Enhancing Stink Bug Resistance in Midsouth Soybean

A Final Report

Submitted by

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INVESTIGATORS:

Principal Investigator: Dr. Jeffrey A. Davis, Professor, LSU AgCenter, (225)-578-5618, jeffdavis@agcenter.lsu.edu

Co-PI: Dr. Pengyin Chen, Professor, University of Missouri (passed away on August 1, 2022)
Co-PI: Dr. J. Grover Shannon, Professor, University of Missouri (2022 to 2024)
Co-PI: Dr. Feng Lin, Assistant Professor, University of Missouri (2024 to 2025)

OBJECTIVE:

The objective of the proposed research was to screen soybean germplasm, advanced breeding selections, and current soybean varieties for resistance to stink bugs and identify specific resistance mechanisms. These goals were achieved, as outlined below, and in the process, the proposed study generated information on stink bug population growth dynamics, identified specific resistance mechanisms, and identified advanced breeding selections and commercial soybean varieties which are resistant to stink bugs.

OUTCOMES:

The results obtained from this project will directly benefit soybean producers and seed companies in all states where stink bugs are yield limiting pests. Public and private soybean breeders can utilize this information to develop high yielding, stink bug resistant varieties. Indirectly, with less insecticides sprayed, other insect pests such as soybean looper, which are resistant to insecticides used for stink bug control, will not be increased by the reduction in natural enemies.

ACCOMPLISHMENTS:

1. Opportunities for training personnel: This project supported the partial salaries of research associates at both LSU AgCenter and the University of Missouri. In addition, this project supported one MS graduate student at Louisiana State University who will be graduating in August 2025. The results outlined below were accomplished in the completion of his degree.

2. Stink bug population growth dynamics: Life tables are essential tools for understanding the population dynamics of pests. They allow researchers to analyze the survival, development, and reproduction rates of insects. These results are essential for developing economic thresholds. In this project, the population dynamics of redbanded stink bug and *Euschistus quadrator* were calculated. Results indicate soybeans are a good host for *E. quadrator* and redbanded stink bug. Pre-adult development period was ~ 30 days with net reproductive rates of ~ 150 eggs per female. Adults can live for 75 days or more with overlapping generations occurring in soybeans. Combined with previous work, population growth potential was modeled at initial populations of 100 or 5, with and without a cold event. Results

Fig. 1. Stink Bug Population Growth Modeling

Month	Initial pop. 100	Initial pop. 5	Cold event
Oct.	100	5	5
Nov.	432	22	22
Dec.	1,867	93	8
Jan.	8,073	403	35
Feb.	34,891	1,744	150
Mar.	150,797	7,539	645
Apr.	651,739	32,586	2,791

can be found in Fig. 1. Allowing even small populations to persist in fields can result in increased issues in the following crop year.

3. Screening for stink bug resistance in commercial soybean varieties: Over three years (2022, 2023, and 2024), twenty-nine MGIV commercial soybean varieties were assessed both in the field and in the laboratory: fourteen in 2022, seven in 2023, and eight in 2024. The same set of cultivars planted in 2022 was also planted again in 2023, and the 2023 set was planted again in 2024 to complete replications. The 2024 set of cultivars was only planted during the 2024 season. Commercial soybean varieties significantly influenced development, survival, and reproduction of stink bugs. Two varieties exhibited reduced population growth through antibiosis with stink bugs having lower survivorship and longer development times. This study highlighted that commercial soybean varieties differ in their ability to suppress stink bug populations and choosing a variety that yields well and reduces reliance on insecticides will be a valuable tool for soybean Integrated Pest Management (IPM).

4. Identification and further breeding of advanced selections for host plant resistance to stink bugs: Advanced breeding selections from Drs. Chen, Shannon, and Lin from the University of Missouri were screened each year for stink bug resistance in the field under natural infestations by the LSU AgCenter under Dr. Davis. Results were then communicated back to the breeders for further incorporation of resistance. A total of ninety-seven advanced selections were screened over three years (Table 1).

Table 1. List of advanced selections screened over from 2022 to 2024.

2022	2023	2023 cont.	2024
S20-20357	S12-1362	S19-19923	S20-2227
S20-20379	S17-1146	S19-2082	S20-5669
S21-21938	S17-1494	S19-7867	S20-15411GT
S21-21962	S17-17644	S20-12454	S20-14129GT
S21-21975	S18-3722	S20-13179	S20-7117
S21-21984	S18-6013	S20-13444	S20-1492
S21-22039	S18-6328	S20-14129	S20-4428
S21-21883	S18-9258	S20-1435	S20-13179LL55
S21-21942	S19-10701	S20-1492	S21-11105
S21-22008	S19-1176	S20-14936	S21-9052
S21-22089	S19-12409	S20-15411	S21-22067
S21-21977	S19-12459	S20-17501	S21-23246HOLL
S21-21993	S19-12537	S20-17527	S20-25654
S21-22067	S19-14058	S20-18805	S21-20276
S21-22147	S19-14284	S20-2227	S20-25571
S21-22234	S19-14307	S20-24521	S22PR-383E3
S21-22294	S19-14797	S20-24524	S21-11102
	S19-17313	S20-4428	S21-11840HP
	S19-17667	S20-5669	S21-17588LL55

S19-17693	S20-7117	S21-11211
S19-17893	S21-21170	S21-6008GT-HOLL
S19-18135	S21-21192	S21-18696LL55
S19-19741	S21-4926	S21-15672
S19-19764	S21-4949	S21-20065
	S99-2281	S21-11972HP
		S21-7836HP
		S22PR-329E3
		S22-24366
		S22-24344
		S22-24401
		S22-24339

This cooperation has resulted in several advanced selections with stink bug resistance which the University of Missouri may release in the future.

DISSEMINATION: The results from this study have been disseminated by the graduate student and me through invited and contributed presentations at national symposia, through trade journals and extension publications, and to stakeholders during field days and production meetings. In addition, we are preparing two peer-reviewed manuscripts that will disseminate these fundamental data sets to the scientific community and will highlight the value of projects funded by the Mid-South Soybean Board.