4th Annual
Midwest Soil Improvement Symposium: 2014
Research and Practical Insights into Using Gypsum

Gypsum as a Soil Fertility Tool and Remedy for Sodic Soils

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AUGUST 13, 2014

GYPSOIL BRAND GYPSUM | KARA

Gypsum as a soil fertility tool and remedy for sodic soils

Dorivar Ruiz Diaz
Soil Fertility and Nutrient Management

Midwest Soil Improvement Symposium, 2014
August 13, 2014

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Outline

- Gypsum as nutrient source.
- Sulfur deficiency in Kansas.
- Recent studies evaluating Gypsum as fertilizer source.
- Gypsum for sodic soil conditions.

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Gypsum as nutrient source

- Gypsum can supply Ca and S.
- Frequently used as source of Ca for peanut production.
- Available sulfur for plant uptake (sulfate).
  - 15-18 percent sulfur.
  - Elemental sulfur: Time required for oxidation.
- Can be a good alternative for side-dress or topdress application.

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Sulfur deficiency

- Sulfur deficiency in no-till wheat has become common in many areas of Kansas.
- Common issue in eastern KS.
- Deficiencies may occur for a couple of reasons.
  - Reduction in sulfur additions from atmospheric deposition and phosphorus fertilizer applications.
  - Cooler soil temperatures in no-till planting, which slows S mineralization.

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Sulfur deficiency

- Sandy soils may show significant response.
- Subsoil S may be significant.
- Profile soil test for S, 0-24 in recommended in KS.

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Sulfur deficiency in winter wheat Kansas

Sulfur deficiency in corn in Kansas

Sulfur fertilizer application

- Deficiencies more likely in sandy soils, but most textural classes on hilltops and slopes, especially on eroded.
- Sulfur application may show significant yield increase in some conditions.
- Difference in sulfur availability from fertilizer sources.

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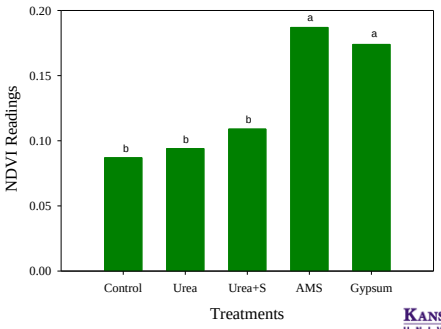
Wheat NDVI response to sulfur source 10 days after application



Asebedo and Mengel, 2014

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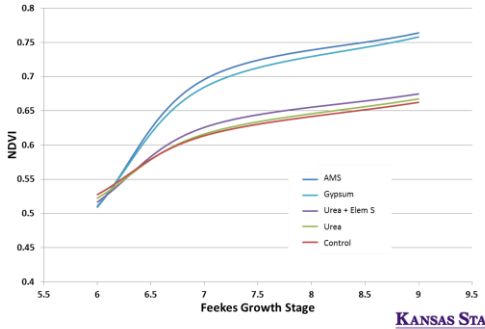
Wheat NDVI response to sulfur source



Asebedo and Mengel, 2014

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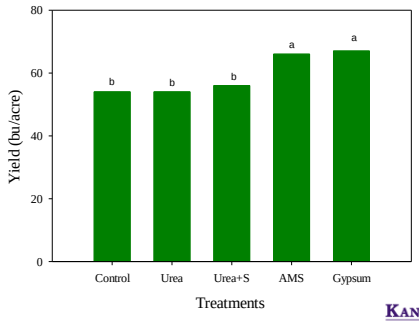
Wheat response with in-season sulfur application

Asebedo and Mengel, 2014

Yield response with in-season sulfur application



Asebedo and Mengel, 2014

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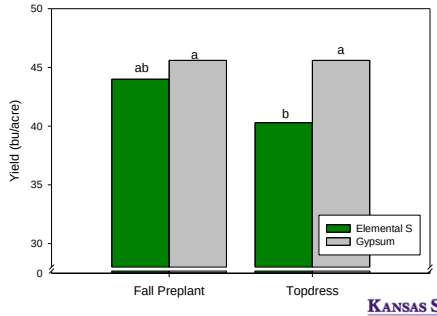
Wheat yield response with in-season vs pre-plant application



Ruiz Diaz, 2011

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Corn response to S using Gypsum source

- Gypsum surface broadcast applied with no incorporation after planting at 0, 10, 20, and 40 lb S/acre.
- Total of 45 locations in Iowa.
- Evaluation of soil and tissue testing as diagnostic tool.

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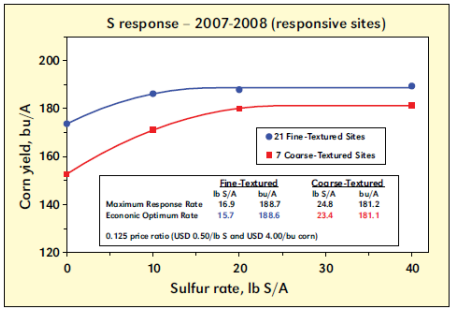
Corn response to S using Gypsum source



Sawyer, 2013

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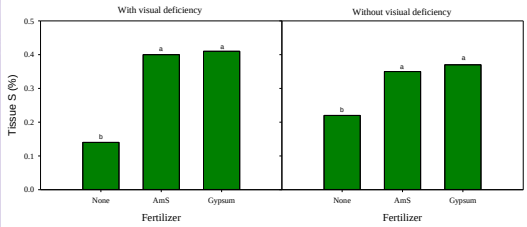
Alfalfa tissue concentration and fertilizer source



Sawyer, 2013

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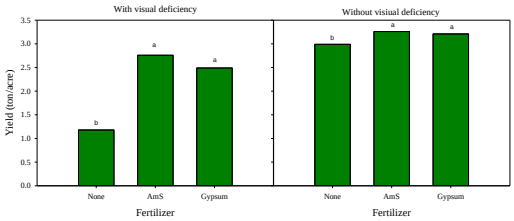
Alfalfa yield response to sulfur source



Sawyer, 2013

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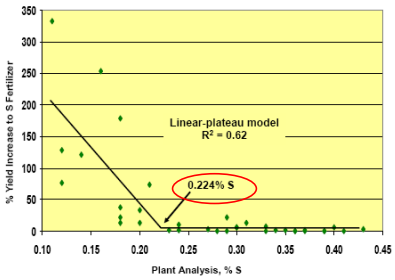
Critical tissue S in alfalfa



Sawyer, 2013

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Sulfur and micronutrients for wheat in Kansas

- Evaluate wheat response to sulfur and micronutrients with broadcast fertilizers.
- Evaluate diagnostic tools: soil test and tissue nutrient concentration.

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Materials and methods

- 14 locations for wheat.
- Fertilizer treatments:
  - Seven treatments: 5 individual nutrients, a mix, and a control.
  - S= 15 lbs/acre
  - Mn, Zn, Cu= 10 lbs/acre
  - B= 5 lbs/acre
  - Mix

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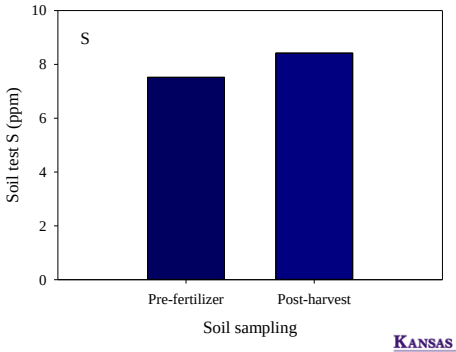
Soil test with fertilizer application



Ruiz Diaz, 2013

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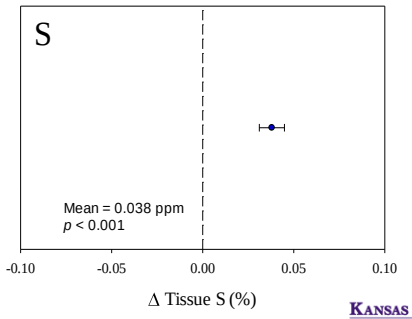
Change in wheat tissue S concentration



Ruiz Diaz, 2013

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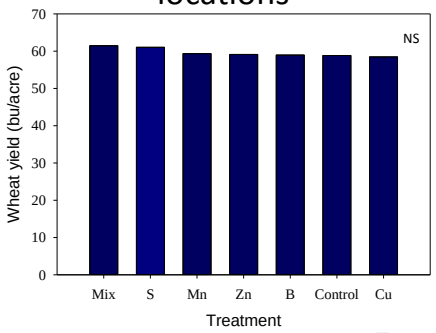
Wheat yield response across locations



Mix-Cu= 3 bu/acre

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Sodic soils

- Sodic soils are high in exchangeable sodium.
- The combination of high levels of sodium and low total salts tends to disperse soil particles, making sodic soils of poor tilth.
- These soils are sticky when wet, nearly impermeable to water and have a slick look.
- As they dry, they become hard, cloddy and crusty.

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Sodic soils

- Soluble salts are usually low (EC less than 4 dS/m).
- High levels of sodium on the exchange complex
  - Sodium adsorption ratio (SAR) more than 13
  - Exchangeable sodium percentage (ESP) more than 15
- Soil pH often exceed 8.5.

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Gypsum for sodic soils

- The most widely used Ca soil additive.
  - High solubility.
- Application rate of gypsum is best determined by a soil analysis.
  - Sodium adsorption ratio (SAR) or exchangeable sodium percentage (ESP).
  - CEC
  - Soil depth
  - Replacement of exchangeable Na

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Summary

- Sulfur deficiency becoming a common problem in KS and Midwest.
- In-season correction of sulfur deficiency requires the use of a sulfate fertilizer source.
- Gypsum can provide available sulfur for pre-plant and in-season fertilization.

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Questions?

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