

Research Proposal Submitted to the
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Title: Improving Herbicide Options in Beets

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Previous work and justification

Red beet production is moving toward narrow row/bed culture because of the potential to significantly reduce costs and improve economic returns. This has not improved weed control efforts, as cultivation is more difficult. Control with herbicides can run between \$50- \$120/A with less than satisfactory results.

Frontier is currently under consideration for registration, but registration has been delayed because of crop safety concerns, particularly with postemergence applications. Postemergence use patterns for Frontier are preferred by the registrant because of injury on light soils when Frontier is applied preemergence. The postemergence strategy is valid in sugar beets because Frontier extends the weed control of traditional practices in a long season crop. In short-season table beets, preemergence applications would be best. Split applications could be used to reduce early season injury but provide adequate weed control. However, in tests in 2001, this strategy did not work, as injury to beets was as much with the split application as with the single post plant application. Several other herbicides were tested but with unsatisfactory results.

The objective of this research was to again test the potential of using Frontier in a split application for weed control in beets. This experiment also included the treatments of a minor crop registration project for metolachlor on table beets.

Methods

Detroit Dark Red Table beets were planted on May 1 on a 12-inch row spacing with 4 rows per bed into a silt loam soil. The experimental design was a randomized complete block with four replications. Fertilizer (350 lbs /A, NPK 12-29-10) was banded next to each row at planting. Herbicides were applied with a 3 nozzle boom set at 20" between nozzles and held 18" above the soil surface. Herbicides were applied with 8002 or 8003 nozzles with 20 GPA H₂O. PES herbicides were applied 1 or 2 days after planting and followed by 1 hour of irrigation equaling 1/3". EPOST herbicides were applied to beets with 2 leaves emerged and Stinger herbicide was

applied to 6-leaf beets. Crop emergence was counted from 3 ft of row of each plot. Plant growth and phytotoxicity were evaluated 1, 2 and 4 weeks after the EPOST applications. Beets were harvested from two 8.2 ft rows in each plot and graded by size. Weed control was estimated at harvest.

Results

Dual Magnum applied PES at 0.66 lbs ai/A or more significantly reduced weed competition and improved yield compared to the unweeded check. EPOST applications of Dual Magnum at all rates injured beets and did not sufficiently control weeds, thus reducing yield compared to the PES applications. The exception was Dual Magnum applied EPOST over Pyramin (Tr. 14), which greatly improved nightshade control.

The split application of Outlook slightly reduced crop injury but had poor weed control compared to Outlook applied in a single application. Outlook applied at 0.54 lbs ai/A had the greatest yield and controlled weeds better than any of the Dual Magnum treatments. Outlook applied after the first irrigation (Tr.18) had as much or more injury than when applied immediately after planting, and did not improve weed control.

Stinger did not adequately control weeds. Glyphosate wick wipes improved pigweed control and yield slightly.

Table 1. Table beet crop tolerance to herbicides at 1, 2, and 4 weeks after the EPOST treatments were applied, Vegetable Research Farm, Corvallis, OR, 2002.

Treatment	Timing	Date	Rate	No.	Emergence obs.	Crop growth							
						Lb ai/A	Seedlings/ 3 ft of row	May 30 ^a		June 5 ^b		June 21 ^c	
								GR ^d	P ^e	GR	P	GR	P
								%	1-10	%	1-10	%	1-10
1	Untreated	-	-	4	32	0	0	3	0	0	0.0		
2	Dual Magnum	PES	2-May	0.33	4	31	5	0.0	6	0.5	5	5.0	
3	Dual Magnum	PES	2-May	0.66	4	30	6	0	8	0.3	10	2.5	
4	Dual Magnum	PES	2-May	1.32	4	34	5	0.0	5	0.5	5	0.0	
5	Dual Magnum	EPOST	24-May	0.33	4	31	0	0.0	0	0.0	3	0.0	
6	Dual Magnum	EPOST	24-May	0.66	4	34	5	0.5	3	0.5	5	0.0	
7	Dual Magnum	EPOST	24-May	1.32	4	29	48	4.8	40	2.8	28	0.0	
8	Pyramin (standard)	PES	3-May	3.50	4	39	0	0.0	1	0.0	3	0.0	
9	Outlook	PES	2-May	0.18	4	35	3	0.3	3	0.0	5	0.0	
	Outlook	EPOST		0.36									
10	Outlook	PES	2-May	0.36	4	27	43	3.5	43	1.3	23	0.0	
	Outlook	EPOST	24-May	0.72									
11	Outlook	PES	2-May	0.54	4	26	9	0.0	13	0.0	13	0.0	
12	Outlook	PES	2-May	0.36	4	29	8	0.0	5	0.3	0	0.0	
13	Pyramin Glyphosate	PES Rope wicked	3-May 12-Jul	3.5	4	35	3	0.0	4	0.3	3	0.0	
14	Pyramin Dual Magnum	PES EPOST	3-May 24-May	3.50 0.33	4	33	4	0.0	5	0.0	10	7.5	
15	Pyramin	PES	3-May	3.50	4	30	0	0.0	5	0.0	3	0.0	
16	Stinger	POST	6-Jun	0.094	4	32	0	0.0	0	0.0	15	2.5	
17	Stinger	POST	6-Jun	0.188	4	31	0	0.3	0	0.3	20	0.0	
18	Outlook	Post IRR ^f	8-May	0.36	4	27	13	0.3	11	0.3	5	2.5	
FPLSD (0.05)						ns	8	0.5	8	0.6	14	ns	

^a 1 week after EPOST.^b 2 weeks after EPOST.^c 3 weeks after EPOST.^d GR = Growth reduction estimate of biomass.^e P= Phytotoxicity rating, 0=no herbicide injury symptoms, 10=plant death.^f Outlook applied after 1st irrigation.

Table 2. Table beet yield and weed control, Corvallis, OR 2002.

Treatment	Timing	Date	Rate	No. obs.	Beet root yield				Weed control at harvest				
					Tons		Grade (root diameter)		Hairy night-hade	Powell amaranth	Speedwell	Total	
					1-1.63"	1.63-2.63"	2.63-3.5"						%
1	Untreated check	-	-	-	4	7.5	43	14	58	0	0	0	0
2	Dual Magnum	PES	2-May	0.33	4	9.8	29	6	72	23	95	99	28
3	Dual Magnum	PES	2-May	0.66	4	15.8	19	3	78	53	98	100	58
4	Dual Magnum	PES	2-May	1.32	4	15.5	17	6	76	68	99	100	64
5	Dual Magnum	EPOST	24-May	0.33	4	11.5	38	24	62	18	70	99	20
6	Dual Magnum	EPOST	24-May	0.66	4	10.6	28	3	72	3	99	100	18
7	Dual Magnum	EPOST	24-May	1.32	4	9.1	29	13	69	5	71	98	15
8	Pyramin (standard)	PES	3-May	3.50	4	14.1	33	10	67	40	85	98	41
9	Outlook Outlook	PES EPOST	2-May	0.18 0.36	4	12.0	27	6	73	20	96	100	23
10	Outlook Outlook	PES EPOST	2-May 24-May	0.36 0.72	4	14.0	26	9	69	70	99	100	73
11	Outlook	PES	2-May	0.54	4	17.6	15	1	77	80	100	100	79
12	Outlook	PES	2-May	0.36	4	15.6	20	8	80	54	100	100	54
13	Pyramin Glyphosate	PES Rope wicked	3-May 12-Jul	3.5	4	16.1	23	6	74	68	80	90	65
14	Pyramin Dual Magnum	PES EPOST	3-May 24-May	3.50 0.33	4	14.9	24	2	76	96	100	100	96
15	Pyramin	PES	3-May	3.50	4	15.2	28	9	69	65	100	93	65
16	Stinger	POST	6-Jun	0.094	4	11.4	35	8	65	66	88	20	43
17	Stinger	POST	6-Jun	0.188	4	9.6	36	24	65	94	70	0	30
18	Outlook	Post IRR	8-May	0.36	4	16.0	23	14	75	48	100	100	50
19	Glyphosate	Rope wicked	12-Jul			8.4	43	11	57	18	45	0	15
FPLSD (0.05)						4.6	15	ns	Ns	31	34	14	28

Table 3. Schedule and herbicide application data for beet trial, Corvallis, 2002**Site characteristics**

Plot size/exp. design	3 'x 30', 4 12" rows per bed	RCBD 4 reps
Proceeding crop	Snap beans, barley winter cover crop	

Herbicide application data

Date	May 2	May 3	May 8	May 24	June 6	July 12
Crop stage						
Herbicide/treatment	PES	Pyramin	Outlook	Dual Magnum, Outlook	Stinger	Roundup
Application timing	PES	PES	PES delayed	POST 2 leaf emerged	POST 6 leaf, 6 in tall	12 inch tall
Start/end time	7:30 -8:30	8 -8:30	7:15-7:30	6:45-7:30	6:30-6:45	4:00 PM
Air temp/soil temp (2")/surface	51/52/53	54/54/54	52/44/45	60/55/55	50/54/54	
Rel humidity	-	-	-	72%	92%	
Wind direction/velocity	W 0-1	E 0-1	0	0	0	
Cloud cover	100	50	0	Haze	50% haze	
Soil moisture	Dry	Dry	Very dry at surface	Dry	Damp	
Plant moisture	-	-	-	Dry	Very wet	
Sprayer/PSI	BP CO ₂ 40 PSI	BP CO ₂ 40 PSI	BP CO ₂ 40 PSI	BP CO ₂ 40 PSI	BP CO ₂ 30 PSI	Wick-wipe
Mix size	2.1 L/8 plots	2.1 L/8 plots	2.1 L/8 plots	2.1 L/8 plots	2.1 L/8 plots	33% 2 mph
Gallons H ₂ O/acre	20	20	20	20	20	
Nozzle type	8003	8002	8002	8002	8002	
Nozzle spacing and height	3 20x18	3 20x18	3 20x18	3 20x18	3 20x18	
Soil inc. method/implement		I hr irrigation		Irrigated on May 26, 1 hr	Irrigated 3 hr on June 3	
Rainfall		Rain on May 5		Rain on May 27		

Table 4. Journal of activities for snap bean trial, 2002.

Date	Activity	Irrigation	Rainfall
		(1hr approx. 1/3in.)	In.
01-May-02	Planted		
02-May-02	PES herbicides applied		
03-May-02		1 hr	
05-May-02			0.25
08-May-02	PES delayed Outlook applied		
13-May-02			0.1
15-May-02		1.5 hrs	
16-May-02			0.2
19-May-02			0.3
22-May-02			0.35
24-May-02	EPOST Dual Magnum and Outlook applied		
26-May-02		1 hr	
27-May-02			0.25
03-Jun-02		3 hr	
06-Jun-02	Clopyralid		
11-Jun-02		4 hrs	
17-Jun-02			0.29
20-Jun	Kocide to control Cercospera leaf spot, 3 lbs product/A		
24-Jun-02		4 hrs	
08-Jul-02		4 hrs	
12-Jul-02	Wick wipe glyphosate		
15-Jul-02		5 hrs	
22-Jul-02		5 hrs	
27-Jul-02		4 hrs	
2-Aug-02	Harvest		
3-Aug-02	Final weed evaluation		