

## Foliar blights in carrots: A perplexing issue

California is the leading producer of carrots in the United States. Carrots are grown year-round in diverse growing areas in California. Four main production areas in California are the southern San Joaquin Valley and the Cuyama Valley, the southern desert (Imperial and Riverside Counties); the high desert (Los Angeles County); and the central coast (Monterey County). Of all these areas, the southern San Joaquin Valley has the most concentrated area under carrot production with Kern County producing almost 60% of the total carrots in California. The nation's two largest carrot growers and shippers are also located in Kern County.

However, this pride of being the “Carrot Capital” in the nation also comes with several challenges for carrot cultivation. One such challenge is the pest/disease management as carrots are susceptible to various plant diseases. Proper identification and diagnosis of a disease is crucial for timely, efficient and economical management of the disease. One of the difficult group of carrot diseases that growers deal with are the foliar blights. These are easily noticeable in the field and are often hard to diagnose. Blight symptoms may look similar but can be caused by completely different pathogen.

The most prominent carrot foliar disease is *Alternaria* leaf blight, which can be troublesome during some years. Other foliar diseases are minor or may appear sporadically if conditions are favorable. *Alternaria* leaf blight is caused by fungus *Alternaria dauci* and can cause considerable damage to carrot tops, particularly in some varieties. Usually, the disease affects the older leaves first but can progress to young foliage if warm moist weather persists. Symptoms appear as dark brown to black necrotic lesions (often surrounded by a yellow halo) along leaf margins and petioles. These lesions may coalesce and expand to kill the leaves. In severe infections, tops will have scorched/ blackened appearance. Yield losses occur as the carrots cannot be lifted by the tops during mechanical harvest due to weakened tops. Often the spores are washed down to the base of the petioles by sprinkler irrigation and the black oblong spores can be observed using a hand lens. Under the microscope, long-beaked, multicelled conidia can be seen on the leaves and petioles of diseased plants.



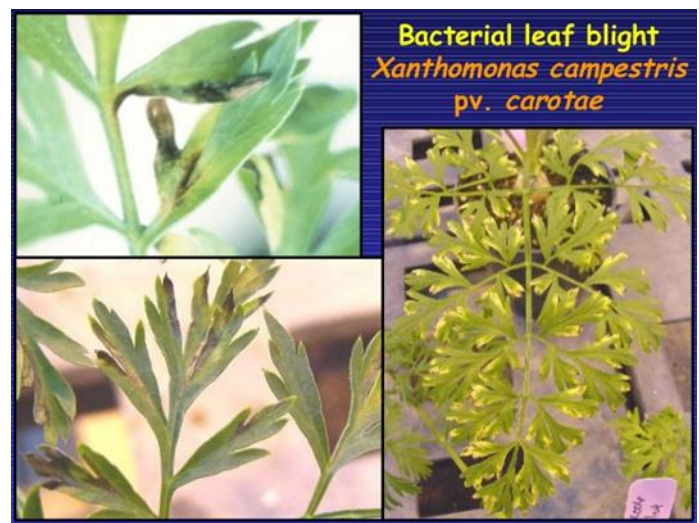
*Alternaria* leaf blight Pic credit Gerald Holmes

Early blight of carrots is another fungal disease caused by *Cercospora carotae* and is often problematic in coastal growing regions. Generally the young foliage and plants are preferred. However, under heavy infestation, both older and younger leaves are susceptible to attack. Symptoms appear as small, circular Early blight can be differentiated from Alternaria leaf blight by looking at the very thin thread-like spores on the lesions under a microscope.

Bacterial leaf blight, as obvious is caused by a bacteria *Xanthomonas campestris* pv. *carotae* could be a significant problem in certain carrot production areas in Antelope and Cuyama valley. Symptoms appear as irregular brown spots on leaf margins and may appear water soaked with an irregular yellow halo. These spots may coalesce and develop into dark brown streaks on petioles. Bacterial oozing, a noticeable clear bacterial exudate, which is a characteristic diagnostic feature of this disease can be usually seen with the lesions on leaves and petioles. Bacterial blight is often noticed in the field as brown areas about 3-4 feet in diameter.



Pic credit: Lindsey Toit, Washington state University



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Alternaria leaf blight and Bacterial blight are seed borne diseases and can be spread on or in contaminated seed. The best way to manage and prevent introducing these diseases into the field is by planting clean disease free or indexed seed. Seed treatment using hot water soaks is an effective method to ensure clean seed. The pathogens may also survive on infected crop debris. Incorporating the infected crop debris immediately after harvest (to hasten decomposition) will also help in managing these pathogens. Practicing crop rotation for 2-3 years will assure no surviving inoculum in the soil.

Fungicides may be used for control of Cercospora leaf blight and Alternaria leaf blight especially under favorable environmental conditions. Frequent scouting the field will help decide if and when further treatments are needed. An early application of a fungicide at the three to four leaf stage can be helpful in keeping the disease pressure low. Copper fungicides are sometimes used as preventative for Alternaria leaf blight and Cercospora leaf blight but once the disease is detected in the field other fungicides may be needed. Copper fungicides work best for bacterial blight, although this disease is rarely problematic.

Always check with the farm advisor, extension specialist or pest control advisors if there is any difficulty in determining what disease may be present in the field and how it can be managed.

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