Fighting Diseases in Florida Strawberry Through Advanced Breeding Technology

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Major Diseases in FL Strawberries

Angular leaf spot

Phytophthora crown and root rot

Colletotrichum crown rot

Anthracnose fruit rot

Charcoal rot

Powdery mildew
# Disease Resistance in FL Strawberries

<table>
<thead>
<tr>
<th>Disease</th>
<th>Strawberry Festival</th>
<th>Winterstar™</th>
<th>Florida Radiance</th>
<th>Sweet Sensation®</th>
<th>Florida Beauty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anthracnose fruit rot</td>
<td>Blue</td>
<td>Blue</td>
<td>Medium-susceptible</td>
<td>Susceptible</td>
<td>Susceptible</td>
</tr>
<tr>
<td>Angular leaf spot</td>
<td>Medium-susceptible</td>
<td>Medium-susceptible</td>
<td>Susceptible</td>
<td>Susceptible</td>
<td>Susceptible</td>
</tr>
<tr>
<td>Charcoal rot</td>
<td>Medium-susceptible</td>
<td>Medium-susceptible</td>
<td>Susceptible</td>
<td>Susceptible</td>
<td>Susceptible</td>
</tr>
<tr>
<td>Botrytis fruit rot</td>
<td>Medium-susceptible</td>
<td>Medium-susceptible</td>
<td>Susceptible</td>
<td>Susceptible</td>
<td>Susceptible</td>
</tr>
<tr>
<td>Colletotrichum crown rot</td>
<td>Medium-susceptible</td>
<td>Medium-susceptible</td>
<td>Susceptible</td>
<td>Susceptible</td>
<td>Susceptible</td>
</tr>
<tr>
<td>Phytophthora crown &amp; root rot</td>
<td>Susceptible</td>
<td>Susceptible</td>
<td>Susceptible</td>
<td>Susceptible</td>
<td>Susceptible</td>
</tr>
<tr>
<td>Powdery mildew</td>
<td>Medium-resistant</td>
<td>Medium-resistant</td>
<td>Medium-susceptible</td>
<td>Medium-susceptible</td>
<td>Medium-susceptible</td>
</tr>
</tbody>
</table>

- **Resistant**
- **Medium-resistant**
- **Susceptible**
- **Medium-susceptible**
Resistance in UF Breeding Germplasm

Angular leaf spot
- 14.101-225

Phytophthora crown and root rot
- Festival

Colletotrichum crown rot
- Elyana

Anthracnose fruit rot
- 13.26-134

Charcoal rot
- 13.26-134

Powdery mildew
- 13.55-195
Finding Resistance Genes...
Location of Resistance Genes

Lg1  Lg2  Lg3  Lg4  Lg5  Lg6  Lg7
A B C D  A B C D  A B C D  A B C D  A B C D  A B C D

0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200

CCR: C. gloeosporioides
PhCR: P. cactorum

Powdery mildew

Charcoal rot

AFR: C. acutatum

ALS: X. fragaria

R S R S R S R S

Sujeet Verma
Detecting Resistance Gene...

- DNA marker

[Images of DNA strands and flags labeled Xf1, Pc2, Cg1, Ca1]
Improving Disease Resistance

DNA marker-assisted seedling selection (MASS)
A High-Throughput MASS: Sample Collection
A High-Throughput MASS: DNA Extraction and Genotyping
A High-Throughput MASS: Data Analysis
Seedlings with Target Gene
Gene Editing Technology in Florida Strawberry
Phytophthora Crown and Root Rot: ‘Sweet Sensation®’ FL127
Current Breeding for Disease Resistance

Festival × Sweet Sensation®

Color | Flavor | Size | Yield | Resistant
-------|--------|------|-------|----------
|       |        |      |       | ✓        |

Jewels in the Genome: Combining desired attributes that lead to new cultivars
Gene Editing Technology to Speed Superior Strawberry Variety Development

Not GMO

Festival

Sweet Sensation®
Gene-edited Resistant ‘Sweet Sensation®’ to Phytophthora Crown and Root Rot

Dr. Cheolmin Yoo

Sweet Sensation®

S (Sweet Sensation®) 

R (Festival)
Conclusions

• Using DNA marker tests to increase disease resistance

• Developing non-GMO methods to improve target disease resistance in varieties
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- Jose Hernandez
- Kelsey Cearley
- Luis Osorio
- Wantanee Prescott
- Zhen Fan
Identifying Location...

Accutatum - Resistance (R) gene
Strawberry Gene Scanning...
Molecular Scissors in Genetic Engineering

Development of gene-editing technology to speed superior strawberry variety development

- Conventional breeding
- Gene editing technology
Cultivar development with gene editing
Molecular Scissors in Genetic Engineering