

# Fusarium wilt: biology and management

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**UCDAVIS**



# *Fusarium oxysporum*

Common soilborne fungus

Most strains are not pathogenic

Many host-specific pathogens

Tomato

Melon

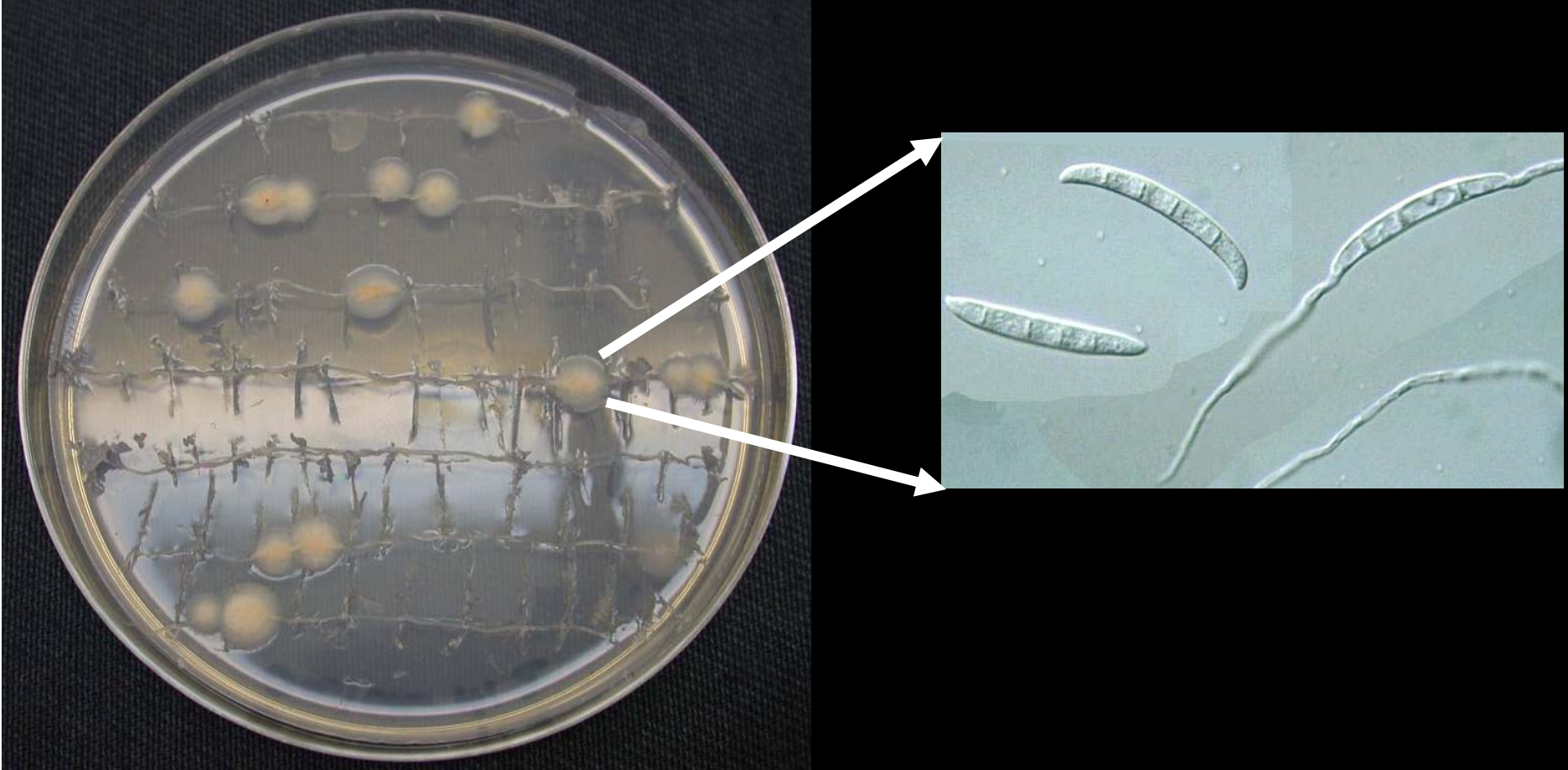
Cotton

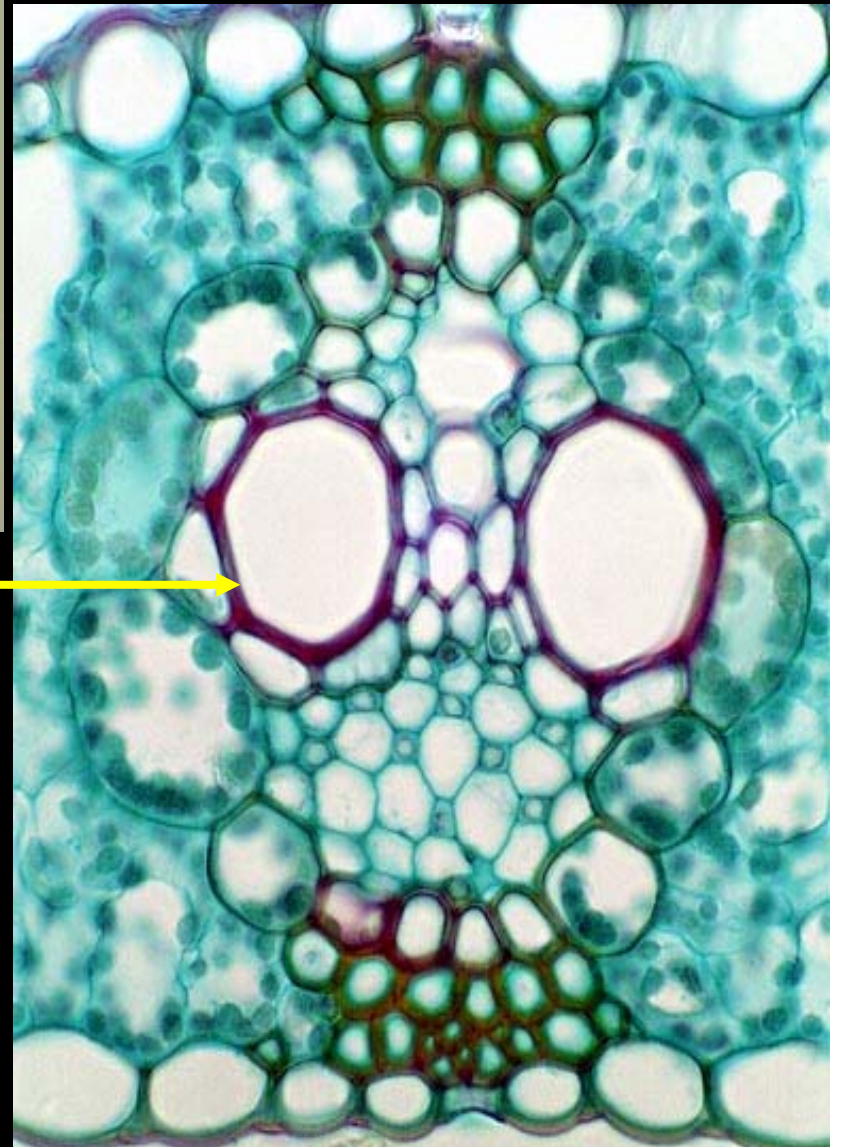
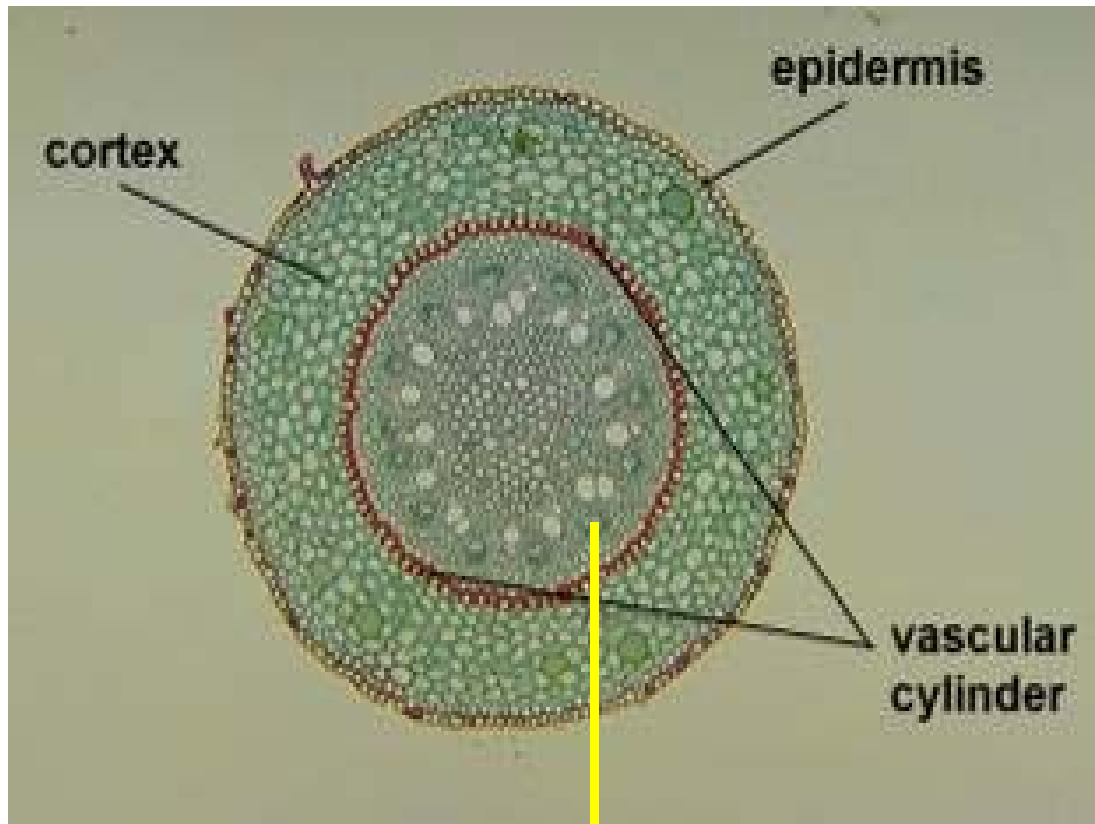
Lettuce

**Do not affect  
strawberry**

# *Fusarium oxysporum*

infects plant roots





**Non-pathogens are  
restricted to the cortex**

**Pathogens colonize  
the xylem**

**Blocked xylem vessels restrict flow of water to the crown**



**Causes wilting and plant collapse**

**Growth of the pathogen emerging from the xylem**



**Crown cross section**

# Discovered in Australia in 1962

Soon after that:



Discovered in  
California  
in 2008

Source is unknown

## Introduction to California may have been on plants

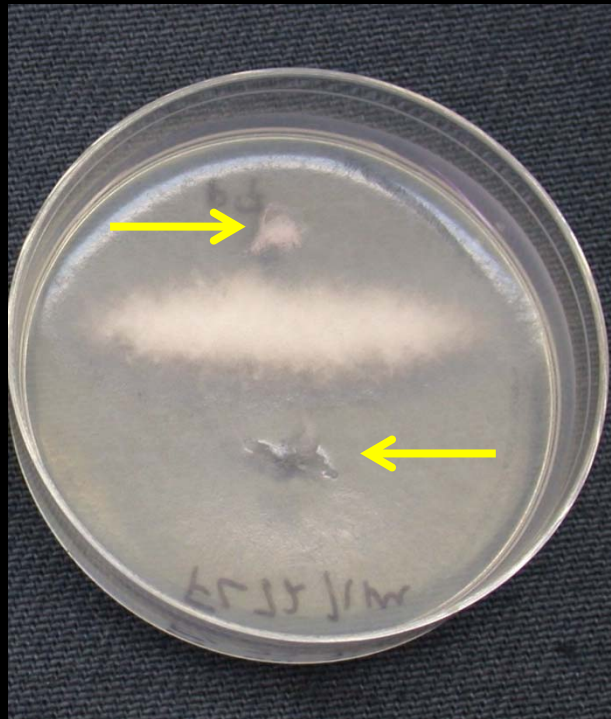


Infected plants can be symptomless

**Not a single, recent  
introduction to California**

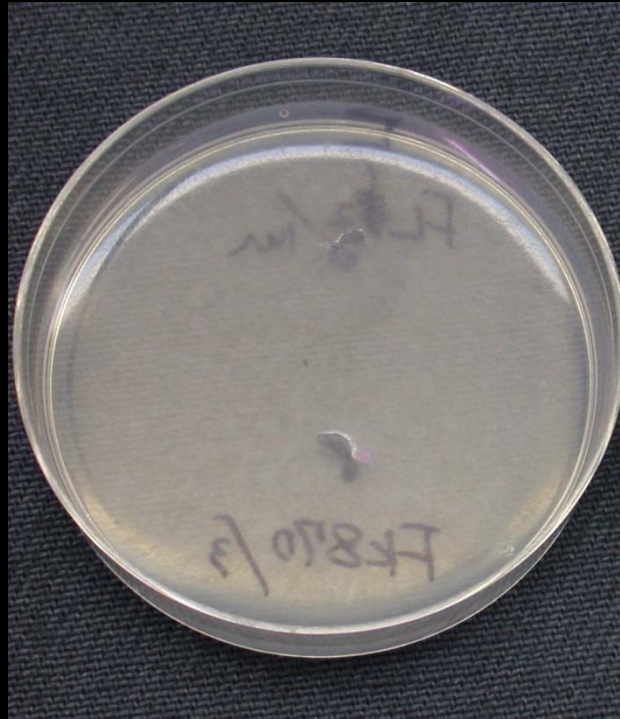


# Tests for somatic compatibility



**Compatible**

# Tests for somatic compatibility



**Incompatible**

**60 isolates were tested**

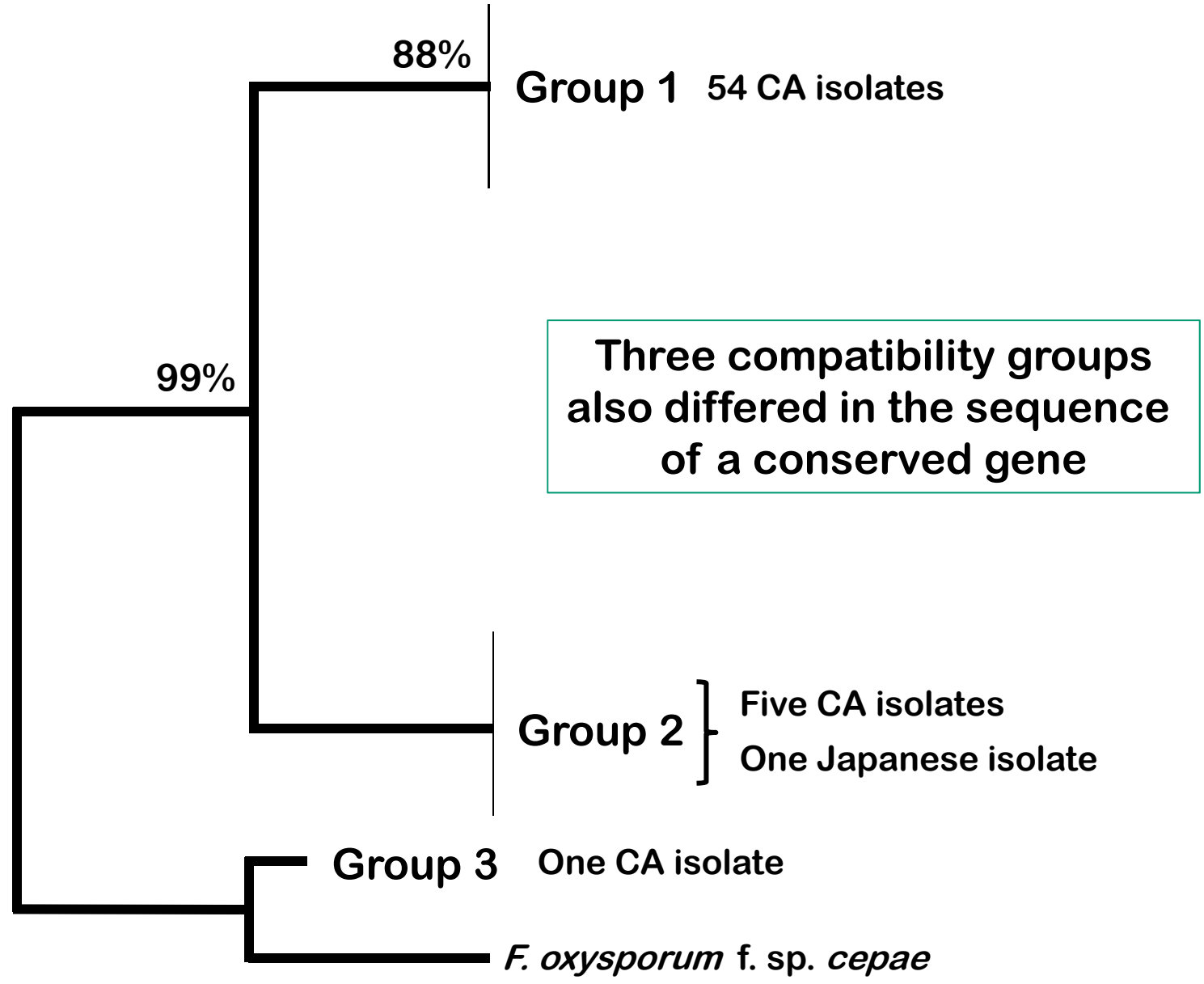
**Three compatibility groups**



**Incompatible**

**Compatible**

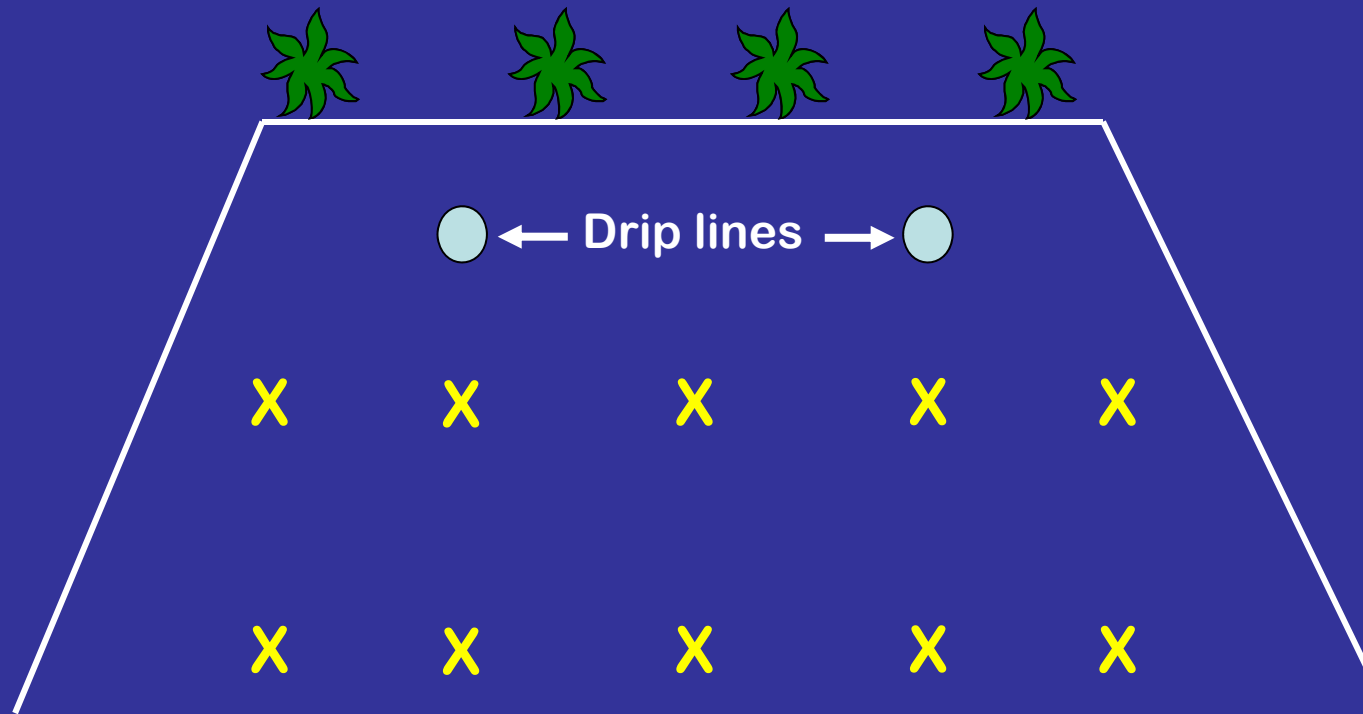
# Divergence in sequence of the translation elongation factor





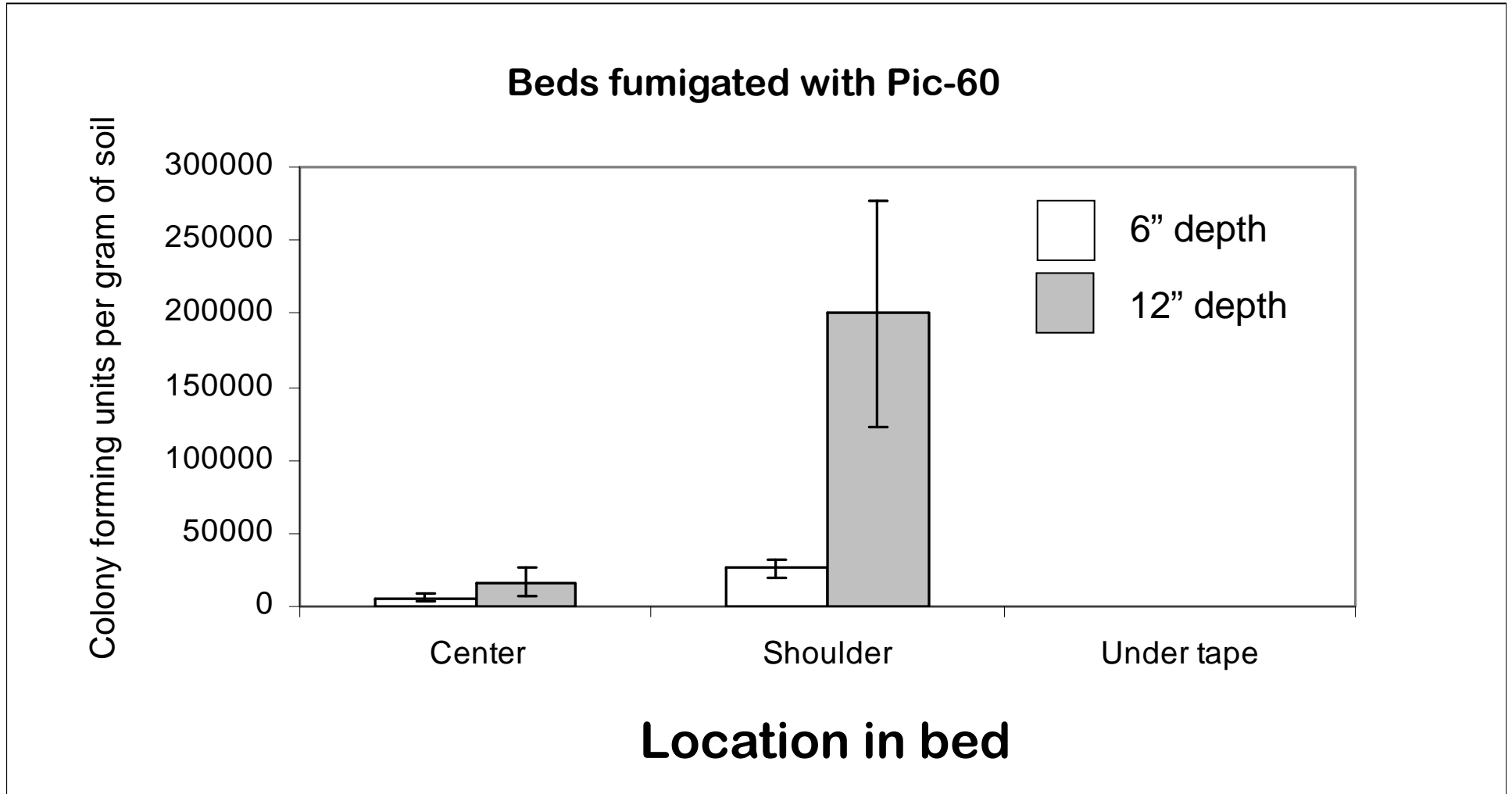
**Fusarium wilt  
became a  
problem in fields  
where fumigants  
were applied to beds**

# Bed fumigation



X = buried inoculum of *Fusarium oxysporum*

# Effect of location on fumigant efficacy



# Effect of inoculum depth on onset of disease

Top 4 inches

4 – 6 inches

6 – 8 inches

12 – 14 inches



Depths at which  
inoculum was placed



## Nine weeks after planting

Top 4"

4 - 6"

6 - 8"

12 - 14"



**Mild symptoms on plants exposed to inoculum below 12”**



**14 weeks after planting**

**Inoculum below 12"**



**The pathogen was present in the crown  
of all plants by 14 weeks after planting**

# Cumulative effect of inadequate fumigation



# Management of Fusarium wilt

Avoid introductions

Clean equipment before  
moving between locations

Use only pathogen-free plants

# **Management of Fusarium wilt**

**Reduce inoculum levels**

**Pre-plant fumigation**

**Flat fumigation to treat the entire field**

**Bed fumigation: multiple drip lines**

**Don't plant buffer zones**

## **Efficacy of fumigants**

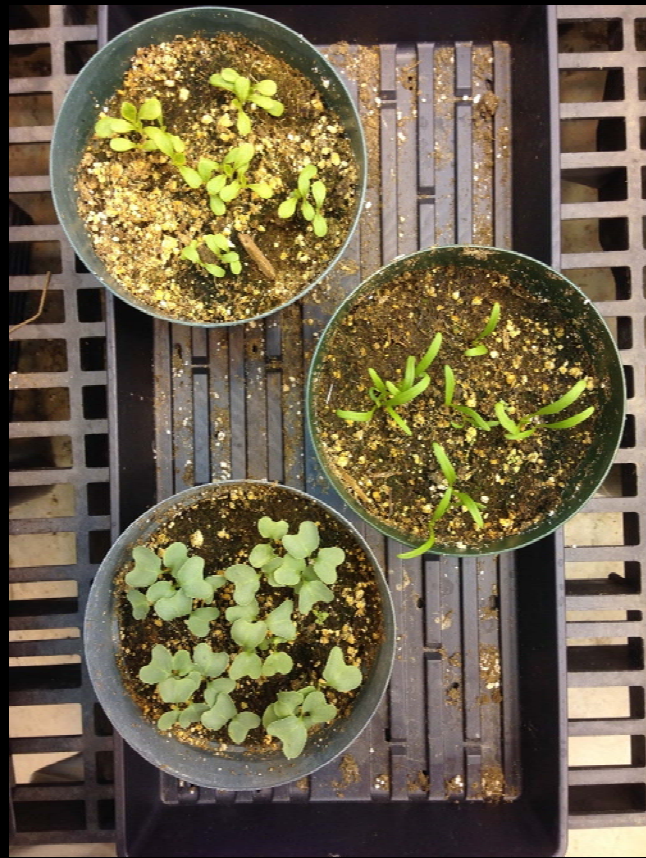
**Chloropicrin @ 400 pounds/acre is needed to be as effective as 2:1 MeBr:Pic @ 350 pounds/acre**

**Telone (1,3-Dichloropropene) is a nematicide**

**Metam sodium can be effective  
but not reliable in heavy soils**

# Management of Fusarium wilt

## Crop rotation



Broccoli  
Lettuce  
Spinach

Being tested to  
determine if they are  
colonized by the  
Fusarium wilt pathogen



# **Management of Fusarium wilt**

**Reduce infection rates**

**Effect of soil pH on Fusarium wilt**

**Elevating pH to 7.0 reduced severity of Fusarium wilt of tomato**

# **Reduced severity and impact of Fusarium wilt on strawberry by manipulation of soil pH, soil organic amendments and crop rotation**

**Xiangling Fang • Ming Pei You • Martin John Barbetti**

**More severe disease under acidic conditions**

Soil was collected from a field where disease was severe

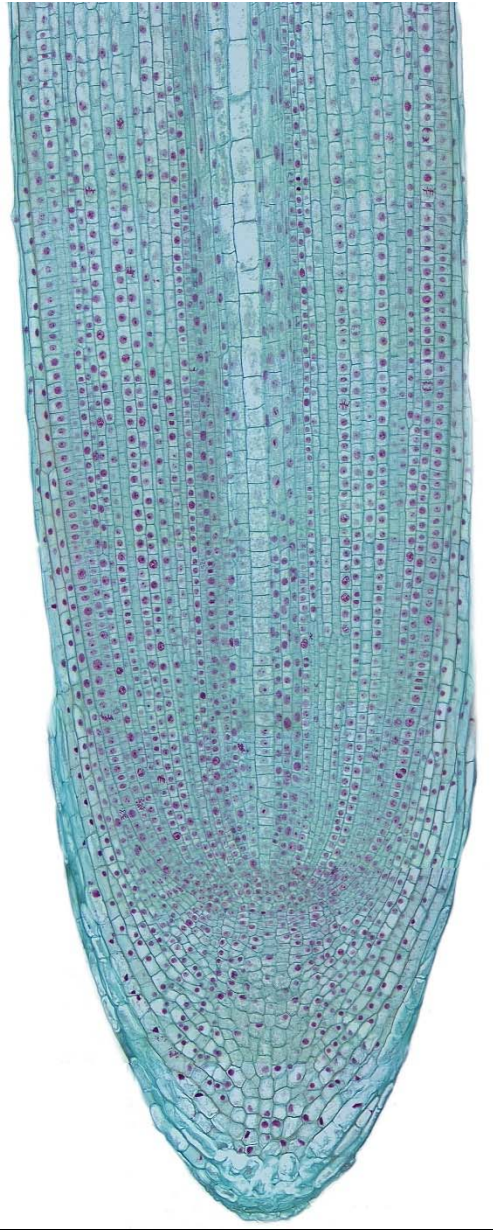




Adjust pH to 5.1 or 7.0

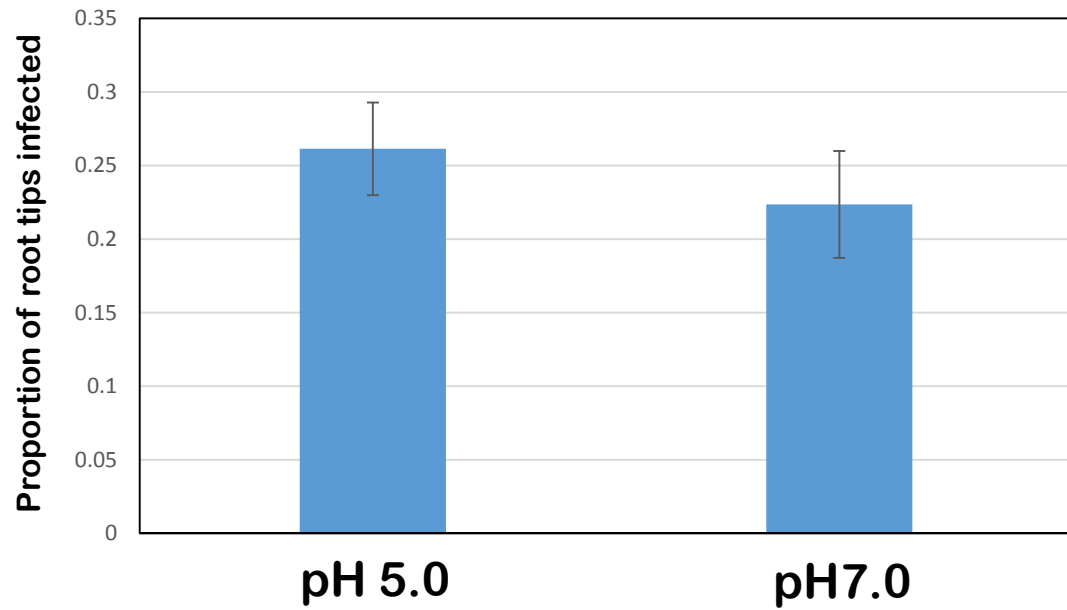
Frequency of root infection was determined





**Root tips**

## Frequency of infection by *Fusarium oxysporum*

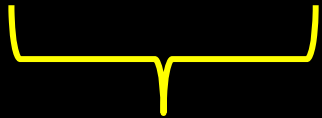


## Australia

Sandy soil  
pH 5.2



pH 6.7



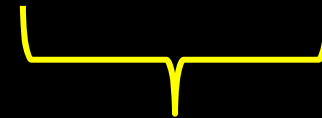
May be beneficial

## California

Clay soil  
pH 7.1



pH 5.1



Does not increase  
risk of disease

# Management of Fusarium wilt

Disease resistance



# Differences in susceptibility to Fusarium wilt

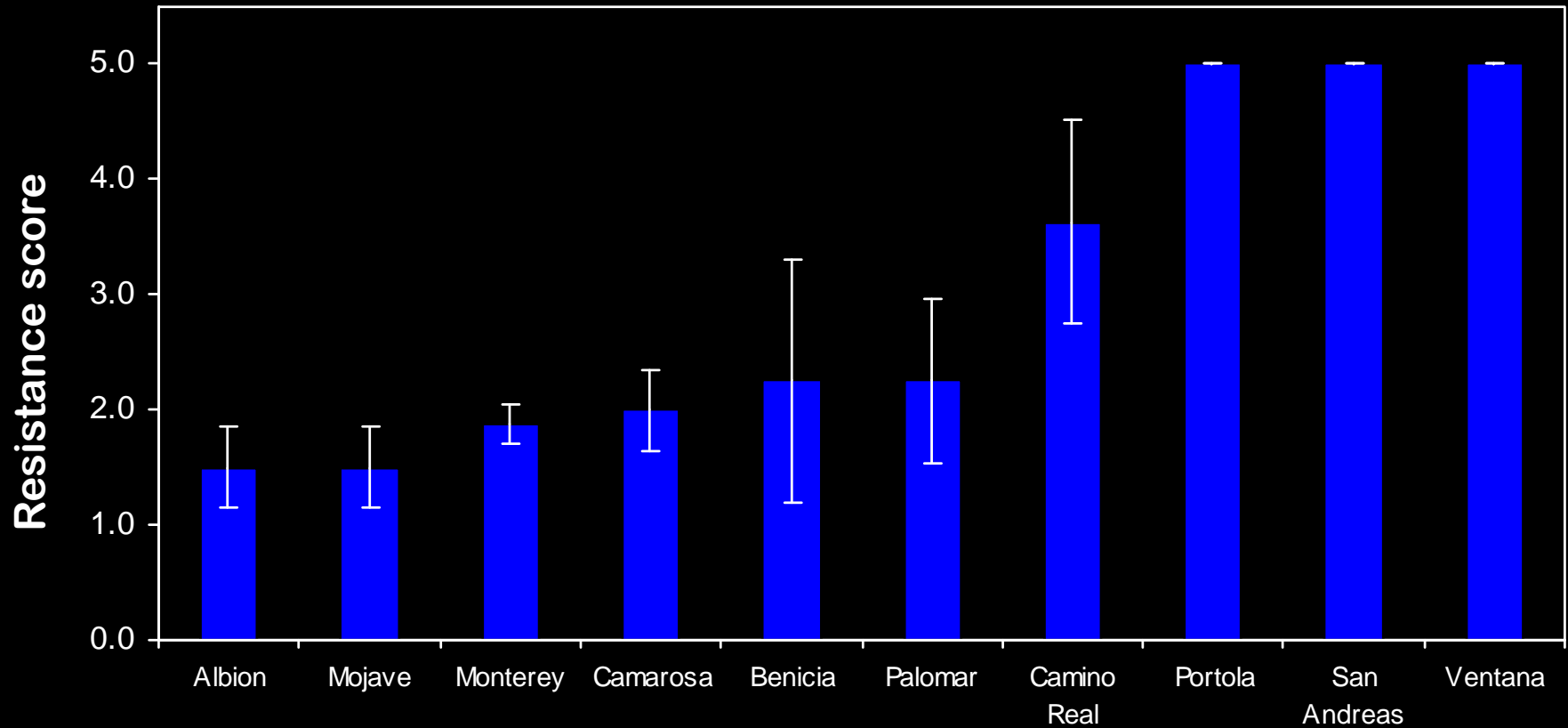


**Camarosa**



**Ventana**

# Current UC cultivars



**1 – 5 Scale; 1 = Susceptible, 5 = Resistant**

**San Andreas**

**Albion**



# Thanks

california  
STRAWBERRY COMMISSION



*Lassen Canyon Nursery Inc.*

**Hansen Trust**

