





Bacterial diseases of lettuce

Disease and cause	Photo	Symptoms	Disease cycle	Conditions favouring disease	Disease spread
Bacterial leaf spot <i>Xanthomonas campestris</i> pv. <i>vitiens</i>		Appears as water-soaked, circular, transparent spots on fully developed outer leaves. These areas develop into black spots that coalesce, often turning most of the leaf black. In moist conditions the disease may spread to inner leaves.	The pathogen survives and is transmitted in infected seed, infected crop debris and infected volunteer lettuce plants. <i>X. campestris</i> pv. <i>vitiens</i> infects lettuce leaves via stomata and hydathodes.	Disease is favoured by wet conditions and warm temperatures (24–29°C).	Pathogen spreads from infected plants by wind, rain and sprinkler irrigation.
Marginal leaf spot <i>Pseudomonas marginalis</i> pv. <i>marginalis</i>		Marginal leaf blight: As the name suggests, the disease mainly occurs on the leaf margins. The disease first appears as small pale spots that rapidly turn brown then black. Infected tissues become brown, and then dry and papery.	<i>P. marginalis</i> survives in the soil on infected debris, and alternative crop hosts such as onion, cabbage, and cucumber. <i>P. marginalis</i> infects plants through damaged tissue and leaf stomata – and particularly hydathodes – when leaves are wet.	Disease is favoured by wet conditions.	<i>P. marginalis</i> bacteria exude from marginal leaf blight lesions and are spread to other leaves and plants by rainfall or sprinkler irrigation.
Varnish spot <i>Pseudomonas cichorii</i>		Affects the inner leaves of head lettuce, and is characterised by shiny, dark-brown, necrotic lesions around the leaf midrib. Noticeable at harvest when outer leaves are removed.	<i>P. cichorii</i> survives on plant debris in the soil. The pathogen has a wide host range including celery, cabbage and tomato. <i>P. cichorii</i> mainly infects through stomata or leaf damage.	Pathogen favours wet conditions and warm temperatures (20–25°C) for infection.	Dissemination is via infected seed and water-splash.
Bacterial soft rot <i>Pectobacterium carotovorum</i>		First indications are rapid wilting of outer leaves. Water-soaked areas appear around infected wounds, and within 2–3 days infected tissue breaks down. Eventually, the head becomes wet and slimy and turns brown.	<i>P. carotovorum</i> survives in soil and crop debris. The bacterium generally enters plants through wounds caused by implements, insects, other infection, or weather events such as frost, hail, waterlogging or sun scorch. Mature plants are more susceptible.	Bacterial soft rot is associated with very moist conditions and warm temperatures (optimum 25–30°C).	<i>P. carotovorum</i> is spread by water (rainfall or sprinkler irrigation) and farm equipment.

Bacteria

- Bacteria are simple organisms, consisting of single cells.
- Most bacteria reproduce by simple division and can rapidly multiply.
- Bacteria do not form complex infection structures (as fungi do) and require openings to enter plant hosts.
- These entry points are natural openings in the leaves, such as stomata, or tissue damage caused by wounds from fungal/insect damage, hail, mechanical injury, or herbicides.
- Once in plant tissues, the bacterium multiplies in the intercellular spaces of the epidermis and then colonises the intercellular spaces of the mesophyll (inner leaf tissue).
- In the absence of suitable host plants, disease-causing bacteria reside in the soil, mostly on plant material.
- Spread of bacteria occurs by wind, water-splash, insects, implements and machinery.
- Unlike pathogenic fungi (e.g., *Sclerotinia sclerotiorum*, *Botrytis cinerea*) no particular pathogen structures can be seen on plant tissues infected with bacteria.

Disease management

- No lettuce varieties resistant to bacterial disease of lettuce.
- Bacteria-free seed must be used.
- Crop rotation (>2–3 years) with non-host plants.
- Plant lettuces in well-prepared ground that has good drainage.
- Copper sprays in combination with mancozeb. Note that lettuce can be susceptible to copper.
- Wider row spacing, rows arranged in the direction of prevailing winds, and lower plant density, improve air flow and decrease humidity around the plants.
- Irrigation should be carried out preferably in the morning and early afternoon to allow plants to dry out as soon as possible.
- Avoid excessive nitrogen fertiliser application, which can result in lush, succulent plants that are more prone to bacterial infection.
- Avoid working in the lettuces while plants are wet to reduce transmitting bacteria.
- As much plant debris as possible must be eliminated at harvest and must not be buried in the soil as the bacterium can successfully survive there. If no alternative, deeply bury crop debris.