

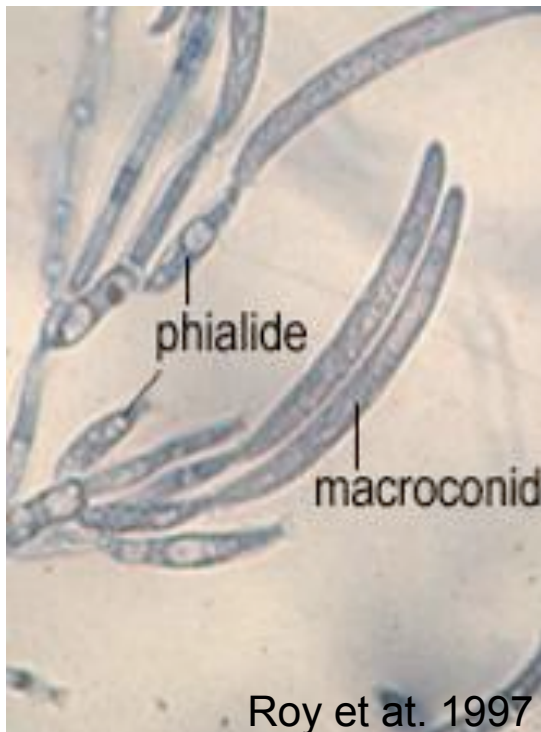
Effect of time of inoculation and temperature on soybean sudden death syndrome

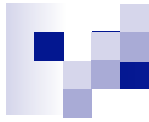
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Iowa State University



Sudden Death Syndrome

- Caused by *Fusarium virguliforme*
- Soilborne fungal pathogen
- Infects the roots, causing root rot





- Interveinal chlorosis and necrosis
- Premature defoliation
- Yield losses





Timing of infection and SDS symptoms

- Foliar symptoms typically develop during reproductive stages
- Roots can be infected as early as seedling emergence (Gao et al., 2006, Huang and Hartman, 1998)
- Early planting increases risk of SDS, suggesting importance of early infections
- The period of susceptibility to root infections is not known



Objectives:

1. Determine the effect of plant age at inoculation on development of SDS symptoms

Plant Age at Time of Inoculation

Inoculation at different plant ages



17°C / 7 days
24°C / 30 days



Rating root and foliar severity

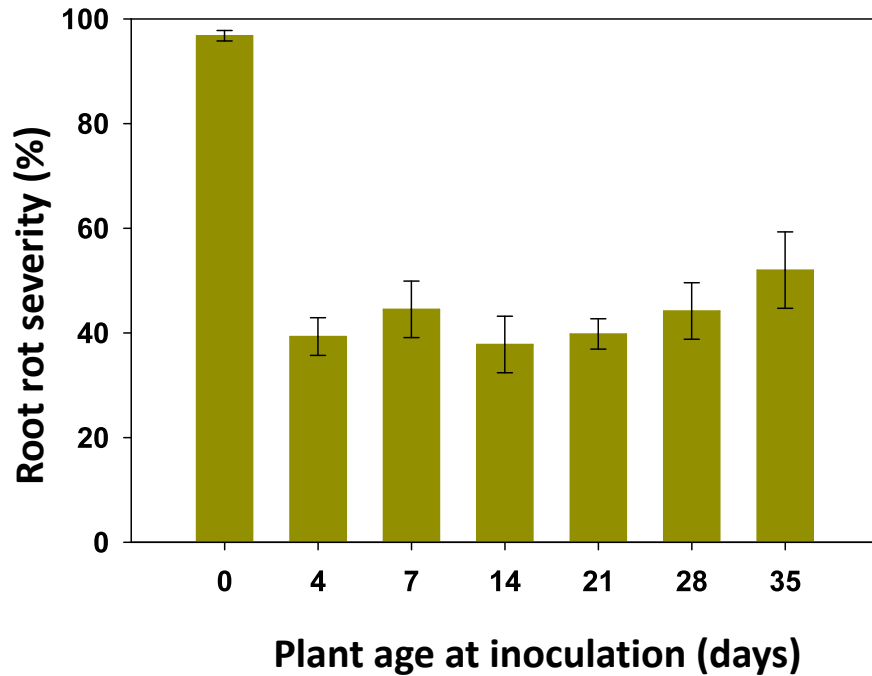


18 and 38 days
after inoculation

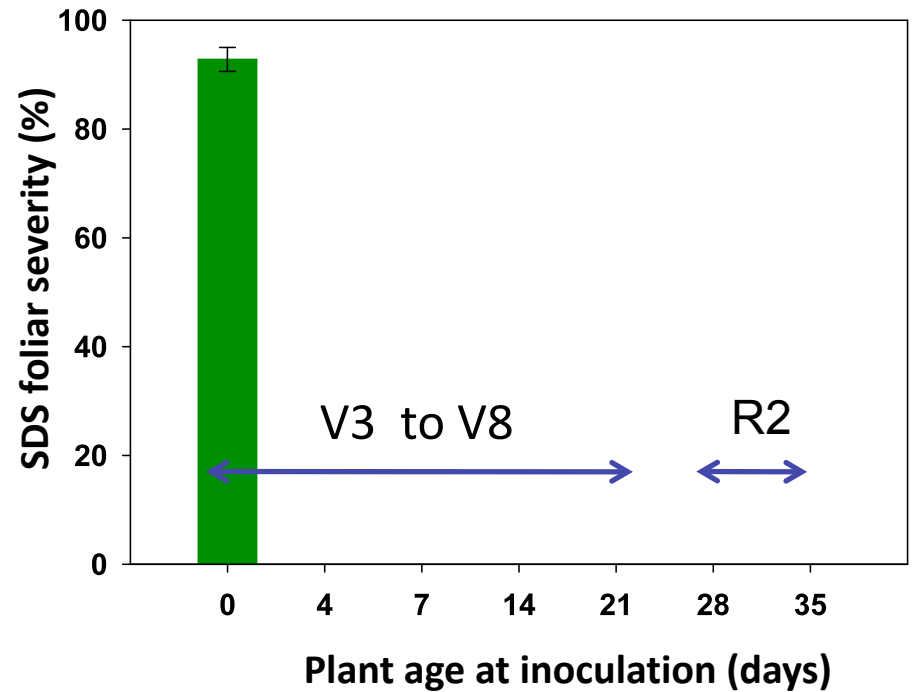
Plant age at inoculation	0	4	7	14	21	28	35
GS at inoculation	Seed	VE	VC	V1	V2	V3	V4

SDS symptoms 38 days after inoculation

Roots



Leaves



Effect of plant age at inoculation in field plants

Symptoms 30 days after inoculation



0 days



4 days



7 days



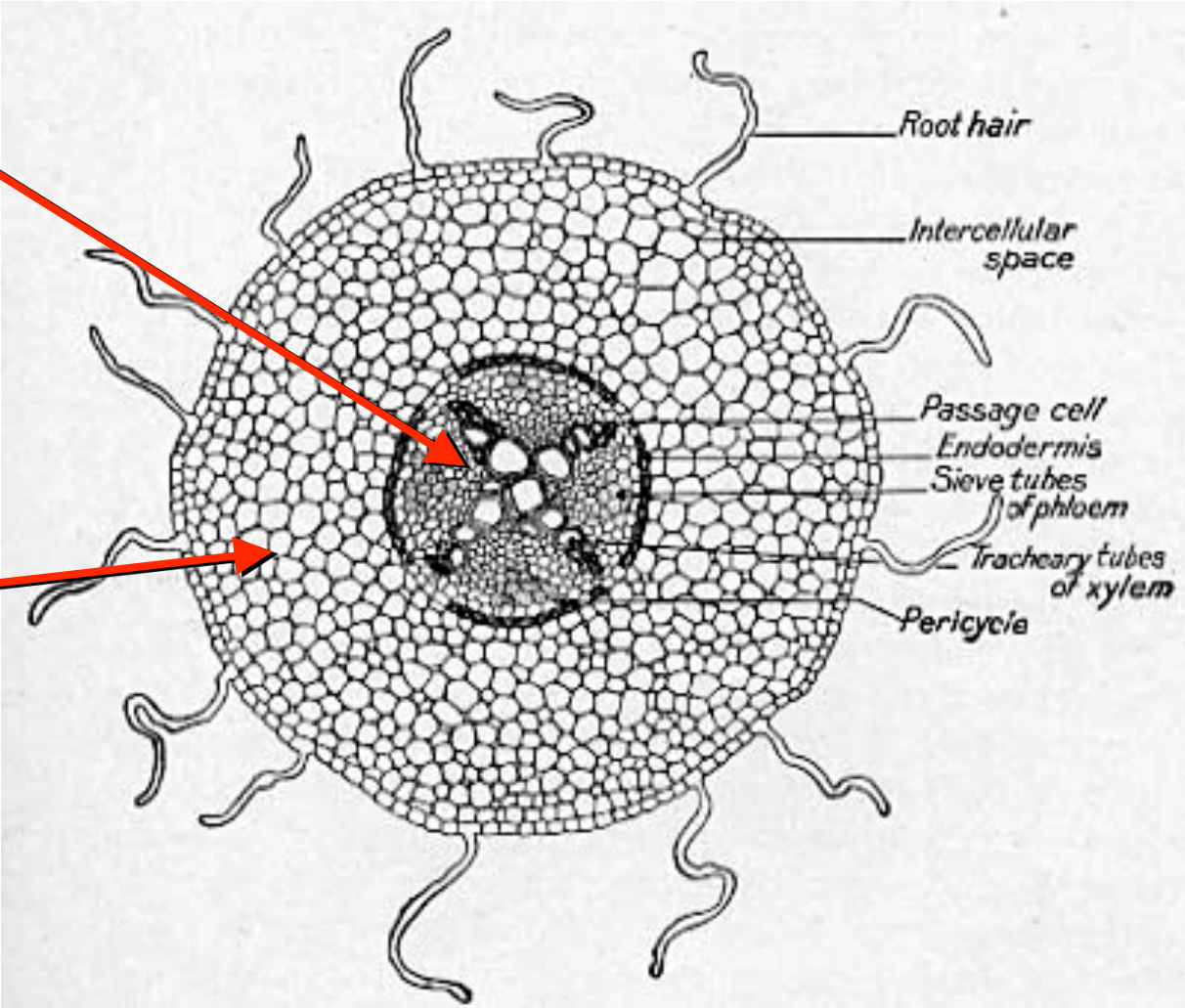
14 days

Plant age at inoculation

Fungal colonization of the xylem needed for SDS foliar symptoms (Navi and Yang, 2008)

Vascular tissue

Cortex

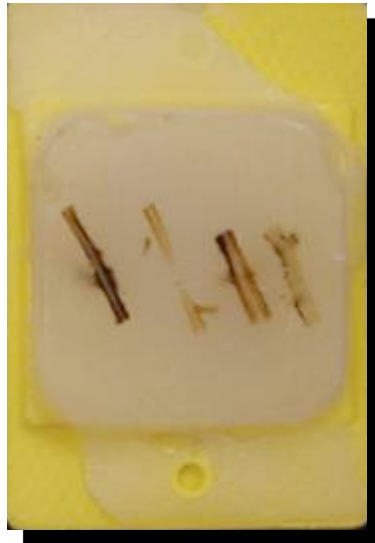


Microscopic observations of roots

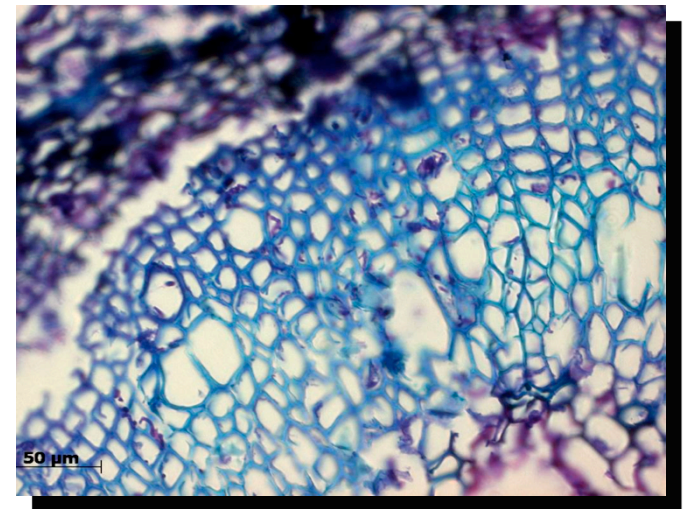
Inoculation at
0,4,7 and 14 DAP



Root pieces
excised

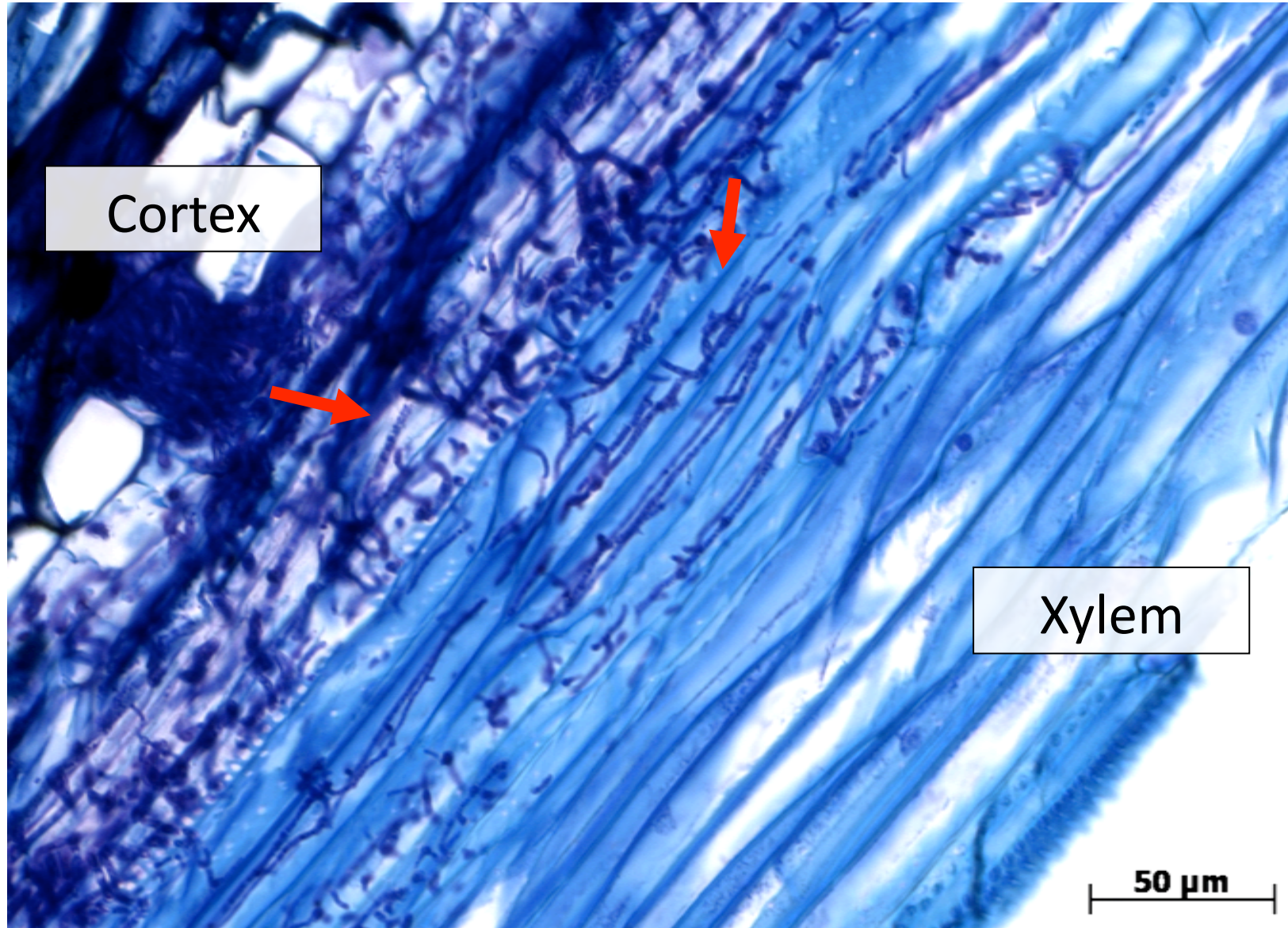


Microtome root
sections

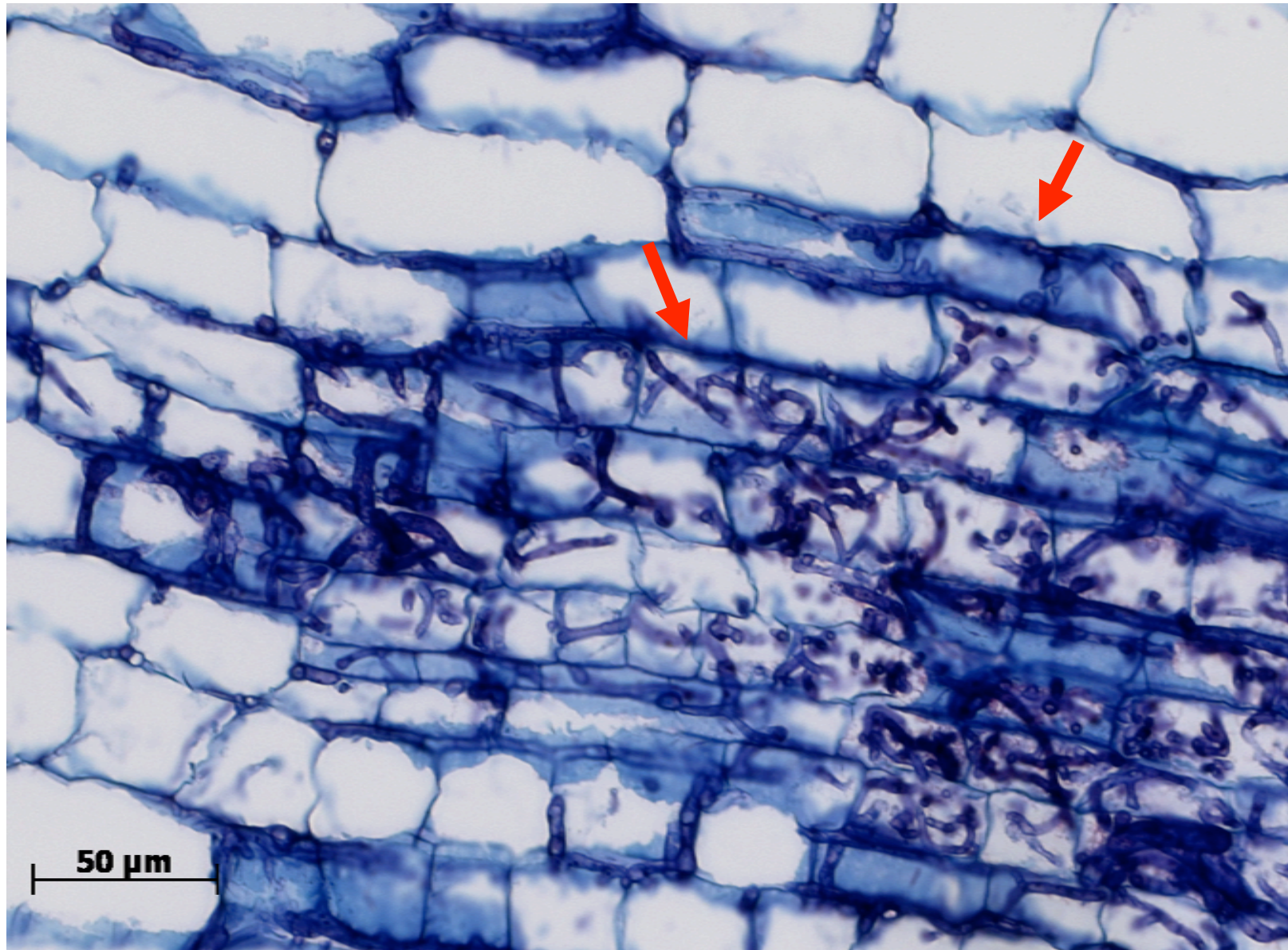


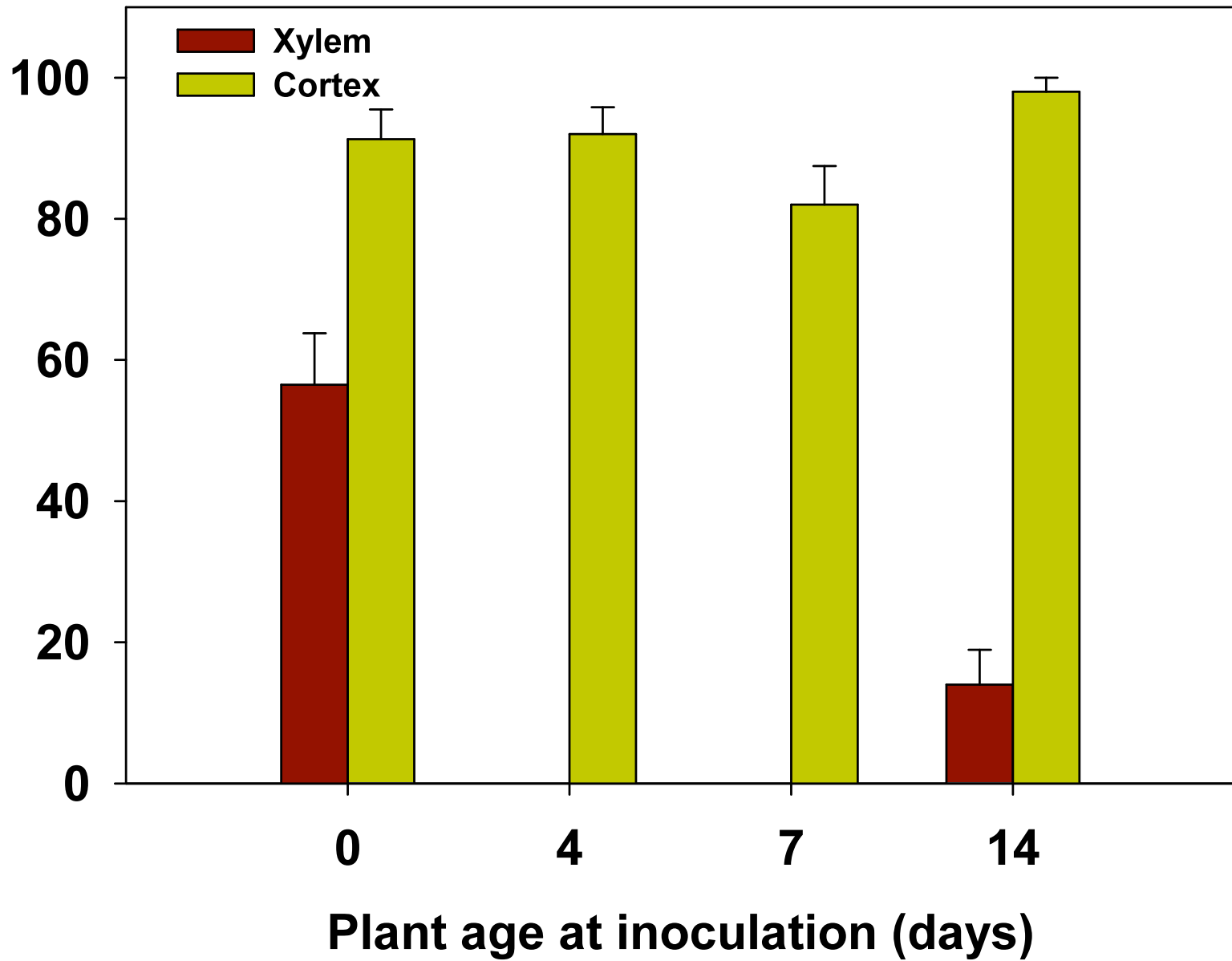
Observation of cortical
and vascular tissues

Hyphae in the cortex and xylem of plants inoculated 0 DAP



Hyphae in the cortex of plants inoculated 3, 7 and 14 DAP





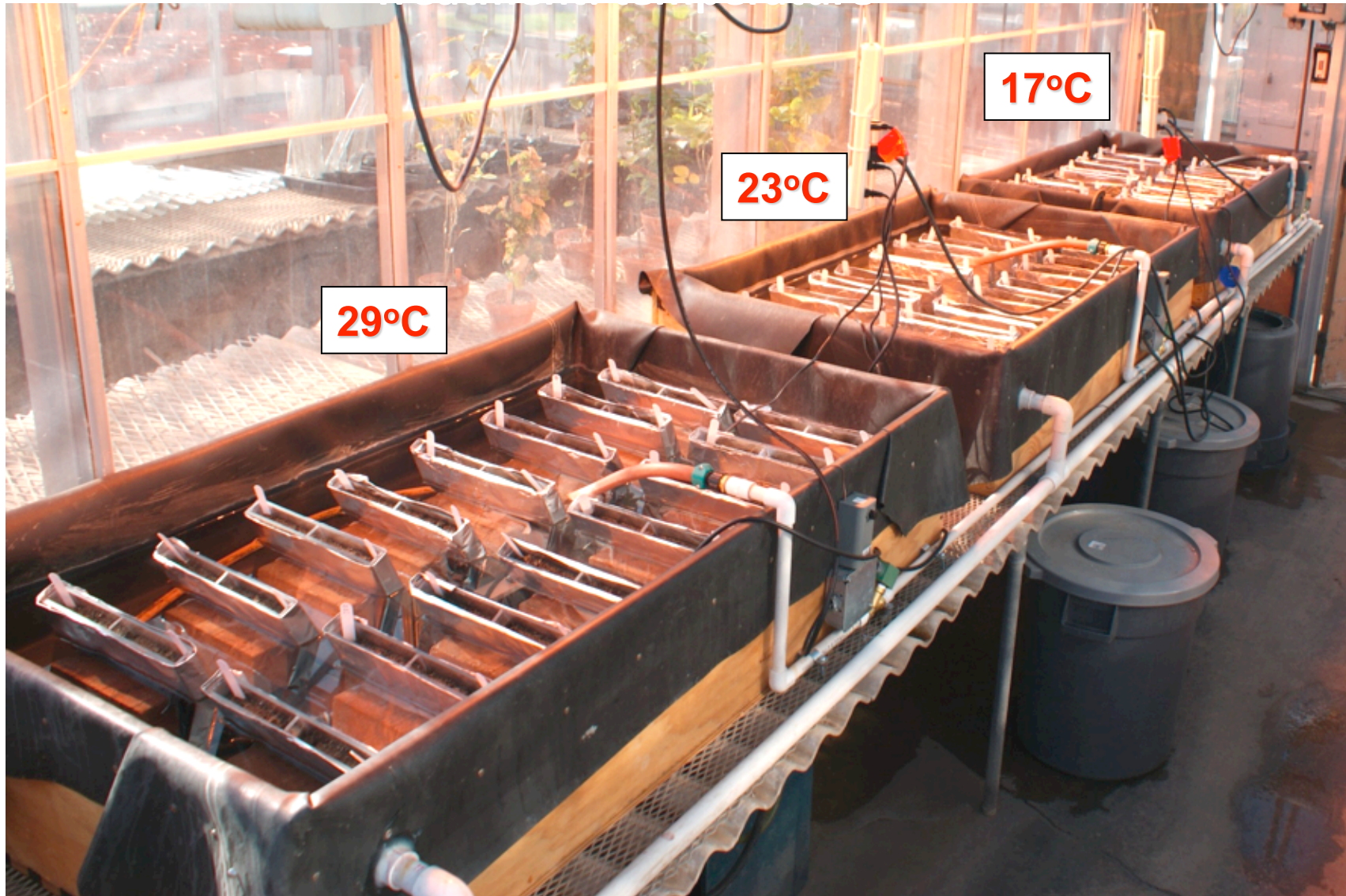
Objectives

1. Determine the effect of plant age at inoculation on development of SDS symptoms
2. To test if soil temperature affects susceptibility to SDS of plants inoculated at different ages

Soybeans grown in mini-rhizotrons



Plants grown in water baths at three temperatures



Plants inoculated at four ages within each temperature

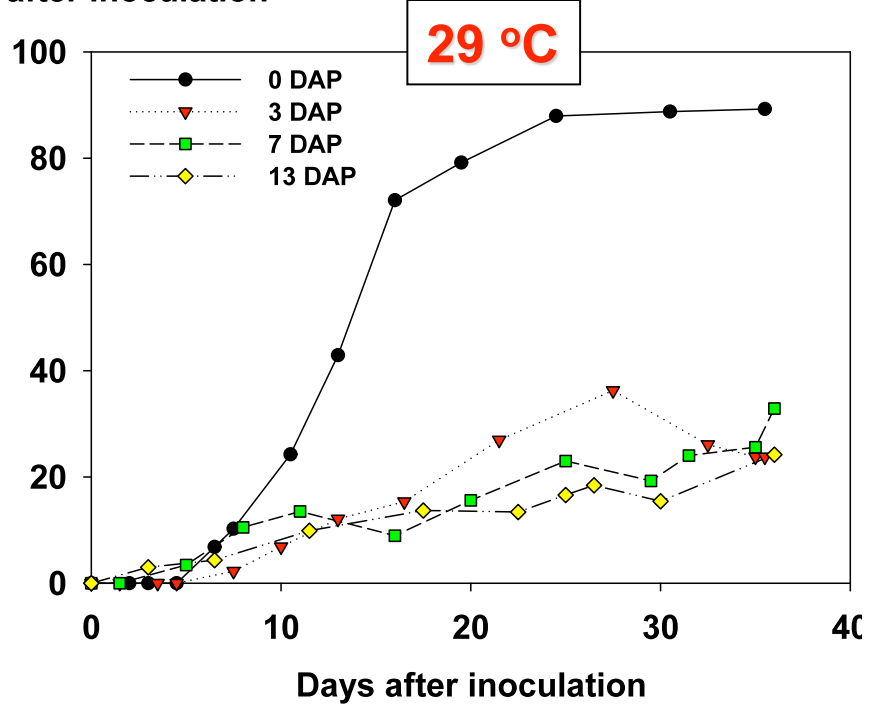
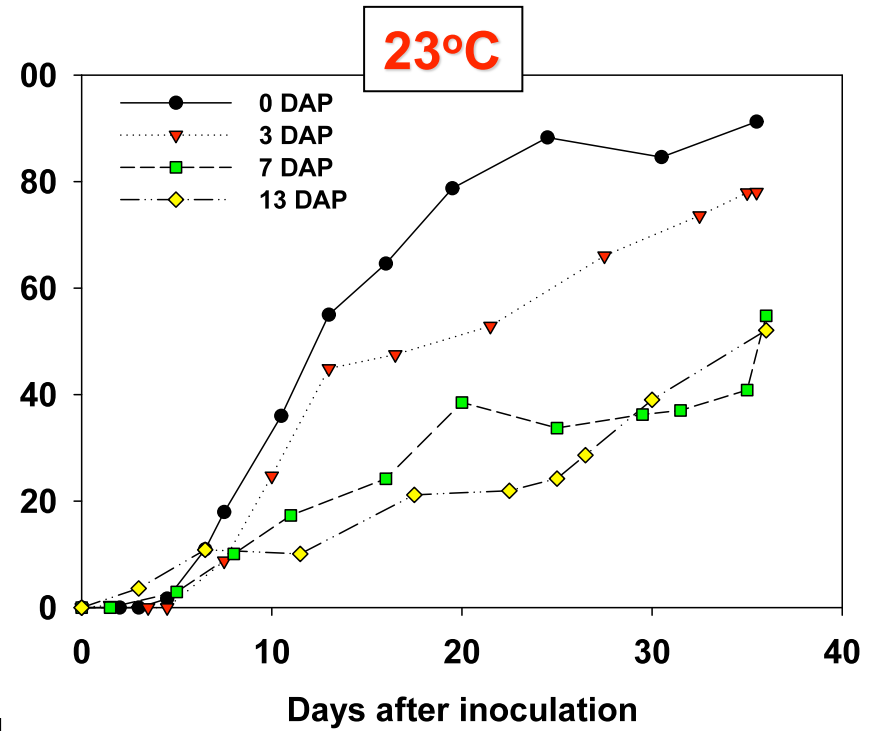
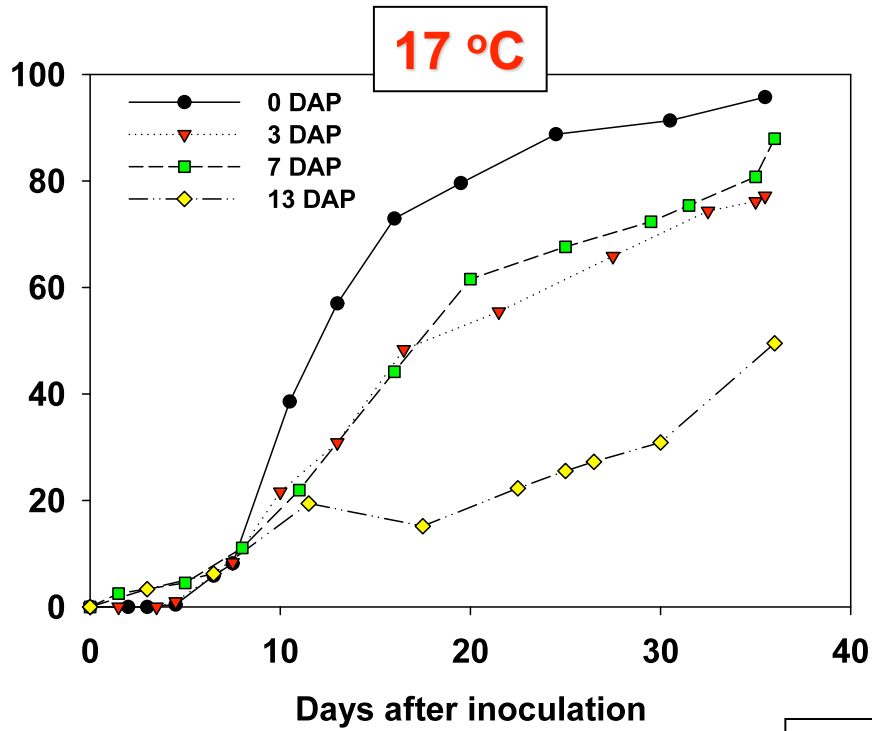
0 DAP

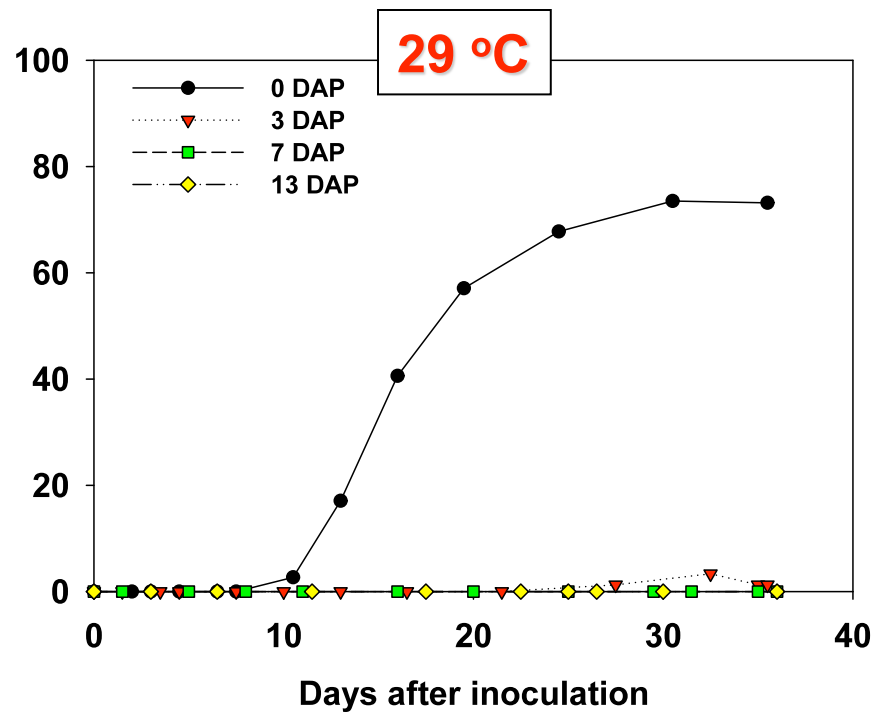
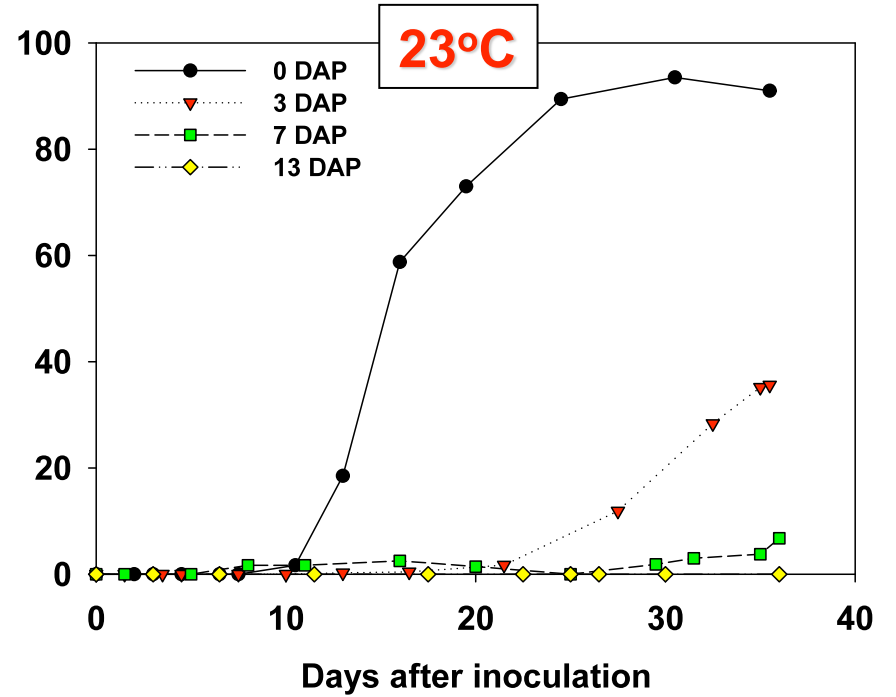
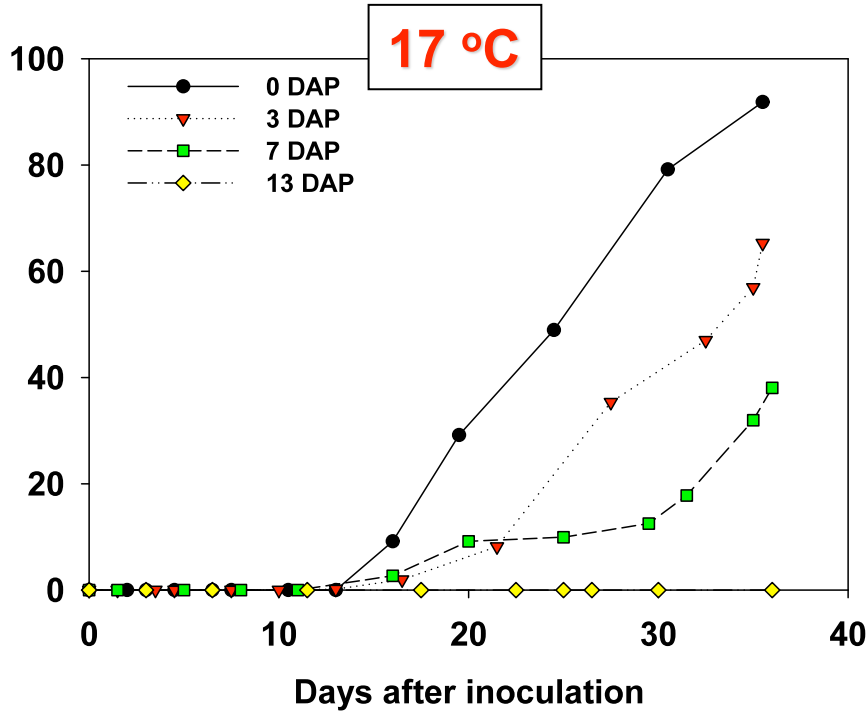
3 DAP

7 DAP

13 DAP







Effect of plant age at inoculation in field plants

Symptoms 30 days after inoculation



0 days



4 days



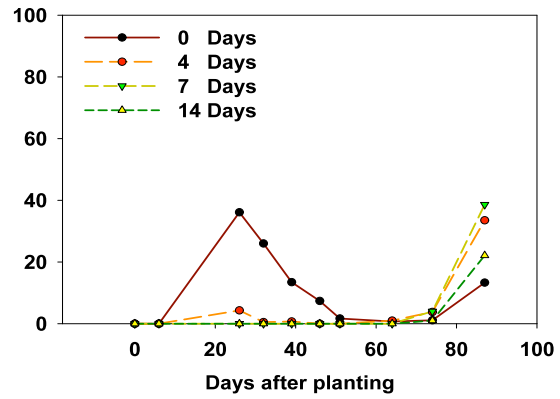
7 days



14 days

Plant age at inoculation

Effect of plant age at inoculation in field conditions

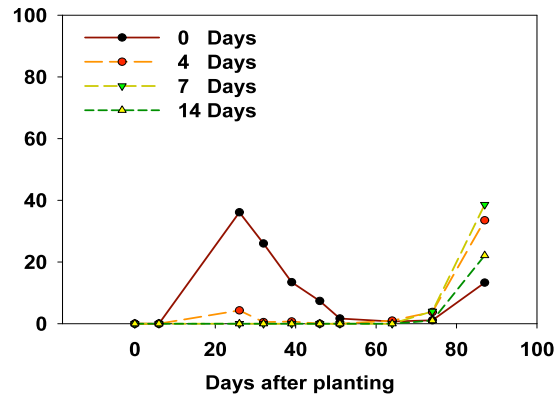


V2

R stages?

V6

Effect of plant age at inoculation in field conditions



V2

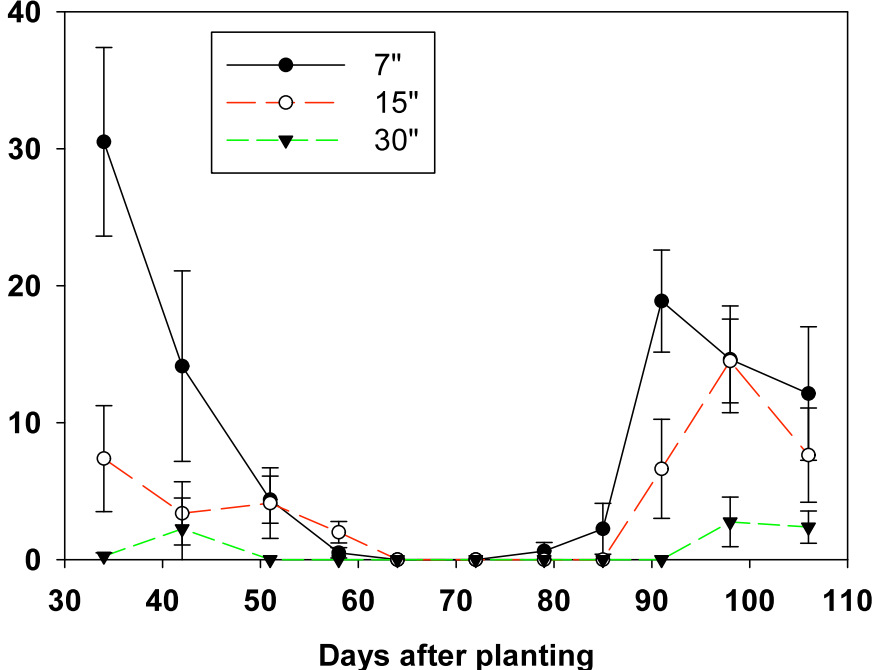
R7

V6

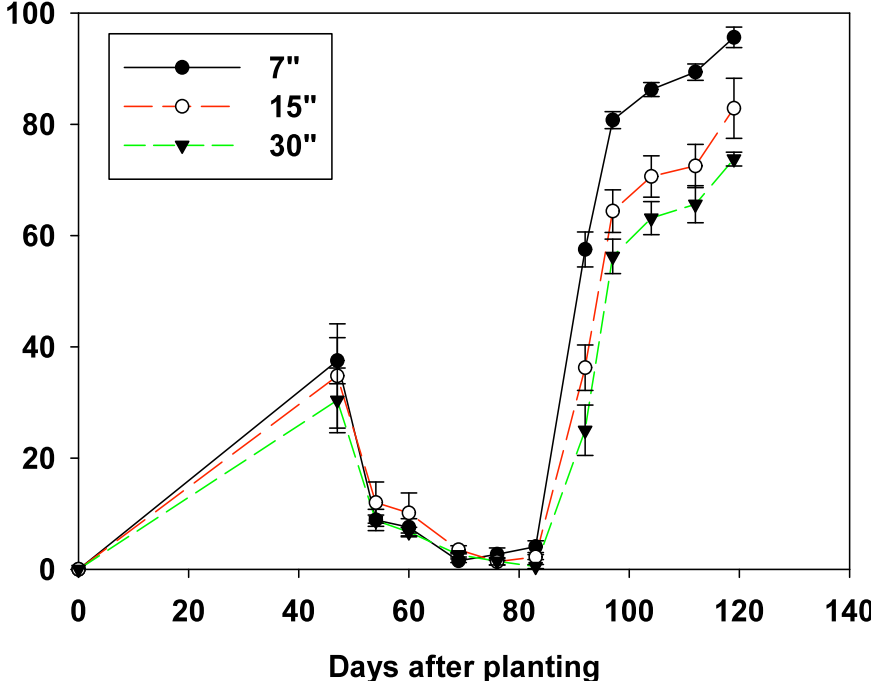
R5

Artificially inoculated microplots, Ames, IA

2007



2008



Current work

- Extend inoculation timing to reproductive stages
- Test effect of SCN on the infection process of *F. virguliforme*
- Assess role of physiological changes during root growth on susceptibility to SDS

Questions?



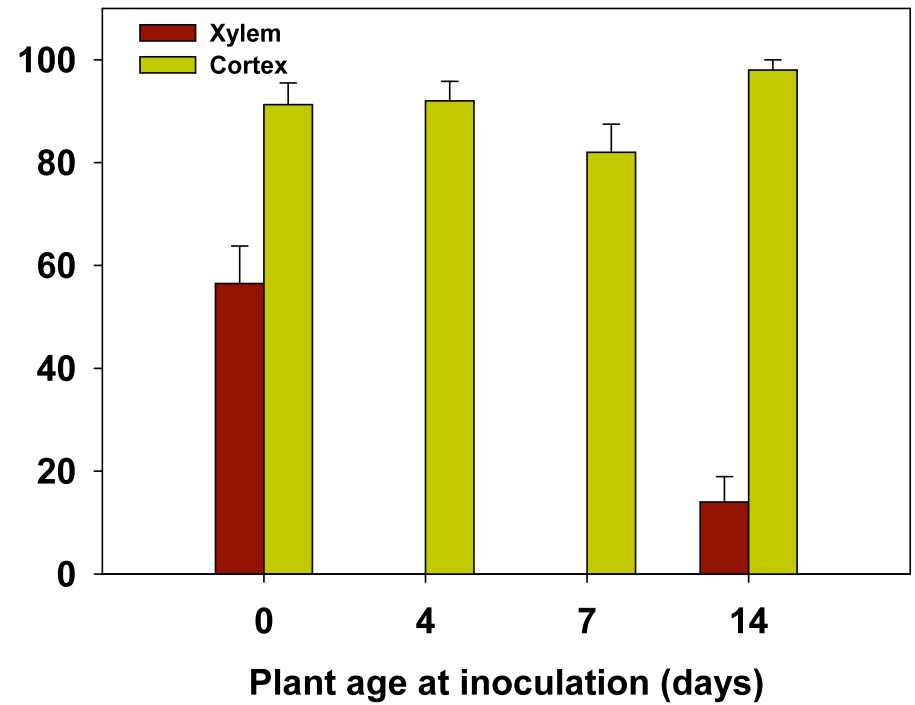
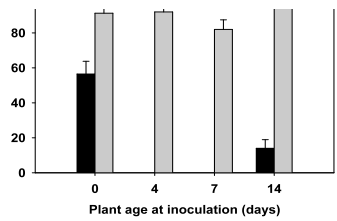
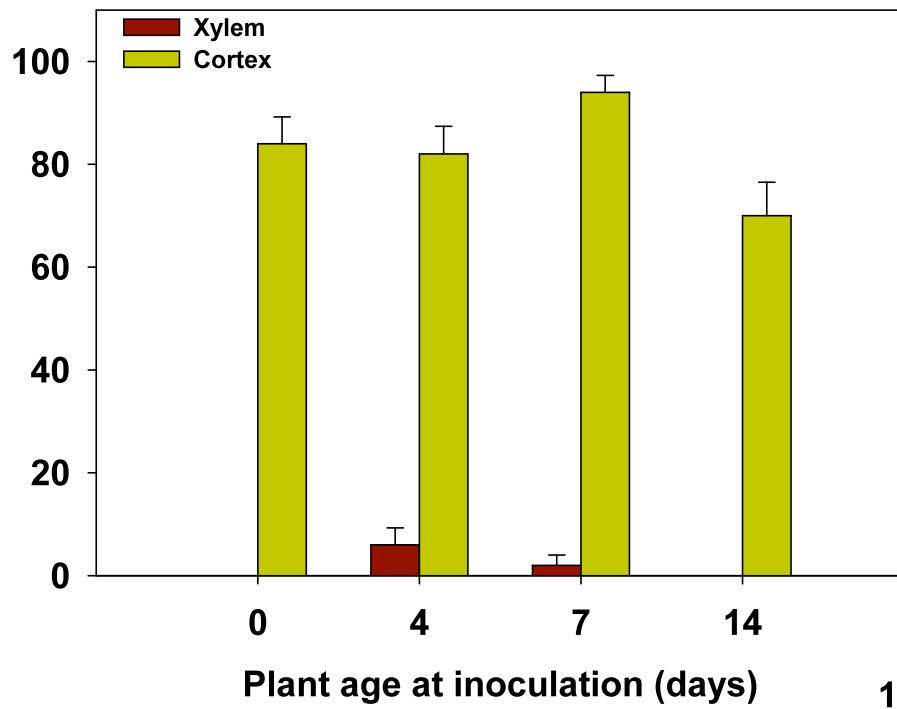




0 conidia mL¹



10,000 conidia mL¹



Questions?

How relevant is this to breeders???

- greenhouse screening assays.....how they relate to the field.....
- Mechanisms of resistance.....suberin and lignin accumulation

Would inoculum density have an effect?

- Probably yes.....
- we have tried experiment applying 100 fold increase in oc....and obtained same results....there is a delay in symptom development...

-What would happen to R var?

-Would it have two peaks?

-Why **should breeders worry about the veg vs rep stages.....?**