Coffee Varieties with Coffee Leaf Rust (CLR) Resistance

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Hawaii Agriculture Research Center (HARC)
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Coffee Leaf Rust (CLR)

*Hemileia vastatrix*
## Spread of Coffee Leaf Rust (CLR)

<table>
<thead>
<tr>
<th>Year</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>1869</td>
<td>Ceylon (now Sri Lanka)</td>
</tr>
<tr>
<td>1913</td>
<td>Kenya</td>
</tr>
<tr>
<td>1970</td>
<td>Brazil</td>
</tr>
<tr>
<td>1976</td>
<td>Nicaragua</td>
</tr>
<tr>
<td>1980</td>
<td>El Salvador</td>
</tr>
<tr>
<td>1981</td>
<td>Guatemala</td>
</tr>
<tr>
<td>1983</td>
<td>Colombia</td>
</tr>
<tr>
<td>1986</td>
<td>Jamaica</td>
</tr>
<tr>
<td>20 <strong>?</strong></td>
<td>Hawaii</td>
</tr>
</tbody>
</table>
Coffee Leaf Rust (CLR)  
*Hemileia vastatrix*

- Timely Application of Fungicides
- Breeding for Varieties with Coffee Leaf Rust (CLR) Resistance  
  Sustainable approach - for environment and economics
### Coffee with Rust Resistance?

<table>
<thead>
<tr>
<th>Coffee Variety</th>
<th>Rust Resistance?</th>
<th>Cupping Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arabica (<em>Coffea arabica</em>)</td>
<td>No</td>
<td>High</td>
</tr>
<tr>
<td>Robusta (<em>Coffea canephora</em>)</td>
<td>Yes</td>
<td>Low</td>
</tr>
</tbody>
</table>
Discovery of rust resistance coffee and research

- Hibrido de Timor (HDT) was discovered at ex-Portuguese Colony of Timor (now Timor Lorosae) in 1950s

  HDT = natural hybrid of Arabica x Canephora

- Coffee Rust Research Center (CIFC), Portugal
  - Characterization of more than 45 rust races.
  - Distribution of CLR resistant hybrids to many countries
  - Testing of coffee for many races of CLR
Rust resistant varieties derived from Hybrido de Timor (HDT)

http://www.anacafe.org/glifos/index.php/Variedades_resistentes_a_roya
Collection of rust resistant cultivars imported

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Breeding Line</th>
<th>Source</th>
<th>Year</th>
<th>Rust</th>
<th>Progeny</th>
<th>Importer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Icatu</td>
<td>?</td>
<td>Brazil</td>
<td>1992</td>
<td>R</td>
<td>Yes</td>
<td>Pioneer Mill Co</td>
</tr>
<tr>
<td>Catimor</td>
<td>T-5175</td>
<td>Promecafe, Dr. Osorto, Guatemala</td>
<td>1991</td>
<td>R</td>
<td>Yes</td>
<td>HARC</td>
</tr>
<tr>
<td>Catimor</td>
<td>T-8667</td>
<td>Promecafe, Dr. Osorto, Guatemala</td>
<td>1991</td>
<td>R</td>
<td>Yes</td>
<td>HARC</td>
</tr>
<tr>
<td>Icatu vermelho</td>
<td>2941</td>
<td>Dr. H. Medina, IAC, Campinas, Brazil</td>
<td>1997</td>
<td>R, horizontal</td>
<td>No</td>
<td>Dan Kuhn CTHAR</td>
</tr>
<tr>
<td>Icatu vermelho</td>
<td>LMC4782</td>
<td>Dr. H. Medina, IAC, Campinas, Brazil</td>
<td>1997</td>
<td>R, horizontal</td>
<td>No</td>
<td>Dan Kuhn CTHAR</td>
</tr>
<tr>
<td>Catimor</td>
<td>5175</td>
<td>Dr. H. Medina, IAC, Campinas, Brazil</td>
<td>1997</td>
<td>R</td>
<td>No</td>
<td>Dan Kuhn CTHAR</td>
</tr>
<tr>
<td>Obata</td>
<td>LMC1669-20</td>
<td>Dr. H. Medina, IAC, Campinas, Brazil</td>
<td>1997</td>
<td>R</td>
<td>No</td>
<td>Dan Kuhn CTHAR</td>
</tr>
<tr>
<td>TUPI</td>
<td>LMC1669-33</td>
<td>Dr. H. Medina, IAC, Campinas, Brazil</td>
<td>1997</td>
<td>R</td>
<td>No</td>
<td>Dan Kuhn CTHAR</td>
</tr>
</tbody>
</table>
Hybrids of Catimor x Hawaiian Cultivars

Catimors: T8776, T5175

Hawaiian Cultivars:

1999

Typica  Catuai  Mokka

F1 Hybrids

2014
# Crosses made for rust resistance

<table>
<thead>
<tr>
<th>HI cultivars</th>
<th>Catuai</th>
<th>Typica</th>
<th>Mokka</th>
<th>Other arabica</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catimors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T-5175</td>
<td>10(^a)(94)(^b)</td>
<td>8 (56)</td>
<td>18(377)</td>
<td>7 (58)</td>
<td></td>
</tr>
<tr>
<td>T-8667</td>
<td>18 (133)</td>
<td>2 (12)</td>
<td>10 (104)</td>
<td>11 (77)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>28</td>
<td>10</td>
<td>28</td>
<td>18</td>
<td>84 (911)</td>
</tr>
</tbody>
</table>

\(^a\): F1 Cross #  
\(^b\): F1 Tree #
Selection of rust resistant varieties with cupping quality

**HARC/ HI**
- Select 20 F1 hybrids of Catimor x Hawaiian Varieties
- Harvest cherries for cupping
- Make self pollination of top trees
- Plant seeds (F2) of rust resistance and Good cupping
- Select top F2 trees for propagation

**CIFC (Coffee Rust Research Center) Portugal**
- Dr. Varzea, IITC, Portugal
  - Bioassay for rust resistance
  - Y1 Test results against 10+ rust races
  - Y2 Test results against 10+ rust races
F1: Catimor x HI arabica

Select trees with cupping quality and rust resistance

Self Pollination to obtain F2

F3 planting

Seed Propagation

Cupping Quality

Rust Resistance

2014

2016

2017?
What we can do now

- If you visit coffee growing regions/fields, wash your clothes, hats, shoes before going coffee fields in Hawaii!

- Import green coffee under HI regulation!

- Do not import/plant rust resistant varieties from outsides of HI. If you do, separate them from your arabica varieties!
HARC Coffee Research Team and Collaborators

HARC
  Chifumi Nagai
  Ming-Li Wang
  Jayme Barton and Kunia staff

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