Improving corn and soybean yields with starter and foliar fluid fertilizers

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Starter and foliar including micronutrients

- Fields with high corn and soybean yields may benefit from micronutrients.
- Typically low micronutrient requirements can be combined with a starter program.
- The use of foliar micronutrient application in combination with soil-applied program.
- Evaluate nutrient sufficient or potential “hidden hunger”
Objectives

• Assessment of corn and soybean grain yield and early growth response to starter fertilizer with micronutrients.

• Evaluate responses with and without additional foliar fertilizers.

• Evaluate foliar nitrogen in corn (derived from methylene ureas and triazone).
Methods

• Factorial Arrangement in RBCD with Two Factors:

• Starter: None, NPK, NPK + micronutrients.

• Foliar: None, NPK, NPK + micronutrients.
  – V6 for Corn and R1 for soybean.

• Micronutrient mix:
  – Mn, Zn, Cu as EDTA
  – Fe as HEDTA, and B.
Methods

• Measurements
  – 0- to 6-inch soil samples
  – Whole corn plants at V6
  – Soybean trifoliolates at R1
  – Tissue sampling after foliar fertilizer application
  – Grain yield

• Statistics
  – ANOVA using the GLIMMIX procedure of SAS
Methods

• Six irrigated locations for corn during 2010, 2011 and 2012.

• Six irrigated locations for soybean during 2010, 2011 and 2012.

• Optimum N,P,K fertility, hybrids, irrigation, and population.

• N, P, K: 4-10-10 and 10-10-10.
## Methods

### Nutrient application rates

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Corn biomass V6 - across locations

![Bar graph showing biomass V6 across different starter treatments.]

- **None**
- **NPK**
- **NPK + M**

The graph shows that the biomass V6 is significantly different among the treatments. The letters a, b, and p<0.05 indicate the significance of the differences:
- **a** for NPK and NPK + M
- **b** for None

**Starter Treatment**

- **None**
- **NPK**
- **NPK + M**

**Biomass V6 (g/plant)**

- 0
- 1
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15

**p<0.05**
Corn nutrient uptake - V6

Across locations
Corn grain yield - across locations

- Starter Treatment: None, NPK, NPK + M
- Grain yield (bu/acre): 215, 223, 224
- p=0.02

Across locations
Responsive location - Rossville 2012

Starter Treatment
- None
- NPK
- NPK + M

Grain yield (bu/acre)
- 0
- 100
- 120
- 140
- 160
- 180
- 200
- 220
- 240

192 (c)
203 (b)
215 (a)

p<0.001

Starter Treatment
- None
- NPK
- NPK + M

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## Responsive location - Rossville 2012

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Responsive location - Tissue analysis

Sufficiency range: Mills and Jones, 1996
Corn grain yield - foliar

Across locations

Starter Treatment
- None
- NPK
- NPK + M

Grain yield (bu/acre)
- 0
- 100
- 120
- 140
- 160
- 180
- 200
- 220
- 240

p=0.702
Foliar nitrogen - corn

- Derived from methylene ureas and triazone
- Slower drying on the leaves?
Foliar nitrogen corn

Across locations

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$p = 0.2$
Soybean
Soybean yield - starter

Across locations

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p=0.082

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Soybean yield - foliar

Across locations

Yield (bu/acre)

Starter Treatment
None NPK NPK + M

p=0.901
# Field variability soil Zn

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Zn (DTPA)
Field variability soil Zn

Distance (feet)

Zn (ppm)

Thomas Co, 2012
Field variability soil Zn

![Field variability soil Zn graph]

- Finney Co
- Thomas Co
- Jewell Co
- Saline Co
- Ellis Co

Zn (DTPA)
### Field variability soil Mn

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Field variability soil Mn

Distance (feet)

Mn (ppm)

Mn

Distance (feet)

Thomas Co, 2012
Summary

• Micronutrients seems to have no “starter effect” on corn biomass in addition to N and P.

• Response to starter w/ micros vary by soil type.
  – Location with sandy soil and low OM show significant response.

• Foliar application show no yield response in our study.
Summary

- Micronutrients with starter fertilizers may help with small scale soil nutrient variation.
- Within-field soil test variability for micronutrients should be considered.
- Starter with micronutrients may be an effective “insurance” to avoid potential yield loss in some conditions.
Acknowledgement

• Fluid Fertilizer Foundation
• Kansas Corn Commission
• AGVISE Laboratories
• Servi-Tech Laboratories
• Nutra-Flo
• Waters Agricultural Laboratories
• Olsen's Agricultural Laboratory
Questions?
Field variability soil Mn