2017 Delaware Soybean Board Report

Title: Can Plant Population Play a Role in Reducing Lodging Losses in Soybeans from Dectes Stem Borer?

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Objectives:

1. Evaluate the role plant populations can play in reducing lodging losses from Dectes stem borers.

2. Identify the ideal plant populations for maximizing stem diameter while maintaining yield potential under irrigated and non-irrigated soybean production.

Methods:

Asgrow '4135' soybeans were planted on May 18 at the University of DelawareWarrington Irrigation Research Farm located in Harbeson, DE. Plots were established at seeding rates of 80,000, 110,000, 140,000, and 170,000 seeds per acre and received two different irrigation treatments, irrigated (>50% soil moisture) and non-irrigated. Plots were arranged in a randomized split plot design with six replications. Stand counts were taken on June 6 and October 31 by counting the total number of plants in 34'8" of

linear row in the center of each plot. Plots were sampled for Dectes stem borer adults by sweeping on July 14 and August 3, 17, and 22. Plant height was measured by recording the height of three, randomly selected plants in each plot. Prior to harvest, fifty soybean stems were sampled from each plot by collecting ten consecutive plants in five random locations to document stem diameter and to determine the percentage of infested plants. Stem diameter was measured at the first node on each plant using a digital caliper. Stems were split and the presence or absence of Dectes stem borer larvae was recorded. The number of lodged plants was recorded in 1/1000th of an acre in the center of each plot. Plants that were determined to be un-harvestable (lying flat on the ground) were collected and thrashed to estimate lodging loss. Yield was recorded at harvest, November 3, 2017, and data were analyzed using a general linear model. Means were separated following significant F-tests using Fisher's LSD (α=0.05).

Results:

Seeding rate did not have a significant effect on plant height, yield, percent infested stems, percent lodged plants, or lodging loss. However, stem diameter was significantly greater at the lower seeding rates compared to the higher plant populations regardless of irrigation treatment (Table 1). The irrigated plots were significantly taller, had fewer infested stems, fewer lodged plants, and less lodging loss compared to the non-irrigated plots. There were no significant differences between the irrigated and non-irrigated treatments for yield (Table 2).

Table 1. Seeding rate treatment effect on full soybean height, yield, stem diameter, % infested stems with Dectes stem borer, % lodged plants, and lodging losses in 2017 at the University of Delaware Warrington Farm in Harbeson, DE.

Seeding Rate Treatment	Final Stand	Plant Height	Yield	Stem Diameter	Infested Stem	Lodged Plants	Lodging Losses
	plants/A	inches	bu/A	inches	%	%	bu/A
80,000 seeds/acre	73,000	35 a[1]	63 a	**0.341 a**	23 a	7 a	1.2 a
110,000 seeds/acre	96,000	35 a	60 a	**0.314 ab**	18 a	12 a	2.8 a
140,000 seeds/acre	123,000	35 a	63 a	**0.280 bc**	19 a	13 a	2.7 a
170,000 seeds/acre	146,000	37 a	59 a	**0.258 c**	18 a	10 a	1.8 a

[1]Treatment means followed by the same letter are not significantly different.

Table 2. Irrigation treatment effect on soybean height, yield, stem diameter, % infested stems with Dectes stem borer, % lodged plants, and lodging losses in 2017 at the University of Delaware Warrington Farm in Harbeson, DE.

Irrigation Treatment	Plant Height	Yield	Stem Diameter	Infested Stem	Lodged Plants	Lodging Losses
	inches	bu/A	inches	%	%	bu/A
No Irrigation[1]	**34 a**[2]	60 a	0.310 a	**22 a**	**13 a**	**3.2 a**
Irrigation	**37 b**	63 a	0.286 a	**16 b**	**8 b**	**1.1 b**

[1]Irrigation treatment were kept at >50% available soil moisture (0% = dry; 100% moisture = wet).
[2]Treatment means followed by the same letter are not significantly different.

Discussion:

Stem diameter was significantly greater at lower plant populations compared to higher seeding rates but this did not reduce the percentage of lodged plants or lodging losses based on the populations evaluated (final stand: 73,000, 96,000, 123,000, and 146,000 plants per acre). However, there is a trend that suggests that as plant populations increase, the percentage of lodged plants also increases. The irrigated plots had fewer infested plants, less lodging, and less lodging losses compared to the non-irrigated plots. One possible explanation for this may be that the non-irrigated plants were more stressed, weakening the plant's natural defenses and as a result, they may have been more attractive to females for depositing eggs.

There were no significant differences for yield, regardless of seeding rate. This suggests that final plant populations, as low as 73,000 plants per acre have similar yield potential compared to higher plant populations. However, it should be noted that plant spacing was even for all the plant populations evaluated. Results may be different if plant spacing is uneven and there are large skips within rows, especially at lower plant populations. Irrigation did not have a significant effect on yield. Additional research is needed to evaluate the yield potential of lower seeding rates under different growing conditions such as a dry year.