Managing Fusarium Wilt of Watermelon with Soil Fumigation?

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Fusarium Wilt of Watermelon

- Caused by the fungi *Fusarium oxysporum* f. sp. *Niveum*
- Long lived in the soil environment
- Ideal time for crop rotation is 5-10 years
- Four races of the pathogen are present in the United States
- There are no seedless cultivars available with resistance to race 2-3
- The use of grafted plants is the only option for managing race 2
  - Nematode management is a necessity with current rootstocks
Materials and Methods

• 1,3 Dichloropropene + Chloropicrin Rate Trial
• Jackson Farms, Grand Ridge, FL
• Fumigated March 13
• Beds 30” wide x 8” tall
• Fumigants were shank applied with three back-swept shanks
• Fumigant deployed 8” deep
• NTC, 125 lb/acre, 250 lb/acre
• Plots covered with 1.25 mil black Berry TIF
• ‘Troubadour’ set on March 29
Materials and Methods

- Fumigant + Fungicide Trial
- Jackson County, FL; Crisp County, GA; Toombs County, GA
- Fumigated March 13, 14, 21, 27
- 200 lb/acre chloropicrin
- Beds 30” wide x 8” tall (FL); 18” wide x 4” tall (GA)
- Fumigants were shank applied with two (GA) or three (FL) back-swept shanks
- Fumigant deployed 8” deep
- Plots covered with 1.25 mil black TIF
Materials and Methods

• Fungicides drip applied at planting, 14 and 28 days post planting
• 5.7 fl oz prothioconazole
• ‘Troubadour’ (FL), ‘Tri-X 313’ (GA)
• Disease incidence was rated weekly beginning at disease onset
Effect of Fumigation on Fusarium Wilt Incidence

- NTC
- Pic 60 125 lb
- Pic 60 250 lb

Effect of Plastic Mulch on Fusarium Incidence

- NTC
- Proline
- Pic 60
- Pic 60 Proline

Effect of Fumigation on Watermelon Yield and Size

- Yield (lb/acre)
- Avg wt (lb)

- NTC
- Pic 60 125 lb
- Pic 60 250 lb
Effect of fumigation and fungicide treatment on incidence of Fusarium wilt of watermelon in Toombs County, GA, during 2018.

<table>
<thead>
<tr>
<th>Treatment and rate per acre</th>
<th>App code$^z$</th>
<th>Disease incidence (%)$^y$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chloropicrin (Pic-100)</td>
<td></td>
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</tr>
<tr>
<td>200 lb</td>
<td>1</td>
<td>34.5 b$^w$</td>
</tr>
<tr>
<td>Proline 480 SC</td>
<td>2,3,4</td>
<td>32.8 b</td>
</tr>
<tr>
<td>Untreated</td>
<td></td>
<td>48.2 a</td>
</tr>
</tbody>
</table>
Effect of fumigation and fungicide treatment on incidence of Fusarium wilt of watermelon in Crisp County, GA, during 2018.

<table>
<thead>
<tr>
<th>Treatment and rate per acre</th>
<th>App code$^z$</th>
<th>Disease incidence (%)$^y$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chloropicrin (Pic-100) 200 lb</td>
<td>1</td>
<td>46.4 b$^w$</td>
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<td>Proline 480 SC 5.7 fl oz.</td>
<td>2,3,4</td>
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<tr>
<td>Chloropicrin (Pic-100) 200 lb</td>
<td>1</td>
<td>35.4 c</td>
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<tr>
<td>Proline 480 SC 5.7 fl oz.</td>
<td>2,3,4</td>
<td></td>
</tr>
<tr>
<td>Untreated</td>
<td></td>
<td>64.7 a</td>
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</tbody>
</table>
Effect of fumigation and fungicide treatment on incidence of Fusarium wilt of watermelon in Crisp County, GA, during 2018.

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<th>Treatment and rate per acre</th>
<th>App code&lt;sup&gt;z&lt;/sup&gt;</th>
<th>Disease incidence (%)&lt;sup&gt;y&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chloropicrin (Pic-100) 200 lb</td>
<td>1</td>
<td>17.2 c&lt;sup&gt;w&lt;/sup&gt;</td>
</tr>
<tr>
<td>Proline 5.7 fl oz</td>
<td>2,3,4</td>
<td>40.0 b</td>
</tr>
<tr>
<td>Miravis 8.5 fl oz</td>
<td>2,3,4</td>
<td>48.5 b</td>
</tr>
<tr>
<td>Propulse 13.5 fl oz</td>
<td>2,3,4</td>
<td>40.0 b</td>
</tr>
<tr>
<td>Chloropicrin (Pic-100) 200 lb + Proline 5.7 fl oz</td>
<td>1,2,3,4</td>
<td>8.5 d</td>
</tr>
<tr>
<td>Chloropicrin (Pic-100) 200 lb + Miravis 8.5 fl oz</td>
<td>1,2,3,4</td>
<td>14.2 cd</td>
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<tr>
<td>Chloropicrin (Pic-100) 200 lb + Propulse 13.5 fl oz</td>
<td>1,2,3,4</td>
<td>8.5 d</td>
</tr>
<tr>
<td>Untreated</td>
<td></td>
<td>68.5 a</td>
</tr>
</tbody>
</table>
Effect of Fumigation on Fusarium Wilt Incidence - 2019

% Fusarium Wilt

- NTC
- Pic 60 125 lb/a
- Pic 60 250 lb/a

Date
- 16-Apr
- 23-Apr
- 2-May
- 9-May
- 13-May
- 28-May
- 5-Jun

Incidence Values:
- a
- b
- ns

Significance Levels:
Compact Bed Study – Jackson County 2020

- NT compact bed LDPE
- NT compact bed TIF
- NT standard bed LDPE
- NT standard bed TIF
- Compact bed LDPE 250 LB/A
- Compact bed TIF 250 LB/A
- Standard bed LDPE 250 LB/A
- Standard bed TIF 250 LB/A

% Fusarium Infestation

Date:
- 16-Apr
- 23-Apr
- 2-May
- 9-May
- 13-May
- 28-May
- 5-Jun

Graph showing the percentage of Fusarium infestation over time for different bed and material combinations.
## Nutsedge Control with Compact and Standard Beds – Jackson Farms - 2019

<table>
<thead>
<tr>
<th>Treatment</th>
<th>nutsedge/sq ft</th>
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</thead>
<tbody>
<tr>
<td>Non treated compact bed LDPE</td>
<td>0.6</td>
</tr>
<tr>
<td>Compact bed LDPE 250 LB/A</td>
<td>0.3</td>
</tr>
<tr>
<td>Not treated compact bed TIF</td>
<td>0.8</td>
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<tr>
<td>Compact bed TIF 250 LB/A</td>
<td>0</td>
</tr>
<tr>
<td>Non treated standard bed LDPE</td>
<td>0.6</td>
</tr>
<tr>
<td>Standard bed LDPE 250 LB/A</td>
<td>0.3</td>
</tr>
<tr>
<td>Non treated standard bed TIF</td>
<td>0.6</td>
</tr>
<tr>
<td>Standard bed TIF 250 LB/A</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Tomato Yield (lb/acre)</td>
</tr>
<tr>
<td>------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
</tr>
<tr>
<td><strong>1st</strong></td>
<td>Compact</td>
</tr>
<tr>
<td></td>
<td>Standard</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>Compact</td>
</tr>
<tr>
<td></td>
<td>Standard</td>
</tr>
</tbody>
</table>
Compact Bed Geometry

Standard 30” bed, 250 lb/ac Pic Clor 60 + TIF plastic = $786

Compact 15” bed, 250 lb/ac Pic Clor 60 + TIF plastic = $513
Fusarium management with soil fumigation?

• Fumigation with chloropicrin has been shown to significantly reduce Fusarium wilt incidence and improve watermelon yield
  • *certain bed dimensions and plastic are likely required to achieve the best results
• Fumigation with chloropicrin has been shown to have not effect on Fusarium wilt incidence
• Fumigation with chloropicrin alone will likely HAVE NO EFFECT on nutsedge pressure
  • Chloropicrin applied with Telone or Paladin under TIF are effective at managing nutsedge
• Fungicides have an additive effect to fumigation but are not effective enough when used alone
Back to the field

• There are instances of positive and negative results from multiple locations over the last two years
  • Why there is discrepancy in these results is unclear
• Because of fumigation costs, it needs to provide consistent repeatable results to be adopted by stakeholders
Funding

Gulf Coast Watermelon Association

United States Department of Agriculture
National Institute of Food and Agriculture

Methyl Bromide Transition Program 2016-51102-25814
Questions?