California Melon Research Board Report

Evaluation of plant growth regulator application to concentrate fruit set and reduce the period of melon harvest

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Abstract
As labor becomes more expensive and less available, reduction of the number of harvests represents a potential opportunity to substantially reduce expenses. To do this, it is necessary to concentrate fruit set for a more uniform maturation of the crop. Several plant growth regulators are currently available for increasing yield and quality of other crops. This study represents a screening of several of these materials to evaluate the impact on yield and quality of cantaloupe. On 27 Jun, melon seeds cv. Caribbean Gold were sown into a Panoche clay loam soil at University of California West Side Research and Extension Center. The treatments included the following: **a)** Prestige (CPPU) 5 ppm active ingredient (ai)applied 27 Jul approximately two weeks after first flower, **b)** Retain (AVG) 132 PPM ai applied on 27 Jul, **c)** ProMaxa (NAA) 15 PPM ai - applied after crown and early lateral fruit development on 15 Aug and **d)** ProTone (S-ABA) 150 PPM ai – applied on 15 Aug, and **e)** an untreated control. Yield was generally similar among treatments as were solids and flesh firmness, but plots treated with Retain had numerically higher yields at the first harvest. The ProMaxa treatment had more culls at the first harvest, and there was an apparent difference in the shape of many fruit from ProMaxa plots. There is more work required prior to use in a commercial setting, but it would appear that early applications of Retain may have promise in altering maturity and creating a possibility of a more concentrated fruit set.

Significance, need and benefit to melon industry

For cantaloupe and honeydew melon, harvesting represents the largest labor input. Labor availability at critical periods is decreasing in agricultural areas with concentrations of labor-intensive crops, and cost of agricultural labor has been increasing. Reducing the number of passes through the field without substantial negative impact on yield is highly desirable due to the potential reduction of labor. In addition, concentrating crop maturity may enhance the potential efficiency of mechanical harvest.

Plant growth regulators (PGRs) impact maturation, yield and quality in other crops. The purpose of this study is to screen currently available PGRs for their ability to concentrate cantaloupe fruit set.

Methods

On 27 Jun, Harper type melon cv. Caribbean Gold (Rik Zwaan) seeds were sown into a Panoche clay loam soil at University of California West Side Research and Extension Center. To emergence, the area was sprinkler-irrigated. All irrigations after plant emergence were applied with drip tubbing injected to a 10-inch depth into beds measuring 80 inches center-to-center. Fertilization, irrigation and pest management was like commercial practice.

The treatments included the following: **a)** Prestige (CPPU) 5 ppm active ingredient (ai)applied 27 Jul approximately two weeks after first flower, **b)** Retain (AVG) 132 PPM ai applied on 27 Jul, **c)** ProMaxa (NAA) 15 PPM ai - applied after crown and early lateral fruit development on 15 Aug and **d)** ProTone (S-ABA) 150 PPM ai – applied on 15 Aug. In addition, an untreated control was included. Treatments were arranged in a 4-replicatation randomized complete block design. All materials were applied in the equivalent of 40 gallons per acre. On 18, 20, 22 and 25 Sep; 20 row feet were harvested from each plot of all treatments at estimated maturity. Each fruit was sized by number of fruit per carton (6, 9, 12, 15, 18 and 23) and cull. From each plot on each harvest date, 3 representative marketable fruit were tested for solids and flesh firmness. A factorial Analysis of Variance was performed on the data and Least Significant Difference at a probability of 0.05 ($LSD_{0.05}$)

Results

The plant regulator applications tested under the conditions of this study had yields that were similar to or less than the untreated control (Table 1). Yields were lower in the Prestige-treated plots as compared to Retain, ProTone and the untreated Control. The ProMaxa treated plants had significantly more very large fruit (#6's) and fewer medium sized fruit (#12's) than Retain, ProTone and the untreated control. Soluble solids averaged at 11.29 ^{o}brix and there were no differences among treatments. Flesh firmness average was 5.806 and there were no significant differences among treatments.

Yield was higher at the first harvest generally, and there were greater numbers of large (9's) and medium (12's) sized fruit as compared to the later harvest dates (Table 2). In addition, there were greater numbers of culls at the last harvest.

A significant harvest date x PGR treatment interaction regarding yield (P=0.0017), number of very large (6's) (P=0.050), and medium fruit (12's) (P=0.0157). It is interesting that at the first harvest, the Retain treatment had significantly higher yields than the other PGR treatments, and the yields were numerically higher but not significantly (P=0.05) than the untreated control (Table 3). Most culls were due to malformations causing the fruit to be much wider than tall and to develop lateral lines extending from the stem to the blossom end. This condition was common in the ProMaxa treatment.

While none of the treatments produced striking positive results, the Retain treatment seemed to have a positive impact, but additional work is needed to evaluate timings and the potential of rotations of materials for the purpose of concentrating harvest.

Table 1. Influence of plant growth regulators on yield and quality based on multiple harvests from 18 to 25 Sep 2017

treatments[z]	number of fruit per size category [y]				culls	yield (cartons /acre)	solids (°brix)	firmness (lbf)
	6	9	12	15				
Prestige (CPPU 7.5 ppm)	3.25	10.00	7.25	4.25	8.00	829.9	11.7	6.16
Retain (AVG 132 ppm)	4.25	17.00	13.50	7.00	7.00	1368.5	11.4	5.72
ProMaxa (NAA 15 ppm)	9.50	11.75	3.75	0.75	9.25	1062.2	11.4	5.69
ProTone (S-ABA 150 ppm)	5.50	16.75	15.25	3.25	7.25	1393.4	11.1	5.77
Untreated Control	4.50	14.75	16.75	5.25	7.00	1350.8	10.7	5.69
LSD ($P_{0.05}$)	4.16	NS	6.268	NS	NS	474.21	NS	NS

[z] Prestige and Retain were applied on 27 Jul; ProMaxa and ProTone were applied on 15 Aug.

[y] Number of fruit over all four harvests per 20 ft of an 80-inch bed. Sizing is based on the number of fruit that fit into a carton.

[x] Solids were tested on composite samples from three fruit with a digital refractometer.

[w] Flesh firmness was tested at six points on each of three fruit with a hand held penetrometer.

[v] Numbers that differ by Least Significant Difference at the bottom of the column are significantly different at a probability of 5%.

Table 2. Influence of harvest date on yield and quality over plant growth regulator applications; Sep 2017.

date harvested[z]	number of fruit per size category [y]				culls	yield (cartons /acre)	solids (°brix)	firmness (lbf)
	6	9	12	15				
18 Sep	1.60	5.60	5.00	1.50	1.05	459.2	11.5	5.74
20 Sep	1.65	3.05	2.35	0.55	0.70	276.5	11.5	5.78
22 Sep	1.25	3.50	2.35	1.15	0.45	284.1	11.2	5.91
25 Sep	0.90	1.90	1.60	0.90	2.75	181.1	11.0	5.79
LSD ($P_{0.05}$)	NS	1.372	1.504	NS	1.478	118.9	NS	NS

[z] Harvest was initiated when fruit were fully netted, light green and brix were consistently above 10.

[y] Number of fruit over all four harvests per 20 ft of an 80-inch bed. Sizing is based on the number of fruit that fit into a carton.

[x] Solids were tested on composite samples from three fruit with a digital refractometer.

[w] Flesh firmness was tested at six points on each of three fruit with a hand held penetrometer.

[v] Numbers that differ by Least Significant Difference at the bottom of the column are significantly different at a probability of 5%.

Table 3. Influence of plant growth regulator by harvest date on yield and quality; Sep 2017.

Harvest [z]	PGR treatment[y]	number of fruit per size category [x]				culls	yield (cartons /acre)	dis-torted	rot
		6	9	12	15				
18 Sep	**Prestige**	1.25	2.75	1.50	0.75	0.50	225.06	0.50	0.00
	Retain	2.50	9.25	7.50	4.25	0.25	768.65	0.25	0.25
	ProMaxa	1.50	4.00	1.75	0.25	2.75	279.96	2.75	0.00
	ProTone	0.25	5.00	5.00	0.75	0.25	347.57	0.25	0.00
	Untreated	2.50	7.00	9.25	1.50	1.50	674.72	1.50	0.00
20 Sep	**Prestige**	0.00	1.75	1.00	0.00	1.50	90.75	1.50	0.25
	Retain	1.50	3.25	1.75	1.25	0.25	274.52	0.25	1.50
	ProMaxa	3.00	3.25	1.00	0.00	0.75	308.55	0.75	0.25
	ProTone	2.50	4.00	3.75	1.00	0.00	405.20	0.00	0.25
	Untreated	1.25	3.00	4.25	0.50	1.00	303.56	1.00	0.50
22 Sep	**Prestige**	1.00	3.00	3.00	1.00	0.75	266.80	0.75	0.00
	Retain	0.25	3.00	2.25	0.75	0.00	200.10	0.00	0.00
	ProMaxa	3.50	3.00	1.00	0.00	1.50	326.70	1.50	0.00
	ProTone	1.00	5.25	4.00	1.25	0.00	381.15	0.00	0.00
	Untreated	0.50	3.25	1.50	2.75	0.00	245.93	0.00	0.00
25 Sep	**Prestige**	1.00	2.50	1.75	2.50	0.75	247.29	0.75	0.25
	Retain	0.00	1.50	2.00	0.75	3.25	125.23	3.25	0.00
	ProMaxa	1.50	1.50	0.00	0.50	2.50	147.01	2.50	0.25
	ProTone	1.75	2.50	2.50	0.25	5.50	259.54	5.50	0.00
	Untreated	0.25	1.50	1.75	0.50	1.75	126.60	1.75	0.00
LSD ($P_{0.05}$)[w]		2.081	NS	3.134	NS	2.338	230.11	2.234	0.450

[z] Harvest was initiated when fruit were fully netted, light green and brix were consistently above 10.

[y] Number of fruit over all four harvests per 20 ft of an 80-inch bed. Sizing is based on the number of fruit that fit into a carton.

[x] Prestige and Retain were applied on 27 Jul; ProMaxa and ProTone were applied on 15 Aug. Both were applied in the equivalent of 40 gallons/acre.

[v] Numbers that differ by Least Significant Difference at the bottom of the column are significantly different at a probability of 5%.

x