

Fusarium Wilt Tropical Race 4 (TR4)

FUSARIUM OXYSPORUM F. SP. CUBENSE (E.F. SMITH),

FUNGI: ASCOMYCOTA: SORDARIOMYCETES

INTRODUCTION

Fusarium oxysporum f.sp. cubense Tropical Race 4 (Foc TR4) is a strain of fungus that causes Fusarium wilt of bananas. It infects most varieties of banana cultivars but is known predominantly for attacking Cavendish, the most widely cultivated variety in the world. More than 80% of global banana and plantain production is thought to be based on TR4 susceptible germplasm. If unchecked, Foc TR4 can wipe out an entire plantation.

DESCRIPTION

The disease can progress in different ways.

1. The older leaves may turn yellow, beginning with patches at the leaf margin (Fig. 1). This continues to the youngest unfurled leaves over 1 to 3 weeks. The yellow leaves remain erect for 1-2 weeks or some may collapse at the petiole and hang down the pseudostem.
2. Leaves may remain completely green except for a petiole streak or patch but collapse as a result of buckling of the petiole. All the leaves eventually fall, beginning with the oldest.

Other symptoms include

- ⇒ splitting of the base of the pseudostem (Fig. 2);
- ⇒ necrosis of the emerging heart leaf, irregular/pale margins on new leaves, shorten internodes and with the lamina wrinkled and distorted.

The internal symptom of Fusarium wilt is vascular discoloration.



Figure 1: *Fusarium Wilt TR4*; banana cultivar with yellowing symptoms on lower leaves. Photo, ©David Jones from <https://www.cabi.org/isc/datasheet/24621>



Figure 2: Basal splitting - splitting of the base of the pseudostem of a 'Cavendish' cultivar. Photo, ©David Jones from <https://www.cabi.org/isc/datasheet/24621>

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DESCRIPTION cont'd

Discoloration varies from pale yellow in the early stages to dark red or almost black in later stages (Fig. 3).

BIOLOGY

The fungus attacks the banana's vascular system and as diseased plants die, the fungus grows out of the xylem into surrounding plant tissues. As the plant decays, many chlamyospores are formed which become incorporated in the soil. Chlamyospores are stimulated to germinate and infect nearby banana roots, 'daughter shoots'. Following germination, mycelium is produced from which conidia form in 6-8 hours and chlamyospores in 2-3 days. Small secondary or tertiary roots are invaded.

None of the common banana cultivars is immune and the fungus is able to establish itself in the vascular system of the root. The infection spreads systemically through the vascular system of the corm, pseudostem and fruit stalk. TR4 can survive for up to 30 years as chlamyospores in infested plant debris or in the roots of alternative hosts.

DAMAGE

The severity of the damage is related to interactions between the strain, its host and environmental conditions. TR4 has devastated commercial plantations of Cavendish bananas in Taiwan, Indonesia, Malaysia and Australia's Northern Territory .

TR4 is noted to affect almost 80% of the banana cultivars worldwide. While the symptoms expressed by TR4 are the same as other strains of *F. oxysporum f. sp. cubense*, TR4 affects a wider host range of banana cultivars and kills the plant and 'daughter' suckers.



Figure 3: Vascular discoloration - discoloration of vascular tissue in a rhizome. Photo from <https://www.sun.ac.za>

ENTRY PATHWAYS

TR4 can be spread via infected planting material, infested soil and water. The fungus spreads locally and internationally through infected, often symptomless, suckers and attached soil. Infested soil can travel short and long distances on machinery, tools, shoes and vehicles.

REFERENCE(S)

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Pictures: Copyright by David Jones taken from CABI datasheet - *Fusarium oxysporum f.sp. cubense* (Panama disease of banana) accessed at <https://www.cabi.org/isc/datasheet/24621> on September 3, 2018