Project updates on tomato root-knot nematode and southern blight in Kern County

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Evaluation of alternative nematicides for management of RKN

• Resistant cultivars
  Instances of breakdown of MI gene resistance

• Pre-plant fumigation
  Expensive, environmental safety concerns
  New fumigant regulations by DPR
Symptoms

• Roots deformed due to galls
• Plants stunted and less vigorous
• Roots unable to sustain the water and nutrients needs of plants
• Reduced yield and poor fruit quality
Field trial: Shafter research station

- Nematode nursery at the farm
- Replicated block design with 4 replications
- A nematode susceptible tomato variety Halley was planted
- Treatments applied either as a pre-plant or post-plant
- At harvest, tomato roots from each plot evaluated for root galling (scale of 0-10)
- Data analyzed in SAS
2019 trial

• Trial planted on: June 26
• Four treatments:
  1. Untreated control
  2. Velum 0-1 week after planting (Velum A); applied July 1
  4. Velum 1-4 week after planting (Velum C); applied July 10

• 20 feet plots (60’ beds) with a 2 feet buffer between plots
• Root galling index: 0-10 (0= no visible galls   10 extensive galling)
Galling on tomato roots caused by root knot nematode

Control Velum A Nimitz Velum C

Root gall index

Treatment

P<0.0001
Pitfalls

• Trial affected by beet leafhoppers
• Some incidence of southern blight
Screening varietal resistance for management of southern blight in processing tomatoes

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Introduction

• Soil borne fungal disease
• Caused by *Athelia rolfsii (Sclerotium rolfsii)*
• Historically a concern in Kern county
• Now an emerging concern in northern California
• High temperatures, high soil moisture, and frequent irrigation
• High probability of it being a concern in future
Management - difficult

• Deep plowing not an option
• Difficult to apply fungicides at the base of the plant
• Crop rotation not an option - wide host range
• Fumigation: expensive and regulatory issues
• Grafted transplants not economically feasible
Previous efforts

Evaluation of rootstocks for grafted plants as a strategy to manage Southern Blight in tomato (Solanum Lycopersicum)

Sclerotium rolfsii is a soil-borne fungus responsible for the disease Southern blight. With few effective chemical controls, this disease is a continuing problem in the southeastern U.S. Vegetable grafting has gained momentum as a method to manage soil-borne diseases. An experiment was conducted to evaluate 6 lines of tomato (Solanum lycopersicum) and two near relatives (Solanum pimpinellifolium) for varying levels of resistance to S. rolfsii. The intraspecific rootstocks Multifort and Maxfort were also analyzed for Southern blight resistance. These six lines are processing tomatoes from Texas A&M University: 5635M, 5707M, 5719M, 5737M, 5876M, and 5913M with reported resistance to S. rolfsii. In 1992, Leeper and others released six processing tomato breeding lines with resistance to S. rolfsii (Leeper et al., 1992). Leeper (1992) specifically states that there are 2 PIs (S. pimpinellifolium) with noted resistance, however, they were not specifically used in the breeding program. The original source of resistance was unknown but following research from Mohr (1955) was shown that the method of incurred resistance was cited as secondary stem thickening as the plant matured which provided a greater barrier against the pathogen. To evaluate disease resistance, plants were grown under greenhouse conditions in Auburn, AL. These eight lines plus two susceptible controls were organized in a RCBD with two plants of each line per block with four replications repeated 3 times in Aug, Sept, and Oct 2016. One isolate of S. rolfsii was used to inoculate half of the plants in each block when the plants were 8-weeks-old. The plants were evaluated and graded on a 0-5 scale over the next 7-10 days. All plants disclosed signs of infection three to four days after inoculation. Greenhouse screening
Field Trial: Evaluate susceptibility of six commercial cultivars and six resistant breeding lines

- Grower’s field (Boswell farm)
- Replicated block design with four reps
- Plots: 60 inches wide and 40 feet long
- Planted on May 21
- Evaluate disease incidence: symptoms and mortality
- Harvested on August 29
- Data on marketable yield
- Data analysis using SAS
Varieties: 12 total

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<th>Texas Lines</th>
<th>Commercial lines</th>
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<td>2. SUN 6366</td>
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<td>3. 5737M</td>
<td>3. HZ 1428</td>
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<td>4. 5913M</td>
<td>4. N 6416</td>
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<tr>
<td>5. 5719M</td>
<td>5. HZ 4707</td>
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<tr>
<td>6. 5876M</td>
<td>6. 3887 HMX</td>
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Disease incidence: Southern blight 08/20/19

% incidence

P=0.07
AUDPC : Southern blight

![Bar chart showing AUDPC for various varieties.](chart.png)
Average yield per plot (100 sq ft)

<table>
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<tr>
<th>Variety</th>
<th>Yield (lbs)</th>
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$F_{11, 36} = 2.27 \ P = 0.034$
Summarize

• Breeding lines performed well in the GH and field studies
• Potential to benefit the processing tomato industry
• Some commercial cultivars were also at a lower risk in the GH studies
• Further evaluations needed
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