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Timing and Rates of Chateau Herbicide in Russet Burbank Potatoes. H. Hatterman-Valenti and C. Auwarter

Field research was conducted at the Oakes Irrigation Research site near Oakes, ND to evaluate timing and rates of Chateau herbicide on Russet Burbank potatoes. Plots were 4 rows by 20 feet arranged in a randomized complete block design with 4 replicates. Seed pieces (2 oz) were planted on 36-inch rows and 12-inch spacing on May 24, 2022. Treatments included no hilling (application code A) with just herbicides 2 days after application (DAP), early hill with herbicides (application code B) 2 DAP, a normal hill with herbicide (application code C) 16 DAP, and no hill with herbicide (A) followed by hilling with herbicide (C). Extension recommendations were used for cultural practices throughout the year. The trial was harvested on September 24.

Weed Control Ratings:

				29 DAP				35 DAP			
TRT	TRT		App	----------% Control----------				----------% Control----------			
No.	Name	Rate	Code	Common Lambsquarter	Redroot Pigweed	Green Foxtail	Injury	Common Lambsquarter	Redroot Pigweed	Green Foxtail	Injury
1	Chateau	1.5 oz/a	A	96.7ab	100.0	95.0b	5.0a	95.0	98.3	93.3b	0.0
2	Chateau	0.75 oz/a	A	95.0b	100.0	96.7ab	5.0a	95.0	100.0	95.0ab	0.0
3	Chateau	1.5 oz/a	C	100.0a	100.0	100.0a	0.0c	100.0	100.0	100.0a	0.0
4	Chateau	0.75 oz/a	C	100.0a	100.0	98.3ab	0.0c	98.3	100.0	98.3a	0.0
5	Chateau	1.5 oz/a	A	100.0a	100.0	100.0a	0.0c	100.0	100.0	100.0a	0.0
	Boundary	1 pt/a	C								
6	Chateau	0.75 oz/a	A	100.0a	100.0	100.0a	0.0c	100.0	98.3	100.0a	0.0
	Boundary	1 pt/a	C								
7	Chateau	1.5 oz/a	B	99.4ab	100.0	96.7ab	0.6bc	98.3	100.0	96.7ab	0.0
8	Chateau	0.75 oz/a	B	97.8ab	98.3	95.0b	2.2ab	96.7	98.3	95.0ab	0.0
9	Chateau	0.75 oz/a	B	100.0a	100.0	100.0a	0.0c	100.0	100.0	100.0a	0.0
	Chateau	0.75 oz/a	C								
10	Boundary	2 pt/a	C	100.0a	100.0	100.0a	0.0c	100.0	100.0	100.0a	0.0
		LSD P=0.10		2.34	.	2.32	1.53	2.76	2.24	3.22	.

Yield:

TRT	TRT		App	----------CWT/A----------					
No.	Name	Rate	Code	Total	<4 oz	4-6 oz	6-10 oz	10-14 oz	>14 oz
1	Chateau	1.5 oz/a	A	301.807	70.680	63.677	119.657	38.177	9.620
2	Chateau	0.75 oz/a	A	331.117	55.737	71.270	131.483	42.033	30.597
3	Chateau	1.5 oz/a	C	412.523	57.840	81.053	167.087	81.377	25.167
4	Chateau	0.75 oz/a	C	392.407	76.670	78.530	135.203	74.040	27.967
5	Chateau	1.5 oz/a	A	422.143	54.030	67.897	164.590	80.343	55.283
	Boundary	1 pt/a	C						
6	Chateau	0.75 oz/a	A	407.247	53.030	71.830	151.160	82.070	49.157
	Boundary	1 pt/a	C						
7	Chateau	1.5 oz/a	B	390.757	75.503	81.613	142.737	66.447	24.457
8	Chateau	0.75 oz/a	B	346.410	52.483	62.860	128.790	81.403	20.873
9	Chateau	0.75 oz/a	B	408.987	62.527	74.840	154.790	85.383	31.447
	Chateau	0.75 oz/a	C						
10	Boundary	2 pt/a	C	407.727	70.093	72.330	138.970	78.923	47.417
		LSD P=0.10		83.50	14.00	18.20	41.83	32.92	27.43

Tuber Counts:

TRT	TRT		App	----------Tuber Counts in 20 RowFt----------						
No.	Name	Rate	Code	Total	<4 oz	4-6 oz	6-10 oz	10-14 oz	>14 oz	>4 oz
1	Chateau	1.5 oz/a	A	137.0	66.3	28.0	34.0	7.3	1.3	70.7
2	Chateau	0.75 oz/a	A	132.3	52.7	31.0	37.0	8.0	3.7	79.7
3	Chateau	1.5 oz/a	C	157.3	56.3	35.3	46.7	15.7	3.3	101.0
4	Chateau	0.75 oz/a	C	166.3	75.3	35.3	38.0	14.0	3.7	91.0
5	Chateau	1.5 oz/a	A	149.7	51.3	29.7	46.0	15.3	7.3	98.3
	Boundary	1 pt/a	C							
6	Chateau	0.75 oz/a	A	145.7	49.7	32.0	42.3	15.3	6.3	96.0
	Boundary	1 pt/a	C							
7	Chateau	1.5 oz/a	B	162.0	70.0	35.7	40.3	12.7	3.3	92.0
8	Chateau	0.75 oz/a	B	136.0	53.7	27.3	36.7	15.7	2.7	82.3
9	Chateau	0.75 oz/a	B	159.7	62.7	32.7	44.0	16.0	4.3	97.0
	Chateau	0.75 oz/a	C							
10	Boundary	2 pt/a	C	161.3	69.3	31.3	39.3	15.0	6.3	92.0
		LSD P=0.10		29.13	12.43	8.24	12.62	4.44	2.44	14.74

Weed control was adequate throughout the trial. 29 DAP, injury to the potatoes occurred early on when Chateau was applied 2 DAP. No injury was seen 35 DAP. All treatments had greater than 95% control of Common Lambsquarter and Redroot Pigweed. There were no significant differences in yield. The highest yielding treatment was treatment 5 with a yield of 422 CWT/A. The lowest yielding treatment was treatment 1 with 302 CWT/A.

Broadleaf crop response to preplant, low-dose rate of dicamba, Carrington, 2022.
(Greg Endres and Mike Ostlie)

The field study is being conducted at the NDSU Carrington Research Extension Center with support from the ND Soybean Council and Northarvest Bean Growers Association. Study objective is to evaluate soybean, pinto bean and sunflower plant growth and seed yield response based on timing of planting following application of preplant, low-dose soil rate of dicamba with or without water activation. Experimental design was a randomized complete block with a split-plot arrangement (main plot=crop; split plot=herbicide; and split-split plot=planting date) and four replications. The irrigated trial was established with winter rye as prior crop on conventional-till Heimdal-Emrick loam soil with 3.6% organic matter, 7.6 pH (0- to 6-inch depth), 26 lb nitrate-N/A, 27 ppm P, 229 ppm K, 1.45 ppm Zn, and 0.2 mmho/cm soluble salts (0- to 6-inch depth). Sonalan was preplant incorporated (PPI) applied on May 25. Urea was PPI applied at 109 lb N/A on May 26 for sunflower plots. Dicamba (Clarity at 4 fl oz/A [0.125 lb ai/A]) was soil applied with a CO_2-hand-boom plot sprayer delivering 17 gal/A at 35 psi through Lurmark 015E80 nozzles to the center 6.7 ft of 10- by 25-ft plots on June 3 with 46 F, 76% RH and 7 mph wind to dry soil surface. Planting dates were June 6 and 23; 3 and 20 days, respectively, following application of dicamba. Crop cultivar and targeted stands: soybean - 'AG03XF2' (XtendFlex) and 150,000 plants/A; pinto bean - 'ND Falcon' pinto bean and 80,000 plants/A; and sunflower - 'AC2101' and 20,000 plants/A. Crops were planted in 30-inch rows. No irrigation or rain occurred between application of dicamba and the first planting date; and 3.01 inches between application of dicamba and the second planting date; and 15.95 inches June 1-Sept. 30. Seed harvest with a plot combine occurred on the following dates: soybean and pinto bean=Oct. 10 (pinto bean plants hand-pulled and placed in swaths Oct. 4); and sunflower=Oct. 19.

A dicamba-tolerant variety was used in the trial. Soybean plant stand (trial average=172,700 plants/A) was similar among treatments (Table 1). Plant emergence and flower dates were similar among treatments, and maturity also was similar with dicamba and untreated check within planting dates. Plant injury, height and canopy closure were not impacted by dicamba. Seed yield was similar with dicamba and untreated check within planting dates. Test weight was similar among treatments.

Table 1. Soybean response to preplant dicamba, Carrington, 2022.

Treatment		Plant											
		Stand	Development			Injury (%)[1]			Height (cm)[2]		Canopy closure (%)	Seed	
Planting date	Herbicide	plt/A	Emergence	Flower	Physiological maturity (R8)	WAE[3]					Canopeo	Yield	TW
		27-Jun	Day of year			1 to 2	3 to 4	6 to 8	3 to 4	6 to 8	28-Jul	bu/A	lb/bu
6-Jun	untreated check	159,698	165	191	263	0	0	0	30	65	95	62.2	57.0
	dicamba	169,658	165	191	264	0	0	0	29	66	95	61.6	57.0
23-Jun	untreated check	169,990	181	207	276	0	0	0	43	82	78	53.1	57.6
	dicamba	191,571	181	207	275	0	0	0	42	83	78	54.8	57.9
CV (%)[4]		5.3	2.7	2.2	1.4	183.3	161.7	234.5	25.5	5.3	7.3	9.9	1.2
LSD (0.05)[4]		NS	NS	NS	6	NS	NS	NS	NS	NS	NS	5.9	NS

[1]Biomass reduction. Dates of injury notes: first planting=27-Jun, 8-Jul and 27-Jul; second planting=8-Jul, 26-Jul and 15-Aug.

[2]Dates of height notes: first planting date=8-Jul and 27-Jul; second planting date=27-Jul and 15-Aug.

[3]WAE=weeks after plant emergence.

[4]Statistics include all three crops in analysis.

Pinto bean plant stand, averaging 83,700 plants/A, was similar among treatments (Table 2). Plant emergence and flower dates were similar among treatments. However, plant maturity was delayed 12 days with dicamba compared to the untreated check with the first planting date. Plant injury with early planting after application of dicamba ranged from 12-24%. Plant height and canopy closure were not impacted by dicamba. Seed yield and test weight were not negatively impacted by dicamba. Seed count generally was slightly reduced with dicamba.

Table 2. Pinto bean response to preplant dicamba, Carrington, 2022.

Treatment		Plant										Seed		
		Stand	Development			Injury (%)[1]			Height (cm)[2]		Canopy closure (%)			
Planting		plt/A	Emergence	Flower	Physiological maturity (R8)	WAE[3]					Canopeo	Yield	TW	Count
date	Herbicide	27-Jun	Day of year			1 to 2	3 to 4	6 to 8	3 to 4	6 to 8	28-Jul	cwt/A	lb/bu	no./lb
6-Jun	untreated check	78,355	165	211	262	0	0	0	26	54	89	2712	58.1	1,550
	dicamba	73,707	165	214	274	23	24	12	20	44	85	2443	58.6	1,499
23-Jun	untreated check	92,299	181	220	274	0	0	0	44	48	73	2258	58.4	1,517
	dicamba	90,307	181	220	275	0	0	0	39	54	69	2669	58.3	1,483
CV (%)[4]		5.3	2.7	2.2	1.4	183.3	161.7	234.5	25.5	5.3	7.3	9.9	1.2	1.5
LSD (0.05)[4]		NS	NS	NS	6	5	5	4	NS	NS	NS	NS	NS	35

[1]Biomass reduction. Dates of injury notes: first planting=27-Jun, 8-Jul and 27-Jul; second planting=8-Jul, 26-Jul and 15-Aug.

[2]Dates of height notes: first planting date=8-Jul and 27-Jul; second planting date=27-Jul and 15-Aug.

[3]WAE=weeks after plant emergence.

[4]Statistics include all three crops in analysis except seed count.

Sunflower plant stand, averaging 23,200 plants/A, was similar among treatments (Table 3). Plant emergence and flower dates were similar among treatments, and maturity also was similar with dicamba and untreated check within planting dates. Plant injury was not observed, and height was similar among treatments. Seed yield, test weight and oil content were not negatively impacted by dicamba.

Table 3. Sunflower response to preplant dicamba, Carrington, 2022.

Treatment		Plant									Seed		
		Stand	Development			Injury (%)[1]			Height (cm)[2]				
					Physiological	WAE[3]							
Planting		plt/A	Emergence	Flower	maturity (R8)						Yield	TW	Oil
date	Herbicide	27-Jun	Day of year			1 to 2	3 to 4	6 to 8	3 to 4	6 to 8	cwt/A	lb/bu	%
	untreated check	24,569	169	224	270	0	0	0	58	179	20.1	28.8	38.1
6-Jun	dicamba	22,909	165	220	267	0	0	0	50	174	19.4	29.7	39.2
	untreated check	21,249	177	232	277	0	0	0	76	190	21.1	28.4	40.0
23-Jun	dicamba	24,237	181	236	280	0	0	0	85	191	26.3	27.9	39.8
CV (%)[4]		5.3	2.7	2.2	1.4	183.3	161.7	234.5	25.5	5.3	9.9	1.2	2.8
LSD (0.05)[4]		NS	NS	NS	6	NS	NS	NS	NS	NS	NS	NS	NS

[1]Biomass reduction. Dates of injury notes: first planting=27-Jun, 8-Jul and 27-Jul; second planting=8-Jul, 26-Jul and 15-Aug.

[2]Dates of height notes: first planting date=8-Jul and 27-Jul; second planting date=27-Jul and 15-Aug.

[3]WAE=weeks after plant emergence.

[4]Statistics include all 3 crops in analysis except seed oil.

Weed Control in Onion. H. Hatterman-Valenti and C. Auwarter.

This study was conducted near Oakes, ND to look at different rates and timings of PRE-emerge, delayed PRE-emerge and early POST herbicides on the onion varieties 'Delgado' and 'Mondella', long-day, sweet Spanish onions. The trial was planted on May 15, 2022 on 18" centers with a population of 250,000 seeds/a. The PRE-emerge treatments (application code A) were applied 8 days after planting (DAP), the delayed PRE-emerge treatments (application code B) were applied 11 DAP and the early POST treatments were applied at the Flag Leaf stage (application code C), 24 DAP. Onions have little competition when weeds begin to present themselves. POST applications for controlling emerged weeds needs to be at or after the 2-leaf stage. All treatments had adequate to good control keeping the weed pressure low and no injury. A 2-leaf application (38 DAP) of oxyfluorfen and 8-leaf application of flumioxazin on all the treatments did a good job of keeping most weeds away. There was also a hand-weeded check that didn't receive any herbicide. Onions were harvested on October 6 (144 DAP), when all plants were mature.

Weed Control Ratings:

				24 DAP		36 DAP		57 DAP	
TRT	TRT		App	% Control		% Control		% Control	
#	Name	Rate	Code	Common Lambsquarter	Redroot Pigweed	Common Lambsquarter	Redroot Pigweed	Common Lambsquarter	Redroot Pigweed
1	Dacthal	10 lb/a	A	96.3a	97.5a	96.2ab	96.3ab	97.2ab	98.8a
2	Nortron	1.36 pt/a	A	93.8a	93.8a	95.0ab	90.0bc	90.7bc	96.2a
	Prowl H2O	0.75 pt/a	A						
3	Nortron	1.36 pt/a	A	100a	97.5a	95.0ab	92.5abc	92.7abc	95.0a
	Prowl H2O	0.75 pt/a	B						
4	Prowl H2O	0.75 pt/a	A	96.3a	100.0a	94.8ab	93.8abc	92.1abc	91.3a
	Nortron	1.36 pt/a	B						
5	Prowl H2O	1.5 pt/a	A	100.0a	95.0a	94.9ab	90.0bc	92.7abc	86.3a
6	Prowl H2O	0.75 pt/a	A	90.0a	95.0a	85.9b	82.5d	76.6c	71.3b
7	Prowl H2O	1.5 pt/a	B	96.3a	100.0a	94.9ab	93.8abc	93.9abc	96.3a
8	Prowl H2O	0.75 pt/a	B	96.3a	97.5a	92.3ab	90.0bc	85.7bc	85.0a
9	Nortron	1.36 pt/a	B	96.3a	97.5a	94.9ab	91.3abc	91.7abc	93.8a
	Prowl H2O	0.75 pt/a	B						
10	Prowl H2O	1.5 pt/a	B	100.0a	100.0a	98.7ab	96.3ab	97.2ab	95.0a
	Buctril	1 pt/a	B						
11	Prowl H2O	1.5 pt/a	B	98.8a	98.8a	93.6ab	93.8abc	93.9abc	96.3a
	RoundUp	22 floz/a	B						
12	Prowl H2O	1.5 pt/a	C	0.0b*	0.0b*	88.0ab	92.5abc	88.1bc	92.5a
13	Buctril	1 pt/a	B	96.3a	100.0a	94.9ab	92.5abc	97.2ab	91.3a
	Prowl H2O	1.5 pt/a	C						
14	RoundUp	22 floz/a	B	96.3a	98.8a	97.5ab	91.3abc	97.2ab	91.3a
	Prowl H2O	1.5 pt/a	C						
15	Nortron	1.36 pt/a	C	0.0b*	0.0b*	88.4ab	92.5abc	89.0bc	90.0a
	Prowl H2O	0.75 pt/a	C						
16	Nortron	1.36 pt/a	B	87.5a	97.5a	87.3ab	86.3cd	79.6bc	87.5a
17	Nortron	2.72 pt/a	B	96.3a	98.8a	92.4ab	95.0abc	90.7bc	96.3a
18	Hand-weeded			100.0a	100.0a	100.0a	100.0a	100.0a	100.0a
19	Dacthal	10 lb/a	B	97.5a	96.3a	94.9ab	92.5abc	93.9abc	91.3a
20	Nortron	2.72 pt/a	C	0.0b*	0.0b*	93.7ab	93.8abc	96.3ab	93.8a
			LSD P=0.10	13.74	14.65	6.74	4.71	7.74	8.15

*Ratings were made before any herbicide application.

Weed control was good to very good throughout the trial. Timely application with rain or irrigation following led to good residual activity of the herbicides. The maintenance sprays of Goal Tender at the 2-leaf stage and Chateau at the 8-leaf stage helped keep weeds low throughout the season. Nortron and Prowl H2O applied alone had better control of weeds using the higher rate when applied at the delayed PRE-emerge application; 2.72pt/a vs 1.36 pt/a of Nortron and 0.75 pt/a vs 1.5 pt/a Prowl H2O. Tank mixing or 2 separate applications did not significantly increase the chance of controlling weeds. Timing of the application, whether PRE-emerge, delayed PRE-emerge or early POST did not significantly differ among treatments. The hand-weeded check had the best weed control and yield in the trial. Both hand-weeded 'Delgado' and 'Mondella' had the highest yield with 950 and 602 CWT/a, respectively. The hand-weeded 'Mondella' yield was significantly better than all other treatments. The highest yielding 'Delgado' treatment where herbicide was applied was treatment 11; Prowl H2O @ 1.5 pt/a plus RoundUp @ 22floz/a at delayed PRE, with a yield of 885 CWT/a. The lowest was treatment 2; Nortron @ 1.36 pt/a plus Prowl H2O @ 0.75 pt/a at PRE, with 620 CWT/a. The highest yielding 'Mondella' treatment where herbicide was applied was treatment 19; Dacthal @ 10 lb/a at delayed PRE, with a yield of 456 CWT/a. The lowest was treatment 5; Prowl H2O @ 1.5 pt/a at PRE, with a yield of 323 CWT/a. This treatment had a lower yield than Prowl H2O @ 0.75 pt/a at the same time (PRE), even though weed control was the other way around.

'Delgado' Yield:

TRT	TRT		App	----------CWT/A----------					
#	Name	Rate	Code	<1"	1" - 2.25"	2.25" - 3"	3" - 4"	>4"	Total
1	Dacthal	10 lb/a	A	0.000	53.780	183.745	311.790	243.283	790.307
2	Nortron	1.36 pt/a	A	2.835	3.520	117.800	331.315	194.308	619.778
	Prowl H2O	0.75 pt/a	A						
3	Nortron	1.36 pt/a	A	2.260	58.260	191.105	353.405	169.658	775.432
	Prowl H2O	0.75 pt/a	B						
4	Prowl H2O	0.75 pt/a	A	0.000	35.850	116.838	346.360	207.433	698.340
	Nortron	1.36 pt/a	B						
5	Prowl H2O	1.5 pt/a	A	1.306	64.345	152.693	331.315	174.940	714.091
6	Prowl H2O	0.75 pt/a	A	0.436	85.470	237.525	304.743	160.375	787.832
7	Prowl H2O	1.5 pt/a	B	3.245	55.060	187.268	351.483	187.585	785.609
8	Prowl H2O	0.75 pt/a	B	7.669	58.580	170.940	393.415	159.415	779.791
9	Nortron	1.36 pt/a	B	11.480	63.063	237.200	388.295	123.883	822.804
	Prowl H2O	0.75 pt/a	B						
10	Prowl H2O	1.5 pt/a	B	2.922	35.853	180.223	300.263	198.788	716.857
	Buctril	1 pt/a	B						
11	Prowl H2O	1.5 pt/a	B	6.663	58.580	225.360	394.380	197.510	885.384
	RoundUp	22 floz/a	B						
12	Prowl H2O	1.5 pt/a	C	3.125	54.418	180.543	234.003	282.338	754.194
13	Buctril	1 pt/a	B	3.578	58.580	224.078	332.595	177.023	796.660
	Prowl H2O	1.5 pt/a	C						
14	RoundUp	22 floz/a	B	3.988	59.220	223.118	355.645	236.240	879.787
	Prowl H2O	1.5 pt/a	C						
15	Nortron	1.36 pt/a	C	0.569	62.454	211.127	340.184	193.578	804.988
	Prowl H2O	0.75 pt/a	C						
16	Nortron	1.36 pt/a	B	0.246	74.905	141.808	319.473	214.155	750.012
17	Nortron	2.72 pt/a	B	2.738	33.293	182.143	277.535	274.655	765.206
18	Hand-weeded			3.064	56.660	265.053	461.280	163.255	950.235
19	Dacthal	10 lb/a	B	7.163	56.338	237.200	302.185	169.018	773.254
20	Nortron	2.72 pt/a	C	7.601	62.103	258.008	321.073	156.853	807.130
			LSD P=0.10	6.102	36.824	73.150	95.856	107.524	154.876

'Mondella' Yield:

TRT	TRT		App	----------CWT/A----------					
#	Name	Rate	Code	<1"	1" - 2.25"	2.25" - 3"	3" - 4"	>4"	Total
1	Dacthal	10 lb/a	A	0.000	26.312	60.688	119.083	125.163	336.438b
2	Nortron	1.36 pt/a	A	0.000	27.592	79.632	189.825	66.263	367.808b
	Prowl H2O	0.75 pt/a	A						
3	Nortron	1.36 pt/a	A	0.960	44.229	54.567	209.993	88.673	418.063b
	Prowl H2O	0.75 pt/a	B						
4	Prowl H2O	0.75 pt/a	A	1.920	18.417	47.113	179.263	119.080	368.288b
	Nortron	1.36 pt/a	B						
5	Prowl H2O	1.5 pt/a	A	3.200	16.391	74.439	166.458	59.543	323.310b
6	Prowl H2O	0.75 pt/a	A	0.640	48.787	110.156	144.370	79.708	392.458b
7	Prowl H2O	1.5 pt/a	B	0.000	20.079	96.877	172.220	120.360	412.303b
8	Prowl H2O	0.75 pt/a	B	1.600	40.591	105.328	226.958	72.825	453.438b
9	Nortron	1.36 pt/a	B	1.516	31.295	86.459	233.976	81.651	438.083b
	Prowl H2O	0.75 pt/a	B						
10	Prowl H2O	1.5 pt/a	B	4.800	26.543	80.687	201.348	131.248	449.755b
	Buctril	1 pt/a	B						
11	Prowl H2O	1.5 pt/a	B	0.000	25.648	119.561	149.813	151.413	450.395b
	RoundUp	22 floz/a	B						
12	Prowl H2O	1.5 pt/a	C	1.600	32.294	86.790	169.980	118.443	418.065b
13	Buctril	1 pt/a	B	1.280	35.019	92.328	173.180	76.828	388.935b
	Prowl H2O	1.5 pt/a	C						
14	RoundUp	22 floz/a	B	0.640	34.440	104.796	161.975	137.648	442.075b
	Prowl H2O	1.5 pt/a	C						
15	Nortron	1.36 pt/a	C	0.960	29.728	99.917	151.413	109.160	399.818b
	Prowl H2O	0.75 pt/a	C						
16	Nortron	1.36 pt/a	B	3.843	25.127	93.622	171.898	67.223	371.008b
17	Nortron	2.72 pt/a	B	0.960	18.618	73.980	167.418	88.030	357.563b
18	Hand-weeded			3.200	22.513	117.281	245.365	210.955	602.608a
19	Dacthal	10 lb/a	B	0.000	29.001	130.095	210.313	83.550	456.480b
20	Nortron	2.72 pt/a	C	4.483	17.932	86.336	168.380	118.763	421.585b
			LSD P=0.10	4.321	22.536	57.012	61.421	53.458	83.171

SP2203. Buckwheat Response to Grass Herbicides

Dr. Howatt and Mettler. Koto buckwheat was planted near Fargo, ND on May 23, 2022. Treatments 2-7 were applied to 6 to 7-leaf buckwheat with buds present on June 27, 2022 at 6:55AM at 59°F, 72% relative humidity, 0% cloud-cover, 5 mph wind velocity at 270°, and damp soil surface at 68°F. Treatments 8-13 were applied to 20% blooming buckwheat on July 6, 2022 at 8:57AM at 74°F, 71% relative humidity, 25% cloud-cover, 4 mph wind velocity at 135°, and damp soil surface at 72°F. A desiccation treatment of glyphosate was applied on September 12, 2022 at 10:15AM at 66°F, 52% relative humidity, 5 mph wind velocity at 225°, and dry soil surface at 55°F. Herbicides were applied with a backpack sprayer delivering 8.5 gpa at 40 psi through 11001 TT nozzles to a 7-foot-wide area the length of 10 by 30-foot plots. The experiment was a randomized complete block design with four replicates.

				7/5	7/13	7/18	7/26	9/28
	Treatment	**Rate**	**Timing**	**Bkwht**	**Bkwht**	**Bkwht**	**Bkwht**	**Bkwht**
		-OZ AI/A, %V-		----------% Control----------				Yield (lb/a)
1	Untreated			0	0	0	0	333
2	Quiz + PO	1.3+20	6 to 7 leaf	0	0	0	0	385
3	Cleth-2EC + PO	2+20	6 to 7 leaf	0	0	0	0	458
4	Cleth-SM + NIS	2+0.25	6 to 7 leaf	0	0	0	0	427
5	Quiz + PO	2.6+20	6 to 7 leaf	0	0	0	0	362
6	Cleth-2EC + PO	4+20	6 to 7 leaf	0	0	0	0	337
7	Cleth-SM + NIS	4+0.25	6 to 7 leaf	0	0	0	0	435
8	Quiz + PO	1.3+20	20% bloom	0	0	0	0	393
9	Cleth-2EC + PO	2+20	20% bloom	0	0	0	0	269
10	Cleth-SM + NIS	2+0.25	20% bloom	0	0	0	0	336
11	Quiz +PO	2.6+20	20% bloom	0	0	0	0	484
12	Cleth-2EC + PO	4+20	20% bloom	0	0	0	0	313
13	Cleth-SM + NIS	4+0.25	20% bloom	0	0	0	0	437
	CV:			.	.	.	.	47
	LSD P=0.05			.	.	.	.	260

Comments: All herbicides applied were very safe to buckwheat. There were no differences in visible injury or yield. In general, buckwheat yields are low due to lack of moisture, grasshopper damage, and heavy Venice mallow competition.

SP2202 Buckwheat Response to Soil Herbicides

Dr. Howatt and Mettler. Koto buckwheat was planted near Fargo, ND on May 23, 2022. PRE-treatments were applied on May 24, 2022 at 11:40AM at 74°F, 43% relative humidity, 15% cloud-cover, 8 mph wind velocity at 135°, and damp soil surface at 63°F. A desiccation treatment of glyphosate was applied on September 12, 2022 at 10:15AM at 66°F, 52% relative humidity, 5 mph wind velocity at 225°, and dry soil surface at 55°F. Herbicides were applied with a backpack sprayer delivering 17 gpa at 40 psi through 11002 TT nozzles to a 7-foot-wide area the length of 10 by 30-foot plots. The experiment was a randomized complete block design with four replicates. The experiment was conducted on silty clay soil with 4.9% organic matter, a pH of 7.8 and a CEC of 46.2 meq/100g.

			6/17	6/29	7/26	9/28
	Treatment	**Rate**	**Bkwht**	**Bkwht**	**Bkwht**	**Bkwht**
		OZ AI/A	----------% Injury----------			-Yield- lb/a
1	Untreated Check		0	0	0	252
2	Metr-4F	4	0	1	0	183
3	Metr-4F	8	2	1	0	169
4	S-meto-D2M	26	1	3	0	202
5	S-meto-D2M	52	7	1	0	181
6	Dime	15	0	0	0	269
7	Dime	30	2	0	0	224
8	Pysf-SC	2.5	0	0	0	263
9	Pysf-SC	5	4	2	0	190
10	Meso	2.5	1	1	0	212
11	Meso	5	6	8	0	226
12	Isxf	0.75	0	1	0	310
13	Isxf	1.5	1	2	0	363
	CV:		140	156	0	27
	LSD P=0.05		4	3	.	90

Comments: There was little variation in visible injury on buckwheat among the herbicides applied. All are relatively safe to buckwheat. The higher rate of s-metolachlor resulted in the most injury. Dimethenamid-p was the most safe herbicide, but also the least effective against weeds. The HPPD herbicides mesotrione, and isoxaflutole are of particular interest in getting registered as they resulted in low levels of visible buckwheat injury and can control weeds rather well within the crop.

In general, buckwheat yields are low due to lack of moisture, grasshopper damage, and heavy Venice mallow competition. Both rates of isoxaflutole resulted in greater yields than any applications of metribuzin and s-metolachlor. Most other herbicides resulted in similar buckwheat yields.

WhtO2209 Triallate Response to Residues in Oat

Dr. Howatt and Mettler. Tame oat was planted on May 19, 2022 near Fargo, ND. Treatments were applied on May 19, 2022 at 8:55AM at 57°F, 80% relative humidity, 0% cloud-cover, 3 mph wind velocity at 90°, and dry soil surface at 59°F. Herbicides were applied with a backpack sprayer delivering 17 gpa at 40 psi through 11002 TT nozzles to a 10-foot-wide area, 20 feet long, which left 10 feet of each plot untreated. The experiment was a randomized complete block design with four replicates. The experiment was conducted on silty clay soil with 6.1% organic matter, a pH of 7.6 and a CEC of 35.4 meq/100g.

	Treatment	Rate	Residue	Bales	6/6 Oat	6/17 Oat	6/22 Oat
		----OZ AI/A, %V----			----------% Control----------		
1	Untreated Check				3	0	0
2	Tria (Far-Go)	16	0%	none	43	0	0
3	Tria	16	25%	1/8	35	0	0
4	Tria	16	50%	1/4	35	0	0
5	Tria	16	75%	3/8	25	0	0
6	Tria	16	100%	1/2	13	0	0
	CV:				26	0	0
	LSD P=0.05				10	.	.

Comments:

- Applying the herbicide to only 20’ of the 30’ plot allowed for a direct comparison between the treated area and untreated area with similar residue amounts. It was observed that the planted oats had a similar growth response within each plot at later evaluations, whether it was treated or not. Any differences among treatments in the first evaluation were attributed to the variable levels of residue and minor herbicide effect as delay of emergence rather than a lasting result of the herbicide.
- At the first evaluation, plots with 50% or more residue had better emergence and more vigorous oats which gave the impression that triallate controlled oats better at lower residues but the emergence was only delayed. There was a lack of precipitation to activate the herbicide in a timely manner. The straw helped to conserve moisture and speed germination as well as any herbicide tie-up, which would explain the first evaluation differences. As emergence and growth continued, lack of differences in the later evaluation timings again indicated no lasting or definite herbicide effect. A more substantial rain event was likely necessary to get the expected activity on this susceptible species.

SP2216 Defol 5 Dry Bean Desiccation

Dr. Howatt and Mettler. Eclipse black bean was planted on June 2, 2022 near Fargo, ND. Treatments were applied to beans with greater than 80% yellow to brown foliage and 70% tan pods on September 2, 2022 at 5:45AM at 66°F, 81% relative humidity, 0% cloud-cover, 0-1 mph wind velocity at 30°, and dry soil surface at 70°F. Herbicides were applied with a backpack sprayer delivering 8.5 gpa at 40 psi through 11001 TT nozzles to a 7-foot-wide area the length of 10 by 30-foot plots except for treatment 3. Treatment 3 was applied at 17 gpa at 40 psi through 11002 TT nozzles. The experiment was a randomized complete block design with four replicates. Plots were harvested on September 12, 2022.

	Treatment	Rate	Spray Volume	9/6 bean leaf	9/6 bean stem	9/6 bean pod	9/9 bean leaf	9/9 bean stem	9/9 bean pod	9/12 bean leaf	9/12 bean stem	9/12 bean pod	9/12 Seed Moisture	9/12 Yield
		--- OZ AI/A ---	GPA	---------- % Desiccation ----------									%	lb/A
1	Untreated Check			38	18	80	45	20	81	48	60	86	12.6	1670
2	Defol 5 + Hot MES	96+16.7	8.5	90	43	92	91	50	93	92	80	95	12.1	1727
3	Defol 5 + Hot MES	96+16.7	17	86	28	86	86	33	88	89	74	94	12.1	1590
4	Flum-EZ + Hot MES	1+16.7	8.5	83	38	88	86	45	88	89	75	95	12.3	1818
5	Flum-EZ + Defol 5 + Hot MES	1+48+16.7	8.5	93	53	94	94	65	95	96	89	96	12.0	2141
6	Saff + Hot MES	0.71+16.7	8.5	81	33	86	88	45	88	95	84	95	12.0	1911
7	Saff + Defol 5 + Hot MES	0.71+16.7	8.5	92	48	93	96	68	95	96	92	95	11.7	1722
	CV:			5	17	2	5	14	2	4	6	1	2	15
	LSD P=0.05			6	9	3	6	10	3	5	7	2	0.37	386

Comments: Treatment 5 and 7 resulted in the most desiccation of leaves, stems and pods at the first two evaluations. By 9/12 treatments became more similar. The additions of Flum or Saff with Defol resulted in more desiccation than the two products alone. Visually at harvest, the higher spray volume of Defol performed similarly to Flum applied alone, however the lower spray volume of Defol resulted in greater desiccation than both the former applications. Seed moisture was most in the untreated, with treatments 2, 3, 5, 6, and 7 resulting in drier seed. Flum (treatment 4) did not lower seed moisture. Saff applied with Defol resulted in less moist seed compared to treatments 2, 3, and 4. Yield was unaffected by the desiccation treatments. Average yield for this study was 1,797 lbs/A.

SP2218 Defol 5 Flax Desiccation

Dr. Howatt and Mettler. York Flax was planted on June 2, 2022 near Fargo, ND. Treatments were applied to flax with 80% tan bowls and 16 to 22 inch Venice mallow on September 2, 2022 at 5:10AM at 66°F, 81% relative humidity, 0% cloud-cover, 0-1 mph wind velocity at 30°, and dry soil surface at 70°F. Herbicides were applied with a backpack sprayer delivering 8.5 gpa at 40 psi through 11001 TT nozzles to a 7-foot-wide area the length of 10 by 30-foot plots except for treatment 3. Treatment 3 was applied at 17 gpa at 40 psi through 11002 TT nozzles. The experiment was a randomized complete block design with five replicates. Plots were harvested on September 12, 2022.

	Treatment	Rate	Spray Volume	9/6 Flax	9/6 vema	9/9 flax	9/9 vema	9/12 flax	9/12 vema	9/12 Seed Moisture	9/12 Yield
		--- OZ AI/A ---	GPA	----------		% Desiccation		----------		%	lb/A
1	Untreated Check			12	0	17	0	23	0	11.9	543
2	Defol 5 + Hot MES	96+16.7	8.5	34	50	54	66	79	75	10.8	493
3	Defol 5 + Hot MES	96+16.7	17	28	36	56	56	72	67	10.5	544
4	Saff + Hot MES	1+16.7	8.5	33	8	38	28	48	64	9.9	581
5	Saff + Defol 5 + Hot MES	1+48+16.7	8.5	40	55	54	77	79	88	9.2	493
6	Glyt-PM + AMS All	0.71+16.7	8.5	38	1	71	20	89	38	8.8	644
7	Glyt-PM + Defol 5 + Hot MES	0.71+16.7	8.5	40	30	69	66	92	65	9.4	431
	CV:			18	20	10	16	7	9	8	23
	LSD P=0.05			7	7	6	9	6	6	1	161

Comments: Similar to the canola and black bean experiments, Defol 5 applied at 8.5 GPA resulted in more crop and weed desiccation compared to the higher spray volume of 17 GPA. The addition of Defol 5 to Saff and Glyt drastically improved Venice mallow control. Treatment 5-7 resulted in less seed moisture at harvested compared to treatments 1-3. Yield was not impacted by the desiccation applications. However, it was estimated that 40 to 50% of the bowls passed through the combine, resulting in less than desired yield. Typically, flax will yield near 1200 to 1400 pounds per acre. Average yield in this experiment was 533 lbs/A.

SP2215 Defol 5 Spring Canola Desiccation

Dr. Howatt and Mettler. Truflex Canola A1088213 was planted on June 2, 2022 near Fargo, ND. Treatments were applied to canola with 25% brown seed and 3 to 4 foot tall pigweed species on August 30, 2022 at 10:10AM at 76°F, 64% relative humidity, 0% cloud-cover, 5-7 mph wind velocity at 240°, and dry soil surface at 68°F. Herbicides were applied with a backpack sprayer delivering 8.5 gpa at 40 psi through 11001 TT nozzles to a 7-foot-wide area the length of 10 by 30-foot plots except for treatment 3. Treatment 3 was applied at 17 gpa at 40 psi through 11002 TT nozzles. The experiment was a randomized complete block design with three replicates. Plots were harvested on September 9, 2022.

	Treatment	Rate	Spray Volume	9/2 Canola pods	9/2 Canola stems	9/2 Rrpw	9/6 Canola pods	9/6 Canola stems	9/6 Rrpw	9/9 Canola pods	9/9 Canola stems	9/9 Rrpw	9/9 Seed Moisture	9/9 Yield
		--- OZ AI/A ---	GPA	---------- % Desiccation ----------									%	lb/A
1	Untreated			63	20	0	82	18	3.0	93	23	3.0	12.5	1020
2	Defol 5 + Hot MES	96+16.7	8.5	78	30	9.0	95	47	17	97	53	17	11.5	875
3	Defol 5 + Hot MES	96+16.7	17	70	30	17	93	37	10	97	40	10	11.5	1051
4	Defol 5 + Hot MES	48+16.7	8.5	70	27	15	88	37	6.7	97	37	7.0	11.7	815
5	Sharpen + Defol 5 + Hot MES	0.71+48+16.7	8.5	80	37	26	90	35	62	97	58	62	11.7	927
6	Sharpen + Hot MES	0.71+16.7	8.5	65	27	20	87	27	28	96	53	28	12.4	771
7	Reglone + Surf-AC 910	6+1.42	8.5	98	80	75	97	90	72	97	96	85	11.4	1127
	CV:			12	28	34	4	14	17	2	13	15	5	11
	LSD P=0.05			16	18	14	6	11	9	1.2	12	8	1.0	179

Comments: Treatment 7 with Reglone resulted in the most desiccation of canola pods and stems. Treatment 5 resulted in more visible pod desiccation on 9/2 and 9/6 when compared with other treatments that included Defol 5, but by harvest differences were minimal. At harvest on 9/9/22, differences in stem desiccation were visibly apparent. For example, Defol 5 when applied at 8.5 GPA resulted in greater stem desiccation than when applied at the higher spray volume of 17 GPA. 0.12” of rain occurred the morning of harvest, likely equalizing any seed moisture differences that were present. No seed moisture differences were observed. Yield differences occurred, likely as a result of plot variability within the study area as it isn’t expected that the treatments applied would impact yield. The average yield for the past 10 growing seasons in North Dakota is about 1,700 lbs/a. Our average plot yield was 940 lbs/a.

SP2217 Defol 5 Sunflower Desiccation

Dr. Howatt and Mettler. Royal hybrid(RH270EX) sunflower was planted on June 3, 2022 near Argusville, ND. Treatments were applied on September 28, 2022 at 8:40AM at 39°F, 61% relative humidity, 10% cloud-cover, 4-5 mph wind velocity at 150°, and dry soil surface at 54°F. Herbicides were applied with a backpack sprayer delivering 8.5 gpa or 17 gpa (specifics in chart below) at 40 psi through 11001 or 11002 TT nozzles to a 7-foot-wide area the length of 10 by 30-foot plots. The experiment was a randomized complete block design with 4 replicates. Plots were harvested on October 12, 2022. Desiccation evaluations took place at 3, 7, 12, and 14 DA-A.

	Treatment	Rate	Spray Volume	10/1 Sunf Leaves	10/1 Sunf Head	10/1 Sunf Stem	10/5 Sunf Leaves	10/5 Sunf Head	10/5 Sunf Stem	10/10 Sunf Head	10/10 Sunf Stem
		--- OZ AI/A ---	GPA	----------% Desiccation----------							
1	Untreated Check			35	28	40	50	43	50	60	63
2	Defol 5 + Hot MES	96+16.7	8.5	70	48	58	93	71	74	78	76
3	Defol 5 + Hot MES	96+16.7	17	63	40	55	90	63	68	70	73
4	Saff + Hot MES	0.71+16.7	8.5	48	33	48	83	58	68	73	75
5	Saff + Defol 5 + Hot MES	0.71+48+16.7	8.5	60	38	48	92	65	73	79	83
6	Glyt-PM + AMS All	12.4+2.5%	8.5	38	30	43	59	48	53	63	60
7	Glyt-PM + Defol 5 + Hot MES	12.4+48+16.7	8.5	55	35	45	86	58	55	69	69
	CV:			10	9	11	5	6	8	3	6
	LSD P=0.05			8	5	8	6	5	8	4	6

	Treatment	Rate	Spray Volume	10/12 Sunf Head	10/12 Sunf Stem	10/12 Sunf Seed	10/12 Sunf Seed	10/12 Sunf Seed	10/12 Sunf Head +Seed	10/31 Sunf Head +Seed	10/31 Sunf Head +Seed
		--- OZ AI/A ---	GPA	-% Desiccation-		Fresh Weight (g)	% Moisture	Yield lb/ac	Fresh Weight (g)	Dry Weight (g)	% Moisture
1	Untreated Check			61	64	2689	13	3465	1920	1083	43
2	Defol 5 + Hot MES	96+16.7	8.5	81	83	2268	12	2956	1892	1141	40
3	Defol 5 + Hot MES	96+16.7	17	70	73	2370	12	3021	1751	1002	43
4	Saff + Hot MES	0.71+16.7	8.5	74	76	2139	12	2776	1867	1067	43
5	Saff + Defol 5 + Hot MES	0.71+48+16.7	8.5	79	85	2289	12	2989	2115	997	52
6	Glyt-PM + AMS All	12.4+2.5%	8.5	64	64	2115	13	2714	1872	1032	45
7	Glyt-PM + Defol 5 + Hot MES	12.4+48+16.7	8.5	73	71	2386	13	3085	2053	968	53
	CV:			3	4	15	6	15	13	9	15
	LSD P=0.05			3	4	527	1	677	379	144	10

Comments: Treatment 2, Defol 5 at 8.5 GPA, resulted in better desiccation of sunflower compared to Defol 5 applied at 17 GPA. Defol 5 when added to Saflufenacil at a half rate (48 oz ai/a) resulted in similar levels of desiccation when Defol 5 was applied alone at 96 oz ai/a with a spray volume of 8.5 GPA. Treatment 6, glyphosate only, resulted in less sunflower desiccation than all other treatments.

Statistically, seed moisture, seed plus head moisture, and yields were not different between treatments. Although during harvest, it was noticeably more difficult to thresh heads and clean seed from Treatments 1, 6, and 7, where seed moisture was near 13%.