Nematode Resistance and Agronomic Performance of LONREN Lines

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CREATION OF TRIPLE-SPECIES TETRAPLOID HYBRIDS USED TO INTROGRESS RESISTANCE FROM *G. longicalyx* (F) INTO *G. hirsutum* (AD)

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1. **HLA hybrid (strategy: substitute F for A)**

AADD x FF → $(FAD)^2$ x DD → (FADD)

2. **HHL hybrid (strategy: substitute F for D)**

AADD x AA → $(AAD)^2$ x FF → (AADF)

DD = *G. armourianum*
AA = *G. herbaceum*

LONREN BACKCROSS-1 FAMILIES

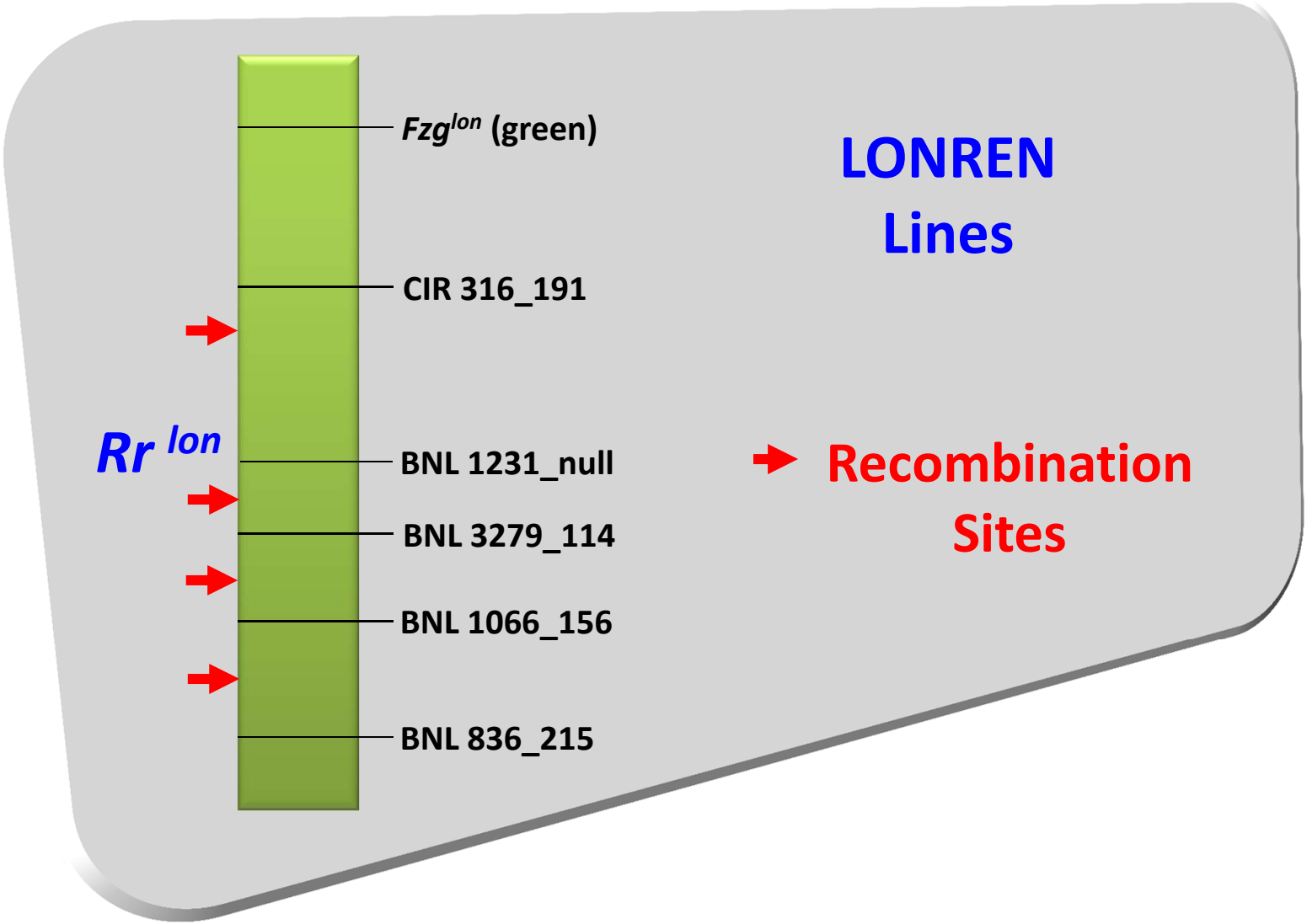
1. HLA-A Group (4 random BC_1 male parents)
   8 families derived from backcross-1 plants:
   2, 77A, 83, **84***, 85, 103A, 122, and 132

2. HLA-B Group (Acala NemX BC_1 male parent)
   14 families derived from backcross-1 plants:
   4, 8, 21, 26, 34, 35, 45, 61, 75, 77B, 81, 91, 99, 103B

3. HHL Group (Acala NemX BC_1 male parent)
   6 families derived from backcross plants:
   3, 5, 7, 11, 14, and 17

*** LONREN-1 and LONREN-2 germplasm lines released from this family in April 2007.**

MARKERS ON INTROGRESSION SEGMENTS FROM *G. longicalyx*



EFFECTS OF LONGICALYX RESISTANCE IN DELTAPINE 458 B/R ISOLINES

Reniform Nematode Populations in BC_6S_1 Progeny Seven Weeks After Inoculation			
Resistance Status*	n	Nematode Numbers (% DP 16)	
		Mean	Range
RR	12	0.8	0 – 2
Rr	14	3.7	0 – 16
rr	8	106.1	5 – 201

* Determined from test crosses and six SSR markers.

SEED COTTON YIELDS OF LONREN PROGENY ROWS (TEXAS A&M BRAZOS RIVER PLANTATION 2007)

Line / Cultivar	No. of Rows*	Yield (kg per row)	
		Mean	Range
LONREN-1 (Composite of BC_7S_2 seed from 17 Sibs):			
Susceptible Sibs	3	3.34	2.80-3.51
Resistant Sibs	16	3.22	2.21-4.12
LONREN-2 (Composite of BC_7S_2 seed from 20 Sibs):			
Susceptible Sibs	3	3.42	3.26-3.70
Resistant Sibs	20	3.75	2.27-4.81
Fibermax 958	6	3.19	2.00-3.65
PSC 355	1	3.65	

* 17 Sib lines exceeded the mean of Fibermax 958, the last backcross parent; 10 Sibs exceeded the mean for PSC 355, the performance standard.

EFFECTS OF LONRENS ON RENIFORM POPULATIONS (ST. JOSEPH, LA 2007)

Cultivar/Line	Sampling Date		
	6/30/07	8/13/07	9/7/07
Delta Pearl	3,520	93,440	63,680
LONREN 1	4,800	1,920	480
LONREN 2	13,760	7,680	1,080

EFFECTS OF PLANTING LONREN LINES IN 2007 ON VIGOR OF 2008 PLANTINGS

Line	2007 Planting	Vigor Ratings - 2008			NDVI Values*
		6/3	6/17	7/7	7/7
JAJO 123	Suscept	6	5	5	495
JAJO 125	LONREN 1	10	9	8	611
JAJO 128	LONREN 2	10	9	8	678
JAJO 129	Suscept	6	5	5	418
Delta Pearl	Suscept	5	5	6	441

* Collected by Gene Burris.

RENIFORM NEMATODE SUPPRESSION BY LONRENS (ST. JOSEPH, LA 2008)

Cultivar/Line	Sampling Dates (nematodes per 500 cc soil)			
	6/3/08	7/8/08	8/7/08	10/2/08
Delta Pearl	41,280	102,720	67,840	67,520
LONREN 1 (BC1-84)	30,720	23,360	15,040	13,120
LONREN 1S (S Sib)	33,600	46,720	82,240	49,600
LONREN 2 (BC1-84; -1055)	26,560	20,480	10,880	6,080
LONREN 2S (S Sib)	6,080	48,640	92,480	56,640
ME Green (BC1-84, branch)	6,080	13,440	14,400	13,440
ME White (NEMSTACK)	10, 880	7,040	15,680	5,120
MO Green (BC1-132)	12,480	13,120	21,440	7,360
MO White (NEMSTACK)	6,720	15,040	8,320	1,280
MA (BC1-2)	1,600	16,320	7,360	2,880
MB (BC1-77; -1055)	7,040	14,400	17,920	2,880
MF (BC1-85; -3279)	9,600	16,640	7,680	7,360
MN (BC1-122)	5,120	5,760	7,040	1,600
FM 966 (check)	20,160	57,920	93,440	40,640
R (%S)	46.2	22.8	15.0	11.4

SUPPRESSION OF RENIFORM NEMATODE BY HLA-B LINES (BRAZOS RIVER FARM 2008)

Line	Nematodes/100cc soil		Δ %
	S Progeny	R Progeny	
1	788	272	66
2	1,353	299	78
5	1,251	541	57
7	1,505	352	77
7A	1,919	404	79
9	1,878	353	81
10	1,433	615	57
11	1,779	573	68
12	1,613	444	73
13	1,657	594	64
MEAN	1,518	445	70

MEAN* YIELDS OF SUSCEPTIBLE & RESISTANT ISOLINES CHROMOSOME 11 INTROGRESSION WITHOUT NEMATODES

Measurement	Reaction to Reniform Nematode		Δ %
	Susceptible	Resistant	
Seed Cotton/plant (g)	71.1	78.1	+9.8
Lint (%)	42.1	40.5	-3.8
Lint/plant (g)	29.9	31.6	+5.7

* Means of 42 and 71 progeny rows from susceptible and resistant BC_7S_1 sibs, respectively, of 14 lines.

MEAN* FIBER QUALITIES OF SUSCEPTIBLE & RESISTANT ISOLINES CHROMOSOME 11 INTROGRESSION WITHOUT NEMATODES

Quality Character	Reaction to Reniform Nematode		Δ %
	Susceptible	Resistant	
MIC	4.68	4.53	-3.2
UHM	1.06	1.04	-1.9
UI	82.5	83.0	+0.6
STR	27.4	28.2	+2.8

* Means of 42 and 71 progeny rows from susceptible and resistant BC_7S_1 sibs, respectively, of 14 lines.


Brazos River Farm
Texas A&M University

CORRELATIONS OF VIGOR, STAND, AND YIELD WITH RESISTANCE AND PLANTER BOX

Measurement	Planter Box (A-D) / Resistance (S or R)			
	A/S	B/R	C/S	D/R
Vigor (1-5)	5.00	3.23	5.00	2.73*†
Stand (per 100)	81.0	84.5	78.2	74.2*
SC Yield (g/10ft)	927	585	924	557†

* Planter Box D significantly less than Box B (LSD, 5%).

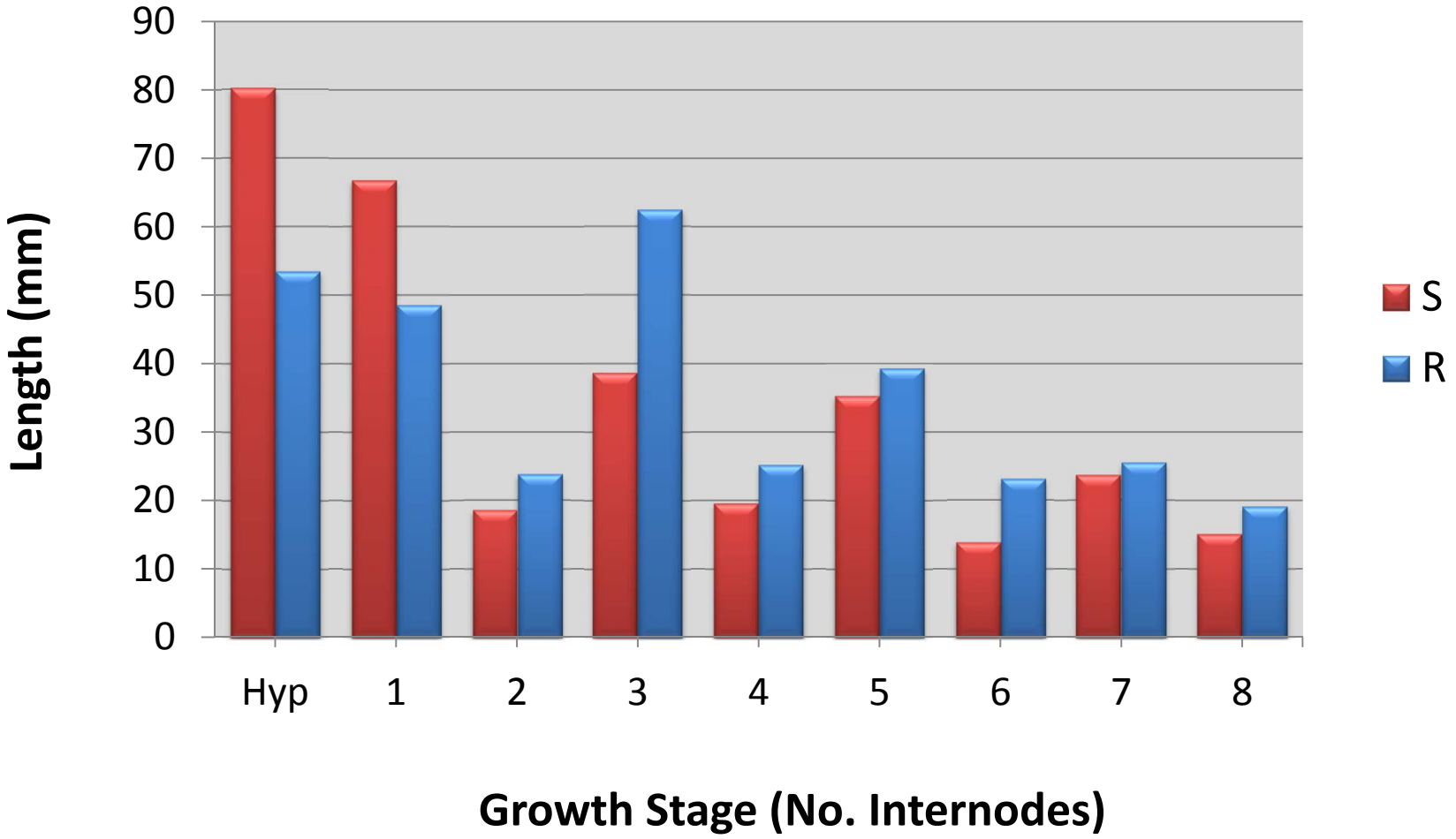
† R significantly less than S (LSD, 5%).

Stunting in sandy loam soil
(Seeds planted in nematode infested soil cores)

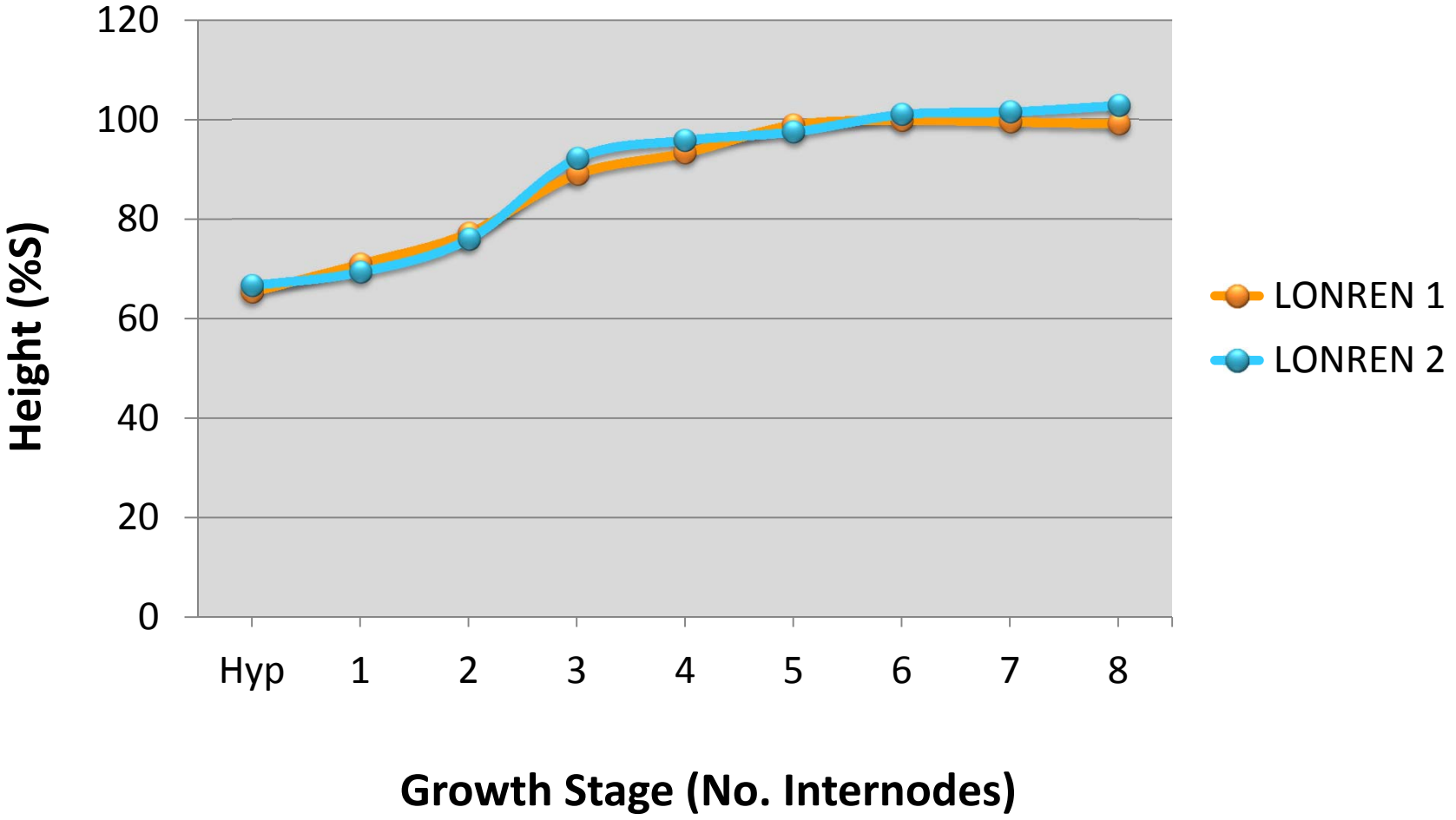
8/6/2008

8/14/2008

HYPOCOTYL AND INTERNODE LENGTHS OF RESISTANT AND SUSCEPTIBLE LONREN-1 SIBS (PLANTED IN HEAVILY INFESTED SOIL CORES)

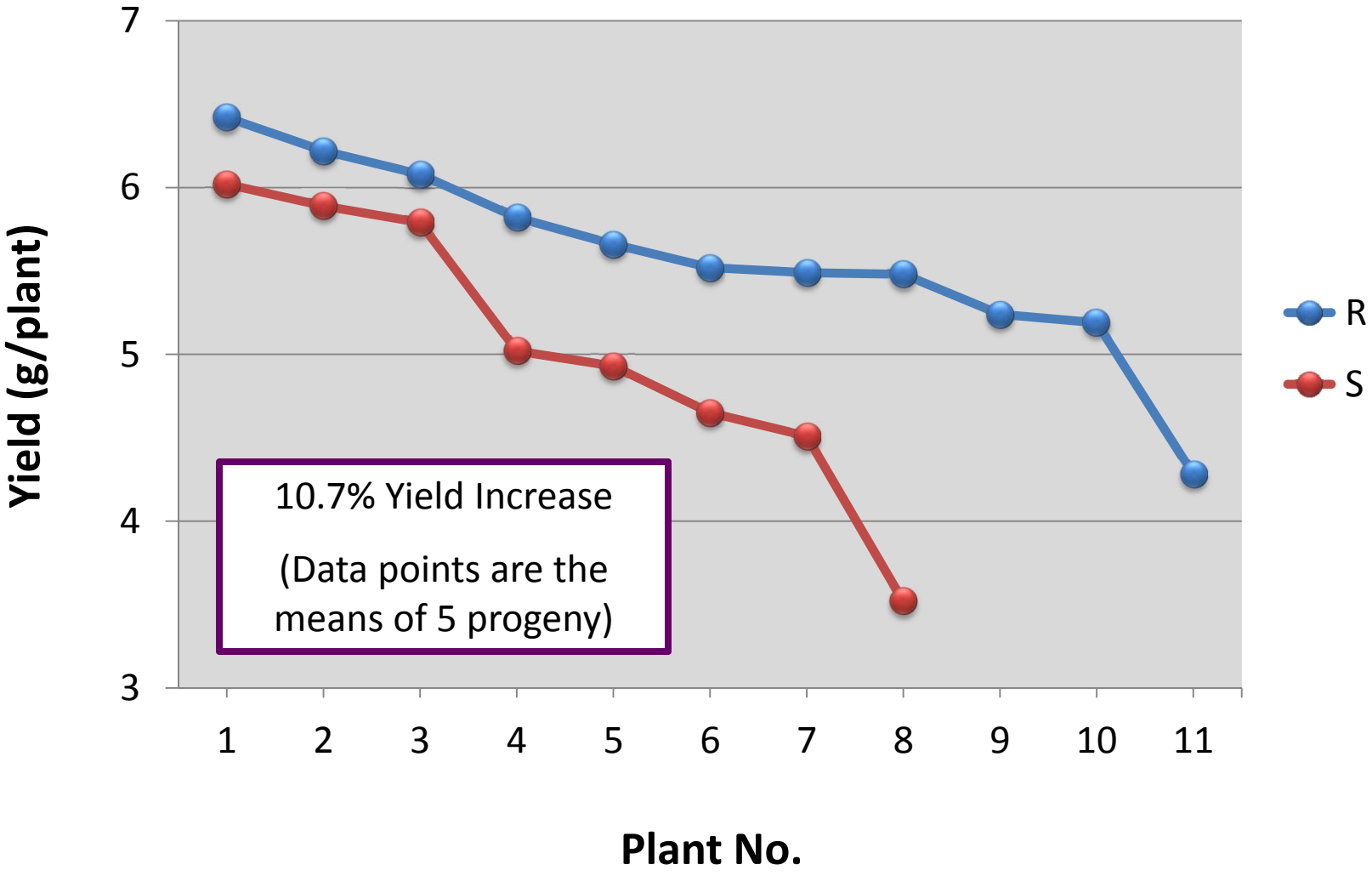


CUMULATIVE HEIGHT OF RESISTANT COMPARED TO SUSCEPTIBLE SIBS (PLANTED IN HEAVILY INFESTED SOIL CORES)

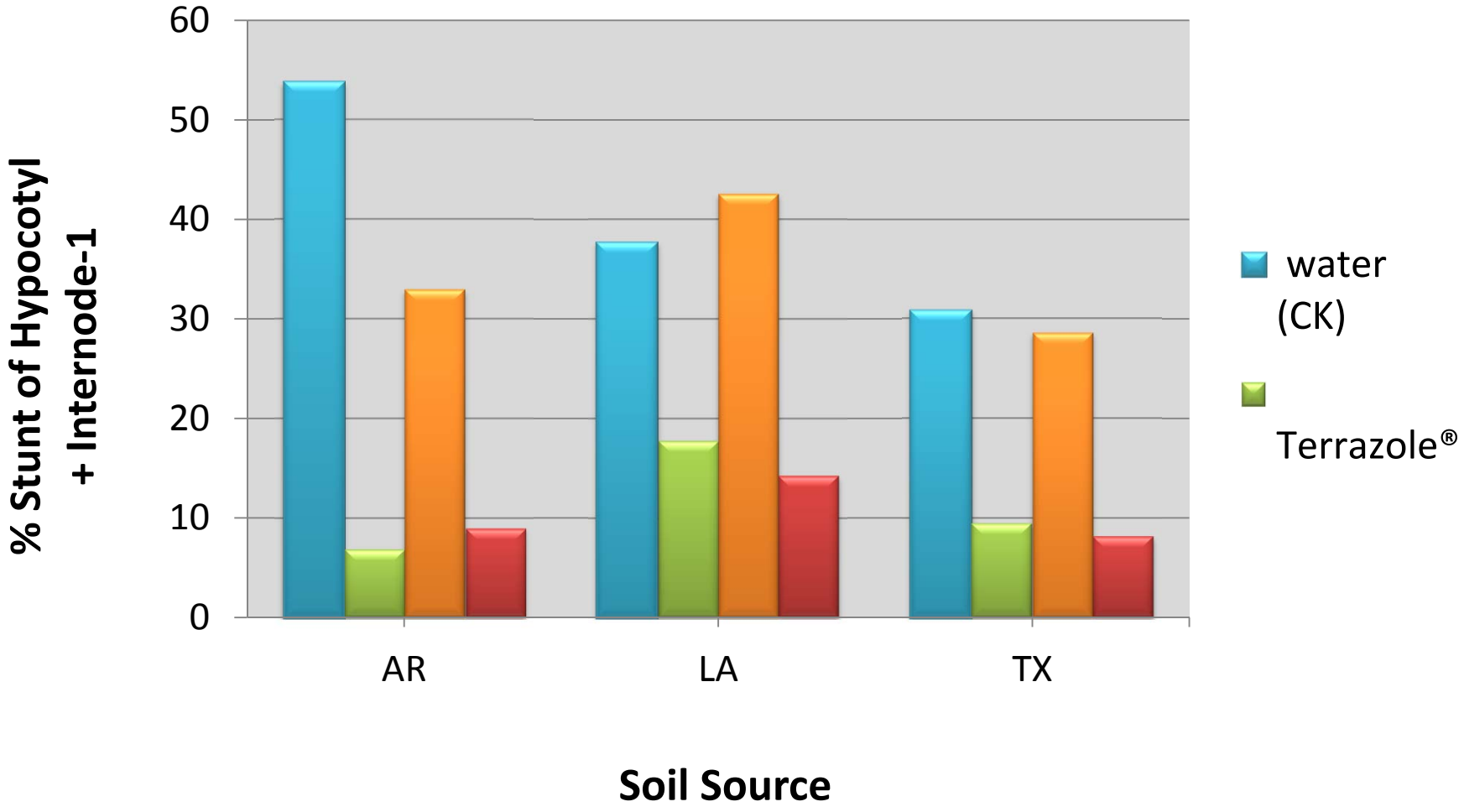



Yield From Plants with
Heavily Infested Soil Cores
Susceptible
Resistant

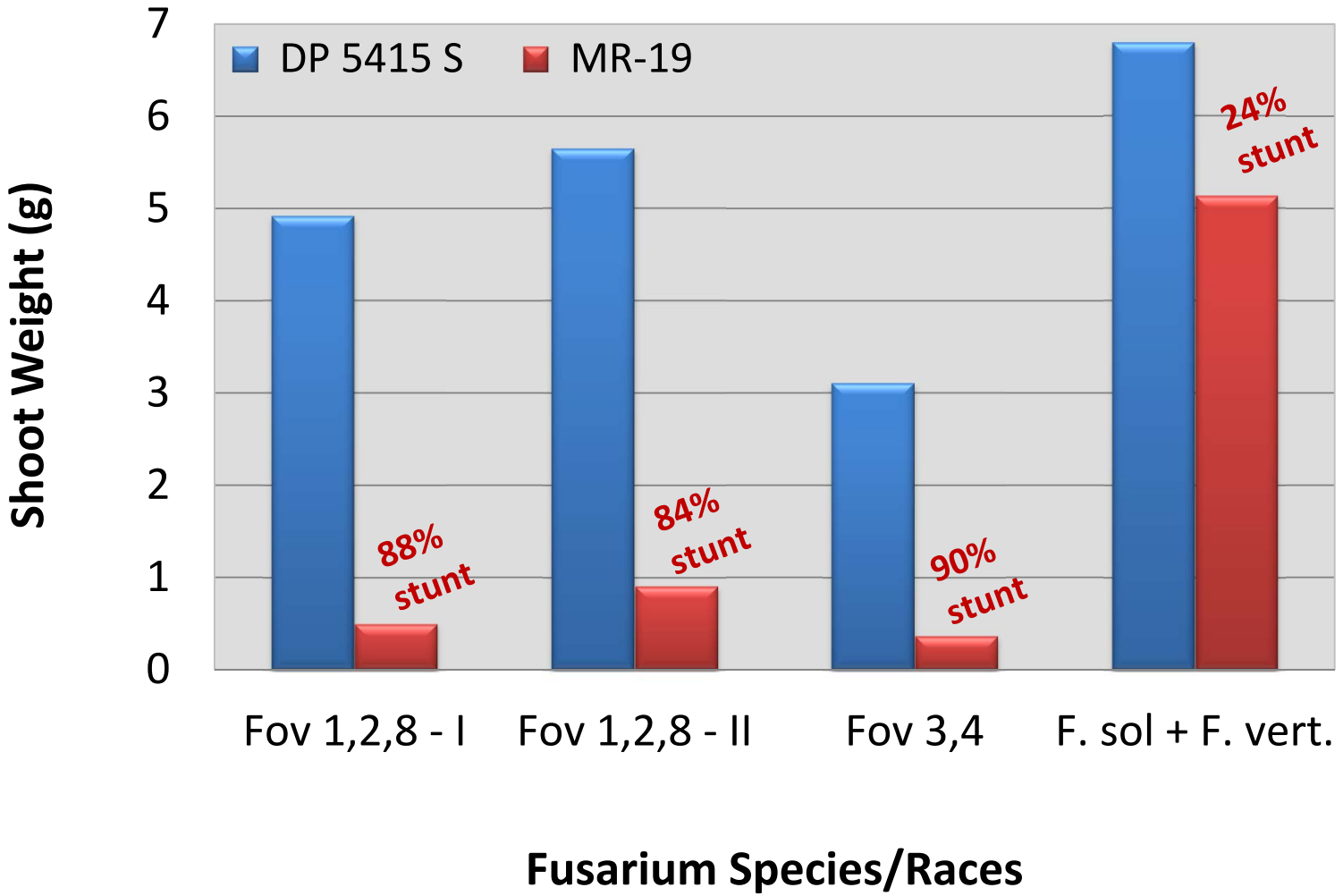
VARIATIONS IN YIELD OF DELTAPINE 458 NEAR ISOLINES (BC_7 PROGENY FROM BC_6S_1 PLANTS)



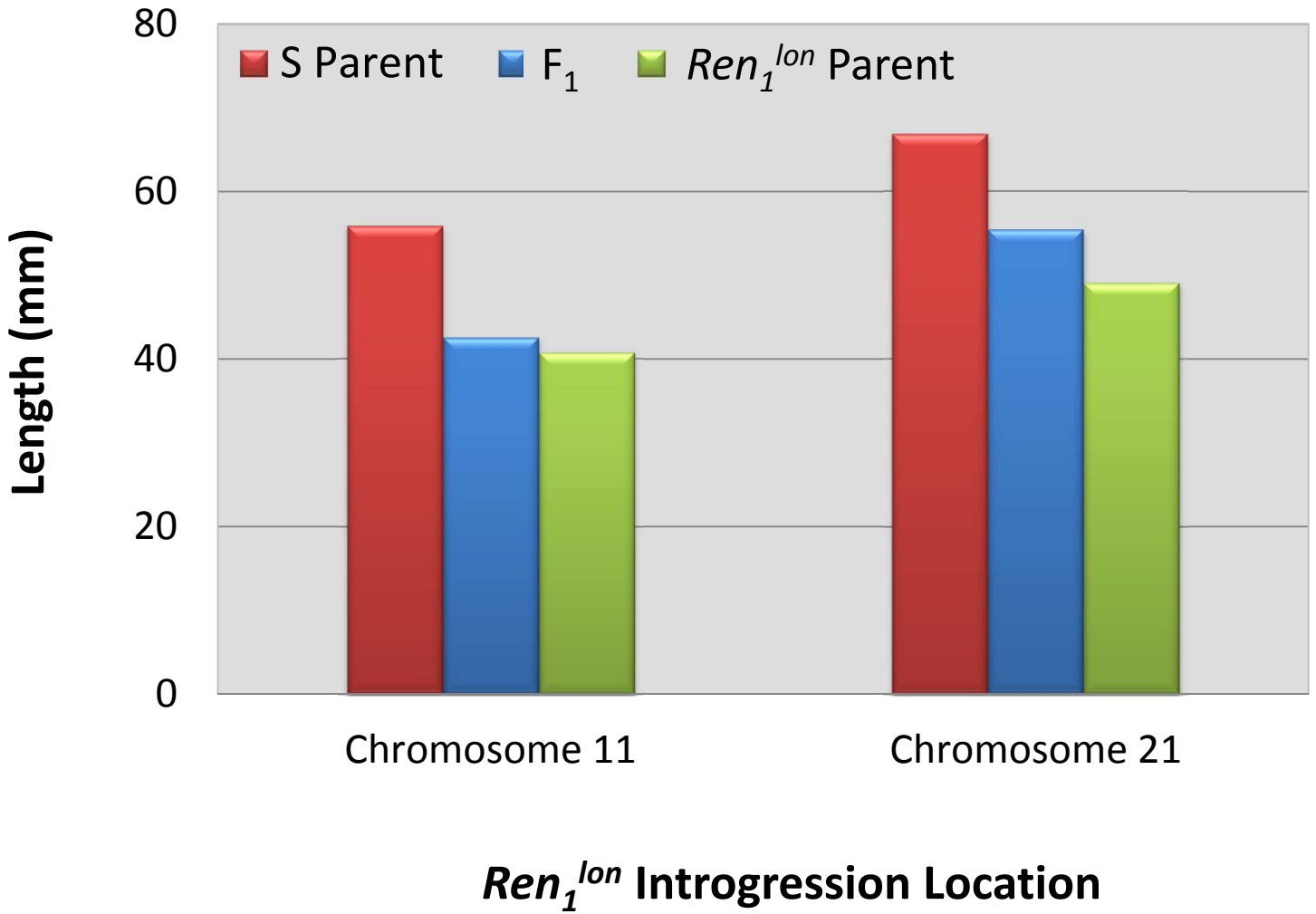
EFFECTS OF FUNGICIDES ON PERCENT STUNTING (NEMATODE RESISTANT VS. SUSCEPTIBLE SIBS) IN THREE NATURALLY-INFESTED SOILS



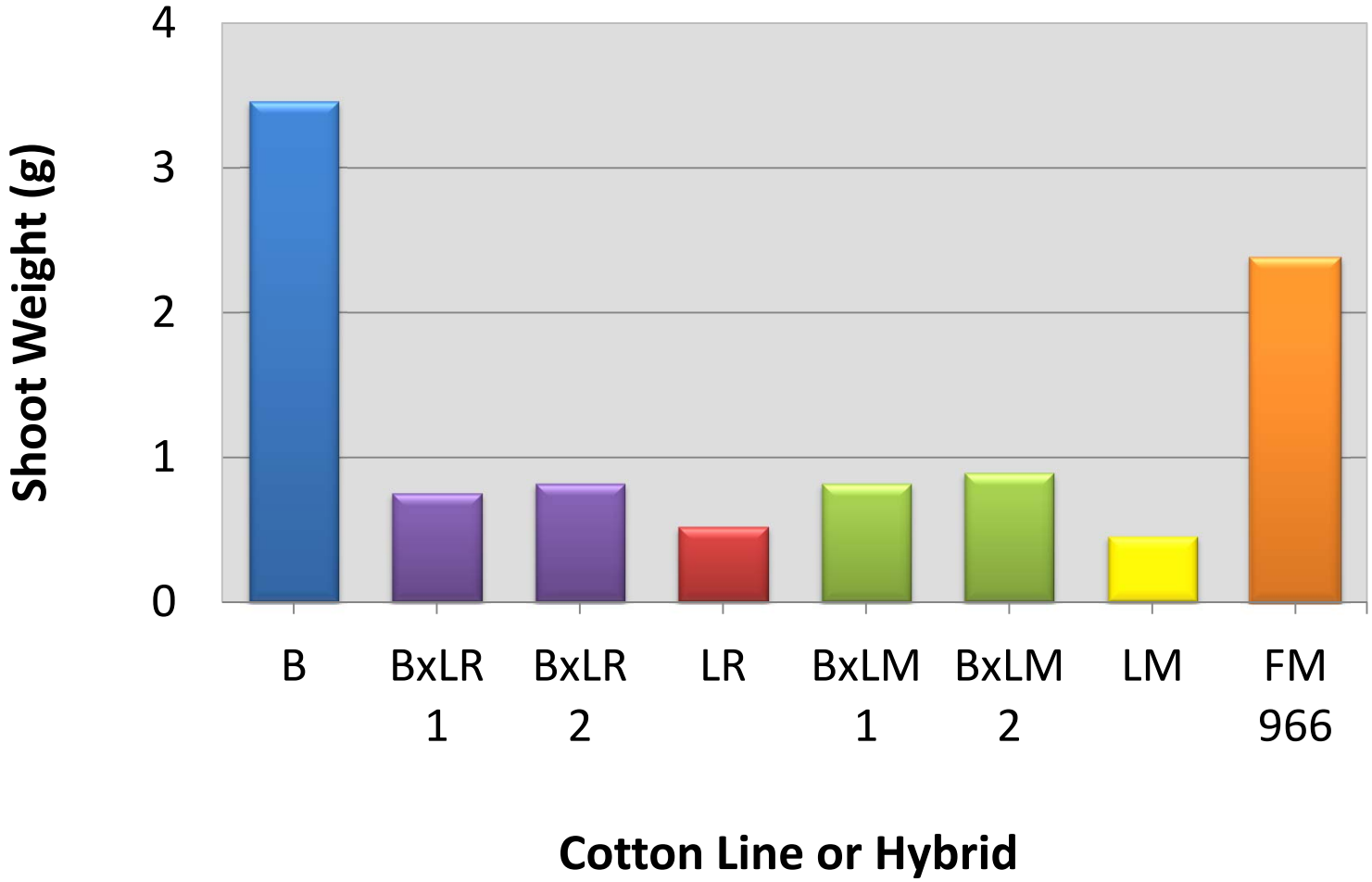
EFFECT OF *Fusarium* SPECIES ON STUNTING CAUSED BY RENIFORM-*Thielaviopsis* COMPLEX



MEAN EFFECT OF THE *Ren*$_1^{lon}$ GENE ON HYPOCOTYL LENGTH IN CHROMOSOME 11 VERSUS 21



SHOOT WEIGHTS OF 18-DAY-OLD HYBRIDS OF LONREN (LR, LM) X BAR 6-1-2 (B) COMPARED TO PARENTS AND FIBERMAX 966 IN STUNT BIOASSAY



Attempts to Recombine Reniform Resistance (*Ren_1^{lon}*) and Stunt Resistance in a LONREN Line

1) About 10,000 F_2 progeny derived from more than 2,000 F_1 plants (heterozygous for the BNL 3279_114 marker and resistant to reniform nematode) were screened for resistance to stunt caused by a reniform nematode-*Thielaviopsis* complex. These plants represented all 28 LONREN families.

2) Close to 3,000 of these F_2 stunt-resistant selections were screened for BNL 3279_114.

3) Nearly 200 of the F_2 selections contained BNL 3279_114, and were increased for seed which was used to retest for stunt resistance and homozygosity of the marker.

4) F_3 and F_4 seed from plants confirmed to be stunt-resistant and homozygous for BNL 3279_114 were screened for resistance to reniform nematode.

5) Seven and two stunt resistant lineages homozygous for BNL 3279_114 on Chromosome 11 and 21, respectively, were obtained. All lost nematode resistance and the BNL 1231 repulsion marker for *Ren_1^{lon}*.