

Crop Production Guide

Lettuce (Field)



Introduction

Lettuce (*Lactuca sativa*) is a leafy vegetable from the daisy family. This vegetable has enjoyed a long history of cultivation, as the crop was supposedly domesticated in ancient Egypt from the prickly lettuce *Lactuca scariola*. Lettuce has huge popularity today and due to its short maturity times and ease of cultivation, there are multitudes of options for lettuce cultivation in the field. Since the early domestication of lettuce, the leaf structure and growth habits have been further modified into four distinct types: romaine, crisphead, butterhead and loose leaf. Within these types there is a variety of cultivars to choose from that can meet the needs of both large- and small-scale vegetable operations.

Growth Requirements

In the field, lettuce responds well to moderately-to well-drained soils; the crop is adapted to a wide variety of soil types and profiles but shows greatest production on soils with a pH of 6.0 to 6.8. Light textured soils, which tend to warm quickly in the spring, are optimal for early harvest; heavier textured soils tend to delay harvest. Adequate soil organic matter is crucial for optimal lettuce production, as water deficit during growth can limit yield. Lettuce is a cool-season crop and exhibits maximal growth rates between 15 and 18°C. Temperatures above 30°C for several days will induce flowering (bolting) in lettuce, causing the leaves to take on a bitter taste, and making the produce unmarketable. Lettuce is very cold hardy, and fully acclimatized (hardened) lettuce transplants can tolerate temperatures as low as -4°C. Cool growth requirements, low maturity times, and cold tolerance make this crop a good candidate for double cropping in a field situation, especially if season extension technology can be employed.

Due to its long history of cultivation, there is a huge variety of lettuce cultivars available. Lettuce used for producing leaves fall into four main categories. While the different types of lettuce are similar in growth requirements, the leaves produced differ greatly in appearance and texture and thus have different culinary uses. The type and cultivar of lettuce selected should reflect the intended purpose of the leaf, the nature and size of the operation, and the harvest windows available.

Vegetable cultivars suggested in this production guide are based on available season length, tolerance to disease, and suitability for current production practices prevalent in the Province of Newfoundland and Labrador.

Crisphead Cultivars:
Dillon, Pacesetter, Yucaipa



Crisphead or iceberg lettuce produce crisp leaves that form a dense head.

Loose-leaf Cultivars:
Black Seeded Simpson, Tango, New Red Fire (red), Grand Rapids



Loose-leaf or bunching lettuce form soft leaves in a very loose crown, highly amenable to repeated cuttings over a longer harvest window.

Romaine Cultivars:
Green Forest, Valley Heart, Patrona M.I., Green Tower, Arroyo M.I.



Romaine lettuce produces crispy, upright leaves with great utility.

Butterhead Cultivars:
Barilla, Odyssey M.I., Skyphos M.I. (red)



Butterhead, Boston or Bibb lettuce form soft sweet leaves that form a crown.



Nutritional Value

Lettuce contains Vitamins A and C and is a good source of calcium and iron. The average head of lettuce contains 65-70 kcal.

Crop Establishment

Seed Germination

Lettuce seed will germinate at temperatures as low as 5°C but has optimal germination between 16-20°C. As temperatures increase past 20°C, germination will be inhibited. During summer germination for late summer or fall planning, it may be necessary to actively cool the germination area to ensure good germination and high vigor.

Seeding/Planting

Lettuce can be planted in the field as transplant or as seed. Seed should be sown as soon as soils are workable. Transplants are usually started four to six weeks prior to planting, depending on whether the greenhouse is heated.

Direct seeding may be aided by a seed coating to allow for precision spacing. Thin plants to meet specified spacing when two to three true leaves have formed.

Romaine and Crisphead type lettuce are planted in rows approximately 60 cm apart with plants spaced 30 to 38 cm within the row.

Loose-leaf and Butterhead lettuce are typically planted in row 45 to 55 cm apart with 22 to 20 cm between plants in the row.

Crop Management

Lettuce is a fast-growing crop that requires frequent irrigation and enjoys a cool growing season. In general, lettuce will require annual or supplied rain fall of 25 to 30 cm over the course of the growing season. As lettuce leaves are composed of 95 per cent water, the growth rate of the plant is very sensitive to insufficient water. Lettuce is also intolerant of high temperatures

– several days of temperatures in excess of 30°C will cause bolting and cause the leaves to take on a bitter, unpleasant taste and render the crop unmarketable. Lettuce that passes harvest maturity will also begin to bolt. Harvest management is crucial to ensuring minimal losses in lettuce production delayed harvest of a mature crop can render an entire planting unmarketable, and the perishable nature of lettuce leaves means the produce must arrive to the consumer within a few weeks or it is again unmarketable.

Nutrition

All soil fertility and limestone applications require soil analysis at the Provincial Soil, Plant and Feed Laboratory. Test soil before undertaking any agricultural activities. Consult your crop or soil fertility specialist for production recommendations.

Nitrogen: Butterhead, Romaine and leaf lettuce have the same general requirements for nitrogen, with a total requirement of 110-140 kg/ha depending on spacing and season length. Up to 55-70 kg/ha total nitrogen can be applied via broadcast and disked in prior to planting. The remaining 55-70 kg/ha can be applied three to five weeks after planting as a sidedress, preferably after thinning (if required). Splitting the sidedress into two small applications may give greater yield depending on cultivar, precipitation and season length.

Crisphead lettuce has a slightly lower nitrogen requirement, with a total annual application of 65-90 kg/ha. Up to 45 kg/ha can be applied at broadcast for higher applications; the remainder should be applied as a sidedress.

For organic soil (peat), nitrogen application rate can be increased by 25 per cent.

Phosphorus: Lettuce is unlikely to respond to additional phosphorus application if soil test values are above 375 mg/L. For organic soil, please consult your crop or soil fertility specialist.



Potassium: Lettuce is unlikely to respond to additional potassium applications if soil test values are above 380 mg/L. For organic soil, please consult your crop or soil fertility specialist.

Micronutrients: Small applications of boron, molybdenum and copper may be beneficial in lettuce grown on mineral soils, depending on soil test results. Application of these elements on organic, peat-based soil will be necessary.

If deficiency symptoms are suspected, contact your crop or soil fertility specialist for diagnostic services (soil or plant tissue analysis may be needed).

Application

Applications of blended fertilizer N-P-K should be broadcast and disked in before planting. This application should contain one-third to one-half of the total nitrogen fertility required for the year. The remaining nitrogen application should be side-dressed in either one or two subsequent applications.

If possible, incorporate micronutrients during broadcast with most of the macronutrients; if mid-season deficiencies are observed for these elements foliar application may be appropriate.

If applying raw manure, it must be applied at least 120 days before harvest.

Growers should either:

- Use properly composted or otherwise sterilized manure for application during the current growing season, or
- Apply raw manure in the fall before crops are planted the next spring.

Climatic Limitations

Climatic limitations for lettuce revolve around maintaining adequate water supply during growth and development, and avoiding exposure to temperatures greater than 30°C. For these reasons, insular Newfoundland has



regions well suited to the production of field lettuce. The Labrador region of the province and some areas on the central part of the island may see issues with excess temperature and prolonged periods (7 to 14 days) without adequate rainfall, which will require irrigation to produce a high quality product.

Pests and Diseases

Disease: Root Rot (Rhizoctonia, Fusarium and Pythium)

“Damping off” is a common name given to the symptoms of infection of seedlings by root rot fungus from the genera Rhizoctonia, Fusarium and Pythium. While the organisms that can cause this disease are not closely related, they share the same set of symptoms and controls. These diseases can affect lettuce production in both field and greenhouse situation. Damping off can affect a wide variety of vegetable crops at the seedling stage; however, lettuce are particularly vulnerable. The causal fungus attacks seedlings and young plants by rotting the root system which manifests as weak, stunted seedlings that eventually wilt and topple.



For lettuce transplants, the disease can be removed by sterilizing the trays and growth media the transplants are grown in. In addition, adequate air flow is essential. Filling trays so that the media is flush with the top of the tray, and periodically lifting any covering so moisture can escape, are necessary to ensure seedlings are not affected by the root rot fungi associated with damping off.

In the field, adequate drainage and proper seed or transplant spacing are necessary to release excess moisture from the soil. Excess moisture and wet conditions are favorable to the development of root rot diseases associated with damping off.

Disease: Gray Mold (Botrytis)

Gray mold can develop in the field during the seedling stage of lettuce development, but more often occurs in greenhouse transplants. The fungus usually develops in tissues near the soil surface. Early infection appears with outer leaves turning brown and taking on a slimy texture. As the disease progresses, large sections of leaves become brown and slimy, and small, gray, spore-producing structures become visible on the destroyed leaf surface. This is a fast-moving organism and can quickly spread to other plants in the immediate tray, other trays, and entire greenhouses if the fungus is exposed to high humidity and cool temperatures for several days. This organism has a wide host range, is present in most environments, and is opportunistic in that it will infect plants that have been weakened by waterlogged soil, drought, improper fertility or other pathogens such as those associated with “damping off.”

Gray mold can be controlled with good greenhouse and field sanitation. This includes removing all dead plant material, sanitizing seedling trays and benches, and cleaning watering systems. Moisture control is also key to control this pathogen. In a greenhouse situation, this involves proper venting and air movement in and around the growing plants. In the field, maintaining proper plant spacing to ensure air movement can reduce disease pressures.

Disease: Head Rot (several species of Pseudomonas bacteria, often multiple in one infection)

Pseudomonas bacteria cause a soft rot in a wide variety of crop plants. Under conditions where humidity is high and there is sufficient rainfall or other water movement, this disease can be highly destructive. Unfortunately, the different bacterial species tend to show infection and different entry points in the leaf, and thus can be complicated to identify properly. Early infection can manifest as small irregular, brown/yellow, roughly circular spots on the leaf surface. The disease can also appear at the margin or midrib and travel down the stem. Depending on the species of Pseudomonas, the bacterium can be restricted to leaf tissues or may work into the stem and root system, which also rot. Tests to properly identify which species of Pseudomonas has caused a plant disease generally involve genetic testing, or a series of petri dish experiments to see what substrates the bacterium utilizes.

Outbreaks of Pseudomonas bacterial infection often occur after physical damage to the plants by workers, machinery or insects. Infection is also greatly increased following high rainfall or waterlogged conditions. Control is greatly aided by proper soil drainage, plant spacing to ensure air movement and avoiding field activities during wet weather. The use of an overhead boom watering system is also not advisable when Pseudomonas has been identified as an issue.

Slugs (Mollusk)

Characteristics: As slugs are mainly nocturnal, damage is often observed during the first visit to the field in the morning. Damage may appear as irregularly shaped holes/feeding trails in the leaf. As there are several species of slug in the province and of varying size, these holes/trails may be confined to regions between leaf veins or encompasses most of the leaf. During moist periods, or after the plants have gained enough foliage to give adequate shade within the leaf canopy, you may find slugs actively feeding during morning. Slugs also leave a distinctive slime trail wherever they go, which



appears as a mucus-like film. The extremely thin film may be visible on the soil surface for several hours after the slug has left.

Slugs require high humidity and cool temperatures to remain hydrated and active. Areas with poor drainage can be problematic. Areas bordering the field that have lush vegetation may provide an area for slugs to hide during the day. If possible, keep areas close to fields free of excess vegetation, such that air can circulate to the ground layer of vegetation and not give the slug a hiding area. Diatomaceous earth and dry ash can be used to create a barrier that will slowly kill the slug; however, these tend to lose effectiveness when wet and are not feasible on large-scale plantings. Traps using boards or sunken cups and bait can be effective in small-scale operations. Using targeted watering techniques such as drip irrigation as opposed overhead irrigation can also be helpful in controlling slugs. Commercial pesticides for slugs are available in Canada.

For more information about crop production and soil fertility services contact: 709.637.2046

Harvest and Handling

Lettuce is a perishable vegetable and needs to be handled properly, cooled rapidly and sold quickly. To get maximum shelf life from the lettuce crops, field heat needs to be removed quickly after harvest. Typically, lettuce destined for wholesale is harvested, packed in containers, and quickly cooled either by vacuum or hydrocooling to bring the temperature of the produce to 1°C. Lettuce is stored or shipped at 0°C and a relative humidity of 98-100 per cent. If the lettuce has been properly handled in the field and cooled quickly and stored correctly it can be held in a marketable condition for two to three weeks depending on type.

