

## Tropical race 4 in Africa

In November 2013, it was announced that tropical race 4 (TR4) had been confirmed in northern Mozambique, in a plantation of Cavendish bananas for export. It was the first, and so far only, report of the fungal strain on the African continent.

Until then, the distribution of the pathogen had been limited to parts of Asia and a region of Australia.



### What is TR4?

Tropical race 4 (TR4) is the name given to the strains of the soil-borne fungus *Fusarium oxysporum* f. sp. *ubense* that causes Fusarium wilt (popularly known as Panama disease) in Cavendish cultivars in the tropics. The term TR4 was coined to distinguish these strains from the ones that only affect Cavendish cultivars in the presence of predisposing factors, such as low temperatures, and have since become known as subtropical race 4 (STR4).

### What does TR4 mean for African bananas?

Many African countries\* already have fungal strains – collectively known as race 1 and race 2 – that cause Fusarium wilt in cultivars such as Gros Michel (Bogoya) and Pisang Awak (Kayinja). Since TR4 also causes disease in cultivars susceptible to these two races, it has the potential of affecting cultivars other than Cavendish. The main unknown is the reaction of Plantains and East African highland bananas. Preliminary trials in Asia suggest that these cooking bananas might be resistant to TR4, but since they are already resistant to races 1 and 2, symptoms of Fusarium wilt should be investigated to avoid spreading the pathogen if it proves to be TR4.

### How to avoid spreading TR4

The disease can be spread through infected planting material, infested soil adhering to farm equipment and footwear, and surface water. Once established, the fungus can persist in soil for an indefinite period of time and cannot be managed using chemical pesticides. Using clean planting material, such as tissue-culture plantlets, avoiding sharing farm equipment with other growers, promptly destroying suspected cases, fencing the affected area, digging a trench to prevent water from flowing out of the area and planting a cover crop are among the actions that can be taken to avoid spreading the disease.

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\* In Africa, Fusarium wilt has been reported in Ethiopia, Kenya, Uganda, Rwanda, Burundi, Tanzania, including Zanzibar, Malawi, Mozambique, South Africa, Madagascar, as well as the islands of Mauritius, Comoros and Pemba, DR Congo, Congo Brazzaville, Cameroon, Nigeria, Ghana, Sierra Leone and Guinea Conakry.

## How to recognize TR4

TR4 produces characteristic Fusarium wilt symptoms. The first visible symptom is usually the yellowing of the older leaves. As the disease progresses, the leaves collapse, forming a skirt of dead leaves around the lower part of the plant. Alternately, leaves may remain green, but collapse as a result of buckling of the petiole. Splitting of the base of the pseudostem is another common symptom, as is wrinkling and distortion of the emerging leaf.



G. Blomme

Leaf yellowing and wilting



M. Dita

Splitting of the pseudostem



M. Dita

Emerging leaf symptoms



A. Javellana

Pseudostem discoloration

The main internal symptom is vascular discoloration of the rhizome and pseudostem, which varies from pale yellow in the early stages to dark red or almost black in later stages. The fruits do not show any specific disease symptoms. The above- and below-ground parts of affected plants eventually rot and die.

### What can it be confused with?

The early wilt symptoms can be confused with nutritional deficiency or water stress. The leaf symptoms can also be confused with those of *Xanthomonas* wilt, better known as BXW. In plants affected by *Fusarium*, yellowing and wilting of the leaves typically progresses from the older to the younger leaves. The wilted leaves may also snap at the petiole and hang down the pseudostem. In plants affected by *Xanthomonas* wilt, the wilting can begin with any leaf and the infected leaves tend to snap along the leaf blade. Another difference is that BXW-infected plants produce bacteria-laden exudates.



E. Boa

BXW-infected plant

## How to confirm TR4

The quickest way to confirm a suspected TR4 infection is by analysing tissue samples using the TR4-specific PCR molecular test, whose results can be obtained in less than a day. Fungal isolates can also be analysed to determine their vegetative compatibility group (VCG), a process that can take one to three months. TR4 isolates belong to the VCG 01213/16 complex, although other VCGs are also known to cause Fusarium wilt in Cavendish cultivars.

For more information and access to resources go to [www.promusa.org/Tropical+race+4+-+TR4](http://www.promusa.org/Tropical+race+4+-+TR4).