

# Reniform Resistance Sources From Wild *G. hirsutum* and From *G. arboreum*

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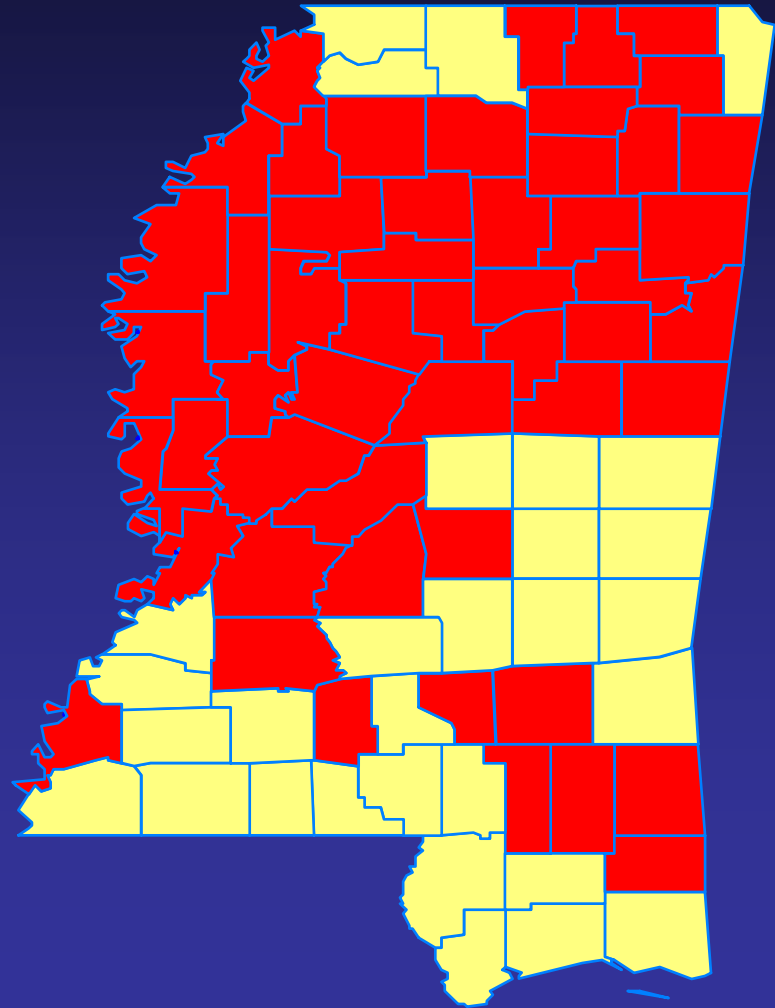


# INTRODUCTION

- The information being presented is from Macon LaFoe's Thesis Project.
- LaFoe, II, J. M. 2005. Resistance to reniform nematode in exotic cotton lines. M. S. thesis, Mississippi State University, Mississippi State, MS.

# Reniform Nematode Distribution

- *R. reniformis*  
52 counties
- 414,720 infested  
acres (32.4%)



# OBJECTIVES

- To evaluate to 8 *Gossypium arboreum* accessions for reniform nematode resistance
- To evaluate the inheritance of resistance to reniform nematodes in selected *G. arboreum* accessions
- To evaluate selected *G. hirsutum* day neutral plant selections for resistance to reniform nematode

# Materials and Methods

## Plant Material

- Eight *G. arboreum* accessions
  - A2-019, A2-076, A2-113, A2-144, A2-159, A2-190, A2-194, and susceptible A2-082 (Stewart and Robbins, 1994)
- *G. hirsutum* day neutral plant selections MT 1348, MT 2468, and MT 2469

# Materials and Methods

## Field

- Seven resistant *G. arboreum* accessions crossed with susceptible (A2-082)
- $F_1$  was sent to Tecoman, Mexico to generate  $F_2$
- Plants selections - MT 2468 and MT 2469
  - 40 I.P. of MT 2468
  - 18 I.P. of MT 2469

# Materials and Methods

## Inoculation Maintenance

- Reniform nematode inoculum Baton Rouge, LA
- Well-drained box, gallon clay pots
- Susceptible hosts- DP 5415, Rutgers tomatoes, and SF 459 (kenaf plants)



# Inoculation Techniques

- RN infested soil mixed with sand mixture
  - 3 RN/gram of soil
- Pipette RN 10 days after planting
  - 6 RN/gram of soil





# Nematode Extraction

## Baermann Funnel Technique



# Baermann Funnel

- Funnel
- PVC
- Filter
- Petri Dish



# Materials and Methods

- Plants grown:
  - 500 cm<sup>3</sup> Solo plastic cups
  - Sand mixture – 6:1 fine sand (<400µm) and vermiculite at 5 g/kg
- Fertilized weekly
  - 10 ml Miracle Gro<sup>®</sup> pot<sup>-1</sup>
- 60 DAP
- Irrigation as needed

# Materials and Methods

- *G. arboreum* Test
  - RCB design with 4 replications
    - 5 sub-samples within each replication
  - Individual plant harvested
  - 100 g of soil pot<sup>-1</sup> for extraction

# Results

## *G. arboreum* parents

ENTRY	MEAN ( RN g <sup>-1</sup> soil)
A2-082	14.13 a
A2-159	6.13 b
A2-194	5.50 b
A2-076	4.88 b
A2-144	2.75 b
A2-019	2.75 b
A2-113	2.38 b
A2-190	1.88 b

LSD = 6.14

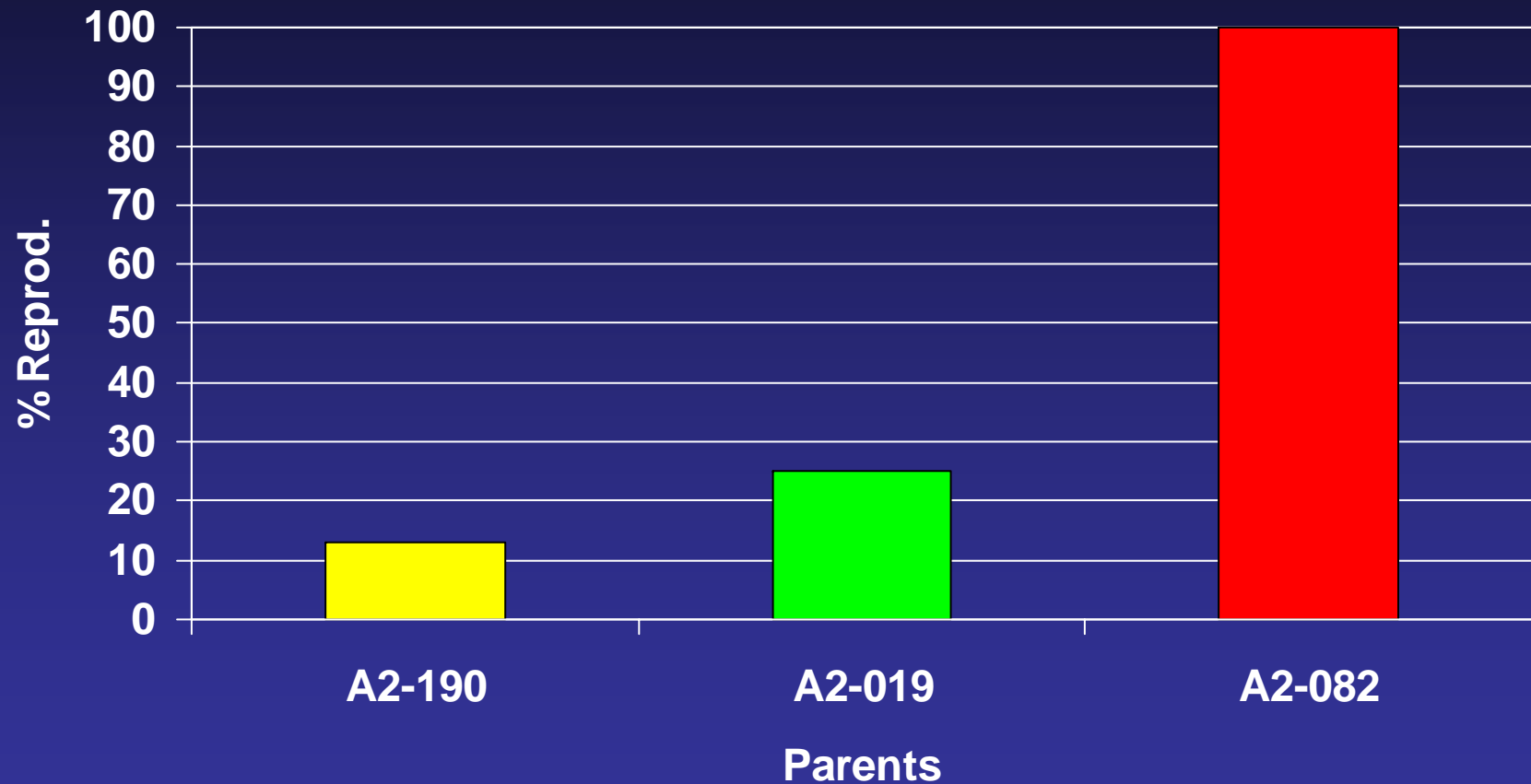
# Materials and Methods

- *G. arboreum* F<sub>2</sub> population
- For every 25 F<sub>2</sub> plants, 5 parent plants
  - Total of 200 F<sub>2</sub> plants, 40 each parent
  - 100 g soil pot<sup>-1</sup> for extraction
  - Performance of individual F<sub>2</sub> plants is expressed as percent reproduction of susceptible parent within each block

# *G. arboreum* – F2 Progeny

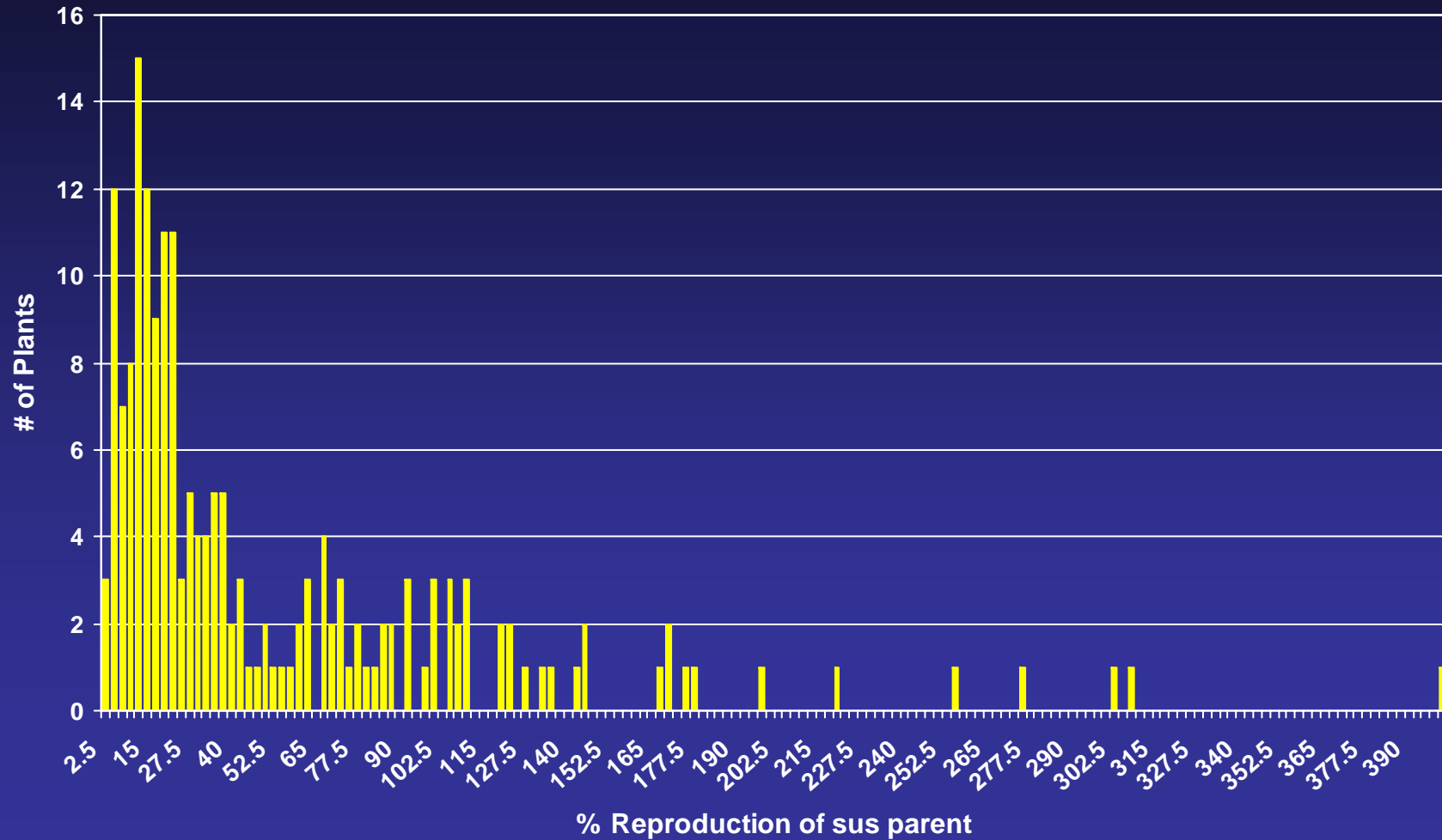


# *G. arboreum* Parents

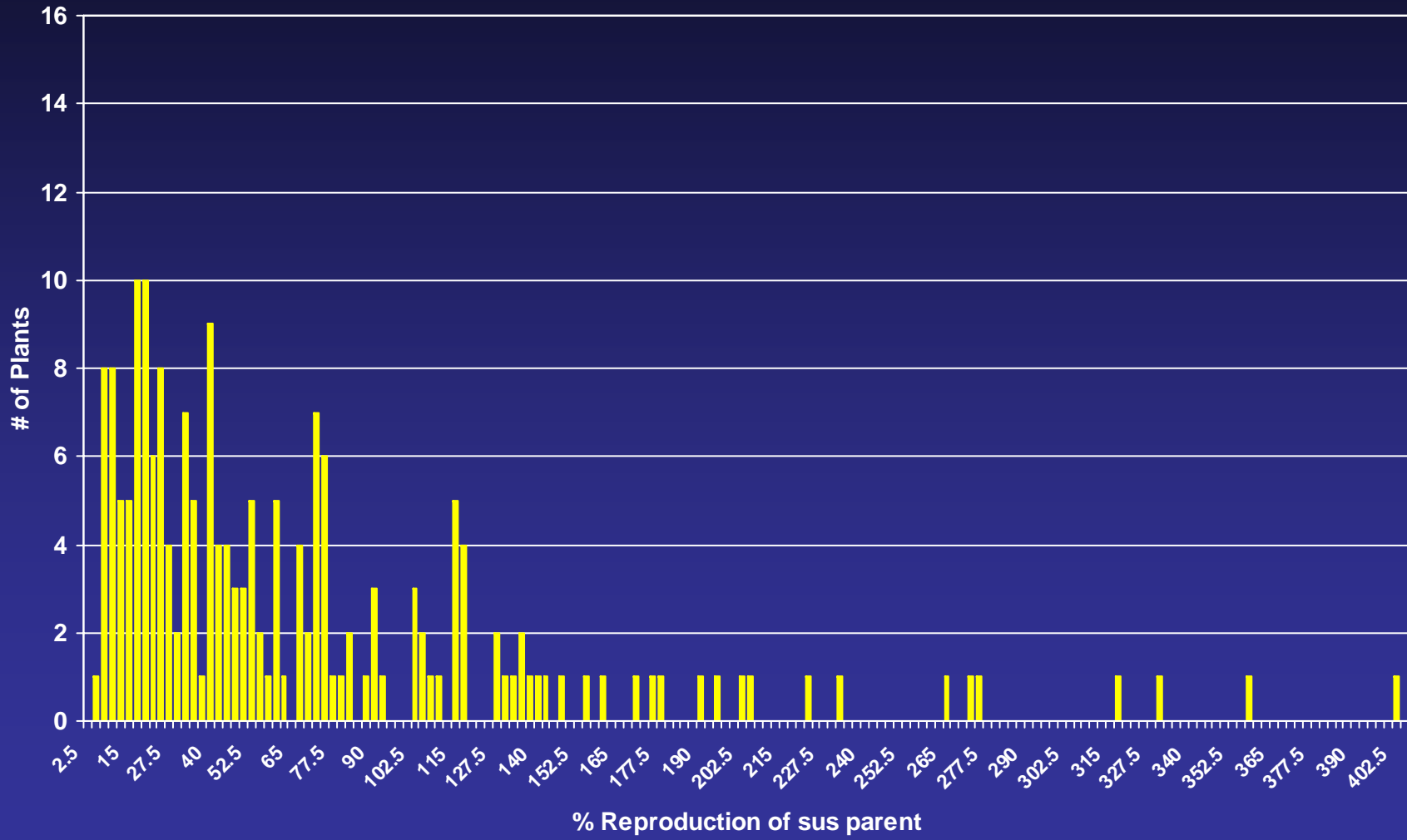




# A2-190 x A2-082



# A2-019 x A2-082



# Chi-Square

<i>G. arboreum</i> cross	Observed		Expected		Ratio	chi-square	
	R	S	R	S			
A2-019 × A2-082	106	83	177	12	15:1	457.609	*
A2-019 × A2-082	106	83	142	47	3:1	36.065	*
A2-019 × A2-082	106	83	106	83	<b>9:7</b>	<b>0.002</b>	NS
A2-019 × A2-082	106	83	154	35	13:3	78.567	*
A2-190 × A2-082	104	85	177	12	15:1	483.683	*
A2-190 × A2-082	104	85	142	47	3:1	40.213	*
A2-190 × A2-082	104	85	106	83	<b>9:7</b>	<b>0.115</b>	NS
A2-190 × A2-082	104	85	154	35	13:3	85.314	*

\*significant at 0.05

# Summary

- ***G. arboreum* parental test**
  - Resistance was confirmed
- ***G. arboreum* F<sub>2</sub> populations –**
  - Both F<sub>2</sub> populations skewed distributions toward resistant parent
  - Possibility of partial dominance being responsible for inheritance of resistance
  - Genetic analyses – Chi-square fit a 9:7 ratio

# Materials and Methods

- Day neutral accessions – MT 1348, MT 2468, and MT 2469
  - All plants completely randomized
  - Susceptible DP 5415
  - 100 g soil pot<sup>-1</sup> for extraction

# F4 Progeny - MT 1348

Plant	% DP 16	Plant	% DP 16
1	184	11	174
2	87	12	158
3	107	13	77
4	126	14	139
5	185	15	186
6	<b>11</b>	16	211
7	<b>38</b>	17	129
8	120	18	226
9	125		
10	221		

A.F. Robinson

# MT 1348 – F<sub>5</sub> Selection

	Cotton Line	Individual Plant Number		Bulk Sample	Reprod. % of Check
		F4	F5		
1	MT 1348	6	1	9.1	48.1
2	MT 1348	6	19	8.9	47.3
3	MT 1348	7	5	5.3	27.9
4	MT 1348	7	6	8.2	43.3
5	MT 1348	7	7	7.2	38.2
6	MT 1348	7	12	9.4	49.6
7	MT 1348	7	13	8.3	44.1
8	MT 1348	7	14	4.6	24.6
9	MT 1348	7	16	8.5	44.9
10	MT1348	7	19	6.3	33.4

Average susceptible check = 18.9 RN g<sup>-1</sup> soil : 20 F5 plants screened from each F4 selection.

# Summary

- Resistance found in F<sub>4</sub> progeny - MT 1348
- Resistance found in F<sub>5</sub> progeny – MT 1348
- MT 1348 still heterozygous
- Further evaluation on saved progeny needed



# MT 2468 and MT 2469

- *G. hirsutum* day neutral selection:
  - MT 2468 - 40 individual plants (2 plants/I.P.)
  - MT 2469 - 18 individual plants (2 plants/I.P.)
- Seven F<sub>3</sub> day neutral plants with resistance

# MT 2468 – F<sub>3</sub> Selection

F <sub>3</sub> Selection Number	Entry	Initial Seed Source	Individual Plant Number		Bulk Method RN g <sup>-1</sup> soil	% of Susc. Check
			F <sub>2</sub>	F <sub>3</sub>		
1	MT 2468	03-9313	3	2	2.30	48.9
2	MT 2468	03-9313	8	2	1.93	41.1
3	MT 2468	03-9313	18	2	1.19	25.3
4	MT 2468	03-9313	26	1	1.58	33.6
5	MT 2468	03-9313	27	1	1.11	23.6
6	MT 2468	03-9313	38	1	2.34	49.8
7	MT 2468	03-9313	40	1	1.20	25.5

Average susceptible check = 8.52 RN g<sup>-1</sup> soil core method and 4.70 RN g<sup>-1</sup> soil bulk method: 2 F<sub>3</sub> plants from each F<sub>2</sub> day-neutral selection screened.

# MT 2468 – F<sub>4</sub> Selection

Cotton Line	Initial Source	Individual Plant Number			Bulk Sample RN/g soil	Reprod. % of Check
		F <sub>2</sub>	F <sub>3</sub>	F <sub>4</sub>		
MT 2468	03-9313	3	2	8	8.5	44.9
MT 2468	03-9313	3	2	10	8.7	45.8
MT 2468	03-9313	8	2	6	5.5	28.9
MT 2468	03-9313	8	2	2	8.8	46.7
MT 2468	03-9313	18	2	1	8.8	46.8
MT 2468	03-9313	18	2	10	9.2	48.6
MT 2468	03-9313	26	1	6	8.2	43.4
<b>MT 2468</b>	<b>03-9313</b>	<b>27</b>	<b>1</b>	<b>4</b>	<b>0.9</b>	<b>4.7</b>
<b>MT 2468</b>	<b>03-9313</b>	<b>27</b>	<b>1</b>	<b>5</b>	<b>2.9</b>	<b>15.4</b>
<b>MT 2468</b>	<b>03-9313</b>	<b>27</b>	<b>1</b>	<b>6</b>	<b>3.6</b>	<b>18.8</b>
MT 2468	03-9313	38	1	10	6.7	35.4
MT 2468	03-9313	38	1	1	8.4	44.4
MT 2468	03-9313	40	1	10	6.8	35.8
MT 2468	03-9313	40	1	6	7.6	40.2
MT 2468	03-9313	40	1	5	8.7	45.9

Average susceptible check = 18.9 RN g<sup>-1</sup> soil : 10 F<sub>4</sub> plants from each F<sub>3</sub> selection screened.

# Summary

- Resistance found in each  $F_3$  resistant plant
- Plants still heterozgous
- Further evaluation on saved progeny needed

# Conclusions

- Resistance confirmed in *G. arboreum*
- Resistance partial dominant/multi-genic?
- Moderate resistance in day-neutral MT 1348
- Moderate resistance in day-neutral MT 2468

# QUESTIONS???

