Fusarium wilt tropical race 4 a disease threatening a global smallholder and industrial crop: Anticipatory actions & research needs

Miguel Dita

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Tropical Race 4– Spreading threat

2012
Tropical Race 4– Spreading threat

2018
Bananas and livelihoods in LAC

Total estimated area: ~ **1,230,460 ha**

People directly affected: ~ **12,304,600**
(2 person/ha – 5 family member)

Banana area – ha (Source: Faostat 2014)
The impact on export industry

Top-10 Banana and plantain Export in 2015 (tons)

<table>
<thead>
<tr>
<th>Country</th>
<th>Export (tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ecuador</td>
<td>6,287,605</td>
</tr>
<tr>
<td>Guatemala</td>
<td>2,333,893</td>
</tr>
<tr>
<td>Costa Rica</td>
<td>1,978,185</td>
</tr>
<tr>
<td>Colombia</td>
<td>1,684,148</td>
</tr>
<tr>
<td>Philippines</td>
<td>1,223,132</td>
</tr>
<tr>
<td>Mexico</td>
<td>440,703.35</td>
</tr>
<tr>
<td>Dominican</td>
<td>371,597.88</td>
</tr>
<tr>
<td>C. d'Ivoire</td>
<td>323,952.38</td>
</tr>
<tr>
<td>Cameroon</td>
<td>282,514.72</td>
</tr>
<tr>
<td>Panama</td>
<td>275,273.48</td>
</tr>
</tbody>
</table>

Data: Fruitrop (Production 2013 + import export UE & USA 2014)

Source: Banana UNIT- MAGAP, Ecuador
..it is not only exports... food security!

<table>
<thead>
<tr>
<th>Country</th>
<th>Total</th>
<th>Dessert banana</th>
<th>Banana Staple</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dominican</td>
<td>72.4</td>
<td>30</td>
<td>42.4</td>
</tr>
<tr>
<td>Colombia</td>
<td>70.5</td>
<td>14.9</td>
<td>55.6</td>
</tr>
<tr>
<td>Ecuador</td>
<td>48.3</td>
<td>23.8</td>
<td>24.5</td>
</tr>
<tr>
<td>Peru</td>
<td>41.4</td>
<td>14.5</td>
<td>26.9</td>
</tr>
<tr>
<td>Costa Rica</td>
<td>39</td>
<td>21.4</td>
<td>17.6</td>
</tr>
<tr>
<td>Brazil</td>
<td>34.1</td>
<td>31.7</td>
<td>2.4</td>
</tr>
<tr>
<td>Guatemala</td>
<td>19.8</td>
<td>11.4</td>
<td>8.4</td>
</tr>
<tr>
<td>Mexico</td>
<td>15.7</td>
<td>14.1</td>
<td>1.6</td>
</tr>
</tbody>
</table>

Source: Bioversity International, FruiTrop, FAOStat

Photos Miguel Dita
Local Market, Tanzania, 2013
Photo: Miguel Dita
Local Market In The Philippines

Foto: Miguel Dita, 2012
Fusarium wilt of banana

Management options

- Resistant cultivars
- Cycle
- Management options
  - Fusarium wilt
  - Banana
- Soil health
  - Micro N
  - pH
  - Organic Matter
  - Microbiome
  - Micro N
- Exclusion
- A/B
- NO₃
- NH₄
- Ca+
A molecular diagnostic for tropical race 4 of the banana fusarium wilt pathogen


*Embrapa Cassava & Tropical Fruits, Cruz das Almas, 44386-000, Bahia, Brazil. †Plant Research International B.V., PO Box 16, 6700 AA Wageningen, the Netherlands. ① 1012 Plum Lane, Davis, California, USA, and ②Embrapa LABEX Europe, PO Box 16, 6700 AA Wageningen, the Netherlands.
Diagnostic: Let’s speak the same language

- Diagnostic is a **Process** of different steps, that has as a **Major** component: **The field** (samples, expertise, integrated analyses, sense)

- **PCR, qPCR, LAMP, VCG** analyses et al. are **just techniques** and do **not replace plant pathologists**

- Regulatory bodies need to **ALWAYS** have **well-trained Plant Pathologists** and perform carefully analyses of the diagnostic **Process** before make any **risky and groundless** announcement
Anticipatory actions
Strengthening Diagnostic Capacities, Increasing Preparedness and Readiness

Bioversity, MUSALAC
NPPOs/ RPPOs

- Trained
- In the pipeline
Capacitando jóvenes científicos para que conozcan el problema y traigan nuevas ideas – Creando oportunidades!
Multiplicadores: una etapa lógica para crear capacidades
Anticipatory actions

Strengthening and harmonizing detection and diagnostic capacities

1st Latin American and the Caribbean Workshop on Diagnostic of Foc TR4
May 22 -26, 2017 , SENASICA, Mexico.
Anticipatory actions

Strengthening and harmonizing detection and diagnostic capacities

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Anticipatory actions

Regional Contingency plant V.2

National contingency plans: Costa Rica, Ecuador, Colombia, Mexico, Brazil...
Anticipatory actions

Eradication of first TR4 Outbreaks
Anticipatory actions

Surveillance for quarantine banana pest - SENASICA

- *Fusarium oxysporum f.sp. cubense* - TR4
- Moko - *Ralstonia solanacearum* R2)
- *Xanthomonas vasícula pv. Musacearum* - *BXW*
- *Banano Bunchy Top Virus* - *BBTV*

- 602,775 observations
- 111 technicians
- 14 institutions

Source: R. González, Senasica, Mexico
Ecuador
Colombia

> 30,000 direct jobs + 80,000 indirect

Zonas Bananeras de Exportación en Colombia

Annual export: US$ 836 M
Anticipatory actions

Simulations
App

México
Carta à FAO sobre o problema de Foc R4T- Corupá 2015
Acrobat'2016 – realizado em Miami - Motivo R4T

Acrobat’2016 – Declaração de Miami sobre R4T

http://banana-networks.org/musalac/2016/05/25/declaracion-conjunta-para-la-defensa-de-la-industria-bananera-de-america-latina-y-el-caribe-ante-la-amenaza-de-la-raza-4-tropical-del-mal-de-panama/
Regional meetings about TR4
Panama, December, 2016

Contingency plan for Foc TR4 V2.0
Regional action plan for LAC
Bananas in LAC a large corridor of vulnerability
Anticipatory actions

Latin-American and the Caribbean Platform for Surveillance of bananas
Latin American Command for Evaluation of Execution Plans and Management of Eventual Outbreaks of Foc TR4

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Latin American Command for Evaluation of Execution Plans and Management of Eventual Outbreaks of Foc TR4

To be a group of professionals internationally respected for impartiality, technical-scientific capacity and confidentiality, who advises and acts in a coordinated and synergistic manner with the official bodies on issues related to Foc R4T.
1. Exclusion (Keep farms free of Foc-TR4 [Biosecurity])
2. Preparedness [Contingency plans]
3. Research [farm, country, region, continent .....]
**Resistance: some considerations**

**Urgent:** evaluate genotypes of interest including GCTCV somaclones

**Urgent:** Diversification: new business, **think outside the Cavendish box**

**Urgent:** Phenotyping our local varieties
- Plantains?, Hybrids released (Embrapa, FHIA, CIRAD...)
- Improved diploids
- Parental lines of breeding programs
- Genotypes in advanced selection process

**We need + support for banana breeding programs!**

*Anticipatory breeding takes time!*

**Public-Private-Partnership: Global Consortium**
Quarantine disease: priority actions

1. Declare all quarantine pest as it and set priorities
   Have systematized and integrated Surveillance Systems at regional / Continental level

2. Establish standardized diagnostic systems - safe banks of positive controls

3. Elaborate and implement National Contingency Plans with their respective National Emergency Groups

4. Plan and execute National / Regional simulation exercises

5. Establish training programs in:
   - Surveillance,
   - Diagnosis
   - Management of outbreaks

6. Develop and execute targeted awareness campaigns
   (Effective Communication – Target users)
We have an idea on what would be the best scenario to face threatening diseases, but...

**Concerted Integration**

- SuperMarkets
- Consumers
- Exporters

- Producers
- Associations
- NGOs

- Governments
- NPPOs
- RPPOs

- Policy Makers

**Exclusion**

**Resistant Varieties**

**Cultural Control**

**Biological Control**
Obrigado

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