Research Report to the Oregon Processed Vegetable Commission, 2007

Title: Improving Herbicide Options in Beets, Carrots, and Other Root Crops

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Weed management in table beets has improved with the recent registration of Dual Magnum. Hairy nightshade control continues to be a challenge, however. Nortron (ethofumesate) herbicide is now labeled for use and will help with nightshade control, but there is very little experience in the PNW on the best use patterns for this herbicide. Another concern is carryover, particularly for fresh market producers that often plant another crop immediately after beets are harvested. Tankmixing Dual Magnum with moderate rates of Nortron may improve weed control, reduce the risk of crop injury, and reduce the potential for carryover.

Methods

Table beets were planted on beds with 3-26 inch rows on May 15, 2007. Preemergence herbicides were applied the next day with a hand-held boom sprayer with 3-8002 nozzles (20 inch spacing on the boom), at 30 PSI, and with 20 GPA of water. Herbicides were incorporated with irrigation water shortly after planting. Postemergence herbicides were applied when beets had cotyledon to 2 leaves, 2 leaves, or 4 true leaves. The predominant weed at the field site was hairy nightshade. Crop injury and hairy nightshade density were evaluated at 3 WAP, and weed control evaluated at harvest. All plots were cultivated once. Beets were harvested on August 2 from one 8.2 ft section of each row in the middle of the plot, graded, and weighed.

Results and Discussion

The overall weed control estimate at harvest accounted for approximately 88% of the yield variability. Neither Dual Magnum nor Nortron applied alone provided adequate hairy nightshade control (Table 1, Figure 1). However, Dual Magnum tankmixed with Nortron at the lowest rate of 0.47 lbs ai/A (15 oz/A) reduced hairy nightshade density by 5-fold compared to Nortron alone at the same rate. Hairy nightshade density was reduced to only $12/m^2$ when smetolachlor was tankmixed with the highest rate of Nortron. The two higher rates of Nortron stunted crop growth when applied with Dual Magnum, but did reduce plant stand. The best yields were with Nortron at 1.88 lbs ai/A or when any rate of Nortron was tankmixed with Dual Magnum (Figure 2). Future research should examine the synergism between these two herbicides for hairy nightshade control, particularly with reduced rates of Dual Magnum. Dual Magnum will occasionally reduce table beet stands under unfavorable environmental conditions. Lowering the Dual Magnum rate and tank mixing with Nortron may reduce the potential of crop injury yet maintain acceptable levels of hairy nightshade control.

Nortron applied POST alone or with Dual Magnum did not provide adequate weed control (Table 2). The addition of Stinger (Tr. 13) to the tankmix at 0.188 lbs ai/A (8 oz) improved weed control when applied to 4-leaf beets. Tankmixing Spin-Aid with Nortron and applying at the cotyledon to 2-leaf stage controlled 94% of the weeds at harvest (Tr. 14) and yield was very high even though there was stunting of the crop early in the season. These two treatments (13 and 14) yielded 21.3 and 28.2 t/A, respectively (data not shown in table) and did not affect the size of the beets or the number of beets harvested.

Table 1. Effect of Dual Magnum and Nortron applied PES as a tankmix on hairy nightshade control and table beet

yield, Corvallis.

	Herbicide	Rate	Stand	Phytotoxicity	Stunting	Weed control			Beet root harvest	
						Hairy nightshade		Composite	Yield	Grade
						Density	Control			
			13-Jun	7-Jun	13-Jun	13-Jun	21-Aug	21-Aug	21-	Aug
		lbs ai/A	no/4 ft of row	0-10	0-100 %	no./m²	%	%	t/A	% 1-2
1	Dual Magnum	0.64	34	0.0	3	32	63	46	15.3	83
2	Nortron	0.47	34	0.0	0	69	23	23	9.4	77
3	Nortron	0.94	37	0.0	4	48	61	60	20.4	69
4	Nortron	1.88	36	0.5	10	23	96	91	27.5	49
5	Nortron	0.47	41	0.0	3	12	81	71	27.1	61
	Dual Magnum	0.64								
6	Nortron	0.95	36	0.4	20	13	95	81	28.4	48
	Dual Magnum	0.64								
7	Nortron	1.88	38	0.1	18	6	94	87	29.8	49
	Dual Magnum	0.64								
8	Check	-	35	0	0	99	0	0	0	-
	FPLSD (0.05)		ns	0.7	12	34	22	27	9.1	26

Table 2. Effect of postemergence herbicide applications on weed control in table beets, Corvallis, 2007.

Herbicide Timing Rate Stand Phytotoxicity Stunting Weed control

	Herbicide	e Timing	Rate	Stand	Phytotoxicity		Stunting		Weed control		
					7-Jun	13-Jun	7-Jun	13-Jun	13-Jun		21-Aug
									Hairy nightshade	Composite rating	Composite rating
			lbs ai/A	No/4' row	0	-10	0-1	00 %	9	6	%
9	Nortron Dual Magnum Stinger	4 lf 4 lf	0.156 0.640 0.188	33	-	0.8	-	5	_a	_a	71
10	Nortron	4 lf	0.313	37	-	0.3	-	5	3	5	30
11	Nortron Dual Magnum	2 lf 2 lf	0.164 0.640	34	0	0.5	0	0	43	35	33
12	Nortron Dual Magnum Stinger	4 lf 4 lf	0.313 0.640 0.094	41	-	0.8	-	0	-	-	58
13	Nortron Dual Magnum Stinger	4 lf 4 lf	0.313 0.640 0.188	39	-	0.5	-	0	-	-	76
14	Nortron Spin-Aid	coty to 2-lf coty to 2-lf	0.164 0.244	37	2.0	0.8	25	30	100	98	94
15	Nortron Spin-Aid	2 lf 2 lf	0.164 0.488	28	2.8	1.3	21	18	86	83	50
16	Nortron Spin-Aid	4 lf 4 lf	0.313 0.748	37	-	0.5	-	8	57	54	61
17	Spin-Aid	2 lf	0.488	37	1.0	0.8	9	9	56	60	36
18	Spin-Aid	4 lf	0.748	34	-	1.3	-	13	71	66	40
19	Dual Magnum	2 lf	0.640	35	0.1	0.5	0	3	0	0	23
20	Dual Magnum	4 lf	0.640	33	-	0.0	-	0	0	0	25
	FPLSD (0.05)			ns	0.7	ns	8	12	28	24	23

 $^{^{}a}$ (-) data missing in this column because the treatment effect was incomplete when this evaluation was made.

Table 3. Herbicide application data.

Date	May 16, 2007	May 31, 2007	June 01, 2007	June 07, 2007		
Crop stage	Planted 5-15-07	coty-2 lf	2-lf	4-1f		
Weeds and growth stage						
Hairy nightshade		21f		2-4" tall		
Purslane		2lf, 1/4 in dia.		2-4" tall		
Smartweed		21f		2-4" tall		
Herbicide/treatment	PES	Spin-Aid coty-2 lf	2-lf	4-lf		
Application timing	PES	coty-2 lf	2-lf	4-lf		
Start/end time	7-8 AM	7-7:30	7:15-8 am	6-6:45 AM		
Air temp/soil temp (2")/surface	60/62/66	65/62/64	72/72/76	53/56/54		
Rel humidity	68%	48%	48%	80%		
Wind direction/velocity	0-1 NE	NE 0-0.5	SW 0-1	0		
Cloud cover	0	0	0	100		
Soil moisture	very Dry	damp irrigated on 5-29	Dry	Dry		
Plant moisture	-	light dew	light dew	light dew		
Sprayer/PSI	BP 30 PSI	BP 40 PSI	BP 40 PSI	BP 40 PSI		
Mix size	2100 mls	2100 mls	2100 mls	2100 mls		
Gallons H20/acre	20	20	20	20		
Nozzle type	8002	8003	8003	8003		
Nozzle spacing and height	3 nozzle boom 20/20	3 nozzle boom 20/20	3 nozzle boom 20/20	3 nozzle boom 20/20		
Soil inc. method/implement	1.5 hrs irrigation at 9 AM	None	1 hr at 2 pm	6-8 2 hrs		
Soil test	pH=6.2	% OM (LOI) 2.4%	CEC 22.5 meq/100g so	CEC 22.5 meq/100g soil		

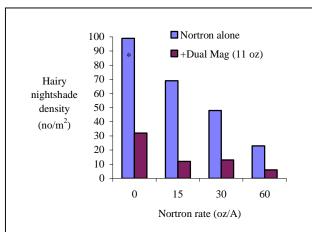


Figure 1. Nortron and Dual Magnum tankmix effects on hairy nightshade density. (*) Check plot with no herbicides applied.

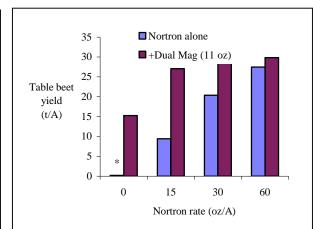


Figure 2. Nortron and Dual Magnum tankmix effects on table beet yield. (*) Check plot with no herbicides applied.