Enhancing Continuous Corn Production Under High Residue Conditions with Starter Fluid Fertilizer Combinations and Placements

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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 yield (Vetsch et al., 2010).

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Objectives

- The objectives of this study were to:
  1) 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 continuous 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

No.†	APP, 10-34-0 Rate	APP, 10-34-0 Placement	UAN, 28-0-0 Rate	UAN, 28-0-0 Placement	ATS, 12-0-0-26 Rate	ATS, 12-0-0-26 Placement	N+P+S Application rate
	gal./A		gal./A		gal./A		lb $N+P_2O_5+S$
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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2010 Summary

- Waseca
  - Sulfur (ATS) increased grain yield 6–9 bu/A, when averaged across UAN and APP treatments.
  - 2 gal/A of ATS alone 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.
- Rochester
  - No yield response to fluid starter fertilizers.
  - APP enhanced early growth and dry matter yield.
  - APP and UAN decreased grain moisture at harvest.

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2011 Methods and measurements:

- Took 0-*6" soil samples for pH, P, K and OM*
  - Webster clay loam, OM=7.2%, Bray P=47, K=264, pH=5.9
  - Mt Carroll silt loam, OM=3.4%, Bray P=13, K=68, pH=6.3
- Planted corn at 35,000 seeds/A
  - DeKalb 52-43 at Waseca on **May 17**, 39% residue cover
  - DeKalb 51-85 at Rochester on **May 19**, 12% residue cover
- Applied UAN at V2 to bring all plots up to 200 lb N/A
- Applied 120 lb K_2O/A at Rochester.
- Plant heights and whole plant samples at V7

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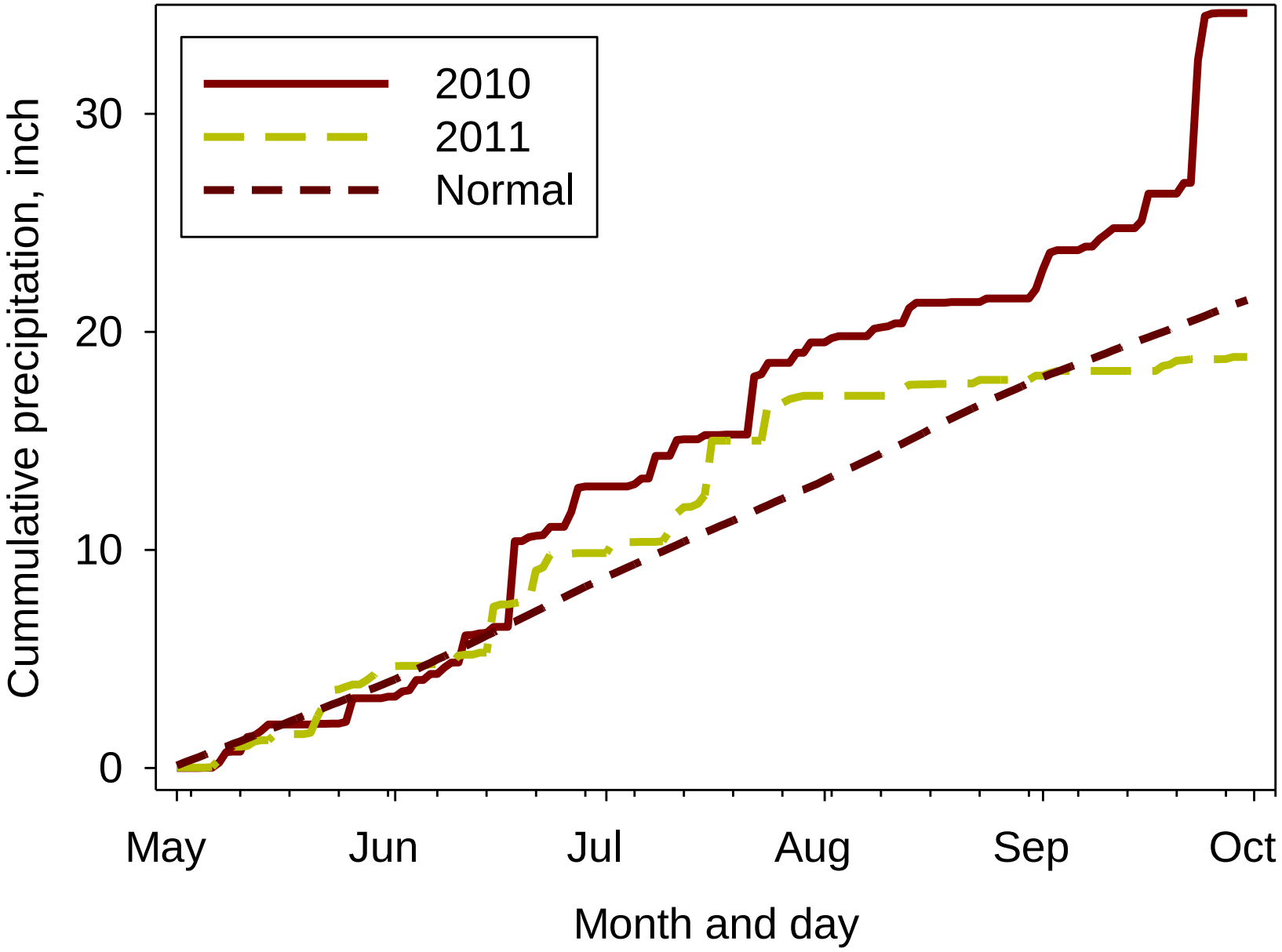
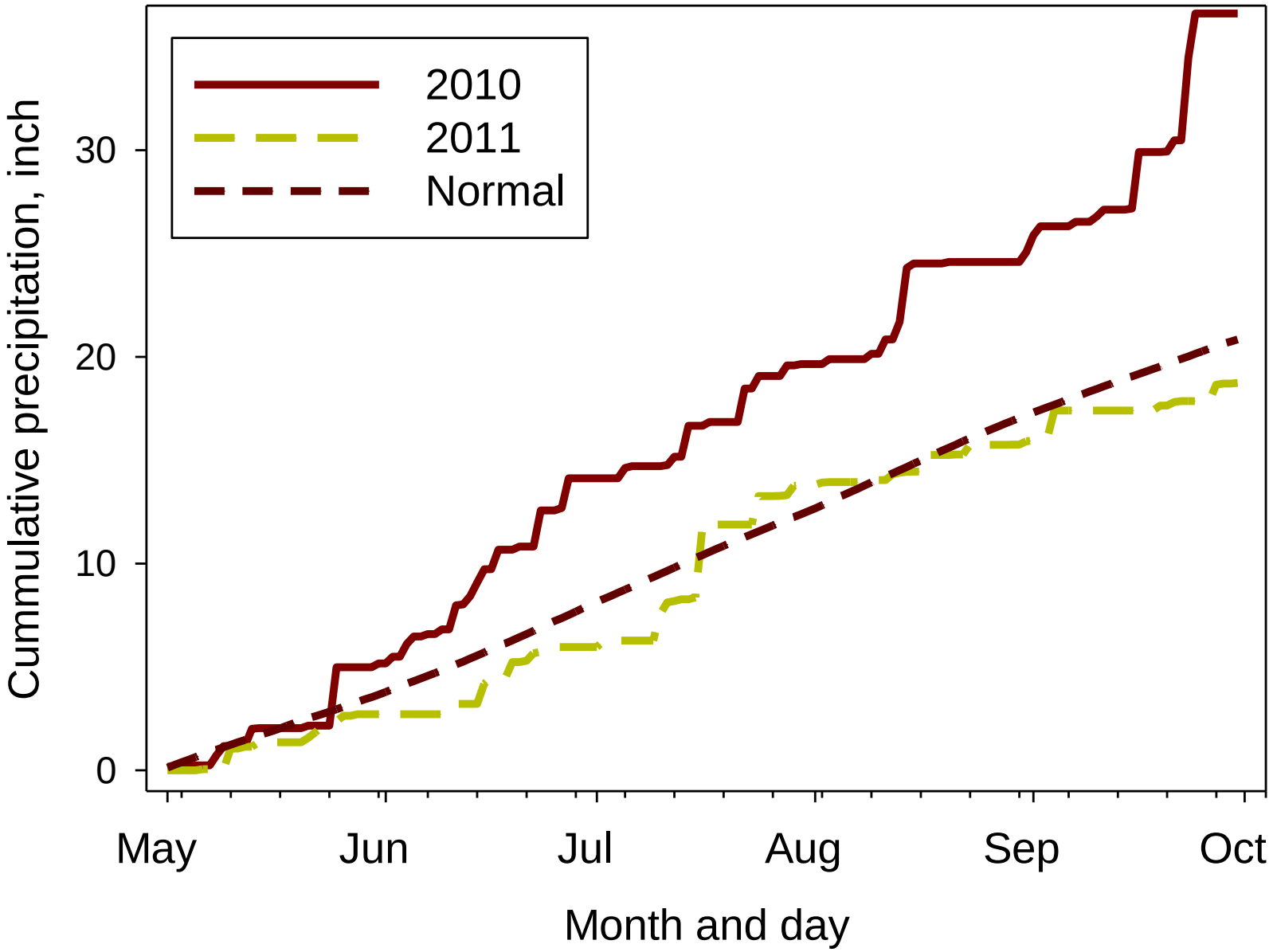
Growing season rainfall at Waseca

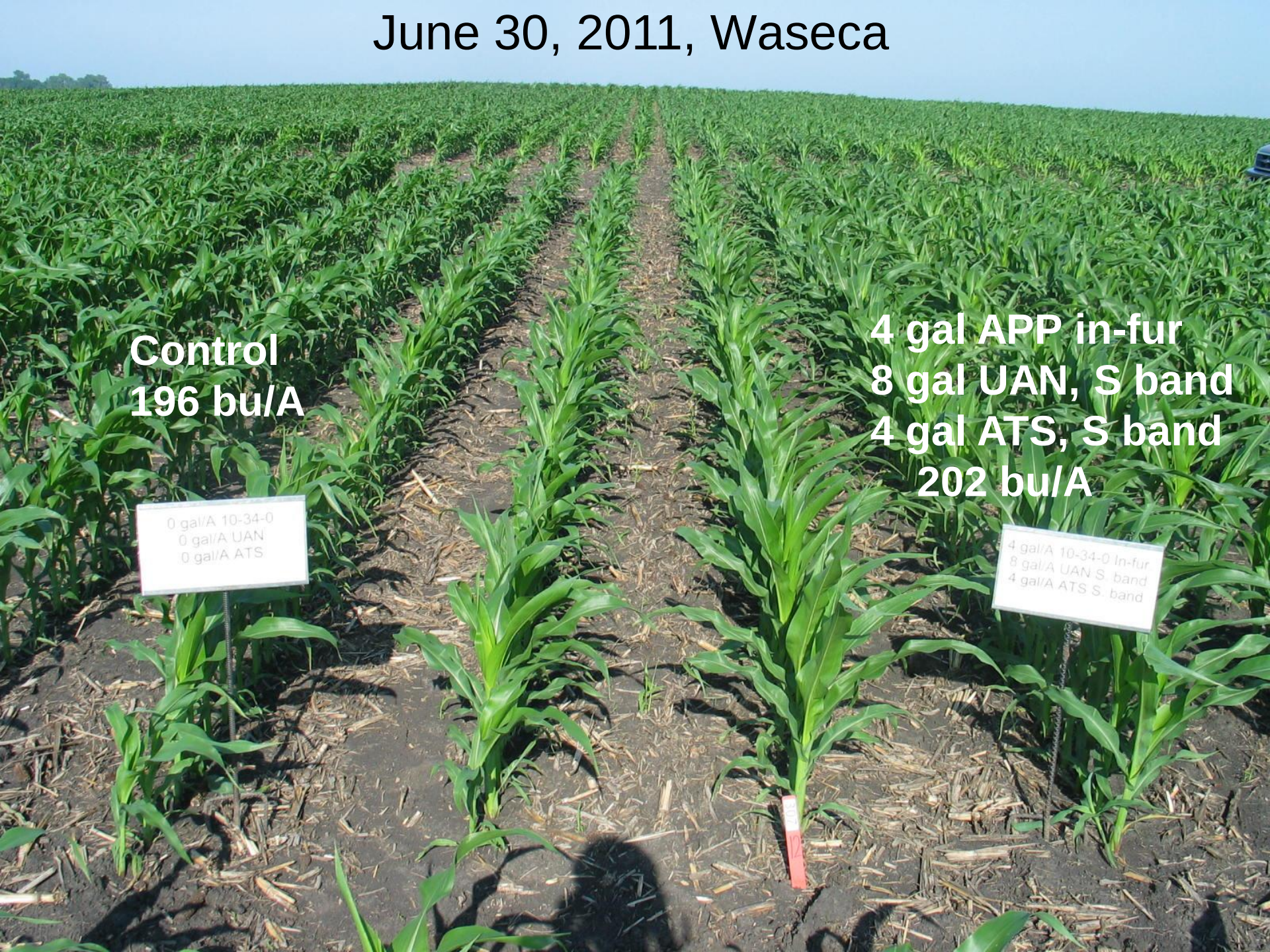


Growing season rainfall at Rochester

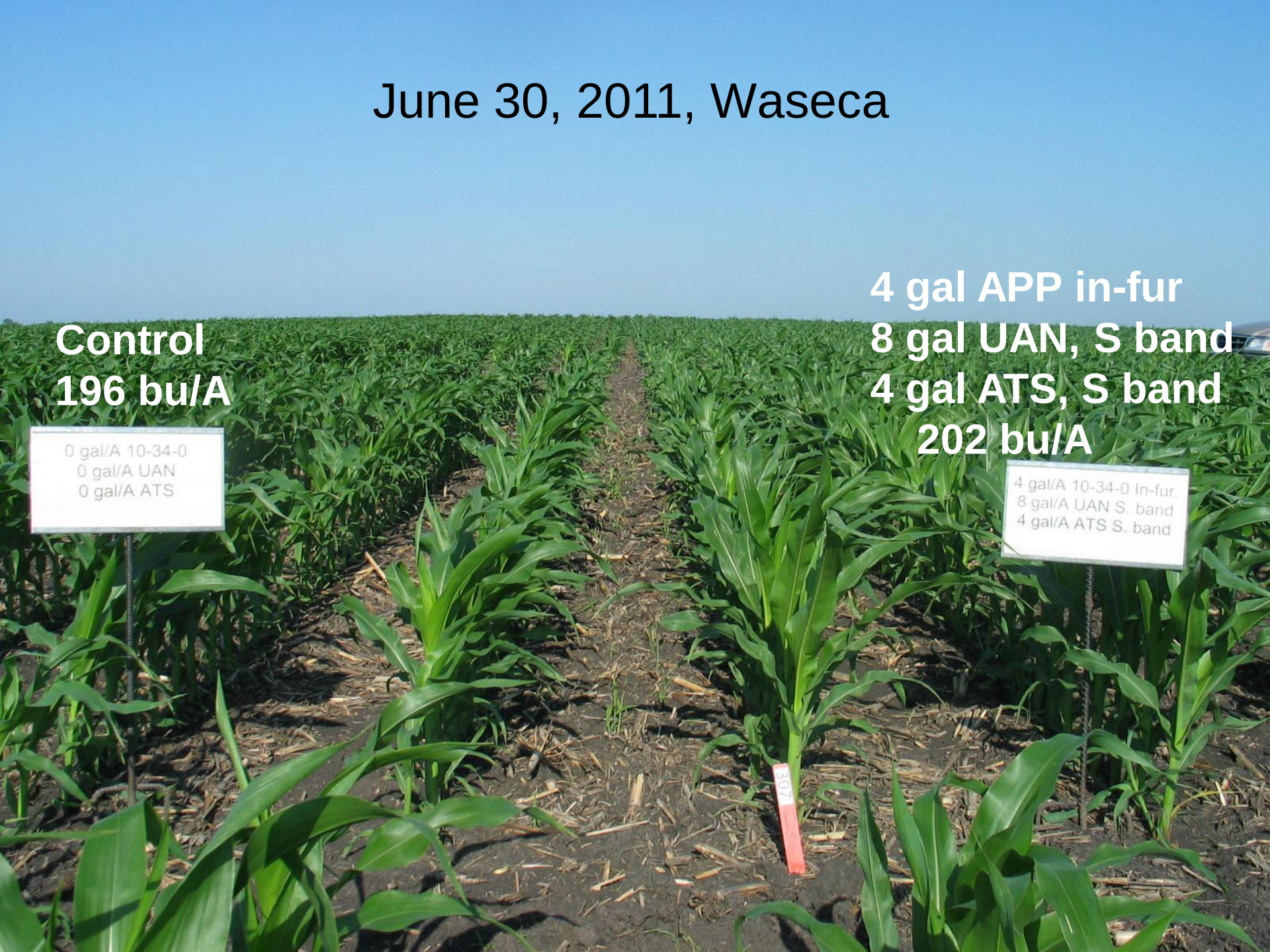


June 20, 2011 Waseca

June 30, 2011, Waseca



June 30, 2011, Waseca



June 30, 2011, Waseca


June 30, 2011, Waseca
4 gal APP in-furrow
8 gal UAN, S band
4 gal ATS, S band

Corn grain moisture and yield, plant height at V7 and relative leaf chlorophyll at VT at Waseca, 2011

Main effects of trts 1-12	Grain H_2O	Grain Yield	Plant height	Leaf Chloro
	%	bu/A	inch	%
APP (10-34-0) in-furrow				
None	18.5 a	194 a	34.3 b	98 a
4 gal/A	17.9 a	198 a	37.1 a	98 a
UAN (28-0-0) surface dribble band				
None	18.3 a	195 a	35.0 b	98 a
8 gal/A	18.2 a	197 a	36.4 a	97 a
ATS (12-0-0-26) surface dribble band				
None	17.8 b	196 a	34.6 b	97 a
2 gal/A	18.1 b	197 a	35.4 b	98 a
4 gal/A	18.8 a	196 a	37.1 a	97 a

2011 Waseca site summary

- No significant differences in grain yield were found at this site.
- APP, UAN and ATS application at planting did increase early growth (plant height and whole plant dry matter yield at V7)
- Surface band application of ATS reduced plant stand about 1,300 plants/A (data not shown).

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Corn grain moisture and yield, plant height at V7 and relative leaf chlorophyll at VT, Olmsted Co. 2011

Main effects of trts 1-12	Grain H_2O	Grain Yield	Plant height	Leaf Chloro
	%	bu/A	inch	%
APP (10-34-0) in-furrow				
None	21.3 a	195 b	28.7 b	97 a
4 gal/A	19.9 b	199 a	33.1 a	98 a
UAN (28-0-0) surface dribble band				
None	20.6 a	197 a	30.3 b	98 a
8 gal/A	20.5 a	198 a	31.5 a	97 a
ATS (12-0-0-26) surface dribble band				
None	20.9 a	194 b	30.2 a	96 b
2 gal/A	20.5 a	196 b	31.1 a	98 a
4 gal/A	20.4 a	202 a	31.4 a	98 a

2011 Olmsted Co. site summary

- 4 gal/A of APP (16 lb P_2O_5/A) increased grain yield 4 bu/A compared with the 0 gal/A of APP and reduced grain moisture 1.4 percentage points (STP=13 ppm), when averaged across ATS and UAN treatments.
- 4 gal/A of ATS (11.5 lb S/A) increased grain yield 8 bu/A compared with the 0 gal/A of ATS, when averaged across UAN and APP treatments.
- Generally, APP, UAN and ATS fluid fertilizers enhanced early growth (plant height and dry mater yield at V7).
- Sulfur fertilization increased relative leaf chlorophyll content (greenness of plant).

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2010–11 Summary

- Applying 4 gal/A of APP in-furrow
  - reduced grain moisture at 3 of 4 loc-yrs
  - increased grain yield at 1 of 4 loc-yrs (4 bu/A at Rochester in 2011)
  - increased plant height at all 4 loc-yrs
- Applying 8 gal/A of UAN as a surface dribble band
  - reduced grain moisture at 2 of 4 loc-yrs
  - did not affect corn grain yield
  - increased plant height in 3 of 4 loc-yrs
- Applying ATS in a surface dribble band
  - reduced grain moisture at 1 of 4 loc-yrs
  - increased grain yield in 2 of 4 loc-yrs (4 bu/A avg. overall)
  - increased plant height in 2 of 4 loc-yrs

Conclusion

- During this study period, applying APP and ATS independently or in combination had the greatest likelihood for increasing corn grain yield.
- Generally, APP, ATS and UAN applied as starter fertilizers increased early growth and vigor of continuous corn under reduced tillage and may reduce grain moisture at harvest.

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QUESTIONS

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