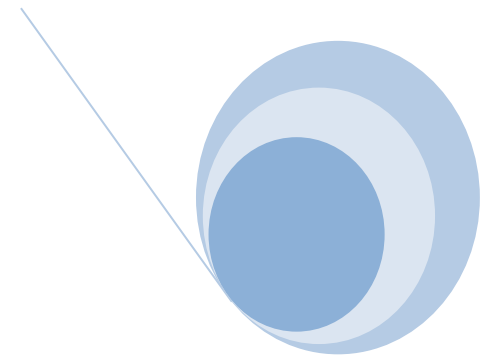# Sudden Death Syndrome Compilation Report 2010

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Participants

Groups currently conducting basic and/or applied research on SDS:

|	
Iowa State University	(Dr. S. Cianzo)
Kansas State University	(Dr. W. Schapaugh)
University of Illinois	(Dr. B. Diers)
University of Minnesota	(Dr. J. Orf)
University of Tennessee	(Dr. V. Pantalone)
Southern Illinois University	(Dr. D. Lightfoot – Dr. S. Kantartzi)
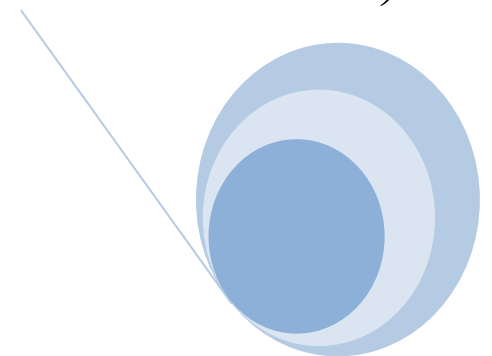
Questionnaire

1. Names or accession numbers of cultivars, lines, or PIs utilized as resistance sources

2. Scoring system used (Field & Greenhouse experiments)

3. Molecular assisted selection: marker types, primers useful for trait introgression

4. Outcome of field and/or greenhouse evaluation experiments

5. Ideas for improving breeding systems for resistance
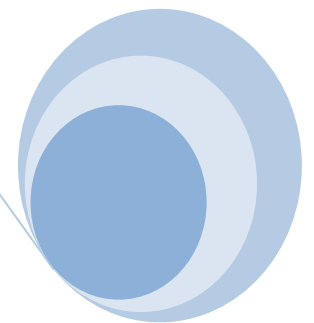
Sources of resistance

Group	Plant Material	Parentage	Reference
ISU	LS98-0582	NK 46-44 x A 4138	
ISU	LS99-2235	'Bell' x P 9451	
ISU	LS94-3207	'Pharaoh' x 'Hartwig'	Schmidt and Klein. 2004
SIU	Forrest	'Dyer' x 'Bragg'	Hnetkovsky et al. 1996
SIU	Pharaoh	'Forrest' x V71-480	Schmidt et al. 1993
SIU	LS90-1920	'Essex' x 'Fayette'	Schmidt et al. 1999
SIU	LS97-1610	S90-1435 x 'Manokin'	
SIU, UIUC, ISU	Ripley	'Hodgson' x V68-1034	Kazi et al. 2008
UIUC	PI 567374		
UIUC	PI 437654		
UIUC	LD00-2817	'Ina' x 'Dwight'	

The main sources of resistance for KSU and U of M programs are breeding lines from SIU
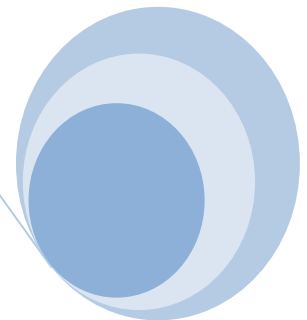
Phenotyping

- All the groups screen genotypes in the field at multiple locations

- UT breeding efforts are hindered by lack of field infestations

- The ISU and UIUC breeding programs test germplasm for resistance in the greenhouse using an inoculum layer method
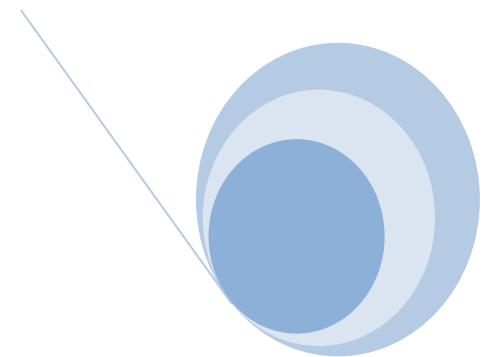
Scoring system

The SIU rating system is generally used for scoring

1. Field locations are monitored during the growing season for the presence of SDS and leaf symptoms are rated at the R_6 stage (full size seeds)

2. SDS rating is based on the scores of:
   - Disease incidence (DI)   : % of plants with symptoms
   - Disease severity (DS)   : scale 1-9

     (1: mild symptoms-9: premature death)

3. Disease index (DX)   :   DI*DS/9   (score 1-100)
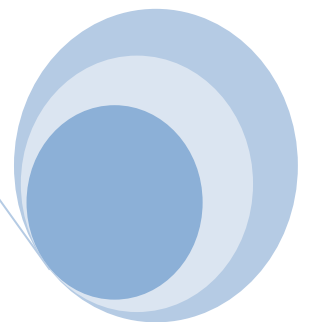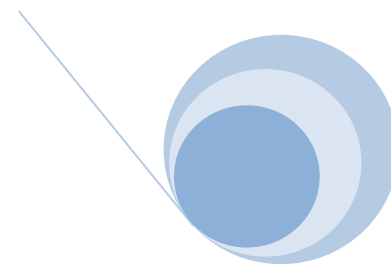
Molecular techniques

- ISU is developing new molecular markers. They used markers identified for 'Ripley' to confirm resistance of AR10SDS (released 2008)

- UIUC is using QTLs from 'Ripley' and PI 567374 focusing on breeding the resistance QTL on linkage group D2 (Chr. 17) and L (Chrom. 19) from both resistance sources into Midwest adapted backgrounds

- UT group is working with a set of 282 RILs from 'Essex' 'Williams 82' using SNPs to detect QTLs for resistance
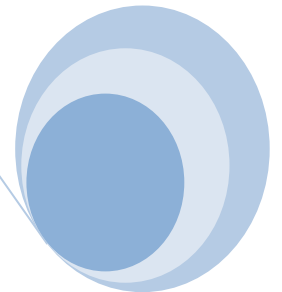
Molecular techniques

At SIU, Dr. Lightfoot's group:

- Markers are used to distinguish the "best of the best" from escapes or near misses

- 'Essex × Forrest' lines were tested in Argentina; transgenic plants were developed to investigate the gene underlying *Rfs2* on linkage group G (Chr. 18)

- It is believed that pathogen recognition triggers a cascade initiated by RLK sensing CLE-like and enzymes secreted during fungal infections. The signalling pathway is followed by intercellular communications by MIPs and major changes in gene expression at the site of infection

Molecular techniques

At SIU, Dr. Kantartzi's group:

- Genome wide analysis of a RIL ($F_{5:8}$) population derived from the cross LS90-1920 × 'Spencer' is applied using SSR and SNP markers for the confirmation of QTLs and the identification of new ones

- Advanced breeding lines are currently genotyping with SSRs linked to known QTLs to confirm resistance

The KSU and U of M groups do not use any molecular markers in their breeding projects
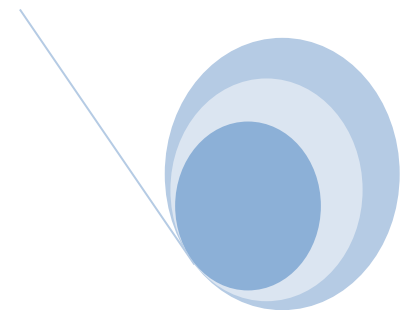
Outcome

UT:
- Will release the high yielding line JTN-5203 in 2010, a MG V conventional soybean line that showed excellent yield (4,500 kg ha^{-1}) in the USDA Uniform Tests and resistance (DX 0.7)
- Anticipate to release the early MG V glyphosate resistant line, TN06-140RR during 2010 with yield of 4,233 kg ha^{-1} in the Tennessee State Variety Test and DX 2.8
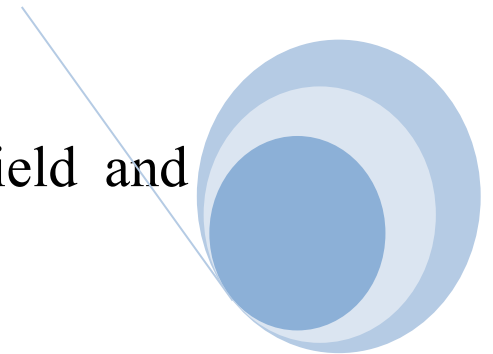
ISU:
- Released AR10SDS germplasm in 2008

UIUC:
- Released LD00-2817

SIU (Schmidt-Kantartzi):
- Will release LS03-4294 which has competitive yield and moderate resistance

Future efforts & suggestions

ISU

- Development of more efficient screening techniques and identification of new resistance genes with their corresponding molecular markers

UIUC

- Improvements in field and greenhouse screening methods

U of M

- Additional nurseries for early maturity material

SIU (Dr. Lightfoot)

- Collaborations for crosses, field tests and map development

SIU (Dr. Kantartzi)

- Multi-location field screening; application of SSR and SNP markers to improve marker resolution and identify new QTLs

Acknowledgements

Participants

- Dr. Silvia Cianzio, ISU
- Dr. Brian Diers, UIUC
- Dr. David Lightfoot, SIU
- Dr. James Orf, U of M
- Dr. Vincent Pantalone, UT
- Dr. William Schapaugh, KSU

Thank you!

Collaborators

- Dr. Khalid Meksem
- Dr. Jason Bond
- Dan Clark
- James Klein
- Cathy Schmidt