Observations on Sunflower Rust in Nebraska and Management Efforts with Fungicide Application Timings

Robert M. Harveson
Extension Plant Pathologist
University of Nebraska
Panhandle REC, Scottsbluff

Rust in Nebraska

- Sunflower rust, caused by the obligate fungal pathogen *Puccinia helianthi*
- Rust is present to some extent each year in Nebraska - both cultivated and wild sunflowers
- In commercial production it often occurs late enough in the season that yields are not affected and treatment is not considered to be necessary - can cause significant losses on susceptible hybrids under conducive conditions

Spore Stages

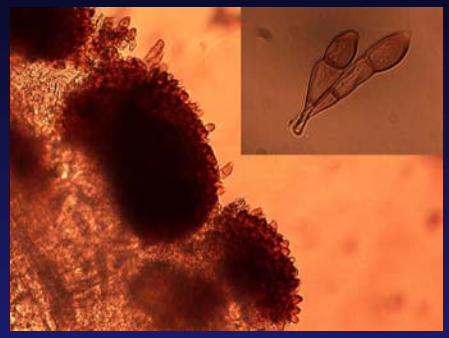
- Pathogen has a complex life cycle consisting of 5 distinct spore stages – all of which occur on sunflower:
  - Uredial
    - reddish-brown (rust) colored and the most commonly observed stage
    - Also the most damaging – can have multiple cycles during the season
  - Telial – overwintering stage

Spore Stages

- In early spring, teliospores germinate to produce basidiospores which can re-infect sunflowers
- Flask-shaped pycnia are formed on the upper leaf surface
- Aecia develop from the pycnia - usually on the lower leaf surface directly below the pycnia
- Aeciospores, formed in developing aecia, then re-infect sunflowers to create new uredia – completing the life cycle

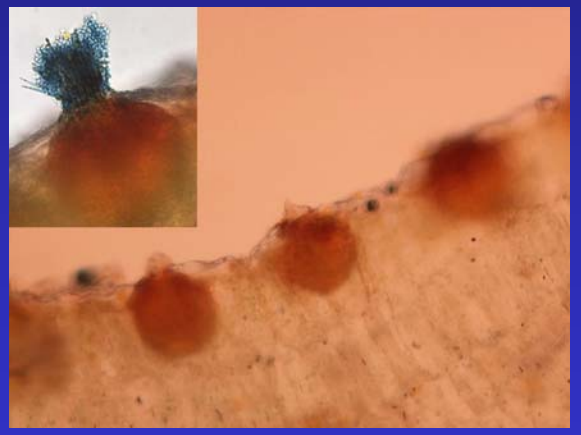
Pathogen Life Cycle

Uredia change to telia with cooler temperatures

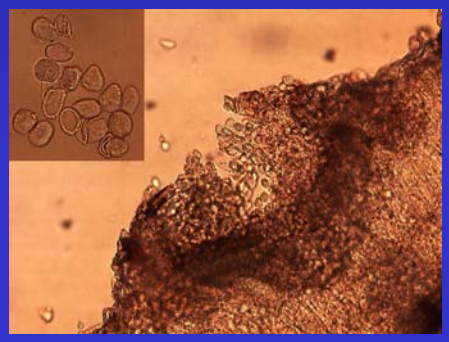


Overwinters as teliospores

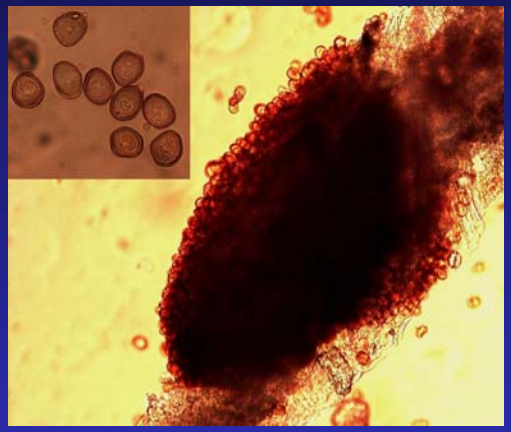
Basidiospores infect sunflowers and form pycnia



Aecia develop from the pycnia



Aeciospores re-infect sunflowers creating new uredia



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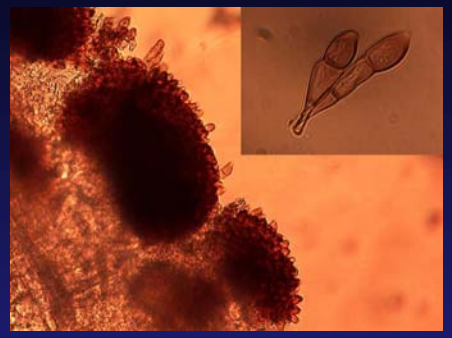

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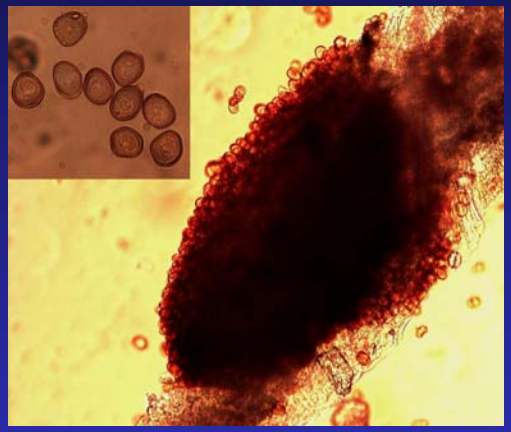
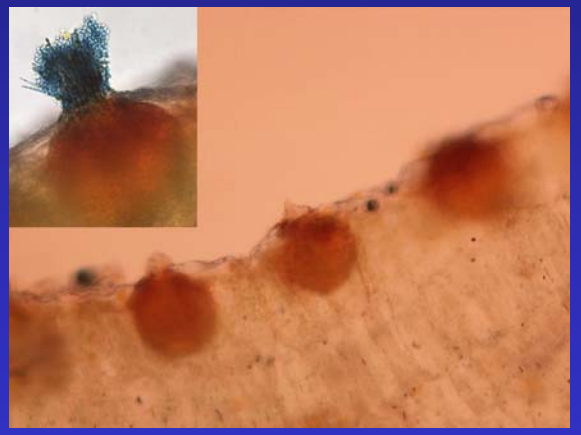


Early Spore Stages



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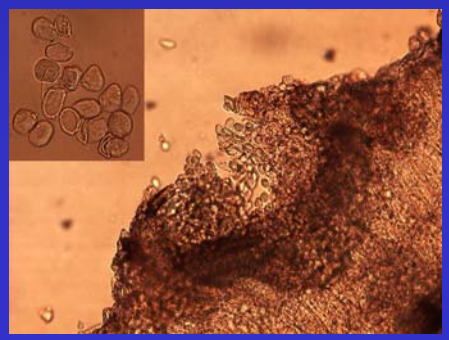
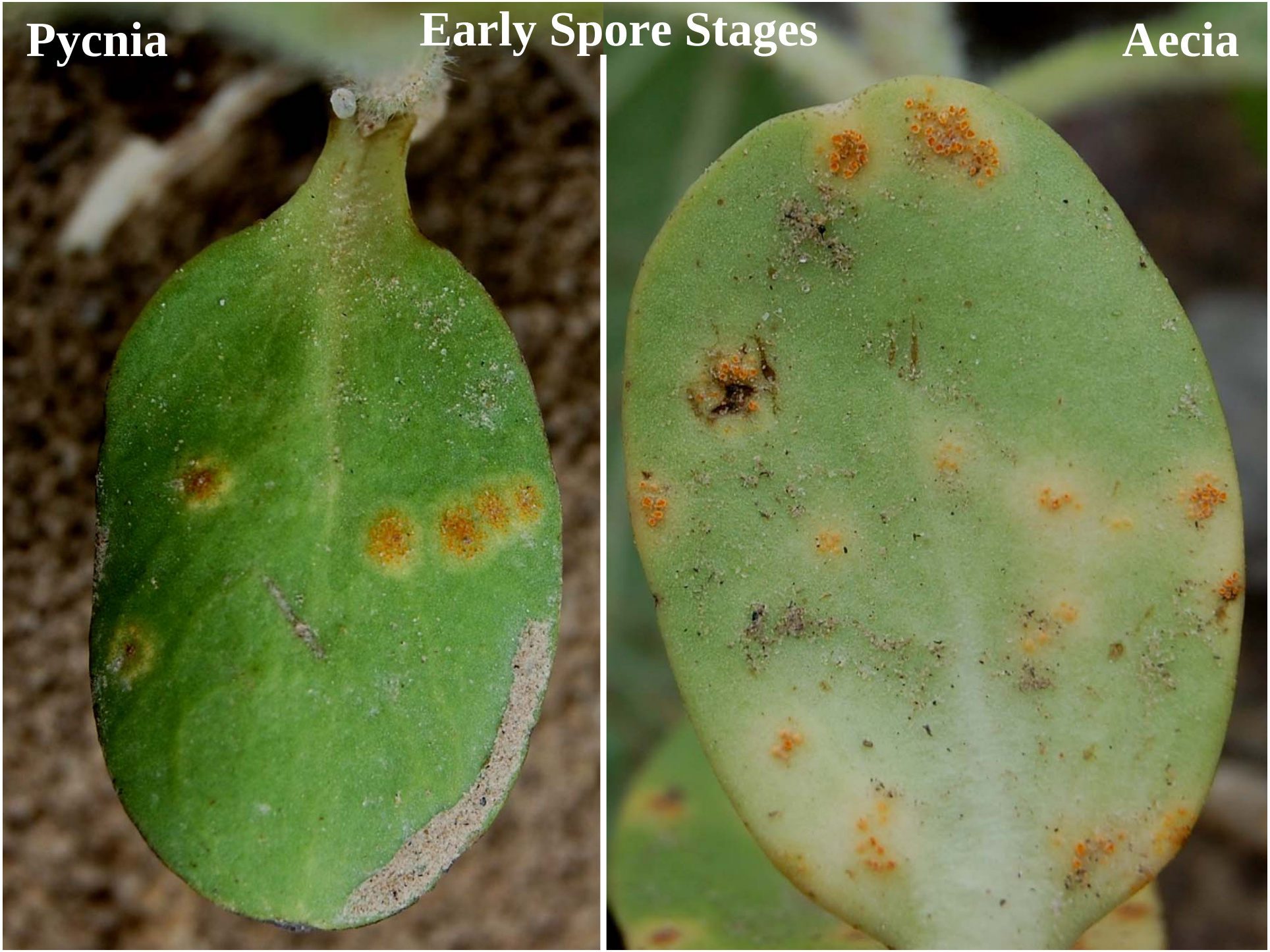


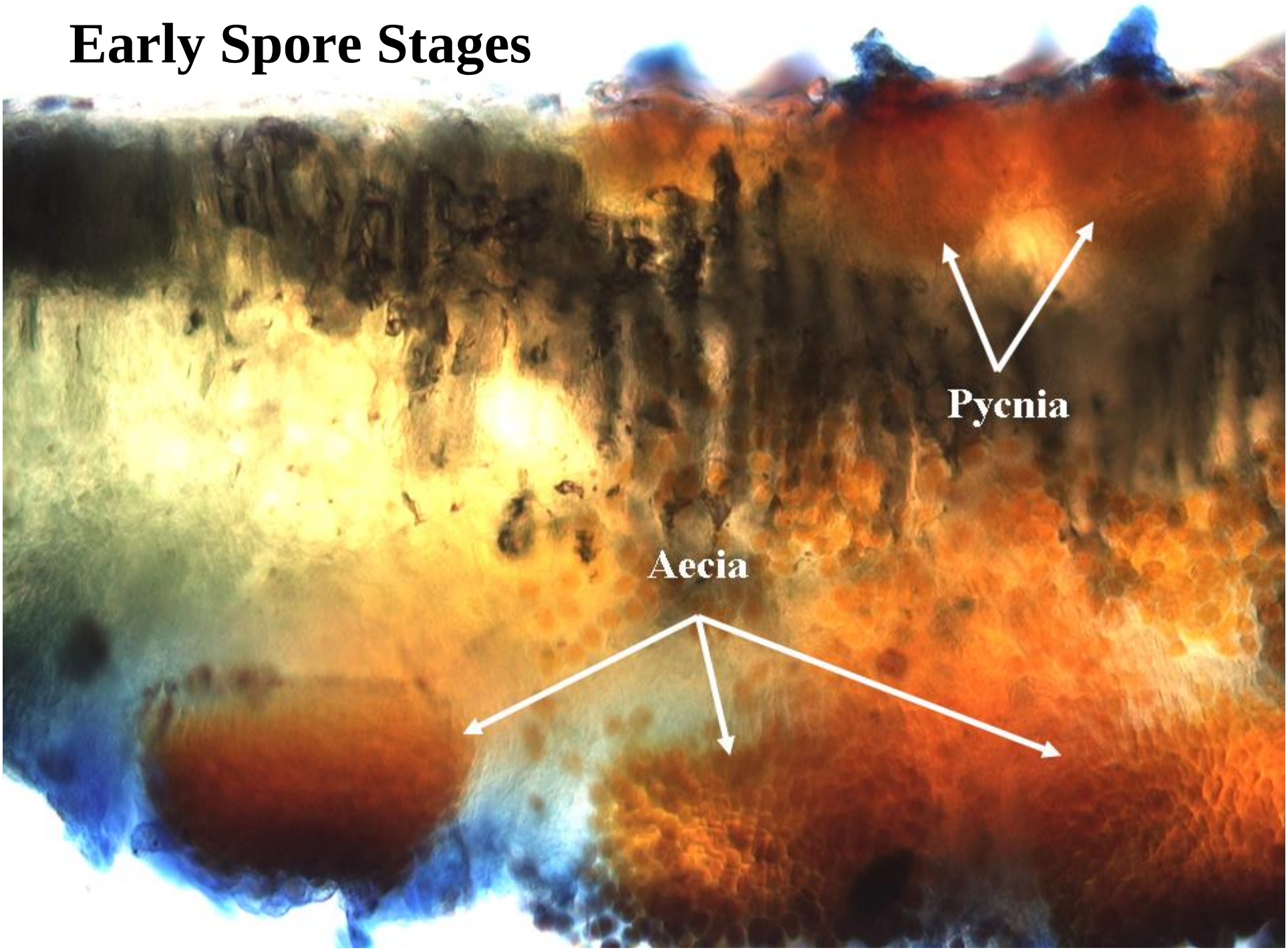
Aecia develop from the pycnia

Rust Survey in 2009

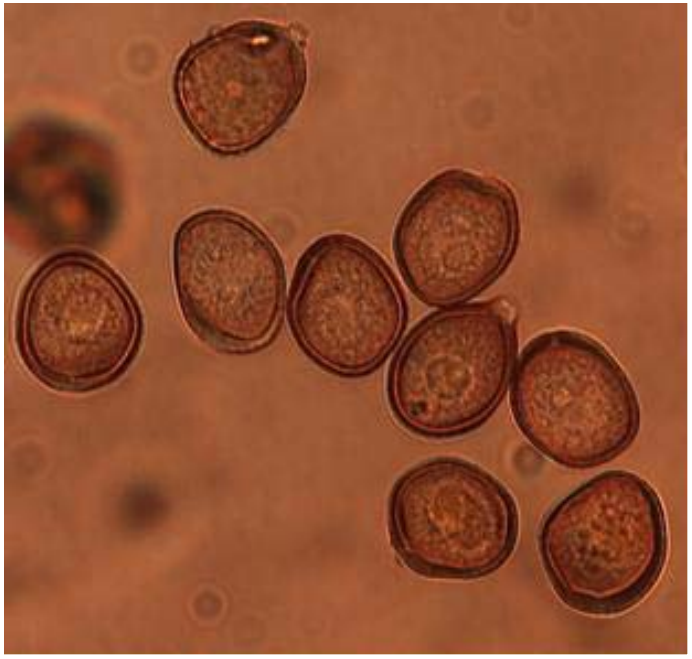
- Temperatures during April, May, and early June were 6°F cooler with 5.5 inches higher rainfall than the 30 year average
- First pycnia and aecia observed in late May
- A survey of western Nebraska conducted over the next four weeks – on volunteers from 2008 production fields (>50 fields/locations)
- Early spore stages found in 44 (85%) of surveyed sites


Pycnia
Early Spore Stages
Aecia

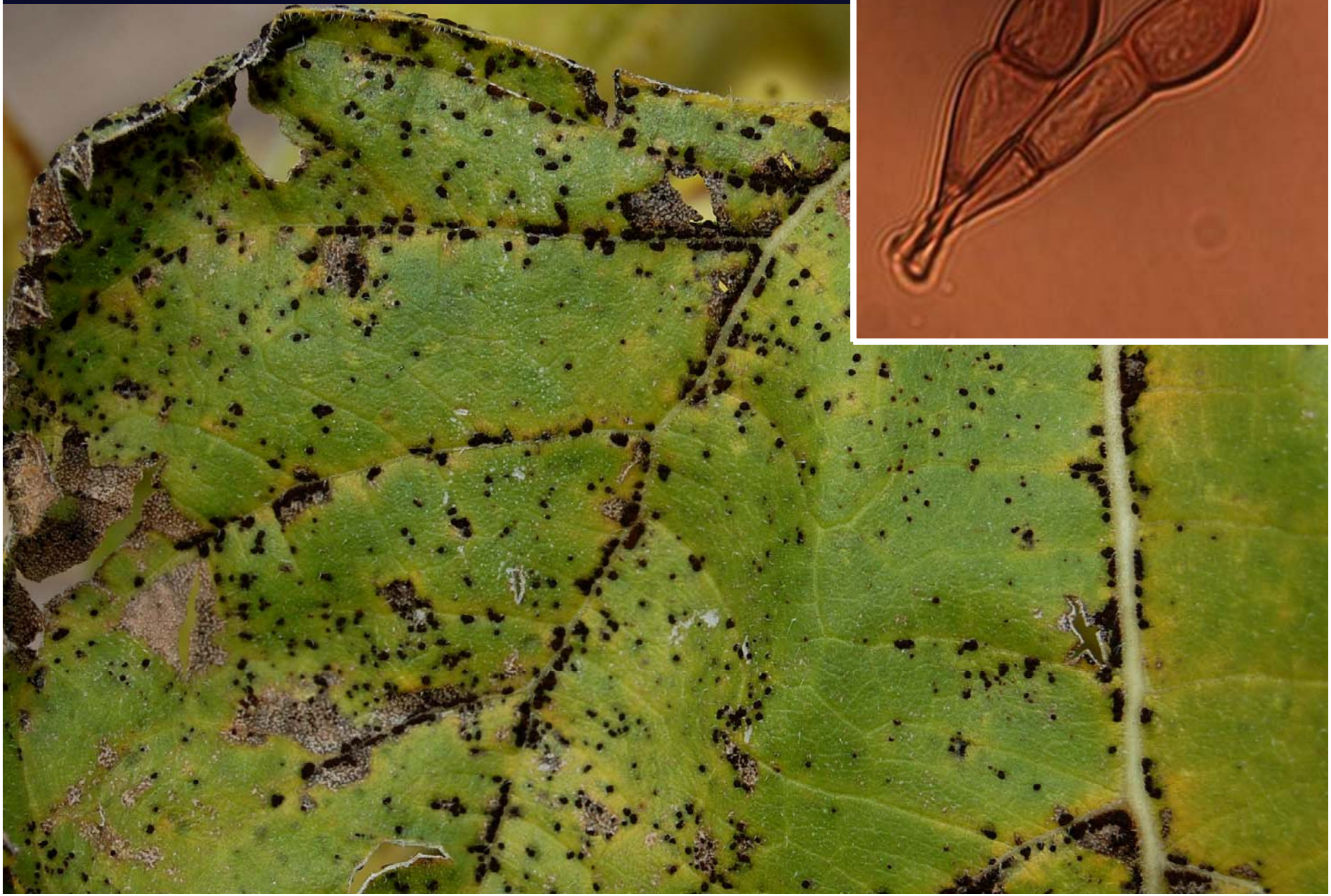
Early Spore Stages



Uredia



Telia



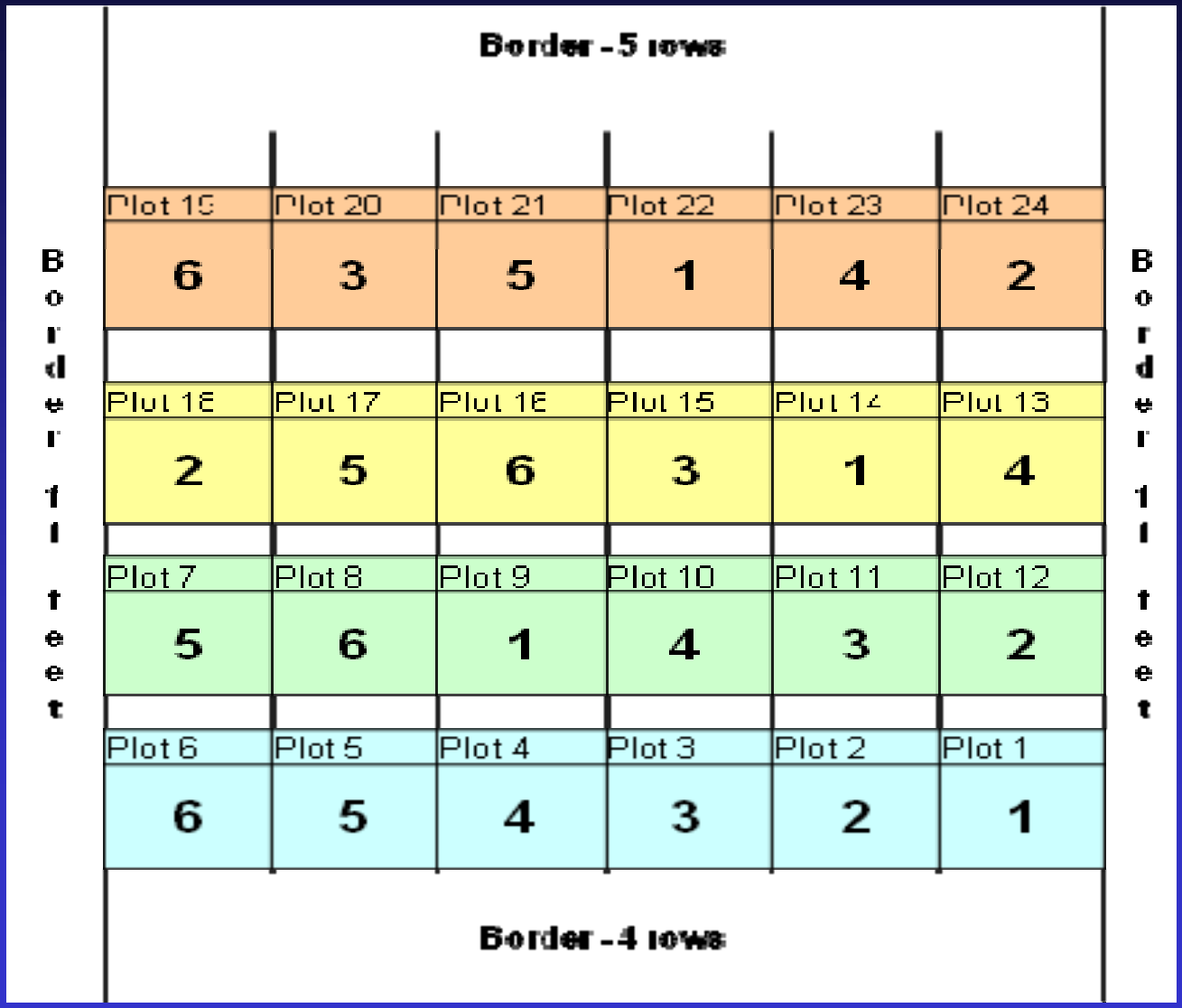
Fungicide Evaluations - Methods

- Two distinct studies conducted:
  - Fungicide evaluations (testing 5 products)
    - Control, Proline (5.7 oz), Prosaro (6.5 oz), Tebuzol (4.0 oz), Headline (9.0 oz) , and Quadris (9.0 0z)
  - Fungicide application timings
    - Control
    - Headline (R1, R4, and R6)
    - Tebuzol (R1)/Headline (R4)/Tebuzol (R6)
    - Tebuzol (R1, R4, and R6)
    - Tebuzol (R1)/Headline (R4)
    - Headline (R4)/Tebuzol (R6)

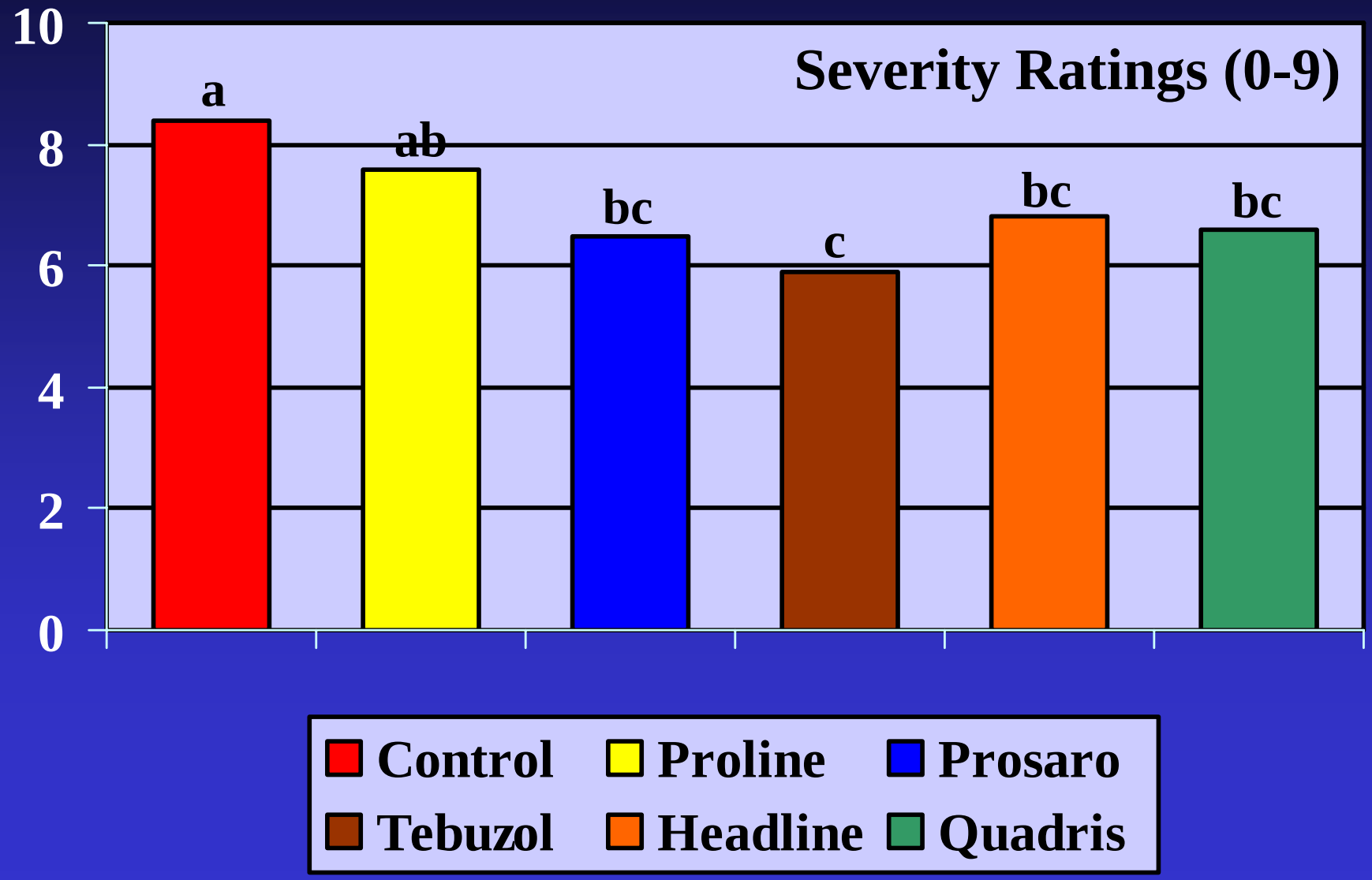
Methodology

- Planted - 6/21 and 6/22
- Plots - four 22 inch rows, 30 ft long with sprinkler irrigation
- Plots inoculated - 7/26
- Sprays made at R1 (8/02), R4 (8/20), and R6 (9/03) growth stages
- Ratings made 9/1-9/2 and 9/16-9/17 on upper two leaves from each of ten plants per plot
- Harvested – 9/23

Fungicide Evaluations – Field Map



Sunflower Rust Fungicide Evaluations Disease Ratings (2009)



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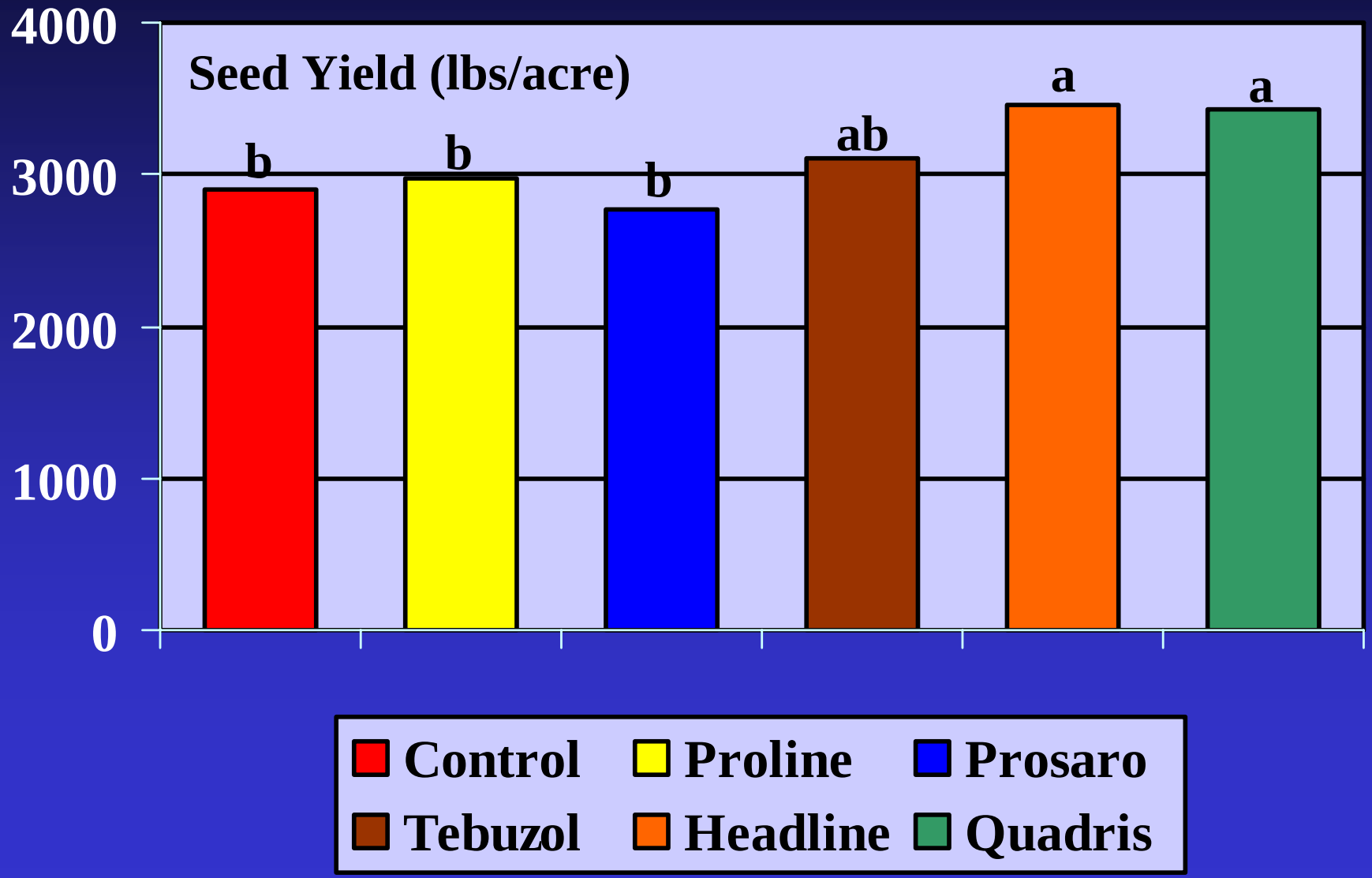
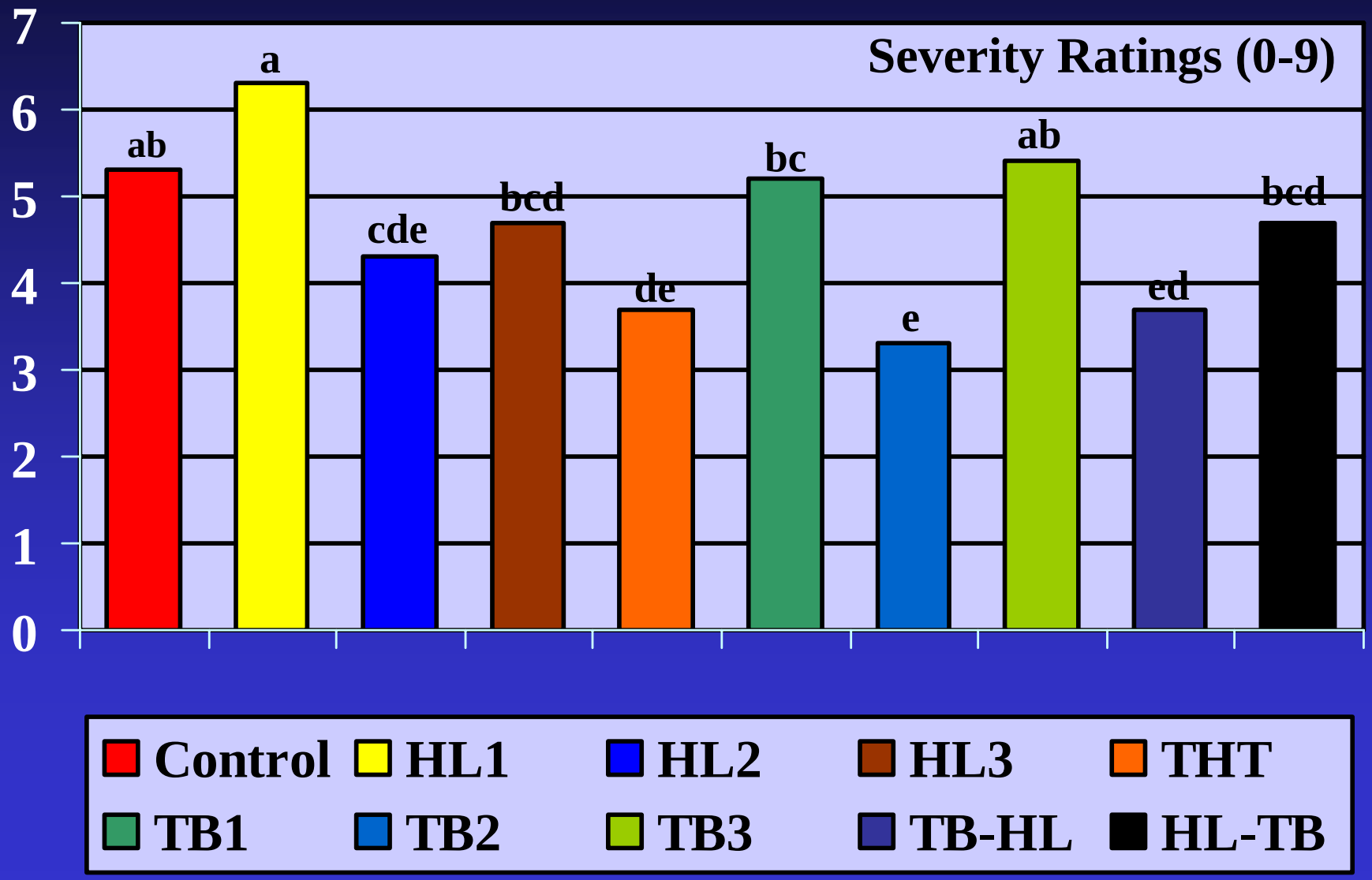


Sunflower Rust Fungicide Timing Evaluations – Disease Ratings (2009)



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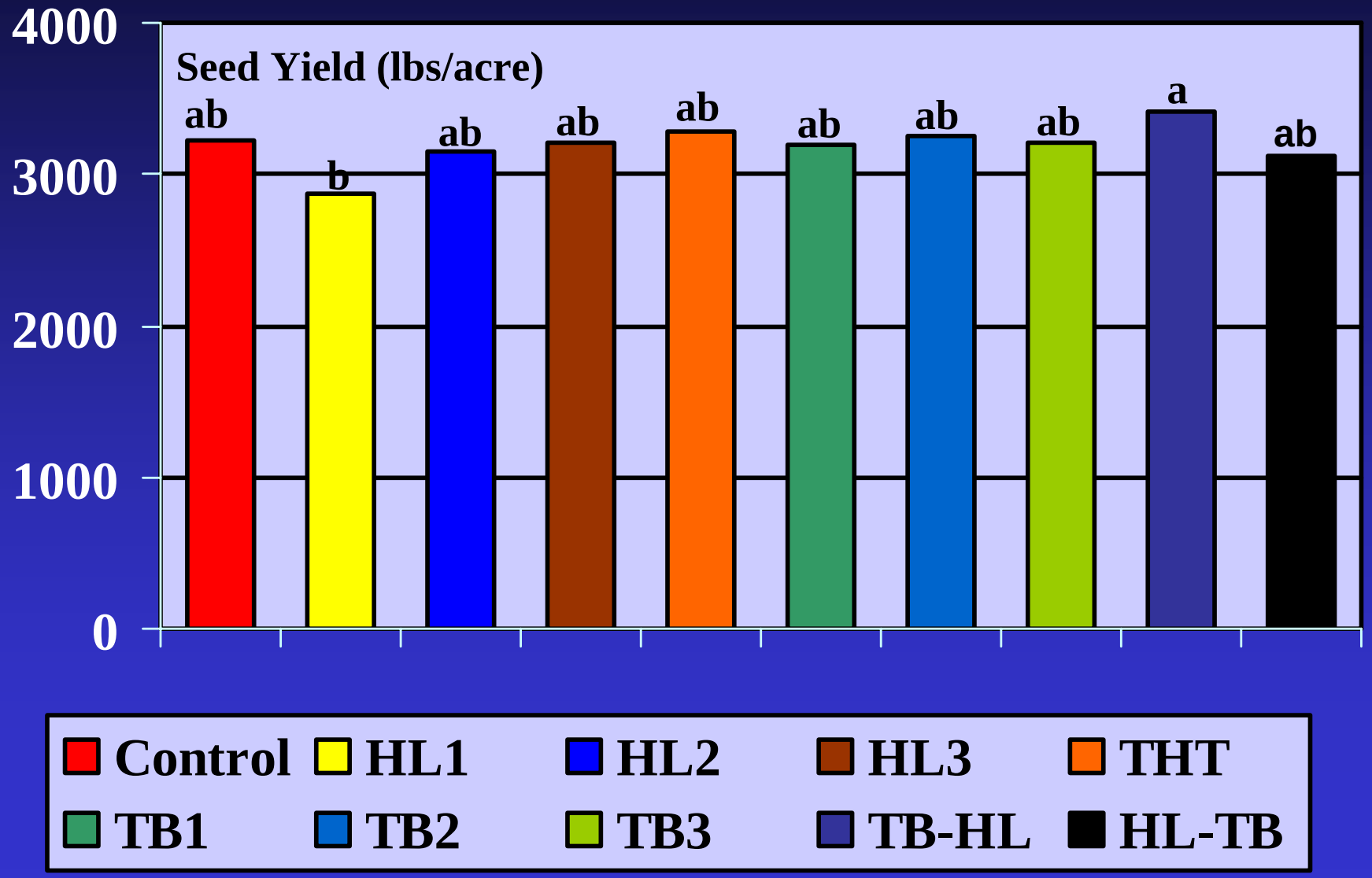
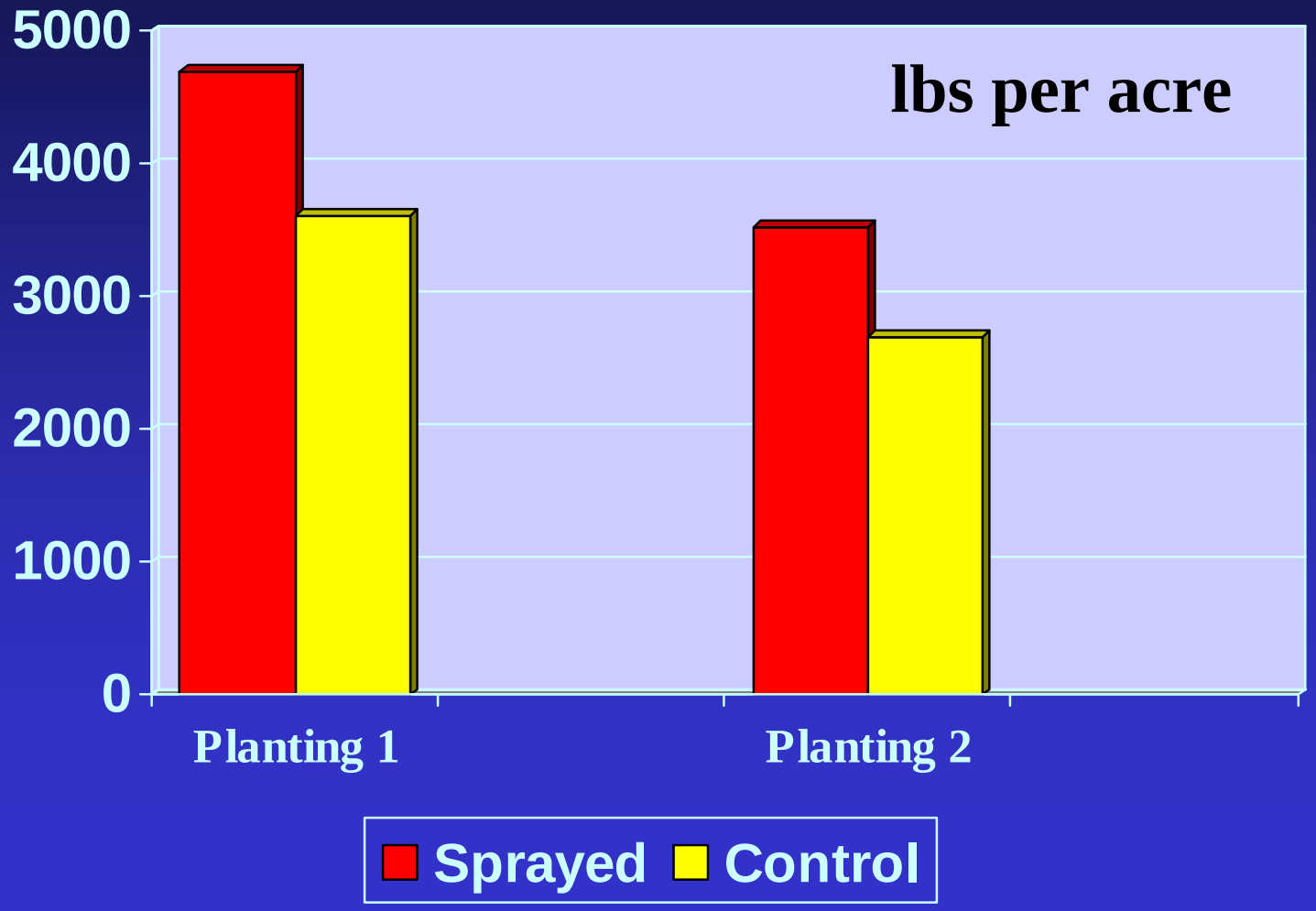


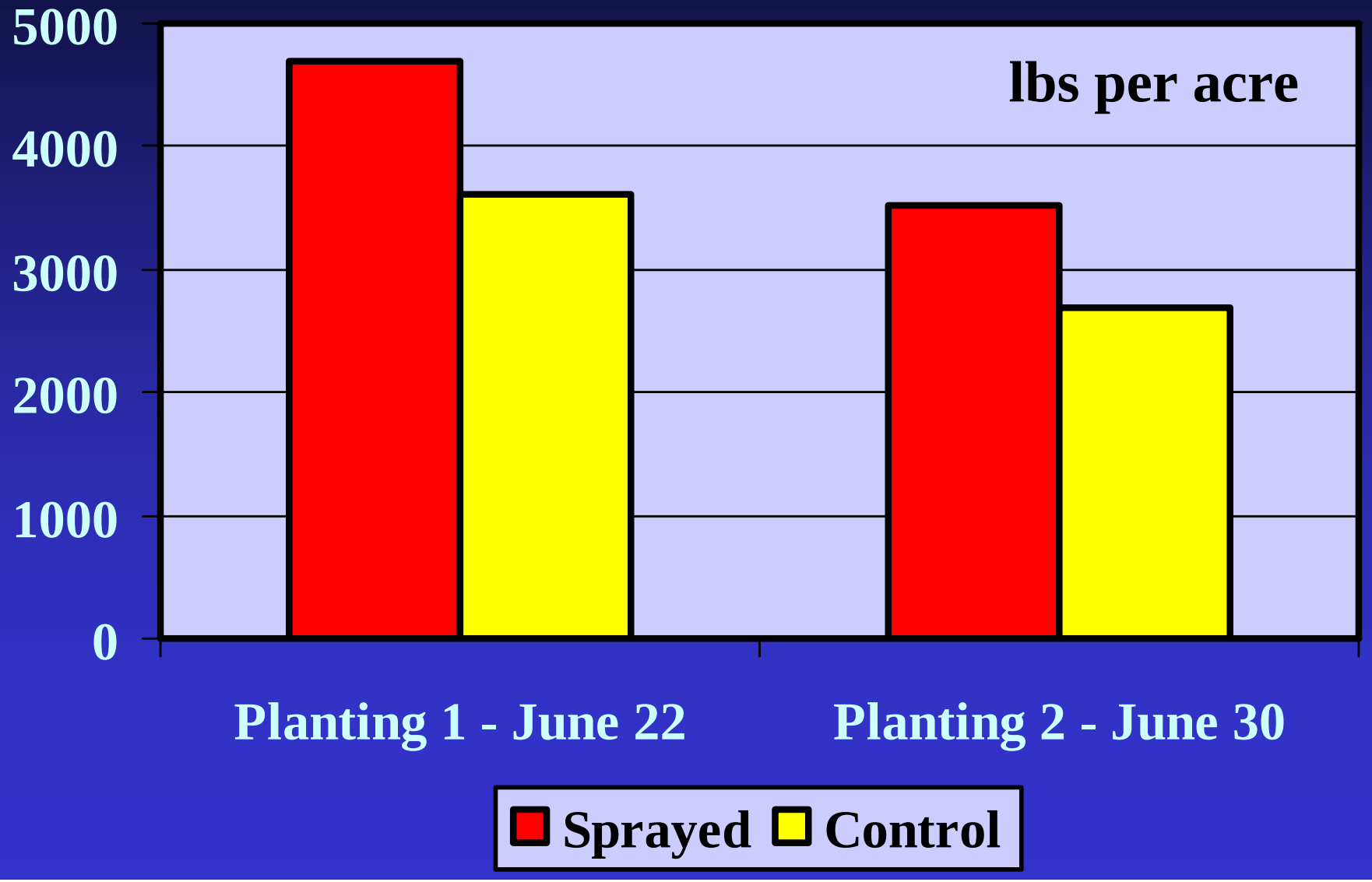
Rust Effects on Yield




June 8, 2009

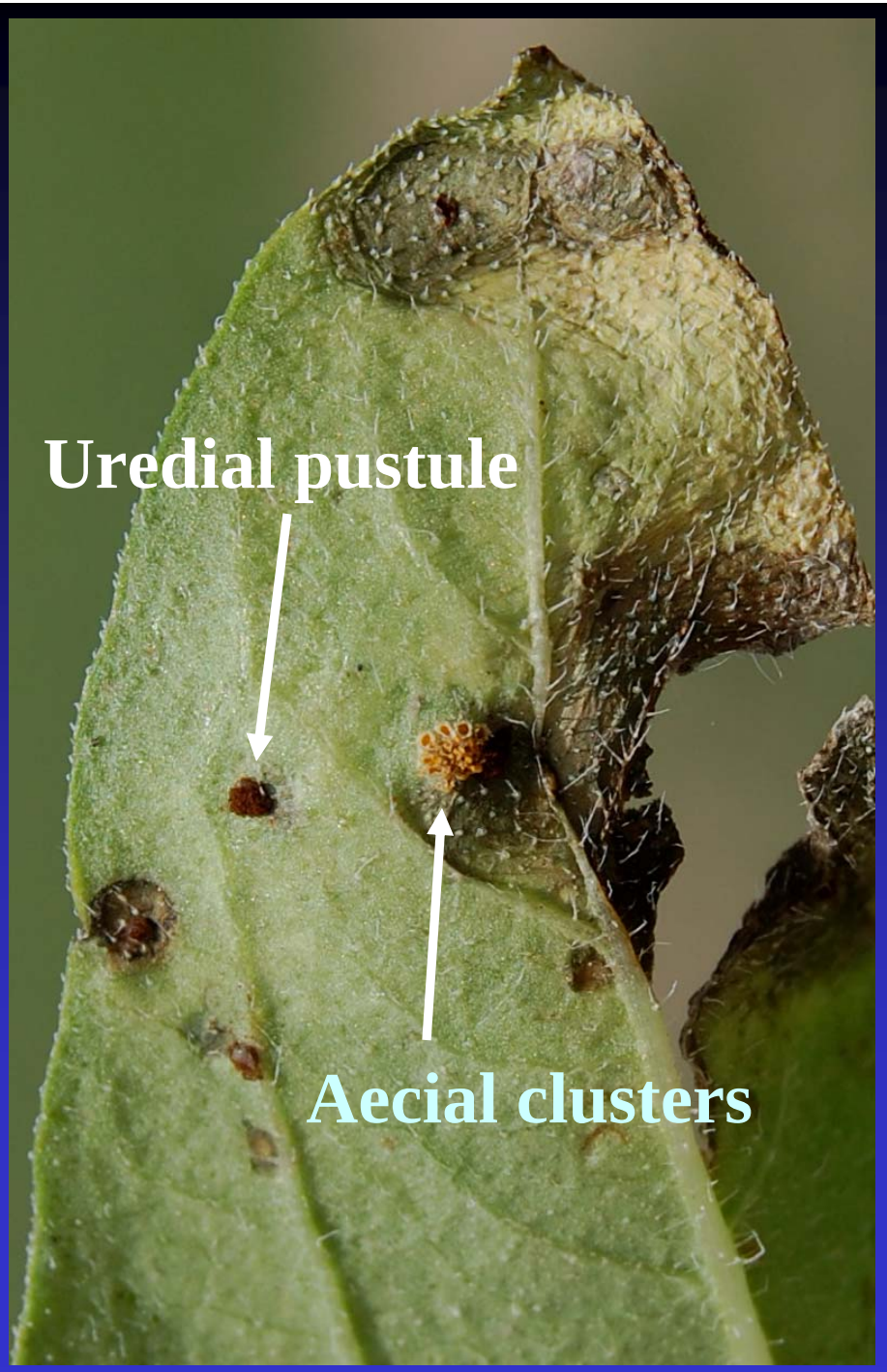

July 28, 2009

Rust Effects on Sunflower Yield



Future Studies

- Early stages have rarely been observed
- Survey for early spore stages again in 2010
- Forecasting mechanism for estimating fungicide application timings?
- Further investigate infection and yield loss in relation to time of infection (age of plants)



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