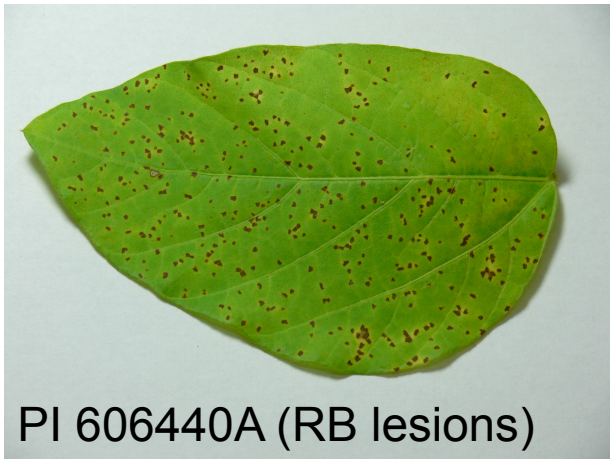
Progress in Developing Soybean Resistant to Soybean Rust

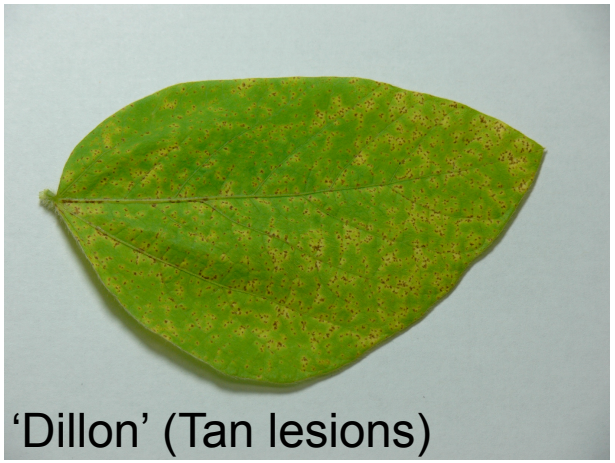
David Walker* and Randy Nelson	**USDA-ARS/Univ. of Illinois, Urbana**
Roger Boerma, Dan Phillips and Donna Harris	**Univ. of Georgia, Athens, Griffin and Attapulgus**
Emerson Shipe and John Mueller	**Clemson Univ., Clemson and Blackville, SC**
David Weaver and Ed Sikora	**Auburn Univ., Auburn and Fairhope, AL**
Blair Buckley and Ray Schneider	**LSU Agricultural Center, Bossier City & Baton Rouge**
David Wright , Jim Marois and Pratibha Sravistava	**North Florida Res. & Ed. Center, Univ. of Florida, Quincy**
Brian Diers	**Univ. of Illinois, Urbana**

*USDA-ARS Soybean/Maize Germplasm, Pathology and Genetics Research Unit & University of Illinois, Urbana, IL

Resistance to soybean rust (*Phakopsora pachyrhizi*) may involve:

- Reddish-brown (RB) instead of Tan lesions
- “Type 0” infection type (immunity)
- Low disease severity
- Fewer uredinia per lesion or unit area
- Slower development of disease on infected tissue
- Slower movement of disease upwards through the foliar canopy
- Limited sporulation from uredinia


PI 606440A (RB lesions)


‘Dillon’ (Tan lesions)

USDA germplasm evaluation tests 2006-2009

www.amaps.com

Rating resistance to SBR

Quincy, Florida, early November 2009

Reactions of accessions with known soybean rust resistance (*Rpp*) genes in 2009 field evaluations

Entry	Gene	MG	Blackville (SC)	Quincy (FL)	Fairhope (AL)	Bossier C. (LA)
LG85-2378	*Rpp1*	III	HR	HR	HR	R
PI 200492	*Rpp1*	VII	HR	HR	-	MR
PI 230970	*Rpp2*	VII	-	MR	-	-
PI 506764 (Hyuuga)	*Rpp*(?) Hyuuga	VII	R	R	R	S
'FT-2'	(LG C2)	VII	MR	HR	HR	S
PI 462312	*Rpp3*	VIII	MR	R	MR	S
PI 459025B	*Rpp4*	VIII	R	MR	MR	S
PI 200487	*Rpp5-*	VIII	R	HR	R	S
PI 200526	*Rpp5-*	VIII	S	S	S	S

Reactions of accessions with region-specific resistance in 2009 field evaluations

Entry	Name	MG	Blackville (SC)	Quincy (FL)	Fairhope (AL)	Bossier C. (LA)
PI 416810	Ban kuro daizu	IX	R	HR	R	S
PI 417089A	Kuro daizu	IX	R	HR	HR	S
PI 417208	Oka kaizu	VIII	R	HR	HR	S
PI 567046A		VIII	HR	HR	HR	S
PI 567189A	Ekhabac	IV	R	HR	HR	S
PI 594172A		VII	R	R	R	S
PI 605829		V	R	HR	HR	S
PI 605838	Xanh si man	V	R	R	R	S
PI 615437	A9	VI	R	HR	R	S

Reactions of accessions with at least moderate resistance (MR) at all locations in 2009

Entry	Name	MG	Blackville (SC)	Quincy (FL)	Fairhope (AL)	Bossier C. (LA)
PI 203398	Abura	VIII	R	R	R	MR
PI 417125	Kyushu 31	VIII	R	R	HR	MR
PI 567024		VIII	R	HR	R	MR
PI 567025A		VIII	R	R	R	MR
PI 567034		VIII	HR	HR	HR	MR
PI 567102B		IX	HR	HR	HR	MR
PI 567104B		IX	HR	HR	HR	R
PI 567129		IX	HR	R	R	MR
PI 605773		V	R	HR	MR	MR

2009 reactions of Ft. Detrick “retest” accessions resistant in Quincy, FL in 2008

Accession	Name	MG	2009 Reaction in Quincy, FL	2009 Reaction in Fairhope, AL
PI 307880C		X	MR	S
PI 417085	Kumaji 1	IX	R	HR
PI 417129B	(Kyushu 40)	IX	S	R
PI 567090		IX	HR	HR

PI parents of USDA breeding lines that were resistant in Quincy in 2009

Resistant parent	MG	Current generation	Avg reaction in SE locations in 2009	Reaction in Bossier City in 2009
PI 203398	VIII	F6:7 RILs	R	S
PI 417089B	IX	F6:7 RILs	R	S
PI 567104B	IX	F6:7 RILs	R	-
PI 567129	IX	F5 RILs	R	R
PI 605891A	V	F6:7 RILs	R	-
PI 615437	VI	F4 RILs	R	S
PI 567189	IV	F4 RILs	R	MR
PI 605838	V	F4 RILs	R	S
PI 417132	VII	F5 RILs	MR	R

Breeding programs that have field-tested lines in Florida or Georgia in 2008 and 2009

Institution	**Researchers**	**Field evaluations**
USDA-ARS, Urbana, IL	David Walker & Randy Nelson	Quincy, FL
Iowa State Univ.	Silvia Cianzio & Leonora Leandro	Quincy, FL
Univ. of Missouri - Columbia	Henry Nguyen, David Sleper, Tri Vuong	Quincy, FL
North Carolina State Univ.	Andrea Cardinal	Quincy, FL
Canadian breeders	Albert Tenuta, Vaino Poysa, Elroy Cober	Quincy, FL
Univ. of Georgia	Roger Boerma, Donna Harris, Dan Phillips	Attapulgus, GA
USDA-ARS, Raleigh, NC	Tommy Carter	Attapulgus, GA

Other 2009 germplasm evaluations in Quincy

70 *Glycine soja* accessions

207 *G. max* x *G. tomentella* backcross lines developed by Dr. Ram Singh

Tolerance or moderate resistance among Southeastern public cultivars

Cultivar	MG	Origin	Yield loss difference in 2008 (%)	Disease severity in 2009 (1-5)	Yield loss difference in 2009 (%)
'Dillon'	VI	Clemson Univ.	75.7 ± 1.5	5.00 A	44.9 ± 4.2
'Boggs'	VI	Univ. of Georgia	60.7 ± 1.2	4.78 AB	25.3 ± 1.2
'N7001'	VII	USDA-ARS, Raleigh	59.5 ± 4.0	4.44 C	25.7 ± 4.4
G00-3209 (Woodruff)	VII	Univ. of Georgia	50.4 ± 3.5	4.00 D	5.2 ± 3.8
'Kuell	VIII	Auburn Univ.	82.5 ± 1.6	5.00 A	48.0 ± 1.2

Acknowledgements

- USDA-ARS
- United Soybean Board
- Auburn University
- Clemson University
- University of Florida – North Florida Research and Education Facility
- University of Georgia
- Louisiana State University