

RESULTS FROM MSPB-FUNDED RESEARCH–SMART PROJECT

One of the objectives of the MSPB is to support the training of agricultural practitioners by providing funds that support graduate research assistants that are affiliated with funded projects. A list of theses and dissertations that have resulted from this effort, along with the names of degree recipients, can be found [here](#).

One such product from this support effort is a thesis titled “[Impact of planting strategies on soybean \(*Glycine max* L.\) growth, development, and yield](#)” that was authored by Mr. Shane Carver as part of the MSU-ES SMART program under the direction of Dr. Trent Irby, SMART Coordinator. Results from Chapters II and III of this thesis are summarized below.

Chapter II: Evaluating the effect of row spacing, planting date, and seeding rate on soybean growth, development, and yield

- Rain-fed (nonirrigated) experiments were conducted in 2016 [three locations–Starkville (Marietta fine sandy loam soil), Brooksville (Brooksville silty clay soil), and Stoneville (Sharkey clay soil)] and 2017 [two locations–Starkville and Brooksville].
- At each location, a MG IV RR2 Xtend variety was planted in wide [38 in.], narrow [30 in.], and ultra-narrow [15 in.] rows at seeding rates of 80, 100, 120, 140, and 160 thousand seeds/acre in mid-April, mid-May, and mid-June.
- Plant height and number of nodes were measured/counted at stage R5.5, and seed yield was measured in all experiments each year. A partial budget analysis was calculated for each seeding rate each year.
- Number of nodes at R5.5 was not significantly affected by any of the experimental variables. Number of nodes ranged from 17.1 [38-in.-wide rows, mid-June planting, 160 thousand seeds/acre] to 23 [mid-May planting, 15-in.-wide rows, 160 thousand seeds/acre].
- As expected, plants in the April plantings were the shortest [29 in.] compared to those in the mid-May [33 in.] and mid-June plantings [31 in.]. All of these average heights were sufficient to ensure optimum harvestability.
- Row spacing alone did not affect average soybean yield, but did interact with planting date to significantly affect seed yield. In the mid-April and mid-May plantings, soybeans grown in the three row spacings produced statistically equivalent yields that ranged from 35.4 bu/acre [narrow rows, mid-April planting] to 42.9 bu/acre [ultra-narrow rows, mid-April planting], and all were greater than yields from the June plantings [26.3 to 30.0 bu/acre] regardless of row spacing.
- Seeding rate alone affected yield; i.e., seeding rate did not interact with either planting date or row spacing to affect yield. The yield rank according to thousands of seed planted per acre was 80 [31.8 bu/acre] < 100 [33.9 bu/acre] ≤ 120 [35.3 bu/acre] = 140 [36.3 bu/acre] = 160 [36.8 bu/acre]. Planting at the 120 and 140 thousand seeds/acre rate resulted in the greatest net returns to seeding rate. Thus, planting more than 140 thousand seeds/acre in these dryland plantings did not result in increased yield and resulted in lower net returns to seeding rate.

Chapter II Take Home Message

The above summary points from these dryland studies support the following conclusions.

- Soybeans planted earlier in the season will produce the greatest yield.
- Choice of row spacing for soybean plantings is not as important as planting early.
- Using narrow rows will not overcome lower yields from June plantings.
- Using a seeding rate greater than 140 thousand/acre will not result in increased yield and will likely lower net return.

- Using a seeding rate lower than 100 thousand/acre will likely result in both lower yield and net return.
- These results further support the use of the ESPS in Midsouth dryland soybean plantings, and also support the use of seeding rates that are between about 120 and 140 thousand/acre.

Chapter III: Determining the optimal seeding rate and planting approach for replant situations in Mississippi soybean

- Experiments were conducted in 2016 and 2017 at two irrigated locations [Starkville (Marietta fine sandy loam soil) and Stoneville (Sharkey clay soil)], and in 2017 at a nonirrigated location [Brooksville (Brooksville silty clay soil)].
- At each location, experiments were planted between Apr. 21 and May 12 with varying percentages of a MG IV RR2 [RR] variety and a MG IV LibertyLink [LL] variety at 130 thousand seeds/acre in rows that were 38 in. apart.
- The RR and LL varieties were mixed at the following percentages: 1) 100% RR, 0% LL; 2) 75% RR, 25% LL; 50% RR, 50% LL; 25% RR, 75% LL; and 0% RR, 100% LL to achieve a seeding rate of 130 thousand/acre. The LL variety was used to allow randomized plant elimination within rows by a broadcast application of glyphosate at Stage V1 when the unifoliate leaves above the cotyledons were fully unrolled.
- Replant treatments were initiated between May 24 and June 9 except at Starkville in 2017 because of excess rainfall.
- Replanting consisted of planting 0% [no replant], 25%, 50%, 75%, and 100% of the initial seeding rate [130 thousand/acre] of the RR variety alongside the same rows at 7 to 10 days after glyphosate was applied to remove the LL plants. There were also treatments with no replanting into the various reduced stands—i.e., the initial stand minus the removed LL plants was left with no replanting—and removal of the entire initial stand and replanting with different percentages of the initial seeding rate.
- When the initial stand was reduced by 25% with no replanting, yield [48.4 bu/acre] was not significantly reduced below that from the initial seeding rate with no plant removal [51.6 bu/acre]; thus, there was no yield advantage to replanting the lost 25% and the cost of replanting was not recouped.
- When 50% of the initial stand was removed with no replanting, yield [46.3 bu/acre] was significantly reduced below that from the initial seeding rate with no plant removal [51.6 bu/acre], but replanting an amount of seed that equaled the percentage stand removal did not result in increased yield [47.3 vs. 46.3 bu/acre]. Thus, the cost of replanting was not recouped.
- When 75% of the initial stand was removed with no replanting, yield [33.5 bu/acre] was significantly reduced below all yields from treatments with less stand loss. Replanting an amount of seed that equaled the percentage stand removal of 75% resulted in a significant yield increase above that from not replanting (39.9 vs. 33.5 bu/acre). These results indicate that replanting should occur when the initial soybean plant population is reduced by more than 50%.
- When complete reduction of the existing stand occurred, replanting at the seeding rate to equal 100% of the lost stand resulted in a yield [32.9 bu/acre] below that from the initial stand [51.6 bu/acre] that was not reduced. However, replanting this 100% failed stand at a seeding rate that equaled only 50% of the initial seeding rate resulted in a yield [29.9 bu/acre] that was equivalent to that [32.9 bu/acre] obtained from replanting at the 100% seeding rate. Thus, it may not be economically feasible to replant a completely failed stand at the initial seeding rate.

Chapter III Take Home Message

- The results from this study underline the importance of achieving an adequate soybean plant stand from an initial planting in order to maximize yield and eliminate/reduce costs associated with replanting.

- A reduction of an initial soybean stand of up to 25% likely will not justify any replanting.
- Interestingly, replanting of the 50%, 75%, and 100% removal treatments at a seeding rate lower than that equal to the removed stand resulted in yields that were equivalent to those achieved from replanting at a seeding rate equal to the removal treatment. Thus, replanting when stands are reduced by these amounts likely can be done at a reduced rate to save money.

Of course, any decisions based on results from the above studies should ensure that high-quality soybean seed are used in all plantings and replantings. I encourage you to view the entire thesis via the above link for complete details about the conduct of, treatments used in, and results from the summarized studies.

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