Inheritance of Root-knot Nematode Resistance and Progress in Marker Development

Peng Chee and Lloyd May,
University of Georgia
Richard Davis, USDA-ARS

Genetic mapping population
(by Lloyd May)

- M-120 x Pima S6 population
- F1are highly resistant to RKN
- Self-pollinated F_1 plants
  - 226 F_2 progenies

Screening Techniques
(by Richard Davis)

1. gall rating
   - 0-10 scale (0=no galls, 1=1-10% galled, 2=11-20% galled, etc.)

2. total eggs
   - total number of eggs extracted from whole root system

3. eggs/g root
   - standardize egg counts because larger root systems usually do support more total reproduction due to an increase in the number of acceptable feeding sites

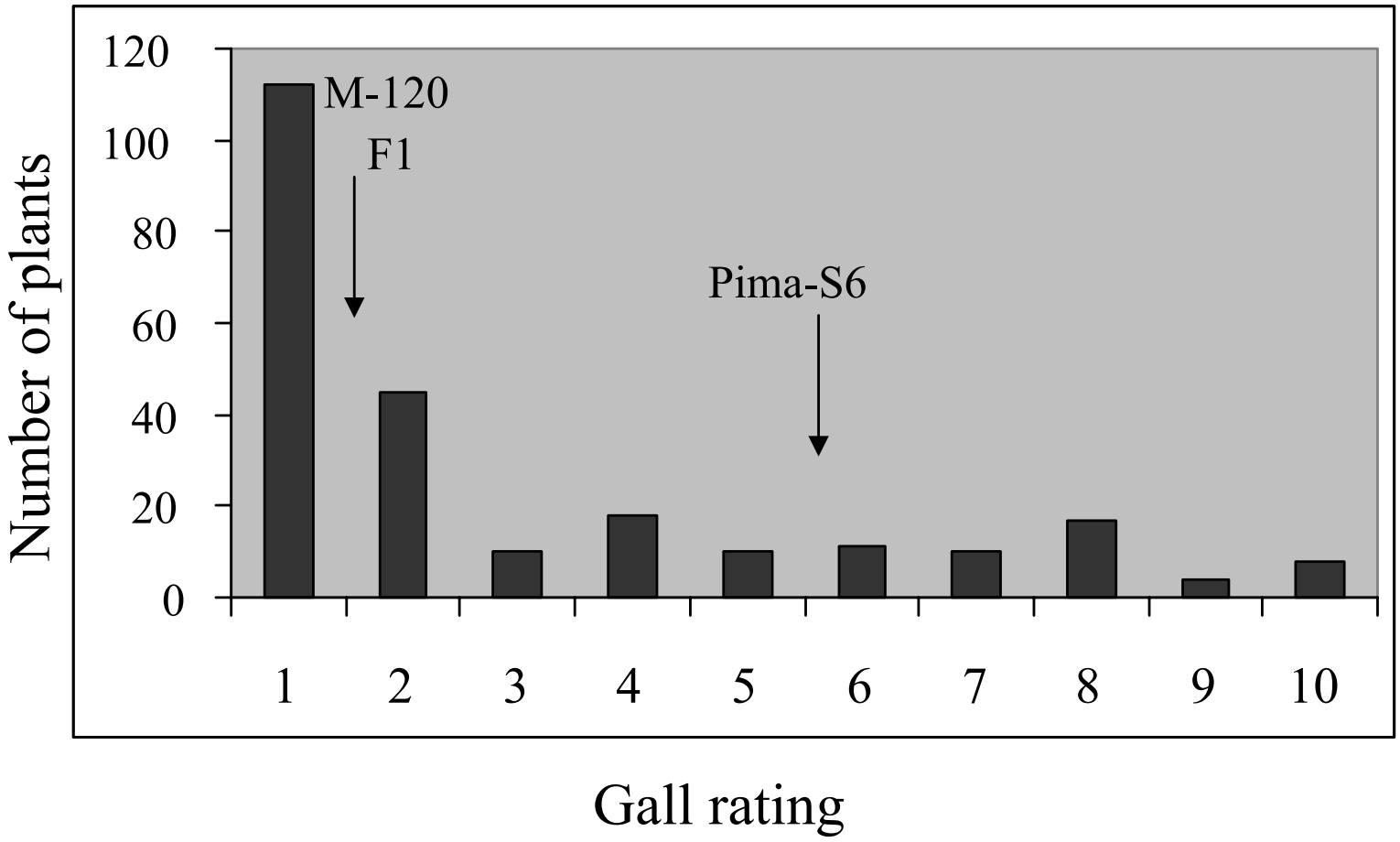
Egg Production and Galling on Pima S6, M-120 and the F1 cross

Plant	galling	eggs	root-wgt	egg/g-root
M-120	2	600	12.7	47.2
M-120	1	0	12	0.0
M-120	2	0	7.4	0.0
M-120	1	1800	10.2	176.5
M-120	1	0	14.1	0.0
M-120	1	900	7.8	115.4
Mean	**1.3** a	**550.0** a	**10.7** a	**56.5** a
PimaS-6	7	36900	22.8	1618.4
PimaS-6	5	161700	22.1	7316.7
PimaS-6	2	6900	13.4	514.9
PimaS-6	4	71100	22.9	3104.8
PimaS-6	9	151800	21	7228.6
PimaS-6	7	121500	26.5	4584.9
Mean	**5.7** b	**91650** b	**21.5** b	**4061.4** b
F1	1	1500	29.2	51.4
F1	1	3900	28.3	137.8
F1	1	600	42.1	14.3
F1	1	3000	41.2	72.8
F1	1	6600	22.8	289.5
Mean	**1** a	**3120** a	**32.7** b	**113.1** a

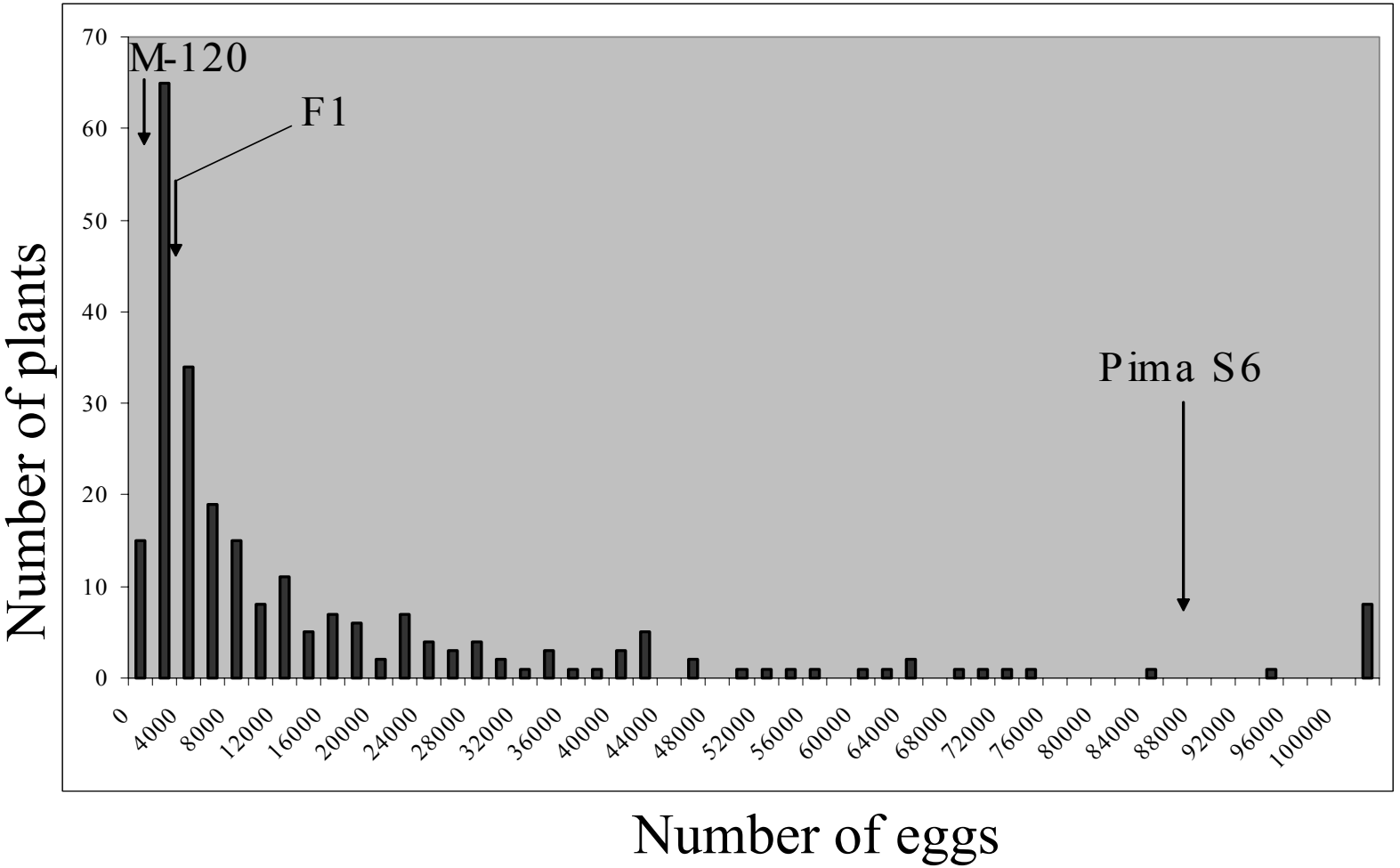
Correlation among phenotypes in F2 population

	galling (0-10)	*rt-wgt (g)*	*eggs*	*egg/g root*
galling (0-10)	**1**			
rt-wgt (g)	**0.20**	**1**		
eggs	**0.53**	**0.34**	**1**	
egg/g root	**0.57**	**0.10**	**0.91**	**1**
$r_{0.05,\ 224\ df} = 0.138$				

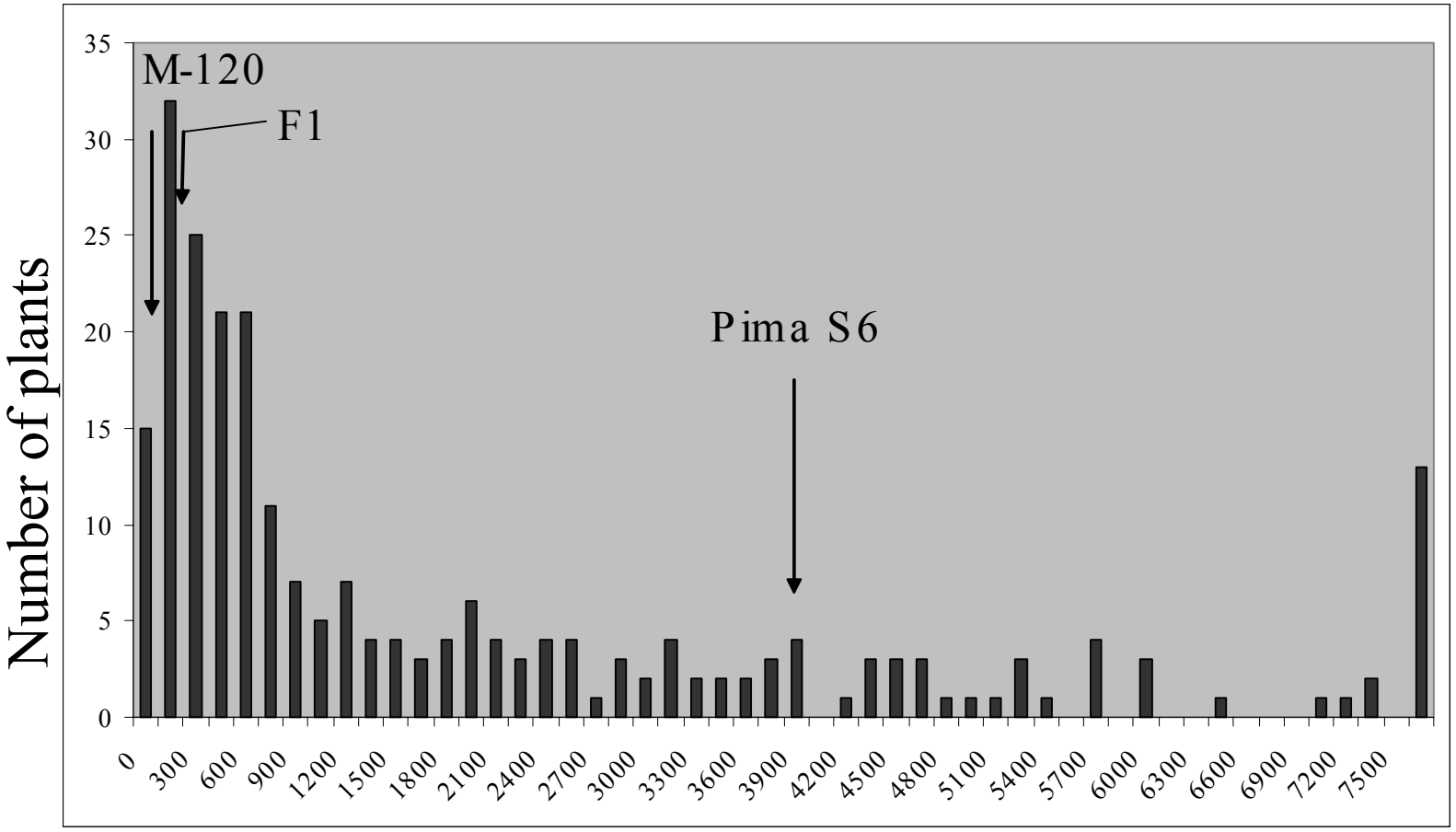
Distributions of gall rating in F_2 population



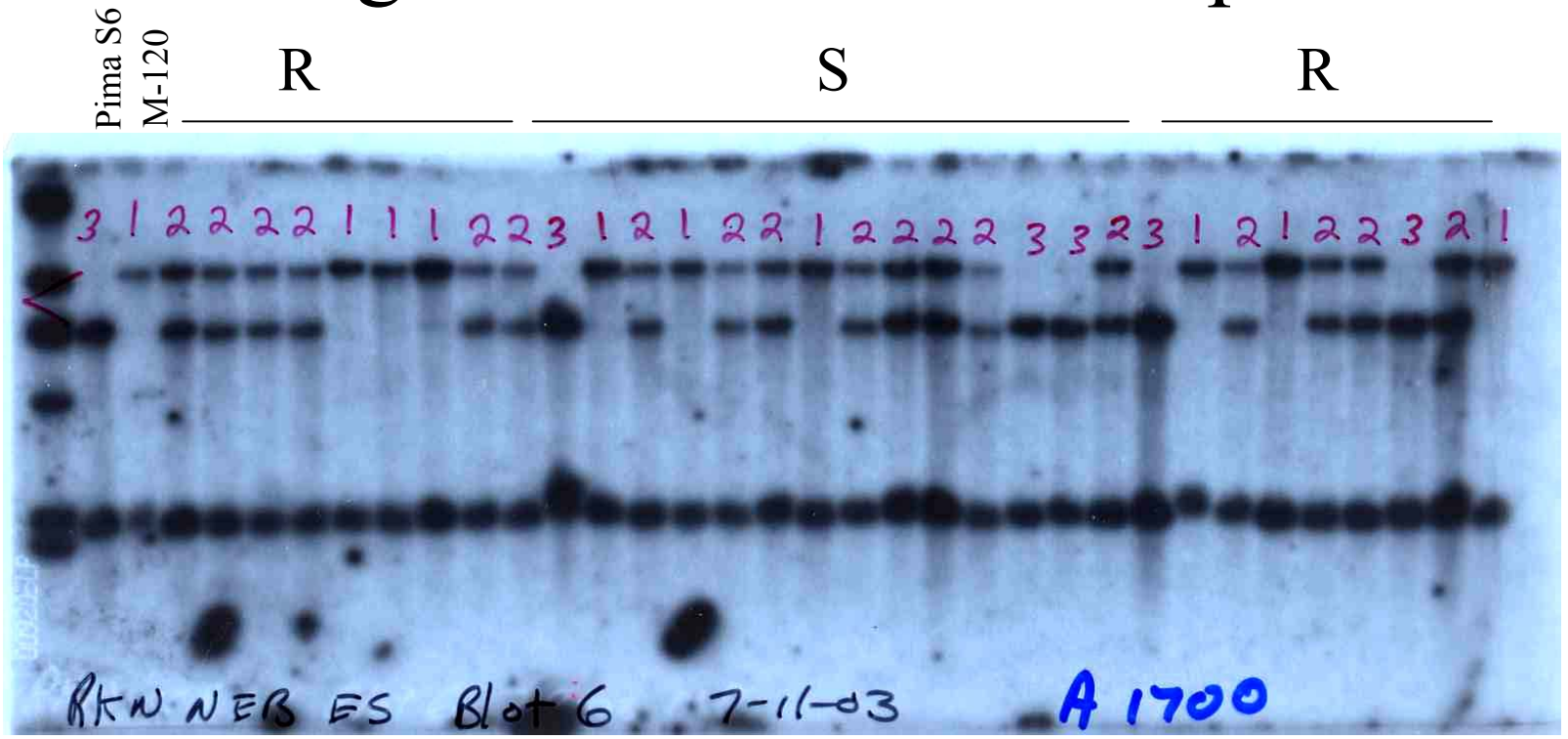
Distributions of eggs count in F_2 population



Distributions of egg/g-roots in F_2 population



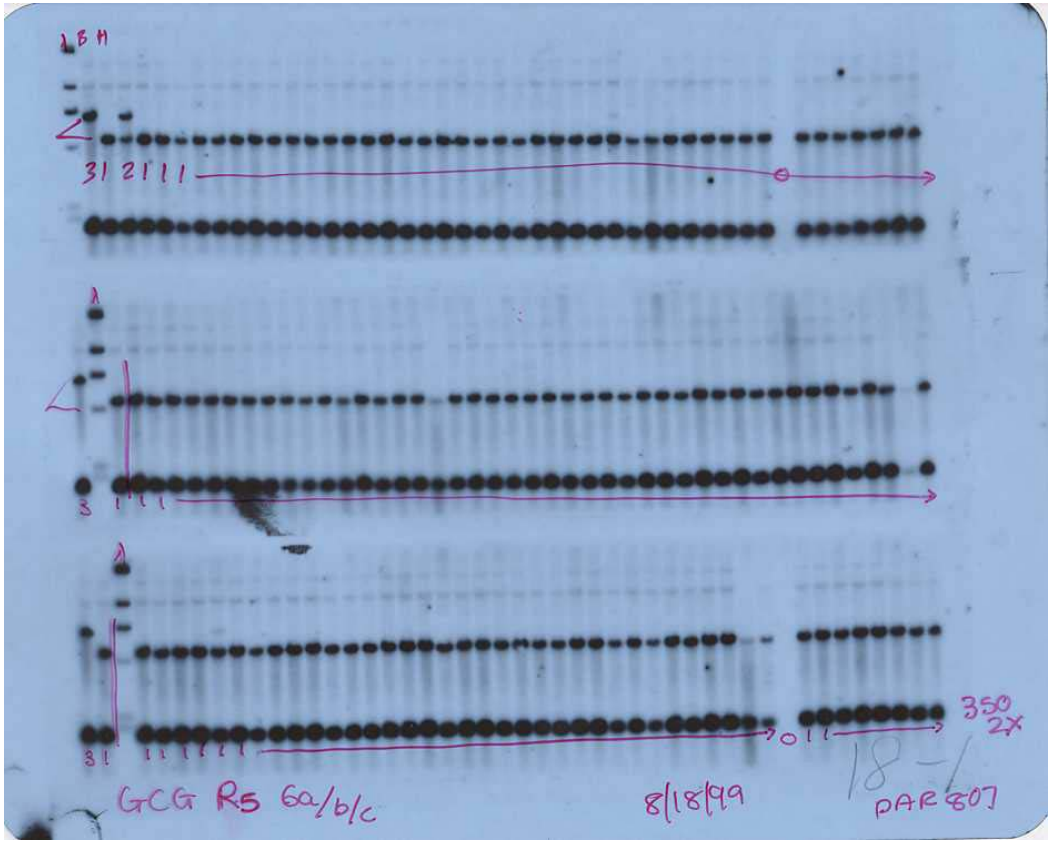
Progress in marker development

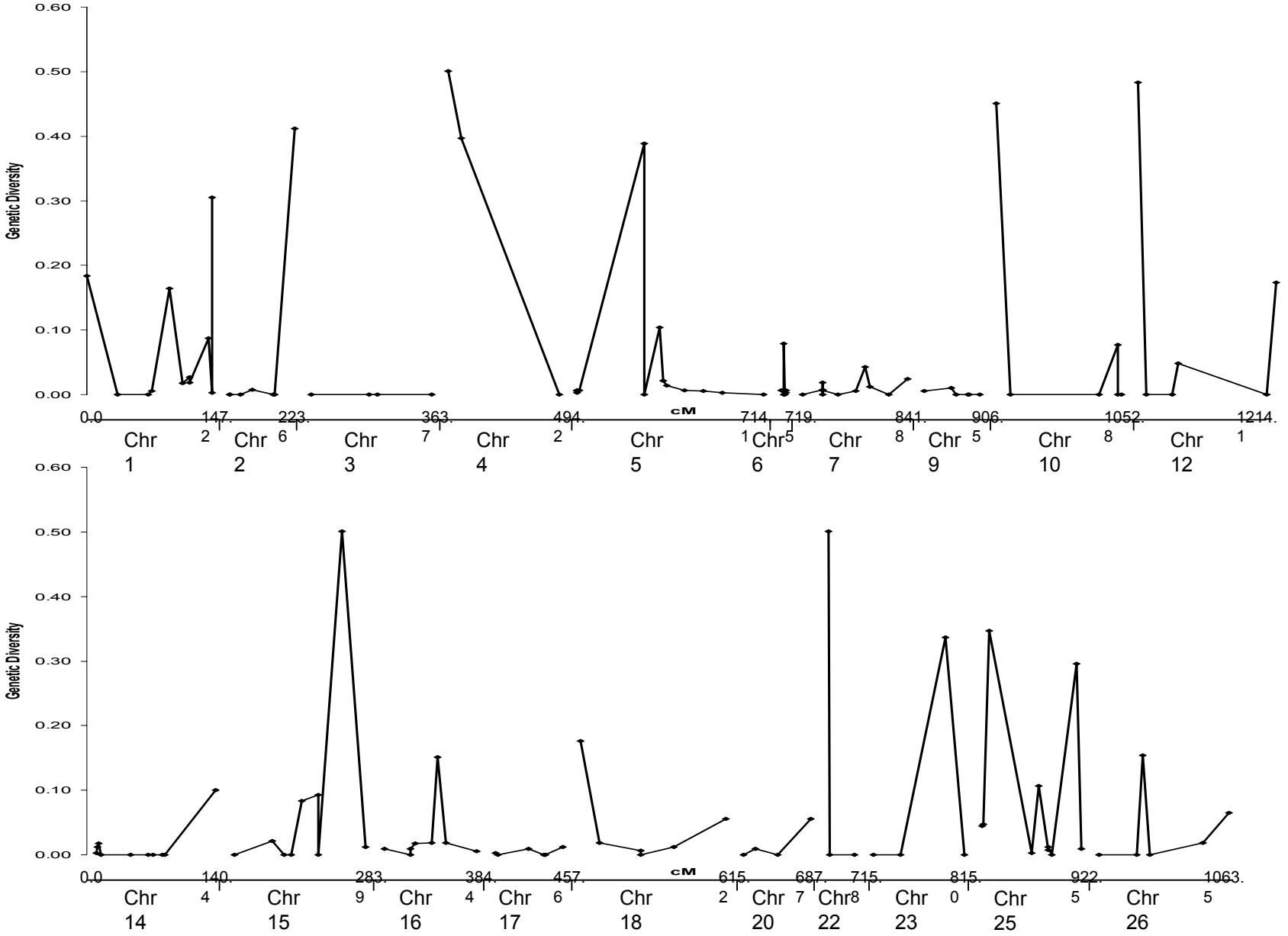


Progress

- 200 markers need to be tested
- 20 – 25 cM / marker - average distance
- 46 markers tested to date

Polymorphisms in cotton
- 335 cultivars
- 261 RFLP
  - 139 polymorphic
  - Max of 4 alleles




Genetic Diversity
0.60
0.50
0.40
0.30
0.20
0.10
0.00
cM
0.0
147.2
223.6
363.7
494.2
714.1
719.5
841.8
906.5
1052.8
1214.1
Chr 1
Chr 2
Chr 3
Chr 4
Chr 5
Chr 6
Chr 7
Chr 9
Chr 10
Chr 12
Genetic Diversity
0.60
0.50
0.40
0.30
0.20
0.10
0.00
cM
0.0
140.4
283.9
384.4
457.6
615.2
687.7
715.8
815.0
922.5
1063.5
Chr 14
Chr 15
Chr 16
Chr 17
Chr 18
Chr 20
Chr 22
Chr 23
Chr 25
Chr 26