Interseeding of Grass and Legume Cover Crops into Early Vegetative Stage Corn

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Introduction

Three main areas of cover crop interseeding (cover crop species selection, establishment timing, and seeding method) need further research to understand how these interact with modern corn hybrids under Iowa climate and soil conditions. Further exploration of these factors will fill a knowledge gap to guide best management practices for interseeding cover crops into a corn cash crop. To develop best management practices for interseeding cover crops into a corn cash crop, this project aims to evaluate the effects of interseeded cover crop species, establishment timing, and seeding method on corn productivity. These experiments will help clarify treatment effects on 1) cover crop establishment, biomass accumulation, and nutrient uptake; 2) corn growth, productivity, and nutrient uptake; and 3) weed community and diversity.

Materials and Methods

These trials had a split-plot layout with interseeding timing as the main plot and cover crop variety as the subplot. Corn was planted late-April or early-May in two other locations near Sutherland and Lewis, Iowa. The treatments were drilled at V5 (mid-June) and V8 (mid-July) stage corn. Four cover crop species were used (winter rye, annual ryegrass, cowpea, and red clover), and a no cover crop check also was included for each timing. Crop growth and development, nutrient uptake, crop reflectance, and grain yield were evaluated.

Results and Discussion

Corn and cover crop growth and development were evaluated at two corn stages–V17 (late vegetative) and R3 (milk stage). For both samplings, there were no significant differences in corn biomass and yield between treatments at harvest (Tables 1, 2, and 3). For the cover crop growth, there was enough growth of winter rye, annual ryegrass, and cow pea, but not enough for red clover. The seeding depth may have been too deep for red clover. For both samplings (Tables 4 and 5), cowpea and winter rye had the highest amount of biomass for both timings. Annual ryegrass growth was minimal at Castana, however, at Sutherland, more annual ryegrass was present. Seeding timing also was significant, with earlier seeding having superior biomass growth. Only for the first sampling (Table 4), there was an interaction between seed species and seeding time, with cowpea at V5 reaching 98 lb/acre, winter rye at V5 producing 64 lb/acre, cowpea at V8 at 50 lb/acre, and winter rye at V8 at 24 lb/acre.

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Table 1. Corn biomass accumulation at first sampling (V17) July 15, 2020.[1]

	V5	V8	Annual rye	Cereal rye	Cowpea	Red clover
	Corn biomass accumulation (lb/acre)					
V5	7,812					
V8		7765				
	P = 0.6902					
Annual rye	8,888	7,790	8,339			
Cereal rye	6,543	7,897		7,220		
Cowpea	8,605	7,787			8,196	
Red clover	7,064	6,904				6,984
	P = 0.2396			P = 0.1446		

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

Table 2. Corn biomass accumulation at second sampling (R3, milk stage) August 4, 2020.[1]

	V5	V8	Annual rye	Cereal rye	Cowpea	Red clover
	Corn biomass accumulation (lb/acre)					
V5	16,348					
V8		16,417				
	P = 0.9746					
Annual Rye	17,334	16,596	16,955			
Cereal Rye	17,808	16,306		17,057		
Cowpea	16,301	17,880			17,091	
Red clover	15,331	17,288				16,310
	P = 0.8005			P = 0.4748		

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

Table 3. Corn yield at harvest (R6, maturity stage) October 24, 2020.[1]

	V5	V8	Annual rye	Cereal rye	Cowpea	Red clover
	Corn grain yield (bushels/acre)					
V5	239					
V8		246				
	P = 0.2808					
Annual rye	223	245	234			
Cereal rye	242	246		244		
Cowpea	248	238			243	
Red clover	248	246				247
	P = 0.5209			P = 0.7753		

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

Table 4. Cover crop biomass accumulation at first sampling (V17) July 15, 2020.[1]

	V5	V8	Annual rye	Cereal rye	Cowpea	Red clover
	Cover crop biomass (lb/acre)[2]					
V5	37 A					
V8		15 B				
	P = 0.0005					
Annual rye	0 C	2 C	1 C			
Cereal rye	64 B	24 B		44 B		
Cowpea	98 A	50 A			74 A	
Red clover	0 C	0 C				0 C
	P = 0.0044			P < 0.0001		

[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 5. Cover crop biomass accumulation at second sampling (R3, milk stage) August 4, 2020.[1]

	V5	V8	Annual rye	Cereal rye	Cowpea	Red clover
	Cover crop biomass (lb/acre)[2]					
V5	44 A					
V8		14 B				
	P = 0.0305					
Annual rye	0	0	0 C			
Cereal rye	62	13		38 B		
Cowpea	157	58			107 A	
Red clover	0	0				0 C
	P = 0.1914			P = 0.0009		

[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.