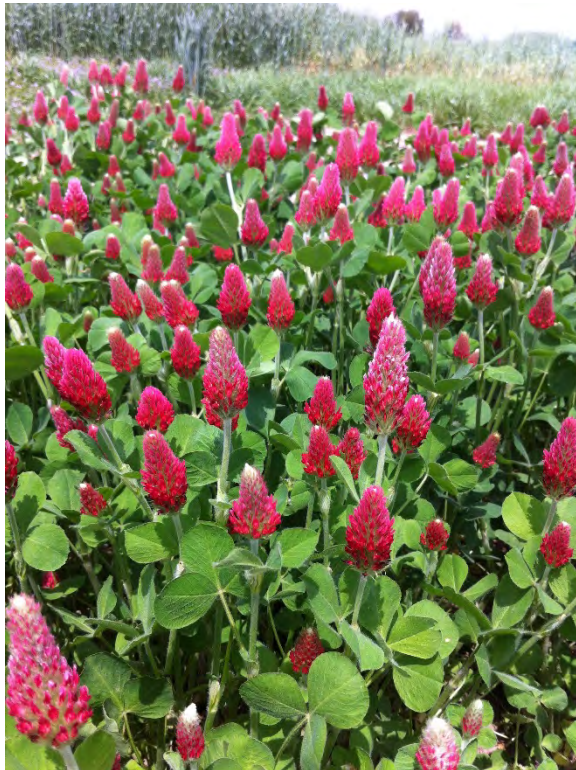


A top-down photograph of a field with cover crops. The plants are green but show signs of stress, with some leaves appearing yellowed and damaged. The ground is sandy and covered with dry, brown plant matter. A white text box is overlaid in the center of the image.

The Effects of Herbicide Carryover on Cover Crops

Objective

To determine which corn and soybean herbicides are most likely to carryover and cause injury to cover crop species.



Cover Crop Carryover Research - Methodology

General: Field experiments were conducted in 2013-2015 in Columbia, MO. Corn and soybean were planted in May/June. All herbicide programs tested were POST applications and applied in late June to early July.

Cover Crop Planting Dates: Sept. 10 or 11, 2013-2014

Seeding Rates (lb/A):

Wheat =	120
Cereal Rye =	110
Italian ryegrass =	25
Oats =	70
Crimson Clover =	30
Austrian Winter Pea =	50
Hairy Vetch =	20
Tillage Radish =	8



Influence of Soybean Herbicide Treatments on Fall Cover Crop Stand (2013-2015)

■ No stand reduction in any year
 ■ Stand reduction in 1 of 3 years
 ■ Stand reduction in ≥ 2 of 3 years

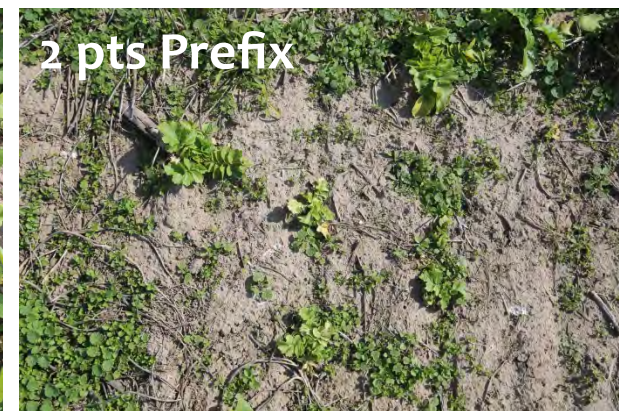
Herbicide Treatment	Rate	Cover Crop Species							
		Winter Wheat	Tillage Radish	Cereal Rye	Crimson Clover	Winter Oat	Austrian Pea	Annual Ryegrass	Hairy Vetch
	--product/A--	-----% Stand Reduction relative to non-treated, 28 days after emergence-----							
Spartan	8 fl ozs	Yellow	Yellow	Green	Green	Yellow	Green	Yellow	Green
Valor	2.5 ozs	Green	Yellow	Green	Green	Green	Green	Yellow	Green
Sencor	0.5 lb	Yellow	Green	Yellow	Green	Green	Yellow	Green	Green
Authority First	6.4 ozs	Green	Green	Green	Yellow	Green	Green	Yellow	Green
Classic	1.5 ozs	Yellow	Yellow	Green	Green	Green	Green	Green	Green
Flexstar	20 fl ozs	Green	Red	Green	Yellow	Red	Green	Green	Green
Cobra	12.5 fl ozs	Green	Green	Green	Green	Green	Green	Green	Green
Pursuit	4 fl ozs	Green	Red	Green	Yellow	Yellow	Green	Green	Green
Firstrate	0.6 oz	Green	Green	Green	Green	Green	Green	Green	Green
Synchrony XP	0.375 oz	Green	Green	Green	Green	Green	Green	Green	Green
Dual II Magnum	1.33 pts	Yellow	Green	Green	Green	Green	Green	Green	Green
Warrant	1.5 qts	Green	Yellow	Green	Red	Green	Green	Yellow	Green
Zidua	3 ozs	Yellow	Green	Green	Green	Red	Green	Red	Green
Prefix	2 pts	Green	Red	Green	Green	Yellow	Green	Yellow	Green

Influence of Soybean Herbicide Treatments on Fall Cover Crop Biomass (2013-2015)

■ No biomass reduction in any year
 ■ Biomass reduction in 1 of 3 years
 ■ Biomass reduction in ≥ 2 of 3 years

Herbicide Treatment	Rate	Cover Crop Species							
		Winter Wheat	Tillage Radish	Cereal Rye	Crimson Clover	Winter Oat	Austrian Pea	Annual Ryegrass	Hairy Vetch
	--product/A--	-----% Biomass Reduction relative to non-treated, 28 days after emergence-----							
Spartan	8 fl ozs	Yellow	Green	Yellow	Green	Yellow	Red	Yellow	Green
Valor	2.5 ozs	Green	Yellow	Yellow	Yellow	Yellow	Red	Green	Yellow
Sencor	0.5 lb	Yellow	Green	Green	Green	Green	Red	Green	Yellow
Authority First	6.4 ozs	Yellow	Red	Green	Yellow	Green	Green	Green	Green
Classic	1.5 ozs	Green	Yellow	Green	Yellow	Yellow	Green	Green	Green
Flexstar	20 fl ozs	Green	Red	Green	Red	Green	Red	Green	Green
Cobra	12.5 fl ozs	Green	Green	Green	Green	Green	Green	Green	Green
Pursuit	4 fl ozs	Yellow	Red	Green	Red	Red	Green	Green	Green
Firstrate	0.6 oz	Yellow	Green	Yellow	Green	Green	Red	Green	Green
Synchrony XP	0.375 oz	Green	Green	Green	Red	Green	Green	Green	Green
Dual II Magnum	1.33 pts	Green	Green	Green	Yellow	Green	Red	Yellow	Yellow
Warrant	1.5 qts	Green	Green	Green	Red	Yellow	Red	Green	Yellow
Zidua	3 ozs	Red	Green	Yellow	Yellow	Yellow	Red	Red	Yellow
Prefix	2 pts	Red	Red	Yellow	Yellow	Green	Yellow	Green	Green

Carryover of POST Soybean Treatments to Tillage Radish



Carryover of POST Soybean Treatments to Cereal Rye



Non-treated, Annual Ryegrass



3 ozs Zidua, Annual Ryegrass



Influence of Corn Herbicide Treatments on Fall Cover Crop Stand (2013-2015)

■ No stand reduction in any year
 ■ Stand reduction in 1 of 3 years
 ■ Stand reduction in ≥ 2 of 3 years

Herbicide Treatment	Rate	Cover Crop Species							
		Winter Wheat	Tillage Radish	Cereal Rye	Crimson Clover	Winter Oat	Austrian Pea	Annual Ryegrass	Hairy Vetch
	--product/A--	-----% Stand Reduction relative to non-treated, 28 days after emergence-----							
Atrazine	2 qts	Green	Green	Green	Green	Green	Green	Green	Green
Callisto	3 fl ozs	Green	Green	Green	Green	Green	Green	Green	Green
Laudis	3 fl ozs	Green	Green	Green	Green	Green	Green	Green	Green
Impact	3/4 fl oz	Green	Green	Green	Green	Red	Yellow	Green	Green
Balance Flexx	5 fl ozs	Green	Yellow	Green	Green	Yellow	Yellow	Green	Green
Stinger	1/2 pt	Green	Green	Green	Yellow	Green	Yellow	Yellow	Green
Python	1 oz	Green	Yellow	Yellow	Green	Green	Yellow	Green	Green
Resolve	1 oz	Green	Yellow	Green	Green	Green	Yellow	Yellow	Green
Accent Q	0.9 oz	Red	Yellow	Yellow	Green	Green	Yellow	Green	Green
Surestart + Atra	1.75 pt + 1 qt	Green	Green	Green	Green	Green	Green	Green	Green
Halex GT + Atra	4 pt + 1 qt	Green	Green	Green	Green	Yellow	Green	Red	Yellow
Capreno	3 fl ozs	Green	Green	Green	Green	Green	Yellow	Green	Green
Zidua	3 ozs	Green	Green	Green	Green	Yellow	Yellow	Red	Green

Influence of Corn Herbicide Treatments on Fall Cover Crop Biomass (2013-2015)

■ No biomass reduction in any year
 ■ Biomass reduction in 1 of 3 years
 ■ Biomass reduction in ≥ 2 of 3 years

Herbicide Treatment	Rate	Cover Crop Species							
		Winter Wheat	Tillage Radish	Cereal Rye	Crimson Clover	Winter Oat	Austrian Pea	Annual Ryegrass	Hairy Vetch
		-----% Biomass Reduction relative to non-treated, 28 days after emergence-----							
Atrazine	2 qts	Yellow	Green	Green	Red	Green	Green	Yellow	Green
Callisto	3 fl ozs	Green	Green	Green	Green	Green	Yellow	Green	Yellow
Laudis	3 fl ozs	Yellow	Yellow	Green	Yellow	Green	Green	Green	Green
Impact	3/4 fl oz	Red	Yellow	Green	Green	Red	Green	Red	Green
Balance Flexx	5 fl ozs	Yellow	Red	Yellow	Yellow	Yellow	Green	Green	Green
Stinger	1/2 pt	Yellow	Yellow	Yellow	Red	Green	Yellow	Green	Yellow
Python	1 oz	Yellow	Yellow	Green	Green	Green	Green	Green	Yellow
Resolve	1 oz	Green	Red	Green	Green	Green	Green	Red	Green
Accent Q	0.9 oz	Red	Red	Green	Yellow	Green	Green	Yellow	Green
Surestart + Atra	1.75 pt + 1 qt	Yellow	Yellow	Yellow	Yellow	Green	Yellow	Green	Yellow
Halex GT + Atra	4 pt + 1 qt	Green	Yellow	Green	Red	Yellow	Red	Red	Yellow
Capreno	3 fl ozs	Green	Green	Green	Green	Green	Yellow	Yellow	Green
Zidua	3 ozs	Yellow	Green	Green	Yellow	Yellow	Green	Red	Green

Conclusions

Herbicide carryover injury on cover crop species is going to vary from year to year, largely due to rainfall and time of application

The general order of sensitivity of cover crops to herbicide carryover, from greatest to least sensitive: **tillage radish > Austrian winter pea > crimson clover = annual ryegrass > winter wheat = winter oats > hairy vetch = cereal rye**

Soybean herbicide treatments that were most injurious to cover crops: **fomesafen (Flexstar/Prefix), pyroxasulfone (Zidua), imazethapyr (Pursuit), acetochlor (Warrant), sulfentrazone (Authority products)**

Corn herbicide treatments that were most injurious to cover crops: **topramezone (Impact), mesotrione (Callisto, Halex GT, etc.) clopyralid (Stinger, SureStart), isoxaflutole (Balance Flexx), pyroxasulfone (Zidua, etc.), nicosulfuron (Accent Q, etc.),**