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| Project Number:  | 2120-172-0126 |
| Project Title:  | Enhanced Pest Control Systems for Mid-South Soybean Production |
| Organization:  | LSU AgCenter |
| Project Lead Name: | Paul P. Price, III (Trey) |
| **National Soybean Checkoff Research Database** [**https://www.soybeanresearchdata.com/**](https://www.soybeanresearchdata.com/) **(public website funded by USB). Please include a non-technical project status along with your project status. The non-technical project status will be published to the website. If a non-technical project status is not provided, the contents of this entire report will be published.** |
| Project Status - What key activities were undertaken and what were the key accomplishments during the life of this project? Please use this field to clearly and concisely report on project progress. The information included should reflect quantifiable results (expand upon the KPIs) that can be used to evaluate and measure project success. Technical reports, no longer than 4 pages, may be included in this section.  |
| **Identification of Cercospora leaf blight-resistant PI lines:** During the 2016-2018 growing seasons, approximately 500 plant introductions (PI) were screened in multiple locations in the mid-southern United States. Soybean accession lines (n = 568), representing maturity groups III to VII, were planted across the southeastern USA and evaluated for the presence and severity of naturally occurring CLB during 2016 and 2017 based upon multiple evaluation scales. Good correlations between symptom types allowed for unification of multiple scales into a single evaluation scale that was used in 2018. Evaluation scales were converted to categorical data and compared to search for accessions that exhibited consistent resistance to the disease. In this study, >50 accessions were identified with resistance to CLB. In addition, a new evaluation scale was described allowing for fast and accurate evaluation of large-scale field experiments for CLB across multiple locations. This work detailing CLB-resistant PI lines was published in the Journal of Crop Improvement ([link](https://doi.org/10.1080/15427528.2020.1865226)). Breeding programs are currently using these germplasm sources to develop CLB resistant varieties. Jinesh Patel (Auburn) has identified genetic regions involved with CLB resistance based on our data from the PI screening project. We await a manuscript draft from his program. We received seed from GRIN and have planted the 25 PIs that are highly susceptible to CLB to be compared with the resistant PIs (50) in future studies (Patel, Auburn; Richards, LSU). This work has the potential to ID quantitative trail loci (QTLs) related to CLB-resistance.**Identification of Cercospora leaf blight-resistant commercial varieties:** Over the past six growing seasons, many publicly available soybean varieties have been screened for CLB resistance throughout many locations in the mid-southern United States (please see table below).

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| **Year** | **Location Number** | **Entry Number** |
| 2016 | 14  | 30 |
| 2017 | 14 | 30 |
| 2018 | 13 | 45 |
| 2019 | 12 | 40 |
| 2020 | 12 | 56 |
| 2021 | 12 | 25 |

The trials were rated for CLB, if present, and preliminary data indicate somewhat consistent resistance across years and locations. We are in the process of preparing a manuscript to be submitted to Plant Disease detailing results from the past six seasons. During 2018-2021, most of the locations were sampled, and *Cercospora* spp. isolates were obtained and stored in our culture collection in Baton Rouge for future studies (Shrestha, Doyle – LSU). **Preliminary identification of QoI (strobilurin) fungicide resistance:**  We have amassed a collection of hundreds of *Cercospora* spp. isolates over the past four seasons. The vast majority of these isolates are *C. flagellaris*; however, there are a significant number of other/unknown species. Preliminary results from fungicide sensitivity tests indicate strobilurin resistance in 0 to 100% of isolates, depending on location origin. We have used three assays to determine strobilurin fungicide resistance within our isolates including: PCR-RFLP, LAMP, and poison plates. Results from all three assays were consistent, and Sanger sequencing was used to further confirm resistance. A draft manuscript detailing our QoI-resistance work is in preparation and may constitute first reports for all states involved except LA. The LAMP assay is especially promising as it has the potential to be used in the field. Isolates collected during this project also are currently being genetically characterized to determine species, genetic diversity, and population structure differences over locations (Shrestha, Doyle – LSU). Preliminary results indicate differences in species associated with CLB among locations. |
| Did this project meet the intended Key Performance Indicators (KPIs)? List each KPI and describe progress made (or not made) toward addressing it, including metrics where appropriate.  |
| • Release (publication) of CLB resistant PI list. **Accomplished.**• Release (publication) of CLB resistant variety list. **Accomplished.** Preliminary data has been released and a manuscript is in preparation.• Release (publication) of cercosporin screening assay. **Partially accomplished.** Preliminary data was released; however, only approximately 70% correlation between the assay and field observations was achieved.• Incorporation of resistant material into breeding lines. **Accomplished.**• Evaluation of breeding lines containing CLB resistance. **Accomplished.** Manuscript in preparation.• Release of high yielding lines with CLB resistance. **Accomplished.**• Identification of fungicide resistance in other states. **Accomplished.** Preliminary data indicates so. Manuscript in preparation.• Identification of Cercospora species involved. **Accomplished.** Preliminary data indicates multiple *Cercospora* spp. involved varying in composition with location. Manuscript in preparation. • Development of recombinant inbred line populations for mapping resistance to CLB and FLS. **Foundation provided for future work.** Seed increases of PIs failed due to field disasters delaying accomplishment. • Identification of QTLs for CLB resistance. **Foundation provided for future work.** Seed increases of PIs failed due to field disasters delaying accomplishment.• Initiate mapping populations for stink bug resistance. **Foundation provided for future work.** Seed increases of PIs failed due to field disasters delaying accomplishment.• Make crosses to develop an initial set of stink bug tolerant lines with elite material to improve agronomic characteristics. **Accomplished.** |
| Expected Outputs/Deliverables - List each deliverable identified in the project, indicate whether or not it was supplied and if not supplied, please provide an explanation as to why. |
| **Please see previous section.** |
| Describe any unforeseen events or circumstances that may have affected project timeline, costs, or deliverables (if applicable.) |
| **Please see KPI section.** |
| What, if any, follow-up steps are required to capture benefits for all US soybean farmers? Describe in a few sentences how the results of this project will be or should be used. |
| Results from this project have identified breeding material resistant to Cercospora leaf blight, one of the most important foliar diseases of soybean in the southern United States. Since fungicide resistance exists in the CLB pathogen population, we must rely on selection of resistant varieties to manage this disease. Our hope is that breeders will continue to utilize this material when developing soybean varieties adapted to the mid-South. A foundation developed for quantitative trait loci (QTL) identification during this project will hopefully result in more efficient breeding processes for CLB in the future utilizing molecular techniques. Isolates of *Cercospora* spp. from many locations involved in the study will shed light on species composition across locations as well as fungicide resistance resulting in significant disease management implications for soybean farmers. Development of stinkbug tolerant varieties may prove to be crucial to soybean production because of widespread insecticide resistance and regulatory hurdles in insecticide development. Our hope is that breeding efforts will continue for stinkbug tolerance through state commodity boards and other funding agencies.  |
| **List any relevant performance metrics not captured in KPI’s.** |
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| **Non-technical project status:** |
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