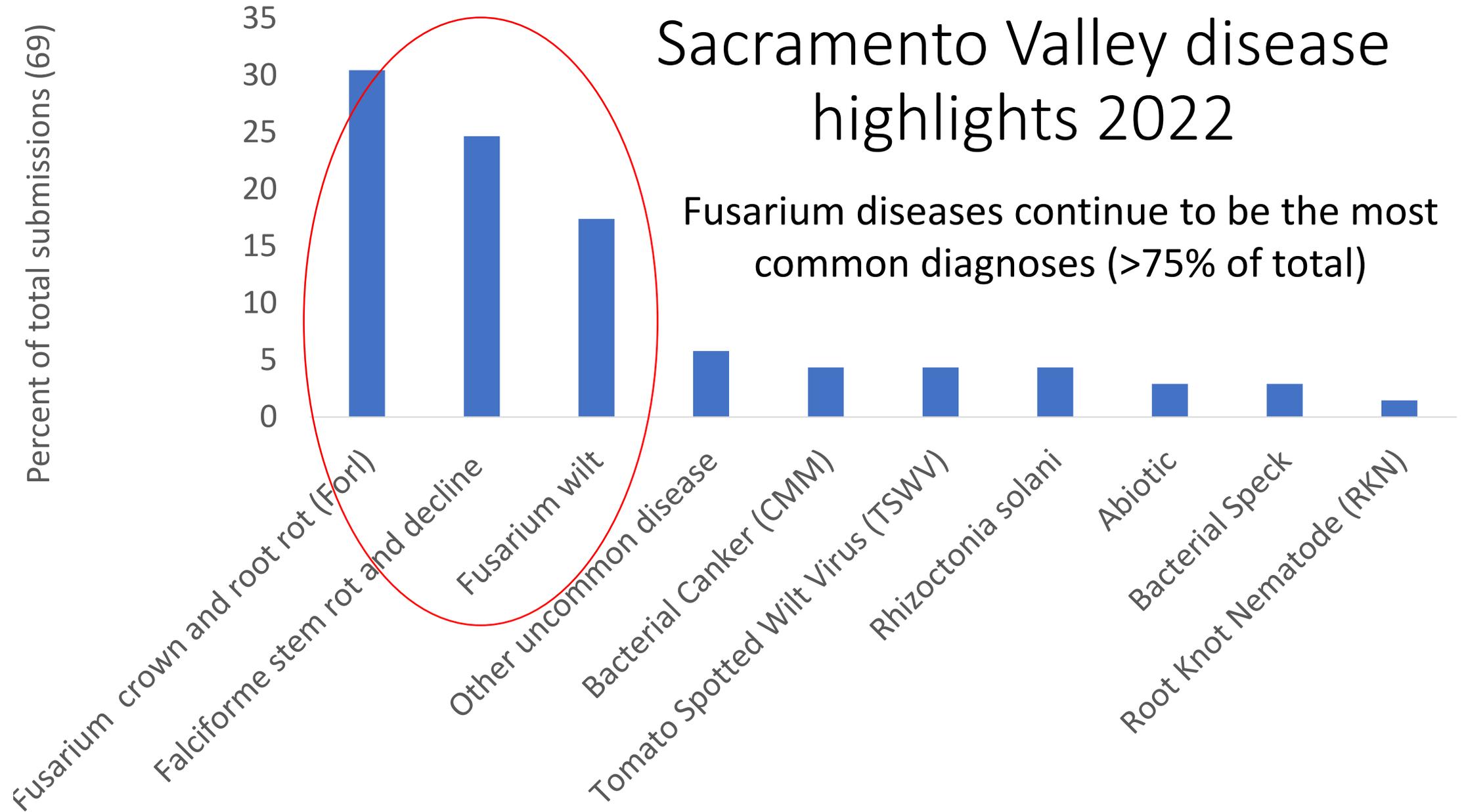


# 2022 Tomato disease patterns in the lower Sacramento Valley

Cassandra Swett  
UC Davis, Dept. of Plant Pathology

# Sacramento Valley disease highlights 2022

Fusarium diseases continue to be the most common diagnoses (>75% of total)



## *Fusarium oxysporum*

Fusarium wilt  
*f. sp. lycopersici*  
Fol (race 3)

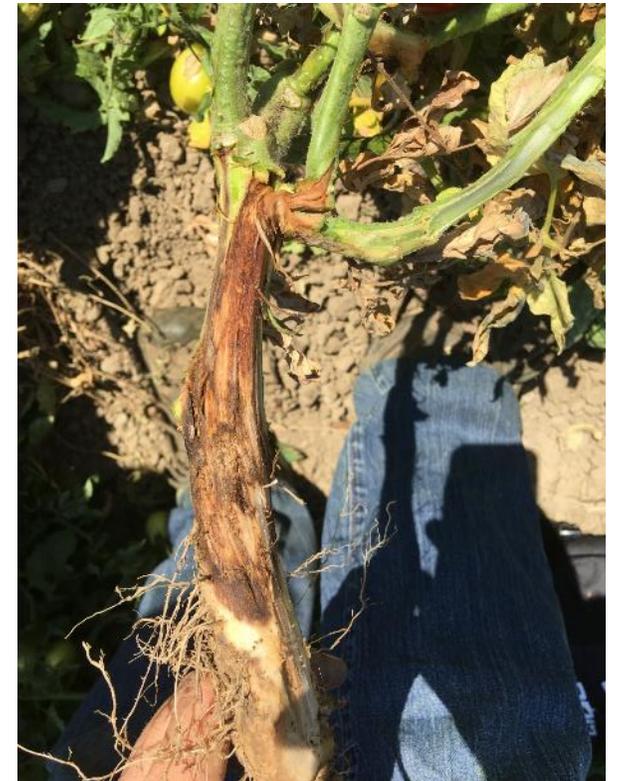


Fusarium crown and  
root rot  
*f.sp. radicis-lycopersici*  
Forl

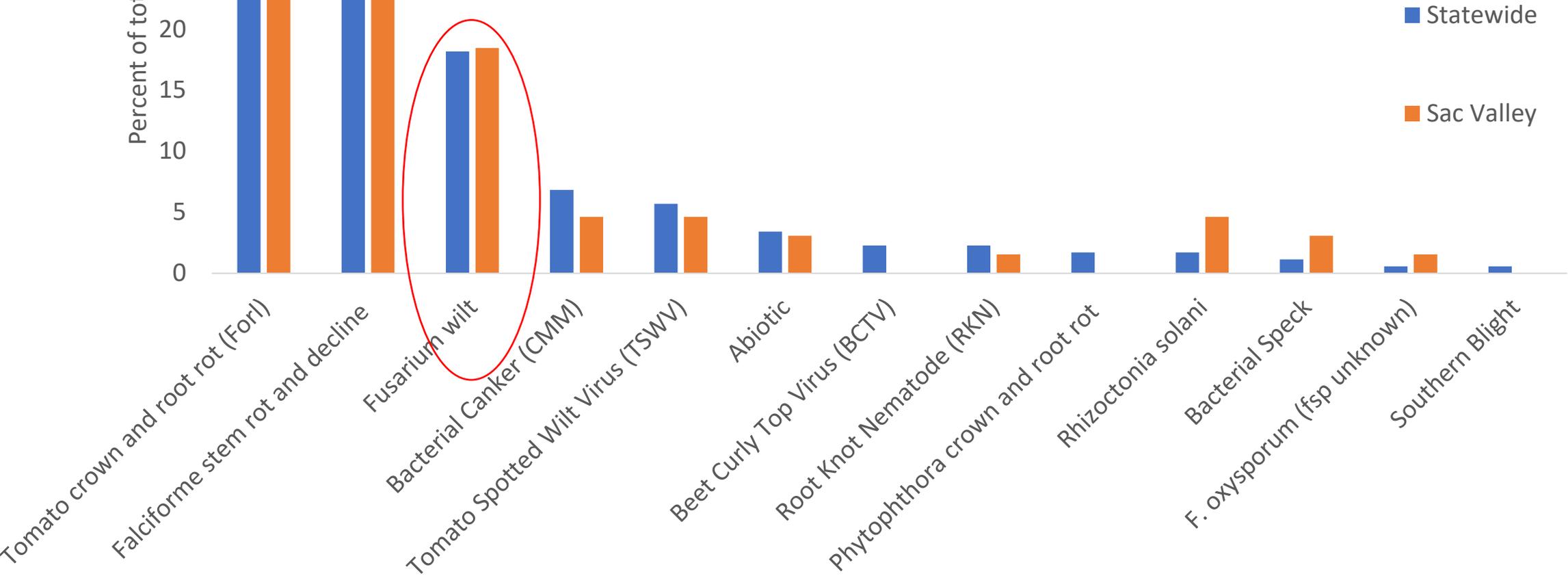


## *Fusarium* *falciforme*

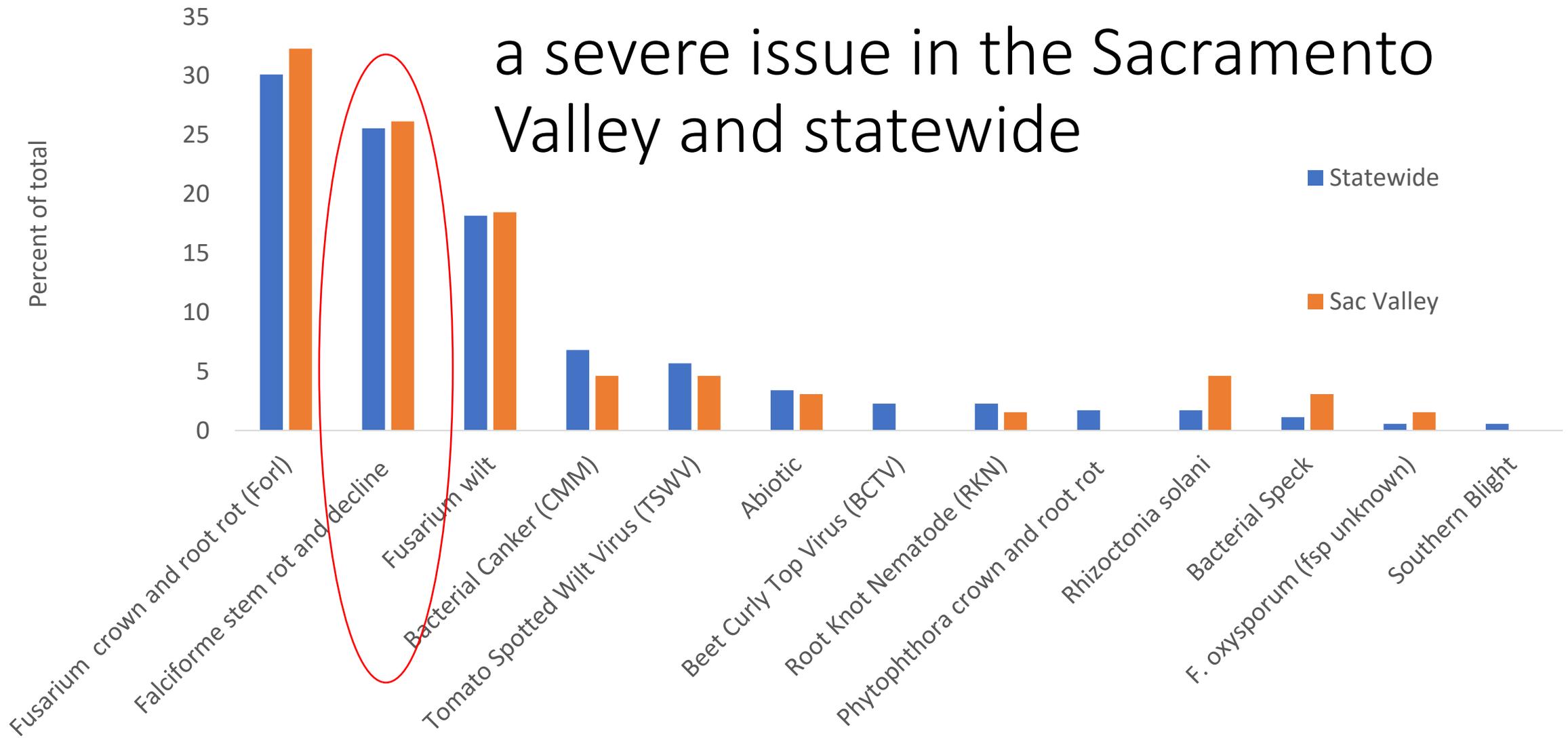
Stem rot and vine  
decline



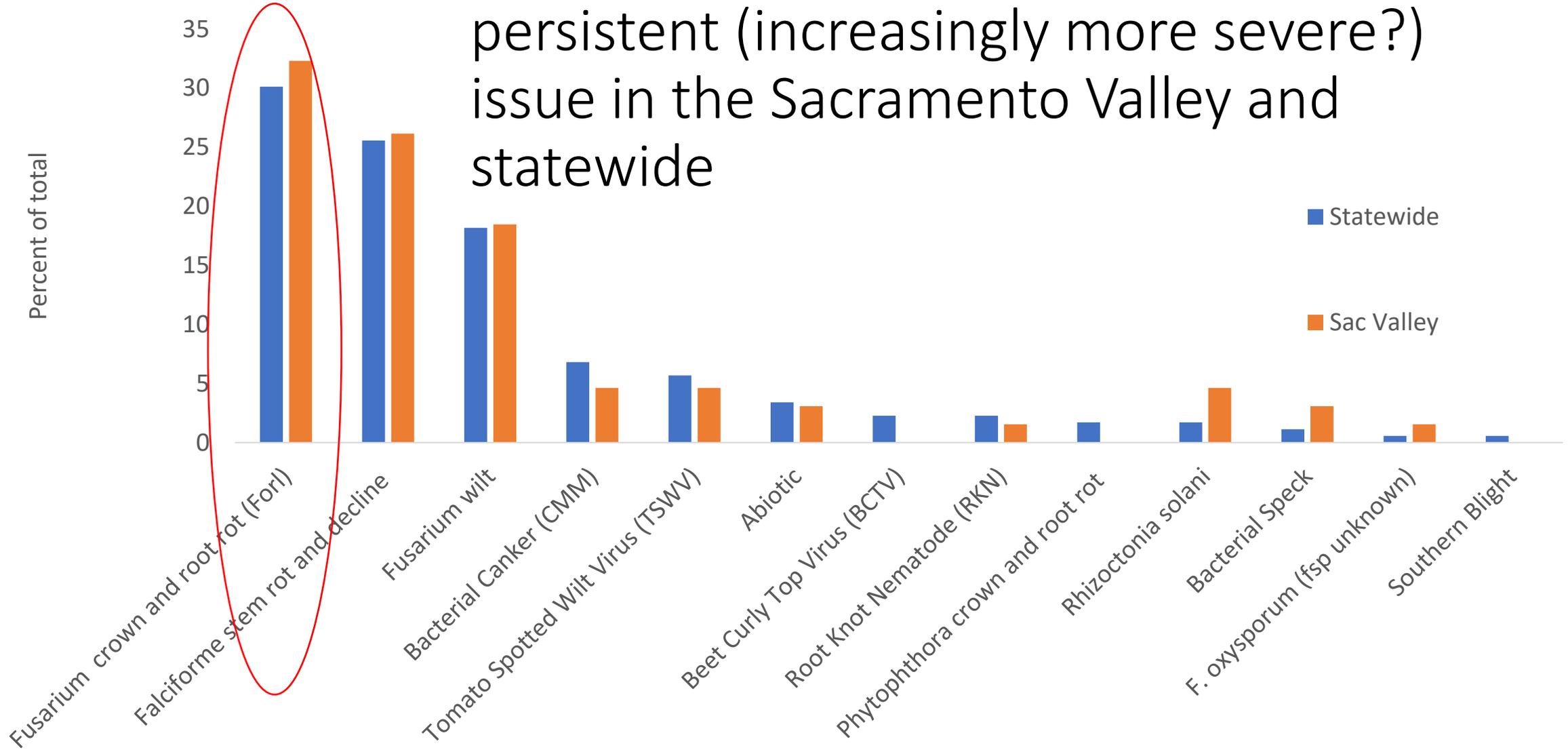
Fusarium wilt diagnoses were ~30% lower than previous years-F3 cultivars more common



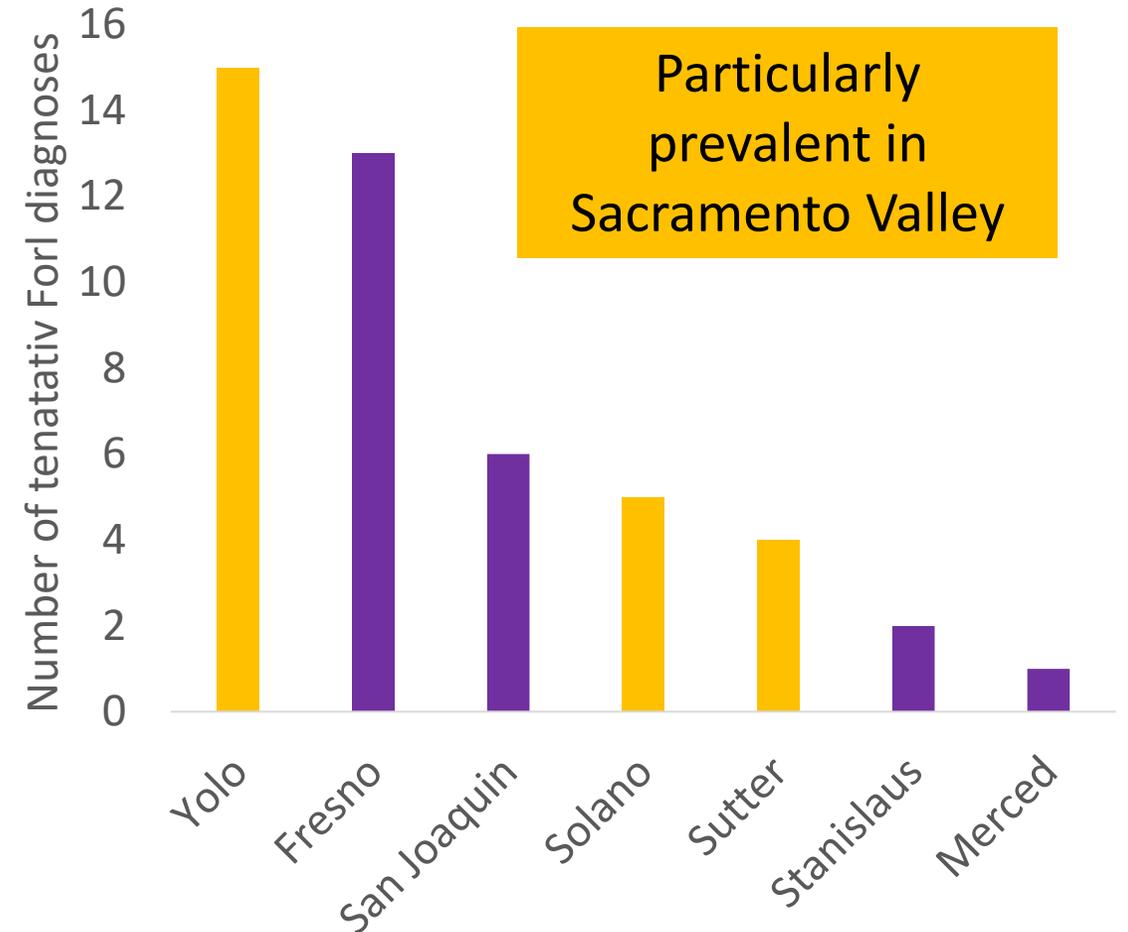
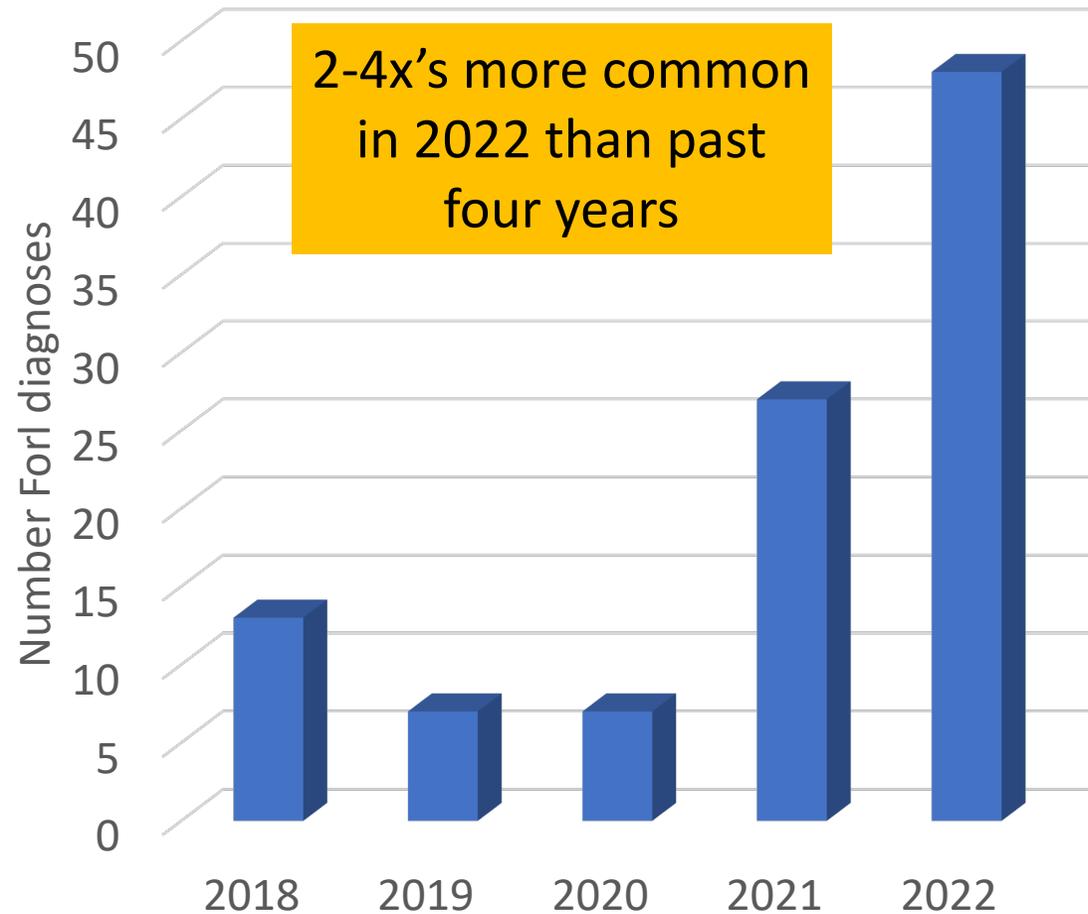
# Fusarium falciforme continues to be a severe issue in the Sacramento Valley and statewide



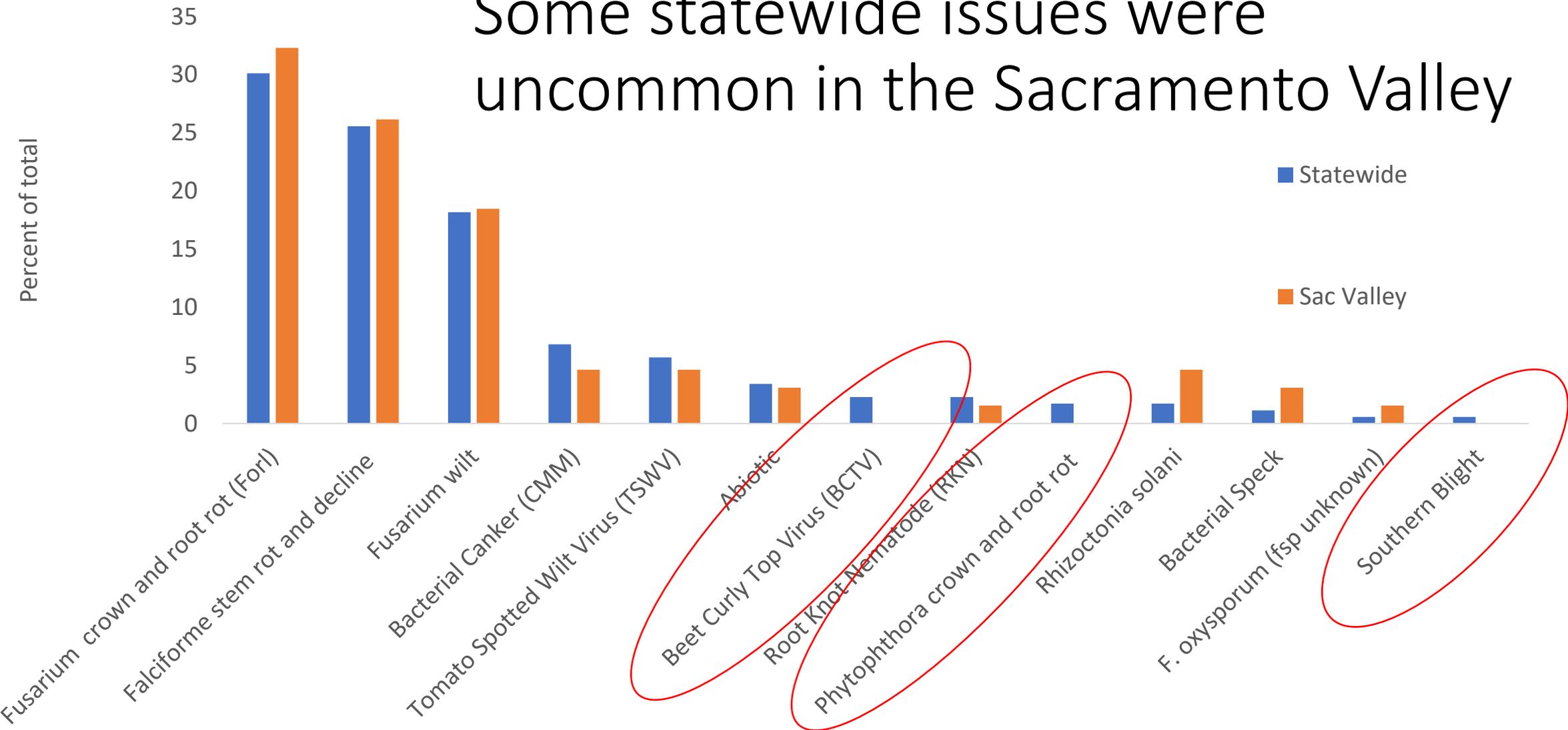
Fusarium crown and root rot is a persistent (increasingly more severe?) issue in the Sacramento Valley and statewide



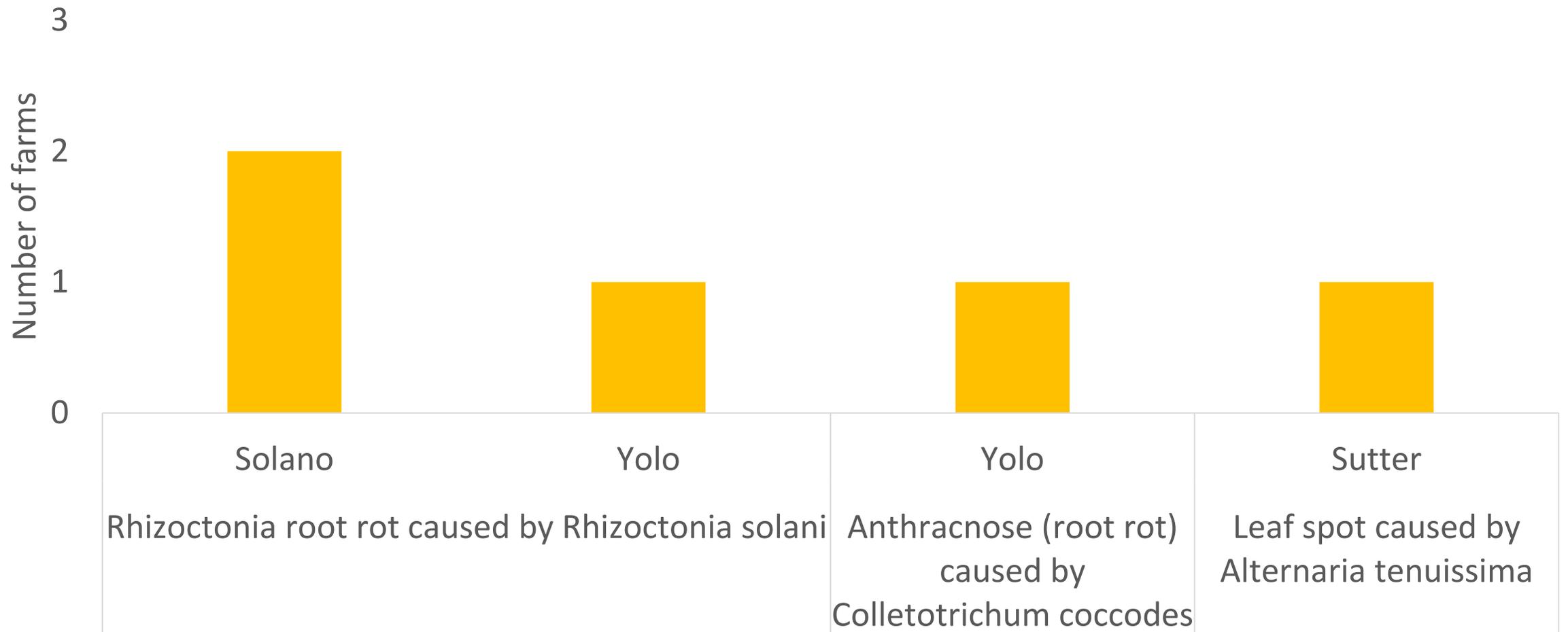
# Fusarium crown and root rot: an increasing statewide issue



# Some statewide issues were uncommon in the Sacramento Valley



# Putative new diseases detected in 2022-were only detected in Sacramento Valley



# Statewide monitoring of resistance-breaking strains

Diseases managed by single gene resistance

- TSWV (Sw5 gene)
  - Known to have resistance breaking strains (Gilbertson, Turini)
  - Present in the Sacramento Valley

# Statewide monitoring of resistance-breaking strains

Diseases managed by single gene resistance

- TSWV (SW5 gene)
- Root knot nematode (Mi gene)

# Root knot nematode resistance breaking common statewide-2021 survey (Hodson, Swett)

## Statewide:

- RKN recovered from 27 fields planted to resistant cultivars
- 100% of tested isolates (18) were resistance-breaking (controlled temp)

## Sacramento valley:

- Resistance-breaking RKN detected in 11 fields

		% Root galling		
	County	Isolate	Celebrity' (Mi+)	Rutgers' (Mi-)
<i>M. incognita</i>	Yolo	139	33	31
	Yolo	140	44	32
	Yolo	143	23	27
	Yolo	144	35	33
	Yolo	145	19	28
	Yolo	146	30	37
	Yolo	213	6	7
	Yolo	R-R	43	44
	Solano	212	4.6	12
	Fresno	157	30	32
	Fresno	158	26	28
	Fresno	208	24	20
	Fresno	207	28	44
	Fresno	151	34	44
<i>M. javanica</i>	Merced	183	28	38
	Sutter	A-S	46	37
	Stanislaus	C-L	0	1

### Controls

<i>M. incognita</i>	Hr3	36	29
<i>M. incognita</i>	I3	0	47
<i>M. javanica</i>	VW5	33	25
<i>M. javanica</i>	VW4	5	42



# Statewide monitoring of resistance-breaking strains

Diseases managed by single gene resistance

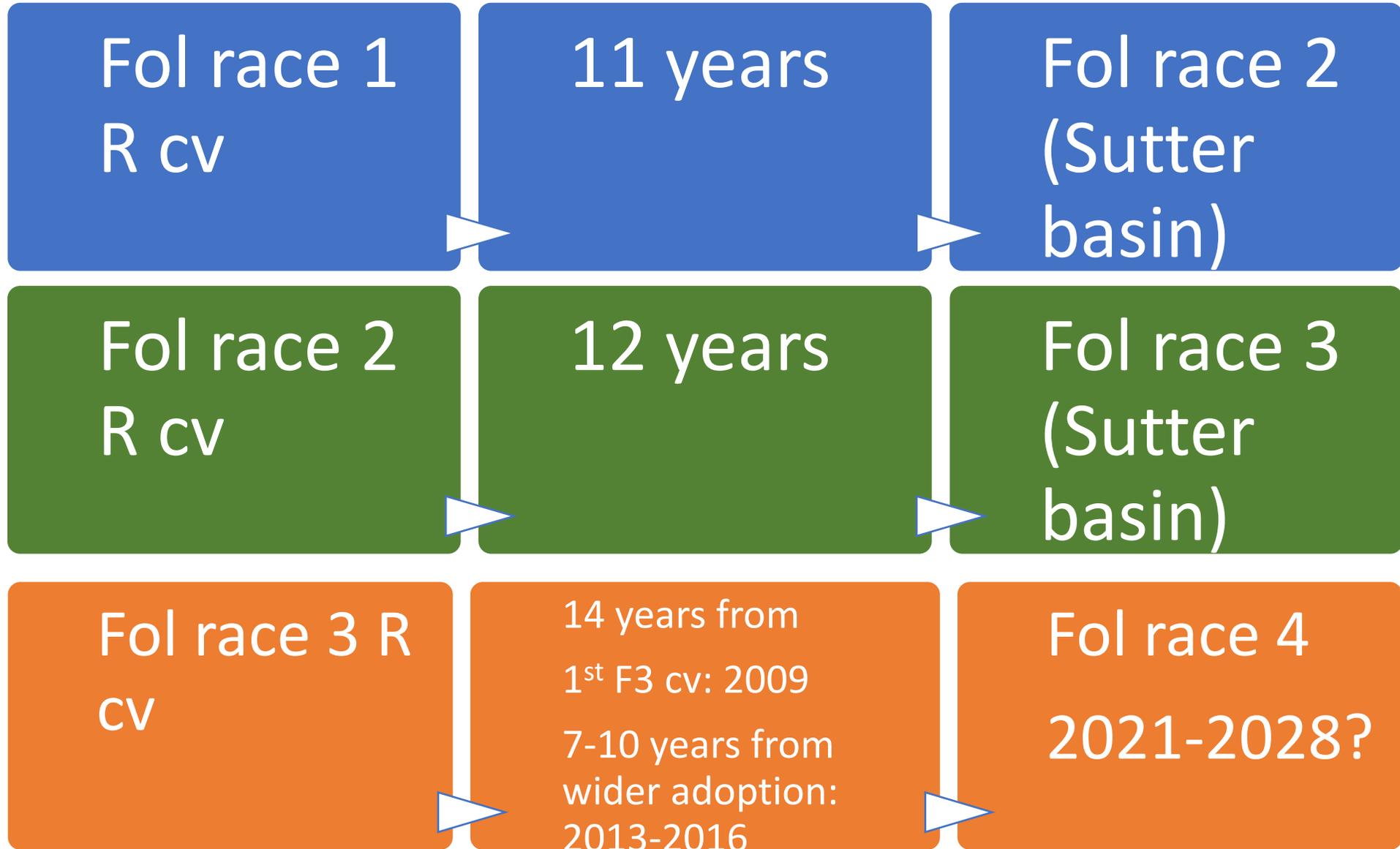
- TSWV (SW5 gene)
- **Root knot nematode (Mi gene)**
  - Resistance breaking is widespread
  - This is not a temperature-related issue-GH studies controlled for temperature
  - 60% of RB-RKN-infested fields also had one or more Fusarium disease
    - There are likely RKN interactions with Fusarium diseases

# Statewide monitoring of resistance-breaking strains

Diseases managed by single gene resistance

- TSWV (SW5 gene)
- Root knot nematode (Mi gene)
- **Fusarium wilt race 3 (I3 gene, F3 cultivars)**

# Fusarium wilt resistance-breaking race timeline



# Fusarium wilt in resistant cultivars

17 F3 fields in 5 years had Fol

All were Fol race 3

\*Efforts are opportunistic: lack rigorous surveys\*

		No fields (percent)					
		Fol					
Year	Total	R1	R2	R3	R4	Forl	Non-Path
2017	2	0	0	2 (100%)	0	0	0
2018	11	0	0	11 (100%)	0	0	0
2019	0	0	0	0	0	0	0
2020	2	0	0	2 (100%)	0	0	0
2021	2	0	0	2 (100%)	0	0	0
Total	17	0	0	17 (71%)	0	0	0

# Statewide monitoring of resistance-breaking strains

## Diseases managed by single gene resistance

- TSWV (SW5 gene)
- Root knot nematode (Mi gene)
- **Fusarium wilt race 3 (I3 gene, F3 cultivars)**
  - No resistance breaking race 4 detected; have maybe five years.
  - Fol R3 disease development in F3 cultivars-off types? Predisposing conditions influencing I3 resistance gene expression?

# Statewide monitoring of resistance-breaking strains

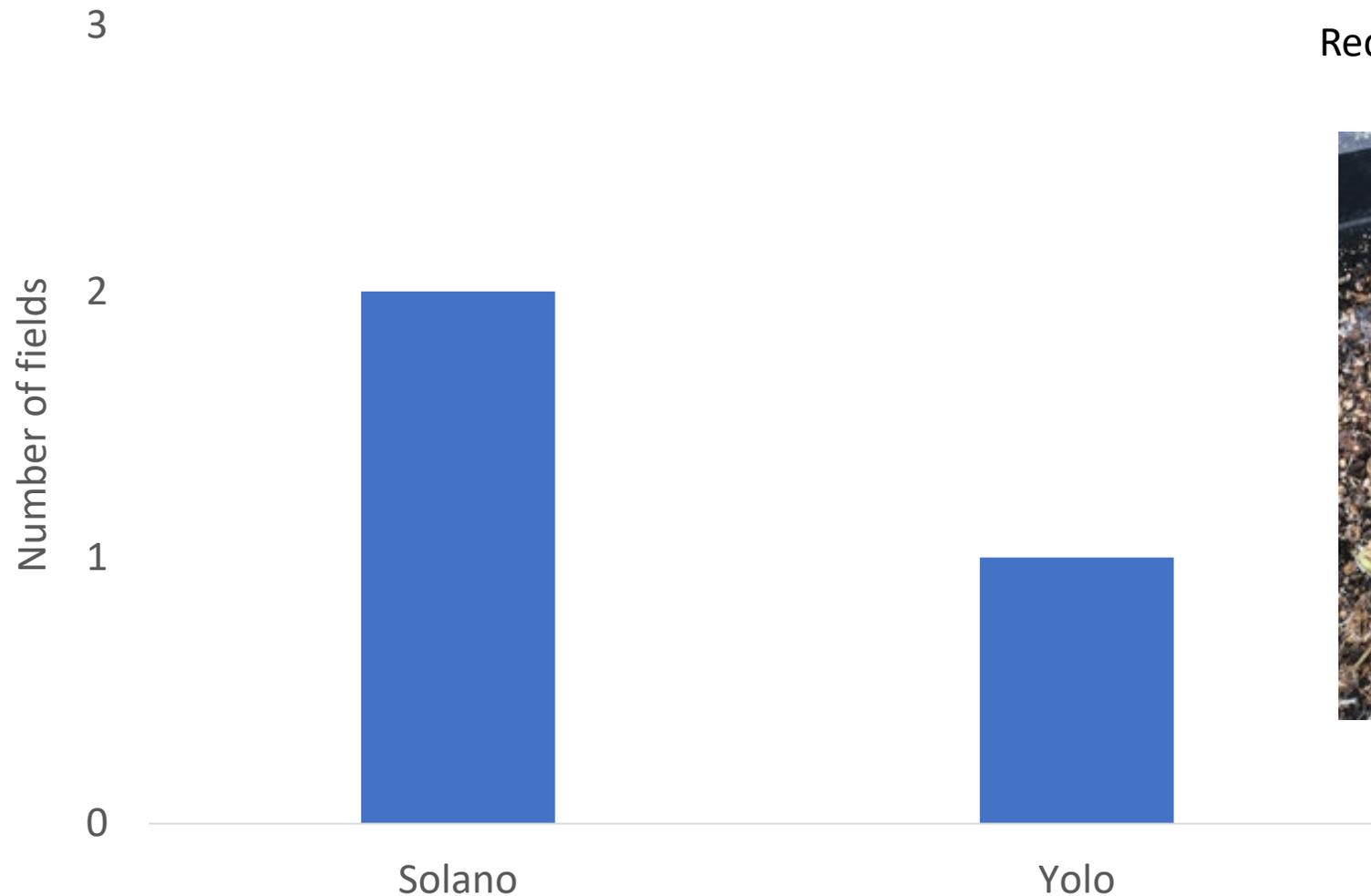
## Diseases managed by single gene resistance

- TSWV (SW5 gene)
- Root knot nematode (Mi gene)
- Fusarium wilt race 3 (I3 gene, F3 cultivars)
- **Fusarium crown and root rot (Frl gene, Fr cultivars)**

# Potential For1 resistance-breaking detected for the first time

3 fields, H5522: the primary Fr CV in 2022

All in the Sacramento Valley



Requires in-planta phenotyping to confirm resistance breaking



# Statewide monitoring of resistance-breaking strains

## Diseases managed by single gene resistance

- TSWV (SW5 gene)
- Root knot nematode (Mi gene)
- Fusarium wilt race 3 (I3 gene F3 cultivars)
- **Fusarium crown and root rot (Frl gene, Fr cultivars)**
  - Might have possible Forl race 2 (Frl resistance breaking race)
  - Testing is needed-may be non-pathogenic *F. oxysporum*

# Statewide monitoring of resistance-breaking strains

Diseases managed by single gene resistance

- TSWV (SW5 gene)
- Root knot nematode (Mi gene)
- Fusarium wilt race 3 (I3 gene F3 cultivars)
- Fusarium crown and root rot (Frl gene, Fr cultivars)

Early identification of resistance breaking is critical  
Use of sanitation and other management methods will be important  
to slow spread statewide  
Enabling the breeding industry to develop new resistant materials

# Upcoming: new UC IPM tomato disease diagnosis field guide

University of California  
Agriculture and Natural Resources

Diagnosing vine decline  
and rot diseases of  
tomatoes in the field

UC Davis 2022 Vegetable Disease Field Day  
Cassandra Swett, Bob Gilbertson  
Department of Plant Pathology

University of California  
Agriculture and Natural Resources

Diagnóstico de  
decaimiento foliar y  
enfermedades de  
pudrición de tomates en el  
campo

UC Davis 2022 Vegetable Disease Field Day  
Cassandra Swett, Bob Gilbertson  
Traducido por: Johanna Del Castillo Múnera  
Department of Plant Pathology  
UC Davis



**Curly top disease (CTD)-beet curly top virus (BCTV)**  
Vector: beet leafhopper  
Symptoms  
Observed early in the season  
often in fields near foothills  
Plants are stunted and dull-green  
Leaves: dull-green to yellow, crumple, curl upward or even roll, and swollen purple veins  
Fruits: small and ripen prematurely  
CTD is sporadic but can cause economic loss in bad years; no resistant varieties but known risk factors

**Tomato necrotic spot disease-tomato necrotic spot (ToNSV)**  
A windborne pollen-transmitted virus introduced to tomato via thrips feeding  
Symptoms  

- Generally seen early in the season
- Leaves are distorted and show brown necrotic spots and stems are necrotic
- Not economically important: tomato plants recover (defense response) and there is little within field spread
- More common in Northern Counties in 2022
- Detected with RT-PCR test

University of California  
Agriculture and Natural Resources

Fusarium falciforme en cultivares con pudrición de pie severa, sin moteado

Se ve como

Marchitamiento por Fusarium

Igual en:  
Toxicidad de boron y salinidad

Questions?

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<https://swetlab.faculty.ucdavis.edu/>

