HEALTHY FOOD SYSTEMS • HEALTHY ENVIRONMENTS • HEALTHY COMMUNITIES • HEALTHY CALIFORNIANS
University of California
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Bacterial disease of Onions

Bacterial diseases that can affect onion production in California are caused by several different bacterial pathogens. The main bacterial diseases causing significant production losses in California are Soft rot, Sour Skin, Slippery Skin and Center rot. However, these bacterial diseases are very similar in symptoms and are difficult to distinguish from each other. Most common symptoms include softening and water soaking of bulb tissue and breakdown of the fleshy scales inside the bulb. As the disease progresses, neck becomes soft and mushy and a yellow to brown discoloration is visible in the affected tissue. Most of the bacterial diseases may also have foliar symptoms.

These bacterial pathogens can enter through wounds on the foliage, neck, bulb, or roots caused by disease, insects or mechanical injury. In all cases, water is essential for entry and spread of the bacteria to the wound site and into the plant. Splashing water from sprinkler irrigation or rain are the most common ways that the soil inhabiting bacteria move from the soil onto the wounded area. Once inside the leaves, the bacteria advances into the bulb where the scales in the bulb breakdown. Often it is possible to trace the infected inner scales to the infected leaf. Onions are very resistant to these bacteria prior to bulbing but once the plants begin to bulb, the plants become susceptible to infection.

SYMPTOMS

Soft rot (caused by *Dickeya (=Erwinia) chrysanthemi, Bacillus cereus, Klebsiellla sp., Lactobacillus sp, Pectobacterium (=Erwinia) carotovorum* ssp. *carotovorum*)

Soft rot is mainly a problem on mature bulbs and is most common as a postharvest problem in storage or transit. The main sources of inoculum for soft rot pathogen can be contaminated soil and crop debris. Symptoms usually appear as water soaked areas on the older leaves near the soil line and eventually leaves become mushy. The soft rot progresses through the neck into bulb and the entire bulb breaks down with a soft foul smelling watery rot.

Figure 1. Pectobacterium carotovorum (Lindsey du Toit, WSU)

Figure 2. Dickeya spp (Lindsey du Toit, WSU)

Sour Skin: (caused by *Burkholderia (Pseudomonas) cepacia*) It is a late season disease where a light brown watery rot develops inside the leaves. Sometimes young leaves wilt and die back. Infected scales within the bulb are pale-yellow and rotten while the adjacent scales and the center of the bulb remain healthy and firm. Infected bulbs often are foul smelling due to secondary infection by yeasts. Sour skin bacteria also enters the onion plant through wounded leaves.

Figure 3. Burkholderia cepacia
(*David B. Langston, University of Georgia, Bugwood.org)*

Slippery Skin: (caused by *Burkholderia gladioli* pv. *allicola)*

Symptoms appear as one or two wilted leaves in the center of the plant and these leaves turn yellow and dieback at the tips while other leaves remain healthy. In the beginning, the affected bulb may appear healthy without any symptoms except softening of the neck. As the disease progresses, inner scales turn brown, soft and rotten. In slippery skin, the inner core slips out when the neck is squeezed.

Figure 4. Burkholderia gladioli subsp. *alliicola*
(*David B. Langston, University of Georgia, Bugwood.org)*

Center rot: (caused by *Pantoea agglomerans (Erwinia herbicola* or *Enterobacter agglomerans)* This is relatively a new disease in North America reported in 2006 in Georgia. Symptoms appear as small, tan-dark green water soaked lesions on center leaves. These lesions coalesce, followed by wilting and die back of infected leaves. Another common symptom

Figure 3 Pantoea agglomerans (Lindsey du Toit, WSU)

Figure 2 Pantoea agglomerans (Lindsey duToit, WSU)

of *Pantoea* is that the inner young leaves can become bright yellow and some varieties may be more susceptible than others. As the pathogen moves into the bulb, it causes reddish-brown discoloration of the scales. The bulbs may be foul smelling if the disease is followed by other secondary infections.

MANAGEMENT

A. Cultural control

1. Always use clean pathogen free seed and transplants.
2. Good sanitation practices like removing infested crop residues, cull piles and volunteer plants help in reducing inoculum levels in the field
3. Currently we do not have any commercial resistant cultivars. But growers should choose varieties with tight neck and erect tops as these are less susceptible to bacterial diseases especially soft rots and sour skin.
4. Crops rotation with non-host crops like corn, cotton or safflower for two or more years helps in lowering inoculum levels in the field.
5. Avoid excessive nitrogen applications.
6. One of the simplest measures (unfortunately not always possible) is to switch from sprinkler irrigation to furrow irrigation once the plants begin to form bulbs. This eliminates the splashing of water onto the leaves and bulbs and spread of the pathogen. These bacteria survive in water very well and using tail water further spreads the bacteria onto other plants.
7. Protecting the tops from wounding early in the season is important in avoiding bacterial problems later in the season.
8. Bulb mites and nematodes need to be avoided by proper field preparation and field site selection before planting.
9. Harvest onions only after the tops are fully matured and avoid rough handling of the bulbs to prevent bruising and injury.
10. Cure and store bulbs at 32 to 36ºF (32–34ºF for sour skin) with adequate ventilation to prevent moisture on the bulbs that provides a favorable site for the bacteria to grow.

B. Chemical Control

Application of a copper based bactericide can slow infection and spread of the pathogen, however, there are also concerns about copper tolerant strains of bacteria. Applications should

begin two weeks before bulb initiation and continue at 5-7 day intervals until harvest Copper bactericides are only effective as a preventive application and will be ineffective after symptoms develop. Copper bactericides mixed with EDCB fungicide such as Mancozeb or Maneb may also help in reducing dissemination of the pathogen. Products like Oxidate (hydrogen peroxide & peroxyacetic acid) can be used to reduce bacterial populations on leave surface but will not have curative properties.

Note: A group of three UC Farm Advisors and a UCR Plant Pathologist have received a grant from USDA (NIFA Award #2019-51181-30013) to research onion bacterial bulb diseases in collaboration with a larger group of researchers from 11 other states. This upcoming onion season, we'll be starting surveys of commercial onion fields. Beginning the following season, we'll establish field trials to evaluate management methods. I will be looking for affected onion fields in spring/early summer of 2020. I hope you'll call or email me to let me know about any local fields with suspected symptoms.

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