Spring Blackstem and Leaf Spot Resistance Screening in the USDA-ARS National Plant Germplasm System's *Medicago* spp. Genetic Resources

Brian Irish, Deborah Samac, USDA-ARS

RATIONALE & OBJECTIVES

- Spring blackstem and leafspot (SBS) of alfalfa (*Medicago sativa*) is an important foliar disease that can lead to significant losses in severe infections. Disease management options are limited, and resistant cultivars are not available.

Objectives:

Optimization of SBS disease screening protocols.

Evaluating and selecting resistant alfalfa standard check cultivars.

Screening and defining *Medicago* spp. taxon host range.

Evaluate and select resistant alfalfa germplasm.

Make data and information from the research broadly available.

STUDY DESCRIPTION

- Experiments were conducted in greenhouses using seedling plants and followed modified NAAIC SBS Standard Test protocols.
- Where appropriate, experimental designs with sufficient replicates were used and statistical analyses conducted to show significant treatment effects.

Table 1. Number of accessions screened, mean disease reaction and resistant plant selections for alfalfa (*Medicago sativa*) subspecies evaluated against *Phoma medicaginis*, casual agent of spring blackstem and leafspot.

Taxon	N[1]	Mean[2]	Selections	
			Plants[3]	%[4]
M. s. subsp. *falcata* var. *viscosa*	12	2.47	17 (4)	9.4
M. s. subsp. *glomerata*	11	2.50	20 (4)	12.1
M. s. subsp. *falcata*	371	2.67	187 (70)	3.4
M. s. subsp. *caerulea*	71	2.98	13 (13)	1.2
M. s. subsp. *varia*	347	3.00	128 (75)	2.5
M. s. subsp. *sativa*	2,016	3.18	539 (356)	1.8
M. s. subsp. *tunetana*	6	3.39	2 (1)	2.2
Total	**2,834**	-	**523**	

[1]Number of accessions screened per taxon.
[2]Using proposed new rating 1-5 rating scale developed in this research.
[3]# resistant plant selections (rating <1.5); (*n*) = # accessions resistant plants were selected from.
[4]Proportion (5) of resistant plants selected from total plants evaluated for each subspecies (e.g., *viscosa* [(17 plant selections) / (12 accessions x 15 plants/accessions) x (100) = 9.4%]).

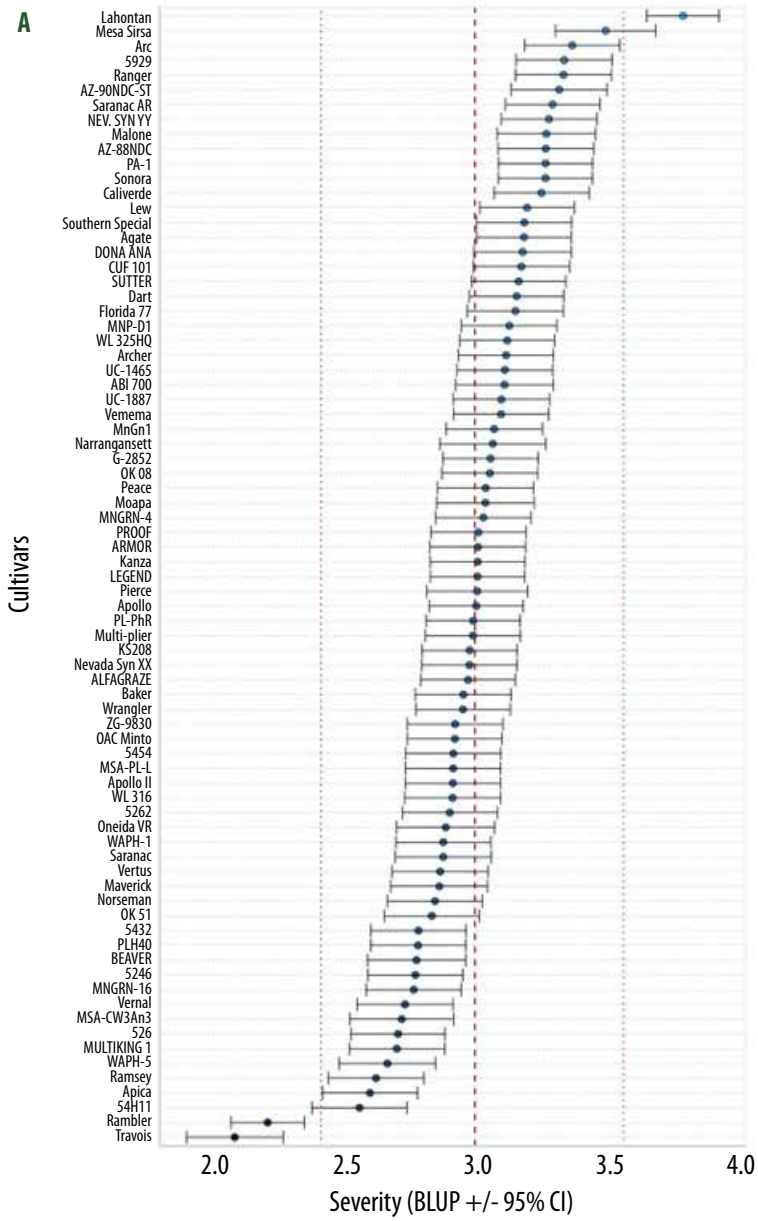
RESULTS

- NAAIC Standard Test protocols for SBS have been optimized with proposed suggested improvements for adoption consideration. Modifications include:
  - Alternate rating scale better reflecting visual symptoms.
  - Reduced spore concentrations to discern disease reaction.
  - Alternate Standard resistant check cultivars proposed (e.g., 'Travois').
  - Addition of Petri dishes to verify spore/inoculum viability.
- Alfalfa Standard Check cultivars assessed for disease reaction to SBS and resistant selections made for recurrent selection.
- SBS disease reaction and host range more clearly defined for alfalfa related taxa (e.g., *Medicago* spp.) with resistant species identified in multiple studies.
- Large groups (>2,800) of alfalfa (*M. sativa*) accessions evaluated for SBS disease reaction with resistant selections made for recurrent selection.
- Research presented in several forums with data and germplasm slated to become available along with peer-review publication.

CONCLUSIONS/SUGGESTIONS

- Optimization and protocol modifications to the NAAIC SBS Standard Test will be proposed to be considered for adoption by the appropriate committee.
- Evaluate potential of resistant *Medicago* taxa (i.e., alfalfa relatives) in contributing SBS disease resistant traits directly through traditional (or other) approaches.
- Make available data as well as disease resistant pre-bred selections for utilization in germplasm enhancement.

Transplanting selections in crossing blocks for recurrent selection.



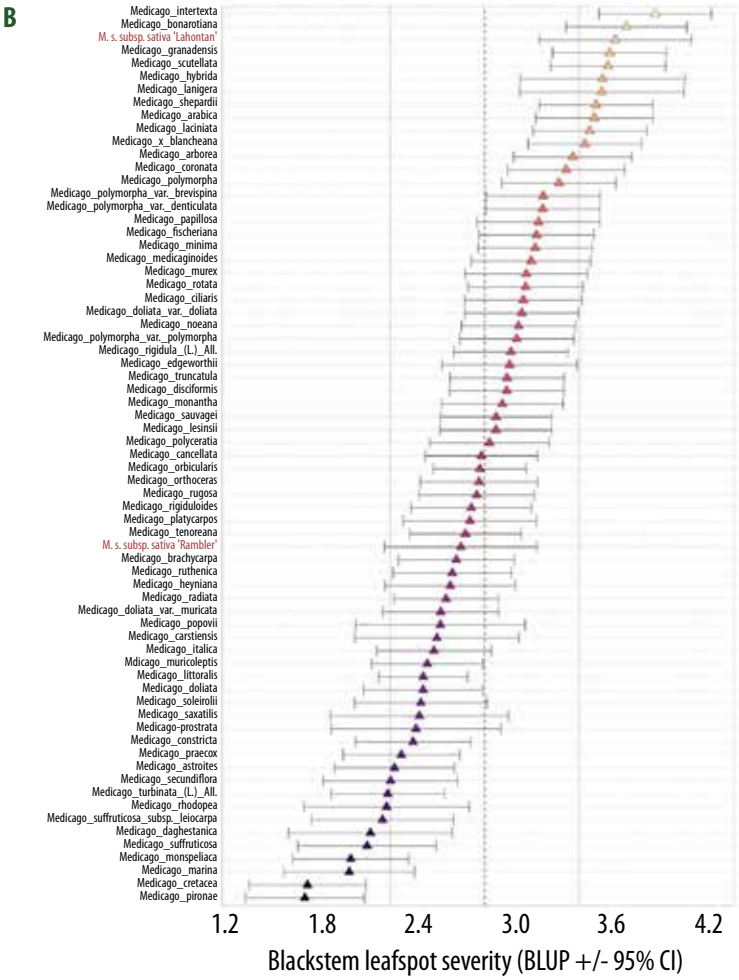


Figure 1. Estimated mean disease ratings and 95% confidence intervals using best linear unbiased predictions (BLUP) and a modified 1-5 rating scale along for **A)** alfalfa (*Medicago sativa*) Standard Check cultivars (Concentration 1 x 10^6 spores/ml); and **B)** for *Medicago* spp. taxa (Concentration 5 x 10^4 spores/ml) evaluated for disease reaction to *Phoma medicaginis*, casual agent of spring blackstem and leaf spot.

Alfalfa
U.S. Alfalfa Farmer Research Initiative

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