

Research Report to the
Agricultural Research Foundation
and the
Oregon Processed Vegetable Commission
2005

Title: Weed Control in Table Beets

Project leader

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SUMMARY OF RESEARCH ON TABLE BEETS (2004-05)

2005, Dayton

- Dual Magnum applied to the soil at 0.64 lbs ai/A after table beets were planted (PPS) reduced beet growth slightly when used in combination with Roneet or Pyramin (Tr. 1-10, Table 1).
- Table beet yield was substantially improved when Dual Magnum PPS was applied after Roneet PPI or tank mixed with Pyramin (Table 2).
- Dual Magnum PPS treatments (Tr. 6 and 8) yielded more than Pyramin, Roneet, or Pyramin + Roneet treatments (Table 2).
- The largest yield was Roneet PPI + Pyramin PPS + Dual Magnum PPS (23 t/A), a 6 t/A increase over the conventional treatment of Roneet and Pyramin. Increased yield was directly related to improved weed control (Table 2).
- Outlook POST1 applied after Dual Magnum PPS caused a significant yield decrease (Table 2).

2005, Corvallis

- Dual Magnum applied to table beets at 0.64 lbs ai/A reduced beet growth slightly early in the season (Table 4).
- Table beet yield increased with increasing rates of Dual Magnum because of reduced competition from smartweed (Table 4).

2004, Jefferson

- Dual Magnum applied post-plant surface (PPS) with Roneet or Roneet + Pyramin significantly improved weed control compared to either Roneet or Pyramin applied singly.
- Dual Magnum PPS applied alone did not provide adequate weed control, even though crop yield was significantly greater in Dual Magnum treatments (13.9 t/A) than the unweeded check (5.9 t/A).

- Dual Magnum PPS at 0.32, 0.64, 0.96, and 1.32 lbs ai/A (applied with Pyramin PPS) caused 4, 13, 18 and 15 % growth reduction, respectively, at 1 month after planting, but yield in all of these treatments was greater than or equal to the yield of the weeded check.

2004, Corvallis. Excessive irrigation was applied after planting to mimic wet soil conditions that are often encountered in April and May in Oregon.

- Dual Magnum applied PPS and EPOST had little to no effect on crop yield at this site at anticipated label rates.
- Stunting of beet growth from Dual Magnum PPS was noted at rates of 0.64 lbs ai/A or above through June 11, but only at 0.96 lbs ai/A on June 23.
- Beet yields with Dual Magnum applied PPS at 0.32 to 0.96 lbs ai/A were statistically equivalent to the untreated check (22.4 t/A).
- The application of Dual Magnum at 0.96 lbs ai/A reduced the percentage of beets in the combined size class of 1 and 2 from 80 to 60 %, an indication of fewer but larger beets.

2005 Research Report

Methods

Field experiments were conducted in Dayton, OR and at the OSU Vegetable Research Farm in Corvallis. The soil at Dayton was a silt loam with a pH of 5.2, OM of 5.2% (LOI) and CEC of 14.7 meq g/soil. Roneet was applied on May 31 and incorporated within 10 minutes with a harrow to designated treatments. Beets were planted on 18 inch rows on June 1 and PPS (post-plant surface) treatments applied June 3. Plots were 10 ft wide by 30 feet long. Herbicides were incorporated with irrigation water shortly after planting. POST treatments were applied at the 2-leaf or 4-leaf stage depending on treatment. Beets were pulled on August 20 from a 5 ft section of one of the middle rows in 4-row bed.

At Corvallis, Roneet was incorporated in all plots June 14 and beets planted with a Gaspardo planter. Pyramin was applied PPS to all plots to help reduce weed competition with the crop. Dual Magnum treatments were applied PPS on June 15, then plots irrigated to incorporate the herbicide on June 17. Plots were 30' long and four rows wide with 18" between rows and 2' between the outside rows of each plot. Additional fertilizer (260 lbs 12-29-10) was dribbled on the surface between rows at planting. Beets were harvested on Sept. 1 from 10 ft. of one row in each plot and graded.

Results

Dayton, 2005. Dual Magnum applied to table beets at 0.64 lbs ai/A reduced beet growth slightly when used in combination with Roneet or Pyramin (Tr. 1-10, Table 1). Table beet yield was substantially improved when Dual Magnum was applied after Roneet or tank mixed with Pyramin (Table 2, Figure 1). Dual Magnum treatments (Tr. 6 and 8) yielded more than Pyramin, Roneet, or Pyramin+Roneet treatments. The largest yield was Roneet+Pyramin+Dual Magnum (23 t/A), a 6 t/A increase over the conventional treatment of Roneet and Pyramin. Increased yield was directly related to improved weed control. Outlook applied after Dual Magnum caused a significant yield decrease.

Alternative treatments with Spinaid, Stinger, and Upbeet applied POST after Dual Magnum treatments increased both visual injury symptoms and reduced growth. In most cases, the beets recovered and yielded as well as the check. Exceptions were Dual Magnum (PPS) followed by Outlook (EPOST), which had good weed control (95%) but only yielded 16.9 tons/A.

Corvallis, 2005. Dual Magnum applied to table beets at 0.64 lbs ai/A reduced beet growth slightly early in the season (Table 4). Table beet yield increased with increasing rates of Dual Magnum. Even though Roneet and Pyramin were applied to the plots, smartweed densities were very high. Dual Magnum controlled smartweed at the higher rates, thus yield increased with increasing Dual Magnum rates.

Summary

Weed management is a continual challenge to Oregon table beet growers. Research over the last several years has documented that s-metolachlor (Dual Magnum) will substantially improve weed control and crop yields when applied alone or in concert with other registered herbicides such as Roneet and Pyramin, with the potential to significantly reduce the cost of weed control in table beet production. EPA completed the tolerance assessment for Dual Magnum on root crops and posted a tolerance for s-metolachlor on table beets and other root crops on Aug. 31, 2005. We submitted a request to ODA for a special local needs label on September 21 and anticipate a registration for 2006.

Table 1 cont'd

Herbicide	Timing	Date	Rate	Obs.	June 28 (1 WA POST1)				July 23 (4 WA POST2)					
					Emer- gence	Phyto- toxicity	Stunting	Weed control	Phyto- toxicity	Stunting	Weed control			
					no/3 ft	0-10	%	%	0-10	%	Pig- weed	Lambs- quarters	Avg. weed control	
					lbs ai/A	N	----- % -----							
27	Dual Mag Upbeet COC	PPS POST1	3-Jun 21-Jun	0.64 0.031	4	43	3	23	100	0	13	99	100	99
28	Dual Mag Upbeet COC	PPS POST1	3-Jun 21-Jun	0.64 0.063	4	48	3	30	100	0	6	100	100	100
29	Unweeded				4	41	0	0	0	0	15	0	0	0
30	Weeded				4	40	0	0	0	0	5	100	100	99
FPLSD (0.05)						ns	1	11	13	ns	13	18	27	17

Table 2. Effect of herbicides on weeds and table beet yield, Dayton, OR, 2005.

	Herbicide	Timing	Date	Rate	Rate	Cost of herbicide	Total cost of treatment	Obs. N	Yield (27-Aug)			Weed control at harvest		
									No. roots	Yield	Avg. wt of beets	Pigweed	Lambs-quarters	Avg. weed control
				<i>lbs ai/A</i>		<i>\$/A</i>			<i>No./5 ft</i>	<i>t/A</i>	<i>----- % -----</i>			
1	Roneet	PPI	31-May	4.00 pts	3.0	26	26	4	19	4.8	0.098	8	20	8
2	Roneet	PPI	31-May	4.00 pts	3.0	26	109	4	43	16.9	0.181	53	89	60
	Pyramin	PPS	3-Jun	5.00 lbs	3.3	83								
3	Pyramin	PPS	3-Jun	5.00 lbs	3.3	83	83	4	30	10.0	0.141	38	60	40
4	Roneet	PPI	31-May	4.00 pts	3.0	26	30	4	46	19.5	0.201	93	62	74
	Dual Mag	PPS	3-Jun	0.33 pts	0.3	4								
5	Roneet	PPI	31-May	4.00 pts	3.0	26	35	4	45	21.3	0.217	96	98	94
	Dual Mag	PPS	3-Jun	0.67 pts	0.64	9								
6	Dual Mag	PPS	3-Jun	0.67 pts	0.64	9	9	4	45	18.0	0.192	84	91	74
7	Dual Mag	PPS	3-Jun	0.33 pts	0.3	4	87	4	35	17.5	0.234	83	98	83
	Pyramin	PPS	3-Jun	5.00 lbs	3.3	83								
8	Dual Mag	PPS	3-Jun	0.67 pts	0.64	9	9	4	44	19.8	0.206	95	96	89
9	Dual Mag	PPS	3-Jun	0.67 pts	0.6	9	92	4	43	19.4	0.211	95	96	93
	Pyramin	PPS	3-Jun	5.00 lbs	3.3	83								
10	Roneet	PPI	31-May	4.00 pts	3.0	26	118	4	48	23.0	0.225	94	94	93
	Pyramin	PPS	3-Jun	5.00 lbs	3.3	83								
	Dual Mag	PPS	3-Jun	0.67 pts	0.64	9								
11	Dual Mag	PPS	3-Jun	0.67 pts	0.64	9	123	3	37	19.2	0.253	62	100	86
	Spinaid	POST2	28-Jun	6.00 pts	1.0	114								
12	Dual Mag	PPS	3-Jun	0.67 pts	0.64	9	123	4	36	17.3	0.222	98	100	98
	Spinaid	POST1	21-Jun	3.00 pts	0.5	57								
	Spinaid	POST2	28-Jun	3.00 pts	0.5	57								

Table 2 cont'd

	Herbicide	Timing	Date	Rate	Rate	Cost of herbicide	Total cost of treatment	Obs. N	Yield (27-Aug)			Weed control at harvest		
									No. roots	Yield	Avg. wt of beets	Pigweed	Lambs-quarters	Avg. weed control
				<i>lbs ai/A</i>			<i>\$/A</i>	<i>No./5 ft</i>		<i>t/A</i>				
13	Dual Mag	PPS	3-Jun	0.67 pts	0.64	9		4	43	19.3	0.205	96	100	99
	Spinaid	POST1	21-Jun	2.00 pts	0.33	38								
	Spinaid	POST2	28-Jun	2.00 pts	0.33	38	85							
14	Dual Mag	PPS	3-Jun	0.67 pts	0.64	9		4	54	22.9	0.191	96	98	96
	Outlook	POST1	21-Jun	0.72 pts	0.54	13	22							
	Stinger	POST1	21-Jun	0.500 pts	0.19	30	52							
15	Dual Mag	PPS	3-Jun	0.67 pts	0.64	9		4	42	17.3	0.193	94	100	95
	Dual Mag	POST1	21-Jun	0.33 pts	0.32	4								
	Spinaid	POST1	21-Jun	2.00 pts	0.33	38	51							
16	Dual Mag	PPS	3-Jun	0.67 pts	0.64	9		4	48	20.5	0.198	91	79	81
	Stinger	POST1	21-Jun	0.125 pts	0.05	7.5	16							
17	Dual Mag	PPS	3-Jun	0.67 pts	0.64	9		3	44	22.1	0.233	92	90	90
	Stinger	POST1	21-Jun	0.250 pts	0.09	15	24							
18	Dual Mag	PPS	3-Jun	0.67 pts	0.64	9		4	53	23.9	0.212	93	84	86
	Stinger	POST1	21-Jun	0.500 pts	0.19	30	39							
19	Dual Mag	PPS	3-Jun	0.67 pts	0.64	9		4	39	19.5	0.241	94	99	94
	Spinaid	POST1	21-Jun	2.00 pts	0.33	38								
	Stinger	POST1	21-Jun	0.125 pts	0.05	7.5	54							
20	Dual Mag	PPS	3-Jun	0.67 pts	0.64	9		4	40	16.1	0.183	94	100	95
	Spinaid	POST1	21-Jun	2.00 pts	0.33	38								
	Stinger	POST1	21-Jun	0.250 pts	0.09	15	62							
21	Dual Mag	PPS	3-Jun	0.67 pts	0.64	9		4	39	20.5	0.245	94	95	91
	Spinaid	POST1	21-Jun	2.00 pts	0.33	38								
	Stinger	POST1	21-Jun	0.500 pts	0.19	30	77							

Table 2 cont'd

	Herbicide	Timing	Date	Rate	Rate	Cost of herbicide	Total cost of treatment	Obs. N	Yield (27-Aug)			Weed control at harvest		
									No. roots	Yield	Avg. wt of beets	Pigweed	Lambs-quarters	Avg. weed control
				<i>lbs ai/A</i>			<i>\$/A</i>			<i>No./5 ft</i>	<i>t/A</i>			
22	Dual Mag	PPS	3-Jun	0.67 pts	0.64	9		4	43	18.6	0.199	91	99	92
	Betamix	POST1	21-Jun	2.00 pts	0.33	25								
	Stinger	POST1	21-Jun	0.125 pts	0.047	7.5	41							
23	Dual Mag	PPS	3-Jun	0.67 pts	0.64	9		4	42	16.3	0.180	95	96	95
	Outlook	POST1	21-Jun	0.72 pts	0.54	13	22							
24	Dual Mag	PPS	3-Jun	0.67 pts	0.64	9		4	38	16.9	0.206	99	100	99
	Outlook	POST1	21-Jun	0.72 pts	0.54	13								
	Spinaid	POST1	21-Jun	2.00 pts	0.33	38	60							
25	Dual Mag	PPS	3-Jun	0.67 pts	0.64	9		4	42	20.6	0.227	100	100	99
	Outlook	POST1	21-Jun	0.72 pts	0.54	13								
	Spinaid	POST1	21-Jun	2.00 pts	0.33	38								
	Stinger	POST1	21-Jun	0.250 pts	0.09	15	75							
26	Outlook	POST1	21-Jun	0.72 pts	0.54	13		4	28	7.4	0.115	13	41	18
	Stinger	POST1	21-Jun	0.25 pts	0.09	15								
	Upbeet	POST1	21-Jun	0.50 oz	0.031	30	58							
27	Dual Mag	PPS	3-Jun	0.67 pts	0.64	9		4	40	17.6	0.215	95	95	94
	Upbeet	POST1	21-Jun	0.50 oz	0.031	30	39							
	COC			1%										
28	Dual Mag	PPS	3-Jun	0.67 pts	0.64	9		4	39	18.7	0.224	99	100	99
	Upbeet	POST1	21-Jun	1.00 oz	0.063	60	69							
	COC			1%										
29	Unweeded							4	13	2.7	0.088	0	0	0
30	Weeded							4	35	14.0	0.182	74	93	60
	FPLSD (0.05)								13	6.1	0.06	21	25	19

Table 3. Site characteristics and herbicide application data for Dayton site, 2005.

Site characteristics				
Plot size/exp. design	10 x 30	RCBD		
Proceeding crop	sweet corn			
Soil test	Ph	OM	CEC	
	5.2	5.2%	14.7	
Herbicide application data				
Date	May 31, 2005	June 3, 2005	June 21, 2005	June 28, 2005
Crop stage			2-leaf	4-leaf
Weeds			see notes below ¹	
Herbicide/treatment	Roneet		all POST1	POST 3 11,12,13
Application timing	PPI	PPS	POST1	POST2
Start/end time	11:30-12:30	2-5 PM	8:00 - 11:00	12-12:15
Air temp/soil temp (2")/surface	63/69/69	78/90/88	75.4 / 76.8 / 81	75/75/78
Reel humidity	98%	55%	80%	80%
Wind direction/velocity	0-2 se	0-2 all directions	2-3 W	01- SW
Cloud cover	100/raining	0	100	100
Soil moisture	damp to wet	Damp to wet	Damp	damp and sticky
Plant moisture			Dry	very wet from rain
Sprayer/PSI	40	35	40	40
Mix size	3 gal	3 gal for single Dual Magnum treatments; 2100 ml for Dual PPS tankmixes and Pyramin	2100 ml	2100
Gallons H2O/acre	20	20	20	20
Nozzle type	8002	8002	8002	8002
Nozzle spacing and height	20/18	20/18	20/18	20/18
Soil inc. method/implement	2x harrow disk spring tooth disk	irrigated in immediately after application	rain or irrigation possible	

¹ Pigweed	2-3 leaf, 2 inch diameter
Black and hairy nightshade	2 leaf, 1 inch
Groundsel	2 leaf, 1 inch
Dog fennel	2 leaf, 1 inch
Barnyardgrass	1 leaf/ 1/2 inch diameter

Table 4. Table beet tolerance to Dual Magnum herbicide, Corvallis, 2005.

Herbicide	Timing	Rate		Obs.	4 WAP			Harvest			
					Emer- gence	Phyto- toxicity	Stunting	No. roots harvested	Yield	Grade	
										No. 1	No. 2
		<i>pts</i>	<i>lbs</i> <i>ai/A</i>		<i>no/ 5</i> <i>ft</i>			<i>/10 ft. of</i> <i>row</i>	<i>t/A</i>	<i>%</i>	
1 Dual Magnum	PPS	0.67	0.64	4	20	0	5	47	15.4	15	61
2 Dual Magnum	PPS	1.0	0.95	4	18	0	10	51	14.9	19	61
3 Dual Magnum	PPS	1.33	1.27	4	21	0	15	47	20.8	6	54
4 Check (weeded)				4	20	0	0	53	22.0	8	60
5 Check (unweeded)				4	20	0	0	56	12.9	19	63
<i>FPLSD</i>					<i>ns</i>	<i>ns</i>	<i>8</i>	<i>ns</i>	<i>5.9</i>	<i>ns</i>	<i>ns</i>

Table 5. Site characteristics and herbicide application data for Corvallis, 2005.

Site characteristics				
Plot size/exp. design		10*30	4 reps	RCBD
Proceeding crop		Sweet corn		
Soil test		pH 6.0	OM 5.1 %	CEC 20.5
Herbicide application data				
Date		June 14, 2005	June 15, 2005	June 17, 2005
Herbicide/treatment		Roneet	Dual Magnum	Pyramin
Application timing		PPI	PPS	PPS
Start/end time		4:30 PM	6:30-7:30	10-10:30 AM
Air temp/soil temp (2")/surface		65/ /	52/55/54	75/81/85
Rel. humidity		75%	85%	78%
Wind direction/velocity		3-6 W	0	1-4 E
Cloud cover		0	Clear	50%
Soil moisture		dry	soil dry	Damp
Sprayer/PSI		Tractor	BP 40PSI	BP 40PSI
Mix size		30 Gal	2100	3 gal
Gallons H2O/acre		30	20	20
Nozzle type		8002	8002	8002
Nozzle spacing and height		Rotera within 15 minutes	20/18	20/18
Soil inc. method/implement			Irrigation	Irrigation

