Cereal Rye Seeding Method and Seeding Rate

RFR-A2044

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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. In an effort to design best management practices (BMPs) for the adoption of cereal rye between soybean and corn cropping system, this trial was conducted to learn about the effects of different seeding methods and rates of a cereal rye cover crop.

Materials and Methods

These trials started with planting of Elbon cereal rye in fall 2018. For the broadcast treatment, plots were planted before soybean harvest, while drilled plots occurred after harvest. For broadcast plots, seeding rates were 1.0 (low), 1.33 (medium), and 1.67 (high) million seeds/acre, and for drilled plots, 0.33 (low), 0.67 (medium), and 1.0 (high) million seeds/acre. Termination occurred 14 days before corn planting. Due to technical issues with the second year broadcast seeding (rye planting in fall 2019), there are only treatments for the drilled seeding rates. This trial is part of a larger trial with locations near Ames and Crawfordsville, Iowa.

Results and Discussion

Cereal rye biomass accumulation was very different between years due to weather. The fall of 2018 and 2019 were both cooler and wetter and limited fall growth (data not shown). In both years, the later timing of the drill seeding resulted in minimal fall germination and growth, which subsequently reduced spring growth of the drill seeding method. Spring 2020 was much warmer than spring 2019. In the spring of 2020, cereal rye broke dormancy approximately 30 days earlier (early March) compared with spring 2019 (early April).

In 2019, the broadcast seeding method had significantly ($P = <0.0001$) more biomass accumulation than the drilled seeding method (146.5 compared with 54.5 lb/acre, Table 1). For both years, seeding rate did not significantly influence cereal rye biomass growth (Table 1 and 3). Cereal rye biomass ranged from 83 to 120 lb/acre in 2019 and 98 to 116 lb/acre in 2020. Both are well below critical biomass levels that would be expected to limit corn yields.

Neither seeding method or seeding rate influenced corn grain yield in 2019 and 2020 (Table 2 and 3). The no cereal rye check yielded 225 bushels/acre in 2019 and 227 bushels/acre in 2020.

Effect of year was significant for incidence of rot on the radicle and the seminal roots ($P < 0.05$). Greater root rot incidence was observed in the 2020 growing season compared with 2019. The main effect of seeding method was significant on seedling root rot incidence in 2019 (Table 4). In 2019, root rot incidence in both the radicle and the seminal root tissue was greatest from the broadcasted plots. In contrast, no effect of seeding rate was detected for root rot incidence in both tissue types in both 2019 and 2020 (Table 5). Comparatively, greater root rot incidence was observed on the radicle and the seminal roots of seedlings from the no-rye check plots at the Sutherland location compared with the Crawfordsville location. Radicle root rot incidence in seedlings from no-rye check was about 36 percent in 2019 and 69 percent in 2020. Similarly, seminal root rot incidence was 14 percent in 2019 and 42 percent in 2020 (data not shown).

Acknowledgements

Special thanks to Terry Tuttle and the farm staff for carrying out plot management. This project was funded by the Iowa Nutrient Research Center.

Table 1. Cereal rye biomass accumulation for broadcast and drill seeding method at low, medium, and high seeding rate in spring 2019, Sutherland, Iowa.[1]

	Broadcast	Drill	Low	Medium	High
	rye biomass accumulation (lb/acre)[2]				
Broadcast	146.5 A				
Drill		54.5 B			
	P < 0.0001				
Low	128.5	38.0	83.3		
Medium	139.3	56.5		97.9	
High	171.6	69.1			120.3
	P = 0.7941		P = 0.0548		

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

[2]Biomass accumulation that are significantly different at P < 0.05 have different letters following the yield values within each box.

Table 2. Corn grain yields following cereal rye cover crops with broadcast and drill seeding method at low, medium, and high seeding rate in 2019, Sutherland, Iowa.[1]

	Broadcast	Drill	Low	Medium	High
	corn yield (bushels/acre)				
Broadcast	222.0				
Drill		226.1			
	P = 0.2546				
Low	221.8		225.1		
Medium	225.2			224.4	
High	219.0				222.6
	P = 0.8403		P = 0.5186		
No rye check	224.9				

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

Table 3. Cereal rye biomass accumulation and corn grain yield for drill seeding at a low, medium, and high seeding rate in spring of 2020, Sutherland, Iowa.[1]

	Low	Medium	High
	biomass accumulation (lb/acre)		
Biomass accumulation	98.4	116.4	116.4
	P = 0.8192		
	corn yield (bushels/acre)		
Corn grain yield	223.0	231.9	232.2
	P = 0.4473		
No rye check	226.8		

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

Table 4. Effect of seeding method on corn seedlings root rot incidence sampled at V2 to V4 in 2019 and 2020, Sutherland, Iowa.

Year	Seeding method	Radicle rot incidence (%)^{x}	Seminal rot incidence (%)^{y}
2019	Broadcast	46.8^{z}	21.8
	Drill	29.6	10.2
	P value	0.0211	0.0249

^{x}Radicle rot incidence was calculated as the percentage of seedlings with lesions on the radicle.
^{y}Seminal rot incidence was calculated as the percentage of seedlings with lesions on the seminal.
^{z}Mean value was compared based on LSD with P value 0.05.

Table 5. Effect of seeding rate on corn seedlings root rot incidence sampled at V2 to V4 in 2019 and 2020, Sutherland, Iowa.

Year	Seeding rate	Radicle rot incidence (%)^{x}	Seminal rot incidence (%)^{y}
2019	High	36.8^{z}	12.5
	Low	36.8	11.8
	Medium	41.0	23.6
	P value	0.8538	0.1035
2020	High	58.3	40.0
	Low	70.0	38.3
	Medium	70.0	46.7
	P value	0.5264	0.7141

^{x}Radicle rot incidence was calculated as the percentage of seedlings with lesions on the radicle.
^{y}Seminal rot incidence was calculated as the percentage of seedlings with lesions on the seminal.
^{z}Mean value was compared based on LSD with P value 0.05.