MANAGING BLACKLEG IN POTATO

WHAT IS IT?

This fact sheet provides information on managing Blackleg in potato crops, the bacteria which commonly cause the disease and what you can do to prevent and manage it.

Blackleg on potato can be caused by either *Pectobacterium* or *Dickeya* species, and they often work together in different combinations to cause this disease. Both bacteria species belonging to the *Pectobacteriaceae* family. In Australia, bacteria causing Blackleg was previously classified as *Erwinia* species.

WHAT DOES IT LOOK LIKE?

Blackleg causes stem decay, often extending several centimetres above the ground. Damage to the inside tissue continues even higher up inside the stem (**Figure 1** right). Plant leaves may turn bright yellow and/or curl and the plant will eventually wilt and die (**Figure 2 lower** right). Infected plants produce few or no tubers.

Blackleg can also cause severe seed decay and lack of plant emergence in severe cases (**Figure 3** below).

Figure 1: Blackleg internal symptoms where the two plants on the left are infected by soft rot bacteria, causing blackened internal symptoms and crop wilt, compared with a healthy plant on the right (© 2020 DPIRD)

Figure 2: Potato plant in field infected with Blackleg (Dr Nandita Pathania, QDAF)

Figure 3: Signs of non-emergence in infected seed lot in the United States (©2017 Dr Steven B. Johnson, Ph.D. University of Maine Cooperative Extension)

HOW DOES IT DEVELOP AND SPREAD?

Pectobacterium and *Dickeya* are not commonly found on minitubers grown in greenhouses or glasshouses. Infection of seed tubers generally occurs once planted in the ground or can also occur during grading. Each generation of potato multiplication tends to increase the risk of *Pectobacterium* and *Dickeya* incidence on potato tubers. The bacteria can live in tuber lenticels without causing disease (asymptomatic) so it is not possible to visually assess seed potato lots for risk.

It is not possible to determine visually whether plants are infected with *Pectobacterium* or *Dickeya* as the symptoms are so similar. Confirmation of which pathogen is present can only be confirmed through laboratory testing. Laboratory testing for these bacteria can be done in Australia but is expensive.

Blackleg development is highly dependent on the environment and is unpredictable. It can occur at any time during the growing season and development is favoured by cool, wet conditions at planting followed by warmer weather. Temperatures above 30°C during the growing season appear to be particularly conducive to disease development.

When infected tissues break down, bacteria are released into the soil and travel in soil moisture to other plants. Blackleg causing bacteria do not survive in the soil for more than a few months, however they may survive in crop debris, weeds, volunteer potatoes and water. They can also be transmitted by insects.

The main spread of both these bacteria occurs at harvest. Bacterial numbers increase dramatically on dying vines and the bacteria will contaminate harvest equipment and may become air-borne during harvest.

Pectobacterium can enter daughter tubers through the stem or through wounds caused by insects, mechanical damage, or harvest equipment. Once inside a tuber, it will decay the inside of the tuber, but not the tuber skin, causing bacterial soft rot (**Figure 4a and 4b above**).

Figure 4a: External view of a tuber showing a water-soaked lesion with bacterial ooze (© 2020 DPIRD)

Figure 4b: Cross-section of infected tuber showing internal rot (© 2020 DPIRD)

The bacteria will also decay stems damaged by cultivation equipment or severe weather, causing above ground stem rot. It is common to find multiple *Pectobacterium* species or *Pectobacterium* and *Dickeya* together when blackleg, aerial stem rot, or soft rot symptoms are present.

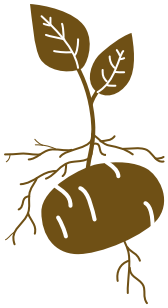
HOW CAN I MANAGE IT?

Below are some steps that can be taken to reduce the risk of Blackleg. Most of these management principles will also help to prevent other tuber diseases.

TO REDUCE THE RISK OF DISEASE AT PLANTING:

- Use certified seed which has been inspected for disease symptoms during their production.
- Plant whole seed rather than cut seed, particularly in regions where tuber soft rot and blackleg diseases have been a problem (such as in warm or wet soils).
- Fully suberize seed (form a permanent wound barrier) if using cut seed.
- Do not plant cold seed into wet ground.
- Schedule planting to avoid periods when extremely wet or high temperatures prevail.
- Practice long crop rotations (4 – 8 years), particularly for seed production.

TO REDUCE THE RISK OF DISEASE DURING CROP GROWTH:



- Irrigate with non-contaminated water and avoid over-irrigating to minimise water flow in crops.
- Do not over-fertilise with nitrogen and maintain optimal calcium and magnesium levels in plants.
- Do not rouge (remove) infected plants as this is likely to spread the disease.
- Avoid the risk of cross-contamination between alternative host crops such as ornamental bulbs grown in the same paddocks and weeds.
- Practice good farm hygiene and avoid the movement of machinery or personnel between contaminated and non-contaminated areas on farm and/or disinfect equipment between paddocks.

TO REDUCE THE RISK OF DISEASE DURING AND AFTER HARVEST:

- Quickly kill potato vines (the bacteria will multiply on the vines as they senesce, so limiting senescence may reduce disease incidence the following year).
- Avoid physical damage to tubers, roots and stems which provide entry points to bacteria during harvest and grading.
- Tubers should be allowed to suberise (curing) before going into storage.
- Ensure storage conditions are suitable for reducing soft rot development including good airflow, high humidity and appropriate levels of oxygen and carbon dioxide, do not overfill stores.

WHERE CAN I FIND MORE INFORMATION?

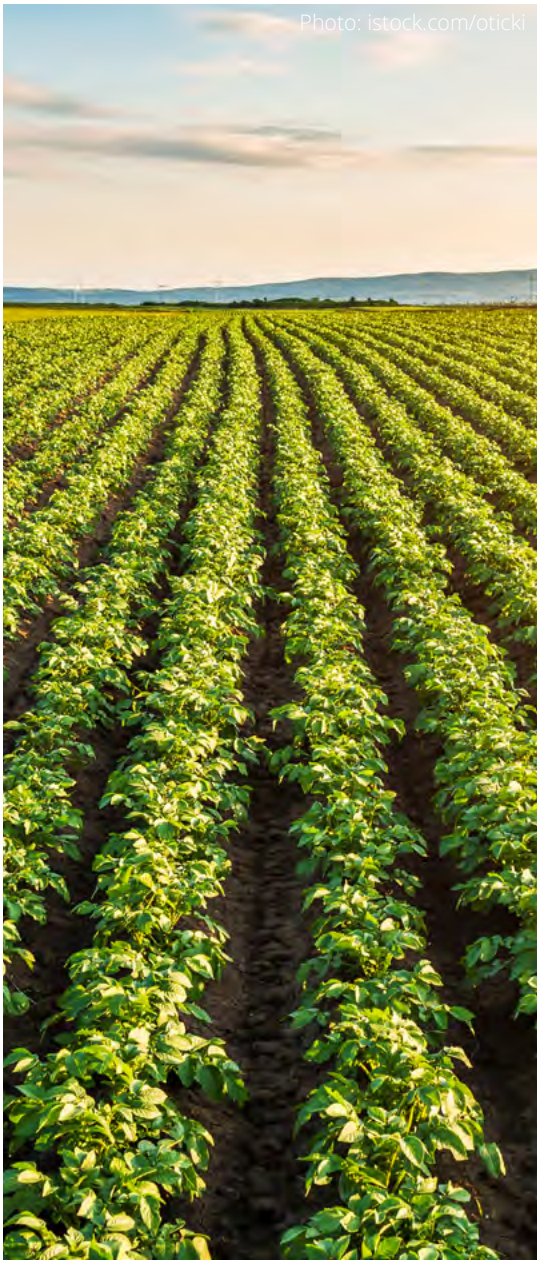


Photo: istock.com/oticki

Acknowledgements and references:

The Potato Crop Its Agricultural, Nutritional and Social Contribution to Humankind (2020) Hugo Campos and Oscar Ortiz (eds) Chapter 10 Bacterial Diseases of Potato by Amy Charkowski, Kalpana Sharma, Monica L. Parker, Gary A. Secor, and John Elphinstone

Review Bacterial Blackleg Disease and R&D Gaps with a Focus on the Potato Industry PT18000 (2018) Len Tesoriero, Crop Doc Consulting

Dr Rachel Mann *personnel communication*

Soft rot diseases of potatoes (2017) Andrew Taylor, Department of Primary Industries and Regional Development

Further resources:

Control of black leg, black scurf and other postharvest storage rots of seed potatoes PT105 (1996) Rolf de Boer, Agriculture Victoria

Effect of calcium nutrition on decay of summer sown seed potatoes PT98011 (2003) G. Howell, A. Boulton, A. Watson, NSW Agriculture

Blackleg on Potatoes in Australia (2019) S.B. Johnson, AuSPICA

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