

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 triazole).



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.



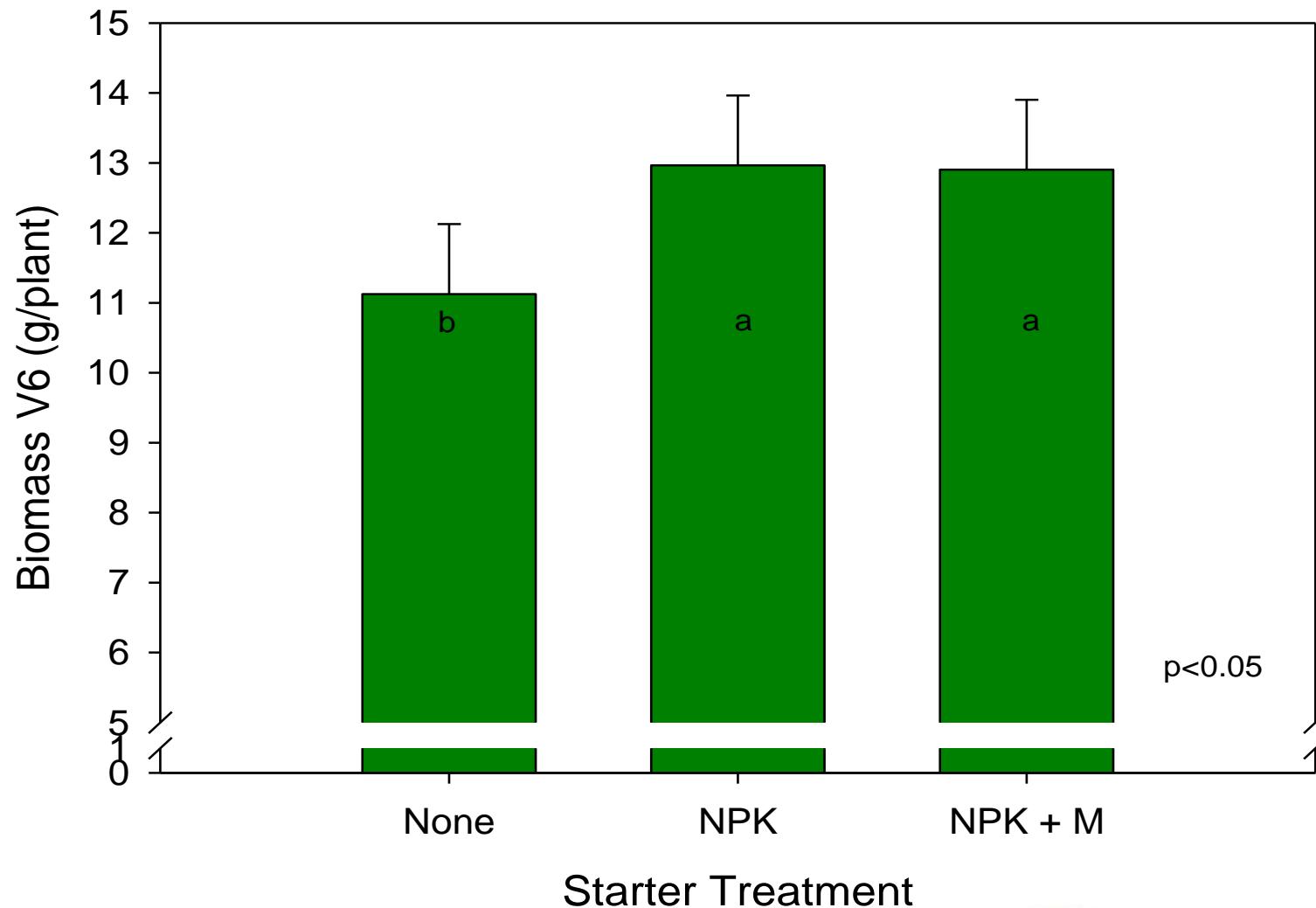
Methods

Nutrient application rates

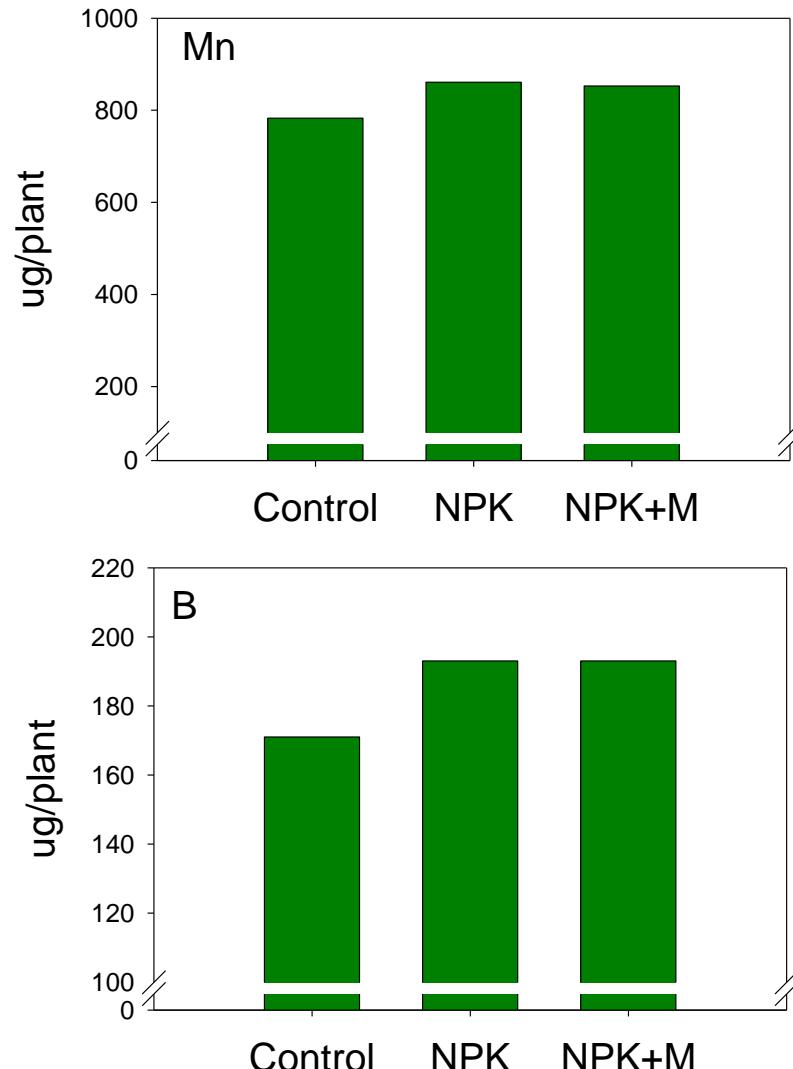
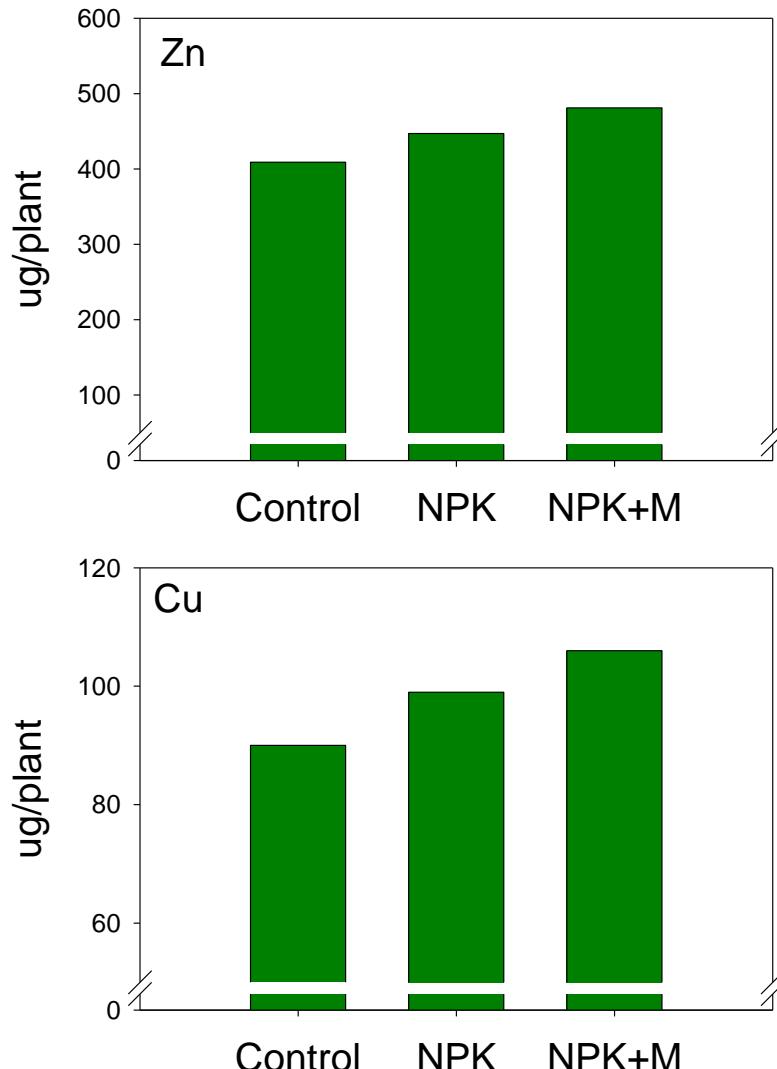
	N	P2O5	K2O	Fe	Zn	Cu	Mn	B
<u>Starter</u>	----- lbs/acre -----							
NPK	4	10	10	-	-	-	-	-
NPK + micros	4	10	10	0.5	0.5	0.5	0.5	0.5
<u>Foliar</u>								
NPK	2	2	2	-	-	-	-	-
NPK + micros	2	2	2	0.2	0.2	0.2	0.2	0.2



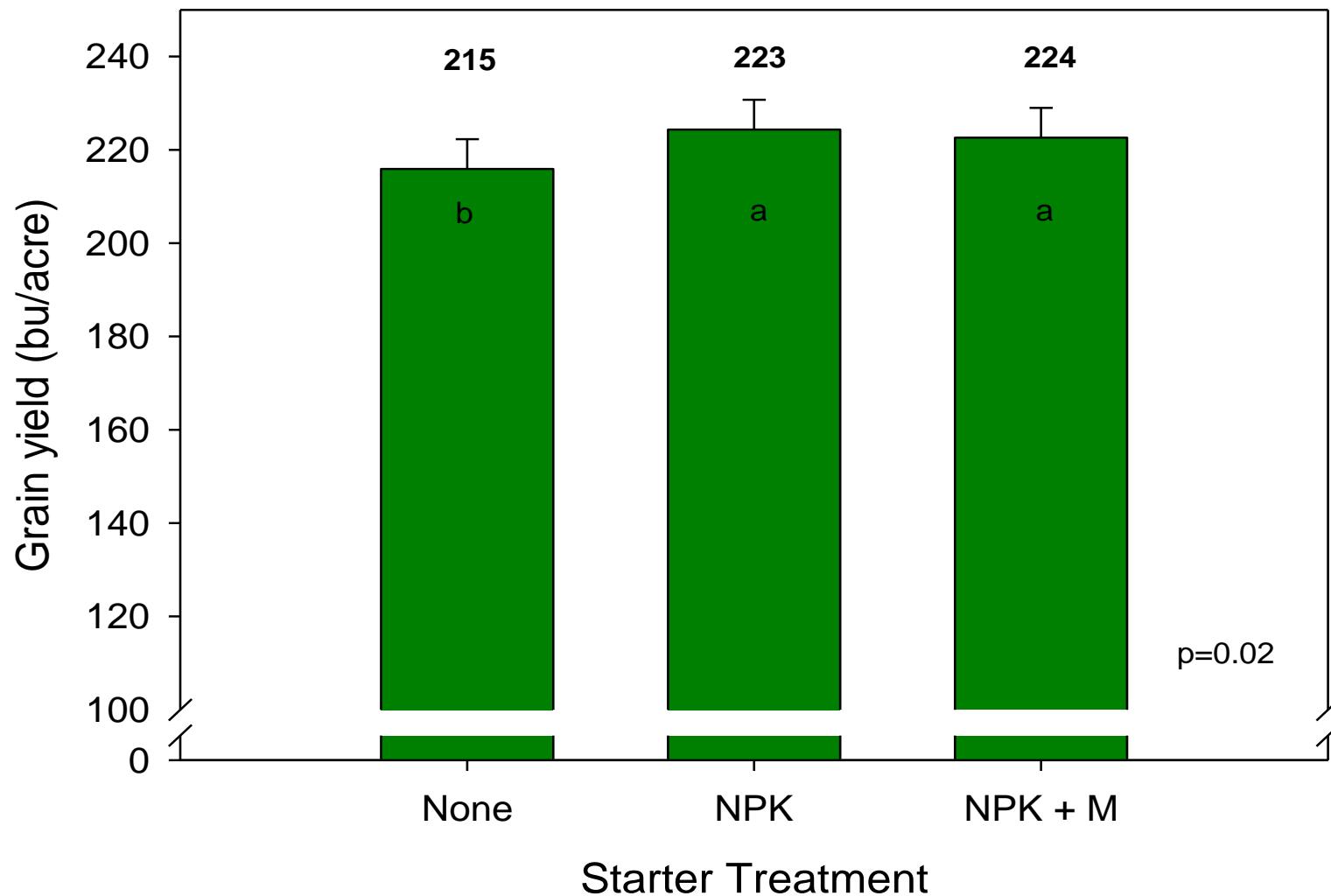
Corn biomass V6 - across locations



Corn nutrient uptake - V6

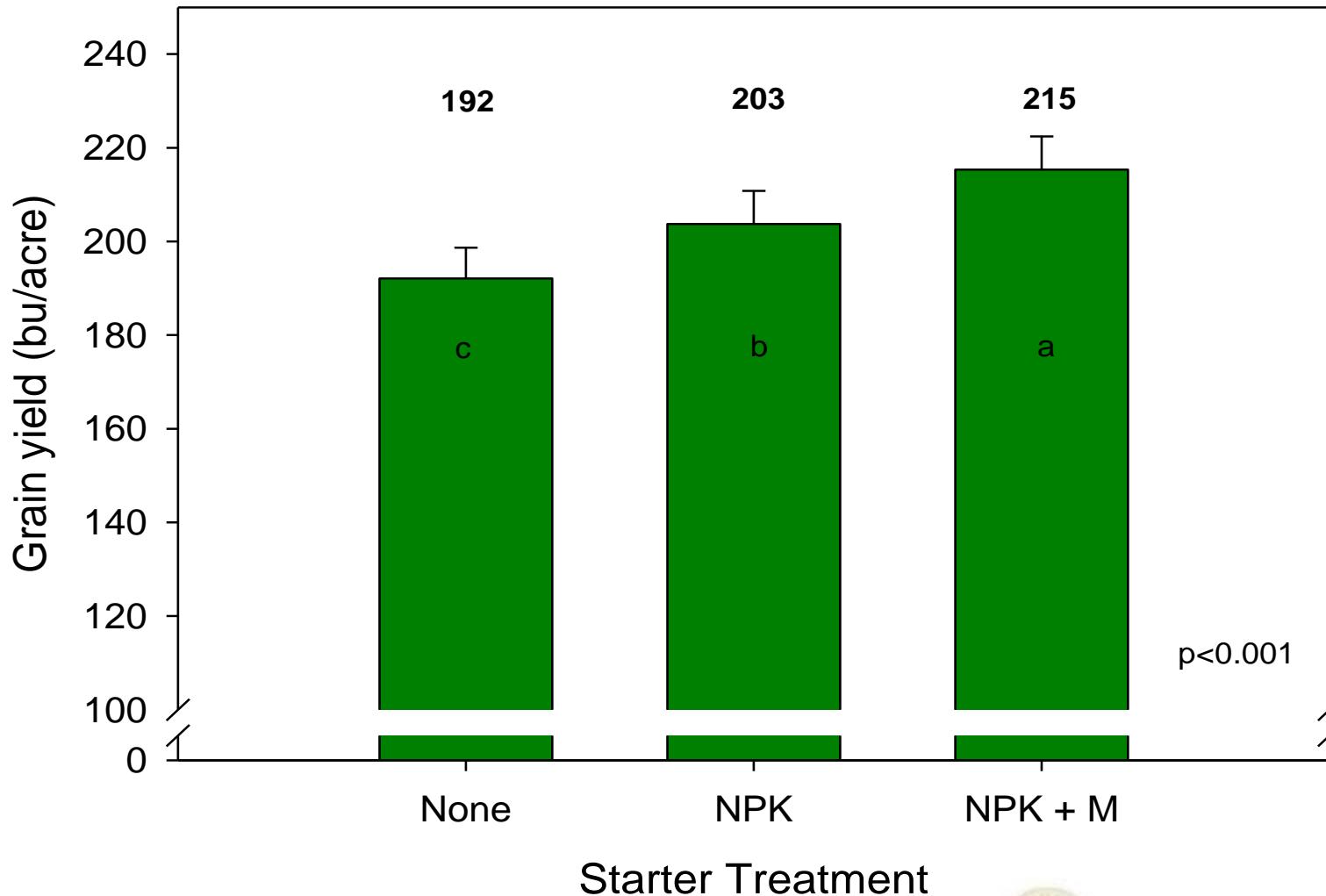


Corn grain yield - across locations



Responsive location - Rossville

2012



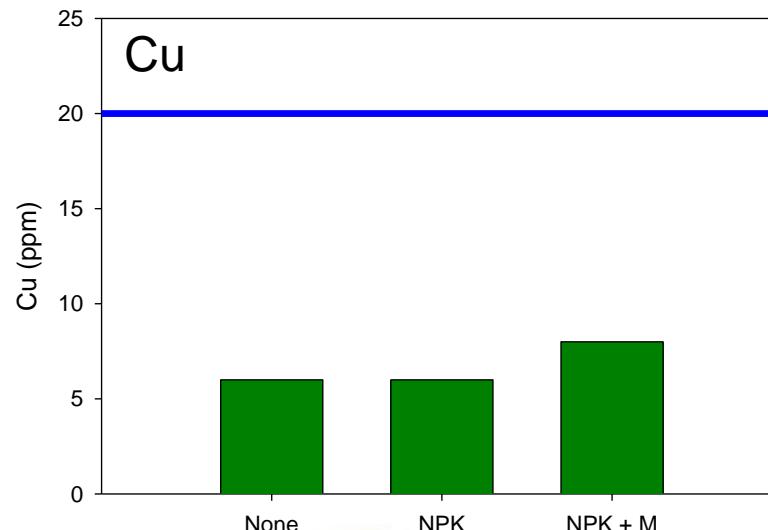
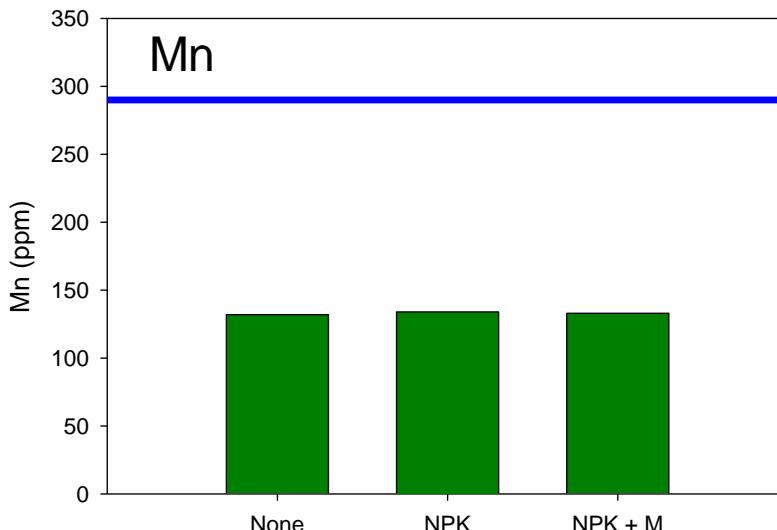
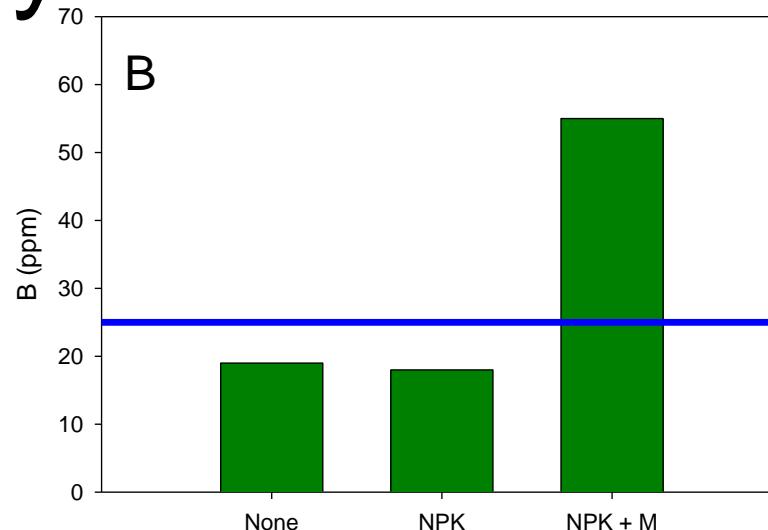
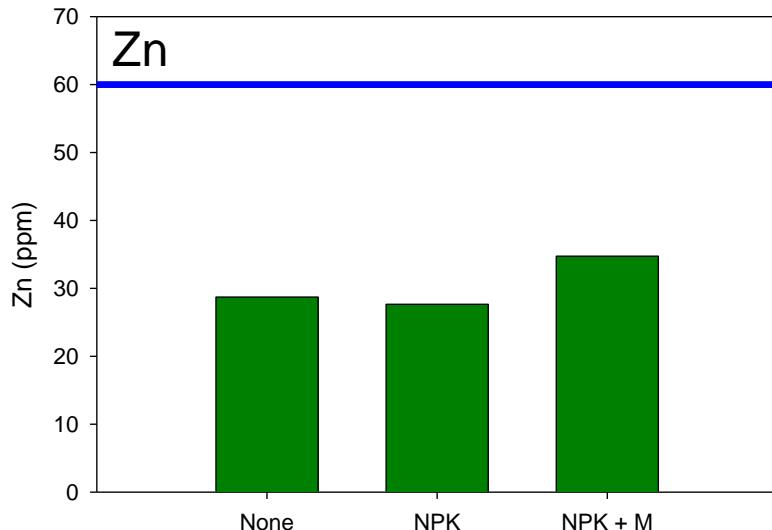
Responsive location - Rossville

2012

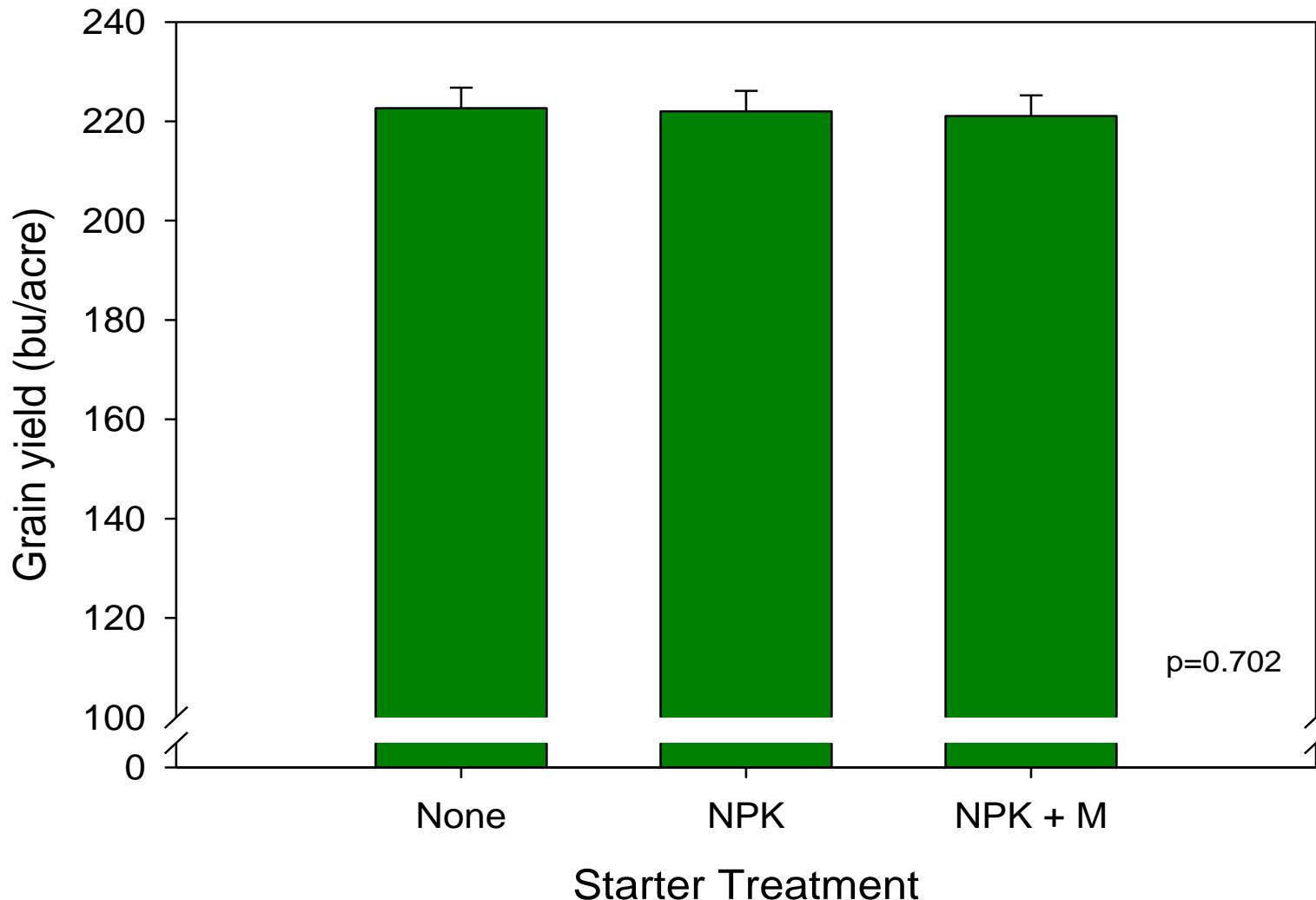
<u>Soil parameter</u>	Rossville
pH	6.8
Soil test P (ppm)	24
Soil test K (ppm)	114
CEC (meq/100g)	4.5
OM (%)	0.9
Sand (%)	80
Clay (%)	5



Responsive location - Tissue analysis



Corn grain yield - foliar

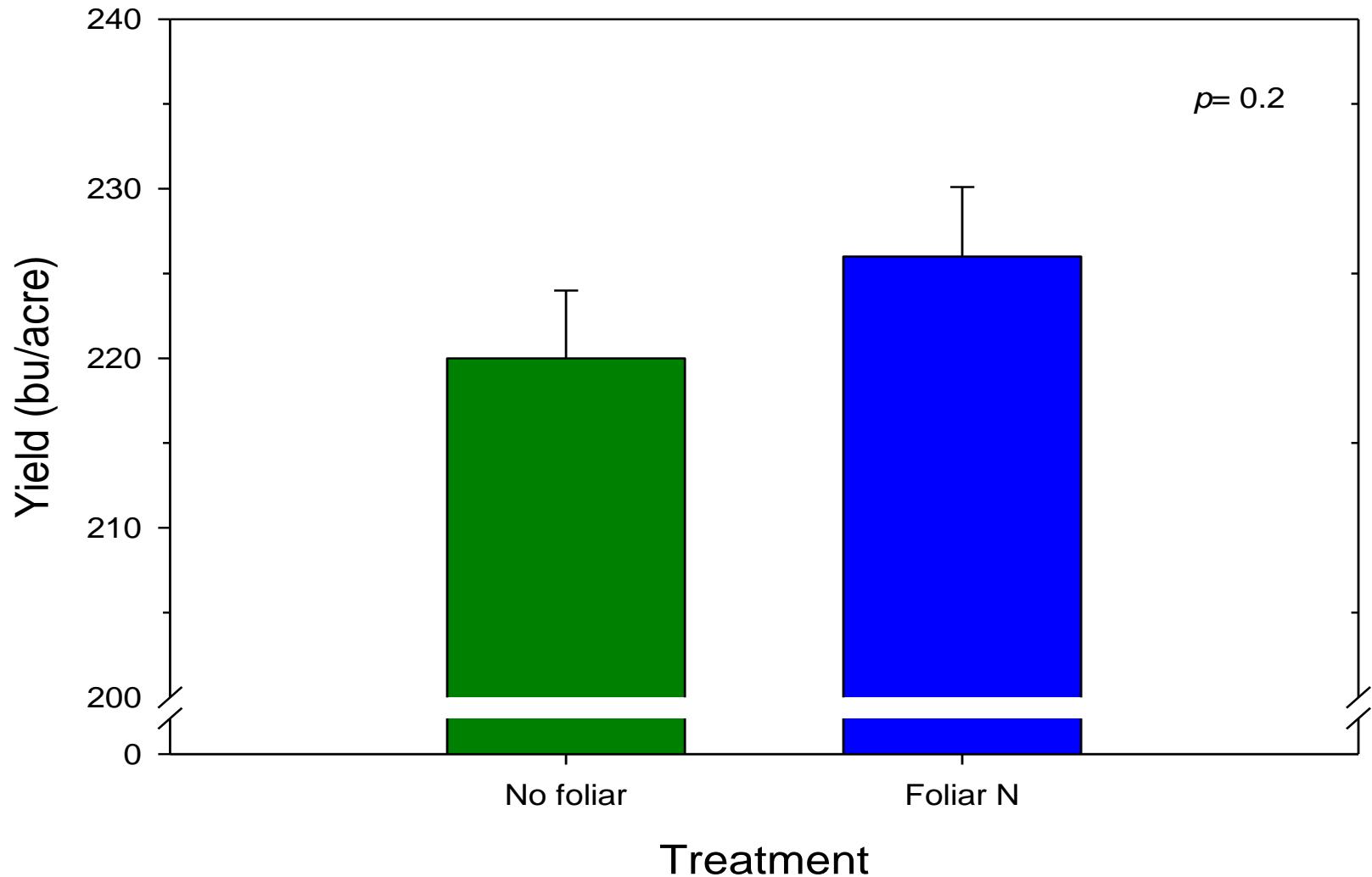


Foliar nitrogen - corn

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



Foliar nitrogen corn



Across locations



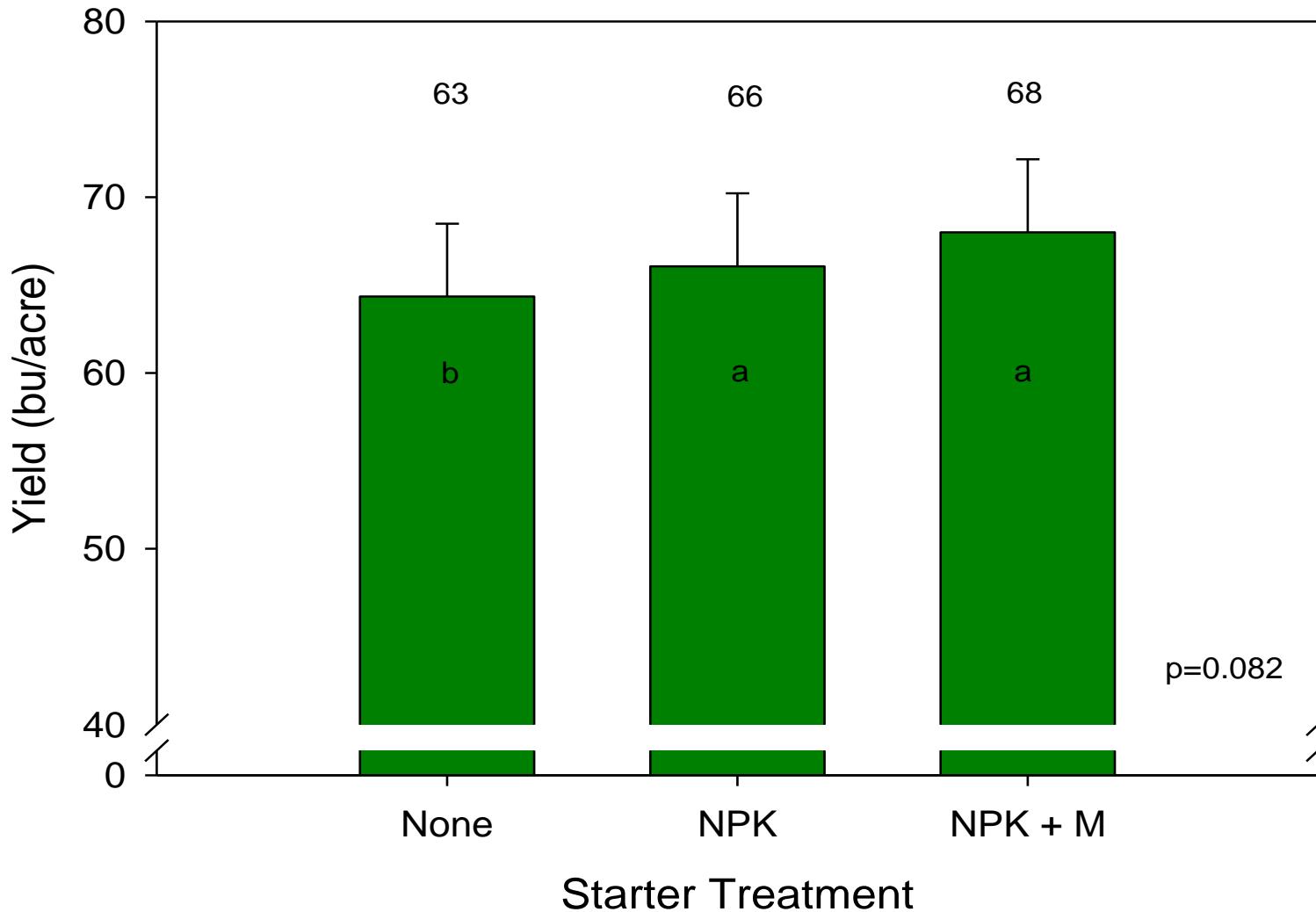
Soybean



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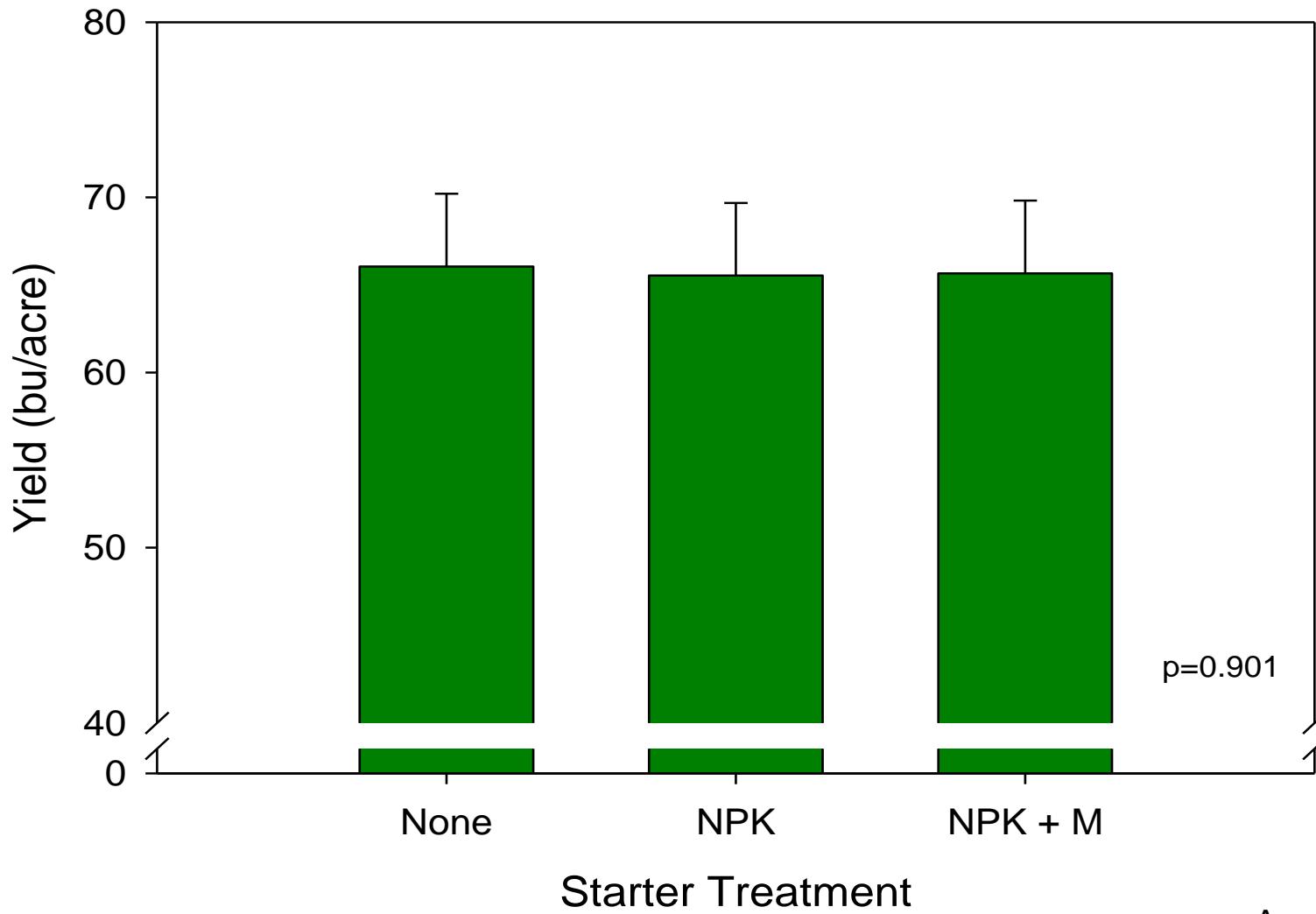
Soybean yield - starter



Across locations



Soybean yield - foliar



Field variability soil Zn

Ellis Co

1.7	2.0	2.5	1.4	2.0	1.5	1.4	1.5	1.7	2.0	1.7	1.6
1.4	1.2	1.7	1.5	1.3	1.1	1.4	2.0	1.1	1.4	1.4	1.0
1.6	1.9	1.6	2.1	1.4	1.4	1.6	2.2	1.8	1.2	1.4	1.5

Saline Co

0.9	1.1	0.7	0.8	0.8	0.9	0.9	0.9	0.5	0.8	0.8	0.8
0.7	0.6	0.6	0.9	0.6	1.1	0.6	0.8	0.7	0.9	0.9	0.7
0.6	0.6	0.5	0.7	0.7	0.8	0.5	0.7	0.6	0.8	1.0	1.0

Jewell Co

0.3	0.2	0.3	0.3	0.3	0.3	0.4	0.4	0.5	0.5	0.5	0.5
0.4	0.5	0.5	3.5	0.4	0.4	0.4	0.5	0.5	0.6	0.6	0.6
0.5	0.3	0.3	0.3	0.5	0.4	0.5	0.5	0.4	0.6	0.6	0.6

Thomas Co

0.8	0.8	0.7	0.6	0.7	0.6	0.6	0.6	0.5	0.6	0.6	0.6
0.6	0.9	0.7	0.8	0.7	0.6	0.5	0.6	0.6	0.5	0.5	0.6
0.8	0.7	0.8	0.8	0.6	0.5	0.6	0.6	0.5	0.4	0.5	0.5

Finney Co

0.5	0.4	0.5	0.4	0.4	0.5	0.3	0.2	0.2	0.3	1.2	0.3
0.5	0.6	0.3	0.5	0.5	1.0	0.3	0.6	0.7	0.2	0.2	0.2
0.4	0.5	0.8	0.4	0.5	0.5	0.4	0.4	0.5	0.3	0.3	0.2

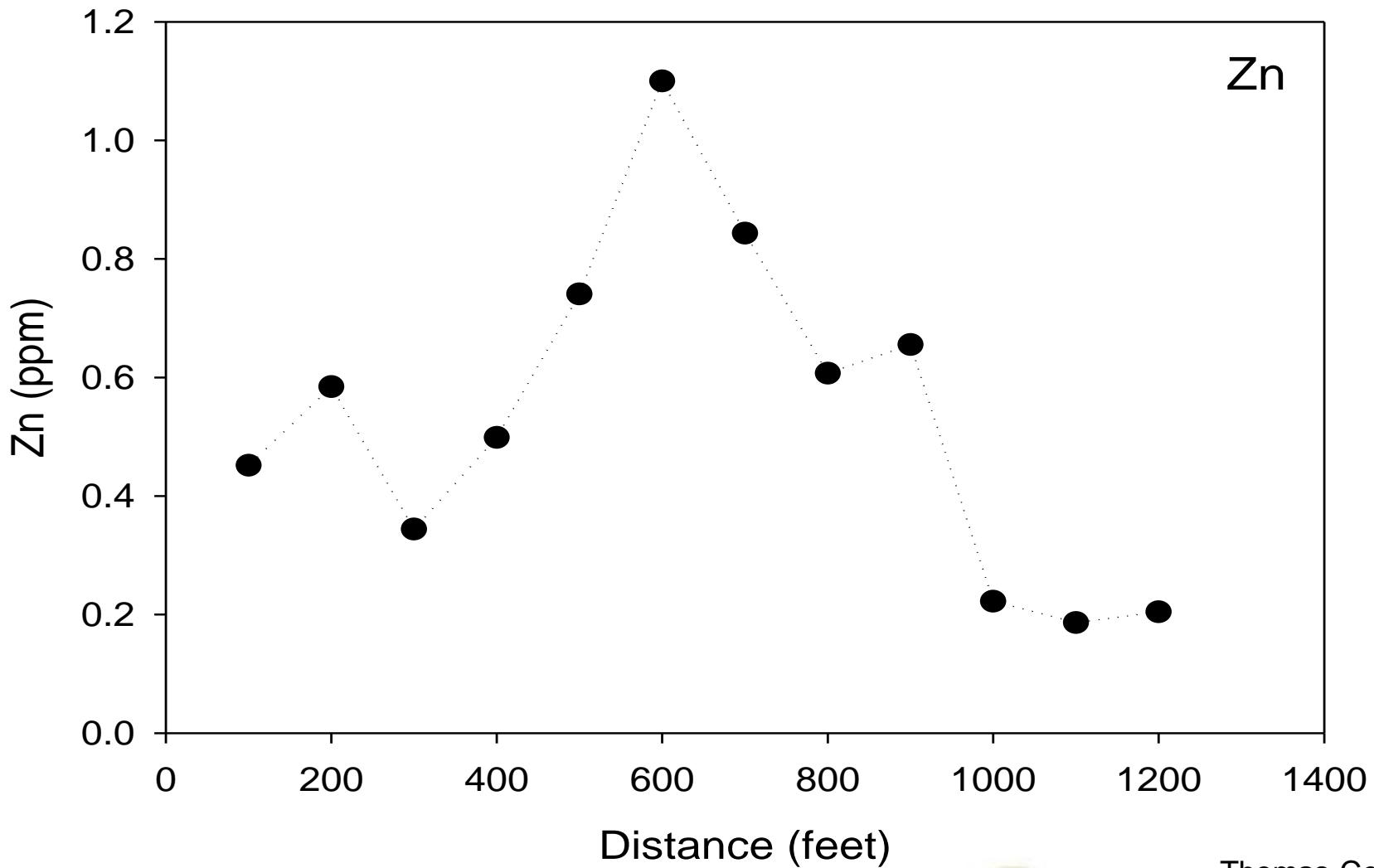
1500 ft

360 ft

Zn (DTPA)



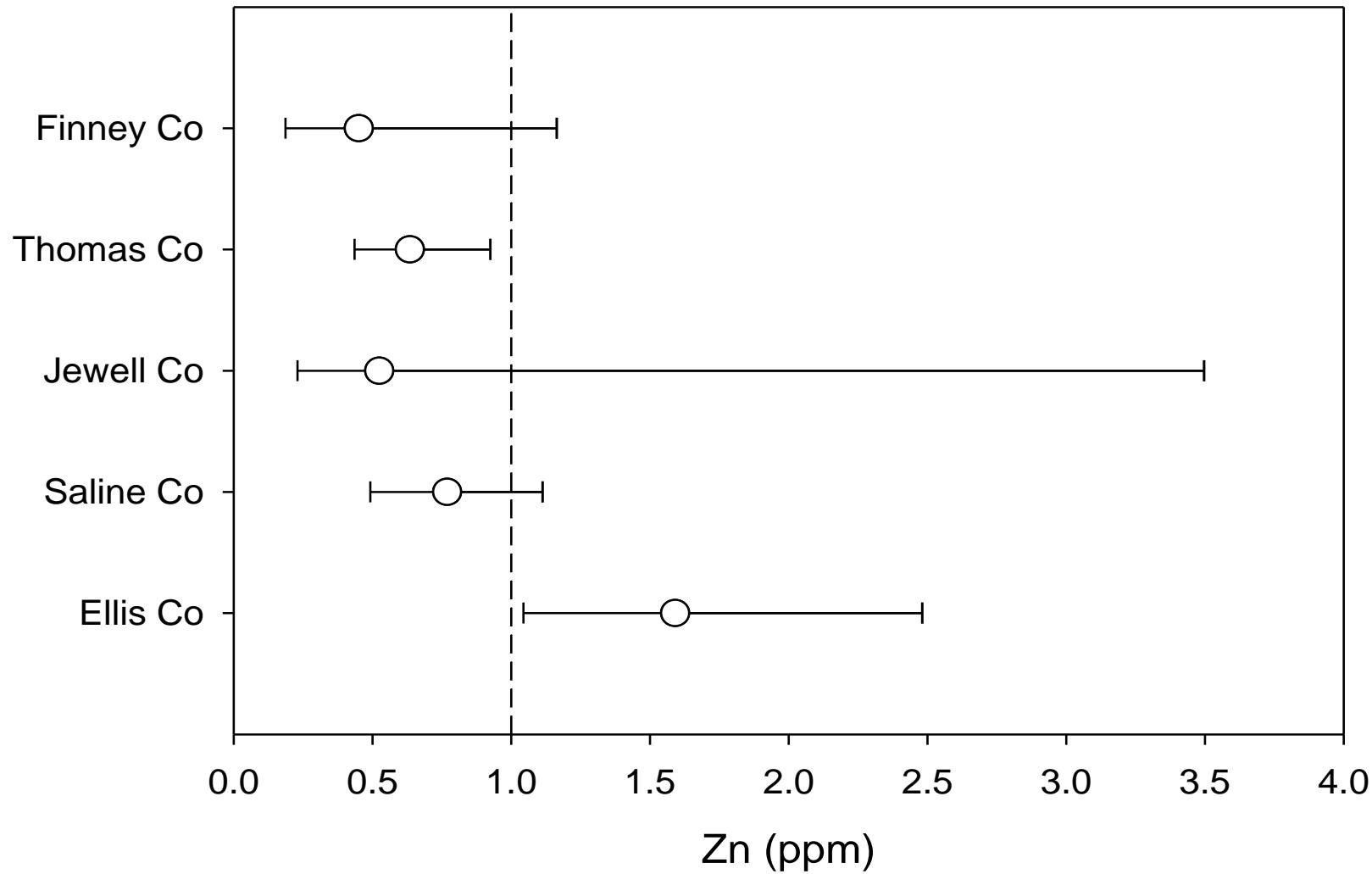
Field variability soil Zn



Thomas Co, 2012



Field variability soil Zn



Zn (DTPA)



Field variability soil Mn

Ellis Co

30	29	25	27	26	29	35	39	34	34	39	30
28	32	30	31	37	33	28	25	33	48	41	38
37	28	33	30	37	44	32	41	29	28	32	27

Saline Co

42	53	46	53	55	52	51	48	48	57	61	55
49	47	48	47	48	58	48	50	56	58	61	58
51	48	43	45	54	56	49	50	51	58	61	64

Jewell Co

36	41	43	48	42	44	53	53	60	59	44	57
39	57	59	47	46	45	52	61	67	70	66	63
52	45	53	50	37	45	61	51	61	58	67	63

Thomas Co

70	75	75	71	68	62	66	64	59	57	58	56
66	85	73	76	73	62	56	67	50	47	49	56
72	78	71	76	63	65	61	60	57	52	62	59

Finney Co

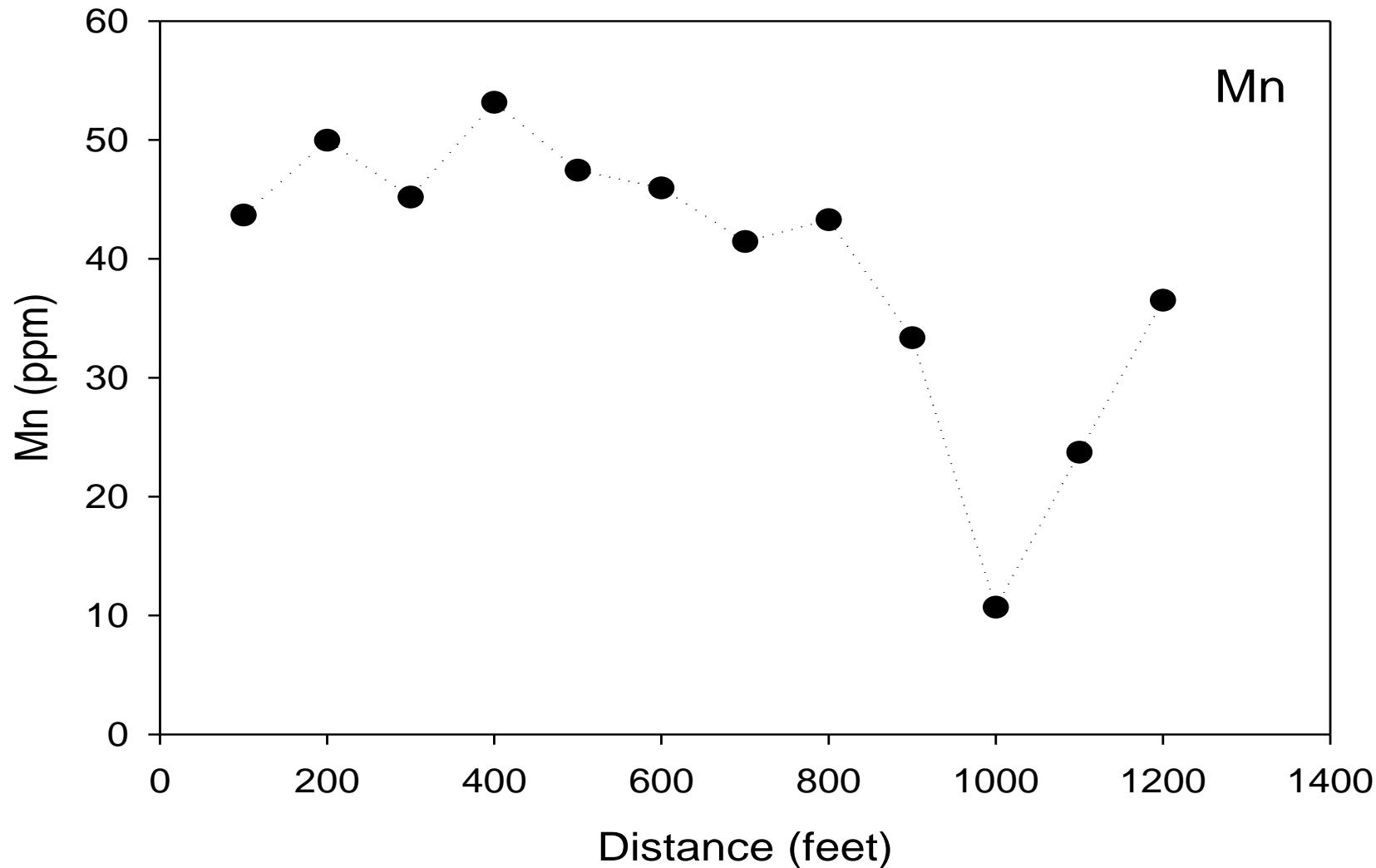
46	52	46	46	41	39	36	28	24	11	24	37
49	52	46	61	49	43	42	53	27	23	31	32
36	46	44	52	52	56	47	49	49	51	30	26

1500 ft

360 ft



Field variability soil Mn



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
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- Nutra-Flo
- Waters Agricultural Laboratories
- Olsen's Agricultural Laboratory



Questions?



Field variability soil Mn

