



Potatoes - bacterial wilt

Roger Osborn, Knoxfield

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Bacterial wilt is one of the most destructive diseases known to attack plants, and has a very wide host range. On potato, the disease is also known as brown rot, southern wilt, sore eye or jammy eye.

Bacterial wilt of potato is generally favoured by temperatures between 25°C and 37°C. It usually does not cause problems in areas where maximum day temperatures do not exceed 25°C and where night temperatures fall below 13°C.

Under conditions of optimum temperature, infection is favoured by wetness of soil. However, once infection has occurred, severity of symptoms is increased with hot and dry conditions, which facilitate wilting.

Bacterial wilt is a serious problem in many developing countries in the tropical and sub-tropical zones of the world. It is usually found between the latitudes 45°N and 45°S. It has been recorded in all Australian states except Tasmania.

Economic importance

At an international level, bacterial wilt is responsible for losses amounting to hundreds of millions of dollars.

In Victoria, the Trafalgar area and a large portion of the Koo-wee-rup Swamp were abandoned for potato growing about 60 years ago because of the losses resulting from the severity of the disease. More recently, crops near Catani have been a total loss and others in the Gembrook and Erica areas severely affected.

Potentially the greatest threat is to the seed industry. Some importing states and overseas countries regard bacterial wilt in the same light as black wart, ring rot, and golden nematode, and ban imports from areas known to be infected.

The disease can cause total loss of a crop and prevent the use of land for potato production for several years.

Causal organism

Bacterial wilt is caused by a soil-borne bacterium named *Pseudomonas solanacearum*. On the basis of the type of host plants it attacks it is divided into three races, and on the basis of its biochemical properties it is divided into four biovars. The most widespread strain in Australia is race 3/biovar II. This strain is known to occur in New South Wales, Queensland, Victoria and Western Australia, and it primarily attacks potato. Two other strains, which attack other hosts

besides potato, are also known to occur in Australia, but these are confined to the Northern Territory and Queensland.

Host range

Bacterial wilt attacks more than 200 species of plants belonging to 33 families. These include economically important hosts such as tobacco, potato, tomato, eggplant, pepper, banana, peanut and beans. Thorn apple and nightshade are two common weed hosts that are attacked by the disease.

Symptoms

Typical symptoms are wilting, yellowing and some stunting of the plants, which finally die right back. Wilting is first seen as a drooping of the tip of some of the lower leaves similar to that caused by a temporary shortage of water. At first only one branch in a hill may show wilting. Affected leaves later become permanently wilted and roll upwards and inwards from the margins. The wilting then extends to leaves further up the stem and is followed by a yellowing of the leaves. This yellowing, wilting and in-rolling of the leaves makes diseased plants very obvious, especially when surrounded by healthy plants. The leaves finally turn brown and fall off, beginning at the base of the stem and continuing upwards.



Figure 1. Typical wilt symptoms caused by Pseudomonas solanacearum

Symptoms in the tuber are very specific: brownish-grey areas are seen on the outside, especially near the point of attachment of the stolon. Cut tubers may show pockets of white to brown pus or browning of the vascular tissue which, if left standing, may exude dirty white globules of bacteria. As the disease progresses bubbly globules of bacteria may exude through the eyes; soil will often adhere to the exuded bacteria, hence the name 'sore eyes' or 'jammy eyes'.



Figure 2. Bacterial ooze from vascular ring of a cut infected potato tuber



Figure 3. Typical 'sore-eye' symptom on infected tuber

Disease cycle

Potato wilt bacterium is a soil-borne organism primarily inhabiting the roots. It enters the root system at points of injury caused by farm implements, nematodes and by other means. It is spread by irrigation water and contaminated soil.

The wilt bacterium is able to survive for periods up to 2-3 years in bare fallow soils, and for longer periods in soils cropped to non-solanaceous crops.

Infected seed is an important method of dissemination, both locally and over considerable distances. It is not the heavily infected tuber that is the problem since these generally rot away, only maintaining contamination of the land in which they were grown. However, slightly infected tubers, which show no visible symptoms, pose a serious threat of spreading the disease to new areas. Self-sown potatoes are extremely difficult to eradicate and, if a paddock is infected, the disease may remain in it for five or six years after the initial outbreak.

Bacteria can also be spread to clean tubers from an infected seed-cutter. There is also a real danger of infection if secondhand bags are used or if half tonne bins have held infected potatoes. Growers should be aware of these risks and take precautionary measures.

Control

Bacterial wilt is difficult to control because of the soil-borne nature of its causal organism. Thus, rotations with non-solanaceous crops for periods exceeding five years, and fallowing for periods exceeding three years, may be required.

Although several resistant varieties have been developed in recent years, they have not been found to be entirely satisfactory. Of the current varieties Katahdin and Sebago show some resistance provided that the level of field infection is not too high.

However, the most practical means of controlling the disease are the use of certified seed, and planting in areas where bacterial wilt has not occurred previously. Exclusion of the disease may be exercised by quarantine or other legislative measures. For example, Tasmania, which so far has not recorded bacterial wilt, is very careful to import only healthy seed. New Zealand and South Africa ban the importation of seed from areas known to have the disease. Other measures of control include:

- Machinery taken onto a diseased paddock should be left on the paddock while it is being worked.
- Machinery removed from the paddock should then be washed clean with a disinfectant solution.
- Clothing and boots of people working in the paddock should be exchanged for clean items when leaving the paddock, or else boots should be washed in a suitable disinfectant.
- Irrigation water should never be allowed to run freely over or below the soil surface. It should never be allowed to return to the dam or stream from which it is pumped, nor to any other irrigation source.
- After harvest all diseased and discarded tubers should be collected and buried at least one metre underground.
- On no account should any of the produce from a diseased crop be kept as seed.
- The diseased paddock should then be sown down to pasture for at least five years.
- Clean seed potatoes, preferably certified seed, should be used for future crops on that property.
- If secondhand bags or half tonne bins have been used to hold potatoes, these should be thoroughly washed and disinfected before being used again. Bags should be disinfected or discarded.

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