POLYMER-COATED UREA (ESN) FOR CORN

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OBJECTIVES

- Control N leaching losses on sandy, irrigated soils
- Determine optimum times and rates of N application
- Evaluate N source & management practice effects
- Evaluate a nitrification inhibitor with N sources & application times

Nitrogen Management Experiment, Hancock, WI
8 July 2004

TREATMENTS (2003 -2006)

- N Sources: PCU(ESN), Ammonium Sulfate, Urea
- N Timing: Preplant, Sidedress, Split(s)
- Rates: 0-250 lb N/acre, +/- Sulfur*

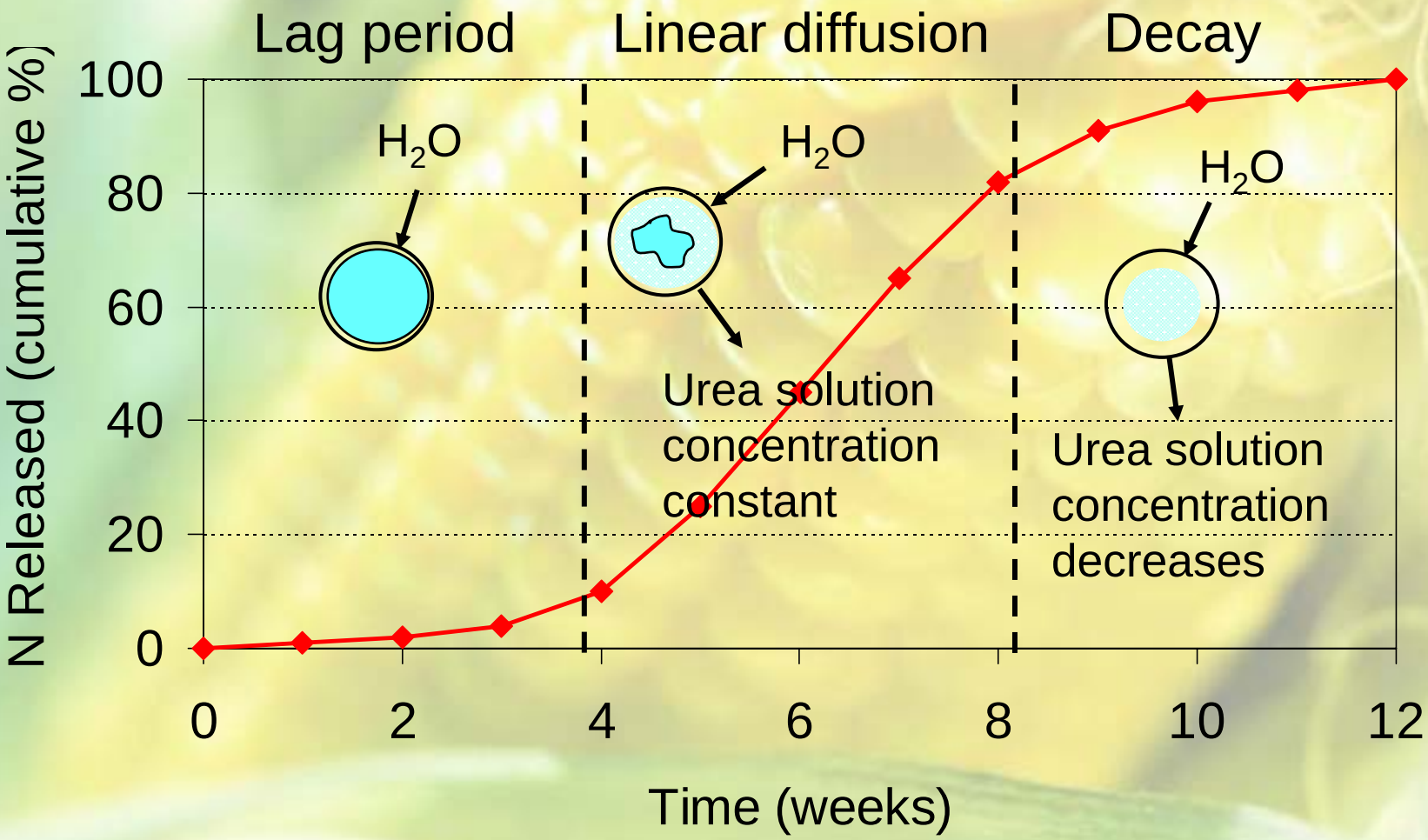
*S source = gypsum

TREATMENTS

- Polymer-Coated Urea (ESN)
  - Control (0 lb N/a) + 40 lb S/a*
  - Split (Preplant & 4 wk): 100, 150, 200, and 250 lb N/a + 40 lb S/a.
  - Preplant: 100, 150, 200, and 250 lb N/a + 40 lb S/a.

*S source = gypsum

ESN Release Mechanism



Agrium

TREATMENTS

- Ammonium Sulfate
  - Split (4 & 6 wk): 100, 150, 200, and 250 lb N/a.
  - Preplant: 150 and 200 lb N/a.
  - Preplant + nitrification inhibitor (DCD): 150 and 200 lb N/a
  - Sidedress (4 wk): 150 and 200 lb N/a.

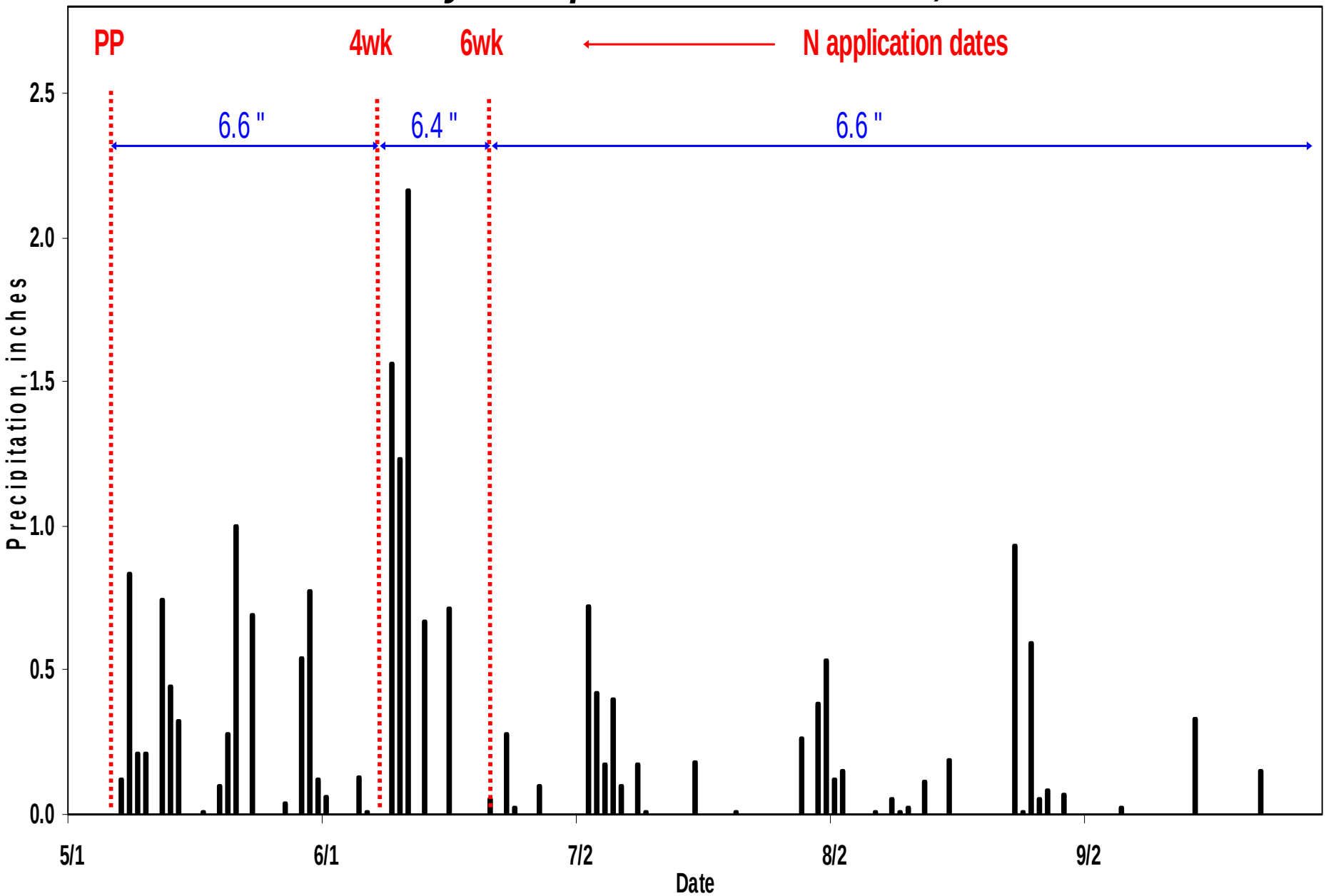
TREATMENTS

- Urea
  - Preplant: 150 and 200 lb N/a.
  - Sidedress (4 wk): 150 and 200 lb N/a + 40 lb S/a.
  - Sidedress (4 wk): 150 and 200 lb N/a w/o S.

Monthly departure from normal precipitation, Hancock, 2003-2006

Month	2003	2004	2005	2006
	---------- Inches ----------			
May	1.35	3.15	-0.41	1.7
June	-0.43	3.34	-0.46	-2.4
July	-1.47	-0.78	1.99	-1.0
August	-3.34	-1.00	-0.58	-1.1
Sept.	-1.44	-3.69	-0.28	-0.89
Total	-5.33	1.02	0.26	-3.69

Time of N application relative to precipitation from May to September at Hancock, 2004.



N Source & timing effects on corn grain yield at Hancock, WI, 2004

N source	N timing	N rate, lb/acre 150	200	Mean
		--- grain yield, bu/acre ---		
PCU (ESN)	PP	170	163	167c
	PP+4 wk	177	185	180b
Am. Sulf.	PP	126	137	132e
	PP+DCD	128	143	136e
	4 wk	179	183	181b
	4 wk & 6 wk	189	202	196a

No N control = 115 bu/acre.

N Source & timing effects on corn grain yield at Hancock, WI, 2004

		N rate, lb/acre		
N source	N timing	150	200	Mean
		--- grain yield, bu/acre ---		
Urea	PP + S	135	148	141de
	4 wk + S	144	159	151d
	4 wk w/o S	141	162	151d

No N control = 115 bu/acre

N Source & timing effects on corn grain yield at Hancock, WI, 2006

N source	N timing	N rate, lb/acre 150	200	Mean
		--- grain yield, bu/acre ---		
PCU (ESN)	PP	185	180	182NS
	PP+4 wk	182	183	182
Am. Sulf.	PP	179	182	180
	PP+DCD	187	192	189
	4 wk	180	172	176
	4 wk & 6 wk	187	179	182

No N control = 95 bu/acre.

N Source & timing effects on corn grain yield at Hancock, WI, 2003-2005

		Year *		
N source	N timing	2003	2004	2005
		--- grain yield, bu/acre ---		
PCU (ESN)	PP	204NS	167c	186ab
	PP+4 wk	205	180b	189a
Am. Sulf.	PP	196	132e	175b
	4wk+6 wk	194	181b	180ab
Urea	PP + S	--	141de	154c
	4 wk + S	--	151d	181ab

* Yields shown are means of 150 and 200 lb N/acre rates.

EONR and corn yields with PCU and ammonium sulfate treatments (2003-2006)

	Polymer-coated urea (ESN)			Am. sulf.
Year	Preplant	PP & 4wk	4 wk	4 & 6 wk
	---------- EONR*, lb N/acre ----------			
2003	200 (218)	181 (207)	--	189 (196)
2004	227 (173)	215 (190)	--	193 (202)
2005	165 (189)	158 (193)	152 (187)	167 (184)
2006	123 (182)	115 (185)	102 (174)	90 (181)

*EONR based on five rates (0-250 lb N/a). Values in ( ) are yields at the EONR.

Average yield and N recovery with N treatments, Hancock 2003-2005

Treatment	Yield (bu/acre)	N recovery (%)
ESN preplant	185	44
Am. Sulf. Prepl.	171	41
AS +NI preplant	178	43
Urea preplant	159	19
ESN pre & 4wk.	189	49
Am. Sulf., 4wk	179	50
AS, 4wk & 6wk	189	56
Urea, 4wk	171	35

Ave. control yield = 103 bu/acre; Ave. control N uptake = 67 lb/acre.

SUMMARY - 2003-2006

- In normal or below normal rainfall years, preplant ESN is = or > sidedress or split ammonium sulfate or urea
- Preplant ammonium sulfate was superior to preplant urea
- Using a NI (DCD) with AS increased yields and N recovery in some years, but not with excessive early rainfall

SUMMARY - 2003-2006

- In wet years, ESN is a superior preplant N source compared with conventional fertilizers
- Split sidedress applications of ammonium sulfate are superior to preplant ESN in wet years
- Using preplant ESN as a general practice would involve some risk of reduced performance in wet years

N Source & timing effects on corn grain yield at Hancock, WI, 2003-2005

N source	N timing	Year* 2003	2004	2005
		--- grain yield, bu/acre ---		
Control	--	107	115	96
PCU (ESN)	PP	204NS	167c	186ab
	PP+4 wk	205	180b	189a
Am. Sulf.	PP	196	132e	175b
	PP+DCD	202	136e	183ab
	4wk & 6 wk	194	181b	180ab

* Yields shown are means of 150 and 200 lb N/acre rates.