Evaluation of Banana Clones for Commercial Potential In Hawaii

Scot Nelson & Gabriel Sachter-Smith

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Subgroup</th>
<th>Source</th>
<th>ITC Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Niyarma Yik</td>
<td>AA</td>
<td>UHM research collection</td>
<td>ITC0269</td>
</tr>
<tr>
<td>Inyoya</td>
<td>AAA, Mutika/Lujugira</td>
<td>UHM research collection</td>
<td>ITC0163</td>
</tr>
<tr>
<td>Ney Poovan</td>
<td>AAB/ABB, Pisang Awak*</td>
<td>UHM research collection</td>
<td>ITC0459</td>
</tr>
<tr>
<td>Gran Nain</td>
<td>AAA, Cavendish</td>
<td>local grocery store</td>
<td>N/A</td>
</tr>
<tr>
<td>Mbirabire</td>
<td>AAA, Mutika/Lujugira</td>
<td>UHM research collection</td>
<td>ITC0154</td>
</tr>
<tr>
<td>Santa Catarina</td>
<td>AAB, Pome</td>
<td>local grocery store</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Average Rating of Banana Cultivars to a 95% Confidence Level

- Extremely Like: 5
- Like: 4
- Neutral: 3
- Dislike: 2
- Extremely Dislike: 1

Banana Cultivars: Niyama Yik, Inyoya, Ney Poovan, Gran Nain, Mbirabire, Santa Catarina

Average Ratings:
- Niyama Yik: 5.05
- Inyoya: 5.00
- Ney Poovan: 5.20
- Gran Nain: 5.40
- Mbirabire: 5.25
- Santa Catarina: 5.15
Transfer of Gene(s) for PRSV Resistance from *Vasconcellea quercifolia* to Papaya (mid 1990s – 2009)

- C. *papaya* Line 2.001 x *V. quercifolia*
- ~500 F1 hybrids produced in Australia
- 11 male F1s with some pollen fertility

Rod Drew & Chris O’Brien
Monina Siar & Andy Sajise
Backcrossing in P.I. with *C. papaya* ‘Cariflora’ Recurrent Parent

- Developed for PRSV resistance

Intergeneric BC4 at Los Banos

BC2, BC3, BC4

‘Cariflora’ papaya - backcross recurrent parent

Intergeneric BC4 at Los Banos
Evaluation of Resistance to Ringspot Virus from a Wild Relative of Papaya

Rod Drew, Simeona Siar, Maureen Fitch, Steve Ferreira, Karen Pitz, Richard Manshardt

Carica papaya x Vasconcellea quercifolia
- four BC$_5$ populations (~180 plants)
- segregating for PRSV resistance in the Philippines
Inoculation dates: Aug 16, Sept. 13, Oct. 11

△ = 9 mo. old at 1st inoculation
○ = 5 mo. old at 1st inoculation
5648 = ‘Cariflora’
ELISA (Abs 405nm) Shows Little Difference Among Intergeneric BC5s & ‘Cariflora’

<table>
<thead>
<tr>
<th>LINE</th>
<th>Maximum</th>
<th>Average</th>
<th>Minimum</th>
<th>PRSV +</th>
<th>PRSV -</th>
</tr>
</thead>
<tbody>
<tr>
<td>DS</td>
<td>0.722</td>
<td>0.361</td>
<td>-0.016</td>
<td>0.434 (12)</td>
<td>(0)</td>
</tr>
<tr>
<td>Kapoho</td>
<td>0.682</td>
<td>0.323</td>
<td>-0.121</td>
<td>0.396 (18)</td>
<td>(0)</td>
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<tr>
<td>F1</td>
<td>0.526</td>
<td>0.119</td>
<td>-0.129</td>
<td>0.278 (12)</td>
<td>0.018 (6)</td>
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<tr>
<td>B15</td>
<td>0.463</td>
<td>0.092</td>
<td>-0.218</td>
<td>0.263 (14)</td>
<td>0.014 (9)</td>
</tr>
<tr>
<td>Cariflora</td>
<td>0.473</td>
<td>0.093</td>
<td>-0.205</td>
<td>0.238 (17)</td>
<td>-0.011 (7)</td>
</tr>
<tr>
<td>B8</td>
<td>0.298</td>
<td>0.059</td>
<td>-0.107</td>
<td>0.204 (11)</td>
<td>0.054 (10)</td>
</tr>
<tr>
<td>B7</td>
<td>0.359</td>
<td>0.046</td>
<td>-0.09</td>
<td>0.150 (16)</td>
<td>0.037 (9)</td>
</tr>
<tr>
<td>SK x D</td>
<td>0.179</td>
<td>-0.073</td>
<td>-0.185</td>
<td>(0)</td>
<td>0.000 (19)</td>
</tr>
</tbody>
</table>

DS & Kapoho = PRSV-Susceptible controls

Red box = Intergeneric BC5 & Cariflora recurrent parent

Sk x D = PRSV-Resistant Controls (transgenic)
Tentative Conclusions:

• Younger plants (5 mo.) show PRSV symptoms faster than older plants (9 mo.)
• Solo genotypes become infected more quickly and more severely than intergeneric BC progenies
• No important difference (so far) between intergeneric BCs and recurrent parent ‘Cariflora’
  • Days to symptom expression
  • Symptom severity
  • ELISA Abs. @ 405nm
  • Percentage of symptomless plants 4 mo. after first inoculation
Movement of Genetically Engineered (GE) Genes

Background

- 1992 - PRSV discovered in major production areas on Big Island
- 1998 – resistant GE papaya cultivars released
- 2012 – 80% of commercial papaya fields are GE
WHY study gene movement??

• Resolve conflicting claims about scale of GE “contamination”

• Develop science-based information for bio-containment procedures

• Assist organic growers
Objectives:

• Determine occurrence of GE plants in “feral” papaya populations outside commercial fields

• Determine the relative importance of pollen and seed in dispersal of GE plants
Results

• Of 623 feral plants surveyed on Oahu & Big Is., 22% were GE.
• No evidence of out-crossing among 119 non-GE hermaphrodite plants.
• 16% of 128 non-GE female papaya plants had some level of GE out-crossing.
• Analysis of sex ratios among feral escapes revealed that gene flow from commercial fields into surrounding areas occurs primarily by seed dispersal (birds, pigs, roadside spillage, human consumers), not pollen movement.
• Few GE escapes persist beyond the 1st generation (poor weeds).
• Transgene flow into established feral populations will be slow and gradual.
How To Isolate Your Field From GE Papayas

To avoid GE gene flow:

1. plant only non-GE seed
2. eliminate female plants in your field
3. eliminate spontaneous plants in your vicinity