Fusarium Diseases of Tomato

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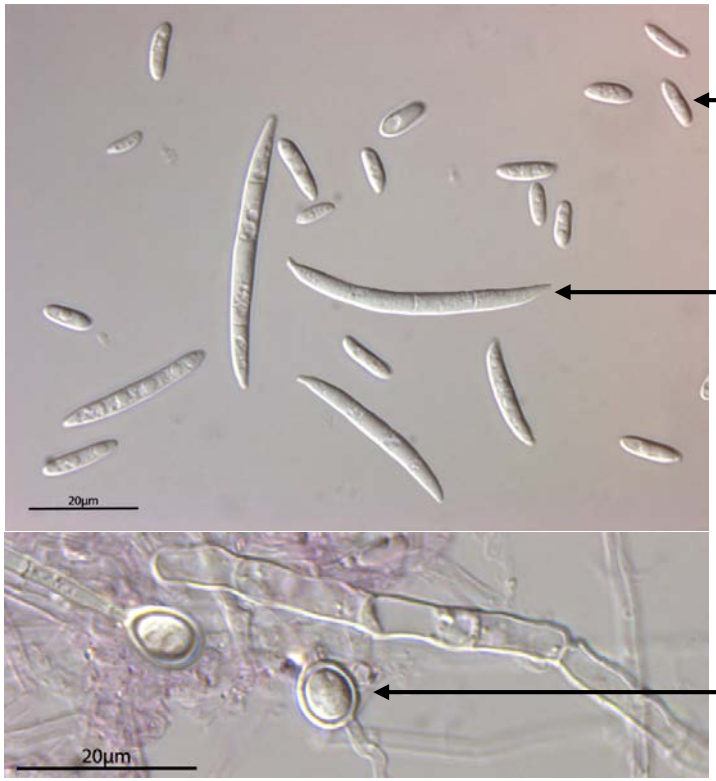


Microconidia

Macroconidia

Chlamydospores

- *Fusarium oxysporum* and *F. solani* form species are host specific
- Millions of spores are produced in each infected plant
- Because *Fusarium* retains its saprophytic ability, it remains in soil indefinitely, sustaining itself on other crops and weeds (without causing disease)

Fusarium Diseases of Tomato

Fusarium Foot Rot

Fusarium solani f. sp. *eumartii*

Fusarium Diseases of Tomato

Fusarium Foot Rot

Fusarium solani f. sp. *eumartii*

Host: Tomato, potato, eggplant, pepper

Fusarium Crown and Stem Rot

Fusarium striatum

Fusarium Crown and Root Rot

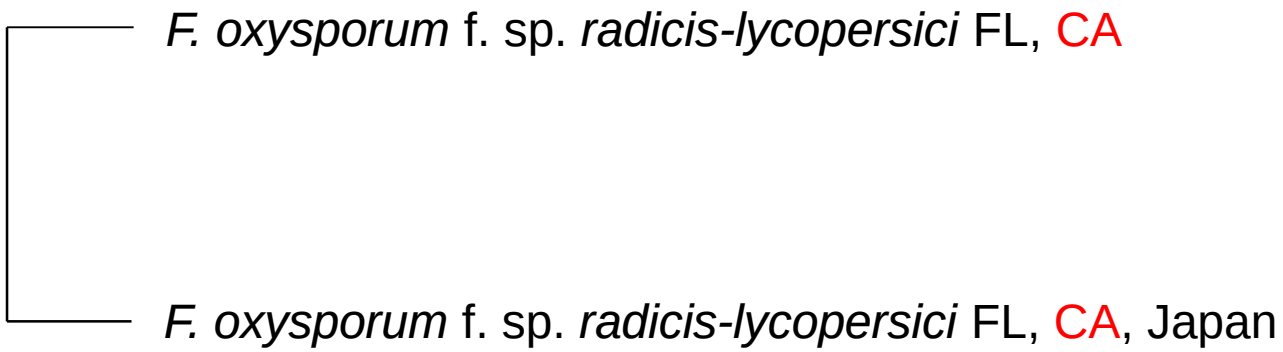
Fusarium oxysporum f. sp. *radicis-lycopersici*

Fusarium Diseases of Tomato

Fusarium Crown and Root Rot

Pathogen: *Fusarium oxysporum* f. sp. *radicis-lycopersici*

Host: some legumes, cucurbits, other solanaceous plants, and more



IGS and EF sequences

Fusarium Diseases of Tomato

Fusarium Crown and Root Rot
Pathogen: *Fusarium oxysporum* f. sp. *radicis-lycopersici*
Host: some legumes, cucurbits, other solanaceous plants, and more

Knight’s Landing, Yolo County

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Fusarium Crown and Root Rot

Fusarium oxysporum f. sp. *radicis-lycopersici*

Fusarium Wilt

Fusarium oxysporum f. sp. *lycopersici*

- Race 1
- Race 2
- Race 3

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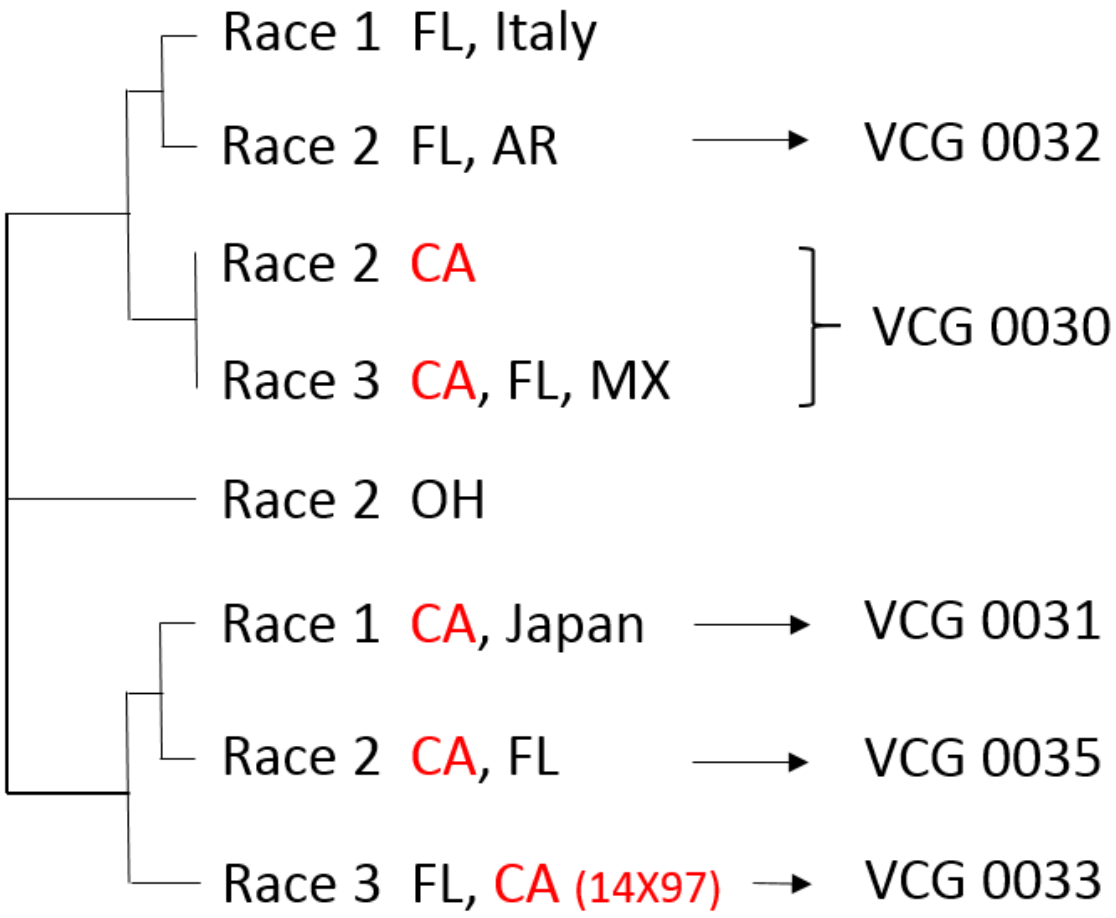
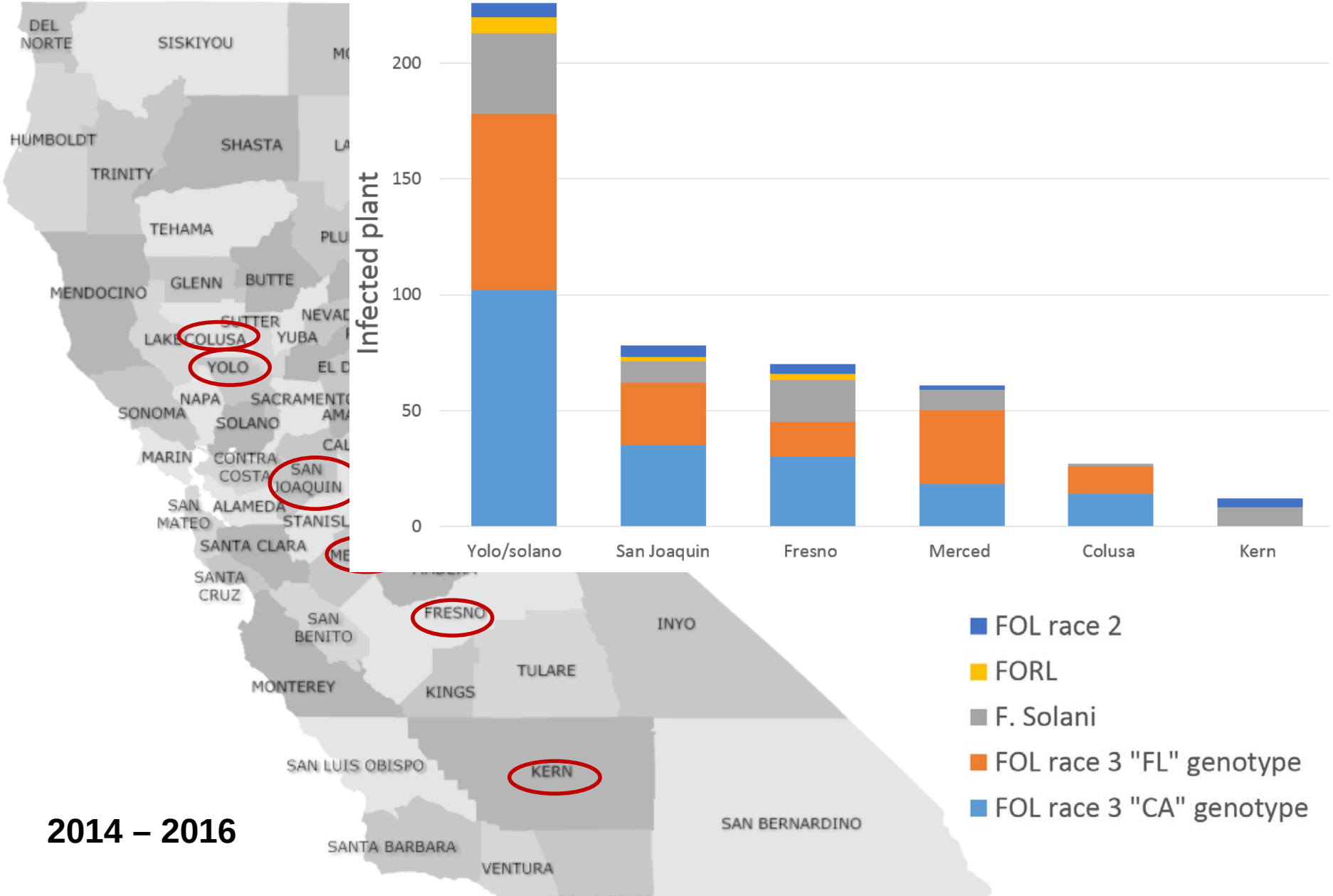
Fusarium Crown and Root Rot
Pathogen: *Fusarium oxysporum* f. sp. *lycopersici*
Host: tomato



IGS sequences and VCGs

Knight’s Landing, Yolo County

Collection of *Fusarium* spp. from Infected Tomato Fields



2014 – 2016

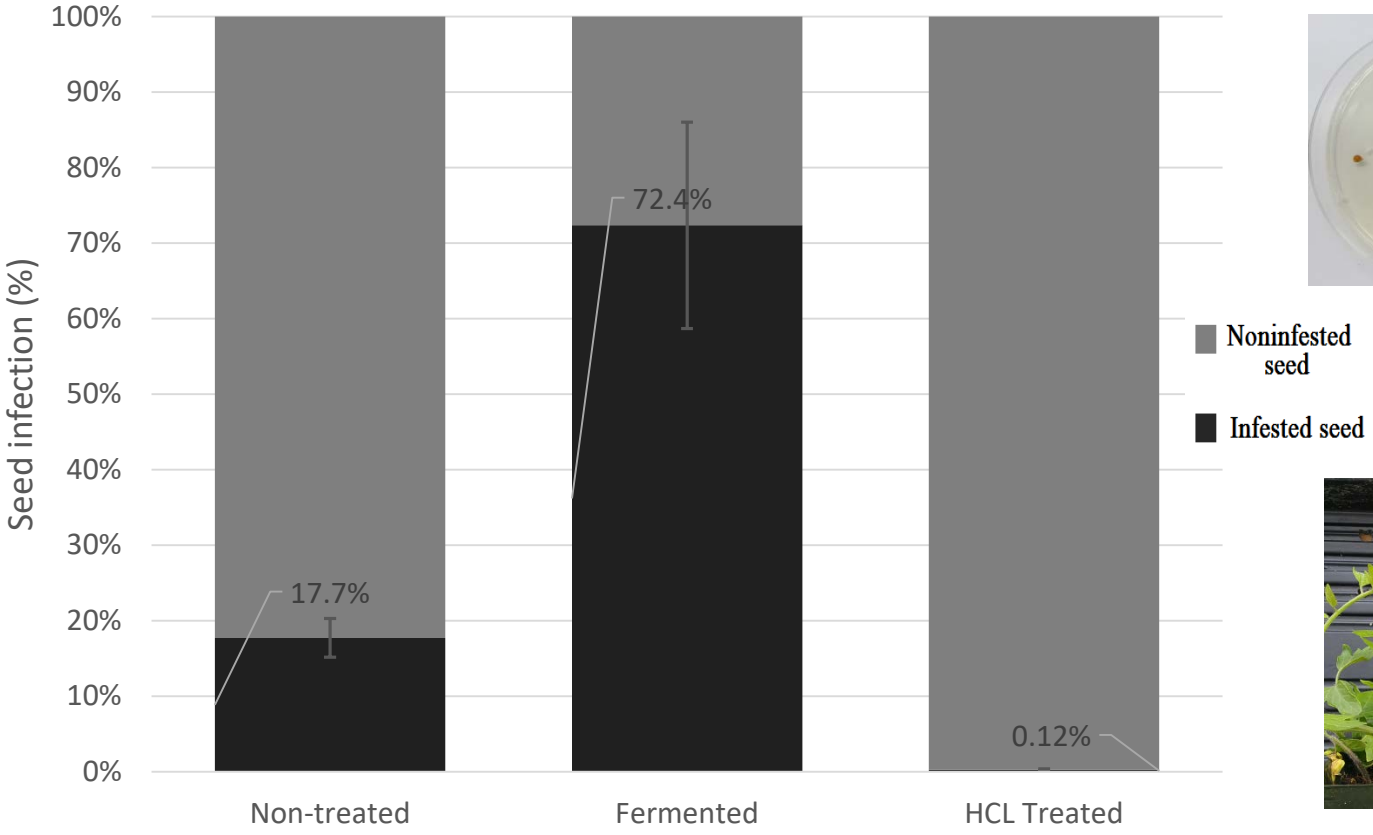
Movement of Fusarium Diseases

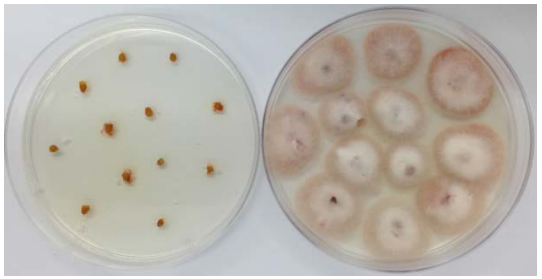
- Seed
  - Seeds should be treated (HCL/heat/fungicide)
- Any way soil and infected crop debris is moved
  - Most importantly in infected crop debris on farm machinery (harvester at the end of the season)

Movement of Fusarium Diseases

Movement of Fusarium Diseases

Recovery of FOL race 3 from seeds harvested in commercial fields

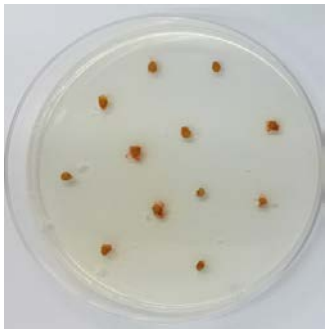




The average incidence of FOL race 3 isolated from 5000 tomato seeds harvested from three commercial fields.

Recovery of *Fusarium* from commercial seed lots of various cultivars

Seed lot	*Fusarium* per 10,000 seeds	FOL?	Path test
1	0	0	0
2	0	0	0
3	0	0	0
4	0	0	0
5	7	1	Pending
6	0	0	0
7[Z]	1	1	Pending



10,000 seeds were plated directly onto Komada's medium and monitored at 14 days for growth of Fusarium species. All potential Fusarium colonies were transferred onto APDA.
[Z]There was only 5,000 seeds in commercial seedlot 7.

- Two FOL race 3 Florida genotypes was confirmed based on molecular characterization (EF and IGS sequences)

- Pathogenicity tests need to be conducted to confirm pathogenicity

Management of Fusarium Diseases

- Clean seed
  - Seeds should be treated (HCL/heat/fungicide)
- Soil fumigation/Fungicide/solarization
  - In greenhouse, plant in steamed soil
- Rotation
  - Small grains, other cover crops, and non-susceptible crops.
  - Avoid host plants (*F. solani*: eggplant, potato, pepper; FORL: some legumes, cucurbits, other solanaceous plants, and more)
- Resistance
  - Resistant varieties are common for all races of FOL
  - One commercial variety with resistance/tolerance to FORL
- Containment/sanitation
  - Removal of infected plants (most inoculum is produce above-ground)?
  - Limit spread of infested soil and infected crop debris by cleaning equipment between fields.

Seed Treatments

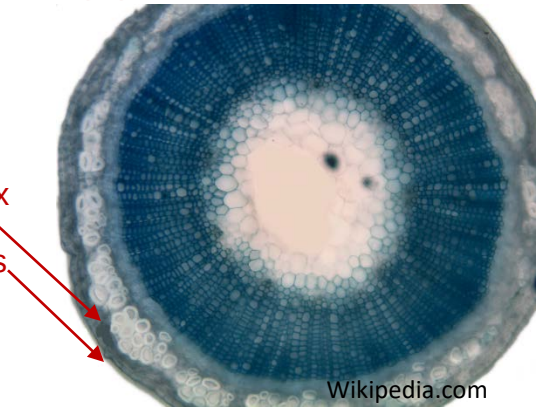
Pretreatment (23°C, 100rpm, 1hr)	Treatment (10min)	Rate (g a.i./L water)	% Infected
Nontreated	None	0	52.14 a[x]
Nontreated	Water (23°C)	0	51.04 a
Nontreated	Water (55°C)	0	1.06 b
Nontreated	Azoxystrobin (55°C)	0.12	0 c
Nontreated	Fludioxonil (55°C)	0.12	0 c
Water	None	0	50.26 a
Water	Water (55°C)	0	0 c
Water	Azoxystrobin (55°C)	0.12	0 c
Water	Fludioxonil (55°C)	0.12	0 c
Potato dextrose broth	None	0	51.65 a
Potato dextrose broth	Water (55°C)	0	14.9 d
Potato dextrose broth	Azoxystrobin (55°C)	0.12	0 c
Potato dextrose broth	Fludioxonil (55°C)	0.12	0 c

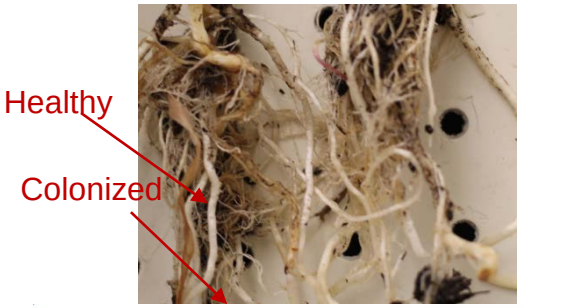
- FOL race 3 was eradicated from seed collected in 2015 when seeds were immersed in azoxystrobin or fludioxonil at 55°C for 10 minutes.
- FOL race 3 was also eradicated when seeds were pretreated in water at 23°C for 1 hour followed by immersion for 10 min in the water at 55°C

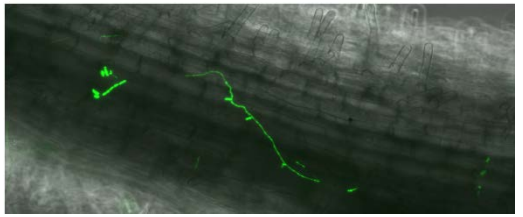
Host Range of *F. oxysporum* f. sp. *lycopersici* (FOL) race 3 California and Florida Genotypes

Host	FOL Race 3 Genotype California	FOL Race 3 Genotype Florida
Tomato (susceptible)	+/+/+	+/+/+
Tomato (resistant)	0/+/+	0/+/+
Onion	0/0/+	0/0/+
Pumpkin	0/+/+	0/+/+
Lettuce	0/0/+	0/0/+
Sunflower	0/0/+	0/0/+
Watermelon	0/+/+	0/+/+
Bean	0/+/+	0/+/+
Pepper	0/0/+	0/0/+
Sweet corn	0/0/+	0/0/+
Broccoli	0/0/+	0/0/+
Common purslane	0/+/+	0/+/+
Lamb's quarters	0/+/+	0/+/+
Redstem filaree	0/+/+	0/+/+
Velvet leaf	0/+/+	0/+/+
Field bindweed	0/+/+	0/+/+
Nightshade	0/+/+	0/+/+
Rye grass	0/0/+	0/0/+

Weeds

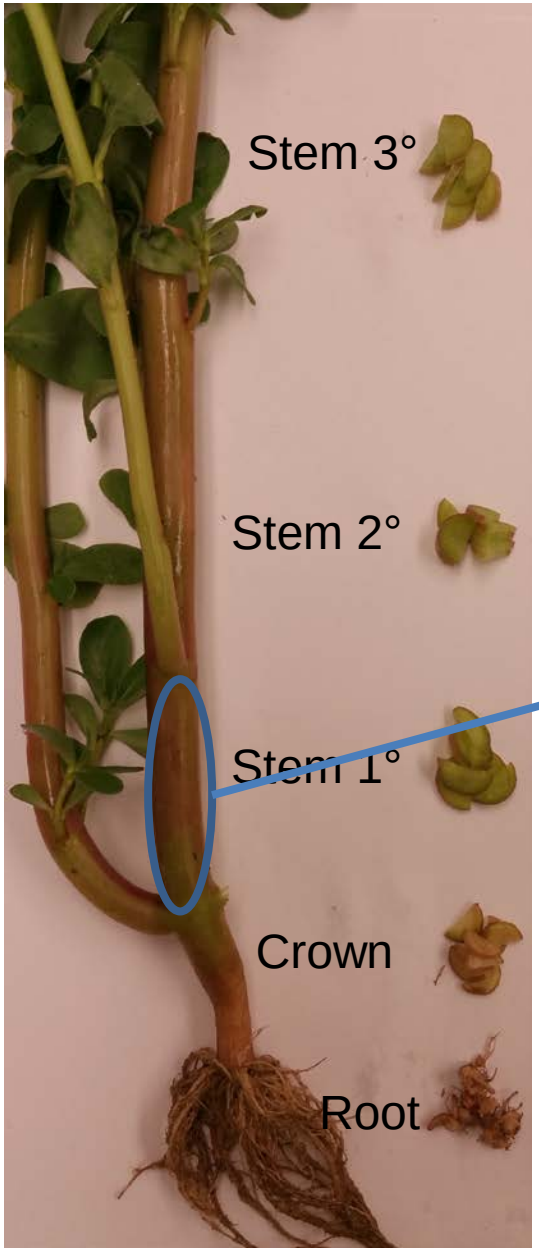


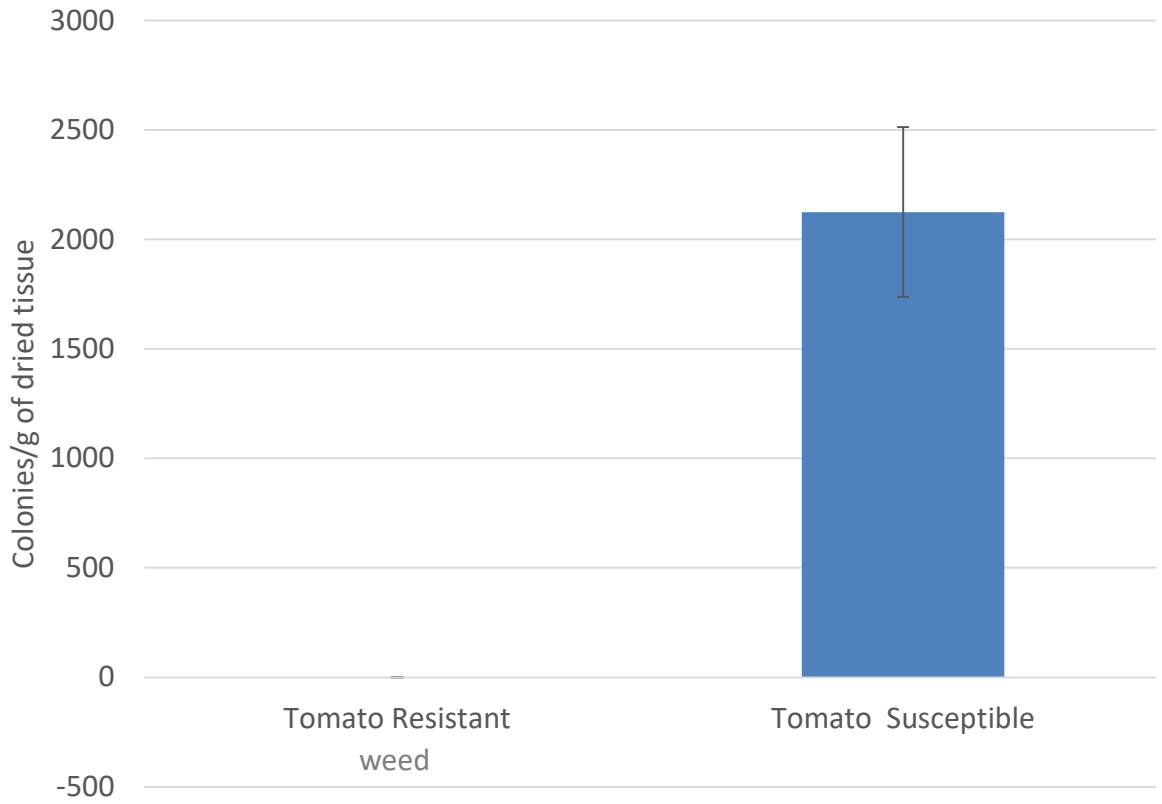




- FOL race 3 California and Florida genotypes are genetically different, but the two share identical host range tested.
- Both are able to sustain itself on the roots of many plant species but its capability of invading xylem tissue is limited to tomato.

Propagules of FOL in Stem Tissue





Thank you

- Question?