

**Fusarium oxysporum f.sp. cubense**



**Fig. 1.** Internal symptoms by *Fusarium oxysporum f.sp. cubense* in banana pseudostem (a); external symptoms of a banana plant (b & c); and culture of *Foc* tropical race 4 (d). Photo credits A. Daly (a & b), G. Walduck (c) R. Meldrum (d).

**Disease:** Banana Fusarium wilt or Panama disease

**Classification:** K: Fungi, D: Ascomycota, C: Sordariomycetes, O: Hypocreales, F: Nectriaceae

**Distribution and Host Range:**

Banana Fusarium wilt, also known as Panama disease, is caused by the pathogen *Fusarium oxysporum* Schlect. f.sp. *cubense* (E.F. Smith) Snyder & Hans. This disease is a major threat to both the Australian and international banana industries. *Fusarium oxysporum f.sp. cubense (Foc)* is a soilborne fungal pathogen found throughout the world where bananas are grown. This pathogen is broadly categorised into four races; races 1, 2 and 4 are pathogenic only to banana (*Musa spp.*) and race 3 is pathogenic only to *Heliconia spp.* All races are present in Australia. The pathogen is further categorised into vegetative compatibility groups (VCGs) or strains, of which there are 21 recognised worldwide. The most important race of this pathogen is race 4, which affects most of the cultivated banana varieties, including Cavendish. Until recently, race 4 was only detected in subtropical production areas, affecting Cavendish plants predisposed by cold conditions. However, in the 1990's a genetically different strain of this pathogen known as tropical race 4 (*Foc* TR4), or VCG 01213, which causes considerable damage to Cavendish plants in tropical regions emerged. Currently, the occurrence of *Foc* TR4 in Australia is limited to a region near Darwin in the Northern Territory.

**Key Distinguishing Features:**

*Foc* enters a banana plant through its roots and moves through the vascular system, causing a reddish-brown discolouration. The external symptoms of this disease include yellowing and wilting of the leaves, the oldest leaves succumbing first. Eventually all leaves become necrotic, the top one or two remaining erect and the plant collapses and dies.

**Impact and Quarantine:**

Once *Foc* enters a banana plantation it is impossible to eradicate and generally leads to the destruction of the entire plantation. *Foc* TR4 is especially virulent and spreads faster than the other strains of *Foc*. If it were to spread to Queensland, the majority of the Australian banana industry would be vulnerable to its devastating effects. Consequently, it is a major threat to the biosecurity of the industry. There are no commercial varieties resistant to *Foc* TR4, so quarantine measures (attempting containment of outbreaks and restricting movement of planting material and soil) are currently the most effective means of control.

**Management and Control:**

Currently there are no methods for eradicating *Foc* and it is extremely difficult to control. The pathogen is easily transported in infested soil and the spores can survive for decades.

**Further Reading:**

PaDIL <http://www.padil.gov.au/viewPestDiagnosticImages.aspx?id=492>

Daly, A. and Walduck, G. (2006). Fusarium wilt of bananas (Panama disease). Agnote no. 151, Department of Regional Development, Primary Industry, Fisheries and Resources. [http://www.nt.gov.au/d/Content/File/p/Plant\\_Pest/786.pdf](http://www.nt.gov.au/d/Content/File/p/Plant_Pest/786.pdf)

**Key Contacts:** Rachel Meldrum, email: [r.meldrum@crcplantbiosecurity.com.au](mailto:r.meldrum@crcplantbiosecurity.com.au), Phone: (08) 89992247

This work is supported by the Cooperative Research Centre for National Plant Biosecurity