	1	4	H
28 + 6	Minecto Pro*	5.5 to 10.0 fl oz/A	cyantraniliprole + abamectin	7	12	H

Cutworms See also section E 3.1. Soil Pests - Detection and Control.

Apply one of the following formulations:						
Group	**Product Name (*=Restricted Use)**	**Product Rate**	**Active Ingredient(s) and Crop Restrictions**	**PHI (d)**	**REI (h)**	**Bee TR**
1A	Lannate LV*	1.5 pt/A	methomyl (check the label for PHI)	7/10	48	H
3A	Pyrethroid insecticides registered for use on Lettuce types: see table at the end of Insect Control.					

Leafhoppers

Control of leafhoppers will prevent spread of lettuce yellows. In the spring, spray when plants are ½ inch tall, and repeat as needed. In the fall, spray seedlings 4-5 times at 5-day intervals.

Apply one of the following formulations:						
Group	**Product Name (*=Restricted Use)**	**Product Rate**	**Active Ingredient(s) and Crop Restrictions**	**PHI (d)**	**REI (h)**	**Bee TR**
1A	Lannate LV*	1.5 to 3.0 pt/A	methomyl (check the label for PHI)	7/10	48	H
1B	Acephate 97 UP	0.5 to 1 lb/A	acephate - **head lettuce only**	21	24	H
1B	Dimethoate 400	0.5 pt/A	dimethoate - **leaf lettuce only**	14	48	H
3A	Pyrethroid insecticides registered for use on Lettuce types: see table at the end of Insect Control.					
4A	Neonicotinoid insecticides registered for use on Lettuce types: see table at the end of Insect Control.					
16	Courier SC	9.0 to 13.6 fl oz/A	buprofezin	7	12	L

Leafminers

Apply one of the following formulations:						
Group	**Product Name (*=Restricted Use)**	**Product Rate**	**Active Ingredient(s) and Crop Restrictions**	**PHI (d)**	**REI (h)**	**Bee TR**
1B	Dimethoate 400	0.5 pt/A	dimethoate - **not labeled for head lettuce**	14	48	H
3A	Pyrethroid insecticides registered for use on Lettuce types: see table at the end of Insect Control.					
4A	Neonicotinoid insecticides registered for use on Lettuce types: see table at the end of Insect Control.					
5	Entrust SC (OMRI)	6.0 to 10.0 fl oz/A	spinosad	1	4	M
5	Radiant SC	6.0 to 10.0 fl oz/A	spinetoram	1	4	M
6	Agri-Mek SC*	1.75 to 3.5 fl oz/A	abamectin	7	12	H
17	Trigard 75WSP	2.66 oz/A	cyromazine	7	12	H
28	Coragen 1.67SC	5.0 to 7.5 fl oz/A	chlorantraniliprole - **soil and foliar**	1	4	L
28	Exirel	13.5 to 20.5 fl oz/A	cyantraniliprole	1	12	H

Leafminers -continued next page

Leafminers -continued

28	Verimark	6.75 to 13.5 fl oz/A	cyantraniliprole - **soil**	n/a	4	H
28	Harvanta 50SL	10.9 to 16.4 fl oz/A	cyclaniliprole	1	4	H
28 + 6	Minecto Pro*	5.5 to 10.0 fl oz/A	cyantraniliprole + abamectin	7	12	H

Tarnished Plant Bugs can cause serious damage to the fall crop; it is usually numerous where weeds abound.

Apply one of the following formulations:						
Group	**Product Name (*=Restricted Use)**	**Product Rate**	**Active Ingredient(s) and Crop Restrictions**	**PHI (d)**	**REI (h)**	**Bee TR**
1A	Sevin XLR Plus	1 to 2 qt/A	carbaryl	14	12	H
3A	Pyrethroid insecticides registered for use on Lettuce types: see table at the end of Insect Control.					
4A	Neonicotinoid insecticides registered for use on Lettuce types: see table at the end of Insect Control.					
29	Beleaf 50SG	2.8 oz/A	flonicamid	0	12	L

Thrips Some species spread Tomato Spotted Wilt Virus. Scout for thrips and begin treatments when observed. **Do not** produce vegetable transplants with bedding plants in the same greenhouse.

Apply one of the following formulations:						
Group	**Product Name (*=Restricted Use)**	**Product Rate**	**Active Ingredient(s) and Crop Restrictions**	**PHI (d)**	**REI (h)**	**Bee TR**
1A	Lannate LV*	1.5 to 3.0 pt/A	methomyl (check the label for PHI)	7/10	48	H
3A[1]	Pyrethroid insecticides registered for use on Lettuce types: see table at the end of Insect Control.					
4A[2]	Neonicotinoid insecticides registered for use on Lettuce types: see table at the end of Insect Control.					
5	Entrust SC (OMRI)	6.0 to 10.0 fl oz/A	spinosad	1	4	M
5	Radiant SC	6.0 to 10.0 fl oz/A	spinetoram	1	4	M

[1]Resistance concerns with western flower thrips [2]Resistance concerns with tobacco thrips

Group 3A Pyrethroid Insecticides Registered for Use on Lettuce, Endive and Escarole

Apply one of the following formulations (check if the product label lists the insect you intend to spray; not all pyrethroids are labeled for all lettuce types; the label is the law):

Product Name (*=Restricted Use)	**Product Rate**	**Active Ingredient(s)**	**PHI (d)**	**REI (h)**	**Bee TR**
Baythroid XL*	0.8 to 3.2 fl oz/A	beta-cyfluthrin †	0	12	H
Brigade 2EC*, others	2.1 to 6.4 fl oz/A	bifenthrin†	7	12	H
Hero EW*	4.0 to 10.3 fl oz/A	zeta-cypermethrin + bifenthrin† **- head lettuce only**	7	12	H
Mustang Maxx*	2.24 to 4.0 fl oz/A	zeta-cyhalothrin*†	1	12	H
Permethrin 3.2EC*, others	2 to 8 fl oz/A	permethrin†	1	12	H
PyGanic Crop protection EC 5.0 II (OMRI)	4.5 to 15.61 fl oz/A	pyrethrins	0	12	H
Tombstone*, others	0.8 to 3.2 fl oz/A	cyfluthrin†	0	12	H
Warrior II*	0.96 to 1.92 fl oz/A	lambda-cyhalothrin†	1	24	H
Combo products containing a pyrethroid					
Endigo ZC*	4.0 to 4.5 fl oz/A	lambda-cyhalothrin + thiamethoxam † (Group 4A)	7	24	H
Leverage 360*	3.0 fl oz/A	beta-cyfluthrin + imidacloprid † (Group 4A)	7	12	H
Voliam Flexi	6.0 to 7.0 fl oz/A	thiamethoxam + chlorantraniliprole (Group 28)	7	12	H

†=Not recommended for BAW or CEW

Group 4A Neonicotinoid Insecticides Registered for Use on Lettuce, Endive and Escarole

Apply one of the following formulations (check if the product label lists the insect you intend to spray; not all neonicotinoids are labeled for all lettuce types; the label is the law):

Product Name (*=Restricted Use)	**Product Rate**	**Active Ingredient(s)**	**PHI (d)**	**REI (h)**	**Bee TR**
Admire Pro	4.4 to 10.5 fl oz/A	imidacloprid - **soil**	21	12	H
Admire Pro	1.3 fl oz/A	imidacloprid - **foliar**	7	12	H
Assail 30SG	2.0 to 4.0 oz/A	acetamiprid	7	12	M
Belay 2.13SC	9.0 to 12.0 fl oz/A	clothianidin - **soil**	21	12	H
Belay 2.13SC	3.0 to 4.0 fl oz/A	clothianidin - **foliar**	7	12	H
Actara 25WDG	1.5 to 3.0 oz/A	thiamethoxam	7	12	H
Platinum 75SG	1.66 to 3.67 oz/A	thiamethoxam	30	12	H
Scorpion 35SL	9.0 to 10.5 fl oz/A	dinotefuran - **soil**	21	12	H
Scorpion 35SL	2.0 to 5.25 fl oz/A	dinotefuran - **foliar**	7	12	H

Group 4A Neonicotinoid Insecticides Registered for Use on Lettuce, Endive and Escarole - continued next page

Group 4A Neonicotinoid Insecticides Registered for Use on Lettuce, Endive and Escarole - continued

Venom	5.0 to 7.5 oz/A	dinotefuran - **soil**	21	12	H
Venom	1.0 to 3.0 oz/A	dinotefuran – **foliar**	7	12	H
Combo products containing a neonicotinoid					
Endigo ZC*	4.0 to 4.5 fl oz/A	thiamethoxam + lambda-cyhalothrin (Group 3A)	7	24	H
Leverage 360*	3.0 fl oz/A	imidacloprid + beta-cyfluthrin + (Group 3A)	7	12	H

Disease Control

THE LABEL IS THE LAW-see the Pesticide Use Disclaimer on the first page of chapter F. Recommended Fungicides

Seed Treatment Dust seed with Thiram 480DP at the rate of 1 level tsp/lb of seed (3.0 oz/100 lb).

Damping-off caused by *Phytophthora*, *Pythium*, and *Rhizoctonia*

An application of mefenoxam or metalaxyl at planting will also help suppress White Rust and Downy Mildew development early in the season. Uniform applied at transplanting or seeding will also help suppress early-season Rhizoctonia root rot and Downy Mildew.

Code	Product Name (*=Restricted Use)	Product Rate	Active Ingredient(s) Crop Restrictions	PHI (d)	REI (h)	Bee TR
Apply one of the following in a 7-inch band after seeding or transplanting:						
4	Ridomil Gold 4SL	1.0 to 2.0 pt /A	mefenoxam	AP	12	N
4	Ultra Flourish 2E	2.0 to 4.0 pt /A	mefenoxam	AP	48	N
4	MetaStar 2E AG	4.0 to 8.0 pt/A	metalaxyl	AP	48	N
49 + 4	Orondis Gold 1.67SC	13.9 to 27.8 fl oz/A[1]	oxathiapiprolin + mefenoxam	AP	48	--
For Damping-off and Rhizoctonia control:						
4 + 11	Uniform 3.66SE	0.34 fl oz/1000 row	mefenoxam + azoxystrobin	AP	0	N

[1]Can be used in transplant water, see label for instructions

Bacterial and Fungal Diseases

Bottom Rot caused by *Rhizoctonia*

For the spring and fall crops, all fields should receive one of the following fungicide applications one week after transplanting or thinning and at 10 and/or 20 days later if conditions warrant and/or cultivation has been done. Uniform (0.34 fl oz 3.66SE/1000 ft row) applied in-furrow at transplanting or seeding for root rot control will also help early-season suppression of Downy Mildew.

Code	Product Name (*=Restricted Use)	Product Rate	Active Ingredient(s) Crop Restrictions	PHI (d)	REI (h)	Bee TR
4+11	Uniform 3.66SE	0.34 fl oz /1000 ft row	mefenoxam + azoxystrobin	AP	0	N
7	Endura 70WG	8.0 to 11.0 oz/A	boscalid[1] **- not labeled for endive and escarole**	14	12	--
11	azoxystrobin 2.08F	0.40 to 0.80 fl oz/1000 ft row	azoxystrobin	0	4	N

[1]Do not cultivate directly after applying iprodione or Endura (see labels for details).

Corky Root (*Rhizomonas suberifaciens*)

Development of this bacterial disease is favored by continual cropping in the same field. Cultural practices that reduce soil compaction, such as the use of a rye cover crop and high beds, should be considered. Limit irrigation between transplanting or thinning. Warm soil temperatures and high soil N levels may exacerbate disease.

Downy Mildew (*Bremia lactucae*)

Ridomil Gold 4SL, Ultra Flourish 2E, MetaStar 2E AG or Orondis Gold applied for damping-off control at seeding or transplanting will also help in the control of early-season Downy Mildew. Downy Mildew can cause problems during extended periods of cool, wet weather. Fungicide applications should begin and continue as conditions favor disease development.

Code	Product Name (*=Restricted Use)	Product Rate	Active Ingredient(s) Crop Restrictions	PHI (d)	REI (h)	Bee TR
Rotate one of the following fungicides:						
7 + 11	Merivon 2.09SC	8.0 to 11.0 fl oz/A	fluxapyroxad + pyraclostrobin	1	12	N

Downy Mildew – continued next page

Downy Mildew - continued

11	Reason 500SC	5.5 to 8.2 fl oz/A	fenamidone **- not labeled for endive and escarole**	2	12	--
21	Ranman 400SC	2.75 fl oz/A	cyazofamid	0	12	L
28	Previcur Flex 6F	2.0 pt/A	propamocarb HCl	2	12	N
43	Presidio 4SC	3.0 to 4.0 fl oz/A	fluopicolide	2	12	L
With one of the following fungicides every 7 d as long as weather conditions favor disease development.						
40	Revus 2.08F	8.0 fl oz/A	mandipropamid - **not labeled for escarole**	1	4	--
40	Forum 4.17SC	6.0 fl oz/A	dimethomorph - **not labeled for escarole**	0	12	N
40 + 45	Zampro 525SC	14.0 fl oz/A	dimethomorph + ametoctradin	0	12	--
49 + 40	Orondis Ultra 2.33SC	5.5 to 8.0 fl oz/A	oxathiapiprolin + mandipropamid	1	4	--

Gray Mold (*Botrytis cinera*)

Gray old is most troublesome in transplant greenhouses where air movement is poor and relative humidity high. Avoid overcrowding plants and water early in the day to help reduce leaf wetness overnight. Vent structure as much as possible to reduce relative humidity. See Table E-11 for options for *Botrytis* control in the greenhouse. In the field, rotate between the following fungicides every 7 d as long as conditions are favorable for disease development.

Code	Product Name (*=Restricted Use)	Product Rate	Active Ingredient(s) Crop Restrictions	PHI (d)	REI (h)	Bee TR
7	Endura 70W	8.0 to 11.0 oz/A	boscalid - **not labeled for endive and escarole**	14	12	--
7 + 11	Merivon 2.09SC	8.0 to 11 fl oz/A	fluxapyroxad + pyraclostrobin	1	12	N
12	Cannonball 50WP	7.0 oz/A	fludioxonil	0	12	L

Leaf Spots caused by *Septoria*, *Anthracnose*, and *Cercospora* spp.

In fields with a history of leaf spot diseases, and when conditions are favorable for disease development, rotate among the following fungicides every 7 d as long as weather conditions favor disease development.

Code	Product Name (*=Restricted Use)	Product Rate	Active Ingredient(s) Crop Restrictions	PHI (d)	REI (h)	Bee TR
3	Rhyme 2.08SC	5.0 to 7.0 fl oz/A	flutriafol	7	12	--
7	Fontelis 1.67SC	14.0 to 24.0 fl oz/A	penthiopyrad	3	12	L
7 + 11	Merivon 2.09SC	4.0 to 11.0 fl oz/A	fluxapyroxad + pyraclostrobin	1	12	N
11	azoxystrobin 2.08F	6.0 to 15.5 fl oz/A	azoxystrobin	0	4	N

Lettuce Drop (*Sclerotinia*)

The pathogen has a wide host range including allium, brassica, and solanaceous crops. Proper and adequate crop rotations are necessary since the pathogen can survive in soils for many years.

Apply one of the following as a directed spray at transplanting and/or thinning. See labels for restrictions. Rotate between the following fungicides if more than one application is needed.						
Code	**Product Name (*=Restricted Use)**	**Product Rate**	**Active Ingredient(s) Crop Restrictions**	**PHI (d)**	**REI (h)**	**Bee TR**
2	iprodione 4F[1]	1.5 to 2.0 pt/A	iprodione	14	12	N
7	Endura 70W	8.0 to 11.0 oz/A	boscalid - **not labeled for endive and escarole**	14	12	--
7 + 11	Merivon 2.09SC	4.0 to 11.0 fl oz/A	fluxapyroxad + pyraclostrobin	1	12	N
7 + 12	Miravis Prime	13.4 fl oz/A	pydiflumetofen + fludioxonil	0	12	--
12	Cannonball 50WP	7.0 oz/A	fludioxonil	0	12	L
P05	Regalia (OMRI)	0.5 to 4.0 qt/A	Extract of *Reynoutria sachalinensis*	0	4	--
Other pre-plant option: Apply Contans 5.3WG at 2.0 to 4.0 lb/A approximately 3-4 months prior to the anticipated onset of disease to allow the active agent to reduce inoculum levels of sclerotia in the soil. Following application, incorporate to a depth of 1-2 inches but **do not** plow before seeding or transplanting lettuce to avoid untreated sclerotia in lower soil layers from infesting the upper soil layer.						

[1]Do not cultivate directly after application (see labels for details).

Viruses

Big-Vein: Big Vein is favored by cool temperatures (<60°F, 16°C) and high soil moisture conditions. Produce the crop on raised beds and avoid planting in fields with low-lying areas. Soil fumigation is helpful (see section E 1.5. Soil Fumigation). **Lettuce Mosaic Virus**: Use virus-free or Mosaic Tested lettuce seed. **Tomato Spotted Wilt Virus (TSWV)**: TSWV is spread from flowering ornamental plants (flowers) to lettuce by thrips. Do not grow any ornamental bedding plants in the same greenhouse as lettuce transplants. Scout and monitor for greenhouse thrips regularly and begin an insecticide control program once observed. **Turnip Mosaic Virus**: Troublesome in late summer and early fall plantings. Control weed hosts around irrigation risers and in border areas. **Yellows**: Control leafhopper vectors with insecticides - see Insect Control section above.

If you are having a medical emergency after using pesticides, call 911 immediately.

If you have any of the following symptoms during or shortly after using pesticides: headache, blurred vision, pinpoint pupils, weakness, nausea, cramps, diarrhea, and discomfort in the chest, call a physician and the National Poison Control Center hotline (1-800-222-1222).

Your call will be routed to your State Poison Control Center.
Anyone with a pesticide exposure poisoning emergency can call the toll-free telephone number for help. Personnel at the Center will give you first-aid information and direct you to local treatment centers if necessary.

For immediate medical attention call 911. Prompt action and treatment may save a life.

POISON Help®
1-800-222-1222

In Case of an Accident

- **Remove the person from exposure.**
- **Get away from the treated or contaminated area immediately.**
- **Remove contaminated clothing.**
- **Wash with soap and clean water.**
- **Call a physician and the Poison Control Center (1-800-222-1222) or agency in your state.**
- **Have the pesticide label with you! Follow the First Aid Precautionary Statements.**
- **Be prepared to give the EPA registration number to the responding center/agency.**