Enhancing Continuous Corn **Production Under High Residue Conditions with Starter Fluid Fertilizer Combinations and Placement** Jeff Vetsch Univ. of Minnesota Southern Research and Outreach Center 2011 Fluid Fertilizer Foundation Forum Feb. 21, 2011

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Introduction

- Crop rotations in the Midwest have changed to more corn-intensive rotations.
- These rotations produce large amounts of biomass (corn stover) that remain on the soil surface with conservation tillage systems. This is good in terms of erosion control, but can be a significant challenge to corn producers on many poorly drained, colder soils of the Northern Corn Belt from the standpoint of seedbed preparation, early corn growth, and vield (Vetsch et al., 2010).

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Objectives

- The objectives of this study are to:
 - determine the effects of fluid starter fertilizer combinations and placement of 10-34-0 (APP), 28-0-0 (UAN), and 12-0-0-26 (ATS) on second-year corn production in reduced tillage (chisel plow) high-residue conditions,
 - 2) provide management guidelines on placement and rate of UAN, APP, and ATS combined as a starter for crop consultants, local advisors, and the fertilizer industry.

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Treatments

	<u>APP, 10-34-0</u>		UAN, 28-0-0		ATS, 12-0-0-26		N+P+S
No. [†]	Rate	Placement	Rate	Placement	Rate	Placement	Application rate
	gal./A		gal./A		gal./A		lb N+P ₂ O ₅ +S
1	0		0		0		0+0+0
2	0		0		2	Surface dribble	3+0+5.8
3	0		0		4	Surface dribble	5+0+11.5
4	0		8	Surface dribble	0		24 + 0 + 0
5	0		8	Surface dribble	2	Surface dribble	27+0+5.8
6	0		8	Surface dribble	4	Surface dribble	29+0+11.5
7	4	In furrow	0		0		5+16+0
8	4	In furrow	0		2	Surface dribble	7+16+5.8
9	4	In furrow	0		4	Surface dribble	10+16+11.5
10	4	In furrow	8	Surface dribble	0		29+16+0
11	4	In furrow	8	Surface dribble	2	Surface dribble	31+16+5.8
12	4	In furrow	8	Surface dribble	4	Surface dribble	34+16+11.5
13	4	In furrow	0		1	In furrow	6+16+2.9
14	4	In furrow	8	Surface dribble	1	In furrow	30+16+2.9

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Methods and measurements:

- Took 0-6" soil samples for pH, P, K and OM
 - Webster clay loam, OM=6.1%, Bray P=42, K=191, pH=5.5
 - Mt Carroll silt loam, OM=4.8%, Bray P=22, K=170, pH=7.3
- Planted corn at 35,000 seeds/A
 - DeKalb 52-43 at Waseca (Webster) on May 3
 - DeKalb 48-37 at Rochester (Mt Carroll) on April 27
- Applied UAN at V2 to bring all plots up to 180 lb N/A
- Plant heights and whole plant samples at V7-8
- Relative leaf chlorophyll readings at VT
- Combine harvested (saved grain sample)

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2010 Growing season rainfall (inches)

Growing season rainfall (long-term normal)				
Waseca	Rochester			
3.3 (4.0)	3.7 (3.5)			
9.6 (4.2)	6.6 (4.0)			
6.6 (4.5)	3.8 (4.6)			
2.4 (4.6)	6.5 (4.3)			
12.7 (3.2)	9.6 (3.1)			
	Growing season rai Waseca 3.3 (4.0) 9.6 (4.2) 6.6 (4.5) 2.4 (4.6) 12.7 (3.2)			

34.6 (20.4)

30.2 (19.6)

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Total







(orland)

June 21, Waseca

193 bu/A, 21%

0 gal/A 10-34-0 0 gal/A UAN 0 gal/A ATS

209 bu/A, 16%

4 gal/A 10-34-0 In-8 gal/A UAN S. ba 4 gal/A ATS S. ba 0 gal/A 10-34-0 8 gal/A UAN S. band 4 gal/A ATS S. band



Corn grain moisture an	d yield	l, plant	t heigh	nt at V7			
and relative leaf chlo	rophyll	at VT	at Wa	iseca			
	Grain	Grain	Plant	Leaf			
Main effects of trts 1-12	H_2O	Yield	height	Chloro			
	%	bu/A	inch	%			
APP (10-34-0) in-furrow							
None	18.6 a	214 a	32.7 b	95 a			
4 gal/A	17.7 b	214 a	35.3 a	96 a			
UAN (28-0-0) surface dribble band							
None	18.6 a	216 a	32.4 b	95 b			
8 gal/A	17.7 b	212 a	35.5 a	96 a			
ATS (12-0-0-26) surface dribble band							
None	19.5 a	209 b	32.5 b	91 c			
2 gal/A	18.0 b	218 a	34.6 a	96 b			
4 gal/A	17.0 c	215 a	34.8 a	99 a			

Corn grain yield as affected by the ATS and UAN rate applied at planting at Waseca.



Corn grain moisture and yield, plant height at V7							
and relative leaf chlorophyll at VT at Waseca							
-	Rate / p	lacemen	t of fert.	Grain	Grain	Plant	Leaf
Trt	APP	UAN	ATS	H_2O	Yield	height	Chloro
#		gal / acre		%	bu/A	inch	%
1	0, In-F	0, SB	0, SB	20.7	202	28.4	90
7	4, In-F	0, SB	0, SB	19.0	207	32.9	92
13	4, In-F	0, SB	1, In-F	18.6	219	34.7	94
8	4, In-F	0, SB	2, SB	18.2	223	35.0	95
10	4, In-F	8, SB	0, SB	18.8	212	34.9	92
14	4, In-F	8, SB	1, In-F	17.9	209	35.0	93
11	4, In-F	8, SB	2, SB	16.8	210	37.1	97
Ave	erage LS	D (0.10)	:	1.1	10	1.4	2

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Waseca site summary

- Sulfur (ATS) increased grain yield 6–9 bu/A, when averaged across UAN and APP treatments.
- 2 gal/A of ATS without APP and UAN increased grain yield 18 bu/A compared with the control (no APP, UAN or ATS).
- APP, UAN and ATS fluid fertilizers enhanced early growth and decreased grain moisture.
- Total N uptake in corn at black layer was reduced by 10-12 lb/A when UAN was applied at planting. This suggests N loss (wet summer) was greater with these treatments and a reduced yield potential.

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Corn grain moisture and yield, plant height at V7 and relative leaf chlorophyll at VT at Rochester.

	Grain	Grain	Plant	Leaf		
Main effects of trts 1-12	H_2O	Yield	height	Chloro		
	%	bu/A	inch	%		
APP (10-34-0) in-furrow						
None	17.4 a	208 a	36.8 b	97 a		
4 gal/A	16.5 b	210 a	40.0 a	98 a		
UAN (28-0-0) surface dribble band						
None	17.1 a	209 a	38.2 a	97 a		
8 gal/A	16.8 b	209 a	38.6 a	97 a		
ATS (12-0-0-26) surface dr	ibble bar	nd				
None	17.1 a	209 a	38.2 a	97 b		
2 gal/A	17.0 a	209 a	38.3 a	98 a		
4 dal/A	168a	210 a	387a	98 a		

Rochester site summary

- No significant differences in grain yield were found at this site.
- Both APP and UAN at planting did reduce grain moisture at harvest.

- APP increased early growth (plant height)

- [S] in whole plants at V7 increased as ATS rate increased, but no affect on grain moisture (data not shown)
 - I have yet to get a significant yield response to S at this site (history of dry beef manure fertilization).

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QUESTIONS

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