Influence of K Deficiency on Soybean Aphid Populations in Wisconsin

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Background

Soybean Aphids first discovered in Wisconsin in 2000.

Production fields showed large numbers of aphids in areas showing symptoms associated with low potassium availability

Objective

Determine the effect of K deficiency on soybean aphid population dynamics and resulting soybean yields.

Methods

- Field experiments established at Arlington, WI
- 2001 and 2002
- Plots: 10’ x 24’
- Three K levels (high, med, low)
- Sprayed and unsprayed treatments at each K level.
- Total of 6 treatments

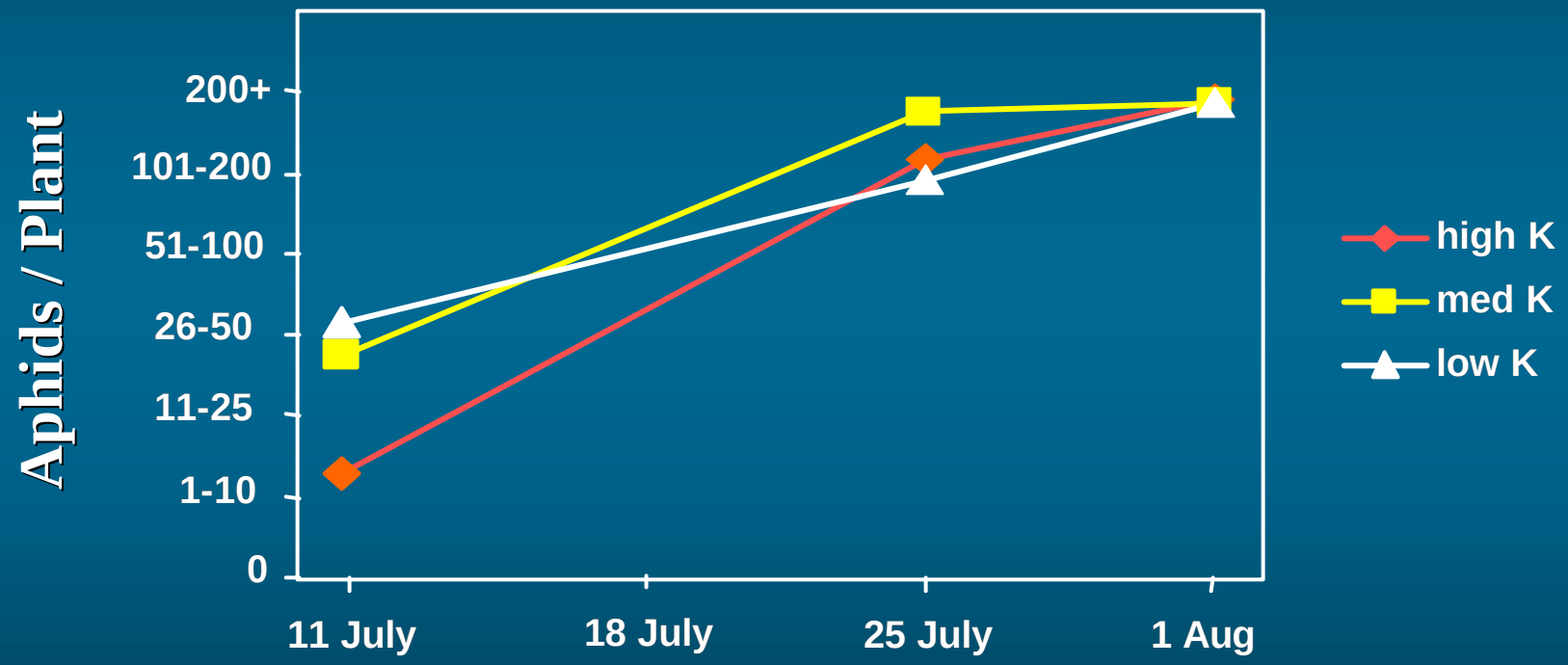
Methods cont.

- Aphid counts were taken from each plot
- 20 plants/plot in 2001 and 10 plants/plot in 2002
- Yields recorded at harvest time.

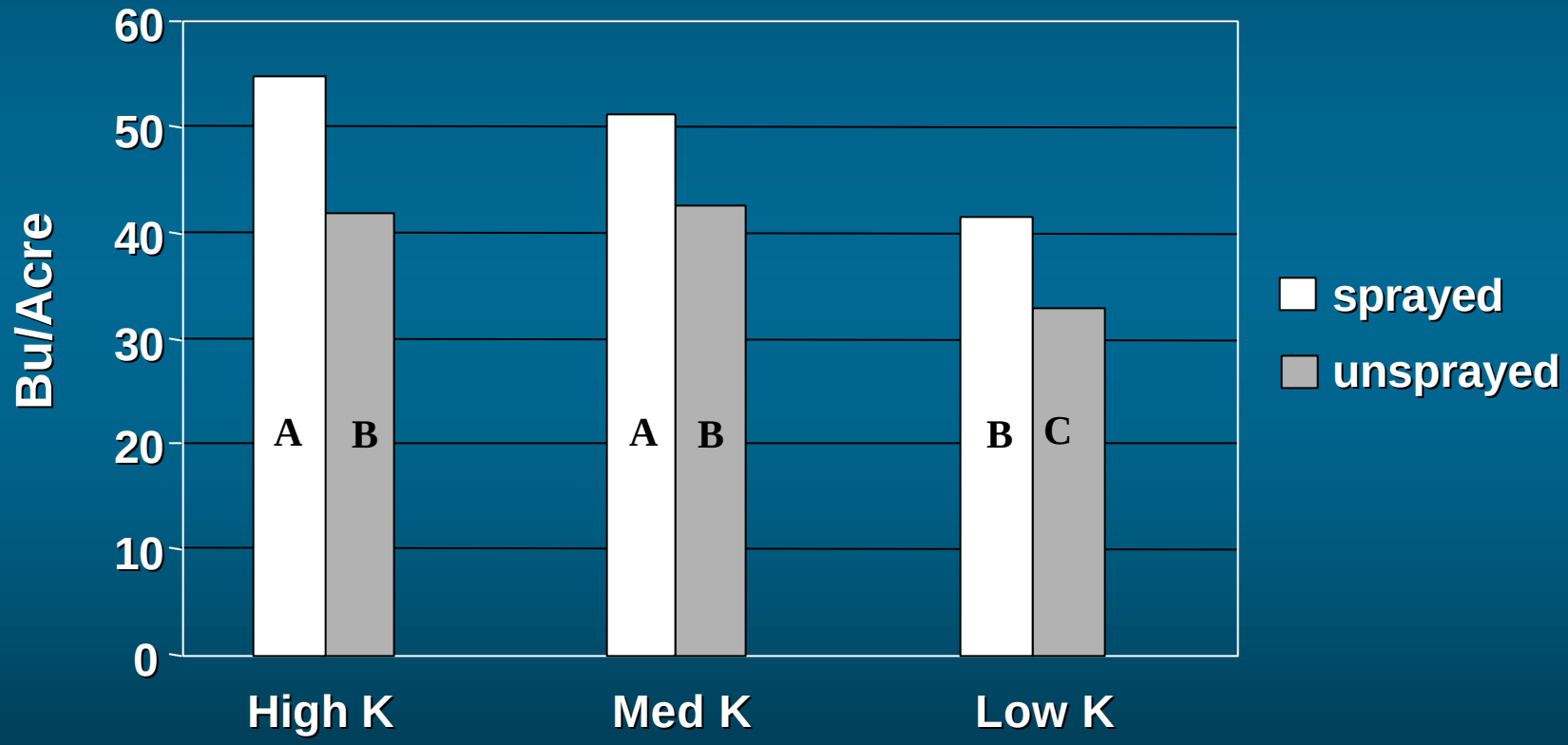
Potassium Levels (2 year average)

Treatment	Soil Avail K (ppm)	Leaf Tissue K (ppm)
“high” K	111.4 A	1.88 A
“med” K	93.5 B	1.58 B
“low” K	60.8 C	1.01 C

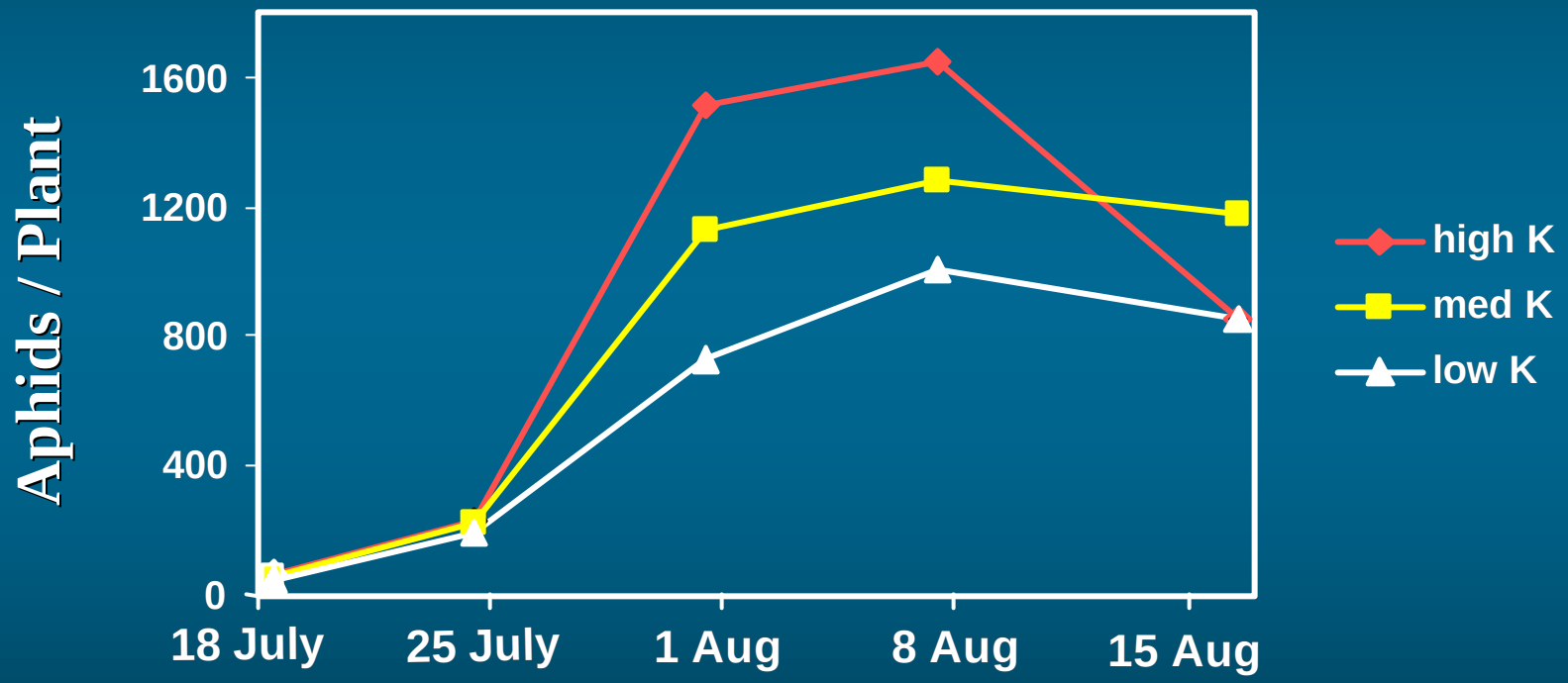
Whole Plant Aphid Counts: 2001 Data



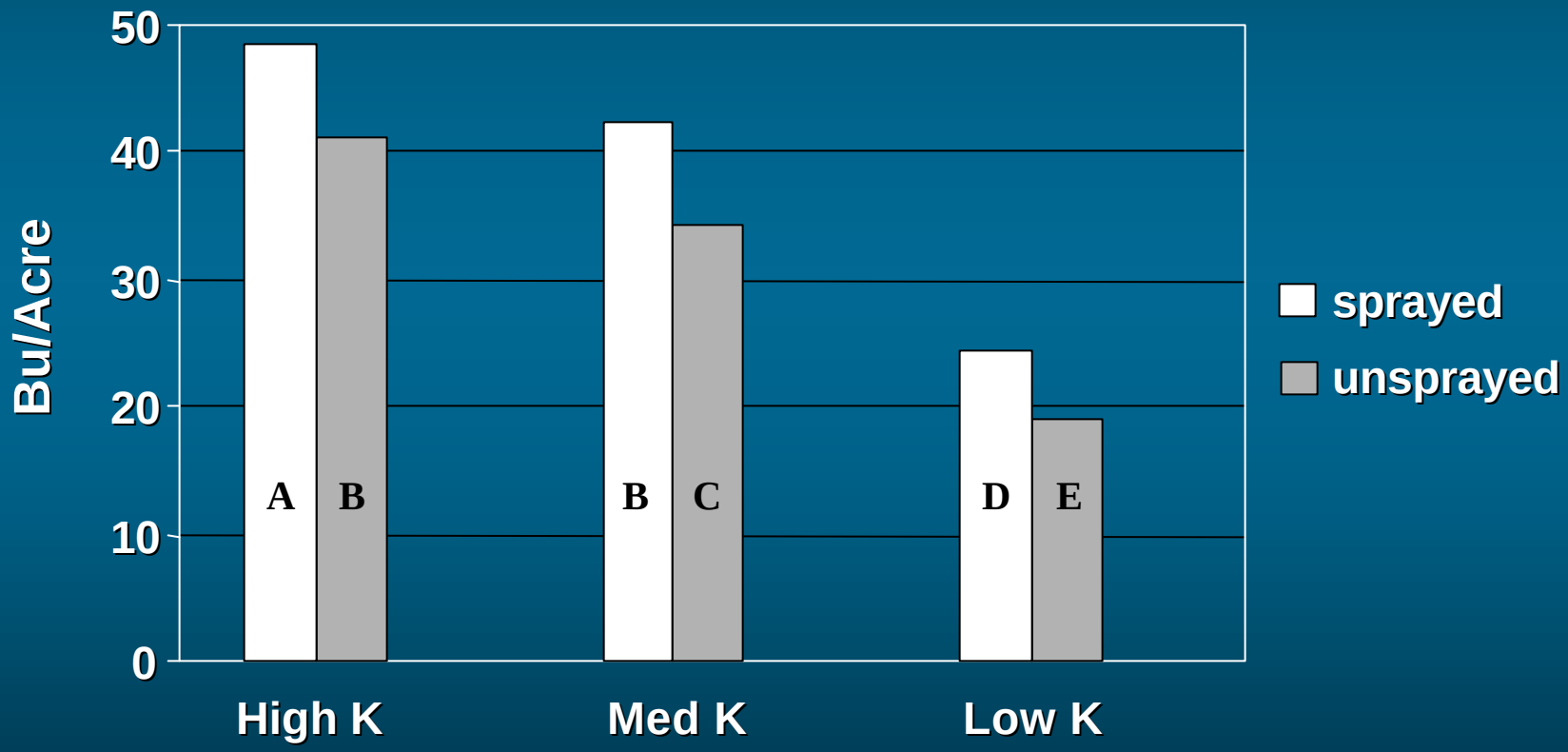
Soybean Yields for Aphid Infested and Non-infested Treatments at Three K Levels (2001 data)



Whole Plant Aphid Counts: 2002 Data



Soybean Yields for Aphid Infested and Non-infested Treatments at Three K Levels (2002 data)



% Yield Loss Resulting From Aphid Infestation (spray vs unsprayed)

Treatment	2001	2002
“high” K	24 %	15 %
“med” K	17 %	19 %
“low” K	21 %	23 %
Average	21 %	19 %

Summary

- Localized patches of K deficient soybeans may result promote high aphid populations.
- The combined effects of K deficiency and aphid feeding on yield are additive.

Life Table Study

Objectives: To determine the effect of K availability in leaf tissue on SBA survivorship, reproduction, and development.

Life Table Study

- Treatments:
  1) leaves showing K deficiency
  2) leaves appearing healthy
- 10 leaves per treatment
- 1 neonate (newborn) aphid per leaf
- Leaves taken from the field and placed into petri dishes in the lab
- Individual aphids were monitored for 30 days and number of offspring recorded

Life Table Statistics

Avg. Number of Offspring Produced per Individual Aphid

K Deficient	671.7	A
Healthy	490.0	B

(N=10, P = 0.003)

Life Table Summary

- **K deficient plants increased aphid fecundity in the laboratory.**

- **However, we do not know how this translates to aphid populations under field conditions.**

Conclusions

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- K deficient plants may harbor increased concentrations of free N in the plant sap or certain amino acids that are beneficial to aphid population growth.

- Maintaining ample K may serve to deter aphid outbreaks, and help avoid insecticide applications.