



Screening for resistance to Fusarium wilt

For more information about the Bioversity International Musa Germplasm Transit Centre, see:

■ Factsheet 1:

Operations, Outreach and Impact

■ Factsheet 2:

Unravelling the genetic basis of banana traits using Next Generation Sequencing technologies

■ Factsheet 3:

Phenotyping for drought

■ Factsheet 5:

Use of banana diversity for nutritious diets

Fusarium wilt of banana, caused by the fungal pathogen *Fusarium oxysporum* f. sp. *cabense* (Foc), has widely been considered as one of the most devastating diseases in agricultural history, until resistant Cavendish banana cultivars replaced susceptible ones in Central America. New outbreaks of the disease on hitherto resistant cultivars in Asia and more recently in Africa and Australia, caused by the Tropical race 4 (TR4) strain of the pathogen, have raised concerns that the disease is, once again, threatening banana production in the world.

No chemical or cultural control measures exist for Foc. Once the pathogen is introduced into a production field, it can stay in the soil for many decades, thus spelling the end of production of susceptible cultivars in that field. The use of resistant cultivars is the only viable option. Of particular concern is the threat to food security in Africa, where the East African Highland bananas (EAHB) and plantains form the staple diet and only source of income to millions of Africans.



Distribution of tropical race 4 (TR4). Map produced by ProMusa 2014 (www.promusa.org).

Progress

To establish whether EAHB and plantain are resistant to Foc TR4, Asian research institutions are evaluating African banana cultivars in China and the Philippines under the coordination of Bioversity International. A total of 7 EAHB and 7 plantains were sent from the International Musa Germplasm Transit Centre (ITC) in Belgium for evaluation in China and the Philippines, where Foc TR4 is causing epidemics in commercial plantations. At 52 weeks after planting, disease incidence in the Philippines ranged from 0-1% in the plantains and 1-5% in the EAHB, while the susceptible check 'Grand Naine' showed 58% and the susceptible local cultivar 'Lakatan' 91% incidence. In China, the results are even more significant as all the plantains and EAHB were free from infection while the susceptible check 'Williams' showed 69% and the local susceptible check 'Baxi' 70% infection. 'GCTCV 119', a resistant Cavendish somaclone developed by the Taiwan Banana Research Institute (TBRI) sustained no infection either.

Through the ITC, Foc-resistant somaclones acquired from TBRI were shared and evaluated in countries where TR4 is currently

causing severe epidemics. A further selection of 'GCTCV 119', named 'GCTCV 219', is currently being commercially adapted with small-scale farmers in the Philippines. Twenty farmer-collaborators were selected and pilot farms established, with more than 30,000 seedlings of GCTCV 219 distributed and planted. The harvesting time and ripening protocol are being optimized, and innovative packaging of clusters of 4-5 fingers and differentiated branding is being piloted to promote acceptance in the Japanese market.

Looking ahead

Further screening of the *Musa* gene pool for host reaction to Fusarium wilt is ongoing. The results to date of the screening and evaluation work give new hopes, both to African and Asian banana producers. While screening of more African plantain and EAHB cultivars is recommended, the results indicate that at least some of the major cultivars currently grown are resistant to the disease that has just hit the continent. In the Philippines, the new somaclones are opening up new opportunities to sustain the multidollar banana industry in the country.



'Grand Naine' (left) vs 'GCTCV 219' (right) in a farm heavily infested with tropical race 4 of Fusarium wilt, the Philippines, August 2013. Credit: Bioversity International/ A. Molina.



Piloting shipment of 'GCTCV 219' fruits from the Philippines to Japan. Credit: Bioversity International/ V. Sinohin.

For more information about Fusarium wilt, check out the Musapedia page on Fusarium wilt: <http://www.promusa.org/Fusarium+wilt>

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