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MISSISSIPPI SOYBEAN PROMOTION BOARD
PROJECT NO. 14-2018 (YEAR 1)
2018 ANNUAL REPORT

Title: **Determination of organisms affecting soybean seed quality and fungicide efficacy in reducing associated losses.**

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BACKGROUND

Major economic losses in the southern U.S. soybean production system may be attributed to poor grain quality which can result from delayed harvest. In extreme situations grain elevators have reported an average of 7% damage. In some years, Phomopsis seed decay, caused by *Phomopis longicola* (PL), can have an economic impact by affecting harvested soybean grain quality resulting in losses for soybean farmers at the grain elevator. In addition, PL can occur in soybean seed production fields and subsequently result in seed exhibiting slow seed germination or no germination when planted. The objective of this research was to determine differences in grain damage among soybean entries under environmental conditions conducive to reducing the quality of harvested grain.

METHODS

Field trials were established under rainout shelters (n=2) consisting of greenhouse cold frames covered with two-ply semi-clear plastic in 2018. Each shelter contained twenty-one entries planted as single row plots on 30-inch centers measuring 12 ft in length and replicated three times. All plots in Shelter 2 were inoculated at the R5.5 growth stage using a PL spore suspension consisting of beta conidia, while plots in Shelter 1 remained non-inoculated. The soybean plots in Shelter 2 received a 4 fl oz/acre application of trifloxystrobin + prothioconazole (as Stratego YLD) at beginning maturity (R7) while the plots in Shelter 1 remained non-treated. Shelters were simultaneously overhead-irrigated for approximately 200 hours. Plots were hand-harvested at full maturity (R8) to determine plot weight and associated grain damage.

Observations of grain damage were based on observations of a composite of symptoms associated with Phomopsis seed decay that included presence of white mycelium considered to be PL, as well as individual kernels with a shriveled, elongated, or cracked appearance. Hundred kernel weights were determined from post-harvest grain samples and seed viability was measured using a simple germination test consisting of three subsamples from each harvested plot sample incubated at 22°C for 7 days.

RESULTS

Data were subjected to analysis of variance using PROC GLM in SAS. Significant differences were observed in the non-fungicide shelter among entries, with a 78% difference in weight between Progeny 4211 (selected check) and 11030-541-210 and an 81% difference in damage between 11030-541-210 and DB06X06-093, two advanced entries from the USDA breeding program (Fig. 1, Table 2). No significant differences in harvested weight, hundred kernel weight, or grain damage were observed in the fungicide-treated shelter (Fig. 2, Table 1, Table 2).

Figure 1. Harvest data in grams of grain per plot and grain quality evaluations as visual damage (%) and damage kernel total (DKT) from trials under rainout shelters in Stoneville, MS. with no fungicide applied.

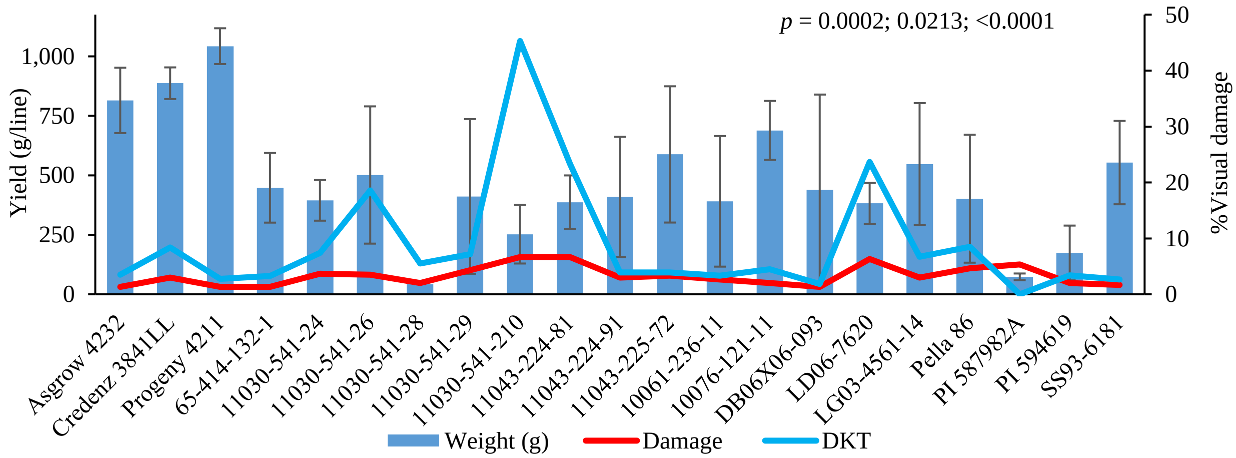
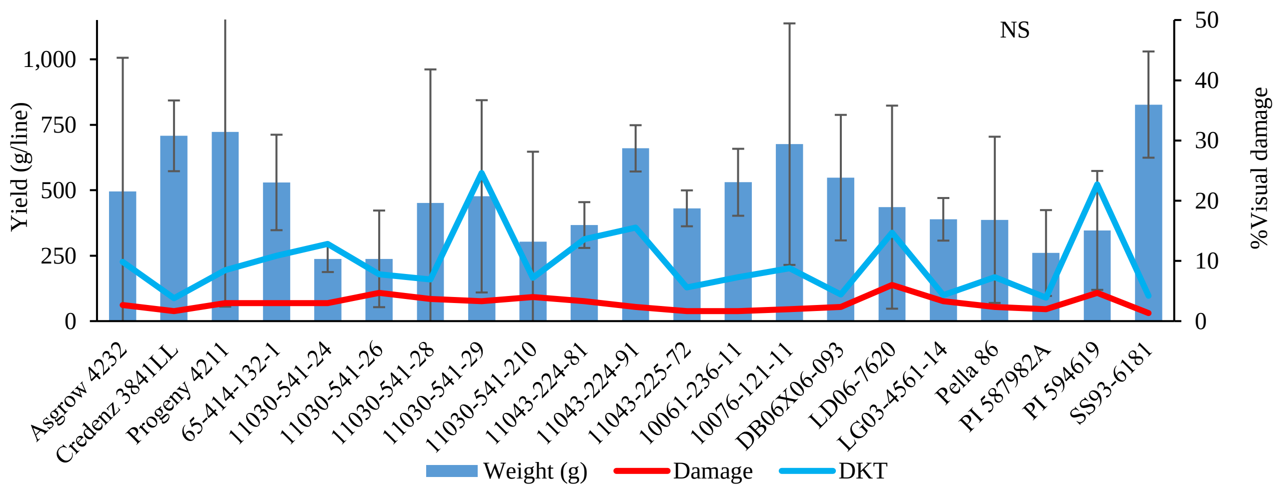


Figure 2. Harvest data in grams of grain per plot and grain quality evaluations as visual damage (%) and damage kernel total (DKT) from trials under rainout shelters in Stoneville, MS with fungicide (as Stratego YLD) applied at R7.



Discussion

PI lines did not perform as well as the commercial lines with respect to yield; however, less damage was observed with some PI lines when compared to commercial checks. Some level of harvested grain damage occurred regardless of variety or line. Differences suggest there may be some tolerance within commercial germplasm and experimental lines. Increased damage reduced germination.

Currently, methods are in process to determine pathogens present on harvested grain which may contribute to a reduction in quality. Additional research is needed to determine the potential of germplasm in reducing seed quality losses.

Outreach

Project components have been discussed at board meetings including the Mississippi Soybean Promotion Board summer tour and at the Mid-South Soybean Promotion Board summer and winter meetings. A poster (Southern Division APS) and oral presentation (Southern Soybean Disease Workers) have been made with the data collected in 2018 trials.

On-going Research

This study will be conducted again in 2019. The planting date will be targeted for mid-April to early May 2019 depending on repair of the shelters. Thus, we will continue to examine factors contributing to the reduction in quality of harvested grain with new soybean germplasm.

Table 1. Results from post-harvest evaluation of 100 kernel weight and seed viability from 2018 Stoneville, MS field location.

	No fungicide applied		**Fungicide applied**	
Treatment	**100 kernel weight (g)**	**% Germination**	**100 kernel weight (g)**	**% Germination**
LG03-4561-14	19.4	36.5	20.2	10.3
Pella 86	23.5	2.2	20.6	35.2
CZ3841LL	.	61.7	18.0	51.2
LD06-7620	19.8	6.2	19.3	9.7
PI 587982A	.	.	21.1	28.8
SS93-6181	21.2	69.3	19.2	26.8
PI 594619	17.8	65.3	21.4	42.0
Progeny 4211	23.8	20.2	20.3	33.9
AG4232RR2Y	21.6	71.8	18.4	3.8
11043-225-72	21.8	30.5	.	21.0
65-414-132-1	.	.	21.1	8.5
11043-224-91	20.7	90.7	20.3	12.7
11030-541-24	18.1	13.3	16.5	1.7
11043-224-81	20.4	6.7	18.7	7.0
11030-541-26	19.1	9.7	21.0	4.7
11030-541-29	19.3	13.0	21.5	31.0
11030-541-210	18.3	5.3	.	.
11030-541-28	.	.	22.9	33.5
10061-236-11	22.4	51.7	20.9	20.5
10076-121-11	21.6	41.2	20.1	6.2
DB06X06-093	21.6	28.3	19.3	49.3
p = value	0.0740	0.2521	0.7646	0.7335

Table 2. Harvest results for average treatment seed weight and associated damage evaluations.

	No fungicide applied			Fungicide applied		
Treatment	**Weight (grams)**	**Damage (1-10 scale)**	**Mid-South Grain Ratings (DKT)**	**Weight (grams)**	**Damage (1-10 scale)**	**Mid-South Grain Ratings (DKT)**
LG03-4561-14	547.2 bcde	3 bcd	6.7 cd	388.8	3.3	4.3
Pella 86	401.8 defgh	4.67 abcd	8.5 cd	386.8	2.3	7.3
CZ3841LL	887.1 ab	3 bcd	8.37 cd	707.7	1.7	3.8
LD06-7620	382.2 defgh	6.33 ab	23.67 b	435.3	6.0	14.67
PI 587982A	73.2 gh	5.33 abc	.	260.0	2.0	3.9
SS93-6181	553.5 bcde	1.67 d	2.67 d	827.0	1.3	4.2
PI 594619	173.8 fgh	2 cd	3.4 d	346.4	4.7	22.73
Progeny 4211	1042.8 a	1.33 d	2.77 d	722.9	3.0	8.47
AG4232RR2Y	814.8 abc	1.33 d	3.53 d	495.6	2.7	9.85
11043-225-72	587.9 bcde	3.33 abcd	3.93 d	430.8	1.7	5.57
65-414-132-1	447.6 def	1.33 d	3.27 d	529.6	3.0	10.87
11043-224-91	409.0 defg	3 bcd	3.93 d	659.9	2.3	15.53
11030-541-24	394.8 defgh	3.67 abcd	7.43 cd	237.7	3.0	12.83
11043-224-81	387.1 defgh	6.67 a	23.3 b	367.0	3.3	13.63
11030-541-26	501.5 cdef	3.5 abcd	18.55 bc	237.8	4.7	7.75
11030-541-29	411.4 defg	4.33 abcd	7.2 cd	476.6	3.3	24.6
11030-541-210	252.6 efgh	6.67 a	45.3 a	303.5	4.0	7.2
11030-541-28	42.3 h	2 cd	5.5 cd	451.8	3.7	6.9
10061-236-11	390.7 defgh	2.67 cd	3.35 d	530.3	1.7	7.3
10076-121-11	688.8 abcd	2 cd	4.47 d	675.9	2.0	8.77
DB06X06-093	439.3 def	1.33 d	1.85 d	548.0	2.3	4.4
p-value	0.0002	0.0213	<0.0001	0.6373	0.6996	0.8445