

1. OPVC REPORT COVER PAGE

OPVC Project Number:

Project title: Improving the Utility of Upbeet (Triflulfuron) Herbicide in Table Beets

PI: Ed Peachey
OSU Department of Horticulture
541-740-6712
Ed.Peachey@oregonstate.edu
4017 Ag & Life Sciences Bldg.
Corvallis, OR 97331

Total Project Request

Year 3: \$3,426

2. EXECUTIVE SUMMARY

Despite the availability of several herbicides in table beets, weed control is still problematic. UpBeet (triflulfuron; DuPont) was recently labeled, but the labeled timings and rate are inadequate for optimum weed control, particularly for lambsquarters. An experiment was placed at the OSU Vegetable Research Farm to determine the tolerance of 2-leaf table beets to UpBeet when applied at double the currently labeled rate of 0.5 oz/A, and to beets at the cotyledon stage at 0.5 oz/A. Upbeet applied at these timings and rates significantly improved lambsquarters control and ultimately provided the largest yield. UpBeet injury to table beets at these rates and timings was insignificant. The UpBeet label could be expanded to encompass application of 0.5 oz/A at the cotyledon stage, or to increase the rate to 1 oz/A when applying to table beets at the 2-leaf stage.

3. FULL REPORT

BACKGROUND

Despite the past availability of several herbicides for beets, weed competition continues to trouble table beet growers. We have tested combinations of s-metolachlor (Dual Magnum) and ethofumesate (Nortron) over the past 6 years and developed use pattern for this tankmix for growers struggling to manage hairy nightshade, a particularly troublesome weed in beets. Our efforts also produced a recent registration for Upbeet herbicide, which has already improved weed control options in beets but only when applied to very small weeds. The main limitation of Upbeet is the rate allowed. Currently that rate is set at ½ oz per acre, which is only effective on very small weeds. Upbeet is labeled at 1 oz/A in sugar beets, and this provides much more flexibility of use, particularly with late emerging weeds that have escaped PRE herbicides or cultivation. The registrant is willing to consider a rate increase but enhanced efficacy and table beet safety must be demonstrated and ensured before a label change is possible.

OBJECTIVE

Determine tolerance of table beets to Upbeet herbicide at 1 oz/A and the flexibility gained (i.e. timing and weed spectrum) with the higher rate.

SIGNIFICANT FINDINGS

- Upbeet applied at 0.5 oz/A to table beets at the cotyledon stage and at 1.0 oz/A to 2-leaf beets significantly improved lambsquarters control and ultimately provided the largest yield.
- UpBeet injury to table beets was insignificant at the above- mentioned rates and timings.
- The UpBeet label could be expanded to encompass application at the cotyledon stage, or increase the rate applied at the 2-leaf stage.

METHODS

The experiment was placed at the OSU Vegetable Research Farm. Plots were 10 ft wide by 25 ft long. Treatments were applied in a strip-plot arrangement with 4 replications. The full set of UpBeet treatments was applied to plots without any PRE herbicide and to another full set of plots with Dual Magnum (2/3 pt/A) and Nortron (16 oz/A) applied PRE. Upbeet was applied at ½, 1, and 2 oz/A at the cotyledon, 2-leaf, and 4 lf stage of growth for beets. Beets were harvested from 5 ft of row and graded. The main weeds present in the plots were pigweed, hairy nightshade, and lambsquarters.

RESULTS AND DISCUSSION

Crop injury increased slightly as Upbeet rate increased within each timing (Table 1). Crop injury ratings were greatest when UpBeet was applied at the cotyledon stage. The largest increase in crop injury occurred at the cotyledon application timing and when applied over plots treated with Dual Magnum and Nortron PRE.

Pigweed and lambsquarters control ratings shortly after the 2-leaf application doubled with the application of 2 oz/A rather than 0.5 oz/A UpBeet (Table 1). Hairy nightshade was controlled by all rates of UpBeet. Overall (composite) weed control dissipated quickly in the plots without PRE herbicides, and was so poor at the end of the season that we chose not to harvest the beets. UpBeet applied at the cotyledon stage made a significant improvement in weed control through harvest, particularly lambsquarters, and the improved weed control was not dependent on rate.

Table beet yield averaged 33% more with UpBeet applied at 0.5 oz/A at the cotyledon stage and 1 oz/A applied to 2-leaf beets compared to plots with only PRE herbicide applied (Fig. 1). The effect was related to improved control of lambsquarters, the predominate weed at this site (Fig 2).

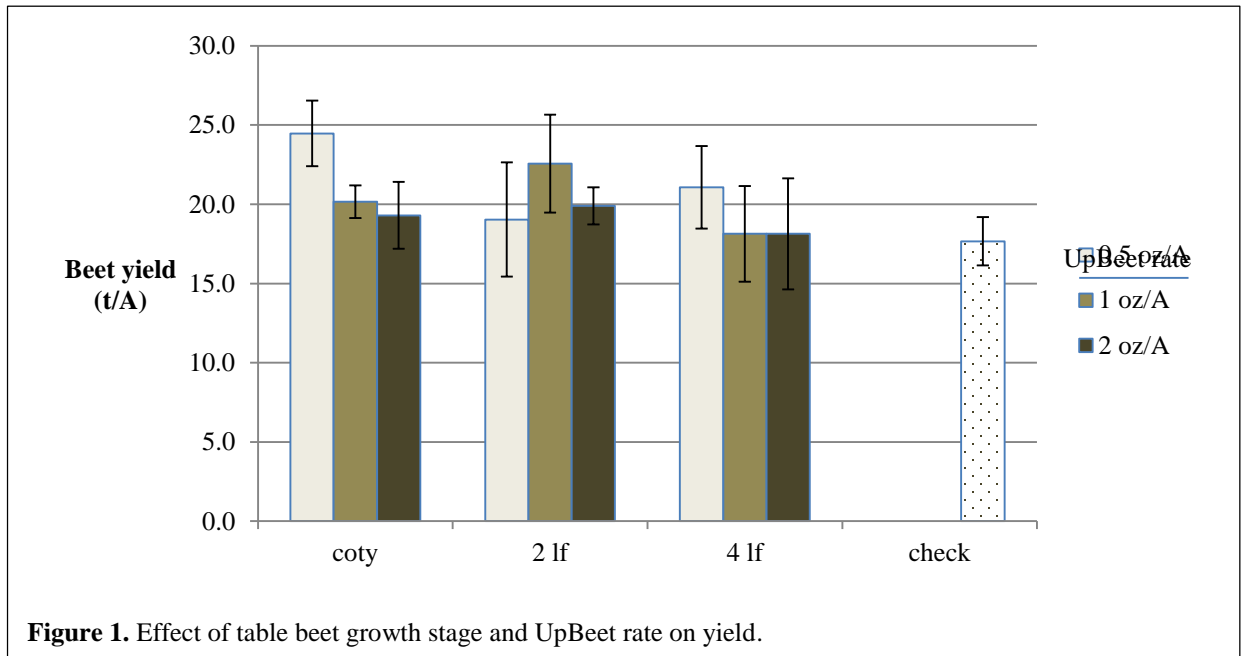


Figure 1. Effect of table beet growth stage and UpBeet rate on yield.



Figure 2. Photos demonstrating lambsquarters control with Upbeet applied at ½ oz/A to beets at the cotyledon stage (A, top) and the 2-leaf stage (B). Dual Magnum and Norton were applied at planting.

Table 1. Effect of Upbeet herbicide on weed control in table beets.

	PRE herbicide	Upbeet timing	Upbeet rate	Phyto rating	Stunting of beets		Weed control rating							
					20-Jun ^a	20-Jun ^a	June 20 ^a				July 22			
							Pigweed	Hairy nightshade	Lambs-quarters	Composite rating	Pigweed	Hairy nightshade	Lambs-quarters	Composite rating
							----- % -----							
			<i>oz/A</i>	<i>0-10</i>	<i>%</i>									
1	-	-	-	0.3	6	0	0	0	0	0	0	0	0	
2	-	coty	0.5	0.8	13	48	84	38	76	23	71	46	19	
3	-	coty	1	1.0	23	78	83	48	78	20	78	45	15	
4	-	coty	2	1.8	30	84	91	69	86	24	70	44	28	
5	-	2 lf	0.5	1.5	13	10	38	25	33	5	58	25	10	
6	-	2 lf	1	1.8	11	10	33	15	35	30	71	23	28	
7	-	2 lf	2	2.3	18	23	48	28	45	43	79	61	48	
8	-	4 lf	0.5	-	-	0	0	0	0	20	5	23	13	
9	-	4 lf	1	-	-	0	0	0	0	5	38	53	33	
10		4 lf	2	-	-	0	0	0	0	14	50	45	13	
	FPLSD (0.05)			1	8	18	16	36	14	28	25	ns	24	
11	DMag+Nort	-	-	0.3	13	100	85	56	84	99	21	81	58	
12	DMag+Nort	coty	0.5	1.0	18	100	98	91	97	100	100	91	91	
13	DMag+Nort	coty	1	1.3	23	100	97	93	97	100	98	93	93	
14	DMag+Nort	coty	2	2.0	39	100	99	95	99	100	100	95	95	
15	DMag+Nort	2 lf	0.5	1.8	20	98	88	69	86	98	95	63	63	
16	DMag+Nort	2 lf	1	1.3	15	98	91	85	91	100	100	66	66	
17	DMag+Nort	2 lf	2	1.8	20	100	91	80	90	100	100	65	70	
18	DMag+Nort	4 lf	0.5	-	-	100	84	54	81	100	94	66	66	
19	DMag+Nort	4 lf	1	-	-	100	77	36	76	99	98	59	58	
20	DMag+Nort	4 lf	2	-	-	99	86	43	81	99	100	61	61	
	FPLSD (0.05)			1.1	11	ns	12	32	11	ns	20	29	28	

^a rating made 3 days after 2-leaf application, and 3 days before 4-leaf application.

Table 2. Effect of herbicide timing and Upbeet rate on weed control and crop yield. All plots were treated with Dual Magnum and Nortron after planting and weed control ratings made by comparing against plots without any herbicide applied. N=3 (data from block 1 were excluded because weed density was much greater in this block and skewed the yield data).

	Timing	Upbeet rate	Weed control at harvest				Root no	Root wt	Avg. root	Grade			
			Pigweed	Hairy nightshade	Lambsquarters	Composite rating				% 1	% 2	% 3	% >t3
		<i>oz/A</i>	<i>----- % control -----</i>				<i>no/5 ft of row</i>	<i>t/A</i>	<i>g</i>	<i>----- % -----</i>			
1	-	-	99	28	92	70	32	17.7	127	11	50	33	4
2	coty	0.5	100	100	93	93	37	24.5	161	4	42	46	8
3	coty	1	100	97	93	93	39	20.2	119	8	57	33	0
4	coty	2	100	100	95	95	33	19.3	141	8	46	46	0
5	2 lf	0.5	98	97	83	83	36	19.0	131	9	45	45	0
6	2 lf	1	100	100	88	88	32	22.6	190	6	46	33	16
7	2 lf	2	100	100	87	87	35	19.9	131	7	45	47	0
8	4 lf	0.5	100	93	88	88	38	21.1	127	9	49	41	0
9	4 lf	1	99	97	78	77	40	18.1	103	7	62	30	0
10	4 lf	2	98	100	82	82	41	18.1	101	13	49	34	3
FPLSD (0.05)			ns	26	11	11	ns	3.7	ns	ns	ns	ns	ns

Table 3. Herbicide application data.

	1	2	3	4	5
Date	June 3, 2014	Thursday, June 12, 2014	Tuesday, June 17, 2014	Monday, June 23, 2014	Tuesday, June 24, 2014
Crop stage	planted 6-2	Coty	2-leaf	4-lf	4-lf
Weeds and growth stage					
Pigweed		Coty to 2 lf	Coty to 6 lf	Coty to 8lf < 5 in	Coty to 8lf < 5 in
Nightshade		Coty to 2 lf	Coty to 6 lf	Coty to 8 lf < 5 in	Coty to 8 lf < 5 in
Lambsquarters		Coty to 2 lf	Coty to 6 lf	Coty to 10 lf < 5 in	Coty to 10 lf < 5 in
Herbicide/treatment	DM + Nortron	Upbeet coty	Upbeet 2-leaf	Upbeet 4-leaf	Stinger 4 lf 8 oz
Application timing	PES	Coty	2-leaf	2-leaf	4 lf
Start/end time	6:30-7AM	7:00-7:45	1:15-1:45 PM	6:15 to 7 AM	9=9:15 MA
Air temp/soil temp (2")/surface	59/58/58	56//	70/64/69	61/63/61	71/68/70
Rel humidity	70%	70%	47%	72%	55%
Wind direction/velocity	0	SSW 2-3 max 4 occasional gusts	SW 0-0.3	0	S 0-3
Cloud cover	100	100%	95%	0%	50%
Soil moisture	Irrigated 6-1	Dry	Dry	Dry	Damp, just cultivated
Plant moisture	-	Dry	Dry	Dry	Damp from dew
Sprayer/PSI	BP 25	BP CO2/25 PSI	BP CO2/25 PSI	BP CO2/25 PSI	BP CO2/25 PSI
Mix size	3 gal	6000 mls	2100/2 plots	2100/2 plots	2100/2 plots
Gallons H2O/acre	20	20	20	20	20
Nozzle type	5-XR8003	5-XR8003	5-XR8003	5-XR8003	4-XR8003
Nozzle spacing and height	20/24	20/24 above canopy	20/24 above canopy	20/24 above canopy	20/24 above canopy
Soil inc. method/implement	Irrigation on 6-4 1/2 in wind from N 1 to 5 mph, mostly ok	-			

4. BUDGET DETAILS

Salary:		FTE	Amount
	Faculty (Peachey)	0.02	1300
	Other Labor (summer help, 9.50/hr)		1000
	OPE for all categories		626
Travel:			
	Domestic (in state)		100
	Domestic (out of state)		
Field rental			300
Supplies:			100
Equipment:			0
Total			3426