Fighting banana diseases – the end of Cavendish?

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What is the World Banana Forum (WBF)?

Multi-stakeholder global platform created to leverage dialogue and cooperation among players in the banana value chain

**Mission:**
Promote sustainable production and trade

**Objective:**
Support the adoption of good practices that address environmental, economic and social challenges including value distribution, externalities and negative impacts.
Why bananas?

- The world’s most exported fresh fruit (> US$ 7 billion/year)
- Essential source of income and employment for hundreds of thousands of rural households in developing countries.
- Serious environmental, economic and social challenges due to:
  - Large monoculture plantations
  - High use of agrochemicals (mostly fertilizers and pesticides)
  - High production costs
  - Impacts on workers and local communities
  - Low market prices

Meeting those complex challenges requires the involvement of all stakeholders of the banana sector worldwide.
Structure of the WBF and deliverables

- **Steering Committee**
- **Secretariat** hosted by the FAO
- **Thematic Working Groups**:  
  1. Sustainable Production Systems and Environmental Impact  
  2. Distribution of Value  
  3. Labour Rights
- **Task Forces**: Fundraising, Communication, Fusarium TR4

**Some Outputs to date**

- Key players working together to set a level playing field;  
- Online portal to exchange information on good practices;  
- Training workshops and capacity-building projects;  
- Collaborative public-private partnerships and field research;  
- National and international events to plan joint actions;  
- Publication of statistics, analyses and case studies.
Members

The WBF welcomes the participation of any stakeholder from the sector willing to contribute towards a sustainable banana value chain.

- Major banana companies
- Retailers
- Producers and their organizations
- Trade associations and exporter groups
- Civil Society Organizations
- Trade Unions
- Research institutions
- Governmental representatives
- International Organizations
- Public and private donors
Banana diseases – Case Studies:

• Fusarium wilt Tropical Race 4 (Foc TR4)

• Black leaf streak
  Black Sigatoka
Fusarium Wilt or Panama Disease

www.panamadisease.org

GOING BANANAS?
The serious threats facing the world’s favourite fruit

Learn how we can save the banana... And why that is so important. When was the last time you ate a banana? Have you ever considered what it might be like if the famous musical hit 'Yes, we have no bananas' was to become a reality?

A threat called Panama Disease

Such a scenario is not as unlikely as it may seem as the future of the world's favourite fruit is under threat. Be a banana friend forever.

Support with a tweet!
The current banana industry is ‘Cavendish’ Ocean
Cavendish varieties comprises 41% of all bananas grown worldwide and > 60% in Top 10 producing countries.

- Cavendish (AAA)
- Plantains (AAB)
- Other dessert types
- Other cooking types

Banana production - Top 10 producing countries [Dita et al 2013 - Data FAO stat, Lescot 2010]
Fusarium Wilt of Banana: Global distribution

This map represents the FOC distribution for illustrative purposes only and it is not based on scientific research or to be taken as an official reference.

Source: www.pananmadisease.org/en/map
By the 1960s, ‘Gros Michel’ had been replaced in export production by cultivars of the Cavendish subgroup

‘Gros Michel’ learns his fate
Fusarium Wilt: Symptoms
Foc dissemination in the field – Soil-borne disease

Next victim

Future victim?

RIP - Killed by TR4
According to Horticulture Plant Protection Department (2007) reported that epidemic rates of Foc race 4 in Sumatra and other provinces reach 100 km/year.
Impact of Foc TR4 in Asia: A global threat

PRODUCTION AREA
Indonesia

MARKET EFFECTS
Taiwan

West Sumatra
(Horticulture Processing and Marketing Department, 2005)
New entries: Jordan and Mozambique

**Jordan:**
- 2006 first disease symptoms
- 1,500 ha Cavendish
- 80% affected
- No solution
- Origin?
Fusarium wilt of banana: Global distribution

Three urgent Actions

- Keep your farm/region free - Exclusion
- Awareness + preparedness
- Research

Under evaluation for Foc TR4

TR4

Race 1 and 2

This map represents the FOC distribution for illustrative purposes only and it is not based on scientific research or to be taken as an official reference.
Importance of diagnostic tools

- First set made available 140 years after first report
- 2008 for FOC TR1 and 2010 for FOC TR4 (Wageningen University)
- Available Soil, water and plants
- 6 hours with PCR
- 15 minutes with Lamp
Risk assessment, capacity-building and preparedness for Foc TR4 in LAC

Bioversity, MUSALAC & National Plant Health Organizations
A Contingency Plan for Foc TR4 - Latin American and the Caribbean

Plan de contingencia ante un brote de la raza 4 tropical de *Fusarium oxysporum* f. sp. *cubense*

Elaborado por:
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Plutarco Elías Echegoyén Ramos
Luis Fernando Pérez Vicente
Is eradication of TR4 possible?

- Good farming practices,
- Biotic, abiotic factors
- Biofumigation
  - Verticillium
  - Rhizoctonia
  - Fusarium oxysporum
  - Nematodes
- Chemicals
  - Fungicides
  - Anti-fungals
Resistance is the first best management option
## Banana cultivars reported with resistance to Foc TR4

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<thead>
<tr>
<th>Variety</th>
<th>Resistance</th>
<th>Market</th>
<th>Sources</th>
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<td>FHIA 01</td>
<td>R</td>
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<td>Poor</td>
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<td>Pisan Jai Buya</td>
<td>R</td>
<td>NA</td>
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<td>*GCTV 119</td>
<td>MR</td>
<td>Good</td>
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<td>Molina, 2011</td>
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<tr>
<td>GCTV 218</td>
<td>MR</td>
<td>Good</td>
<td>Molina, 2011</td>
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<tr>
<td><em>M. acuminate malaccensis</em>*</td>
<td>R</td>
<td>Seeded</td>
<td>Walduck &amp; Daly 2007</td>
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<tr>
<td>ABB varieties</td>
<td>R</td>
<td>NA</td>
<td>Molina - unpublished</td>
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<td>(Saba, Tanduk)</td>
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* There are many GCTV, produced by TBRI, Taiwan, which are continuously replaced for new somaclons with some resistance levels
**Some *M.a. malaccensis* are susceptibles
Enhancing plant health and resistance through soil management

TR4

Control

pH 5

Photos taken 4 weeks after inoculation

pH 6
Integrated approach for Foc disease management and improved productivity

Sustainable production of banana from high value, but Foc-susceptible varieties
Integrated crop and watershed management

Generating a toolbox of practices based on agro-biodiversity for sustainable management of Foc in banana

Landscape and watershed

Local landscape & Multi-Farm

Farm ecosystem

Plantation ecosystem

Banana Plantation

Banana plant + Foc(DNA)

Adapted from Staver 2011

Photo – ENDURE Guadalupe
Is there hope for Fusarium wilt in banana?

- **Immediate**: Rapid diagnostics, quarantine measures
- **Short-term**: Concerted Action Plan, anaerobic soil disinfection, early warning systems, good farming practices, agro-diversification
- **Long-term**: Varietal resistance
- **No control measures are currently available**

Will Cavendish bananas survive?
Task Force on Fusarium Tropical Race 4

The Task Force was created in December 2013.

Actual members are:

• Chiquita
• Dole
• Taste
• WBF Secretariat
• FAO Plant Protection Division
• Wageningen University and Research Centre
• Bioversity International
• CIRAD

CALL FOR ACTION CIRCULATED
All interested organizations are welcome to join!
Populations:

Costa Rica 100
Colombia 100
Ecuador 100
Philippines 100

Population included:
Martinique? 40
Guadalupe? 30
Management options of BLSD

• Deleafing,
• Good farming practices
• Use of chemicals (aerial spraying)
  – Systemic Fungicides
• Resistance
  – Gene cloning, hybrids
  – Phenotyping
  – Genetic engineering
  – MusaRadix
INCIDENCE OF BLACK SIGATOKA CONTROL TO THE RETAIL PRICE

15-20% INCIDENCE in 2001 (Ploetz, 2001)
Fungicide resistance in Costa Rica

Wild type
Cartargena Farm (Guácimo)
San Pablo Farm (Siquirres)
Zent Farm (Matina)
20 - 30 km apart
Hope for Black Sigatoka in banana??

- **Immediate:** Improved screens for resistance monitoring
- **Short-term:** Test & compare alternative products for disease control that do not suffer from rapid decline in efficacy
- **Long-term:** True resistance
Key conclusions

1. Industry is > 70% depending on Cavendish bananas. The future is threatened and depends on several external variables.

2. High reliability on a single cultivar and on dedicated high-level research work [www.bananaresearch.org](http://www.bananaresearch.org)

3. **Scenario A (BAU):** Fusarium wilt continues to spread in 3 major regions, Sigatoka control costs increase as well as fungal resistance. Production costs and price will increase in the medium term.

4. **Scenario B (improved):** Diseases are controlled through improved farming practices. Diversification of varieties in the medium-term. Fair price distribution in the value-chain.

5. **Scenario C (deteriorated):** Diseases become unmanageable in the medium term. Production area will shrink. Supply reduced, price very high. Industry will be badly damaged.
The way forward for Cavendish

1. Menu of available options from simple to sophisticated
2. Resistant bananas are the first best option but require time, adoption of good farming practices is the second-best but are immediately available from farm to landscape management
3. Develop a sustainable value chain strategy that includes a risk assessment and cost-benefit analysis to secure supply
4. Promote smart and responsible production, strengthen local capacity, raise awareness across the supply chain to sustainable sourcing
5. Anticipate impacts, implement preparedness and contingency plans for Fusarium, explore alternatives to cope with fungicide resistance to Black Sigatoka
6. Industry and other stakeholders to choose scenario and foster a level playing field, taking into account that cooperation is not an option
The Secretariat of the World Banana Forum

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Thank you!
For more information: