

Diagnosing Panama TR4

Early detection and diagnosing the presence of Panama disease tropical race 4 (Panama TR4), combined with rapid destruction of infected banana plants and on-farm restrictions, are the only way to control and contain the disease. When plants are found to have signs of the disease, Biosecurity Queensland undertakes a process of assessment, testing, diagnosis, and support – this fact sheet explains the process.



Getting a diagnosis

When a plant showing signs of Panama TR4 is identified, Biosecurity Queensland surveillance staff and authorised officers will visit your property and follow these steps:



1 A visual assessment

Plants are inspected for external signs of Panama TR4 including leaf yellowing, wilting and stem splitting. If found, the plant is cut to look for internal signs – a yellow, reddish or brown-black discolouration of the stem or corm's vascular tissue. Photos are taken of intact and cut plants, and you are advised that suspect plants have been found.

2 Collect and send samples

Samples of plant material are taken from any discoloured tissue that is found in the stem or corm as the plant is systematically examined. The plant or the stump is then marked and a sign placed indicating that samples have been taken. Samples are securely packaged, labeled, and sent with a secure chain of custody to a specialised laboratory in Brisbane.

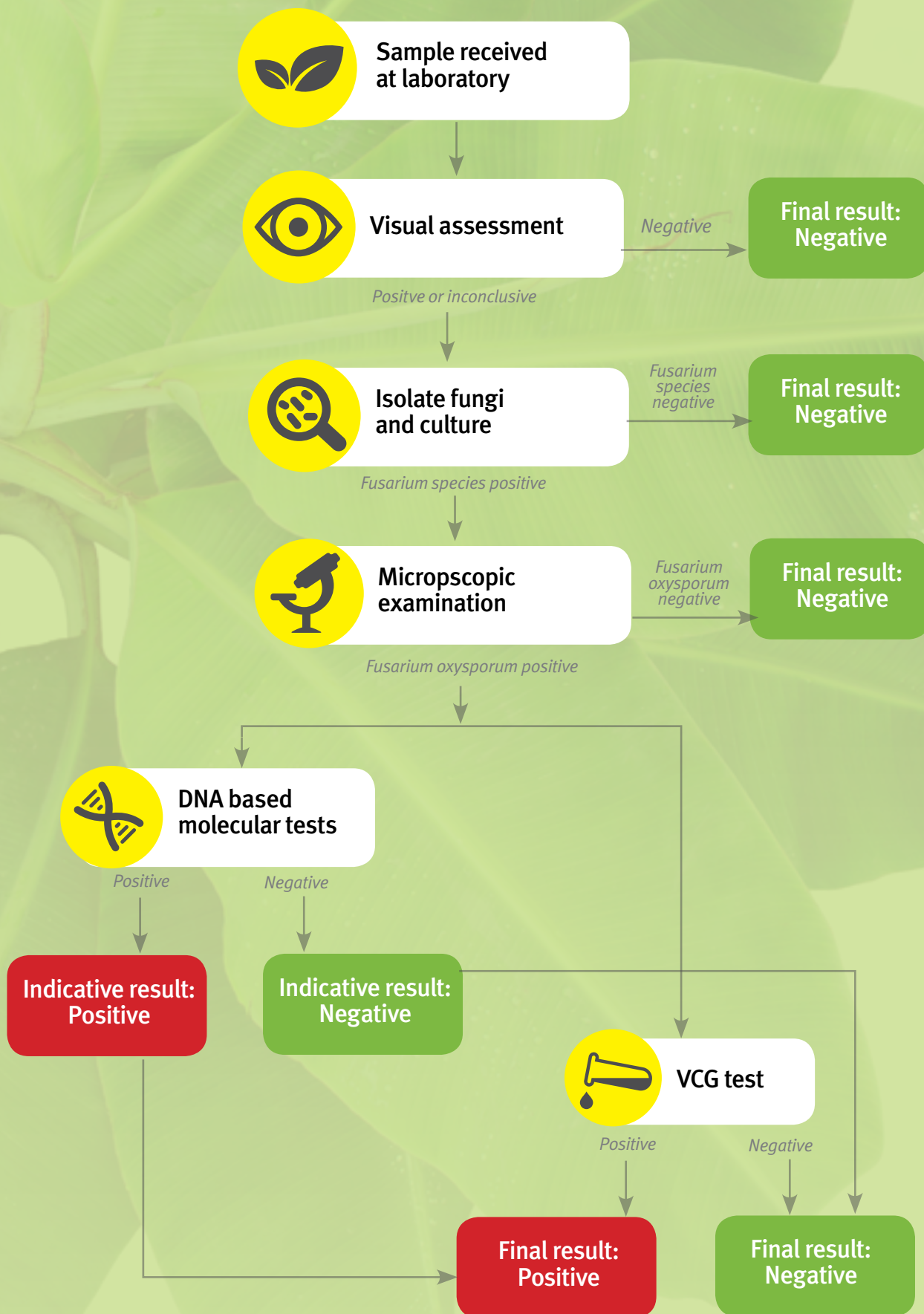
3 Laboratory testing

A range of laboratory tests are undertaken which can take up to 6 weeks – these are explained overleaf.

4 Give your results

The results of the tests are given by phone and confirmed by a letter and a diagnostic report. If positive for Panama TR4 you'll be advised how to control and contain the disease. Biosecurity Queensland will notify key stakeholders of the positive result, without giving away identifying information on the grower or the property.

Panama TR4 diagnostic flowchart





Panama TR4 laboratory tests and results



Visual assessment

Laboratory staff cut open the plant tissue samples and examine them for internal symptoms that could be caused by Panama TR4. Reference is also made to photographs of external symptoms taken in the field.



Isolate fungi and culture

Small pieces of the discoloured plant tissue are dissected from the sample and placed on agar gel plates for incubation over a number of days. Any plates which have growth of Fusarium fungi undergo further examination.



Microscopic examination

Fusarium cultures are examined under a microscope to see if they are the species *Fusarium oxysporum*, which includes the Panama TR4 pathogen. If *Fusarium oxysporum* is present it will undergo further tests to see if it is the form that causes the disease.



DNA based molecular tests

Fusarium oxysporum isolated from a sample is put through several DNA-based tests. These include PCR (polymerase chain reaction) tests and DNA sequencing. The PCR tests confirm that the isolate is a *Fusarium oxysporum* species and secondly whether or not it is the TR4 strain of Panama disease.

DNA sequencing is also performed on genes that have markers specific to the tropical race 4 strain of Panama disease.



VCG test

To get final confirmation, *Fusarium oxysporum* cultured from the plant sample is grown along with a tester culture derived from a known Panama TR4 fungus. It is then assessed using a VCG (vegetative compatibility group) test which will show if it is the same strain based on whether or not it reacts with the TR4 tester culture. This test provides conclusive evidence if the disease is present in the plant.

Waiting for results - what can you do?

When a sample is collected on your property for Panama disease tropical race 4 testing, it's important to know and understand your obligations under the *Biosecurity Act 2014* (Qld).

Under the Act, an individual or organisation whose activities pose a biosecurity risk has a legal responsibility for managing those risks, known as a 'general biosecurity obligation' (GBO).

There are many ways to effectively meet your GBO for Panama TR4, as a minimum the following steps are suggested:

- As a precautionary measure, don't move soil, plant material or any other risk items off the property until you have the test results.
- Restrict peoples' access to any suspect plants, including any suckers. Mark and cordon off suspect plants, and the immediate surrounding area, to limit possible spread of soil or plant material.
- Immediately review on-farm biosecurity measures to limit potential spread of disease around or from your property and assess the level of risk your farming activities might present. Panama TR4 can be spread through the movement of infected plant material, or as spores in contaminated soil and water (for example soil on vehicles, equipment, footwear, animals or in irrigation water). If necessary, update your on-farm biosecurity plan.
- Ensure staff and visitors to your property have access to cleaning and disinfection equipment and are aware that vehicles, farming appliances, equipment and personnel need to meet biosecurity decontamination requirements.

More information about your GBO is available at biosecurity.qld.gov.au



Positive results - what happens?

When the test results are positive, a Biosecurity Queensland officer will call to tell you, and it will be confirmed by a letter and a diagnostic report.

You will receive a 'Notice of presence of Panama disease tropical race 4' which will contain conditions that you will need to meet to protect your farm and the broader industry.

Biosecurity Queensland's expert Panama TR4 team will quickly support and guide you to ensure the best possible biosecurity solutions for your property. They will do their best to ensure your business can continue trading.

For privacy reasons, test results are not made available to the general public. If a positive result is received, Biosecurity Queensland will notify key stakeholders, without issuing specific owner or property details or information.

More information

Biosecurity Queensland's Panama TR4 Program is working closely with growers, industry and the community to minimise the spread of the disease and support affected farms. We can provide a range of information packages including training on the disease and in decontamination processes. Call 13 25 23 or email panamatr4@daf.qld.gov.au