

Evaluation of Fungicides and Timing for Rust Control in Inoculated Trials in North Dakota

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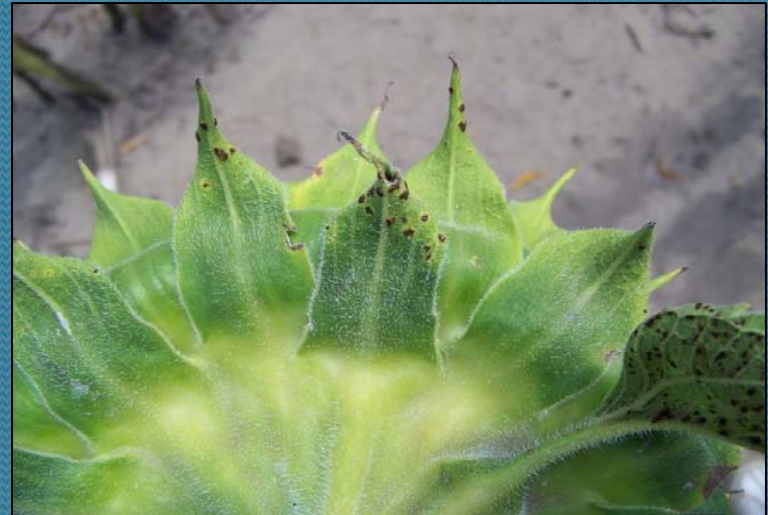


Outline

- Sunflower Rust
- Fungicide Efficacy Trials 2008 and 2009
- Fungicide Timing Trials 2008 and 2009
- Analysis of both years
- Further topics of investigation

Introduction - Sunflower Rust

- *Puccinia helianthi*
- Autoecious and macrocyclic
- Urediniospore economically important
- Earlier time of detection (ND)
 - Aecia
- Severity
 - Time of arrival
 - Environmental conditions
 1. Free Moisture (Dew)
 2. Temps 55-85°F



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Why Do We Need Fungicides?

- Sunflower hybrid performance tests at CREC 2009
- Natural infection

Oilseed (73 entries)

-range = trace to 26.3%

-mean = 5.3%

Confection (17 entries)

Leaf rust

-range = 8 to 86%

-mean = 57.1%

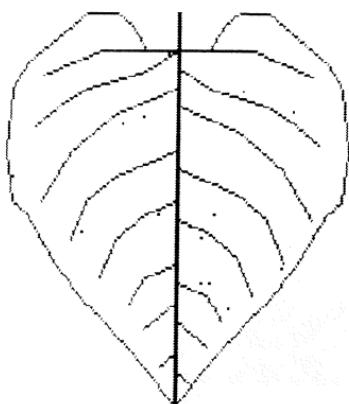
Upper plant rust

-range = 0 to 40%

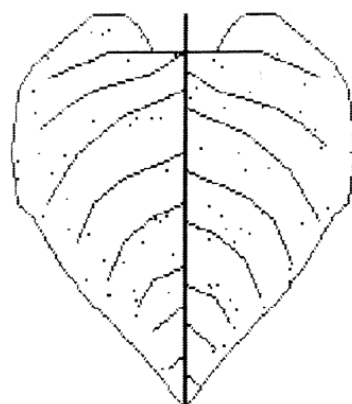
-mean = 22.7%

Introduction - Fungicides

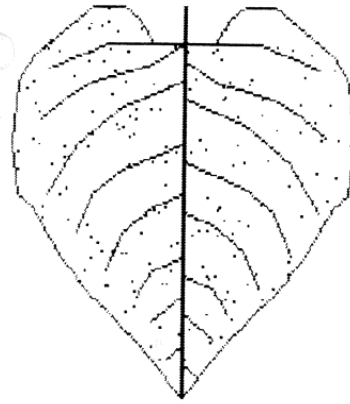
- Action threshold = 3% pustule coverage on upper four leaves –Shtienberg 1995
- Available chemicals
 - QoI (Headline, Quadris)
 - Triazoles (Folicur)



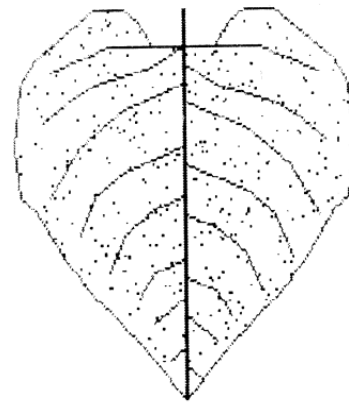
Leaf Area Affected .1%



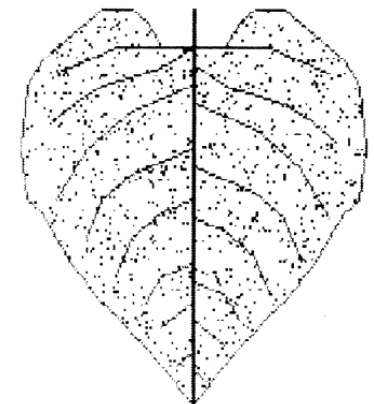
Leaf Area Affected .5%



Leaf Area Affected 1%



Leaf Area Affected 2%



Leaf Area Affected 5%

Fungicide Efficacy – Treatment List

- Core Fungicides

Headline @ 9.0 fl oz

Quadris @ 9.0 fl oz

Proline @ 5.7 fl oz

Prosaro @ 6.5 fl oz

Tebuzol @ 4.0 fl oz

- Other Fungicides

Endura @ 8.0 fl oz

Quash @ 10.0 fl oz

Folicur @ 4.0 fl oz

-Grandin Only

Experimentals

- Applications at R5.2-5.5

- 9-20 gpa, backpack sprayers

Fungicide Timing – Treatment List

- Two Fungicides
 - Headline @ 9.0 fl oz
 - Tebuzol @ 4.0 fl oz
- Five Treatments
 - Non-treated
 - R3.5 – R4
 - R5.2 – R5.5
 - R6+
 - All three timings

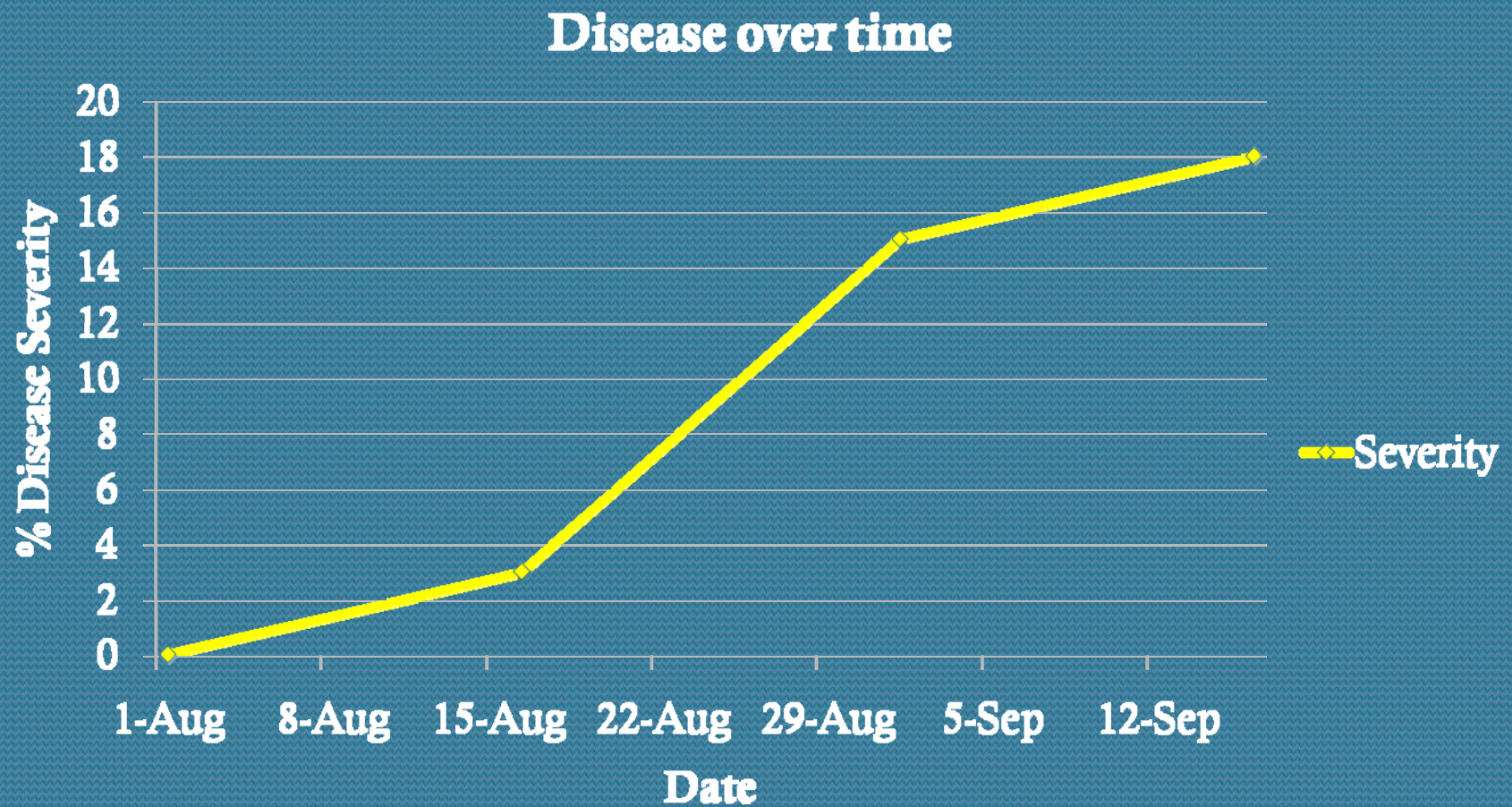
Materials and Methods: Fungicide and Timing Trials

- Evaluate fungicide efficacy
Fungicide Trials
- Evaluate optimum application time
Timing Trials
- CREC, Grandin-CHS, and LREC
Inoculated (Race 336) spreader rows
CREC and LREC irrigated
- CREC and Grandin-CHS
Re-inoculated: treatment plots
- Multiple disease evaluations – Rust severity diagrams
- AUDPC
- Yield

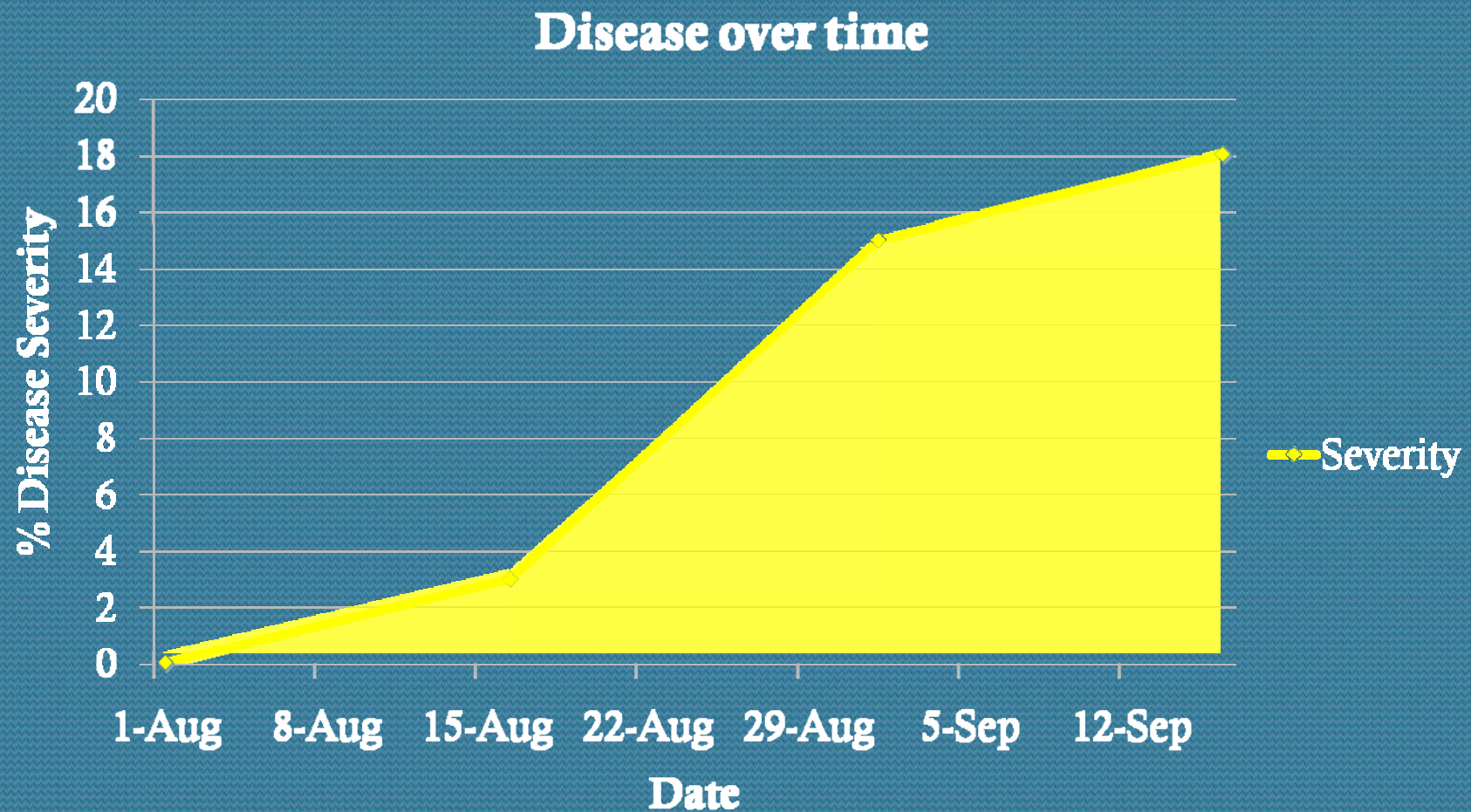


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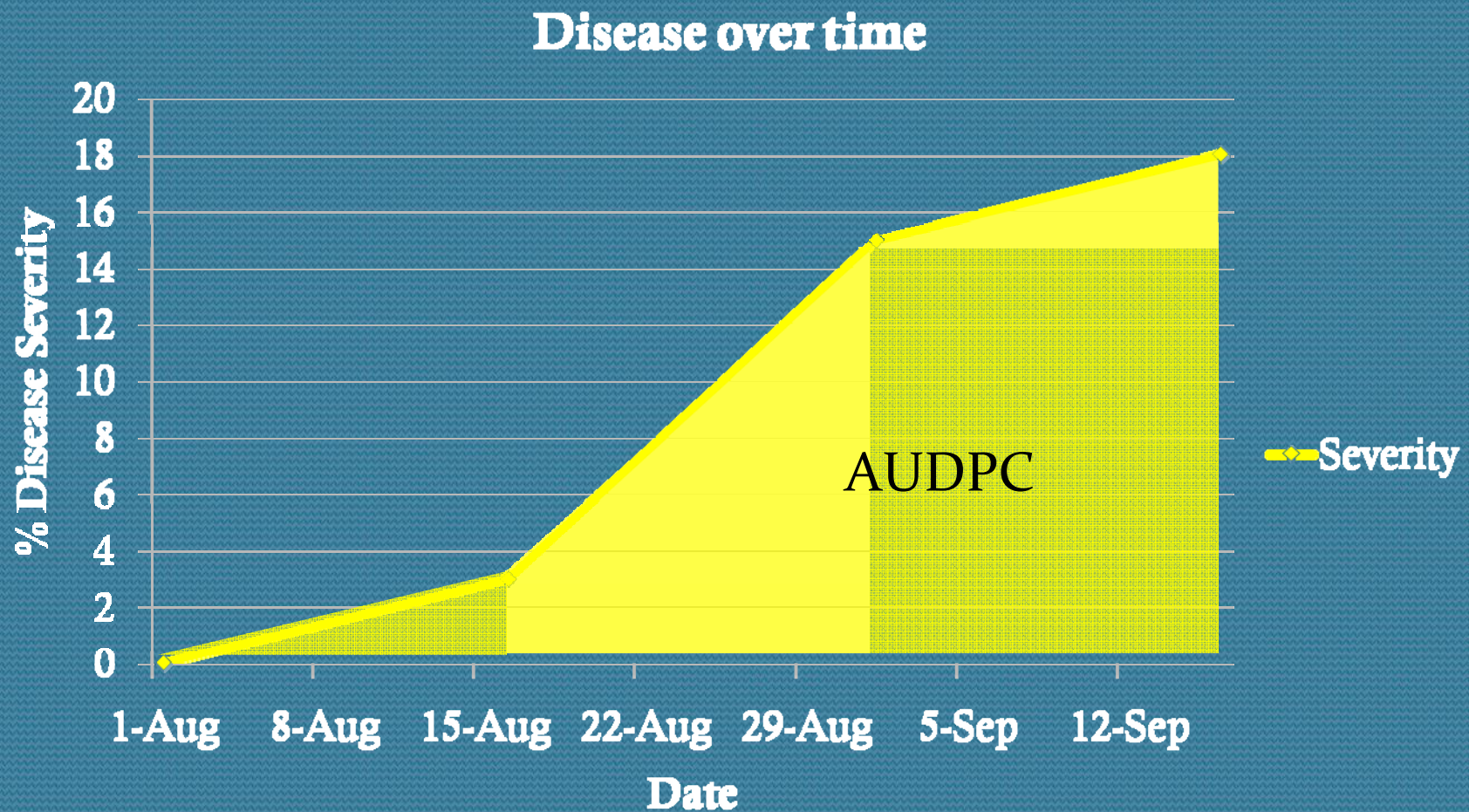
AUDPC = area under disease progress curve



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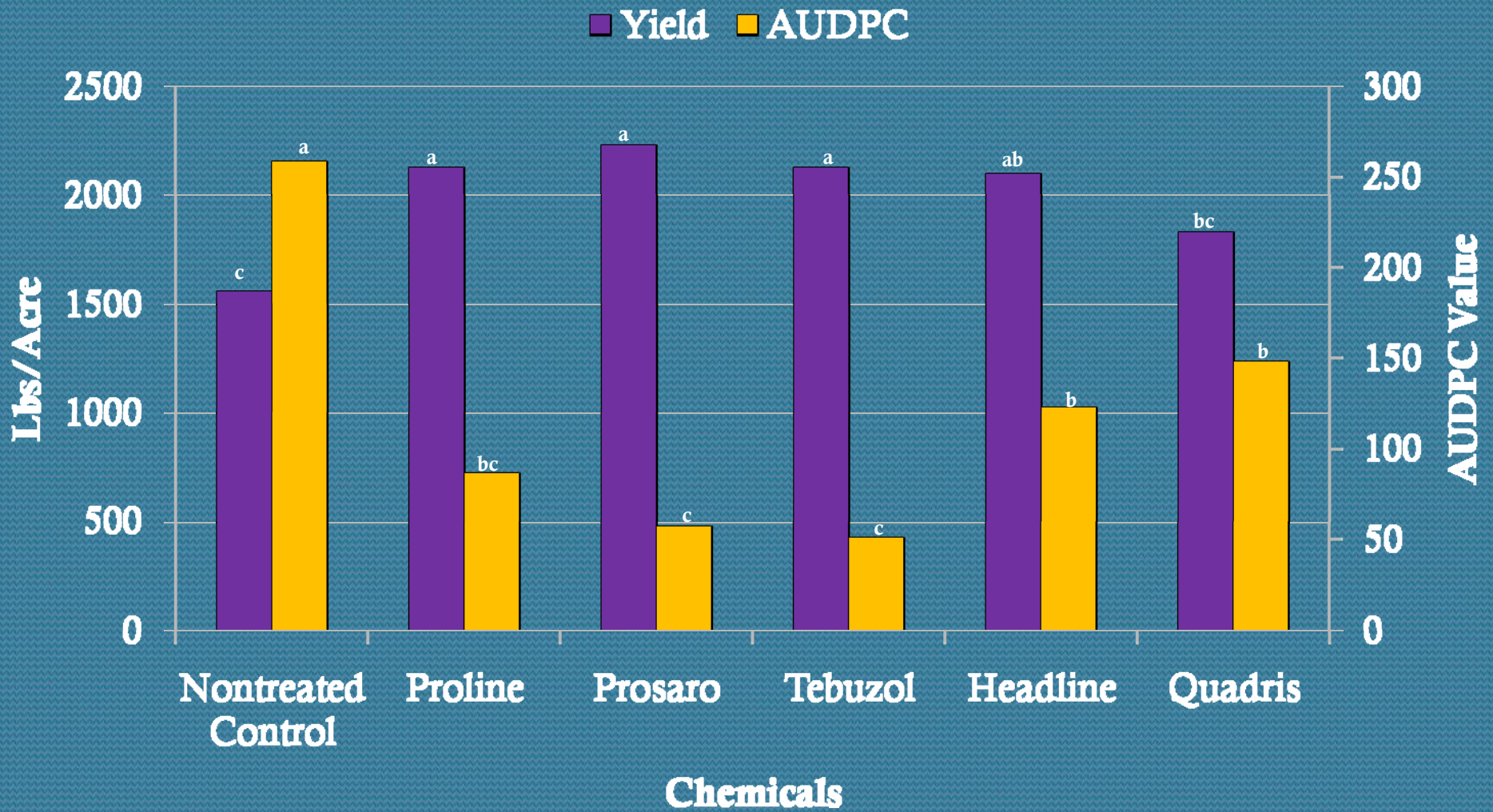
AUDPC = area under disease progress curve



2008 - Efficacy

- All fungicides reduced disease
- Efficacy Trials
 - Triazoles (Prosaro, Proline, Tebuzol, and Quash)
 - Lower AUDPC values at 1-2% severity??

2009 – CREC - Efficacy



Disease Severity ~1.0% at time of applications

2009 Efficacy

- Fungicides had lower AUDPC values than non-treated control
- Triazoles (FRAC 3) tended to have lower AUDPC values than strobilurins (FRAC 11) and boscalid (FRAC 7)
Disease Severity 0-1.0% at time of applications

2008 - Timing

- Timing Trials
 - Timing 2 (R5.2 – R5.5) reduces disease as much as three applications
 - Headline most effective at early stages of rust onset
 - Tebuzol most effective in later stages of rust epidemic

2009 Data – Timing – CREC

Treatment	% Sev.	Disease severity (according to upper 4 leaves using severity diagrams)					AUDPC	Yield (lb/A)
		R3-4 ₁	R5.5-5.9 ₂	R6 ₃	R6-7	R7-8		
Non-treated Control		0 a	1.1625 a	3.95 a	12.0 a	38.5 a	453.25 a	1577.3 f
Headline (9oz)	T1 = 0.5%	0 a	0.4075 b	1.4125 c	4.95 bc	25.625 b	251.89 b	2029.9 cd
Tebuzol (4oz)	T1 = 0.5%	0 a	0.71 ab	2.5 b	6.875 b	24.875 bc	282.5 b	1722.0 ef
Headline (9oz)	T2 = 1.0%	0 a	0.8525 ab	0.825 c	1.05 d	14.75 d	134.87 cd	2345.1 ab
Tebuzol (4oz)	T2 = 1.0%	0 a	0.8625 ab	1.4625 c	2.15 cd	8.55 de	109.86 d	2177.3 bc
Headline (9oz)	T3 = 4%	0 a	0.8625 ab	2.925 b	5.85 b	16.125 cd	217.09 bc	1830.5 de
Tebuzol (4 oz)	T3 = 4%	0 a	0.95 a	2.825 b	7.175 b	14.625 d	220.68 bc	1611.6 ef
Tebuzol / Headline / Tebuzol	T1, T2, T3	0 a	0.8975 a	0.875 c	1.025 d	4.375 e	63.14 d	2456.4 a
Tebuzol / Headline	T1, T2	0 a	1.0 a	0.8875 c	1.063 d	14.5 d	135.98 cd	2472.2 a
Headline / Tebuzol	T2, T3	0 a	0.7925 ab	0.875 c	1.088 d	4.6 e	63.9 d	2347.0 ab
LSD		0	0.4681	0.8312	3.0085	8.9589	92.782	229.7

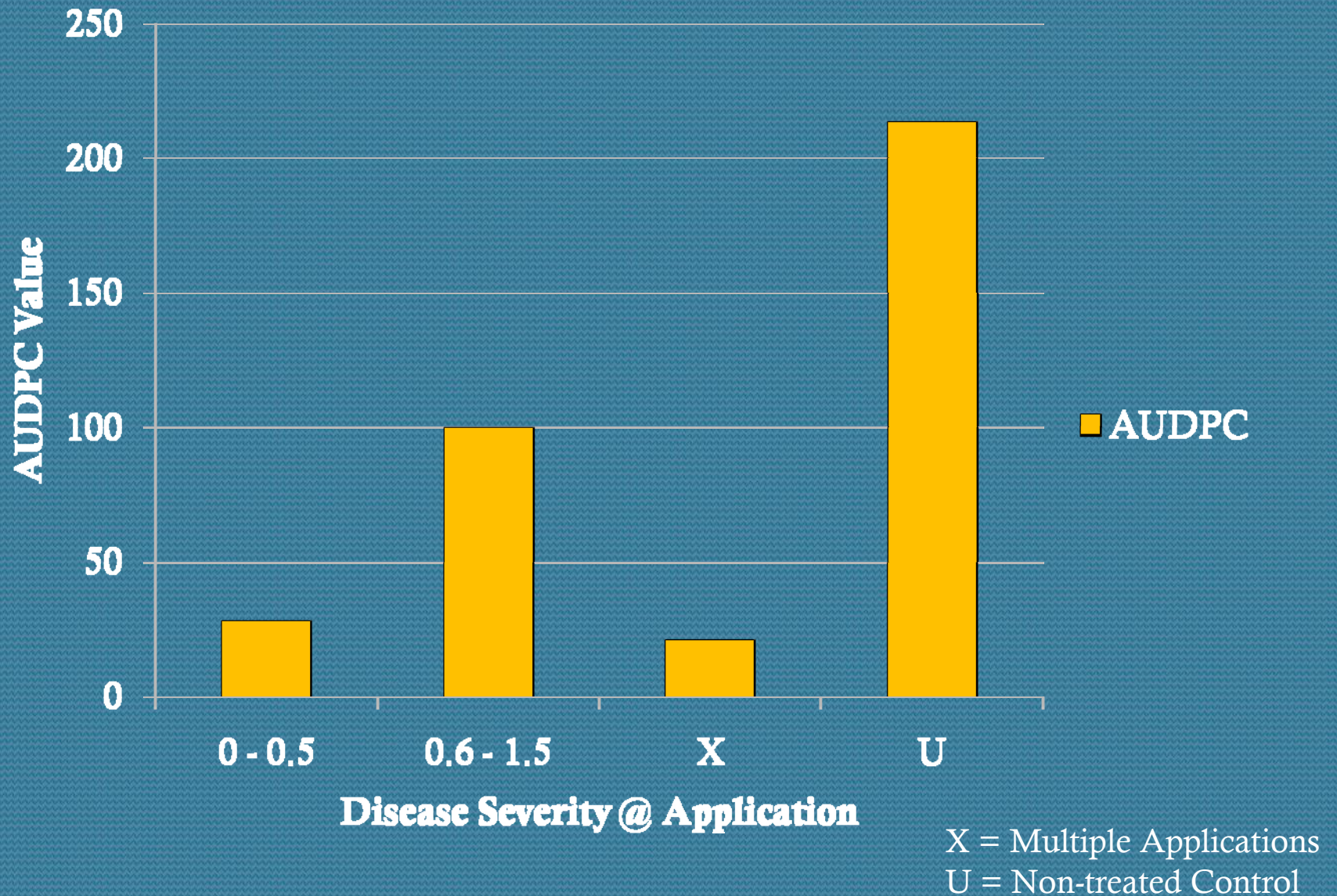
2009 Timing

- Most locations had all treatments with statistically lower AUDPC values than the non-treated control
- Most of the time, single application at R5.2-R5.5 (T2) had lower AUDPC values than the single applications of T1 and T3
- Application of fungicide after R6+ may be too late
- Multiple applications had lowest AUDPC values

2008 and 2009 – Timing Summary

- Headline and Tebuzol same with some exceptions
- R4 – More trials (Data suggests too early)
- R6+ – Too late
- R5 – Severity threshold?

Fungicide Timing Trials (All Location Years) – R5



What needs to be done next?

- We know triazoles and strobilurins reduce disease
- Timing is KEY!
- Simulate an early disease onset
 - Higher rust severity at early growth stages
 - Application at early reproductive and R5 stage
 - Multiple combination treatments (triazoles and strobilurins)



Thank You

- Acknowledgements

- Personnel at NDSU RECs and CHS
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- Chemical Companies

