Russell W. Wallace & John C. Hodges
Vegetable Research Program
Texas A & M University
Lubbock Research & Extension Center

Texas Cooperative EXTENSION
The Texas A&M University System

Evaluation of Herbicides for Weed Control and Crop Injury in Garden Beets

Objective: To determine the effects of preemergence (PRE) and postemergence (POST) herbicide applications on weed control, crop injury and yield of garden beets in the Texas Wintergarden.

Introduction: A trial was conducted in 2004 to evaluate the effects of PRE and POST herbicides applied alone or in combination for crop injury, weed control and yields in processing garden beets (*Beta vulgaris*) grown in the Texas Wintergarden. The trial was established at the Del Monte Ag Research Farm located near Crystal City on a clay loam soil with a pH of 8.1 and less than 2% organic matter. Standard crop management and pest control (fertilizer, pesticides, etc.) measures were applied as needed during the growing season to maximize beet production. Following bed shaping on August 31, garden beets (var. "Red Ace") were planted using 4-bed (2 lines/bed) gravity-fed planter boxes that seeded at commercial spacing and depth. Plot size measured 13.34' x 25' with 4 beds/plot. Pre-plant incorporated (PPI) and PRE treatments were applied using a CO_2-pressurized backpack sprayer and hand-held boom equipped with four flat fan nozzles that delivered 20 GPA at 30 PSI (for application data see Tables 1 and 2). PPI treatments were incorporated using a hand-held rake for this trial. Following seeding and herbicide applications the trial site was irrigated within 24 hours. The trial was designed as randomized complete block (RCBD) replicated 4 times. Percent weed control and crop injury ratings were recorded during the season and beets were harvested on November 18 (80 days after planting). All data were subjected to ANOVA procedures and means separated using the LSD at the 5% level.

Results and Discussion: Crop injury ratings recorded 18 days after treatment (DAT) showed that significant early stunting (Table 3) was caused by Dual Magnum 7.62E (0.65 lb ai), Outlook 6E (0.5 lb ai), Nortron 4SC (2.0 lb ai), Eptam 7-E (3.06 lb ai), and significant plant death occurred with Prefar 4E applications (both rates). Eptam injury may have possibly been reduced had the herbicide been incorporated using standard field equipment rather than being raked in after seeding. Crop injury recorded 32 DAT did not vary greatly from that of the earlier observations with the exception of Ro-Neet followed by Progress 1.8EC. Progress POST applications caused minor stunting and leaf burn on beets when applied at the 2 – 3 leaf stage. Control of pigweed 32 DAT was 90% or better when Dual Magnum, Outlook and Nortron (except 1.0 lb ai rate) were applied PRE. However, only fair to good control of pigweed was observed in plots treated with Eptam or Prefar. In this study, Ro-Neet (the grower standard) failed to adequately control pigweed 32 DAT, but control significantly increased when POST treatments of UpBeet 50DF (0.016 or 0.032 lb ai) and Progress were applied. Similar trends for all herbicide treatments were observed for control of signalgrass in this trial. Ro-Neet failed to adequately control signalgrass, however, POST applications of Nortron, UpBeet and Progress significantly improved control. Beet yields were highest in the handweeded control plots in this study, averaging 18.35 tons/A. While significant injury by some herbicide treatments was observed in this trial, beets were apparently able to overcome this injury to produce sufficient yields in this study. Treatments of Ro-Neet and Dual Magnum had lower yields (approximately 20%), though not significantly, when compared to the control. Nortron treatments showed a linear response, in that as the rate of Nortron applied PRE increased, yields tended to decrease. Outlook caused a significant (32%) decrease in yields. Though lower, yields in Eptam-treated plots may have been a response to lower weed control at the low rate and crop injury at the higher rate. Where UpBeet was applied POST following Ro-Neet PPI applications, yields increased an average 8%. Progress treatments significantly reduced beet yields in this trial. Prefar plots were not harvested. These results indicate the potential for Dual Magnum, Nortron, Eptam and UpBeet as herbicides for use in weed control programs for processing garden beets grown in the Texas Wintergarden area.

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Table 1. Application data for PPI's and PRE's.

Location	Crystal City	**Wind speed / direction**	SE / 5 – 15 mph
Date	August 31	**Crop**	Garden Beets
Time of day	2:00 p.m.	**Variety**	Red Ace
Type of application	Broadcast	**Crop stage**	Seed
Carrier	Water	**Air temp. (^{o}F)**	90
Gas	CO_2	**Soil temp. (^{o}F)**	87
GPA	20	**Soil beneath**	Moist
PSI	30	**Soil surface**	Dry
Nozzle tips	8002	**% Relative humidity**	High
Nozzle spacing	18"	**Sky conditions**	Partly cloudy
Boom width (")	6.5'	**# Replications**	4
Boom height (")	18"	**Sprayed by**	RWW / JCH
Weeds present: None			

Table 2. Application data for EPOST's.

Location	Crystal City	**Wind speed / direction**	E / 5 – 15 mph
Date	September 17	**Crop**	Garden Beets
Time of day	2:30 p.m.	**Variety**	Red Ace
Type of application	Broadcast	**Crop stage**	2 – 3 leaves
Carrier	Water	**Air temp. (^{o}F)**	97
Gas (if not CO_2)	CO_2	**Soil temp. (^{o}F)**	80
GPA	20	**Soil beneath**	Semi-moist
PSI	30	**Soil surface**	Dry, compact
Nozzle tips	8002	**% Relative humidity**	High
Nozzle spacing	18"	**Sky conditions**	Sunny
Boom width (")	6.5'	**# Replications**	4
Boom height (")	18"	**Sprayed by**	RWW
Weeds present: Pigweed (2 – 6 leaves), volunteer corn (6"), signalgrass (2 – 4")			

Figure 1. Garden Beets (var. "Red Ace") treated with Ro-Neet 6-E (PPI) followed by UpBeet 50DF (POST).

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Table 3. The effects of selected herbicide treatments on crop injury, weed control and yield of garden beets

Product(s)	Rate (lb a.i./A)	Timing	% Beet Injury 18 DAT	% Beet Injury 32 DAT	% Control Pigweed 32 DAT	% Control Signalgrass 32 DAT	Beet Yield Tons/A 11/18
Weedy Check		Season	0	0	0	0	14.17
Handweed		Season	0	0	99.0	99.0	18.35
Ro-Neet 6-E	2.25	PPI	5.0	11.3	59.8	53.8	14.97
Dual Magnum 7.62E	0.65	PRE	22.5	23.3	99.0	95.0	14.77
Outlook 6E	0.5	PRE	40.0	41.3	99.0	95.0	12.49
Nortron 4SC	0.5	PRE	0	0	95.8	81.3	17.54
Nortron 4SC	1.0	PRE	0	5.0	72.3	86.3	15.88
Nortron 4SC	2.0	PRE	27.5	30.0	92.3	93.8	14.06
Eptam 7-E	2.63	PPI	7.5	11.3	72.0	77.5	13.35
Eptam 7-E	3.06	PPI	28.8	26.3	77.3	78.8	12.70
Prefar 4-E	5.0	PRE	98.0	92.3	85.8	97.0	0
Prefar 4-E	6.0	PRE	85.8	79.8	83.5	95.8	0
Ro-Neet 6-E + Nortron 4SC + NIS	2.25 0.164 0.25% v/v	PPI EPOST	0	0	66.3	83.8	13.46
Ro-Neet 6-E + UpBeet 50DF + NIS	2.25 0.016 0.25% v/v	PPI EPOST	0	0	95.8	87.5	15.50
Ro-Neet 6-E + UpBeet 50DF + NIS	2.25 0.032 0.25% v/v	PPI EPOST	0	0	95.8	87.5	16.87
Ro-Neet 6-E + Progress 1.8EC + NIS	2.25 0.34 0.25% v/v	PPI EPOST	0	16.3	95.8	87.5	9.95
		LSD (0.05)	**12.9**	**14.9**	**32.6**	**18.7**	**4.4**