



WITH UP-TO-DATE SOYBEAN PRODUCTION INFORMATION

MISSISSIPPI SOYBEAN PROMOTION BOARD PROJECT NO. 03-2016 (YEAR 1) 2016 ANNUAL 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) of 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, to manage harvest, or after wheat production. 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 that 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 potential. 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

Asgrow 4632 soybean seed were planted on 5 and 8 Apr on silt loam and clay soils, respectively.

Plants in the silt loam trial reached the R2, R3, and R5 growth stages on 6, 17, and 28 June, respectively. Damage treatments including 0, 25, 50, 75, or 100% removal of fruiting structures were imposed on the R stage dates listed above.

In the clay soil trial, plants reached the R2, R3, and R5 growth stages on 8, 20, and 28 June, respectively. Damage treatments (same as above) were imposed on these R stage dates. Percent green



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stems was estimated on 13 and 14 Sep in the silt loam and clay soil trials, respectively. Both trials were harvested on 23 Sep.

These trials received no supplemental irrigation. Rainfall that occurred between planting and harvest and the 10-year average rainfall for Stoneville, MS are illustrated in Figure 1. Rainfall during early to mid May was below the 10-year average, while rainfall during July and August was substantially above the 10-year average.

For the trial conducted on the silt loam soil, there was a significant interaction between growth stage and fruit removal level for the percentage of non-senesced main stems. One hundred percent fruit removal at the R2 growth stage resulted in significantly more non-senesced main stems than all other treatments (Table 1). There was a trend for fewer non-senesced stems when fruit removal treatments were imposed at later growth stages.

There was a significant interaction between growth stage and fruit removal level for yield. Fruit removal of $\leq 75\%$ at the R2 growth stage, $\leq 100\%$ at the R3 growth stage, or $\leq 50\%$ at the R5 growth stage did not impact yield compared to the non-damaged control. Only fruit removal of 100% at the R2 and R5 growth stages significantly reduced yield.

For the trial conducted on the clay soil, there were no significant differences among treatments for the percentage of non-senesced main stems or yield (Table 2). Percent non-senesced main stems ranged from 55% to 100%, while yields ranged from 49.2 to 71.6 bu/acre. Results from these studies are somewhat different from those of previous studies in which fruit removal of 100% at the R3 and R4 growth stages and fruit removal of $\geq 50\%$ at the R5.5 growth stage reduced yields. Plant development progressed fairly rapidly with plants reaching the R5 growth stage by the end of June.

Although these studies did not receive irrigation, rainfall during late July through late August was substantially higher than the 10-year average (Figure 1). With plants reaching R5 early in the growing season (late June) and above average rainfall during July and August, it is possible that plants were able to compensate for fruit loss to some degree.

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 early during the reproductive portion of the growing season if adequate moisture is available. Also, similar to previous studies, these data illustrate that severe levels of fruit loss at R5 can significantly reduce yield. If average or below average rainfall had occurred during July and August, it is possible that very different results would have been obtained. Caution should be used when interpreting these data since they are from only one site-year for each trial and above average rainfall occurred during July and August.

END PRODUCTS—COMPLETED OR FORTHCOMING

Currently, these data are considered preliminary, especially with the above average rainfall that occurred during July and August of 2016. Therefore, these data have not been formally presented to the public.. However, some aspects of the data were informally presented at grower meetings during the winter/spring of 2017.

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Table 1. Impact of fruiting structure loss at different growth stage for soybeans grown on a silt loam soil without supplemental irrigation.

Growth Stage	Damage Level	% Non-Senesced Main Stems	Yield (bu/acre)
R2	25%	47.5bc	43.8ab
R2	50%	54.3b	45.6a
R2	75%	57.7b	44.6ab
R2	100%	88.8a	28.0d
R3	25%	40.0bcd	39.6abc
R3	50%	61.3b	43.3ab
R3	75%	40.0bcd	45.3a
R3	100%	40.0bcd	40.1abc
R5	25%	37.5bcd	39.6abc
R5	50%	23.8cd	37.1bc
R5	75%	20.0d	41.8ab
R5	100%	22.5cd	33.6dc
Control	-	39.6bcd	43.3ab
<i>P>F</i>		0.04	0.03

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 for soybeans grown on a clay soil without supplemental irrigation.

Growth Stage	Damage Level	% Non-Senesced Main Stems	Yield (bu/acre)
R2	25%	70.0	70.0
R2	50%	56.1	62.2
R2	75%	61.1	66.4
R2	100%	60.0	57.6
R3	25%	94.4	70.0
R3	50%	78.8	70.0
R3	75%	83.8	71.6
R3	100%	55.0	67.5
R5	25%	96.1	70.6
R5	50%	100.0	62.0
R5	75%	95.0	60.7
R5	100%	93.8	49.2
Control	-	90.6	68.5
<i>P>F</i>		0.53	0.87

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

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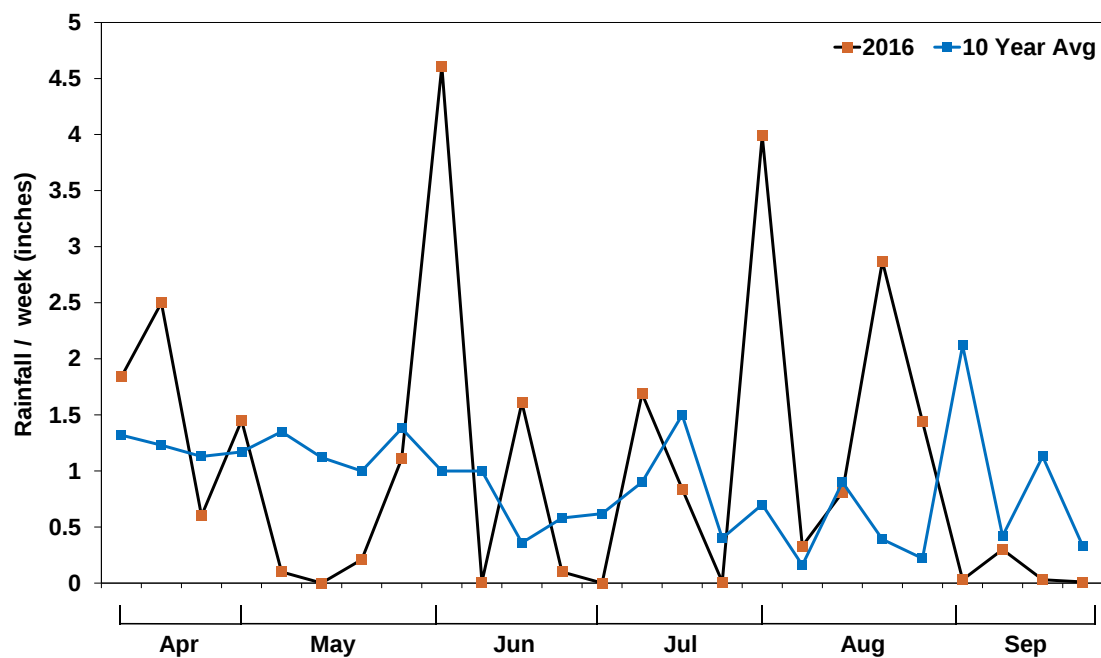


Figure 1. Weekly rainfall totals from 5 April to 23 Sep. 2016 and 10-year average rainfall for Stoneville, MS.