Subcontractor Final Report

Project Number:	
Project Title:	
Organization:	
Principal Investigator Name:	Brian Ward

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.

Both breeding line and commercial cultivar data collected over 2016-2017 were analyzed. Breeding lines PI 548548 and PI 592756 (blight symptoms), and PI398982 and PI399022 (petiole symptoms) were found to be resistant to Cercospora Leaf Blight (CLB) both years across all locations that saw disease based on their individual disease parameters used. No commercial cultivars were found to be resistant by conventional standards in part because of high variability between locations. A publication should be produced soon that details the general resistances between varieties as well as meaningful state-wide resistances.
Travel was also conducted to 16 locations across AL, AR, LA, MO, MS, TN, and TX. Every location displayed CLB symptoms and isolates were collected from all locations, resulting in a 1,000+ isolate collection.
Stocks were created and catalogued for population studies and fungicide resistance screenings.
Data is currently being collected for the 2018 field trials to be added to the existing data. With strong data coming in, publications on both the PI and variety trial should be coming soon.

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.

- Promising CLB resistance was found in breeding line trials, but not in commercial screenings. With new data incoming, an update on this point should be expected soon.
- Breeding lines that showed resistance were identified and information disseminated to breeders to begin work incorporating them into viable cultivars.
- N/A
- N/A
- N/A

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.

See previous.

Describe any unforeseen events or circumstances that may have affected project timeline, costs, or deliverables (if applicable.)

No unforeseen events have occurred as of yet.

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.

Along with follow-up data analysis of incoming CLB data from the 2018 growing season, population and fungicide resistance studies will be conducted on the Cercospora isolate collection made during 2018. Results from these projects will give breeders resistant lines to CLB that they can incorporate for resistance in commercial cultivars, inform growers of commercial varieties that are particularly resistant or susceptible to CLB, give a map of pathogen population to aid in understanding of the disease, and alert experts to fungicide resistance across the mid-south to widely-used fungicide classes.

List any relevant performance metrics not captured in KPI's.

Further molecular and biological quantification work is being done analyzing factors that trigger symptoms in the late stages of soybean growth as compared to early vegetative and reproductive stages.
Projects are being conducted analyzing soybean bacterial endophytes' effects on Cercospora pathogens, and if they could be used as a form of biological control.
Fungal pathogen viral testing is being conducted as another avenue for potential management strategies.

Project Number:	1720-172-0124 (Year 2 of 2);1820-172-0124
Project Title:	Enhanced Pest Control Systems for Mid-South Soybean Production
Organization:	Texas A&M AgriLife Research
Principal Investigator Name:	Xin-Gen (Shane) Zhou

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.

The soybean CLB disease resistance trial was established at the Texas A&M AgriLife Research and Extension Center, Beaumont, TX in 2018 to evaluate the performance of 45 soybean cultivars and germplasm lines on their resistance against Cercospora leaf blight. Cultivar treatments were arranged in a randomized complete block design with four replicates. Plots were raised beds consisting of four 20-ft rows spaced 30 in. between rows. Soybean was planted on June 15 using a planter at the rate of 8 seeds per ft of row. Prior to planting, all plots received 40 lb/A of potassium and 60 lb/A of phosphorus. Immediately after planting, all plots were sprayed with a mix of Dual II Magnum (2.5 pt/A) and FirstRate (0.75 oz/A) for control of weeds. Irrigation followed local recommendations. On Aug 13 and 27, the insecticide Brigade (10 oz/A) was applied to plots for control of insects. On October 2 (maturity), percent leaf area showing the purling, bronzing or leathery symptoms and percent petioles with lesions were visually assessed for each plot. Plots were harvested on November 11 and soybean yields were determined. Soybean seed stain (0-100%) was rated from the harvested soybeans for each plot. Prior to analysis, data on percent leaf area and percent petioles affected with the disease were square root transformed while yield data were log 10 transformed to normalize the distribution of the data. These data were back transformed for presentations.

Cercospora leaf blight disease pressure was considered low to moderate in the experimental area. The % leaf area, % petioles, and % seed stain affected by the disease reached up to 33, 80, and 55%, respectively, to the end of the cropping season (Table 1). Delta Grow 4967LL, S11-16653, S15-3772RY, S14-15138R, S13-10592C, S14-15146R, and S14-9017R were among the entries having the lowest levels of % leaf area affected and % petioles with lesions. There was a significant correlation between % leaf area affected and % petioles affected by the disease in 45 soybean entries evaluated (Fig. 1).

UA5615C, S11-20242, S15-10434C, R07-6669, R12-6751RR, S11-17025, and Progeny 4930LL were among the entries having the least percentages of seed stain, with less than 10 % seed stain (Table 1). S14-9017R, S11-16653, R11-7999, S11-20242, and S11-20195GT performed well in soybean yield, having greatest levels of yield (more than 5,000 lb/A).

Table 1. Percent leaf area and petioles affected by Cercospora leaf blight, seed stain and yield of 45 soybean entries 2018

Entry #	Entry	Source	% leaf affected	% petioles affected	% seed stain	Yield (lb/A)
1	UA 5014C	AR	20	55	30	3954
2	UA 5615C	AR	21	61	0	3585
3	R11-171	AR	21	65	20	2545
4	R04-342	AR	15	55	23	3869
5	R07-6669	AR	20	68	8	4195
6	R10-298	AR	20	64	10	3631
7	R13-9687	AR	15	60	20	3037
8	R13-13997	AR	15	60	20	3658
9	R15-818	AR	18	48	30	3784
10	R15-2422	AR	18	53	16	3690

11	R15-1150	AR	19	53	13	3260
12	R12-6751RR	AR	15	43	8	3779
13	R13-4638RY	AR	15	43	10	4798
14	R11-7999	AR	30	68	13	5528
15	UARK-288	AR	25	49	30	4090
16	S11-9618RR2	MO	15	48	50	2526
17	S13-3851C	MO	15	46	45	3569
18	S14-15146R	MO	11	36	20	3550
19	S14-15138R	MO	10	35	18	3367
20	S11-20337GT	MO	21	45	38	3383
21	S11-20242	MO	20	41	0	5512
22	S11-17025	MO	15	57	8	3908
23	S11-20195GT	MO	33	70	10	5112
24	S12-4718	MO	18	48	10	4751
25	S11-16653	MO	8	23	10	5667
26	S14-9017R	MO	15	30	20	5719
27	S13-2743C	MO	20	80	55	2325
28	S13-10590C	MO	20	45	53	2989
29	S13-10592C	MO	10	31	13	3679
30	S15-3772RY	MO	9	34	30	3506
31	S15-5904RY	MO	18	49	28	3374
32	S14-9051R	MO	18	43	33	3863
33	S15-3847RY	MO	16	48	23	3061
34	S15-16886C	MO	23	65	10	4056
35	S15-17812C	MO	30	64	25	2872
36	S13-1955C	MO	20	48	21	3804
37	S15-10434C	MO	15	53	4	4032
38	S15-10879	MO	16	33	45	4345
39	S16-14558	MO	13	43	15	3648
40	S16-8156	MO	21	51	25	4235
41	LA13006	LA	19	43	--**	--
42	Progeny 4930LL	Progeny	15	44	8	4689
43	Delta Grow 4967LL	Delta Grow	5	16	15	3700
44	S13-1805C	MO	20	53	30	4679
45	REV 51A56	Terral Seed	19	44	21	2901
LSD (0.05)*			9.2	18.2	9.6	1003
P > F =			< 0.0001	<0.0001	< 0.0001	<0.0001

*Means are compared according to Fisher's protected Least Significance Difference (LSD) at P = 0.05.

** Not evaluated due to poor stand.

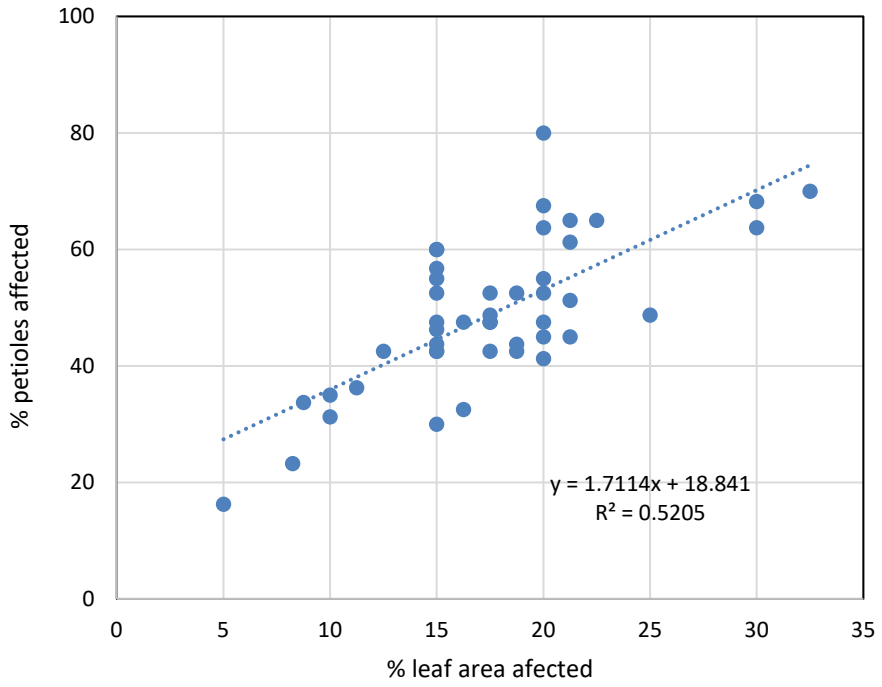

Fig. 1. Correlation between % leaf area affected and % petioles affected by Cercospora leaf blight of 45 soybean entries in the Texas trial in 2018.

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.

The field trial has met all the KPIs. The trial was properly conducted and all the disease assessments for leaf disease severity, and petiole and seed stain disease incidence were collected as scheduled. The trial was harvested, and yields were determined.

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.

Several lines with some levels of resistance against CLB were identified from the field trial conducted under the Texas environments (see Table 1).

Describe any unforeseen events or circumstances that may have affected project timeline, costs, or deliverables (if applicable.)

Frequent rainfall in the spring delayed the plating of this trial.

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.
These disease and yield data collected from this study could be useful for breeders to develop CLB-resistant cultivars with high yield potential in the southern United States.
List any relevant performance metrics not captured in KPI's.

Project Number:	1720-172-0124 (Year 2 of 2);1820-172-0124
Project Title:	Enhanced Pest Control Systems for Mid-South Soybean Production
Organization:	Texas A&M AgriLife Research
Principal Investigator Name:	Xin-Gen (Shane) Zhou

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.

A field trial evaluating soybean stink bug resistance was established at the Beaumont Center, TX in 2018. The trial consisted of five germplasm lines, D68-0102, D86-11839, D88-5272, D88-5974, and D92-4216. These lines were arranged in a randomized complete block design with four replicates. Plots consisted of four 20-ft rows spaced 30 in. between rows. Soybean was planted on June 15th, 2018 using a planter at the rate of 8 seed per ft of row. Prior to planting, all plots received 40 lb/A of potassium and 60 lb/A of phosphorus. Immediately after planting, all plots were sprayed with a mix of Dual II Magnum (2.5 pt/A) and FirstRate (0.75 oz/A) for control of weeds. Irrigation followed local recommendations. Starting at stage R3, scouting of plots using a sweep net was conducted to assess the number of stink bugs. The number of southern green stink bugs and brown stink bugs was counted from 25 sweeps per plot on September 19th, and October 1st and 12th. Prior to data analysis, both southern green stink bugs and brown stink bugs were combined, and square root transformed to normalize the distribution of the data. The data were then back transformed for presentation. No yield data were reported here since at the writing of this report, the trial was not ready for harvest until one week later. The yield data will be reported later once the trial is completed.

Throughout the cropping season, only southern green stink bugs and brown stink bugs, with a majority of the bugs being southern green stink bugs, were present in the plots. No redbanded stink bugs were observed. No significant difference in the number of total stink bugs among the five germplasm lines evaluated were observed on the scouting date of September 19th (Table 1). However, total numbers of stink bugs on D68-0102, D86-11839, D88-5272, and D92-4216 were significantly lower than those on D88-5974 on the two later assessment dates of October 1st and 12th.

These results indicate that D68-0102, D86-11839, D88-5272, and D92-4216 may have some tolerance against both southern green stink bugs and brown stink bugs.

Table 1. Stink bug assessment on five soybean lines in the field trial at Beaumont, TX in 2018

			No. of bugs/25 sweeps*		
Entry #	**Entry**	**Source**	**Sep. 19**	**Oct. 1**	**Oct. 12**
1	D68-0102	LSU	1.8	4.5 b	17.5 b
2	D86-11839	LSU	1.8	4.3 b	21.5 b
3	D88-5272	LSU	2.5	2.3 b	21.0 b
4	D88-5974	LSU	2.0	7.5 a	32.0 a
5	D92-4216	LSU	1.0	3.0 b	15.0 b
LSD (0.05) **			NS***	2.8	10.2
P > F =			0.9460	0.0133	0.0304

*Total number of southern green stink bugs and brown stink bugs.

**Means are compared according to Fisher's protected Least Significance Difference (LSD) at P = 0.05.

***Not significant at $P = 0.05$.

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.

The field trial has met all the KPIs. The trial was properly conducted and all the disease assessments for leaf disease severity, and petiole and seed stain disease incidence were collected as scheduled. The trial was harvested, and yields were determined.

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.

Four germplasm lines (D68-0102, D86-11839, D88-5272, and D92-4216) with a level of tolerance against stink bugs were identified from the field trial conducted under the Texas environments (see Table 1).

Describe any unforeseen events or circumstances that may have affected project timeline, costs, or deliverables (if applicable.)

Frequent rainfall in the late spring delayed the plating of this trial, resulting in a delayed harvest.

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.

These stink bug data collected from this study could be useful for breeders to develop stink bugs-tolerance cultivars with high yield potential in the southern United States.

List any relevant performance metrics not captured in KPI's.