

This is a section from the

2016

Mid-Atlantic

Commercial Vegetable Production Recommendations

The manual, which is published annually, is 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
njaes.rutgers.edu

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.

LETTUCE, ENDIVE AND ESCAROLE

Recommended Lettuce, Endive, and Escarole Varieties

Crop, Variety, Type, and Color				Season ¹		Reported Disease Resistance ²			Environment ³		
Variety	Crop	Type	Color	S	F	DM	LMV	CR	Heat	Tip	Note
Green Curled	Endive	Endive	Green	X							
Keystone	Endive	Endive	Green	X						X	
Salad King	Endive	Endive	Green	X							
Florida Deep Heart	Escarole	Escarole	Green	X							
Full Heart	Escarole	Escarole	Green	X							
Buttercrunch	Lettuce	Bibb	Green	X							
Winter Density	Lettuce	Bibb	Green	X	X						
Nancy	Lettuce	Boston	Green	X			X				
Optima	Lettuce	Boston	Green	X		X	X			X	
Adriana	Lettuce	Butterhead	Green	X		X	X		X	X	
Bennett	Lettuce	Butterhead	Green	X	X	X			X		
Dancine	Lettuce	Butterhead	Green	X		X					
Forlina	Lettuce	Butterhead	Green	X	X	X	X		X		
Harmony	Lettuce	Butterhead	Green	X		X	X			X	
Hungarina	Lettuce	Butterhead	Green	X	X	X	X		X		
Rex	Lettuce	Butterhead	Green	X	X	X			X	X	HT/GH
Skyphos	Lettuce	Butterhead	Red	X		X	X				
Cherokee	Lettuce	Crisp	Red	X	X	X			X		
Magenta	Lettuce	Crisp	Red	X	X	X	X				
Muir	Lettuce	Crisp	Green	X	X	X	X		X		
Nevada	Lettuce	Crisp	Green	X	X				X	X	
Sierra	Lettuce	Crisp	Green	X	X				X		
Ithaca	Lettuce	Iceberg	Green	X	X						
Keeper	Lettuce	Iceberg	Green	X	X					X	
Summer Time	Lettuce	Iceberg	Green	X					X		
Bergams Green	Lettuce	Leaf	Green	X	X			X	X	X	
Green Star	Lettuce	Leaf	Green	X	X	X			X	X	
New Red Fire	Lettuce	Leaf	Red	X	X						
Red Express	Lettuce	Leaf	Red	X	X						
Red Sails	Lettuce	Leaf	Red	X							
Royal Oakleaf	Lettuce	Leaf	Green	X							
Starfighter	Lettuce	Leaf	Green	X	X	X			X		
Tropicana	Lettuce	Leaf	Green	X	X				X	X	
Two Star	Lettuce	Leaf	Green	X	X				X	X	
Waldmann's Green	Lettuce	Leaf	Green	X							
Coastal Star	Lettuce	Romaine	Green	X				X			
Cuore	Lettuce	Romaine	Green	X		X					
Dov	Lettuce	Romaine	Green	X	X				X		
Green Forest	Lettuce	Romaine	Green	X				X		X	
Helvius	Lettuce	Romaine	Green	X		X	X	X		X	
Ideal Cos	Lettuce	Romaine	Green	X	X					X	
Monte Carlo	Lettuce	Romaine	Green	X		X				X	
Musena	Lettuce	Romaine	Green	X		X					
Pomegranate Crunch	Lettuce	Romaine	Red		X						
Rouge de Hiver	Lettuce	Romaine	Red	X							
Rubicon	Lettuce	Romaine	Green	X	X	X		X	X		

¹Recommended season. S=Spring, F=Late Summer and Fall.

²Reported disease resistance. DM=Downy Mildew resistant, LMV=Lettuce Mosaic Virus resistant, CR=Corky Root resistant.

³Environmental reactions and Notes. Heat = heat tolerant and bolting tolerant. Tip=leaf tipburn resistant. HT/GH=for high tunnel or greenhouse use only.

Recommended Nutrients Based on Soil Tests

Before using the table below, refer to important notes in the Soil and Nutrient Management chapter in Section B and your soil test report. These notes and soil test reports provide additional suggestions to adjust rate, timing, and placement of nutrients. Your state’s soil test report recommendations and/or your farm’s nutrient management plan supercede recommendations found below.

	Pounds N per Acre	Soil Phosphorus Level				Soil Potassium Level				Nutrient Timing and Method
		Low	Med	High	Very High	Low	Med	High	Very High	
				(Opt.)	(Opt.)			(Opt.)	(Opt.)	
		Pounds P ₂ O ₅ per Acre				Pounds K ₂ O per Acre				
Leaf lettuce,	100-125	200	150	100	0	200	150	100	0	Total nutrient recommended.
Endive, or	50-75	200	150	100	0	200	150	100	0	Broadcast and disk-in.
Escarole	25-50	0	0	0	0	0	0	0	0	Sidedress 3-5 weeks after planting.
Iceberg lettuce	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.

Lettuces for Salad Mixes

Lettuce including looseleaf, red leaf, oakleaf, romaine and other lettuces are commonly use in salad mixes in baby or small leaf stages. See the Section F “Specialty Vegetables” for more information.

Growing Conditions

Lettuce, endive and escarole are cool-season crops. Properly hardened lettuce transplants can tolerate temperatures as low as 20° to 25°F (-6.67° to -3.89°C). Temperatures above 85°F (29.4°C) for several days will cause seedstalk formation and bolting in lettuce. Temperatures below 70°F (21.1°C) during the seedling stage promote premature seedstalk formation in endive and escarole.

Seed Treatment

Treat seeds to prevent disease. See the Disease section for more information.

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. Seed for the lettuce crop is sown in frames in November, in unheated greenhouses in December, and in heated greenhouses in January and February at the rate of 4 to 6 ounces of seed for 1 acre of plants. Plants are ready for field planting early in 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 and visible. Pelleted seed should be watered at night during high-temperature periods (soil temperatures above 80°F [26.7°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 are induced to enter physiological dormancy by temperatures in excess of 85°F. This can make it difficult to establish a fall crop. Priming lettuce seeds in 1% potassium phosphate (K₃PO₄) for 20 hours at 75°F prior to sowing will prevent thermodormancy from occurring. Many vendors currently offer primed lettuce

seeds as a product for fall production.

Fall lettuce crop. Seed in the field July 25 to August 10 in Pennsylvania and other cool areas, and August 5 to 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 feet apart with plants 12 to 15 inches apart in the row. Leaf and Boston type lettuce are planted 3 to 4 rows per bed with beds spaced 66 to 72 inches on centers. Space plants 9 to 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 a single coated seed every 2 to 3 inches, or two seeds spaced 1 inch apart every 12 inches. Direct-seeded plants should be thinned when two or three true leaves have formed.

Endive and Escarole. Plant three to four rows per bed and space beds 66 to 72 inches on centers. Space plants 9 to 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 hand cut and trimmed, and placed in cartons or containers in the field. It is then vacuum cooled or hydrocooled. Specialty leaf lettuces and other greens for bag mixes are hand harvested or mechanically harvested.

A strong bitter taste and toughness develops if harvest is delayed or if crop is over-mature. The product then becomes unmarketable.

Head lettuce is harvested when the heads are of good size (about 2 lbs), well-formed and solid. Leave three undamaged wrapper leaves on each head. Put heads in containers in the field and avoid bruising. Leaf, butterhead and cos/romaine types are cut, trimmed and bundled before placing in cartons.

Lettuce should be precooled to 34°F soon after harvest and stored at 32°F and 98 to 100% relative humidity for retention of quality and shelf life. At 32°F, head lettuce can

be held in good condition for 2 to 3 weeks. Leaf, cos/romaine, and butterhead lettuce has a shorter shelf life. Lettuce is easily damaged by freezing, so all parts of the storage room must be kept above the highest freezing point of lettuce (31.6°F).

Weed Control

Identify the weeds in each field and select recommended herbicides that control those weeds. See Tables E-3 and E-4.

Match preplant incorporated and preemergence herbicide rates to soil type and percent organic matter in each field.

Apply postemergence herbicides when crop and weeds are within recommended size and/or leaf stage.

Determine the preharvest interval (PHI) for the crop. See Table E-4 and consult the herbicide label.

Find the herbicides you plan to use in the Herbicide Resistance Action Committee's (HRAC) **Herbicide Site of Action Table E-8** and follow the recommended good management practices to minimize the risk of herbicide resistance development by weeds in your fields.

Bensulide--5.0 to 6.0 lb/A. Apply 5.0 to 6.0 quarts per acre Prefar 4E before planting and incorporate 1 to 2 inches deep with power-driven rotary cultivators, or apply preemergence and activate with one-half inch of sprinkler irrigation within 36 hours to control most annual grasses. Use the maximum recommended rate preemergence followed by irrigation to suppress certain annual broadleaf weeds including common lambsquarters, smooth pigweed, and common purslane.

Pronamide--1.0 to 2.0 lb/A. Apply 2.0 to 4.0 pounds per acre Kerb 50W to seeded or transplanted head lettuce, endive, and escarole. Irrigation (1 to 2 inches) should follow application. Primarily controls annual grasses and certain broadleaf weeds. Unlabeled crops should not be planted for 3 to 12 months, depending on herbicide rate used and crop. See label. Labeled crops include heading lettuce varieties, endive, and escarole.

Postemergence

Clethodim--0.094 to 0.125 lb/A. Apply 12.0 to 16.0 fluid ounces of Select Max 0.97EC with nonionic surfactant to be 0.25% of the spray solution (1 quart per 100 gallons of spray solution) postemergence to control many annual and certain perennial grasses, including annual bluegrass. Select will not consistently control goosegrass. Control may be reduced if grasses are large or if hot, dry weather or drought conditions occur. For best results, treat annual grasses when they are actively growing and before tillers are present. Repeated applications may be needed to control certain perennial grasses. Yellow nutsedge, wild onion, or broadleaf weeds will not be controlled. Do not tank-mix with or apply within 2 to 3 days of any other pesticide unless labeled, as the risk of crop injury may be increased, or reduced control of grasses may result. Observe a minimum preharvest interval of 14 days.

Sethoxydim--0.2 to 0.3 lb/A. Apply 1.0 to 1.5 pints per acre Poast 1.5EC with oil concentrate to be 1 percent of the spray solution (1 gallon per 100 gallons of spray solution) postemergence to control annual grasses and certain perennial grasses. **The use of oil concentrate 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 nonionic surfactant when grasses are small and soil

moisture is adequate. Control may be reduced if grasses are large or if hot, dry weather or drought conditions occur. For best results, treat annual grasses when they are actively growing and before tillers are present. Repeated applications may be needed to control certain perennial grasses. Yellow nutsedge, wild onion, or broadleaf weeds will not be controlled. Do not tank-mix with or apply within 2 to 3 days of any other pesticide unless labeled, as the risk of crop injury may be increased, or reduced control of grasses may result. Observe a minimum preharvest interval of 30 days (head types) or 15 days (leaf types) and apply no more than 3 pints per acre in one season. Labeled for head and leaf-type lettuces.

Postharvest

Paraquat--0.6 lb/A. **A Special Local-Needs 24(c) label has been approved for the use of Gramoxone SL 2.0 or OLF for postharvest desiccation of the crop in Delaware, New Jersey and Virginia.** Apply 2.4 pints per acre Gramoxone SL 2.0 or OLF as a broadcast spray after the last harvest. Add nonionic surfactant according to the labeled instructions. See the label for additional information and warnings.

Insect Control

THE LABEL IS THE LAW. PLEASE REFER TO THE LABEL FOR UP TO DATE RATES AND RESTRICTIONS.

NOTE: Copies of specific insecticide product labels can be downloaded by visiting the websites www.CDMS.net or www.greenbook.net. Also, specific labels can be obtained via web search engines.

NOTE: NOT ALL PESTICIDES ARE LABELED FOR EACH CROP IN THIS SECTION. REFER TO THE LABELS TO DETERMINE WHICH CROPS ARE LABELED FOR EACH PESTICIDE.

Aphid

On fall crop, seedling protection from aphids is important. Spray if the aphid population reaches 1 aphid/plant during the seedling stage of plant development, or >4 aphids/plant beyond the seedling stage. Apply one of the following formulations:

acephate--(**head lettuce only**) 0.5 to 1.0 lb Acephate 97UP (or OLF)
 acetamiprid--2.0 to 4.0 oz/A Assail 30SG (or OLF)
 clothianidin--**soil** 9.0 to 12.0 fl oz/A Belay 2.13SC, **foliar** 3.0 to 4.0 fl oz/A Belay 2.13SC
 dimethoate--(**not for head lettuce**) 0.5 pt/A Dimethoate 400 (or OLF)
 flonicamid--2.0 to 2.8 oz/A Beleaf 50SG
 imidacloprid--**soil** 4.4 to 10.5 fl oz/A Admire Pro (or OLF), **foliar** 1.3 fl oz/A Admire PRO (or OLF)
 imidacloprid + beta-cyfluthrin--3.0 fl oz/A Leverage 360
 lambda-cyhalothrin+thiamethoxam--(**head and leaf lettuce only**) 4.0 to 4.5 fl oz/A Endigo ZC
 methomyl--1.5 to 3.0 fl oz/A Lannate LV
 pymetrozine--2.75 oz/A Fulfill 50WP
 spirotetremat--4.0 to 5.0 fl oz/A Movento
 thiamethoxam--**soil** 1.66 to 3.67 oz/A Platinum 75SG; **foliar** 1.5 to 3.0 oz/A Actara 25WDG

Beet Armyworm

Apply one of the following formulations:

chlorantraniliprole--**soil/drip/foliar** 3.5 to 5.0 fl oz/A Coragen 1.67SC
 cyantraniliprole--(soil) 5 to 10 fl oz/A Verimark, (foliar) 7 to 13.5 fl oz/A Exirel
 emamectin benzoate--2.4 to 4.8 oz/A Proclaim 5SG
 flubendiamide--1.5 fl oz/A Belt SC (or other labelled mixtures containing flubendiamide like Vetica)
 indoxacarb--3.5 to 6.0 oz/A Avaunt 30WDG
 methomyl--1.5 to 3.0 fl oz/A Lannate LV
 methoxyfenozide--4.0 to 8.0 fl oz/A Intrepid 2F (early season); 8.0 to 10.0 fl oz (mid to late season)
 spinetoram--5.0 to 10.0 fl oz/A Radiant SC
 spinosad--4.0 to 8.0 fl oz/A Entrust SC **OMRI-listed**

Cabbage Looper

Apply one of the following formulations:

Bacillus thuringiensis--0.5 to 1.5 lb/A Dipel DF (or OLF) **OMRI-listed**
 beta-cyfluthrin--1.6 to 2.4 fl oz/A Baythroid XL (or other labeled mixtures containing beta cyfluthrin like Leverage 360)
 bifenthrin--(**head lettuce only**) 2.1 to 6.4 fl oz/A Bifenture EC (Sniper or OLF)
 chlorantraniliprole **soil/drip/foliar**--3.5 to 5.0 fl oz/A Coragen 1.67SC
 cyantraniliprole--(**soil**) 6.75 to 13.5 fl oz/A Verimark, (foliar) 10 to 17 fl oz/A Exirel
 cyfluthrin--1.6 to 2.4 fl oz/A Tombstone (or OLF)
 emamectin benzoate--3.2 to 4.8/A Proclaim 5SG
 flubendiamide--1.5 fl oz/A Belt SC (or other labelled mixtures containing flubendiamide like Vetica)
 indoxacarb--2.5 to 3.5 oz/A Avaunt 30WDG
 lambda-cyhalothrin--(**head and leaf lettuce only**) 0.96 to 1.60 fl oz/A Warrior II or 1.92 to 3.20 fl oz/A Lambda-Cy (LambdaT, or OLF)
 lambda-cyhalothrin + chlorantraniliprole--(**head and leaf lettuce only**) 5.0 to 8.0 fl oz/A Voliam Xpress
 methomyl--1.5 to 3.0 fl oz/A Lannate LV
 methoxyfenozide--4.0 to 8.0 fl oz/A Intrepid 2F (early season); 8.0 to 10.0 fl oz/A Intrepid 2F (mid to late season)
 permethrin--2.0 to 8.0 fl oz/A Perm-Up 3.2 (or OLF)
 spinetoram--5.0 to 10.0 fl oz/A Radiant SC
 spinosad--3.0 to 6.0 fl oz/A Entrust SC **OMRI-listed**
 zeta-cypermethrin--3.2 to 4.0 fl oz/A Mustang Maxx (or OLF)
 zeta-cypermethrin+bifenthrin--(**head lettuce only**) 4.0 to 10.3 fl oz/A Hero EC

Corn Earworm (CEW)

Note. Head lettuce seedlings, in the 7- to 18-leaf stage, are vulnerable to CEW attack in August to September. Control must be achieved before center leaves start to form a head (15- to 18-leaf stage). Apply Lannate every 2 to 5 days or permethrin every 5 to 10 days according to CEW moth populations and pest management alerts. Apply one of the following formulations:

beta-cyfluthrin--2.4 to 3.2 fl oz/A Baythroid XL (or other labelled mixtures containing beta cyfluthrin like Leverage 360)
 bifenthrin--2.1 to 6.4 fl oz/A Bifenture EC (Sniper 2EC or OLF)

chlorantraniliprole **soil/drip/foliar**--3.5 to 5.0 fl oz/A Coragen 1.67SC
 cyantraniliprole--(soil) 5 to 10 fl oz/A Verimark, 7 to 13.5 fl oz/A Exirel
 cyfluthrin--2.4 to 3.2 fl oz/A Tombstone (or OLF)
 emamectin benzoate--2.4 to 4.8 oz/A Proclaim 5SG
 flubendiamide--1.5 fl oz/A Belt SC (or other labelled mixtures containing flubendiamide like Vetica)
 lambda-cyhalothrin--(**head and leaf lettuce only**) 1.28 to 1.92 fl oz/A Warrior II or 2.56 to 3.84 fl oz/A Lambda-Cy (LambdaT, or OLF) (or other labelled mixtures containing lambda-cyhalothrin like Endigo ZC)
 lambda-cyhalothrin+chlorantraniliprole--(**head and leaf lettuce only**) 5.0 to 8.0 fl oz/A Voliam Xpress
 methomyl--1.5 to 3.0 fl oz/A Lannate LV
 permethrin--4.0 to 8.0 fl oz/A Perm-Up 3.2 (or OLF)
 spinetoram--5.0 to 10.0 fl oz/A Radiant SC
 zeta-cypermethrin+bifenthrin--(**head lettuce only**) 4.0 to 10.3 fl oz/A Hero EC

Cutworms (Also see Chapter E the "Cutworms" section in "Soil Pests--Their Detection and Control".)

Apply one of the following formulations:

beta-cyfluthrin--0.8 to 1.6 fl oz/A Baythroid X L (or other labelled mixtures containing beta-cyflithrin like Leverage 360)
 bifenthrin--2.1 to 6.4 fl oz/A Bifenture EC (Sniper, or OLF)
 cyfluthrin--0.8 to 1.6 fl oz/A Tombstone (or OLF)
 flubendiamide--1.5 fl oz/A Belt SC (or other labelled mixtures containing flubendiamide like Vetica)
 imidacloprid + beta-cyfluthrin--3.0 fl oz/A Leverage 360
 lambda-cyhalothrin--(**head and leaf lettuce only**) 0.96 to 1.60 fl oz/A Warrior II or 1.92 to 3.20 fl oz/A Lambda-Cy (LambdaT, or OLF)
 lambda-cyhalothrin +chlorantraniliprole--(**head and leaf lettuce only**) 6.0 to 9.0 fl oz/A Voliam Xpress
 methomyl--1.5 to 3.0 fl oz/A Lannate LV
 permethrin--4.0 to 8.0 fl oz/A Perm-Up 3.2EC (or OLF)
 zeta-cypermethrin--2.24 to 4.00 fl oz/A Mustang Maxx (or OLF)
 zeta-cypermethrin+bifenthrin--(**head lettuce only**) 4.0 to 10.3 fl oz/A Hero EC

Leafhopper

Control of leafhoppers will prevent spread of lettuce yellows. In the spring, spray when plants are one-half inch tall; repeat as needed. In the fall, spray seedlings four to five times at 5-day intervals. Apply one of the following formulations:

acephate--(**head lettuce only**)0.5 to 1.0 lb/A Acephate 97UP (or OLF)
 beta-cyfluthrin--2.4 to 3.2 fl oz/A Baythroid XL
 bifenthrin--(**head lettuce only**) 2.1 to 6.4 fl oz/A Bifenture EC (Sniper 2EC or OLF)
 buprofezin--9.0 to 13.6 fl oz/A Courier SC
 clothianidin--**soil** 9.0 to 12.0 fl oz/A Belay 2.13SC, **foliar** 3.0 to 4.0 fl oz/A Belay 2.13SC
 cyfluthrin--(potato leafhopper)-0.8 to 1.6 fl oz/A, (other leafhoppers) 2.4 to 3.2 fl oz/A Tombstone (or OLF)
 dimethoate--0.5 pt/A Dimethoate 400 (**not for head lettuce**) (or OLF)
 dinotefuran--**soil** 5.0 to 6.0 oz/A, **foliar** 1.0 to 3.0 oz/A Venom 70SG; or **soil** 9.0 to 10.5 fl oz/A, **foliar** 2.00 to 5.25 fl oz/A Scorpion 35SSL (or OLF)

imidacloprid--**soil** 4.4 to 10.5 fl oz/A Admire Pro, **foliar** 1.3 fl oz/A Admire PRO (or OLF)
 imidacloprid + beta-cyfluthrin--3.0 fl oz/A Leverage 360
 lambda-cyhalothrin--(**head and leaf lettuce only**) 1.28 to 1.92 fl oz/A Warrior II or 2.56 to 3.84 fl oz/A Lambda-Cy (LambdaT, or OLF)
 methomyl--1.5 to 3.0 fl oz/A Lannate LV
 permethrin--2.0 to 8.0 oz/A Perm-Up 3.2 (or OLF)
 thiamethoxam--**soil** 1.66 to 3.67 oz/A Platinum 75SG; **foliar** 1.5 to 3.0 oz/A Actara 25WDG
 zeta-cypermethrin--2.24 to 4.00 fl oz/A Mustang Maxx (or OLF)
 zeta-cypermethrin+bifenthrin--(**head lettuce only**) 4.0 to 10.3 fl oz/A Hero EC

Leafminer

Apply one of the following formulations:
 abamectin--1.75 to 3.50 fl oz/A Agri-Mek 0.7SC (or OLF)
 chlorantraniliprole--(**larvae only**) **soil/drip/foliar** 5.0 to 7.5 fl oz/A Coragen 1.67SC
 cyantraniliprole--(soil) 6.75 to 13.5 fl oz/A Verimark, (foliar) 13.5 to 20.5 fl oz/A Exirel
 cyromazine--2.66 oz/A Trigard 75WSP
 dimethoate--0.5 pt/A Dimethoate 400 4EC (**not for head lettuce**) (or OLF)
 dinotefuran--**soil** 5.0 to 6.0 oz/A, **foliar** 1.0 to 3.0 oz/A Venom 70SG; or **soil** 9.0 to 10.5 fl oz/A, **foliar** 2.00 to 5.25 fl oz/A Scorpion 35SL (or OLF)
 permethrin--4.0 to 8.0 fl oz/A Perm-Up 3.2 (or OLF)
 spinetoram--6.0 to 10.0 fl oz/A Radiant SC
 spinosad--6.0 to 10.0 fl oz/A Entrust SC **OMRI-listed**

Tarnished Plant Bug

This insect can cause serious damage to the fall crop; it is usually numerous where weeds abound. Apply one of the following formulations:

beta-cyfluthrin--2.4 to 3.2 fl oz/A Baythroid XL
 bifenthrin--(**head lettuce only**)5.12 to 6.4 fl oz/A Bifenture EC (Sniper 2EC or OLF)
 carbaryl--1.0 to 2.0 qts/A Sevin XLR Plus (or OLF)
 cyfluthrin--2.4 to 3.2 fl oz/A Tombstone (or OLF)
 lambda-cyhalothrin--1.28 to 1.92 fl oz/A Warrior II or 2.56 to 3.84 fl oz/A Lambda-Cy (LambdaT, or OLF)
 lambda-cyhalothrin + thiamethoxam--(**head and leaf lettuce only**) 4.0 to 4.5 fl oz/A Endigo ZC
 zeta-cypermethrin--3.2 to 4.0 fl oz/A Mustang Maxx (or OLF)
 zeta-cypermethrin+bifenthrin--(**head lettuce only**) 10.3 fl oz/A Hero EC

Thrips

Some species of thrips 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:

beta-cyfluthrin--0.8 to 1.6 fl oz/A Baythroid XL
 cyantraniliprole--13.5 to 20.5 fl oz/A Exirel
 imidacloprid + beta-cyfluthrin--3.0 fl oz/A Leverage 360
 methomyl--1.5 to 3.0 fl oz Lannate LV
 spinetoram--6.0 to 10.0 fl oz/A Radiant SC
 spinosad--6.0 to 10.0 fl oz/A Entrust SC OMRI-listed
 zeta-cypermethrin--3.2 to 4.0 fl oz/A Mustang Maxx (or OLF)
 zeta-cypermethrin+bifenthrin (**head lettuce, onion thrips only**)--10.3 fl oz/A Hero EC

Pesticide	Use Category ¹	Hours to Reentry ²	Days to Harvest			
			Head Let.	Leaf Let.	En-Esc.	Esca-dive role
INSECTICIDE						
abamectin(Agri-mek)	R	12	7	7	7	7
acephate	G	24	21	--	--	--
acetamiprid	G	12	7	7	7	7
<i>Bacillus</i>						
<i>thuringiensis</i>	G	4	0	0	0	0
beta-cyfluthrin	R	12	0	0	0	0
bifenthrin	R	12	7	--	--	--
buprofezin	R	12	7	7	7	7
carbaryl	G	12	14	14	14	14
chlorantraniliprole	G	4	1	1	1	1
clothianidin(soil,foliar)	G	12	21/7	21/7	21/7	21/7
cyantraniliprole(soil)	G	4	--	--	--	--
(foliar)	G	12	1	1	1	1
clothianidin(soil)	G	12	21	21	21	21
(foliar)	G	12	7	7	7	7
cyfluthrin	R	12	0	0	0	0
cyromazine	G	12	7	7	7	7
dimethoate	R	48	--	14	14	14
dinotefuran (soil)	G	12	21	21	21	21
(foliar)	G	12	7	7	7	7
emamectin						
benzoate	R	12	7	7	7	7
flonicamid	G	12	0	0	0	0
flubendiamide	G	12	1	1	1	1
flubendiamide +						
buprofezin	G	12	7	7	7	7
imidacloprid (soil)	G	12	21	21	21	21
(foliar)	G	12	7	7	7	7
imidacloprid + beta-						
cyfluthrin	R	12	7	7	7	7
indoxacarb	G	12	3	3	3	3
lambda-cyhalothrin	R	24	1	1	-	-
lambda-cyhalothrin +						
chlorantraniliprole	R	24	1	1	-	-
lambda-cyhalothrin +						
thiamethoxam	R	24	7	7	-	-
methomyl (<1.5 pt)	R	48	7	7	10	10
methomyl (>1.5 pt)	R	48	10	10	10	10
methoxyfenozide	G	4	1	1	1	1
permethrin	R	12	1	1	1	1
pymetrozine	G	12	7	7	7	7
spinetoram	G	4	1	1	1	1
spinosad	G	4	1	1	1	1
spirotetramat	G	24	3	3	3	3
sulfloxafor	G	12	3	3	3	3
thiamethoxam (soil)	G	12	30	30	30	30
(foliar)	G	12	7	7	7	7
zeta-cypermethrin	R	12	1	1	1	1
zeta-cypermethrin+	R	12	7	--	--	--
bifenthrin						

(table continued next page)

Pesticide	Use Category ¹	Hours to Reentry ²	Days to Harvest			
			Head Let.	Leaf Let.	En-Scave	role
FUNGICIDE (FRAC code)						
azoxystrobin (Group 11)	G	4	0	0	0	0
Botran (Group 14)	G	12	14	14	14	14
Cannonball (Group 12)	G	12	0	0	0	0
Contans WG (biological)	G	4	0	0	0	0
Endura (Group 7)	G	12	14	14	--	--
Fontelis (Group 7)	G	12	3	3	3	3
Forum (Group 40)	G	12	0	0	0	--
iprodione (Group 2)	G	12	14	14	14	14
Merivon (Groups 7+11)	G	12	1	1	1	1
MetaStar (Group 4)	G	48	At plant application only			
Previcur Flex (Group 28)	G	12	2	2	2	2
Reason (Group 11)	G	12	2	2	-	-
Revus (Group 40)	G	4	1	1	1	-
Ridomil Gold (Group 4)	G	12	At plant application only			
Ultra Flourish (Group 4)	G	48	At plant application only			
Uniform (Groups 4 + 11)	G	0	At plant application only			
Zampro (Groups 45 + 40)	G	12	0	0	0	0

See Table D-6.

¹ G = general, R = restricted

² Chemicals with multiple designations are based on product and/or formulation differences. CONSULT LABEL.

Dash (--) in table indicates pesticide is **NOT** labeled for that crop.

Disease Control

Seed Treatment

Dust seed with thiram 480DP at the rate of 1 level teaspoon per pound of seed (3.0 oz/100 lb). See Table E-13 for additional seed treatment options.

Damping-Off and Other Seedling Diseases

(See the "Disease Control in Plantbeds" section in this publication.) Apply one of the following in a 7-inch band after seeding or transplanting. Use formula given in the "Calibration for Changing from Broadcast to Band Application" section of Calibrating Granular Application Equipment to determine amount of Ridomil Gold or Ultra Flourish needed per acre:

mefenoxam--(Ridomil Gold--1.0 to 2.0 pt 4SL/A or 2.0 to 4.0 pt Ultra Flourish 2E/A)

metalaxyl (MetaStar)--4.0 to 8.0 pt 2EAG

Uniform--0.34 fl. oz 3.66SE/1000 row. See label for restrictions. Uniform applied at planting will also help control Rhizoctonia and Downy mildew

An application of mefenoxam or metalaxyl at planting will also help suppress Downy mildew development early in the season.

Downy Mildew

An application of mefenoxam (Ridomil Gold 4SL or Ultra Flourish 2E), or metalaxyl (MetaStar 2E) for damping-off

will assist in the control of early-season downy mildew. See "Damping-Off and Other Seedling Diseases" above for use pattern. Use one of the following during periods of high moisture and moderate temperatures.

Alternate one of the following fungicides as long as conditions favor disease development:

Revus--8.0fl. oz 2.08SC/A

Zampro--14.0 fl oz 525SC/A

Reason--5.5 to 8.2 fl. oz 500SC/A

Merivon--8.0 to 11.0 fl oz 2.09SC/A (Downy mildew suppression only)

Forum--6.0 fl oz 4.18SC/A

Previcur Flex--1.33 pt 6F/A

Leaf Spots (Septoria, Anthracnose, and Cercospora)

When conditions favor disease development, alternate the following and repeat every 7 to 14 days:

Merivon--4.0 to 11.0 fl oz 2.09SC/A (Purple blotch and Leaf blight) or 8.0 to 11.0 fl oz 2.09SC/A (Downy mildew suppression)

Fontelis--14.0 to 24.0 fl oz 1.67SC/A

azoxystrobin--6.0 to 15.5 fl oz 2.08F/A or OLF

Bottom Rot (Rhizoctonia)

A midsummer application of a soil fumigant will be beneficial for the fall crop (Refer to "Soil Fumigation" section for details on materials and application techniques). 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.

Endura--8.0 to 11.0 oz 70W/A (suppression only) (2 applications per season allowed)

iprodione--1.5 to 2.0 lb 50WP/A or OLF (3 applications per season allowed)

Do not cultivate directly after applying either of the above (see labels for details)

Uniform--0.34 fl oz 3.66SE/1000 ft row in-furrow applied at transplanting or seeding for root rot control will also help suppress Downy mildew

Lettuce Drop (Sclerotinia)

Apply one of the following at transplanting and/or thinning (see labels for restrictions). Rotate fungicides if more than one application is needed:

Cannonball--7.0 oz 50WP/A

iprodione--1.5 to 2.0 lb 50WP/A or OLF (2 applications per season allowed)

Endura--8.0 to 11.0 oz 70W/A (suppression only) (2 applications per season allowed)

azoxystrobin--0.40 to 0.80 fl. oz/1000 row ft. 2.08F or OLF

Do not cultivate directly after application (see labels for details)

Preplant: Apply 3 to 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 to 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.

Contans--2.0 to 4.0 lb 5.3WG/A

Gray Mold (*Botrytis*)

Gray mold is most troublesome in transplant greenhouses where air movement is poor and relative humidity remains high. Avoid overcrowding plants and water early in the day to help reduce leaf wetness overnight. If possible vent to reduce relative humidity.

Apply one of the following as a foliar spray:

Cannonball--7.0 oz 50WP/A

Endura--8.0 to 11.0 oz 70W/A (2 applications per season allowed)

Merivon--8.0 to 11.0 fl oz 2.09SC/A (for suppression only)

Botran--3.0 tbsp 75WP/gal (greenhouse use) or 2.0 to 5.3 lb 75WP/A in field application (1 application allowed at high rate, see label for details, may cause temporary bronzing of leaves)

Yellows

Control leafhopper vectors with insecticides. Refer to the preceding "Leafhopper" section under Insect Control.

Viruses

LMV (lettuce mosaic virus): Use virus-free or MT lettuce seed.

TuMV (turnip mosaic virus): Troublesome in late summer and early fall plantings. Control weed hosts around irrigation risers and areas bordering fields.

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.

Big-Vein

This viral disease is favored by cool temperatures (<60°F) and high soil moisture conditions. Produce the crop on raised beds and avoid planting in fields with low-lying areas. Soil fumigation is helpful. Refer to the "Soil Fumigation" section for details on application.

Corky Root

Development of this bacterial disease is favored by continual cropping and by high soil moisture conditions. Cultural practices that reduce soil compaction, such as the use of a rye cover crop and use of high beds should be considered. Limiting irrigation between transplanting or thinning should be adopted to reduce disease incidence.