

Lettuce

Culture

Lettuce is a cool-season crop that grows best on well-drained muck soils. Due to high summer temperatures, head lettuce is not grown to any extent in Ohio. Excessive hot weather or dryness can cause pithiness, bitterness and bolting.

Once-over harvesting is essential for efficiency. Therefore, it is important that the crop matures uniformly. To ensure consistency, seed should possess a high germination percentage. Because of the high cost of seed and plant thinning, precision seeding should be used with coated seed. Lettuce seed should be dropped every 2.5-3.0 inches with precision seeding.

Transplants can be started in greenhouses in late February or March for transplanting into fields in late March or April. Plants are ready in 3-5 weeks.

Varieties

Bibb

Summer Bibb
Buttercrunch

Boston

Dark Green Boston (spring only)
Esmeralda
Mantilla
Ermosa

Romaine

Darkland
Parris Island Cos (spring only)
Green Tower
Ideal Cos (trial only)

Red Leaf

New Red Fire (slow bolting)
Red Leaf 20 (spring only)
SVR 69292 (trial only)

Leaf Lettuce

Slobolt
Grand Rapids (spring only)
Waldmann's Green (spring only)
Tiara
Krisp-N-Green

Lime and Fertilizer Muck Soils

Maintain soil pH at 5.4-6.0.

Mineral Soils

Maintain soil pH at 6.0-6.8.

Broadcast and disk in all fertilizer prior to planting. Apply per acre 120-150 lb N, 120-150 lb P₂O₅ and 120-150 lb K₂O.

Spacing and Transplanting

Transplants are used to achieve uniformity. Plants are grown 3-4 weeks in the greenhouse prior to transplanting.

Rows: 12-14 inches between rows.

In-row: 8-10 inches between plants.

Bibb

Rows: 9 inches between rows.

In-row: 4-6 inches between plants.

Disease Control

Damping Off

Buy seed commercially treated with Thiram or Apron Maxx. If Pythium has been a problem, apply **Ridomil Gold** EC at 1-2 pt/A to soil at planting. See label directions.

Downy Mildew

Space rows to allow for good aeration and drying. Avoid overhead irrigation late in the day. If disease threatens, apply one of the following fungicides:

Fixed copper fungicide (NuCop 3L or 50 DF) according to label directions.

***Aliette** 80WDG 2.0-5.0 lb/A (3 days-PHI).

Acrobat 50WP 6.4 oz/A (0 days-PHI). Tank mix with protectant fungicide such as Maneb.

Maneb 75DF or 80 WP 1.5-2.0 lb/A (10 days-PHI).

***Aliette/Maneb** 2+2 4 lb/A (10 days-PHI).

***Quadris** 12.3-15.4 fl oz/A (0 days-PHI).

***Curzate** 60DF 3.2-5.0 oz/A (3 days-PHI). Apply with a protectant fungicide such as Manex. Maximum 30 oz per 12 months. (HEAD LETTUCE ONLY).

Do not tank mix Aliette and copper fungicides. Speckling may occur on some varieties under certain conditions.

Quadris may also be phytotoxic under certain circumstances. See labels for precautions.

Manex 1.2-1.6 qt/A (10 days-PHI).

***Previcur Flex** 2.0 pt/A (2 days-PHI).

Rhizoctonia Bottom Rot and Sclerotinia Drop

Rotation, deep plowing, and the use of raised beds are suggested practices that should minimize incidence of these diseases. If disease has been severe in the past, consider application of one of the following fungicides to seedlings:

***Rovral** (50 W) 1.5-2.0 lb/A (14 days-PHI). (See label directions.)

***Rovral** (4F) 1.5-2.0 pt/A (14 days-PHI). (See label directions.)

Botran (75W) 2-3.5 lb/100 gal water (14 days-PHI).

***Endura** 8-11 fl oz/A (14 days-PHI) (Sclerotinia bottom rot: suppresses Rhizoctonia drop). Follow label recommendations for fungicide resistance management.

***Switch** 62.5WG 11-14 oz/A (0 days-PHI).

Contans WG 2-4 lb/A in 50-100 gal water (Sclerotinia drop). This biological fungicide has shown promise in some states for drop management. Apply immediately after harvest or 3-4 months before planting lettuce.

Botrytis Gray Mold

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

***Tanos** 8 oz/A (3 days-PHI). Must be tank-mixed with a protectant fungicide.

Botran (75W) may be applied at a rate of 2.66 lb/100 gal water. Do not apply within 14 days of harvest.

***Endura** 8-11 fl oz/A (14 days-PHI). Follow label recommendations for fungicide resistance management.

***Switch** 62.5WG 11-14 oz/A (0 days-PHI).

*Follow guidelines for fungicide resistance management on the product label (see pages 59-60).

Lettuce Mosaic Virus (LMV)

This virus is carried in infested seed and is spread readily by aphids. Sow only mosaic-free indexed seed (sold as MTO). Control aphids and weeds near to production areas. Keep new and old lettuce plantings as far apart as possible. Disk under old lettuce fields immediately following harvest.

Insect Control

See the table on the next page for overview of insecticides used to control lettuce pests.

Note on aphid management: Examine 30 randomly selected plants per field and categorize the aphid population on each plant into one of the following seven categories:

0 (none)	if no aphids found
1 (trace)	if 1 to 3 aphids found
2 (low)	if 4 to 10 aphids found
3 (moderate)	if 11 to 30 aphids found
4 (moderate/high)	if 31 to 100 aphids found
5 (high)	if 101 to 300 aphids found
6 (very high)	if 301 or more aphids found

Treatment is suggested if the average rating is 2 or higher, for plants beyond the seedling stage. Treatment is suggested if the average rating is 1 or higher during the seedling stage.

Note on worm management: Treatment is suggested when 15% of the stand is infested by any caterpillar species. For example, if 30 randomly selected plants are examined per field, treatment would be indicated if 5 infested plants are found.

Aster leafhopper management: Lettuce plantings should be treated with insecticides to prevent the aster leafhopper from vectoring the disease, according to the aster yellows index developed at the University of Minnesota. The key times to treat lettuce plantings are approximately 10-14 days after transplanting or crop emergence, and approximately 21 days before harvest. The first timing is to protect the current field from infections that would show up before harvest, whereas the second is to prevent any leafhoppers that have developed in the field from moving the disease to other fields. Use an insecticide with long residual activity for the early applications (for example, the newer pyrethroids, or carbaryl, or dimethoate) and one with rapid and thorough control of nymphs for the later applications (for example, a newer pyrethroid or methomyl). A distance of at least 60 yards between susceptible fields, or moving any new plantings as far as possible from earlier infected plantings, can also reduce the movement of leafhopper vectors between fields and slow the disease.

• Preplant treatment

Diazinon

For cutworms, wireworms.

Diazinon 14G: 14-28 lb/A.

Diazinon 4EC: 2-4 qt/A.

• At-planting treatment

Dinotefuran (21 days-PHI)

For whiteflies, aphids (suppression), leafhoppers.

Venom 70SG: 5-6 oz/A applied in-furrow, as post-seeding drench, or transplant drench. Limit 12 oz/A per season.

Disulfoton (60 days-PHI, direct-seeded lettuce only)

For aphids, leafhoppers.

Apply on each side of row. Do not apply directly on the seed.

Di-Syston 8EC: 0.6-1.2 oz/1,000 ft.

Di-Syston 15G: 4-8 oz/1,000 ft.

Insecticides for Use on Lettuce in Ohio

(E = excellent; G = good; F = fair; P = poor; ✓ = pest listed on label but efficacy uncertain; - = pest not on label; rating in parentheses = pest not on label but product known to provide some control)

Pest >>	Pre-harvest interval (days)	Aster leafhopper	Loopers	Aphids	Plant bugs	Leaf-miners	Impact on beneficial insects
<i>How often an insecticide has been needed on Ohio farms for this pest in the past>></i>		most years but only if carrying aster yellows	occasional in late summer	most years, especially late season	occasional	rare	
ORGANOPHOSPHATES							
diazinon	14	-	-	F	-	✓	moderate
dimethoate (Cygon)	7, 14	G	-	G	-	✓	disruptive
Di-Syston (disulfoton)	60	✓	-	G	-	-	moderate
malathion (Cythion)	7, 14	F	✓	F	-	-	low/moderate
MSR (oxydemetonmethyl)	14-28	-	-	G	-	-	moderate
Orthene (acephate)	21	✓	G	G	-	-	moderate/disruptive
CARBAMATES							
Lannate (methomyl)	7, 10	F	F	G	-	-	disruptive
Larvin (thiodicarb)	14	-	G	-	-	-	moderate
Sevin (carbaryl)	14	G	-	-	F	-	disruptive
PYRETHROIDS							
Ammo (cypermethrin)	5	✓	G	-	G	-	disruptive
Baythroid (cyfluthrin)	0	✓	G	-	✓	-	disruptive
Capture (bifenthrin)	7	G	G	F	G	-	disruptive
Hero (bifen. + zeta-cy.)	7	G	G	F	G	-	disruptive
Mustang (zeta-cypermethrin)	1, 5	✓	G	-	G	-	disruptive
Pounce (permethrin)	1	F	G	F	-	✓	disruptive
Proaxis (gamma-cyhalothrin)	1	✓	G	✓	✓	-	disruptive
Warrior (lambda-cyhalothrin)	1	✓	G	-	G	-	disruptive
NEONICOTINOIDS (CHLORONICOTINYLS)							
Actara (thiamethoxam)	7	✓	-	✓	✓	-	low/moderate
Admire (imidacloprid)	21	-	-	E	-	-	low/moderate
Assail (acetamiprid)	7	-	-	E	-	-	low/moderate
Platinum (thiamethoxam)	30	✓	-	✓	✓	-	low/moderate
Provado (imidacloprid)	7	-	-	E	-	-	low/moderate
Venom (dinotefuran)	7, 21	✓	-	F	-	✓	low/moderate
OTHER INSECT NERVE POISONS							
Agri-Mek (abamectin)	7	-	-	-	-	✓	low/moderate
Avaunt (indoxacarb)	3	-	G	-	-	-	low/moderate
Beleaf (flonicamid)	0	-	-	✓	✓	-	-
Fulfill (pymetrozine)	7	-	-	G	-	-	low
Proclaim (emamectin benzoate)	7	-	G	-	-	-	low/moderate
Pyronyl, PyGanic (pyrethrins)	0	✓	✓	✓	✓	✓	moderate
Radiant (spinetoram)	1	-	✓	-	-	✓	-
SpinTor (spinosad)	1	-	G	-	-	✓	low
Thionex (endosulfan)	14	F	F	G	-	-	moderate
INSECT GROWTH REGULATORS							
Confirm (tebufenozide)	7	-	G	-	-	-	low
Courier (buprofezin)	7	-	-	-	-	-	low/moderate
Intrepid (methoxyfenozide)	1	-	G	-	-	-	low
Neemix, Aza-Direct (azadirachtin)	0	-	✓	✓	-	✓	low/moderate
Trigard (cyromazine)	7	-	-	-	-	✓	low/moderate
MISCELLANEOUS							
<i>Bacillus thuringiensis</i> (B.t.)	0	-	F	-	-	-	very low
cryolite (Kryocide)	14	-	✓	-	-	-	low
Oberon (spiromesifen)	7	-	-	-	-	-	-
soap (M-Pede)	0	F	-	F	F	-	low

Imidacloprid (21 days-PHI, head and leaf lettuce, endive, escarole)

For aphids, whiteflies.

Admire 2F, Alias 2F: 10-24 fl oz/A. Apply before planting, during planting, or as post-transplant drench.

Admire Pro (4.6F): 4.4-10.5 fl oz/A.

Thiamethoxam (30 days-PHI, head and leaf lettuce, endive)

For aphids, leafhoppers.

Platinum 2SC: 5-11 fl oz/A.

• Bait treatment

Carbaryl (leaf lettuce, 14 days-PHI; head lettuce, 3 days-PHI)

For cutworms, armyworms.

Sevin 5B: 20-40 lb/A.

Prozap Sevin 10% Bait Granules: 10-20 lb/A.

Metaldehyde

For slugs. Broadcast during seedling stage, or band between rows after seedling stage.

Deadline MP (4B): 20-40 lb/A.

Prozap Snail and Slug AG (3.5B): 24-40 lb/A.

Metaldehyde 7.5G: 20 lb/A.

Permethrin (1 day-PHI)

For crickets, cutworms.

Ambush 0.5% Bait: 20-40 lb/A.

• Foliar treatment

Abamectin (7 days-PHI)

For leafminers, mites.

Agri-mek 0.15EC, Abba 0.15EC: 8-16 fl oz/A. Limit 48 fl oz/A per season.

Acephate (21 days-PHI, head lettuce only)

For aphids, loopers.

Orthene 75SP: 0.7-1.3 lb/A for aphids; 1.3 lb/A for loopers. Limit 2.7 lb/A per season.

Orthene 97S: 8-16 oz/A. Limit 2.12 lb/A per season.

Bracket 90S: 0.5-1.1 lb/A.

Acetamiprid (7 days-PHI)

For aphids, whiteflies.

Assail 30SG: 1.8-4.0 oz/A.

***Bacillus thuringiensis* (B.t.)** (0 days-PHI, lettuce, endive, and escarole)

For loopers.

Agree (3.8% a.i.): 1-2 lb/A.

Biobit HP WP (6.4% a.i.): 0.5-2 lb/A.

CryMax WDG (15% a.i.): 0.5-1.5 lb/A.

DiPel DF (10.3% a.i.): 0.5-1 lb/A.

Javelin WG (6.4% a.i.): 0.5-1 lb/A.

Lepinox WDG (15% a.i.): 1-2 lb/A.

XenTari WDG: 0.25-1 lb/A.

Bifenthrin (7 days-PHI, head lettuce only)

For leafhoppers, loopers, plant bugs.

Brigade 2EC, Capture 2EC, Discipline 2EC, Fanfare 2EC, Sniper 2EC, Tundra 2EC: 2.1-6.4 fl oz/A.

Brigade 10WSB: 5.3-16 oz/A.

Bifenthrin + zeta-cypermethrin (7 days-PHI, head lettuce only)

For leafhoppers, loopers, Lygus bug, aphids.

Hero 1.24EC: 4-10.3 fl oz/A.

Buprofezin (7 days-PHI, leaf and head lettuce)

For whiteflies.

Courier 0.7EC: 6-9 oz/A.

Carbaryl (14 days-PHI, leaf lettuce, head lettuce, endive, escarole)

For leafhoppers, caterpillars.

Carbaryl 4L, Sevin 4F; Sevin XLR Plus (4EC): 0.5-2 qt/A.

Sevin 50WP: 1-3 lb/A.

Sevin 80S: 0.62-1.25 lb/A.

Cryolite (14 days-PHI, lettuce)

For loopers.

Kryocide (96% a.i.): 8-20 lb/A, leaf and head lettuce.

Prokil Cryolite 96 (96% a.i.): 10-20 lb/A, head lettuce only.

Cyfluthrin (0 days-PHI)

For loopers, leafhoppers, plant bugs.

Baythroid 2EC: 0.8-3.2 fl oz/A. Limit 4 applications per year.

Cypermethrin (5 days-PHI, head lettuce)

For loopers and other caterpillars; leafhoppers, bugs, thrips, some beetles.

Ammo 2.5EC, Battery 2.5EC: 2.5-5 fl oz/A. Limit 30 fl oz/A per season.

Ammo WSB (39% WP): 1-2 bags/A.

Cymbush 3EC: 1.07-4.27 oz/A. Limit 25 fl oz/A per season.

Cyromazine (7 days-PHI, head and leaf lettuce, endive)

For leafminers.

Trigard 75WP: 1/6 lb (1 packet)/A. Limit 5 applications per crop.

Diazinon (14 days-PHI, lettuce, endive)

For aphids, leafminers.

Diazinon AG500 (4EC): 0.5-1 pt/A.

Diazinon 50WP: 0.5-1 lb/A.

Dimethoate (14 days-PHI, leaf lettuce, endive, escarole only)

NOTE: Dimethoate use on **head** lettuce was cancelled in 2006. Product can be used until supply with old label is depleted.

For aphids, leafhoppers, leafminers.

Dimate 4E; Dimethoate 4EC: 0.5 pt/A.

Dimethoate 2.67EC; Dimate 2.67: 0.75 pt/A.

Dinotefuran (7 days-PHI)

For whiteflies, aphids (suppression), leafhoppers, leafminers, stink bugs, grasshoppers.

Venom 70SG: 1-3 oz/A. Limit 6 oz/A per season.

Emamectin benzoate (7 days-PHI)

For caterpillars.

Proclaim (5WDG): 2.4-4.8 oz/A for corn earworm and fall armyworm; 3.2-4.8 oz/A for cabbage looper. Limit 28.8 oz/A per season.

Endosulfan (14 days-PHI, lettuce)

For aphids, loopers, leafhoppers.

Limit 4 qt/A/year; limit 3 applications on head lettuce and 2 applications on leaf lettuce.

Thionex 3EC; Endosulfan 3EC: 1-1.3 qt/A.

Thionex 50WP: 1.5-2 lb/A.

Flonicamid (0 days-PHI, head and leaf lettuce, endive, escarole)

For aphids.

Beleaf 50SG: 1.2-2.8 oz/A. Limit 3 applications per year.

Gamma-cyhalothrin (1 day-PHI, head and leaf lettuce)

For leafhoppers, loopers, and other caterpillars.

Proaxis (0.5EC): 1.92-3.84 fl oz/A.

Imidacloprid (7 days-PHI, leaf and head lettuce, endive, escarole)

For aphids, whiteflies.

Provado 1.6F, Pasada 1.6F: 3.75 fl oz/A. Limit 18.75 fl oz/A per year. Note: Do not apply Provado if Admire applied at planting.

Indoxacarb (3 days-PHI, leaf and head lettuce, endive, escarole)

For loopers and other caterpillars.

Avaunt 30WG: 2.5-3.5 oz/A for looper; 3.5-6 oz/A for beet armyworm, corn earworm.

Lambda-cyhalothrin (1 day-PHI, leaf and head lettuce)

For loopers and other caterpillars, leafhoppers, stink bug, flea beetles.

Warrior 1EC, Silencer 1EC, Taiga Z 1CS: 1.92-3.84 fl oz/A.

Malathion (14 days-PHI, leaf lettuce; 7 days-PHI, head lettuce, endive)

For aphids, leafhoppers, loopers.

Malathion 5EC: 1.5-2 pt/A for aphids; 2 pt/A for leafhoppers; 2.5- 3 pt/A for loopers.

Malathion 8EC: 0.5-2 pt/A for aphids, leafhoppers; 2 pt/A for loopers.

Methomyl (7 or 10 days-PHI, head lettuce, depending on rate used)

For aphids, leafhoppers, loopers.

Limit 15 applications/crop.

Lannate 90SP: 0.5-1 lb/A for aphids, leafhoppers; 0.25-1 lb/ A for loopers.

Lannate LV (2.4WSL): 1.5-3 pt/A for aphids, leafhoppers; 0.75-3 pt/A for loopers.

Methoxyfenozide (1 day-PHI)

For caterpillars.

Intrepid 2F: 4-10 fl oz/A. Limit 64 fl oz/A per year.

Oxydemetonmethyl (14, 21, 28 days-PHI, head lettuce)

For aphids.

MSR (Metasystox-R 2SC): 1.5-2 pt/A.

Permethrin (1 day-PHI, lettuce, endive, escarole)

For leafhoppers, loopers, leafminers.

Pounce 3.2EC, Arctic 3.2EC, Permethrin 3.2EC: 2-8 oz/A leafhoppers, loopers; 4-8 oz/A for leafminers.

Ambush 25WP; Pounce 25WP: 3.2-12.8 oz/A for leafhoppers, loopers; 6.4-12.8 oz/A for leafminers.

Pymetrozine (7 days-PHI)

For aphids, whiteflies.

Fulfill 50WDG: 2.75 oz/A.

Spinetoram (1 day-PHI)

For looper, corn earworm, leafminers.

Radiant 1SC: 5-10 fl oz/A. Limit 6 applications per crop.

Spinosad (1 day-PHI)

For cabbage looper, armyworms, leafminers.

SpinTor 2SC: 4-10 oz/A. Limit 29 oz/A/year.

Entrust (80WP): 0.5-3 oz/A.

Spiromesifen (7 days-PHI)

For whiteflies.

Oberon 2SC: 7.0-8.5 fl oz/A. Limit 3 applications per crop season.

Tebufenozide (7 days-PHI, lettuce, endive)

For caterpillars.

Confirm 2F: 6-8 oz/A for small plants; 8 oz/A for larger plants and heavy infestation. Limit 56 fl oz/A per year.

Thiamethoxam (7 days-PHI, leaf and head lettuce, endive)

For aphids, leafhoppers.

Actara 25WDG: 1.5-3 oz/A.

Thiodicarb (14 days-PHI, leaf lettuce, head lettuce, endive)

For armyworms, loopers.

Larvin 3.2F: 16-30 fl oz/A. Limit 60 fl oz/A per season.

Zeta-cypermethrin (1 day-PHI, head and leaf lettuce, endive, escarole)

For leafhoppers, loopers and other caterpillars, Lygus bug.

Mustang 1.5EW: 2.4-4.3 fl oz/A.

Mustang Max (0.8EC): 2.24-4.0 fl oz/A.

Weed Control

Preplant Incorporated

Prefar 4E: Prefar may be used on head or leaf lettuce, arugula, cardoon, celery, Chinese celery (transplant only), cress dandelion, endive, Florence fennel, parsley, and radicchio. Controls germinating annual grasses and certain broadleaf weeds. Apply 5-6 qt/A Prefar 4E preplant incorporated. Preemergence applications are effective only if followed by irrigation within 36 hours. Not effective on muck soils.

Preemergence For Lettuce, Endive and Escarole

Kerb 50W: Controls annual grasses and broadleaf weeds. For lettuce on mineral soils, apply 2-4 lb/A Kerb 50W prior to weed emergence. Lettuce on muck soils apply 8-12 lb/A of Kerb 50W, prior to weed emergence. Endive and escarole, apply 2-3 lb/A. Can be incorporated before planting or applied to clean cultivated soil immediately after seeding or transplanting. Preemergence applications require irrigation to incorporate. Do not use post transplanting on leaf lettuce (55 days-PHI).

Postemergence

Poast: Controls annual and perennial grasses. Apply 1-1.5 pt/A Poast. (For head lettuce: 30 days-PHI; For leaf lettuce: 15 days-PHI). Do not exceed 3 pt/A/season. Add 1 qt/A nonphytotoxic oil concentrate. Rate depends on grass species and stage of development.

Select Max: Leaf lettuce only. Controls annual and perennial grasses. Apply 9-16 fl oz/A depending on weeds to be controlled. Include nonionic surfactant (NIS) at 0.25% of the finished spray volume. Repeated applications are permitted, at least 14 days apart but do not apply more than 64 fl oz/A in one growing season. PHI 14 days.

Shielded, Directed Spray

Gramoxone Extra: Controls emerged annual weeds and top growth of perennial weeds. Apply Gramoxone Extra 1.5 pt/A. Postemergence directed spray for emerged annual broadleaf weeds and grasses and suppression of perennial weeds. Use shields to prevent crop spray from contacting crop plants.