SDSU Extension

agronomy

OCTOBER 2020

SOUTH DAKOTA STATE UNIVERSITY®
AGRONOMY, HORTICULTURE, & PLANT SCIENCE DEPARTMENT

Herbicide Residual Effects on Cover Crops after Wheat

Gared Shaffer | SDSU Extension Weeds Field Specialist
Anthony Bly | SDSU Extension Soils Field Specialist
Sara Bauder | SDSU Extension Agronomy Field Specialist
David Karki | SDSU Extension Agronomy Field Specialist
Ruth Beck | SDSU Extension Agronomy Field Specialist
Paul O. Johnson | SDSU Extension Weed Science Coordinator

In the last ten years, crop producers in South Dakota have shown increased interest in cover crops. South Dakota is a major producer of wheat (spring and winter) in the nation. One benefit of small grains is that harvest occurs early enough to allow sufficient time to grow cover crops in the same season. As farmers determine whether to plant a cover crop after wheat harvest, they must consider the potential impact the residual activity of the herbicide(s) used on wheat could have on the cover crop.

Herbicide carryover, a common problem in modern agriculture, is usually not uniform across a field. This can lead to uneven establishment of cover crop species. Heavy herbicide carryover areas include field entrances and edges, sprayer turnaround areas, eroded hills, and high and low pH soils depending on active ingredients. Some herbicides may show worse effects in areas with high or low moisture levels, extreme soil pH, and low organic matter. Another contributing factor could be higher herbicide rates which can lengthen the carryover time after herbicide application. However, there could be other reasons for a decreased cover crop stand that producers need to be aware of, such as moisture deficit, high surface residue, weed pressure, and planting errors (seed depth, rate, and planting time).

Before planting cover crops, some herbicides require a field bioassay to be completed.

To perform a bioassay:

1. Collect a representative soil sample from the field or area in question
2. Mix the sample together and place it in a container (around a gallon of soil)
3. Plant seeds of desired cover crop species in the container of soil
4. As a control, plant some seeds in a container of soil from an adjacent or nearby area which did not receive a herbicide application
5. Observe each container for one week for seed germination and growth

If satisfactory growth is established, when compared to the check, then the cover crop may be planted. One critical thing to remember is that the reliability of a bioassay is only as good as the representative soil sample.

Table 1: Research shows the following wheat herbicides applied on label over wheat do not impact cover crops planted after wheat

SOA	Trade Name	Active Ingredient(s)
1	Tacoma® 1 EC; Axial® XL; Discover® NG	fenoxaprop; pinoxaden; clodinafop
4	2,4D Amine; 2,4D LV4; Clarity®; Starane® Ultra; Voucher; Stinger®	2,4D Amine; 2,4D Ester; dicamba; fluroxypyr; MCPA; clopyralid
6	Buctril®; Basagran®	bromoxynil; bentazon
7	Diuron 4L; Linuron	karmex; linex
8	Far-GO®	triallate
14	Aim EC	carfentrazone

Wheat producers should choose herbicides that give them flexibility to plant cover crops, if that is their intention. Due to potential herbicide carryover, the following questions need to be asked by a cover crop

grower to ensure safe and productive cover crop establishment.

Will the cover crop be grazed or harvested for feed?

If Yes, then any forage restrictions listed on the label **MUST** be followed!

If No, answering the following questions can help ensure successful cover crop establishment. **The producer takes full liability for any cover crop loss.**

1. When was the herbicide applied?
2. What is the anticipated cover crop planting date?
3. How sensitive is each species in the cover crop mix to the applied herbicide?
4. How will the residual herbicide be impacted by field conditions?

For assistance with any cover crop questions, please contact the nearest SDSU Extension Regional Center.

Herbicide Residual Effects on Cover Crops after Wheat

This study was conducted during the 2018 and 2019 growing seasons at the Southeast Research Farm near Beresford, Northeast Research Farm near South Shore, and Dakota Lakes Research Farm near Pierre, South Dakota. Also, at one on-farm location near Roscoe, South Dakota.

RESULTS:

Research has shown that soil pH over seven and lack of microbial breakdown are the leading causes for herbicides used in this study to cause carryover to rotational crops. Microbial breakdown of herbicides are increased in an environment favorable to microbial growth, which includes generally warm temperatures and sufficient soil moisture.

For this study, 21 herbicides were applied over wheat according to label recommendations. After wheat harvest, cover crops were drilled across all herbicide treatments at full seeding rates. Treatments were repeated four times at each study site. Data was collected eight weeks after cover crop planting from each treatment plot by counting cover crop stands in a five square foot area. Statistical analysis (Analysis of Variance, SAS 9.4) showed that the herbicides used in the study did not have significant impact on cover crop species stand across all locations

Results in **Table 2** show highest percent loss of planted cover crops across all locations and years following winter and spring wheat in South Dakota. Depending upon field conditions, cover crop stand ranged from zero to highest percent loss (stated in Table 2). At some locations, stand counts varied quite significantly across replications.

Some herbicide labels clearly state the planting interval for various cover crop species. **Table 3** gives the label restrictions for cover crop planting dates after application of several common wheat herbicides. If the cover crop is planted before the label stated time frame, then the cover crop grower takes full responsibility for any cover crop loss.

Table 2: Highest percent loss of cover crops after in crop wheat herbicide application across all locations and years

Trade Name	SOA	Active Ingredient(s)	Oats		Crimson Clover		Flax		Radish	
			Low Moisture	High Moisture	Low Moisture	High Moisture	Low Moisture	High Moisture	Low Moisture	High Moisture
Ally® XP	2	metsulfuron	0	29	0	31	29	23	17	27
Amber®	2	triasulfuron	17	25	0	32	10	23	17	27
Axial® XL	1	pinoxaden	8	15	0	0	0	0	0	0
Discover® NG	1	clodinafop	9	15	0	0	0	0	0	0
Express®	2	tribenuron	0	0	0	0	0	0	17	27
Glean® XP	2	chlorsulfuron	9	33	0	39	0	43	33	16
Goldsky®	2+4+2	florasulam + fluroxypr + pyroxsulam	12	22	16	43	7	38	14	25
Harmony® SG	2	thifensulfuron	0	0	0	63	21	10	20	45
Huskie®	27+6	pyrasulfotole + bromoxynil	17	9	0	31	31	36	20	36
Huskie® Complete	27+6+2	pyrasulfotole + bromoxynil + thiencarbazone	8	37	3	40	9	50	17	16
Olympus®	2	propoxycarbazone-sodium	8	13	0	31	14	50	17	20
OutRider®	2	sulfosulfuron	9	33	0	39	9	15	33	27
Peak®	2	prosulfuron	19	33	0	43	20	32	33	40
PerfectMatch™	4+4+2	clopyralid + fluroxypr + pyroxsulam	56	15	0	47	18	50	17	36
Prowl® H2O	3	pendimemethalin	0	33	3	44	9	17	17	33
Rimfire® Max	2+2	propoxycarbazone + mesosulfuron	17	50	3	27	23	29	33	27
Sierra™	2	flucarbazone	15	0	0	17	19	21	20	0
Tacoma® 1EC	1	fenoxaprop	0	0	0	0	0	0	0	0
Talinor™	6+27	bicyclopyrone + bromoxynil	0	50	0	64	8	17	17	33
TeamMate™	2	pyroxsulam	12	29	16	43	19	17	17	33
Varro®	2	thiencarbazone	19	25	0	33	0	44	0	45
Low Moisture = 4 to 6.5 inches and High Moisture = 12.5 to 14.5 inches from herbicide application to cover crop planting										

Table 2: Highest percent loss of cover crops after in crop wheat herbicide application across all locations and years, continued.

Trade Name	SOA	Active Ingredient(s)	Rapeseed		Pearl Millet	Field Pea		Sunflower
			Low Moisture	High Moisture	High Moisture	Low Moisture	High Moisture	High Moisture
Ally® XP	2	metsulfuron	0	44	22	0	62	0
Amber®	2	triasulfuron	25	50	22	0	25	50
Axial® XL	1	pinoxaden	0	0	10	0	0	0
Discover® NG	1	clodinafop	0	0	0	0	0	0
Express®	2	tribenuron	0	0	66	0	0	0
Glean® XP	2	chlorsulfuron	17	43	0	25	33	0
Goldsky®	2+4+2	florasulam + fluroxypr + pyroxsulam	23	32	44	25	43	0
Harmony® SG	2	thifensulfuron	17	50	44	0	25	100
Huskie®	27+6	pyrasulfotole + bromoxynil	17	23	44	25	25	50
Huskie® Complete	27+6+2	pyrasulfotole + bromoxynil + thiencarbazone	17	43	22	25	0	50
Olympus®	2	propoxycarbazone-sodium	33	50	22	0	0	100
OutRider®	2	sulfosulfuron	17	47	66	25	33	100
Peak®	2	prosulfuron	0	40	32	25	25	100
PerfectMatch™	4+4+2	clopyralid + fluroxypr + pyroxsulam	17	50	66	25	50	100
Prowl® H2O	3	pendimemethalin	0	50	22	25	12	0
Rimfire® Max	2+2	propoxycarbazone + mesosulfuron	25	29	14	25	33	50
Sierra™	2	flucarbazone	17	15	11	25	0	0
Tacoma® 1EC	1	fenoxaprop	0	0	0	0	0	0
Talinor™	6+27	bicyclopyrone + bromoxynil	17	38	0	25	25	100
TeamMate™	2	pyroxsulam	0	29	0	25	25	50
Varro®	2	thiencarbazone	0	38	32	25	25	50
Low Moisture = 4 to 6.5 inches and High Moisture = 12.5 to 14.5 inches from herbicide application to cover crop planting								

Table 3: Label plant-back restrictions

Trade Name	Cool Season					Warm Season		
	Grass	Legume	Broadleaf			Grass	Legume	Broadleaf
	Oat	Crimson Clover	Flax	Radish	Rapeseed	Millet	Cowpea	Sunflower
Ally® XP	10 [1]	34 [1]	34 [1]	34 [1]	34 [1]	34 [1 & 10]	22 [1]	22 [1]
Amber®	6 [3]	4 [4]	4 [4]	4 [4]	4 [4]	4 [4 & 10]	4 [4]	24 [2]
Axial® XL	90 D	30 D	30 D	30 D	30 D	90 D	30 D	30 D
Discover® NG	30 D	30 D	30 D	30 D	30 D	30 D	30 D	30 D
Express®	1 D [1]	45 D	45 D	45 D	60 D	45 D	45 D	45 D
Glean® XP	10 [1]	FBA [6]	FBA [6]	FBA [6]	FBA [6]	FBA [6 & 10]	FBA [6]	FBA [6]
Goldsky®	9	12	9	12	12	9 [10]	9	9
Harmony® SG	AT	45 D	45 D	45 D	45 D	45 D [10]	45 D	45 D
Huskie®	1	FBA [8]	9	FBA [8]	FBA [8]	4 [7 & 10]	9	9
Huskie® Complete	9	FBA [9]	9	FBA [9]	FBA [9]	FBA [9 & 10]	9	9
Olympus®	24 [11]	FBA [11 & 12]	FBA [11 & 12]	FBA [11 & 12]	FBA [11 & 12]	4 [10 & 11]	10	10
OutRider®	FBA [13 & 14]	FBA [13 & 14]	FBA [13 & 14]	FBA [13 & 14]	FBA [13 & 14]	FBA [13, 10 & 14]	FBA [13 & 14]	22 [14]
Peak®	AT [15]	22 [5 & 16]	22 [5 & 16]	22 [5 & 16]	22 [5 & 16]	1 [5 & 10]	10 [5 & 16]	22 [5 & 16]
PerfectMatch™	9 [17]	18 [17 & 18]	9 [17 & 18]	18 [17 & 18]	18 [17 & 18]	9 [10 & 17]	10.5 [17]	10.5 [17]
Prowl® H2O	18 [19]	18 [19]	18 [19]	18 [19]	18 [19]	18 [19 & 10]	AT [19]	AT [19]
Rimfire® Max	FBA [12]	FBA [12]	10	FBA [12]	FBA[12]	4 [10]	10	10
Sierra™	18	FBA	9	FBA	FBA	18 [10]	11	9
Tacoma® 1EC	NL	NL	NL	NL	NL	NL	NL	NL
Talinor™	3	18	9	18	18	18 [10]	10	9
TeamMate™	9	12	9	12	12	9 [10]	9	9
Varro®	9 [20]	FBA [20]	9 [20]	FBA [20]	FBA [20]	FBA [10 & 20]	9 [20]	9 [20]
All in months unless otherwise noted. D=Days, AT=Any time; FBA=Field bioassay required; NL=Not listed								

Reference guide for Table 3.

Reference Number	Label Restriction Reference Guide
1	Depends on rate, pH soil, amount of precipitation
2	Plant only after field bioassay
3	Six month rotational restriction where soil pH is 7.9 or less, otherwise it is 18 months
4	Four month rotation restriction and bioassay required before rotating to non-listed crops
5	7 additional days if planted on light textured soils (sands and loamy sands) or pH soils greater than 7.9
6	Minimum re-cropping intervals are determined by the rate of breakdown of Glean XP applied. Breakdown in the soil is affected by soil pH, soil temperature, and soil moisture Do not apply to fields with a soil pH above 7.9 Bioassay must be completed before rotating to non-listed crops
7	Requires 8 inches of rain between application and millet planting
8	Minimum of 30 days to plant any rotational crop
9	Minimum of 90 days to plant any rotational crop
10	Some millet varieties are more sensitive than others, Proso Millet is commonly found to be least sensitive
11	refer to label for moisture requirements
12	Minimum of 4 months to plant any rotational crop
13	Field Bioassay required, minimum of 3 months to plant any rotational crop
14	Refer to label for moisture and pH requirements
15	pH, moisture, geographic restrictions and possible field bioassay
16	34 month rotational restriction in Red River Valley
17	Precipitation requirements
18	Field bioassay recommended
19	Depends on timing of application, rate, moisture and geographic area
20	Manufacturer suggests most cover crops maybe planted 90 to 120 days after application

Learn more at extension.sdstate.edu.

P-00185

1,000 copies, $1.05 each, SDSU Extension. Printed on recycled paper. 10/20