Sugarbeet Disease Management

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2026 ACSC Grower Seminar

Sometimes diagnosis is very clear!

Rhizoctonia

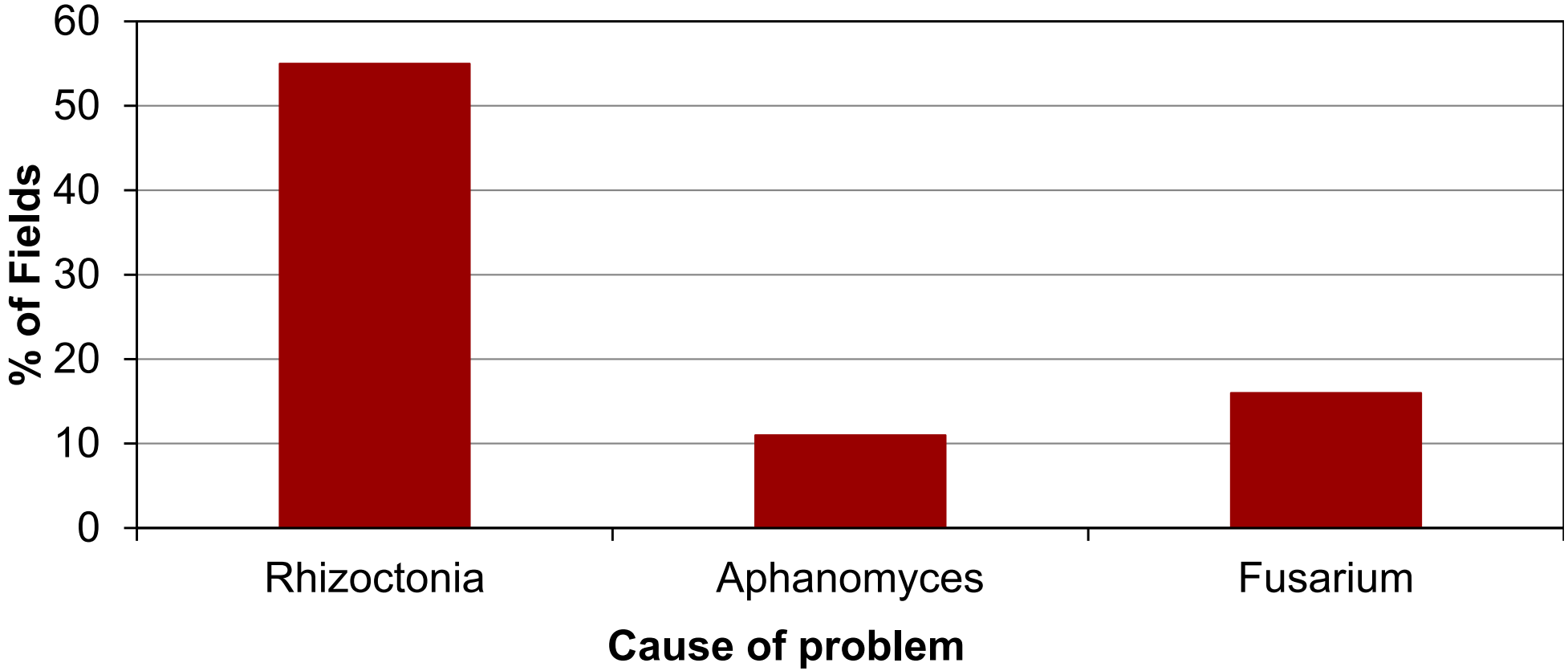
Aphanomyces

Sometimes diagnosis is tricky!

Rhizoctonia + Aphanomyces

Please submit samples for Diagnosis

Summary of 2025 Root Sample Diagnosis



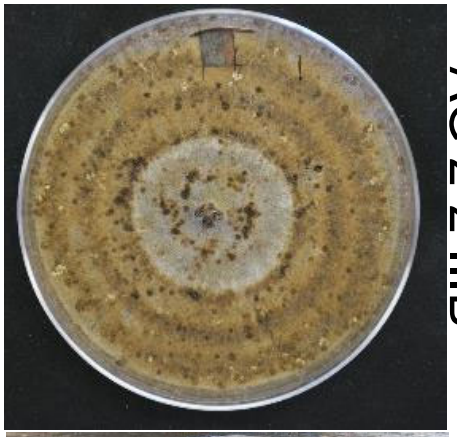
Key points about Sugarbeet Rhizoctonia

- *Rhizoctonia solani* – AG 2-2 (IIIB & IV sub-groups)
  - AG 2-2 IIIB can grow at 35 C (more common in So. MN)
  - AG 2-2 IV (more common in the Red River Valley)
  - IIIB and IV are equally virulent in causing root rot
- Distribution in a field– random vs patchy
- Inoculum depth varies from field to field (low = 0-2 in., moderate 0-4 in. and severe 0-6 in.)
- Row cultivation can increase the risk for crown rot
- Can survive in soil as dormant sclerotia for 2-3 years

Rhizoctonia Damping-off

Rhizoctonia Crown and Root Rot

Rhizoctonia Crown and Root Rot



AG 2-2 IIIB

AG 2-2 IV

Management of Rhizoctonia

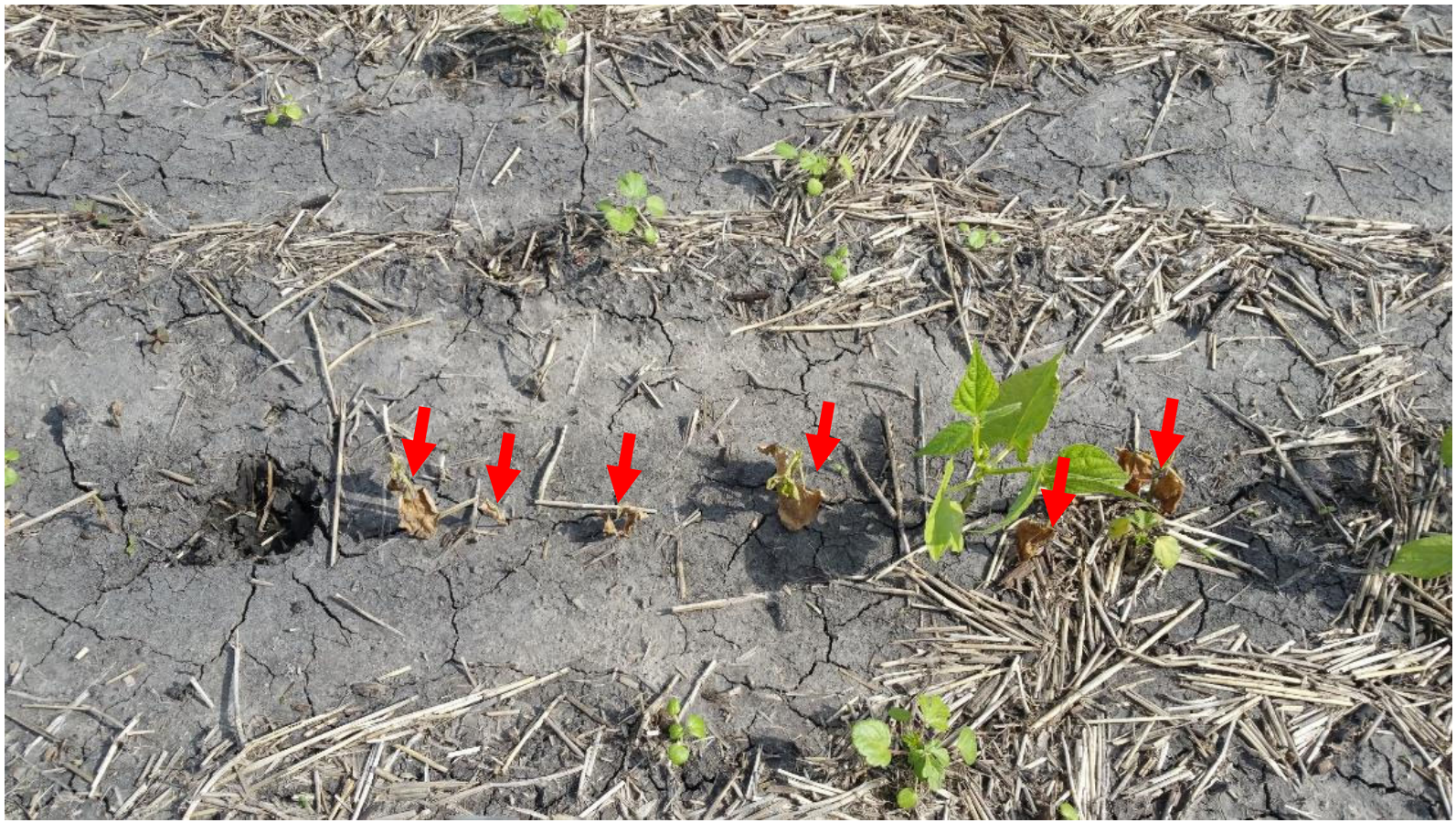
- Early planting
- Crop Rotation
  - Length (short = high risk, long = low risk)
  - Crop choice & weed control
    - Wheat or other small grains is preferred
    - Soybeans/edible beans/ corn increases risk

Soybeans

Pre-emergence

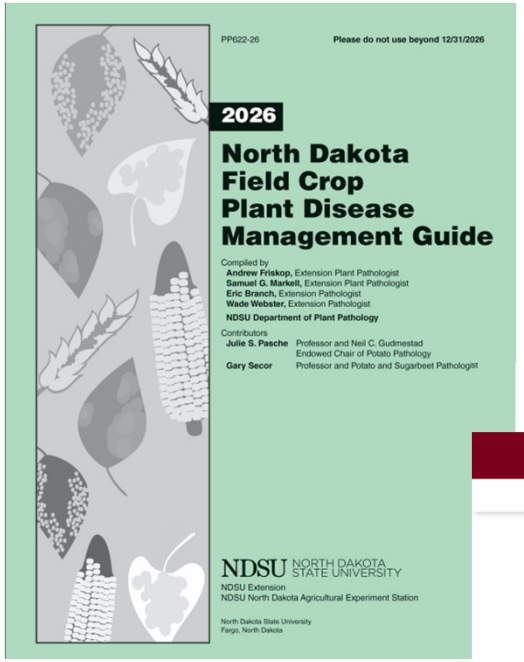
Post-emergence

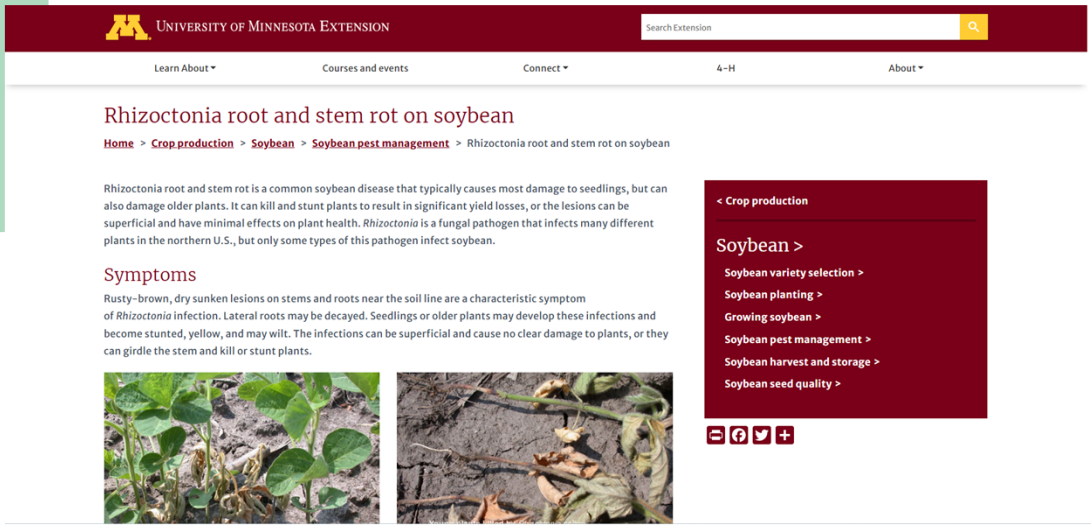
Navy beans



Manage in Rotation Crops

- Resistant varieties?
- Seed treatments
  - Fluxapyroxad, Sedaxane, Rizolex
- In-furrow or postemergence fungicides
  - Azoxystrobin, Pyraclostrobin





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Management of Rhizoctonia

- Crop Rotation
  - Length
  - Crop choice & weed control
- Early planting
- Resistant varieties
  - Genetic resistance does not express until 6 to 8 leaf stage

Rhizoctonia Specialty Variety Matters!

CRYSTAL SUGARBEET SEED

2024 & 2025 OVT 2 Year Data

CRYSTAL SUGARBEET SEED

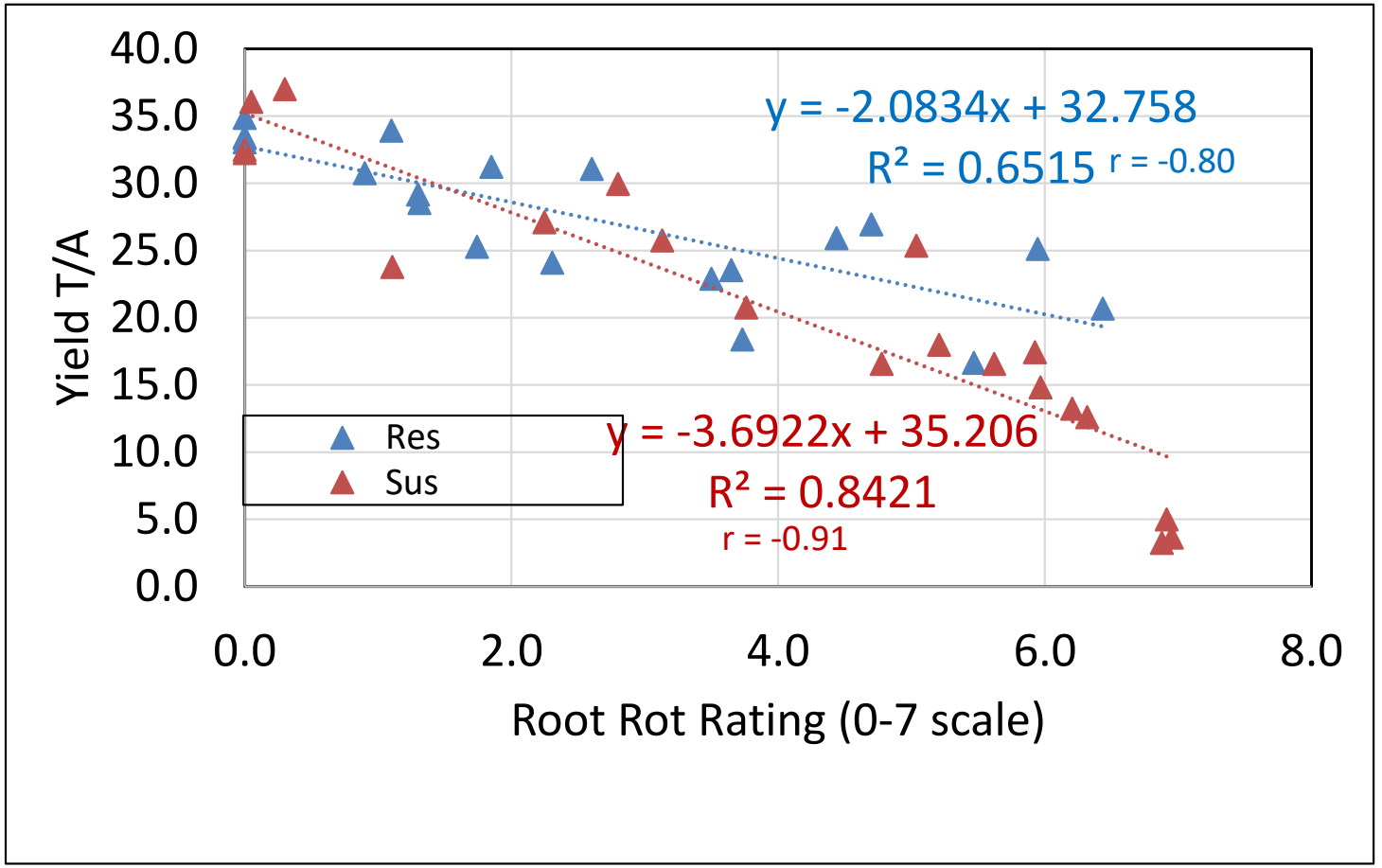
	Rev/Ton	Rev/Acre	Rhizomania	Cercospora	Aphanomyces	Rhizoctonia	Fusarium	Root Aphid
Crystal 471	104	106	MultiSource®	3.8	3.8	3.8	2.3	High
Crystal 361	104	106	MultiSource®	3.5	3.5	3.9	2.2	High
Crystal 369	100	103	MultiSource®	4.0	3.4	4.5	2.3	High
Crystal 130	101	103	MultiSource®	3.9	3.6	3.7	2.7	High
Crystal 260	102	104	MultiSource®	3.4	3.8	3.8	2.5	High
Crystal 793	101	103	MultiSource®	4.1	3.4	4.0	2.4	High
Crystal 912	90	101	MultiSource®	5.0	3.4	3.3	3.9	High
Crystal 022	105	102	MultiSource®	4.7	3.6	3.7	2.5	High
Crystal 269	104	105	MultiSource®	4.5	3.3	4.2	2.4	High
Crystal 138	100	102	MultiSource®	4.6	3.7	3.7	2.8	High

Excellent	Very Good	Caution	Weak

Roundup Ready® is a registered Trademark used under license from Bayer Group

Rhizoctonia Specialty Variety Matters!

For each point increase in root rot severity by harvest:
Specialty Variety: lost ~ 2 tons/A
Susceptible Variety: lost ~ 3.7 tons/A

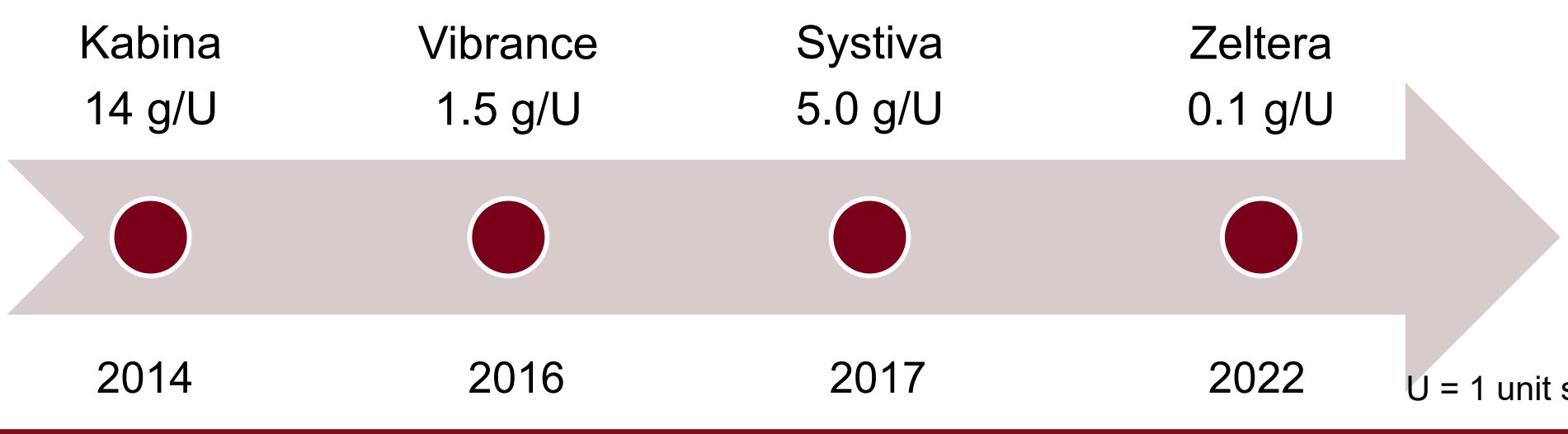


Management of Rhizoctonia

- Crop Rotation
  - Length
  - Crop choice & weed control
- Early planting
- Resistant varieties
- At-planting fungicides
  - Seed treatments
  - In-furrow fungicides

Seed Treatments

- SDHI class of fungicides (**S**uccinate **D**e**H**ydrogenase **I**nhibitor, FRAC group 7)
- Single site of action - Inhibit fungal respiration



In-furrow Fungicides

- Do a jar test for mixing compatibility
- Agitation in the tank is important to avoid nozzle clogging

My Trials:

- Fungicide in 6 gal. water applied via drip tube (2025)
- Fungicide in 3 gal. water + 10-34-0 @ 3 gal. applied via drip tube (past years)

In-furrow Fungicides (rates per acre)

Conventional

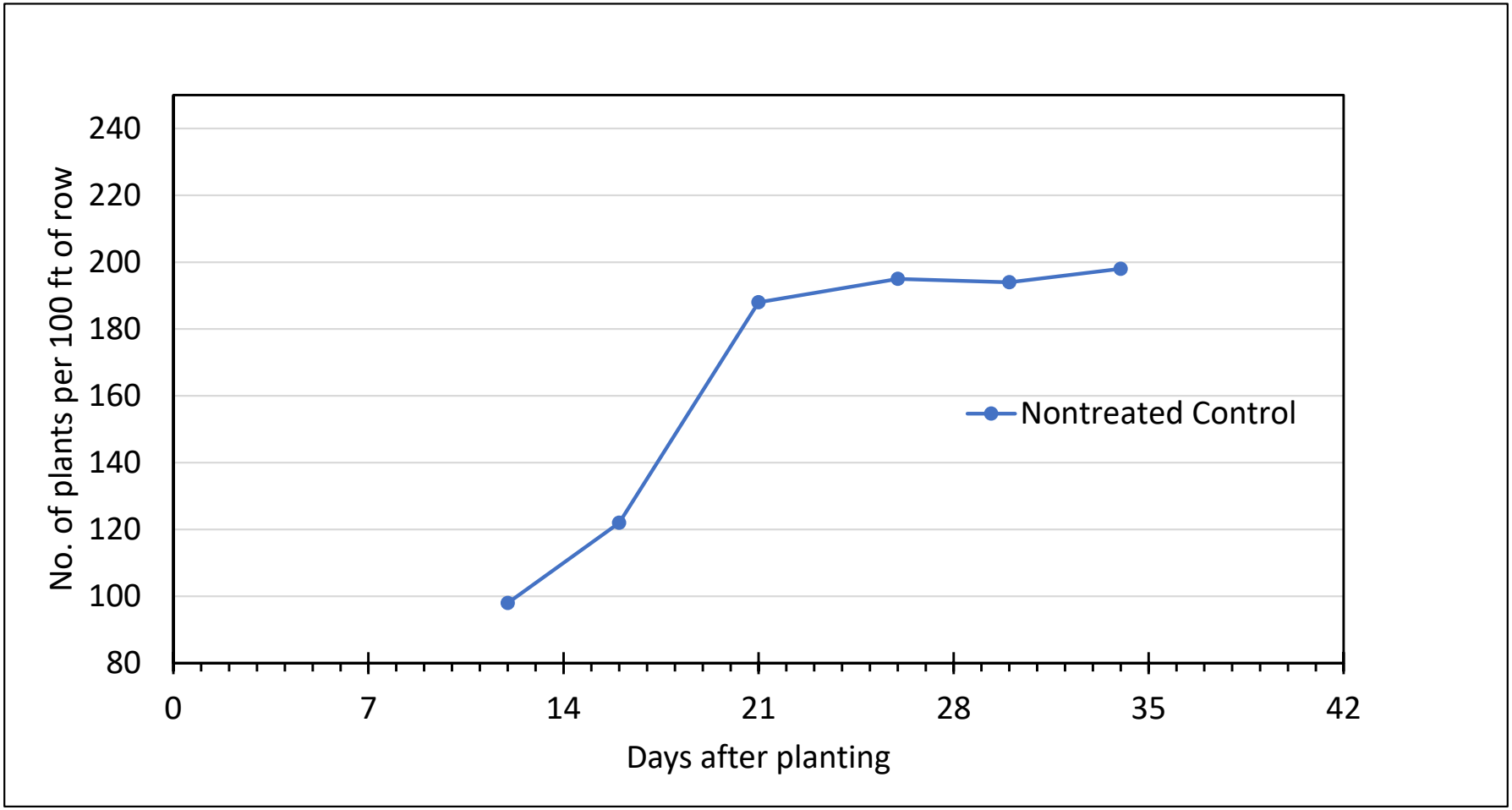
- Quadris 9.5 fl oz (QoI)
- AZteroid 5.7 fl oz (QoI)
- Elatus 7.1 fl oz (QoI + SDHI)
- Headline 9 fl oz (QoI)
- Proline 5.7 fl oz (DMI)
- Propulse 13.6 fl oz (DMI + SDHI)
- Priaxor 6.7 fl oz (QoI + SDHI)

Biologicals

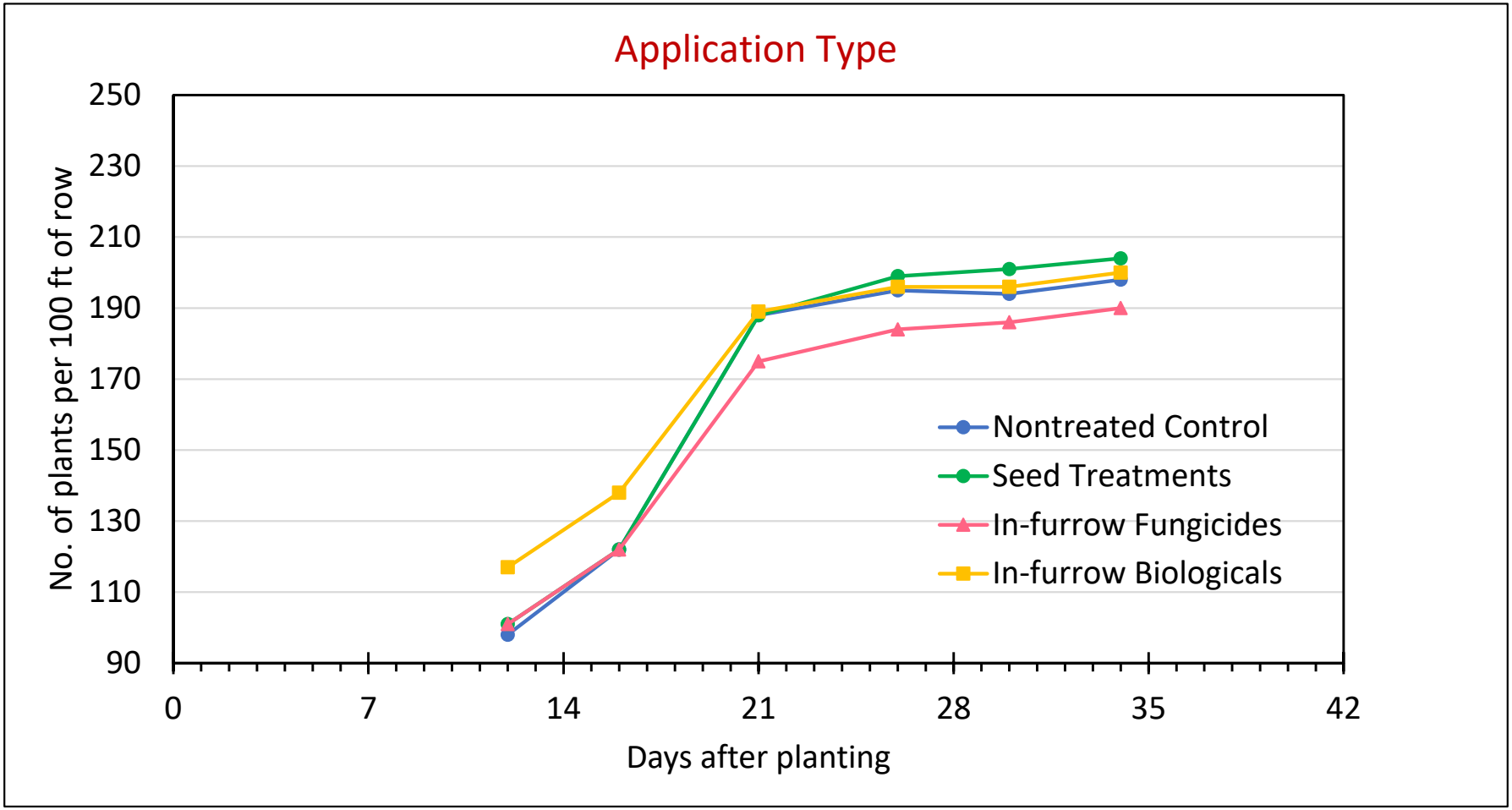
- Zironar (12 fl oz): *Bacillus licheniformis* FMCH001 + *B. subtilis* FMCH002
- Bexfond (14 fl oz): *B. amyloliquefaciens* subsp. *plantarum* FZB42
- Serenade ASO (128 fl oz): *B. subtilis* QST713
- Howler EVO (40 fl oz): *Pseudomonas chloroaphis* AFS009

Rhizoctonia inoculum

(Moderately Susceptible Variety 4.1)



(MS variety 4.1)



Root rot rating scale 0-10

0 1 2 3 4 5 6 7 8 9 10

1 = 1 – 10% rot, 10 = 91 – 100 % rot

At-planting treatments (2025)

Application Type	Root Rot Severity (%)	Sucrose (%)	Root yield (tons/A)	Recoverable sucrose yield (lbs/A)
Nontreated	9.1 ab	17.28 ab	27.0	8554
Seed treatments	5.7 a	17.59 b	27.7	8971
In-Furrow Fungicides	6.5 a	17.19 a	27.5	8713
In-Furrow Biologicals	9.4 b	17.26 ab	27.9	8888
p-value	**0.0239**	**0.0193**	0.7629	0.4059

Management of Rhizoctonia

- Crop Rotation
  - Length
  - Crop choice & weed control
- Early planting
- Resistant varieties
- At-planting fungicides
  - Seed treatments
  - In-furrow fungicides
- Postemergence fungicides

Postemergence Fungicides (rates per acre)

Recommended
Timing: 4-8 leaf stage

- Quadris 10 & 14.5 fl oz (QoI)
- AZteroid 9.2 fl oz (QoI)
- AZterknot 16.6 fl oz (QoI + Knotweed extract)
- Elatus 7.1 fl oz (QoI + SDHI)
- Proline 5.7 fl oz. (DMI)
- Excalia 0.64 fl oz (band), 2.0 fl oz (broadcast) (SDHI)

Postemergence Fungicides

Treatment	Root Rot Severity (%)	Root Rot Incidence (%)	Root Yield (tons/A)	Recoverable sucrose yield (lbs/A)
Nontreated Control	**22.1**	**51.3**	**25.9**	**7583**
Band vs Broadcast Contrast				
7- Band	2.0	11.3	28.0	8472
Broadcast	2.2	8.6	27.1	8110
	0.8650	0.3911	0.2522	0.1090

Gain of 527- 889 lbs RSA over nontreated control

Both methods were equally effective

Fungicide Options for Rhizoctonia

Seed Treatment			In-Furrow			POST		
Kabina			Headline			Quadris		
Systiva			Quadris			Elatus		
Vibrance			Elatus			AZteroid		
Zeltera			AZteroid			Excalia		
			Proline			Topguard EQ		
			Propulse			Proline		
						Propulse		
						Priaxor		

Mode of Action

SDHI	QoI	DMI

Rhizoctonia Management

- Specialty varieties
  - can underperform under severe Rhizoctonia pressure
- Seed treatments - excellent early-season protection
- In-furrow conventional fungicides - excellent early- to mid-season protection
- In-furrow biologicals- Need more field trials in the future
- Postemergence fungicides - mid- to late-season protection
  - No differences between 7-in. band or broadcast
  - 4-leaf (high risk fields) to 8-leaf stage (moderate risk)
- Best Practices
  - Seed treatment + POST (4- to 8-leaf stage) – most fields
  - Seed treatment + in-furrow (make sure they mix well with the starter fertilizers) + POST – may be needed for fields with severe history

Aphanomyces can be a full-season pathogen

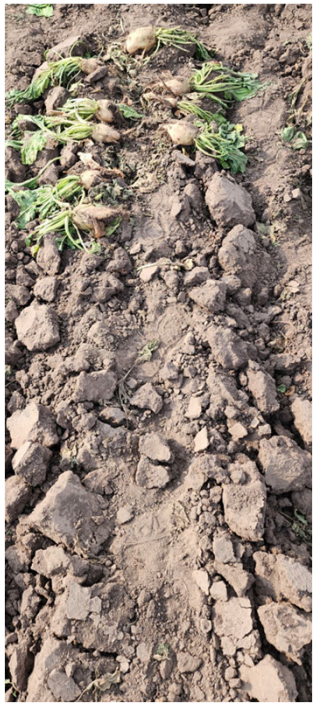
Aphanomyces damping-off

Aphanomyces root rot

Management of Aphanomyces

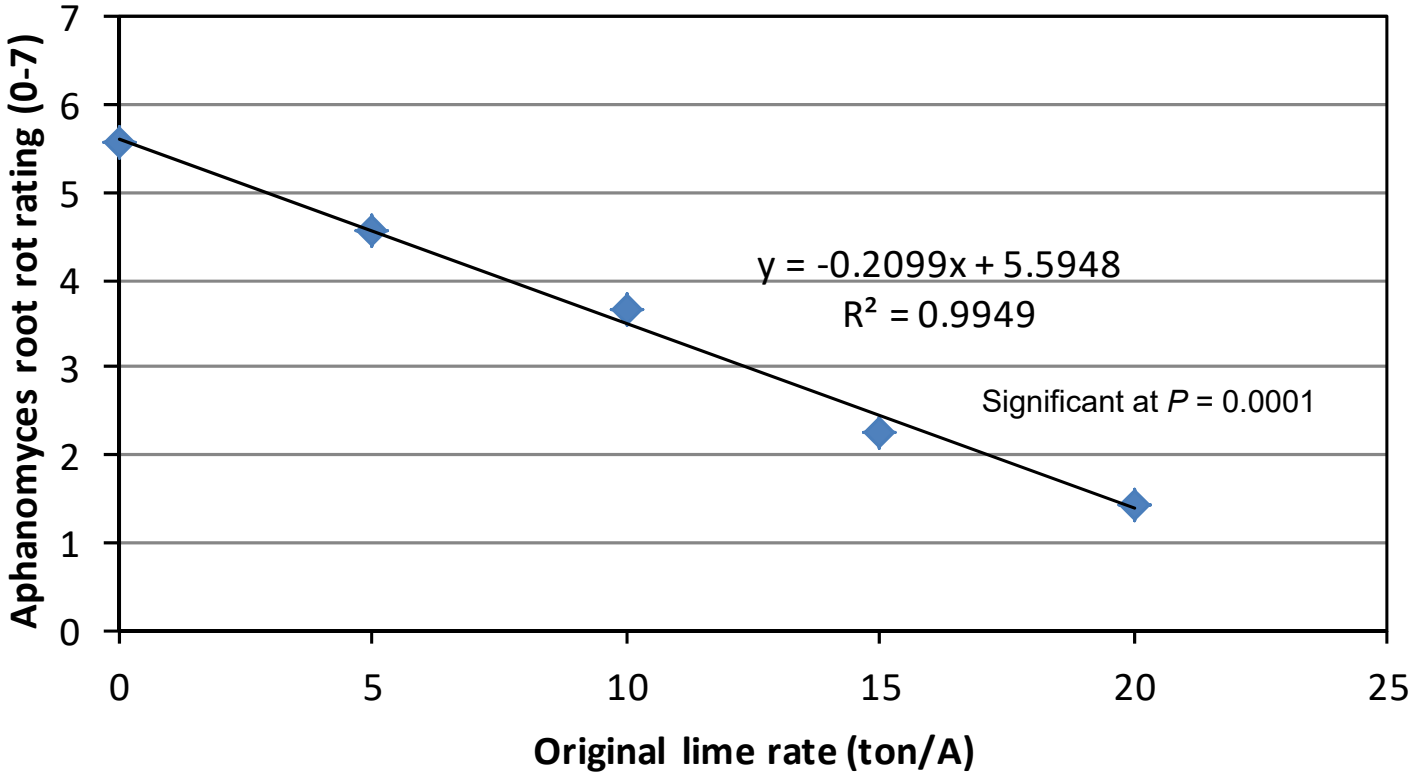
- Early planting
- Seed treatments
  - Tachigaren
  - Intego Solo
- Resistant varieties

Resistant



Susceptible

Waste lime reduced Aphanomyces (12 years after application)



Fusarium Yellows

Fusarium Yellows

Diagnosis is critical because only tolerant varieties can withstand Fusarium

Verticillium wilt

Potatoes in the Rotation

Photo Credit: Carol Windels & Jason Brantner

Genetic Chimera

- Caused by mutations or outcrossing during seed production
- Loss of chlorophyll
- Does not impact yield

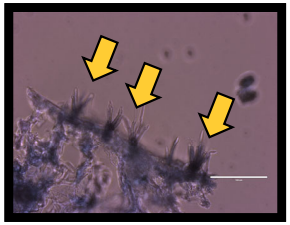
https://extensionpublications.unl.edu/assets/pdf/g2045.pdf

Cercospora leaf Spot (CLS)

Typical CLS

Atypical CLS

Cercospora leaf Spot (CLS)



Pseudostromata – up to 22 months

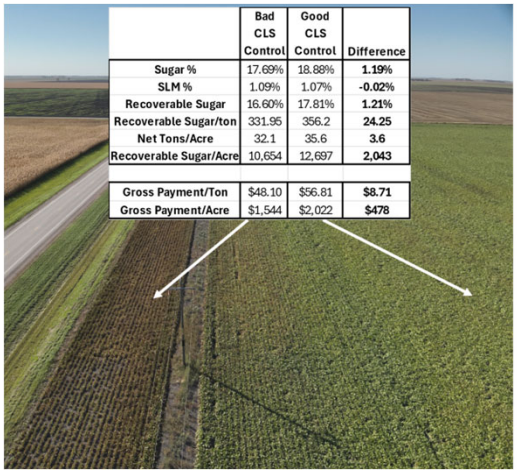
CLS Management

- **Agronomic practices**
  - Crop rotation
  - Tillage (residue incorporation)
  - Weed control

Waterhemp, 2024

CLS Management

- **Fungicides**
  - Application timing (Initiation and subsequent application)
  - Tank-mixing of systemic & contact fungicides
    - DMIs (Triazoles), QoI (Strob) and Topsin
    - EBDC (Mancozeb), Tin and Copper
  - Rotation with different modes of action (MoA)
    - Reduces risk of resistance development
  - Adequate spray volume (~20 GPA, ground) and coverage
  - Take care of the areas not accessible by the spray planes (ground rig or drones)



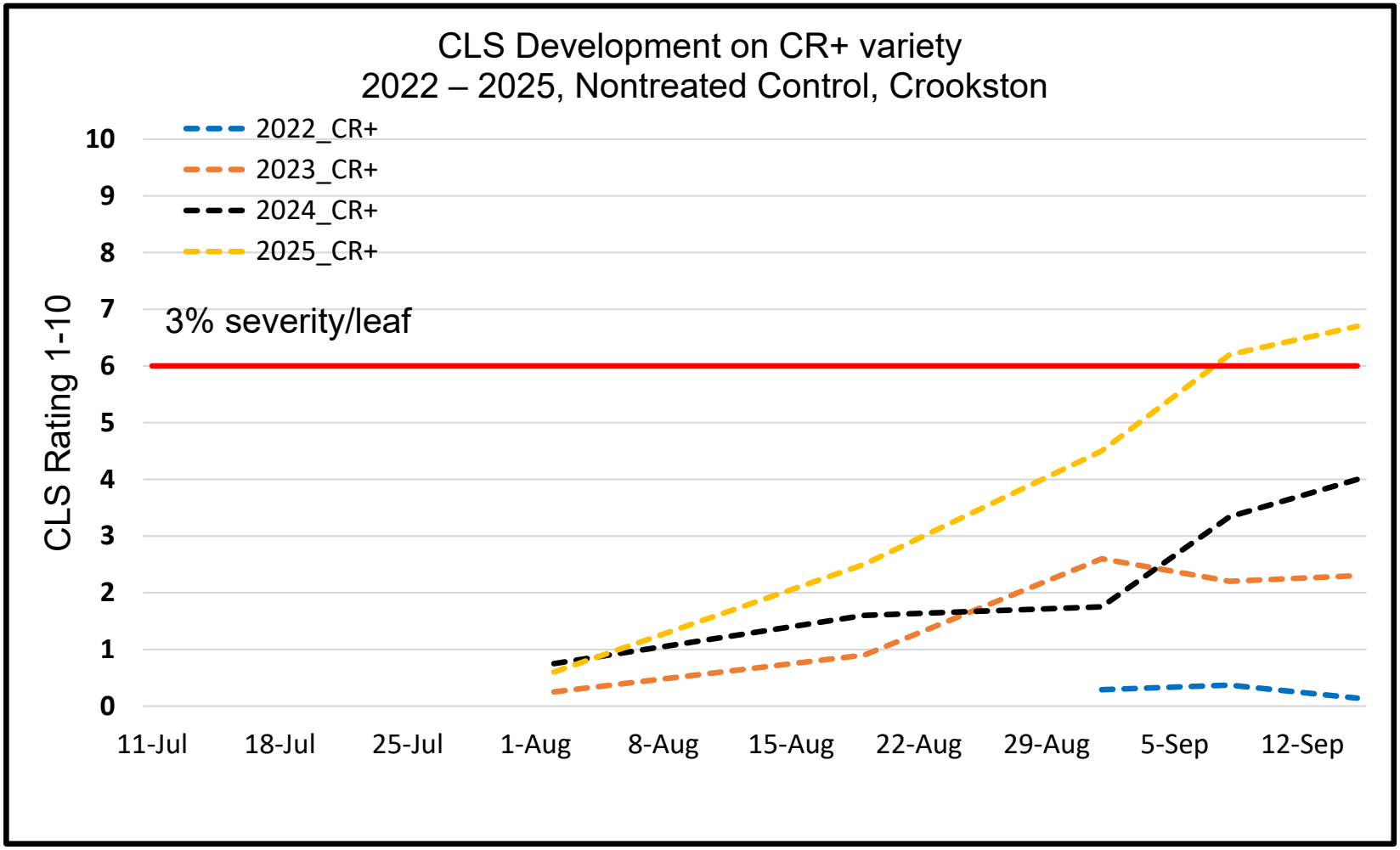
	Bad CLS Control	Good CLS Control	Difference
Sugar %	17.69%	18.88%	1.19%
SLM %	1.09%	1.07%	-0.02%
Recoverable Sugar	16.60%	17.81%	1.21%
Recoverable Sugar/ton	331.95	356.2	24.25
Net Tons/Acre	32.1	35.6	3.6
Recoverable Sugar/Acre	10,654	12,697	2,043
Gross Payment/Ton	$48.10	$56.81	$8.71
Gross Payment/Acre	$1,544	$2,022	$478

Bad area missed 1st
3 fungicide applications
July 2nd, 16th, 31st

- Average Cost of Fungicide = $22
- Application Cost = $8
- Total Cost = $30/app
- 3 applications total = $90

Opportunity Lost
$478 - $90 =
$388/acre

American Crystal Sugar Company


CLS Development on CR+ variety
2022 – 2025, Nontreated Control, Crookston
2022_CR+
2023_CR+
2024_CR+
2025_CR+
3% severity/leaf
CLS Rating 1-10
10
9
8
7
6
5
4
3
2
1
0
11-Jul
18-Jul
25-Jul
1-Aug
8-Aug
15-Aug
22-Aug
29-Aug
5-Sep
12-Sep

Resistant varieties - increased pressure from *C. beticola* ACSC CLS Nursery, Non-inoculated, Nontreated (2025)

2.6 (1)

2.9 (1)

2.9 (1)

2.8 (NC)

Management of CLS – CR+ Variety (2.6 rating)

Spray 1 (Jul 08)	Spray 2 (Jul 24)	Spray 3 (Aug 07)	Spray 4 (Aug 19)	Spray 5 (Sep 02)	CLS Rating (0-10)	RSA (lbs/A)
Nontreated Control					7.05 i	6719
P- value						0.15

Management of CLS – CR+ Variety (2.6 rating)

Spray 1 (Jul 08)	Spray 2 (Jul 24)	Spray 3 (Aug 07)	Spray 4 (Aug 19)	Spray 5 (Sep 02)	CLS Rating (0-10)	RSA (lbs/A)
DMI + EBDC	Tin + Topsin	DMI + EBDC	EBDC	Tin + Priaxor	3.15 ab	7712
Nontreated Control					7.05 i	6719
P- value						0.15

# of Sprays	RSA (lbs/A) gain over control
Five	993

Management of CLS – CR+ Variety (2.6 rating)

Spray 1 (Jul 08)	Spray 2 (Jul 24)	Spray 3 (Aug 07)	Spray 4 (Aug 19)	Spray 5 (Sep 02)	CLS Rating (0-10)	RSA (lbs/A)
DMI + EBDC	Tin + Topsin	DMI + EBDC	EBDC	Tin + Priaxor	3.15 ab	7712
	DMI + EBDC	Tin + Topsin	DMI + EBDC	Tin + Priaxor	3.6 abc	7062
		DMI + EBDC	Tin + Topsin	DMI + Priaxor	5.7 e-i	6778
Nontreated Control					7.05 i	6719
P- value						0.15

# of Sprays	RSA (lbs/A) gain over control
Five	993
Four	343 - 565
Three	59

Summary – Cercospora Leaf Spot Management

- **Timely fungicide application is key**
  - Initiate few days before row closure, early is on-time for CLS
  - Maintain 10-14 days spray intervals (shorten the interval based on rain events for contact fungicides, Use aerial application rather than waiting for the fields to dry out)
  - Critical when the DIV's are favorable for CLS development
- **Rotate Fungicides with different Modes of Action (MoA)**
  - Fungicide resistance is prevalent in most growing regions
  - Tank-mixing of fungicides: Mix single site-of-action fungicides (DMIs, QoIs, and MBCs etc.) with multi site-of-action fungicides (Tin, EBDC, Copper etc.)
- **Cercospora population has strong adaptation to newer varieties**
  - *C. beticola* population is quickly adapting → CLS is showing up earlier in the season
  - CLS severity is increasing every year in the Northern Red River Valley
  - Standard fungicide program with 10-14 days interval is the goal

Alternaria Leaf Spot (ALS)

A. alternata

Stemphylium Leaf Spot (SLS)

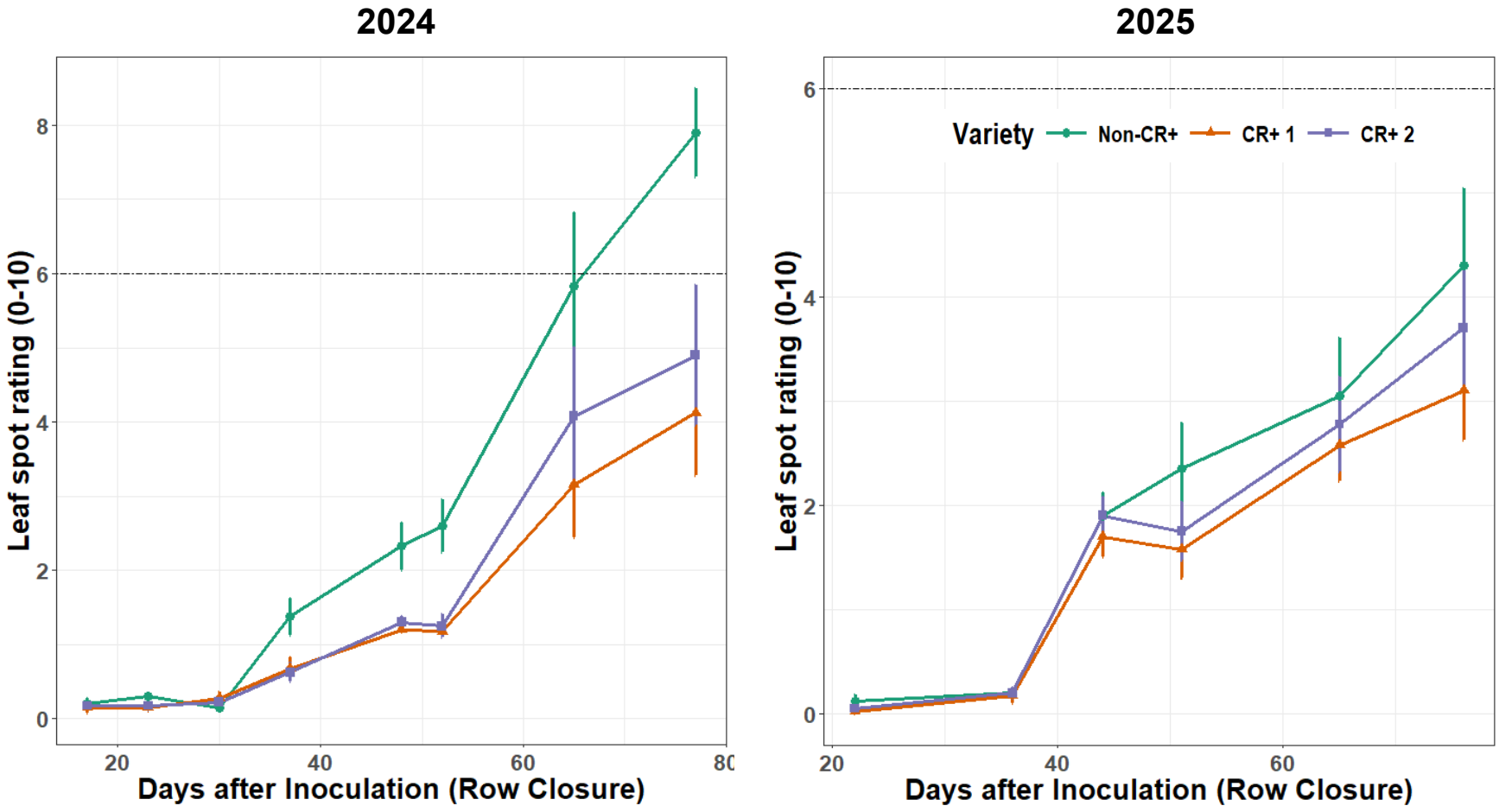
S. vesicarium

Field Trials (2024 & 2025)

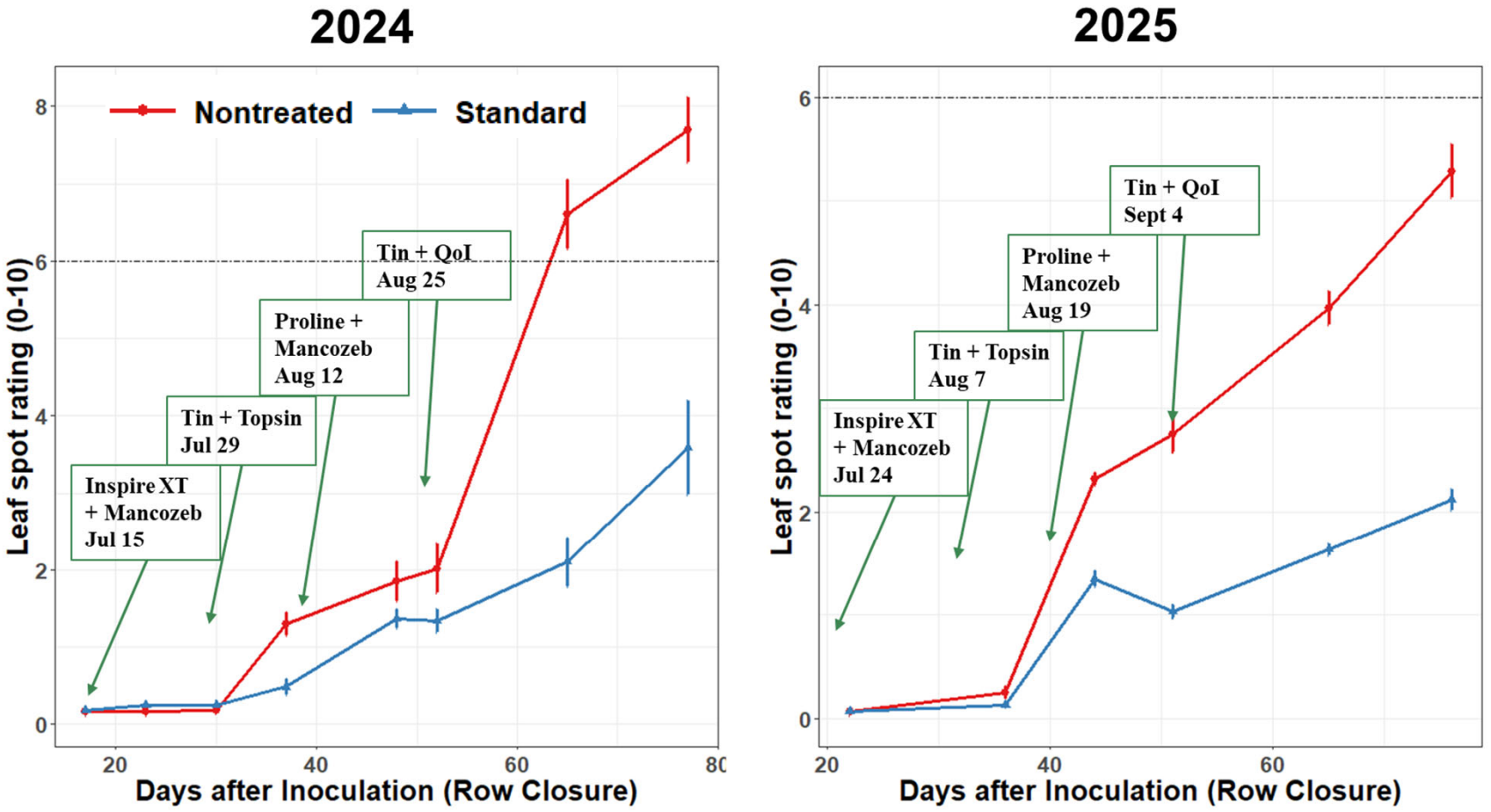
Objectives:

- Are CR+ varieties more susceptible to ALS and SLS than non-CR+ varieties?
- Does a standard CLS fungicide program control ALS and SLS?

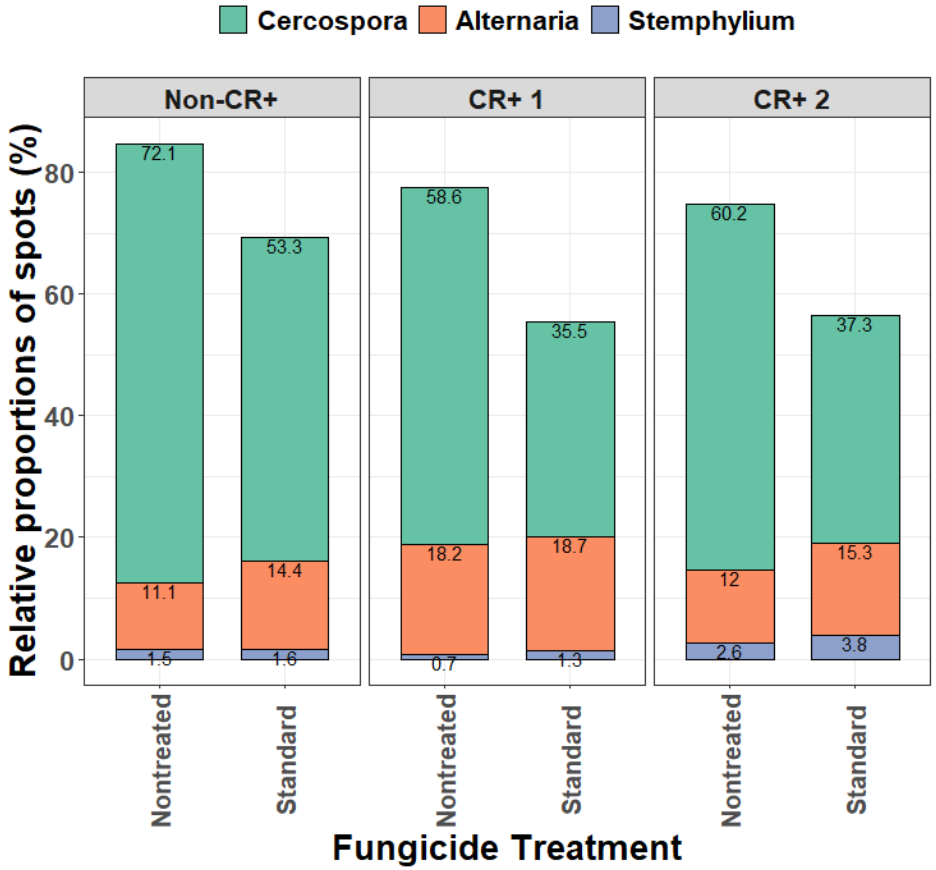
Disease Progress by Variety



Disease Progress by Treatment



Proportion of Spots: Full Season



Summary – Emerging Leaf Diseases

- CLS was predominantly present in both years
- CR+ varieties had lower CLS development
- Fungicide program effectively controlled CLS
- Alternaria LS was higher in one CR+ variety and Stemphylium LS was higher in another CR+ variety
  - Alternaria and Stemphylium are known to be strong saprophytes – can co-colonize CLS lesions

Acknowledgements

- **Sugarbeet Research and Education Board of Minnesota and North Dakota**
- NWROC core research support team
- American Crystal Sugar Company
- Al Farahmand, Germains Seed Technology
- Seed, chemical, and allied industries
- American Crystal Sugar Company quality labs – East Grand Forks and Moorhead
- U of M, NWROC facilities

Thank You!

Sugarbeet Pathology Team

Questions?

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