



Breeding for SCN Resistance in the South



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Importance of SCN in So. USA 2008-09

(Steve Koenning disease loss est. So. States)

Yield loss to SCN as % of losses to all diseases

SCN accounts for 17% of all disease losses

All nematodes account for 35% of all losses
SCN, RKN and other nematodes

Importance

Do Farmers place high priority on SCN resistant seed?

- **SCN resistance sells seed – MO, AR, TN, NC**
- **Less important in GA, LA, MS**
- **Seed dealers like SCN resistance for added benefits over different conditions**

SCN RESISTANCE IS GOOD FOR SEED SALES

SCN Races in AR, TN, NC & MO

- SCN surveys- Races 2 and 5 or any race other than 3 and 14.
- SCN has adapted to Pickett (**Peking**) and Bedford (**PI88788**) types of resistance in which most SCN varieties trace.

Question

Are Peking & PI 88788 still effective?

- **Yes, when properly placed**
- **Some benefit, but need broader resistance**
- **Not as near as effective**

Question

**Do Southern farmers know if
they have SCN?**

- **Generally no**
- **A few cases – not many**
- **Better managers do**

Damage in Field With No Symptoms

- Yield Losses of Up to 30% Without Visible Symptoms



Last SCN Sample Submission for Egg Count



A close-up photograph of a dense field of green plants, likely a legume, showing signs of stress or disease. The leaves are mostly green but have numerous yellow and brown spots, characteristic of a viral infection like Soybean Mosaic Virus (SDS). The text "SDS associated with SCN" is overlaid in white, serif font in the center of the image.

SDS associated with SCN

SCN problems in 2012

Sample ID SCN per (250 cm³) soil

East MS

20625

S. ARK

28875

N. ARK

84500

S.E. MO

34,700

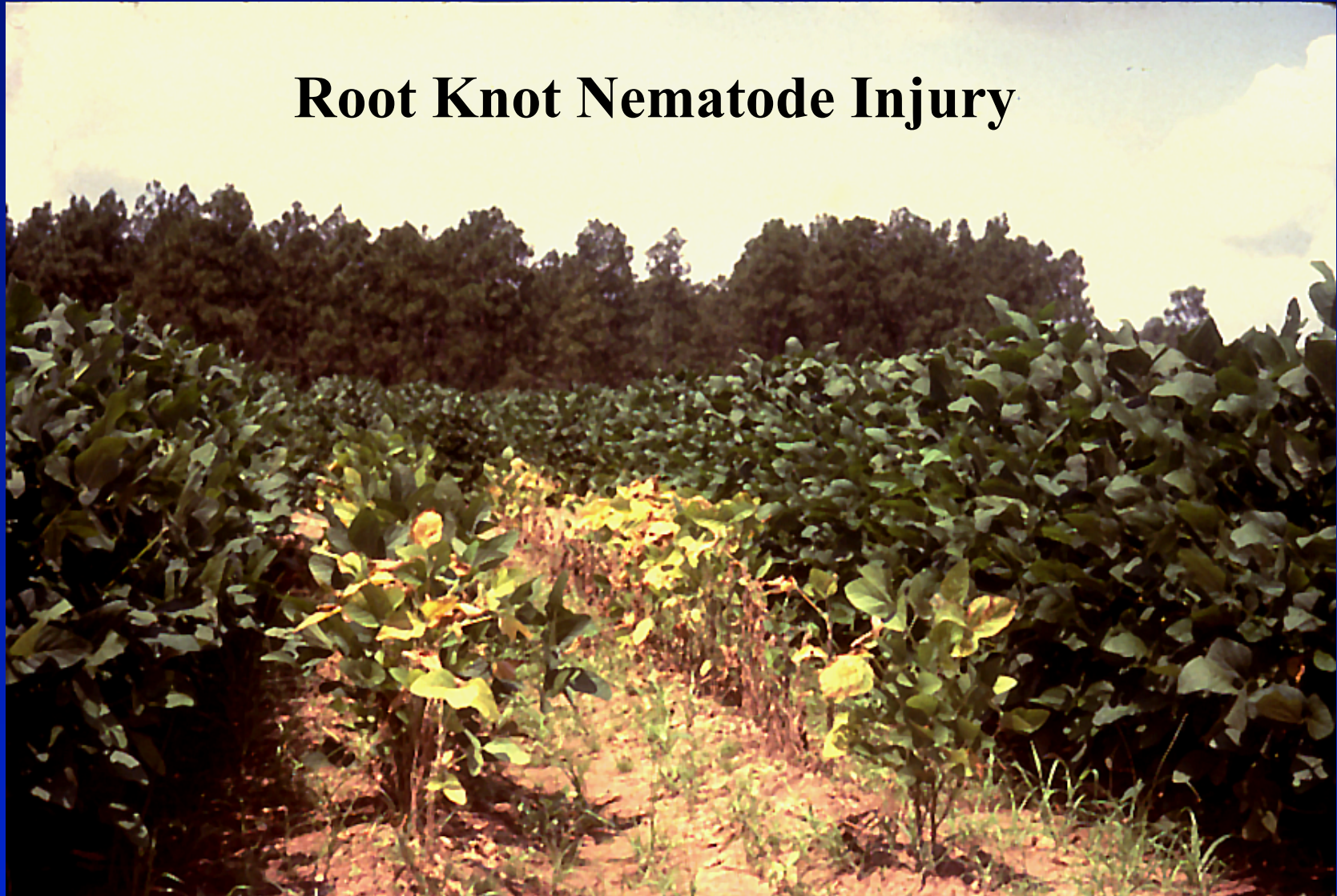
Why is there not more for concern for SCN in South?

Farmers do not know their SCN situation

Farmers are satisfied with the yields they are getting

- 1) Making 50 BU/A+ but could be making more (should be taking advantage of \$14 beans)
- 2) SCN varieties have tolerance as well as resistance and offer protection

Root Knot Nematode Injury



More sandy land from cotton to beans and corn

- **Corn, soybeans and cotton are all hosts to root knot nematode**
- **Reniform nematode is now a factor**

Need varieties resistant to both SCN & RKN

SCN & root knot are often in same field, so we need varieties resistant to both; however since SCN is primarily races 2 and 5 in southern fields- need to varieties that carry SCN resistance from sources other than PI 88788

Varieties with Hartwig type resistance

CONVENTIONAL

- **Jake*- RM 5.4**
- **S05-11482*- RM 5.0**
- **JTN5203- RM 5.2**

ROUNDUP READY

- **MPV 5214NRR*- RM 5.2**
- **Pioneer P95Y60*- RM 5.6**

***MR to SCN Races 1,2,3,5 &14 and RKN**

S10-11200 Key Features

- **Early Group 4 (RM 4.6) Conventional**
- **Moderately Resistant to SCN races 2, 3, 5, and 14**
- **Moderately Resistant to root knot nematode**
- **Resistant to reniform nematode**
- **Resistant to stem canker**
- **Productive Group IV with great nematode pkg**

Promising SCN, RKN conventional line (BU/A)

Line	LOAM	CLAY	SAND	MEAN
S10-11200 (4.6)	68.3	66.1	50.3	65.3
RR Check (4.6)	63.4	69.4	35.3	62.1
# Tests	4	3	1	

Promising RR2 SCN Lines

Line	Yield, BU/A	Mat. Date
Group V		
*S11-5757 (5.1)	78.6	10/3
RR Check	70.7	10/3
* MR SCN races 1, 2, 3, 5 and 14		

SCN Female Index

	FI R1	FI R2	FI R3	FI R5	FI R14
4602 (susceptible)	134	98	82	120	133
S10-11220 (Conv.)	45	10	20	1	8
S11-5727 (RR 2)	24	28	7	3	4

Arelli-Marker Assisted Selection

- ◆ Arelli-SSR markers tagged to SCN resistance to develop soybean germplasm lines
- ◆ SSR markers used include:
 - **Satt 309 (LG G)**
 - **Satt 632 (LG A2)**
 - **Satt 574 (LG D2)**
 - **Others**
- ◆ Developed four lines, with Hartwig as the source of resistance using markers:
 - **JTN-4307**
 - **JTN-4408**
 - **JTN-5110**
 - **JTN-5208**

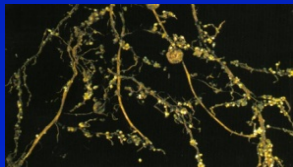
How Can Durable Resistance Be Improved?



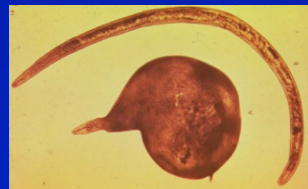
- ◆ Arelli- utilizing new and diverse sources of resistance
- ◆ Using improved methods of selection, including Marker Assisted Selection (MAS)
- ◆ Using 5 new PI sources of SCN resistance to develop adapted soybean lines

USB project- MO, AR and GA

Discovery of genes for resistance to **SCN (MO)**, **RKN (GA)**, and **RN (AR)** for develop of productive soybean cultivars and germplasm with broad resistance to multi-nematode species



(Nguyen Lab and Mitchum Lab, MU)



(<http://nematology.umd.edu/images>)



(<http://www.google.com/images>)

PI Sources for Res to Multi-nematodes

PI	SCN Race					RKN	RN
	<i>R1</i>	<i>R2</i>	<i>R3</i>	<i>R5</i>	<i>R14</i>		
PI 303652	R	MS	R	MR	MS	R	MR
PI 404198B	R	S	R	MR	MS	R	MR
PI 407729	MR	MR	MR	MR	R	MR	MR
PI 438489B	R	MR	R	MR	MR	R	R
PI 467312	MS	MS	R	MR	R	MR	MR
PI 468915	R	MS	R	R	S	MR	MR
PI 507354	MR	S	R	MR	S	MR	MR
PI 548349	MR	MS	MR	MS	MS	R	MR
PI 567305	MR	R	MR	R	MS	MR	R
PI 567387	MS	MR	S	MR	S	R	R
PI 567516C	MR	MR	MR	R	MS	MR	MR

Situation for SCN in the South

- **PI 88788 is still the main source of resistance**
- **PI88788 source is less effective vs SCN**
- **Races 2 and 5 are dominant in many fields**
- **Need more varieties with “Hartwig type” resistance**
- **Other nematodes often in same field (RKN, RN)**
- **Need resistance across nematode species**
- **Broad resistance from new sources are being employed**
- **Genomic MAS would impact development of resistance**

**THANK YOU
VERY MUCH!**