WEED CONTROL IN POTATO WITH SONALAN® HFP (ETHALFLURALIN) HERBICIDE TANK-MIXES

Joel Felix and Joey Ishida, Malheur Experiment Station, Oregon State University, Ontario, OR

Introduction

Weed control in potato is essential in order to avoid competition that could reduce yield and quality of potatoes. If not well controlled, weeds could also impede harvest operations and could possibly serve as alternative hosts for other pests. Two- or three-way herbicide tank-mixtures are often needed to expand the weed control spectrum and to provide season-long weed control. Thus, it is important to evaluate new herbicides on the market for suitability to manage weeds in potato production fields in the Treasure Valley of eastern Oregon and southwestern Idaho. Sonalan® (ethalfluralin) belongs to WSSA/HRAC group 3 herbicides that inhibit microtubule assembly in susceptible plants, resulting in seedling death. Sonalan was recently registered for weed control in potato in various states including Oregon and Idaho. The objective of this experiment was to evaluate the effectiveness of Sonalan to control weeds in potato when applied in tank-mixtures with other herbicides.

Materials and Methods

A field experiment was conducted at the Malheur Experiment Station, Ontario, Oregon, in 2020 on an Owyhee silt loam soil previously planted to wheat. Based on the soil analysis during fall 2019, fertilizer was applied to supply 50 lb/acre nitrogen (N), 50 lb /acre phosphorus, 11 lb/acre manganese, 3 lb/acre boron, and 150 lb/acre potash before fall beds were formed. Thereafter, the area was fumigated using Telone® at 20 gal/acre and beds formed on 36-inch spacing. In spring 2020, fertilizer was applied to supply 100 lb N/acre and Admire® at 7 oz/acre (imidacloprid 0.25 lb ai/acre) was injected at 6-inch depth in each bed.

'Ranger Russet' potato tubers were cut by hand into 2-oz seed pieces, treated with Maxim® MZ (fludioxonil, mancozeb) dust, stored to suberize, and planted on April 10, 2020. Potato planting was accomplished using a two-row assist-feed planter with 9-inch seed spacing in 36-inch spaced beds. A Lilliston Rolling Cultivator was used on April 27 to reshape potato beds and kill all emerged weeds. Herbicide treatments were applied on April 29 using a CO_2-pressurized backpack sprayer fitted with a boom equipped with six EVS8002 flat-fan nozzles to provide a spray volume of 20 gal/acre. Herbicides were immediately incorporated into the soil using sprinkler irrigation that lasted 7 hours to provide about 0.5 inch of water.

The experiment followed a randomized complete-block design with eight treatments (including an untreated control) and four replicates. Each plot was 9 ft wide (3 beds) and 30 ft long. Herbicide treatments including an untreated control are indicated in Tables 1–3.

Irrigation scheduling was based on soil water tension using six granular matrix sensors (GMS,

Watermark soil moisture sensors model 200SS, Irrometer Co., Riverside, CA) placed at 8-inch depth. Irrigation was turned on manually when soil water tension was at 50 to 60 cb. The study was sprinkler irrigated 16 times from April 29 to September 2, 2020, with each event delivering about 1.0 inch of water.

Potato plants were sprayed aerially with fungicide and insecticides as recommended for local production practices.

Plots were evaluated subjectively for weed control on May 18, June 1, and September 8, 2020, based on a scale of 0% (zero control) to 100% (completely weed free). The potato vines were flailed on September 15, 2020. Potatoes were harvested from the middle row of each plot on September 28, 2020. All tubers from each plot were placed into burlap sacks and then placed in a barn where they were kept under tarps until they were graded. Tubers were graded by market class using USDA standards (U.S. No. 1 and U.S. No. 2) and weight (<4 oz, 4–6 oz, 6–12 oz, and >12 oz). Tubers were graded as U.S. No. 2 if any of the following conditions occurred: growth cracks, bottleneck shape, abnormally curved shape, or two or more knobs. Marketable tubers are U.S. No. 1 and U.S. No. 2 larger than 4 oz.

Data were subjected to analysis of variance using PROC GLM in SAS, and means were compared using Fisher's protected least significant difference procedure at $P \leq 0.05$.

Results and Conclusions

Evaluations on May 18 and June 1 indicated complete control for common lambsquarters and redroot pigweed across herbicide treatments (Table 1). Control for hairy nightshade on the respective dates ranged from 40 to 96% and 73 to 96%. Assessment for row closure on June 22 indicated no difference among herbicide treatments.

Late-season evaluations on September 8 indicated a sustained level of weed control, with complete control for common lambsquarters and redroot pigweed, 78 to 96% control for hairy nightshade, and 95 to 98% for barnyardgrass (Table 2).

The cull potato yield was negligible at 3.5 cwt/acre or less across herbicide treatments (Table 3). Yield for unmarketable tubers (<4 oz each) ranged from 63.6 to 74.1 cwt/acre across herbicide treatments compared to 116 cwt/acre for the untreated control. Similarly, the marketable yield was highest and similar across herbicide treatments (511.4 to 574.5 cwt/acre) and low (111 cwt/acre) for the untreated control.

These results indicated that herbicide tank-mixes that include Sonalan provide an industry level of weed control in potato and will contribute in efforts to manage weeds in production fields.

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Table 1. Early and midseason weed control in potato with Sonalan® tank-mixtures, Malheur Experiment Station, Oregon State University, Ontario, OR, 2020.

Treatment[a]	Product rate	Weed control (5/18/2020)[b] Common lambsquarters	Hairy nightshade	Redroot pigweed	Weed control (6/1/2020)[b] Common lambsquarters	Hairy nightshade	Redroot pigweed	6/22/2020 row closure
	units/acre	---------- % ----------			---------- % ----------			
Untreated[c]		0	0	0	0	0	0	0
Sonalan HFP TriCor DF	2 pt 0.67 lb	100 a	58 bc	100 a	100 a	73 a	100 a	95 a
Sonalan HFP Boundary	2 pt 2.7 pt	100 a	88 ab	100 a	100 a	89 a	100 a	95 a
Sonalan HFP Outlook TriCor DF	2 pt 1 pt 0.67 lb	100 a	96 a	100 a	100 a	96 a	100 a	93 a
Sonalan HFP Eptam 7E TriCor DF	2 pt 5.0 pt 0.67 lb	100 a	87 ab	100 a	100 a	96 a	100 a	97 a
Prowl H_2O TriCor DF	2.1 pt 0.67 lb	100 a	40 c	100 a	100 a	81 a	100 a	95 a
LSD (P = 0.05)[d]		NS	36	NS	NS	NS	NS	NS
CV		0.0	31.46	0.0	0.0	15.69	0.0	3.45
Treatment Prob (F)		1.00	0.0235	1.00	1.00	0.1309	1.00	0.4126

[a]Treatments were applied pre-emergence on April 29, 2020. Sonalan HFP 2 pt/acre = ethalfluralin 0.75 lb ai/acre; TriCor DF 0.67 lb/acre = metribuzin 0.5 lb ai/acre; Boundary 2.7 pt/acre = S-metolachlor 1.78 lb ai/acre + metribuzin 0.423 lb ai/acre; Outlook 1 pt/acre = dimethenamid-P 0.75 lb ai/acre; Prowl H_2O 2.1 pt/acre = pendimethalin 1 lb ai/acre.
[b]Means within a column followed by same letter do not significantly differ (P = 0.05, LSD).
[c]Untreated control not included in statistical analysis.
[d]NS = No significant difference.

Table 2. Late-season weed control in potato with Sonalan® tank-mixtures, Malheur Experiment Station, Oregon State University, Ontario, OR, 2020.

		Weed control (9/8/2020)[b]			
Treatment[a]	Product rate	Common lambsquarters	Hairy nightshade	Redroot pigweed	Barnyardgrass
	units/acre	%			
Untreated[c]		0	0	0	0
Sonalan HFP TriCor DF	2 pt 0.67 lb	100 a	78 a	100 a	95 a
Sonalan HFP Boundary	2 pt 2.7 pt	100 a	88 a	100 a	98 a
Sonalan HFP Outlook TriCor DF	2 pt 1 pt 0.67 lb	100 a	95 a	100 a	95 a
Sonalan HFP Eptam 7E TriCor DF	2 pt 5.0 pt 0.67 lb	100 a	96 a	100 a	97 a
Prowl H_2O TriCor DF	2.1 pt 0.67 lb	100 a	79 a	99 a	95 a
LSD (P = 0.05)[d]		NS	NS	NS	NS
CV		0.45	15.9	1.12	5.28
Treatment Prob (F)		0.4449	0.2353	0.4449	0.8561

[a]Treatments were applied pre-emergence on April 29, 2020. Sonalan HFP 2 pt/acre = ethalfluralin 0.75 lb ai/acre; TriCor DF 0.67 lb/acre = metribuzin 0.5 lb ai/acre; Boundary 2.7 pt/acre = S-metolachlor 1.78 lb ai/acre + metribuzin 0.423 lb ai/acre; Outlook 1 pt/acre = dimethenamid-P 0.75 lb ai/acre; Prowl H_2O 2.1 pt/acre = pendimethalin 1 lb ai/acre.
[b]Means within a column followed by same letter do not significantly differ (P = 0.05, LSD).
[c]Untreated control not included in statistical analysis.
[d]NS = No significant difference.

Table 3. Yield in response to weed control in potato with Sonalan® HFP (ethalfluralin), Malheur Experiment Station, Ontario, OR, 2020.

Treatment[a]	Product rate	Cull	US No. 2	<4 oz	U.S. No. 1[b] 4-6 oz	6-12 oz	>12 oz	Total	Marketable[c]	Total yield
	units/acre	cwt/acre								
Untreated		0.0 a	3.0 d	116.0 a	64.9 c	32.7 c	10.3 d	108.0 c	111.0 c	227.0 b
Sonalan HFP TriCor DF	2 pt 0.67 lb	3.0 a	14.6 cd	74.1 b	131.6 a	315.1 a	57.7 c	504.4 ab	519.0 b	596.1 a
Sonalan HFP Boundary	2 pt 2.7 pt	3.5 a	46.2 a	68.9 b	89.5 bc	264.8 b	117.4 a	471.7 b	517.9 b	590.3 a
Sonalan HFP Outlook TriCor DF	2 pt 1 pt 0.67 lb	3.1 a	39.2 ab	71.3 b	108.0 ab	304.0 a	72.0 bc	484.1 b	523.3 ab	597.8 a
Sonalan HFP Eptam 7E TriCor DF	2 pt 5.0 pt 0.67 lb	0.0 a	29.2 abc	63.6 b	108.9 ab	329.9 a	106.5 ab	545.3 a	574.5 a	638.1 a
Prowl H_2O TriCor DF	2.1 pt 0.67 lb	0.8 a	22.5 bcd	70.0 b	121.4 ab	295.7 ab	71.8 bc	488.9 b	511.4 b	582.2 a
LSD (P = 0.05)[d]		NS	20.1	33.9	35	36.7	43.4	49.5	55.4	66.7
CV		188.48	51.65	29.16	22.33	9.48	39.66	7.57	8.0	8.22
Treatment Prob (F)		0.4459	0.0038	0.0488	0.0136	0.0001	0.0015	0.0001	0.0001	0.0001

[a]Treatments were applied pre-emergence on April 29, 2020. Sonalan HFP 2 pt/acre = ethalfluralin 0.75 lb ai/acre; TriCor DF 0.67 lb/acre = metribuzin 0.5 lb ai/acre; Boundary 2.7 pt/acre = S-metolachlor 1.78 lb ai/acre + metribuzin 0.423 lb ai/acre; Outlook 1 pt/acre = dimethenamid-P 0.75 lb ai/acre; Prowl H_2O 2.1 pt/acre = pendimethalin 1 lb ai/acre.
[b]Means within a column followed by same letter do not significantly differ (P = 0.05, LSD).
[c]Marketable tubers are U.S. No. 1 and U.S. No.2 larger than 4 oz.
[d]NS = no significant difference.