

# Management of Rhizoctonia Diseases in Sugarbeet

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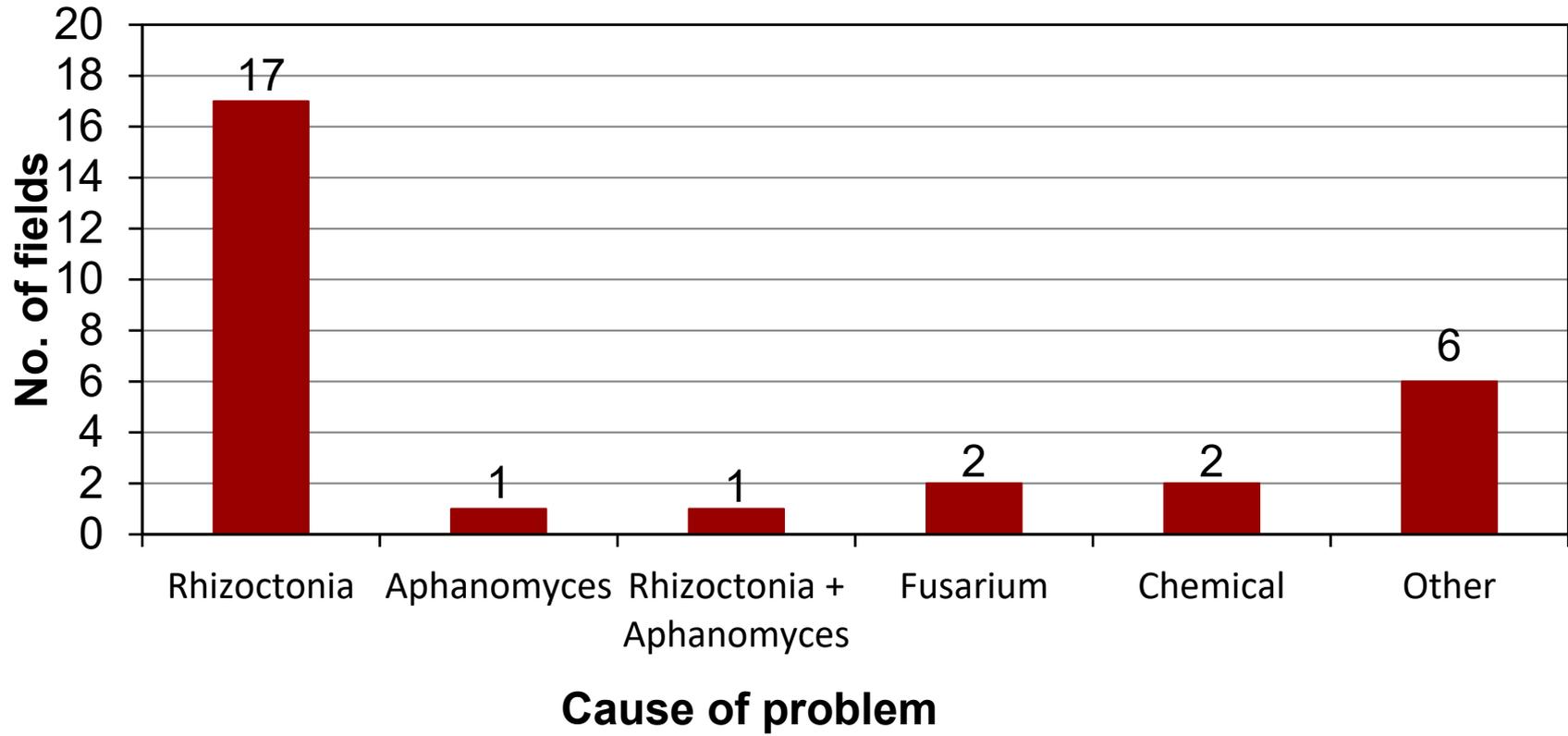
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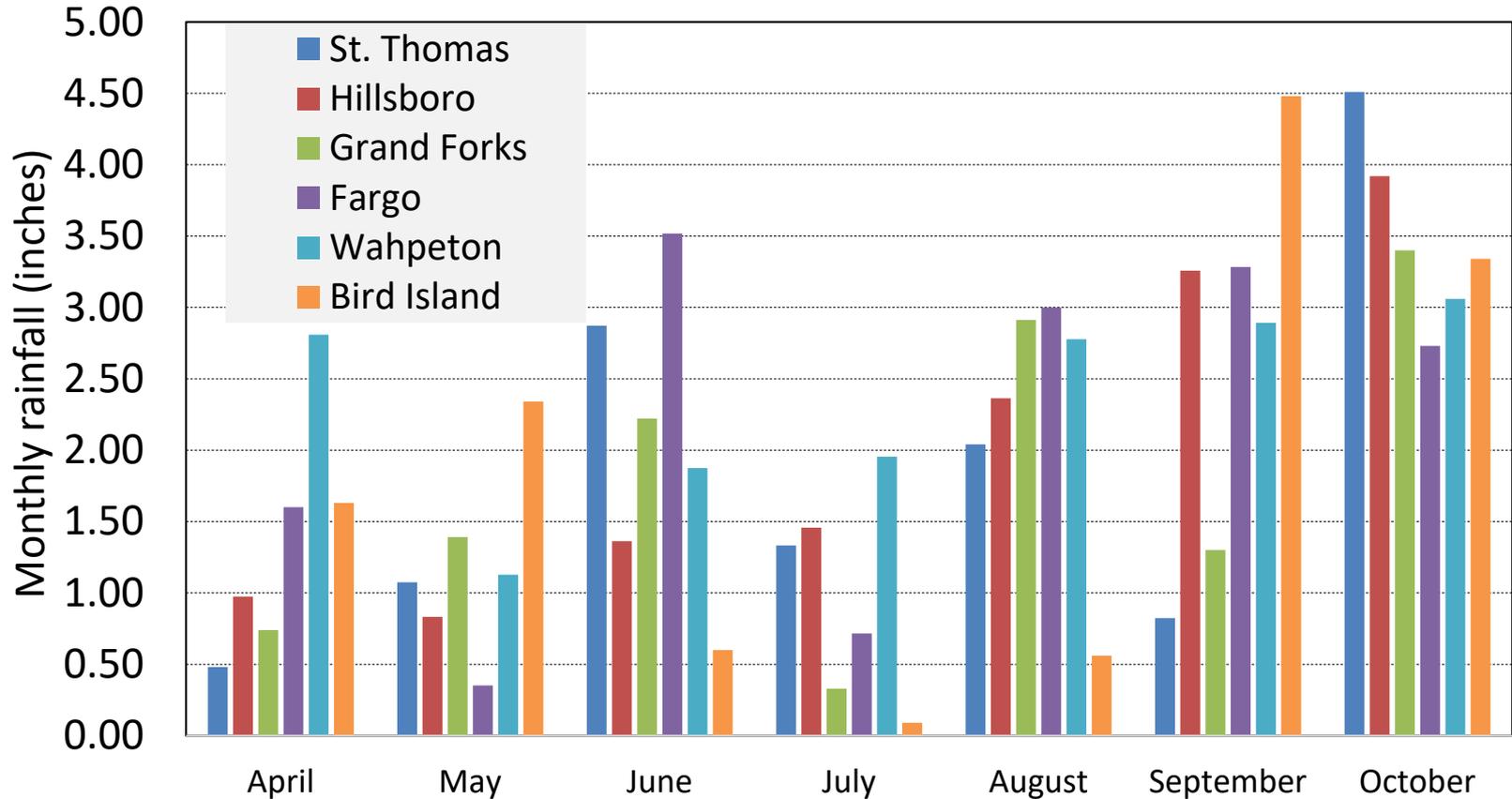
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# Summary of 2021 Field Samples (n = 29)



# 2021 Monthly Rainfall in the RRV and Southern MN



Source: NDAWN Center, NDSU and Wunderground.com



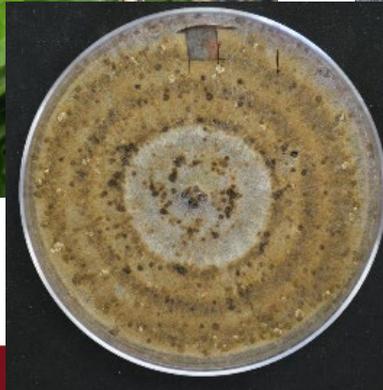
# Rhizoctonia Damping-off



# Rhizoctonia Crown and Root Rot



# Rhizoctonia Crown and Root Rot



# Management of Rhizoctonia

- Crop Rotation
  - Length
  - Crop choice & weed control
- Early planting
- Resistant varieties
- At-planting fungicides
  - Seed treatments (\$13+ per acre)
  - In-furrow fungicides (\$15-24+ per acre)
- Postemergence fungicides (\$15-24+ application cost)



# Integrated Rhizoctonia Management

## Objectives

- Determine the best combination of seed treatment, in-furrow, and/or postemergence fungicides on resistant and susceptible cultivars for:
  - Stand establishment
  - Full-season control of Rhizoctonia diseases



# Materials and Methods

- NWROC, Crookston
- Split-split plot design, 4 reps (May 07)
- Rhizoctonia inoculum broadcast prior to planting (50 kg/ha) and incorporated
  - Variety (main plot)
    - Partially resistant (2-yr rating = 3.8)
    - Susceptible (2-yr rating = 4.8)
  - At-planting treatment (split plot)
    - No seed or in-furrow fungicide treatment
    - Systiva seed treatment (5 g a.i./unit)
    - Quadris in-furrow (9.5 fl oz/A) on Systiva
    - Quadris in-furrow (9.5 fl oz/A) (no seed treatment)
  - Postemergence treatment (POST, 7-inch band, split-split plot)
    - No postemergence fungicide
    - Quadris (14.3 fl oz/A or 0.6 fl oz/1000 ft) at 4-leaf stage (Jun 10)
    - Quadris (14.3 fl oz/A or 0.6 fl oz/1000 ft) at 8-leaf stage (Jun 21)



# Data collection

- Stand counts for early-season disease control and effect on emergence
- Root rot ratings at harvest (1-10)
- Yield and quality
- Analyzed for main effects of:
  - Cultivar
  - At-planting treatment
  - Postemergence treatment
- All possible 2-way and 3-way interactions



# Root rot rating scale 0-10 (New, Sept 2020)



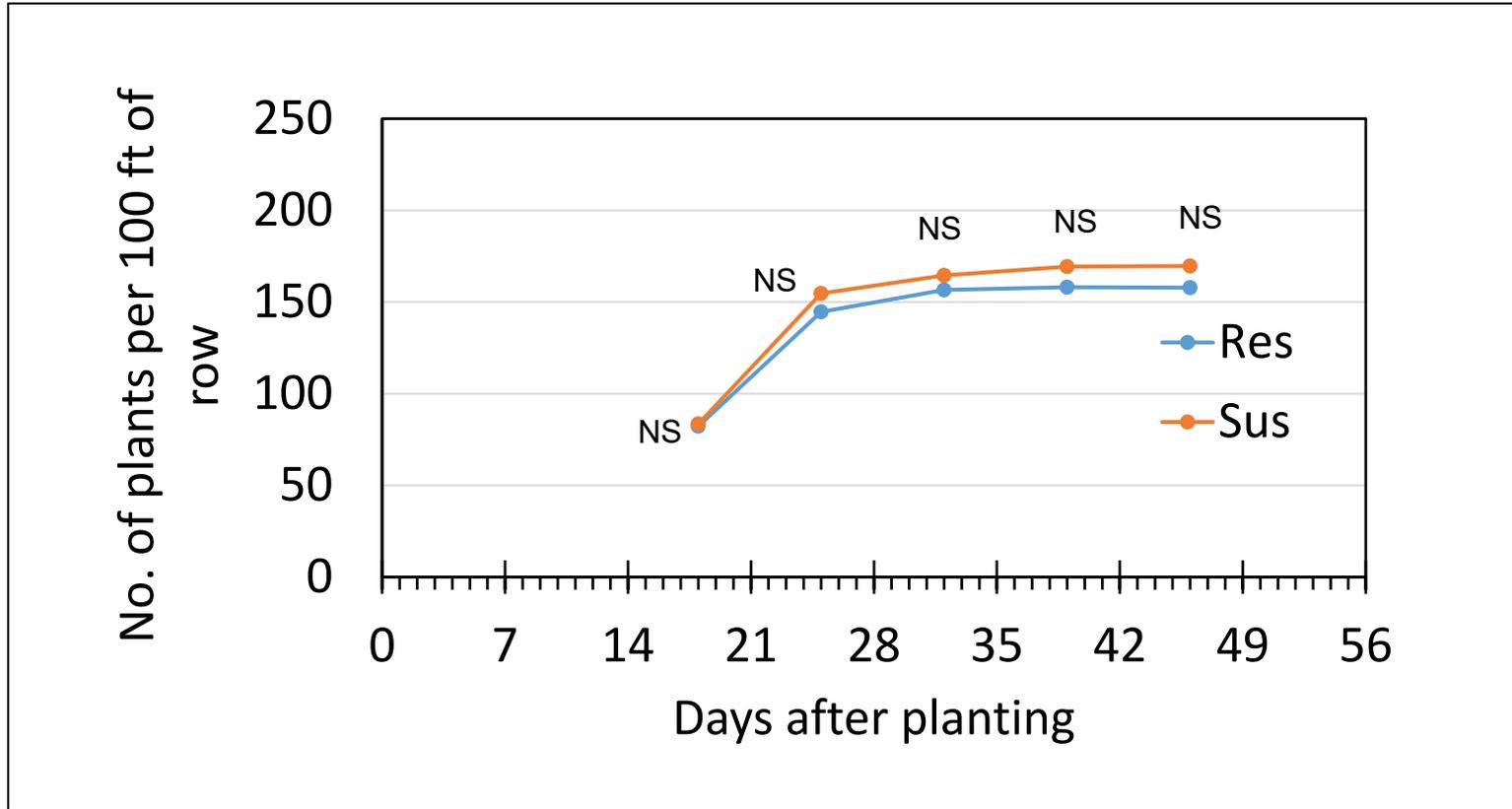
**0      1      2            3      4      5            6      7      8      9      10**

# NWROC Monthly rainfall

Month	Rainfall (inches)	% of 10 yr. mean rainfall	% of 30 yr. mean rainfall
April	0.67	56	56
May	0.95	40	34
June	1.65	44	42
July	0.32	11	10
August	2.3	105	82
September	2.41	108	106
October	4.95	245	226
<b>Total</b>	<b>13.25</b>		



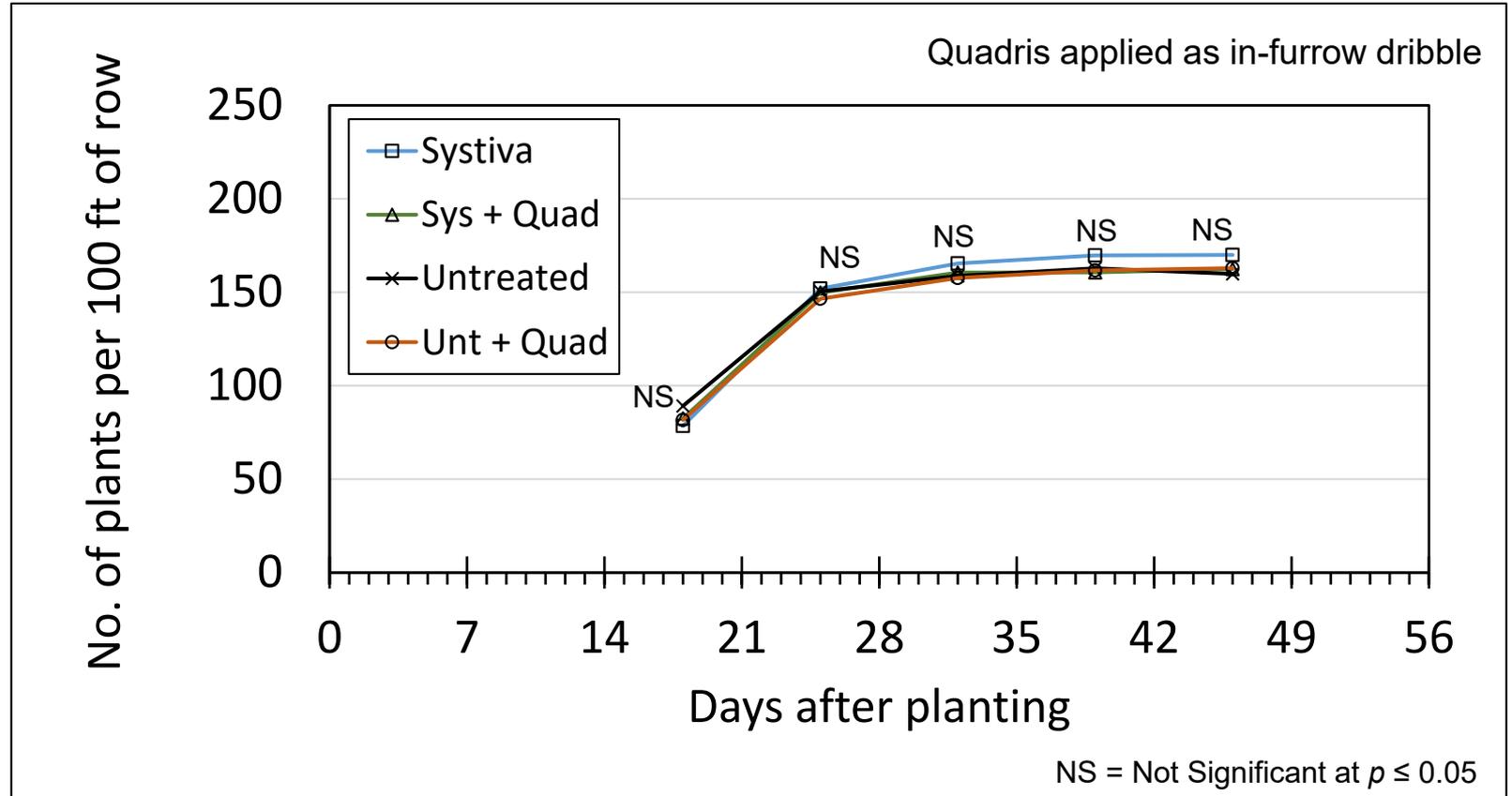
# Varieties – Stands



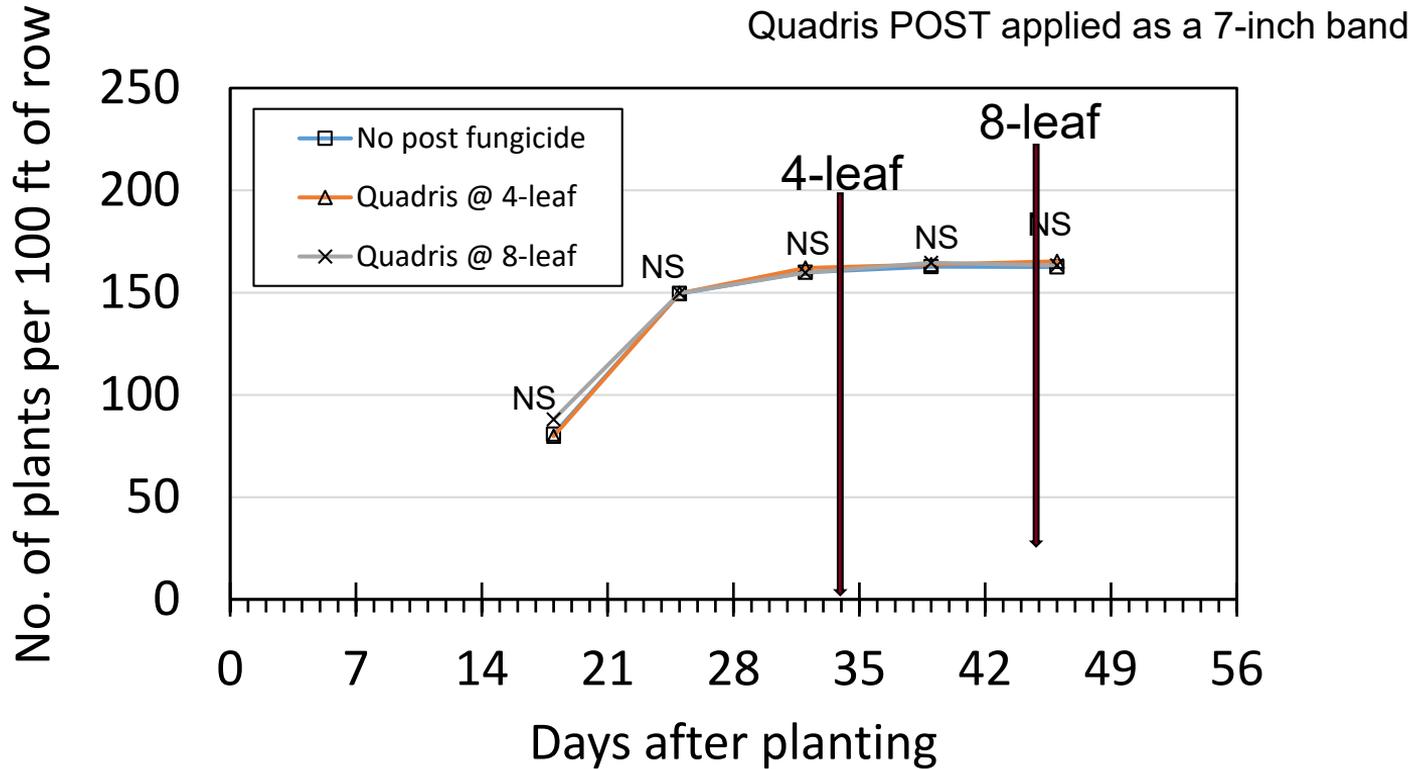
NS = Not Significant at  $p \leq 0.05$



# At-planting treatments – Stands



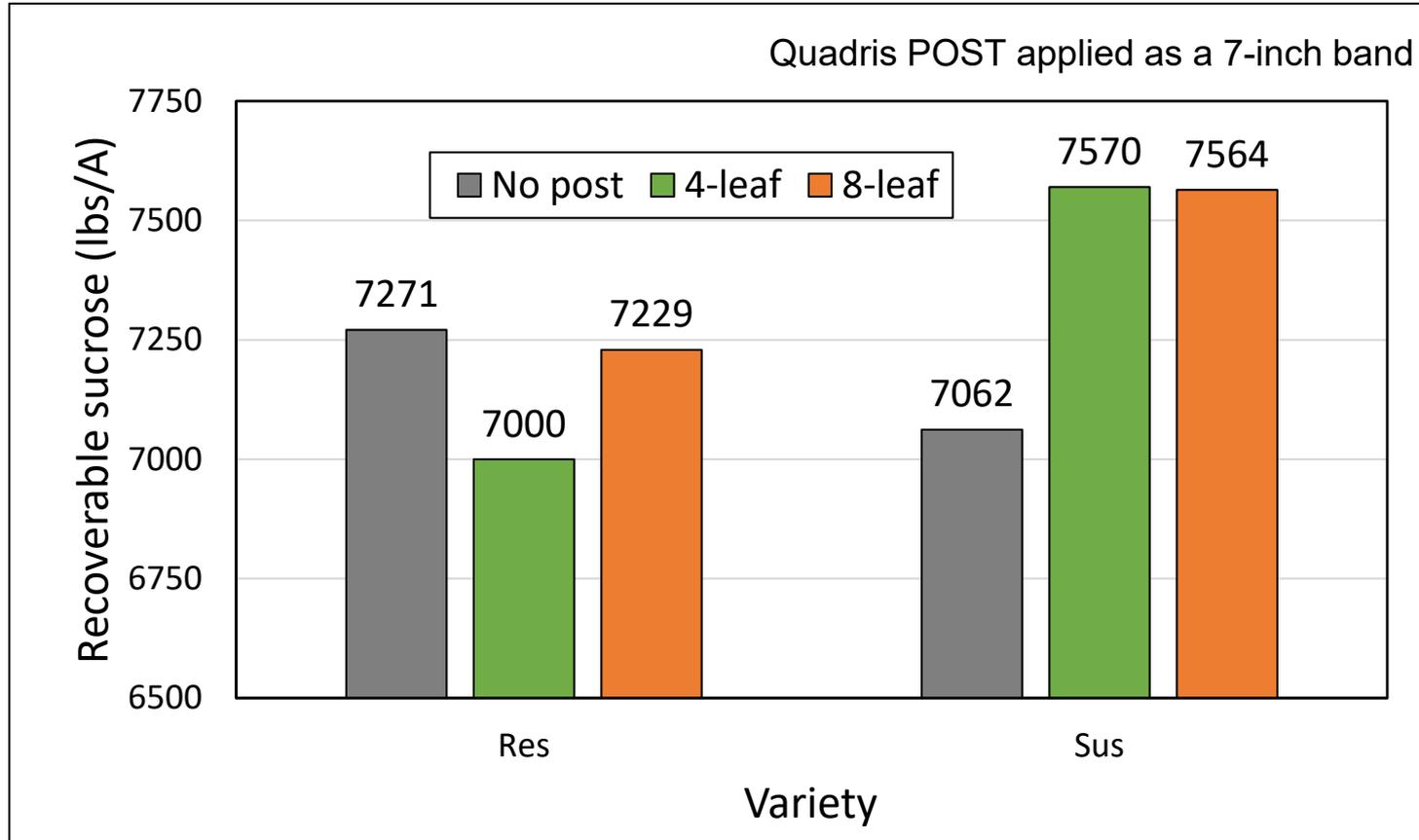
# Postemergence treatments – Stands



NS = Not Significant at  $p \leq 0.05$



# Variety x POST Interaction on RSA



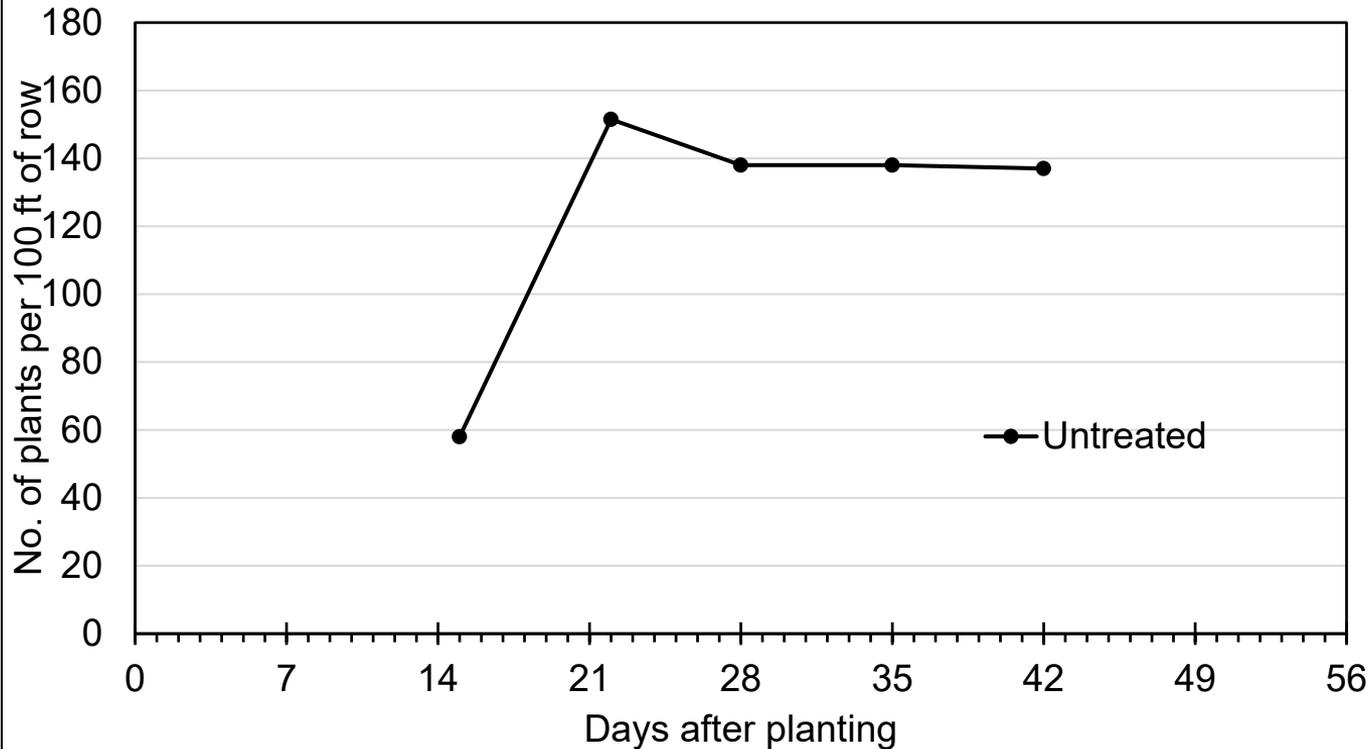
# Evaluation of At-planting treatments

- Determine the effectiveness of seed treatment, in-furrow fungicides on a susceptible cultivar (4.8 rating) for:
  - Stand establishment, yield and quality
  - Full-season control of Rhizoctonia diseases
    - NWROC, Crookston
    - May 10, Rhizoctonia inoculum broadcast prior to planting (50 kg/ha) and incorporated

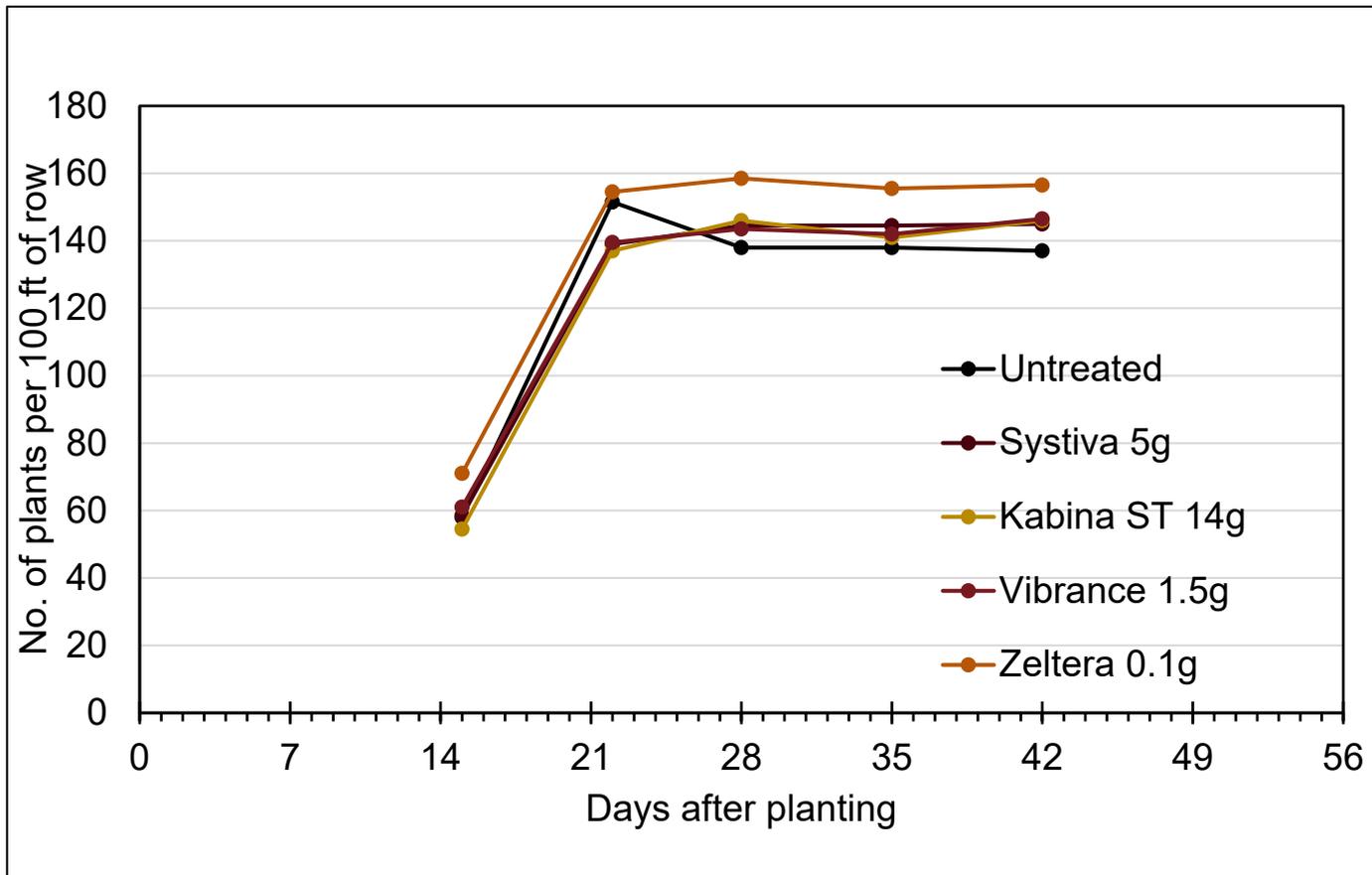


# At-planting treatments

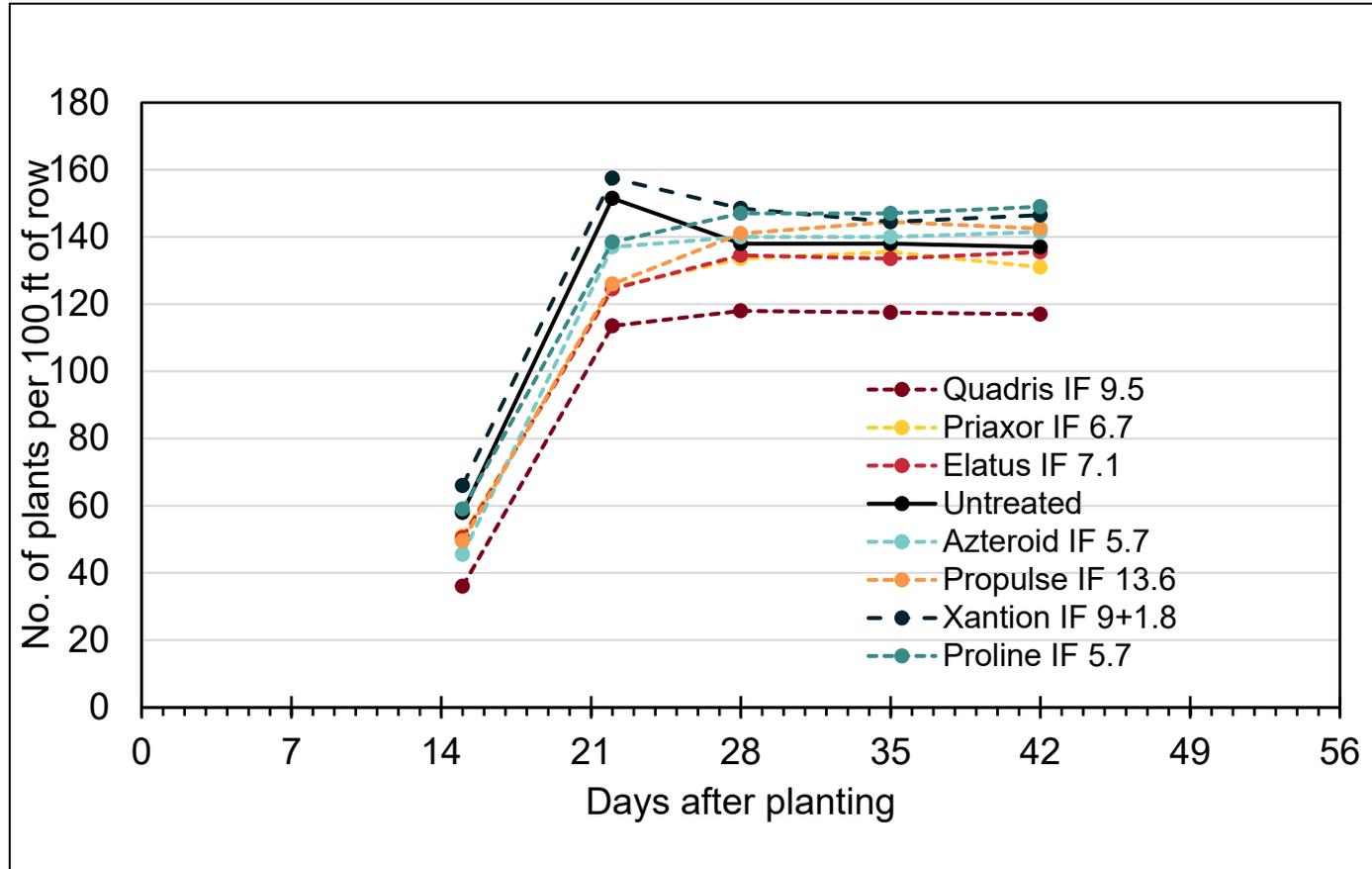
(susceptible variety 4.8)



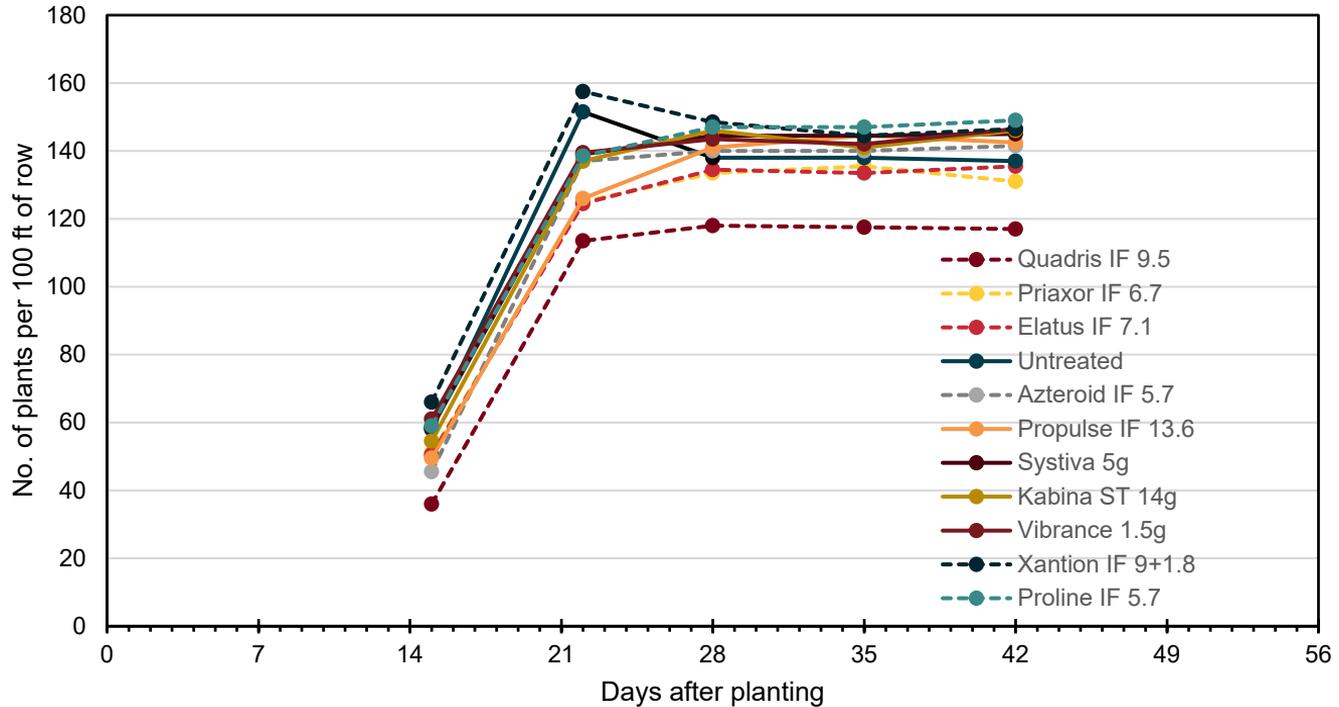
# At-planting treatments



# At-planting treatments



## 2021 At-plant treatments



# Seed treatments – stand counts

Treatment	15 DAP	22 DAP	28 DAP	35 DAP	42 DAP
Untreated control	58	152 ab	138 b	138 b	137 b
Kabina ST 14g	55	137 bc	146 ab	141 ab	146 ab
Systiva 5g	59	139 abc	145 ab	145 ab	145 ab
Vibrance 1.5g	61	140 abc	144 ab	142 ab	147 ab
Zeltera 0.1g	71	155 ab	159 a	156 a	157 a
LSD 0.05		18.8	16.7	16.8	18.0
P-value	NS	0.000846	0.00912	0.0226	0.0167

DAP = Days after planting, NS = No significant difference at  $p \leq 0.05$



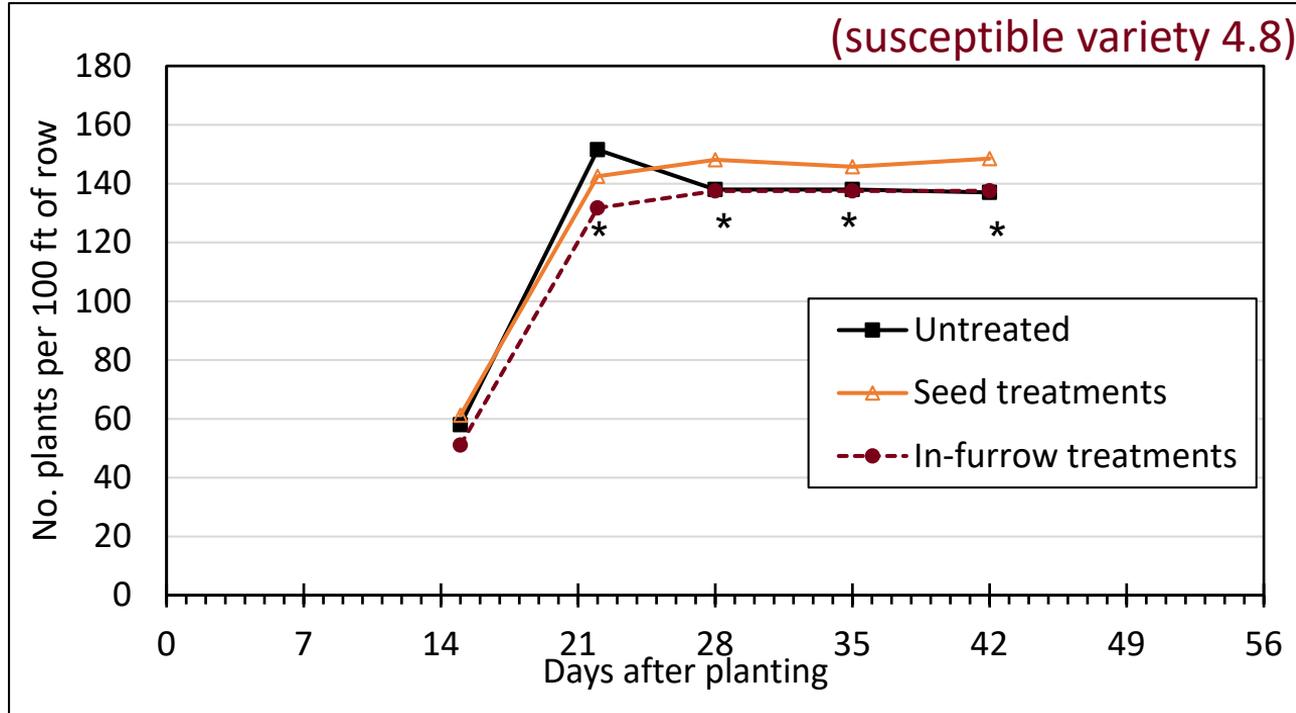
# In-furrow treatments – stand counts

Treatment	15 DAP	22 DAP	28 DAP	35 DAP	42 DAP
Untreated control	58	152 ab	138 b	138 b	137 b
Azteroid IF 5.7	46	137 bc	140 b	140 ab	142 ab
Elatus IF 7.1	51	125 cd	135 bc	134 bc	136 b
Priaxor IF 6.7	51	125 cd	134 bc	136 b	131 bc
Proline IF 5.7	59	139 bc	147 ab	147 ab	149 ab
Propulse IF 13.6	50	126 cd	141 b	145 ab	143 ab
Quadris IF 9.5	36	114 d	118 c	118 c	117 c
Xanthion IF 9+1.8	66	158 a	149 ab	145 ab	147 ab
LSD 0.05		18.8	16.7	16.8	18.0
P-value	NS	0.000846	0.00912	0.0226	0.0167

DAP = Days after planting,  
 NS = No significant difference at  $p \leq 0.05$



# At-planting treatments



Seed treatments vs In-Furrow contrast \*  $p \leq 0.05$



# At-planting treatments

Description	# Harvested roots	Root Rot Rating (1-10)	Root Rot Incidence (%)	Yield (t/A)	% Sugar	% SLM	RST (t/A)	RSA (lbs/A)
Untreated	114	0.71	15	23.3	17.5	1.20	327	7602
Seed treatments	131	0.24	10	25.0	<b>17.2</b>	1.24	<b>320</b>	8026
In-furrow treatments	126	0.32	9	24.1	<b>17.6</b>	1.21	<b>329</b>	7915
Seed vs in-furrow contrast (P-value)	NS	NS	NS	NS	<b>0.007</b>	NS	<b>0.0004</b>	NS



# Evaluation of Postemergence treatments

- Determine the effectiveness of postemergence fungicides on a susceptible cultivar (4.8 rating) for:
  - Mid to late season control of *Rhizoctonia* root rot
    - May 10, NWROC, Crookston
    - Jun 23, inoculation over the top
    - Jun 24, Fungicide treatments as a 7-inch band



# Postemergence treatments

(susceptible variety 4.8)

Treatment and rate/A	Active Ingredient (FRAC Group)	Plant Loss (%)	Root Rot Rating (1-10)	Root Rot Incidence (%)	Sugar (%)	Yield (T/A)	RST (lbs/T)	RSA (lbs/A)
Excalia SC 0.64 fl oz/A	Inpyrfluxam (7)	13.3 d	0.18 d	12.5 d	17.7	29.5 a	330	9732 a
Quadris SC 14.5 fl oz/A Broadcast	Azoxystrobin (11)	18.1 cd	0.50 bcd	12.5 d	17.5	29.3 a	324	9499 a
Topguard EQ 7 fl oz/A	Flutriafol (3) + Azoxystrobin (11)	13.4 d	1.17 bcd	18.8 cd	17.1	29.4 a	319	9365 a
Quadris SC 10 fl oz/A	Azoxystrobin (11)	19.3 cd	0.71 bcd	17.5 cd	17.6	28.2 a	329	9309 a
AZteroid FC <sup>3,3</sup> 9.2 fl oz/A	Azoxystrobin (11)	20.8 cd	0.57 bcd	10.0 d	17.9	27.0 a	335	9052 a
Quadris SC 14.5 fl oz/A	Azoxystrobin (11)	14.5 d	0.37 cd	7.5 d	17.4	27.9 a	321	8947 a
Elatus WG 7.1 oz/A	Azoxystrobin (11) + Benzovindiflupyr (7)	14.0 d	0.53 bcd	13.8 cd	17.0	27.5 a	314	8618 a
Priaxor SC 6.7 fl oz/A	Fluxapyroxad (7) + Pyraclostrobin (11)	17.8 cd	1.60 b	27.5 c	17.3	26.5 a	322	8542 a
Proline 480 SC 5.7 fl oz/A	Prothioconazole (3)	27.0 bc	1.53 bc	27.5 c	17.3	26.6 a	321	8528 a
Propulse SC 13.6 fl oz/A	Fluopyram (7) + Prothioconazole (3)	33.0 b	3.26 a	48.8 b	17.1	21.5 b	315	6794 b
Nontreated control	-	<b>52.8 a</b>	<b>4.36 a</b>	<b>72.5 a</b>	<b>16.4</b>	<b>14.6 c</b>	<b>300</b>	<b>4434 c</b>
LSD 0.05		11.5	1.22	14.75	-	3.74	-	1431
P- value		<b>&lt;0.0001</b>	<b>&lt;0.0001</b>	<b>&lt;0.0001</b>	NS	<0.0001	NS	<b>&lt;0.0001</b>



# Strategies for full-season Rhizoctonia management

- Varietal Selection
  - Can make a difference under moderate to high disease pressure
- Seed treatment
  - Provide excellent early-season protection (Kabina, Systiva, Vibrance, Zeltera, Metlock suite + Kabina, or combinations etc.)
- In-furrow fungicide application
  - Early to mid-season protection
  - Some stand loss under dry and/or cool conditions (2021 conditions), additional injury with starter fertilizers
- Postemergence fungicide application
  - 4- to 8-leaf stage window for application
  - July weather and disease history
  - Resistant variety can respond under severe disease pressure
- For susceptible varieties
  - Seed treatment + POST – best practice
  - Seed treatment + in-furrow + POST – may be needed for fields with severe history



# Acknowledgements

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- American Crystal Sugar Company quality labs – East Grand Forks and Moorhead
- U of M, NWROC facilities





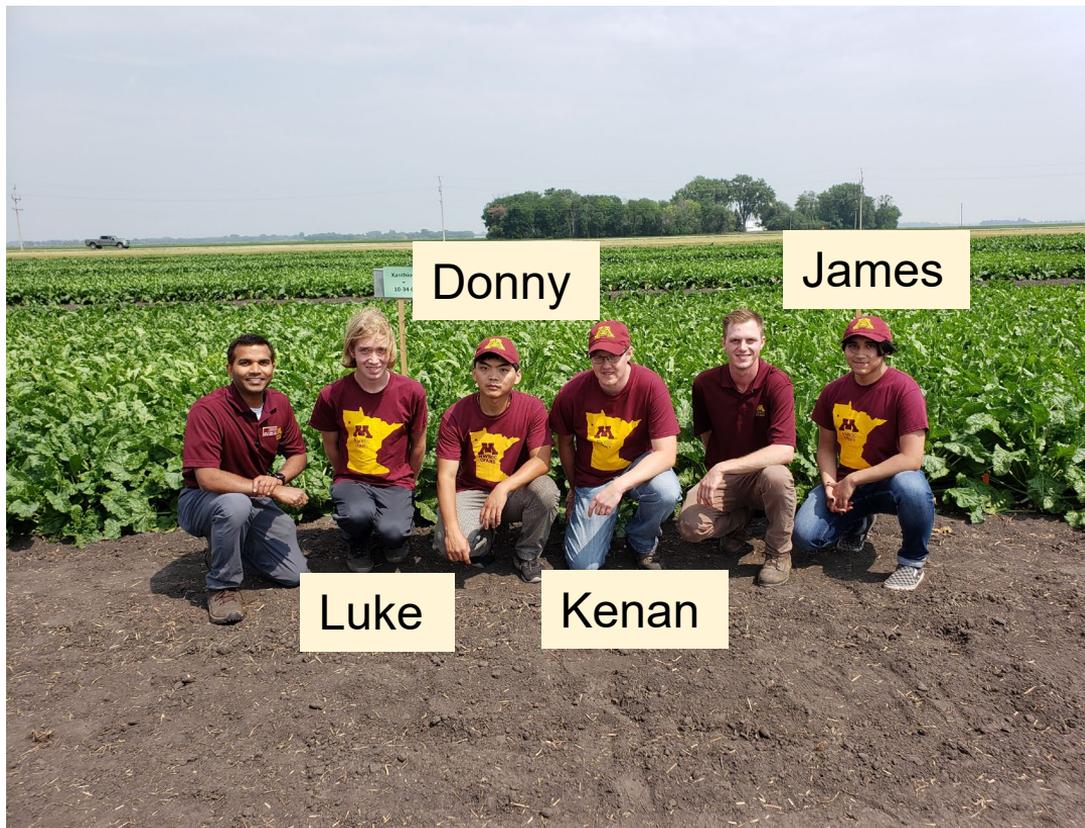
Austin



Jeff

Thank You!

Questions?



Donny

James

Luke

Kenan

