



Tropical Race 4 (TR4) of Fusarium wilt (*Fusarium oxysporum* f.sp. *cubense*): Expanded Threat to Global Banana Production

The threat:

Fusarium wilt disease is among the most destructive diseases of the banana plant. It is caused by the fungus *Fusarium oxysporum* f.sp. *cubense* (Foc) and is also known as Panama disease. The Tropical Race 4 (TR4) of the fungus has been affecting banana plantations severely in Southeast Asia and recently it has been reported, for the first time outside Asia, in Mozambique and Jordan. This race infects the Cavendish varieties, which dominate global trade but are also important for domestic markets, as well as some other cultivars used for local consumption and marketing. Once the disease is present in a field it cannot be controlled effectively by currently available management practices. Hence, prevention and quarantine are the most effective means of control of this disease. The international community and countries at risk are advised to pay attention to the importance of preventive measures.

The banana crop and the disease:

Bananas (*Musa* spp.), including dessert banana, plantain, and cooking banana, are the eighth most important food crop in the world, and the fourth most important in the least developed countries (FAOSTAT, 2013). They are produced in 135 countries and territories across the tropics and subtropics. The vast majority of producers are smallholder farmers who grow the crop for either home consumption or local markets. Less than 15 percent of the global production of more than 130 million metric tonnes is exported. Today, the international banana trade, totaling around 17 million metric tonnes, is worth over US\$ 7 billion per year (FAOSTAT).

Bananas are vulnerable to a number of diseases in various parts of the world, including the Black Sigatoka disease, Xanthomonas wilt (BXW), Bunchy Top Disease (BBTD) and Fusarium wilt. Among these, Fusarium wilt has been the most difficult to control due to its soil-borne nature. The resting spores of the fungus survive in the soil for decades and preclude the return of susceptible bananas, and management options have not been adequately effective. The disease was effectively controlled by the Cavendish varieties which have been resistant to races 1 and 2 of the fungus for decades. However the occurrence of TR4 has significantly changed the situation, as Cavendish and a number of other varieties are highly susceptible to this race.

Spread of the TR4 race of the Fusarium wilt:

TR4 is a growing concern for the banana industry as it infects plantations of the Cavendish varieties. It has been historically proven that Fusarium wilt can significantly affect livelihoods and food security by reducing productivity, income, employment and government revenues in many tropical countries.

In brief, Fusarium wilt TR4 has the following profile:

- There is no viable, fully effective treatment of soil to control Fusarium wilt in the field.
- The fungus' resting spores remain viable in the soil for decades.
- There are no widely adapted resistant varieties available to replace the favored Cavendish bananas.
- Further research is needed to fully understand the biology, genetics and epidemiology of the fungus, and to identify resistant varieties.
- Prevention and quarantine measures are presently the best way to stop the dissemination of the fungus by way of infested soil and infected plant materials to TR4-free areas.

International efforts and elements for a sector-wide action plan for prevention:

Currently there are numerous efforts made by the stakeholders including the research institutions, the banana industry, governments and international organizations to prevent the spread of the disease, but in view of the



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challenges associated with the control of the disease and the risk posed to the global banana supply, it is evident that these need to be intensified. Currently, FAO and its partners, including the World Banana Forum (WBF), The African Foc TR4 consortium, the scientific community and the banana industry are among those making efforts to increase awareness and promote implementation of the preventive measures.

A sector-wide action plan should take into account the following elements:

- Awareness-raising campaigns on the inherent risks of TR4, and dissemination of prevention and quarantine measures wherever Cavendish bananas or other susceptible cultivars are grown;
- development and implementation of prevention strategies to avoid or delay the long- and short-distance spread of the disease;
- enhanced research efforts to understand the epidemiology of the disease and to develop resistant cultivars and management tools;
- capacity building in countries at risk for improved disease identification, prevention, control and management capabilities;
- development of alternative resistant banana cultivars that eventually can replace or complement the susceptible cultivars including Cavendish types;
- strengthening of regional and international collaboration.

The WBF has established a TR4 Task Force to facilitate information sharing and international dialogue leading to development and implementation of action plans to prevent the spread of this disease.

Actions needed at country level:

To prevent spread of the disease into countries at risk and among the plantations, TR4 alerts should be communicated to contribute to:

- Awareness raising at all levels and adoption of appropriate risk assessment, surveillance and early warning systems;
- implementation of phytosanitary measures, such as disinfection, to prevent the spread of the disease through agricultural practices, irrigation and drainage systems, transportation, vehicles, containers, tools, or farm visitors;
- preventive measures, including the use of disease-free planting materials, and prevention of movement of infested soil and infected planting materials into and out of farms;
- capacity building in National Plant Protection Organizations (NPPO) in policy development, extension and research, including the use of rapid and accurate diagnostic tools;
- training of officers, producers and workers in disease identification, prevention and management under field conditions, and appropriate instructions to visitors.

More information:

- Website of the World Banana Forum: www.fao.org/economic/worldbananaforum/fusarium-tr4/en/
- PROMUSA website, scientific information: www.promusa.org/Fusarium+wilt
- Panama disease research programme at WUR: www.panamadisease.org
- Contingency plan against TR4 (Spanish):
www.ippc.int/sites/default/files/documents/20130812/plandecontingenciacontrafoc4toirsa_2013081213%3A52--6.59%20MB.pdf
- International Plant Protection Convention (IPPC): www.ippc.int
- Report of TR4 from Mozambique: www.rtb.cgiar.org/new-banana-disease-to-africa-found-in-mozambique/

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