MISSISSIPPI SOYBEAN PROMOTION BOARD
PROJECT NO. 03-2017 (YEAR 3)
FINAL REPORT

Title: Impact of Fruiting Structure Loss at Various Growth Stages on Soybean Yield under Conditions that may Limit Yield Potential

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BACKGROUND AND OBJECTIVES

Much of the soybean production in Mississippi utilizes some form of the early soybean production system. This includes early planting (early April-early May) and planting early maturing indeterminate soybean varieties (Maturity Group IV and V). These practices have helped to greatly improve soybean yields over the last 20 plus years, and irrigation capabilities have helped to improve and stabilize yields. However, a substantial portion of the 2015 Mississippi soybean crop was cultivated under non-irrigated conditions (estimated at 45%). Also, depending on the year, as much as 40% of the soybean crop in Mississippi may be planted later than what is considered the early production system window for various reasons, including weather, harvest management, or after wheat production, and these plantings are more at risk for corn earworm infestations than earlier plantings. These conditions (later planting, no irrigation capabilities) can limit yield potential.

Recently research was conducted to refine/validate treatment thresholds for corn earworm infesting soybeans. Also, studies were conducted to determine the impact of fruit loss on soybean yield and identify the periods of growth when this impact occurs. This research was focused on situations with higher yield potential that included use of the early soybean production system with irrigation capabilities. Soybeans grown under lower yield potential conditions may not respond to fruit loss in the same manner as those cultivated under conditions conducive to higher yield. Much of the research prior to these studies was non-irrigated; however, the studies utilized later maturing determinate Maturity Group VI and VII varieties which do not reflect the current soybean production practices in Mississippi.

Objective: To investigate the impact of fruiting structure loss (flowers, pods) at different reproductive growth stages on soybean yield under conditions that may limit yield potential (non-irrigated, later planted).

REPORT OF PROGRESS/ACTIVITY - FINAL

Asgrow 4632 soybean seed were planted on 5 and 8 Apr at Stoneville during 2016 (2 experiments), and on 2 May at Stoneville and 27 Apr at Starkville during 2017 (3 experiments). Damage treatments including 0, 25, 50, 75, or 100% removal of fruiting structures were imposed when the majority of plants within designated plots reached the R2, R3, R4, or R5 growth stages. Due to rapid plant growth which lead to plants progressing from the R3 to R5 growth stage within a ca. 8-day period, the R4 growth stage was not included in experiments at Stoneville during 2016.

Percent non-senesced (green) stems was estimated on 13 and 14 Sep during 2016 and on 18 Sep at Starkville and 20 Sep at Stoneville during 2017. Trials were harvested on 23 Sep 2016 at Stoneville, on 4 Oct 2017 at Starkville, and 4 and 9 Oct 2017 at Stoneville. These trials received no supplemental

irrigation, and rainfall that occurred between planting and harvest and the 10-year average rainfall for Stoneville, MS are shown in Figure 1. Rainfall during early to mid-May 2016 was below the 10-year average, while rainfall during July and August of both years was substantially above the 10-year average.

A significant interaction between growth stage and fruiting structure removal level was observed for percent non-senesced main stems (Table 1). Only 100% fruiting structure removal during the R2 growth stage resulted in a significantly higher percent of non-senesced main stems compared to the control. All other treatment combinations resulted in a similar level of non-senesced main stems compared to the control.

There was no significant interaction between growth stage and fruiting structure removal level for yield. Fruiting structure loss during the R5 growth stage significantly reduced yield compared to all other growth stages and the control (Table 2). Across all fruiting structure removal levels, damage during the R5 growth stage resulted in an 8.6 bu/acre yield reduction. Fruiting structure removal of >25% significantly reduced yield compared to the control, with 100% removal resulting in the greatest yield reduction. Across all growth stages, 100% fruiting structure removal resulted in a 9.8 bu/acre yield reduction. Rainfall during late Jul through late Aug during both years was substantially higher than the 10-year average (Figure 1). Although these studies did not receive irrigation, adequate moisture was available and plants were able to compensate for fruit loss.

IMPACTS AND BENEFITS TO MISSISSIPPI SOYBEAN PRODUCERS

Similar to previous studies, these data demonstrate that soybeans may be able to compensate for even severe levels of fruit loss during the early reproductive portion of the growing season if favorable growing conditions occur, ex. adequate moisture. Also, similar to previous studies, these data illustrate that soybean is more sensitive to fruiting structure loss during the R5 growth stage compared to earlier reproductive growth stages. If average or below-average rainfall had occurred during July and August, it is possible that very different results would have been observed.

END PRODUCTS–COMPLETED OR FORTHCOMING

These data demonstrate that under adequate to optimal growing conditions, recommendations for managing fruit-feeding insects should be similar for both irrigated and non-irrigated soybean. Also, soybean planted before and at the end of the optimal planting period responded similarly to fruit loss for soybean planted at an optimum time in other studies. However, these results may not apply to extremely late-planted or severely moisture-limited soybean. Data have been and will continue to be presented at grower meetings.

Table 1. Impact of fruiting structure loss at different growth stage on soybean maturity during 2016 and 2017.

Growth Stage	Damage Level	% Non-Senesced Main Stems
R2	25%	48.5bc
R2	50%	40.1bcd
R2	75%	47.5bcd
R2	100%	70.2a
R3	25%	48.2bc
R3	50%	47.6bc
R3	75%	36.0cd
R3	100%	31.3d
R4	25%	45.6bcd
R4	50%	46.8bcd
R4	75%	55.9ab
R4	100%	55.1ab
R5	25%	42.9bcd
R5	50%	41.4bcd
R5	75%	45.5bcd
R5	100%	53.9b
Control	-	46.8bcd
P>F		<0.01

Means within columns followed by a common letter are not significantly different (FPLSD *P>F* 0.05).

Table 2. Impact of fruiting structure loss at different growth stages on soybean yield during 2016 and 2017

Growth Stage	Yield (bu/acre)	Damage Level	Yield (bu/acre)
R2	59.3a	25%	60.4ab
R3	60.0a	50%	59.6b
R4	59.1a	75%	59.6b
R5	54.2b	100%	53.0c
Control	62.8a	Control	62.8a
P>F	<0.01	*P>F*	<0.01

Means within columns followed by a common letter are not significantly different (FPLSD *P>F* 0.05).

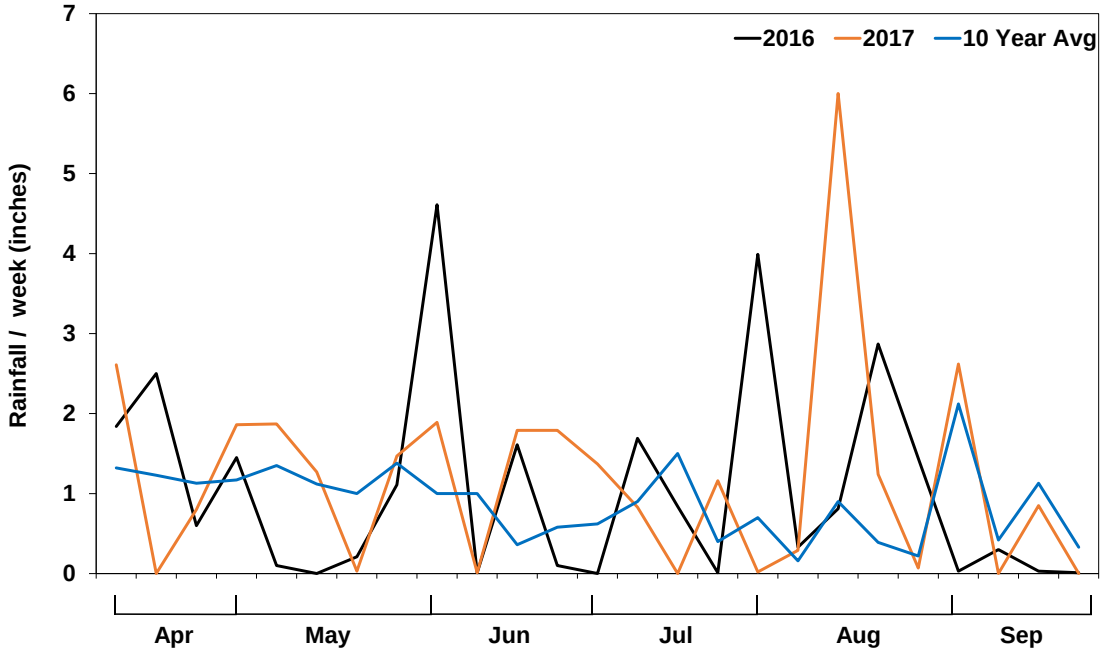

Figure 1. Weekly rainfall totals from 1 Apr to 30 Sep 2016 and 2017, and 10 year average rainfall for Stoneville, MS.