Status report on *Fusarium* wilt disease in India

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Fusarium wilt disease severity map of India

0 – 25%
26 - 50%
51 – 75%
76 – 100%
Diversity (VCG) map of *Foc* isolates in India
### VCGs identified in different varieties of banana in India

<table>
<thead>
<tr>
<th>VCG</th>
<th>Race</th>
<th>Varieties</th>
</tr>
</thead>
<tbody>
<tr>
<td>0125</td>
<td>1</td>
<td>Rasthali, Karpuravalli, Monthan, Ney Poovan, Grand Naine</td>
</tr>
<tr>
<td>0124</td>
<td>1, 2</td>
<td>Rasthali, Karpuravalli, Monthan, Ney Poovan, Grand Naine, Athiakol</td>
</tr>
<tr>
<td>0124/5</td>
<td>1</td>
<td>Rasthali, Karpuravalli, Monthan, Ney Poovan, Athiakol</td>
</tr>
<tr>
<td>0128</td>
<td>1,2</td>
<td>Rasthali, Karpuravalli, Monthan</td>
</tr>
<tr>
<td>0129</td>
<td>4</td>
<td>Rasthali</td>
</tr>
<tr>
<td>01211</td>
<td>4</td>
<td>Karpuravalli, Monthan</td>
</tr>
<tr>
<td>01212</td>
<td>1,4</td>
<td>Rasthali, NeyPoovan</td>
</tr>
<tr>
<td>01214</td>
<td>2</td>
<td>Rasthali</td>
</tr>
<tr>
<td>01213/16</td>
<td>4</td>
<td>Robusta and Grand Naine</td>
</tr>
<tr>
<td>01217</td>
<td>?</td>
<td>Rasthali</td>
</tr>
<tr>
<td>01218</td>
<td>?</td>
<td>Rasthali</td>
</tr>
<tr>
<td>01220</td>
<td>1,4</td>
<td>Rasthali</td>
</tr>
<tr>
<td>Isolate no.</td>
<td>State of origin</td>
<td>Cultivar from which VCG was obtained</td>
</tr>
<tr>
<td>------------</td>
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<td>-------------------------------------</td>
</tr>
<tr>
<td><strong>VCG 0125</strong></td>
<td></td>
<td></td>
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<tr>
<td>200</td>
<td>Assam</td>
<td>Rasthali (AAB)</td>
</tr>
<tr>
<td>44</td>
<td>Tami Nadu</td>
<td>Monthan (ABB)</td>
</tr>
<tr>
<td>216</td>
<td>Tami Nadu</td>
<td>Rasthali (AAB)</td>
</tr>
<tr>
<td><strong>VCG 0124</strong></td>
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<td></td>
</tr>
<tr>
<td>101</td>
<td>Tami Nadu</td>
<td>Karpuravalli (ABB)</td>
</tr>
<tr>
<td>95</td>
<td>Tami Nadu</td>
<td>Karpuravalli (ABB)</td>
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<td>47</td>
<td>Tami Nadu</td>
<td>Rasthali (AAB)</td>
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<td><strong>VCG 01212</strong></td>
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<tr>
<td>185</td>
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<td>Monthan (ABB)</td>
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<tr>
<td>148</td>
<td>Kerala</td>
<td>Rasthali (AAB)</td>
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<tr>
<td><strong>VCG 0129</strong></td>
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<tr>
<td>138</td>
<td>Andhra pradesh</td>
<td>Rasthali (AAB)</td>
</tr>
</tbody>
</table>
Aggravation and spread of Fusarium wilt by Stem borer
Aggravation and spread of Fusarium wilt through tissue cultured plants
The reasons for increase in Fusarium wilt incidence

1. Planting of Fusarium wilt infected suckers (eg. Tripura - only 10% is free from disease) - non-availability of TC plants for cvs like Rasthali, NeyPoovan, Monthan etc.,

2. Perennial system of cultivation especially in Bihar

3. Continuous cultivation of same variety in the same field

4. Non-adoption of Management practices

5. Ratooning of susceptible varieties
Fusarium wilt (RACE 1 – VCG 0124 in cv. Grand Naine (AAA)
Characterization of Cavendish wilt pathogen

VCG test using Australian and Indian nit-M testers

Volatile production
Pathogenicity test in TC plants of Cavendish
Reaction of major commercial varieties of India to a new strain of Fusarium wilt pathogen obtained from Cavendish banana (Race 1 VCG 0124)
Fusarium wilt (RACE 4 – VCG 01213/16 in cv. Grand Naine (AAA)
Katihar (Barari, Mansahi, Kursela, Falka, Korha, Pothia, and Purnia districts (Dhamdhaha, Rupoli etc))
Devastation due to TR4 in Bihar
Pathogenicity test

Control

Inoculated
Vegetative compatibility test
**Confirmation of Foc-TR4 using TR4 specific molecular marker**

### Primer 1

- **PCR programme**
  - Initial Denaturation (1 min): 95 °C
  - Denaturation (30 sec): 95 °C *
  - Annealing (1 min): 60 °C *
  - Extension (2 min): 72 °C *
  - Final extension (10 min): 72 °C

- **Marker**:
  - M - 100 bp Marker
  - B1 - Bihar FOC 1
  - B2 - Bihar FOC 2
  - B3 - Bihar FOC 3
  - B4 - Bihar FOC 4
  - B5 - Bihar FOC 5
  - TC - Tissue culture Plant
  - N - Negative

### Primer 2

- **PCR programme**
  - Initial Denaturation (1 min): 95 °C
  - Denaturation (30 sec): 95 °C *
  - Annealing (1 min): 60 °C *
  - Extension (2 min): 72 °C *
  - Final extension (10 min): 72 °C

- **Marker**:
  - M - 100 bp Marker
  - B1 - Bihar FOC 1
  - B2 - Bihar FOC 2
  - B3 - Bihar FOC 3
  - B4 - Bihar FOC 4
  - B5 - Bihar FOC 5
  - TC - Tissue culture Plant
  - N - Negative

*35 cycles*
PCR amplification race 4 *Foc* isolates using specific primer (SIX 8a AND SIX8b)

Primer SIX 8a

Primer SIX 8b

M – Marker (100 bp ladder)
1 - Theni *Foc*
2 – 0124 (Karpuravalli)
3 – Bihar *Foc* 1
4 - Bihar *Foc* 2
5 - Bihar *Foc* 3
6 - Bihar *Foc* 4
7 – Non Template control