

Soil pH in Relation to Brown Stem Rot and Soybean Cyst Nematode

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Soybean Cyst Nematode (SCN)

- Damage caused by *Heterodera glycines*
- Often damage is not obvious
- Obvious symptoms
 - stunting
 - chlorosis
 - open canopy
 - greater weed pressure
- Control with SCN resistant varieties and crop rotation

Brown Stem Rot (BSR)

- Caused by the pathogen *Phialophora gregata*
- Symptoms appear mid August in WI
- Control with variety selection, crop rotation
- Symptoms include
 - internal stem discoloration
 - interveinal chlorosis and leaf curling

Soil pH: Definition and Implications

- Acidity (low pH) or alkalinity (high pH) characteristic of the soil
- Measured on a log scale
- Governs nutrient availability
- Governs biological activity

Soil pH

- ✓ Measure of alkalinity or acidity on a scale of 0 to 14:



0

Acidic

7

Neutral

14

Alkaline

- ✓ Measure of $[H^+]$ on soil particle surfaces and in soil solution

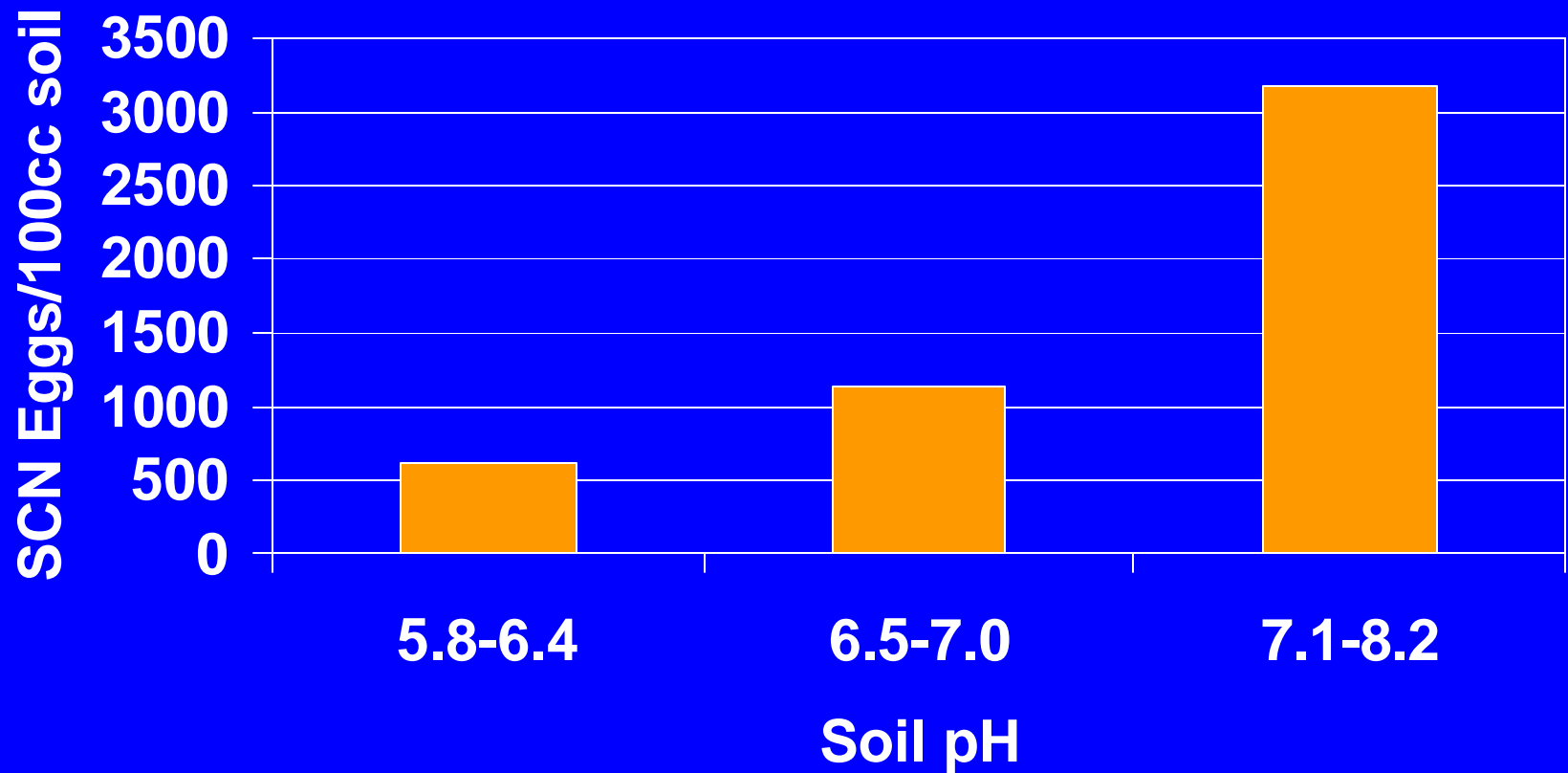
From Cornell:

www.cals.cornell.edu/dept/flori/growon/wph

Soybean Production in Wisconsin

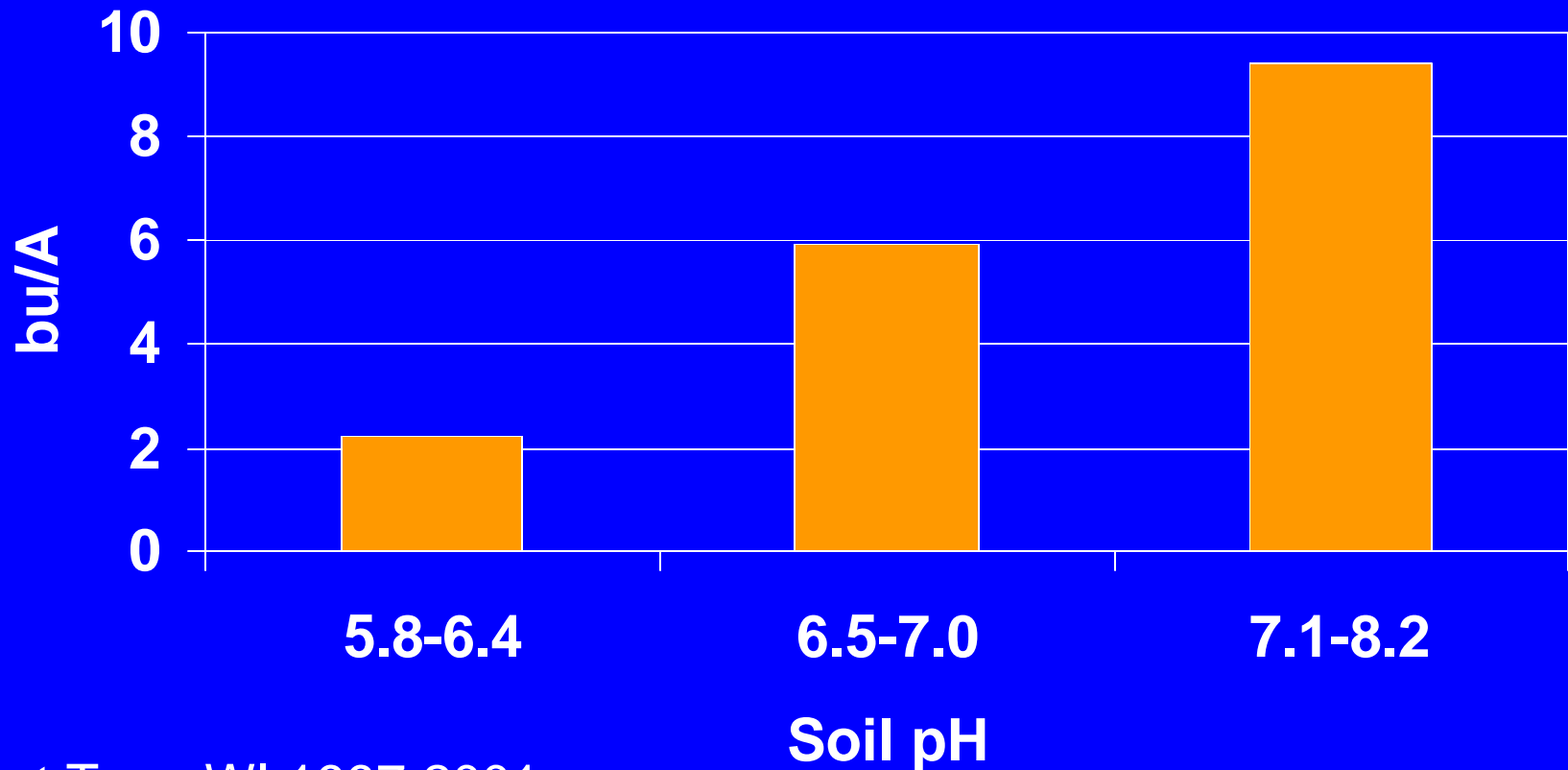
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- Yield potential is greatest at soil pH 7.0, beginning to decrease at pH of 8.0 due to low nutrient availability
 - Wide range of soil pH in Wisconsin
 - Observations of high SCN pressure in high pH; conversely, high BSR severity in low pH areas.

Initial SCN Population Increases as Soil pH Increases



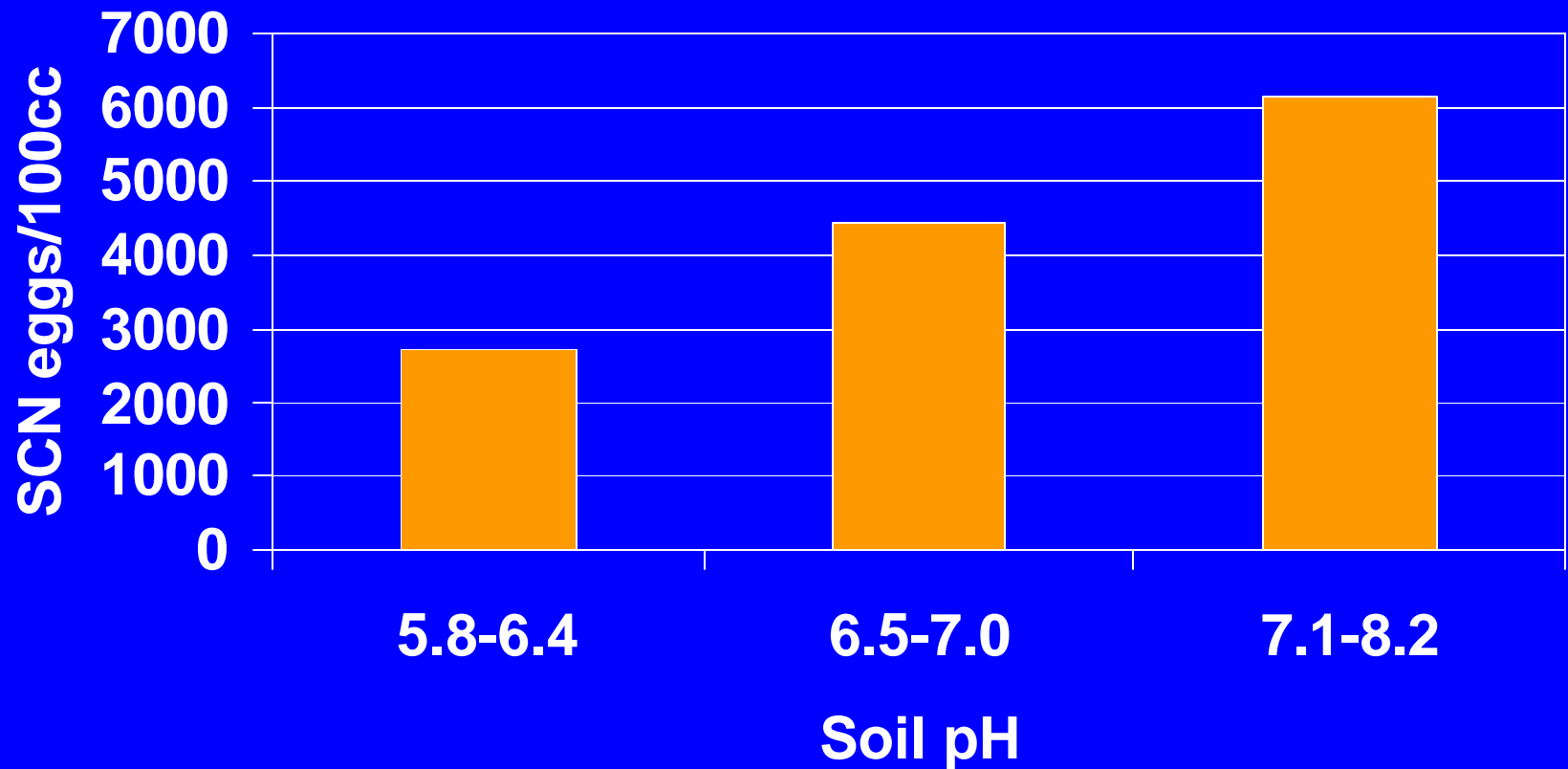
East Troy, WI 1997-2001

Soil pH Affects Yield Difference between SCN R and S Varieties



East Troy, WI 1997-2001

High Final SCN Population Densities are Associated with High Soil pH



East Troy, WI 1997-2001

Summary of SCN- Soil pH Interactions

High soil pH is associated with:

- High SCN initial population
- High SCN final population
- Greatest yield difference between SCN resistant and susceptible

Brown Stem Rot: Symptoms and Disease Ratings

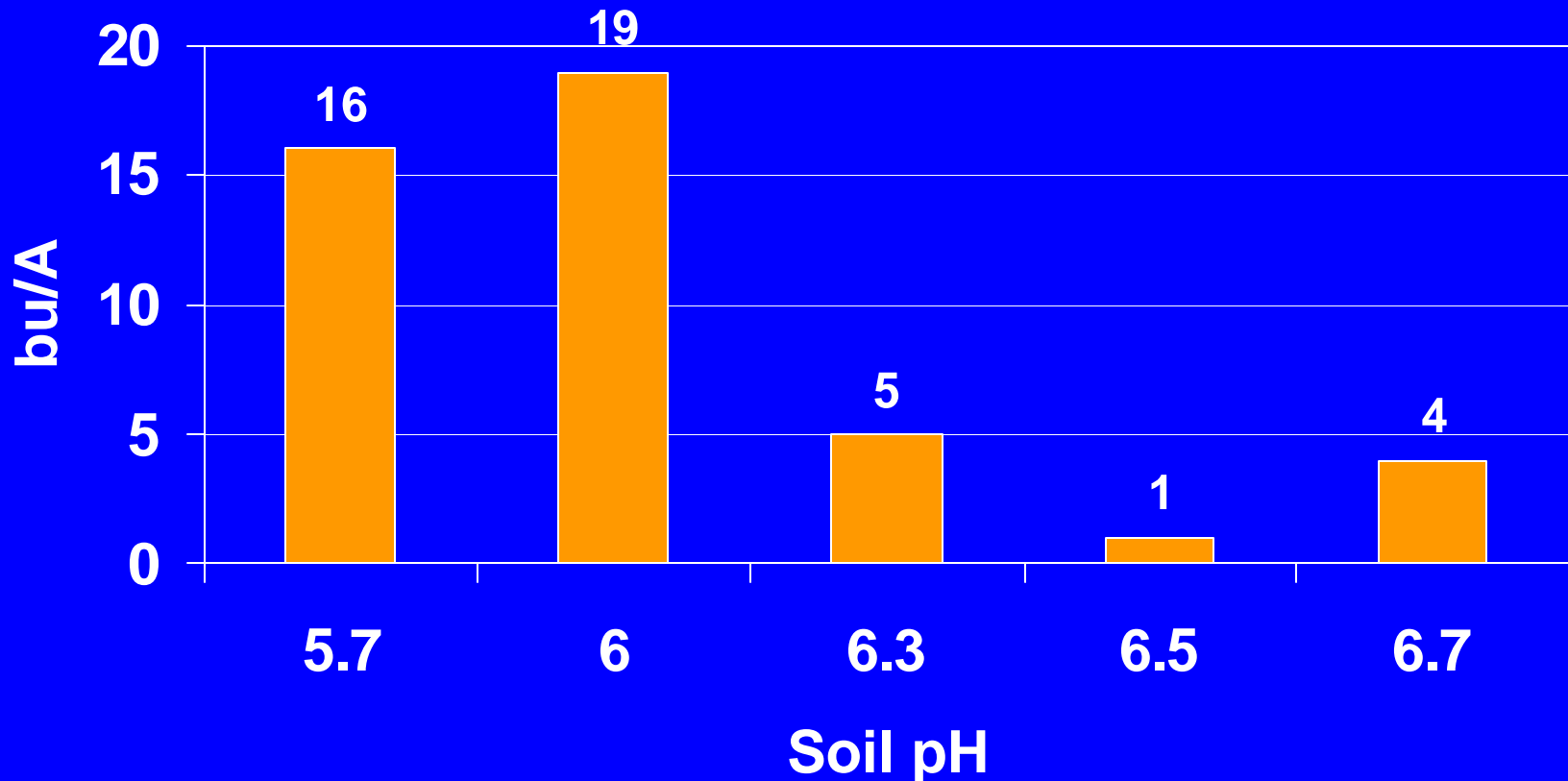


Stem- based
on % internal
discoloration



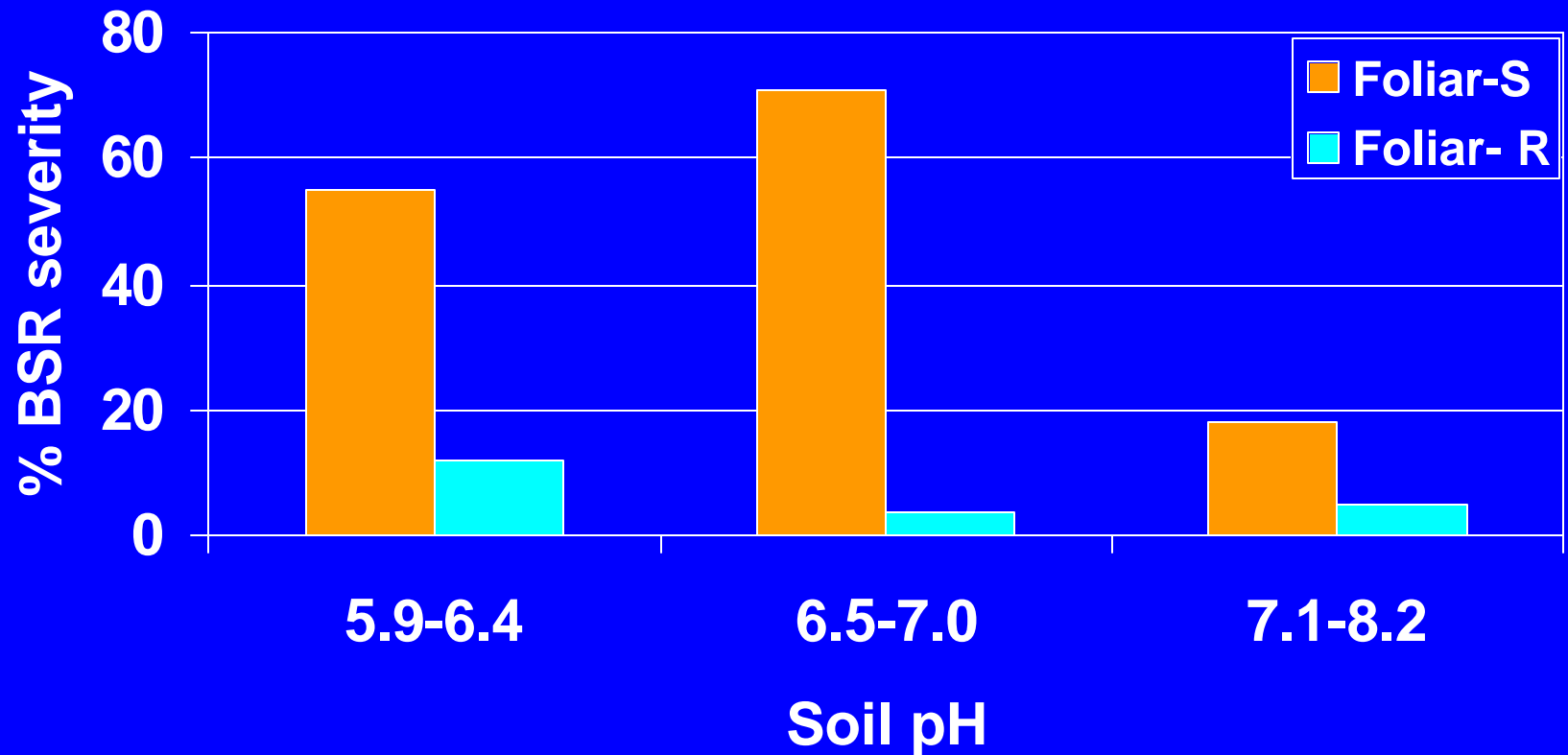
Foliar or Canopy-
based on % incidence
and severity

Yield Difference Between BSR R and BSR S Varieties is Greatest at Low Soil pH



Arlington ARS, 1992-1999

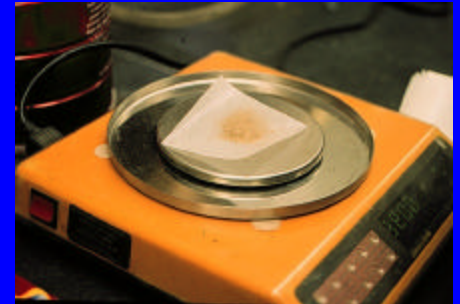
BSR Severity Decreases as Soil pH Increases

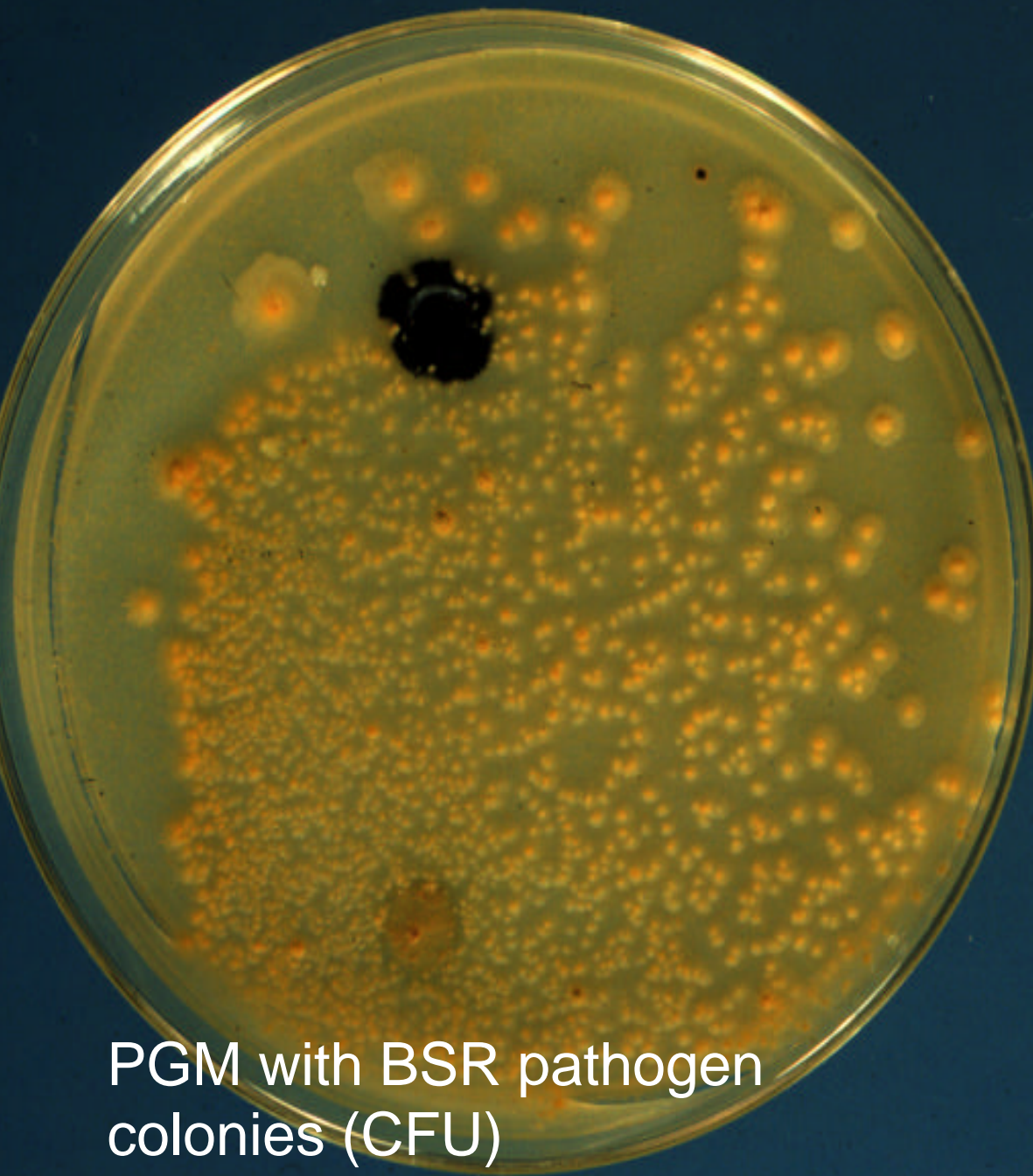


East Troy, WI 2001

Procedure to Assess Levels of the BSR Pathogen in Soybean Tissue

1. Grind stem or root tissue
2. Dilution plate ground material onto semi selective media (PGM)
3. Store plates at 12 C
4. After three weeks, count BSR pathogen (= colony forming units)



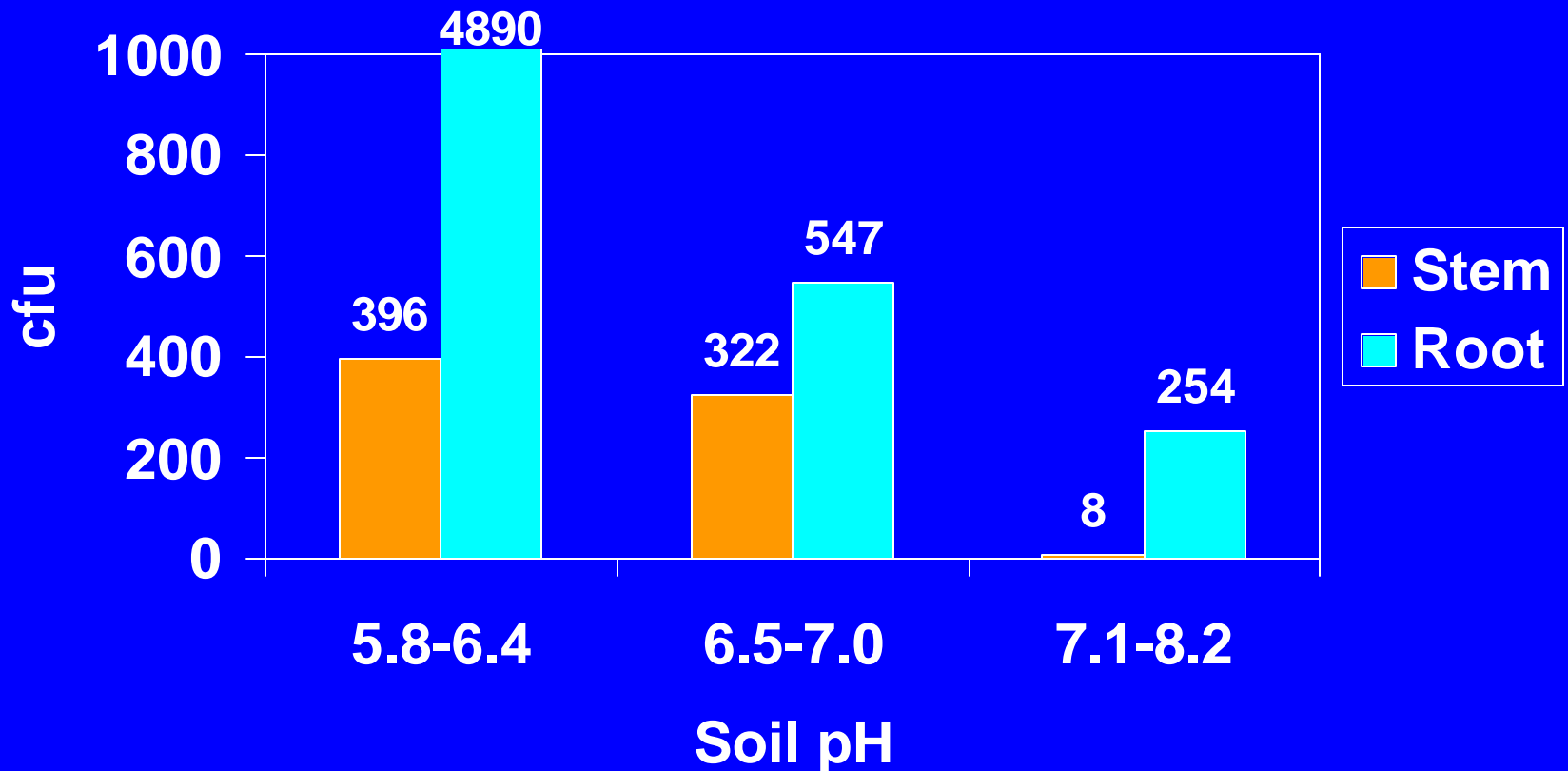


PGM with BSR pathogen
colonies (CFU)

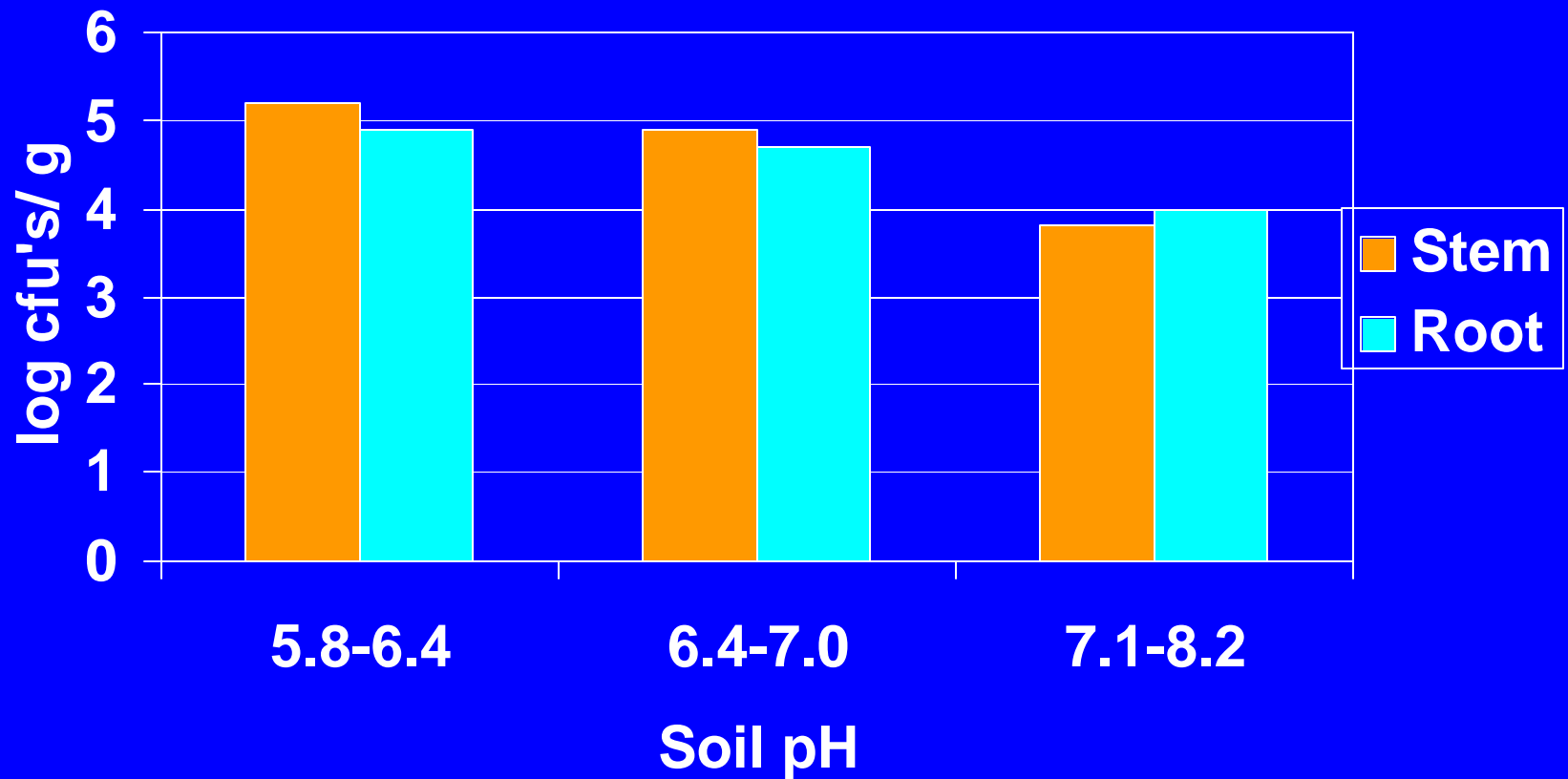


Individual colony
plated on non
selective medium

Population Density of BSR Pathogen Affected by Soil pH

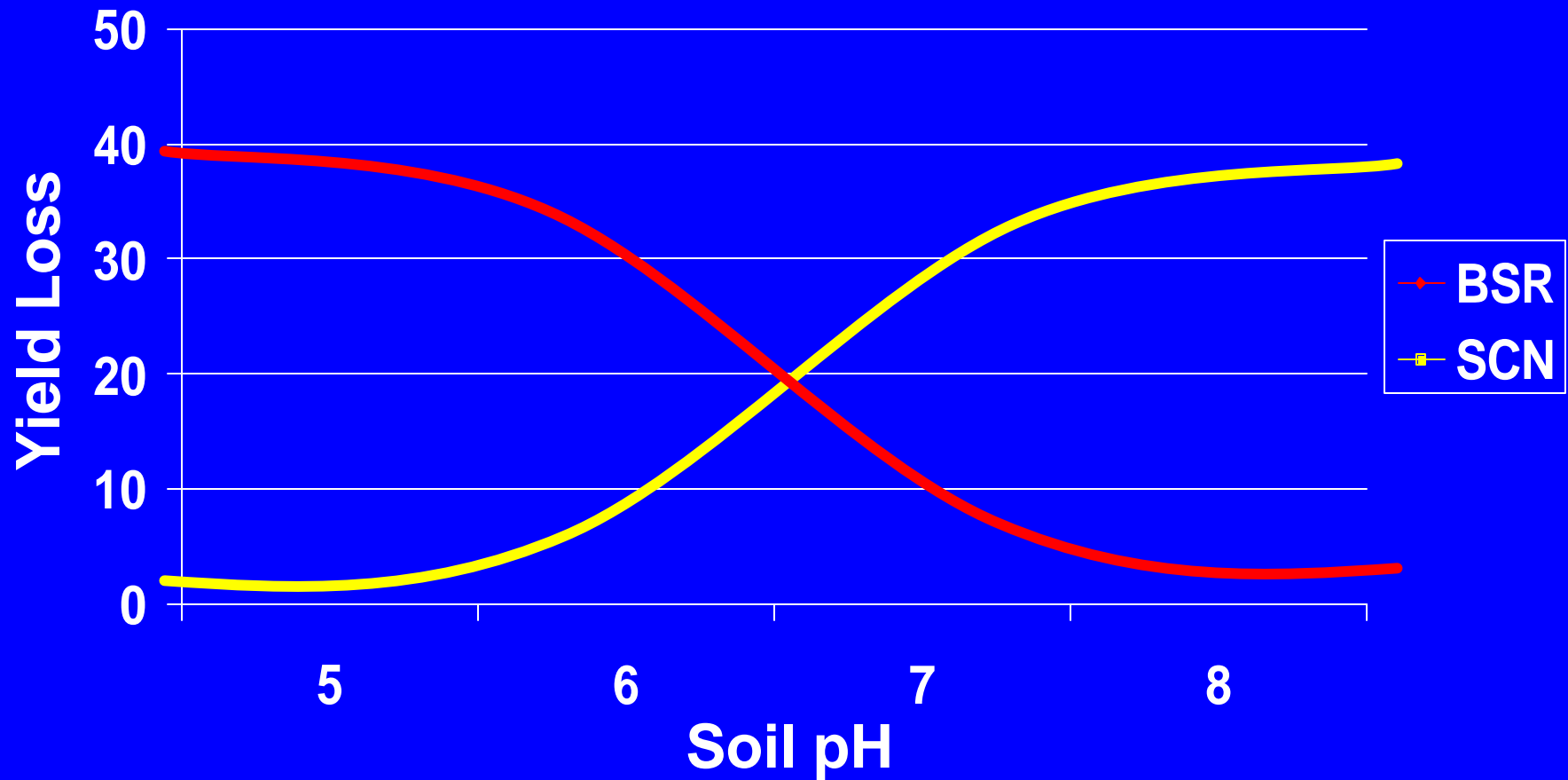


Lowest levels of the BSR Pathogen Were Associated with Highest Soil pH



East Troy, WI 2001

Theoretical Implications of Soil pH and Effect of SCN and BSR on Yield Loss



Implications of SCN and BSR Interactions-Management Strategies

- SCN Resistant Varieties-
Source of SCN resistance is critical
- Varieties derived from:
 - PI 88788: BSR Resistant
 - Peking: BSR Susceptible
 - Hartwig (Cyst X): BSR Susceptible, though not yet available in MG acceptable for WI

Summary



- Yield loss due to SCN is greatest at high soil pH



- Yield loss due to BSR is greatest at low soil pH

Summary

- Management Strategies
 - Determine soil pH
 - Soil sample for SCN
 - Chose appropriate rotation sequence
 - Chose appropriate variety



Resources

- Pest Management in Wisconsin Field Crops 2002 (A3646)
- Soybean Plant Health Website
 - www.plantpath.wisc.edu/soyhealth

Acknowledgements

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