Utilizing Row Cleaners for Better Soybean Emergence after an Overwintering Cover Crop

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Objective

Determine the effect of row cleaner use on soybean emergence, population, and yield when planting green into an overwintering annual ryegrass cover crop.

Background

No-till soybeans are becoming increasingly common in Ohio. Reduced tillage allows for fuel, equipment, and time savings, and a reduction in tillage-related effects such as soil compaction. Keeping residue intact on the soil surface can protect the soil from crusting during wet spring weather, as well as provide an additional nutrient source to the following cash crop as residue decomposes. However, no-till soybeans do offer some challenges for growers, including reduced seed-to-soil contact and cool, wet soils at planting. Previous crop roots and aboveground residue can interfere with planter equipment and lead to reduced depth control and potentially poor seed placement if insufficient downforce and/or planter attachments (such as residue-cutting coulters) are not utilized (Barker et al., 2017). Growers who utilize overwintering cover crops must have a plan for termination method and timing to avoid negative impacts, such as competition for water, nutrients, and light, on the following cash crop. According to the Ohio Agronomy Guide, the ideal planting depth for soybeans in the state is between 1.0 and 1.5 inches. In this study, Precision Planting's Reveal® frame-mounted row cleaners were implemented as an attempt to move cover crop residue out of the planter unit furrow and allow for better depth control, seed placement, and seed-to-soil contact.

Methods

This study was conducted on a Latty Silty Clay soil near Haviland, Ohio. Soybeans were planted into a 6-8" tall standing annual ryegrass cover crop before anthesis, drilled at 20 lb/acre in late October, following corn silage harvest. This study utilized a randomized complete block (RCB) design with each treatment replicated six times. Each treatment was one 30-foot-wide planter pass down the field. Becks 2997XF soybeans were planted at 148,480 seeds per acre following corn and an annual ryegrass cover crop on May 18th, 2023, in 15-inch rows. Soil conditions were moist but below field capacity, as rainfall over the previous week had totaled 0.28 inches, according to NOAA Observed Weather Data. One pre-emerge herbicide application of Engenia and Clethodim was made on May 23rd, 2023, but no other herbicide, insecticide, or fungicide was applied during the growing season. The field has 4" pattern tile spaced 30 feet apart, perpendicular to the study. There were two treatments: row cleaners and the control treatment (no row cleaners). The equipment being tested was the Reveal frame-mounted row cleaner by Precision Planting. It is believed that frame-mounted row cleaners offer better depth control and downforce when compared to row-unit mounted row cleaners. Stand counts were collected with the hula hoop method to track establishment and population differences throughout the growing season between treatments. A 28" diameter hula hoop, which represents 1/10,000 of an acre at 15" row spacing, was thrown randomly twice in each treatment plot at each sampling date (Anderson et al., n.d.). At each stand count date, plant growth stage was tracked for each plot. Yield data was collected via a calibrated yield monitor at harvest on October 20th, 2023. An Analysis of Variance (ANOVA) test with 0.1 confidence level was utilized to compare stand count data and determine treatment differences in yield.

Results

Stand counts were collected on five dates throughout the growing season, from June to September 2023 (Table 1; Figure 1). Due to the size of the field, one extra plot of the row cleaner treatment was included in the study, for a total of 7 row cleaner and 6 control plots. The row cleaner treatment had a numerically higher average stand through the first four stand count dates but evened out to the same stand as the control treatment just before harvest. The average plant growth stage by date did not vary between treatments during the growing season (Table 2).

		Table 1. Avg Plant Population by Date (plants/ac)				
Plot Number	**Treatment**	**6/9/2023**	**6/20/2023**	**7/12/2023**	**8/11/2023**	**9/22/2023**
1	row cleaner	0	50,000	65,000	95,000	80,000
2	row cleaner	30,000	45,000	70,000	80,000	115,000
3	control (none)	20,000	65,000	60,000	105,000	110,000
4	control (none)	0	65,000	85,000	70,000	95,000
5	row cleaner	15,000	65,000	85,000	110,000	70,000
6	control (none)	0	50,000	75,000	90,000	95,000
7	row cleaner	0	35,000	110,000	95,000	90,000
8	row cleaner	0	75,000	95,000	85,000	65,000
9	row cleaner	0	60,000	105,000	85,000	80,000
10	control (none)	10,000	15,000	70,000	85,000	65,000
11	control (none)	0	10,000	80,000	95,000	60,000
12	row cleaner	30,000	20,000	85,000	80,000	110,000
13	control (none)	0	10,000	80,000	60,000	95,000

Figure 1. Stand Count Results by date.
"*" denotes significant result.

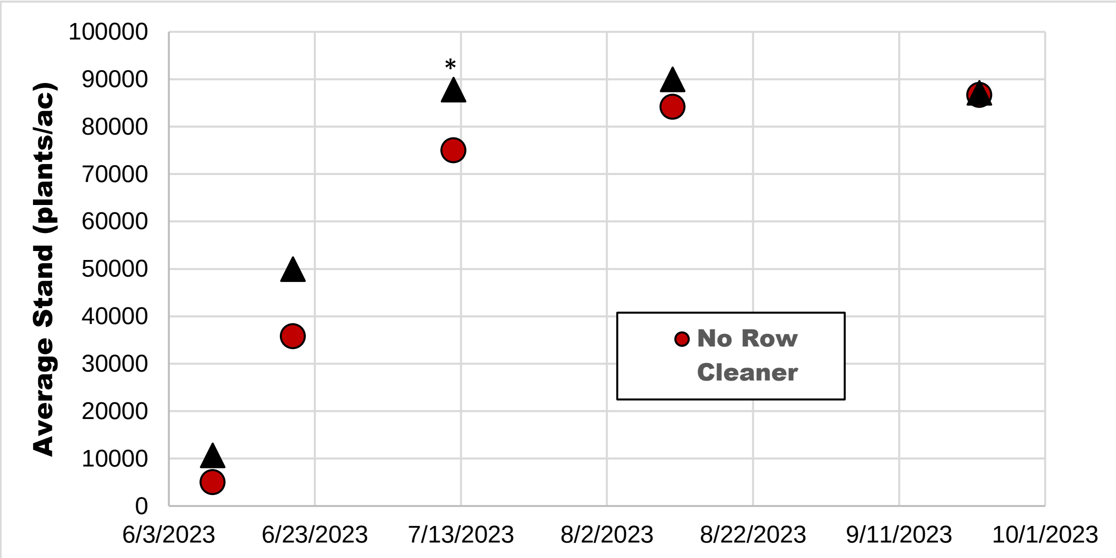


	Table 2. Avg Plant Growth Stage by Date				
Treatment	**6/9/2023**	**6/20/2023**	**7/12/2023**	**8/11/2023**	**9/22/2023**
row cleaner	VE	VE	V2	R2	R6
control (none)	VE	VE	V2	R2	R6

After performing statistical analysis, one date exhibited a significant difference in the average stand count between treatments (P<0.1). On July 12th, 2023, row cleaners had a significantly higher population than the control treatment, with a difference of approximately 12,800 plants per acre between the two treatments. There was no significant difference in yield between the two treatments (Table 3).

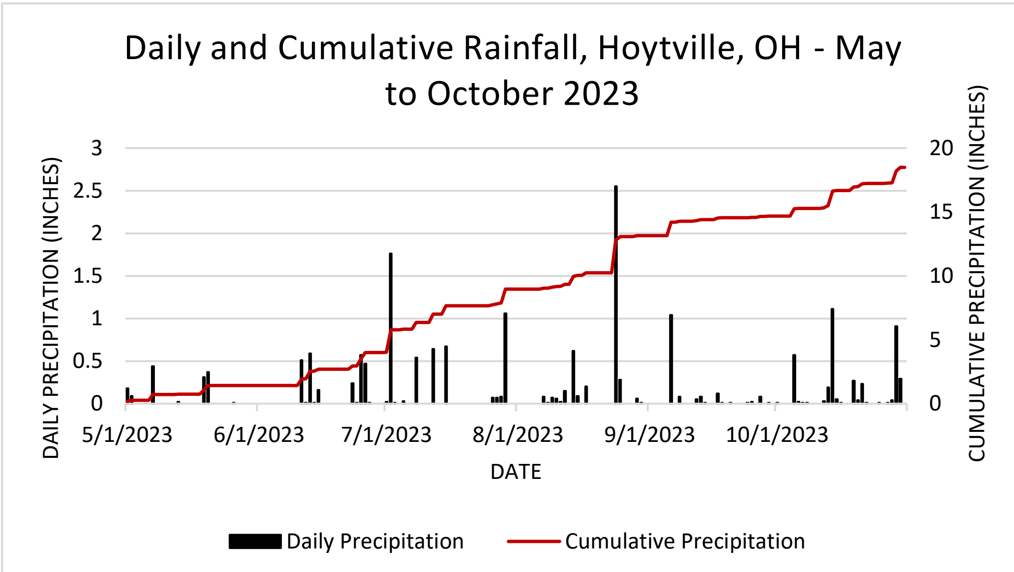
Table 3. Average Yield by Treatment		
Treatment	Avg. Yield (bu/acre)	Avg. Moisture (%)
Row Cleaner	21.5 A	12.37
Control (none)	22.4 A	12.37
	CV = 35.14	LSD (0.1) = 8.98

Same letter denotes there was no significant difference between treatments.

The 2023 growing season was dry in comparison to previous years, which may have contributed to the low yield seen across this entire field. Rainfall data was collected at the OSU OARDC Research Station near Hoytville, Ohio, which is approximately 50 miles from this on-farm research plot (Figure 2). During May-October of 2023, there was 18.31 inches of cumulative rainfall measured at the Hoytville, OH research station.

During the same periods of 2022 and 2021, 22.83 inches and 23.26 inches of cumulative rainfall were measured, respectively. The 2023 growing season showed approximately a 5-inch rainfall deficit when compared to the 2021-2022 average growing season rainfall total.

Figure 2. Daily and Cumulative Rainfall near Hoytville, OH – May to October 2023



Summary

Utilizing row cleaners to move cover crop residue out of the planter row-unit track may ensure better seed-to-soil contact and depth control when planting soybeans into a standing annual ryegrass cover crop. Only one stand count date out of five showed a significant difference between treatments, though numerical differences were noted at four of the five stand count dates. There was no yield benefit to utilizing row cleaners in this manner.

Because of an unusually dry growing season, there may have been impacts to the crop emergence and development that would not have been seen under normal precipitation patterns. Of the nearly 150,000 seeds/acre planting population, final stand was approximately half that at nearly 85,000 plants/acre. According to the Ohio Agronomy Guide, final plant populations of 100,000 to 120,000 plants/acre when planted before May 20th will be adequate for maximum yield. Because the final population in this field was much lower, this result could have impacted the trial results. Moving forward, this study could be conducted again in the same manner as the 2023 growing season to determine impacts under differing weather and plant emergence patterns.

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References

Anderson, M., Vittetoe, R., Licht, M., Rieck-Hinz, A. (n.d.) *Stand Assessments – Soybean.* Iowa State University Extension and Outreach. https://crops.extension.iastate.edu/encyclopedia/stand-assessments-soybean

Barker, D. J., Culman, S., Dorrance, A., Fulton, J., Haden, R., Lentz, E., Lindsey, A., Lindsey, L., Loux, M., McCoy, E., Michael, A., Noel, J., Paul, P., Sulc, R. M., Thomison, P., Tilmon, K., & Witter, J. (2017). *Ohio Agronomy Guide* (15th ed.). Ohio State University Extension.

The Ohio State University. (2024, January 8). *Past Weather Information.* CFAES Weather System. https://weather.cfaes.osu.edu/dailyinfo_B.asp.

National Weather Service. (2024, April 15). *Mean Precipitation by Day for Paulding, OH.* NOWData – NOAA Online Weather Data. https://www.weather.gov/wrh/Climate?wfo=iwx

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