Comparative Performance of BARBREN and LONREN

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BARBREN-713 activities at Auburn

Since April 2011, four BARBREN related activities were started:

(1) Uniform Field Evaluation of BARBREN

conducted in collaboration with LSU Agricultural Center and Texas AgriLife Research

(2) Inclusion in ongoing Yield + Quality trial (LONREN-1 × Fibermax 966 progenies)

(3) Various inoculums assay in greenhouse

(4) BARBREN progeny development

These activities were supported by cooperative agreements from Cotton Incorporated

Activity 1

Uniform Evaluation of BARBREN-713 and LONREN 21-4

2 lines of interest
LONREN 21-4
GB 6-1-2
a.k.a. BARBREN-713

4 checks
DP5415
ST5288B2F
PHY375WR
FM9160B2F

3 locations
Belle Mina, AL
Lubbock, TX
St. Joseph, LA

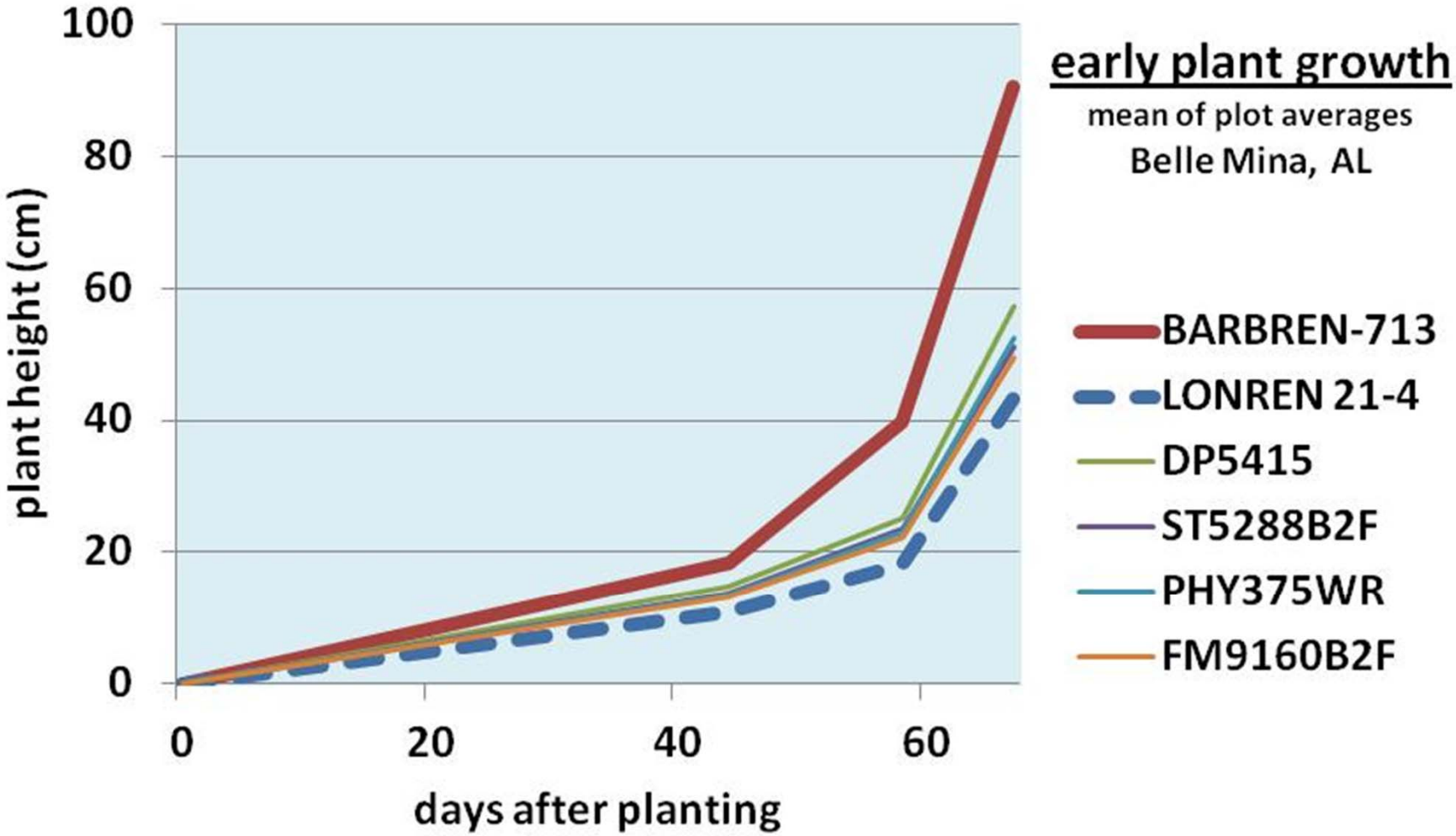
Common design
6 x 6 Latin Square
2 row plots - 50 ft ea.
common fungicide treatment
4 seed / foot

field data
nematode counts
(pre-plant and mid-August)
stand count (30 DAP)
plant heights (45 DAP)
node count (45 DAP)
yield and turnout
fiber analysis

root analysis
10 seedlings/plot
(excavate at 30 DAP)
nematode count
egg count

seedling development

at the 2011 uniform evaluation test



Belle Mina, July 14, 2011 (58 days after planting)

plot 301 – BARBREN-713 **plot 302 - LONREN 21-4**

four row plots

Seed cotton Yields

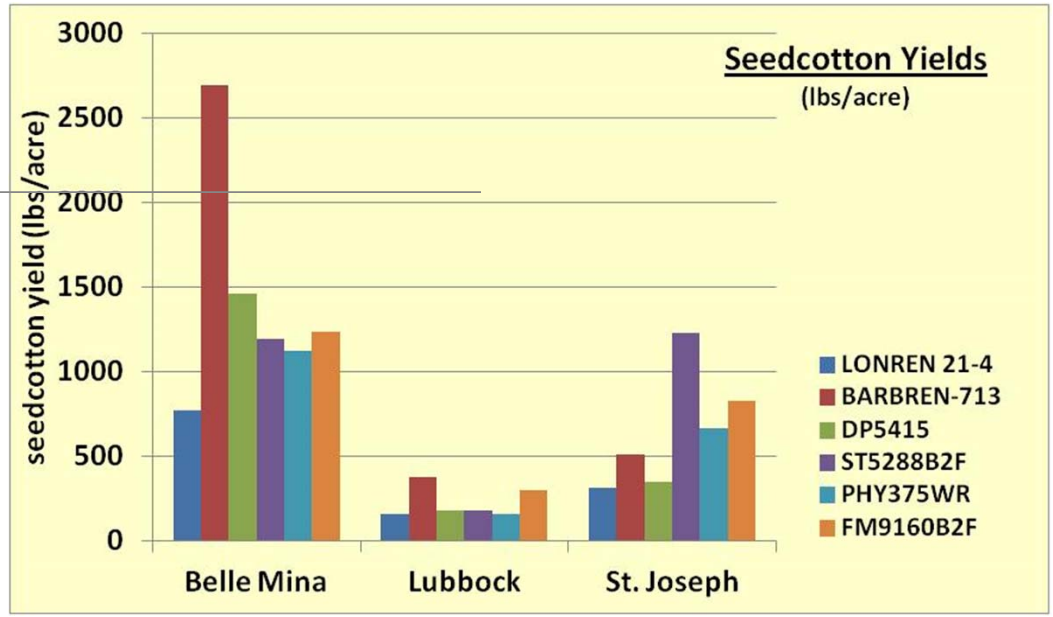
variety	Belle Mina (1)		Lubbock (1)		St. Joseph (2)	
	---------- lbs/acre ----------					
LONREN 21-4	776	c (3)	163	b	317	c
BARBREN-713	2698	a (4)	381	a	513	bc
DP5415	1462	b	181	b	350	c
ST5288B2F	1196	bc	184	b	1232	a
PHY375WR	1124	bc	161	b	666	bc
FM9160B2F	1235	bc	304	a	827	b
$LSD_{0.05}$	549		109		400	

(1) Belle Mina and Lubbock: means from 6 replications

(2) St. Joseph: means from 4 replications

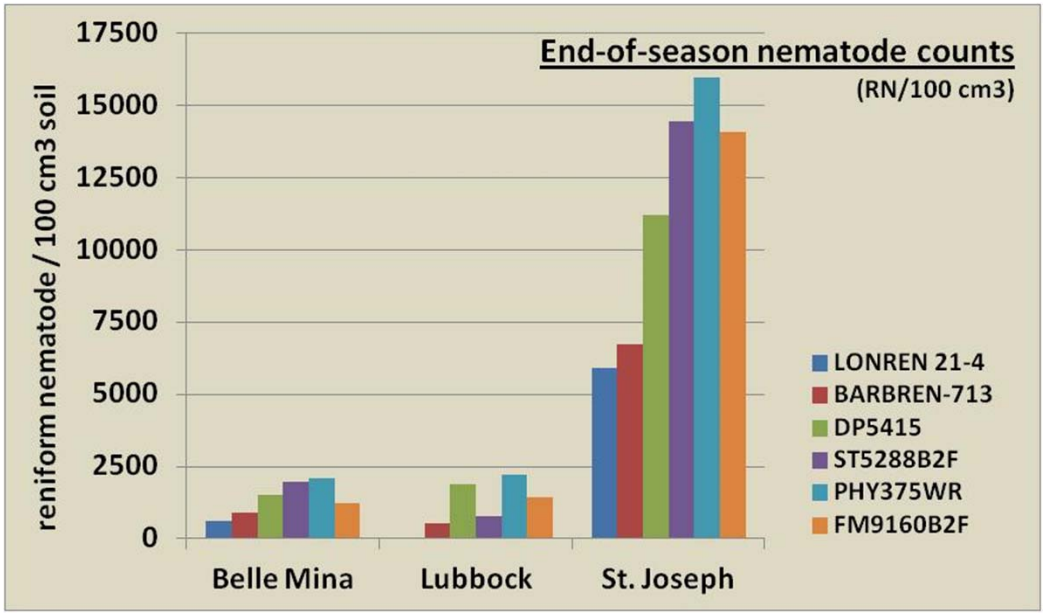
(3) Means in columns followed by the same letter do not differ significantly at the 0.05 probability level

(4) Lint percentage = 37.5%; lint yield = 1015 lbs/acre



End of season reniform nematode counts

variety	Belle Mina (1)	Lubbock (1)	St. Joseph (1)
	---------- reniform nematode per 100 cm3 soil ----------		
LONREN 21-4	601 c (2)	23 d	5911 c
BARBREN-713	893 bc	533 bcd	6709 bc
DP5415	1519 abc	1893 ab	11221 abc
ST5288B2F	1983 ab	767 bcd	14432 a
PHY375WR	2086 a	2233 a	15957 a
FM9160B2F	1245 abc	1447 abc	14091 ab
$LSD_{0.05}$	1196	1223	7597



(1) all locations: data are means of 6 replications

(2) Means in columns followed by the same letter do not differ significantly at the 0.05 probability level

Activity 2

Inclusion of BARBREN-713 in ongoing Yield + Quality trial

* Second year of progeny testing of the cross LONREN-1 × FM966 (F2:5 seed planted in 2011)
* Consist of 20 RN resistant lines + 20 RN susceptible lines + 4 checks
* Conducted at Tennessee Valley Research Station (Belle Mina)
* Conducted on two adjacent fields:
  - one inoculated with reniform nematode
  - one free of reniform nematode (verified yearly)

Field view - 58 days after planting

TVREC - July 14, 2011

row 2227	row 2228	row 2229	row 2230
LONREN 21-4	LONREN-1	LONREN-1 x FM966 resistant line A107	BARBREN-713

single row plots

Results of the Yield and Quality test 2011

Lint Yield (summary)

group	Lint yield group means (lbs/acre)			
	RN present		RN absent	
	Estimate	StdErr	Estimate	StdErr
BARBREN-713	979	± 186	731	± 77
LONREN 21-4	525		721	
RN resistant lines (1)	782	± 43	920	± 20
RN susceptible lines (2)	921	± 42	962	± 20
LONREN-1 and -2	746	± 132	906	± 55
Susceptible checks (3)	1044	± 132	1031	± 55

Reniform Nematode Counts (summary)

group	36 days after planting	4 days after harvesting	season increase
	(RN/150cm3 of soil)		(%)
BARBREN-713	973	1916	+ 97
LONREN 21-4	464	1097	+ 137
RN resistant lines (1)	1126	1242	+ 10
RN susceptible lines (2)	1031	2813	+ 173
LONREN-1 and -2	765	1406	+ 84
Susceptible checks (3)	1035	3160	+ 205

(1) 20 RN resistant lines of the cross LONREN-1 × FM966
(2) 20 RN susceptible lines of the cross LONREN-1 x FM966
(3) FM966 and DP393

Fiber Quality (summary)

		group means of selected fiber quality traits					
		Upper Half		Uniformity			Short Fiber
group	turnout	Mean	Micronaire	Index	Strength	Elongation	Content
	(%)	(inch)	(-)	(%)	(g/tex)	(%)	(%)
Nematode present:							
BARBREN-713	36.8	1.11	4.3	82.9	30.3	5.9	7.3
LONREN 21-4	38.5	1.15	4.6	83.1	30.6	5.9	7.2
RN resistant lines (1)	39.2	1.14	4.5	84.2	33.2	5.7	6.8
RN susceptible lines (2)	39.0	1.14	4.5	83.6	31.1	6.0	7.1
LONREN-1 and -2	39.5	1.13	4.3	83.4	30.7	5.7	7.2
Susceptible checks (3)	39.4	1.19	4.5	84.8	32.6	6.2	6.9
Nematode absent:							
BARBREN-713	38.8	1.11	4.6	82.8	32.2	4.2	7.2
LONREN 21-4	39.0	1.12	4.8	84.2	33.1	4.5	7.0
RN resistant lines	40.1	1.12	4.7	84.5	34.2	4.2	6.6
RN susceptible lines	40.8	1.13	4.7	84.3	32.1	4.6	6.7
LONREN-1 and -2	40.3	1.12	4.5	84.6	32.0	4.3	6.6
Susceptible checks	42.1	1.16	4.6	85.0	32.6	4.8	6.6

(1) 20 Reniform Nematode resistant lines of the cross LONREN-1 × FM966

(2) 20 Reniform Nematode susceptible lines of the cross LONREN-1 × FM966

(3) FM966 and DP393

Activity 3

Various inoculums assay

Similar to an assay conducted in 2010

see *Nematropica* 2011, Vol. 41, No. 1, pp. 68-74

Seven genotypes

RN resistant: BARBREN-713, LONREN 21-4, LONREN-1 and -2

RN susceptible: FM966, DP393 and line B211 (of LONREN-1 × FM966)

10 replications (2 for intermediate observations)

Six inoculum levels

0 - 500 - 1000 - 5000 - 10,000 - 50,000 RN per 150 cm3 of soil

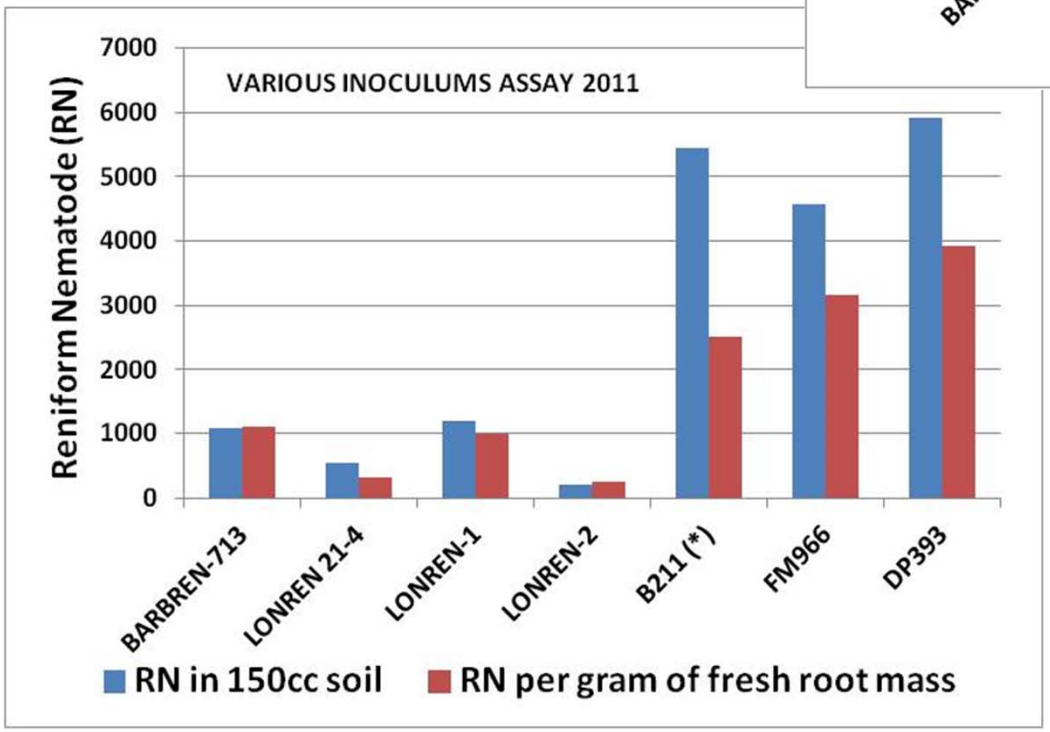
Reniform Nematode extraction at 60 DAI

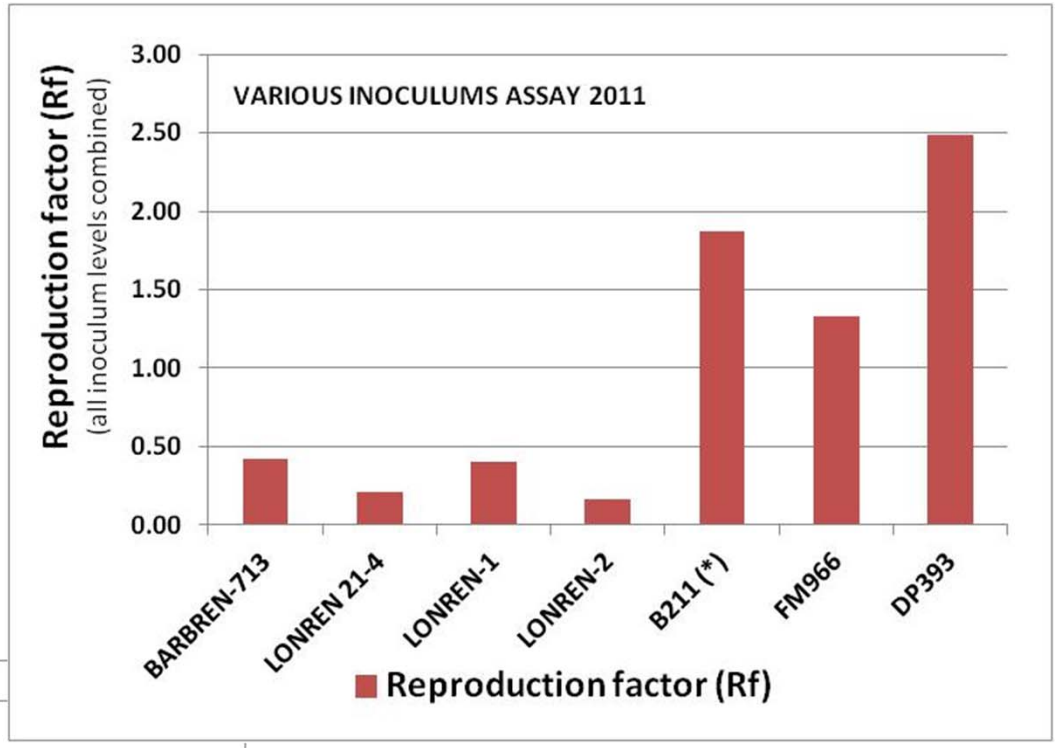
all seedlings photographed after extraction

data on fresh shoot and root mass collected

Combined results across all inoculum levels

Extracted reniform nematode:
- **per cone-tainer (150 cm3)**
- **per gram of fresh root mass**





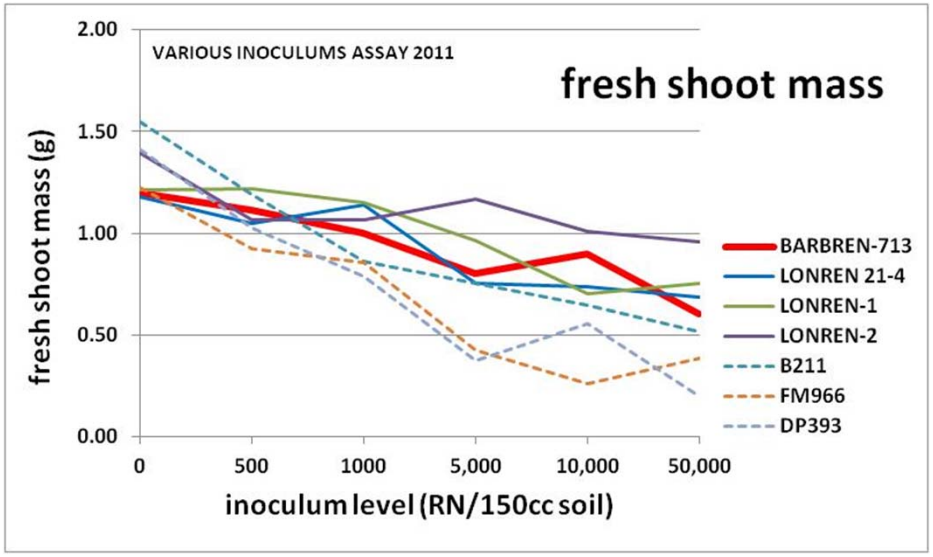
Reproduction factors

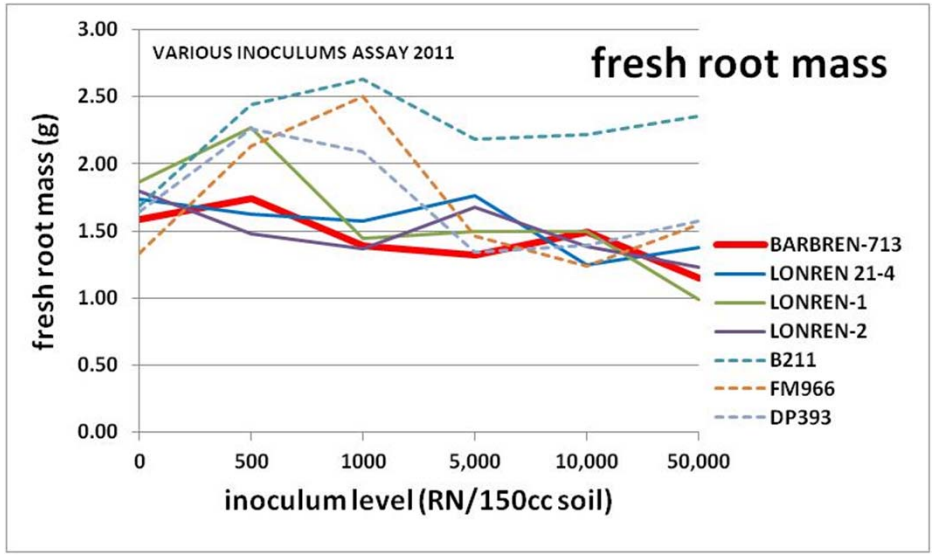
(*) B211 is a RN susceptible line of the cross LONREN-1 x FM966

BARBREN-713

At 60 DAI, roots of BARBREN-713 showed, in general, less damage than those of the LONREN lines, but results <u>varied</u> widely.

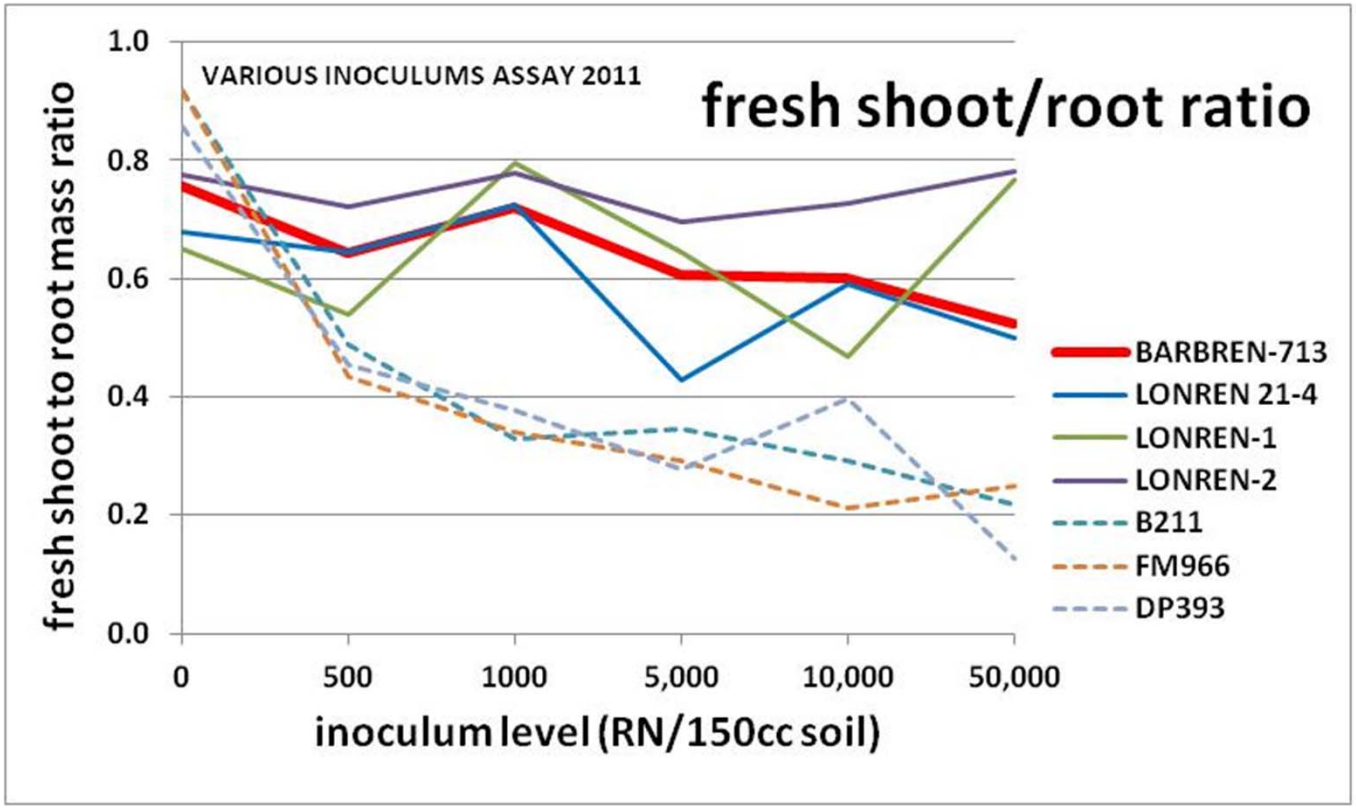
LONREN 21-4





Shoot and root development

In this assay BARBREN-713 simulated the behavior of the LONREN lines



Summary of conclusions of the BARBREN-713 studies

BARBREN-713 limits reniform nematode reproduction

compared to non-resistant RN genotypes, though this
RN reproduction reduction seems to be less than achieved with LONREN lines

BARBREN-713 does not show signs of seedling stunting

BARBREN-713 yields on RN infested fields are encouraging

due to varied nature of the interaction between cotton and reniform nematode, more field experience in a range of environments is required to allow for a more qualified conclusion

BARBREN-713 fiber quality is acceptable

a breeding program incorporating the RN resistance of BARBREN-713 into high yielding, high quality germplasm lines could combine desired traits

BARBREN-713's mechanism of RN resistance needs further investigation

more physiological and histological information is required

activity 4

BARBREN-713 breeding program

Currently underway:

cross LA06307025 × BARBREN-713 made in Summer 2011

LA06307025 is a high yielding RBTN entrant

F_1 planted at Mexico winter nursery

5 other crosses with BARBREN-713 made later in 2011

including one with RN resistant lines of LONREN-1 × FM966

generation advancement currently underway in greenhouse

Planned:

$F_{2:3}$ populations will be generated during the growing season of 2012

RN resistance screening will start in October 2012 and continue till Spring 2013

Advancement to $F_{2:4}$ and seed increase will be done during 2013

Field evaluation, including RN stress tests, will commence in 2014