

Fusarium Diseases of Tomato- an Update on Identification 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
- Crop rotation is recommended as a strategy to reduce Fol R3 inoculum loads
- Recommendations are generic: Rotate with non-tomato crops for at least 2-3 years
 - Many reports are out there that this is not working
- The time out of tomatoes is a guess
 - We don't actually know how long Fol survives in soil
- We assume rotation with non-tomato crops will work since Fol only causes disease in tomato
 - However, we know that other Fusarium wilt pathogens have cryptic hosts which become infected but don't cause disease
 - We are most concerned about cryptic hosts that are **systemically** colonized

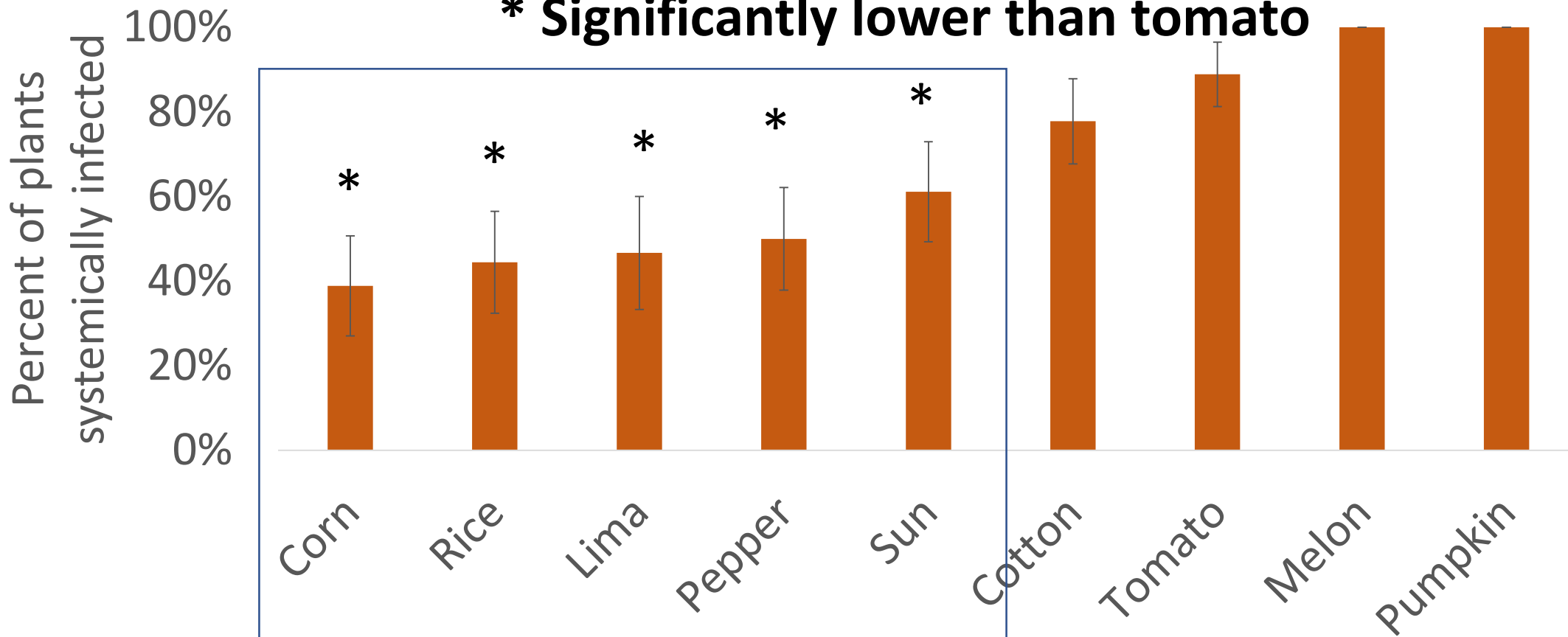


Managing Fusarium wilt with informed crop rotation: assessing host status of rotation crops

Warm Season Rotation Crops

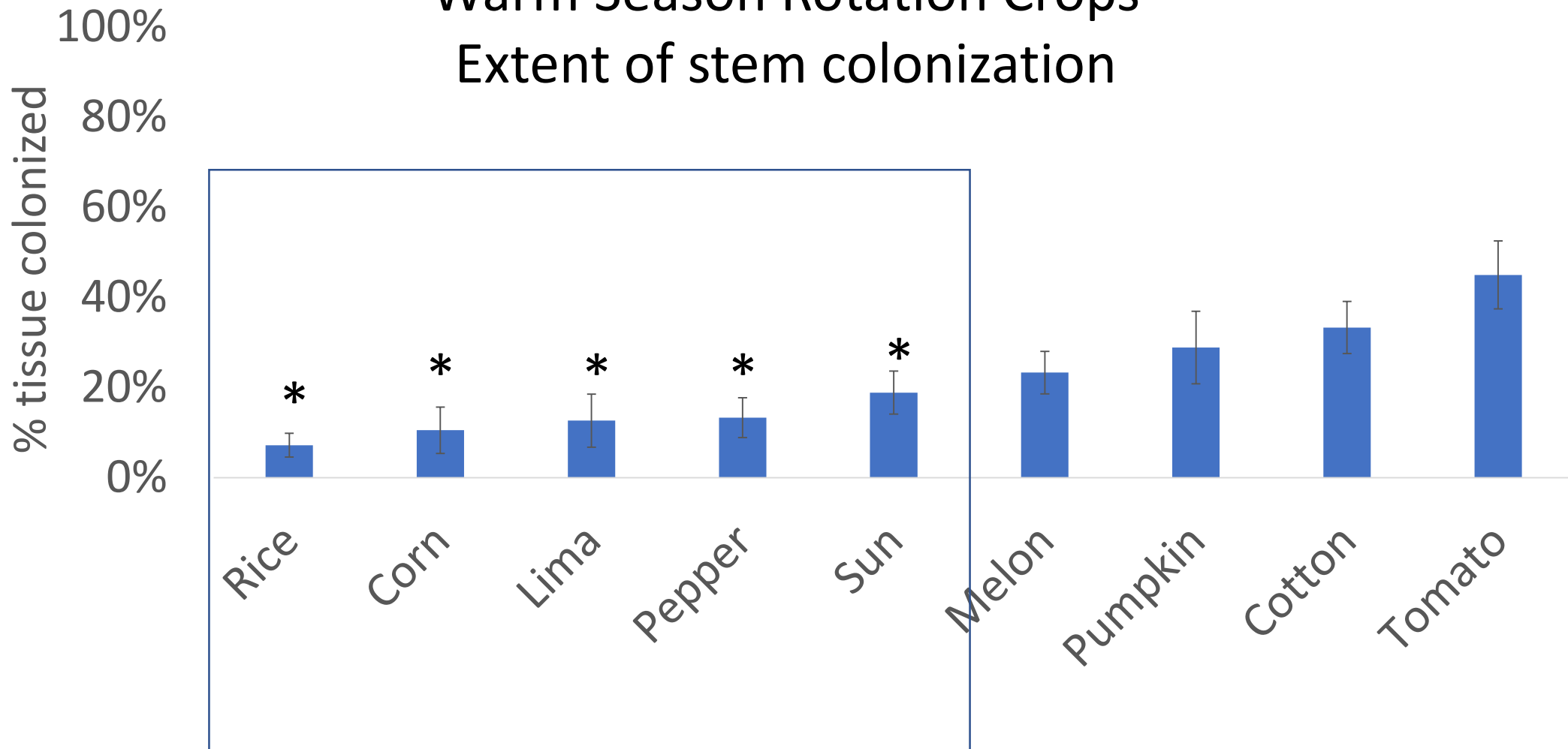
% of plants systemically colonized

*** Significantly lower than tomato**



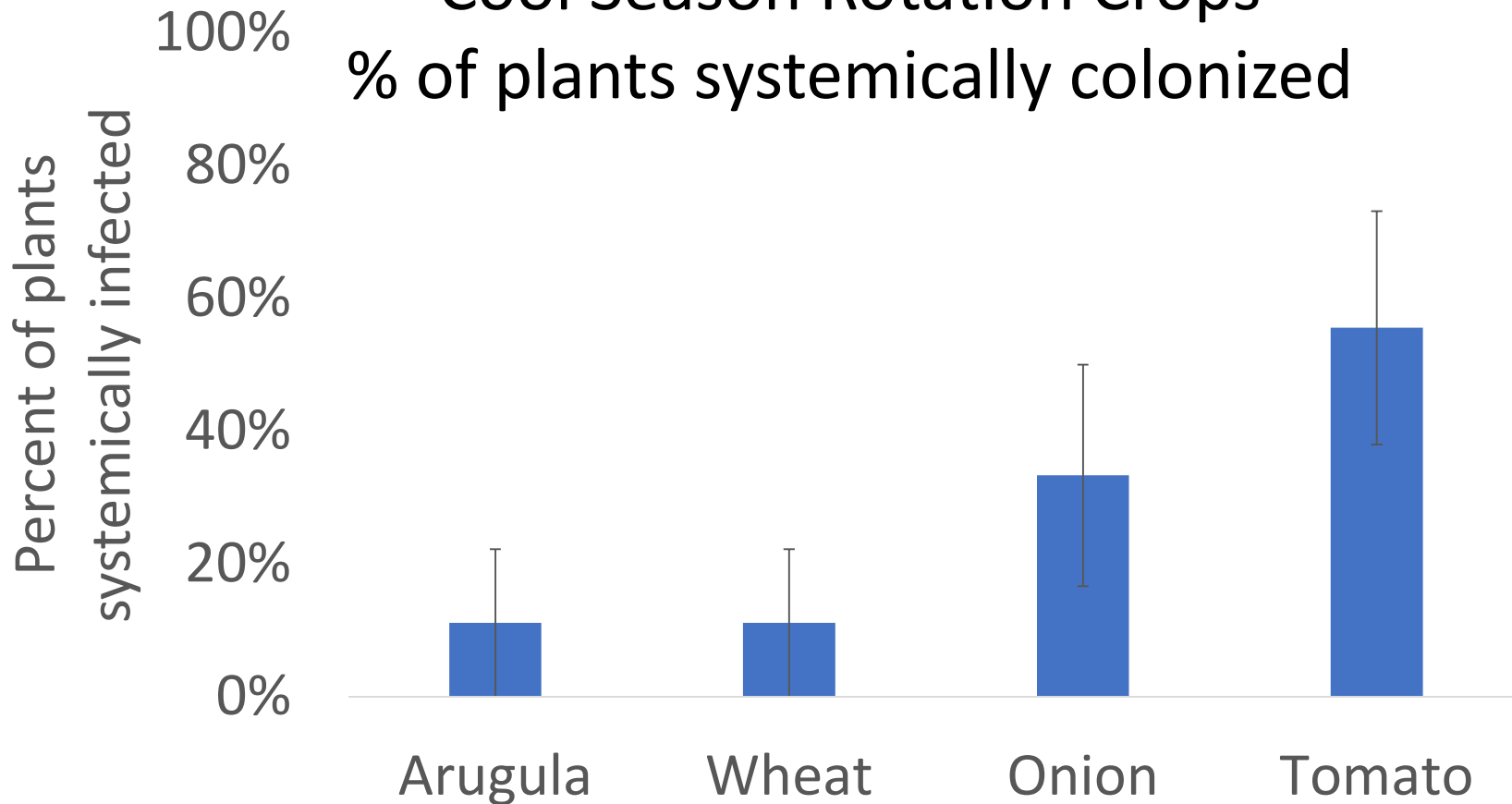
Managing Fusarium wilt with informed crop rotation: assessing host status of rotation crops

Warm Season Rotation Crops
Extent of stem colonization

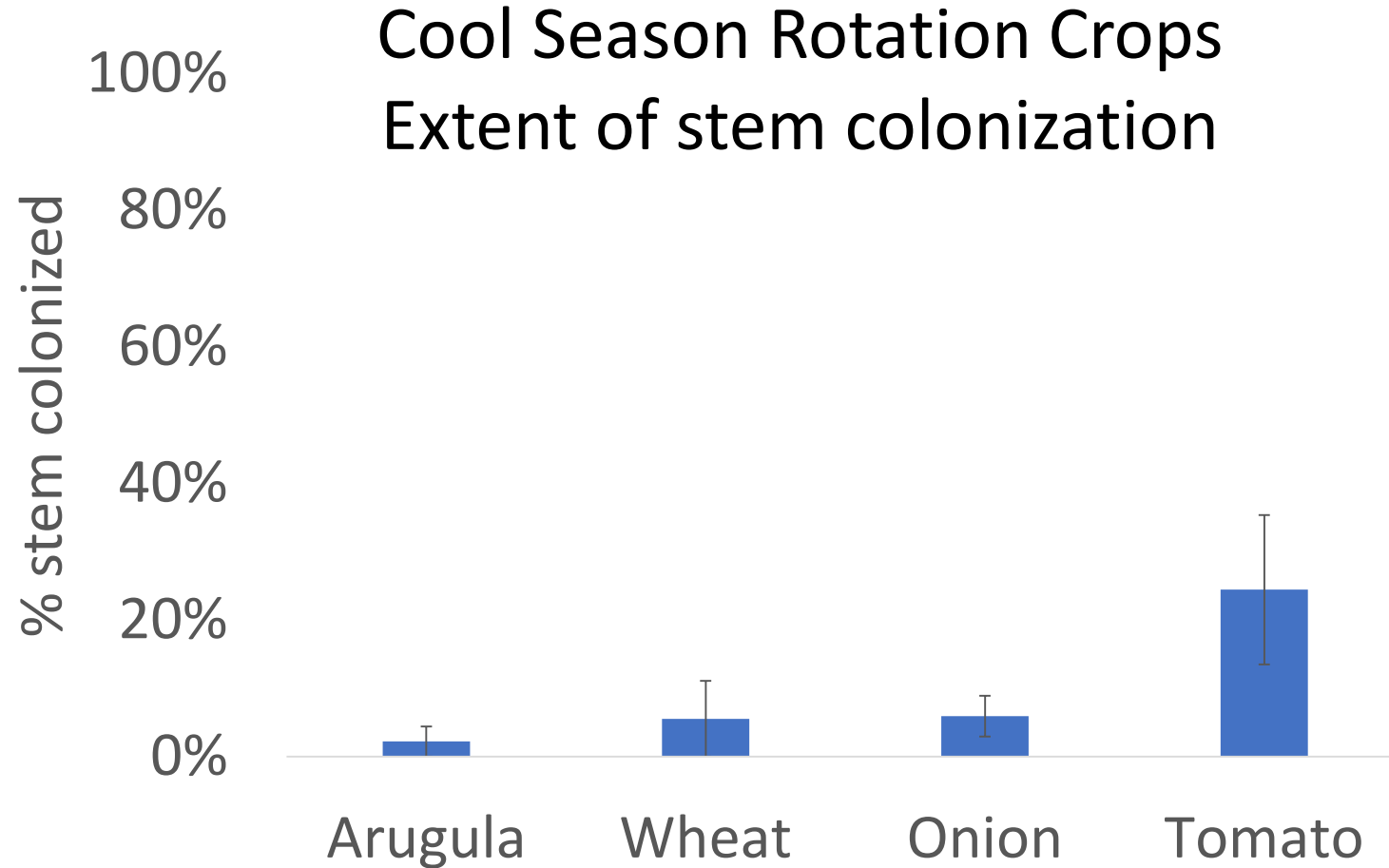


Managing Fusarium wilt with informed crop rotation: assessing host status of rotation crops

Cool Season Rotation Crops
% of plants systemically colonized



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



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

Summary

- Potentially high risk crops are: cotton, cucurbits (melon, pumpkin)
- Potentially low risk crops are: grasses (corn, rice, wheat), beans and peppers (hot—bell not tested)
- Intermediate risk crops: sunflower?; onion?



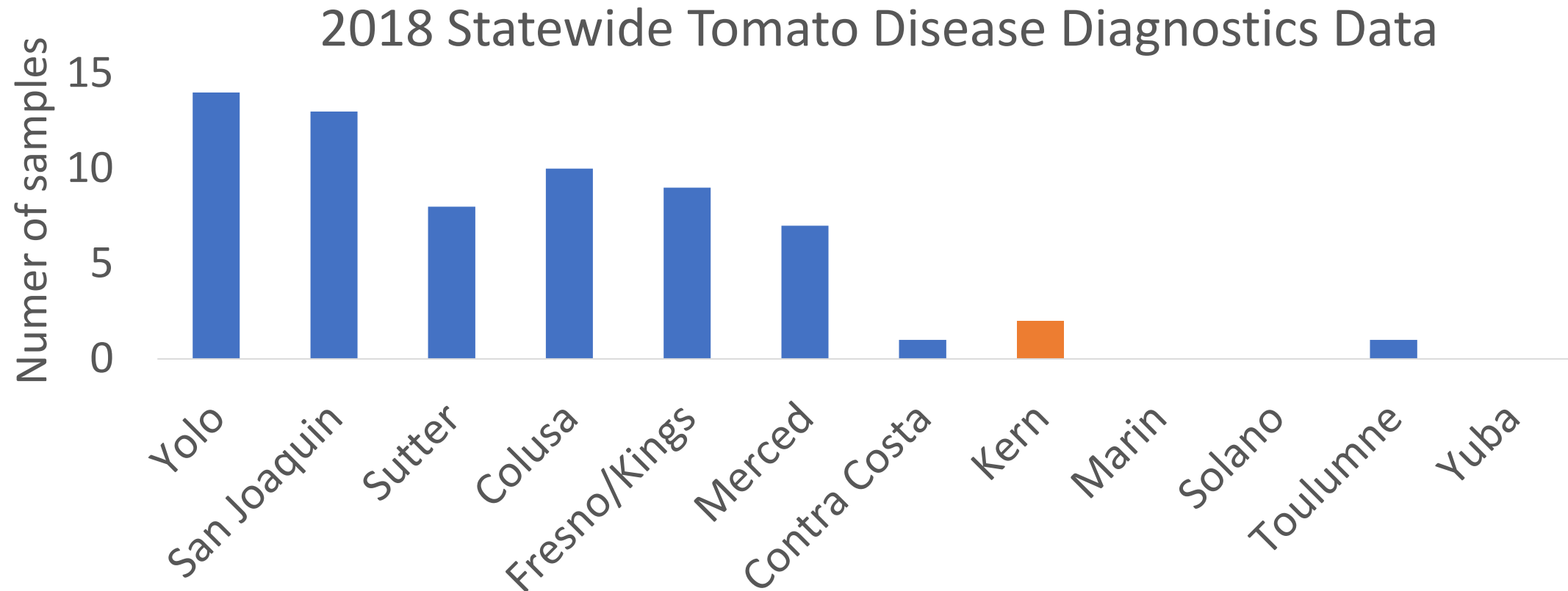
Managing Fusarium wilt with informed crop rotation: 2019 studies

- 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



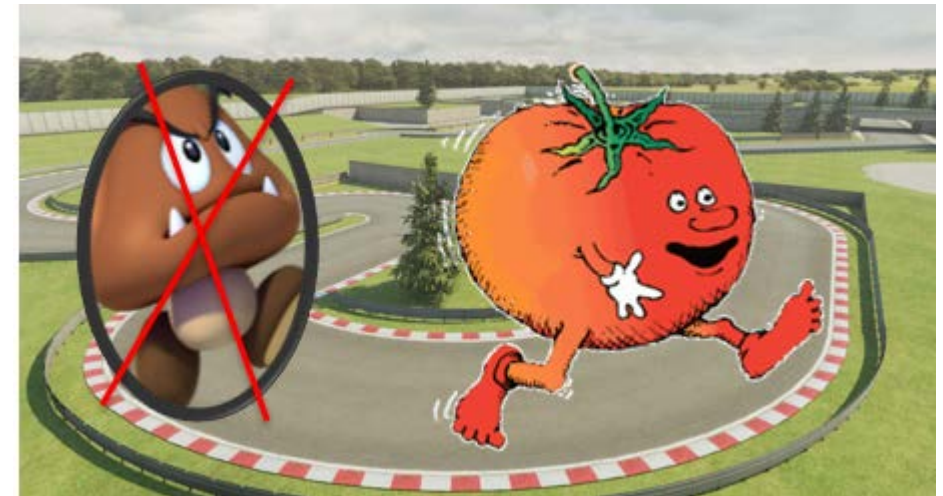
An update on Fusarium wilt spread: First detection in Kern County this year

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 Fo1 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
					Race 3

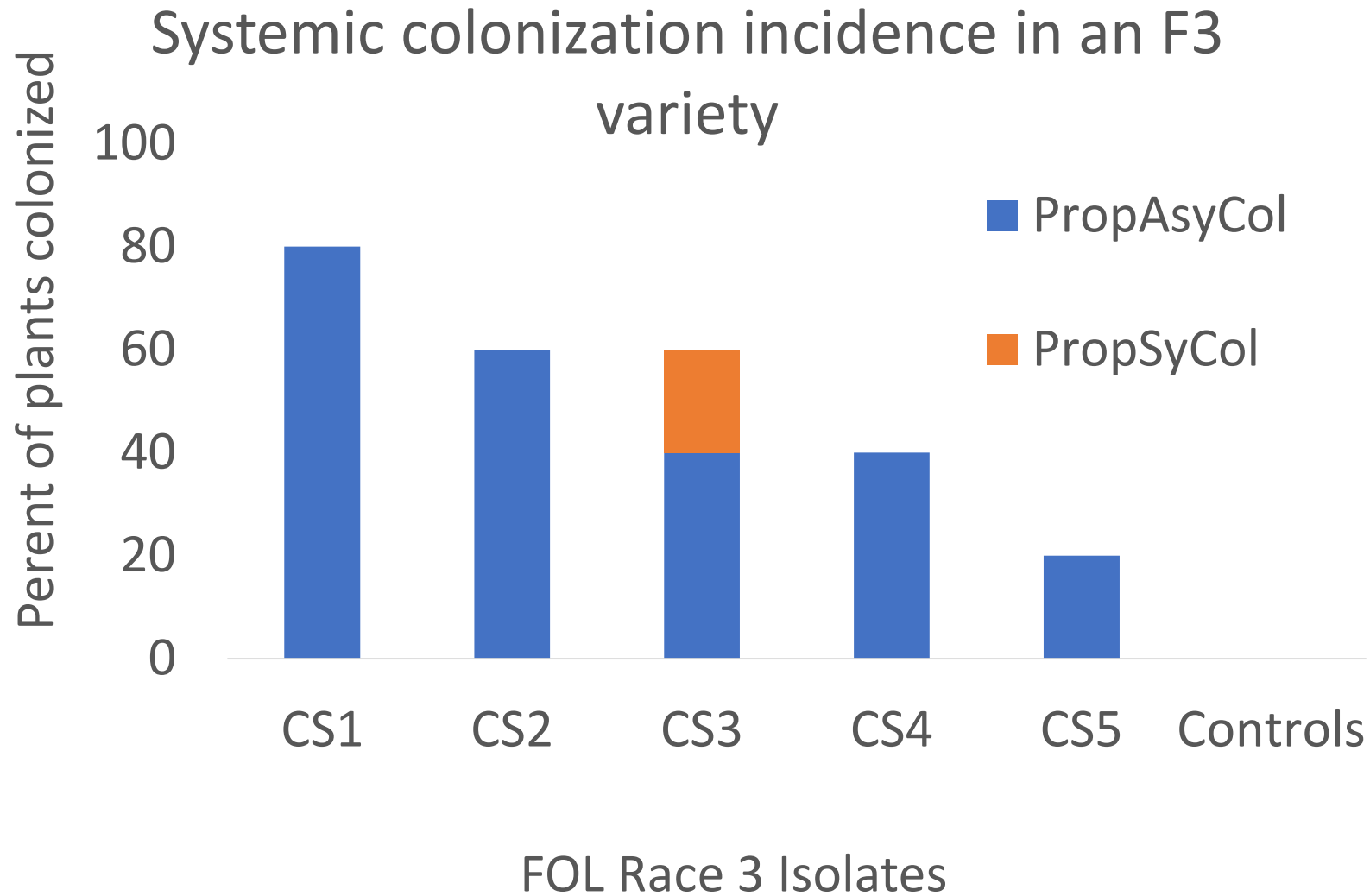
All isolates were Fol race 3
None were race 4

Will be conducting off-type testing in 2019

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

Fol race 3 can cause Fusarium wilt in F3 cultivars

Based on controlled greenhouse and field trials



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



Samples submitted by Gene in 2017







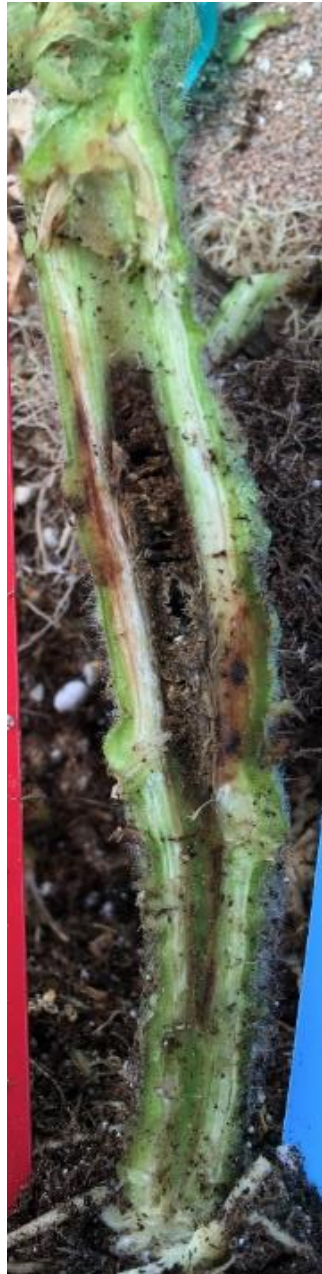


After 1-2 weeks



After 2-3 weeks





plant disease

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DISEASE NOTES

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

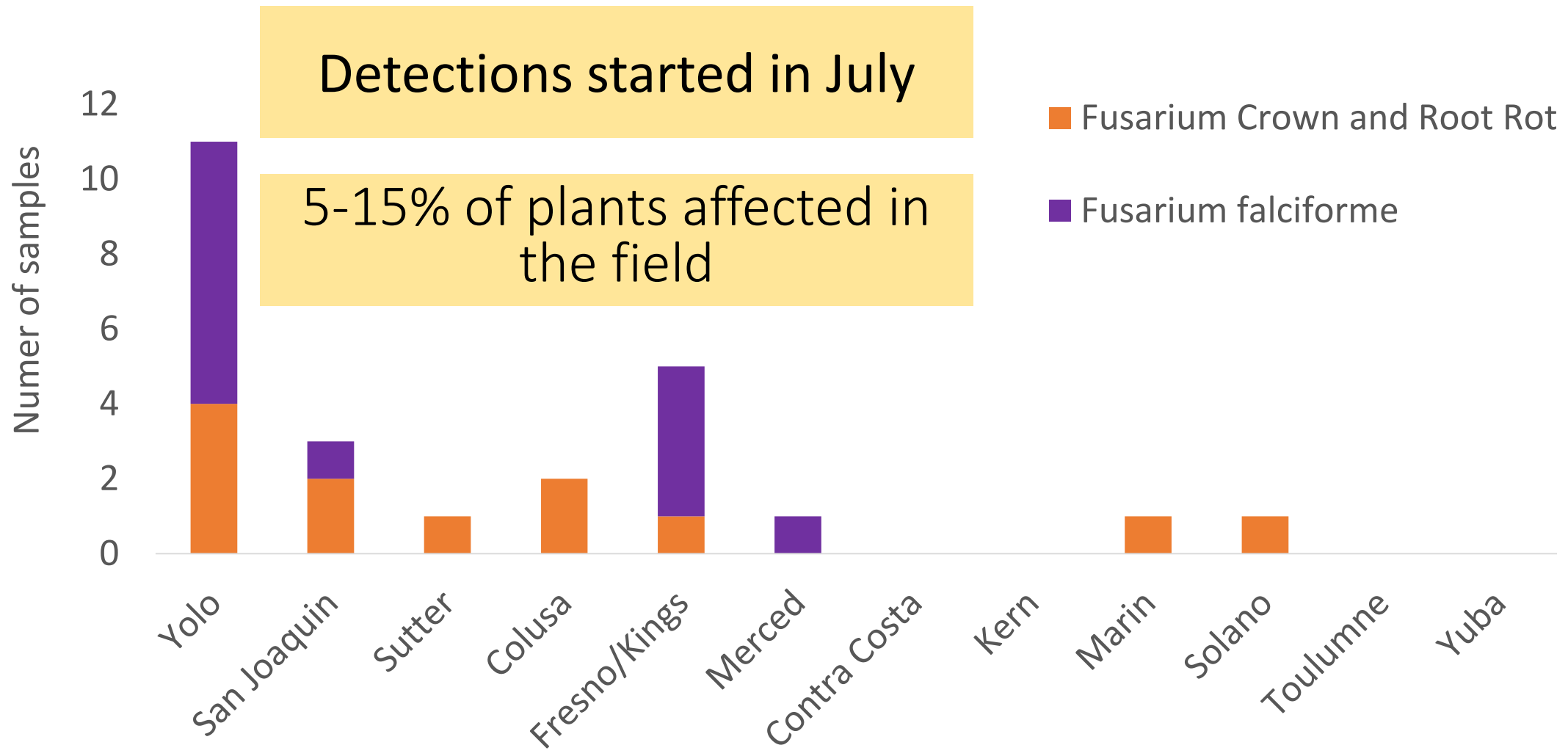
T. A. Vega-Gutiérrez, **C. A. López-Orona**^{id},[†] and **G. A. López-Urquídez**, Facultad de Agronomía, Universidad Autónoma de Sinaloa, Culiacán, CP 80000, Sinaloa, México; **S. Velarde-Félix**, Instituto Nacional de Investigaciones Forestales Agrícolas y Pecuarias (Campus Culiacán), 80000, Culiacán, 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.

Lesion Length (mm)

60
50
40
30
20
10
0

forme
ite 3
(62)

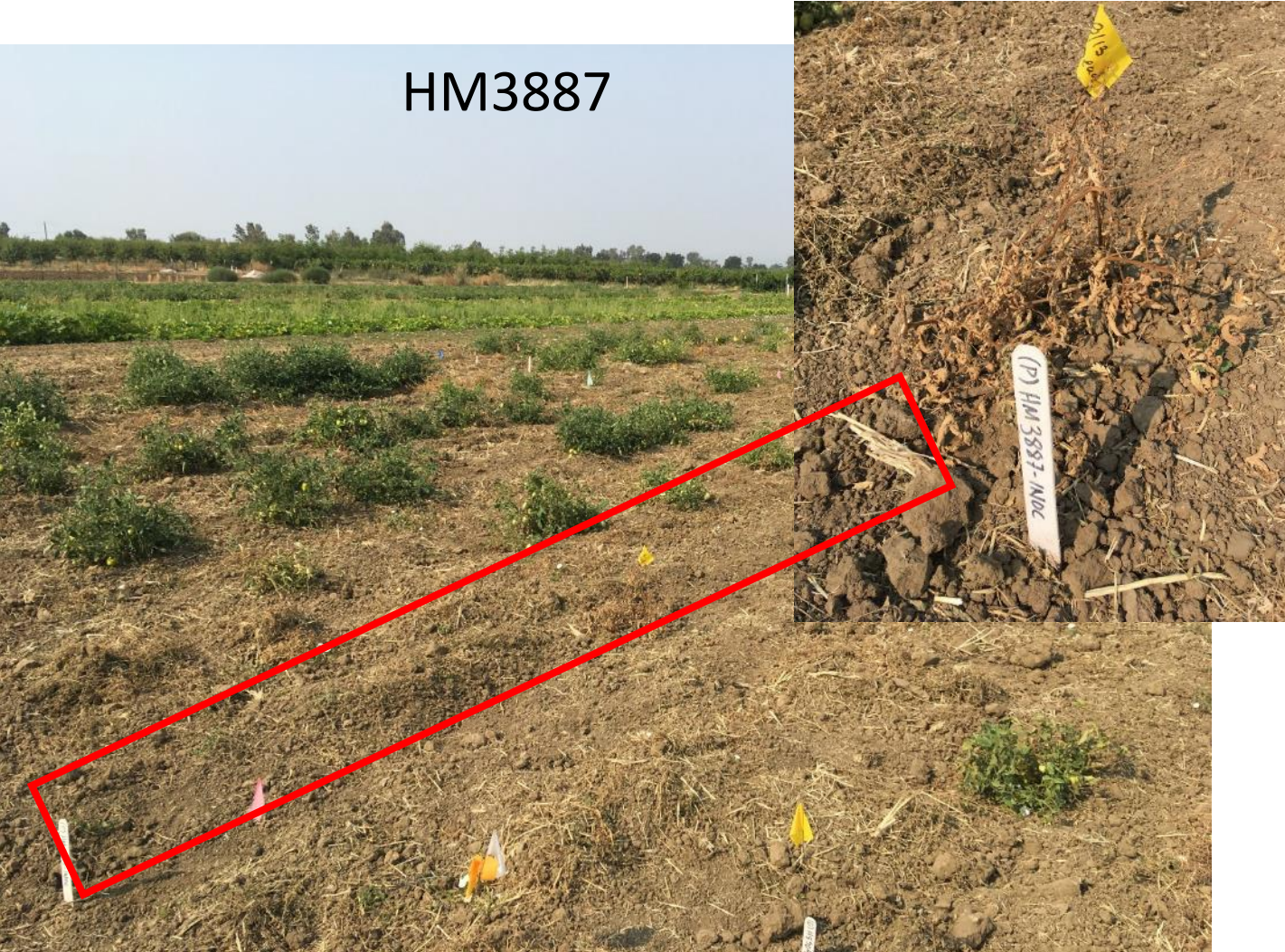
Fusarium falciforme statewide survey



Controlled field trial: inoculated plants

Some cultivars are severely affected

HM3887



Controlled field trial: inoculated plants

Some cultivars are severely affected

Other cultivars are much less affected

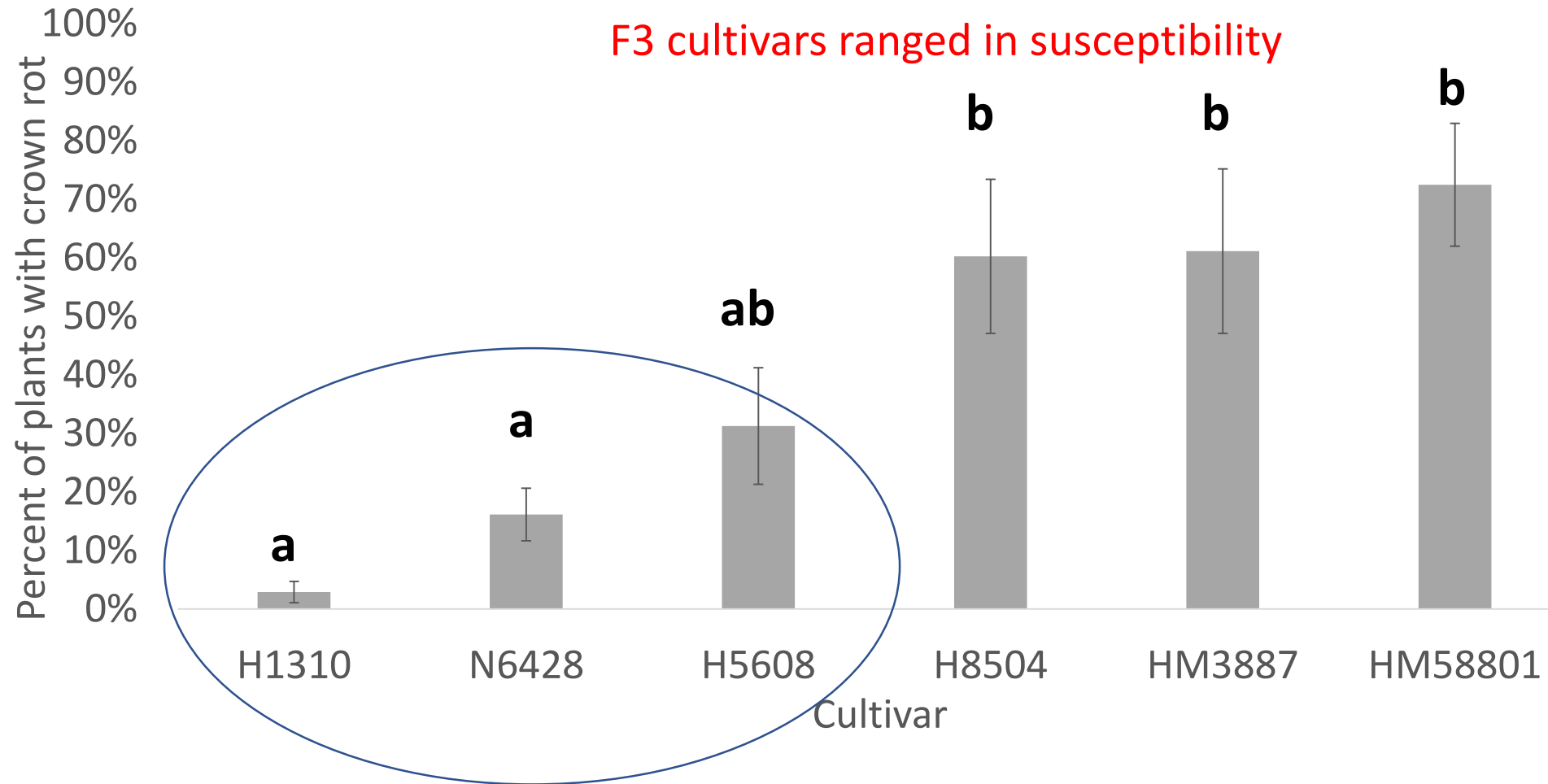
HM3887



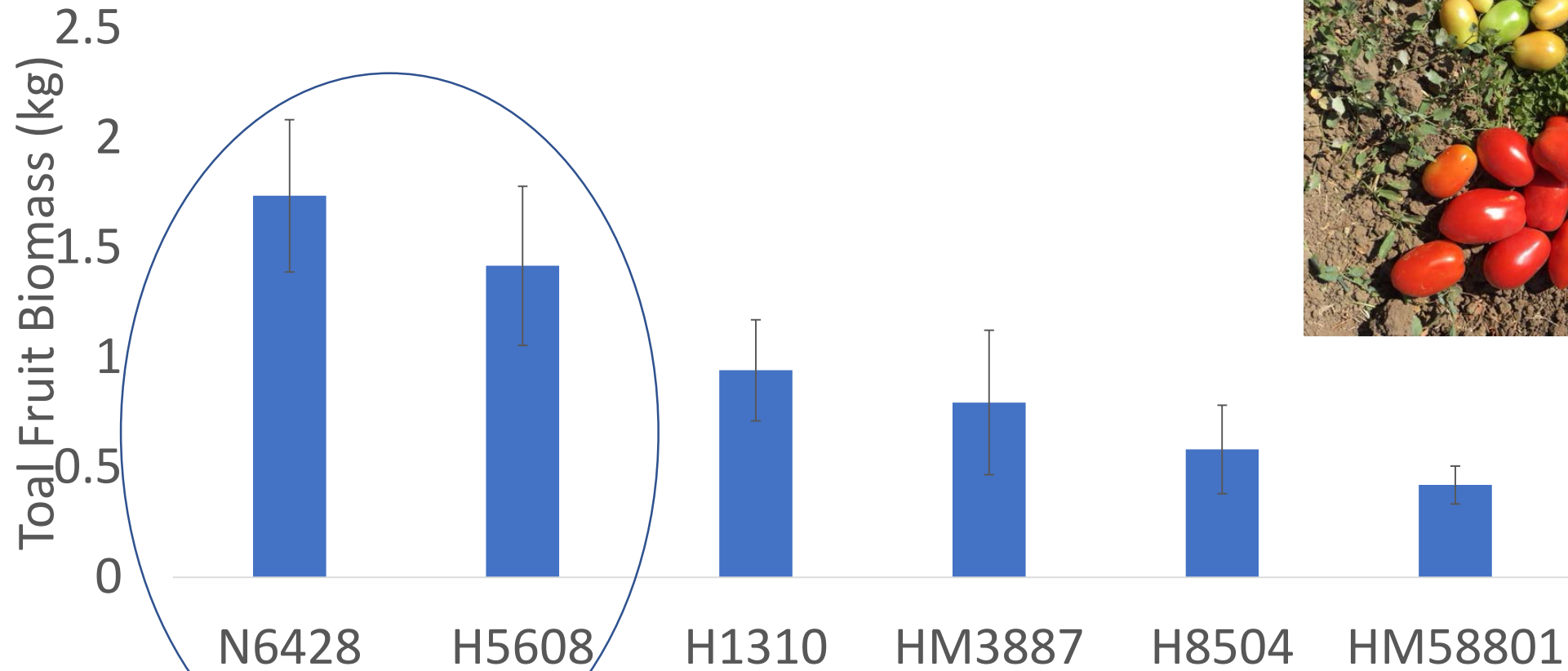
N6428



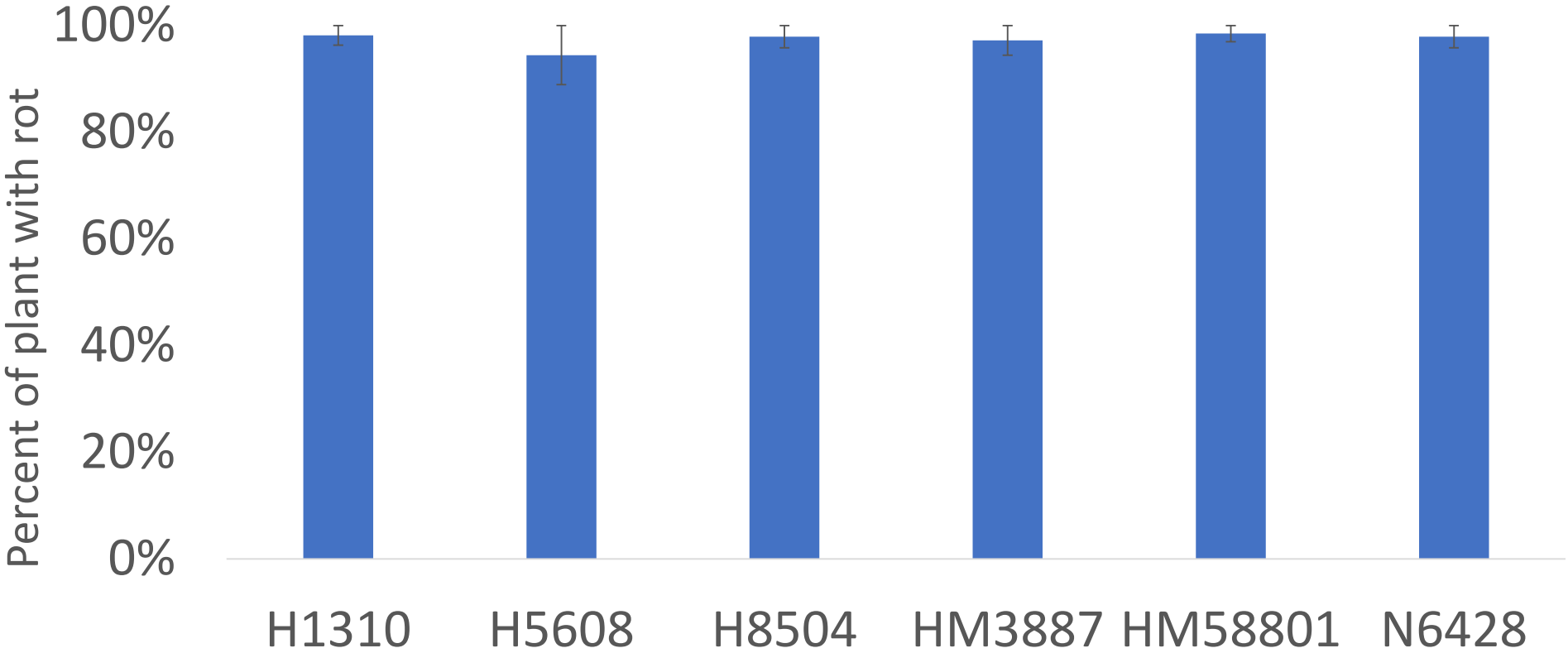
Cultivars differed in the incidence of plants that developed decline symptoms and associated foot/stem rot



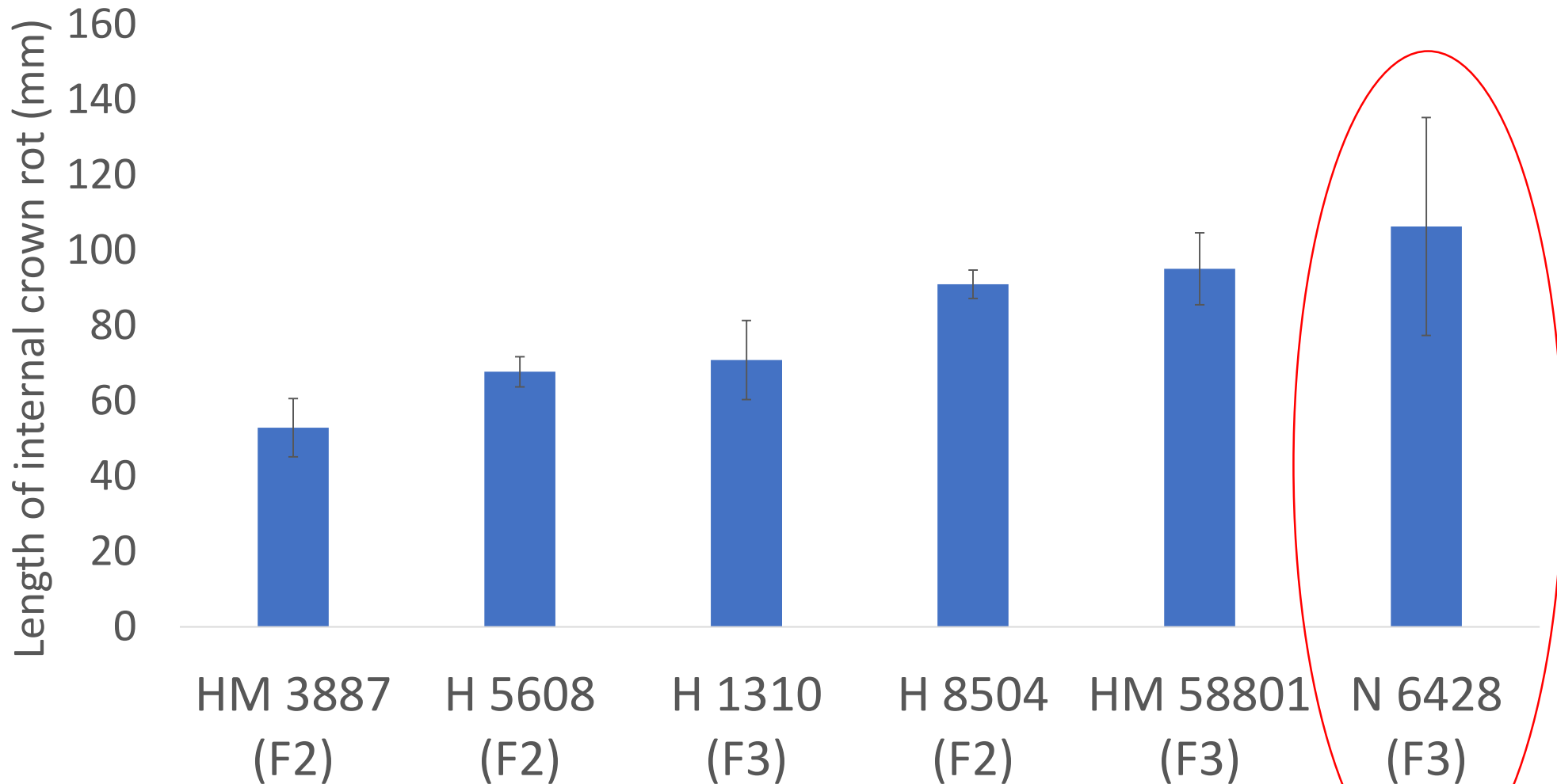
Cultivars with the lowest decline incidence in the had the highest yields



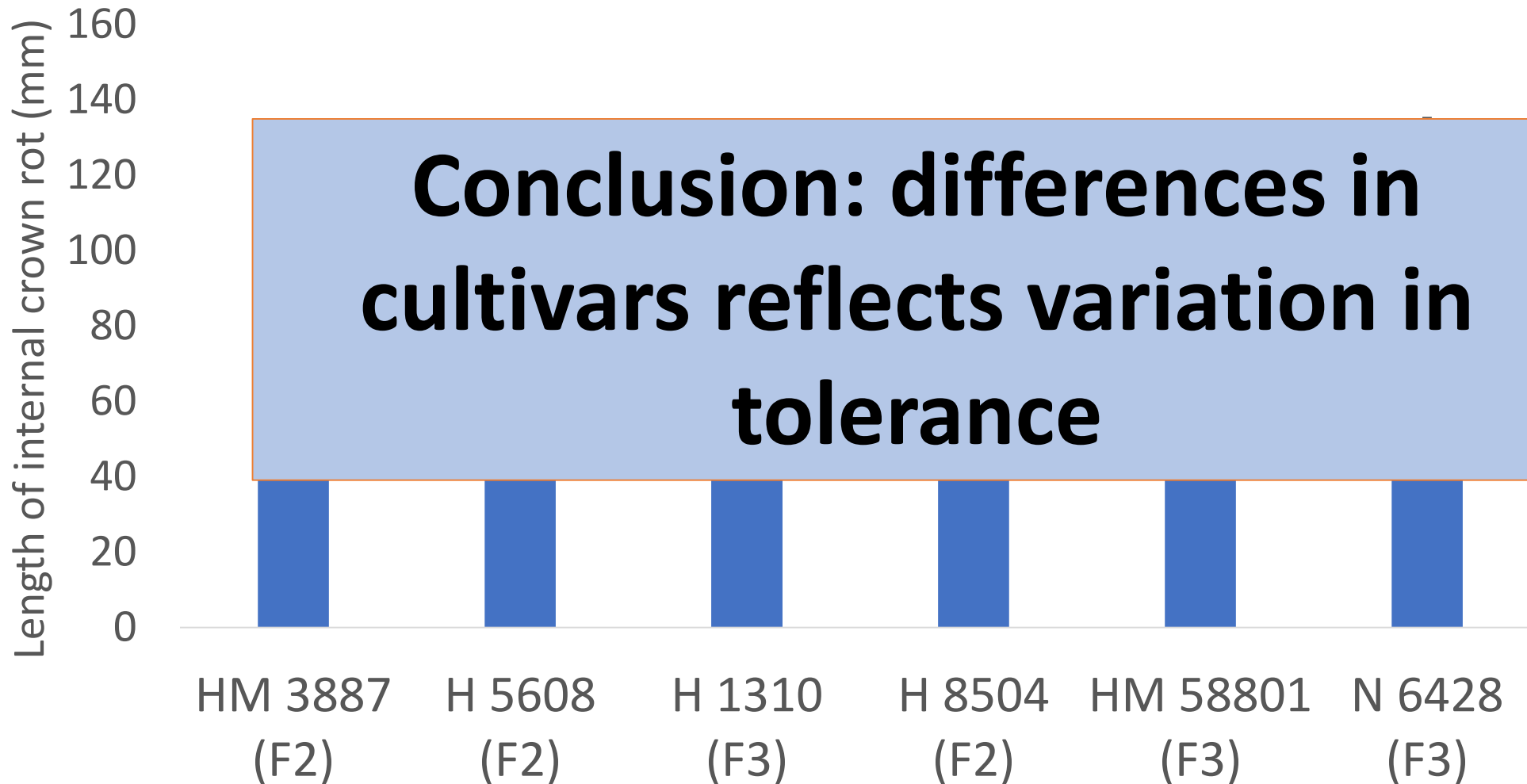
For all cultivars: All or nearly all plants developed foot and stem rot



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



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



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:

2019 UC Davis Tomato Disease Diagnosis and Management Field Day



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Questions?

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