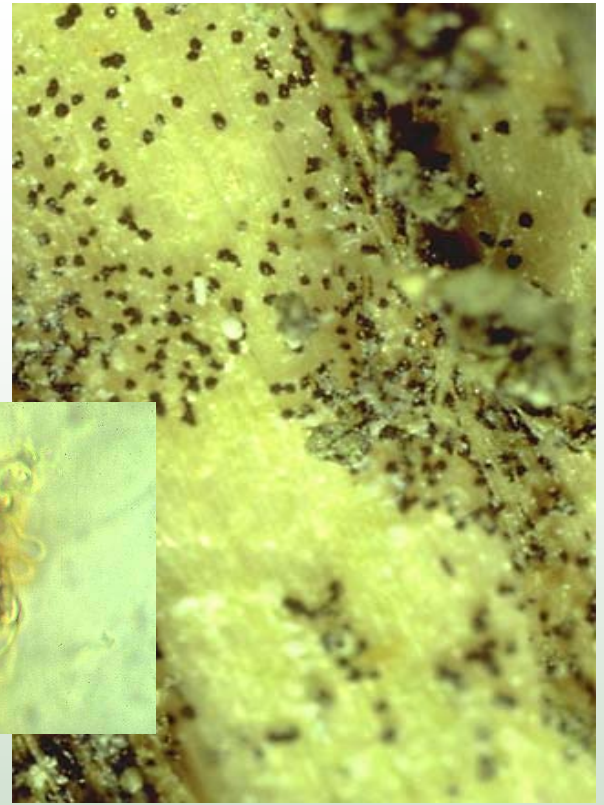
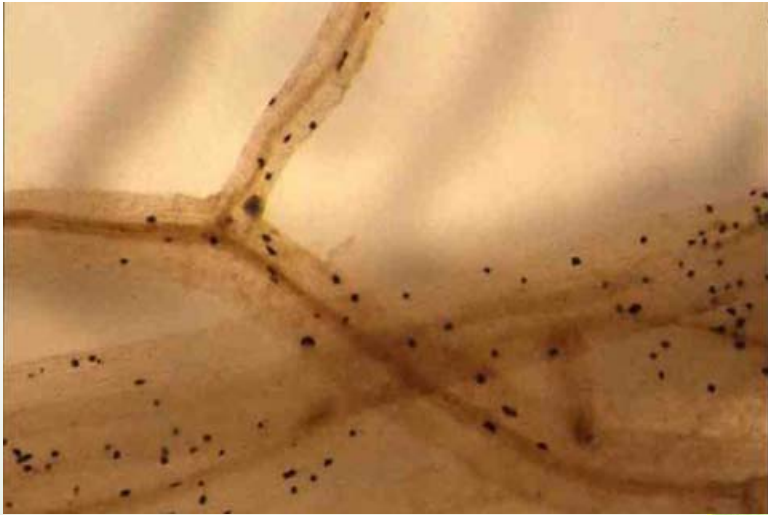




Verticillium dahliae races 1 and 2

- 'V' shaped chlorosis followed by necrosis
- light vascular discoloration
- wilting and premature senescence



microscleroia
up to 2400/g soil

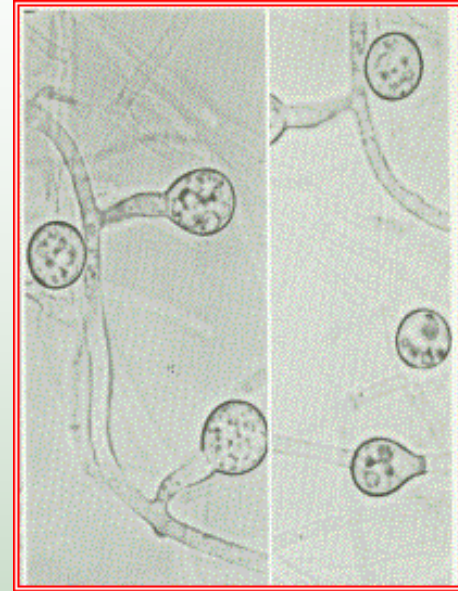
conidia



Fusarium oxysporum races 1, 2, and 3

- yellowing of branches and leaves
- dark vascular discoloration
- general wilting often leading to necrosis/death





Microconidia, macroconidia, and chlamydospores

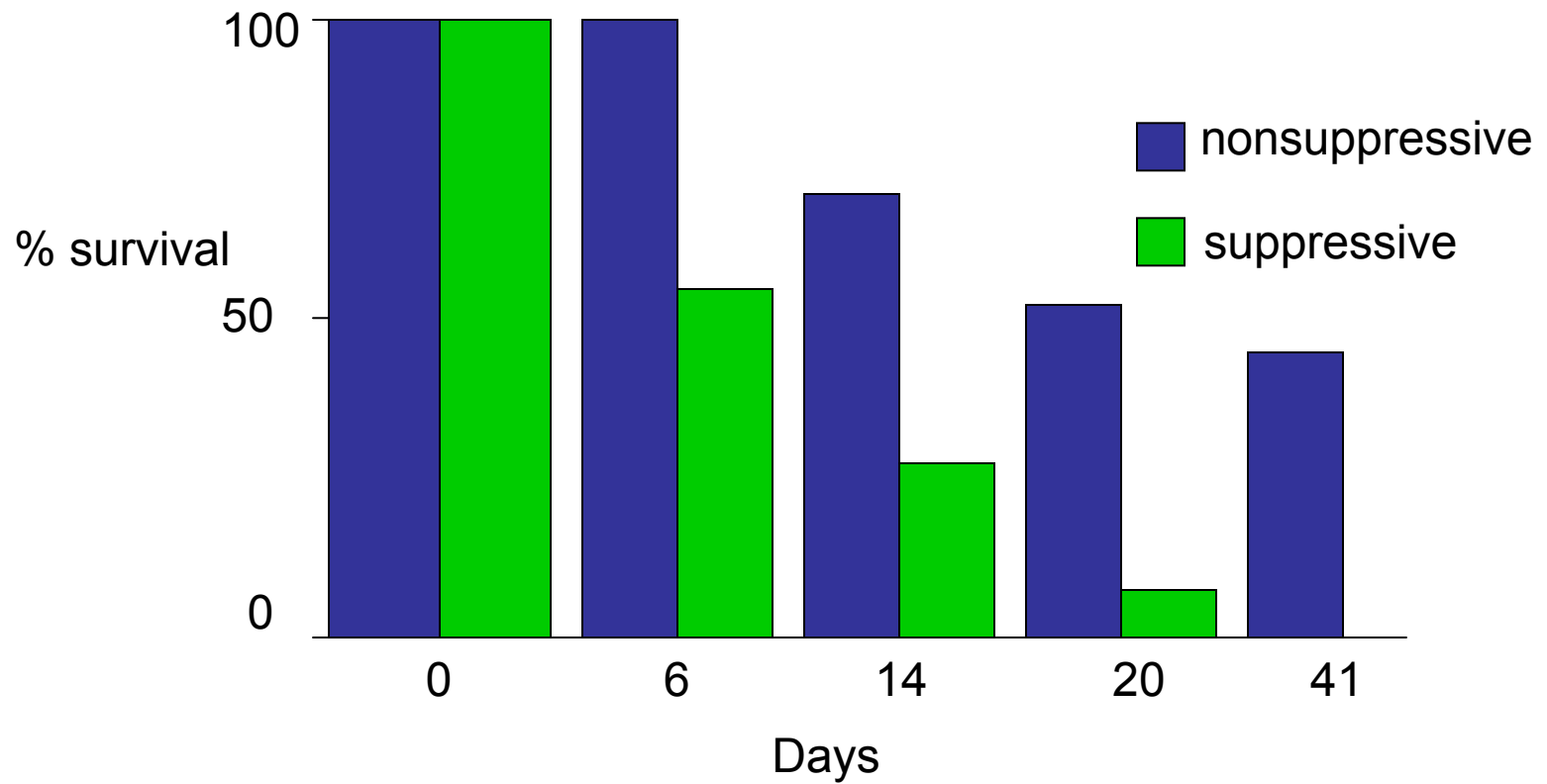
Dissemination

- seed (rare)
- soil
- implements
- water
- crop residue

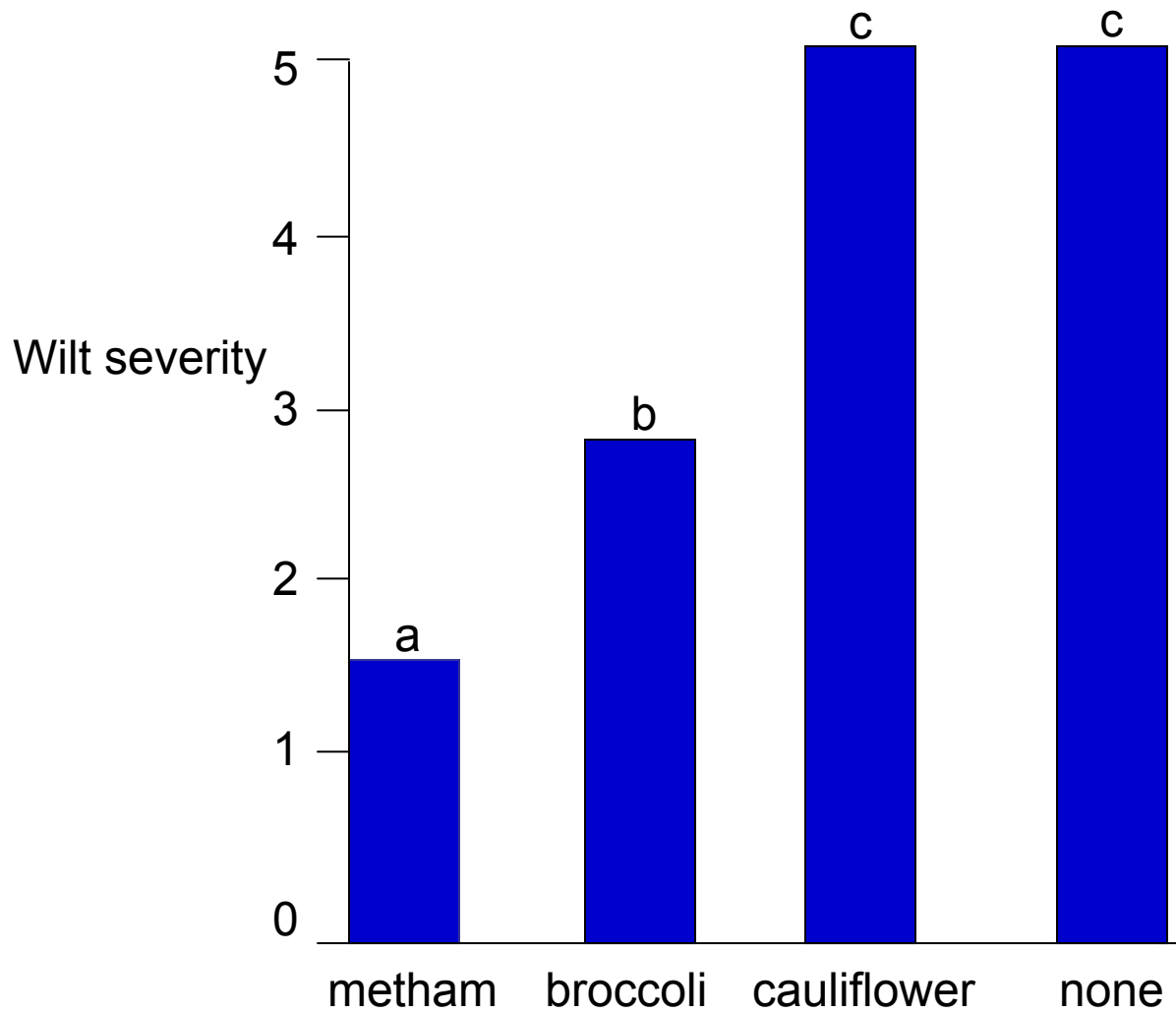
Management

- Resistance
- Sanitation
- 5-7 year crop rotation

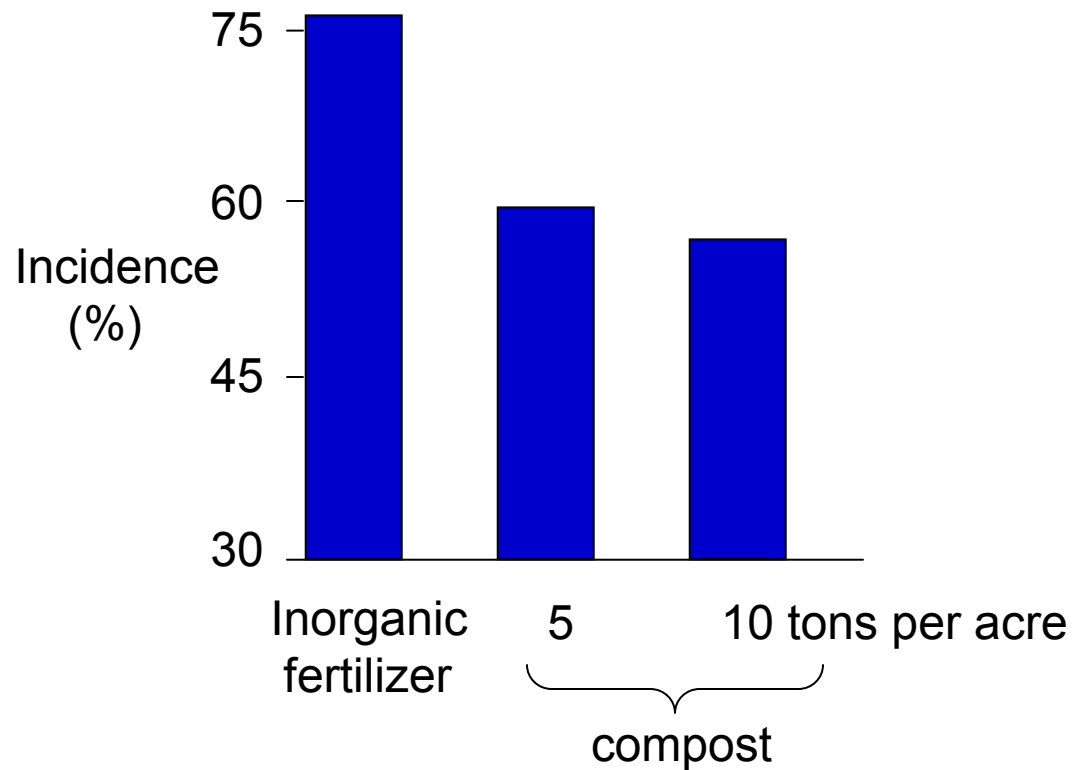
Verticillium Survival



Verticillium and Crop Residues



Verticillium in Strawberry

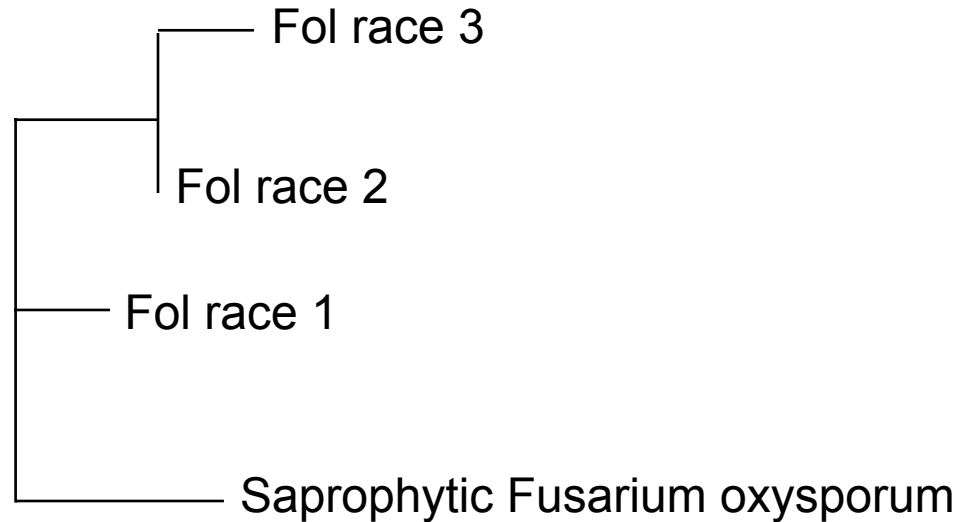


Soil property	Manure	Compost	Cover Crops	Tillage	Verticillium
pH	>	>	<	no effect	no effect
Available nutrients	>	<	mixed effects	mixed effects	>
Total C	>	>	neutral	<	<
Water holding cap.	>	>	>	mixed effects	>
Aggregate stability	>	>	>	<	no effect?
Microbial activity	>	>	>	<	<

From one Sutter Basin field,

36 *Fusarium oxysporum* f. sp. *lycopersici* isolates

- 13 race 3
- 22 race 2
- 1 race 1





Mustard produces ~ 4 gpa of Vapam
< 10% of metham application rate

Hartz et al. 2005. Hortscience 40:2016-19



	Fusarium-infected plants (%)
No cover crop	52
Caliente mustard	70

Miyao et al, 2007. CTRI

Fusarium wilt evaluation, Beeman Farms, Elkhorn, 2007

Variety		yield (t/A)	<u>wilt potential</u>		wilt incidence (%)
			high	low	
CXD 242	VFFF3NP	50 a	55 b	46	0
HMX 4798	VFFF3NP	48 ab	46 ab	51	0
AB 2	VFFP	48 ab	43 ab	54	55
Heinz 9663	VFFNP	41 b	36 a	46	54



Fusarium wilt

avored by:

ammoniacal nitrogen

acid soils

80-90 F

sandy soils

suppressed by:

nitrate nitrogen

alkaline soils

60-70 F

microbially rich soils

Verticillium wilt

avored by:

nitrate nitrogen

alkaline soils

65-80 F

suppressed by:

ammoniacal nitrogen

acid soils

80-90 F

microbially rich soils