

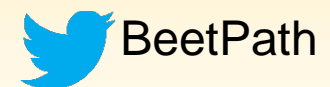
Management of Rhizoctonia in Sugarbeet

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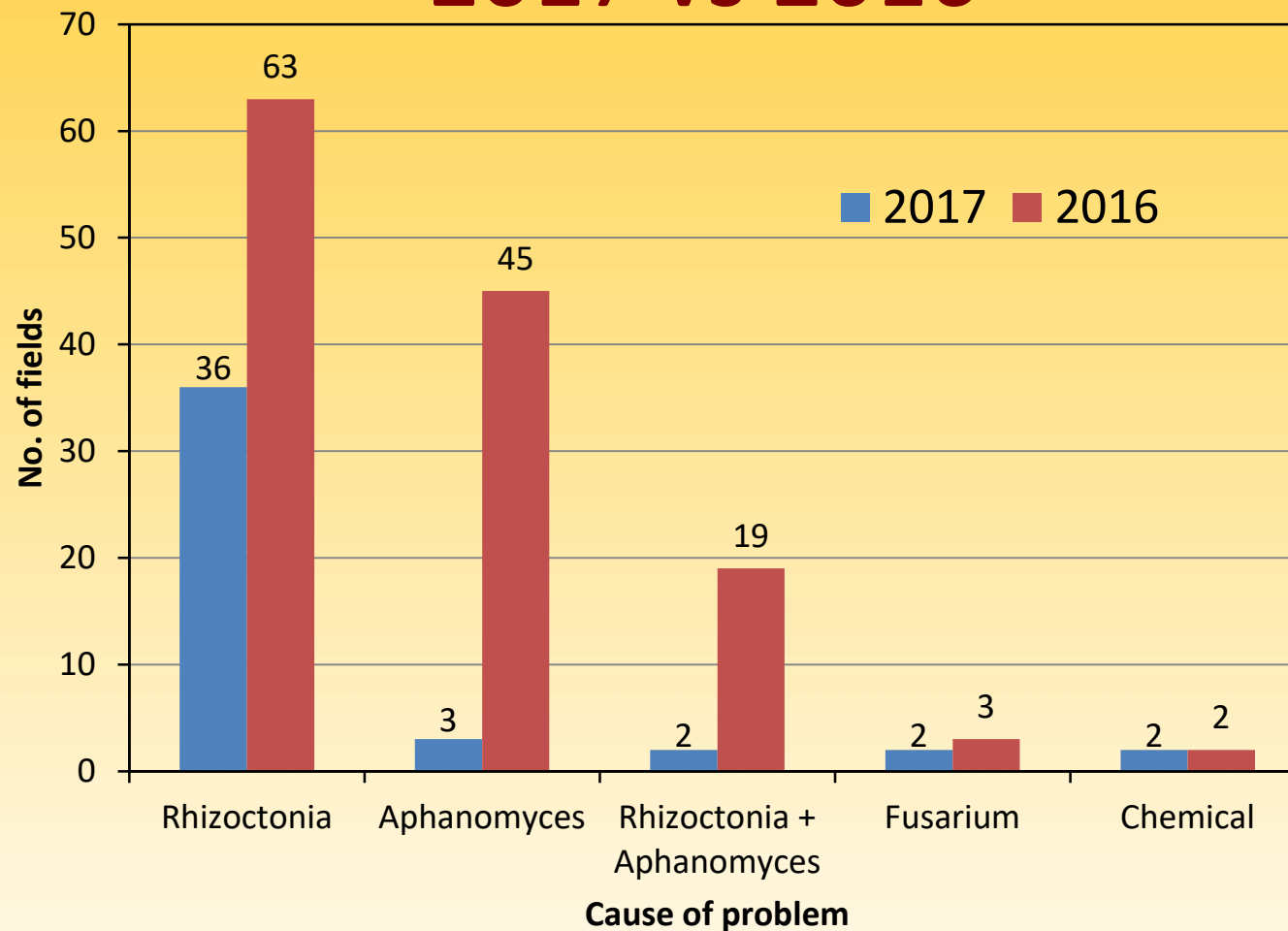
SMBSC Production Seminar, Jan 24, 2018

achanda@umn.edu

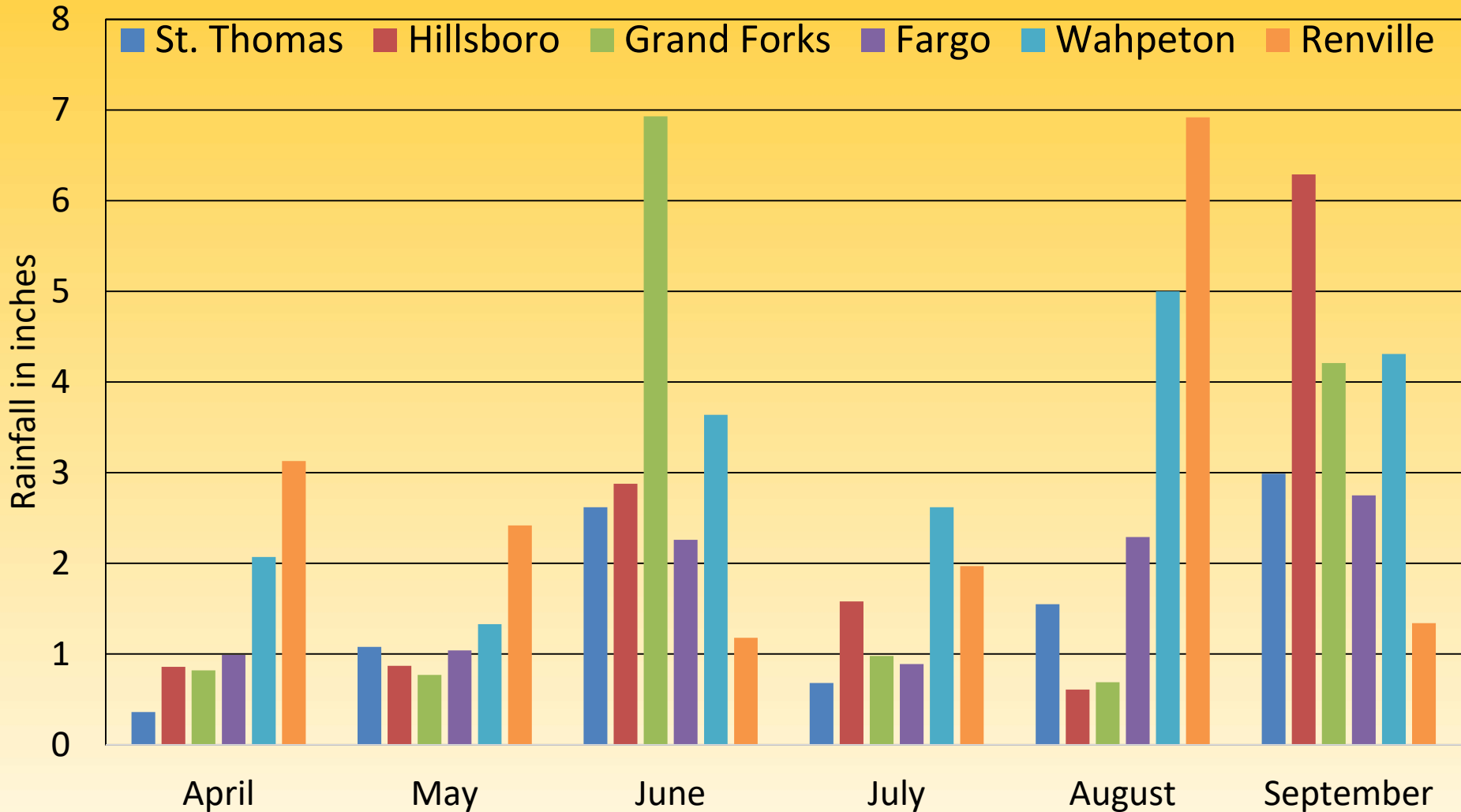


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Summary of Field Samples 2017 vs 2016



2017 Monthly Rainfall – RRV and So. MN



Source: NDAWN Center, NDSU & SMBSC



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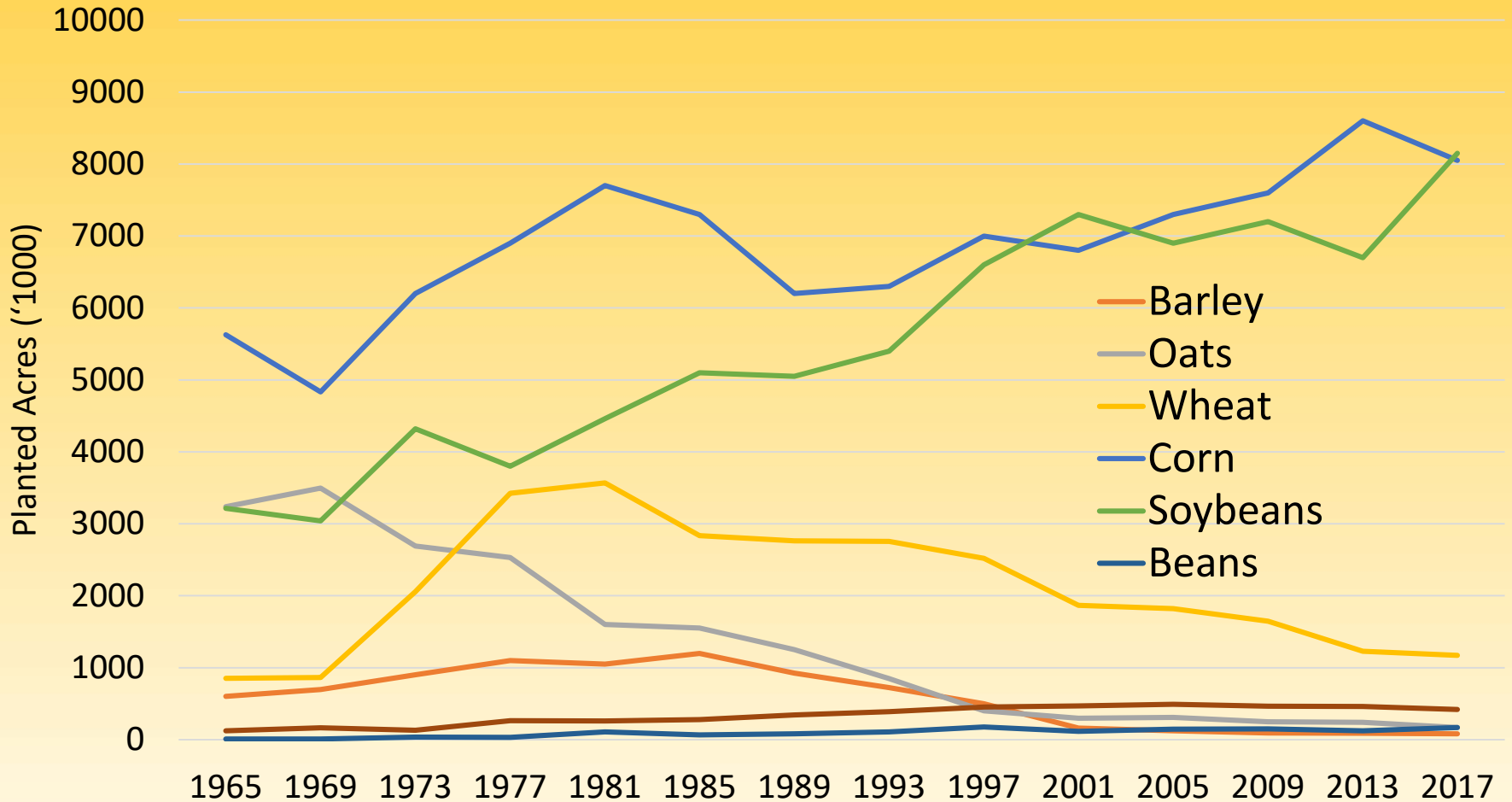
Why is Rhizoctonia becoming
a common problem?



Increase in number of acres
for susceptible crops in
sugarbeet rotation



Acreage for Field Crops in MN

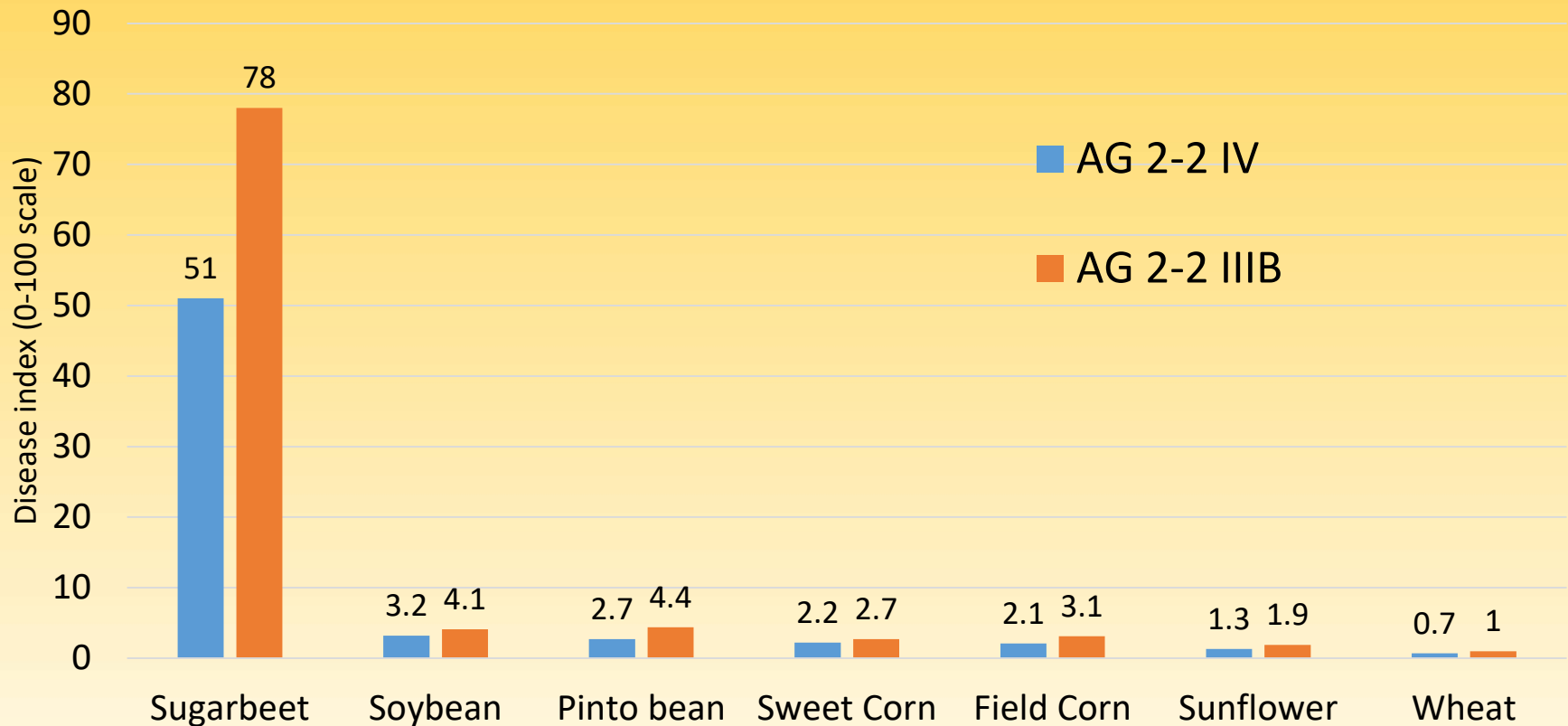


Rhizoctonia

- Fungus – *Rhizoctonia solani*
- Anastomosis group AG 2-2
- AG 2-2 has intraspecific groups (ISGs)
 - AG 2-2 IIIB and AG 2-2 IV
- Both ISGs cause same symptoms on sugarbeet
- Both occur in MN/ND (Windels, 2009)
 - RRV (460 cultures): AG 2-2 IV most common (66%)
 - So. MN (504 cultures): AG 2-2 IIIB most common (56%)



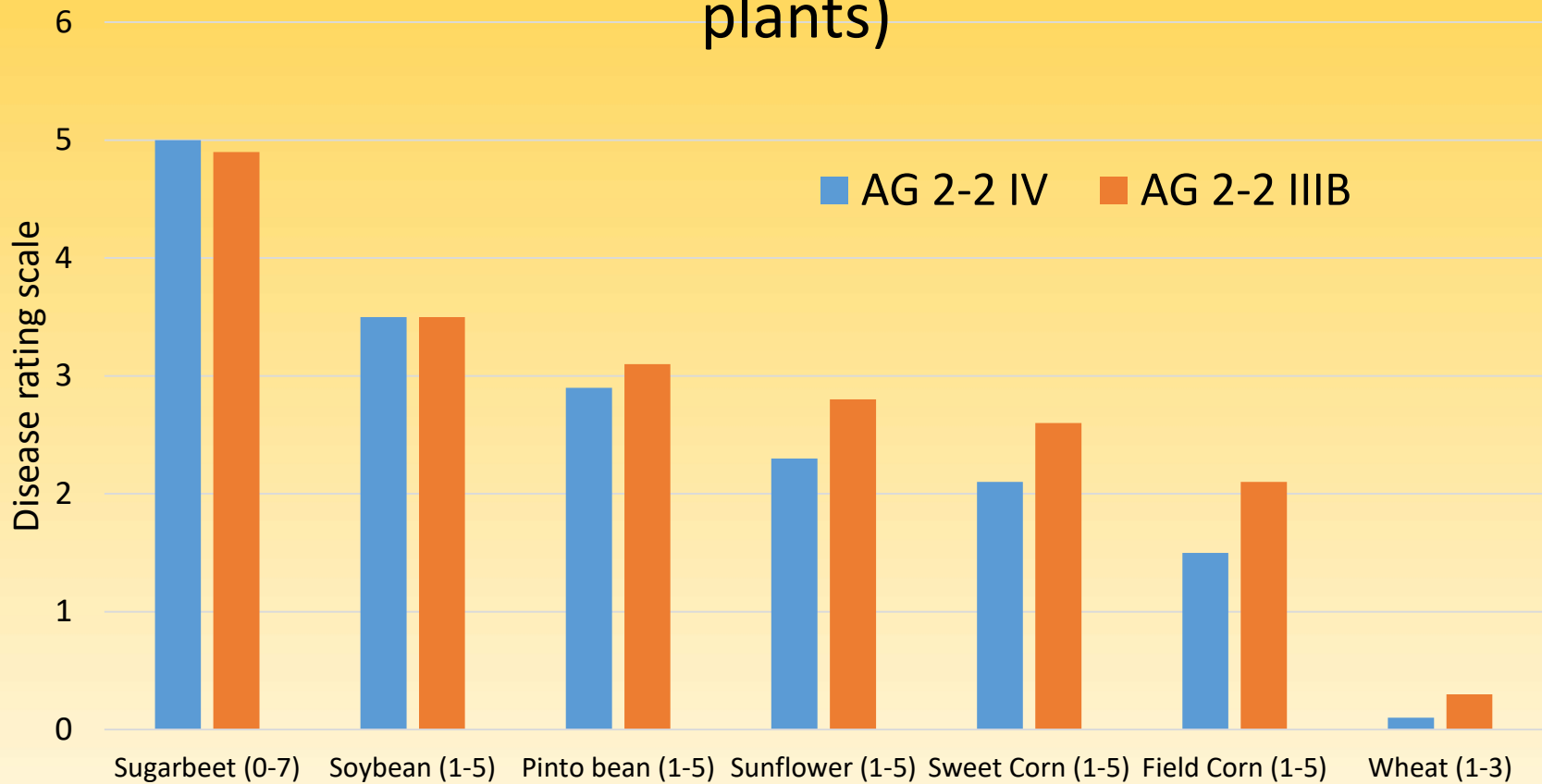
Aggressiveness of AG 2-2 IV and III B on sugarbeet and common rotation crops (seedlings)



(Windels, 2012)



Aggressiveness of AG 2-2 IV and 2-2 IIIB on sugarbeet and common rotation crops (adult plants)



(Windels, 2012)



Average disease ratings

Sugarbeet

(0-7)

~5



Pinto bean

(1-5)

~3



Soybean

(1-5)

~3.5



Wheat

(0-3)

~0.2



(Windels, 2012)

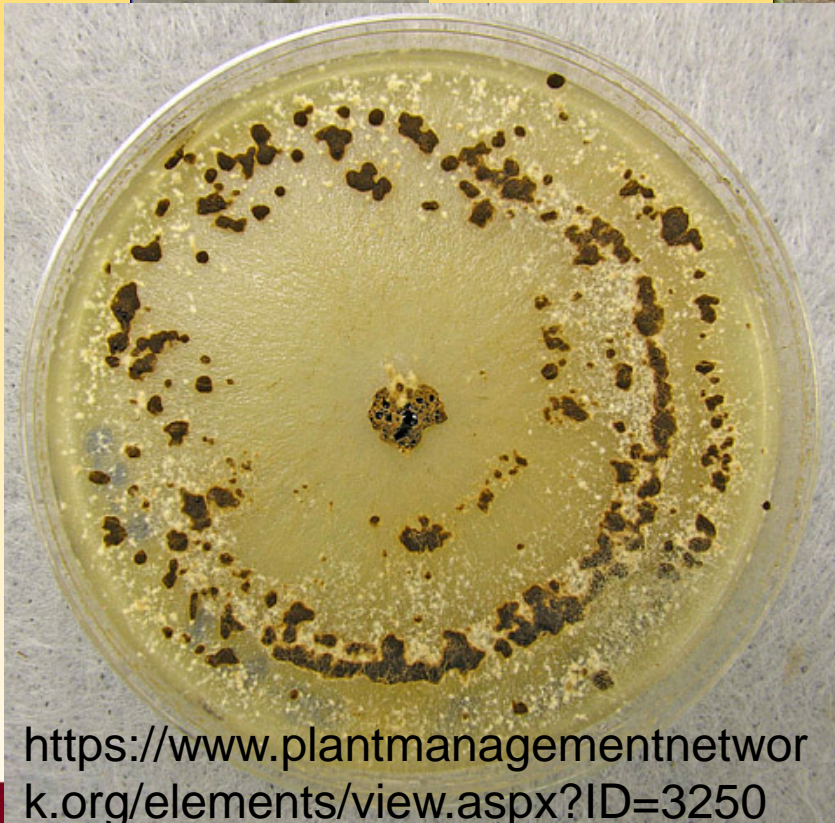


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Damping-off

Crown and Root Rot



<https://www.plantmanagementnetwork.org/elements/view.aspx?ID=3250>



Factors affecting Rhizoctonia

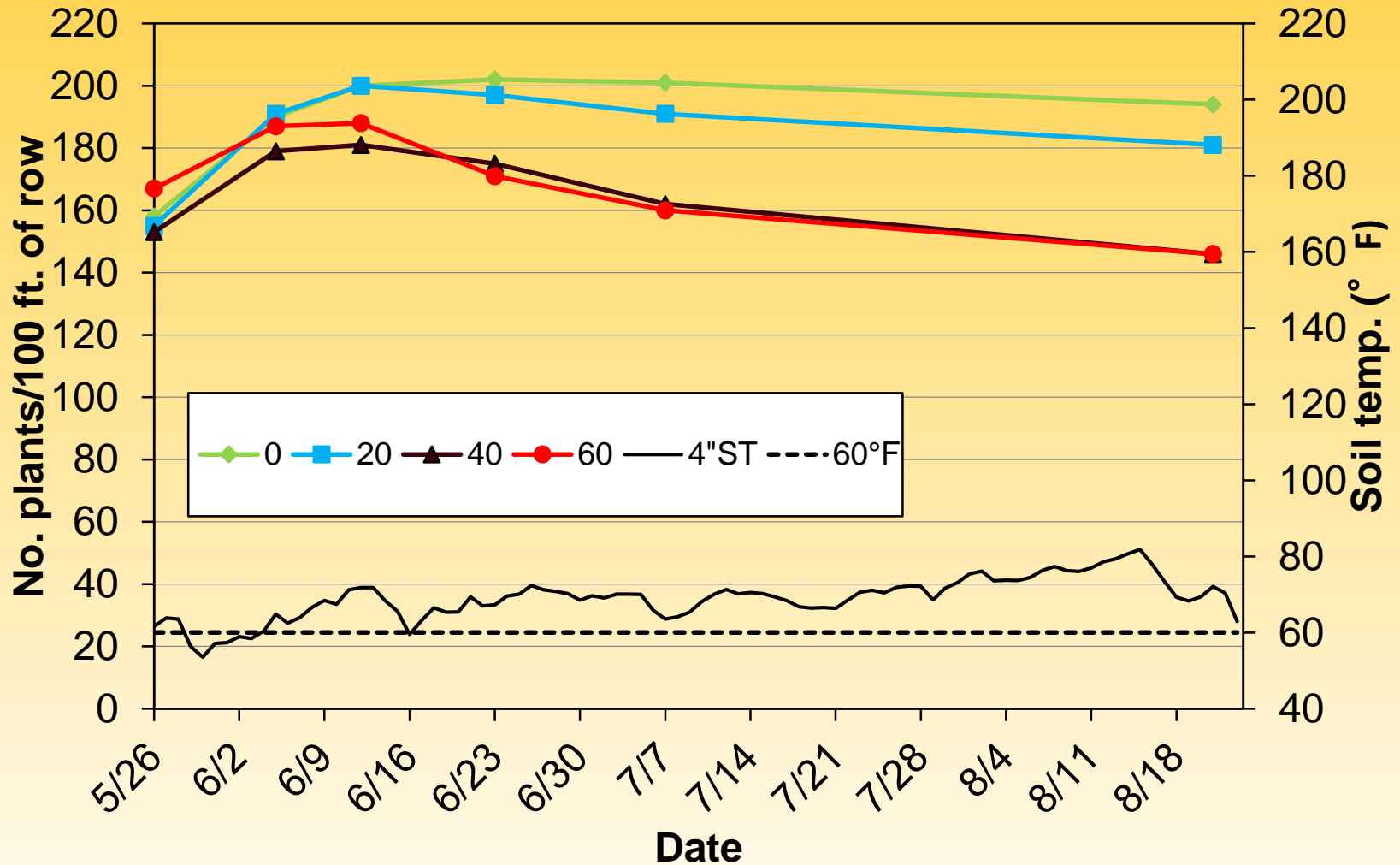
- Density of fungus in soil
 - **High populations**: disease begins early in season even if weather is not ideal
 - **Low populations**: onset of disease is later in season, esp. if weather ideal
- Environment
 - Temperature: 50 to 95+ 0F (68 to 85 0F)
 - Soil moisture: dry to wet @ 25 – 100% MHC
- Susceptibility of variety



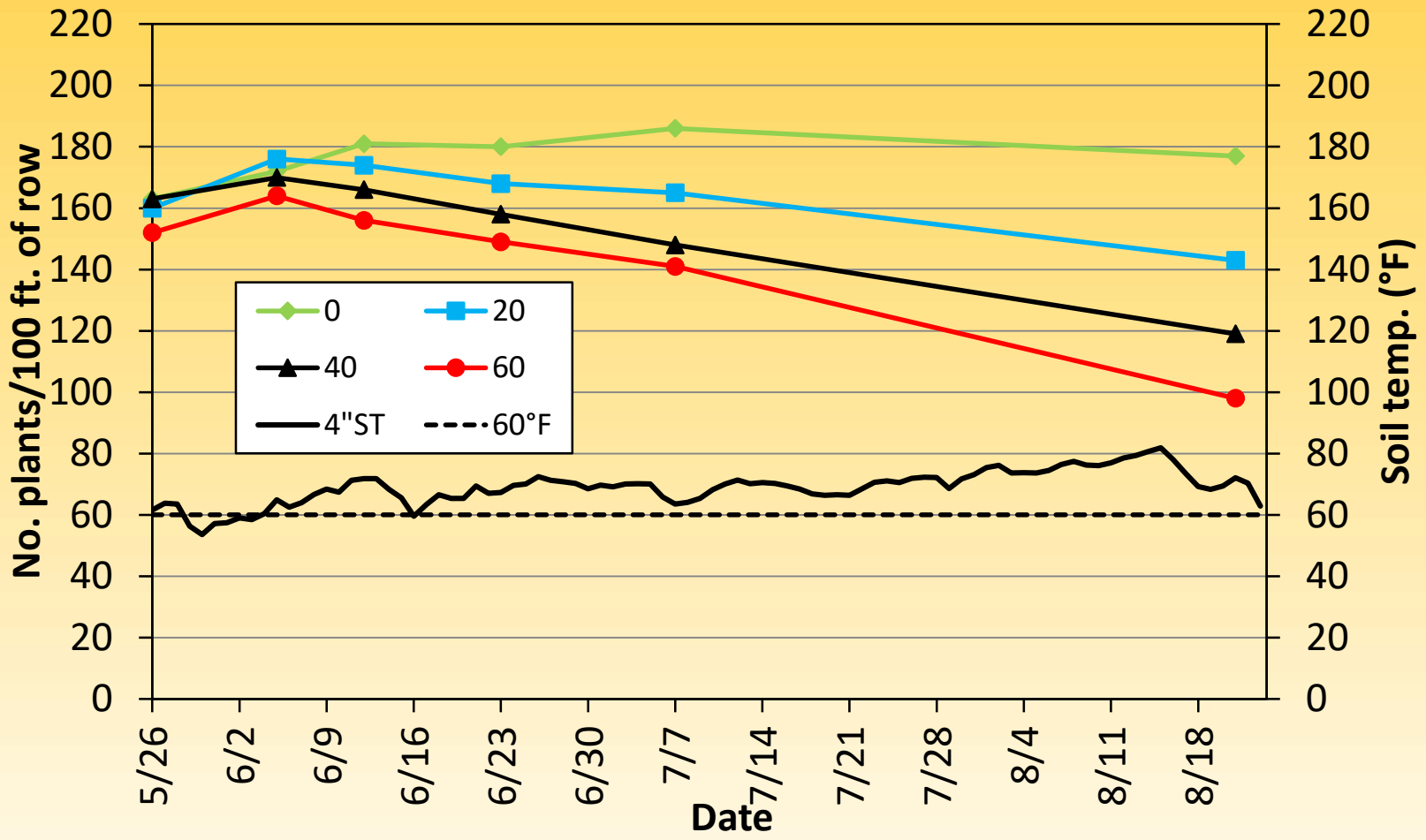
Sugarbeet variety susceptibility and Rhizoctonia levels in the soil



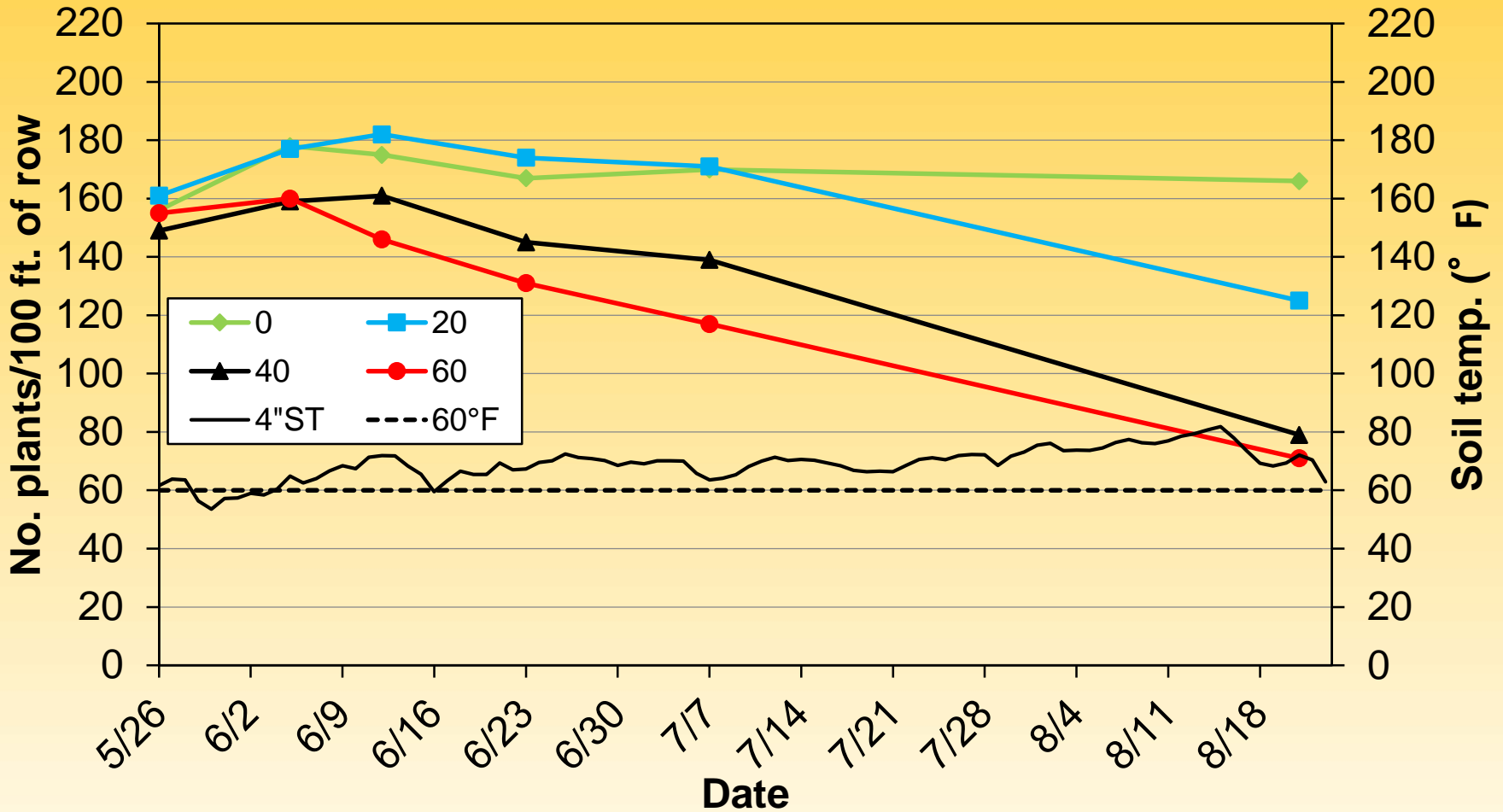
Rhizoctonia & Resistant Variety (~3.4)



Rhizoctonia & Moderately Resistant Variety (~4.0)



Rhizoctonia & Susceptible Variety (~5.3)



Variety selection for 2018

Variety Description	Rhizoctonia Root Ratings				
	2017 Root Rating	2016 Root Rating	2015 Root Rating	2016-2017 2 Year Mean Root Rating	2015-2017 3 Year Mean Root Rating
Fully Approved Varieties					
Beta 92RR30 (Aph)	4.6	4.6	4.8	4.6	4.7
Beta 9475 (CLS)	4.2	4.5	4.6	4.4	4.4
Crystal M579 (High Sugar)	4.8	5.0	4.6	4.9	4.8
Crystal M375	5.5	4.7	4.8	5.1	5.0
Crystal M380	4.9	4.7	4.1	4.8	4.6
Test Market Varieties					
Beta 9606	3.0	3.6		3.3	
Beta 9661	3.6	4.2		3.9	
Beta 9666 (High Sugar)	4.9	5.1		5.0	
Crystal M623	3.2	3.4		3.3	
SV RR958	4.1	4.4	4.3	4.2	4.3
SV RR863 (CLS)	3.8	4.5		4.1	
Specialty Approved					
Crystal RR018 (RHC)	3.3	3.8	3.9	3.5	3.7
Hilleshog 9093RR (RHC)	3.3	3.3	3.3	3.3	3.3
Hilleshog 9739 (RHC)	3.9	3.8	3.5	3.8	3.7
Maribo MA109RR (RHC)	3.1	3.8	2.9	3.4	3.3
Beta 9505 (CLS)	3.5	4.5	4.1	4.0	4.0
Conventional Test Market					
Hilleshog 3035	3.1				

Rhizoctonia Ratings from SMBSC Nursery at Renville and BSDF Nursery in Michigan
 Ratings are on scale of 1 - 7. (1 = Healthy, 7 = Dead)



Management of Rhizoctonia

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



Seed treatments

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

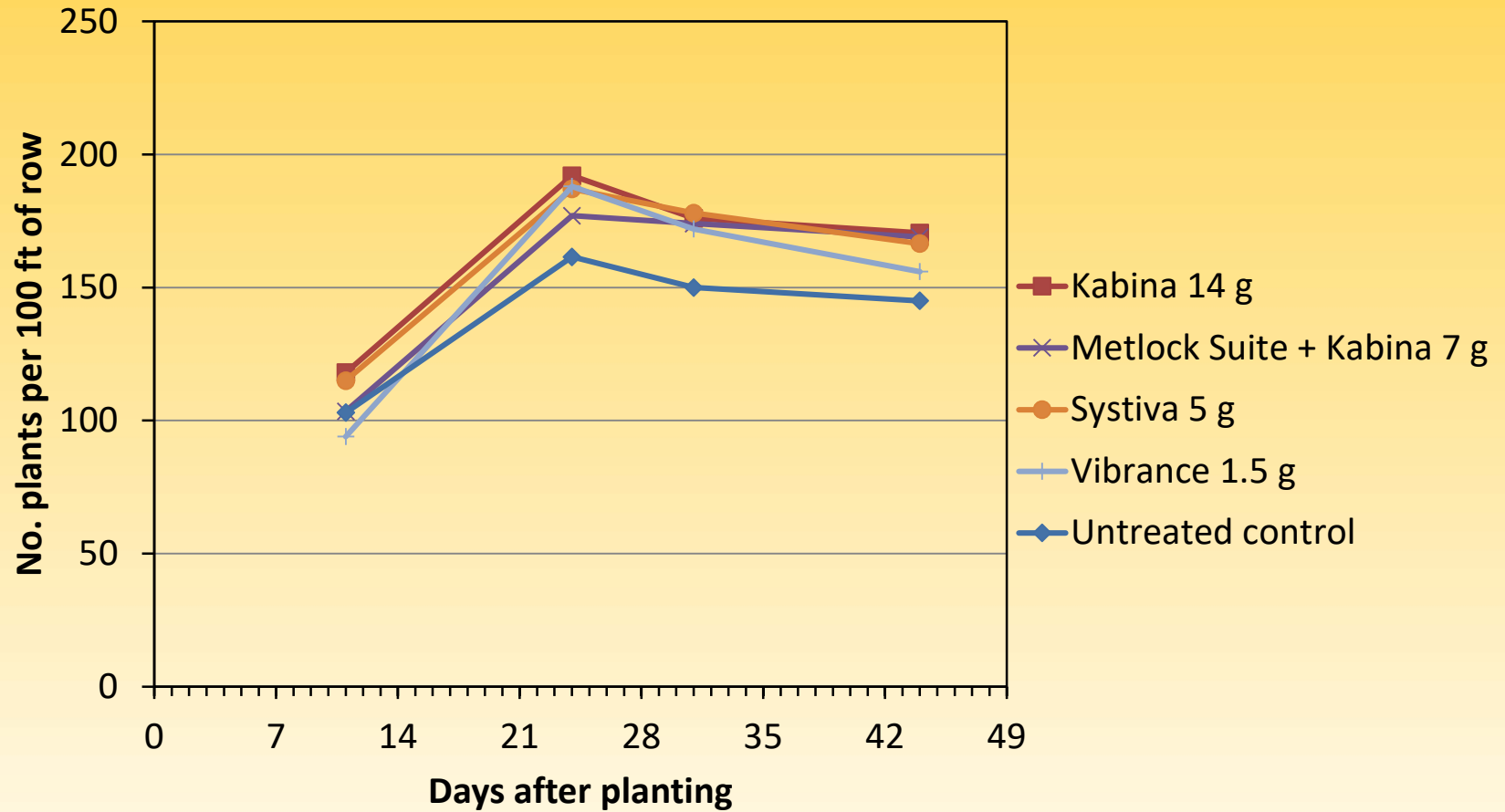


Seed treatments

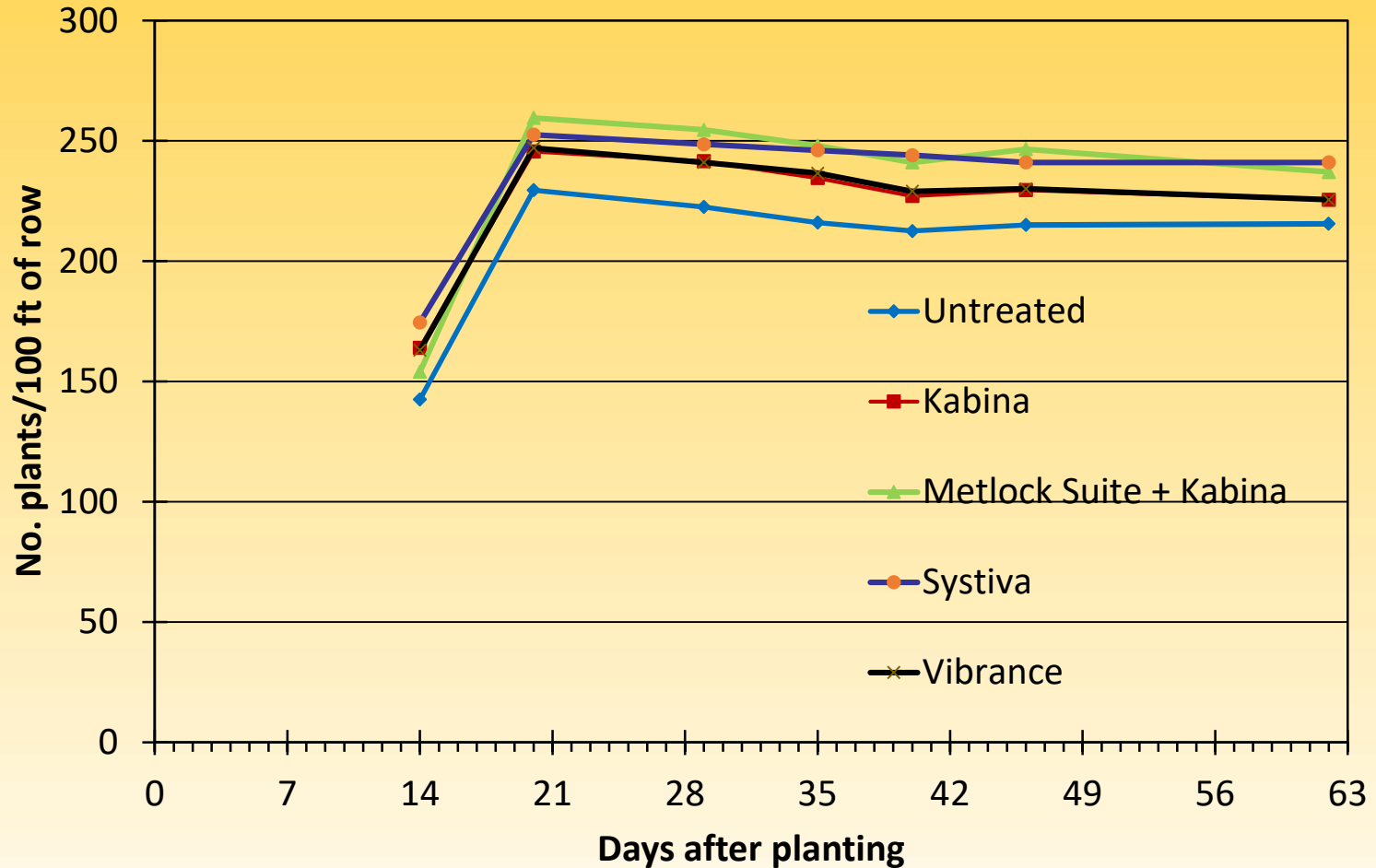
- Kabina 14 g (Penthiopyrad, 2014)
- Vibrance 1.5 g (Sedaxane, 2016)
- Systiva 5 g (Fluxapyroxad, 2017)
- Metlock Suite [Metconazole + Rizolex) + Kabina 7g (Penthiopyrad), 2014)
- In 2017, 100% seed is treated for Rhizoctonia and treatment depends on the seed companies' choice



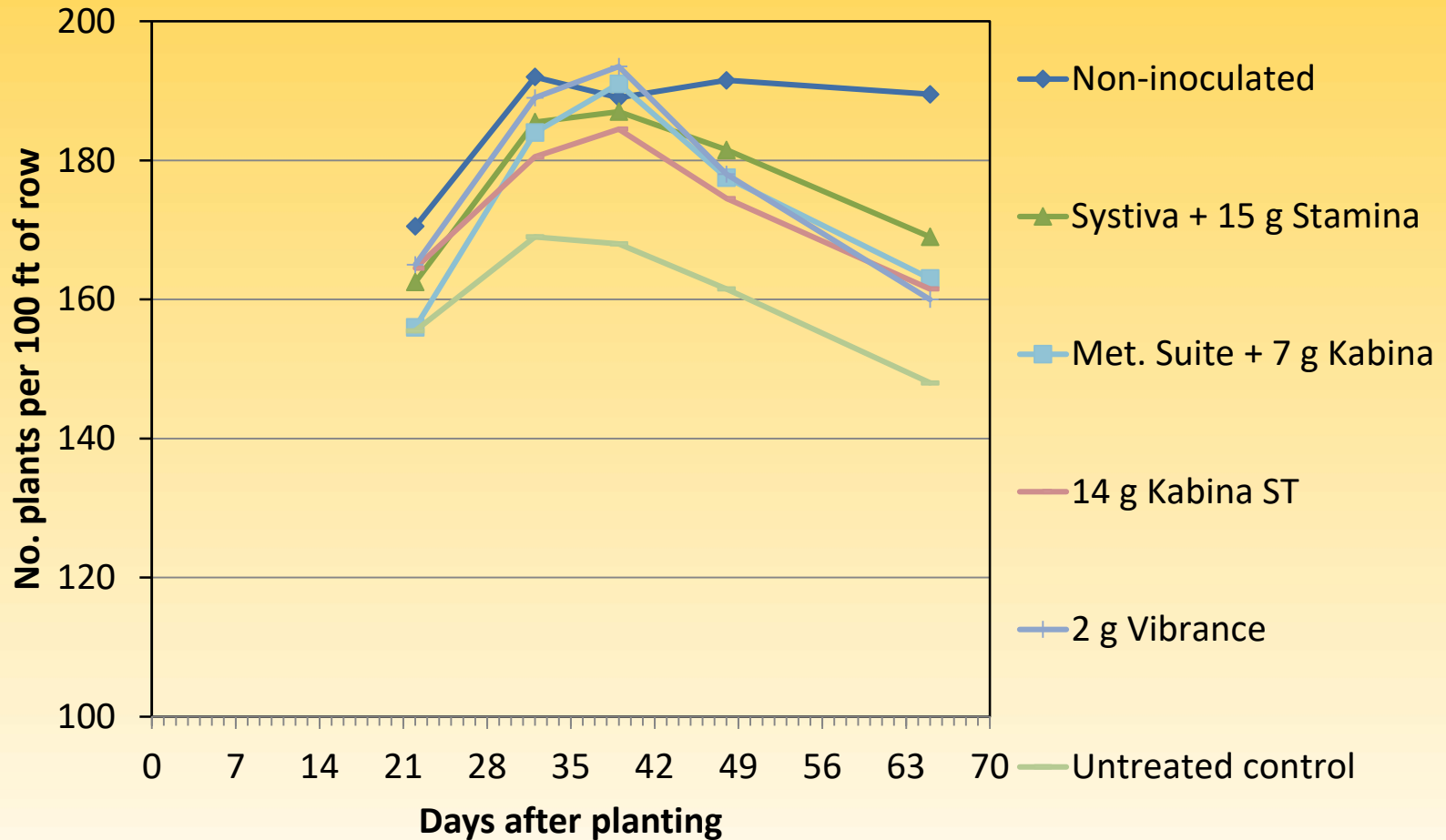
Seed treatments – 2016



Seed treatments – 2017



Seed treatments – 2015

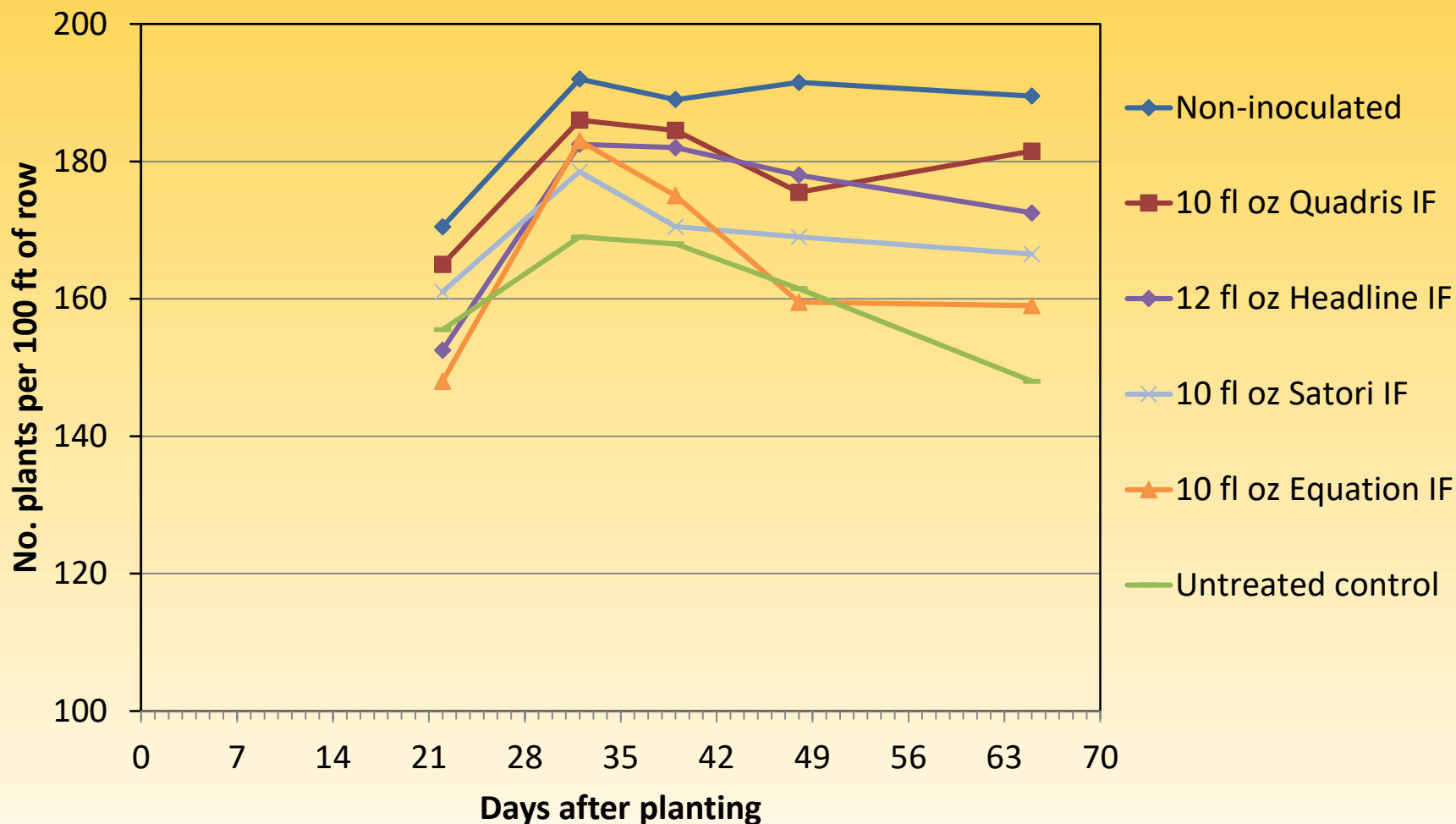


Benefits of seed treatments

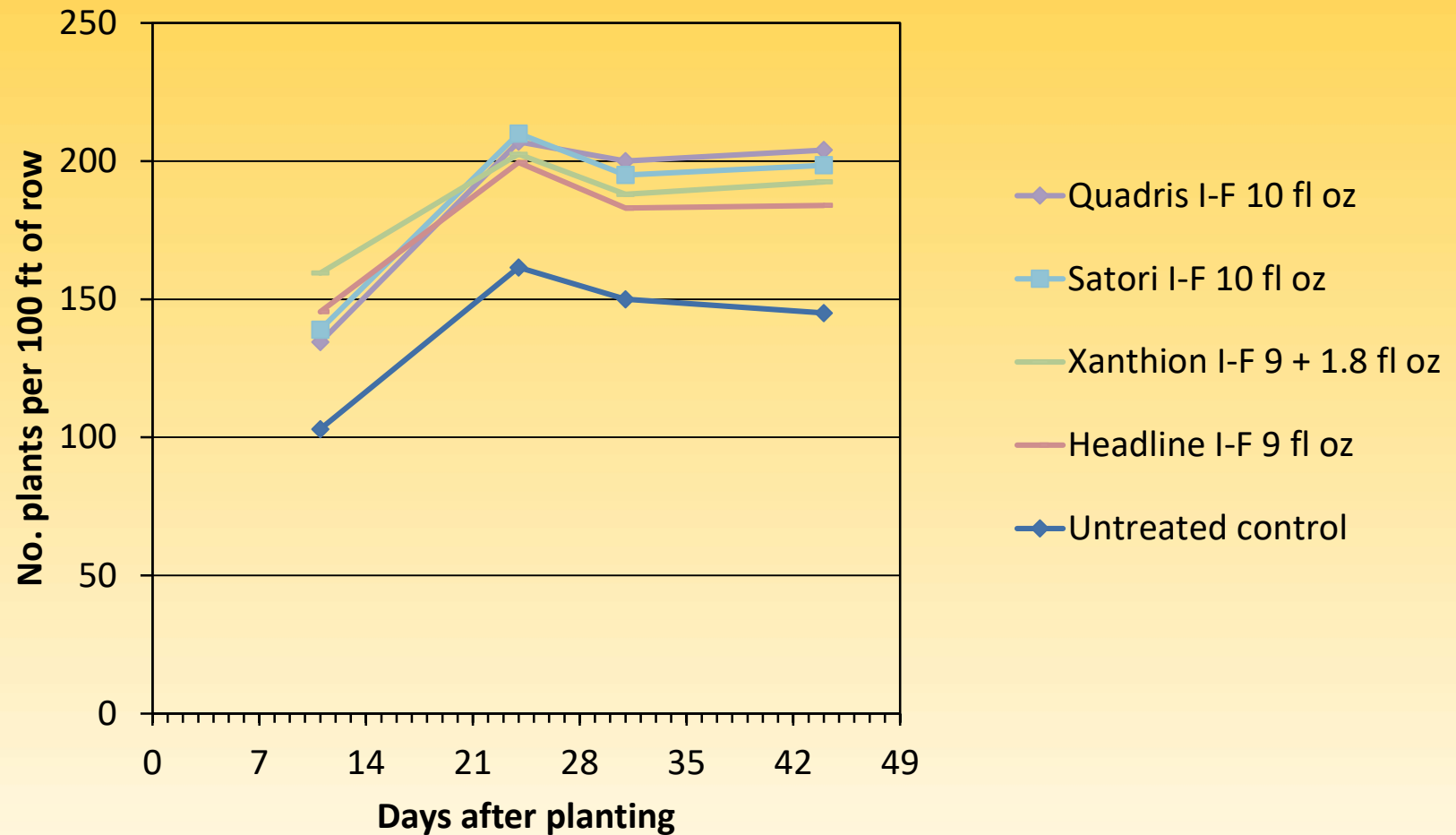
- Ease of use -It comes with seed
- Safety
- No plugged nozzles
- Sugarbeet seedlings are very susceptible to Rhizoctonia early on
- Genetic resistance is not expressed until 6-8 leaf stage
- Effective protection of seedling (4-5 weeks)



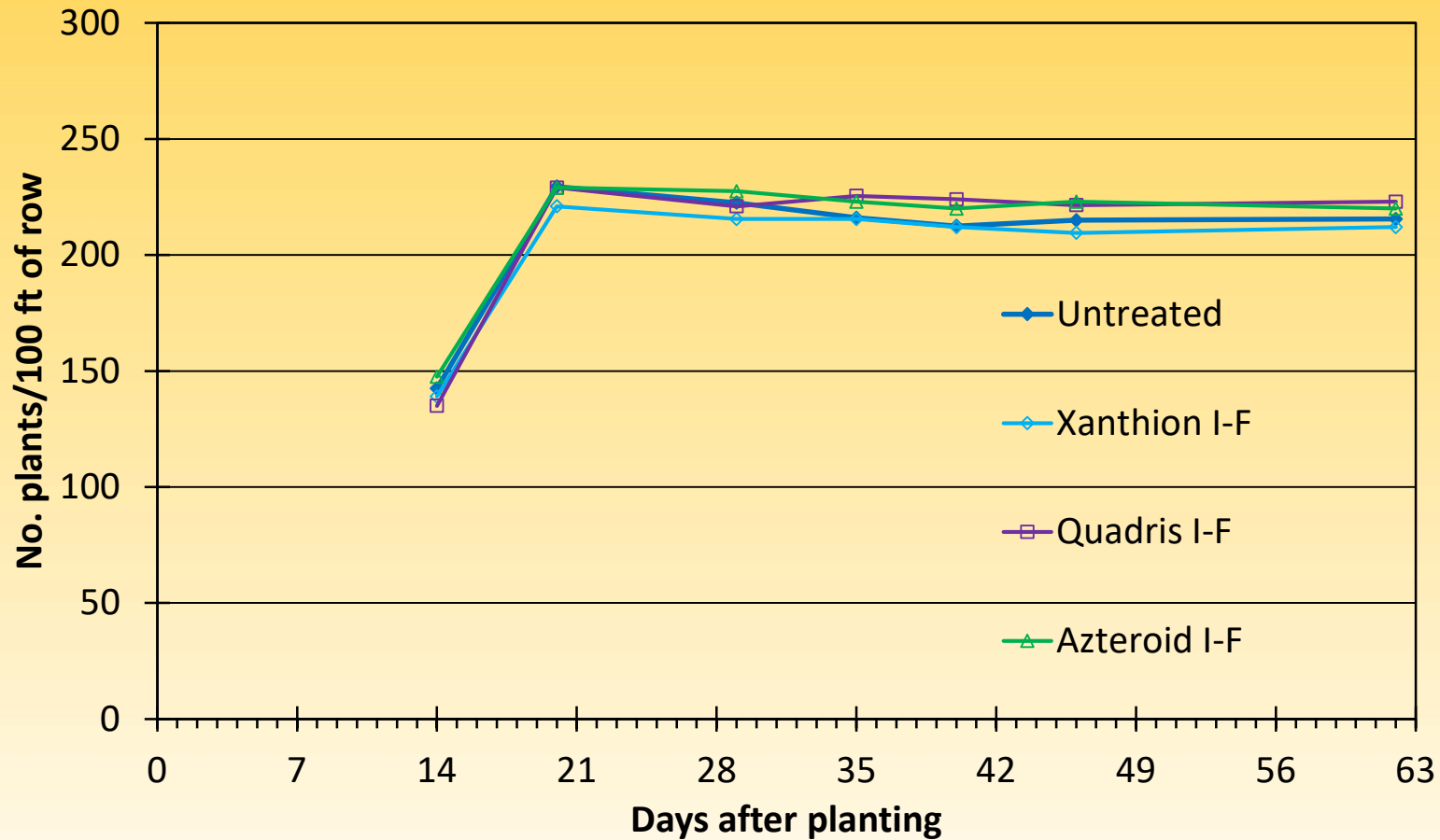
In-furrow treatments – 2015



In-furrow treatments – 2016



In-furrow treatments – 2017



In-furrow treatments

- Benefits
 - Sanitizing the furrow (seedling + soil)
 - More effective than seed treatments – longevity up to 8-10 weeks (Windels, 2010)
- Risks
 - Phytotoxicity
 - cool weather and light soils
 - Mixing with starter fertilizer and other chemicals
 - Plugged nozzles



Seed vs In-furrow treatments - 2015

Treatment	No. harv. Roots/100 ft.	RCRR (0-7)	Yield	Sucrose		
				%	lb ton ⁻¹	lb A ⁻¹
Seed treatments	98	3.9	20.1	16.6	304	6181
In-furrow treatments	127	2.7	25.5	16.5	303	7772
Seed trts. vs in-furrow trts. Contrast analysis <i>p</i> -value	0.001	0.006	0.0032	NS	NS	0.0148

14 g Kabina ST
Metlock Suite
Met. Suite + 7 g Kabina
7 g Kabina ST
2 g Vibrance

12 fl oz Headline IF
10 fl oz Quadris IF
10 fl oz Equation IF
10 fl oz Satori IF

NS = not significantly different



Seed vs In-furrow treatments - 2017

Treatment	No. harv. roots/100 ft	RCRR (0-7)	RCRR % incidence	Yield ton A ⁻¹	% Sucrose	RST	RSA
Seed treatments	195	1.2	22	31.6	17.9	339	10708
In-furrow treatments	191	0.8	15	32.4	18.0	343	11132
P-value	0.43	0.07	0.07	0.36	0.57	0.37	0.22
	NS	NS	NS	NS	NS	NS	NS

Seed Treatments

14 g Kabina ST
 Metlock Suite
 Met. Suite + 7 g Kabina
 5 g Systiva
 1.5 g Vibrance

In-furrow

10 fl oz Quadris
 11.9 fl oz AZteroid
 Xanthion (Headline +
 Integral, 9 + 1.8 fl oz/A)



Postmergence treatments - 2017

Treatment (Rates per Acre)	Percent stand loss	RCRR (0-7)	RCRR % Incidence
No fungicide control	66 a	3.7 a	75 a
AZteroid @ 17.6 fl oz, band	22 b	0.7 b	15 b
Quadris @ 10 fl oz, band	15 b	0.9 b	16 b
Quadris @ 14 fl oz, band	27 b	1.2 b	25 b
Quadris @ 14 fl oz broadcast	14 b	1.1 b	21 b
ANOVA <i>P</i> -value	0.0001	<0.0001	<0.0001
LSD (<i>P</i> = 0.05) ^W	17.6	0.92	18.4



Postmergence treatments - 2017

Treatment (Rates per Acre)	Yield T/A	% Sucrose	RST	RSA
No fungicide control	23.2 c	16.9 c	314 b	7324 c
AZteroid @ 17.6 fl oz	33.6 ab	17.6 ab	330 ab	11084 ab
Quadris @ 10 fl oz	33.5 ab	17.9 a	336 a	11272 a
Quadris @ 14 fl oz	31.9 ab	17.7 a	334 a	10659 ab
Quadris @ 14 fl oz broadcast	33.4 ab	17.4 abc	327 ab	10944 ab
ANOVA <i>P</i> -value	<0.0001	0.0297	0.0460	0.0001
LSD (<i>P</i> = 0.05) ^W	3.86	0.68	15.4	1451



Postmergence treatments - 2017

Treatment (Rates per Acre)	Percent stand loss	RCRR (0-7)	RCRR % Incidence
No fungicide control	66 a	3.7 a	75 a
Topguard EQ @ 7 fl oz	23 b	1.1 b	20 b
Priaxor @ 6.7 fl oz + NIS (0.25%)	25 b	1.5 b	26 b
Proline @ 5.7 fl oz + NIS (0.125%)	25 b	1.6 b	33 b
ANOVA <i>P</i> -value	0.0001	<0.0001	<0.0001
LSD (<i>P</i> = 0.05) ^W	17.6	0.92	18.4



Postmergence treatments - 2017

Treatment (Rates per Acre)	Yield T/A	% Sucrose	RST	RSA
No fungicide control	23.2 c	16.9 c	314 b	7324 c
Topguard EQ @ 7 fl oz	35.5 a	17.5 abc	330 ab	11715 a
Priaxor @ 6.7 fl oz + NIS (0.25%)	31.0 b	16.9 bc	316 b	9809 b
Proline @ 5.7 fl oz + NIS (0.125%)	32.7 ab	17.9 a	336 a	11013 ab
ANOVA <i>P</i> -value	<0.0001	0.0297	0.0460	0.0001
LSD (<i>P</i> = 0.05) ^W	3.86	0.68	15.4	1451



Postmergence treatments - 2016

Treatment	Percent stand loss	RCRR (0-7)	Yield T/A
Non-inoculated			
No-fungicide control	35	3.4	24.3
<i>R. solani</i> -inoculated			
Equation @ 14 fl oz/A	22 bc	1.9 d	31.0 a
Quadris @ 14 fl oz/A	25 bc	2.4 d	29.9 a
Satori @ 14 fl oz/A	20 c	2.4 d	29.6 a
No-fungicide control	55 a	5.5 a	14.0 c
ANOVA <i>P</i> -value	0.043	0.0001	0.004
LSD (<i>P</i> = 0.05) ^z	23.6	1.4	8.3



Postmergence treatments - 2016

Treatment	Sucrose		
	%	lb/ton	lb recov./A
Non-inoculated			
No-fungicide control	14.8	257	6263
<hr style="border-top: 1px dashed black;"/>			
<i>R. solani</i> -inoculated			
Equation @ 14 fl oz/A	14.7	261	8066 a
Quadris @ 14 fl oz/A	15	265	7908 a
Satori @ 14 fl oz/A	14.9	266	7790 a
No-fungicide control	14	244	3411 c
<hr style="border-top: 1px dashed black;"/>			
ANOVA <i>P</i> -value	0.829	0.804	0.002
LSD (<i>P</i> = 0.05) ^z	NS	NS	2284

NS = not significantly different



Postmergence treatments - 2016

Treatment	Percent stand loss	RCRR (0-7)	Yield T/A
Non-inoculated			
No-fungicide control	35	3.4	24.3
<i>R. solani</i> -inoculated			
Priaxor @ 6.7 fl oz/A + NIS	34 abc	4.0 bc	23.4 ab
Priaxor @ 6.7 fl oz/A	49 a	4.8 ab	21.0 bc
Proline @ 5.7 fl oz/A + NIS	44 ab	4.7 abc	20.4 bc
No-fungicide control	55 a	5.5 a	14.0 c
ANOVA <i>P</i> -value	0.043	0.0001	0.004
LSD (<i>P</i> = 0.05) ^z	23.6	1.4	8.3



Postmergence treatments - 2016

Treatment	Sucrose		
	%	lb/ton	lb recov./A
Non-inoculated			
No-fungicide control	14.8	257	6263

<i>R. solani</i> -inoculated			
Priaxor @ 6.7 fl oz/A + NIS	14.9	261	6177 ab
Priaxor @ 6.7 fl oz/A	14.1	246	5112 bc
Proline @ 5.7 fl oz/A + NIS	13.5	232	4677 bc
No-fungicide control	14	244	3411 c

ANOVA <i>P</i> -value	0.829	0.804	0.002
LSD (<i>P</i> = 0.05) ²	NS	NS	2284

NS = not significantly different



Postemergence treatments

- Benefits
 - If you are doing a row cultivation
 - Later season disease control
 - Beneficial if later part of the season stays wet
 - Low disease now means clean fields in the future
 - If using susceptible crops in rotation



Postemergence treatments

- Risks
 - Timing
 - Work better before infection happens
 - May not be useful if later part of the growing season stays dry
 - Band application – severe disease pressure
 - Broadcast application – low disease pressure



Take Home Message for 2018

Rhizoctonia pressure (beets/100 ft. row)	Resistant (Specialty) variety	Seed treatment	In-furrow treatment	Postemergence treatment
Low (170-200)	No No	Yes Yes	No No	No Yes (if following Beans)
Moderate (130 – 170)	Yes Yes No	Yes Yes Yes	No No No	No Yes (if following Beans) Yes
Severe (less than 130)	Yes No	Yes Invest	Yes Your \$\$\$\$\$	Yes Elsewhere!



Take Home Message for 2018

- Seed treatments Kabina, Vibrance, Systiva, or Metlock Suite + Kabina provide excellent early-season protection
- In-furrow applications
 - Similar to seed treatments under low disease pressure
 - Better than seed treatments under high disease pressure
 - May reduce stands under cool and dry soil conditions
- Seed/in-furrow treatments can broaden the window to apply postemergence application (4 to 8 leaf stage)
- Postemergence application is most beneficial under moderate to heavy disease pressure especially if beets are following soybeans or edible beans
- Generic formulations of azoxystrobin are effective



Acknowledgements

- Sugarbeet Research and Education Board of Minnesota and North Dakota
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