Fusarium Diseases of Tomato- Updates on Diagnosis and Management

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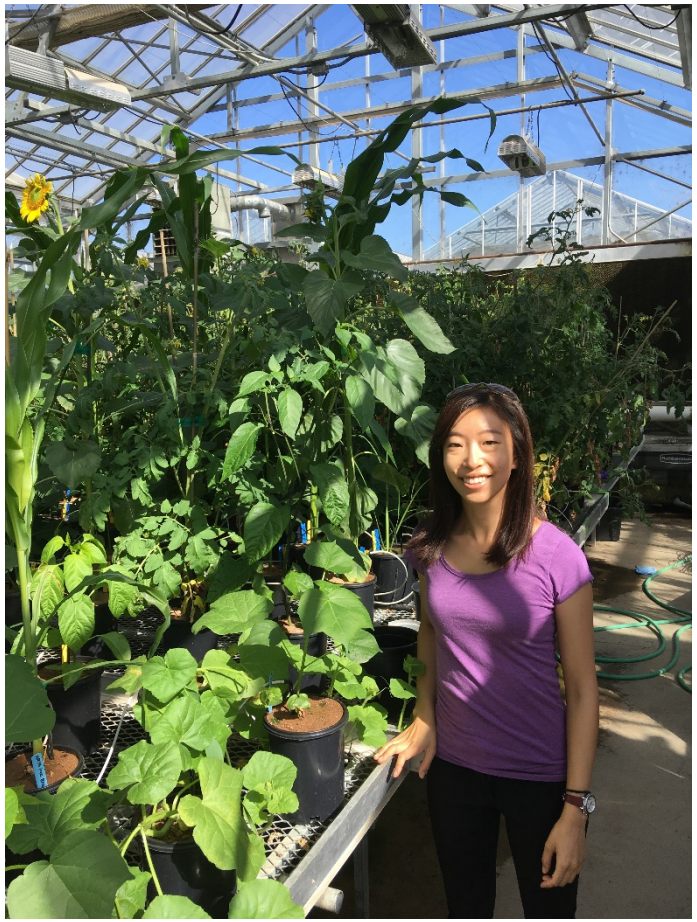
Managing Fusarium wilt with informed crop rotation: assessing host status of rotation crops

- Fusarium wilt: caused by Fusarium oxysporum f. sp lycopersici (Fol); current problem is with race 3
  - This strain only causes wilt in tomato
  - The fungus survives in soil
- Recommend using crop rotation to reduce Fol R3 inoculum loads
  - Generic recommendation: Rotate with non-tomato crops for at least 2-3 years
- Crop rotation is commonly reported to be ineffective
  - We don't know how long Fol survives in soil--Years out of tomato are a guess
  - We don't know whether Fol can infect non-tomato crops
  - Other Fusarium wilt pathogens have **cryptic hosts:** become infected but don't cause disease
  - Systemically colonized cryptic hosts = greatest threat



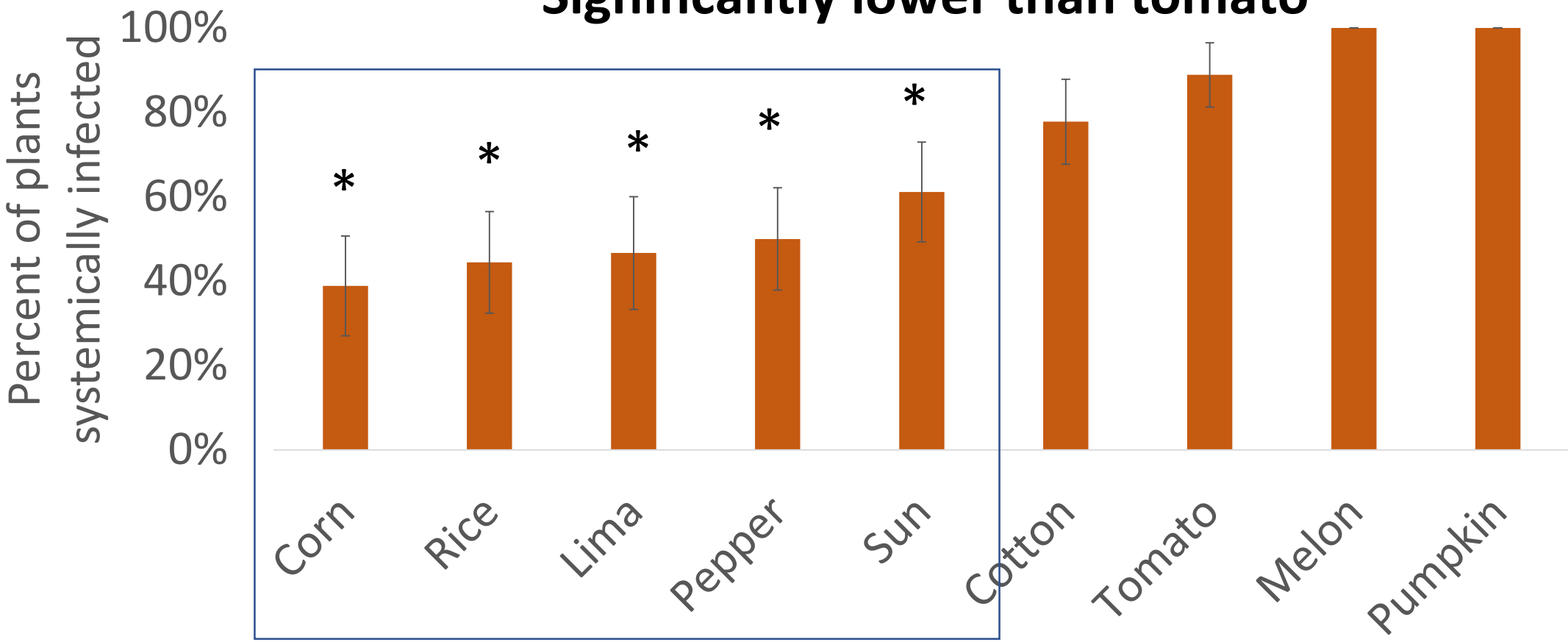
Rino Oguchi

Managing Fusarium wilt with informed crop rotation: assessing host status of rotation crops

Warm Season Rotation Crops

% of plants systemically colonized

*** Significantly lower than tomato**



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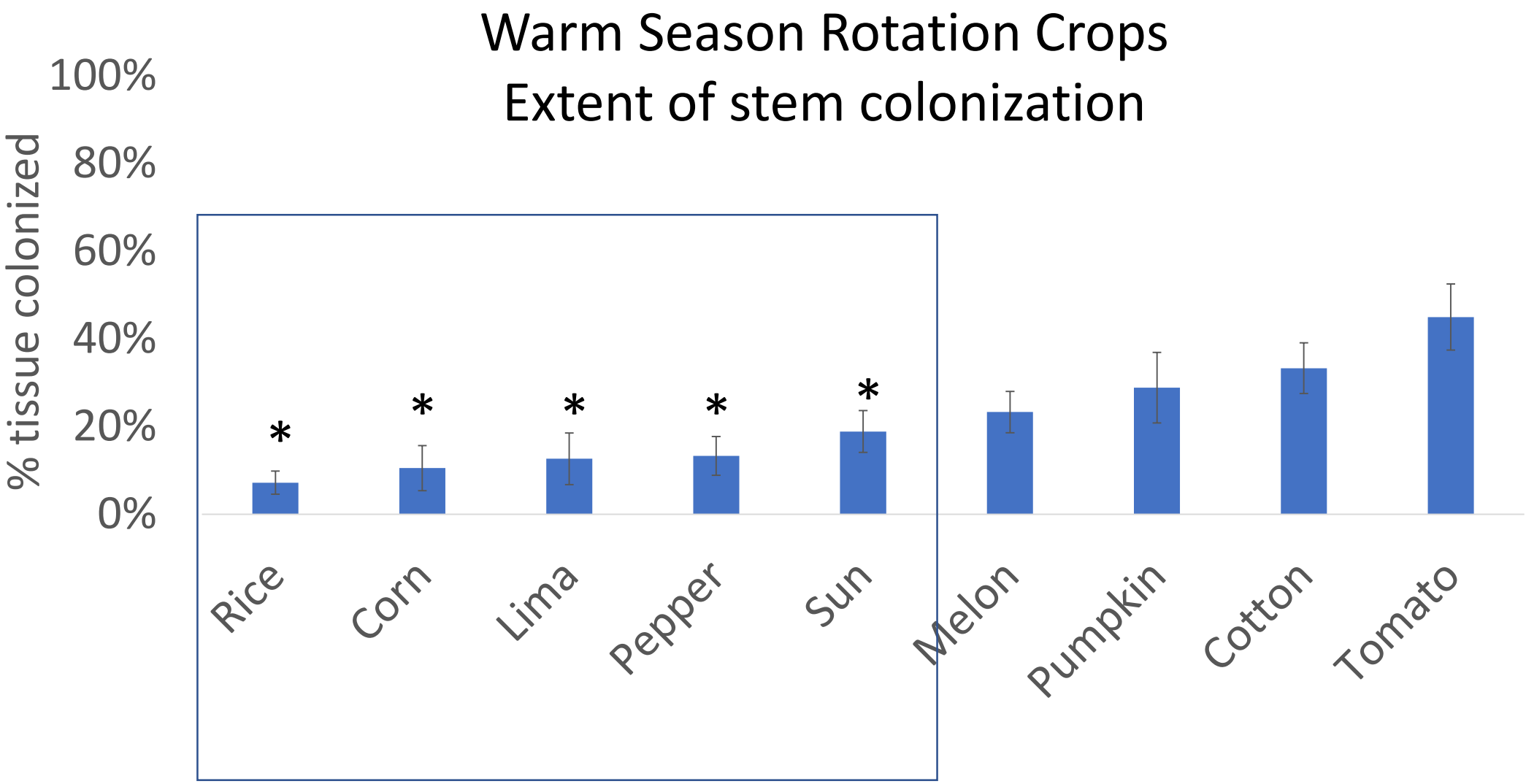

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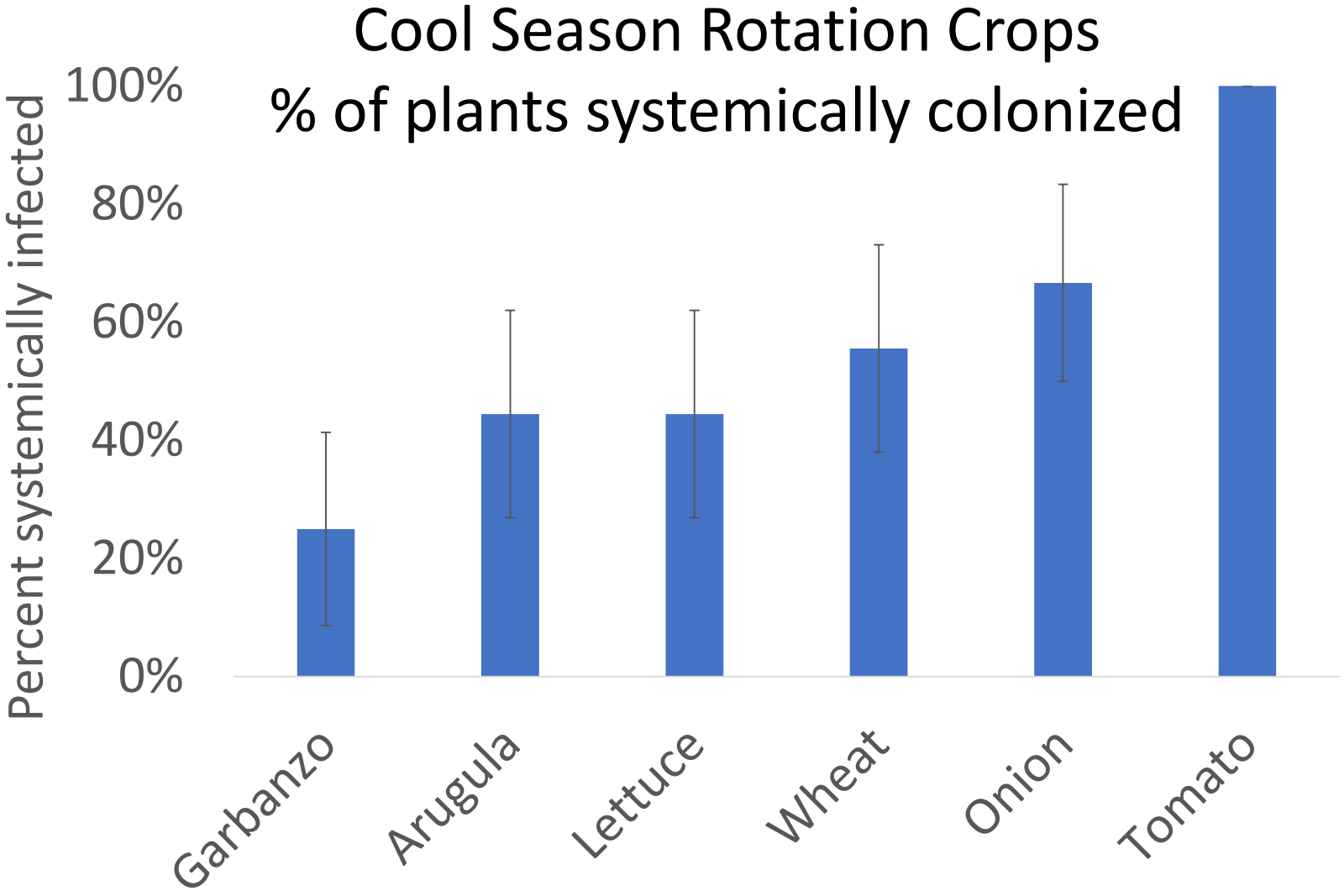

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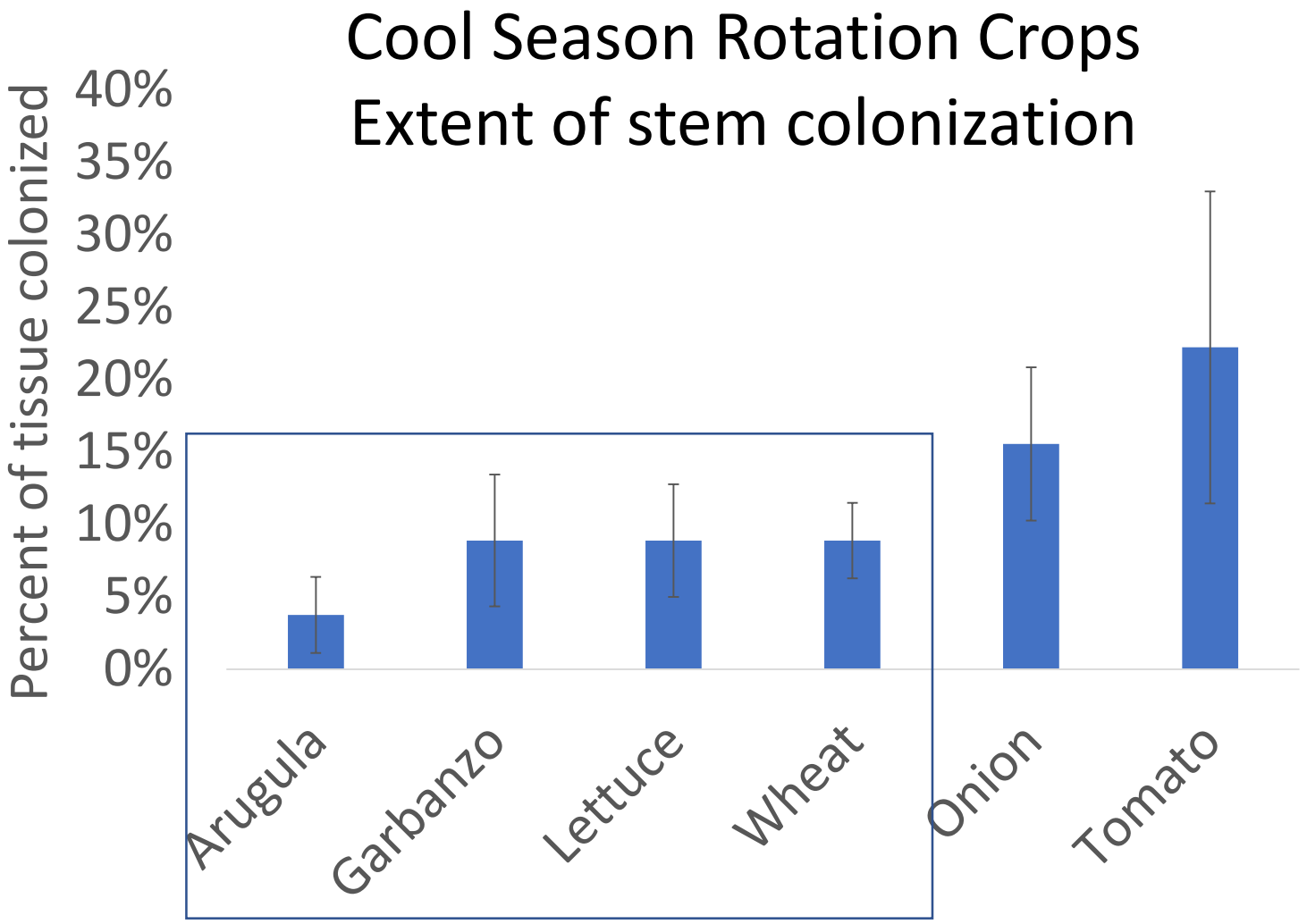
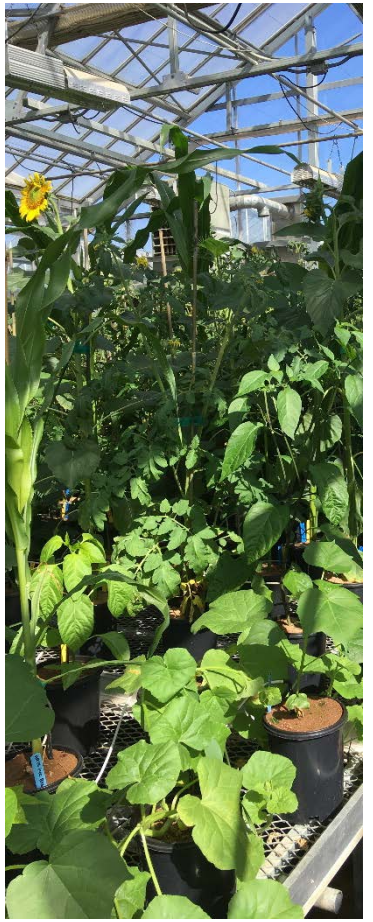


Managing Fusarium wilt with informed crop rotation: assessing host status of rotation crops

- Potentially high risk crops:
  - Cotton
  - Cucurbits (melon, pumpkin)
- Potentially low risk crops:
  - grasses (corn, rice, wheat)
  - Beans (green, garbanzo's)
  - Peppers
  - Brassicas (e.g. arugula)
  - Lettuce
- Intermediate risk crops:
  - Sunflower
  - Onion

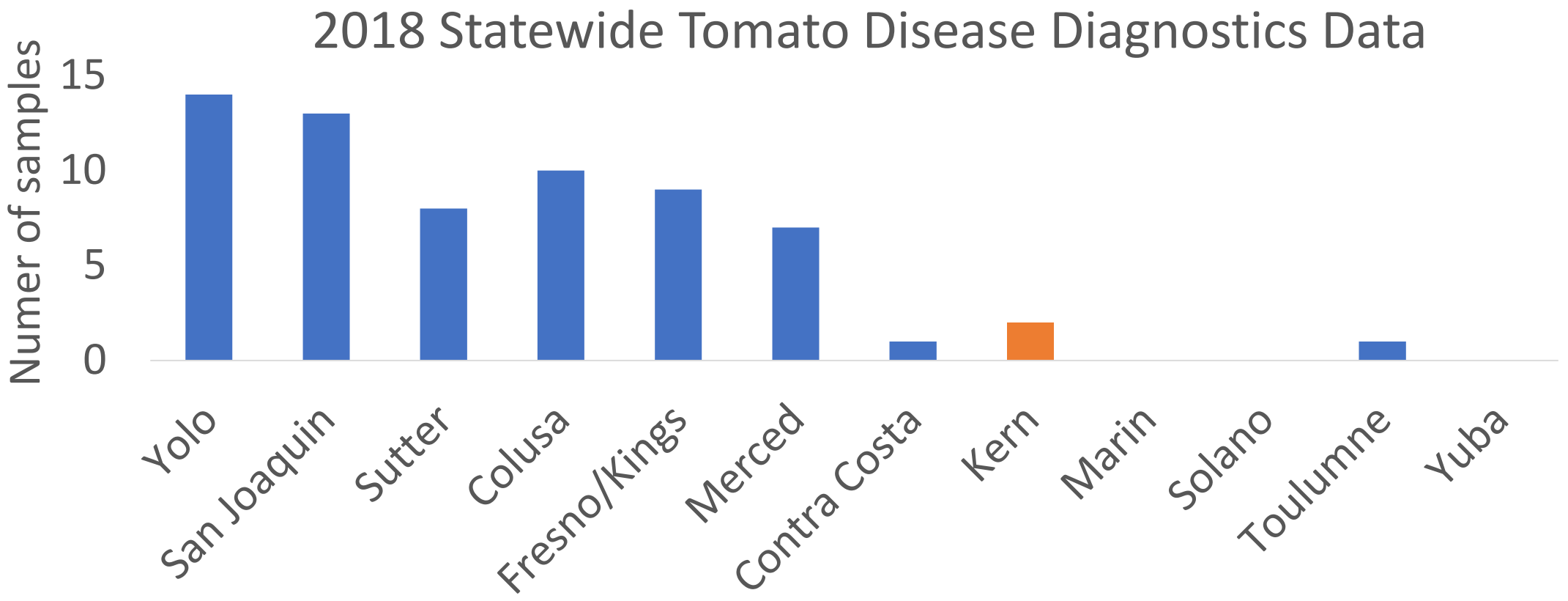


Managing Fusarium wilt with informed crop rotation: 2019 studies

- How many years should I be out of tomato if I had Fusarium wilt?
  →Evaluating the time out of tomato required to reduce inoculum to non-significant levels
- What rotation crops should I grow?
  → Evaluating soil inoculum persistence following incorporation of infected rotation crops
- Are there certain weeds that are pathogen reservoirs?
  → Evaluating weed species as hosts

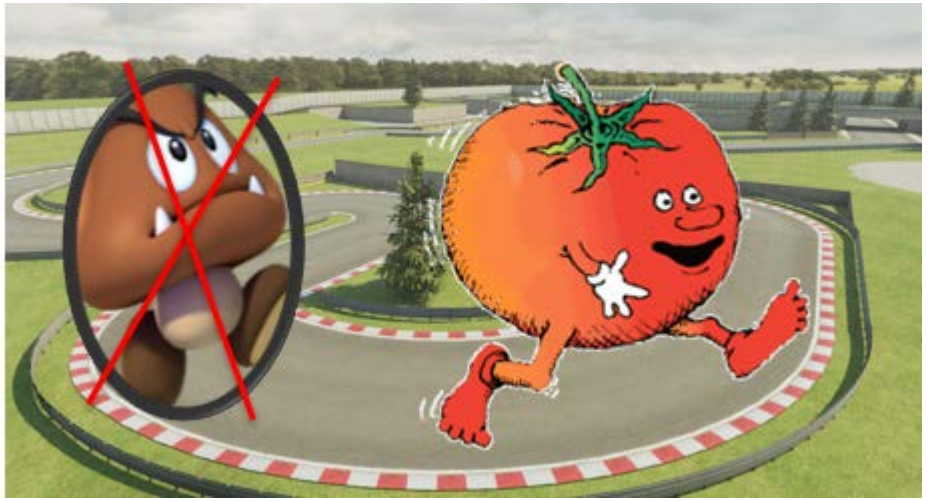
An update on Fusarium wilt spread: First detection in Kern County this year

Likely outcome: demand for F3 material is going to significantly increase



An update on Fusarium wilt race 4 monitoring

- Received ~25 submissions of F3 material with a tentative Fusarium wilt diagnosis
- Most were Verticillium, bacterial canker or crown rots
- We did recover Fol from nine samples
  - → Based on PCR diagnosis
  - → PCR diagnosis (current) can't identify race
  - → PCR diagnosis generates false positives
  - → Conducted race phenotyping



#	F3 cv.	Location	Incidence	Notes	Race ID
1	N 6428	Merced	unknown		Race 3
2	N 6428	Merced	unknown	Fungicide trial	Race 3
6	6343	Fresno	1% of 160 acres	Herbicide Injury (100% 3 edge rows)	Race 3
7	H1662	Sutter	1%	Sprinkler irrigated	Race 3
8	HM 58801	Fresno	5%	Crown rot also present	Race 3
9	SVTM 1082	Yolo	1% of 80 acres		Race 3

All isolates were Fol race 3
None were race 4
Will be conducting off-type testing in 2019

Fusarium falciforme: A new soil-borne disease causing foot and stem rot and rapid decline

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Samples collected and submitted by Gene Miyao in 2017

ned
ogen

plant disease

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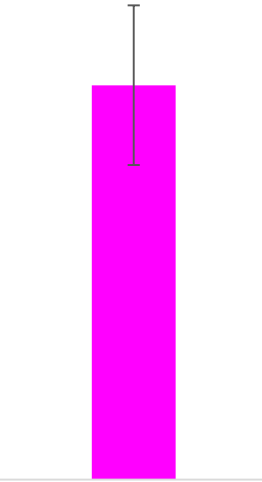
DISEASE NOTES

Foot Rot and Wilt in Tomato Caused by *Fusarium falciforme* (FSSC 3 + 4) in Mexico

T. A. Vega-Gutiérrez, **C. A. López-Orona**,† and **G. A. López-Urquídez**, Facultad de Agronomía, Universidad Autónoma de Sinaloa, Culiacán, CP 80000, Sinaloa, México; **S. Velarde-Félix**, Instituto Nacional de Investigaciones Forestales Agrícolas y Pecuarias (Campus Culiacán), 80000, Culiacán, Sinaloa, México; **L. A. Amarillas-Bueno**, Instituto de Investigación Lightbourn A. C., CP 33981, Cd. Jiménez, Chihuahua, México; **A. R. Martínez-Campos**, Instituto de Ciencias Agropecuarias y Rurales, Universidad Autónoma del Estado de México, Toluca, Estado de México, CP 50000, México; and **R. Allende-Molar**, Universidad Veracruzana, Tuxpan, Veracruz, CP 92895, México.



F. falciforme Isolate 3 (CS162)

Erin Helpio

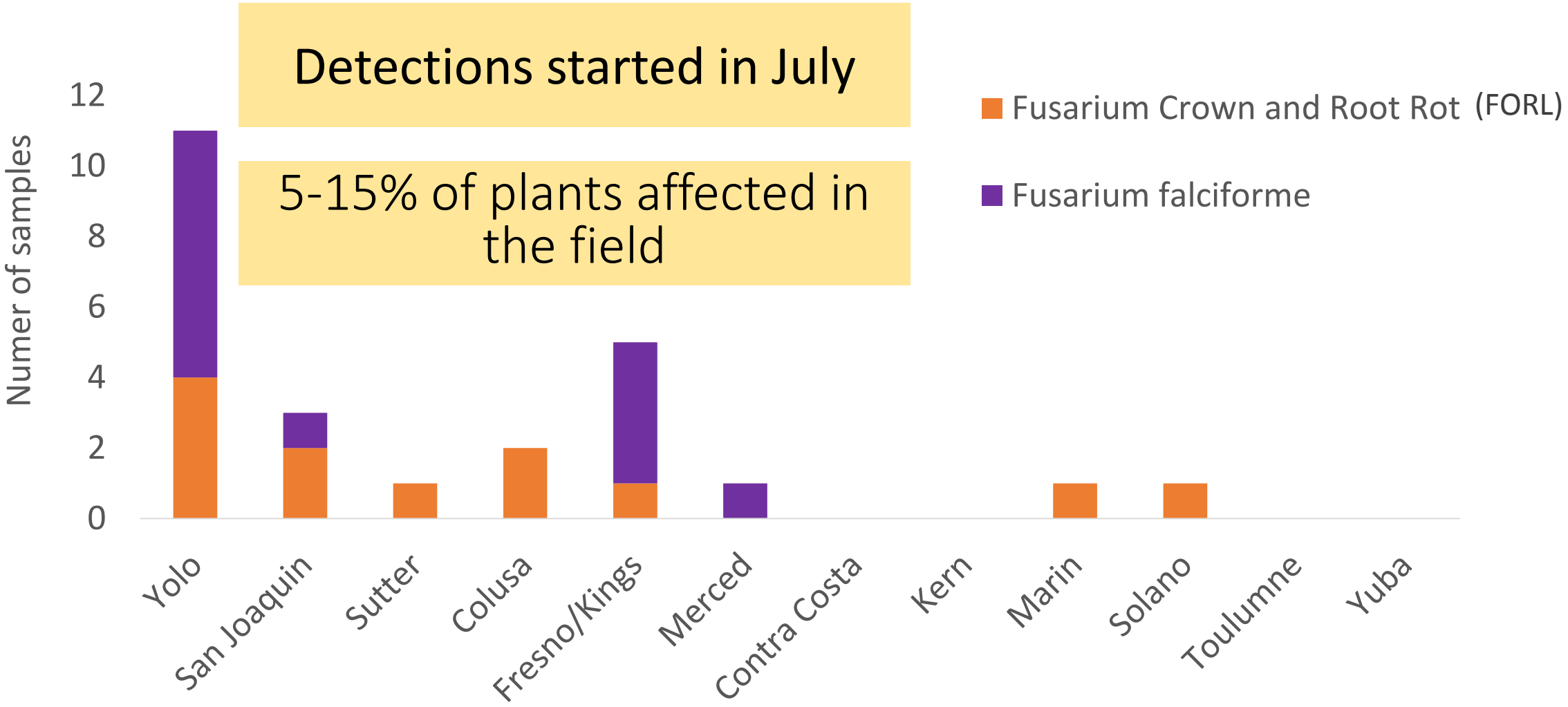
To differentiate from Fusarium wilt:
One-sided leaf yellowing = Fusarium wilt



After 1-2 weeks

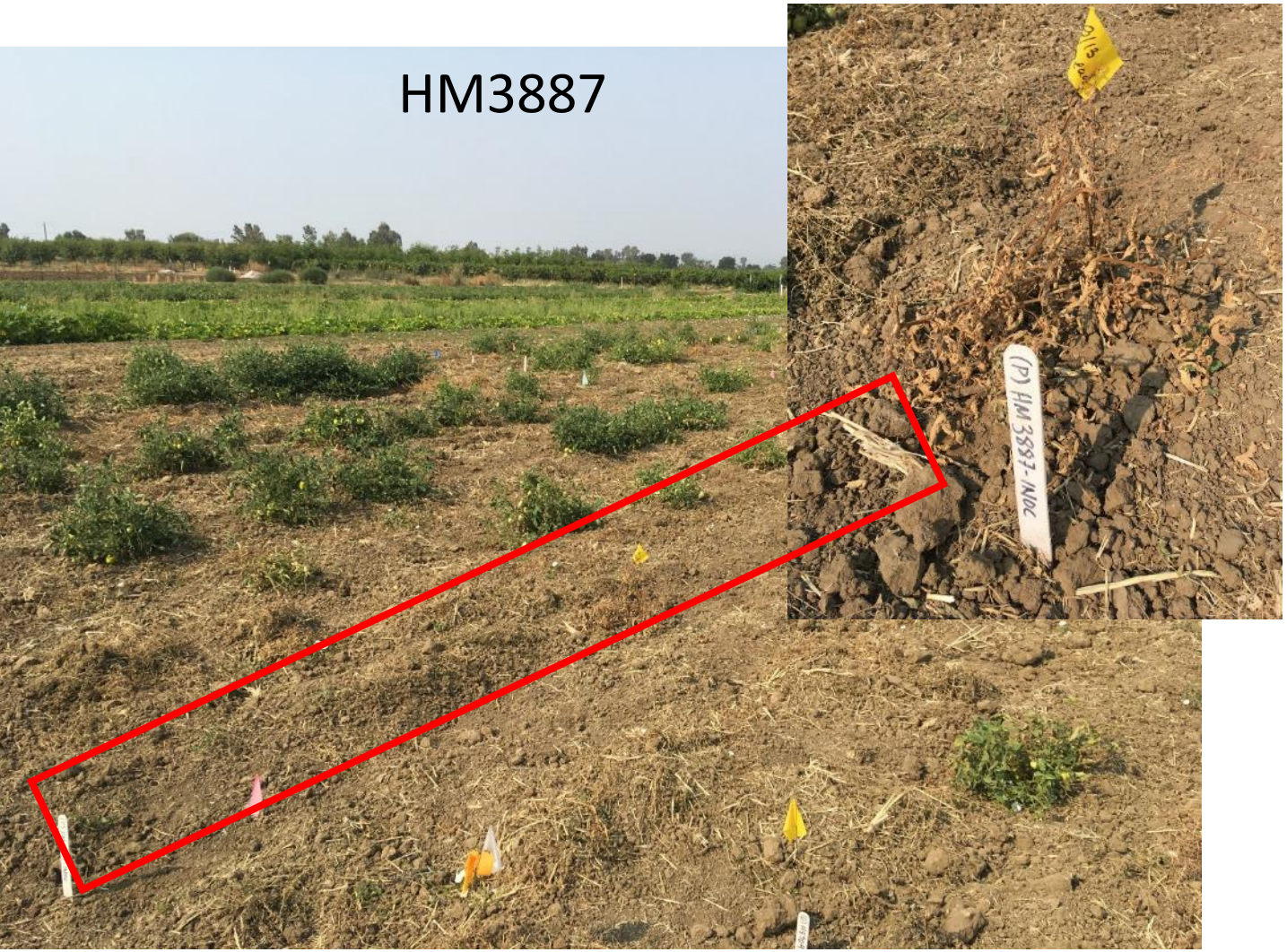
After 2-3 weeks

Fusarium falciforme statewide survey 2018



Controlled field trial: inoculated plants

Some cultivars are severely affected



Controlled field trial: inoculated plants

Some cultivars are severely affected

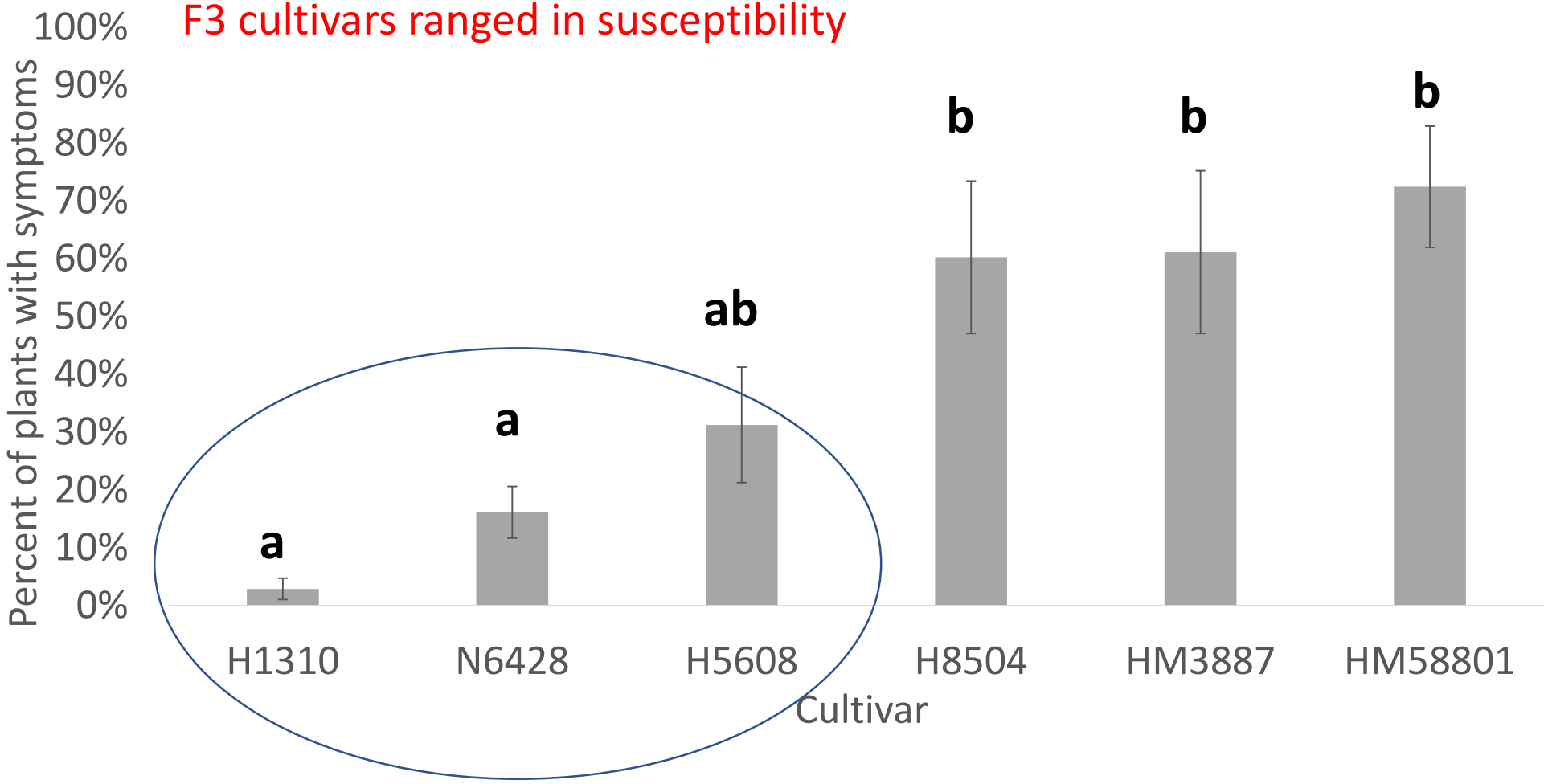
Other cultivars are **much less** affected

HM3887

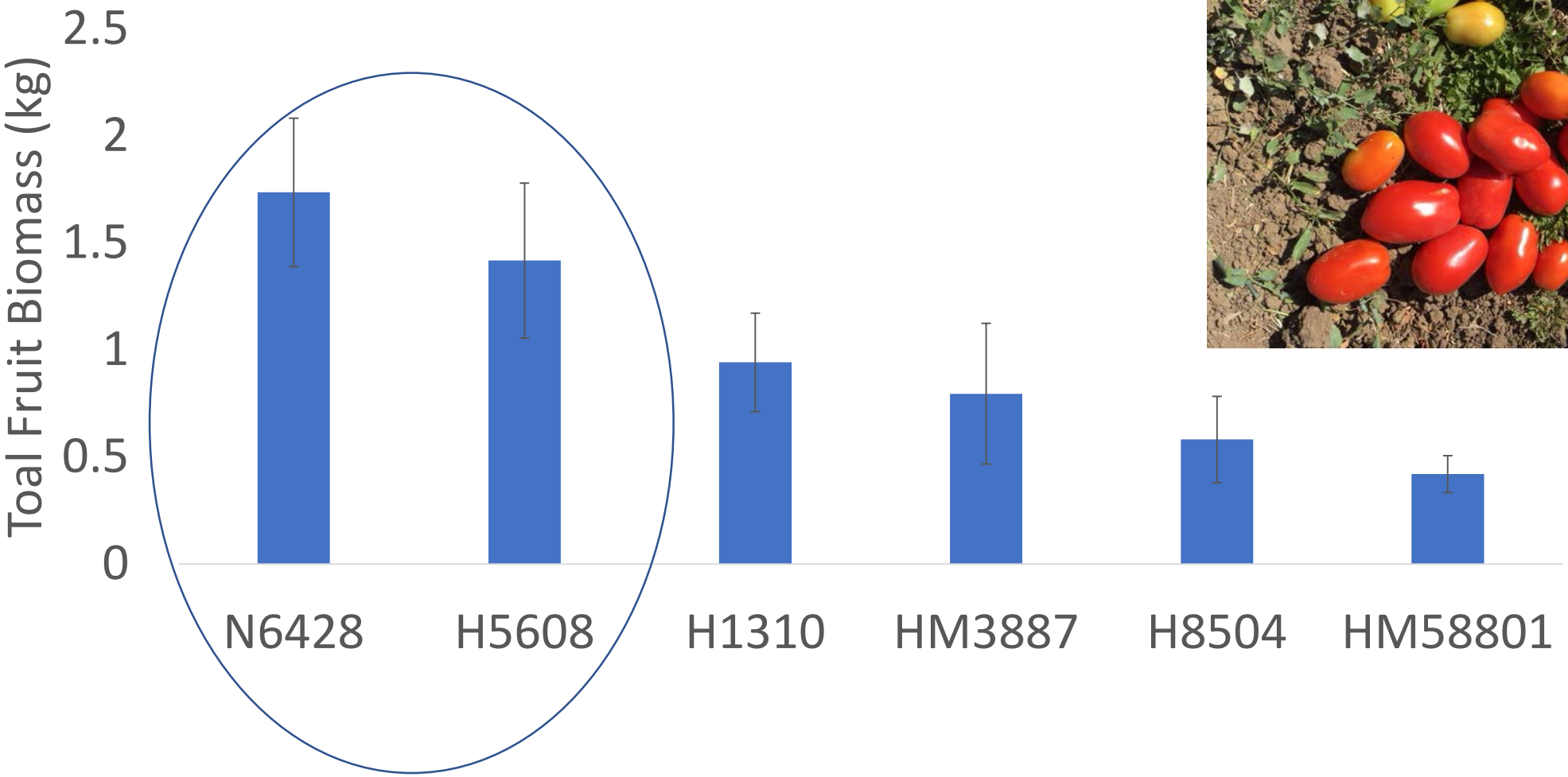
N6428

+

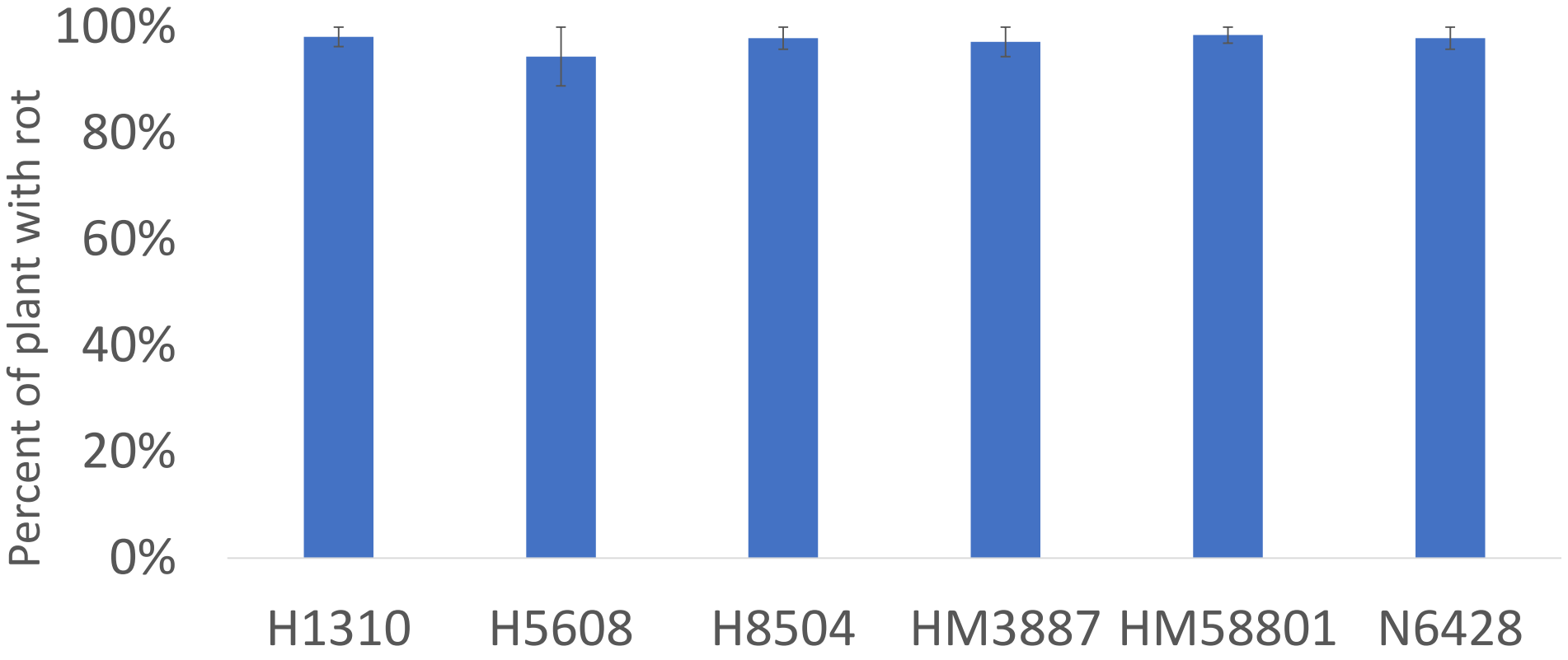
Percent of plants with yellowing + foot/stem rot By cultivar



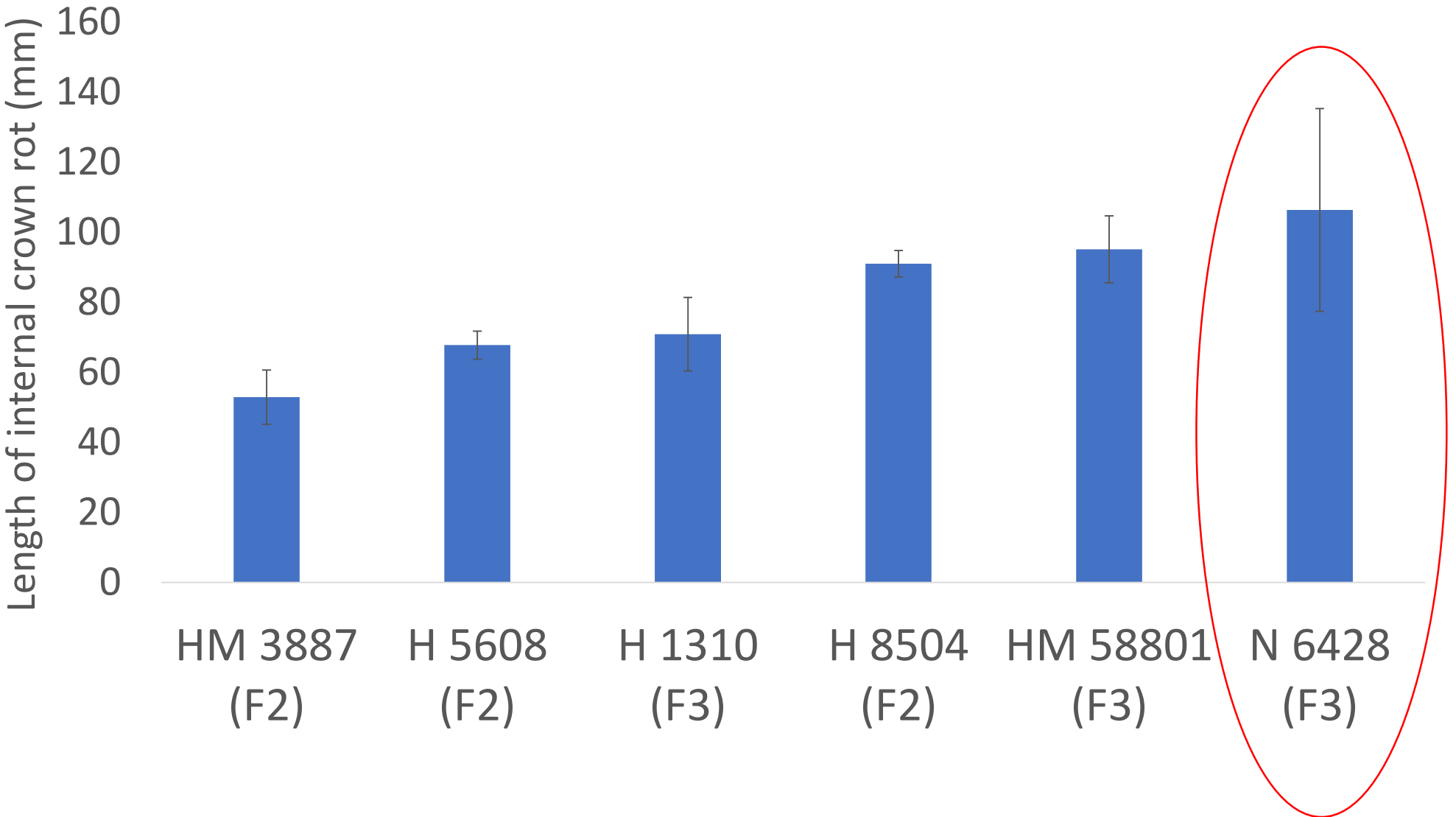
Cultivars that looked the best had the highest yields



For all cultivars: All or nearly all plants developed foot and stem rot



The differences in shoot symptoms were ALSO not due differences in stem rot severity



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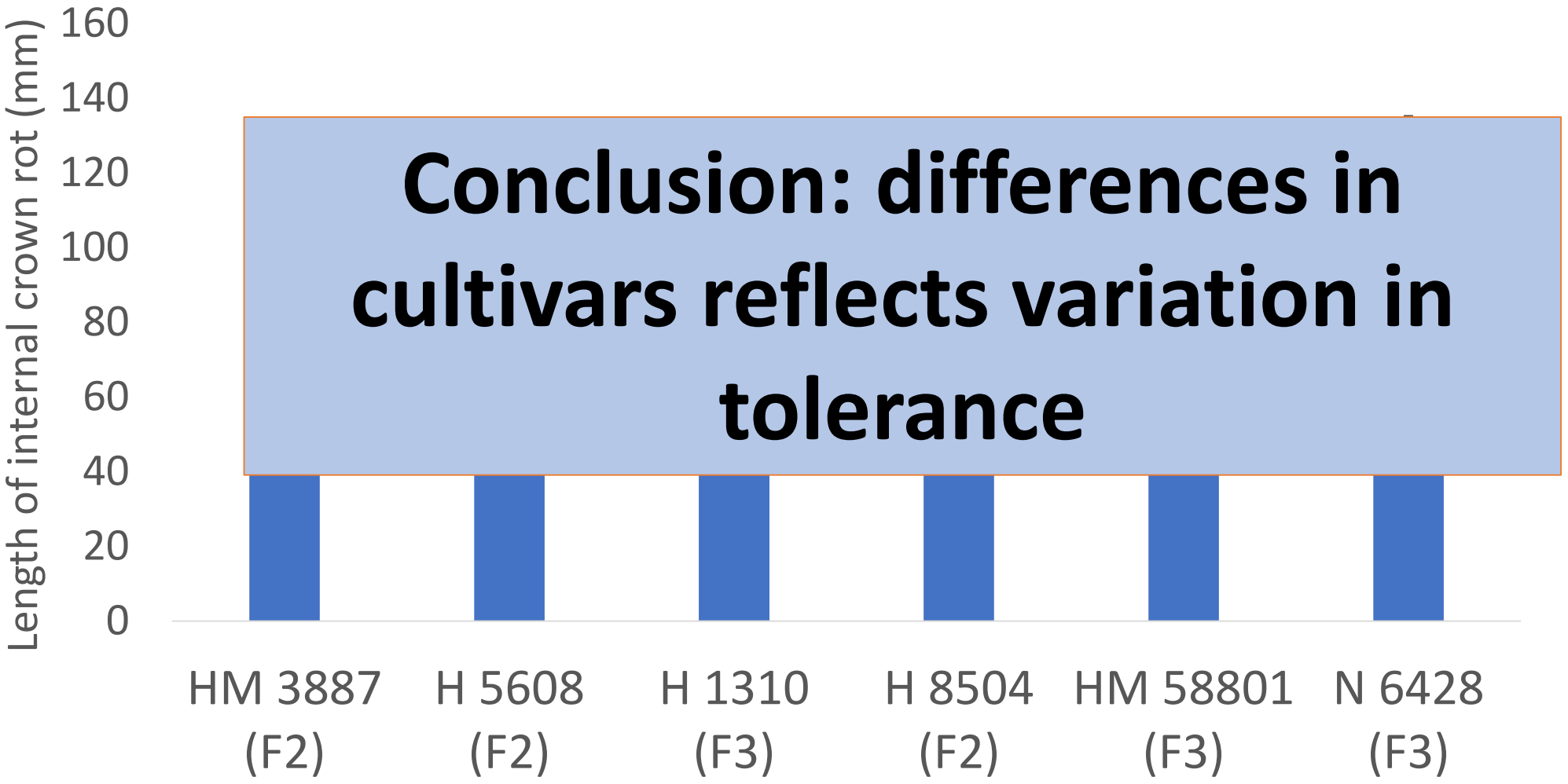
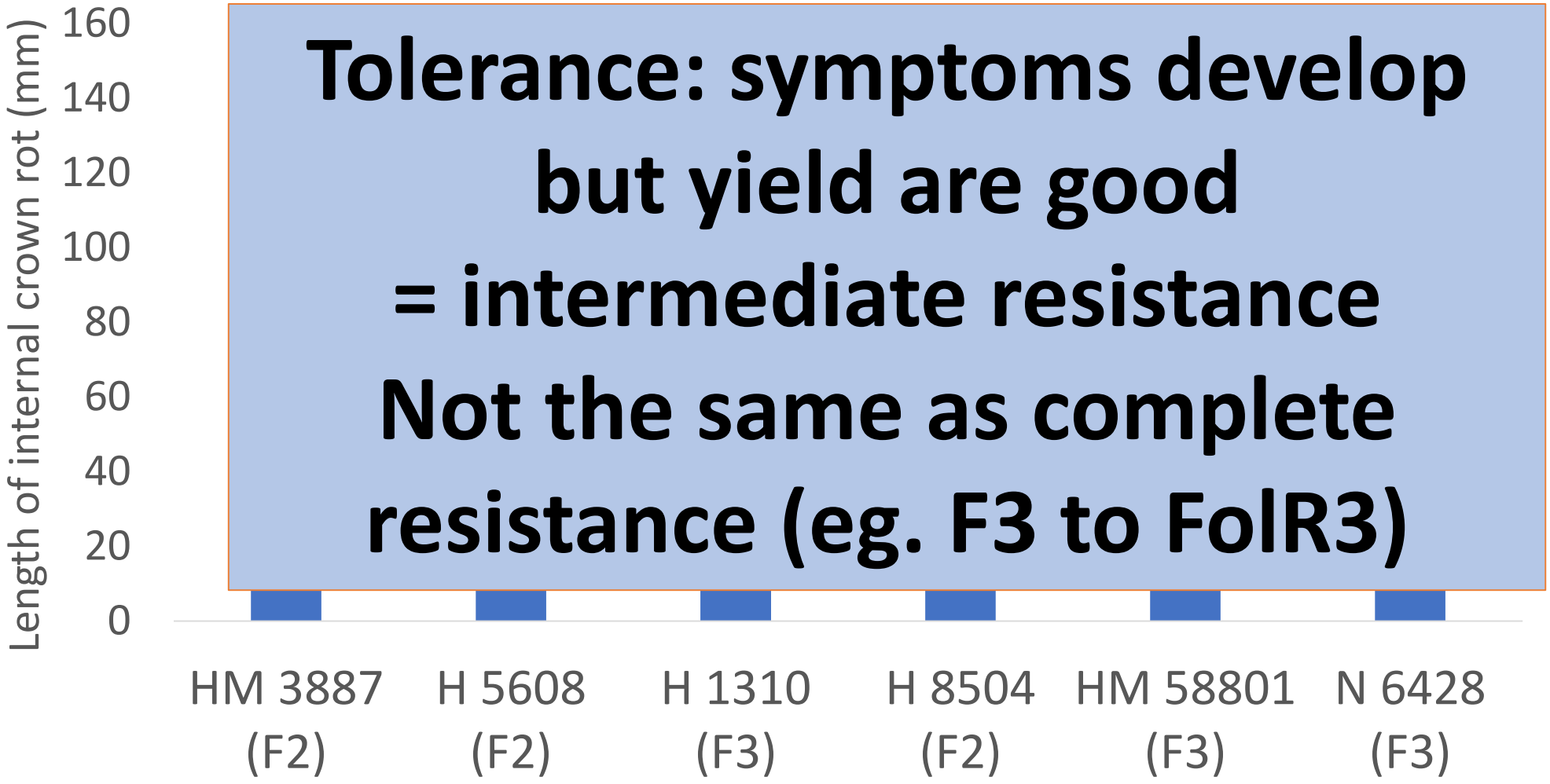


Conclusion: differences in cultivars reflects variation in tolerance

The differences in shoot symptoms were ALSO not due differences in stem rot severity



Tolerance: symptoms develop but yield are good
= intermediate resistance
Not the same as complete resistance (eg. F3 to FolR3)

Take homes

- ***Fusarium falciforme* causes foot rot, stem rot, canopy yellowing and rapid decline, which reduces yield**
  - →Work is ongoing to fully characterize the disease
  - →The fungus is likely making a toxin that causes yellowing
- ***Fusarium falciforme* is a statewide management challenge**
  - →Widespread across the state
  - →Up to 15% of the field can be affected
- **In the short term, use of tolerant cultivars is one management option**
  - →N6428 has been identified as one option
  - →2019 studies will evaluate a wider range of cultivars

To see this all in action:

Acknowledgements

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California Tomato Research Institute

California Environmental Protection Agency
dpr Department of Pesticide Regulation


Questions?
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