Resistance to Fusarium Wilt in Lettuce

Jim McCreight
U.S. Department of Agriculture
Agricultural Research Service
Salinas, California
Contributors

- Krishna Subbarao, UC, Davis (Salinas)
- Mike Matheron, UA, Yuma
- Barry Tickes, UACE, Yuma County
- Steve Koike, UCCE, Monterey County
Fusarium Wilt of Lettuce

- 1955 Japan
- 1990 Huron, California
- 2001 Huron & Yuma
- 2001 Italy
- 2002 Watsonville, California
Fusarium Wilt of Lettuce

- Japan
  - *Fusarium oxysporum f. sp. lactucae*
  - Two races, 1995

- California & Arizona
  - *Fusarium oxysporum f. sp. lactucum*
  - Race 1
## Fusarium Wilt on Lettuce: Races

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>R1</th>
<th>R2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Costa Rica No. 4</td>
<td>R</td>
<td>S</td>
</tr>
<tr>
<td>Banchu Red Fire</td>
<td>S</td>
<td>R</td>
</tr>
<tr>
<td>Patriot</td>
<td>S</td>
<td>S</td>
</tr>
</tbody>
</table>
Resistance Breeding

• Greenhouse tests, Salinas
  – Yuma isolate
  – \(5 \times 10^6\) spores/ml
  – 1 to 4 scale
    1 - No apparent disease or stunting
    2 - Slight-moderate stunting
    3 - Severe stunting and yellowing
    4 - Dead

• Field Tests, Yuma
Two Weeks Post-Inoculation

Vanguard

Empire

Salinas 88

River Green
## Fusarium Wilt Resistance

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Expected</th>
<th>Observed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Empire</td>
<td>S</td>
<td>2.0</td>
</tr>
<tr>
<td>Green River</td>
<td>R</td>
<td>1.5</td>
</tr>
<tr>
<td>Salinas 88</td>
<td>S</td>
<td>1.1</td>
</tr>
<tr>
<td>Vanguard</td>
<td>S</td>
<td>3.2</td>
</tr>
</tbody>
</table>
## Fusarium Wilt Resistance

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Disease category</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Empire</td>
<td>8</td>
</tr>
<tr>
<td>Green River</td>
<td>13</td>
</tr>
<tr>
<td>Salinas 88</td>
<td>18</td>
</tr>
<tr>
<td>Vanguard</td>
<td>0</td>
</tr>
</tbody>
</table>
Four Weeks Post-Inoculation

Patriot

Empire

Salinas 88

Costa Rica No. 4
## Fusarium Wilt Resistance

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Expected</th>
<th>Observed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Costa Rica No. 4</td>
<td>R</td>
<td>1.0</td>
</tr>
<tr>
<td>Empire</td>
<td>S</td>
<td>1.5</td>
</tr>
<tr>
<td>Patriot</td>
<td>S</td>
<td>3.4</td>
</tr>
<tr>
<td>Salinas 88</td>
<td>S</td>
<td>1.6</td>
</tr>
</tbody>
</table>
Fusarium Wilt Summary

• Confirm resistance in ‘Salinas 88’
• Confirm race identity
• Determine inheritance of resistance
Fall Melon Virus

Jim McCreight
U.S. Department of Agriculture
Agricultural Research Service
Salinas, California
Contributors

- Bob Flock, Imperial County
- Judith Brown, UA, Tucson
- Eric Natwick, UCCE, Imperial County
- Keith Mayberry, UCCE, Imperial County
- Tom Turini, UCCE, Imperial County
- Bob Gilbertson, UC, Davis
- James Duffus, USDA, ARS, Salinas
- Hsing-Yeh Liu, USDA, ARS, Salinas
- Bill Wintermantel, USDA, ARS, Salinas
History

• 1977 – 1981
• 1981 – 1990
• 1991 – present
1977 – 1981

- Sweetpotato Whitefly
- Squash Leaf Curl Virus (SLCV)
- Summer Squashes
- Winter Squashes
- Melon Leaf Curl Virus (MLCV)
- Watermelon Curly Mottle Virus (WCMoV)
1981 – 1990

- Sweetpotato Whitefly Outbreak
- SLCV
- Lettuce Infectious Yellows Virus (LIYV)

Arab Emirates, 1982
1991 – Present

• New Whitefly
  – Sweetpotato Whitefly Strain B
  – Silverleaf Whitefly
• Cucurbit Leaf Crumple Virus (CuLCrV), 1998
• Melon Chlorotic Leaf Curl Virus (MCLCV), 2000
• CYSDV in Texas & Mexico, 1999
CuLCrV

- Effects?
- Resistance
CYSDV

- Effects
- Resistance
Fall Melon Virus Summary

• CuLCrV
  – Potential problem
  – Putative resistance

• CYSDV
  – Texas & Mexico
  – Resistance reported