Fresno County white rot management field trial results

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White rot of onions and garlic

- Above ground and below ground symptoms
- Host range is limited to Alliums
Central San Joaquin Valley Infested Fields

More than 21,000 acres are reported as infested with the white rot pathogen.
Caused by *Sclerotium cepivorum*

Sclerotia survive for decades, cause disease at very low concentrations and are easily disseminated.
Germination Stimulants

Materials containing volatile sulfur-containing compounds stimulate sclerotia to germinate in the absence of a host.

- diallyl-disulfide (DADS) reduced soil levels of the fungus by 90 to 98% in field trials*
- DADS is currently unavailable.

Fungicides Applied at Planting

Fungicide application at planting results in reduction of disease severity and increase in yields.
Objectives of 2015-16 Study

• Evaluate fallow application of garlic juice impact on soil levels of sclerotia.
• Assess influence of garlic juice on yield and quality of the garlic.
• Compare performance of garlic juice with and without fungicides applied at planting.
Garlic Juice Treatments

1. garlic juice at 2.0 gal/acre
2. garlic juice at 20.0 gal/a
3. Untreated control

Applied: January 23, 2015
Garlic Juice Injection

- 23 Jan 2015
- 30 gallons of tank mix per acre
- 4 beds per pass
- 40 inch beds
Fungicide Treatments

1. Tebuzol 3.6F 20.5 fl oz/a (tebuconazol) + Cannonball WP 7 oz/a (fludioxonil) + Fontelis 24 fl oz/a (penthiopyrad)

2. Tebuzol 3.6F 20.5 fl oz/a

3. Cannonball WP 7 oz/a

4. Fontelis 24 fl oz/a

5. untreated control

Application details
• Immediately before planting, on 19 Nov 2015,
• Applied in 5 inch band
• CO₂–pressurized sprayer
• 30 psi
• 15 gal/a
Field Conditions

• California Late garlic was planted on 19-20 Nov 2015. First irrigation sprinklers on 21 Nov. After emergence all irrigations were through surface drip.

• Fertilization as well as pest control was according to commercial practice.

• Irrigation was discontinued in late-Apr, which was earlier than ideal for garlic planted in mid- to late-Nov.
Experimental Design

Split-block design

• 4 Replication

• Main plot – garlic juice (4 rows x 150 ft)

• Sub plot – fungicide treatments

All data was collected from the middle two rows
# Garlic Juice Injection

<table>
<thead>
<tr>
<th>REP 1</th>
<th>REP 2</th>
<th>REP 3</th>
<th>REP 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Juice 1</td>
<td>Control</td>
<td>Juice 1</td>
<td>Control</td>
</tr>
<tr>
<td>Juice 2</td>
<td>Control</td>
<td>Juice 2</td>
<td>Control</td>
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<tr>
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<td>Juice 1</td>
<td>Control</td>
<td>Juice 1</td>
</tr>
<tr>
<td>Control</td>
<td>Juice 2</td>
<td>Juice 1</td>
<td>Control</td>
</tr>
</tbody>
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*Note: The table above represents the experimental setup for garlic juice injection with various replicates and controls.*
Garlic Juice Injection
Evaluations

- Soil samples Jan 15 and Dec 15 sclerotia counts
- Above ground symptom rated (0-10) on 28 Mar, 11, 22 Apr and 13 May
- Yield was calculated from hand harvest of 20 row ft. on 26 May 2016
Influence of garlic juice on above ground symptom severity

- garlic juice at 2.0 gal/acre
- garlic juice at 20.0 gal/a
- untreated

Disease rating (0-10): 28 Mar, 11 Apr, 22 Apr, 13 May
Influence of garlic juice on above ground symptom severity

<table>
<thead>
<tr>
<th>Date</th>
<th>Disease Rating</th>
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<tbody>
<tr>
<td>28 Mar</td>
<td>0.6</td>
</tr>
<tr>
<td>11 Apr</td>
<td>0.8</td>
</tr>
<tr>
<td>22 Apr</td>
<td>1.0</td>
</tr>
<tr>
<td>13 May</td>
<td>1.2</td>
</tr>
</tbody>
</table>

- **garlic juice at 2.0 gal/acre**
- **garlic juice at 20.0 gal/a**
- **untreated**

**NO SIGNIFICANT DIFFERENCES**
Influence of fungicides on above ground symptom severity

- Tebuzol 3.6F 20.5 fl oz/a + Cannonball WP 7 oz/a + Fontelis 24 fl oz/a
- Tebuzol 3.6F 20.5 fl oz/a
- Cannonball WP 7 oz/a
- Fontelis 24 fl oz/a
- untreated control
Influence of garlic juice on total yield and yield without signs of white rot

- Garlic juice at 2.0 gal/acre
- Garlic juice at 20.0 gal/acre
- Untreated
Influence of garlic juice on total yield and yield without signs of white rot

![Bar chart showing the effect of garlic juice on yield with no significant differences.](chart.png)
Influence of fungicides on total yield and yield without signs of white rot

The graph shows the comparison of different fungicides on total yield (tons per acre) and healthy yield (tons per acre) for different treatments:

- **Tebuzol 3.6F 20.5 fl oz/a + Cannonball WP 7 oz/a + Fontelis 24 fl oz/a**
- **Tebuzol 3.6F 20.5 fl oz/a**
- **Cannonball WP 7 oz/a**
- **Fontelis 24 fl oz/a**
- **Untreated control**
Sclerotia counts before and after treatment with garlic juice

- Garlic juice at 2.0 gal/acre
- Garlic juice at 20.0 gal/acre
- Untreated

**Graph:**
- Y-axis: Sclerotia/500cc soil
- X-axis: Jan 2015, Dec 2015

**Legend:**
- Blue: Garlic juice at 2.0 gal/acre
- Yellow: Garlic juice at 20.0 gal/acre
- Green: Untreated
Sclerotia counts before and after treatment with garlic juice

- Garlic juice at 2.0 gal/acre
- Garlic juice at 20.0 gal/acre
- Untreated

NO SIGNIFICANT DIFFERENCES
Sclerotia counts before and after treatment with fungicides

- Tebuzol 3.6F 20.5 fl oz/a
- + Cannonball WP 7 oz/a
- + Fontelis 24 fl oz/a
- Tebuzol 3.6F 20.5 fl oz/a
- Cannonball WP 7 oz/a
- Fontelis 24 fl oz/a
- untreated control

Jan 2015
Dec 2015

sclerotia/500 cc soil
Sclerotia counts before and after treatment with fungicides

- Jan 2015
- Dec 2015

- Tebuzol 3.6F 20.5 fl oz/a + Cannonball WP 7 oz/a + Fontelis 24 fl oz/a
- Tebuzol 3.6F 20.5 fl oz/a
- Cannonball WP 7 oz/a
- untreated control

NO SIGNIFICANT DIFFERENCES
Overview

• There were no differences among garlic juice treatments in terms of above ground symptoms, yield, diseased bulbs nor sclerotia counts.

• Tebuzol, Fontelis and the combination fungicide treatment reduced symptom incidence.

• Tebuzol and the combination fungicide treatment had higher yield and healthy yield
Acknowledgments

• California Garlic and Onion Research Advisory Board
• UC West Side Research and Extension Center
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• Rob Wilson – UCCE, Tulelake
• Jeremiah Dung – OSU
• Kevin Colin – Borba Farms
• Sensient Natural Ingredients
• Sequoia
Thank you

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Hard neck garlic lines evaluated for response to *Sclerotium cepivorum*

- Garlic lines were provided for screening in a white rot infested field.
- These entries were derived from true seed garlic.
- Tested at the same field as the garlic juice/fungicide evaluation 2015-2016

Rina Kamenetsky Goldstein - Institute of Plant Sciences-ARO, The Volcani Center, Israel

Itzhak Esquira - Claseed CEO
Hard neck garlic lines evaluated for response to *Sclerotium cepivorum*

- Twenty entries were tested, but three did not emerge due to low number of cloves per entry poor clove conditions.
- Four to 28 cloves per plot in each of 4 replications – if possible
- Planted on

Rina Kamenetsky Goldstein - Institute of Plant Sciences-ARO, The Volcani Center, Israel

Itzhak Esquira - Classeed CEO
Field Conditions

• California Late garlic was planted on 19-20 Nov 2015. First irrigation sprinklers on 21 Nov. After emergence all irrigations were through surface drip.

• Fertilization as well as pest control was according to commercial practice.

• Irrigation was discontinued in late-Apr, which was earlier than ideal for garlic planted in mid- to late-Nov.
Experimental Design

Randomized complete block design

- Four replication
- Plot size: single bed x 5 ft – 2 lines per bed
Evaluations

• Above grounds symptom rated (0-10) on 28 Mar, 11, 22 Apr and 13 May.

• Harvest was earlier than ideal on 27 May 2016: Heads were counted weighed and inspected with 15x magnification for sclerotia.
Influence of garlic juice on above ground symptom severity
Summary

• Additional research is needed to further evaluate the performance of these lines under heavy disease pressure.
• No sclerotia were detected on any of the cloves of two entries.