Update on Lettuce Fusarium Research

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University of Arizona
Yuma Agricultural Center
Status of Fusarium wilt in Yuma

- In 2001, *Fusarium oxysporum f.sp. lactucae* was recovered from diseased plants from six different sites.
- In 2002 (to date), the disease has been confirmed in five new sites.
How to minimize the spread of *Fusarium oxysporum* f. sp. *lactucae*

- Avoid transport of infected plant debris and soil from an infested field into a “clean” field.
**Fusarium oxysporum**

- Comprises 40 to 70% of the total *Fusarium* population in soil.
- Very active saprophyte (nonpathogenic phase).
- When pathogenic, it primarily causes symptoms of wilt and sometimes root rot.
- There are over 75 different formae speciales of *Fusarium oxysporum*. 
What is a formae specialis?

• This is a sub-species categorization based on physiological or biochemical characteristics, particularly with respect to pathogenicity and host range.
Fusarium oxysporum f.sp. lactucae

A = mycelium growing on agar
B = macroconidia
C = microconidia
D = chlamydospores + macroconidia
Symptoms of Fusarium wilt on lettuce

- **Seedling stage**
  - Death of some plants.
  - Red streak through the cortex of the crown and upper root.

- **Older plants**
  - Brown streaks in the vascular system of the crown.
  - Reddish brown discoloration of the crown and upper root cortex.
Fusarium wilt of lettuce
Fusarium wilt of lettuce
Genetic tolerance or resistance is the most effective disease management tool for most wilt diseases caused by *Fusarium oxysporum* on other crops.
Lettuce cultivar evaluation trial

- Trial is being conducted in a field with a history of Fusarium wilt of lettuce.
- Lettuce cultivars are being planted at three different planting dates.
- The replicate plot size is two beds 150 ft. in length, with 4 replicate plots per cultivar arranged in a randomized complete block design.
- Disease development will be monitored from thinning until plant maturity.
Cooperators in this study

"The coalition"

- Arizona Department of Agriculture
- Arizona Iceberg Lettuce Research Council
- Coronation Peak Ranches
- Keithly-Williams Seed
- Seed Trade Association of Arizona
- Select Seed of Arizona, Inc.
- University of Arizona
- USDA
- Yuma Vegetable Shippers Association
More cooperators

- Central Valley Seed
- Coastal Seed Co.
- Harris Moran Seed Co.
- Orsetti Seed Co.
- Paragon Seed Co.
- Progeny Advanced Genetics
- Pybas Seed Co.
- Seminis Vegetable Seed Co.
- Synergene Seed and Technology
- Three Star Seed Co.
### Lettuce cultivar evaluation trial

<table>
<thead>
<tr>
<th></th>
<th>First planting</th>
<th>Second planting</th>
<th>Third planting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wet date</td>
<td>Sep. 7</td>
<td>Oct. 17</td>
<td>Dec. 5</td>
</tr>
<tr>
<td>Terminated</td>
<td>Nov. 8</td>
<td>In progress</td>
<td></td>
</tr>
<tr>
<td>Status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Head lettuce cultivars</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Acacia</strong></td>
<td><strong>Emperor</strong></td>
<td><strong>La Quinta</strong></td>
<td><strong>Snowbird</strong></td>
</tr>
<tr>
<td><strong>Annie</strong></td>
<td><strong>Fallgreen</strong></td>
<td><strong>Lighthouse</strong></td>
<td><strong>Spector</strong></td>
</tr>
<tr>
<td><strong>Beacon</strong></td>
<td><strong>Fortuna</strong></td>
<td><strong>Milestone</strong></td>
<td><strong>Sun Devil</strong></td>
</tr>
<tr>
<td><strong>Buccaneer</strong></td>
<td><strong>Green Pack</strong></td>
<td><strong>Mohawk</strong></td>
<td><strong>Tradition</strong></td>
</tr>
<tr>
<td><strong>Cavalier</strong></td>
<td><strong>Grand Max</strong></td>
<td><strong>Monarch</strong></td>
<td><strong>Tres Equis</strong></td>
</tr>
<tr>
<td><strong>Crusader</strong></td>
<td><strong>Heatmaster</strong></td>
<td><strong>Palma</strong></td>
<td><strong>Valley Green</strong></td>
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<tr>
<td><strong>Desert Heat</strong></td>
<td><strong>Husky</strong></td>
<td><strong>Raider</strong></td>
<td><strong>Valley Queen</strong></td>
</tr>
<tr>
<td><strong>Desert Queen</strong></td>
<td><strong>Javelina</strong></td>
<td><strong>Sahara</strong></td>
<td><strong>Wellton</strong></td>
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<tr>
<td><strong>Desert Storm</strong></td>
<td><strong>Kahuna</strong></td>
<td><strong>Sharpshooter</strong></td>
<td><strong>No names (4)</strong></td>
</tr>
<tr>
<td><strong>Diamond Back</strong></td>
<td><strong>Laguna Fresca</strong></td>
<td><strong>Sniper</strong></td>
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</table>
Other lettuce cultivars

<table>
<thead>
<tr>
<th></th>
<th>Encanto</th>
<th>North Star</th>
<th>Robusto</th>
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</thead>
<tbody>
<tr>
<td>BOS 9021</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clemente</td>
<td>Fresheart</td>
<td>Optima</td>
<td>Slugger</td>
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<tr>
<td>Coastal Star</td>
<td>Green Forest</td>
<td>Paragon PIC</td>
<td>Triton</td>
</tr>
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<td>Conquistador</td>
<td>Green Towers</td>
<td>PIC</td>
<td>Two Star</td>
</tr>
<tr>
<td>Darkland COS</td>
<td>King Louie</td>
<td>Red Fox</td>
<td>Vulcan</td>
</tr>
<tr>
<td>DF 7</td>
<td>Marin</td>
<td>Red Tide</td>
<td>Western Red</td>
</tr>
</tbody>
</table>
Percentage of plants dead per cultivar 25 days after wet date
Percentage of plants dead per cultivar 37 days after wet date

Iceberg lettuce cultivar

% of plants dead

0 20 40 60 80 100

Percentage of plants dead per cultivar
Percentage of plants dead per cultivar 62 days after wet date (Plant maturity)
Lettuce cultivar evaluation trial: Head lettuce
Mean percentage of iceberg lettuce plants dead at various growth stages

Days after wet date

% of plants dead

0 20 40 60 80 100

25 37 62

Days after wet date
Mean percentage of different types of lettuce plants dead at maturity

- Iceberg:
  - Number of cultivars tested: 41

< Number of cultivars tested.
Mean percentage of different types of lettuce plants dead at maturity

- Iceberg: 41% of plants dead
- Butter: 2% of plants dead

< Number of cultivars tested.
Mean percentage of different types of lettuce plants dead at maturity

<table>
<thead>
<tr>
<th>Lettuce type</th>
<th>% of plants dead</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iceberg</td>
<td>41</td>
</tr>
<tr>
<td>Butter</td>
<td>2</td>
</tr>
<tr>
<td>Greenleaf</td>
<td>3</td>
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</tbody>
</table>

< Number of cultivars tested.
Mean percentage of different types of lettuce plants dead at maturity

- Iceberg: 41%
- Butter: 2%
- Greenleaf: 3%
- Red leaf: 4%

< Number of cultivars tested.
Mean percentage of different types of lettuce plants dead at maturity

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<tr>
<td>Greenleaf</td>
<td>3</td>
</tr>
<tr>
<td>Red leaf</td>
<td>4</td>
</tr>
<tr>
<td>Romaine</td>
<td>15</td>
</tr>
</tbody>
</table>

< Number of cultivars tested.
Lettuce cultivar evaluation trial:
Romaine vs. head lettuce
Further research is needed to confirm the preliminary findings presented this morning.