

Reniform Nematode Resistance in Asiatic Cottons

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Introduction

- Asiatic cottons:
 - *G. herbaceum* (A1)
 - *G. arboreum* (A2)
- A-genome accessions with resistance have been identified (Carter, 1981; Yik and Birchfield, 1984)

Stewart and Robbins, 1994:

- 27 *G. herbaceum* and 140 *G. arboreum* accessions
- About 10% of the A-genome accessions in the NPGS were highly resistant
- Nearly all the accessions were more resistant than *G. hirsutum*.

Objectives

1. Develop fertile hybrids between resistant diploid cottons and upland cotton.
2.
 - Determine the number and inheritance of genes conferring resistance.
 - Identify molecular markers linked to RN resistance in *G. arboreum*

Objective 1

- Develop fertile hybrids between resistant diploid cottons and upland cotton.

Germplasm Availability

Species	Accessions
<i>G. herbaceum</i>	A1-24, A1-51
<i>G. arboreum</i>	A2-19, A2-190, A2-194
<i>G. armourianum</i>	D2-1
<i>G. aridum</i>	D4
<i>G. raimondii</i>	D5
<i>G. gossypioides</i>	D6
<i>G. trilobum</i>	D8

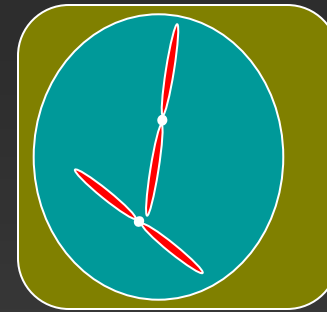
Materials and Methods

- Greenhouse
- Flowers were emasculated
- Cross pollinization

STEP 1

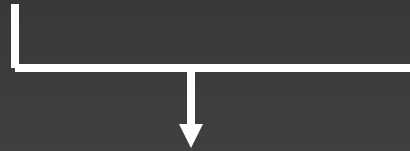


2A



2D

A)



AD (2X)



Colchicine

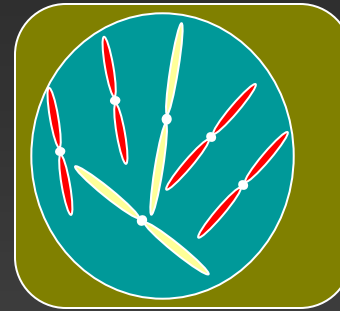


2AD (4X)

B)

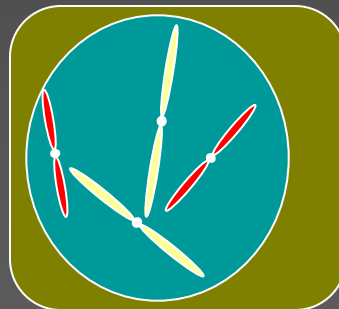


2A



2(ADD)*

*[(AD1)xD2-1]6X



2(AD) (4X)

Results

Pedigree	#Crosses	#Set Bolls	# Seeds	# plants	% G
A1-15 x D4	24	2	30	5	16.7
A2-190 x D5	19	2	25	1	4
A2-190 x D8	2	2	4	2	50
A2-194 x D8	9	3	7	4	57
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TOTAL	570	34	244	12	4.9

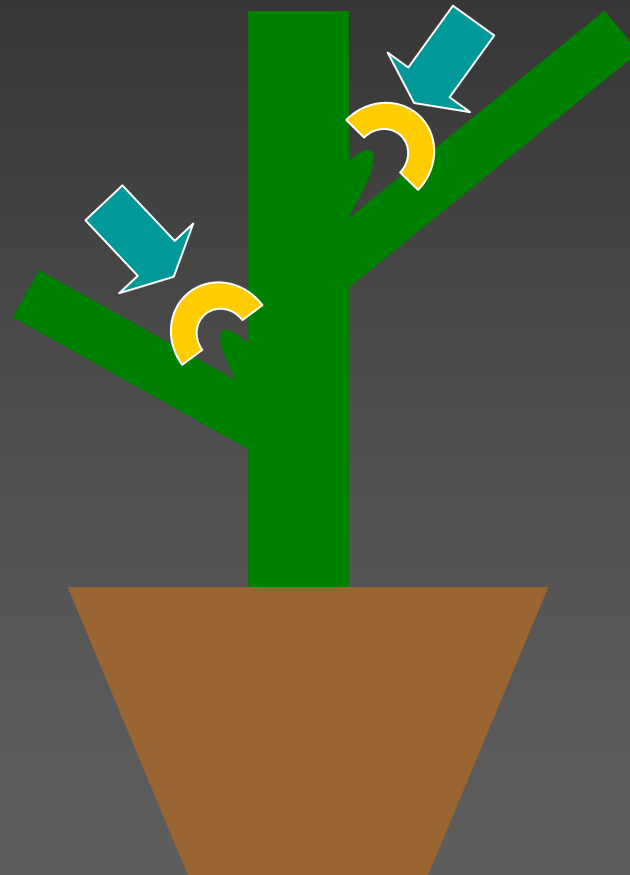
Step 2:

Double the chromosome number

PLANT MATERIAL

1. Dighe (2003):
 - A2-194xD8
 - (A2-128xA2-19)R61F2 x D4
2. Seed from step 1
 - *In situ* Colchicine application

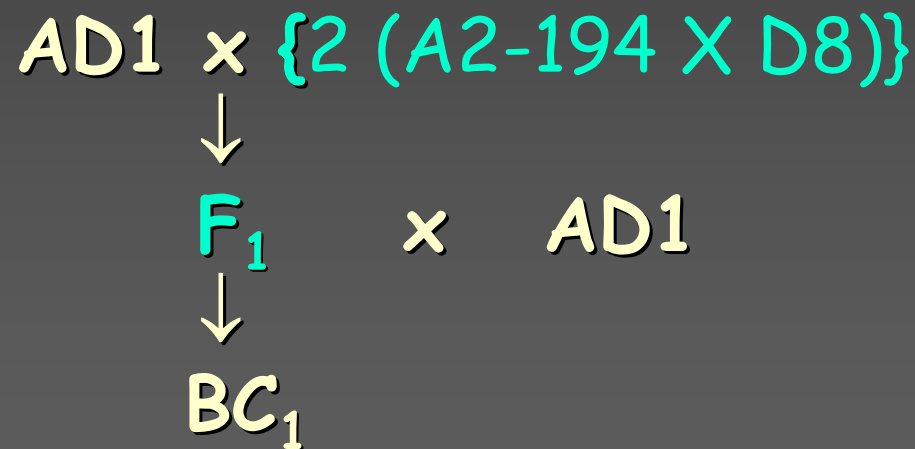
1% colchicine in lanolin



Step 3:

Cross synthetic allotetraploids with upland cotton

■ Methodology:



AD1= DP491, Delta Pearl

Summary (Obj. 1)

- 12 AxD diploids hybrids
- One tetraploid chimeric plant
- Two plants [AD1 x 2(AxD)]
- BC₁, BC₁F₂, and BC₂

Conclusion (Obj. 1)

- Hybridization of reniform resistant *G. arboreum* with cultivated cotton has been successfully accomplished crossing synthetic allotetraploid [2(A2-194 x D8)] with tetraploid upland cotton

Ongoing Research

- RN screening of BC_1F_2 and BC_2 populations
- Optimization of Ovule culture technique for interspecific crosses
- Chromosome doubling

Objective 2

- Determine the number and inheritance of genes conferring resistance.
- Identify molecular markers linked to RN resistance in *G. arboreum*

Materials and Methods

- Amplified Fragment Length Polymorphism ([AFLP](#))
- Bulk Segregant Analysis (BSA)
- *G. arboreum* hybrid A2-128 x A2-19
- Two reniform nematode screenings

2003 RN screening

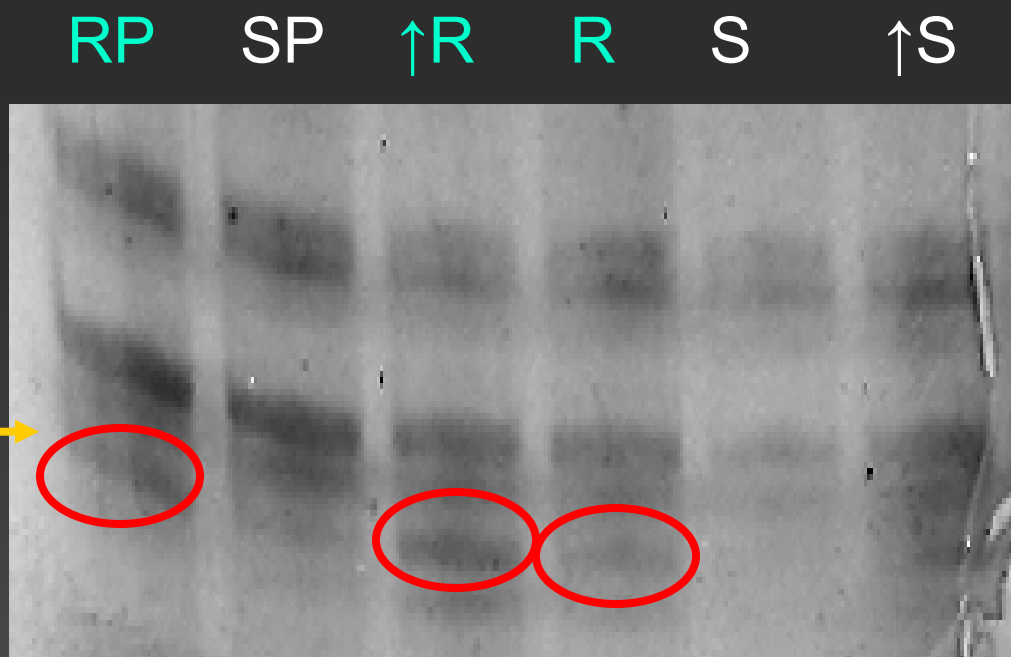
- 227 F2 (A2-128xA2-19) plants
- 25 A2-128
- 25 A2-19
- Inoculated 3300 RN/plant
- pf/pi index



DNA Bulks for AFLP

1. F2 most resistant
2. F2 most susceptible
3. F2 resistant equal to control parent
4. F2 susceptible equal to control parent
5. A2-19 resistant control parent
6. A2-128 susceptible control parent

**Primer
12**



**SCAR
R1**

110 bp →



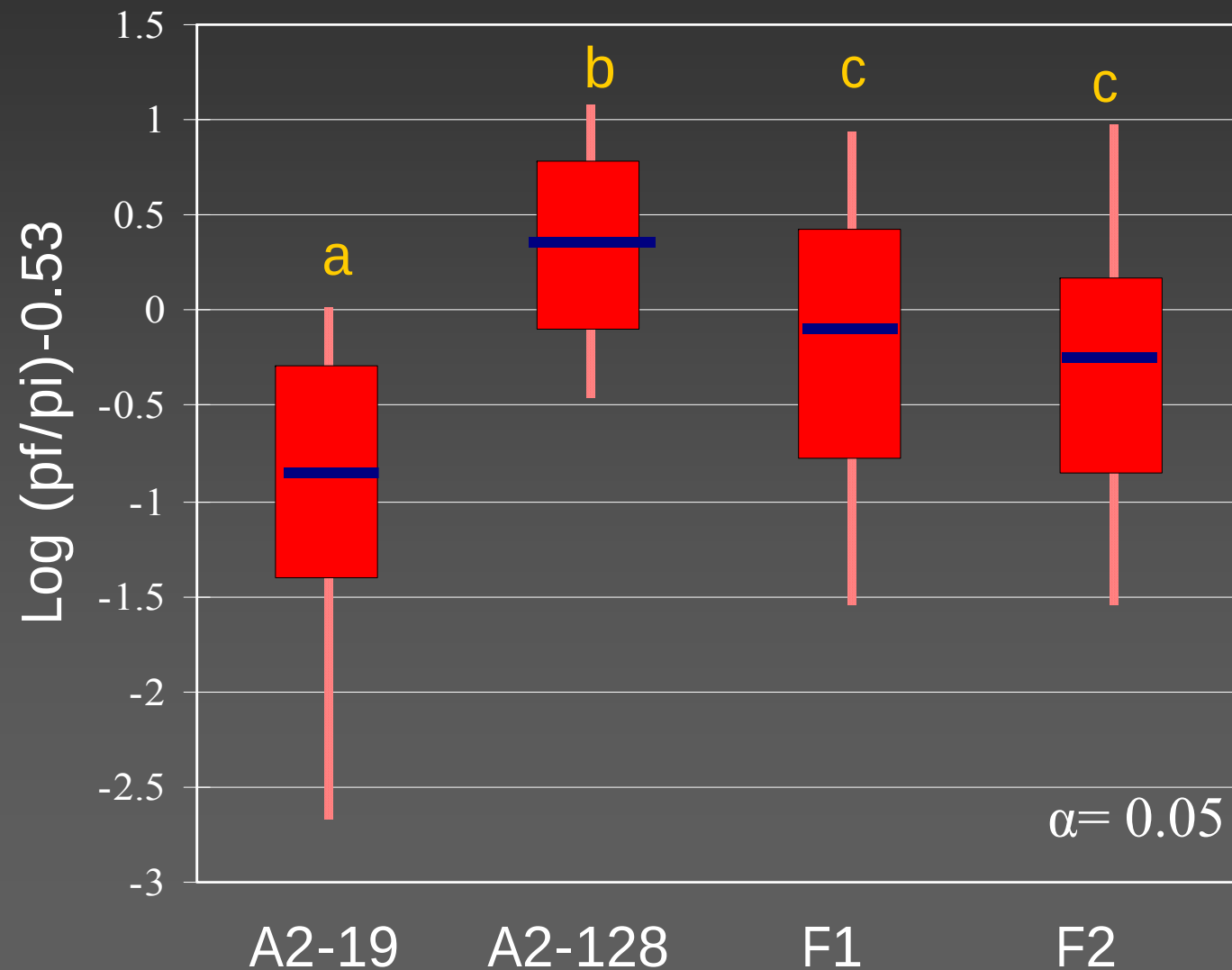
2004 RN screening

- 29 F1 (A2-128xA2-19)
- 127 F2 (A2-128xA2-19) plants
- 141 F2-3 (A2-128xA2-19)
- 31 A2-128
- 42 A2-19
- Inoculated 3300 RN/plant
- pf/pi index

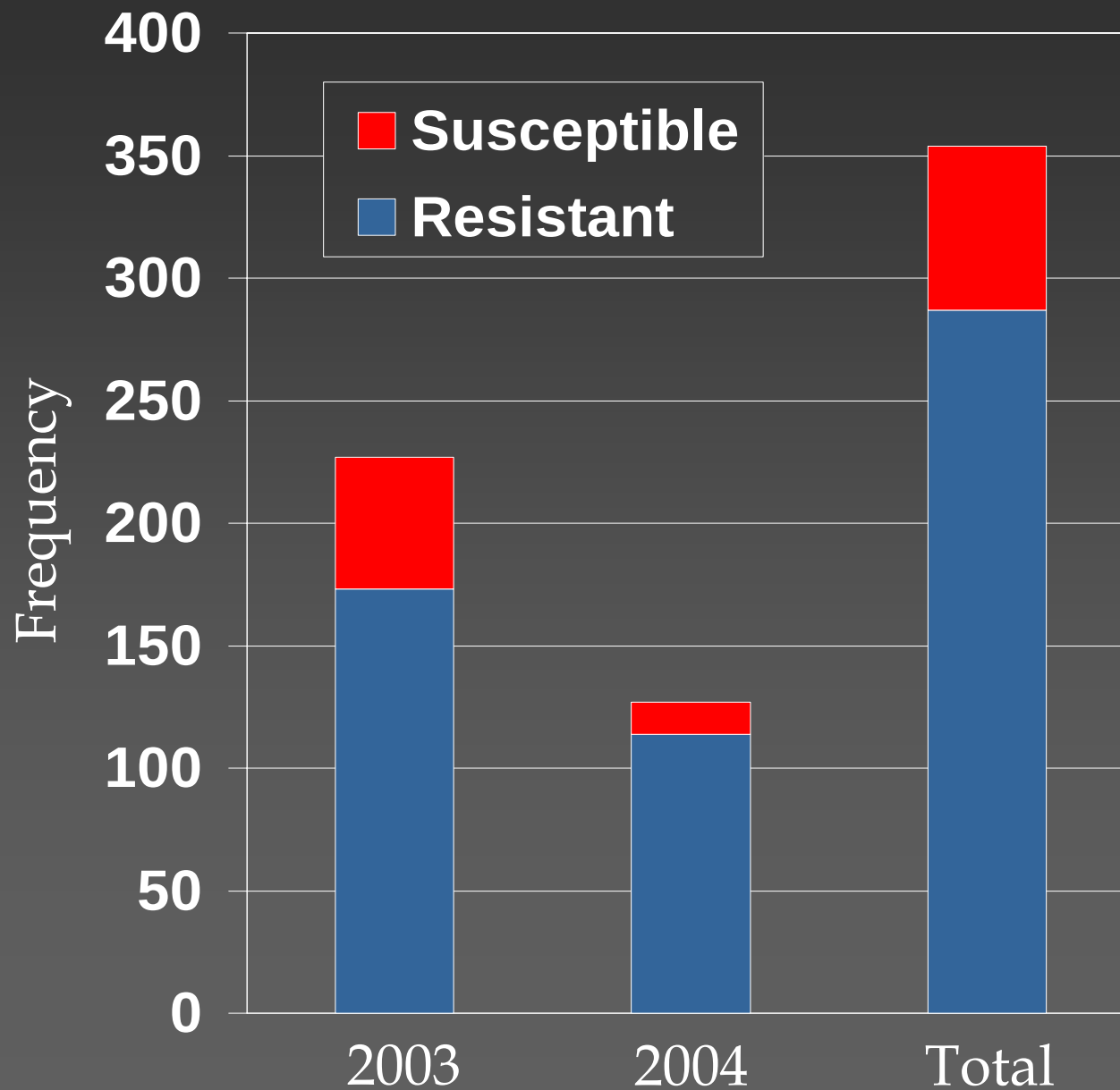
Progeny Test



Populations Distribution



F2 Resistance Segregation



Conclusions (Obj. 2)

- A single additive gene confers resistance to the reniform nematode
- A molecular marker linked to RN resistance was not found because bulks formed for AFLP were not completely homozygous for resistance and susceptibility.

Ongoing Research

- AFLP with homozygous Resistant and Susceptible bulks
- New populations for marker development:
 - A2-194 x A2-128
 - A1-51 x A2-128