

Commercial vegetable production: lettuce

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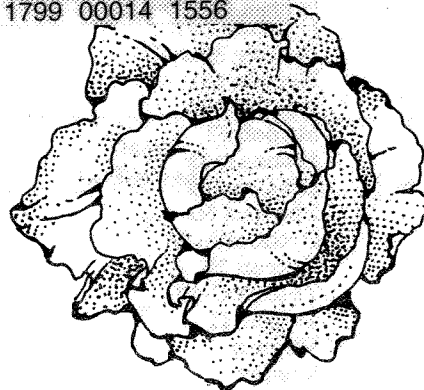
Quick Facts

Most of Colorado's lettuce is produced in the San Luis Valley and nearly all of it is the crisp-head type.

Crisp-head lettuce production is highly specialized and involves large crews, vacuum coolers and specialized equipment.

Lettuce is hand harvested with crisp-head being field packed in 24-head cartons and vacuum cooled.

Loose-head lettuce is grown near population centers for local consumption. It is generally top iced because there is not enough volume to vacuum cool.



The most popular leaf lettuce, however, is probably Grand Rapids. In all cases, mosaic free seed should be used.

Fertilizer

The fertility status of a soil is determined by a test conducted on a composite soil sample taken from the top 8 inches of the soil. The nutrients which need to be supplied will be recommended as part of the soil report. If not tested, the soil should receive 50 pounds of nitrogen and 200 pounds of phosphoric acid (P_2O_5) per acre with another 50 pounds of nitrogen applied just before the crop starts to head.

Fertilizer may be broadcast over the field prior to mulching or disking, or it may be shanked into the bed at planting. The fertilizer band should be placed 2 inches to the side and 2 inches below the seed.

Soil Preparation/Planting

Lettuce requires a good seed bed to obtain the precise seeding depth. With soils having a high clay fraction this is best done by plowing in the fall, listing up rough beds, and letting the frost

Colorado is currently producing 3000 A of head lettuce, the majority of which is grown in the San Luis Valley. Another 300 acres of leaf lettuce is produced annually around the Denver area and on the Western slope.

Lettuce varieties can be divided into crisp head and non-crisp types. Crisphead or iceberg lettuce have been standardized fairly well by the trade to pack 24-2 pound heads to a standard shipping carton. The production of this lettuce is highly specialized. It involves large crews, vacuum coolers, specialized equipment, and the capacity to ship full semi-trailer loads on a fairly regular schedule. While the industry has found no variety entirely satisfactory, the most commonly used variety is Mesa 659.

Non-iceberg lettuce types can be grown in Colorado in the spring and fall, but many varieties will not take the summer heat. Redleaf and Romaine will bolt during warm weather. Green Leaf and Boston will tip burn in hot weather after a shower.

The variety used will be dictated by the type of lettuce desired and the season. If a bibb type of lettuce is desired, the variety Bibb will be planted.

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action mellow the soil. In spring the beds can be shaped and planted. On lighter soils, spring plowing is satisfactory.

Forty to 44-inch beds with two rows on a bed are standard for lettuce production. An acre requires 0.5 to 1 pound of seed which is sown 0.25 to 0.5 inches deep. At lower elevations successive plantings are made from March to June 15 and started again on August 1 to September 15. In the San Luis Valley (high elevation) head lettuce plantings begin in April and continue until August. When day temperatures are above 83° F and night temperatures are above 53° F, germination will be poor due to high temperature dormancy. This can be overcome by planting in dry soil and sprinkling during the night when it is below 53° F. High temperature dormancy may also be overcome by soaking seed for 15 minutes in a 70 to 100 ppm Kinetin solution and drying. Kinetin is first dissolved in ethyl alcohol.

Irrigation

When planting in hot weather, a sprinkler system should irrigate during the night to overcome warm weather dormancy, otherwise, furrow irrigation may be used. Furrow irrigation is preferred by most lettuce growers because foliage stays dry and soil is not splashed onto heads. There is no provision for washing head lettuce since it is packed in the field.

At least one and as many as five irrigations can be required to germinate seed. Thereafter, irrigations are required only to maintain ample soil moisture in the root zone.

Weed Control

Balan (benefin) at the rate of 1 to 1.5 pounds of active ingredient may be applied and incorporated 2 to 3 inches deep before planting, using the lower rate in lighter soils. Prefar (bensulide) at 6 pounds of active ingredient per acre is also recommended and should be incorporated with a power-driven tiller. Crops not appearing on the label should not be used for 18 months after the last application of Prefar. Kerb 50W (pronamide) at 1 to 2 pounds of active ingredient per acre is also recommended.

Lettuce is hoed to thin plants to 12 to 14 inches apart and control weeds in the row, and cultivation is used to control weeds between rows.

Insect Control

Cabbage and alfalfa loopers commonly require control. Treatments need to be applied frequently enough to prevent insects from penetrating into the foliage where they will be protected from treatments. Ambush and Pounce have given superior looper control in recent trials.

Aster or six-spotted leafhoppers are the most important lettuce insect. During late summer this leafhopper transmits the aster yellows disease which can prevent head formation. Young plants

are particularly susceptible to this disease. During heavy leafhopper flights, weekly treatments are needed. The synthetic pyrethroid insecticides are currently the most effective.

Diseases

Bottom rot (caused by *Rhizoctonia solani*) produces reddish brown cankers and a rot of the stem and head at the soil line.

Damping off and seedling blights (caused by *Pythium*, *Rhizoctonia* and *Fusarium* species) cause a pre- or postemergence wilting and death of seedlings. Roots and hypocotyls are discolored, water-soaked and/or rotted.

Downy mildew (caused by *Bremia lactucae*) causes yellow, irregular areas on the upper surface, with white to purplish fungal growth on the lower surface of leaves. Spots turn brown and the leaf may die, especially during periods of cool, moist weather.

Gray mold (caused by *Botrytis cinerea*) can cause a damping off of seedlings; or rotting of stems, petioles, foliage and heads. Leaf tips may turn brown. The disease is favored by cool, moist weather, and heads may become covered by gray fungal growth.

Nematodes cause poor root development, root galls, root cysts, and/or stunted and yellowed plants.

White mold (caused by *Sclerotinia sclerotiorum* or *S. minor*) causes the outer leaves to wilt and die, with a watery rot of the plant. White, cottony fungal growth and hard, black sclerotia form on infected tissue in the field and in storage.

Big vein is caused by a soilborne virus transmitted by a fungus. Mature plants show a clearing of the chlorophyll adjacent to the major veins, hence the name big vein. There is no effective means of controlling big vein of lettuce. Fumigation is expensive and ineffective. Rotation is not practical because the causal organism remains in the soil for more than a decade. Resistant varieties seem to be the only hope, and one variety, Merit, has considerable tolerance.

Lettuce mosaic is spread primarily by the green peach aphid. Plants with seedborne virus scattered throughout the field are the principal source of infection. The control measures are to plant virus free seed and rogue out infected plants. It is being kept under control by seed indexing which prevents virus carrying seed lots from being sold.

Tip burn is a physiological condition which occurs under high relative humidities with high temperatures. Since the grower has little control over the environmental conditions which cause tip burn, the best defense is to use resistant varieties such as Mesa 659. Under favorable conditions for tip burn, even the resistant varieties will show the disorder.

Disease management recommendations generally rely upon crop rotation, pesticides, clean

seed and transplants, good seedbed preparation, and other production practices that reduce plant stress.

Harvesting and Handling

Lettuce is still primarily a hand harvest oper-

ation with most head lettuce fields being harvested twice. Packing is typically done in the field in cartons holding 24 heads with a good yield being 500 cartons. The cartons are vacuum cooled and shipped. Leaf lettuce is packed in a variety of containers and usually top iced since most operations are too small to warrant a vacuum cooler.

Table 1: Insecticide recommendations.

Insect	Insecticide	Rate (lbs Actual/A)	Days to Harvest	Remarks
Leafhopper	carbaryl (Sevin, Sevimol, Savit)	0.5-1.0	3	
	dimethoate (Cygon)	0.25	7	
	malathion	1.0	7	
	permethrin (Ambush, Pounce)	0.05-0.2	1	Restricted
	Disyston	As Labelled		Planting time treatment, do not allow contact with seed. Restricted.
Aphid	mevinphos (Phosdrin)	0.125-1.0	2-4	Restricted.
	dimethoate (Cygon)	0.25	7	
	malathion	1.0	7	
	Diazinon	0.25-0.5	10	
	endosulfan (Thiodan, Tiovel)	0.75-1.0	14	
	methyl parathion	1.0	15	Restricted
	Orthene	0.5-1.0	21	
	Metasystox-R	0.375-0.5	21	
	Disyston	As Labelled		Planting time treatment. Do not allow contact with seed. Restricted.
Loopers and Caterpillars	permethrin (Ambush, Pounce)	0.05-0.2	1	Restricted
	mevinphos (Phosdrin)	0.25-0.5	2	Restricted
	methomyl (Lannate, Nudrin)	0.5-1.0	7-10	Restricted. Longer wait for rates above 0.5 lb.
	endosulfan (Thiodan, Tiovel)	0.75-1.0	14	
	Orthene	0.5-1.0	21	
	<i>Bacillus thuringiensis</i> (Dipel, Thuricide)	As Labelled		Microbial insecticide, exempt from tolerance restrictions

Table 2: Disease control recommendations.

Disease	Pesticide	Application Rate (Acre)	Application Frequency (Days)	Days to Harvest
Bottom rot	Rovral 50	1.5-2 lb	10	14
Damping off and Seedling Blights	Dithane Z78	1 lb/50 gal	Drench soil after seeding	
	Arasan 70s (Thiram 42s)	5.3 oz/100 lb	Seed treatment	
Downy Mildew	Dithane FZ	0.8-2.4 qt	7-10	10
	Dithane M22 Sp	1-3 lb	3-10	10
	Maneb 80	1.5-2 lb	3-10 (max. 3 lb/A)	10
	Dithane Z78	3-4 lb	7	10
	Kocide Maneb	1.2-1.6 qt	7-10	7
	Kocide 101	1-2 lb	7-10	
	Kocide 606	1.3-2.6 pt	7-10	
	Maneb Fl	1.3-1.6 qt	7-10	10
	Manzate D	2.25 lb	3-10	10
	Cit Cop 5E	1.5-3.0 pt	7	
	Phaltan 50	2.0 lb	7	
	Orthocide 50	4.0 lb	7-10	
Gray Mold	Botran 75	2.7 lb	7 (max. 2 appl.)	14
Nematodes	Telone C-17	10-17 gal	Preplant, aerate 7-14 days	
	Telone II	9-15 gal	Preplant, aerate 7-14 days	
	Vapam	40-100 gal	Preplant, aerate 7 days	
	Vorlex	7-15 gal	Preplant, aerate 14 days	
White Mold	Botran 75	5.3 lb	After thinning (max. 1 appl.)	
	Ronilan 50	½ lb/100 gal	7-10 days after transplanting then 14 day intervals	28 (Do not use for leaf lettuce)
	Rovral 50	1.5-2 lb	10	14