

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)

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

$AADD \times FF \longrightarrow (FAD)^2 \times DD \longrightarrow (FADD)$

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

$AADD \times AA \longrightarrow (AAD)^2 \times FF \longrightarrow (AADF)$

DD = *G. armourianum*

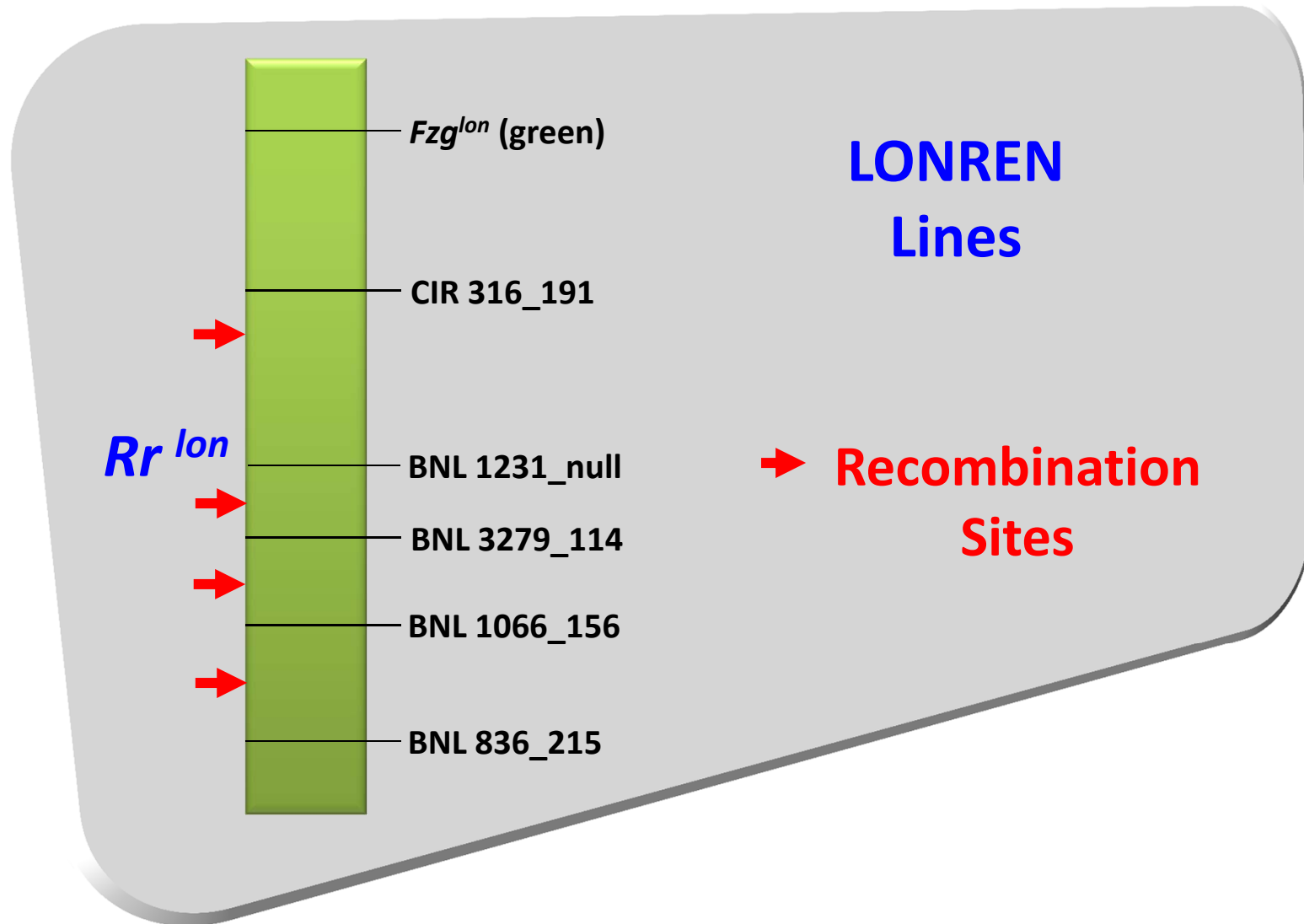
AA = *G. herbaceum*

LONREN BACKCROSS-1 FAMILIES

1. HLA-A Group (4 random BC₁ male parents)
8 families derived from backcross-1 plants:
2, 77A, 83, **84***, 85, 103A, 122, and 132
2. HLA-B Group (Acala NemX BC₁ 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 BC₁ 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 ₆ S 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 ₇ S 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 ₇ S 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 BC₇S₁ 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 BC₇S₁ 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)

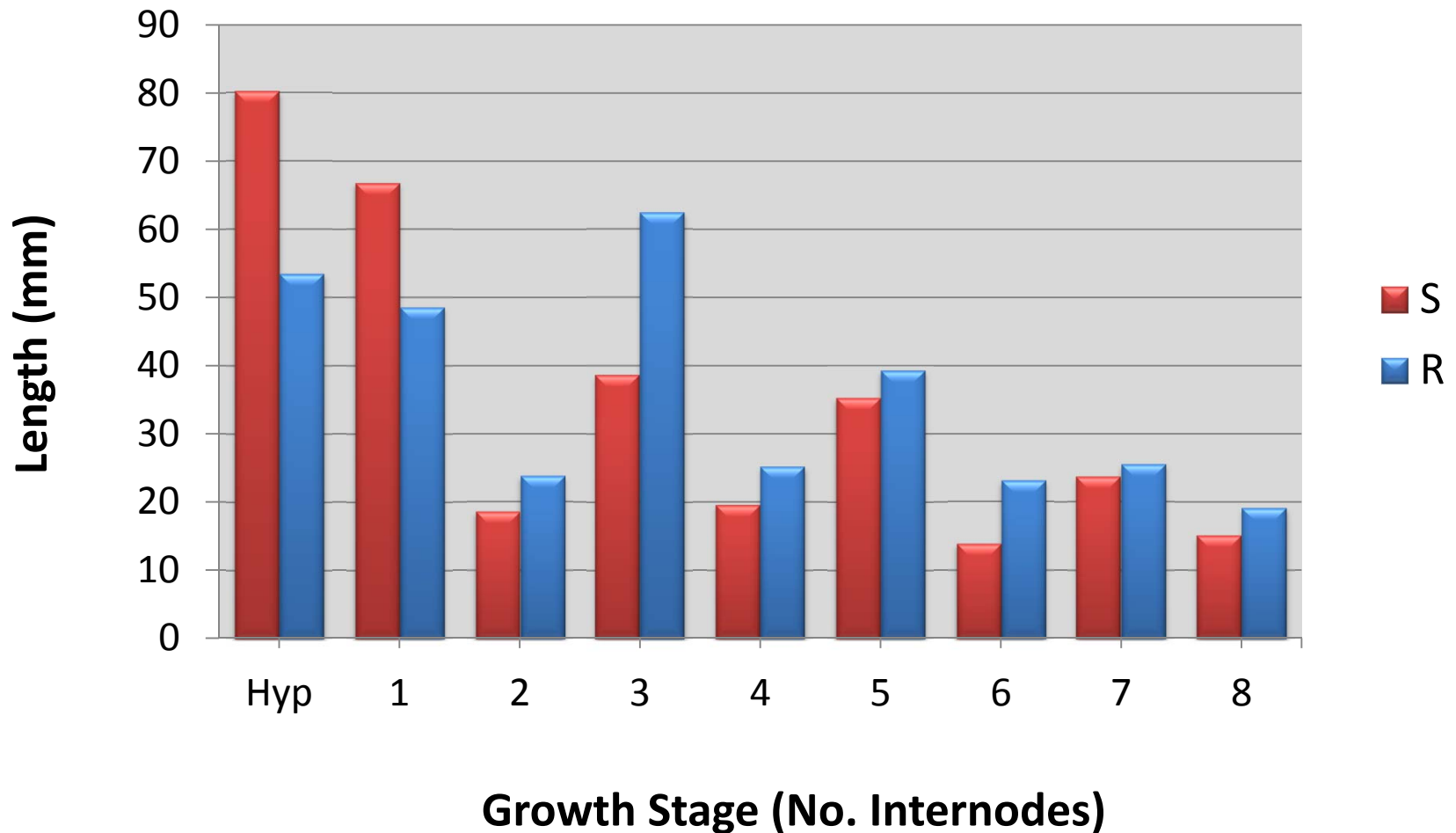


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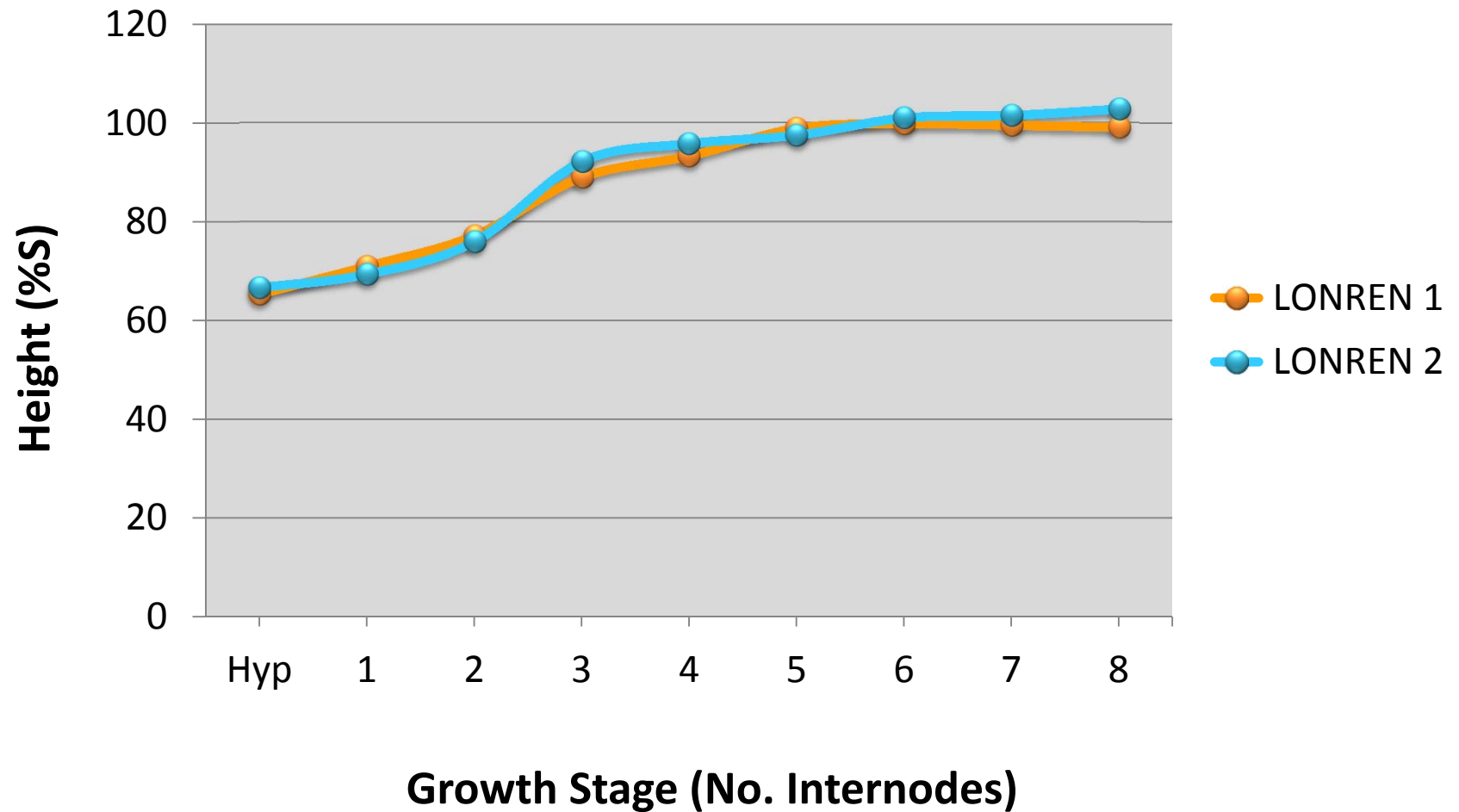


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**HYPOCOTYL AND INTERNODE LENGTHS OF
RESISTANT AND SUSCEPTIBLE LONREN-1 SIBS
(PLANTED IN HEAVILY INFESTED SOIL CORES)**



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



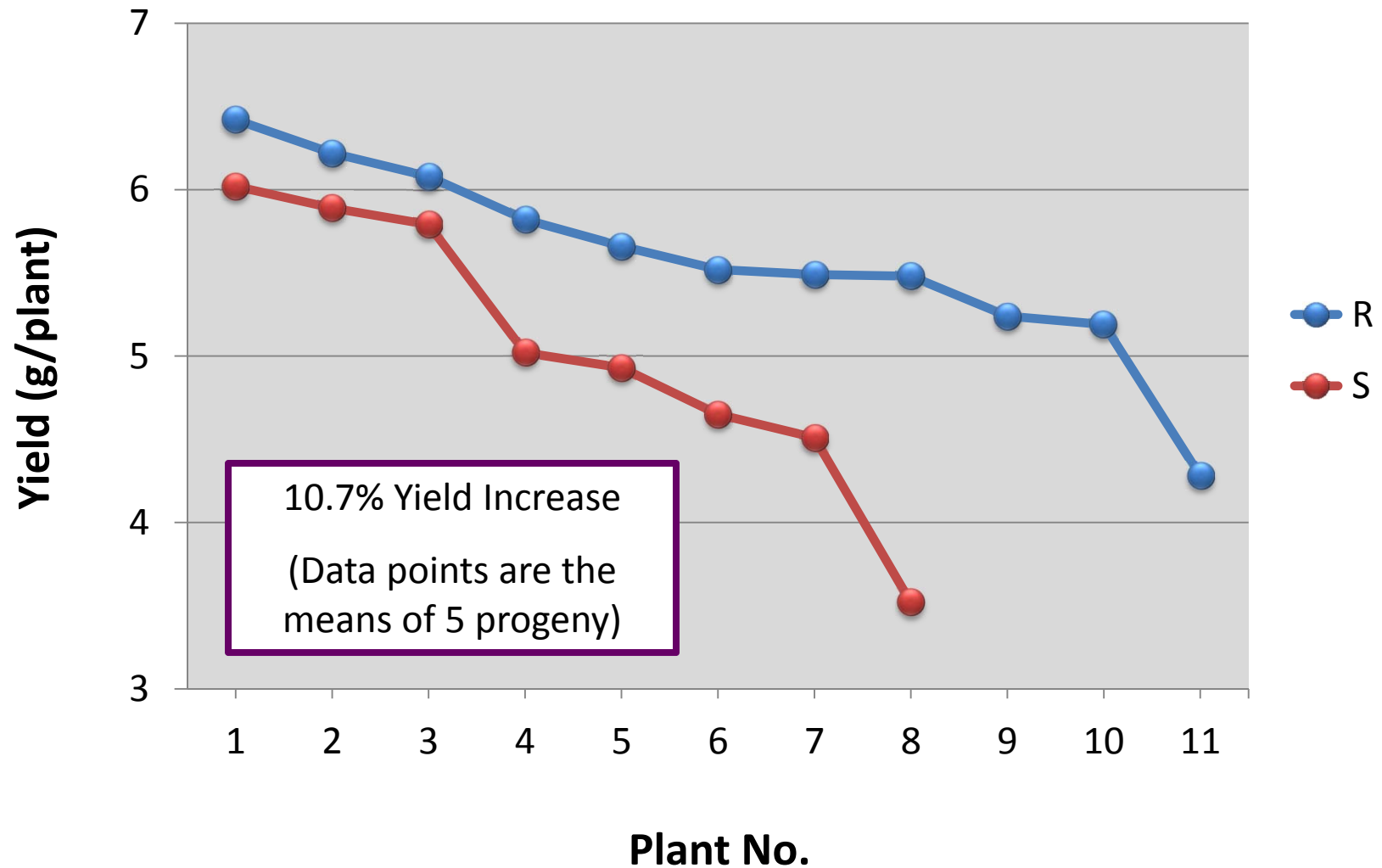
Yield From Plants with Heavily Infested Soil Cores

Susceptible

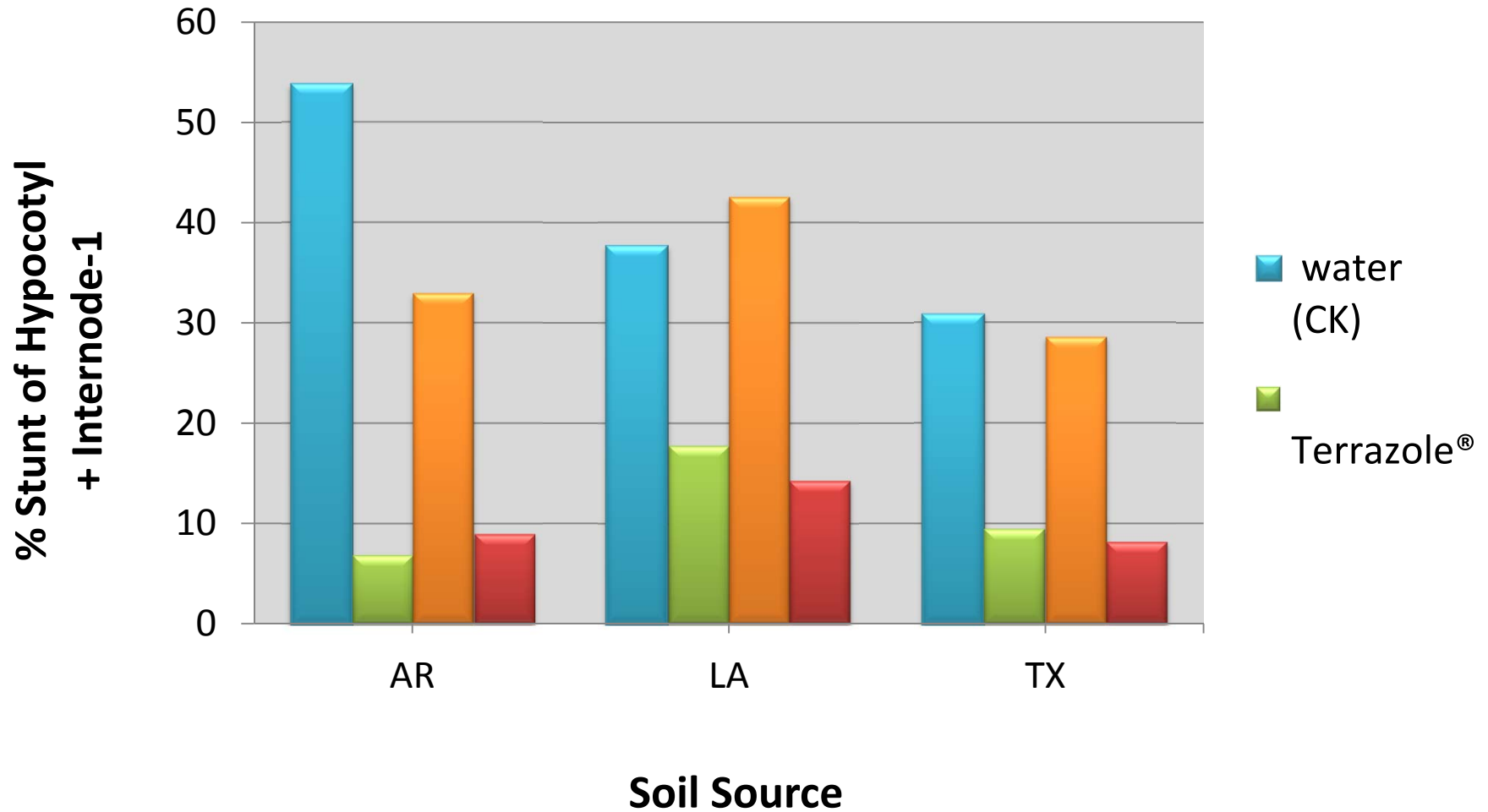
Resistant



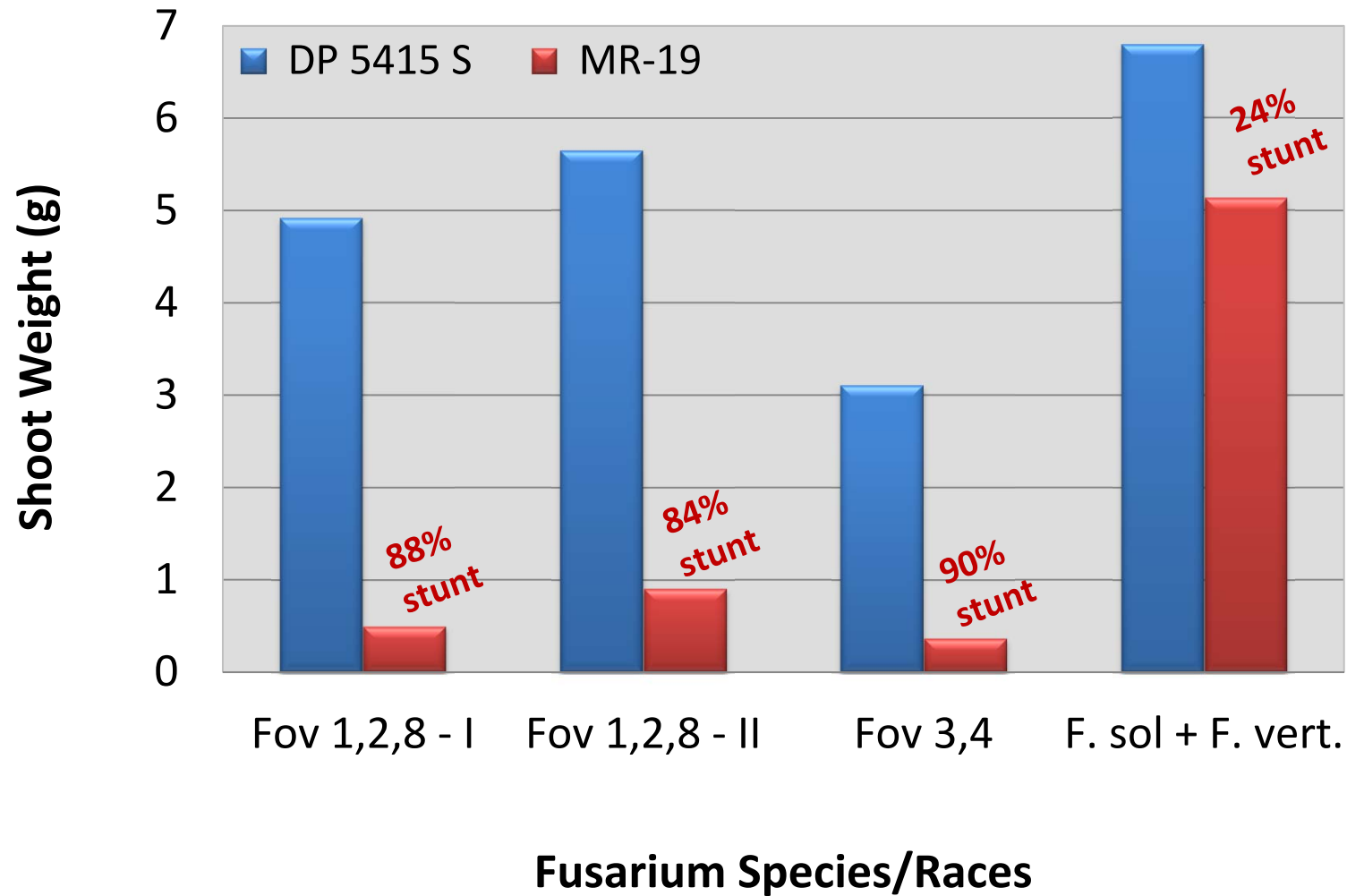
VARIATIONS IN YIELD OF DELTAPINE 458 NEAR ISOLINES (BC₇ PROGENY FROM BC₆S₁ PLANTS)



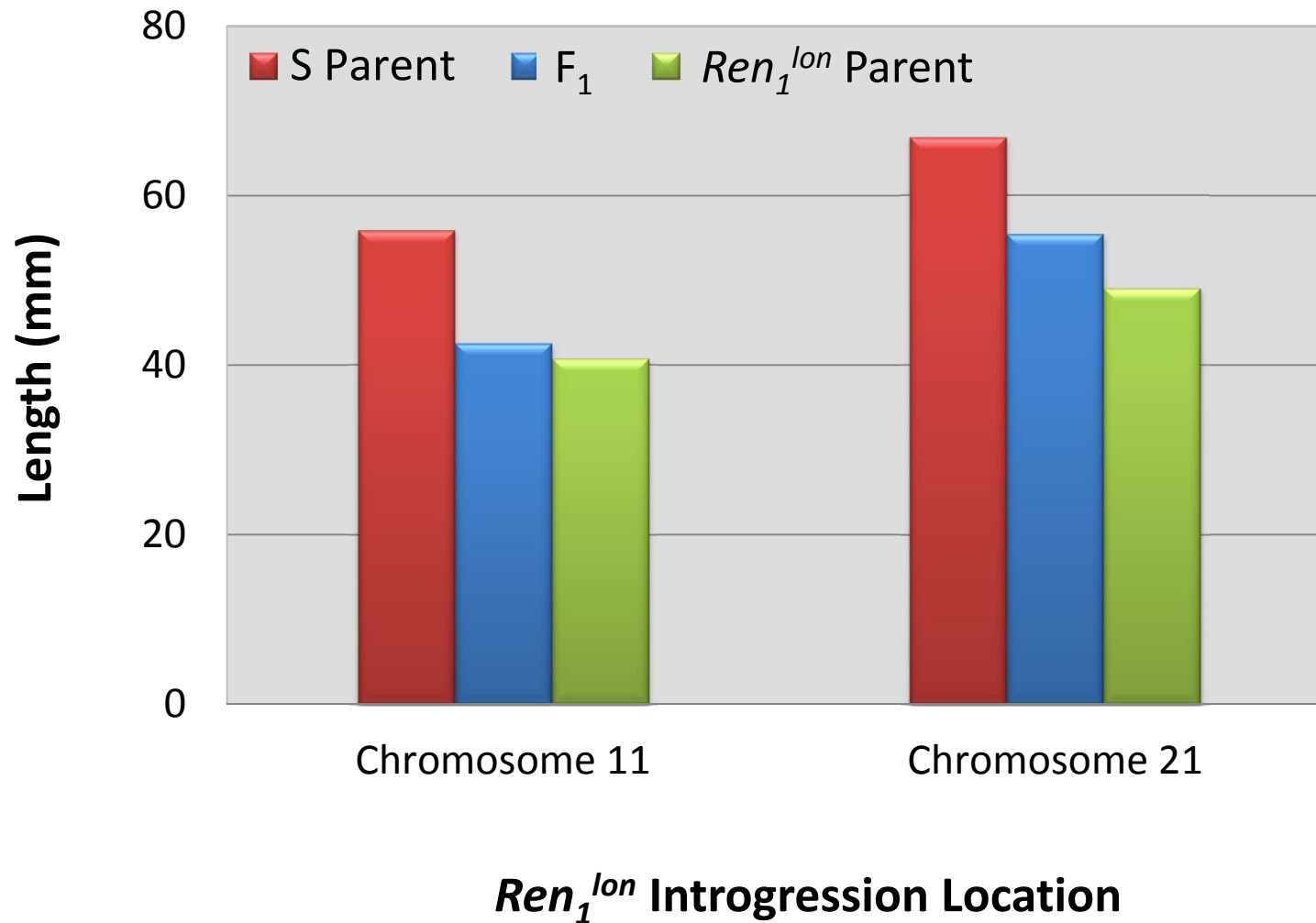
**EFFECTS OF FUNGICIDES ON PERCENT STUNTING
(NEMATODE RESISTANT VS. SUSCEPTIBLE SIBS)
IN THREE NATURALLY-INFESTED SOILS**



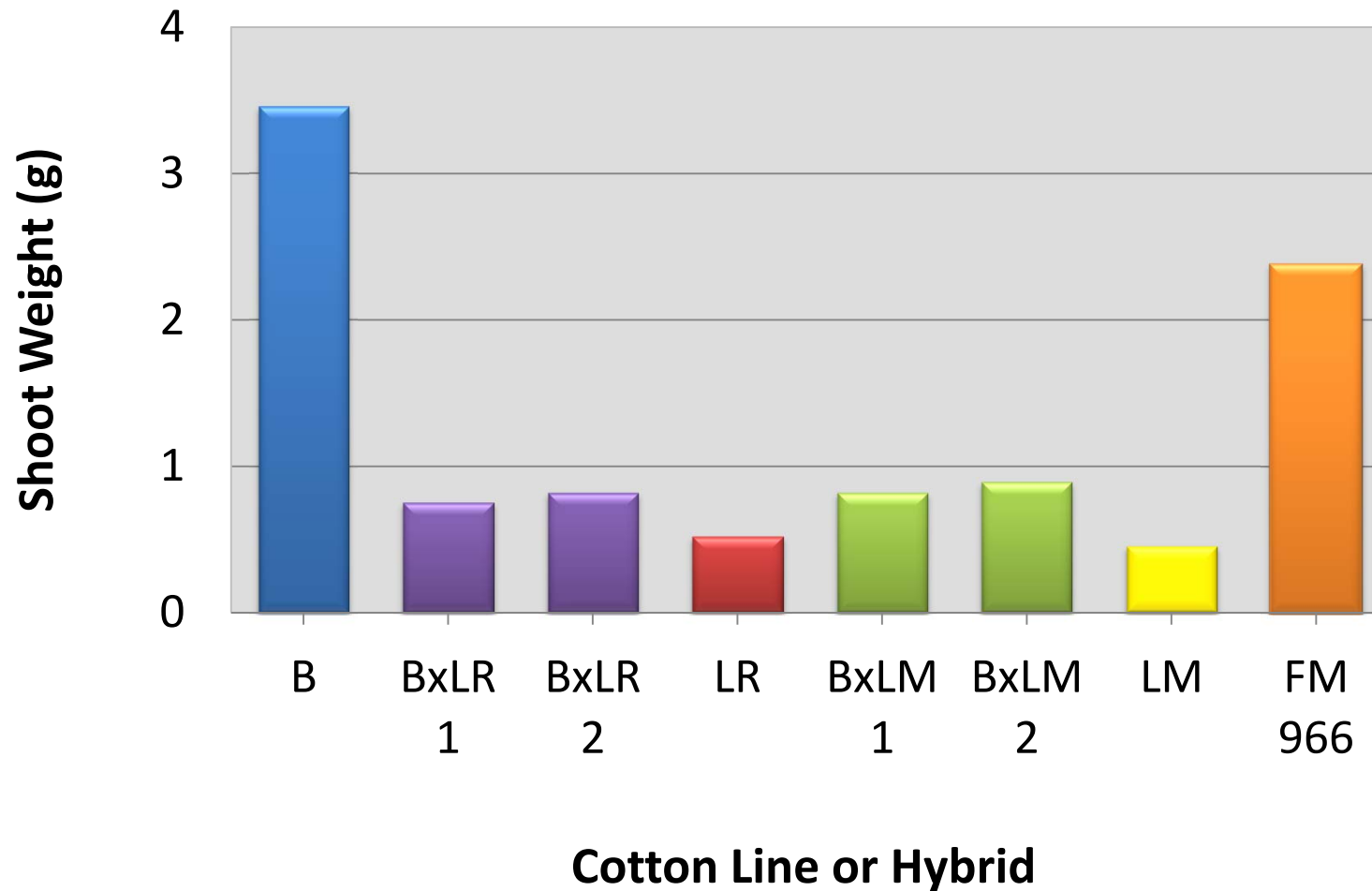
EFFECT OF *Fusarium* SPECIES ON STUNTING CAUSED BY RENIFORM-*Thielaviopsis* COMPLEX



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 (*Ren₁^{lon}*) and Stunt Resistance in a LONREN Line

- 1) About 10,000 F₂ progeny derived from more than 2,000 F₁ 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 F₂ stunt-resistant selections were screened for BNL 3279_114.
- 3) Nearly 200 of the F₂ selections contained BNL 3279_114, and were increased for seed which was used to retest for stunt resistance and homozygosity of the marker.
- 4) F₃ and F₄ 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 *Ren₁^{lon}*.