Differences between Panama and Moko disease

<table>
<thead>
<tr>
<th>Panama Disease</th>
<th>Moko Disease</th>
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</thead>
<tbody>
<tr>
<td>Symptoms progress from older to younger leaves</td>
<td>Symptoms progress from younger to older leaves</td>
</tr>
<tr>
<td>No symptoms seen in young suckers</td>
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<tr>
<td>No oozing seen in exposed surfaces</td>
<td>Bacterial ooze observed on cut surfaces</td>
</tr>
<tr>
<td>No symptoms in fruits</td>
<td>Internal fruit rot possible</td>
</tr>
</tbody>
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Preventative and Control Measures

- Do not import banana and plantain plants or seedlings or other host plants of the disease from countries where PDR4 is present.
- Persons who visit banana and plantain fields in countries where PDR4 is present must leave clothes and shoes in that country or do not visit those fields.
- The Banana Board will carry out surveillance for early detection of the disease.
- The Banana Board will conduct Panama disease awareness sessions for Quarantine and Extension Officers, farmers and the general public.
- Introduce, research and develop resistant varieties.
- Do not use planting material from fields which have Panama disease.
- Use best practices and technologies recommended by the Banana Board.
- Do not disturb infected plants. Mark the spot where the disease is seen. Report to the Banana Board immediately.
- Disinfect all tools and shoes in infected farm with 10% bleach
- Do not allow unauthorized persons to visit your farm.

Countries with Panama Disease Race 4
Taiwan, Peninsula Malaysia, Indonesia, Australia, China, Phillipines, Jordon, Mozambique.

New varieties with various levels of resistance to PDR4:
FHIA 01, FHIA 02, FHIA 18, FHIA 25 (Walduck & Daly 2007; Bingzhi et al. 2004).
Giant Cavendish Tissue Culture Variant: GCTV 119 and GCTV 218 (Bingzhi et al. 2004, Molina 2011).
None of the common commercial varieties are resistant to PDR4.

Alternate Hosts of Panama Disease

- Commelina diffusa
  Water grass
- Euphorbia heterophylla
  Milk Weed
- Panicum purpurencens
  Para grass
- Chloris inflata
  Purple Top

Produced By:
The Banana Board, 10 South Avenue, Kingston Gardens
Kingston 4, Tel: 876-922-2083, Fax: 876-967-3680
Email: bbresearch@cwjamaica.com; Web: thebananaboard.org
**Panama Disease (PD)**

Panama disease Race 4 (PDR4) is a deadly disease of bananas and plantains. It is caused by the soilborne fungus, *Fusarium oxysporum f. sp. cubense*.

PDR4 is currently not present in Jamaica and it is very important to keep it out of the country as long as possible. Only PD Race 1 and PD Race 2 are present in Jamaica.

**Banana varieties killed by PDR1:**
Gros Michel and Silk (Apple, Bumpy, Thousand fingers, Chinese)

**Banana varieties killed by PDR2:**
Bluggoe, Bodles Altafort and Highgate (Jamaican Tetraploid)

PDR4 will kill common varieties of banana: Robusta, Lacatan, William, Gran Naine and Valery (Cavendish) and plantains (Horse, French) and all of the varieties affected by PDR1 and 2.

**Means of Transmission**
Panama Disease is spread through living or dead host plants, infected plant parts and soil from infected fields, carried in and out of the field by persons, tools, animals and irrigation water.

**Symptoms of Panama Disease Race 4**

*Similar symptoms to Race 1 and 2*

- **Premature yellowing of oldest leaves**
- **Dying of leaves and plants**
- **Buckling of the leaves in Gros Michel**
- **Discolouration of vascular tissues of the trunk**
- **Splitting at the base of the trunk**
- **Darkening of water and food channels (vessels) not seen in young suckers**
- **Discolouration of vascular tissues in the corm**