ISSUE2204

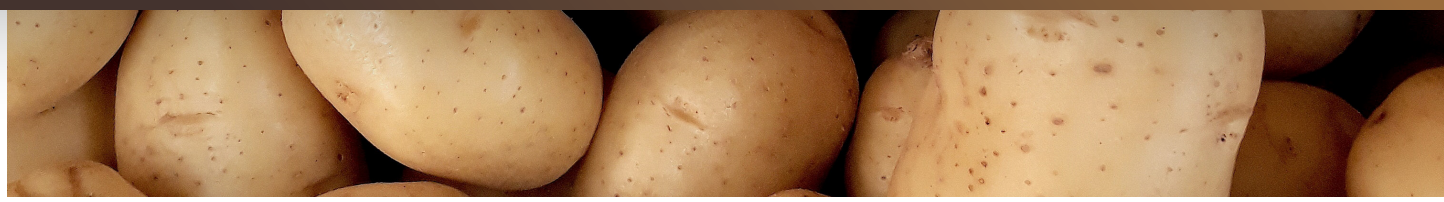
FACTSHEET

POTATO LINK
AUSTRALIAN POTATO INDUSTRY EXTENSION PROJECT

BLACKLEG

Dickeya spp. and *Pectobacterium* spp.

By Ryan Hall



KEY POINTS AND RECOMMENDATIONS

- Managing blackleg requires multiple integrated strategies to achieve the best result
- The most common source of inoculum is infected seed – using certified seed is vital
- If blackleg is suspected of occurring in a crop, growers should consult with their agronomist and have a sample DNA tested
- There are no resistant varieties of potato to blackleg
- There are no chemical controls available for blackleg in potatoes
- While blackleg disease is not widespread, the Australian potato industry should remain alert

WHAT IS BLACKLEG?

Blackleg is a bacterial infection of potato tubers and stems. While the disease is not widespread in Australia, new causal organisms have been identified over the past few years, warranting industry awareness. It is caused by two main bacterial pathogens – *Dickeya* spp. and *Pectobacterium* spp. (formally *Erwinia* spp.). These pathogens can rapidly and aggressively increase from very low inoculum levels and spread through crops.

Blackleg bacteria usually infect the plant through wounds and natural openings. The pathogen can survive in spaces between plant cells and the vascular tissue, remaining dormant until conditions are favourable for disease to develop. As infection does not always result in rots, the disease can spread asymptomatically. Tubers and plants may remain asymptomatic until after the crop has been harvested and is in storage.

Various species that cause the disease are present in different parts of Australia. This can impact the symptoms observed. In Australia, blackleg can be broadly separated into two groups, "new" and "old".

"New blackleg"

- *Dickeya dianthicola*
- *Pectobacterium brasiliense*
- *Pectobacterium parmentieri*

"Old blackleg"

- *Pectobacterium atrosepticum*
- *Pectobacterium carotovorum* (common soft rot)

The new blackleg pathogens are more suited to Australian conditions and a greater risk to production. They have been reported to cause up to 90% loss in some crops overseas. The main cause of blackleg in Europe is *Dickeya solani*. While this pathogen is not thought to be in Australia, it is possible that other *Dickeya* species are present.

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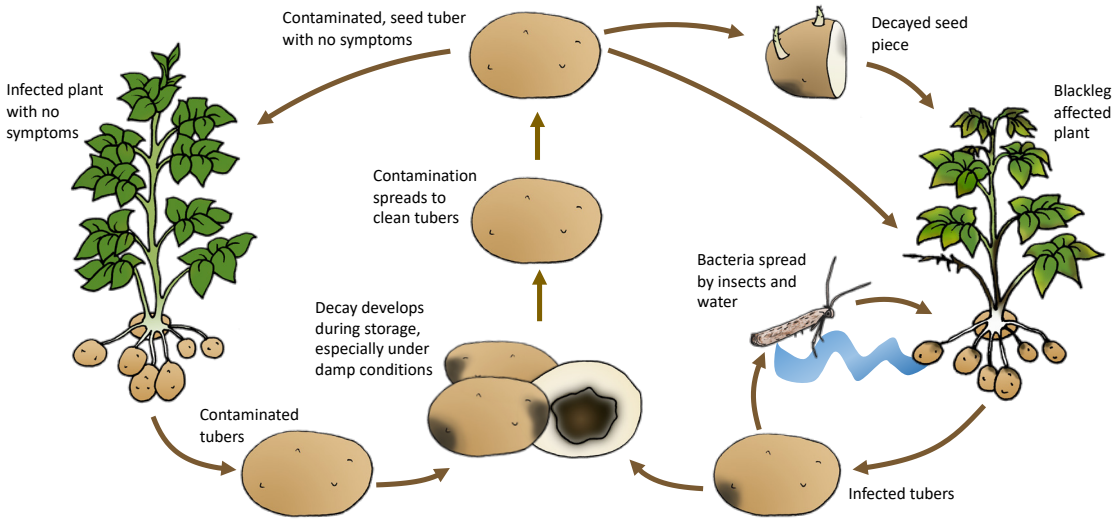

Figure 1. Life cycle diagram of blackleg (J. Ekman, adapted from V. Brewster)

FAVOURABLE CONDITIONS FOR DISEASE DEVELOPMENT

- High soil moisture and low oxygen concentration
- Planting seed in warmer soil
- Temperatures greater than 30ºC during the growing season
- Dense canopies and prolonged periods of leaf wetness
- Physical damage to tubers by insects, equipment or during harvest
- Stems damaged by cultivation or severe weather
- Natural openings present on leaves, stems and tubers

SYMPTOMS OF BLACKLEG

Note that while there can be slight differences between the bacterial species that cause blackleg, the symptoms of *Dickeya spp.* and *Pectobacterium spp.* are often too similar to easily distinguish by eye. Accurate identification can be made through DNA testing in Australian laboratories.

On the plant

- Stem decay, often extending above the ground (Figures 2 and 3)
- Internal stem decay that extends beyond the symptoms of external stem decay
- Bright yellow leaves, leaf curling and wilting (Figure 4)
- Uneven emergence
- Progression of the disease down rows

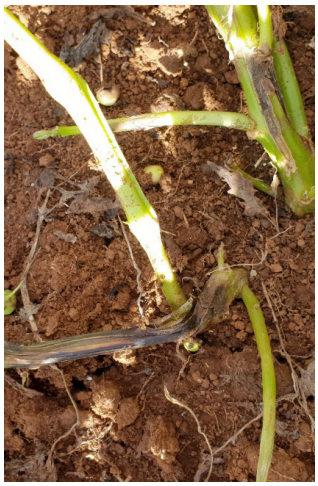

Figure 2. Stem decay caused by *Dickeya* spp. (source: N. Malseed)

Figure 3. Stem decay caused by *Pectobacterium parmentieri* (source: N. Malseed)

Figure 4. In field symptoms of *Pectobacterium parmentieri* plus *P. brasiliense* (source: N. Malseed)

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On the tuber

- A reduced number of tubers or no tubers produced by infected plants
- Internal parts of the tuber decay, but not the skin
- Tissue appears macerated and can have a creamy exudate which will eventually turn black (Figure 5)
- Tubers with "old blackleg" often have a foul smell
- Some infected tubers will remain asymptomatic until planting.

Figure 5. Tuber decay caused by blackleg (photo Paul Bachi, University of Kentucky Research and Education Center, Bugwood.org)

PREVENTION AND MANAGEMENT OF BLACKLEG

In Australia, significant resources have been invested in seed certification in order to prevent spread of blackleg disease. Since 2019 the seed potato certification scheme has implemented a zero tolerance for *Dickeya dianthicola,* utilising DNA testing to ensure clean seed. This program has succesfully reduced incidence of disease, with the result it is relatively uncommon in Australia.

Using clean seed is the key tool for managing blackleg, as there are no other easy solutions. There are currently no resistant potato varieties or chemical controls available. Instead, growers should focus on implementing multiple controls on-farm:

- Reduce risk at planting
  - Use certified disease-free seed
  - Plant whole seed rather than cut, especially in warm or wet soils
  - Avoid planting in extremely wet periods or high temperatures
  - Avoid planting in paddocks that have previously grown alternative hosts
  - Ensure strong on-farm hygiene of equipment and machinery
  - Adopt long rotations between potato crops (4-8 years), especially for seed production
- Reduce risk during crop growth
  - Ensure plants have adequate calcium and magnesium
  - Maintain optimum soil moisture conditions by managing irrigation and drainage
  - Avoid disturbing infected plants, as this can spread disease
  - Avoid mechanical damage to plants and tubers where possible
  - Manage insect pests to avoid damage to plants
- Reduce risk during and and after harvest
  - Avoid harvesting fields while wet
  - Dry harvested tubers before storage
  - Use a modern cool store with effective environmental control technologies
  - Ensure tuber stores are well ventilated and temperature kept stable at around 5°C

FURTHER RESOURCES

https://potatolink.com.au/resources/potatolink-issue-01-dbm8d

Blackleg: preventing a problem – N. Malseed and N. Crump (pg. 20-21)

https://ausveg.com.au/infoveg/infoveg-database/

PT00105 - Control of blackleg and other postharvest storage rots of seed potatoes

PT18000 - Review bacterial blackleg disease and R&D gaps with a focus on the potato industry

https://www.soilwealth.com.au/resources/fact-sheets/pest-and-disease-management/managing-blackleg-in-potato/

https://www.auspica.org.au/wp-content/uploads/2019/02/Blackleg-on-Potatoes-in-Australia.pdf

https://ausveg.com.au/articles/reviewing-best-practice-for-potato-soft-rot-and-blackleg/

https://ausveg.com.au/articles/managing-blackleg-in-potato-crops/

https://www.aphis.usda.gov/plant_health/plant_pest_info/potato/downloads/dickeya/blackleg-%20prevention-control.pdf

https://www.apsnet.org/edcenter/disandpath/prokaryote/pdlessons/Pages/Blacklegpotato.aspx

Wright, D., Bwye, A., Banovic, M., Baulch, J., Wang, C., Hair, S., Hammond, N., Coutts, B. and Kehoe, M., 2018. First report of *Dickeya dianthicola* in potatoes in Australia. Plant Disease, 102(10), pp.2029-2029.

Czajkowski, R., Perombelon, M.C., van Veen, J.A. and van der Wolf, J.M., 2011. Control of blackleg and tuber soft rot of potato caused by *Pectobacterium* and *Dickeya* species: a review. Plant Pathology, 60(6), pp.999-1013.

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