

## POTATO HERBICIDE TRIAL

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### Purpose

To evaluate herbicides for crop tolerance and weed control when applied at different rates as postplant preemergence and postemergence applications to Shepody and Russet Burbank potato varieties.

### Procedure

Herbicides applied as postplant preemergence treatments included Frontier, Dual, Prowl, and Eptam. Frontier was applied alone at rates of 1.17 and 2.34 lb ai/ac. Dual was applied alone at 2.0 lb ai/ac and in tank-mix combination with Prowl and Eptam at 2.0 lb ai/ac of Dual and 1.5 and 2.0 lb ai/ac of Prowl and Eptam, respectively. Frontier was also tank-mixed with Prowl and Eptam using 1.17 lb ai/ac of Frontier and 1.5 and 2.0 lb ai/ac of Prowl and Eptam. These treatments were applied on May 2, and the potatoes were planted on April 25. Potato seed pieces were sprouted and weed seeds germinated, but there was no emergence. After application, three-quarters inch of water was applied by sprinkle irrigation to activate the herbicides.

The postemergence applied herbicides included Matrix (Dupont E9636) applied alone at rates of 0.0156 and 0.0238 lb ai/ac and in tank-mix combination with Eptam, Prowl, and Lexone. Eptam, Prowl, and Lexone rates were 3.0, 0.75, and 0.375 lb ai/ac, respectively. Two surfactants, non-ionic X-77 and MorAct crop-oil-concentrate were compared as herbicide activators. Assure II was tank-mixed with Lexone to evaluate for compatibility and grass control. The postemergence herbicides were applied on May 2. Russet Burbank potatoes were about 90 percent emerged with 4 inches of height on some plants. Shepody plants were about 35 percent emerged with the remainder of the plants pushing up underneath the thin soil crust. Herbicides had to be applied, because the emerged weeds were getting too large. Weed species included redroot pigweed, hairy nightshade, lambsquarters, kochia, and barnyardgrass. Most of the broadleaf weeds had 4-true leaves and were 1-inch in height. The barnyardgrass was with one to three leaves. When postemergence herbicides were applied, the air temperature was 72°F, soil temperature at 4-inches 61°F, and the wind calm with clear skies. The soil surface was dry. On May 3, about 24 hours after the herbicides were applied, the trial area was sprinkle irrigated with one-half inch of water to activate the soil active herbicides.

The herbicide treatments were applied as double overlap broadcast applications using a single bicycle wheel plot sprayer. Spray nozzles were 8002 Teejet fan nozzles

spaced 10-inches apart on a 9-foot boom. Spray pressure was 35 psi, and water was applied at a volume of 31.8 gal/ac.

The previous crop in 1994 had been Stephens winter wheat. After the wheat was harvested, the stubble straw was mulched with a steel flail beater, disked, and irrigated. In October the field was chiseled to a depth of 18-inches and bedded. Soil texture was a silt loam with 1.3 percent organic matter and a pH of 1.3. Bronate at 1 qt/ac had been applied to control weeds in the wheat. One-hundred lb/ac of phosphate and 60 lb/ac of nitrogen were broadcast before chiseling.

In the spring before planting, the bedded land was spike-tooth harrowed, and the centers of the beds were chiseled to a depth of 16-inches with a single shank. Individual plots were two rows wide and forty feet long. An unplanted buffer area one row wide (36 inches) was along both sides of the two treated rows and was used to prevent herbicide mixing between adjacent plots. Each treatment was replicated three times and randomly arranged in blocks using a complete randomized block experimental design. The two-row plots consisted of one row Russet Burbank and the second row Shepody. Individual seed pieces were cut to weigh about two ounces. Seed pieces were spaced about 9 inches apart in the row and planted about 4 inches below the surface of leveled soil. Rows were spaced 36 inches apart. After planting, the potato rows were rehilled using hilling shovels mounted in-front-of and behind rolling teeth of a Lilliston cultivator. The planted potatoes received no further tillage except for two rows where the weeds were controlled by cultivation only without the use of herbicides. This area served as the untreated cultivation check plot. It was cultivated with a Lilliston when the potato foliage was about twelve inches tall and weeds had 2 to 4 inches of growth.

The treatments were evaluated on June 8 for early weed control and crop injury and again on August 30 when the tops had started to desiccate to identify treatments controlling weeds till time of harvest.

Potato tubers were harvested and graded on September 5, 6, and 7. Tubers were graded as number 1, 2, and culls. Number 1 tubers were graded into size categories 4 to 8 oz, 8 to 12 oz, and over 12 oz. Culls were tubers less than 4 oz. Number 2 were larger than 4 oz and too misshapen to be number 1.

## Results

Both Shepody and Russet Burbank potato varieties were tolerant to all herbicide treatments. The following postplant preemergence applied herbicide treatments controlled better than 95 percent of all weed species: Frontier at both 1.17 and 2.34 lb ai/ac rates and tank-mix combinations of Frontier or Dual with Prowl and Eptam. Dual at 2.0 lb ai/ac did not control all weed species. Postemergence applied herbicides giving 95 percent control of all weed species included Matrix + Eptam + NIS at both Matrix rates of 0.0156 and 0.0238 lb ai/ac, Matrix + Prowl + NIS at 0.0238 lb ai/ac of Matrix and 0.75 lb ai/ac Prowl, Matrix + Lexone + NIS at 0.0238 and 0.375 lb ai/ac, and

Matrix + COC at 0.0238 lb ai/ac. Several herbicide treatments gave complete control of pigweed and barnyardgrass. Hairy nightshade and lambsquarters were most difficult for Matrix to control in this trial. Most herbicide treatments that controlled weeds early persisted to control weeds until harvest. Matrix was more active with a crop-oil-concentrate than a non-ionic surfactant. Eptam gave better control of hairy nightshade at the lower rate of Matrix than did Prowl. Good weed control was obtained in this trial with the tank-mix combination of Lexone and Assure II at rates of 0.5 and 0.075 lb ai/ac. This treatment controlled 100 percent pigweed, lambsquarters, kochia, barnyardgrass, and over 85 percent control of hairy nightshade. About 65 percent of the weeds were controlled by cultivation.

Herbicide treatments, with the possible exception of Lexone + Assure II, did not injure the potatoes causing a reduction in tuber size or yield, but tuber yield was reduced by weed competition in those treatments where weed control was not complete. These differences were great enough to be significant at the 5 percent level. Hairy nightshade left uncontrolled was the most competitive weed species in this trial causing the greatest reduction in tuber yield. Total tuber yield was higher for Russet Burbank, but Shepody produced larger tubers, more number 1 and more marketable tubers (Table 3).

The better treatments in this trial included Frontier 2.34 lb, Frontier or Dual in tank-mix combination with Prowl and Eptam applied preemergence, and the postemergence tank-mix applications containing Matrix with Eptam or Prowl and a surfactant.

Table 1. Early crop injury ratings and percent weed control in Shepody and Russet Burbank potatoes treated with herbicides applied as postplant preemergence and post emergence applications. Malheur Experiment Station, Oregon State University, Ontario, Oregon, 1995.

			Crop injury						Percent weed control														
			Russet Burbank			Shepody			H. nightshade			Pigweed			Lambsquarters			Kochia			Barnyardgrass		
Herbicides	Rate	Applied	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
	lb ai/ac		— % —			— % —			— % —														
Frontier	1.17	pre	0	0	0	0	0	0	98	95	95	100	98	99	100	98	95	95	95	98	100	100	100
Frontier	2.34	pre	0	0	0	0	0	0	100	98	99	100	98	99	100	99	99	98	95	98	100	100	100
Dual	2.0	pre	0	0	0	0	0	0	93	95	85	98	98	90	100	100	95	98	98	98	100	100	100
Frontier + Prowl + Eptam	1.17 + 1.5 + 2.0	pre	0	0	0	0	0	0	99	99	99	100	100	100	100	100	100	100	100	100	100	100	100
Dual + Prowl + Eptam	2.0 + 1.5 + 2.0	pre	0	0	0	0	0	0	100	99	100	100	100	100	100	100	100	100	100	100	100	100	100
Matrix + NIS	0.158	post	0	0	0	0	0	0	50	50	80	100	100	100	90	90	90	85	80	85	93	95	95
Matrix + Eptam + NIS	0.0158 + 3.0	post	0	0	0	0	0	0	98	99	98	100	100	100	98	100	100	98	98	100	100	100	100
Matrix + Prowl + NIS	0.0158 + 0.75	post	0	0	0	0	0	0	93	90	93	100	100	100	100	100	100	100	100	100	100	100	100
Matrix + Prowl	0.0158 + 0.75	post	0	0	0	0	0	0	98	93	93	100	100	100	98	100	100	100	98	98	100	100	100
Matrix + Lexone + NIS	0.0158 + 0.375	post	0	0	0	0	0	0	65	75	50	100	100	90	98	98	90	95	95	98	100	100	100
Matrix + NIS	0.0238	post	0	0	0	0	0	0	85	85	80	95	100	100	95	95	85	85	90	90	95	100	100
Matrix + Eptam + NIS	0.0238 + 3.0	post	0	0	0	0	0	0	95	98	99	100	100	100	100	100	100	100	100	100	100	100	100
Matrix + Prowl + NIS	0.0238 + 0.75	post	0	0	0	0	0	0	99	99	99	100	100	100	100	100	100	100	100	100	100	100	100
Matrix + Prowl	0.0238 + 0.75	post	0	0	0	0	0	0	85	85	85	100	100	100	90	90	90	100	100	100	100	100	100
Matrix + Lexone + NIS	0.0238 + 0.375	post	0	0	0	0	0	0	100	99	99	98	100	100	100	100	100	100	100	100	100	100	100
Matrix + COC	0.0238	post	0	0	0	0	0	0	93	98	98	100	100	100	100	100	100	100	100	100	100	100	100
Lexone + Assure II	0.5 + 0.075	post	0	0	0	0	0	0	80	85	80	100	100	100	100	100	100	100	100	100	100	100	100
Cultivated check	—	—	0	0	0	0	0	0	60	55	45	85	70	65	55	60	60	45	50	50	40	35	40
Untreated check	—	—	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

NIS = non-ionic surfactant (X-77) added at rate of 0.25% v/v.

COC = crop oil concentrate (MorAct) added at rate of 1% v/v.

Evaluated June 8.

Ratings: 0 = no herbicide effect. 100 = all plants killed by herbicides.

**Table 2. Weed control ratings taken on August 30 for control of late germinating weeds in Shepody and Russet Burbank potatoes treated with herbicides applied as postplant preemergence and postemergence applications. Malheur Experiment Station, Oregon State University, Ontario, Oregon, 1995.**

			Percent weed control														
			H. nightshade			Pigweed			Lambsquarters			Kochia			Barnyardgrass		
Herbicides	Rate	Applied	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
			%														
Frontier	1.17	pre	95	95	98	100	100	100	100	100	100	100	100	100	100	100	100
Frontier	2.34	pre	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Dual	2.0	pre	95	92	80	95	95	90	90	95	90	90	95	90	90	95	90
Frontier + Prowl + Eptam	1.17 + 1.5 + 2.0	pre	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Dual + Prowl + Eptam	2.0 + 1.5 + 2.0	pre	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Matrix + NIS	0.156	post	50	50	35	100	100	100	100	100	100	100	100	100	100	100	100
Matrix + Eptam + NIS	0.0156 + 3.0	post	95	93	95	100	100	100	100	100	100	100	100	100	100	100	100
Matrix + Prowl + NIS	0.0156 + 0.75	post	98	95	90	100	100	100	100	100	100	100	100	100	100	100	100
Matrix + Prowl	0.0156 + 0.75	post	75	70	85	100	100	100	100	100	100	100	100	100	100	100	100
Matrix + Loxone + NIS	0.0156 + 0.375	post	80	85	35	100	100	100	100	100	100	100	100	100	100	100	100
Matrix + NIS	0.0238	post	35	45	50	100	95	95	95	95	95	100	95	95	100	95	95
Matrix + Eptam + NIS	0.0238 + 3.0	post	98	90	98	100	100	100	100	100	100	100	100	100	100	100	100
Matrix + Prowl + NIS	0.0238 + 0.75	post	98	100	98	100	100	100	100	100	100	100	100	100	100	100	100
Matrix + Prowl	0.0238 + 0.75	post	85	80	75	100	100	100	100	100	100	100	100	100	100	100	100
Matrix + Loxone + NIS	0.0238 + 0.375	post	50	80	98	100	100	100	100	100	100	100	100	100	100	100	100
Matrix + COC	0.0238	post	85	80	90	100	100	100	100	100	100	100	100	100	100	100	100
Loxone + Assure II	0.5 + 0.075	post	85	90	90	100	100	100	100	100	100	100	100	100	100	100	100
Cultivated check	-	-	85	80	80	70	85	70	70	70	70	70	70	70	50	80	50
Untreated check	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

NIS = non-ionic surfactant (X-77) added at rate of 0.25% v/v.

COC = crop oil concentrate (MorAct) added at rate of 1% v/v.

Evaluated August 30.

Ratings: 0 = no herbicide effect. 100 = all plants killed by herbicides.

Table 3. Potato tuber grade, size, and yield of Russet Burbank and Shepody varieties treated with herbicides applied postplant preemergence or postemergence. Malheur Experiment Station, Oregon State University, Ontario, Oregon, 1995.

			Tuber size, grade, and yield															
			Number 2		< 4 oz		4 - 8 oz		8 - 12 oz		> 12 oz		Total yield		Percent no. 1		Percent > 12 oz	
Herbicides	Rate	Applied	Shep	R. Bur	Shep	R. Bur	Shep	R. Bur	Shep	R. Bur	Shep	R. Bur	Shep	R. Bur	Shep	R. Bur	Shep	R. Bur
			cw/ac															
			lb a/ac															
Frontier	1. 17	pre	20	37	34	188	45	182	140	158	236	62	478	804	88. 5	82. 8	49. 8	10. 2
Frontier	2. 34	pre	30	62	31	191	42	161	108	158	281	64	492	834	87. 4	80. 2	57. 1	10. 2
Frontier + Prowl + Eptam	1. 17 + 1. 5 + 2. 0	pre	38	49	40	194	80	133	128	143	250	65	515	585	85. 0	58. 5	48. 6	11. 2
Dual + Prowl + Eptam	2 + 1. 5 + 2. 0	pre	38	47	27	191	48	143	114	147	280	59	504	586	87. 4	59. 5	55. 6	10. 0
Matrix + NIS	0. 0158	post	18	38	38	105	43	75	82	70	53	14	210	300	74. 8	53. 2	25. 1	4. 7
Matrix + Eptam + NIS	0. 0158 + 3. 0	post	20	70	37	177	58	150	137	154	246	53	497	803	88. 6	59. 0	49. 5	8. 7
Matrix + Prowl + NIS	0. 0158 + 0. 75	post	44	61	43	154	88	120	110	137	239	52	504	523	82. 7	58. 9	47. 4	10. 0
Matrix + Prowl	0. 0158 + 0. 75	post	21	79	27	141	56	100	116	109	224	61	444	490	89. 2	55. 0	60. 5	12. 4
Matrix + Lexone + NIS	0. 0158 + 0. 375	post	25	40	31	131	50	119	101	121	188	22	394	433	85. 8	60. 6	47. 6	5. 1
Matrix + NIS	0. 0238	post	20	74	38	128	42	115	114	91	132	32	346	439	83. 2	54. 0	38. 1	7. 2
Matrix + Eptam + NIS	0. 0238 + 3. 0	post	26	59	34	198	88	174	144	134	283	26	534	591	88. 8	56. 6	49. 2	4. 5
Matrix + Prowl + NIS	0. 0238 + 0. 75	post	31	89	39	174	51	122	120	188	254	30	495	803	85. 9	56. 4	51. 3	5. 0
Matrix + Lexone + NIS	0. 0238 + 0. 375	post	30	57	40	225	81	213	144	143	194	39	488	678	85. 1	58. 4	41. 5	5. 8
Matrix + COC	0. 0238	post	23	58	38	188	56	165	134	137	204	47	455	595	86. 6	58. 6	44. 8	7. 9
Lexone + Assure II	0. 50 + 0. 075	post	46	77	33	147	42	144	100	127	198	45	418	540	81. 2	58. 5	47. 2	8. 3
Untreated check	-	-	6	28	27	108	26	65	26	51	17	12	102	283	67. 6	59. 1	16. 7	4. 5
Mean			28	57	33	184	47	133	107	129	198	42	410	525	83. 2	57. 8	44. 7	7. 7
LSD (0.05%)			6	12	6	19	7	16	12	15	12	8	22	30	0. 3	2. 9	0. 3	1. 4
CV (%)			12. 6	12. 5	11. 2	6. 9	9. 3	7. 1	6. 4	7. 1	3. 4	10. 9	3. 1	4. 1	1. 8	3. 1	3. 3	10. 8

Area harvest = 1 row x 40 ft/variety for each replication.