Sulfur Rate and Source Influences Soybean Productivity

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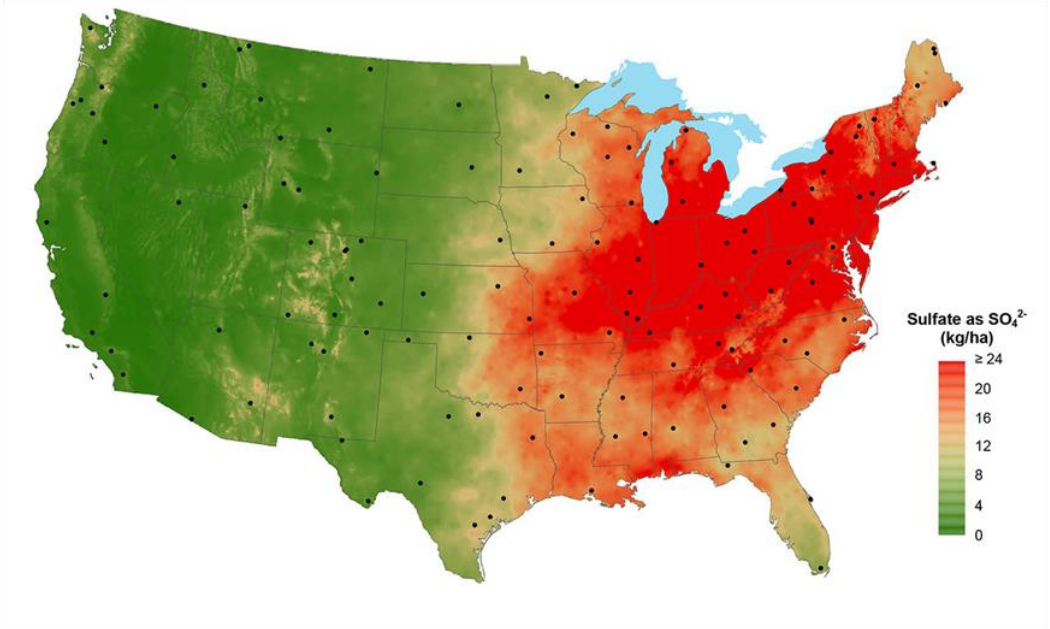
Why Sulfur?

1. Increasing crop yield (greater S requirement and removal)
2. Higher purity phosphate fertilizers
   = Less S
3. Decreased atmospheric deposition

Less Atmospheric Sulfur



1985 > 9 kg S ha^{-1} → **2021 < 2 kg S ha^{-1}**

Source: National Atmospheric Deposition Program/National Trends Network

Sulfur Fertilizer Sources

- AMS
- Tiger 90
- Gypsum
- Polyhalite
- MES15
- ATS

Fertilizer Sulfur Forms

Sulfate = Plant Available Form

Elemental = Requires Oxidation

Sulfur Fertilizer Needs

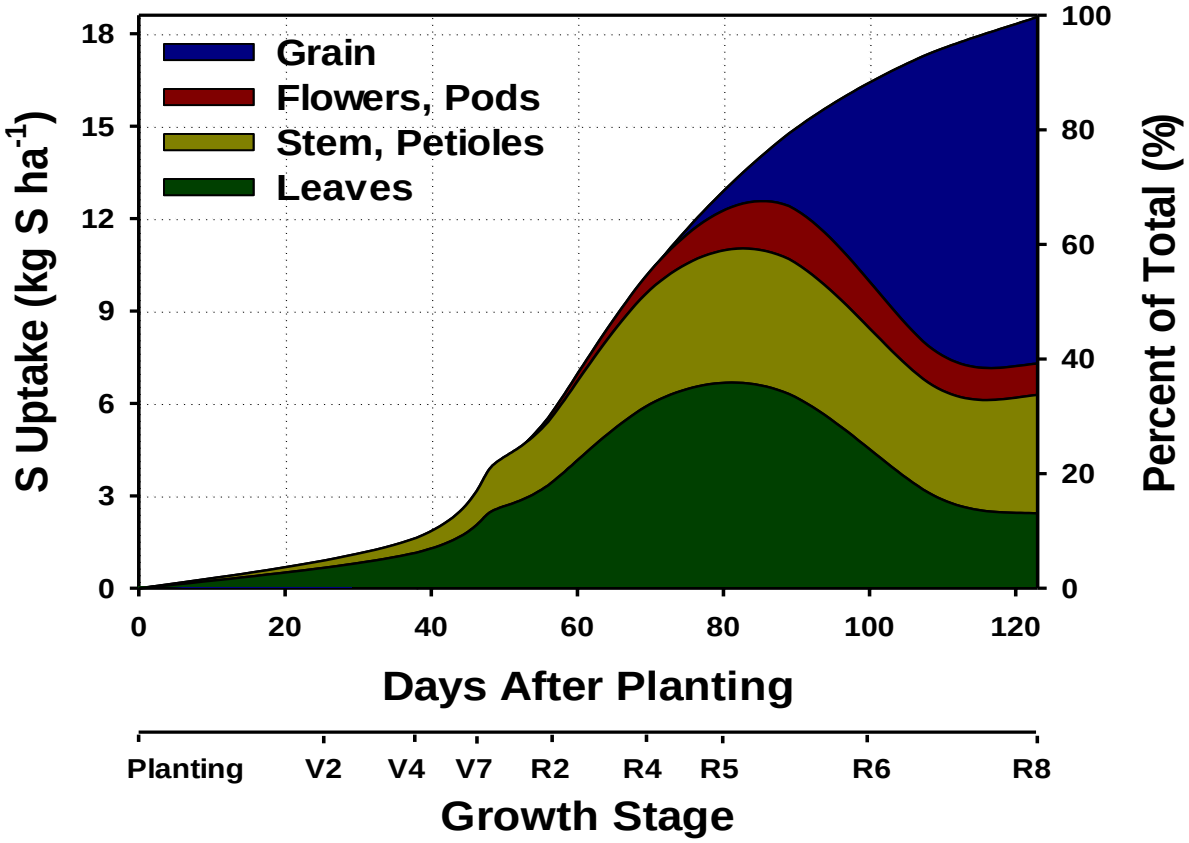
Soybean yield goal = 4.7 Mg ha^{-1}

Requirement = 26 kg S ha^{-1}

Removal = 15 kg S ha^{-1}

Soybean Sulfur Uptake

- Sulfur uptake of soybean is SEASON LONG
- ~60% of total sulfur taken up after R2



Bender et. al (2015)

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Objectives

1. Track Movement and Retention of Sulfur by Source and Rate in the 0-15 cm Profile

2. Evaluate Yield Response of Soybean to Different Fertilizer Sources of Sulfur

Experimental Approach

Fertilizer Source		Sulfur Rate
		kg ha^{-1}
Control		0
AMS	X	17
Tiger 90		34
AMS + Tiger 90		50
MES15		
MAP		0

MAP is balanced at 48 kg phosphorus ha^{-1} for MES 15 at 50 kg S ha^{-1}

All treatments balanced for N with Urea

Treatments were applied as a broadcast application on April 24th, 2025 before planting

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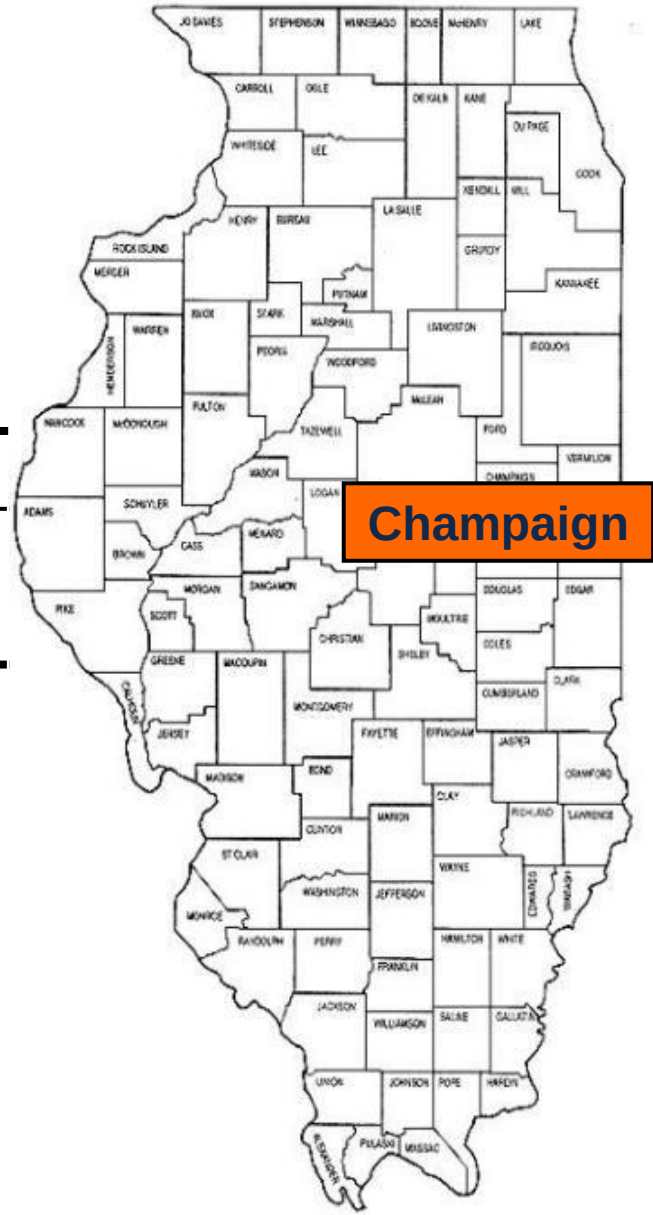
Trial Information at Champaign, Illinois

2025 Soil Test

OM†	CEC	pH	P‡	K	Ca	Mg	S	Zn	Mn	Fe	Cu	B
g kg^{-1}	meq/100g	unit	mg kg^{-1}									
36	15.9	6.5	30	95	2100	475	8	1.4	42	106	1.3	0.5

† OM, Organic Matter; CEC, Cation Exchange Capacity

‡ Mehlich-3 extraction



- Variety → GH3913XF
- Planting Date → April 24th, 2025
- Planting Rate → 312,000 plants ha^{-1}
- Study Design → RCBD with 5 Replications

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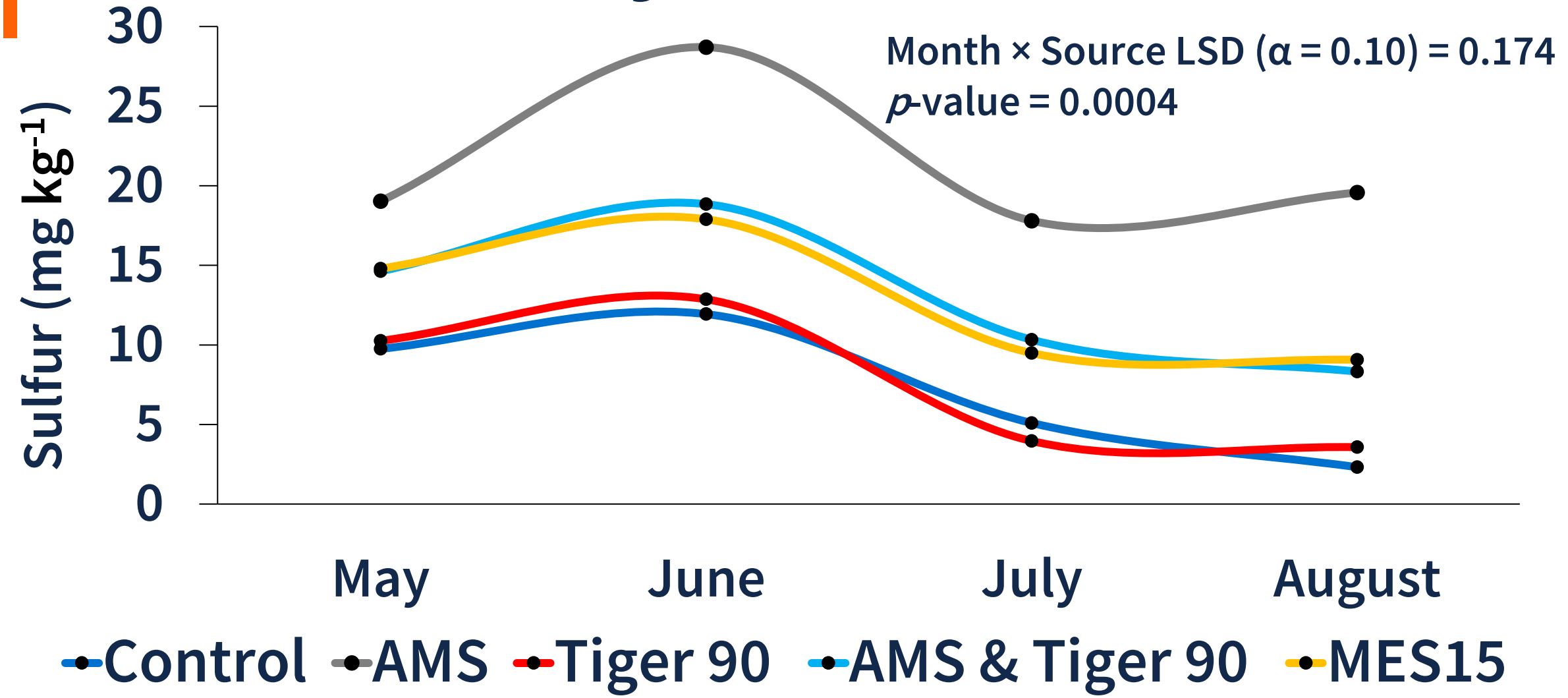
Data Collection

- Monthly soil samples from 0-15 cm depth (Control and High S Rates)
- Grain Yield
- Yield Components

2025 Monthly Soil Test Sulfur



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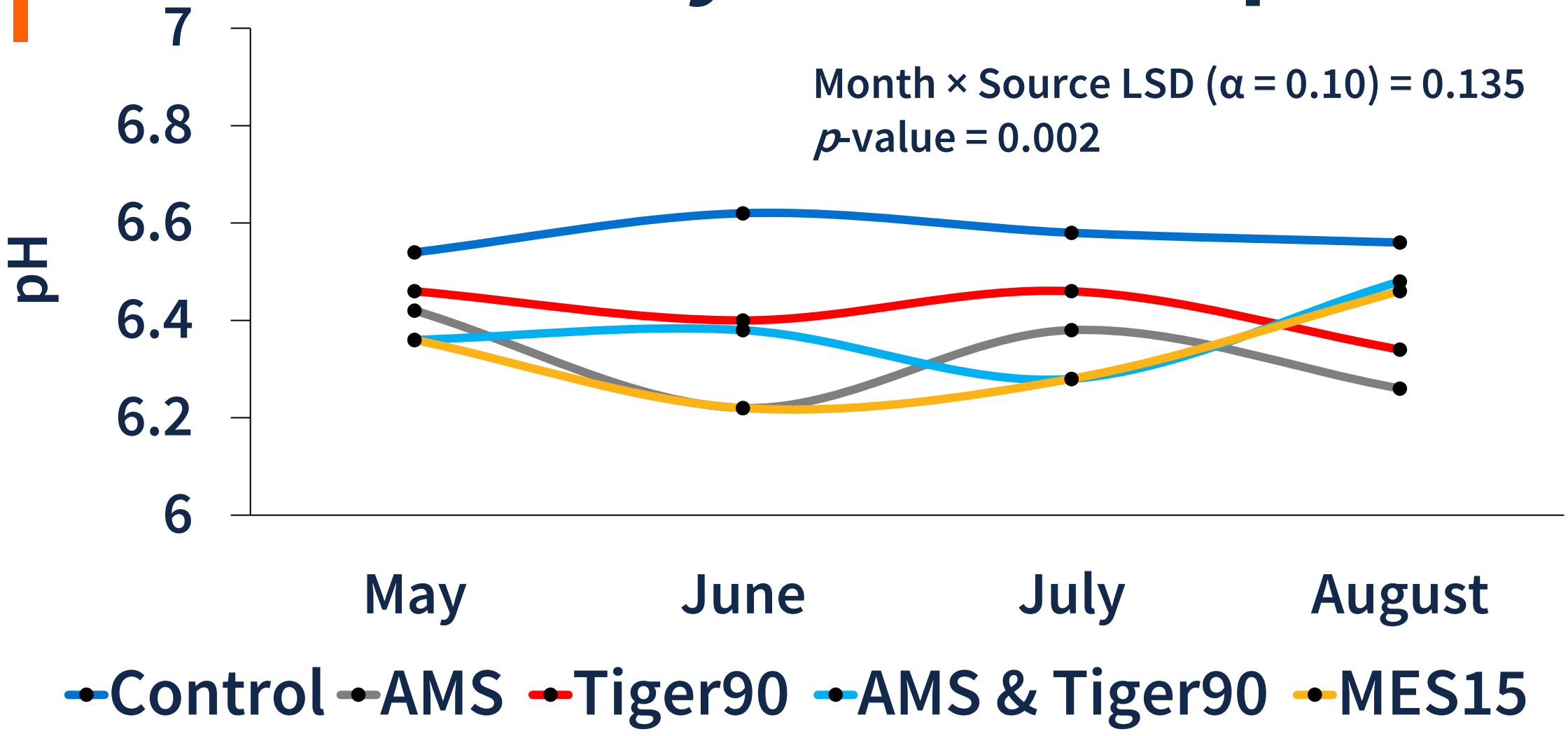
2025 Monthly Soil Test pH



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Soybean Grain Yield

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Treatment Effect on Soybean Grain Yield

Fertilizer Source	Sulfur Rate (kg ha^{-1})		
	17	34	50
	Mg ha^{-1}		
AMS	4.50	4.58	4.51
Tiger 90	4.51	4.71	4.49
AMS + Tiger 90	4.73	4.70	4.51
MES15	4.63	4.59	4.60

Control Yield = 4.42 **MAP = 4.53**

Grain yield expressed at 0% moisture; P-Value = 0.2803

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Soybean Yield Response to Sulfur

Fertilizer Source	Sulfur Rate (kg ha^{-1})		
	17	34	50
	kg ha^{-1}		
AMS	+ 80	+ 160	+ 90
Tiger 90	+ 90	+ 290*	+ 70
AMS + Tiger 90	+ 310*	+ 280*	+ 90
MES15	+ 210	+ 170	+ 180

Control Yield = 4.42

Grain yield expressed at 0% moisture; P-Value = 0.2803

* Indicates a significant difference from the Control Yield using a paired T-test at the 0.1 significance level

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Yield Response to Source Averaged by Rate

Source	Yield
	Mg ha^{-1}
AMS	4.53
Tiger 90	4.61
AMS + Tiger 90	4.65
MES15	4.61
LSD (α = 0.10)	NS
P-Value	0.34

Control Yield = 4.42

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Yield Response to Rate Averaged by Source

Rate	Yield
kg S ha^{-1}	Mg ha^{-1}
17	4.63
34	4.64
50	4.53
LSD (α = 0.10)	0.095
P-Value	0.098

No difference

Δ -110 kg ha^{-1}

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Key Takeaways

- Optimal rate was 17 kg S ha^{-1} this year
- AMS had the highest soil S availability
- The blended fertilizer sources had the highest yield

Next Steps

- Continue monthly soil samplings and analysis
- Evaluate second year response of residual sulfur on corn
- Assess which crop has greater 1st year (applied S) response or better 2nd year (residual S) response

Thank You!

More Information Available at:

Crop Physiology Laboratory

University of Illinois

http://cropphysiology.cropsci.illinois.edu

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