

Utilizing Host Resistance for Reniform Nematode Management

**Louisiana Agricultural Technology
& Management Conference**
(February 8, 2024)

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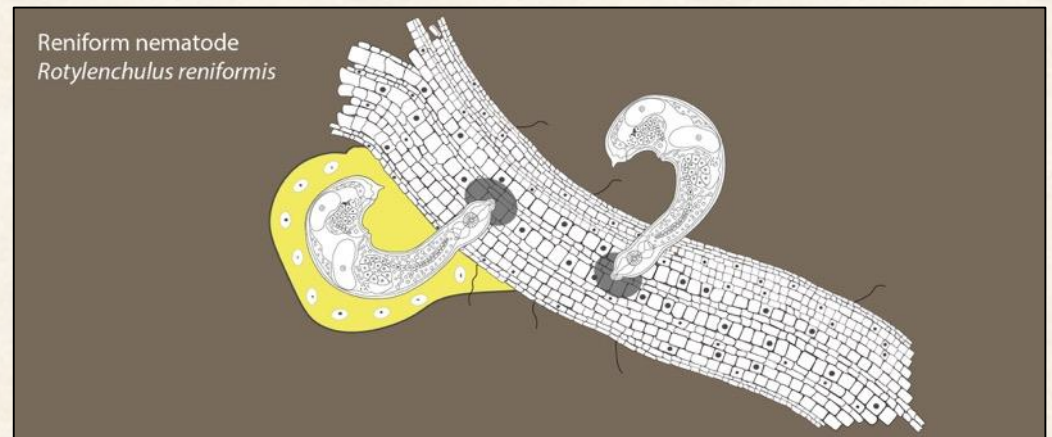
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Outline

1. Reniform Nematode



2. Corn and Grain Sorghum Rotations



3. Cotton Resistance

4. Soybean Resistance

5. Sweetpotato Resistance



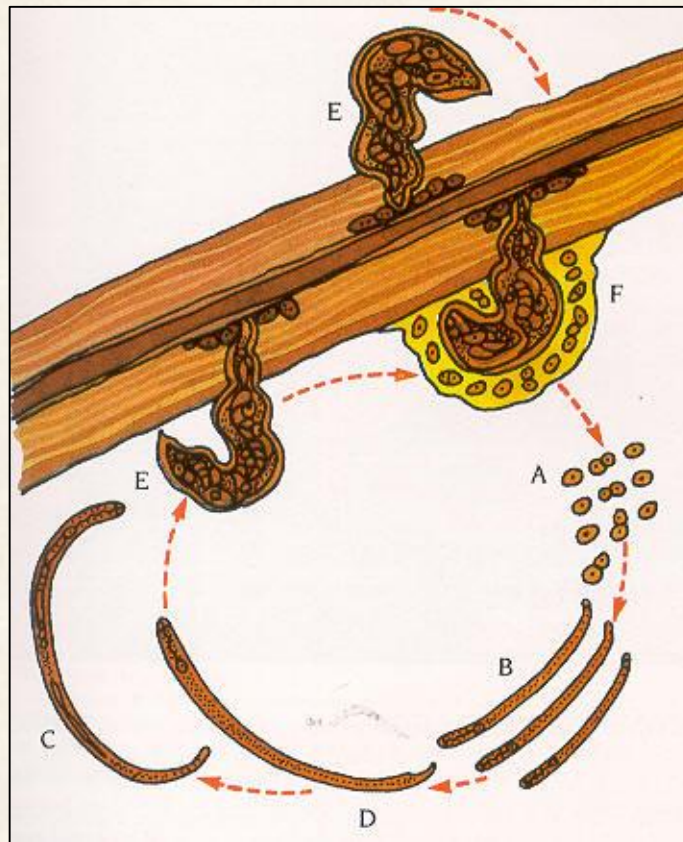
Reniform Nematode

Biology

- *Rotylenchulus reniformis*
- Found in any soil type suitable for growing cotton
- Reported in every southern state producing cotton
- Responsible for loss of ~200,000 bales annually
- Also parasitizes soybean and sweetpotato



Reniform nematode



Mature Reniform Female



Mature Reniform Female with Egg Mass

Reniform Nematode

Crop Damage



low REN

High REN

Reniform Nematode

Crop Damage - Cotton

Cotton in Louisiana:

2.36% yield loss

9,401 bales lost

\$4,129,991 loss in LA



Reniform Nematode

Crop Damage - Soybean

Soybean in Louisiana:

1.89% yield loss

1,229,869 bushels lost

\$16,726,222 loss in LA



(Often goes unnoticed)

Reniform Nematode

Crop Damage - Sweetpotato

Sweetpotato in Louisiana:

? % yield loss

? bushels lost

? \$ loss in LA



Reniform Nematode

Diagnosis

- Soil sampling and nematode diagnostic laboratory



General Nematode Management



Clean Plant Material



Cover Crops



Crop Rotation



Host Resistance

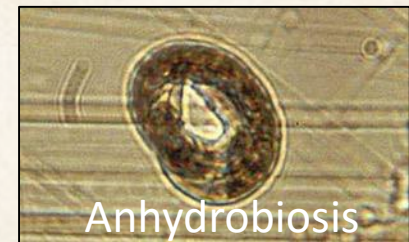


Nematicides

Crop Rotations

Corn and Grain Sorghum

- Non-host crops for reniform nematode
- Used as a rotation to reduce population development
- Temporary suppression of reniform nematode
- Populations will rise once a host crop is planted
 - Cotton
 - Soybean
 - Sweetpotato



Cotton Host Resistance



- Many years of research dedicated to finding cotton host resistance to **Reniform** and **Root-Knot Nematode**

- 2021 release of stacked resistance to **Reniform** and **Root-Knot Nematode**:
 - Deltapine 2141NR
 - Phytogen PHY 332 W3FE
 - Phytogen PHY 411 W3FE
 - Phytogen PHY 443 W3FE

- Relatively new and needs evaluation



Cotton Host Resistance Trials



Objective

- Evaluate the utility of cotton host resistance for management of reniform nematode

Field Locations:

St. Joseph, Louisiana
Winnsboro, Louisiana

Parameters Measured:

- Nematode population development
- Seed cotton yield

2022 Cultivars:

- Deltapine 1646 (Susceptible)
- Deltapine 2141NR (Resistant)
- PhytoGen PHY 332 (Resistant)
- PhytoGen PHY 411 (Resistant)
- PhytoGen PHY 443 (Resistant)

2023 Cultivars:

- Deltapine 1646 (Susceptible)
- Deltapine 2141NR (Resistant)
- PhytoGen PHY 340 (Susceptible)
- PhytoGen PHY 332 (Resistant)
- PhytoGen PHY 411 (Resistant)
- PhytoGen PHY 443 (Resistant)



Cotton Host Resistance Trials

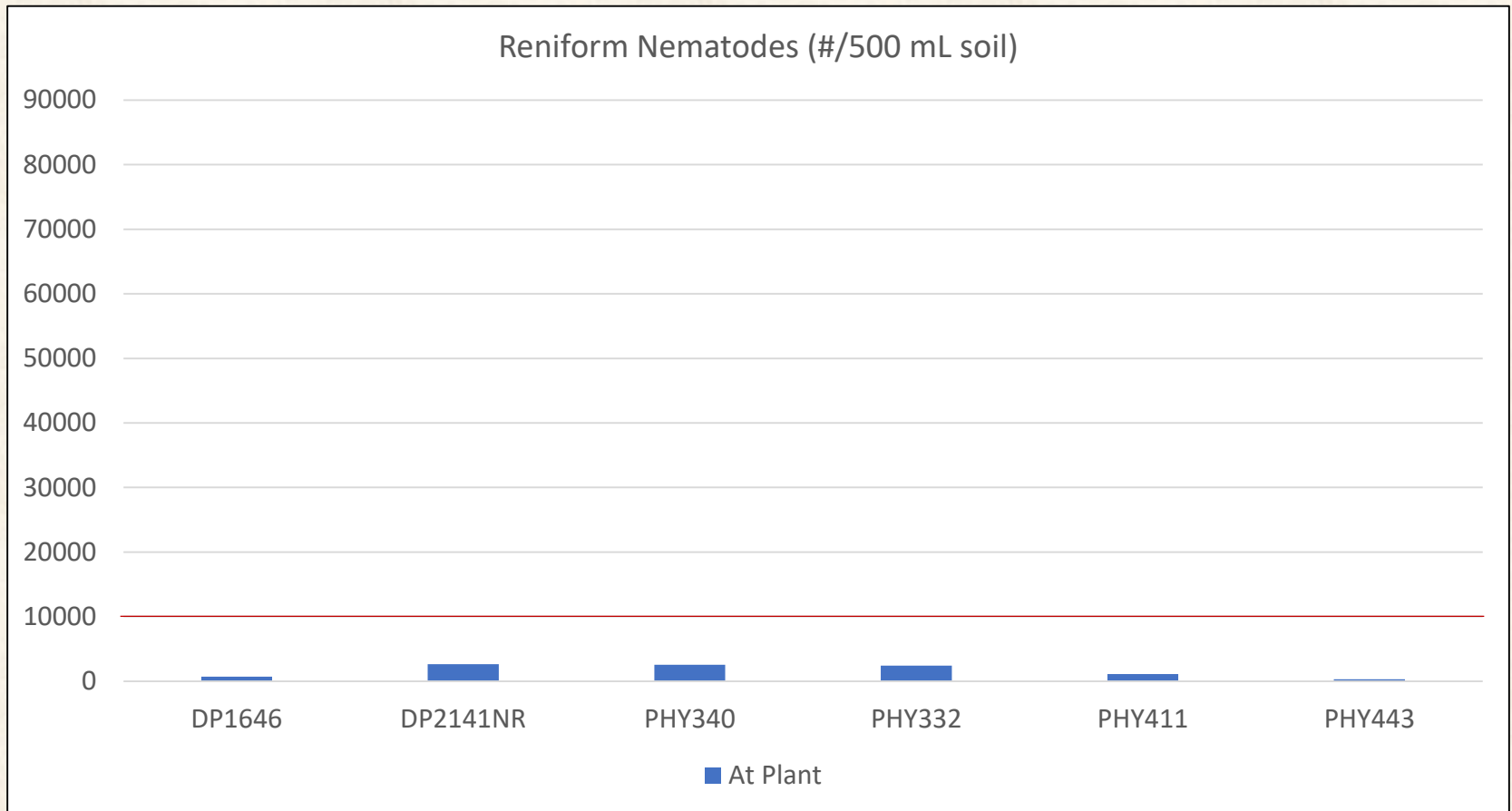


Cotton Host Resistance Trials



Cotton Host Resistance Trials

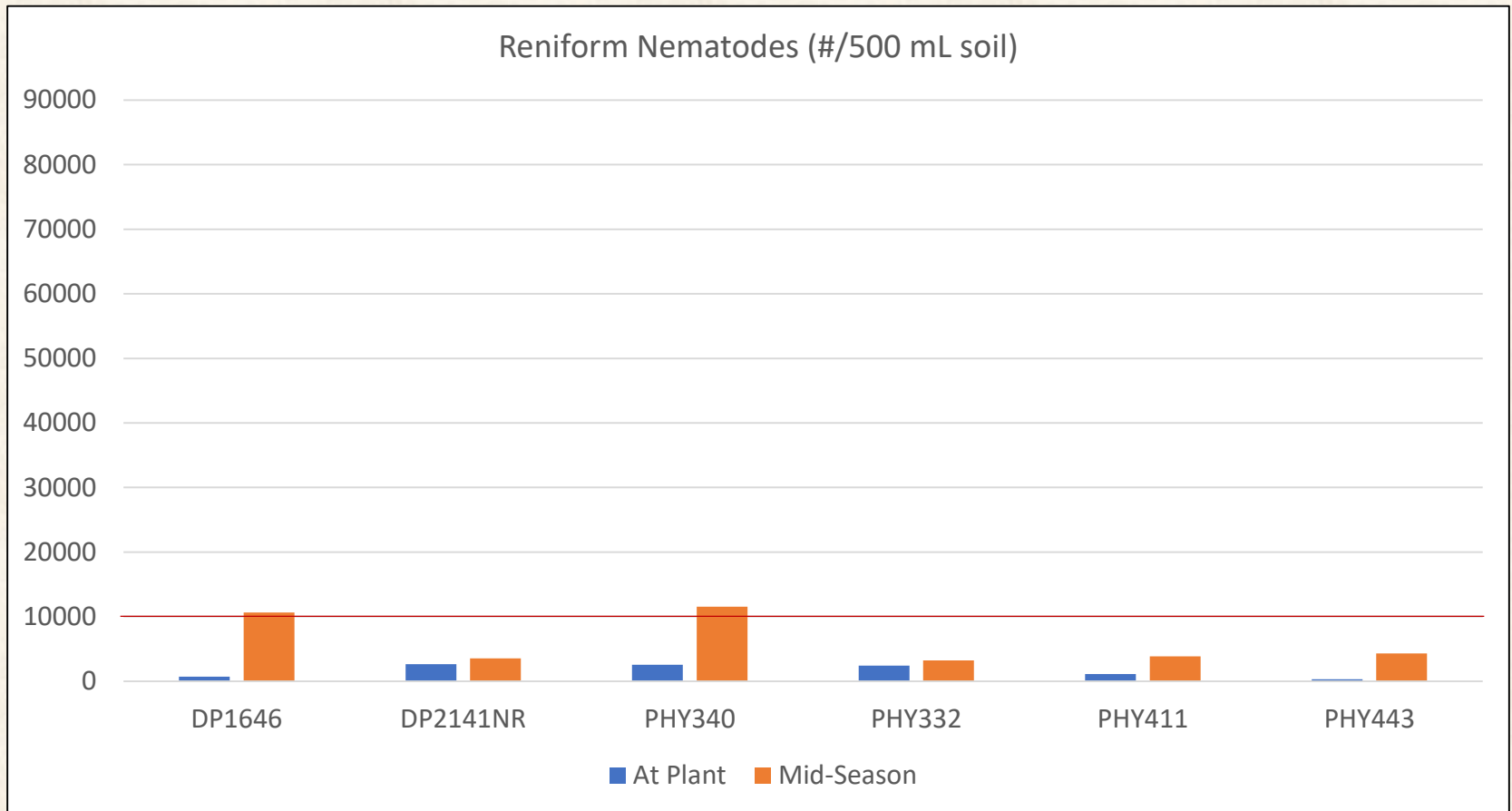
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At plant reniform nematode population densities were low in 2023.

Cotton Host Resistance Trials

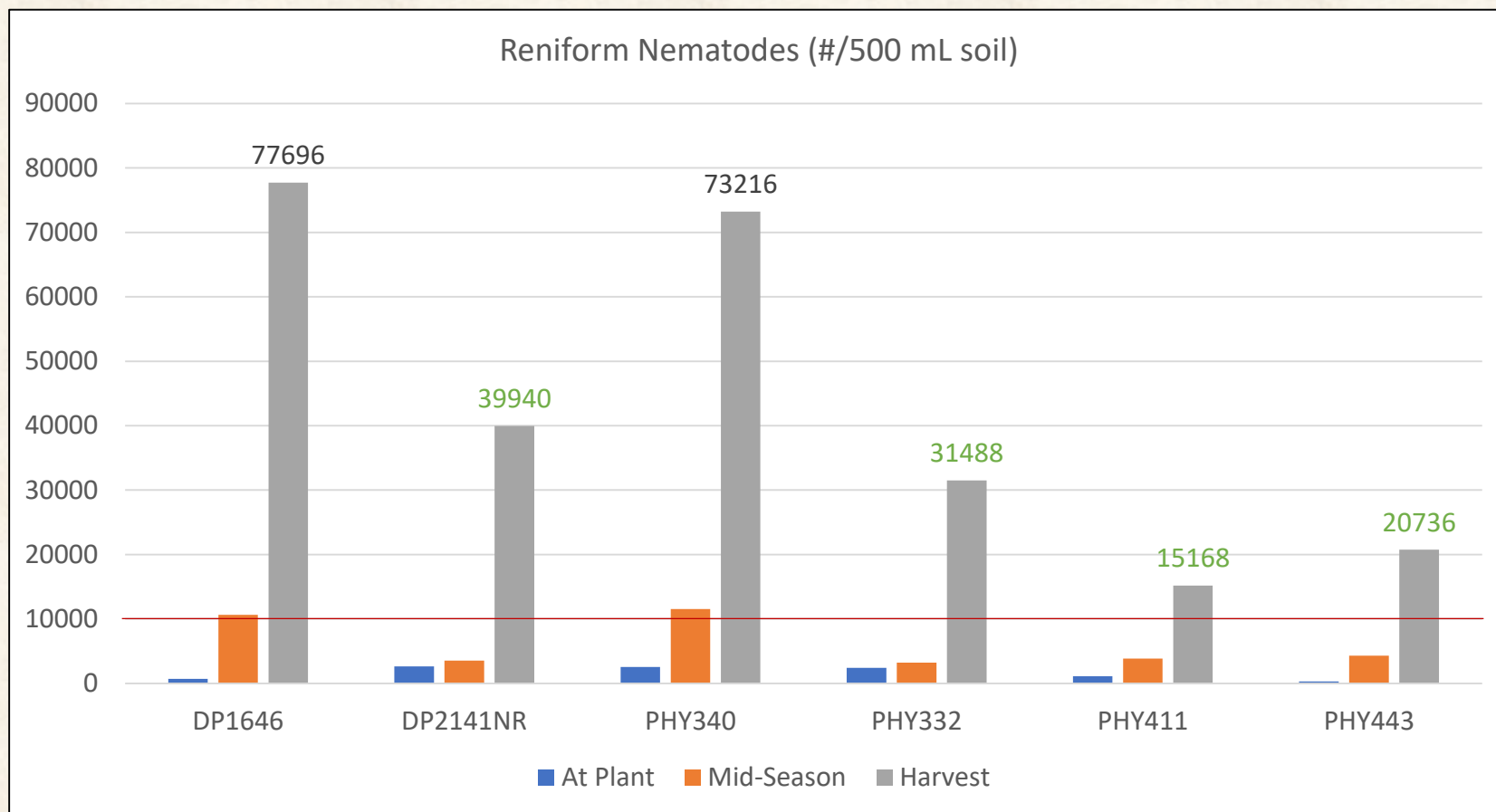
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Susceptible cultivars surpass damage threshold by mid-season.

Cotton Host Resistance Trials

Northeast Research Station, 2023



Lower reniform nematode densities with resistance cultivars.

Cotton Host Resistance Trials

Final Reniform Nematode Soil Population Density (#/500 mL soil)

Cultivar	St. Joseph 2022	St. Joseph 2023	Winnsboro 2022	Winnsboro 2023
Deltapine 1646	15,744	77,696	47,616	95,740
Deltapine 2141NR	11,128	39,940	27,776	66,896
Phytogen PHY340	-	73,216	-	87,984
Phytogen PHY332	9,088	31,488	22,016	38,724
Phytogen PHY411	6,688	15,168	14,144	45,696
Phytogen PHY443	7,104	20,736	26,304	68,752

Resistant cultivars had fewer reniform nematodes

Phytogen PHY411 provided the most consistent nematode suppression

Reniform nematode populations still increased during the growing season

Cotton Host Resistance

Seed Cotton Yield (kg/ha)

Cultivar	St. Joseph 2022	St. Joseph 2023	Winnsboro 2022	Winnsboro 2023
Deltapine 1646	3,192	2,743	1,551	3,879
Deltapine 2141NR	2,899	2,484	1,469	3,982
Phytogen PHY340	-	2,360	-	3,646
Phytogen PHY332	2,979	4,265	1,534	3,578
Phytogen PHY411	3,168	3,625	1,528	3,938
Phytogen PHY443	3,256	2,743	1,578	3,537

Yield benefit of host resistance was inconsistent

Cotton Host Resistance

Summary

- Reniform nematode resistant cotton cultivars suppress nematode population development
- Nematode numbers still increase during the growing season on resistant cultivars
 - Need additional management tactics (i.e., nematicides, crop rotation, etc.)
- No consistent yield benefit of resistant cotton cultivar over DP1646



Soybean Host Resistance



Overview

- Soybean varieties with reniform nematode '*resistance*' exist
 - LSU AgCenter varieties recommendations were outdated (2010) and from Arkansas populations

- Need to identify resistance to Louisiana populations of reniform nematode in locally grown soybean varieties

- 2021 screening of 21 top-selling commercial soybean varieties showed no reniform resistance.

- University of Missouri had developed lines with reported reniform nematode resistance when screened in a greenhouse setting



Soybean Host Resistance Trial

Objective

- Evaluate the utility of soybean host resistance for management of reniform nematode

Field Locations:

St. Joseph, Louisiana
 Winnsboro, Louisiana

Parameters Measured:

- Nematode population development
- Yield

2022 Varieties

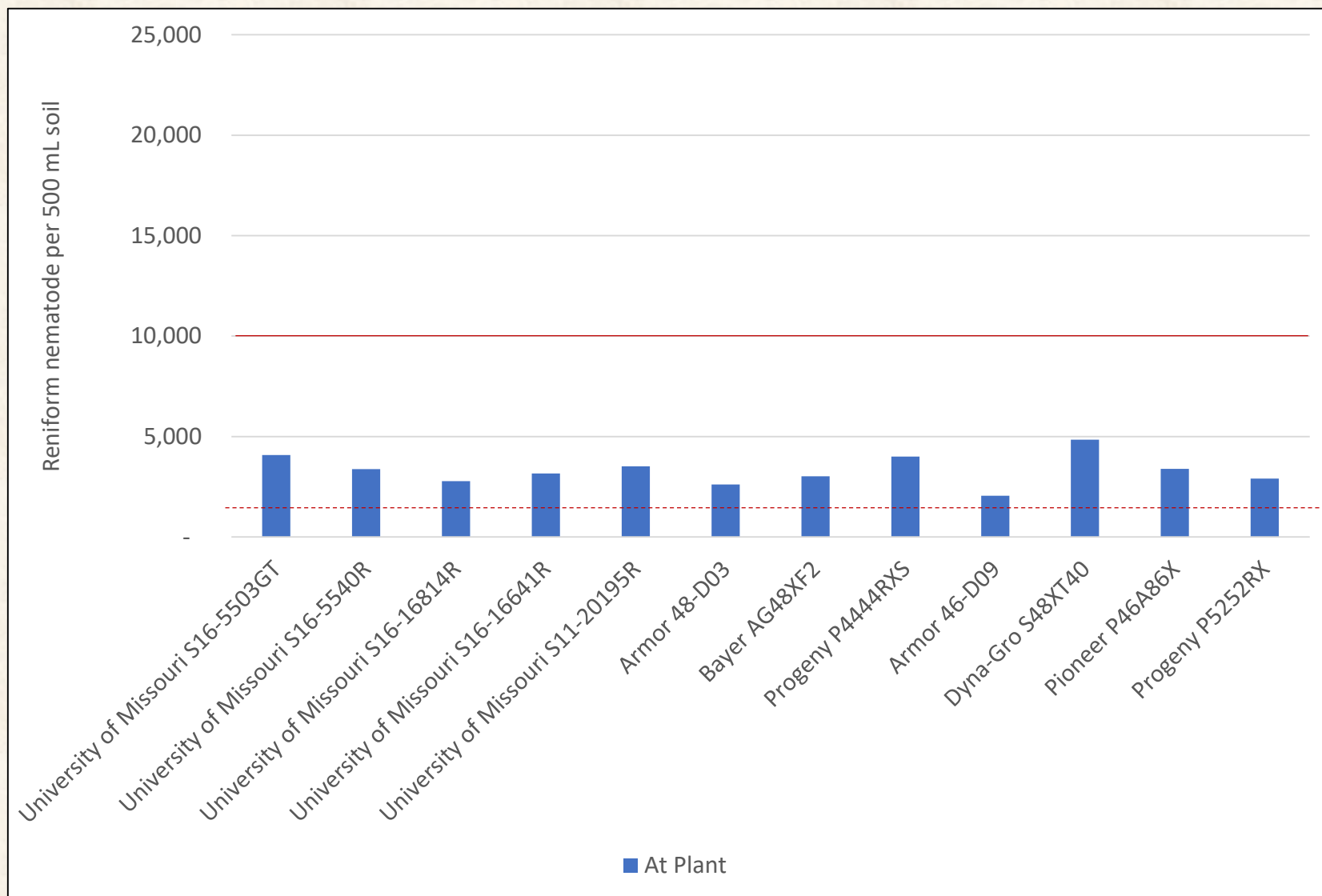
Variety	Reniform Resistant
University of Missouri S16-5503GT	Y
University of Missouri S16-5540R	Y
University of Missouri S16-16814R	Y
University of Missouri S16-16641R	Y
University of Missouri S11-20195R	Y
Armor 48-D03	N
Bayer AG48XF2	N
Progeny P4444RXS	N
Armor 46-D09	N
Dyna-Gro S48XT40	N
Pioneer P46A86X	N
Progeny P5252RX	N

2023 Varieties

Variety	Reniform Resistant
University of Missouri S16-5503GT	Y
University of Missouri S16-5540R	Y
University of Missouri S16-16814R	Y
University of Missouri S16-16641R	Y
Armor 48-D03	N
Bayer AG48XF2	N
LS5009XS	N
Bayer AG48X9	N
P54A54X	N
GT-4677XS	N

Soybean Host Resistance Trial

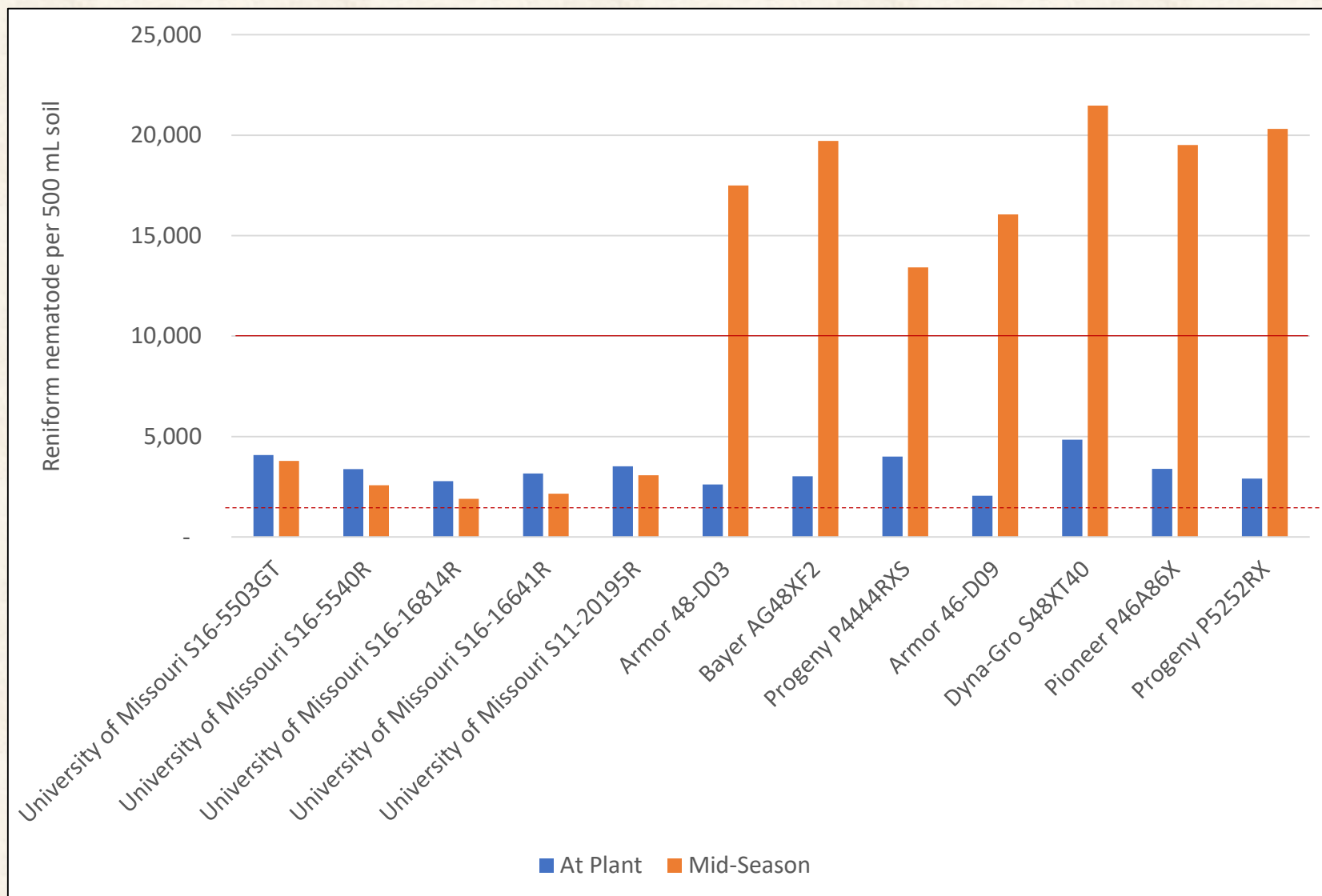
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Moderate reniform nematode pressure at plant.

Soybean Host Resistance Trial

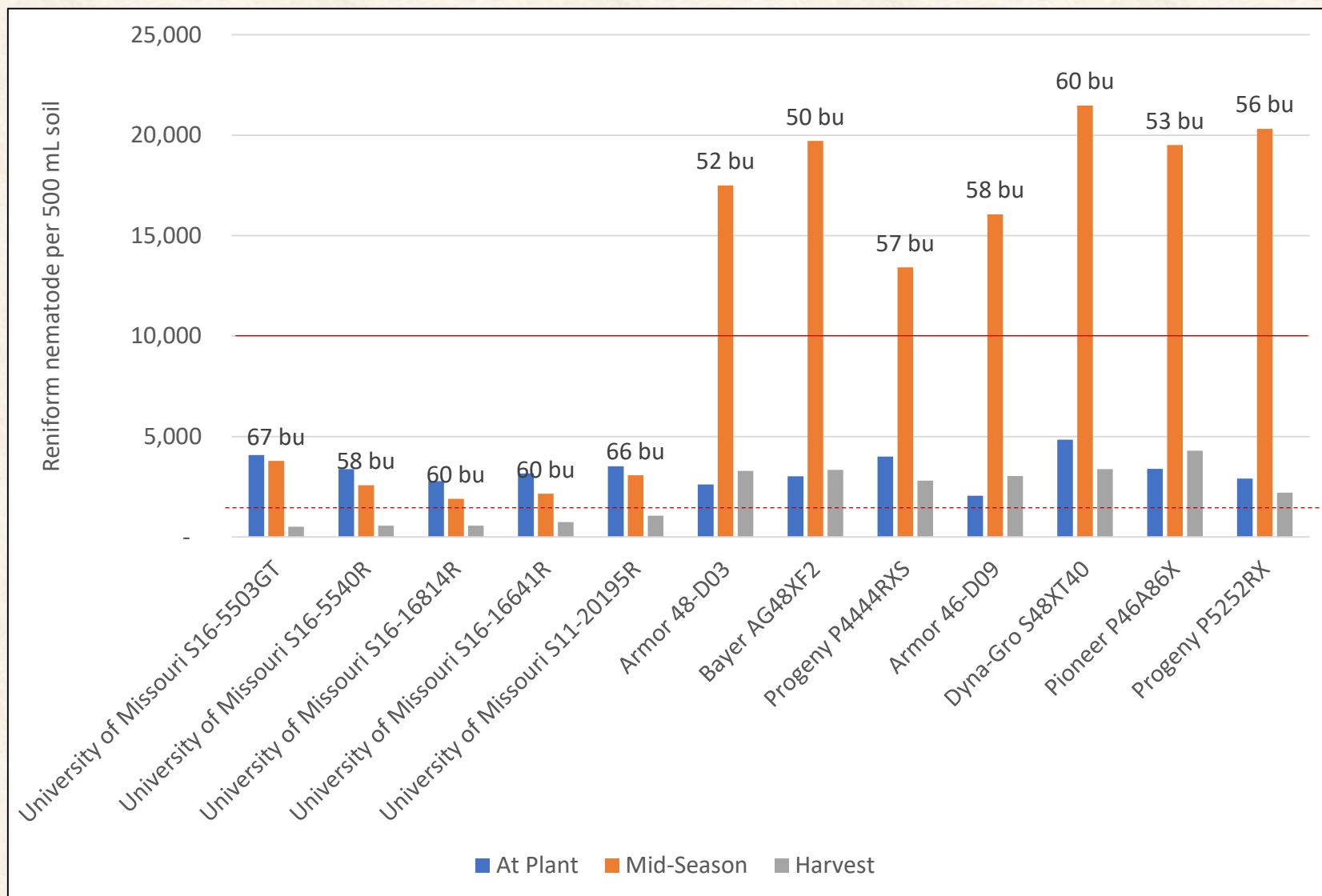
Northeast Research Station, 2022



Reniform populations increase rapidly in susceptible soybean varieties.

Soybean Host Resistance Trial

Northeast Research Station, 2022



Higher yield with resistant soybean varieties.

Soybean Host Resistance Trial

Final Reniform Nematode Soil Population Density (#/500 mL soil)

Variety	St. Joseph 2022	St. Joseph 2023	Winnsboro 2022	Winnsboro 2023
U of Misso S16-5503GT	3,792	4,736	11,240	8,960
U of Misso S16-5540R	2,576	5,952	9,544	8,064
U of Misso S16-16814R	1,904	2,752	8,648	9,584
U of Misso S16-16641R	2,160	3,456	9,136	7,684
Armor 48-D03	17,498	16,640	18,352	22,528
Bayer AG48XF2	19,712	28,160	14,920	23,680

Host resistance consistently reduced reniform nematode densities.

Soybean Resistance

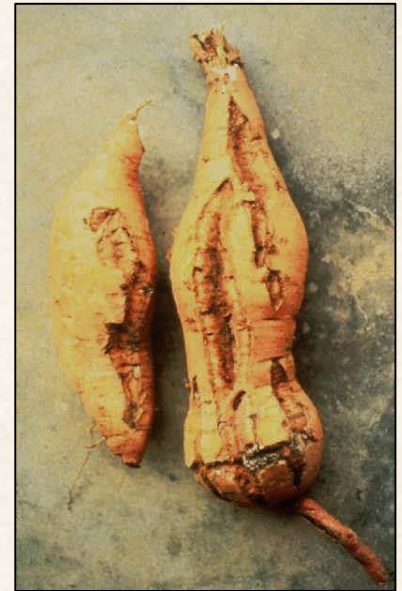
Summary

- Currently grown commercial soybean varieties show no resistance to reniform nematode
- University of Missouri lines with resistance consistently reduced reniform nematode population development
- Need to commercialize these host resistance traits



Sweetpotato Resistance

- No commercial varieties with reniform nematode resistance
- Management relies on **nematicides** and **crop rotation**
- Reports of USDA sweetpotato lines with resistance (2023)
- Will start screening LSU AgCenter sweetpotato lines for host resistance (2024)



Summary

- **Corn** and **grain sorghum** rotations can reduce reniform nematode pressure.
- **Cotton** host resistance can reduce reniform nematode pressure, but additional management tactics may be needed.
- **Soybean** host resistance is a promising tool for reniform nematode management but still needs to be commercialized.
- **Sweetpotato** host resistance to reniform nematode may exist and will be explored in the future.

Acknowledgements

Watson Lab Team:

Dr. Josie Rezende (Research Associate)

David Galo (PhD candidate)

Lucy Kiarie (PhD student)

Iris Aguilar (MS student)

International Interns

Northeast Research Station:

Dennis Burns (Resident Coordinator)

Farm Crew

Macon Ridge Research Station:

Dr. Trey Price (Resident Coordinator)

Myra Purvis (Research Associate)

Farm Crew



Funded By:



Questions?

