

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

TABLE 1: Corn herbicide programs

Herbicide	Amount (kg/ha)
atrazine	2.27
glyphosate	0.283
flumetolam	0.0263
isoxaflutole	0.177
mesotrione	0.107
nicosulfuron	0.0258
pyrasulfone	0.085
nicosulfuron	0.0263
thiencarbazone	0.108
topramezone	0.108
acetochlor + flumetolam + clopyralid	0.027
mesotrione + glyphosate + S-metolachlor	0.99

TABLE 2: Soy herbicide programs

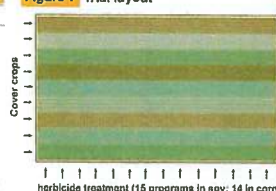
Herbicide	Amount (kg/ha)
sulfentrazone ^a	0.284
flumioxazin ^a	0.071
metribuzin ^a	0.227
sulfentrazone + clorasulfam ^a	0.181
chlorimuron ^a	0.0425
fomesafen ^a	0.710
lactofen ^a	0.443
imazethapyr ^a	0.142
clorasulfam ^a	0.017
chlorimuron + trifluralin ^a	0.0108
S-metolachlor ^a	0.754
acetochlor ^a	1.7
pyrasulfone ^a	0.085
S-metolachlor + fomesafen ^a	1.13

- *Herbicide was applied as a Pre
- ^aHerbicide was applied on weeds that were 10 to 15 cm in height
- 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 m and consisted of 16 rows of every cover crop with row spacing of 19 cm (Figure 1)
- Each treatment was replicated 4 times

TABLE 3: Species planted

Cover crop	Seeding rate
Winter wheat	112.1 kg/ha
Cereal rye	112.1 kg/ha
Tillage radish	6.7 kg/ha
Crimson clover	22.4 kg/ha
Winter oat	78.5 kg/ha
Austrian winter pea	58.0 kg/ha
Annual ryegrass	22.4 kg/ha
Hairy vetch	16.8 kg/ha
Vetch and rye mix	16.8 + 67.3 kg/ha

Figure 1 Trial layout



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

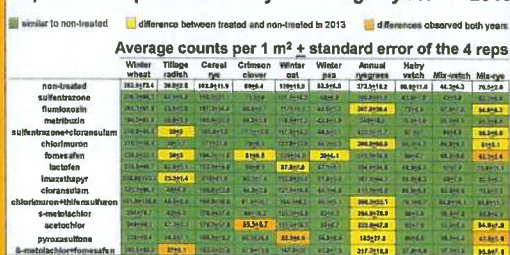
Cover crop stand density was affected more in 2013 than 2014 (Figures 2A and 2B)

Cover crop species affected in both years included:

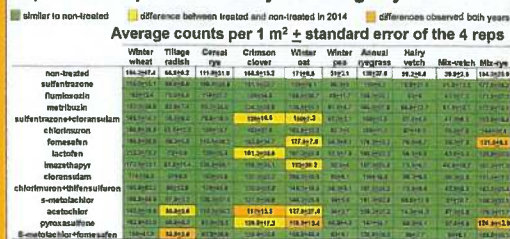
- tillage radish following S-metolachlor-fomesafen (Figure 2C)
- crimson clover following acetochlor
- winter oat following pyrasulfone
- cereal rye & vetch mix following fomesafen and pyrasulfone

Fig. 2 Cover crop stand density (28 DAE)

2A) Cover crop stand density following soybean – 2013



2B) Cover crop stand density following soybean – 2014



2C) Tillage radish following select herbicide treatments



RESULTS (continued)

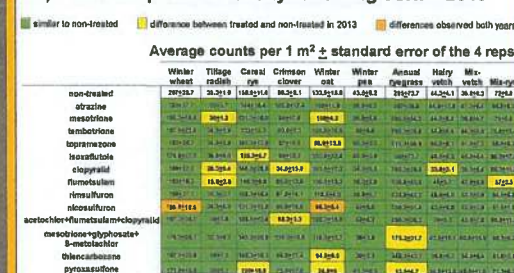
INFLUENCE of CORN HERBICIDE CARRYOVER

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

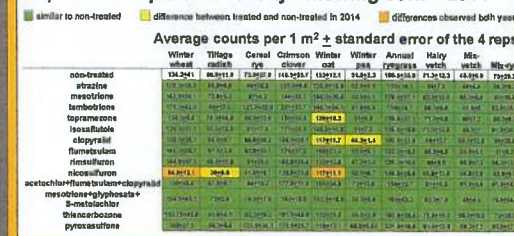
Cover crop species affected in both years included winter wheat and winter oat following nicosulfuron

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 fomesafen and pyrasulfone 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

