Carryover of Common Corn and Soybean Herbicides to Various Cover Crop Species in Missouri

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INTRODUCTION

Interest in cover crops as an element of corn and soybean production systems in the Midwest has increased. This trend has led to the need for additional research to better understand certain aspects including the effect of previous corn and soybean herbicide programs on cover crop stand.

OBJECTIVE

Evaluate the effects of common corn and soybean herbicide programs on the stand and biomass of 8 different cover crop species seeded in the fall.

MATERIALS and METHODS

TRIAL LAYOUT

- Trials conducted in 2013 and 2014 at Bradford Research Center, Columbia, Missouri
- Corn and soybean planted June 12, 2013
- Corn planted May 19, and soybean June 3, 2014
- Soybean planted at 432,434 seed per hectare (ha); corn at 79,074 seed per ha
- Herbicide treatments listed in Tables 1 and 2

Herbicide	Amount (kg/ha)	Herbicide	Amoun
atrazine	2.27		(kg/ha)
clopyralid	0.283	sulfentrazone*	0.284
flumetsulam	0.0283	flumioxozina	0,071
Isoxaflutole	0.177	metribuzin ^a	0.227
mesotrione	0.107	sulfentrazone+clorensulam*	0.181
nicosulfuron	0.0258	chlorimuron*	0.0425
pyroxasulfone	0.085	fomesafen ^b	0.710
timsulfuron	0.0283	lactofen ^b	0.443
tempotrione	0.108	imazethapyr ^b	0.142
thiencarbozone	0.108	cloransulamb	0.017
topramezone	0.027	chlorimuron+thifensulfuronb	0.0106
acetolechlor +	0.99	S-metotachlorb	0.754
flumetsulam+clopyrelid	0.99	acetochlor ^b	1.7
mesotrione + glyphosate +	2.27	pyroxasulfone ^b	0.085
s-metolachlor	2.21	S-metolachlor+fornesafenb	1.13

- Corn and soybean removed as forage in September
- 9 cover crop treatments (Table 3) were planted on September 10 each year
- Each plot was 3 x 27 m² and consisted of 16 rows of every cover crop with row spacing of 19 cm (Figure 1)
- Each treatment was replicated 4 times

ABLE 3: Species	pianicu	F	igu	re 1	ıΤ	ria	ıl la	ayo	ut							
Cover crop	Seeding rate	_		-			-			_	16		-	-	_	
Winter wheat	112.1 kg/ha	_	-													
Cereal rye	112.1 kg/ha	ca														
Tillage radish	6.7 kg/ha	crops	1													
Crimson clover	22.4 kg/ha	9.0														
Winter oat	78.5 kg/ha	Cover														
Austrian winter pea	58.0 kg/ha	_	100													
Annual ryegrass	22.4 kg/ha	_	7													
Hairy vetch	18.8 kg/ha		T	1	,	,	1		-	1	1	1	1	1		
Vetch and rye mix	16.8 + 67.3 kg/ha		har	blcid	de te	teat	ma	nt f	15 0	mon	cam	e in	80	: 14	ı in	

MATERIALS and METHODS (continued)

DATA COLLECTION and ANALYSIS

- Stand density counts were conducted in 2, 1/6 m² areas for each cover crop in every plot at 14 and 28 days after emergence (DAE).
- Stand counts from each plot were averaged, and then all replications of each treatment were averaged and multiplied by 6 to get the stand density per m².
- Tissues were harvested for each cover crop in a 1/3 m² area, dried, and weighed to measure biomass. Dry weights for each treatment were averaged and compared to that of the non-treated control.

RESULTS

INFLUENCE of SOYBEAN HERBICIDE CARRYOVER

Cover crop stand density was affected more in 2013 than 2014 (Figures 2A and 2B)

Cover crop species affected in both years included:

- tillage radish following S-metolachlor+fomesafen (Figure 2C)
- crimson clover following acetochlor
- · winter oat following pyroxasulfone
- · cereal rye & vetch mix following fomesafen and pyroxasulfone

Fig. 2 Cover crop stand density (28 DAE)

2A) Cover crop stand density following soybean - 2013

	Average counts per 1 m ² + standard error of the 4 reps									
	Winter	Titlage radish	Cereal	Crimson	Winter	Winter	Annual	Hetry	Mix-vetch	-
non-treated	161.5472.4	38.052.6	103.0411.5	8998.4	120411,0	\$2,516,5	273.5±18.2	99.0011.6	46.356.3	70.512.6
sulfentrazone	DAHKE	ALBERT	CHESCHI	123/0	HE 1414.2	4216.7	190,8191,81	ALBELE	CHILD	BEHALF
flumfozozin	INSCHOLA	dien	THURSDAY	Grant House		ALDED	307,8136.4	73-62	MAN AS	MARKET
metribuzin	PARTIE	11.0-15	HALALIES	BEREIT	materia.	415+13	Merca	Marte	Milett	48.00
sulfentrazone+cloransulan	DEPMA	3995	111.2+13	STREET,	117,31153	MARCH 1	Association .	and Marie	PHICE	36,346.0
chlorimuron	STREET, S	Mary No.	179931.8	17-117	1212-123	(A)(H)	2012/01/8	100.00	BERTER!	\$162.1
fomesafen	CHARLES	3013	Spallery &	\$196.8	STREET	2016.1	STREME	S. State	88.3-3.6	4234£4
lactofen	235.5+HLT	ALTERNA	TEXT DESK	10-61	37.3n/Ld	GENERAL I	IN POLE	HEREST.		75.8403.4
Imazethapyr	DESCRIPTION.	25385.4	STREET, S.	THE ME A	THEFTER	21.8153	1032143	11.0-4.3	4917.9	#2 Feb. 2
cloransulam	1000000	RMER	THEATON	MARIE	Tathetax	641146.8	1117011	HJES.F	SLEETS.	Them
chlorimuron+thifersuffuror	SEAL PROPERTY.	MARKET	HARDON N.	(612m) 110	THEMES	66.145.1	396.3103.5	78,945	ALBERTA I	adject.
s-metotachter	THE PARTY	4215.7	SE PITA	10:32	SHOPE	Dist	284.8128.8	mell	MAKE	HOUSE.
acetochlor	States III	D.HEJ	STATE OF	\$9,5+&T	TEL SPIKE	\$24E2	\$33.8947.B	E1+1/8	Minte	\$4,847.8
pyroxasulfone	THE R. C.	48.247.9	MARKET	MINORA	EL Jesu	MANUEL	185527.8	meda	983466	anning.
5-metolachioreforesafen	Jul Sept N	2793.7	STATE A	DEPOS	NU BASE	STREETA I	217-7118.8	IF ALL	ST. SHILLS	30,547.0

2B) Cover crop stand density following soybean - 2014



2C) Tillage radish following select herbicide treatments



RESULTS (continued)

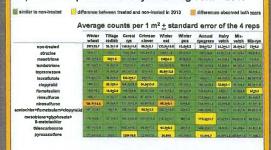
INFLUENCE of CORN HERBICIDE CARRYOVER

More cover crops were affected in 2013 than in 2014 (Figures 3A and 3B)

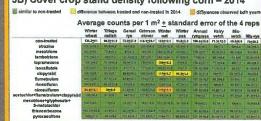
Cover crop species affected in both years included winter wheat and winter oat following nicosulfuron

Fig. 3 Cover crop stand density (28 DAE)

3A) Cover crop stand density following corn – 2013



3B) Cover crop stand density following corn - 2014



CONCLUSIONS

This data suggest that certain residual herbicides common in Midwest soybean and corn programs such as fornesafen and pyroxasulfone can reduce the stand of select cover crop species planted in the fall.

Cover crop stand densities showed more significant differences in 2013. Rain was likely a primary factor in the difference between 2013 and 2014 results. From April to October of 2014, Columbia, Missouri received 25 cm more rain than over the same span of 2013 (Figure 4). This precipitation may have impacted the concentration of herbicide left in the soil at time of cover crop planting.

Fig. 4 Rainfall at Columbia, Missouri, 2013-14

