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

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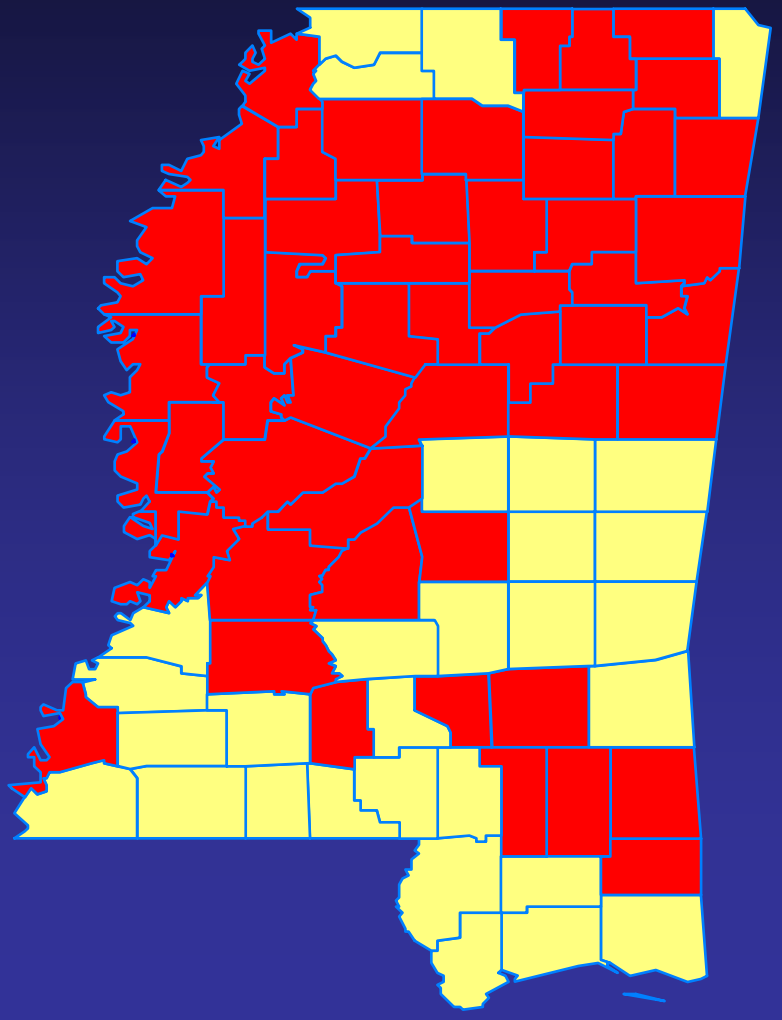
INTRODUCTION

- 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, Misissippi 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^3 Solo plastic cups
  - Sand mixture – 6:1 fine sand (<400µm) and vermiculite at 5 g/kg
- Fertilized weekly
  - 10 ml Miracle Gro® pot^{-1}
- 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^{-1} for extraction

Results

G. arboreum parents

ENTRY	MEAN (RN g^{-1} 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

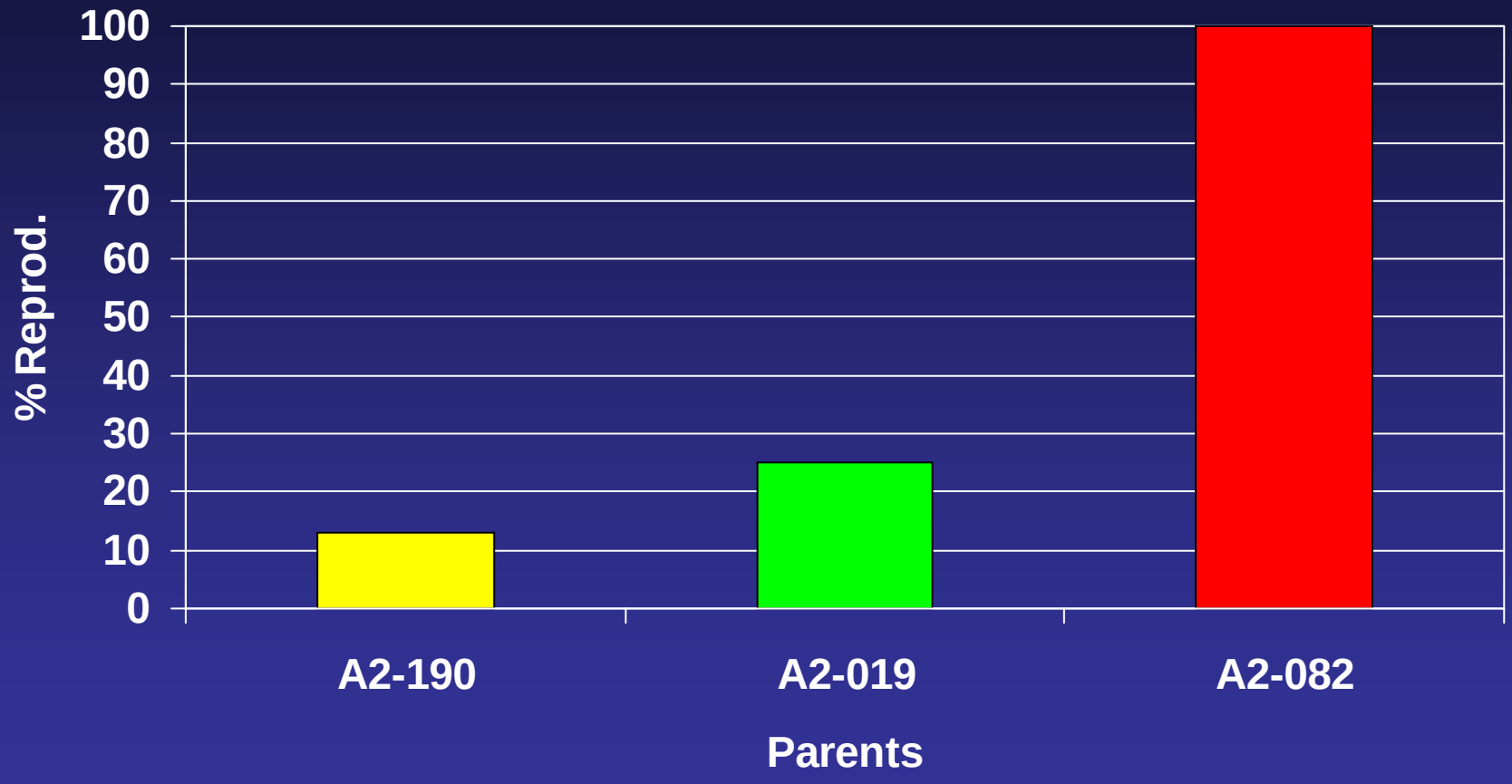
LSD = 6.14

Materials and Methods

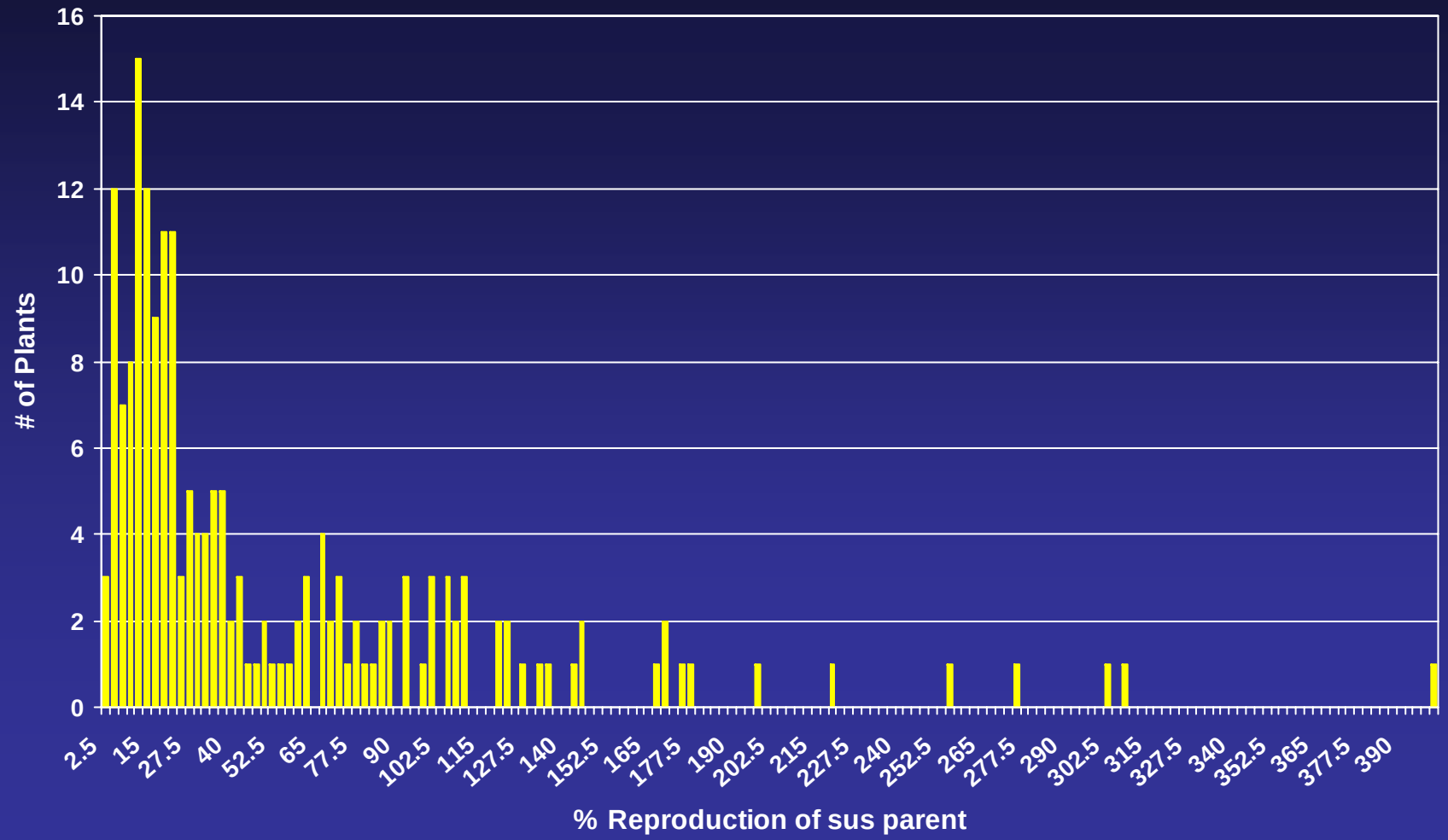
- *G. arboreum* F_2 population
- For every 25 F_2 plants, 5 parent plants
  - Total of 200 F_2 plants, 40 each parent
  - 100 g soil pot $^{-1}$ for extraction
  - Performance of individual F_2 plants is expressed as percent reproduction of susceptible parent within each block

G. arboreum – F2 Progeny

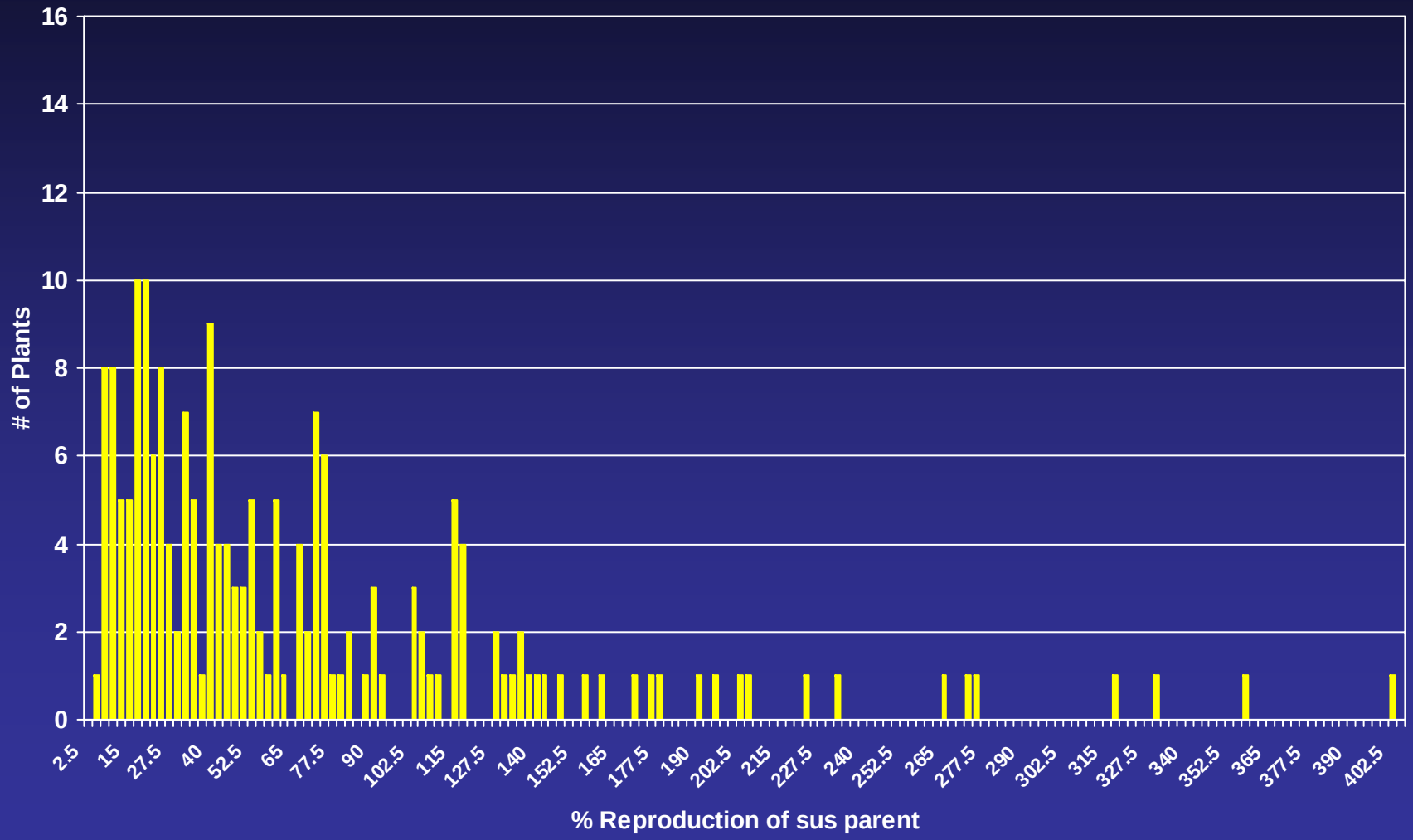
G. arboreum Parents



A2-190 x A2-082



A2-019 x A2-082



Chi-Square

G. arboreum 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	**9:7**	**0.002**	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	**9:7**	**0.115**	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_2 populations –**
  - **Both F_2 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 $^{-1}$ 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	**11**	16	211
7	**38**	17	129
8	120	18	226
9	125		
10	221		

MT 1348 – F_5 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^{-1} soil : 20 F5 plants screened from each F4 selection.

Summary

- Resistance found in F_4 progeny - MT 1348
- Resistance found in F_5 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_3 day neutral plants with resistance

MT 2468 – F_3 Selection

F_3 Selection Number	Entry	Initial Seed Source	Individual Plant Number		Bulk Method RN g^{-1} soil	% of Susc. Check
			F_2	F_3		
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^{-1} soil core method and 4.70 RN g^{-1} soil bulk method: 2 F3 plants from each F2 day-neutral selection screened.

MT 2468 – F_4 Selection

Cotton Line	Initial Source	Individual Plant Number			Bulk Sample RN/g soil	Reprod. % of Check
		F_2	F_3	F_4		
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
MT 2468	**03-9313**	**27**	**1**	**4**	**0.9**	**4.7**
MT 2468	**03-9313**	**27**	**1**	**5**	**2.9**	**15.4**
MT 2468	**03-9313**	**27**	**1**	**6**	**3.6**	**18.8**
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^{-1} soil : 10 F4 plants from each F3 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???