

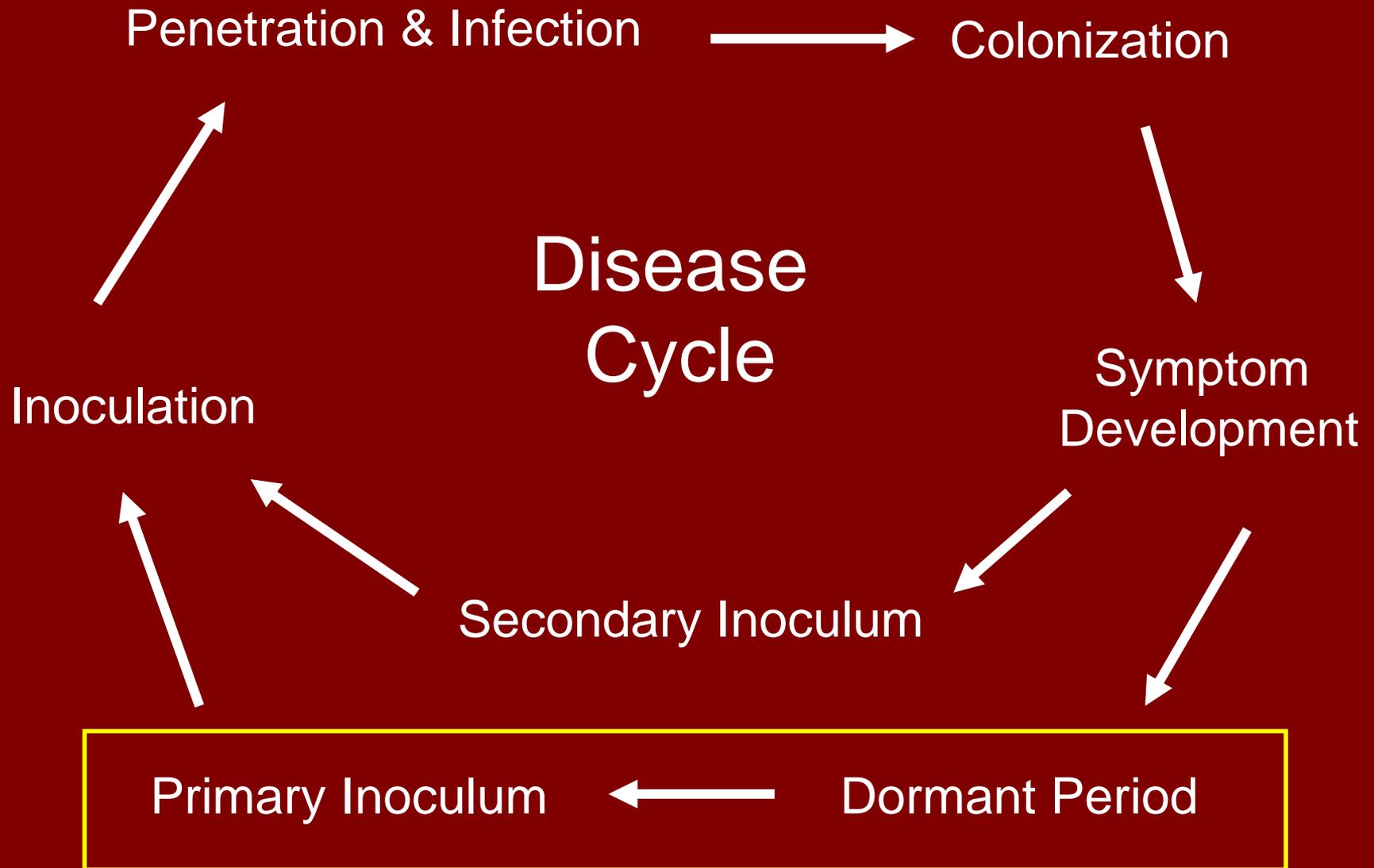
# Factors Involved in Full Season Scab Management

Jason Brock  
Department of Plant Pathology  
UGA – Tifton

2010 Georgia Pecan Growers  
Association Annual Meeting

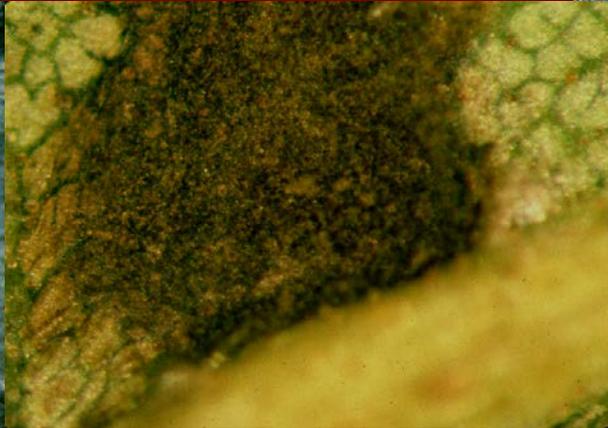
# Disease Cycle

succession of all of events and interactions among the host, pathogen, and environment that occur in a disease



# Overwintering of Pathogen

- as a small, tight mat of fungal material called a "stroma" on shucks, leaf petioles and stems infected the previous season



# Primary Inoculum

- When are spores produced in overwintering lesions?

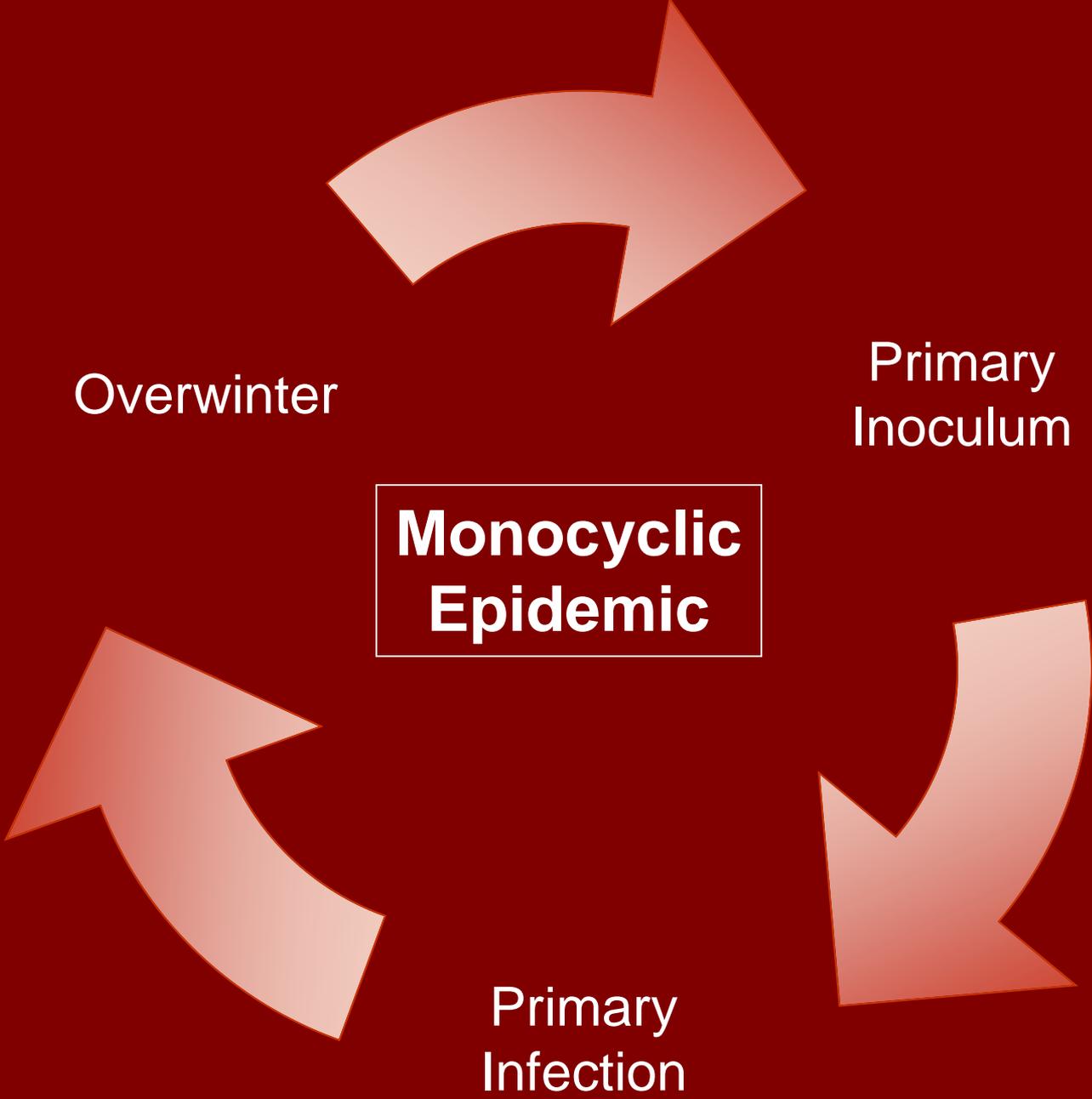


**As late as June**



**Usually starts in April**

*Will removal of infected tissue  
reduce inoculum and  
subsequent disease pressure  
early in the year?*



Overwinter

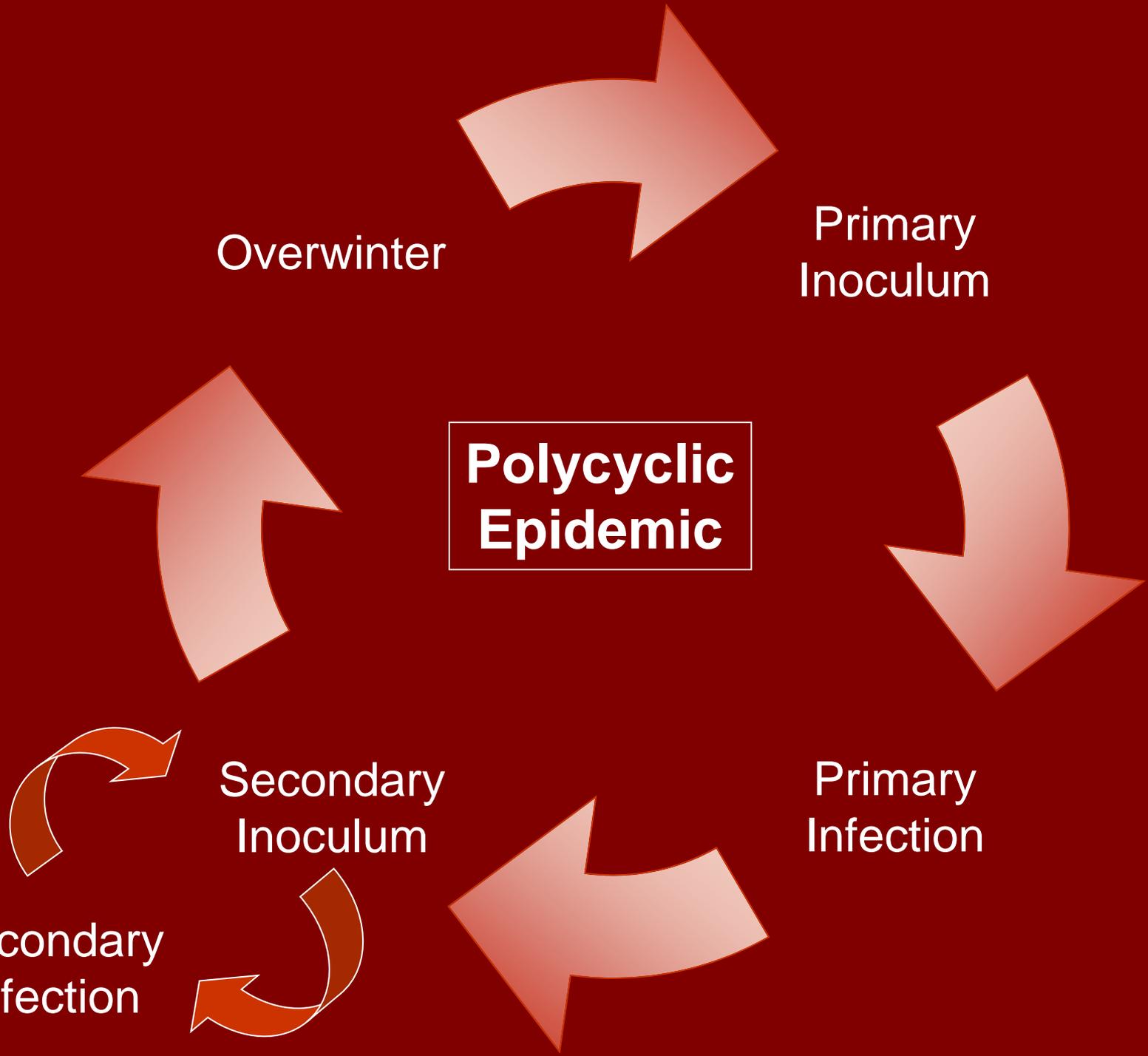
Primary  
Inoculum

**Polycyclic  
Epidemic**

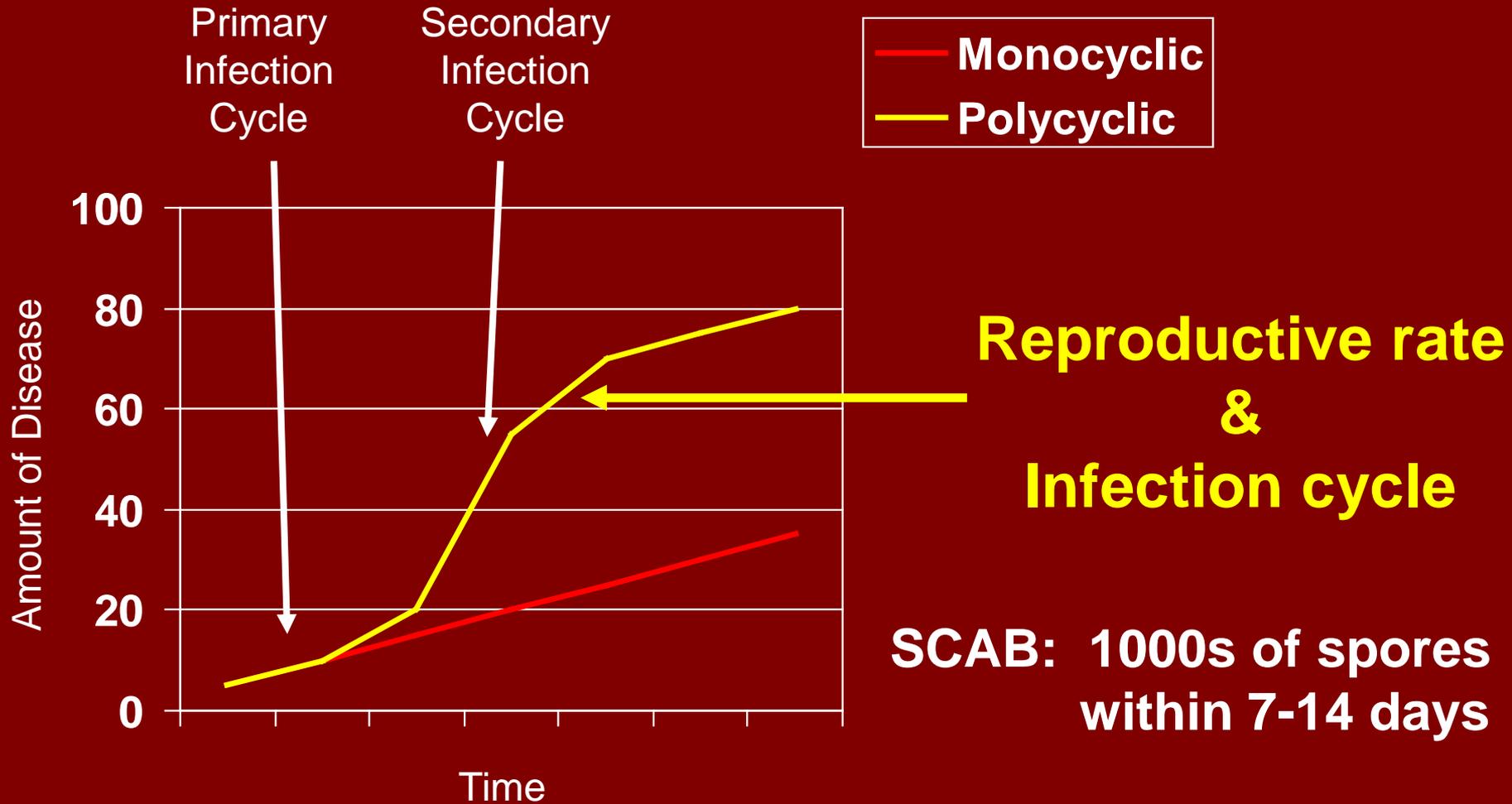
Primary  
Infection

Secondary  
Inoculum

Secondary  
Infection



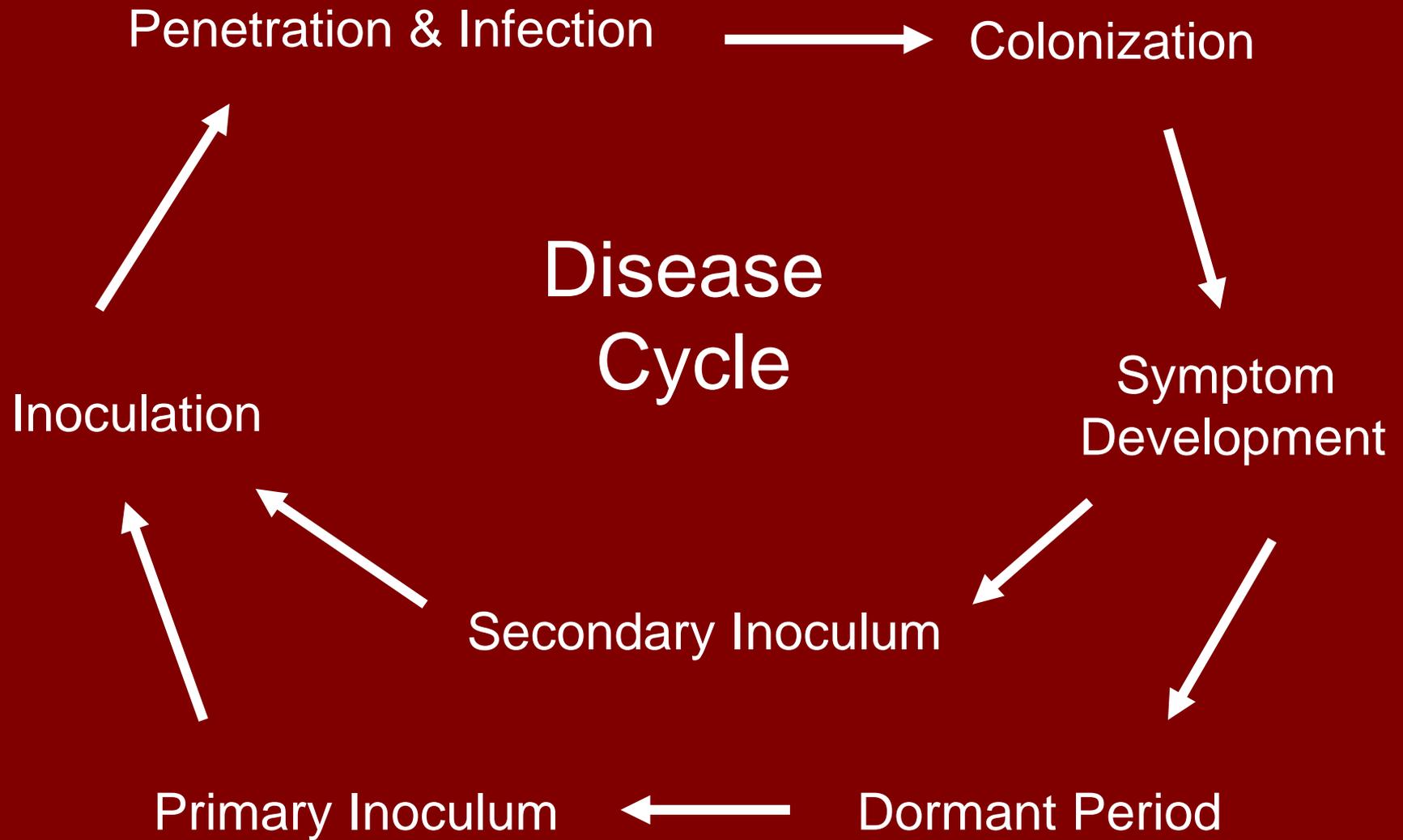
# Disease Progress



*Will removal of infected tissue reduce inoculum and subsequent disease pressure early in the year?*

NOT EFFECTIVELY

- Cannot remove all sources of inoculum
- Polycyclic disease cycle
- Weather conditions more important than primary inoculum.



Penetration & Infection



Colonization



Symptom  
Development



Dormant Period

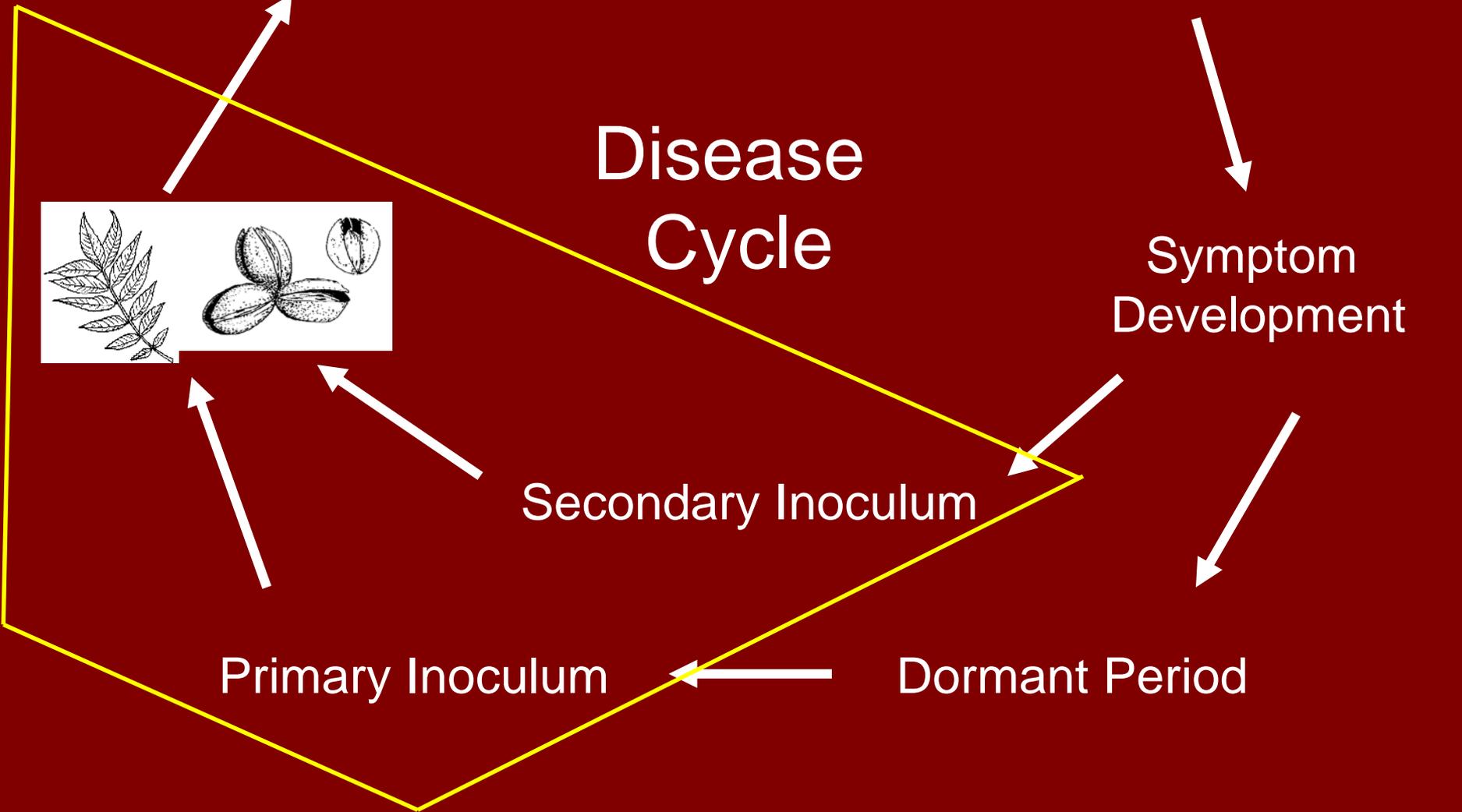


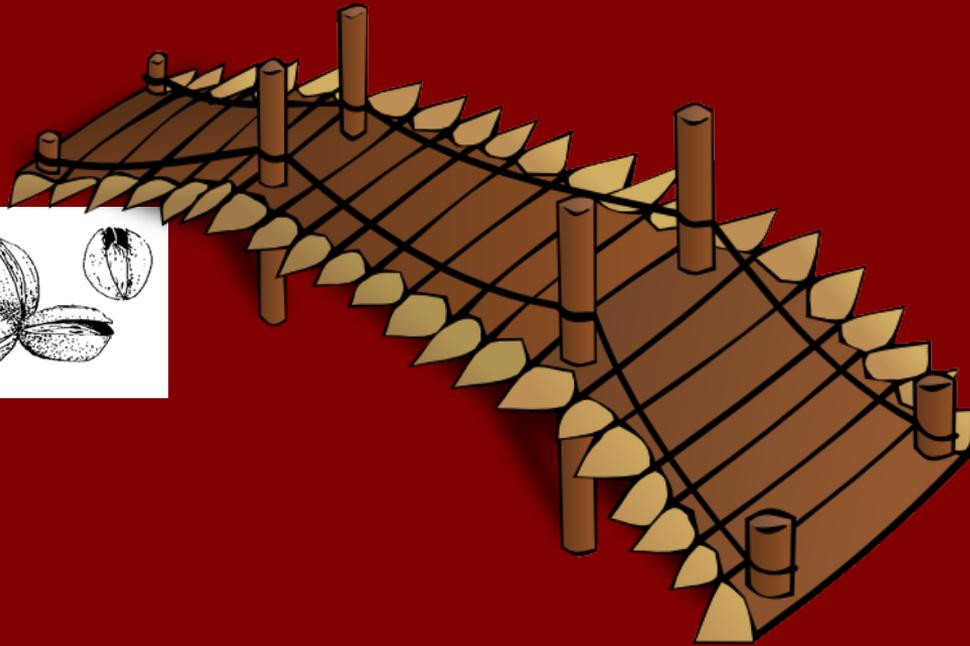
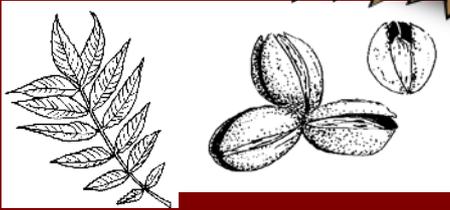
Primary Inoculum

Secondary Inoculum



Disease  
Cycle





# 2009 Wichita – Ponder Farm

TRT	App's	Leaf INC 16-Jul	Nut SEV 16-Jul	Nut SEV 30-Sep
Super Tin + Elast	1 – 10	5.0 b		
Trt A Super Tin + Elast	1 – 3 4 – 10	26.0 a		
Nontreated		30.7 a		

# UGA Fungicide Evaluation Trials

- Dr. Tim Brenneman
  - 1994 through 2008
  - Ponder Farm, Tift County
- Dr. Paul Bertrand
  - On-farm fungicide trials
- To evaluate effect of leaf scab
  - Pre-pollinations applications differ
  - Post-pollination applications same

# 2003 Wichita – Ponder Farm

TRT	App's	Leaf INC 28-Apr	Nut SEV 7-Jul	Nut SEV 8-Aug
Trt A Super Tin + Orbit	1 – 3 4 – 10	36 c	30	87
Trt B Super Tin + Orbit	1 – 3 4 – 10	58 b	30	87
Nontreated Super Tin + Orbit	1 – 3 4 – 10	76 a	32	85

# 1994 Desirable – Ponder Farm

TRT	App's	Leaf INC 3-Jun	Nut SEV 3-Aug	Nut SEV 15-Sep
Nontreated		96 a	62	42
Super Tin	1 – 10	42 b	5	21
Trt A Super Tin	1 – 3 4 – 10	6 c	5	22
Trt B Super Tin	1 – 3 4 – 10	15 c	4	22
Trt C Super Tin	1 – 3 4 – 10	0 c	4	21

# 2003 Desirable – Bertrand

TRT	Leaf INC	Nut SEV
Nontreated		
Trt A		
Trt B		
Trt C		
Trt D		

TRT all pre-pollination; Agri Tin on all trees post-pollination

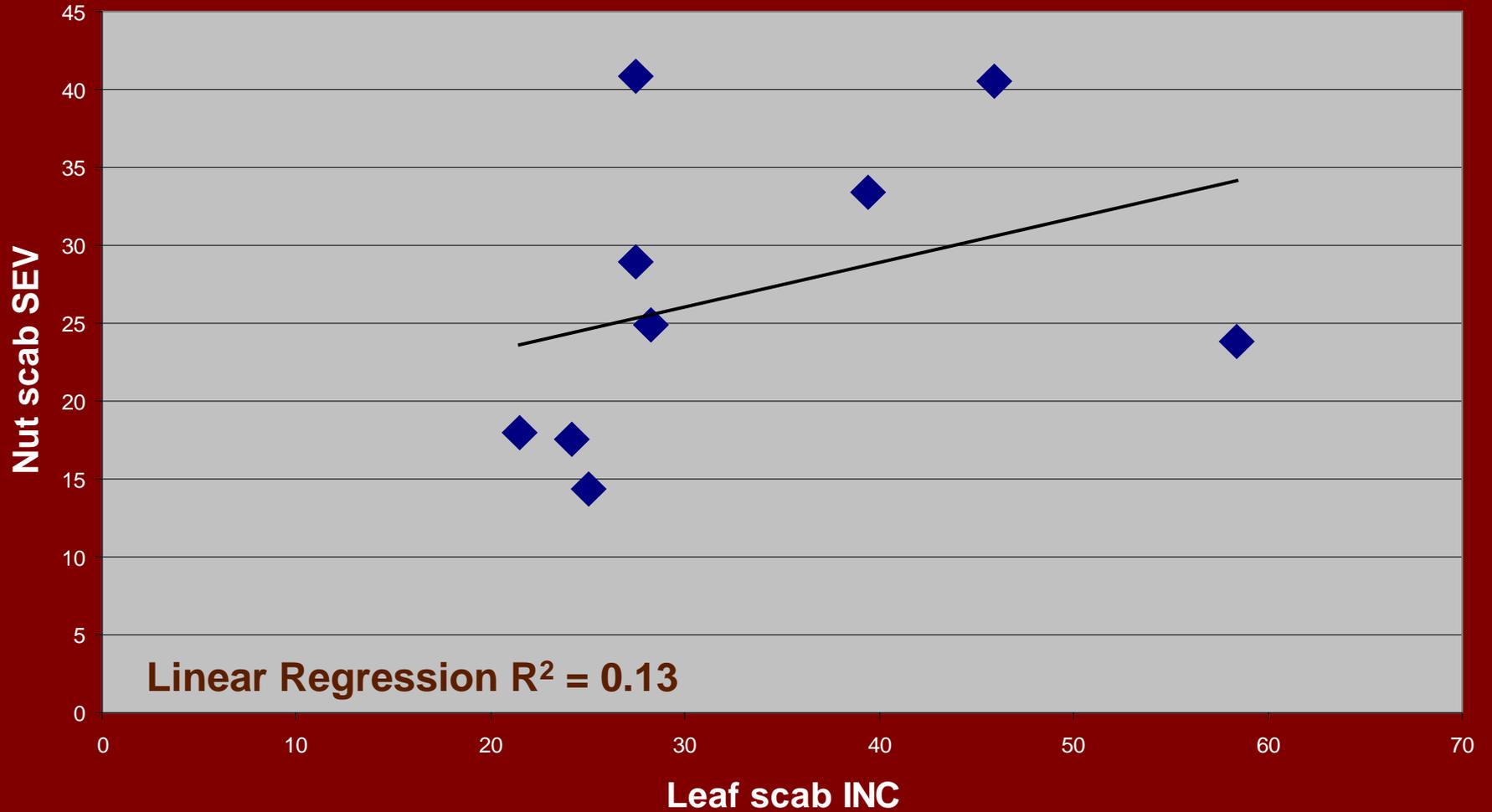
# Does leaf scab have an effect?

- 1996 & 1997 Wichita Plots – Ponder Farm
- Fungicide applications 1 – 3 differ
- Fungicide applications 4 – 10 = Super Tin

# 1996 Wichita - Ponder Farm



# 1997 Wichita - Ponder Farm



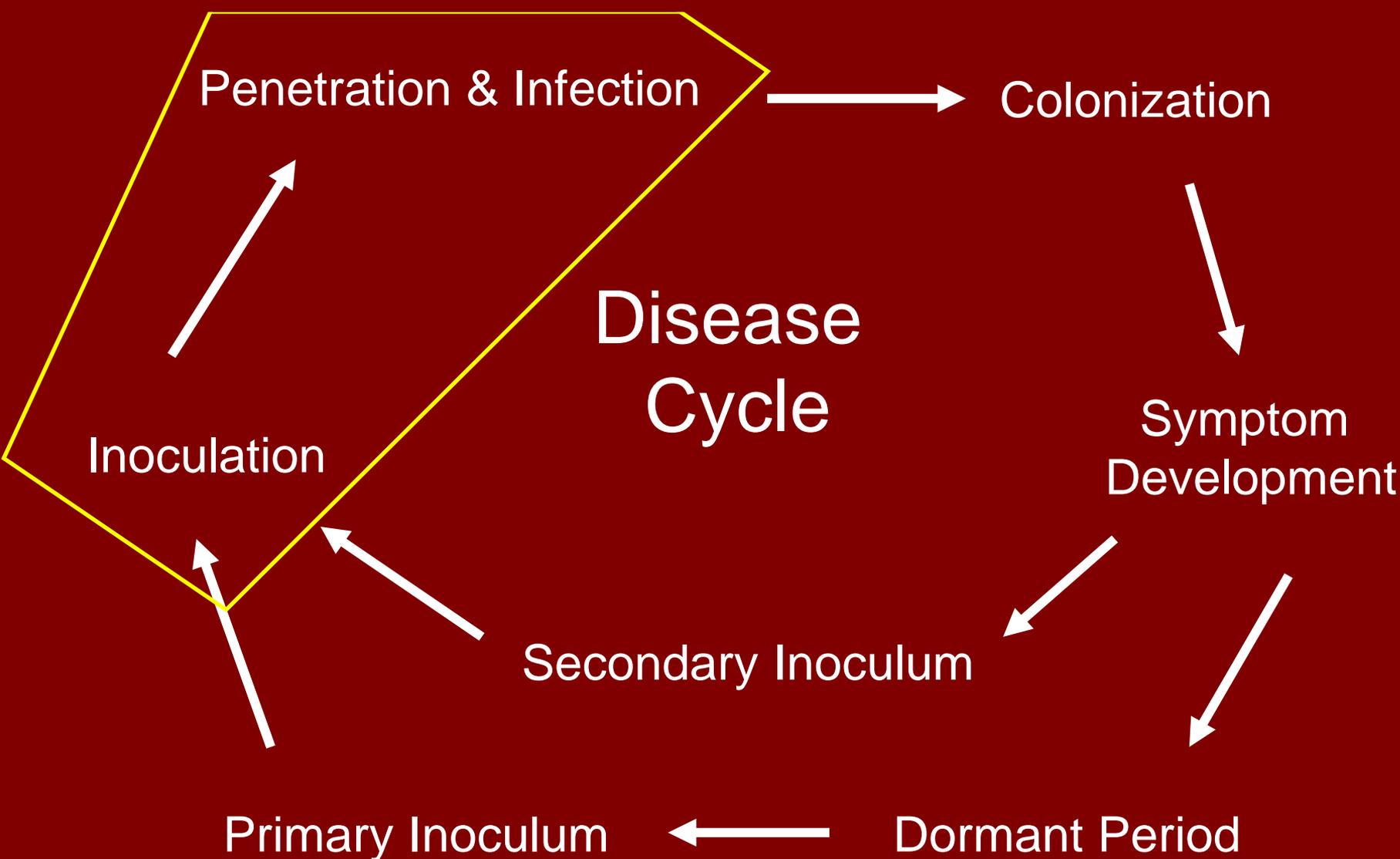
**Differences in leaf scab do not  
always carry over to nut scab.**

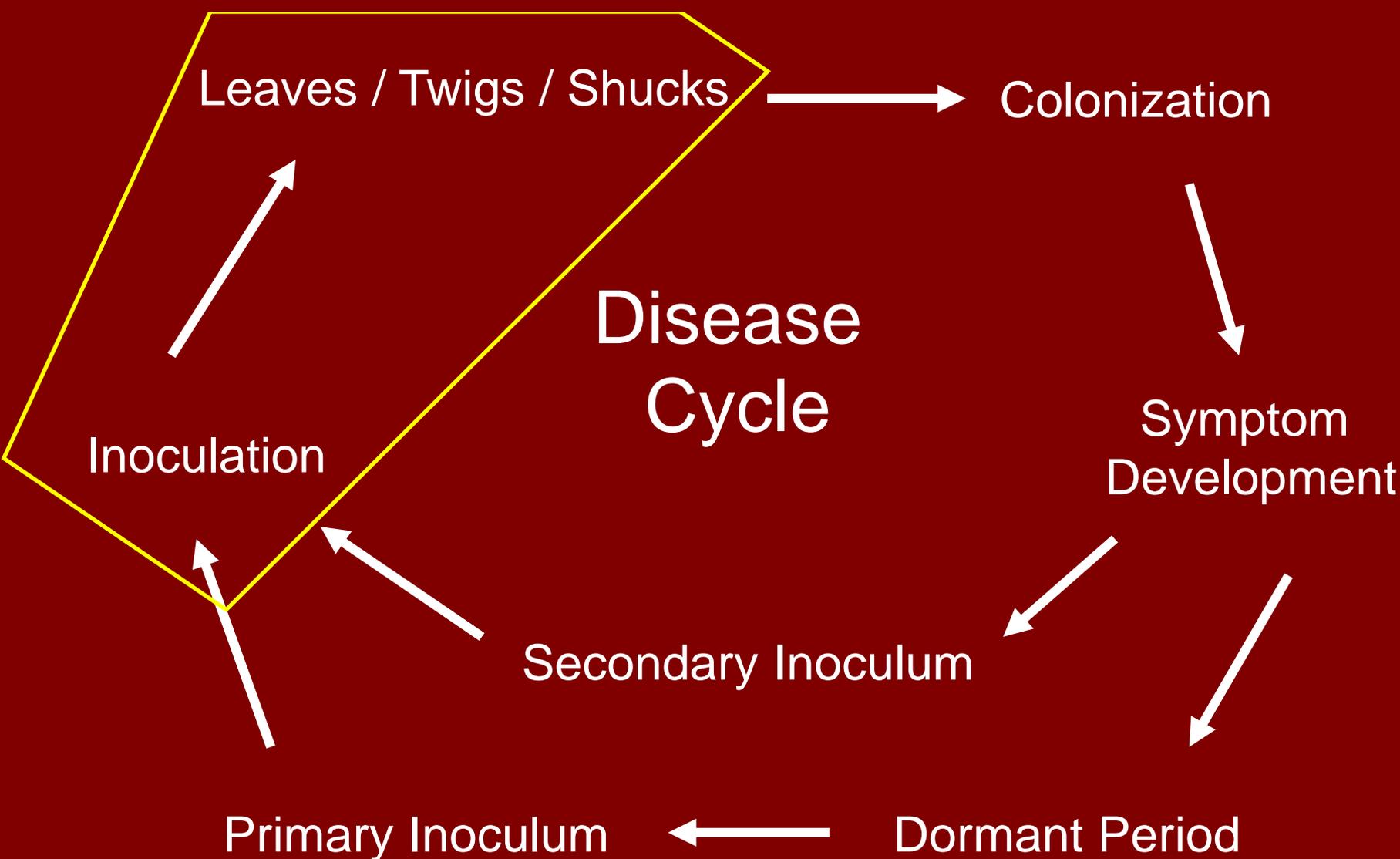
# Is control of leaf scab important?

Leaf/tree health  
&

Increased inoculum potential

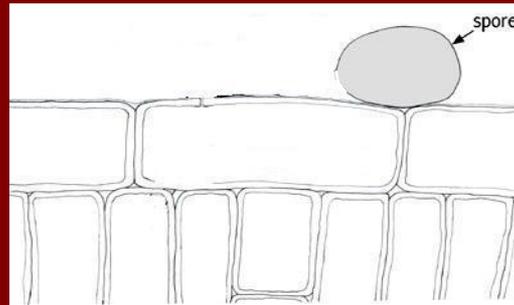
*But - nut scab more dependent on rainfall.*



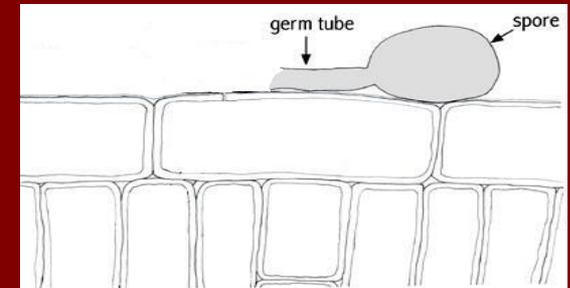


Optimum Temp  
72 – 79 °F  
&  
Leaf Wetness  
6 – 12 hrs

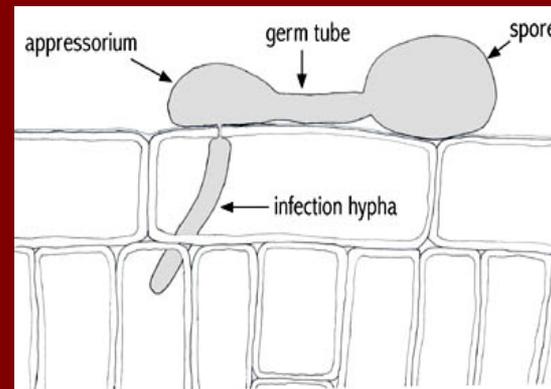
Temp Range  
50 – 95 °F  
&  
Continuous Leaf  
Wetness



Spore on leaf surface



Spore germination



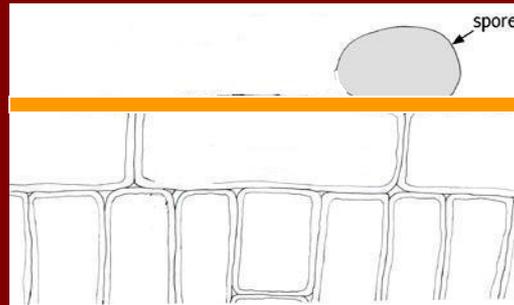
Penetration/infection



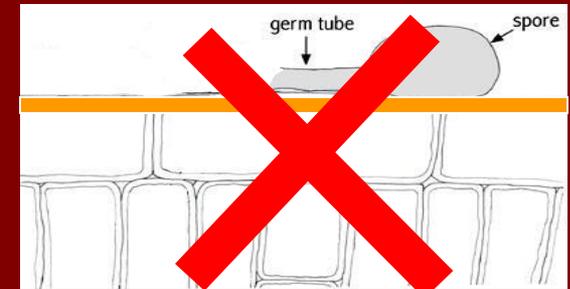


## Protectant (contact) Fungicide Activity

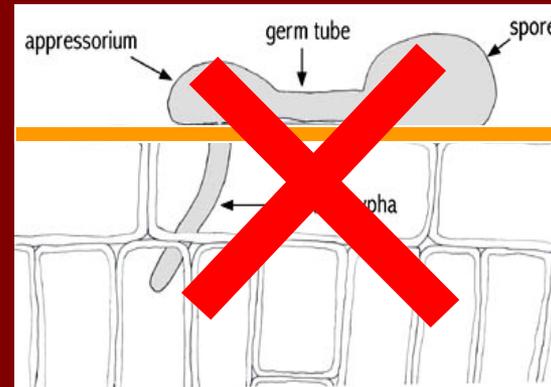
- Fungicides act on surface to prevent spore germination and/or penetration and infection
- Applied before infection occurs
- Protectant fungicides have preventive activity only
- Most systemic fungicides have preventive activity



Spore on leaf surface

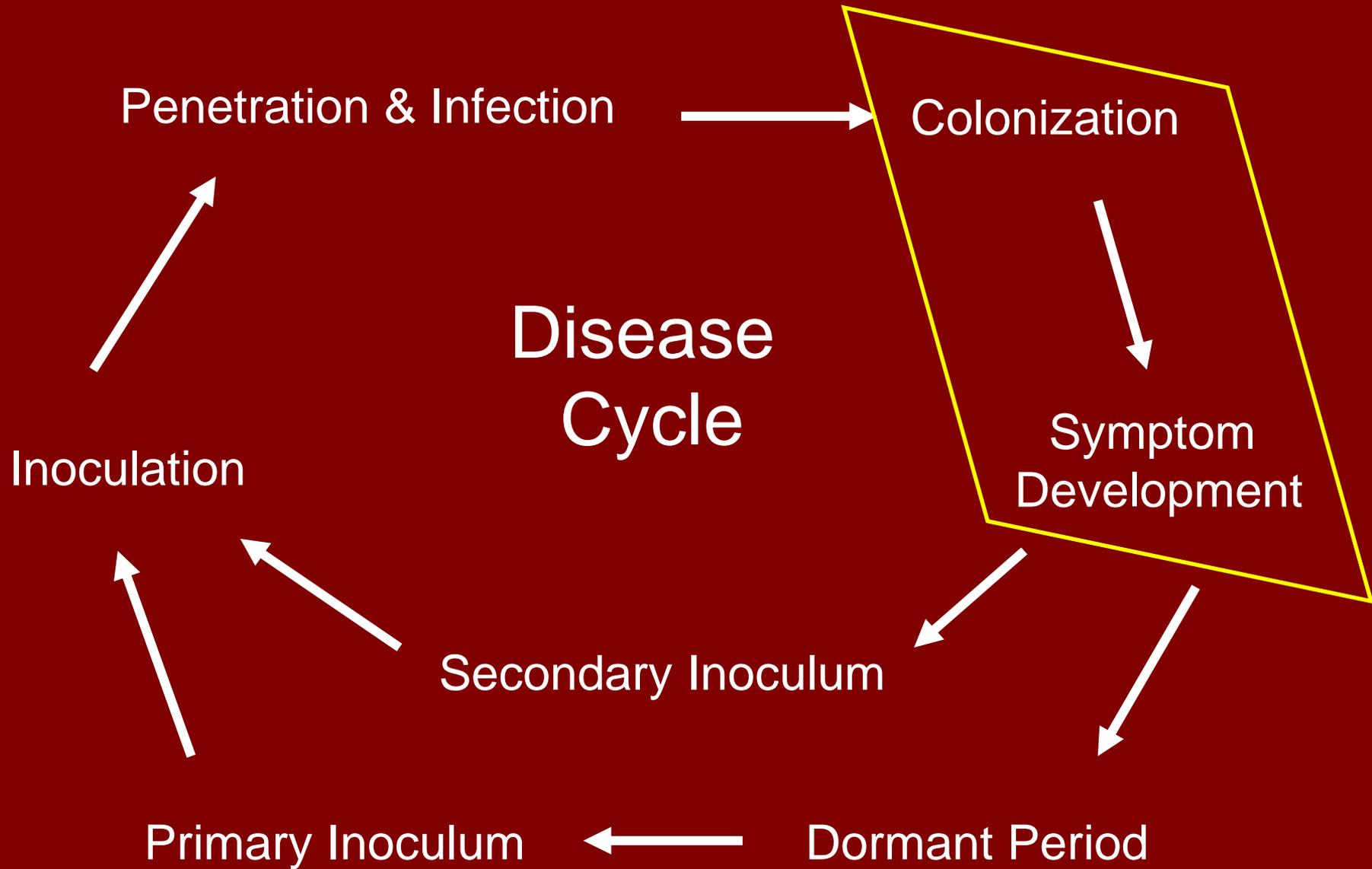


Spore germination

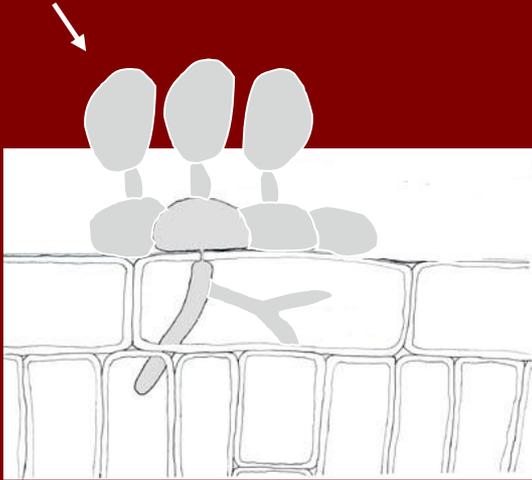


Penetration/infection





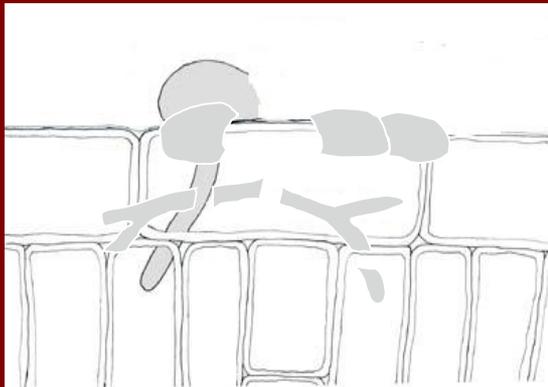
New spores serve as secondary inoculum



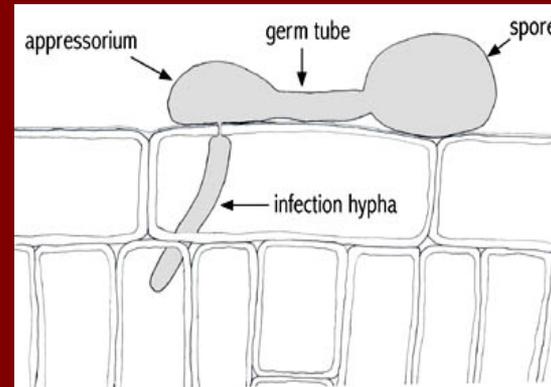
Sporulation

**Lesions visible in 7 – 9 days**

**Lesions active for 4 - 8 weeks**



Fungal growth/visible lesion

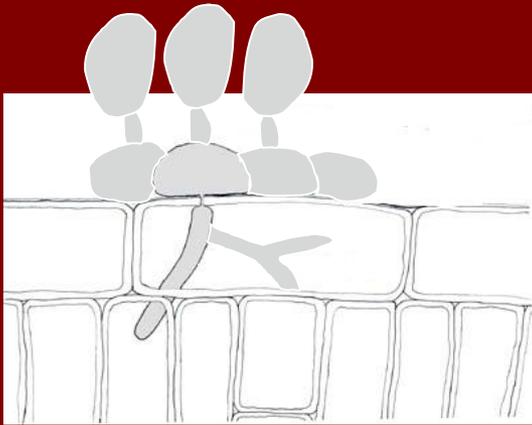


Penetration/infection

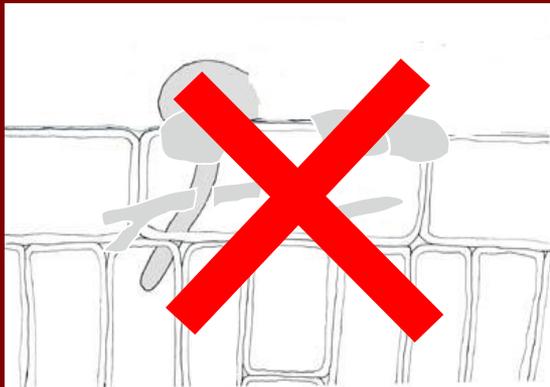


# Curative activity

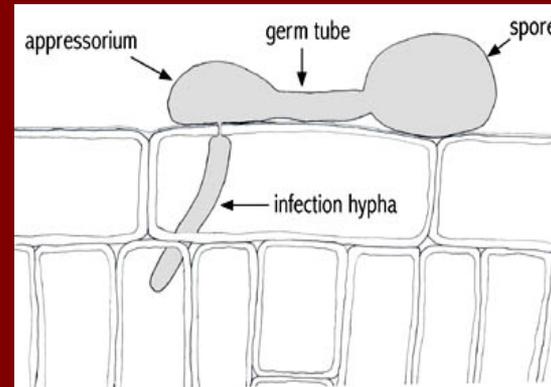
- after infection has occurred
- some systemics can be effective when applied within 1-4 days after infection
- has not been conclusively demonstrated under field conditions for pecan scab



Sporulation



Fungal growth/visible lesion

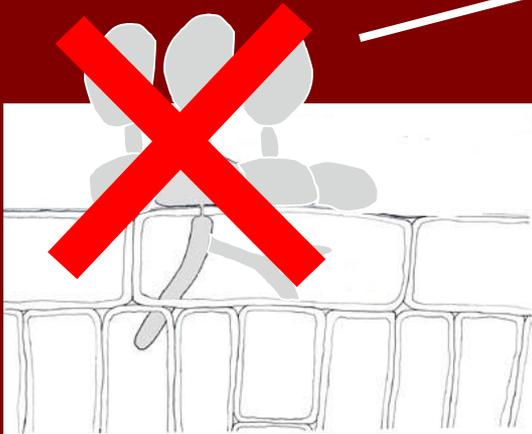


Penetration/infection

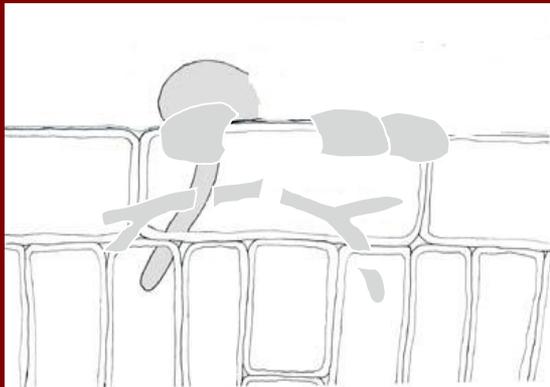


# Anti-sporulant activity

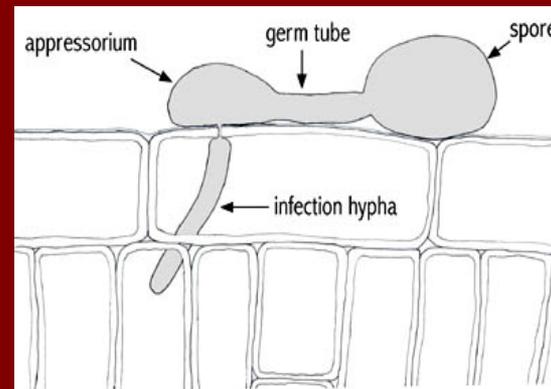
- inhibit sporulation
- little or no experimental data for pecans under field conditions



Sporulation

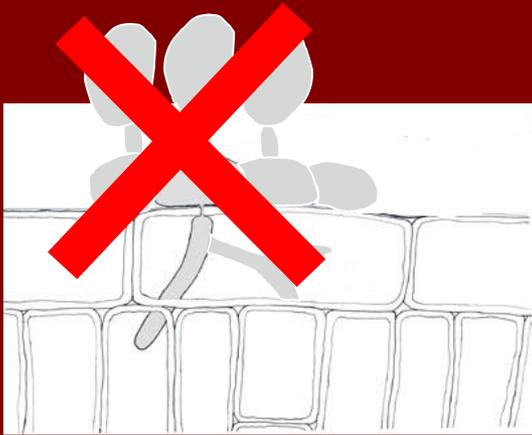


Fungal growth/visible lesion

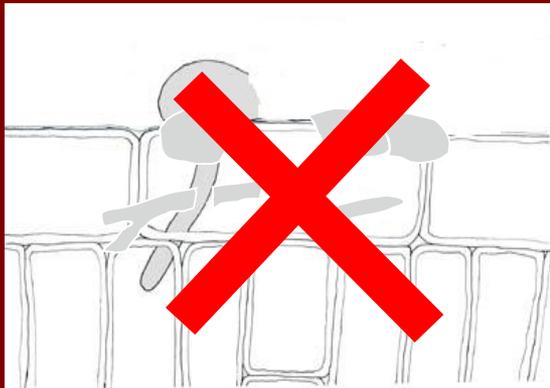


Penetration/infection

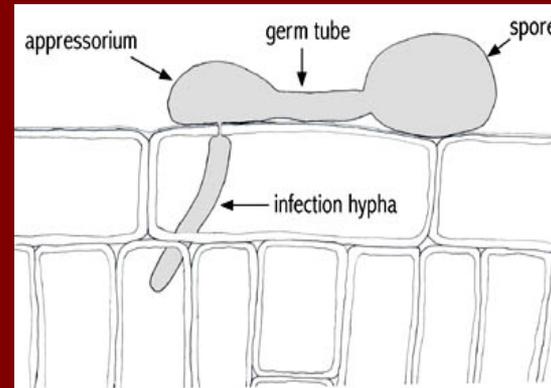
***Curative and anti-sporulant  
use of fungicides for scab  
control is not recommended***



Sporulation



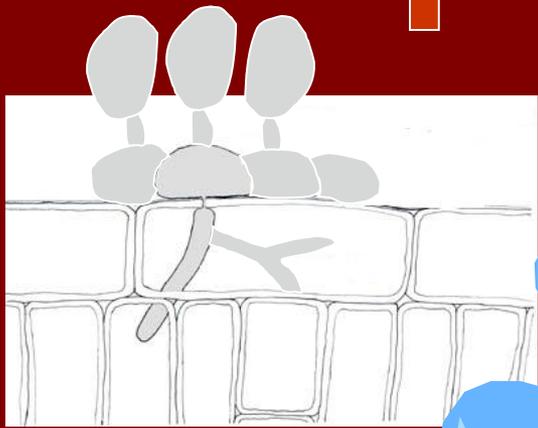
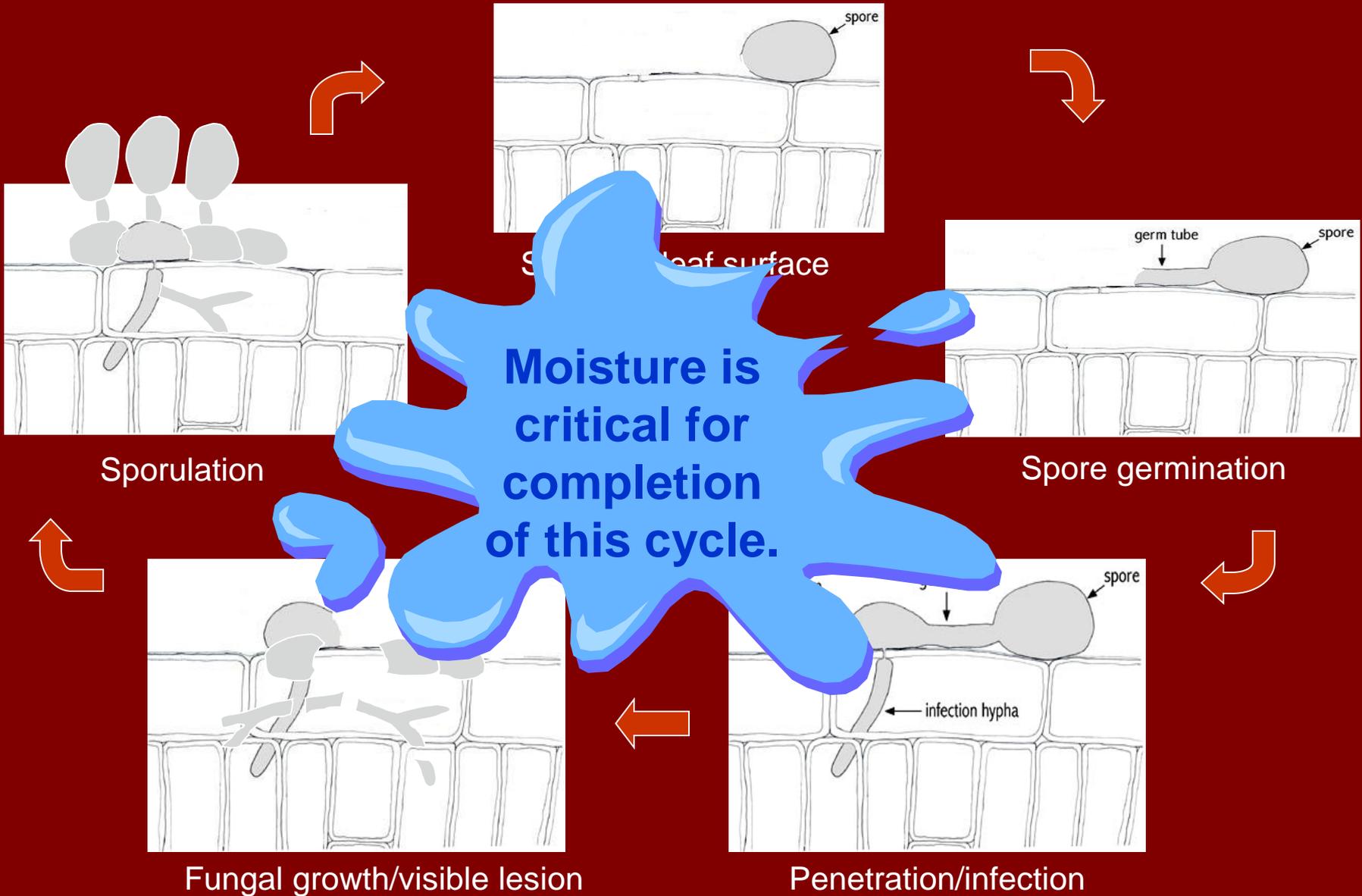
Fungal growth/visible lesion



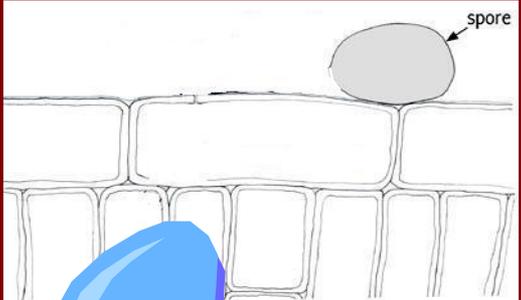
Penetration/infection

Fungicides act to break the infection cycle at one or more specific stages of fungal development.

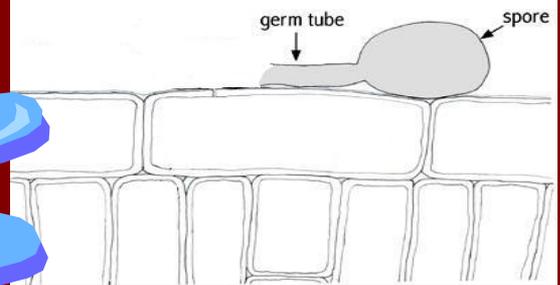
	TPTH	dodine	Qols	DMIs
Germination				
Growth				
Sporulation				



Sporulation



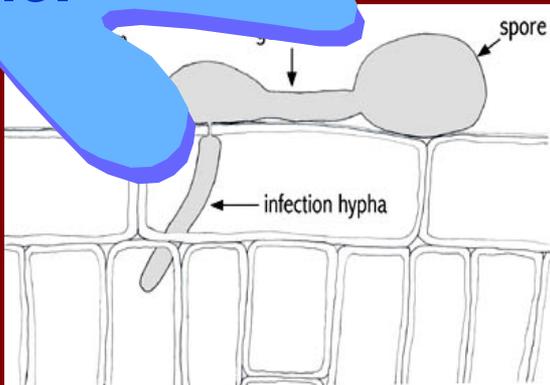
Spore germination



Spore germination



Fungal growth/visible lesion



Penetration/infection

Moisture is critical for completion of this cycle.

# Spraying by AU-PECAN

- Define your protection interval
  - AU-Pecan can use 10 or 14 day
- **AFTER** protection interval has passed

	Rain Events	&	5-day avg. forecast
Spray when	»	0	50% or greater
	»	1	40% or greater
	»	2	20% or greater
	»	3	NA



APR

MAY

JUN

JUL

AUG

- Risk window until leaf maturity (4-6 weeks after bud break)
  - Late season growth flushes
- Direct effect on photosynthesis
- Increase in secondary inoculum
- Not as critical as control of nut scab
  - Other foliar disease can also be important



**APR**

**MAY**

**JUN**

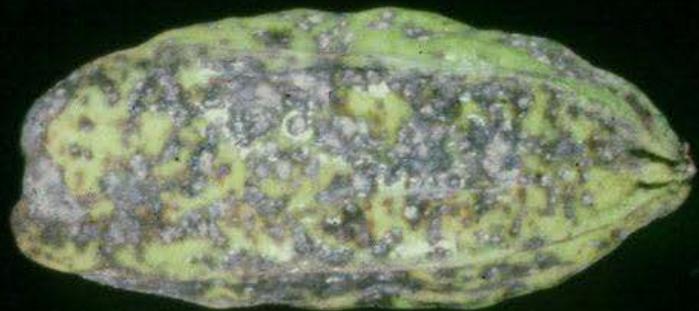
**JUL**

**AUG**

Moderately susceptible for  
2-3 weeks after nut set.

Most susceptible during period of  
rapid expansion (early Jun - mid Jul)

Less sensitive to damage  
after shell hardening.





**APR**

**MAY**

**JUN**

**JUL**

**AUG**

## **Environment**

- *Overcrowding*
- *Site selection*

## **Host**

- *Host Resistance*
- *Plant Health*

## **Pathogen**

- *Fungicides*



APR

MAY

JUN

JUL

AUG

- Inoculum available throughout season.
- Scab problems can arise rapidly.
- Damage related to severity and timing.



APR

MAY

JUN

JUL

AUG

- Management needs to be preventive.
- Fungicide application intervals can be adjusted for weather conditions.

# Appreciation to .....

- Dr. Tim Brenneman
- Dr. Katherine Stevenson
- Dr. Paul Bertrand
  
- Georgia Pecan Growers Association

# Phosphorous Acid Fungicides

Agri-Fos

K-Phite

Phostrol

# Phosphoric Acid ( $\text{H}_3\text{PO}_4$ )

- Plant nutrition
- $\text{H}_2\text{PO}_4^-$ 
  - dihydrogen phosphate
- $\text{HPO}_4^{2-}$ 
  - hydrogen phosphate
- Phosphate

# Phosphorous Acid ( $\text{H}_3\text{PO}_3$ )

- Fungicidal activity
- $\text{H}_2\text{PO}_3^-$ 
  - dihydrogen phosphite
- $\text{HPO}_3^{2-}$ 
  - hydrogen phosphite
- Phosphite

# Phosphorous Acid Fungicides

- Mainly documented to control diseases caused by oomycetes.  
(Pythium, Phytophthora, downy mildews)
- Inhibits metabolic process of oomycetes.
- Possible stimulation of plant's defense mechanisms.