CALIFORNIA MELON RESEARCH BOARD
Final Research Project Report Dec 2, 2019

PROJECT. **Evaluating preplant and post plant herbicide programs for weed management in transplanted LSL melons, year 2.**

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Summary: Trials were conducted at the UC Desert Research and Extension Center (DREC Imperial County) and UC West Side Research and Extension Center (WSREC Fresno County) evaluating weed management and crop safety from various pre plant incorporated (PPI) and post plant (POST) herbicides in transplanted cantaloupes. Cultivar "Infinite Gold" (LSL) was used at WSREC, and "Cayucos Beach" (ESL) at DREC. At both locations, Curbit (ethalfluralin), Prefar (bensulide), Devrinol (napropamide), Dual Magnum (S-metolachlor), Prowl (pendimethalin), and Sandea (halosulfuron) herbicides were applied before transplanting and either mechanically or water incorporated. Additionally, Dacthal (DCPA) and Sandea were also applied 10 days after transplanting. An untreated weedy control treatment was included at both locations for comparison; a hand-weeded check was also evaluated at WSREC. Herbicides were mechanically incorporated 2 – 3 inches one to two days before planting, or sprinkler incorporated with 0.5" (WSREC) or 1" (DREC) of water soon after transplanting. Both locations were drip irrigated for the remainder of the experiment. At the DREC location, crop injury was observed only with POST Sandea and Dacthal treatments. Weed control was better with mechanical versus sprinkler irrigation. Curbit, Curbit + Prefar, and Prowl gave the best control of grassy and broadleaf weeds (especially goosefoot). Best total marketable yield occurred with mechanical incorporation of the Curbit+Prefar treatment, at 807 boxes per acre. There were no significant yield differences between any of the herbicide treatments where sprinkler irrigation was used. Average yield with sprinklers was 243 boxes/A. At the WSREC location, weed pressure from broadleaf weeds, especially groundcherry (nightshade family), was very high, covering nearly 100% of the plot area for certain treatments. With mechanical incorporation, all herbicide treatments provided >90% weed control with the exception of Dacthal, Devrinol, and Prefar; however, significant crop injury occurred in the Prefar+Curbit, Devrinol, Prowl, and Sandea PPI treatments. Sprinkler incorporation of the herbicides did not give adequate weed control, and in fact increased weed germination as compared to the mechanically incorporated plots. Only Sandea at 1 oz/A PPI maintained good weed control throughout the season in the sprinkler irrigated plots, with an average of 72% control. Yields were significantly lower in the plots where sprinklers were used and weed control was poor. Average marketable yield was 1525 and 959 boxes/A for mechanical and sprinkler incorporation, respectively.

OBJECTIVE.
The objective of this trial was to evaluate the use of Curbit (ethafluralin), Prefar (bensulide), Dual Magnum (S-metoachlor), Prowl (pendimethalin), Dacthal (DPCA), Devrinol (napropamide) and Sandea (halosulfuron) herbicides applied pre and post-emergent with either mechanical or sprinkler incorporation on weed control and crop safety in Harper-type LSL or ESL transplanted melons.

Methods

Cayucos Beach ESL cantaloupe transplants were planted at the University of California Desert Research and Extension Center in Holtville, CA, on 3 April 2019. Ten treatments were applied using a randomized complete block design with four replications on 3 April 2019 (unless otherwise noted) and included 1) Curbit pre-plant incorporated (PPI) 4 pints/A, 2) Curbit 4 pints/A + Prefar 6 quarts/A (Tank Mix PPI), 3) Devrinol PPI 10 pints/A, 4) Dual Magnum PPI 1 pint/A, 5) Prowl PPI 3 pints/A, 6) Prefar PPI 6 quarts/A, 7) Sandea PPI 1 oz/A, 8) Dacthal POST 4 lbs/A (banded, 14 days after transplanting), 9) Sandea POST 1 oz/A (over-the-top or banded, 14 days after transplanting), 10) Untreated Control (weedy). The field was divided into two sections, where the experiment was duplicated and treatments received either sprinkler or mechanical incorporation. Sprinkler irrigated plots received about 1" of applied water on April 4 and 16. All plots were drip irrigated for the remainder of the experiment. Weed control and crop safety were evaluated May 9, 17, 24, and June 4. Melons were harvested from June 13 to 18, separated into cull and marketable melons, and grouped by size for weight and brix measurements.

Treatment listing is shown in Table 1. Additional methods for the DREC location are outlined in Dr. Bean's separate report.

At WSREC, the same beds from the 2018 season were utilized. All beds were amended with 200 lbs/A of 10-52-0 one month before planting. Treatments were the same as at DREC (10 herbicide treatments and 2 incorporation methods), with the addition of a hand weeded check plot. Statistical design was a randomized complete block design with 4 replications; plots were 1 bed wide x 30 ft long. Pre-plant treatments were applied on 30-May-2019 using a backpack sprayer at 60 gpa equivalent, then mechanically incorporated using a rotary power mulcher to a depth of about 2". The plots were then transplanted using mechanical finger planters on a 24" spacing on 31-May-2019. After transplanting, ½ of the plots were sprinkler irrigated two times for a target of 1" applied water, however actual applied water ranged from 0.5 – 2" depending on location. All plots were drip irrigated for the remainder of the experiment. Post-plant applications of Sandea 1 oz/A, and Dacthal 10 pts/A were made on 10-June. No adjuvants were used for any of the POST treatments, and they were not sprinkler incorporated. All plots were mechanically cultivated 1 month after transplanting to remove emerged weeds outside of the plant row; no in-row cultivation was performed except in the hand weeded plots. Weed and crop evaluations were made at 10, 30, 48, and 66 days after transplanting. A once-over harvest was performed on 20-Aug by counting all fruit by size in each plot. Brix readings were done on 1 sample fruit from each plot. A summary of the treatments is listed in Table 1.

After transplanting, the field was irrigated via buried drip to match ETc + 10% leaching fraction, using ET estimates from the CIMIS weather station located on the field station. A total of about 23" water was applied. Wrangler (imidacloprid) insecticide was applied at 1 and 4 WAT for aphid control. 100 lbs N/A was applied using UAN30 through the drip system on 6 application events.

Weed and crop phytotoxicity ratings were done using a subjective scale, where 0 = no weeds/no phyto, 1 = 1 - 7%, 2 = 7 - 25%, 3 = 25 - 50%, 4 = 50 - 75%, 5 = 75 - 93%, and 6 = 93 - 100% weeds or phyto. Ratings were made at 2-week intervals throughout the growing season. A once-over harvest was performed on 20-Aug 2019 by counting all fruit by size in each plot. Brix readings were done on 1 sample fruit from each plot using a hand held refractometer at room temperature. All data were analyzed using analysis of variance for a replicated block design; means comparisons were performed using Fishers Protected LSD at 95% confidence level.

Table 1. Herbicide trial treatments for WSREC and DREC locations.

	Cantaloupes	Cantaloupes
Location	WSREC, near Five Points	DREC, near Holtville, CA
P.I.	Scott Stoddard, UCCE	Travis Bean, UCR
Variety and plant date	Infinite Gold, May 31, 2019	Cayucos Beach, April 3, 2019
Plot size and plant spacing	1 bed (80") by 30 ft,4 reps, 24" spacing	1 bed (80") by 30 ft, 24" spacing
Irrigation	buried drip	buried drip
Herbicide inc treatments	mechanical and sprinklers	mechanical and sprinklers
Weed evaluation	2, 4, 7, 9 WAT	5, 6, 7, 9 WAT
Harvest	20-Aug	18-Jun
days	81	76

Treatments WSREC	Herbicide	Timing	Application dates
1	Curbit 4 pts/A PPI	pre plant	30-May
2	Prefar 6 qts/A + Curbit 4 pts/A	pre plant	30-May
3	Devrinol 4 lbs/A PPI	pre plant	30-May
4	Dual Magnum 1 pt/A PPI	pre plant	30-May
5	Prowl 3 pts/A PPI	pre plant	30-May
6	Prefar 6 qts/A PPI	pre plant	30-May
7	Sandea 1 oz/A PRE	pre plant	30-May
8	Dacthal 10 pts/A POST	post plant 10 days	10-Jun
9	Sandea 1 oz/A POST	post plant 10 days	10-Jun
11	Untreated control (weedy)	former border	---
12	Hand weeded check	every 2 weeks	
	All treatments either mechanically incorporated or with sprinklers		
	Sprinklers ran for about 6 hours the day of transplanting & 3 days after		

Treatments, DREC	Treatment Name	Application timing	Application dates
1	Curbit 4 pts/A PPI	pre plant	2-Apr
2	Prefar 6 qts/A + Curbit 4 pts/A	pre plant	2-Apr
3	Devrinol 4 lbs/A PPI	pre plant	2-Apr
4	Dual Magnum 1 pt/A PPI	pre plant	2-Apr
5	Prowl 3 pts/A PPI	pre plant	2-Apr
6	Prefar 6 qts/A PPI	pre plant	2-Apr
7	Sandea 1 oz/A PRE	pre plant	2-Apr
8	Dacthal 10 pts/A	post plant 10 days	16-Apr
9	Sandea 1 oz/A POST	post plant 10 days	16-Apr
10	Untreated control (weedy)	---	---
	All treatments either mechanically incorporated or with sprinklers		
	Sprinklers applied 1" water April 4 and again on April 16		

Results

Complete DREC results are presented in the separate DREC report by Travis Bean. To summarize, significant crop injury was observed only in the Dacthal and Sandea POST treatments, which occurred with both mechanical and sprinkler irrigation. Injury symptoms were noted only at the first evaluation date. Weed control was better with mechanical versus sprinkler irrigation. Curbit, Curbit + Prefar, and Prowl had > 90% control of grassy and broadleaf weeds (especially goosefoot) with mechanical incorporation at 5 weeks after transplanting (WAT); only Prowl had at least 90% weed control when sprinkler incorporated. Best total marketable yield occurred with mechanical incorporation of the Curbit+Prefar treatment, at 807 boxes per acre. There were no significant yield differences between any of the herbicide treatments where sprinkler irrigation was used. Average yield with sprinklers was 243 boxes/A.

At the WSREC location, groundcherry, puncturevine, field bindweed, purslane, venice mallow, pigweed, lambsquarters, junglerice, and volunteer melons from 2018 represented the dominant weeds. Pressure from broadleaf weeds, especially groundcherry (nightshade family), was very high, covering nearly 100% of the plot area for certain treatments. With mechanical incorporation, all herbicide treatments provided >88% weed control at the last evaluation date, with the exception of Dacthal, Devrinol, and Prefar; however, significant crop injury occurred in the Prefar+Curbit, Devrinol, Prowl, and Sandea PPI treatments (Table 2). This injury was especially bad in the mechanical cultivation plots which were also water stressed. Some plots had a loss of almost 100% of plants, however, this was due more to location and less to herbicide treatment, as there was no significant effect of herbicide on plant stands (Table 2).

Sprinkler incorporation of the herbicides did not give adequate weed control, and in fact increased weed germination as compared to the mechanically incorporated plots. Only Sandea at 1 oz/A PPI maintained good weed control throughout the season in the sprinkler irrigated plots, with an average of 72% control (Table 3). This was significantly better than all other treatments. Crop injury was also observed in many of the treatments at 2 and 4 WAT, and was significantly greater with Prowl, Sandea PRE, and Devrinol. Unlike with mechanical incorporated plots, however, no plant loss occurred.

Broadleaf weed control just prior to harvest was significantly better in the herbicide treatments that were mechanically incorporated as opposed to using sprinklers (Figure 1). Grassy weeds, predominantly Junglerice, was also controlled better with mechanical incorporation, however, grassy weed pressure was consistently low through most of the experiment.

Yields were significantly greater in the plots with mechanical incorporation and improved weed control. Average marketable yield was 1525 boxes/A for mechanical incorporation (Table 4). The Devrinol and Dacthal treatments were significantly less than the other herbicide treatments (Figure 2). The untreated control plot (weedy) had the lowest yield (1095 boxes), greatest amount of rotten fruit (nearly 28%), and lowest soluble solids (10.6 Brix) of all the treatments, most likely a result of competition from weeds. Average marketable melon yield in the sprinkler irrigated plots was 959 boxes/A (Table 5). Best overall yields occurred in the Sandea PRE, Sandea POST, and hand weeded treatments, all which yielded over 1250 boxes/A.

A comparison of the two incorporation methods on weed control and melon yield is shown in Table 6. Sprinkler incorporation significantly reduced broadleaf weed control, fruit count, fruit size, total marketable yield, and fruit Brix as compared to mechanical incorporation at this location. These results are similar at both locations, however, there are significant differences in the efficacy and crop safety of particular herbicides evaluated. Curbit + Prefar and Prowl did very well at the DREC location, whereas Sandea was the best overall herbicide at WSREC. Prowl caused substantial crop injury and no weed control with sprinklers at WSREC, and had very poor yields of only 107 boxes/A.

Table 2. Weed control as affected by herbicide treatments at WSREC, mechanical incorporation.

			10-Jun	6/10/19			7/1/19			7/18/19			5-Aug		Season end	
			stand	0 - 6 scale			0 - 6 scale			0 - 6 scale			BL Weeds		Grasses	
	Treatment	Incorporat	#/plot	crop phyto	BL	Grass	crop phyto	BL	Grass	crop phyto	BL	Grass	0 - 6	% control	0 - 6	% control
1	Curbit 4 pts/A PPI	mechanical	12.3	3.0	0.0	0.0	1.3	1.0	0.0	0.3	1.0	0.0	1.3	95.3	0.0	100.0
2	Prefar 6 qts/A + Curbit 4 pts/A PPI	mechanical	12.3	3.5	0.3	0.0	1.8	0.8	0.0	0.3	0.5	0.0	0.8	97.8	0.0	100.0
3	Devrinol 4 lbs/A PPI	mechanical	10.0	4.8	1.0	0.0	4.5	2.0	0.0	0.3	2.3	0.0	3.3	37.8	0.0	100.0
4	Dual Magnum 1 pt/A PPI	mechanical	11.3	3.5	0.5	0.0	1.0	0.5	0.0	0.0	0.5	0.0	0.8	96.0	0.0	100.0
5	Prowl 3 pts/A PPI	mechanical	11.3	4.3	0.0	0.0	2.8	0.8	0.0	0.3	1.0	0.0	0.8	97.0	0.0	100.0
6	Prefar 6 qts/A PPI	mechanical	12.5	2.5	0.3	0.0	0.8	1.3	0.0	0.0	2.0	0.0	3.0	66.3	0.0	100.0
7	Sandea 1 oz/A PRE	mechanical	8.0	5.5	0.3	0.0	5.3	0.8	0.0	0.8	1.3	0.0	1.5	95.0	0.0	100.0
8	Dacthal 10 pts/A POST	none	11.8	---	0.8	0.0	2.8	2.5	0.3	0.3	2.5	0.0	4.0	32.5	0.8	87.5
9	Sandea 1 oz/A POST	none	9.3	---	0.3	0.0	3.3	1.3	0.5	0.5	2.3	0.5	1.8	88.0	0.5	98.0
11	Untreated control (weedy)	---	13.0	0.0	2.8	0.0	0.0	2.8	0.0	0.0	2.8	0.3	4.3	1.3	1.3	2.5
12	Hand weeded check	---	11.8	0.0	3.0	0.0	0.0	2.0	0.0	0.0	0.3	0.0	1.8	89.8	0.8	88.8
		Average	11.2	3.2	0.8	0	2.1	1.4	0.1	0.2	1.5	0.1	2.1	72.4	0.3	88.8
		LSD 0.05	ns	1.9	1.4	---	2.2	ns	---	ns	1.6	---	1.9	32.0	ns	13.4
		CV, %	25.5	40.8	120.4	---	71.3	90.3	---	205	74.1	---	62.6	30.6	216	10.4

Table 3. Weed control as affected by herbicide treatments at WSREC, sprinkler incorporation.

			10-Jun	6/10/19			7/1/19			7/18/19			5-Aug		Season end	
		Incorp	stand	0 - 6 scale			0 - 6 scale			0 - 6 scale			BL Weeds		Grasses	
	Treatment	Method	#/plot	crop phyto	BL	Grass	crop phyto	BL	Grass	crop phyto	BL	Grass	0 - 6	% control	0 - 6	% control
1	Curbit 4 pts/A PPI	sprinkler	14	0.8	3.5	0.0	0.5	3.5	0.0	0.0	4.9	0.0	6.0	0.0	0.0	100.0
2	Prefar 6 qts/A + Curbit 4 pts/A PPI	sprinkler	14	1.5	3.0	0.3	1.5	3.8	0.0	0.5	3.8	0.0	4.8	23.8	0.0	100.0
3	Devrinol 4 lbs/A PPI	sprinkler	14	4.3	4.3	0.0	3.8	4.8	0.0	0.0	6.0	0.0	6.0	0.0	0.0	100.0
4	Dual Magnum 1 pt/A PPI	sprinkler	14	3.0	1.0	0.5	2.0	3.5	0.0	0.0	3.8	0.0	5.5	2.5	0.0	100.0
5	Prowl 3 pts/A PPI	sprinkler	14	3.8	3.0	0.0	6.0	5.8	0.0	0.0	6.0	0.0	6.0	0.0	0.0	100.0
6	Prefar 6 qts/A PPI	sprinkler	14	0.3	5.0	0.5	0.0	5.0	0.0	0.0	5.5	0.0	6.0	0.0	0.0	100.0
7	Sandea 1 oz/A PRE	sprinkler	14	5.0	1.0	0.3	5.3	1.0	0.0	0.0	1.3	0.0	2.5	72.5	0.0	100.0
8	Dacthal 10 pts/A POST	none	14	---	4.3	2.0	0.0	4.3	1.8	0.0	4.8	1.3	6.0	0.0	2.0	50.0
9	Sandea 1 oz/A POST	none	14	---	3.5	2.0	0.5	3.0	2.0	0.0	3.5	2.0	4.5	21.3	3.0	46.3
11	Untreated control (weedy)	---	14	0.0	4.5	0.5	0.0	5.0	2.3	0.0	5.0	2.0	6.0	0.0	3.5	8.8
12	Hand weeded check	---	14	0.0	4.5	0.8	0.0	3.5	0.8	0.0	0.3	0.5	1.0	96.0	0.5	99.0
		Average	14	1.7	3.4	0.6	1.8	3.9	0.6	0.05	4.1	0.5	4.9	19.6	0.8	82.2
		LSD 0.05	---	1.0	1.1	1.1	1.3	1.7	1.2	---	1.0	1.2	1.1	27.7	1.7	30.9
		CV, %	---	41.8	22.5	126.5	50.3	30.5	141	---	17.3	160	15.6	97.6	141	26.1

Ratings scale: 0 = no weeds/no phyto, 1 = <7%, 2 = <25%, 3 = < 50%, 4 = <75%, 5 < 93%, 6 = >93% weeds or phyto

BL = broadleaf weeds, G = grassy weeds. Primary weeds were groundcherry, puncturevine, bindweed, purslane, venice mallow, pigweed, junglerice, and volunteer melons.

LSD 0.05 = Least significant difference at the 95% confidence level. NS = not significant. --- = not enough data to perform statistical analysis. Treatment 10 not included in analysis.

CV = coefficient of variation

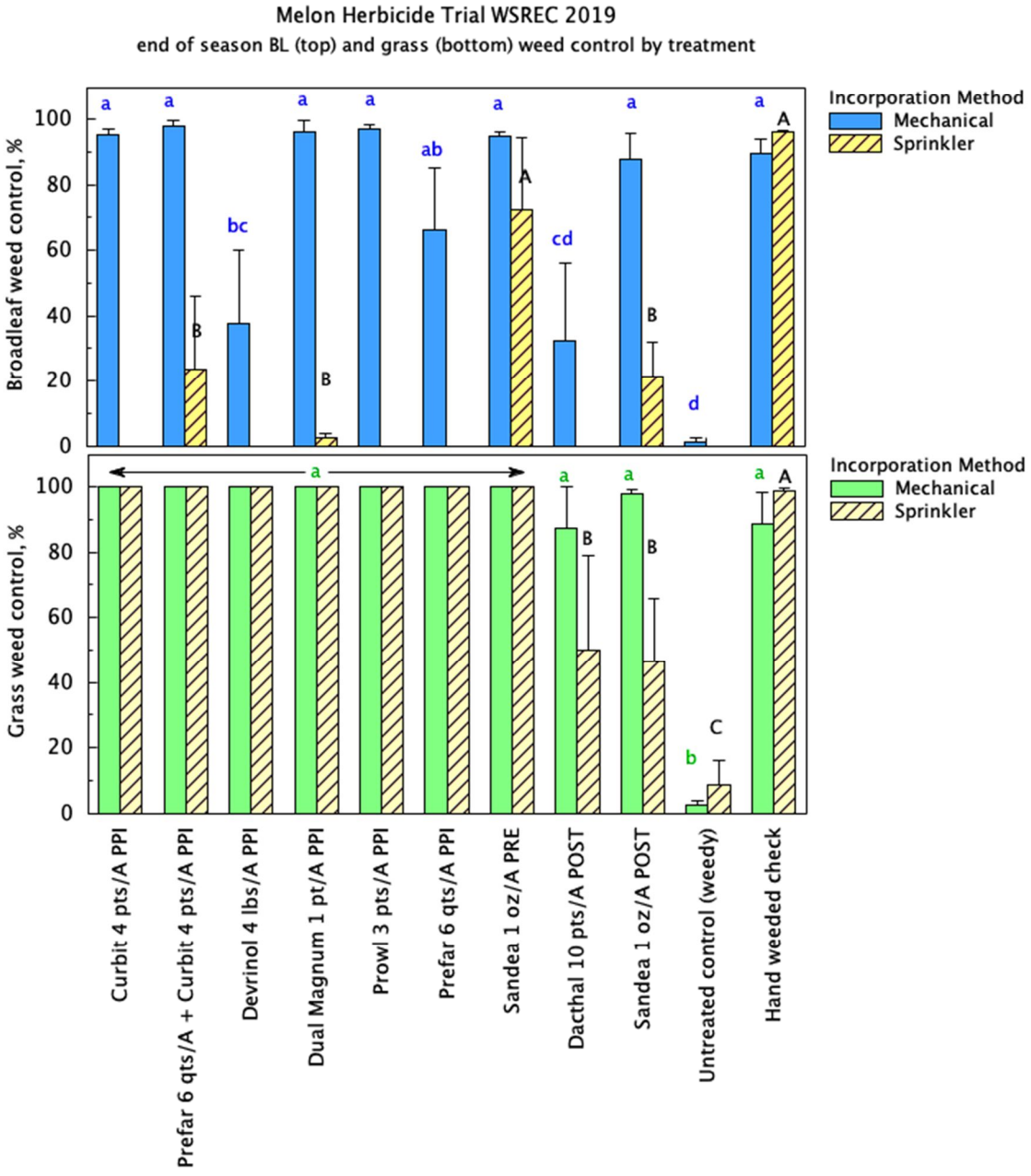


Figure 1. Broadleaf and grassy weed control on the last evaluation date as affected by herbicide treatment and method of incorporation, WSREC 2019.

Table 4. Cantaloupe yield and size as effected by herbicide program , mechanical incorporation, WSREC 2019.

	Treatment	Fruit #/plot	boxes/A by fruit size 15	12	9	6	4 (jumbo)	TMY	Culls Rot, %	shape, %	Jumbos %	18s %	% Brix
1	Curbit 4 pts/A PPI	61	10.9	90.8	302.5	1016.4	231.4	1641.1	7.6%	1.1%	13.5%	8.0%	12.6
2	Prefar 6 qts/A + Curbit 4 pts/A PPI	66	36.3	86.2	490.1	925.7	163.4	1665.3	8.0%	0.0%	9.4%	6.7%	12.1
3	Devrinol 4 lbs/A PPI	53	36.3	81.7	393.3	716.9	190.6	1382.4	5.9%	2.4%	11.9%	4.1%	13.9
4	Dual Magnum 1 pt/A PPI	69	79.9	68.1	296.5	952.9	476.4	1793.8	7.8%	1.6%	26.5%	6.5%	11.8
5	Prowl 3 pts/A PPI	57	29.0	72.6	296.5	744.2	503.7	1616.9	7.8%	3.1%	27.4%	5.3%	13.5
6	Prefar 6 qts/A PPI	58	47.2	59.0	272.3	907.5	231.4	1470.2	14.4%	1.2%	15.6%	4.2%	13.6
7	Sandea 1 oz/A PRE	61	61.7	59.0	350.9	952.9	258.6	1621.4	3.1%	0.0%	14.5%	8.9%	13.1
8	Dacthal 10 pts/A POST	51	32.7	31.8	490.1	580.8	190.6	1293.2	6.2%	0.0%	13.0%	7.5%	11.2
9	Sandea 1 oz/A POST	62	53.2	108.9	540.5	1004.3	163.4	1817.0	4.5%	0.4%	7.7%	12.8%	12.8
11	Untreated control (weedy)	58	32.7	118.0	350.9	544.5	81.7	1095.1	27.7%	0.3%	7.4%	5.5%	10.6
12	Hand weeded check	71	79.9	140.7	387.2	608.0	313.1	1449.0	16.3%	0.3%	22.1%	10.3%	14.1
	Average	59.9	45.4	83.3	379	814	255	1531	9.9	1.0	15.4	7.3	12.6
	Herbicide LSD 0.05	ns	ns	ns	ns	284	ns	433	9.6	ns	ns	ns	2.2
	CV, %	24.6	79.3	69.7	38.8	24.2	92.9	19.6	67.3	227	87.2	68.3	12.3

Boxes/A fruit size = number of mature fruit in a 30 lb box. Jumbo = any fruit larger than a size 6 (average 6.5 lbs)

TMY = total marketable yield of 12, 9, 6, and Jumbo combined

LSD 0.05 = Least significant difference at the 95% confidence level. NS = not significant. --- = not enough data to perform statistical analysis

CV = coefficient of variation

Table 5. Cantaloupe yield and size as effected by herbicide program, sprinkler incorporation, WSREC 2019.

	Treatment	Fruit #/plot	boxes/A by fruit size 15	12	9	6	4 (jumbo)	TMY	Culls Rot, %	shape, %	Jumbos %	18s %	% Brix
1	Curbit 4 pts/A PPI	47	25.4	95.3	484.0	408.4	13.6	1001.3	10.0%	4.3%	1.5%	2.6%	8.5
2	Prefar 6 qts/A + Curbit 4 pts/A PPI	51	25.4	90.8	478.0	462.8	68.1	1099.6	9.4%	2.1%	5.6%	9.0%	9.1
3	Devrinol 4 lbs/A PPI	21	32.7	40.8	181.5	154.3	0.0	376.6	5.9%	4.5%	0.0%	12.8%	9.9
4	Dual Magnum 1 pt/A PPI	51	29.0	36.3	544.5	426.5	108.9	1116.2	14.7%	0.0%	9.4%	5.8%	10.2
5	Prowl 3 pts/A PPI	10	10.9	36.3	48.4	9.1	13.6	107.4	4.4%	2.9%	7.5%	38.6%	8.5
6	Prefar 6 qts/A PPI	46	32.7	9.1	369.1	462.8	40.8	881.8	14.4%	0.0%	5.1%	17.5%	8.5
7	Sandea 1 oz/A PRE	67	50.8	122.5	713.9	644.3	27.2	1508.0	5.6%	0.9%	1.8%	6.1%	14.8
8	Dacthal 10 pts/A POST	42	29.0	45.4	284.4	535.4	149.7	1014.9	13.7%	0.5%	15.1%	5.7%	9.3
9	Sandea 1 oz/A POST	67	98.0	104.4	459.8	508.2	177.0	1249.3	6.6%	0.0%	14.0%	18.9%	9.4
11	Untreated control (weedy)	41	18.2	68.1	387.2	335.8	54.5	845.5	15.3%	0.0%	7.2%	10.4%	10.3
12	Hand weeded check	63	32.7	86.2	399.3	753.2	108.9	1347.6	18.1%	0.0%	7.5%	8.2%	12.2
	Average	46	35	66.8	395.5	427	69.3	959	10.7	1.4	6.8	12.3	10.1
	Herbicide LSD 0.05	12.3	ns	55.5	190	267	ns	314	ns	ns	ns	13.7	3.1
	CV, %	18.5	94.9	57.5	33.4	43.2	124	22.7	65.6	277	124	77.2	17.9

Boxes/A fruit size = number of mature fruit in a 30 lb box. Jumbo = any fruit larger than a size 6 (average 6.5 lbs)

TMY = total marketable yield of 12, 9, 6, and Jumbo combined

LSD 0.05 = Least significant difference at the 95% confidence level. NS = not significant. --- = not enough data to perform statistical analysis

CV = coefficient of variation

Table 6. End of season weed control and total marketable yield as effected by method of incorporation, WSREC 2019.

		BL Weeds		Grasses		Fruit	TMY	Culls		Jumbos	18s	
	Treatment	0 - 6	% control	0 - 6	% control	#/plot	box/A	Rot, %	shape, %	%	%	% Brix
1	Mechanical incorporation	2.1	72.4	0.3	88.8	60.5	1525	10.1	1.0	15.5	7.1	12.6
2	Sprinklers	4.9	19.6	0.8	82.2	46.0	959	10.7	1.4	6.8	12.3	10.1
	Incorporation f-test	***	***	*	ns	***	***	ns	ns	**	**	***
	Incorporation x Herbicides f-test	***	***	*	**	**	***	ns	ns	ns	***	*
	CV, %	31.1	44.7	166	19.4	22.9	21.7	64.9	272	107	77.2	15.0

Ratings scale: 0 = no weeds/no phyto, 1 = <7%, 2 = <25%, 3 = < 50%, 4 = <75%, 5 < 93%, 6 = >93% weeds or phyto

BL = broadleaf weeds, G = grassy weeds. Primary weeds were groundcherry, puncturevine, bindweed, purslane, venice mallow, pigweed, junglerice, and volunteer melons.

TMY = total marketable yield of 12, 9, 6, and Jumbo combined

LSD 0.05 = Least significant difference at the 95% confidence level. NS = not significant. --- = not enough data to perform statistical analysis. Treatment 10 not included in analysis

f-test, *, **, *** significant at 0.05, 0.01, and 0.001 respectively

CV = coefficient of variation

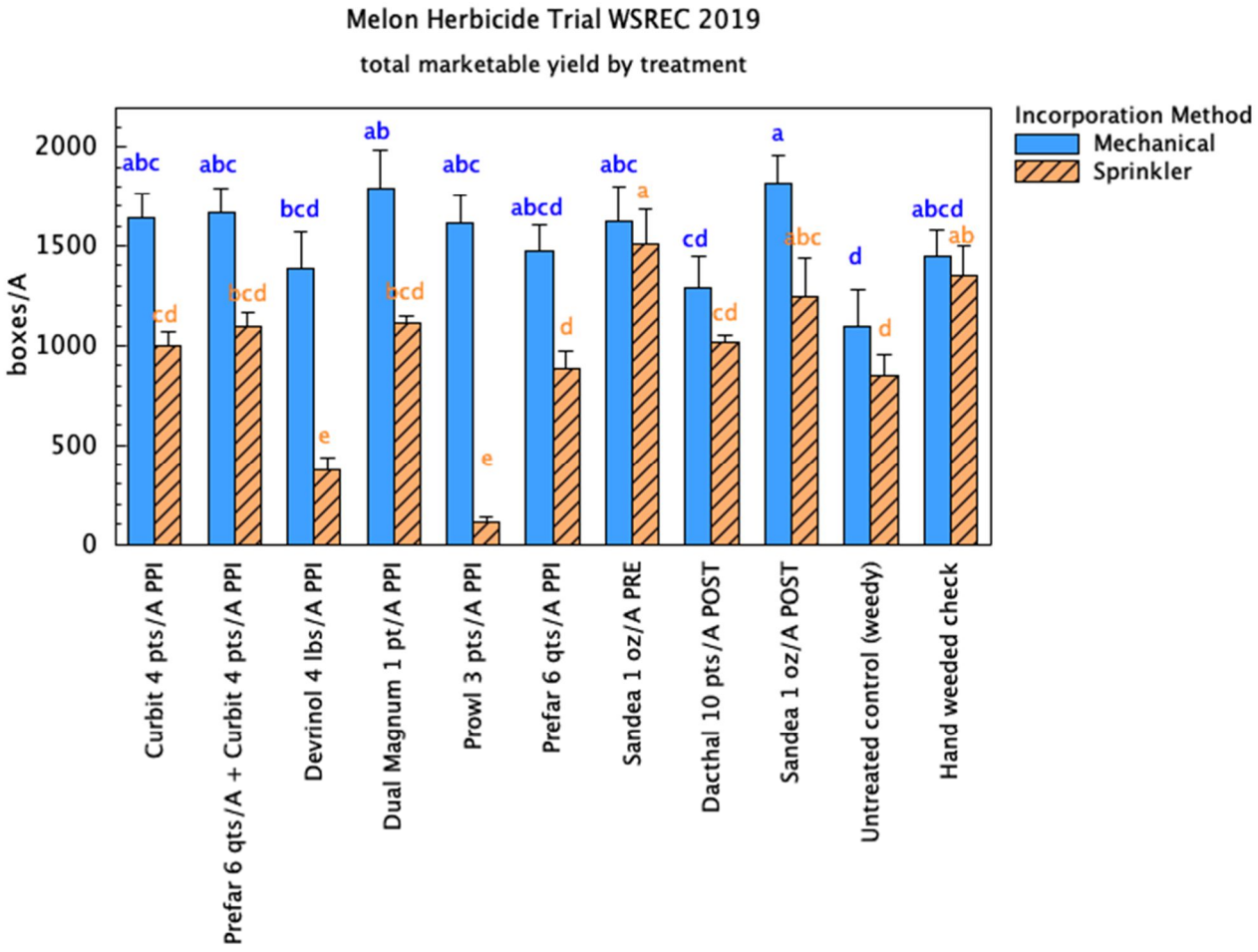


Figure 2. Melon yields as affected by herbicide treatment and incorporation method, WSREC 2019. Columns with the same letters and color are not significantly different (Fisher's Protected LSD 0.05).

Bean 2019 Melon Herbicide Trial Results, 10/30/2019

Location: University of California Desert Research and Extension Center, Holtville, California.
PI: Travis Bean, UC Riverside
Variety and plant date: Cayucos Beach, 4/3 to 4/4, 2019
Plot size and plant spacing: 1 bed (80 in by 30 ft), 24 in spacing
Irrigation: Buried drip
Herbicide incorporation: Mechanical or sprinkler
Weed control and crop injury evaluations: 5/7/2019, 5/17/2019, 5/24/2019, 6/4/2019
Harvest: 6/14, 6/18

Methods

At the University of California Desert Research and Extension Center (DREC) in Holtville, California, an early season melon trail was established using the Extended Shelf Life cultivar 'Cayucos Beach.' Transplants were obtained locally from Keithly-Williams.

Two adjacent blocks were used for the trial: one for mechanical incorporation and one for sprinkler incorporation of herbicides. Herbicide applications (treatments 1-7, Table 1) were made by hand using a backpack sprayer with 25 gpa water 2 April 2019. A mulcher was used to incorporate treatments in the first block to a depth of 2 in after 2 April herbicide applications, and the second block was sprinkle-irrigated with one inch of water following completion of planting on 4 April 2019. A second round of herbicide applications (treatments 8 and 9, Table 1) occurred two weeks later on 16 April 2019, and additional inch of irrigation was applied via sprinklers to the second block only. Both blocks were irrigated using subsurface drip from planting through the duration of the trial. Irrigation, fertilizers, and insect pests were managed by DREC staff according to University of Arizona Statewide Integrated Pest Management guidelines for cucurbits.

Plots were one bed (80 in wide) by 30 ft and treatments were applied in a randomized complete block design with four replications. Weed control and crop injury were rated as percent control or injury (0-100%), with evaluations on 5/7/2019, 5/17/2019, 5/24/2019, and 6/4/2019. The most common weeds at DREC were purslane, pigweed, malva, grass (mostly jungle rice), and goosefoot, with the latter two being dominant over the other species. Melons were harvested on 14 and 18 June 2019, with fruits sized, weighed, and Brix measured. Though located adjacent to each other in an attempt to maintain the uniformity of conditions, the mechanically- and sprinkler-incorporated blocks were treated as separate experiments and direct statistical comparison of results is inappropriate. Data were analyzed using mixed model ANOVA with replications as random effects and treatments as fixed effects.

Results- weed control and crop injury

In the mechanically incorporated herbicide treatment block, the most effective control for grass was achieved by the Curbit, Curbit + Prefar, Devrinol, Prowl, and Prefar PPI. Least effective control was Dacthal and Sandea POST, followed by Sandea PPI. For broadleaves and goosefoot in particular Sandea POST and Curbit, Curbit + Prefar, Prowl, and Prefar PPI were the most

effective treatments. Devrinol PII was the least effective, followed by Dual Magnum and Sandea PII. *For the mechanically incorporated herbicide treatment block, the most effective treatments for both grass and broadleaves with the least crop injury were Curbit, Curbit + Prefar, Prowl, and Prefar PPI.*

For the sprinkler incorporated herbicide treatment block, crop injury was again highest with the two POST treatments (Dacthal and Sandea). The most effective treatments for grass control were Prowl and Curbit + Prefar PPI, while the least effective treatments were Devrinol and Prefar PPI and Sandea POST. The most effective treatments for broadleaves (again, goosefoot in particular) were Sandea PPI and Sandea POST, while the least effective treatments were Curbit, Curbit + Prefar, Devrinol, Dual Magnum, and Prefar PPI. *For the sprinkler incorporated herbicide treatment block, the most effective treatment for both grass and broadleaves with the least crop injury was Prowl PPI.*

Very little crop injury was observed for any of the treatments. The POST application of Dacthal had the highest injury, followed by the POST application of Sandea (treatments 8 and 9, Table 1). Injury appeared to be greater for the Dacthal treatment in the sprinkler-incorporated block. Visible injury symptoms to cantaloupe plants disappeared between the 3 and 4.5 WAT evaluations. *Although direct statistical comparison is not appropriate, results suggest that incorporation method may have affected weed control efficacy of treatments but not visible crop injury.*

Results- crop yield

In the mechanically incorporated herbicide treatment block total marketable yield was highest for the Curbit + Prefar, Prowl, and Prefar PPI treatments. Lowest yield was from the Sandea PPI and Dacthal POST treatments. Percentage of culls was highest for the control and lowest for Prowl PPI. Brix was highest for Devrinol, Prowl, and Prefar PPI and lowest for Sandea PPI and the control.

In the sprinkler incorporated treatment block total marketable yield was highest for the Curbit, Curbit + Prefar, and Prowl PPI treatments and lowest for Dacthal POST. Percentage of culls was highest for Dacthal POST and the control and lowest for Prowl PPI. Brix was highest for Prowl PPI and lowest for Sandea PPI and the control.

Yields and brix appeared to be lower for the sprinkler incorporated herbicide treatment block than for the mechanically incorporated block, with brix falling below 10% and yields reduced by almost half. This could be because of differences in the blocks themselves, the incorporation method, or some other reason. A more intensive research approach utilizing rainout shelters could integrate incorporation methods into a single experiment with a split-plot experimental design. This would allow for direct statistical comparison of crop injury, weed control, and yield metrics.

Table 1: Herbicide Trial Treatments for Desert Research and Extension Center Location. Experimental design duplicated in adjacent fields using either mechanical- or sprinkler-incorporation.

Treatment	Herbicide	PRE/POST	Appl. date
1	Curbit PPI 4 pt/A	Pre-plant	4/2/2019
2	Curbit 4 pt/A + Prefar 6 qt/A PPI	Pre-plant	4/2/2019
3	Devrinol PPI 10 pt/A	Pre-plant	4/2/2019
4	Dual Magnum PPI 1 pt/A	Pre-plant	4/2/2019
5	Prowl PPI 3 pt/A	Pre-plant	4/2/2019
6	Prefar PPI 6 qt/A	Pre-plant	4/2/2019
7	Sandea PPI 1 oz/A	Pre-plant	4/2/2019
8	Dacthal POST 4 lb/A	Post-plant 14 d	4/16/2019
9	Sandea POST 1 oz/A	Post-plant 14 d	4/16/2019
10	Untreated control	NA	NA

Table 2A: Crop injury and weed control for *mechanical incorporation* of herbicides on 7 May 2019 (5 WAT for treatments 1-7, 3 WAT for treatments 8-9). Weeds are grass and five most common broadleaf species.

Treatment	Herbicide	Injury	Grass	Pigweed	Malva	Purslane	Goosefoot
1	Curbit PPI 4 pt/A	3.8	97.3	100.0	98.8	100.0	93.8
2	Curbit 4 pt/A + Prefar 6 qt/A PPI	0.0	97.5	100.0	98.8	100.0	97.5
3	Devrinol PPI 10 pt/A	2.5	98.8	97.5	96.3	97.5	58.8
4	Dual Magnum PPI 1 pt/A	5.0	85.0	100.0	100.0	100.0	80.0
5	Prowl PPI 3 pt/A	2.5	98.8	100.0	98.8	100.0	96.3
6	Prefar PPI 6 qt/A	1.3	88.8	100.0	96.3	100.0	87.5
7	Sandea PPI 1 oz/A	0.0	20.0	97.5	92.5	98.8	78.8
8	Dacthal POST 4 lb/A	10.0	0.0	98.8	100.0	100.0	82.5
9	Sandea POST 1 oz/A	8.8	0.0	98.8	98.8	100.0	98.8
10	Untreated control	0.0	0.0	0.0	0.0	0.0	0.0
Mean		3.8	65.1	99.2	99.8	99.6	86.0
LSD 0.05		4.1	12.0	ns	ns	ns	15.3
CV		37.8%	18.5%	1.1%	2.4%	1.0%	6.1%
Treatment F-test		***	***	ns	ns	ns	***

Ratings scale: % crop injury or weed control as compared to untreated control plots.
LSD 0.05 = Least significant difference at 95% confidence level. NS = not significant. --- = not enough data to perform statistical analyses. Treatment 10 (untreated control) not included in analysis.
CV = Coefficient of variation.
F-test *, **, *** significant at 0.05, 0.01, and 0.001 respectively.

Table 2B: Crop injury and weed control for *mechanical incorporation* of herbicides on 17 May 2019 (6.5 WAT for treatments 1-7, 4.5 WAT for treatments 8-9). Weeds are grass and five most common broadleaf species.

Treatment	Herbicide	Injury	Grass	Pigweed	Malva	Purslane	Goosefoot
1	Curbit PPI 4 pt/A	0.0	97.5	98.8	100.0	98.8	96.3
2	Curbit 4 pt/A + Prefar 6 qt/A PPI	0.0	96.3	100.0	100.0	100.0	98.8
3	Devrinol PPI 10 pt/A	0.0	100.0	100.0	98.8	100.0	70.0
4	Dual Magnum PPI 1 pt/A	0.0	87.5	100.0	100.0	100.0	86.3
5	Prowl PPI 3 pt/A	0.0	96.3	100.0	100.0	98.8	93.8
6	Prefar PPI 6 qt/A	0.0	86.3	97.5	100.0	100.0	91.3
7	Sandea PPI 1 oz/A	0.0	0.0	98.8	96.3	96.3	96.3
8	Dacthal POST 4 lb/A	0.0	5.0	100.0	100.0	100.0	92.5
9	Sandea POST 1 oz/A	0.0	0.0	98.8	98.8	100.0	100.0
10	Untreated control	0.0	0.0	0.0	0.0	0.0	0.0
Mean		0.0	63.2	99.3	99.3	99.3	91.7
LSD 0.05		---	6.8	ns	ns	ns	8.8
CV		---	3.7%	0.9%	1.0%	1.0%	3.3%
Treatment F-test		---	***	ns	ns	ns	***

Ratings scale: % crop injury or weed control as compared to untreated control plots.
LSD 0.05 = Least significant difference at 95% confidence level. NS = not significant. --- = not enough data to perform statistical analyses. Treatment 10 (untreated control) not included in analysis.
CV = Coefficient of variation.
F-test *, **, *** significant at 0.05, 0.01, and 0.001 respectively.

Table 2C: Crop injury and weed control for *mechanical incorporation* of herbicides on 24 May 2019 (7.5 WAT for treatments 1-7, 5.5 WAT for treatments 8-9). Weeds are grass and five most common broadleaf species.

Treatment	Herbicide	Injury	Grass	Pigweed	Malva	Purslane	Goosefoot
1	Curbit PPI 4 pt/A	0.0	95.0	100.0	100.0	100.0	98.8
2	Curbit 4 pt/A + Prefar 6 qt/A PPI	0.0	93.8	100.0	100.0	100.0	97.5
3	Devrinol PPI 10 pt/A	0.0	96.3	100.0	97.5	100.0	61.3
4	Dual Magnum PPI 1 pt/A	0.0	82.5	100.0	95.0	100.0	72.5
5	Prowl PPI 3 pt/A	0.0	93.3	97.5	97.5	100.0	95.0
6	Prefar PPI 6 qt/A	0.0	88.8	98.8	99.5	100.0	86.3
7	Sandea PPI 1 oz/A	0.0	0.0	96.3	92.5	97.5	91.3
8	Dacthal POST 4 lb/A	0.0	0.0	100.0	100.0	100.0	85.0
9	Sandea POST 1 oz/A	0.0	0.0	99.5	99.5	99.5	98.8
10	Untreated control	0.0	0.0	0.0	0.0	0.0	0.0
Mean		0.0	61.1	99.1	97.9	99.7	87.4
LSD 0.05		---	6.2	ns	ns	ns	11.5
CV		---	3.5%	1.2%	2.2%	0.8%	4.5%
Treatment F-test		---	***	ns	ns	ns	***

Ratings scale: % crop injury or weed control as compared to untreated control plots.

LSD 0.05 = Least significant difference at 95% confidence level. NS = not significant. --- = not enough data to perform statistical analyses. Treatment 10 (untreated control) not included in analysis.
CV = Coefficient of variation.
F-test *, **, *** significant at 0.05, 0.01, and 0.001 respectively.

Table 2D: Crop injury and weed control for *mechanical incorporation* of herbicides on 4 June 2019 (9 WAT for treatments 1-7, 7 WAT for treatments 8-9). Weeds are grass and five most common broadleaf species.

Treatment	Herbicide	Injury	Grass	Pigweed	Malva	Purslane	Goosefoot
1	Curbit PPI 4 pt/A	0.0	96.0	100.0	100.0	100.0	93.0
2	Curbit 4 pt/A + Prefar 6 qt/A PPI	0.0	96.8	100.0	100.0	100.0	96.0
3	Devrinol PPI 10 pt/A	0.0	95.5	100.0	98.8	100.0	51.3
4	Dual Magnum PPI 1 pt/A	0.0	76.3	100.0	98.8	100.0	62.5
5	Prowl PPI 3 pt/A	0.0	97.5	100.0	98.8	100.0	97.3
6	Prefar PPI 6 qt/A	0.0	83.0	99.8	96.3	100.0	70.0
7	Sandea PPI 1 oz/A	0.0	0.0	98.8	98.8	100.0	72.5
8	Dacthal POST 4 lb/A	0.0	0.0	98.8	100.0	100.0	83.8
9	Sandea POST 1 oz/A	0.0	0.0	100.0	100.0	100.0	98.5
10	Untreated control	0.0	0.0	0.0	0.0	0.0	0.0
Mean		0.0	60.6	99.7	99.0	100.0	80.5
LSD 0.05		---	7.0	ns	ns	---	17.8
CV		---	4.0%	0.6%	1.0%	---	7.6%
Treatment F-test		---	***	ns	ns	---	***

Ratings scale: % crop injury or weed control as compared to untreated control plots.
LSD 0.05 = Least significant difference at 95% confidence level. NS = not significant. --- = not enough data to perform statistical analyses. Treatment 10 (untreated control) not included in analysis.
CV = Coefficient of variation.
F-test *, **, *** significant at 0.05, 0.01, and 0.001 respectively.

Table 3A: Crop injury and weed control for *sprinkler incorporation* of herbicides on 7 May 2019 (5 WAT for treatments 1-7, 3 WAT for treatments 8-9). Weeds are grass and five most common broadleaf species.

Treatment	Herbicide	Injury	Grass	Pigweed	Malva	Purslane	Goosefoot
1	Curbit PPI 4 pt/A	0.0	28.8	98.8	87.5	100.0	78.8
2	Curbit 4 pt/A + Prefar 6 qt/A PPI	1.3	58.8	100.0	81.3	100.0	77.5
3	Devrinol PPI 10 pt/A	0.0	0.0	95.0	80.0	100.0	77.5
4	Dual Magnum PPI 1 pt/A	0.0	38.8	98.8	88.8	100.0	82.5
5	Prowl PPI 3 pt/A	0.0	92.5	100.0	96.3	100.0	88.8
6	Prefar PPI 6 qt/A	0.0	12.5	96.3	91.3	100.0	76.3
7	Sandea PPI 1 oz/A	0.0	25.0	98.8	95.0	100.0	97.5
8	Dacthal POST 4 lb/A	29.5	25.0	98.8	86.3	100.0	85.0
9	Sandea POST 1 oz/A	6.3	0.0	100.0	93.8	100.0	100.0

Treatment	Herbicide	Injury	Grass	Pigweed	Malva	Purslane	Goosefoot
10	Untreated control	0.0	0.0	0.0	0.0	0.0	0.0
Mean		4.1	31.3	98.5	88.9	100.0	84.9
LSD 0.05		ns	41.6	ns	15.2	---	7.3
CV		212.0%	45.7%	1.5%	5.9%	---	2.9%
Treatment F-test		ns	**	ns	***	---	***

Ratings scale: % crop injury or weed control as compared to untreated control plots.
LSD 0.05 = Least significant difference at 95% confidence level. NS = not significant. --- = not enough data to perform statistical analyses. Treatment 10 (untreated control) not included in analysis.
CV = Coefficient of variation.
F-test *, **, *** significant at 0.05, 0.01, and 0.001 respectively.

Table 3B: Crop injury and weed control for *sprinkler incorporation* of herbicides on 17 May 2019 (6.5 WAT for treatments 1-7, 4.5 WAT for treatments 8-9). Weeds are grass and five most common broadleaf species.

Treatment	Herbicide	Injury	Grass	Pigweed	Malva	Purslane	Goosefoot
1	Curbit PPI 4 pt/A	0.0	15.0	72.5	83.8	100.0	73.8
2	Curbit 4 pt/A + Prefar 6 qt/A PPI	0.0	35.0	72.5	92.5	100.0	78.8
3	Devrinol PPI 10 pt/A	0.0	15.0	100.0	85.0	100.0	65.0
4	Dual Magnum PPI 1 pt/A	0.0	27.5	100.0	90.0	100.0	71.3
5	Prowl PPI 3 pt/A	0.0	78.8	100.0	92.5	100.0	78.8
6	Prefar PPI 6 qt/A	0.0	12.5	97.5	91.3	100.0	65.0
7	Sandea PPI 1 oz/A	0.0	25.0	100.0	95.0	100.0	97.5
8	Dacthal POST 4 lb/A	0.0	10.0	100.0	87.5	100.0	81.3
9	Sandea POST 1 oz/A	0.0	0.0	97.5	90.0	100.0	100.0
10	Untreated control	0.0	0.0	25.0	0.0	0.0	0.0
Mean		0.0	24.3	93.3	89.7	100.0	79.0
LSD 0.05		---	36.7	ns	ns	---	17.0
CV		---	51.7%	12.5%	3.5%	---	7.4%
Treatment F-test		---	*	ns	ns	---	**

Ratings scale: % crop injury or weed control as compared to untreated control plots.
LSD 0.05 = Least significant difference at 95% confidence level. NS = not significant. --- = not enough data to perform statistical analyses. Treatment 10 (untreated control) not included in analysis.
CV = Coefficient of variation.
F-test *, **, *** significant at 0.05, 0.01, and 0.001 respectively.

Table 3C: Crop injury and weed control for *sprinkler incorporation* of herbicides on 24 May 2019 (7.5 WAT for treatments 1-7, 5.5 WAT for treatments 8-9). Weeds are grass and five most common broadleaf species.

Treatment	Herbicide	Injury	Grass	Pigweed	Malva	Purslane	Goosefoot
1	Curbit PPI 4 pt/A	0.0	13.8	98.8	82.5	100.0	65.0

Treatment	Herbicide	Injury	Grass	Pigweed	Malva	Purslane	Goosefoot
2	Curbit 4 pt/A + Prefar 6 qt/A PPI	0.0	32.5	96.3	95.0	100.0	73.8
3	Devrinol PPI 10 pt/A	0.0	0.0	97.5	85.0	100.0	56.3
4	Dual Magnum PPI 1 pt/A	0.0	22.5	97.5	75.0	100.0	43.8
5	Prowl PPI 3 pt/A	0.0	53.8	97.5	87.5	100.0	70.0
6	Prefar PPI 6 qt/A	0.0	10.0	98.8	85.0	100.0	57.5
7	Sandea PPI 1 oz/A	0.0	17.5	100.0	97.5	100.0	97.5
8	Dacthal POST 4 lb/A	0.0	3.8	100.0	87.5	100.0	75.0
9	Sandea POST 1 oz/A	0.0	0.0	100.0	86.3	100.0	100.0
10	Untreated control	0.0	0.0	0.0	0.0	0.0	0.0
Mean		0.0	17.1	98.5	86.8	100.0	71.0
LSD 0.05		---	ns	ns	ns	---	21.4
CV		---	71.5%	1.8%	6.5%	---	10.3%
Treatment F-test		---	ns	ns	ns	---	***

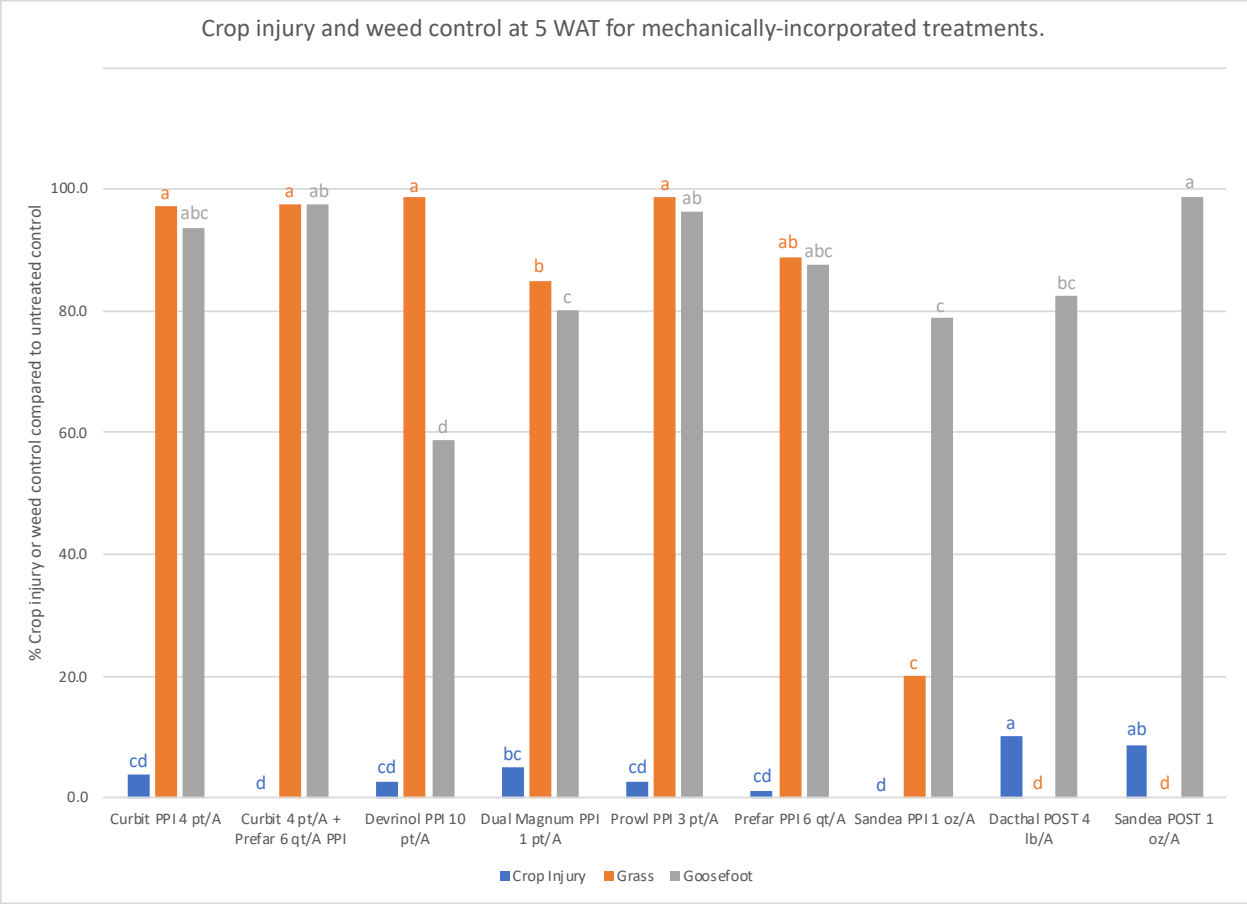
Ratings scale: % crop injury or weed control as compared to untreated control plots.
LSD 0.05 = Least significant difference at 95% confidence level. NS = not significant. --- = not enough data to perform statistical analyses. Treatment 10 (untreated control) not included in analysis.
CV = Coefficient of variation.
F-test *, **, *** significant at 0.05, 0.01, and 0.001 respectively.

Table 3D: Crop injury and weed control for *sprinkler incorporation* of herbicides on 4 June 2019 (9 WAT for treatments 1-7, 7 WAT for treatments 8-9). Weeds are grass and five most common broadleaf species.

Treatment	Herbicide	Injury	Grass	Pigweed	Malva	Purslane	Goosefoot
1	Curbit PPI 4 pt/A	0.0	7.5	100.0	75.0	100.0	43.8
2	Curbit 4 pt/A + Prefar 6 qt/A PPI	0.0	20.0	100.0	85.0	100.0	57.5
3	Devrinol PPI 10 pt/A	0.0	0.0	98.8	85.0	100.0	27.5
4	Dual Magnum PPI 1 pt/A	0.0	10.0	99.8	67.5	100.0	27.5
5	Prowl PPI 3 pt/A	0.0	67.5	99.8	84.5	100.0	61.3
6	Prefar PPI 6 qt/A	0.0	2.5	74.5	80.0	100.0	27.5
7	Sandea PPI 1 oz/A	0.0	10.0	100.0	94.5	100.0	97.5
8	Dacthal POST 4 lb/A	0.0	0.0	100.0	75.0	100.0	68.8
9	Sandea POST 1 oz/A	0.0	0.0	100.0	81.8	100.0	99.0
10	Untreated control	0.0	0.0	0.0	0.0	0.0	0.0
Mean		0.0	13.1	97.0	80.9	100.0	56.7
LSD 0.05		---	25.3	ns	ns	---	25.7
CV		---	66.3%	8.6%	7.9%	---	15.5%
Treatment F-test		---	***	ns	ns	---	***

Ratings scale: % crop injury or weed control as compared to untreated control plots.

LSD 0.05 = Least significant difference at 95% confidence level. NS = not significant. --- = not enough data to perform statistical analyses. Treatment 10 (untreated control) not included in analysis.
CV = Coefficient of variation.
F-test *, **, *** significant at 0.05, 0.01, and 0.001 respectively.



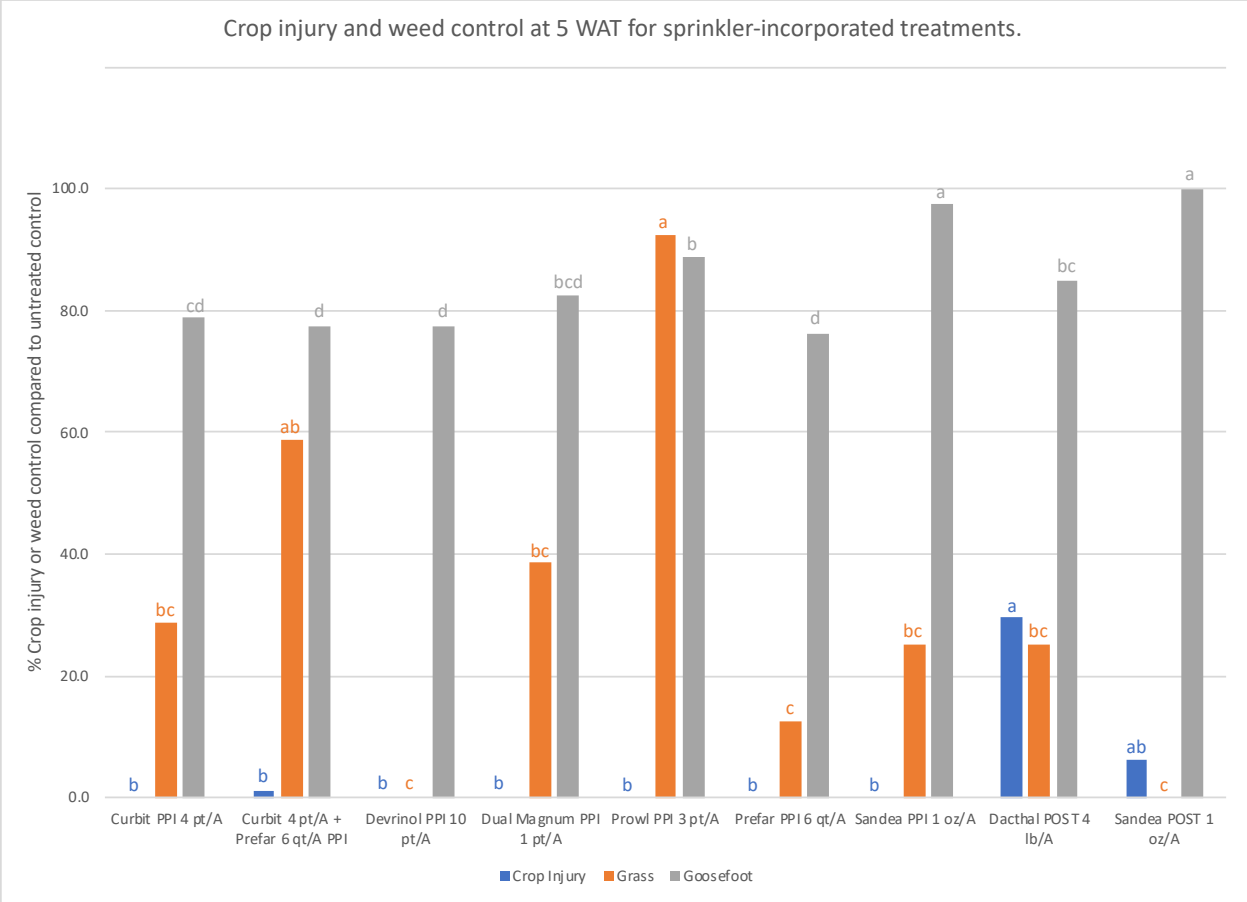


Table 4: Crop yield (cartons/A) and brix by fruit size for *mechanical incorporation* of treatments.

Treatment	Herbicide	S23	S18	S15	S12	S9	TMY	% Culls	% Large	Brix
1	Curbit PPI 4 pt/A	16.6	72.6	101.6	167.9	24.2	366.4	13.4%	28.6%	14.3
2	Curbit 4 pt/A + Prefar 6 qt/A PPI	9.5	115.0	232.4	217.8	242.0	807.2	11.8%	39.7%	14.8
3	Devrinol PPI 10 pt/A	30.8	93.8	159.8	122.6	48.4	424.5	17.1%	22.7%	26.6
4	Dual Magnum PPI 1 pt/A	30.8	90.8	192.4	118.0	66.6	467.7	15.6%	22.3%	17.3
5	Prowl PPI 3 pt/A	33.2	60.5	257.8	195.1	127.1	640.5	3.8%	35.4%	21.4
6	Prefar PPI 6 qt/A	37.9	72.6	214.2	154.3	151.3	592.4	13.8%	32.7%	19.4
7	Sandea PPI 1 oz/A	73.4	54.5	90.7	54.5	30.3	229.9	13.5%	13.9%	12.5
8	Dacthal POST 4 lb/A	59.2	81.7	58.1	59.0	18.2	216.9	26.2%	14.3%	11.0
9	Sandea POST 1 oz/A	49.7	99.8	167.0	90.8	18.2	375.8	12.6%	14.3%	16.9
10	Untreated control	66.3	42.4	105.3	213.3	42.4	403.3	35.4%	24.3%	10.7
Mean		40.7	78.3	157.9	139.3	76.8	452.4	16.3%	24.8%	16.9
LSD 0.05		ns	ns	ns	ns	95.0	290.8	ns	ns	ns
CV		35.6%	34.8%	29.7%	41.8%	42.6%	22.1%	56.0%	30.0%	16.6%
Treatment F-test		ns	ns	ns	ns	***	**	ns	ns	ns

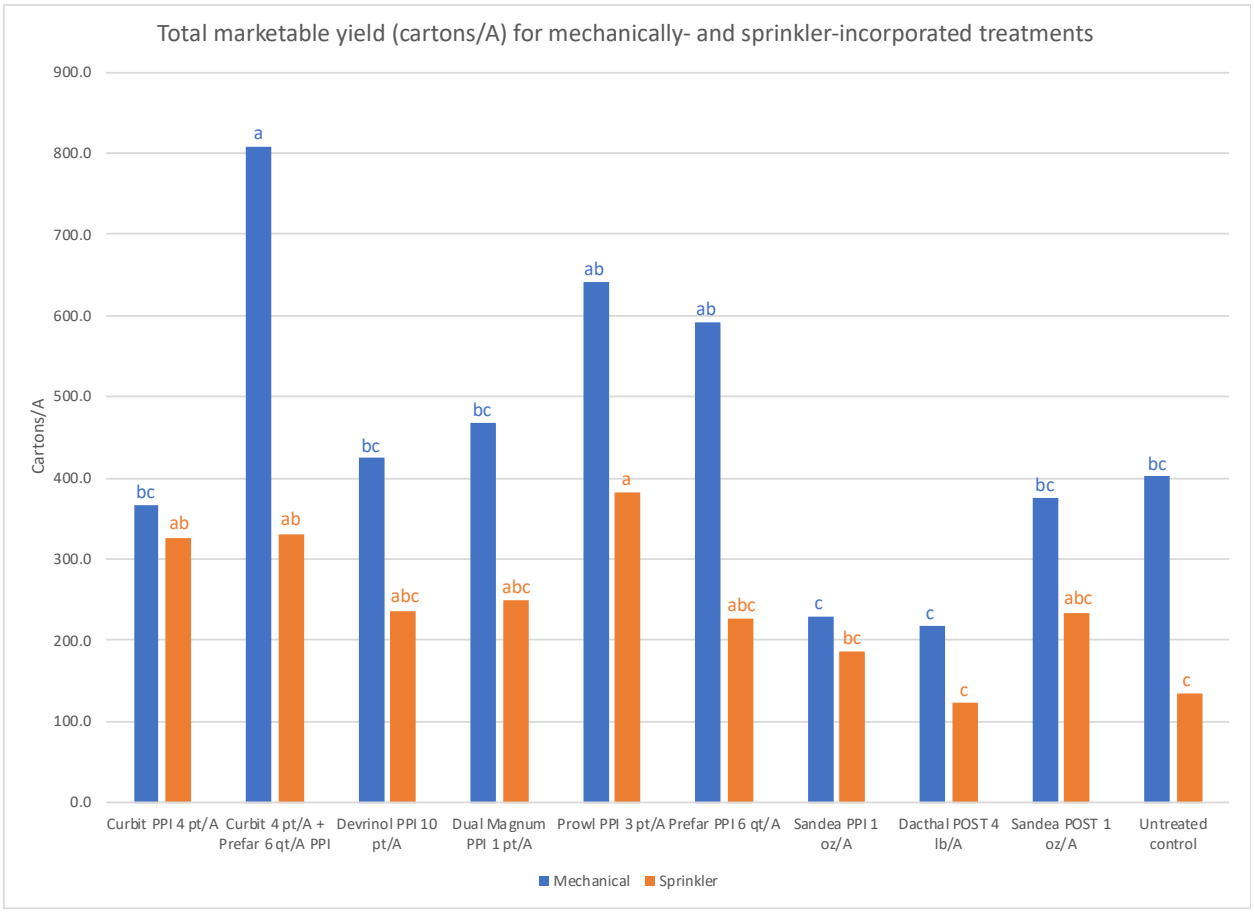
Fruit size listed by number of fruit per carton (e.g., S9 = 9 fruit per carton).
TMY = Total marketable yield (size 9 to 23).

Large fruits are S9 + S12.
Brix listed for large fruits.
LSD 0.05 = Least significant difference at 95% confidence level. NS = not significant. --- = not enough data to perform statistical analyses. Treatment 10 (untreated control) not included in analysis.
CV = Coefficient of variation.
F-test *, **, *** significant at 0.05, 0.01, and 0.001 respectively.

Table 5: Crop yield (cartons/A) and brix by fruit size for *sprinkler incorporation* of treatments.

Treatment	Herbicide	S23	S18	S15	S12	S9	TMY	% Culls	% Large	Brix
1	Curbit PPI 4 pt/A	59.2	54.5	116.2	95.3	60.5	326.4	23.6%	22.3%	14.3
2	Curbit 4 pt/A + Prefar 6 qt/A PPI	66.3	57.5	138.0	86.2	48.4	330.1	38.2%	13.6%	14.9
3	Devrinol PPI 10 pt/A	54.5	36.3	47.2	86.2	66.6	236.3	31.0%	26.1%	9.3
4	Dual Magnum PPI 1 pt/A	30.8	48.4	61.7	72.6	66.6	249.3	27.7%	38.9%	9.9
5	Prowl PPI 3 pt/A	37.9	66.6	94.4	131.6	90.8	383.3	13.4%	39.9%	14.5
6	Prefar PPI 6 qt/A	82.9	45.4	98.0	77.2	6.1	226.6	25.5%	13.3%	9.3
7	Sandea PPI 1 oz/A	78.1	63.5	72.6	49.9	0.0	186.1	24.6%	10.4%	8.0
8	Dacthal POST 4 lb/A	40.3	21.2	54.5	40.9	6.1	122.5	49.3%	10.5%	10.8
9	Sandea POST 1 oz/A	56.8	69.6	79.9	72.6	12.1	234.2	30.7%	14.5%	9.5
10	Untreated control	35.5	48.4	25.4	36.3	24.2	134.3	51.8%	11.4%	9.0
Mean		54.2	51.1	78.8	74.9	38.1	242.9	31.6%	20.1%	11.1
LSD 0.05		ns	ns	ns	ns	ns	ns	ns	ns	ns
CV		37.6%	34.4%	34.6%	48.2%	75.3%	23.4%	33.9%	47.1%	22.3%
Treatment F-test		ns	ns	ns	ns	ns	ns	ns	ns	ns

Fruit size listed by number of fruit per carton (e.g., S9 = 9 fruit per carton).
TMY = Total marketable yield (size 9 to 23).
Large fruits are S9 + S12.
Brix listed for large fruits.
LSD 0.05 = Least significant difference at 95% confidence level. NS = not significant. --- = not enough data to perform statistical analyses. Treatment 10 (untreated control) not included in analysis.
CV = Coefficient of variation.
F-test *, **, *** significant at 0.05, 0.01, and 0.001 respectively.


Total marketable yield (cartons/A) for mechanically- and sprinkler-incorporated treatments
Cartons/A
900.0
800.0
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
bc
ab
a
ab
bc
abc
bc
abc
ab
a
ab
abc
c
bc
c
c
bc
abc
bc
c
Curbit PPI 4 pt/A
Curbit 4 pt/A + Prefar 6 qt/A PPI
Devrinol PPI 10 pt/A
Dual Magnum PPI 1 pt/A
Prowl PPI 3 pt/A
Prefar PPI 6 qt/A
Sandea PPI 1 oz/A
Dacthal POST 4 lb/A
Sandea POST 1 oz/A
Untreated control
Mechanical
Sprinkler