

Herbicide carryover evaluation in cover crops following corn and soybean herbicides

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Introduction

Cover Crops are a growing interest for corn and soybean producers in the North Central region due to the benefits of reducing soil erosion, providing and scavenging nutrients, and increasing soil organic matter.

Objective

This study was conducted to determine whether common soil applied herbicides with residual weed control properties applied in the spring during the establishment of corn and soybean crops affect the subsequent establishment of cover crops in the fall.

Materials and Methods

- Corn and soybean plots with glyphosate-resistant cultivars were planted at Arlington Agricultural Research Station, Arlington, WI on June 2, 2013.
- Plot size was 3 m wide by 15 m long.
- Each corn and soybean trial had fourteen herbicide treatments applied at common labeled rates and timings. Treatments were arranged as a randomized complete block replicated four times. Each crop included a control treatment with no residual herbicide applied, but weeds were managed with postemergence (POST) glyphosate for all treatments as needed to remove any effects from weeds.
- Both trials were harvested for silage near the beginning of September.
- Seven different cover crop species and/or varieties were seeded uniformly across all herbicide treatments to create two split plot experiments with herbicides as whole plots. The cover crops included tillage radish (*Raphanus* spp.), crimson clover (*Trifolium incarnatum*), cereal ryegrass (*Secale cereale*), 70% oat (*Avena sativa*) plus 30% peas (*Pisum sativum*) mixture, and three annual ryegrass (*Lolium multiflorum*) varieties. The annual ryegrass varieties included diploids 'Bruiser' and 'King', and a tetraploid.

Table 1. Planting depth and seeding rate of cover crops

	Crop				
	Cereal Rye	Oats + Peas Mix	Crimson Clover	Tillage Radish	Annual Ryegrasses
Depth (cm)	2.5	2.5	0.6	0.6	0.6
Seeding Rate(kg ha ⁻¹)	54.5	4.53 Peas 25.4 Oats	4.5	5.4	14.7

- Nearly two months after seeding, just before killing frost, the cover crops were evaluated for herbicide injury with digital image analysis for percent cover and for total dried biomass collected from a 0.25m² quadrat per subplot.
- Digital images were taken at 91.4 cm above each cover crop in every plot. The camera (Cannon PowerShot A1400) was mounted at a 70 degree angle on a 2.5 cm by 114 cm board, set to auto mode with zoom set to 0. This board created a stand for the camera to capture consistent photos of all subplots.
- Percent cover was calculated using SigmaScan[®] Pro and Turf Analysis 1-2 Macro.

Results

- Cereal rye was the only cover crop not adversely impacted by the herbicide treatments applied in the corn or soybean trials (P<0.05). All other cover crops had significantly reduced biomass (P < 0.05) and percent cover (P < 0.05) for at least one of the residual herbicide treatments applied in the corn and/or soybean trial.
- Cover crops with reduced biomass (P < 0.05) and percent cover (P < 0.05) are shown with data below. Dry weight values (g 0.25m⁻²) are rounded to nearest tenth.

Figure 1 legend

IMAGE

% Cover, dry weight (g 0.25m⁻²)

Herbicide Treatments	'King' ryegrass	'Bruiser' ryegrass	Tetraploid ryegrass	Oat + Pea Mix	Tillage radish	Crimson clover	Cereal rye
Nontreated	66, 2.8	61, 3.0	63, 2.9	61, 3.5	54, 4.5	38, 2.0	51, 2.9
S-metolachor	18, 0.6	29, 0.4	22, 0.9	54, 1.8	NS	24, 0.9	NS
Imazethapyr	44, 2.0	56, 2.3	57, 2.3	40, 1.5	18, 1.6	NS	
Flumioxazin	38, 1.7	47, 1.9	35, 1.3	45, 1.6	NS	24, 1.4	NS
Pyroxasulfone	35, 1.1	39, 1.2	40, 1.6	43, 2.2	NS		
Flumetsulam	51, 1.5	NS			41, 2.5	NS	
Sulfentrazone	NS	46, 2.2	NS		40, 2.8	NS	
Fomesafen	NS				22, 1.6	NS	

Figure 1. Images are shown for all cover crop by herbicide combinations where the percent cover and biomass were reduced (P<0.05) at seven weeks after planting. Images are not shown for cover crop by herbicide combinations with no adverse cover crop establishment effects.

Conclusions

Our preliminary results suggest that the establishment of many cover crops can be adversely affected by several commonly used corn and soybean herbicides. However, severity of damage will be cover crop and herbicide combination specific. More research is needed to establish best management practices for farmers interested in the use of cover crops following silage harvest.

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