

Nematode Management in Soybean

**Louisiana Agricultural Technology
& Management Conference**
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Outline

1. Nematode Pests of Soybean



2. Nematode Management



3. Host Resistance Trials

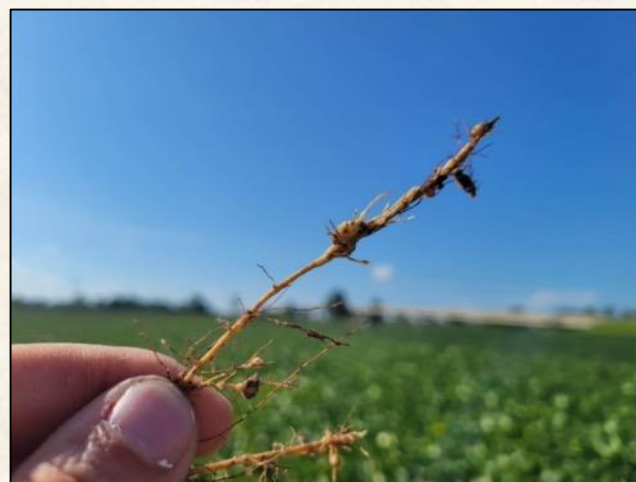
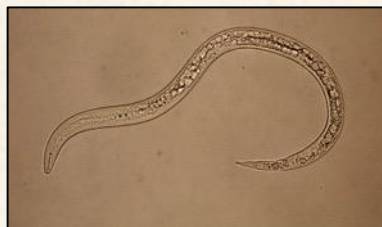


4. Nematicide Trials

Nematode Pests of Soybean

Southern Root-Knot Nematode

- *Meloidogyne incognita*
- Wide host range
- Forms galls on roots
- Aboveground:
 - Yellowing
 - Stunted growth
- Reduces yield
- 'Hot spots' in a field

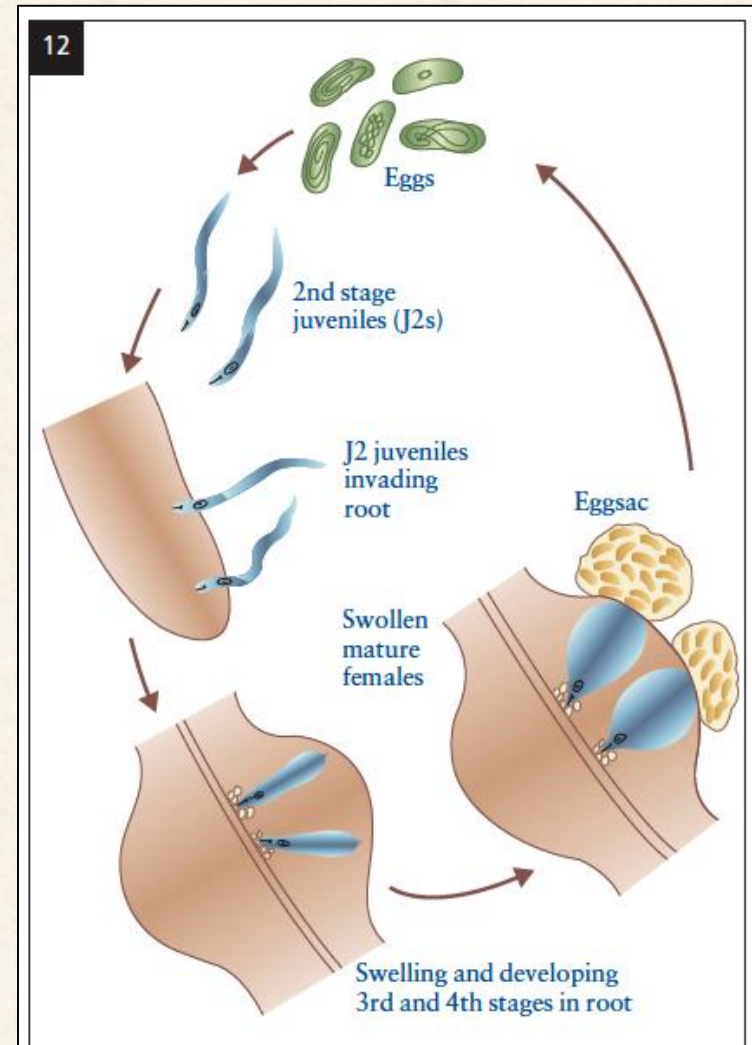


Nematode Pests of Soybean

Southern Root-Knot Nematode

Life Cycle

- J2-stage nematode emerges from egg
- J2 seeks out and penetrates root tip
- J2 establishes feeding site (giant cell)
- Nematode ingests cytoplasmic contents
- J2 increases in size and molts
 - J3-stage, J4-stage, Adult
- Eggs are deposited in egg mass on roots



12 Life cycle of the sedentary endoparasite
Meloidogyne spp.

Nematode Pests of Soybean

Southern Root-Knot Nematode

Root-Knot in Louisiana:

2.23% yield loss

1,451,116 bushels lost

\$19,735,172 loss in LA



Nematode Pests of Soybean

Southern Root-Knot Nematode

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Nematode Pests of Soybean

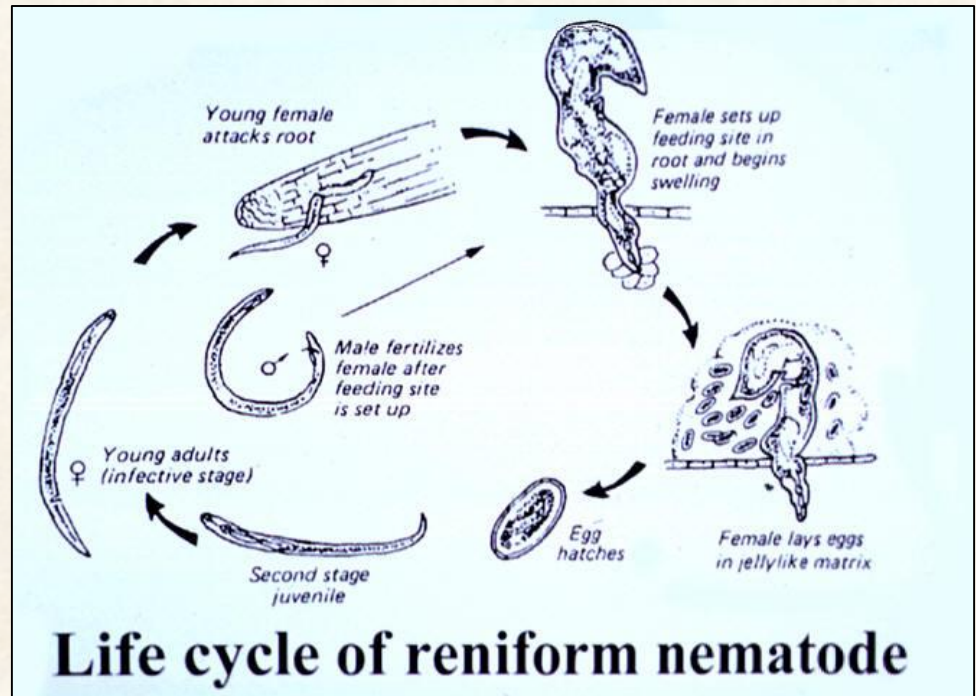
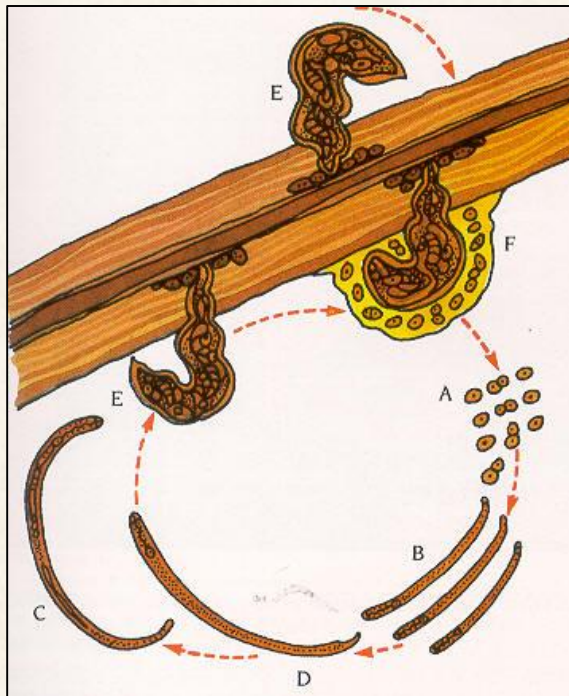
Reniform Nematode

- *Rotylenchulus reniformis*
- Moderate host range
 - Corn and Grain Sorghum = non-host
- No obvious root symptoms
- Reduces yield
- Infested fields occasionally show no obvious signs of damage.



Nematode Pests of Soybean

Reniform Nematode



Nematode Pests of Soybean

Reniform Nematode

Reniform in Louisiana:

1.89% yield loss

1,229,869 bushels lost

\$16,726,222 loss in LA



Nematode Pests of Soybean

Reniform Nematode

Reniform in Louisiana:

1.89% yield loss

1,229,869 bushels lost

\$16,726,222 loss in LA



Sometimes damage is unnoticeable....

Nematode Management in Soybean



Crop Rotation



Cover Crops



Host Resistance



Nematicides

Nematode Management in Soybean

Rotation Crops

- Can rotate to a non-host to starve the nematode
- Difficult when a field has a mixed nematode population
- Common rotation crops in Louisiana:

Rotation Crop	Reniform Nematode	Root-Knot Nematode
Cotton	Host*	Host*
Corn	Poor host	Host
Sweetpotato	Host	Host*



Nematode Management in Soybean

Cover Crops

- Can grow non-host winter cover crop between growing seasons
- Reduce weeds that may act as a 'green bridge' between growing seasons
- Common winter cover crops in Louisiana:

Rotation Crop	Reniform Nematode	Root-Knot Nematode
Winter Wheat	Poor Host	Moderate Host
Winter Ryegrass	Poor Host	Poor Host
Hairy Vetch	Moderate Host	Host
Austrian Winter Pea	Poor Host	Host
Crimson Clover	Host	Host



Nematode Management in Soybean

Host Resistance

Available for root-knot nematode.

In development for reniform nematode.

Concordia Parish – RKN infested field

Trial Conducted by Dr. David Moseley (Dean Lee Research Station)

P46A35X

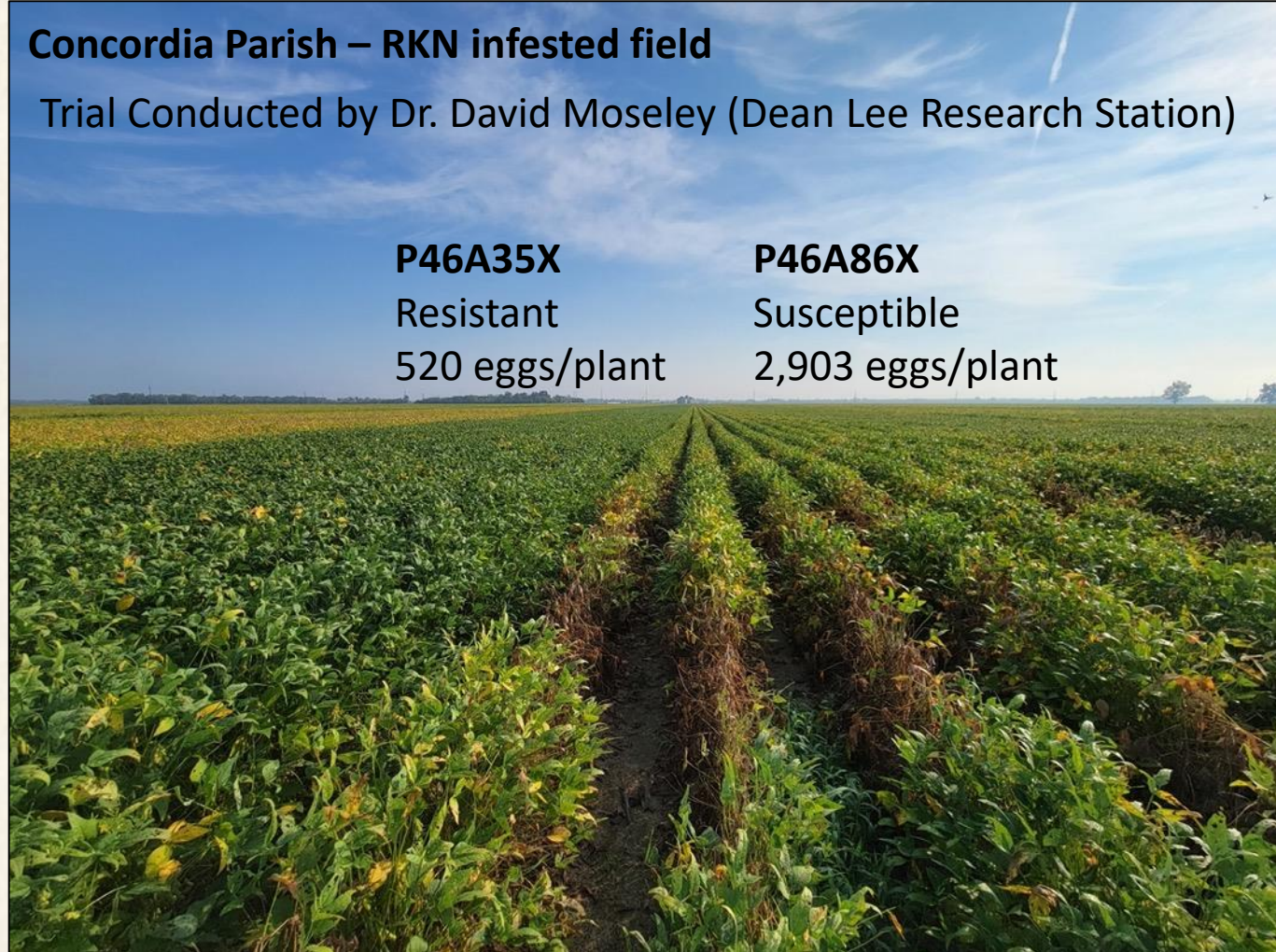
Resistant

520 eggs/plant

P46A86X

Susceptible

2,903 eggs/plant



Nematode Management in Soybean

Nematicides

Crop	Product Choices	Rate	Comments	Nematicide Type	a.i.
Soybean	Poncho Votivo	Seed application	Use in fields with low to moderate nematode levels only.	Seed Coat – Biological	Bacteria
	ILeVO	Seed application	Use in fields with low to moderate nematode levels only.	Seed Coat-3F Nematicide	Fluopyram
	Avicta Complete Beans 500	Seed application	Use in fields with low to moderate nematode levels only.	Seed Coat – Lactone	Abamectin
	Majestene	7.3-19.6 fl oz/1000 row feet	Apply at planting in-furrow or in a T-band.	Liquid – Biological	Bacterial Metabolites
	Telone II	3-6 gal/a	Apply pre-plant under the row. Reserve for heavy nematode pressure.	Soil Fumigant	1,3-D
	Velum	6.84 fl oz	Apply at planting in-furrow	Liquid – 3F Nematicide	Fluopyram

From 2023 Louisiana Plant Disease Management Guide

Reniform Nematode Resistance Trial



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

Reniform Nematode 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

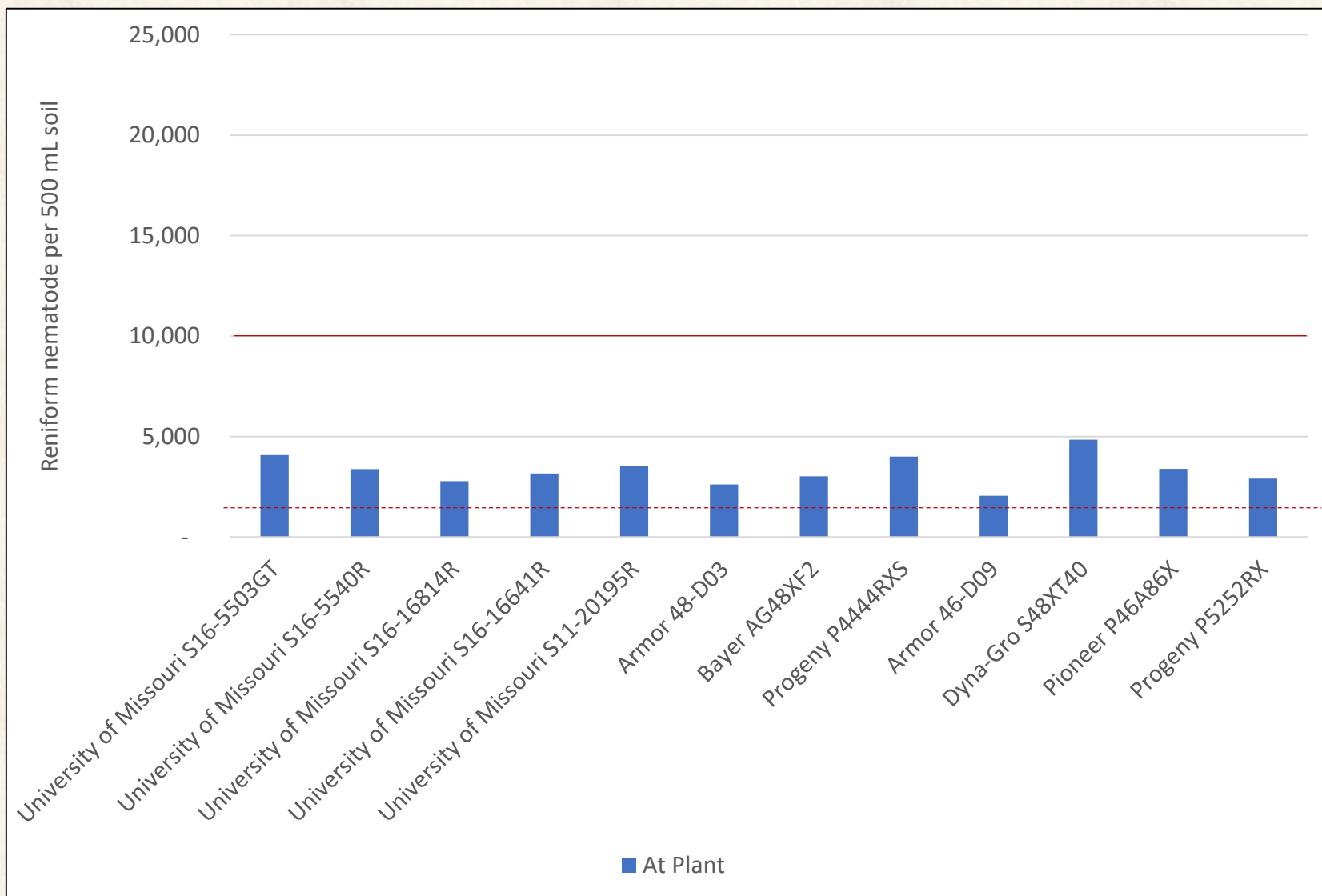
Variety	Reniform Resistant
University of Missouri S16-5503GT	Y
University of Missouri S16-5540R	Y
University of Missouri S16-16814R	Y
University of Missouri S16-16641R	Y
University of Missouri S11-20195R	Y
Armor 48-D03	N
Bayer AG48XF2	N
Progeny P4444RXS	N
Armor 46-D09	N
Dyna-Gro S48XT40	N
Pioneer P46A86X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

2023 Varieties

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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

Reniform Nematode Resistance Trial

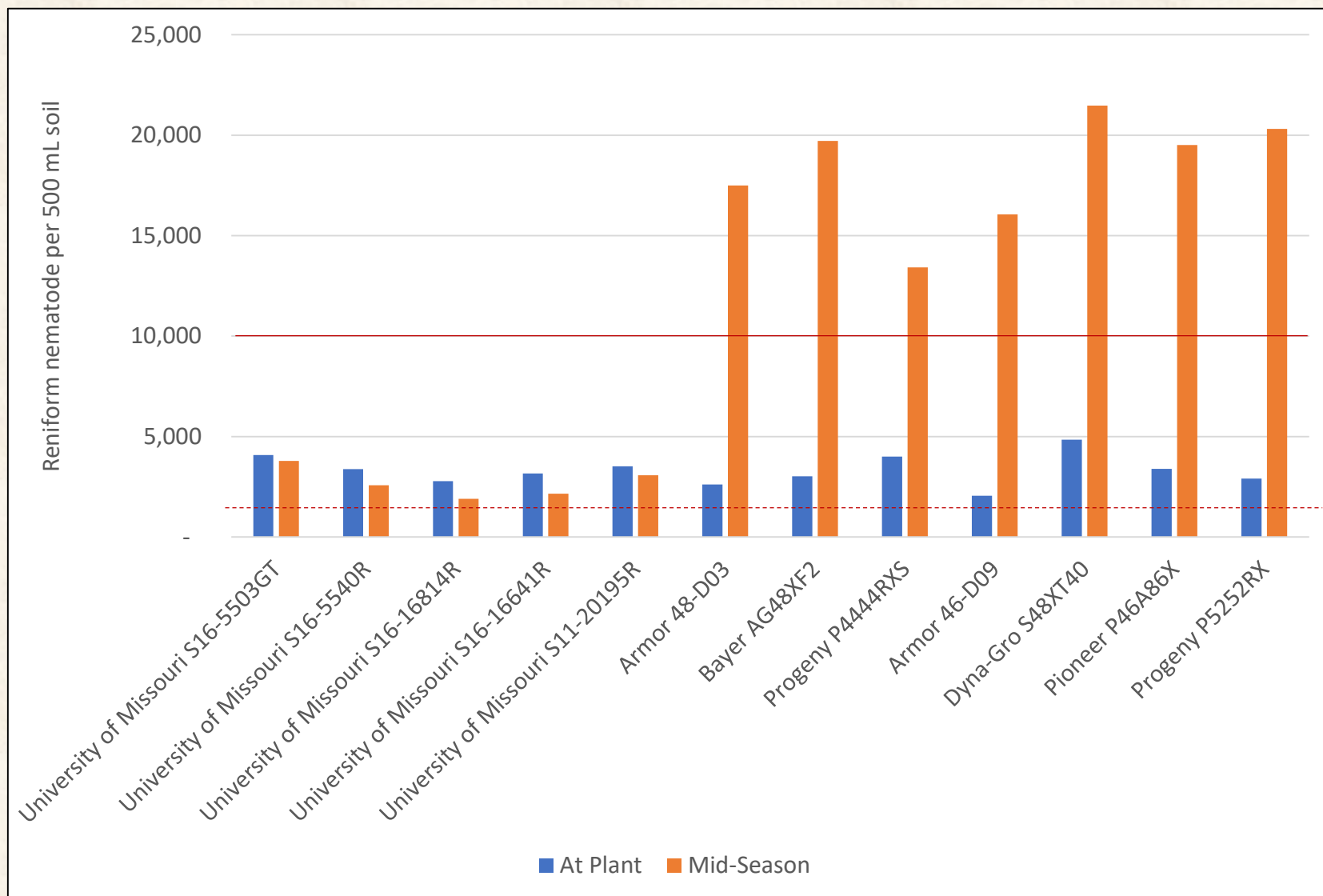
Northeast Research Station, 2022



Moderate reniform nematode pressure at plant.

Reniform Nematode Resistance Trial

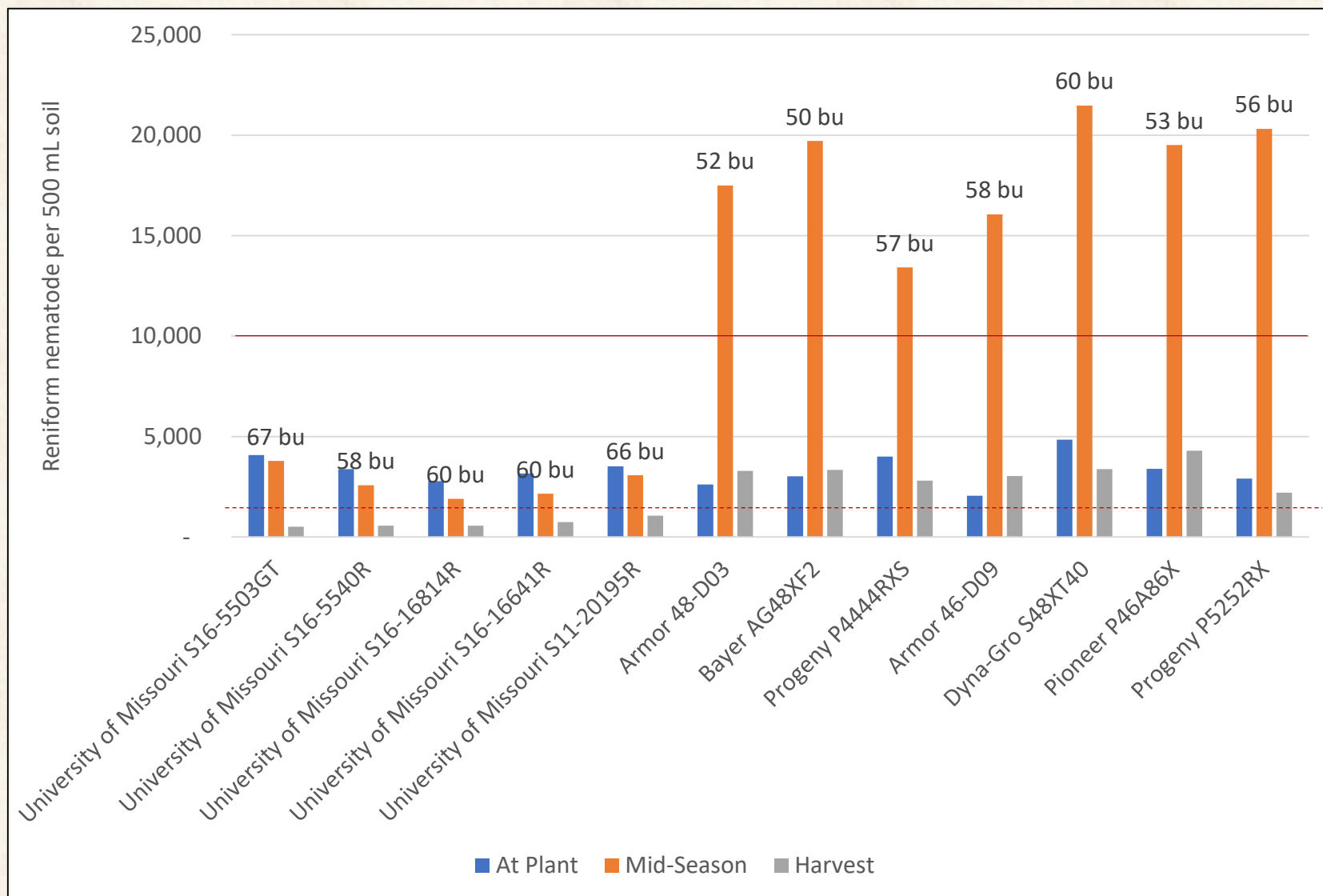
Northeast Research Station, 2022



Reniform populations increase rapidly in susceptible soybean varieties.

Reniform Nematode Resistance Trial

Northeast Research Station, 2022



Higher yield with resistant soybean varieties.

Reniform Nematode 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.

Root-Knot Nematode Resistance Trials

Concordia Parish – RKN infested field

Trial Conducted by Dr. David Moseley (Dean Lee Research Station)

P46A35X

Resistant

520 eggs/plant

P46A86X

Susceptible

2,903 eggs/plant



Nematicide + Host Resistance Trial 2023

Objective: Evaluate the utility of nematicides and host resistance for management of southern root-knot nematode in soybean

Variety Treatments:

1. University of Missouri S16-5503GT (resistant)
2. University of Missouri S16-5540R (resistant)
3. S49-F5X (susceptible)
4. 48-D25 (Susceptible)

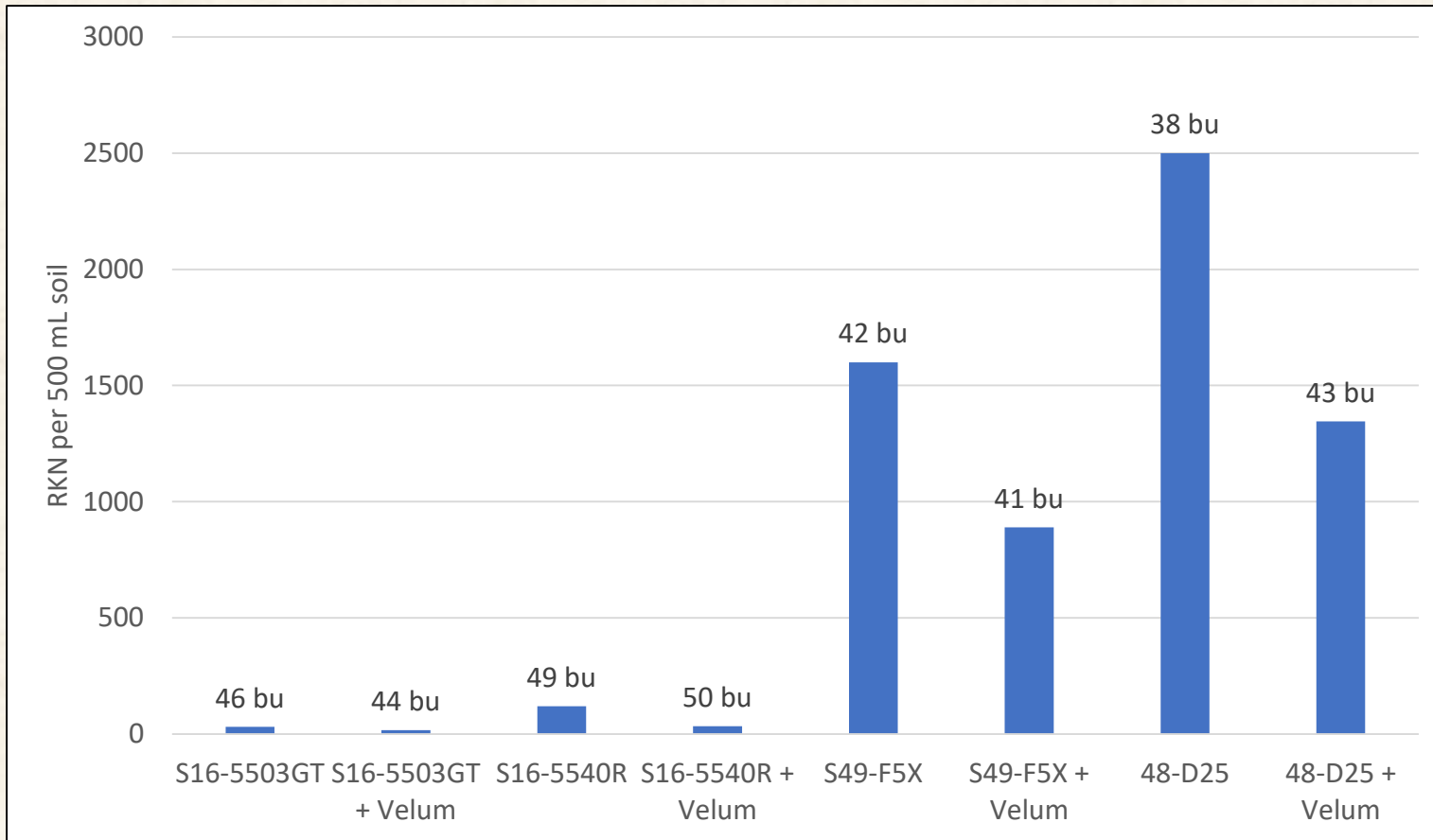
Nematicide Treatments:

1. None
2. In-furrow Velum (6.84 fl oz/A)

Monitor nematodes and yield



Nematicide + Host Resistance Trial 2023



Resistant varieties reduced root-knot nematode population development.

In-furrow applied Velum reduced nematodes by 50%.

Summary

- **Root-knot nematode** and **reniform nematode** are the major nematode pests of soybean in Louisiana.
- **Nematode management** on soybean can include crop rotations, cover crops, host resistance, and nematicides.
- **Host resistance** to root-knot nematode is commercially available, and in development for reniform nematode.
- **Nematicides** can help reduce nematode pressure on susceptible varieties.



Acknowledgements

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Farm Crew

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Myra Purvis (Research Associate)

Farm Crew

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Questions?

