Increased Phosphate Fertilizer Efficiency with Crystal Green® Granular Fertilizer and a Liquid Starter

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Importance of Using a Phosphate Starter Fertilizer

- Phosphorus nutrition is very important for early root development and plant growth.
- Proper P nutrition is required for:
  - cell division and enlargement
  - energy transfer in biological work - photosynthesis
  - reproduction and transfer of heredity traits
  - timely plant maturity
  - high yielding crops
- No other element can substitute for P in plant nutrition
- P nutrition can be a challenge in cold soils – not very available

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Liquid phosphate fertilizer is a perfect start for your crop

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But what happens to phosphate the rest of the season?

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The Phosphate Challenge

- **Up to 90% of conventional applied phosphate is not available to crops during the growing season.**
  - Soil Fixation/Antagonistic Cations
  - Soil Erosion/Runoff removes P
  - Leaching

- **Inefficient phosphates lead to excess nutrient loss and cause harmful environmental degradation.**

Conventional phosphate fertilizers are very inefficient

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Inefficient phosphate sources are preventing yield potential and impacting the environment.

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Why Focus on Phosphate for Higher Crop Yields?

- **Increasing plant populations results in plants with smaller root systems.**
- **Soil test values might not be calibrated for the yield potential of modern hybrids.**
- **Soil P availability is low, while crops require season-long availability.**
- **Improving P efficiency/reduce environmental losses.**

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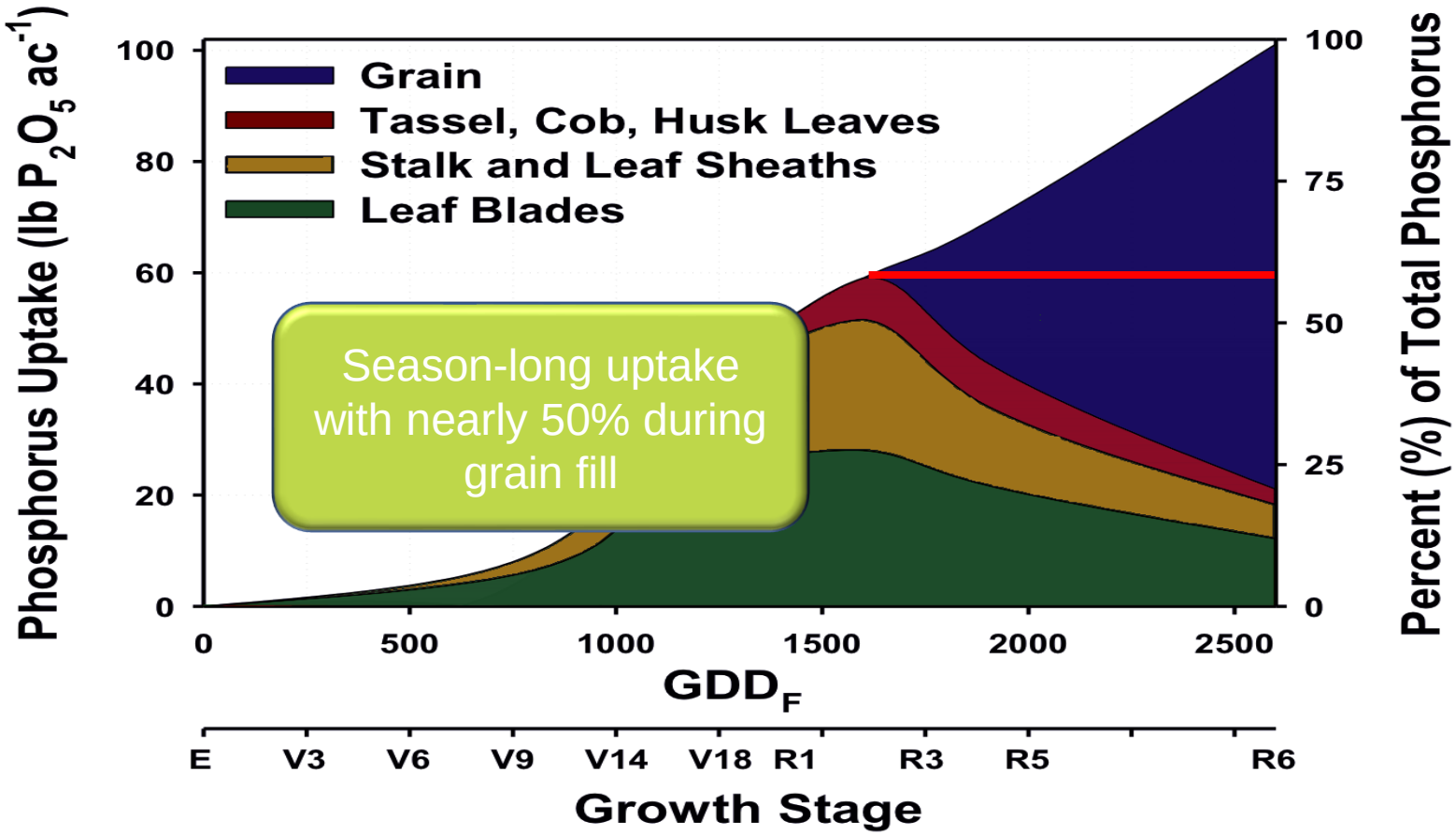
P Availability is Critical for High Yielding Corn

P Uptake & Partitioning for 230 Bushel Corn



Average of 6 hybrids in Champaign and DeKalb IL in 2010

Agron. J. 105:161-170 (2013)

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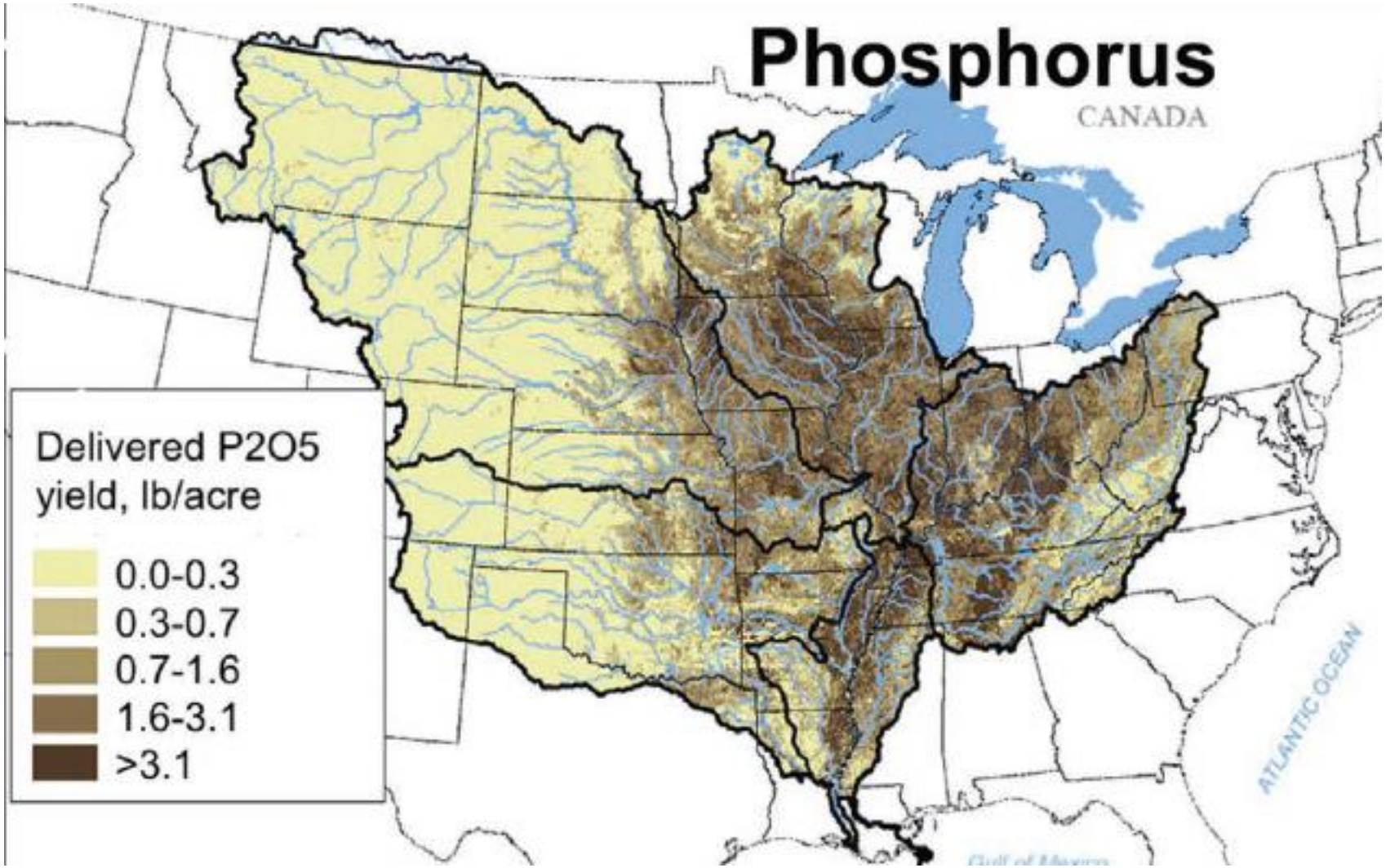
Delivered Phosphorus yield per acre to the Mississippi Watershed



Bruulsema, 2022

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Table 2. Total annual phosphorus load and yields, delivered to the Gulf of Mexico, for the four states contributing the largest loads and the entire Mississippi River watershed. Percentage attributed to each source by the SPARROW model calibrated for 2012 inputs and loads (Robertson & Saad, 2021)

Area	Delivered P load	Delivered yield	Source distribution			
			Urban	Fertilizers	Manures	Natural losses
	thousand tons P_2O_5 equivalent	lb P_2O_5 per watershed acre	%			
Illinois	61	4.2	32	46	7	16
Kentucky	52	5.1	14	29	15	42
Iowa	50	3.5	13	47	25	16
Missouri	46	2.6	20	41	24	16
Mississippi River watershed	490	1.6	21	38	18	23

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Over 50% of the P_2O_5 load is from agriculture!

Bruulsema, 2022

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The need for a more efficient phosphate is critical for the future of agriculture and the environment.

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Introducing Crystal Green® Phosphate Fertilizers

- Maximize Phosphate Efficiency
- Remains Plant Available All Season
- Reduced environmental loss to soil fixation, runoff and leaching.
- Soil incorporation keeps it from moving off-site but still plant available
- Stay where you put it-be there when you need it
- Compatible with other crop nutrients
- Recognized by the 4R Nutrient Stewardship program

Crystal Green	Crystal Green Synchro™ 50
5-28-0 with 10% Mg	8-40-0 with 5% Mg
The most efficient granular phosphate fertilizer on the market. Can be blended in various ratios with ammonium phosphate or applied directly	A fully homogeneous granular phosphate fertilizer containing Crystal Green that eliminates the need for blending with ammonium phosphate fertilizer.

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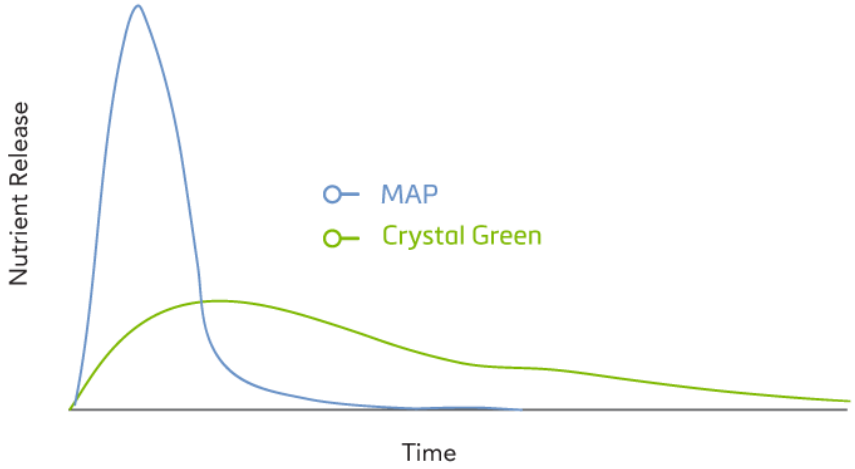
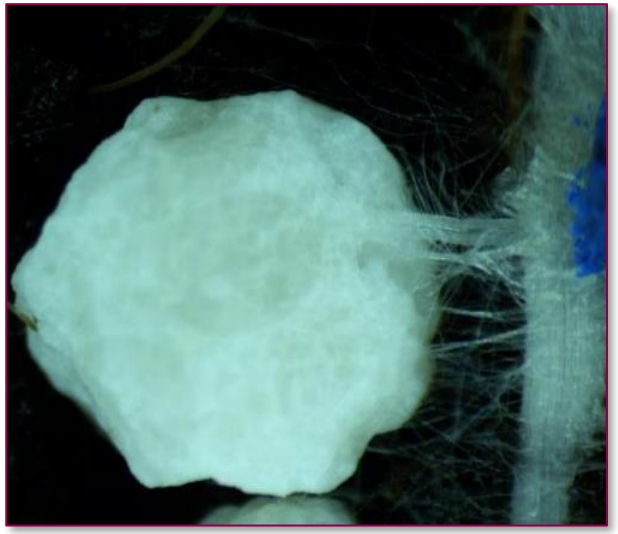
How Crystal Green Works

- Crystal Green phosphate granules solubilize as roots exude organic acids.
- Roots take up nutrients as they need them to promote crop growth and development.
- Remains available all season to meet crop demand.





Roots Mining a Crystal Green Granule

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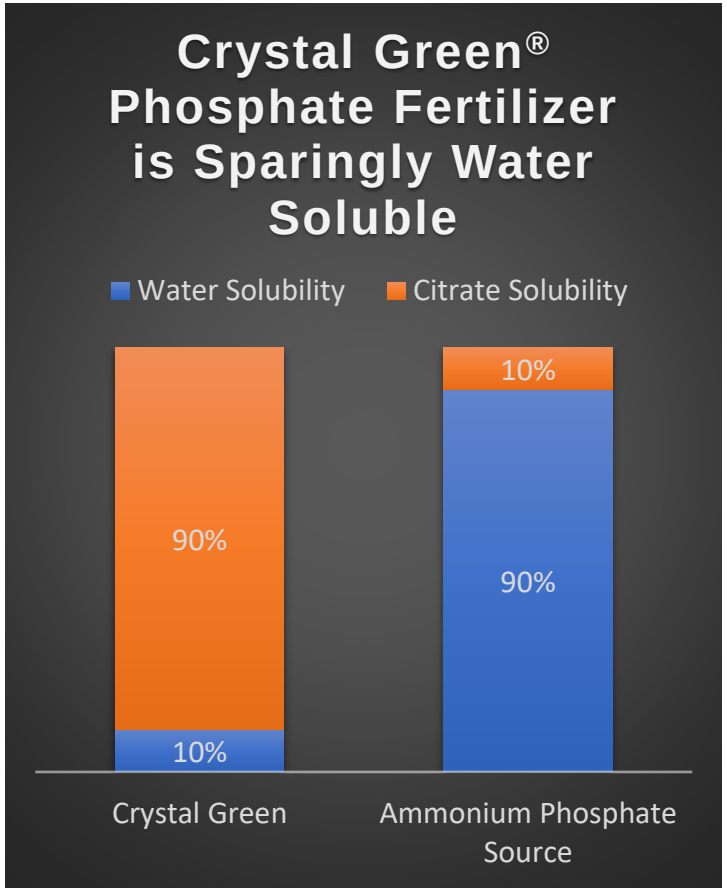
The Solubility of Crystal Green



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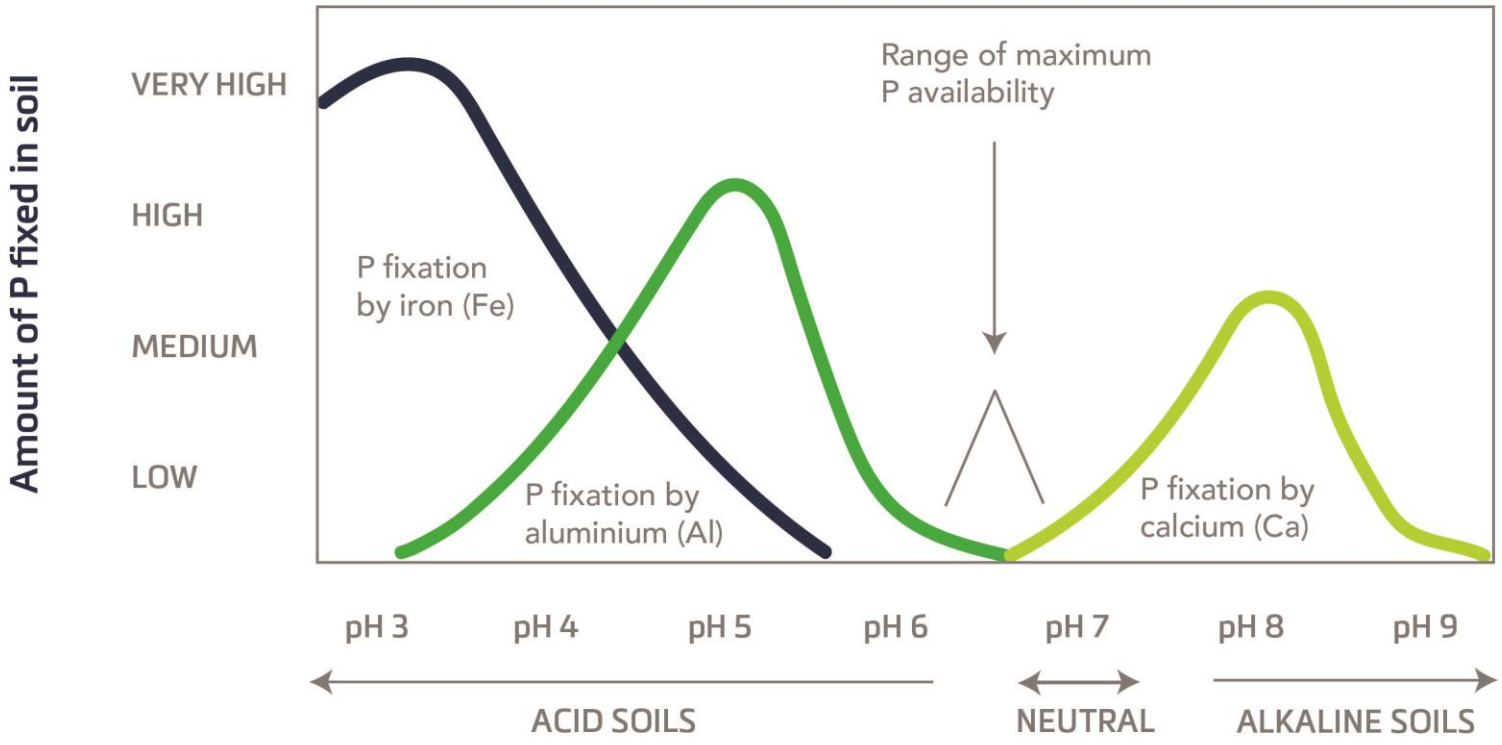
Prevent Soil P Tie-Up

Crystal Green remains plant available in all pH ranges.



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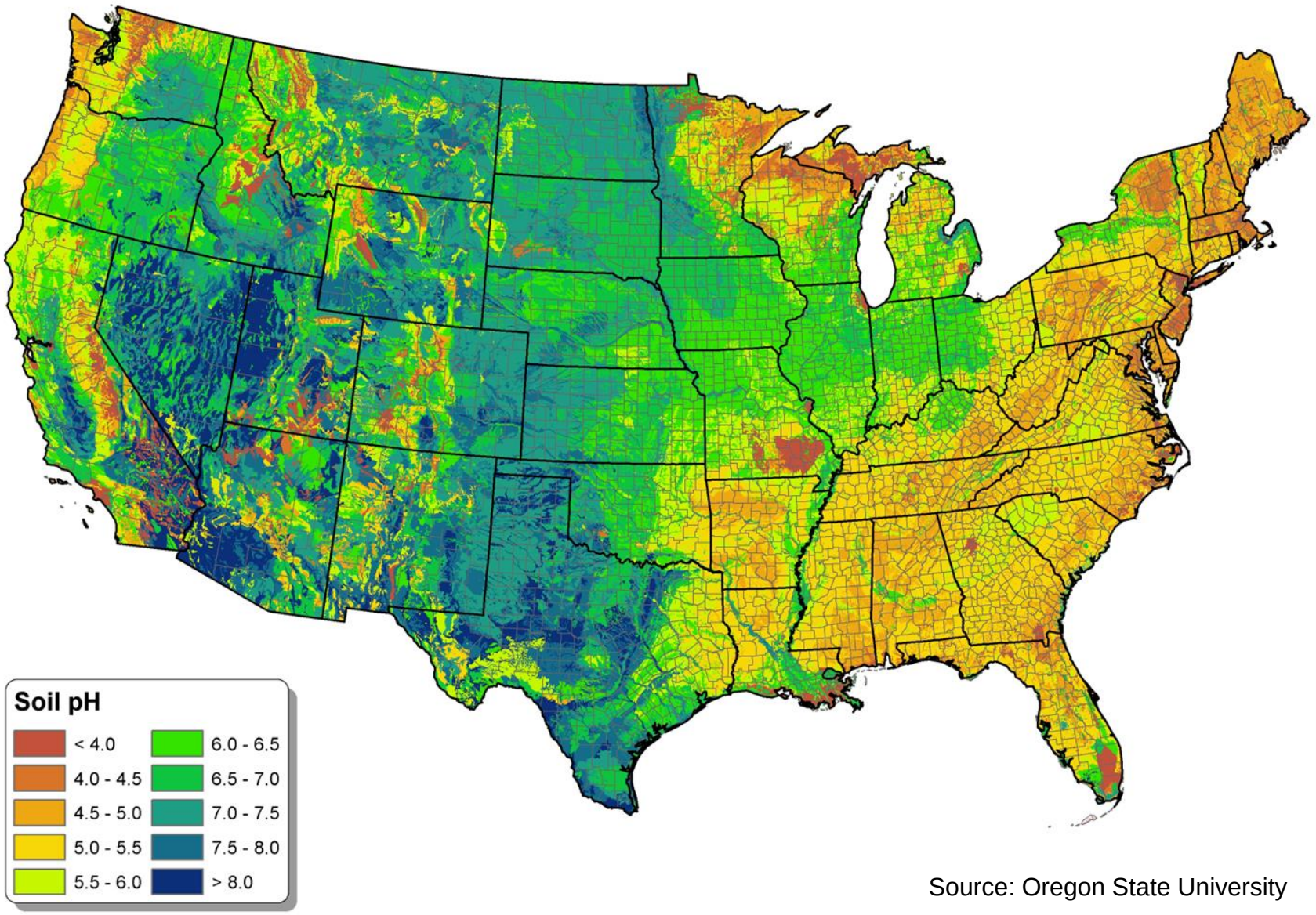
Surface pH is Affected by Geography



Source: Oregon State University

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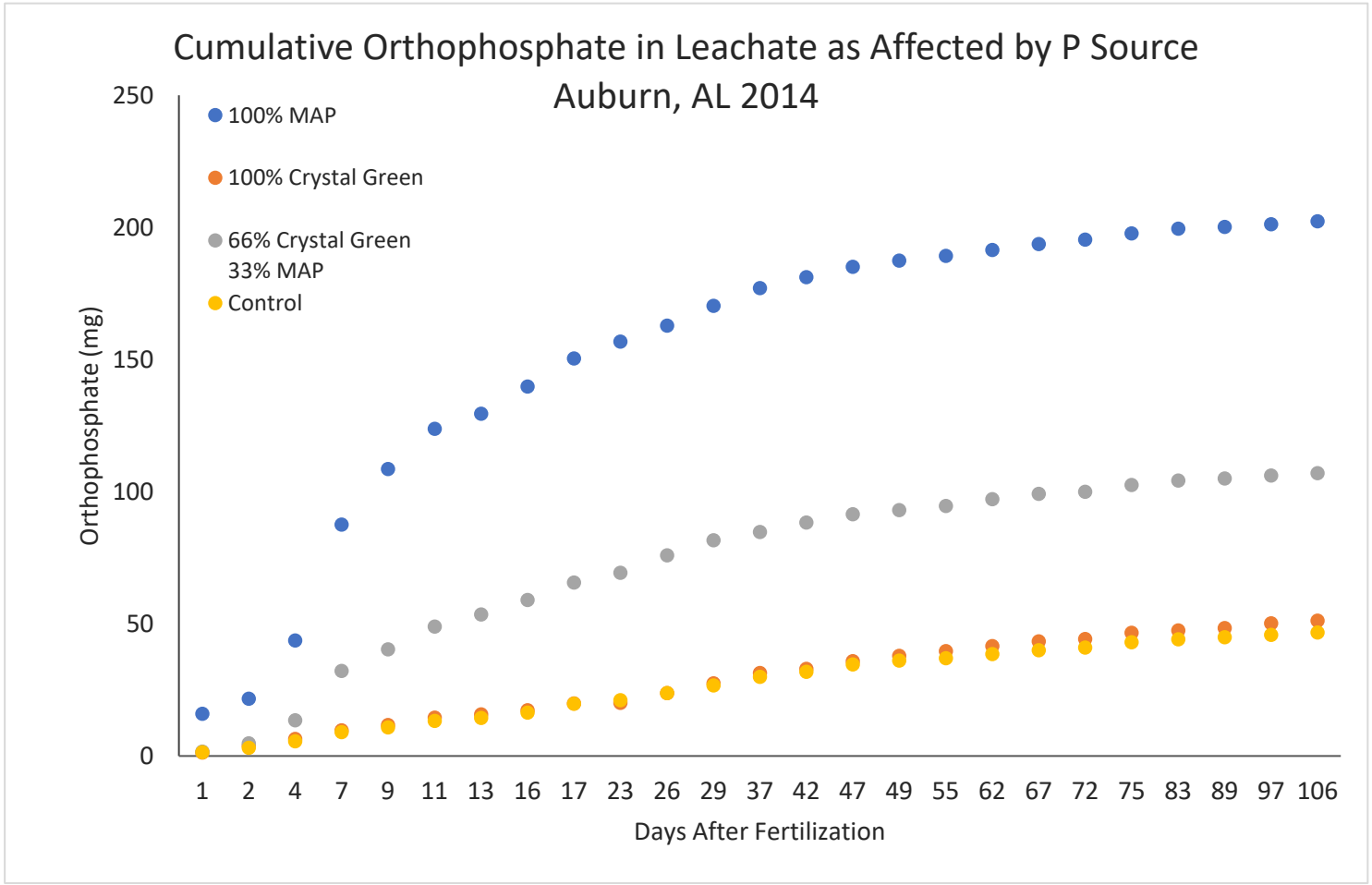
Avoid Runoff & Leaching



By using Crystal Green, leaching or runoff from phosphate fertilizer is significantly reduced.

Research conducted by Auburn University using turf lysimeters, showed Crystal Green phosphate leachates equal to untreated controls. Yet, turf color and quality of establishing bermudagrass was equal to or better than standard practice.

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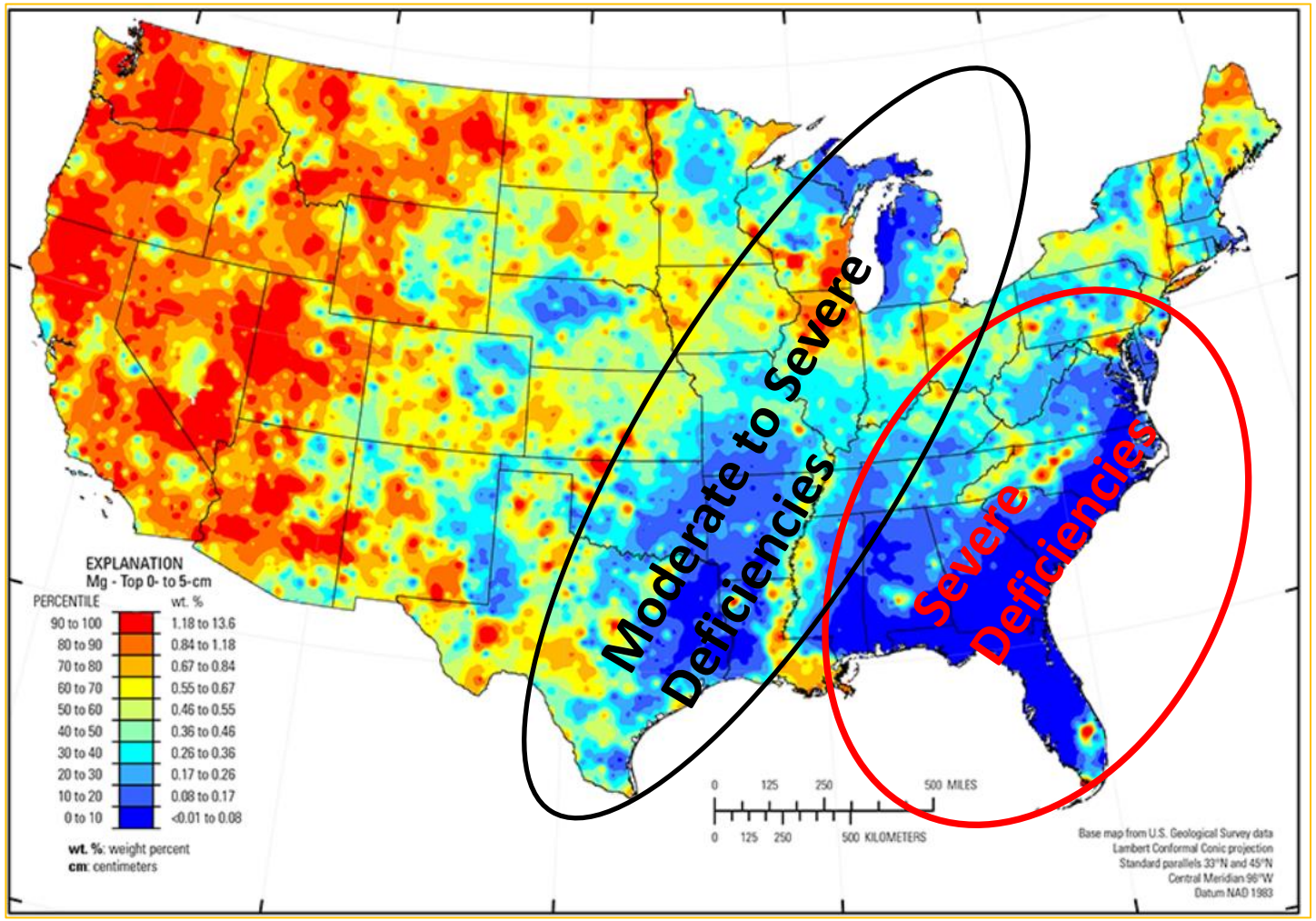
Remember the Magnesium



Mg is required for chlorophyll synthesis and photosynthesis

Current market price for granular magnesium sulfate 9.8% is ranging from $600-$800 per ton

Crystal Green is 5-28-0-**10Mg** in one nutrient-packed granule.

Corn, potato, sugarcane and sugar beet are among the highest Mg-demanding crops in North America.

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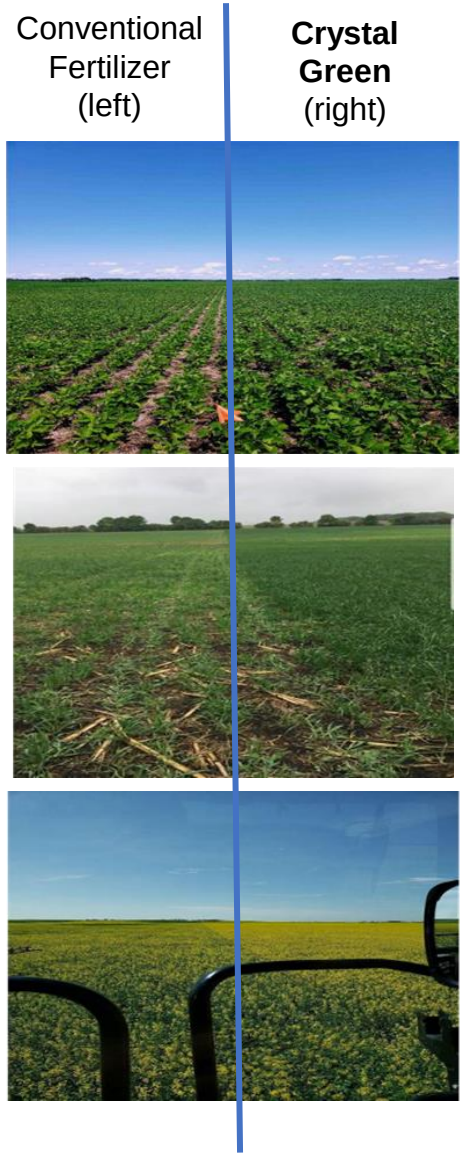
A Fit For Every Crop

Crop	Average Yield Increase
Corn	9 bu/acre
Soybean*	2 bu/acre
Wheat	4.8 bu/acre
Canola	2.6 bu/acre
Potato	26 cwt/acre
Sugar beets	810 Lb. CRS/acre
Tomato	80 box/acre

Continuous research at accredited universities shows Crystal Green is well suited among a variety of different crops and soil types.



*Crystal Green applied at a 50% reduced rate of fertilizer application vs grower standard practice

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Crystal Green paired with a liquid starter is a great combination for high-yielding production practices.

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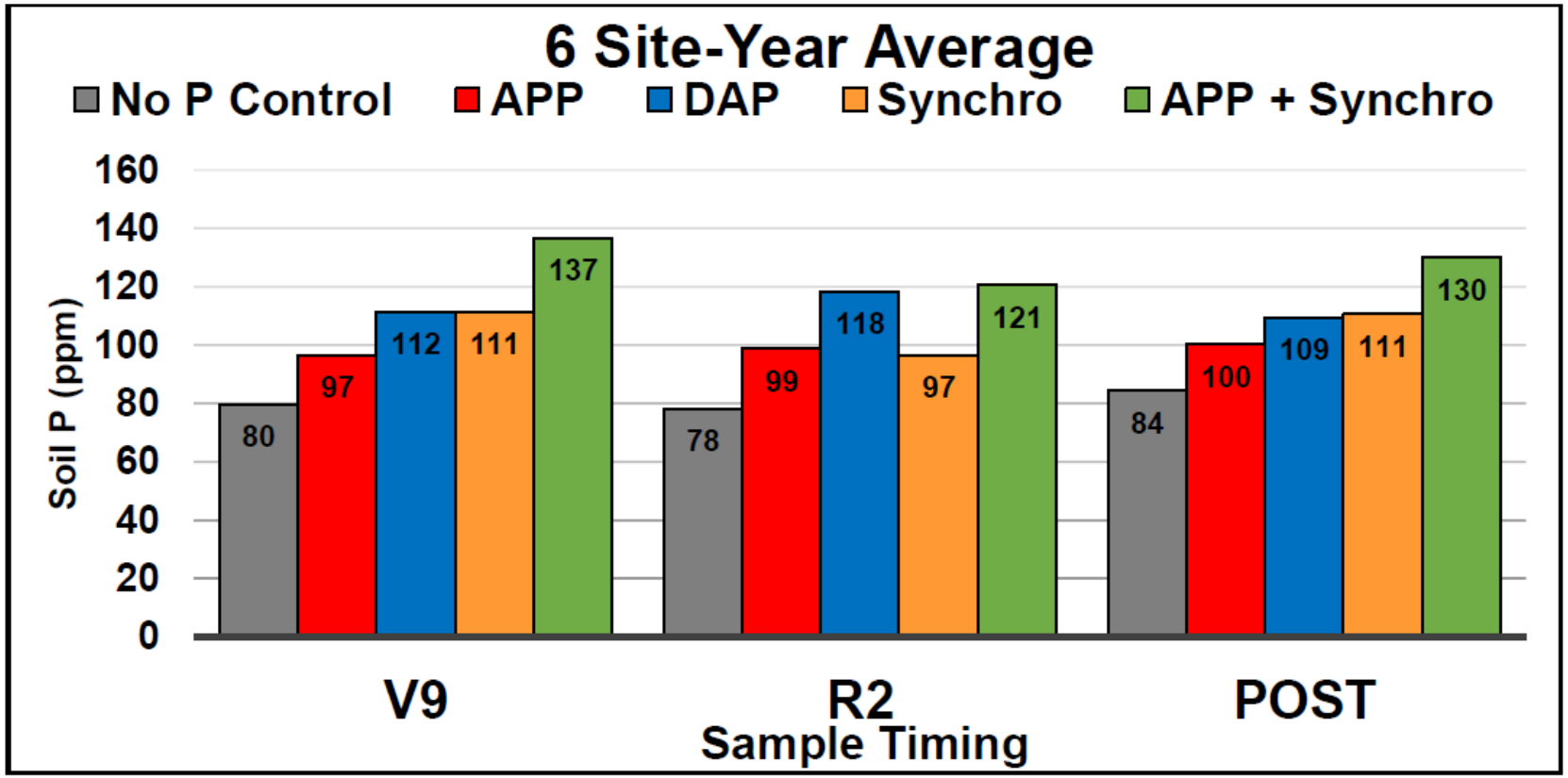

Figure 2.7. Seasonal soil P availability, measured at three corn growth stages (V9, R2, and postharvest [POST]), as affected by P fertilization treatments averaged over six site-years across Illinois. Synchro 73 and Synchro 83 data were averaged together.
LSD ($\alpha = 0.10$): within V9 = 9; R2 = 12; Post = 10.
LSD ($\alpha = 0.10$): P Treatment *x* Time = 11.

Foxhoven, Univ. of IL

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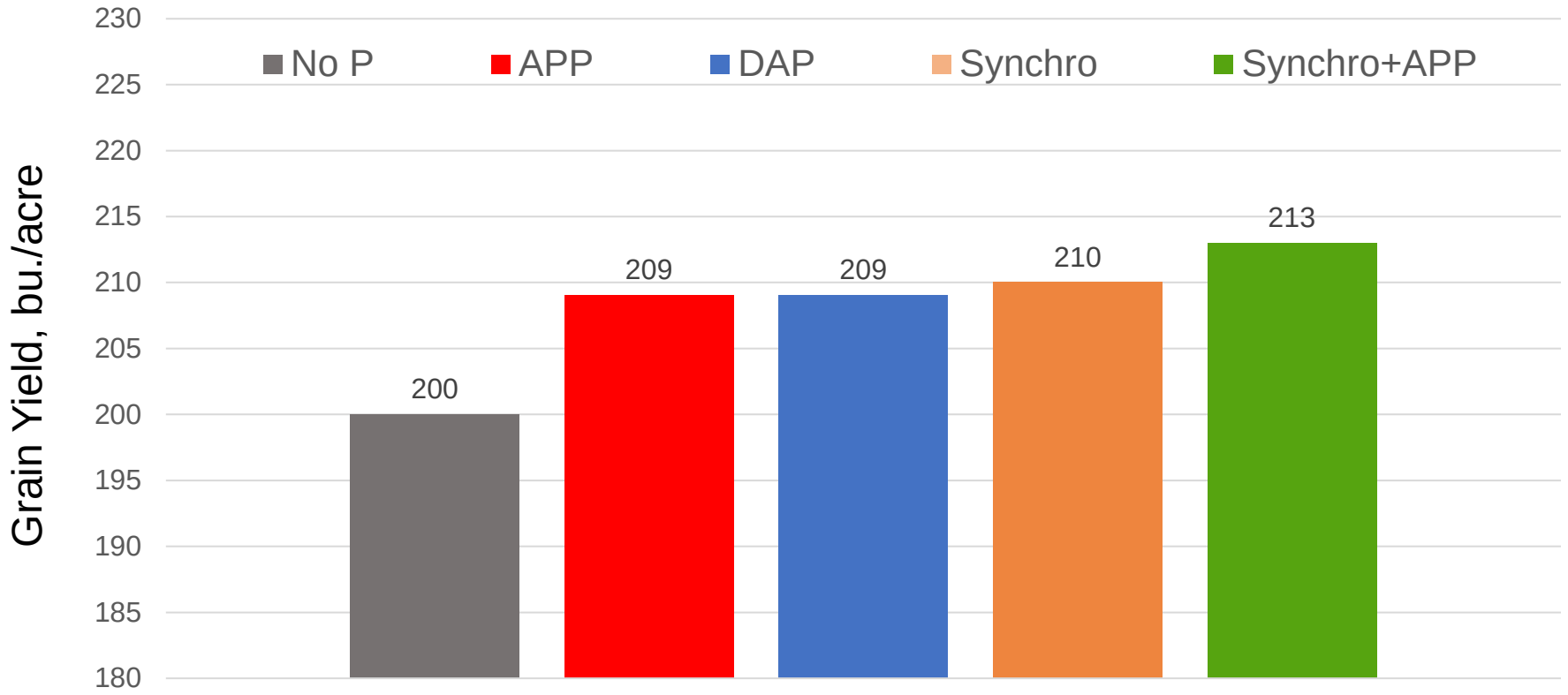
Effect of P Fertilization Treatment on Three Grain Yield Sites 2019



APP- 20 lb. P_2O_5/acre
DAP-100 lb. P_2O_5/acre
Synchro-100 lb. P_2O_5/acre
Synchro- 80 lb. P_2O_5/acre + APP 20 lb.P_2O_5/acre

Foxhoven, Univ. of IL

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Crystal Green applied fall 2022 via strip-till with anhydrous ammonia is ready for spring planting with a starter fertilizer to provide season-long P nutrition.

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Crystal Green + P starter fertilizer will:

- Increase phosphate use efficiency
- Provide season-long P availability
- Significantly reduce phosphate losses

That’s a win for yield and a win for the environment.

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Thank You!

Contact us to learn more.

info@ostara.com

www.ostara.com

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