Strip Tillage and Starter Nitrogen Management for Cover Crop Adoption

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Introduction

The use of cover crops has numerous environmental benefits. However, farmers remain hesitant to change their current production practices mainly due to cost of implementation and potential yield drag. Aiming to design best management practices (BMP) for the adoption of cereal rye between soybean and corn cropping system, this trial was conducted to evaluate if strip tillage and starter fertilizer can be implemented to increase corn seedling vigor, and hence decrease the negative impact of residual effect of rye on plant health and yield of the subsequent corn season.

Materials and Methods

These trials started with planting of Elbon cereal rye in the fall of 2018. For the first year, the cover crop was drilled and with only strip-tillage. In the second year, all plots were broadcasted, and there were two tillage systems, strip and no-till. Besides the tillage treatment, there were four nitrogen rates at planting. Termination occurred around five days before corn planting. Besides the plots with rye growth, these fields had no rye checks for both tillage treatments.

Results and Discussion

Cereal rye biomass accumulation was very different between years due to weather and seeding method. The falls of 2018 and 2019 were both cool and wet, which limited fall growth (data not shown). Cereal rye broke dormancy about 30 days earlier in spring 2020 (early March) compared with the spring of 2019 (early April). These extra 30 days of growth accumulated about 800 heat units (GDD 50), approximately 300 higher than the previous year. The comparisons between treatments differed greatly between research years.

In 2019, as expected, rye growth was very similar across all plots, with overall average of 36 lb/acre. In 2020, growth was much higher with an overall average of 1,546 lb/acre (Table 1). Although the two tillage systems reached different levels of biomass, there was no significant difference between them ($P = 0.2169$).

Corn yields in 2020 were low compared with the regional and historical average (overall average was 126 bu/ac). During the season, weather events such as hail probably harmed yield. Therefore, there were no statistical differences between treatments from the main effects in 2020 (Table 3). In 2019, the only comparison was between starter nitrogen rates at planting (Table 2). The medium and high rates at planting were statistically inferior to the checks. The low rate had intermediary results between the checks and other rates. However, the higher dosage of nitrogen at planting provided lower yields. This could possibly be related to increased early nitrogen losses.

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Table 1. Cereal rye biomass accumulation for two tillage systems and three starter nitrogen plots (treatment was applied only during corn planting) in spring 2020, Kanawha, IA.[1]

	Strip	No-till	Low	Medium	High
	Biomass accumulation (lb/ac)[2]				
Strip	1,199				
No-till		1,893			
	P = 0.2169				
Low	1,547	2,231	1,889		
Medium	885	1,706		1,295	
High	1,165	1,740			1,453
	P = 0.9314			P = 0.2020	

[1]P-values within boxes are used to compare biomass of the main effects or interaction effects within each box.

Table 2. Corn grain yields following cereal rye cover crop with four starter nitrogen rates in 2019, Kanawha, IA.[1]

	Check	Low	Medium	High
	Corn yield (bu/ac)[2]			
Check	188.3 A			
Low		180.1 AB		
Medium			170.5 B	
High				172.0 B
	P = 0.0270			

[1]P-values within boxes are used to compare grain yields of the main effects or interaction effects within each box.
[2]Corn yields that are significantly different at $P < 0.05$ have different letters following the yield values within each box.

Table 3. Corn grain yields following cereal rye cover crops with two tillage systems and four starter nitrogen rates in 2020, Kanawha, IA.[1]

	Strip	No-till	Check	Low	Medium	High
	Corn yield (bu/ac)					
Strip	133.3					
No-till		120.0				
	P = 0.3623					
Check	126.2	124.6	125.4			
Low	135.8	126.3		131.1		
Medium	137.9	120.1			129.0	
High	133.2	108.8				121.0
	P = 0.3473			P = 0.4943		

[1]P-values within boxes are used to compare grain yields of the main effects or interaction effects within each box.