



Pseudomonas Syringae Pv Actinidiae (Psa) – What is it and where did it come from?

Kiwifruit Journal January/February 2011

SHANE MAX – ORCHARD PRODUCTIVITY MANAGER GLOBAL SUPPLY

Pseudomonas Syringae pv Actinidiae (Psa) was confirmed for the first time in New Zealand on 8 November, 2010. Psa is considered by the Korean Plant Pathology Journal as “one of the most serious limiting factors for cultivating kiwifruit.” This bacterial disease has caused devastation to other kiwifruit communities globally, therefore the New Zealand industry’s response was focused and fast. There are many unknowns associated with Psa, especially in a new environment, but we can learn from the experience of others and adapt it to manage Psa in New Zealand.

What is Psa?

Psa is a rod-like organism in shape and while fungal pathogens are common in cultivated crops, bacterial diseases are much more rare and usually prove difficult to manage.

Psa attacks only kiwifruit vines however there are other pseudomonas species that attack other plants, such as stonefruit blast. Pseudomonas syringae syringae (bacterial blossom blight) and pseudomonas syringae sp. are also found on kiwifruit.

With an aerosol spread, the bacteria does not float in the air; it requires a vehicle to move on, such as water or moisture. Therefore, excessive wet and humid weather especially with cooler temperatures is ideal for Psa spread and a drier climate reduces the ability to spread.

Once a bacterium infects a kiwifruit leaf, the leaf’s self defence mechanism is to breakdown the area around the bacteria in an attempt to reduce the spread within the plant. Bacteria also produces phytotoxins as secondary metabolites. One of the secondary metabolites (a pigment in this case) can cause halo blight (brown coloured spots with a light coloured edge). This results in leaf-spotting, often with a yellow glow, a common symptom of bacterial infection.

Once it spreads into the vascular system of the kiwifruit vine, shoot wilting and vine die back can occur. The bacteria is thought to stay latent in the vine but when the conditions are right it is thought that the proliferation of bacteria occurs blocking the vascular tissue. An orange fluid weeping from the vine sometimes is a sign that the vine is infected, but this symptom is not unique to Psa.

The systemic nature of the disease species means it can move within a plant without expressing symptoms on the exterior of where it has travelled. This complicates management of the disease as it is not clear how infected the vine is.

The full life-cycle of Psa is still being defined by researchers. The limited nature of the kiwifruit season, environmental differences and the range of types of Psa limits the ability to define a life-cycle, however it is being investigated.

Overseas, control of Psa has depended on good vine hygiene, cutting back infected material and the application of bactericides such as copper. Unfortunately excessive spraying of bactericides also results in resistant types of Psa, reported as a problem in Japan.



The most common Psa symptom in New Zealand is brown, angular leaf spotting.

Where did it come from?

Originally described in Japan in 1983, the origin of the disease is not confirmed but thought to be from the wild. South Korea then confirmed Psa in 1988, where bacterial canker spread rapidly on Jeju Island. Comparison studies between South Korea and Japan suggest they may have different origins. There is literature from China on the topic suggesting it is very likely to be there although no formal testing has confirmed Psa to international authorities.

In Italy, Psa was first identified in the north in 1992 however it was in the southern region of Lazio that economic loss began in 2007/08 and has grown each season since.



Advanced Psa symptoms, wilting and shoot die back.

In New Zealand, leaf spotting was seen on a Te Puke orchard and Plant & Food Research were notified. After preliminary tests were positive for Psa, the Ministry of Agriculture and Forestry (MAF) and ZESPRI were notified. Further testing then confirmed Psa.

New Zealand Biosecurity tests for a variety of diseases on the arrival of kiwifruit plant material from other countries. Along with border protection, the New Zealand climate differs so much from the most recently badly-affected country, Italy, that Psa was not considered to be a high risk. However, initial discussions with MAF had occurred and an internal ZESPRI group had been formed to plan for this instance.

Why don't we know more?

New Zealand's industry structure differs from everywhere else in the world. In other countries, if a grower has a vine disease, they are less likely than most New Zealand growers to work with their neighbour to fix it. There is not necessarily the community spirit or unity that we have in New Zealand in most other kiwifruit growing areas in the world. We only have to look at the amount the New Zealand industry spends on kiwifruit research in comparison to other countries to see how much more effective our industry is at working together. Therefore the Psa science, data and even the ability to gather information, has been largely fragmented and under-resourced in other countries. We also can't forget that kiwifruit is not the primary crop for the majority of overseas growers.

New Zealand's environment and how Psa behaves here has created a whole new Psa experience that will have to be learnt about over time. Chinese and Japanese researchers have done the most work on Psa but even this is limited. ZESPRI and Plant & Food Research began programmes in 2008 as a response to the Italian outbreak.

Could we have had this for years?

Yes, New Zealand could have had Psa for some time however the symptoms seen on the three orchards with advanced symptoms (at the time of writing) were very different to anything seen before in New Zealand. For the very large majority of Psa-positive orchards the symptoms were limited to leaf spotting. Very little occurrence of further symptoms, suggesting the disease has entered the vascular system of the plant, has been seen. However, the Psa attack, progressing from leaf-spotting to wilt die-back and weeping canes in a matter of days on the few orchards with advanced symptoms, was intense and similar to that seen overseas.

There may be many possible reasons why some vines progressed quickly on those few orchards this year which still need to be understood. However, the speed in progression showed we were not dealing with low level leaf spotting that many orchardists had seen similar versions of in the past without problem; we were dealing with the disease that had caused devastation in other growing regions. The concern now is that for the coming years, as other countries have found, Psa symptoms can very dramatically depend on environmental conditions.



Testing leaf samples for Psa.

So why is it a problem now?

In 2010, the Bay of Plenty had one of the wettest springs. The Italian environment acted similarly, but on a more intense scale, before their outbreak turned to the beginning of the real devastation in 2008. This was then

followed by another record-breaking weather event the next winter and spring seriously increasing the disease damage.

Because of the reduced ability to spread in a drier, warmer environment, Psa symptoms appear to have slowed in New Zealand and this is expected to continue through summer. In saying that, we don't know what Psa will do in the New Zealand environment so stricter orchard hygiene standards should still be followed and orchards still monitored for symptoms. Psa symptoms may occur again when wet, cooler weather returns in autumn and next spring. Autumn applications of copper are considered to lower bacteria loads, and provide some protection for leaf and fruit scars. Refer to the Copper Spraying for Psa Information Sheet on The Canopy (www.zespricanopy.com), for up-to-date Psa information and other orchard practice recommendations.

References

- The Plant Pathology Journal 2005 21(2).
- www.eppo.org ■

Today's global Psa situation

Japan: To understand the infection rate of Hayward and other varieties in Japan is difficult due to small orchard sizes and, as everywhere, environmental differences each year. Between four and six percent (about 58ha) of Hort16A production is affected by Psa each year in the Ehime Chuo region. It is managed by cutting back and strict orchard hygiene. Nearly all orchard practices are done by hand by the grower, making pedantic orchard hygiene easier in comparison to more commercial operations.

South Korea: Jeju Island, South Korea, was a thriving Hayward kiwifruit producer until the late 1980's when Psa spread. Since, Hort16A has been established on the island but orchards are in tunnel houses, reducing the ability of Psa infection and spread by providing wind, rain and cold protection in spring and the ability to control temperature. Despite this there are several orchards battling Psa in Korea, three in severe cold, wet conditions recently gave up after a four to five year battle and cut back their vines.

Italy: After two seasons of Psa at devastating levels for Latina kiwifruit growers, Italy continues to battle Psa. The Italian industry for Hayward operates in a competitive environment with multiple marketers, meaning it is more challenging to get a cohesive and united approach to dealing with Psa. This has resulted in some growers approaching Psa aggressively while others are more relaxed. With Psa having an aerosol spread this range of approaches is counter-active in closely-located kiwifruit growing areas. Some commercial growers in the Italian kiwifruit industry report that they did not act together as fast or aggressive in their removal of infected vines initially resulting in adding to the severity each season. There are many different reports of how many vines have been cut out however it is understood to be around the 30 percent mark for both GREEN and GOLD varieties. Two thirds of ZESPRI licensed orchards in Italy report Psa, with one quarter already completely removed from full infection.

Other: Other countries do not appear to monitor or record their incidence of Psa, however it is informally considered to be affecting China, Iran and other European countries. Chile is testing for Psa at the time of writing.