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

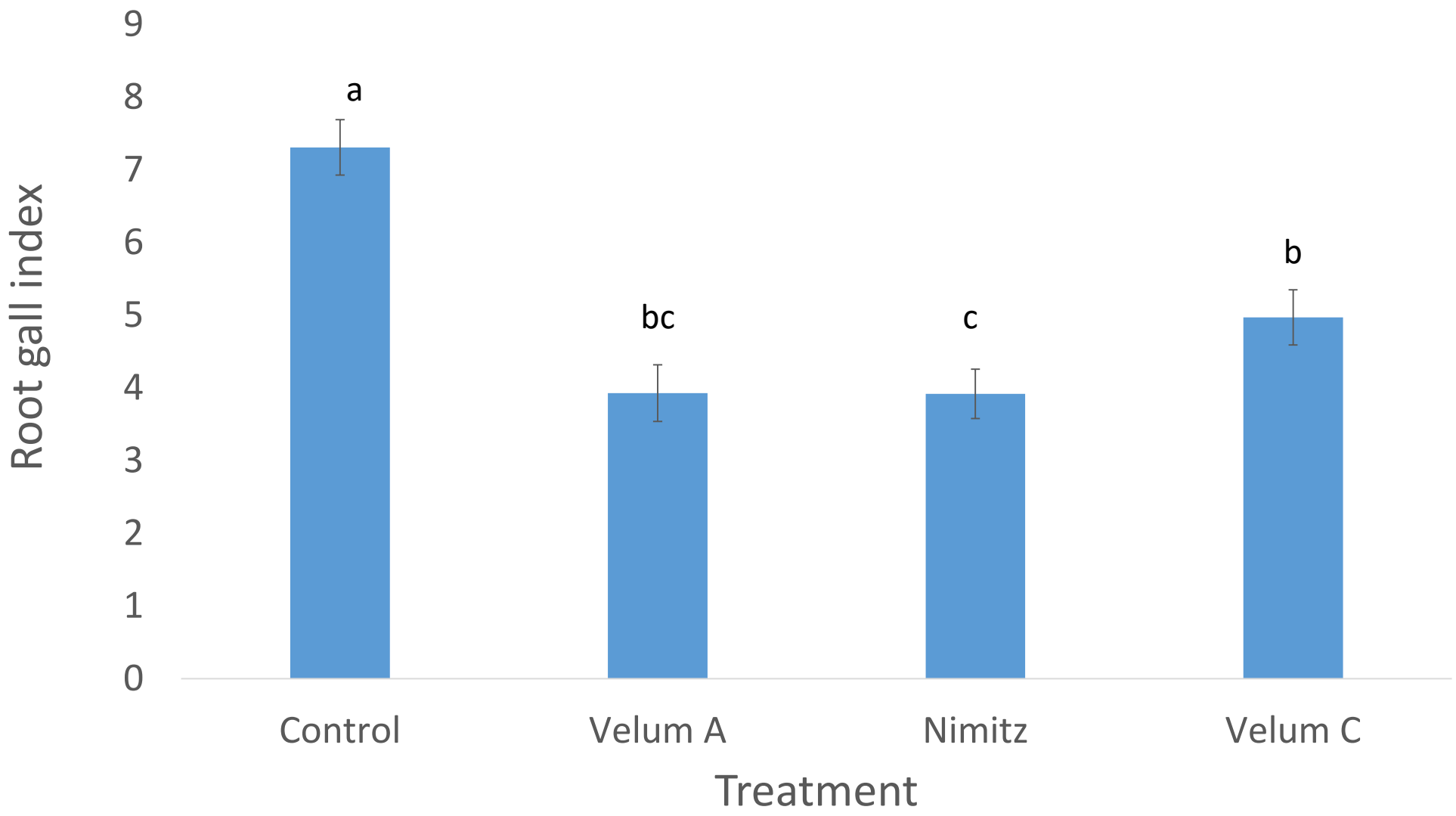
- Nematode nursery at the farm
- Replicated block design with 4 replications
- A nematode susceptible tomato variety Halley was planted
- Treatments applied either as a pre-plant or post-plant
- At harvest, tomato roots from each plot evaluated for root galling (scale of 0-10)
- Data analyzed in SAS

2019 trial

- Trial planted on: June 26
- Four treatments:
    1. Untreated control
    2. Velum 0-1 week after planting (Velum A); applied July 1
    3. Nimitz: Applied June 26
    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



P<0.0001

Control

Velum A

Nimitz

Velum C

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

CULTIVAR & GERMPLASM RELEA

HortScience 27(5):475-478. 1992.

Southern Blight-resistant Tomato Breeding Lines: 5635M, 5707M, 5719M, 5737M, 5876M, and 5913M

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produces 1- to 2-m
fected plants are p
which causes seed
mature plants prog
lowing and wilting
lower leaves. Fruit
the soil can also be
gus penetrate's the
develops surface l
and sunken. As les
20 mm, the fruit su
water-soaked. Frui
under ideal temper
et al., 1991; McCo
Resistance is att
development of sec
on the basal mainst
develop an overlap
to six cell layers d
seedlings. Destruction of the phellem barrier

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

View/Open
Thesis.pdf (1.769Mb)

Date
2017-07-28

Author
Langlois, Roy

Type of Degree
Master's Thesis

Department
Horticulture

Metadata
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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 Maxifort were also analyze for Southern blight resistance. These six lines are processing tomatoes from Texas A&M University: 5635M, 5707M, 5719M, 5737M, 5876M, 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 PI's (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 replicates 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 displayed signs of infection three to four days after inoculation. Greenhouse screening

Field Trial: Evaluate susceptibility of six commercial cultivars and six resistant breeding lines

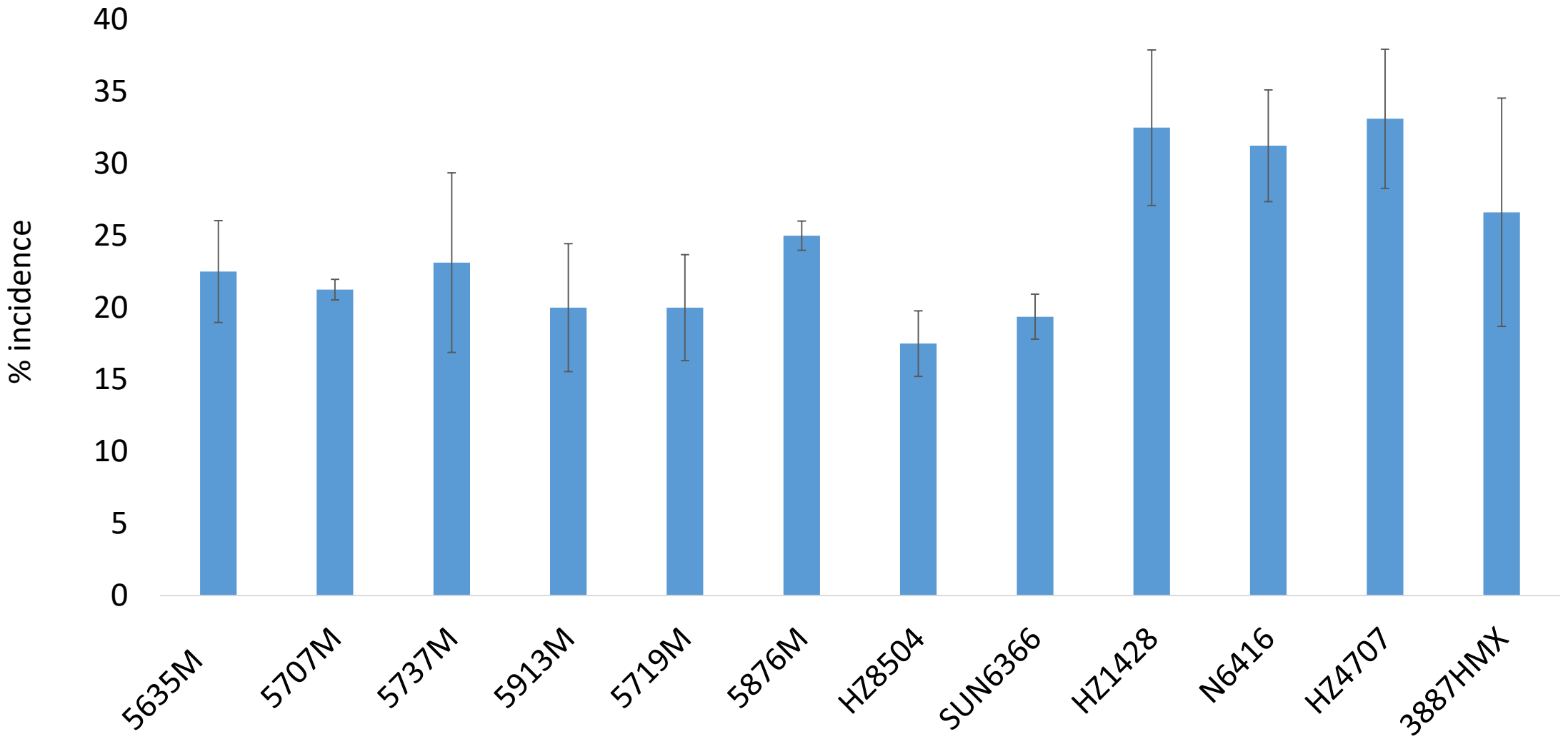
- Grower's field (Boswell farm)
- Replicated block design with four reps
- Plots: 60 inches wide and 40 feet long
- Planted on May 21
- Evaluate disease incidence: symptoms and mortality……
- Harvested on August 29
- Data on marketable yield
- Data analysis using SAS

Varieties: 12 total

Texas Lines	Commercial lines
1. 5635M	1. HZ 8504
2. 5707M	2. SUN 6366
3. 5737M	3. HZ 1428
4. 5913M	4. N 6416
5. 5719M	5. HZ 4707
6. 5876M	6. 3887 HMX

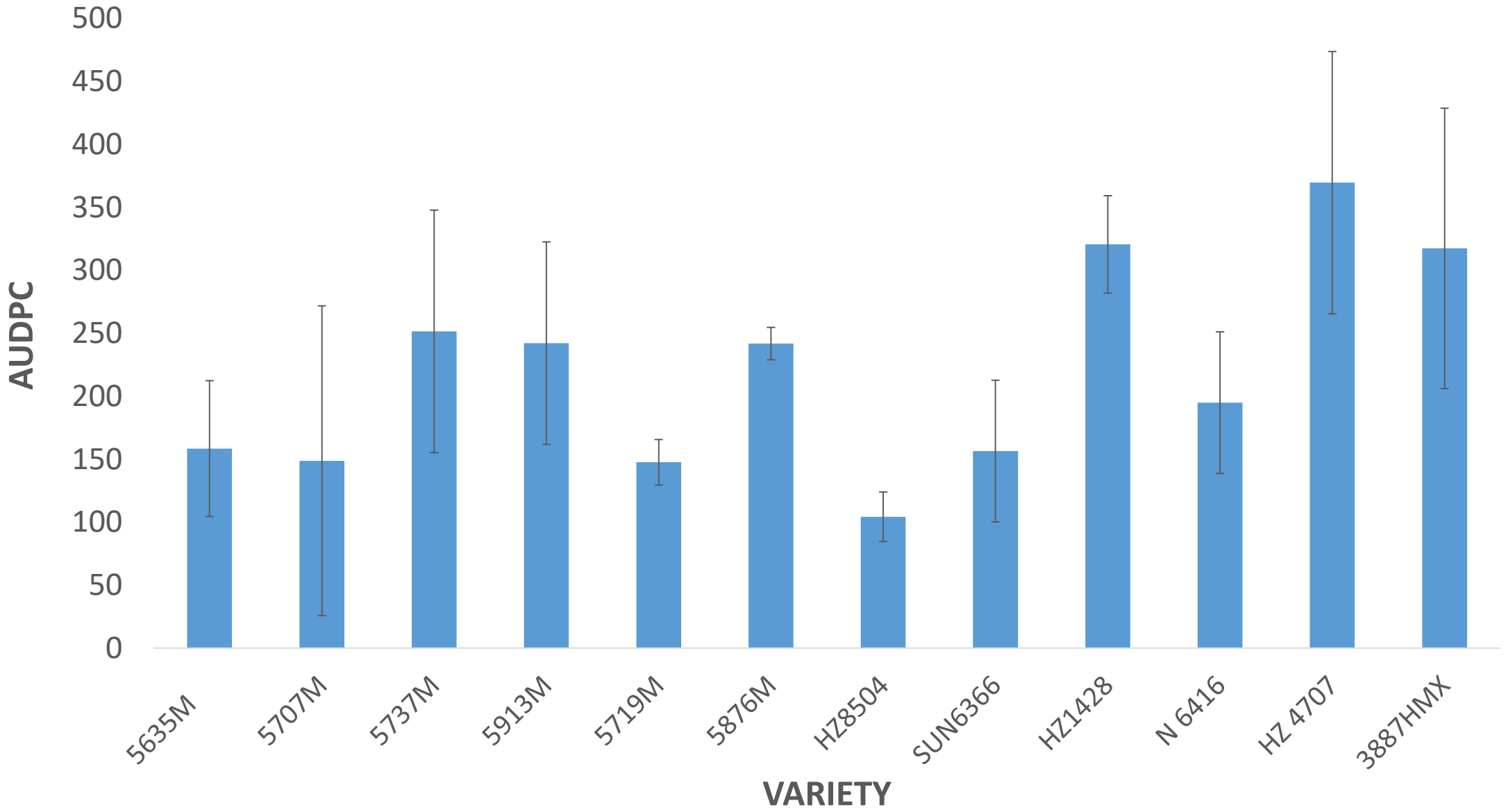
08/29/19

Disease incidence: Southern blight 08/20/19

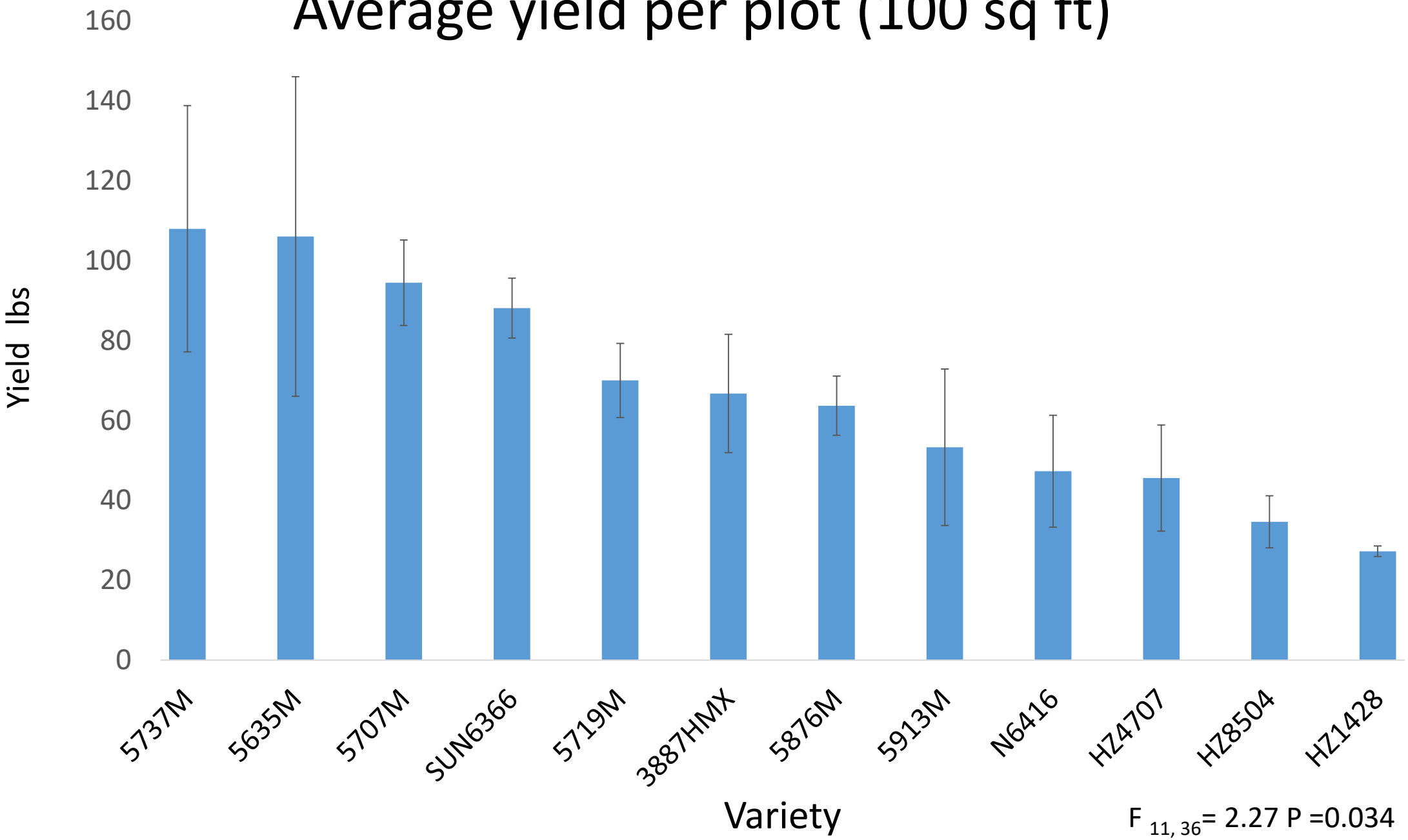


P=0.07

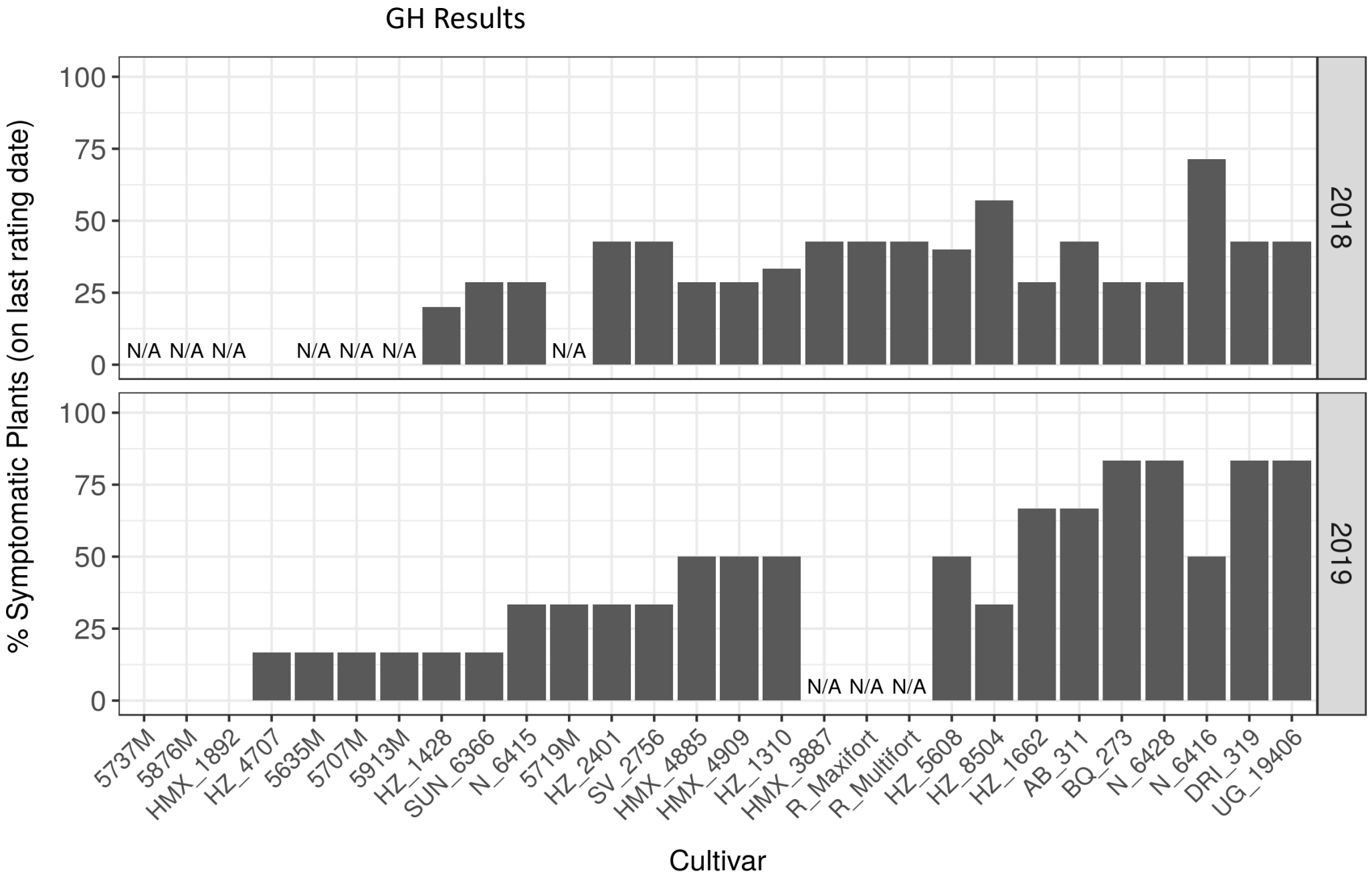
AUDPC : Southern blight



Average yield per plot (100 sq ft)



$F_{11, 36} = 2.27$ $P = 0.034$


GH Results
% Symptomatic Plants (on last rating date)
100
75
50
25
0
2018
2019
N/A N/A N/A
N/A N/A N/A
N/A
N/A N/A N/A
5737M
5876M
HMX_1892
HZ_4707
5635M
5707M
5913M
HZ_1428
SUN_6366
N_6415
5719M
HZ_2401
SV_2756
HMX_4885
HMX_4909
HZ_1310
HMX_3887
R_Maxifort
R_Multifort
HZ_5608
HZ_8504
HZ_1662
AB_311
BQ_273
N_6428
N_6416
DRI_319
UG_19406
Cultivar

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

Acknowledgements

Funding: California Tomato Research Institute,
Bayer Crop Sciences

Boswell Farms: Charlie Riddle and farm crew

Jed Dubose

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