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Economic Risk & Profitability of Soybean Seed Treatments at Reduced Seeding Rates

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Wisconsin Soybean Marketing Board

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Overview

- Recent work & current practices
- Seed treatment and seeding rate effects on yield
- Economically optimal seeding rates *(EOSR)* for the three seed treatments
- Economic risk potential of lower seeding rates and seed treatments

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Recent Work

- Seed Treatment
  - Have been marketed as an insurance product
  - Recent Wisconsin studies have shown seed treatments can be economical with higher grain prices and high yields
  - North Dakota and Michigan studies reported fungicide seed treatments being cost effective less than 33% of the time

- Seeding Rate
  - *EOSR* in Iowa on high yielding sites was 75,000 seed a^{-1}
  - In Kansas dry land soybeans saw no yield increases past 80,000 plants a^{-1}
  - In Kentucky soybeans saw no yield increases past 108,000 plants a^{-1}

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Current Practices

- Growers have been reducing seeding rates gradually over time
  - Due to increased seed costs and equipment changes
- Current recommendation is roughly 140,000 seeds a^{-1}
- Seed treatment use on soybeans is around 75%
- Questions?
  - Can we maintain yield and profitability with reduced seeding rate?
  - How do recent grain price declines impact seeding rates?
  - What is the risk associated with reducing seeding rates?
  - Where do seed treatments fit into the picture?
    - Can they provide risk mitigation and increase yield?

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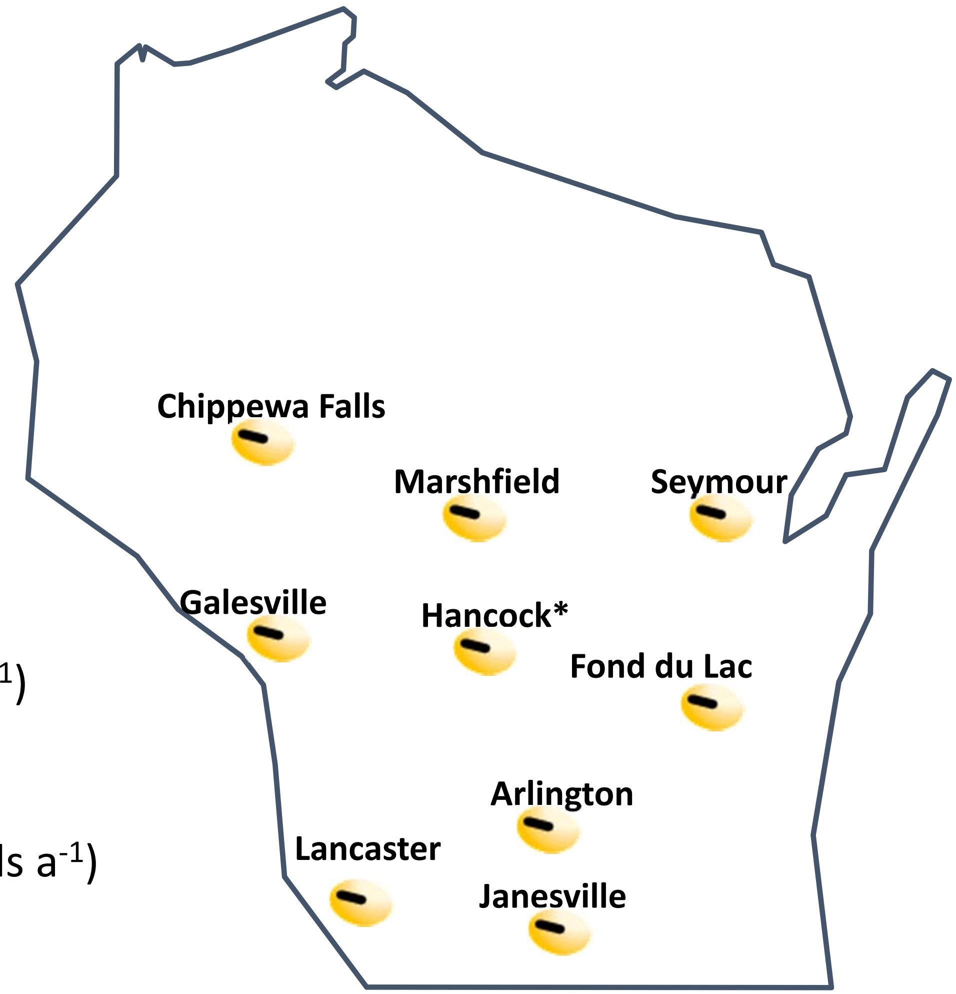
Trial Information

- Years (2012-2013) N =1296
- Regions
  - Southern
  - Central
  - N. Central
- Variety: NK Brand S20Y2
- Planting Date: First 3 weeks in May
- Row Spacing: 15 inches
- Seed treatments
  - UTC
  - ApronMaxx RFC (0.0094 mg ai $seed^{-1}$)
  - CruiserMaxx (0.0858 mg ai $seed^{-1}$)
- Seeding rates
  - 40, 60, 80, 100, 120, 140 (1000 seeds a^{-1})



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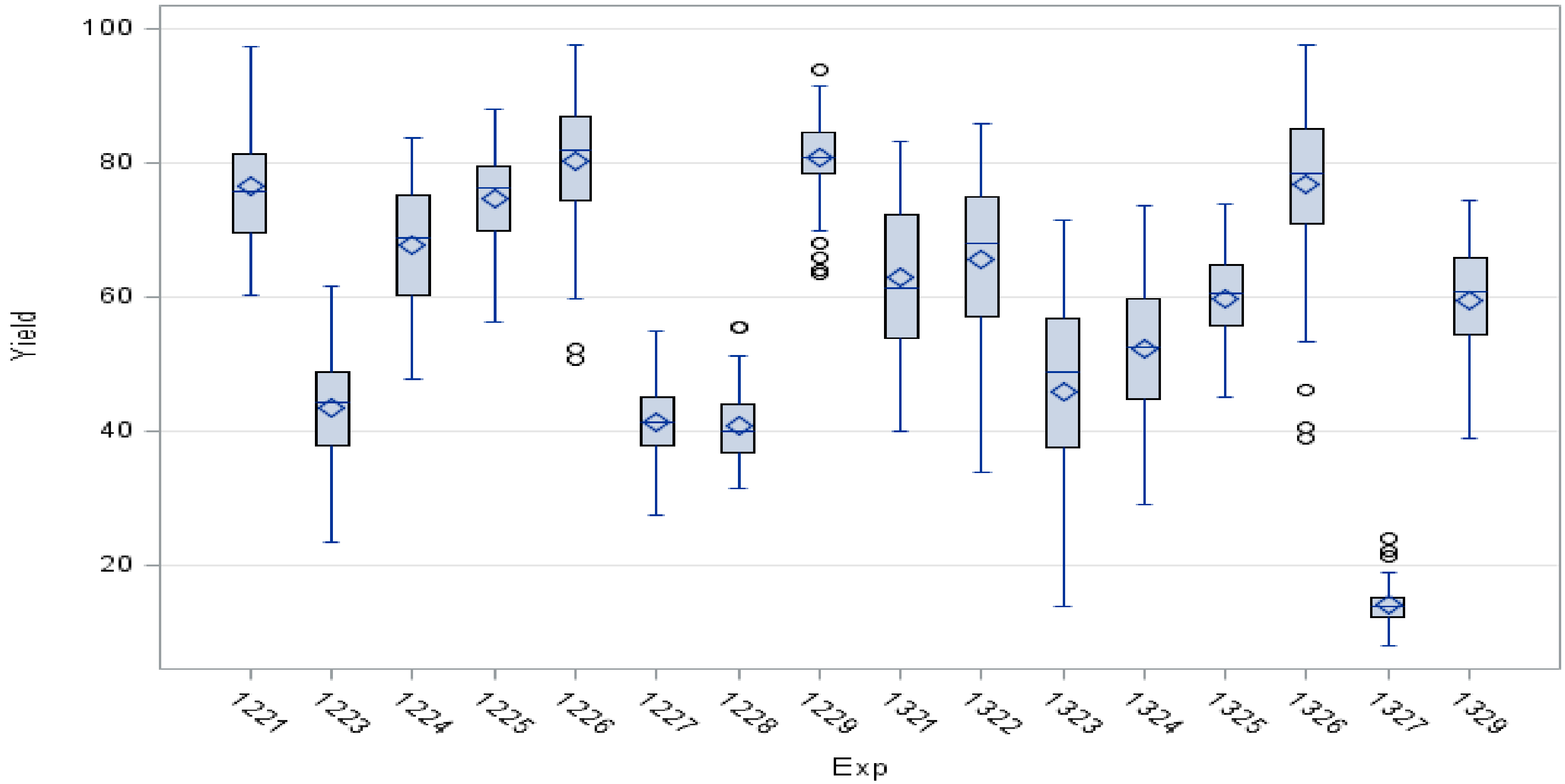
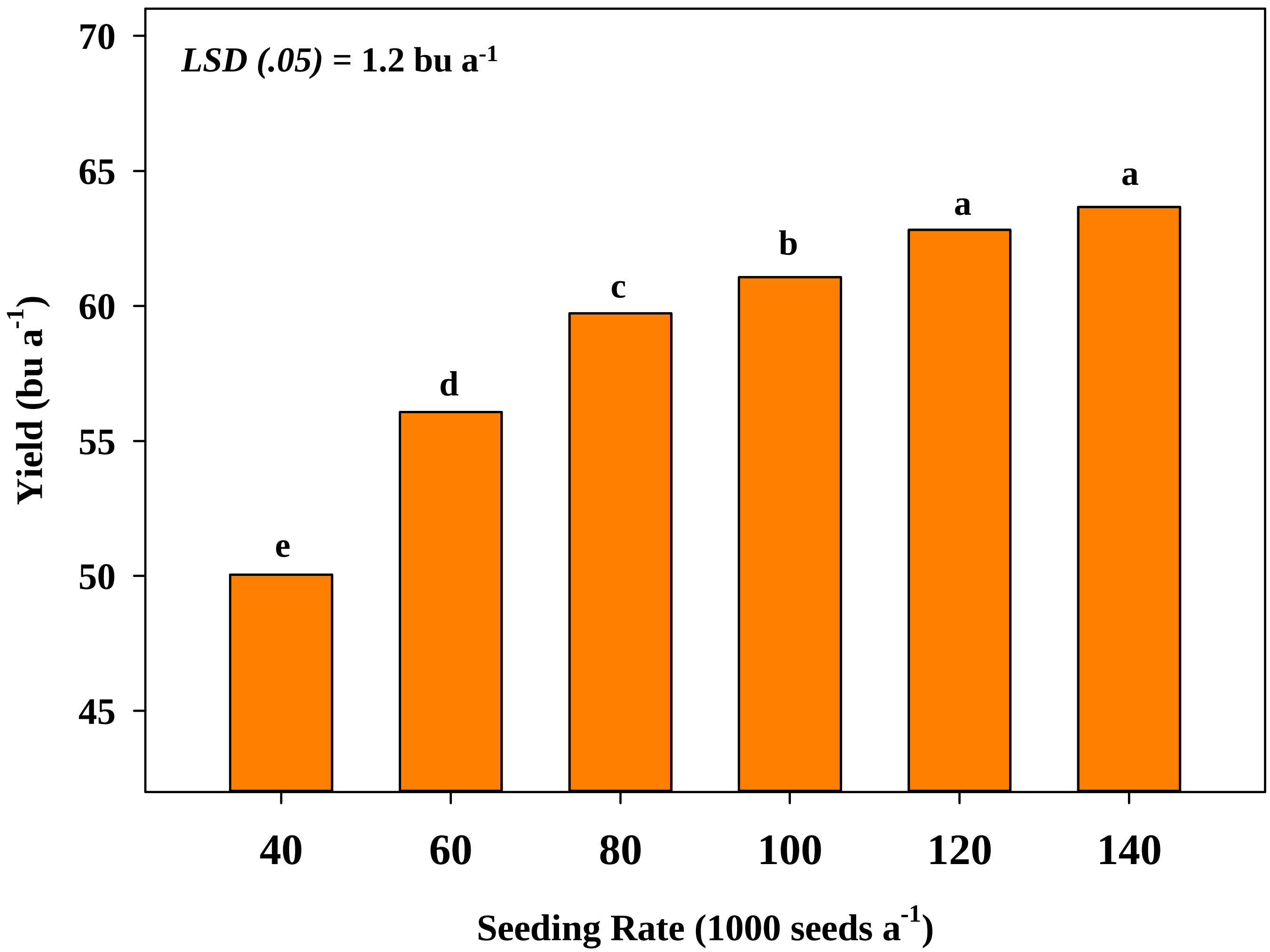
Yield Potential: Locations



- Looked at the treatments across various yield potentials and ultimately, responsive and non-responsive environments.

Main Effect: Seeding Rate



Soybean Canopy Development Time Lapse

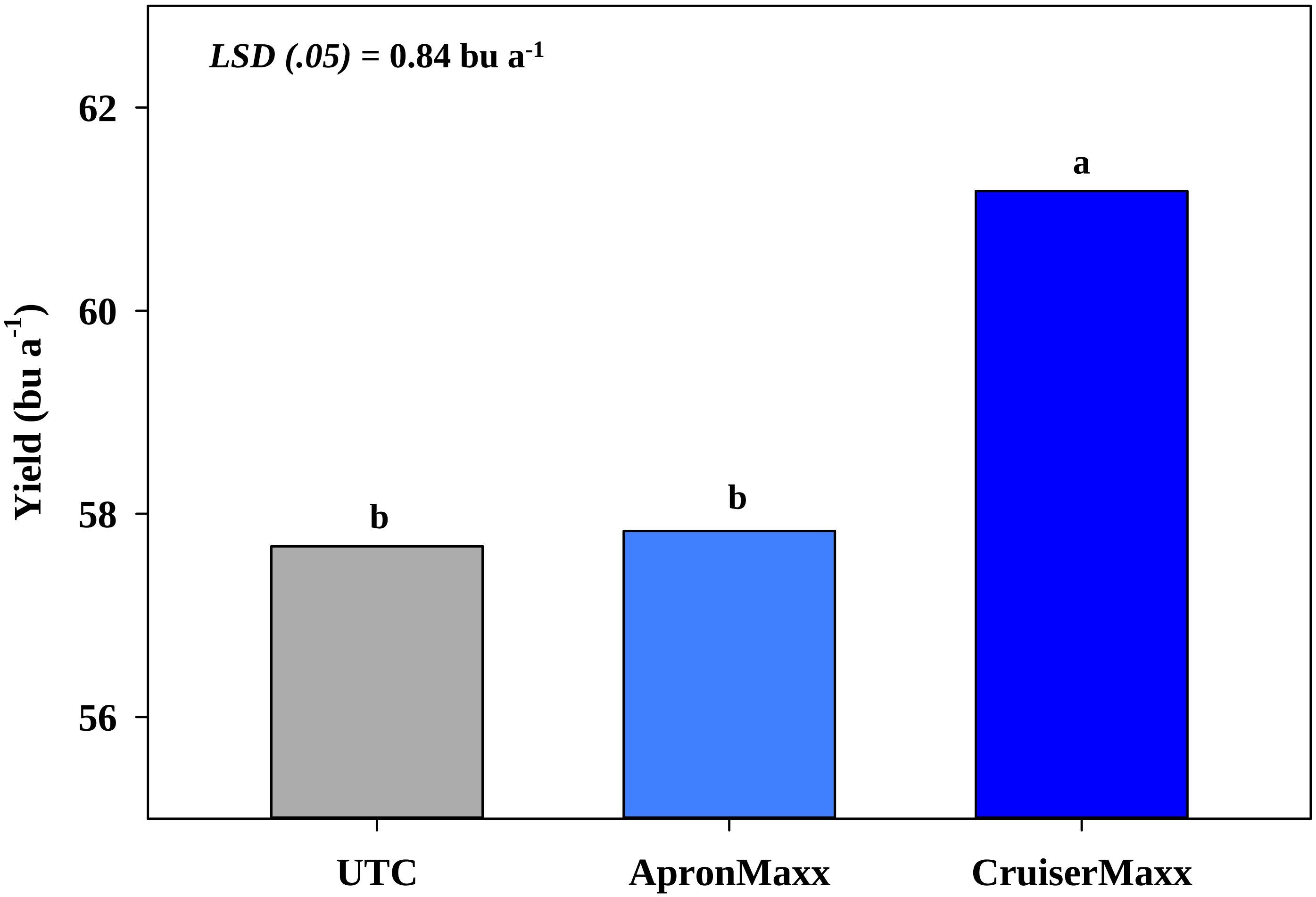
-No Seed Treatment

-May 11th Planting Date

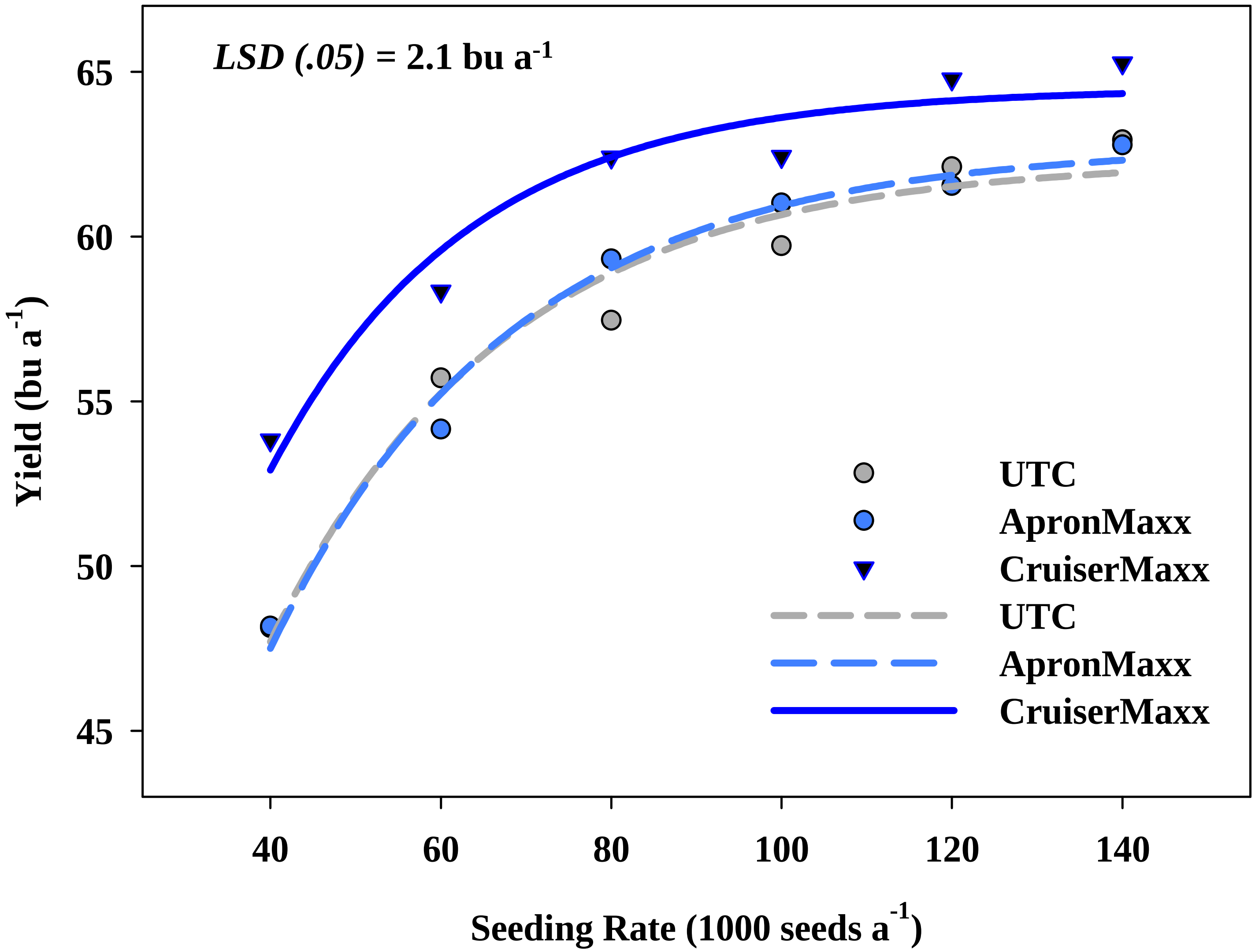
40 K	vs.	140 K
		

40 K % light interception	9	28	49	72	90	96	99	100
Date:	June 6th	June 13th	June 20th	June 27th	July 4th	July 11th	July 18th	July 25th
% light interception 140 K	22	61	84	92	95	98	99	100

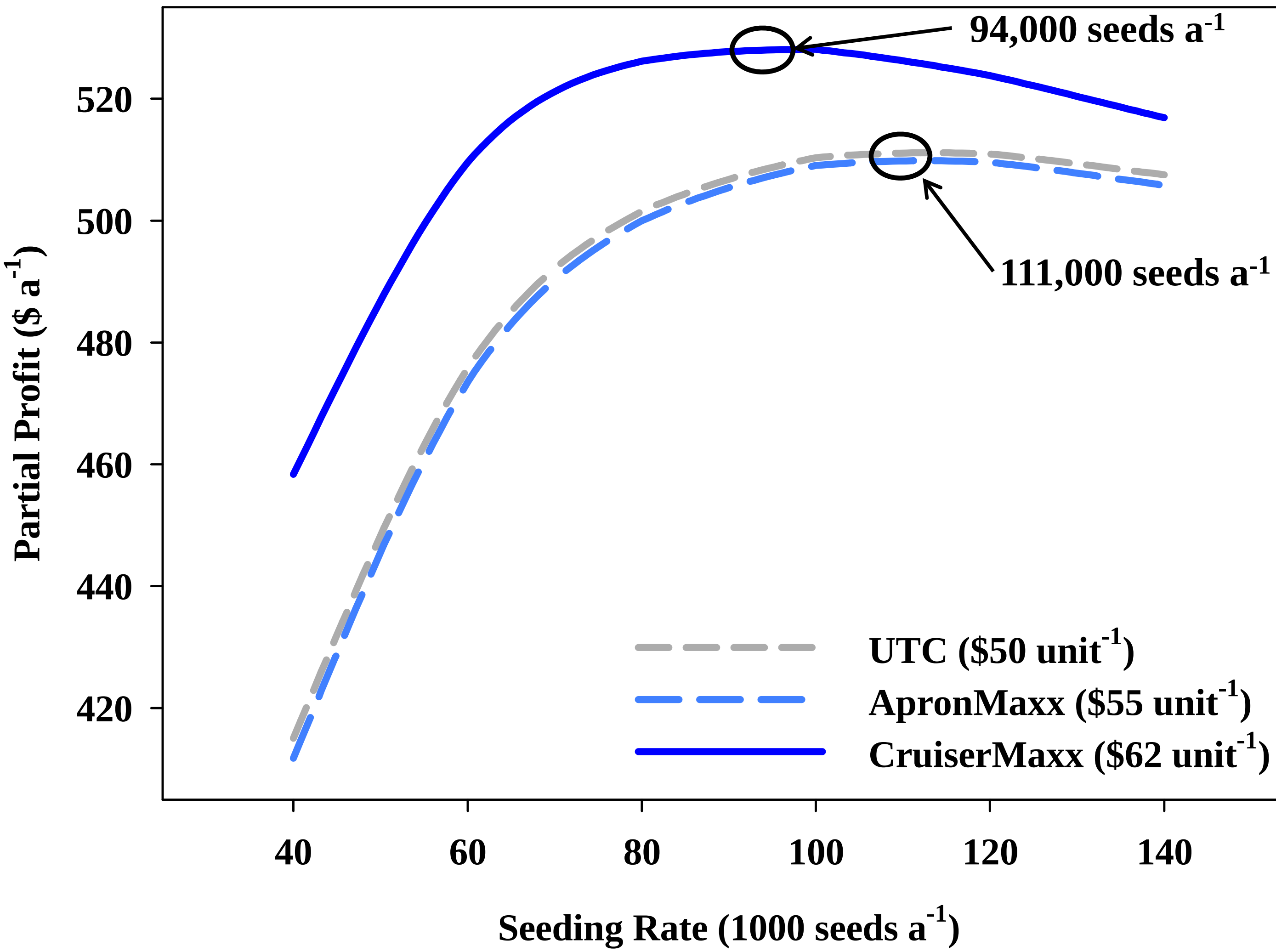
Main Effect: Seed Treatment



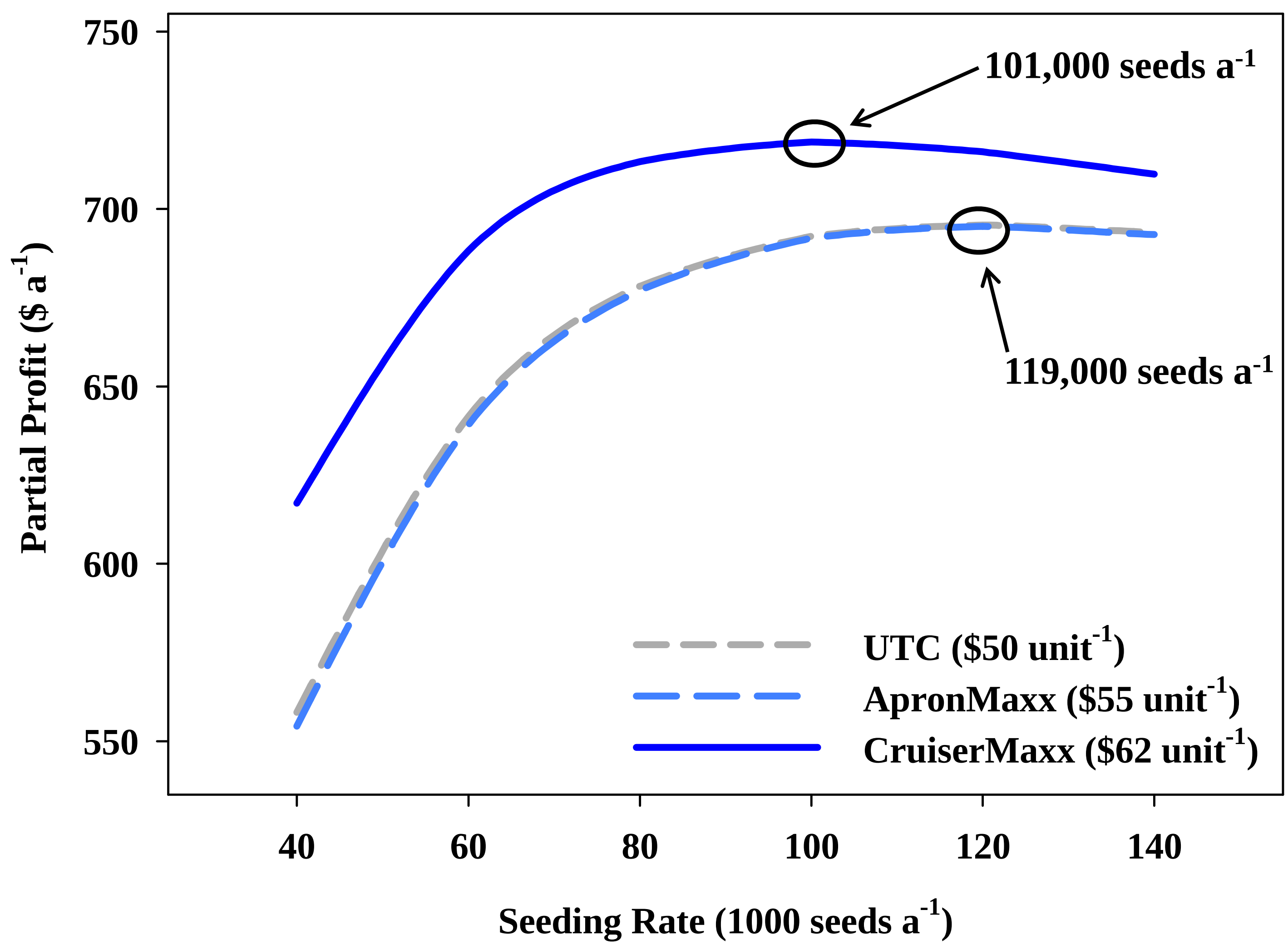
Yield at Various Seeding Rates for Different Seed Treatments



Profit per acre at $9 bu^{-1} Soybeans



Profit per acre at $12 bu^{-1} Soybeans



Economic Risk

- Uncontrollable factors during the growing season
  - Planting date (2012 vs. 2013)
  - Cool and wet condition
  - Inclement weather shortly after planting
  - In field variability
  - Lowering grain markets

- Products and practices that are valuable:
  - Show consistent yield gains
  - Provide profit stability over a wide range of situations and environments
  - Help manage long term margins and economic risk

- Assessing Economic Risk at Various Seeding Rates & How Seed Treatment Affects Risk
  - "Base case" = 140k seeds a^{-1} with no seed treatment (UTC)
  - Our trial allows us 20 comparisons to the base case.
  - The break-even probability shows us the probability that a certain seeding rate x seed trt. combination will increase profit over the base case.
    - Or essentially the risk of a certain treatment combination

Economic Risk Table for $9 bu^{-1} Soybeans

Treatment combination			Avg. profit increase over the Base Case		
Seed Treatment	**Seeding Rate**	**Break-even probability**	**Positive outcomes**	**All outcomes**	**Negative outcomes**
	Seeds acre^{-1}		$ acre^{-1}		
UTC	120,000	0.91	3	3	-2
	100,000	0.69	5	2	-5
	80,000	0.26	4	-8	-12
	60,000	0.01	2	-34	-34
	40,000	0.00	na	-94	-94
ApronMaxx	140,000	0.46	14	-2	-15
	120,000	0.54	15	2	-13
	100,000	0.51	14	1	-13
	80,000	0.28	10	-9	-17
	60,000	0.02	6	-36	-37
	40,000	0.00	na	-98	-98
CruiserMaxx	140,000	0.71	18	10	-11
	120,000	0.83	21	16	-9
	100,000	0.89	23	20	-8
	80,000	0.86	21	17	-8
	60,000	0.51	14	0	-15
	40,000	0.01	5	-51	-52
EOSR					
UTC	111,500	0.84	4	3	-3
ApronMaxx	111,000	0.54	14	2	-13
CruiserMaxx	94,000	0.89	23	20	-8

Economic Risk Table for $12 bu^{-1} Soybeans

Treatment combination		Break-even probability	Avg. profit increase over the Base Case		
Seed Treatment	**Seeding Rate**		**Positive outcomes**	**All outcomes**	**Negative outcomes**
	Seeds acre^{-1}		$ acre^{-1}		
UTC	120,000	0.77	3	2	-3
	100,000	0.44	4	-2	-7
	80,000	0.08	3	-17	-19
	60,000	0.00	1	-55	-55
	40,000	0.00	na	-138	-138
ApronMaxx	140,000	0.49	19	-1	-20
	120,000	0.52	19	1	-18
	100,000	0.44	17	-3	-19
	80,000	0.20	13	-18	-26
	60,000	0.01	8	-57	-57
	40,000	0.00	na	-142	-142
CruiserMaxx	140,000	0.76	27	17	-14
	120,000	0.84	29	23	-12
	100,000	0.87	30	25	-11
	80,000	0.80	26	18	-12
	60,000	0.38	16	-8	-22
	40,000	0.00	6	-79	-79
EOSR					
UTC	119,500	0.76	3	2	-3
ApronMaxx	119,000	0.52	19	1	-18
CruiserMaxx	101,000	0.87	30	25	-11

Conclusions

- Differences in yield, profitability, and economic risk due to seeding rate and seed treatment
- 2nd generation seed-applied insecticides have provided consistent yield benefits
- Multiple factors for determining seeding rates:
  - Expected grain sale price
  - Seed treatment use and components
- Fungicide/Insecticide seed treatment reduced risk across a wide range of seeding rates (80-140k)
- Lowest risk and largest average profit increase was always at the *EOSR*
- Within normal soybean planting windows producers can potentially lower seeding rates with the use of proper seed treatments

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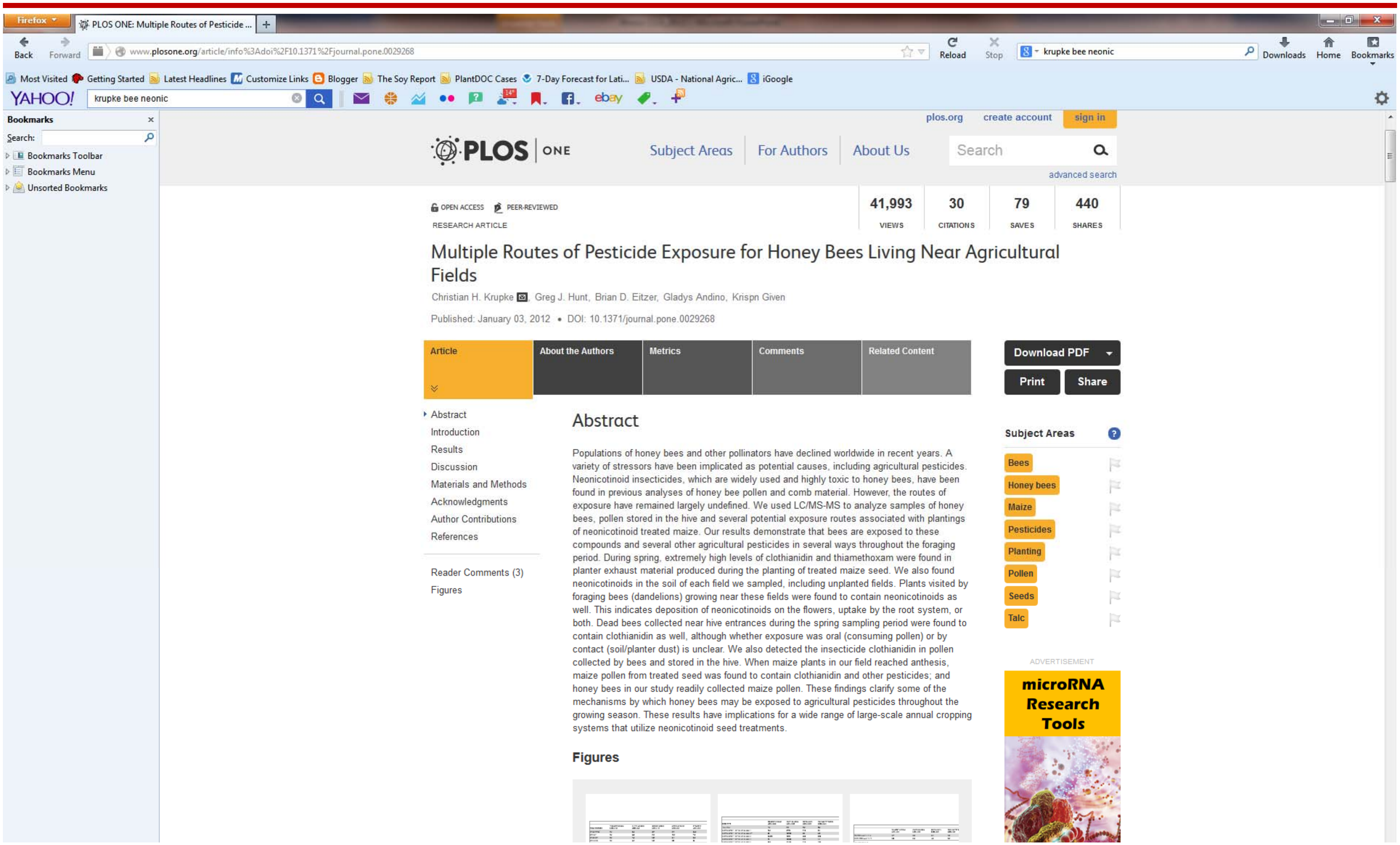
Introduction

Earlier soybean planting coupled with increasing seed costs and higher commodity prices have led to a surge in the number of acres planted with seed treatments (Esker and Conley, 2012). Furthermore, the components and relative cost of various soybean seed treatments has broadened greatly. Recent studies have suggested that growers should consider lowering seeding rates to increase their return on investment (De Bruin and Pedersen, 2008; Epler and Staggenborg, 2008). This recommendation is attributed to the soybean plant's potential compensatory ability at lower plant populations. Ultimately, growers would like to know the value proposition of combining seed treatments with lowered seeding rates. Therefore, the objectives of this study were to:

- Quantify the effects of seed treatments and seeding rates on soybean yield.
- Assess the economic risk and profitability of seed treatments and seeding rates, including calculating economically optimal seeding rate (EOSR) for each seed treatment.

ApronMaxx RFC and CruiserMaxx (Syngenta Crop Protection) seed treatments were used to achieve these objectives because they differ in their components and relative cost per unit. This study was conducted in 2012 and 2013 at nine Wisconsin locations. All locations were planted in 15 inch rows within the first 3 weeks of May.

No Free Lunch: Neonics and Honey Bees



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Christian H. Krupke, Greg J. Hunt, Brian D. Eitzer, Gladys Andino, Krispn Given

Published: January 03, 2012 • DOI: 10.1371/journal.pone.0029268

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Results
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Materials and Methods
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Abstract

Populations of honey bees and other pollinators have declined worldwide in recent years. A variety of stressors have been implicated as potential causes, including agricultural pesticides. Neonicotinoid insecticides, which are widely used and highly toxic to honey bees, have been found in previous analyses of honey bee pollen and comb material. However, the routes of exposure have remained largely undefined. We used LC/MS-MS to analyze samples of honey bees, pollen stored in the hive and several potential exposure routes associated with plantings of neonicotinoid treated maize. Our results demonstrate that bees are exposed to these compounds and several other agricultural pesticides in several ways throughout the foraging period. During spring, extremely high levels of clothianidin and thiamethoxam were found in planter exhaust material produced during the planting of treated maize seed. We also found neonicotinoids in the soil of each field we sampled, including unplanted fields. Plants visited by foraging bees (dandelions) growing near these fields were found to contain neonicotinoids as well. This indicates deposition of neonicotinoids on the flowers, uptake by the root system, or both. Dead bees collected near hive entrances during the spring sampling period were found to contain clothianidin as well, although whether exposure was oral (consuming pollen) or by contact (soil/planter dust) is unclear. We also detected the insecticide clothianidin in pollen collected by bees and stored in the hive. When maize plants in our field reached anthesis, maize pollen from treated seed was found to contain clothianidin and other pesticides; and honey bees in our study readily collected maize pollen. These findings clarify some of the mechanisms by which honey bees may be exposed to agricultural pesticides throughout the growing season. These results have implications for a wide range of large-scale annual cropping systems that utilize neonicotinoid seed treatments.

Figures

Subject Areas

Bees
Honey bees
Maize
Pesticides
Planting
Pollen
Seeds
Talc

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