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PGR Strategies to Increase Yield of 'Hass' Avocado

Continuing Project: Year 2 of 4

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Benefit to the Industry

This research project supports the objectives, expectations and vision of the California avocado industry of increasing grower profitability.

Limited research has been conducted on the use of foliar-applied plant growth regulators in avocado production. This is especially true in California. Over the past 5 years, we have gained experience regarding the response of the 'Hass' avocado to several key commercial PGRs applied at specific stages of tree phenology. Jaime Salvo's and Lauren Garner's dissertation research provide additional basic information to guide our choice of PGR and timing of their application to improve their efficacy in increasing sylleptic shoot growth, fruit size and yield. In addition, we now have data to successfully demonstrate the efficacy of GA_3 and that the cauliflower stage is the best phenological stage for GA_3 application. The next step is to demonstrate that yield or fruit size responds incrementally to increases in GA_3 dose (per Don Koehler, Department of Pesticide Regulation, and reaffirmed by Joe Vandepeute, Don Koehler's replacement).

Objectives

Specific goals of the research project are to increase the productivity of 'Hass' avocado orchards by increasing yield of commerically valuable large size fruit to increase grower income. The project objectives are: (1) to increase yield by annually increasing the number of sylleptic shoots; (2) to increase yield by increasing fruit retention during June drop; (3) to increase fruit size; and (4) to collect dose response data as the next step toward adding avocado to the label for GA_3.

Experimental Plan and Design

All objectives are being met using bearing 'Hass' avocado trees in commercial orchards, one for each objective. The orchards are located in Irvine and Santa Paula. Yield (kg/tree), fruit size distribution (pack out) and fruit quality of 100 randomly selected fruit, including fruit length to width ratio, seed size, flesh width on each side of the seed, flesh quality, days to ripen and peel color, are determined at harvest. Leaves will be collected in September for nutrient analysis (Albion Laboratories). The experimental design is a randomized complete block with 20 individual tree replicates per treatment. There are buffer trees between treated trees and buffer rows between treated rows.

To meet objective 1, Typy (6-BA 1.8% + GA_{4+7} 1.8%) is applied at 0.05% (500 mg/L) and at

0.005% (50 mg/L): *i*) at the initiation of the summer vegetative shoot flush, and *ii*) in winter at stage 5 of inflorescence development when perianth formation is initiated on the secondary and tertiary axes. In addition, at both application times we also tested GA_3 (100 mg/L). Sylleptic and proleptic shoot growth and return bloom (number of indeterminate and determinate floral shoots) will be determined. To meet objective 2, AVG is applied at 250 mg/L *i*) at the cauliflower stage of bloom, *ii*) at full bloom, *iii*) just before June drop starts, and *iv*) at full bloom and again just before June drop starts. To meet objectives 2 and 3, *i*) 2,4-D is applied at 45 g acid equivalents/acre when fruit are 16-20 mm in diameter and *ii*) 3,5,6-TPA is applied at 15 mg/L when fruit are 24 mm in diameter. To meet objective 4, GA_3 is applied at 10, 25, 60 and 120 mg/L at the cauliflower stage of inflorescence development. Untreated trees serve as the control in each experiment. All data are statistically analyzed by analysis of variance using SAS at $P \leq 0.05$.

Summary

Objective 1. Research was initiated in year 1 to meet objective 1 (to increase yield by annually increasing the number of sylleptic shoots). We are conducting this research in the orchard that we are using for the alternate bearing research in Irvine, so that we can treat trees with known cropping histories. The trees in this experiment were all carrying a heavy on-crop to fully test the ability of the treatments to increase sylleptic shoot development and return bloom and yield to mitigate alternate bearing. Also, in addition to Typy (6-BA 1.8% + GA_{4+7} 1.8%) applied at 0.05% (500 mg/L) and at 0.005% (50 mg/L) as indicated in objective 1, we also tested GA_3 at 100 mg/L. GA_3 is known to stimulate vegetative growth and is likely to be registered for use on avocados before other PGRs.

Summer applications of GA_3 (100 mg/L) and Typy (250 mg/L) significantly increased the total number of sylleptic shoots produced by spring, summer and fall flush shoots (P = 0.0022) (Table 1). Typy (250 mg/L) significantly increased the number of sylleptic shoots borne on the fall flush shoots (P = 0.0645). GA_3 (100 mg/L) significantly increased the number of proleptic shoots produced by sylleptic shoots borne on the fall flush shoots (P = 0.0675). The major effect of the treatments was on the fall flush shoots, suggesting that in California, as opposed to Australia, the summer application is too late to increase syllepsis on the summer flush. Also, in contrast to Australia, the winter treatments were totally without effect. Proleptic shoot growth dominated the 2005 spring, summer and fall shoots and was not affected by any PGR treatment (Table 1).

The goal of increasing syllpesis is to increase the complexity of the tree and, thus, increase the number of nodes on which to bear inflorescences the following spring. The summer application of GA_3 (100 mg/L) significantly increased the number of nodes borne on syllpetic shoots produced by the summer flush shoots over some other treatments but not the control (P = 0.0927), whereas Typy (250 mg/L) significantly increased the number of nodes borne on sylleptic shoots produced by fall flush shoots compared to all winter PGR treatments and the control (P = 0.0802) (Table 2). As a result both treatments increased the total number of sylleptic shoots produced by the spring, summer and fall shoot flushes compared to all other treatments including the control (P = 0.0013). The treatments had no effect on the number of nodes on proleptic shoots. Because proleptic shoots dominated, they contributed a greater number of nodes on which to bear inflorescences than syllpetic shoots, 12.8-fold more nodes for the control. This ratio was reduced to only 4.2-fold more nodes per shoot for the trees treated with Typy (250 mg/L) due to the positive effect of this treatment on syllepsis (Table 2). The greatest number of nodes was produced by the summer flush shoots, followed by fall shoots and last spring shoots (Table 2).

Despite the positive treatment effects on the number of sylleptic shoots and total number of nodes on sylleptic shoots, the treatments had no effect on the number of inflorescences that developed in spring 2006 (Table 3). The majority of the inflorescences were produced by proleptic shoots on the fall flush. Indeterminate floral shoots dominated (Tables 4 and 5).

GA_3 (100 mg/L) and Typy (250 mg/L) significantly increased the total number of vegetative shoots produced by sylleptic shoots in the spring, summer and fall shoot flushes compared to the untreated control ($P = 0.0053$) (Table 6). These two treatments also increased the total number of inactive buds on sylleptic shoots of the spring, summer and fall flush shoots ($P = 0.0051$) (Table 7). Typy (250 mg/L) significantly increased the number of vegetative shoots produced by sylleptic shoots of fall flush shoots ($P = 0.0064$), but not the number of inactive buds compared to the control. The greatest number of vegetative shoots and inactive buds were produced by the summer flush shoots (Tables 6 and 7). Thus, the summer applications of GA_3 (100 mg/L) and Typy (250 mg/L) further increased the complexity of the tree. The effect of these treatments on next year's bloom will be of interest.

The effect of the PGR treatments on the existing spring 2005 crop were also tested. Typy (250 mg/L) significantly reduced total yield ($P = 0.0236$) and yield of commercially valuable large size fruit in the combined pool of packing carton sizes 60 + 48 + 40 as kilograms fruit per tree compared to all other treatments, including the control, but not GA_3 (100 mg/L), which resulted in an intermediate total yield and yield of large size fruit ($P = 0.0651$) (Table 8) and as number of fruit per tree ($P = 0.0155$ and $P = 0.0269$, respectivley) (Table 9). In addition, Typy (250 mg/L) significantly reduced the number of fruit per tree greater than packing carton size 60 compared to all other treatments, including the control, but not GA_3 (100 mg/L), which produced an intermediate yield ($P = 0.0365$) (Table 9). No treatment had any effect on any fruit quality parameter evaluated (Table 10).

We are currently counting the number of the summer flush shoots (including sylleptic and proleptic) on the trees in this experiment. Research to meet objective 1 is on schedule.

Objectives 2 and 3. Research to meet objectives 2 and 3 (to increase yield by increasing fruit retention during June drop and to increase fruit size, respectively) is being conducted at a second orchard in Irvine owned by the Irvine Company. For this experiment the crop must be destroyed, so we feel very fortunate to have the cooperation of Jess Ruiz.

In year 1, an off-crop year, no PGR treatment had a positive effect on any yield parameter as kilograms or number of fruit per tree (Tables 11 and 12). However, all AVG treatments significantly reduce the kilograms and number of small fruit (packing carton size 84) compared to the control ($P = 0.0476$). In addition, application of AVG at full bloom and again at the time of exponential increase in fruit size also significantly reduced the kilograms and number of small size fruit of packing carton size 70 compared to the control ($P = 0.0867$). All PGR treatments except 3,5,6-TPA decreased the kilograms and number of small fruit in the combined pool of packing carton sizes 84 + 70 compared to the control (*P* = 0.0082). The 3,5,6-TPA treatment significantly reduced the diameter of the seed without negatively affecting fruit length, fruit width or flesh width compared to fruit from other treatments, including control trees, but not AVG applied at full bloom and again at the time of exponential increase in fruit size, which resulted in an intermediate effect (*P* = 0.0288) (Table 13). No other PGR had any effect on any other fruit quality parameter evaluated (Table 13).

In year 2, an on-crop year, AVG applied at the cauliflower stage of inflorescence development and 2,4-D significantly increased total yield as kilograms fruit per tree (*P* = 0.0561) but not as number of fruit per tree compared to the control, demonstrating that the treatments were increasing fruit size (weight) not fruit set (Tables 14 and 15). All PGR treatments increased the yield of fruit of packing carton size 48 as both kilograms and number per tree compared to the control (*P* = 0.0013), except AVG applied at the time of exponential increase in fruit size which gave an intermediate yield of fruit of size 48. All PGR treatments, except AVG applied at full bloom and again at the time of exponential increase in fruit size, increased the yield of commercially valuable fruit in the combined pool of packing carton sizes 60 + 48 + 40 as kilograms fruit per tree (*P* = 0.0049). In addition, AVG applied at the cauliflower stage or at full bloom and 2,4-D also increased the yield of 60 + 48 + 40 as number of fruit per tree (*P* = 0.0062). AVG applied at the cauliflower stage or at full bloom, 2,4-D and 3,5,6-TPA each significantly increased the yield of fruit greater than size 60 as kilograms fruit per tree compared to the control (*P* = 0.0073). AVG applied at the cauliflower stage of inflorescence development and 2,4-D were the only PGR treatments to also significantly increase the yield of fruit greater than packing carton size 60 as number of fruit per tree compared to the control. No PGR treatment had any effect on any fruit quality parameter evaluated (Table 16).

As 2-year cumulative yield, only 2,4-D significantly increased the yield of fruit of packing carton size 48 (*P* = 0.0222), the combined yield of fruit of packing carton sizes 60 + 48 + 40 ($P \leq$ 0.0625), and the yield of fruit greater than packing carton size 60 ($P \leq 0.0828$) as both kilograms and number of fruit per tree compared to the control (Tables 17 and 18).

When averaged across the 2 years of the experiment, AVG at full bloom, 2,4-D and 3,5,6-TPA significantly increased the yield of fruit of packing carton size 48 as both kilograms (*P* = 0.0050) and number of fruit per tree (*P* = 0.0050) compared to the control for each year of the study (Tables 19 and 20). Only 2,4-D significantly increased the yield of commercially valuable fruit in the combined pool of packing carton sizes 60 + 48 + 40 as both kilograms (*P* = 0.0132) and number of fruit per tree (*P* = 0.0122) compared to the control averaged for the two consecutive years of the experiment. Both AVG applied at full bloom and 2,4-D increased the yield of fruit greater than packing carton size 60 as kilograms per tree compared to the control averaged across the 2 years of the experiment (*P* = 0.0168), but only 2,4-D also increased the yield of fruit greater than packing carton size 60 as number of fruit per tree compared to the control for 2 years (*P* = 0.0118).

In the 2 years of the experiment, year (off- and on-crop) was a significant factor influencing yield and fruit size ($P < 0.0001$), except the yield of fruit of packing carton size 36, 32 and greater than size 32 (Tables 19 and 20). There were also significant interactions between treatment and year (off- or on-crop) related to total yield as kilograms per tree ($P = 0.0953$) and yield of fruit of packing carton 48 ($P = 0.0008$), the combined pool of fruit of packing carton sizes 60 + 48 + 40 ($P \leq 0.0098$) and fruit greater than packing carton size 60 ($P \leq 0.0138$) as both kilograms and number of fruit per tree (Tables 19 and 20).

Averaged across the 2 years of the experiment, no PGR had any effect on any fruit quality parameter evaluated. Year (off- or on-crop) had a significant effect. In the off-crop year (year 1), fruit took fewer days to ripen ($P < 0.0001$), the fruit were wider ($P < 0.0001$), fruit flesh was wider ($P < 0.0001$) and the seed diameter was larger ($P < 0.0001$) than in the following on-crop year. The fruit were harvested 6 weeks earlier in year 1 (an off-crop year) and had greener peels ($P = 0.0003$) and fewer germinated seeds within the fruit ($P = 0.0410$).

AVG applied at the cauliflower stage was not included in year 1 and, thus, could not be included in the statistical analyses of 2-year cumulative yield or 2-year average yield. The research to meet objectives 2 and 3 is on schedule.

Objective 4. To meet objective 4, we obtained an orchard in Santa Paula from the Limoneira Company. However, due to the rain last year, we could not apply the PGR treatments at the proper time for objective 4, so we delayed this objective for one year. I received permission from G. Witney to hold my funds and begin this experiment in the spring of 2006. The GA_3 treatments (10, 25, 62.5 and 156 mg/L) were applied at the cauliflower stage of inflorescence development (March 16, 2006). Yield results will be obtained in 2007. After the 1 year delay, this experiment is on schedule.

Take home message. Both GA_3 (100 mg/L) and Typy (250 mg/L) significantly increased the total number of sylleptic shoots, the number of nodes on syllpetic shoots and the number of vegetative shoots produced on sylleptic shoots the following spring, but not the number of inflorescences. The lack of effect on inflorescence number may be due to the fact that it was an on-crop year or due to the fact that the increased number of sylleptic shoots were predominantly on fall flush shoots that might not have transitioned to floral shoots. The goal was to increase syllepsis and the complexity of the tree – two PGR treatments were successful in doing this, but the results also identified ways to improve the results in subsequent years. It is clear that in California even the July application time is too late to influence sylleptic growth on the summer flush. We plan to apply the July treatments one month earlier and to also shift the winter application to a spring application, i.e., after bud break but before the cauliflower stage. The results confirmed that 'Hass' avocado trees in California are strongly proleptic.

The results identified two promising treatments for increasing yield of large size fruit – 2,4-D applied at 45 g acid equivalents/acre when fruit are 16-20 mm in diameter and AVG applied at full bloom. The treatments increased the yield of fruit of packing carton size 48, the combined pool of fruit of packing carton sizes 60 + 48 + 40 and fruit greater than packing carton size 60 as kilograms and/or number per tree. In addition, the single year of harvest data provide evidence that the earlier application of AVG at the cauliflower stage also increases fruit size, perhaps even more effectviely than the full bloom application. These treatments all increased fruit size in the on-crop year only. Thus, an additional alternate bearing cycle is required to confirm the efficacy of the treatments.

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Table 1. Effect of GA_3 and Typy ($BA+GA_{4,7}$) on number of proleptic, sylleptic, and proleptic on sylleptic shoots produced by the 2005 spring, summer and fall shoots of 'Hass' avocado in Irvine, Calif. by spring 2006.

	Proleptic shoots				Sylleptic shoots				Proleptic on sylleptic shoots				All shoots			
Treatment (mg/L)	Spring	Summer	Fall	Total	Spring	Summer	Fall	Total	Spring	Summer	Fall	Total	Spring	Summer	Fall	Total
	No. shoots/spring, summer or fall shoot															
July application																
GA_3 (100)	2.1	3.8	3.7	9.6	0.1	1.6	1.1 ab[z]	2.7 a	0.0	0.0	0.5 a	0.5	2.2	5.4	5.2	12.7
Typy (50)	2.0	3.5	5.0	10.4	0.1	0.5	0.8 ab	1.3 b	0.0	0.1	0.1 b	0.2	2.1	4.0	5.8	11.8
Typy (250)	1.9	3.9	4.1	9.8	0.2	1.0	1.6 a	2.8 a	0.0	0.1	0.1 b	0.1	2.1	4.9	5.7	12.6
January application																
GA_3 (100)	1.4	4.2	5.6	11.1	0.1	0.6	0.6 b	1.2 b	0.0	0.1	0.1 b	0.2	1.4	4.8	6.2	12.4
Typy (50)	2.0	4.2	4.4	10.6	0.0	0.7	0.4 b	1.1 b	0.0	0.0	0.1 b	0.1	2.0	4.9	4.9	11.8
Control	1.4	3.8	5.6	10.8	0.0	0.8	0.5 b	1.2 b	0.0	0.1	0.1 b	0.2	1.4	4.6	6.2	12.1
P-value	0.2439	0.7329	0.1977	0.5013	0.4221	0.1319	0.0645	0.0022	.	0.8561	0.0675	0.1621	0.2706	0.4661	0.7630	0.9028

[z] Values in a vertical column followed by different letters are significantly different at specified *P* levels by Fisher's Protected LSD Test.

Table 2. Effect of GA_3 and Typy ($BA+GA_{4,7}$) on number of nodes on proleptic, sylleptic, and proleptic on sylleptic shoots produced by the 2005 spring, summer and fall shoots of 'Hass' avocado in Irvine, Calif. by spring 2006.

	Proleptic shoots				Sylleptic shoots				Proleptic on sylleptic shoots				All shoots			
Treatment (mg/L)	Spring	Summer	Fall	Total	Spring	Summer	Fall	Total	Spring	Summer	Fall	Total	Spring	Summer	Fall	Total
	No. nodes/spring, summer or fall shoot															
July application																
GA_3 (100)	20.2	34.6	22.0	76.7	0.4	10.3 a	5.1 ab[z]	15.8 a	0.0	0.0	2.9	2.9	20.6	44.9	29.9	95.3
Typy (50)	19.3	29.7	30.4	79.4	0.7	3.0 b	4.5 ab	8.1 b	0.0	0.4	0.6	1.0	20.0	33.1	35.5	88.5
Typy (250)	17.4	34.4	24.1	75.9	1.6	8.5 ab	7.9 a	18.0 a	0.0	0.2	0.3	0.5	19.0	43.0	32.3	94.3
January application																
GA_3 (100)	12.6	37.0	34.8	84.4	0.4	3.3 b	3.1 b	6.7 b	0.0	0.4	0.6	1.0	13.0	40.7	38.5	92.1
Typy (50)	20.1	36.4	25.7	82.1	0.0	4.5 ab	1.9 b	6.4 b	0.0	0.0	0.4	0.4	20.1	40.8	27.9	88.8
Control	14.0	35.1	32.4	81.5	0.0	4.8 ab	2.1 b	6.9 b	0.0	0.2	0.9	1.1	14.0	40.1	35.3	89.4
P-value	0.3565	0.7429	0.1759	0.8441	0.4577	0.0927	0.0802	0.0013	.	0.7788	0.1568	0.2769	0.3885	0.3883	0.5998	0.9133

[z] Values in a vertical column followed by different letters are significantly different at specified *P* levels by Fisher's Protected LSD Test.

Table 3. Effect of GA_3 and Typy ($BA+GA_{4,7}$) on number of inflorescences on proleptic, sylleptic, and proleptic on sylleptic shoots produced by the 2005 spring, summer and fall shoots of 'Hass' avocado in Irvine, Calif. in spring 2006.

	Proleptic shoots				Sylleptic shoots				Proleptic on sylleptic shoots				All shoots			
Treatment (mg/L)	Spring	Summer	Fall	Total	Spring	Summer	Fall	Total	Spring	Summer	Fall	Total	Spring	Summer	Fall	Total
	No. inflorescences/spring, summer or fall shoot															
July application																
GA_3 (100)	0.0	1.1	1.1	2.1	0.0	0.5	0.1	0.6	0.0	0.0	0.1	0.1	0.0	1.6	1.2	2.7
Typy (50)	0.1	0.6	0.8	1.4	0.1	0.1	0.3	0.4	0.0	0.0	0.0	0.0	0.1	0.7	1.1	1.8
Typy (250)	0.0	0.6	1.5	2.1	0.0	0.0	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.6	1.8	2.4
January application																
GA_3 (100)	0.1	0.7	1.5	2.3	0.0	0.2	0.2	0.4	0.0	0.0	0.0	0.0	0.1	0.9	1.7	2.7
Typy (50)	0.1	0.5	1.2	1.8	0.0	0.2	0.1	0.3	0.0	0.0	0.0	0.0	0.1	0.7	1.3	2.0
Control	0.2	0.7	1.3	2.1	0.0	0.3	0.3	0.5	0.0	0.0	0.0	0.0	0.2	0.9	1.5	2.6
P-value	0.4876	0.9310	0.9162	0.9578	0.4221	0.3133	0.7425	0.9051	.	.	0.4221	0.4221	0.4801	0.6708	0.9248	0.9558

Table 4. Effect of GA_3 and Typy ($BA+GA_{4,7}$) on number of indeterminate inflorescences on proleptic, sylleptic, and proleptic on sylleptic shoots produced by the 2005 spring, summer and fall shoots of 'Hass' avocado in Irvine, Calif. in spring 2006.

	Proleptic shoots				Sylleptic shoots				Proleptic on sylleptic shoots				All shoots			
Treatment (mg/L)	Spring	Summer	Fall	Total	Spring	Summer	Fall	Total	Spring	Summer	Fall	Total	Spring	Summer	Fall	Total
	No. indeterminate inflorescences/spring, summer or fall shoot															
July application																
GA_3 (100)	0.0	1.0	1.0	2.0	0.0	0.5	0.1	0.5	0.0	0.0	0.1	0.1	0.0	1.5	1.1	2.6
Typy (50)	0.1	0.4	0.8	1.2	0.1	0.1	0.3	0.4	0.0	0.0	0.0	0.0	0.1	0.5	1.1	1.6
Typy (250)	0.0	0.5	1.3	1.8	0.0	0.0	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.5	1.5	2.0
January application																
GA_3 (100)	0.1	0.7	1.5	2.3	0.0	0.2	0.2	0.4	0.0	0.0	0.0	0.0	0.1	0.9	1.7	2.6
Typy (50)	0.1	0.3	1.2	1.6	0.0	0.2	0.1	0.2	0.0	0.0	0.0	0.0	0.1	0.5	1.3	1.8
Control	0.1	0.5	1.2	1.8	0.0	0.3	0.3	0.5	0.0	0.0	0.0	0.0	0.1	0.8	1.5	2.3
P-value	0.6481	0.6226	0.9227	0.8508	0.4221	0.2712	0.6772	0.7176	.	.	0.4221	0.4221	0.5583	0.3702	0.9401	0.8639

Table 5. Effect of GA_3 and Typy ($BA+GA_{4,7}$) on number of determinate inflorescences on proleptic, sylleptic, and proleptic on sylleptic shoots produced by the 2005 spring, summer and fall shoots of 'Hass' avocado in Irvine, Calif. in spring 2006.

	Proleptic shoots				Sylleptic shoots				Proleptic on sylleptic shoots				All shoots			
Treatment (mg/L)	Spring	Summer	Fall	Total	Spring	Summer	Fall	Total	Spring	Summer	Fall	Total	Spring	Summer	Fall	Total
	No. determinate inflorescences/spring, summer or fall shoot															
July application																
GA_3 (100)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Typy (50)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Typy (250)	0.0	0.1	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2
January application																
GA_3 (100)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Typy (50)	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Control	0.0	0.1	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2
P-value	.	0.2205	0.5294	0.2055	.	.	0.4221	0.4221	.	.	.	.	.	0.2205	0.6583	0.3184

Table 6. Effect of GA_3 and Typy ($BA+GA_{4,7}$) on number of vegetative shoots on proleptic, sylleptic, and proleptic on sylleptic shoots produced by the 2005 spring, summer and fall shoots of 'Hass' avocado in Irvine, Calif. in spring 2006.

	Proleptic shoots				Sylleptic shoots				Proleptic on sylleptic shoots				All shoots			
Treatment (mg/L)	Spring	Summer	Fall	Total	Spring	Summer	Fall	Total	Spring	Summer	Fall	Total	Spring	Summer	Fall	Total
	No. vegetative shoots/spring, summer or fall shoot															
July application																
GA_3 (100)	3.1	6.2	2.6	11.8	0.1	1.0	0.9 ab[z]	2.0 ab	0	0.0	0.3	0.3	3.1	7.2	3.8	14.1
Typy (50)	3.2	5.6	3.6	12.3	0.0	0.3	0.5 bc	0.8 bc	0	0.1	0.1	0.1	3.2	5.9	4.1	13.2
Typy (250)	3.6	6.4	2.7	12.6	0.0	1.2	1.5 a	2.7 a	0	0.0	0.1	0.1	3.6	7.5	4.2	15.3
January application																
GA_3 (100)	2.4	7.0	3.8	13.2	0.0	0.3	0.4 bc	0.7 c	0	0.1	0.1	0.2	2.4	7.4	4.3	14.1
Typy (50)	2.8	6.4	2.8	12.0	0.0	1.0	0.1 c	1.0 bc	0	0.0	0.1	0.1	2.8	7.4	2.9	13.1
Control	2.5	6.7	4.6	13.8	0.0	0.5	0.2 bc	0.7 c	0	0.0	0.2	0.2	2.5	7.2	4.9	14.6
P-value	0.7987	0.7927	0.1250	0.7642	0.4221	0.3876	0.0064	0.0053	.	0.5583	0.5701	0.6583	0.7958	0.7743	0.5891	0.7882

[z] Values in a vertical column followed by different letters are significantly different at specified *P* levels by Fisher's Protected LSD Test.

Table 7. Effect of GA_3 and Typy ($BA+GA_{4,7}$) on number of inactive buds on proleptic, sylleptic, and proleptic on sylleptic shoots produced by the 2005 spring, summer and fall shoots of 'Hass' avocado in Irvine, Calif. in spring 2006.

	Proleptic shoots				Sylleptic shoots				Proleptic on sylleptic shoots				All shoots			
Treatment (mg/L)	Spring	Summer	Fall	Total	Spring	Summer	Fall	Total	Spring	Summer	Fall	Total	Spring	Summer	Fall	Total
	No. inactive buds/spring, summer or fall shoot															
July application																
GA_3 (100)	11.7	26.5	19.2	57.4	0.5	9.1 a[z]	3.8	13.4 ab	0.0	0.0	2.5 a	2.5	12.2	35.6	25.5	73.2
Typy (50)	12.7	20.6	25.6	58.9	0.6	2.9 b	3.3	6.7 bc	0.0	0.4	0.6 b	1.0	13.3	23.8	29.5	66.6
Typy (250)	12.5	27.5	22.3	62.3	1.5	8.2 ab	6.1	15.8 a	0.0	0.2	0.3 b	0.5	14.0	35.9	28.7	78.5
January application																
GA_3 (100)	7.6	25.9	29.6	63.1	0.4	3.0 b	2.6	5.9 c	0.0	0.4	0.4 b	0.8	8.0	29.2	32.6	69.7
Typy (50)	13.8	27.8	23.6	65.2	0.0	3.9 ab	2.1	5.9 c	0.0	0.0	0.4 b	0.4	13.8	31.7	26.0	71.4
Control	7.0	25.0	24.7	56.7	0.0	3.7 ab	1.7	5.4 c	0.0	0.3	0.4 b	0.7	7.0	29.0	26.8	62.7
P-value	0.1924	0.6935	0.5287	0.7953	0.6261	0.1047	0.1823	0.0051	.	0.8095	0.0765	0.1914	0.2034	0.2699	0.8429	0.4523

[z] Values in a vertical column followed by different letters are significantly different at specified *P* levels by Fisher's Protected LSD Test.

Table 8. Effect of GA_3 and Typy ($BA+GA_{4,7}$) on harvest of 'Hass' avocado in Irvine, Calif. on 14 June 2006.

		Packing carton size										
Treatment (mg/L)	Total	84	70	60	48	40	36	32	> 32	60+48+40	84+70	> 60
	Total kg/tree											
July application												
GA_3 (100)	69.42 ab[z]	2.80	8.71	16.63 ab	28.12	10.93	1.66	0.50	0.06	55.68 ab	11.51	57.91
Typy (50)	76.73 a	2.80	9.90	21.55 a	31.27	10.65	0.50	0.06	0.00	63.47 a	12.71	64.02
Typy (250)	61.72 b	2.18	6.24	13.95 b	27.76	10.04	1.05	0.45	0.04	51.75 b	8.42	53.30
January application												
GA_3 (100)	77.46 a	2.21	10.70	20.73 a	32.45	10.15	0.96	0.26	0.00	63.34 a	12.90	64.56
Typy (50)	79.79 a	2.98	9.04	19.96 a	35.17	11.43	0.86	0.35	0.00	66.56 a	12.02	67.77
Control	78.76 a	2.79	9.55	21.03 a	33.64	10.22	1.37	0.16	0.00	64.89 a	12.34	66.42
P-value	0.0236	0.8207	0.3497	0.0318	0.2435	0.9961	0.6395	0.8281	0.5502	0.0651	0.5206	0.1082

[z] Values in a vertical column followed by different letters are significantly different at specified *P* levels by Fisher's Protected LSD Test.

Table 9. Effect of GA_3 and Typy ($BA+GA_{4,7}$) on harvest of 'Hass' avocado in Irvine, Calif. on 14 June 2006.

Treatment (mg/L)	Total	Packing carton size: 84	70	60	48	40	36	32	> 32	60+48+40	84+70	> 60
	Total fruit no./tree											
July application												
GA_3 (100)	325 ab[z]	24	56	85 ab	117	37	5	1	0	239 bc	80	245 ab
Typy (50)	365 a	24	64	111 a	130	36	2	0	0	276 ab	88	278 a
Typy (250)	284 b	19	40	72 b	115	34	3	1	0	221 c	59	225 b
January application												
GA_3 (100)	366 a	19	69	106 a	135	34	3	1	0	275 ab	88	279 a
Typy (50)	374 a	26	58	102 a	146	38	3	1	0	287 a	84	290 a
Control	371 a	24	61	108 a	140	34	4	0	0	282 ab	85	286 a
P-value	0.0155	0.8207	0.3497	0.0318	0.2435	0.9961	0.6395	0.8281	0.5502	0.0269	0.5667	0.0365

[z] Values in a vertical column followed by different letters are significantly different at specified *P* levels by Fisher's Protected LSD Test.

Table 10. Effect of GA_3 and Typy ($BA+GA_{4,7}$) on fruit quality parameters[z] of 'Hass' avocado in Irvine, Calif. on 14 June 2006.

Treatment (mg/L)	Days to ripen	Fruit length	Fruit width	Seed diameter	Flesh width	Peel color	Flesh quality: Vascularization	Discoloration	Decay	Seed germination
July application										
GA_3 (100)	12.8	101.00	68.34	38.62	29.71	4.0	0.9	0.6	0.1	0.6
Typy (50)	13.0	99.86	67.82	37.31	30.51	3.9	0.4	0.2	0.0	0.6
Typy (250)	12.6	103.74	69.41	38.13	31.28	4.0	0.5	0.6	0.0	0.9
January application										
GA_3 (100)	12.9	103.38	68.43	37.94	30.67	3.9	0.6	0.5	0.1	0.5
Typy (50)	12.7	102.14	67.61	38.23	29.38	3.9	0.5	0.3	0.1	0.8
Control	12.8	100.78	68.87	38.14	30.73	3.9	0.7	0.3	0.1	0.5
P-value	0.9821	0.4404	0.5304	0.8087	0.2723	0.7433	0.4163	0.1776	0.6314	0.6536

[z] When ripe, internal fruit quality was evaluated for abnormalities and discoloration. Vascularization (presence of vascular bundles and associated fibers) of the flesh was also determined. The internal fruit quality parameters were visually rated on a scale from 0 (normal) to 4 (high incidence of abnormalities, discoloration, or vascularization).

Table 11. Effect of AVG, 2,4-D and 3,5,6-TPA on harvest of 'Hass' avocado in Irvine, Calif. in 2005.

		Packing carton size										
Treatment	Total	84	70	60	48	40	36	32	> 32	60+48+40	84+70	> 60
	Total kg/tree											
AVG												
Cauliflower stage	–	–	–	–	–	–	–	–	–	–	–	–
Full bloom (*a*)	9.91	0.00 b[z]	0.05 abc	0.18	1.82	5.01	2.10	0.64	0.09	7.02	0.05 bc	9.86
Exp. Fruit growth (*b*)	7.61	0.00 b	0.04 abc	0.19	1.85	3.69	1.11	0.64	0.08	5.74	0.04 bc	7.57
(*a*) + (*b*)	7.93	0.00 b	0.02 c	0.28	1.77	3.48	1.58	0.62	0.19	5.53	0.02 c	7.92
2,4-D	6.07	0.00 b	0.02 bc	0.14	0.90	2.83	1.31	0.79	0.09	3.87	0.02 c	6.05
3,5,6-TPA	7.71	0.02 ab	0.11 a	0.63	1.80	2.97	1.10	0.77	0.32	5.40	0.13 ab	7.58
Control	8.32	0.05 a	0.10 ab	0.62	3.20	3.35	0.59	0.38	0.04	7.16	0.15 a	8.17
P-value	0.8913	0.0476	0.0867	0.2028	0.3412	0.7447	0.1602	0.8290	0.5784	0.8088	0.0120	0.8914

[z] Values in a vertical column followed by different letters are significantly different at specified *P* levels by Fisher's Protected LSD Test.

Table 12. Effect of AVG, 2,4-D and 3,5,6-TPA on harvest of 'Hass' avocado in Irvine, Calif. in 2005.

		Packing carton size										
Treatment	Total	84	70	60	48	40	36	32	> 32	60+48+40	84+70	> 60
	Total fruit no./tree											
AVG												
Cauliflower stage	–	–	–	–	–	–	–	–	–	–	–	–
Full bloom (*a*)	33.80	0.00 b[z]	0.32 abc	0.95	7.56	16.85	6.19	1.71	0.21	25.36	0.32 bc	33.48
Exp. Fruit growth (*b*)	26.52	0.00 b	0.27 abc	0.98	7.69	12.41	3.25	1.71	0.20	21.08	0.27 bc	26.24
(*a*) + (*b*)	27.31	0.00 b	0.10 c	1.41	7.34	11.70	4.65	1.65	0.45	20.45	0.10 c	27.21
2,4-D	20.26	0.00 b	0.16 bc	0.73	3.73	9.50	3.86	2.09	0.20	13.95	0.16 c	20.10
3,5,6-TPA	27.56	0.15 ab	0.71 a	3.23	7.45	9.98	3.24	2.04	0.76	20.67	0.86 ab	26.70
Control	31.57	0.41 a	0.65 ab	3.17	13.27	11.24	1.74	1.00	0.10	27.68	1.06 a	30.52
P-value	0.8726	0.0476	0.0867	0.2028	0.3412	0.7447	0.1602	0.8290	0.5784	0.7846	0.0082	0.8812

[z] Values in a vertical column followed by different letters are significantly different at specified *P* levels by Fisher's Protected LSD Test.

Table 13. Effect of AVG, 2,4-D and 3,5,6-TPA on fruit quality parameters[z] of ‘Hass’ avocado in Irvine, Calif. in 2005.

Treatment	Days to ripen	Fruit length	Fruit width	Seed diameter	Flesh width	Peel color	Flesh quality: Vascularization	Flesh quality: Discoloration	Flesh quality: Decay	Seed germination
AVG										
Cauliflower stage	–	–	–	–	–	–	–	–	–	–
Full bloom (*a*)	9.5	98.93	72.24	39.75 a[y]	32.50	3.7	0.6	0.4	0.3	0.5
Exp. Fruit growth (*b*)	9.5	99.89	73.11	40.45 a	32.67	3.7	0.5	0.1	0.1	0.4
(*a*) + (*b*)	9.6	100.47	73.21	38.73 ab	34.48	3.7	0.5	0.4	0.4	0.5
2,4-D	9.7	99.99	73.55	40.34 a	33.17	3.8	0.8	0.2	0.2	0.5
3,5,6-TPA	9.9	99.44	71.79	37.63 b	34.16	3.7	0.6	0.4	0.3	0.3
Control	9.6	97.53	72.30	39.48 a	32.81	3.7	0.6	0.3	0.2	0.4
P-value	0.7464	0.7901	0.5209	0.0288	0.1589	0.9409	0.6697	0.4678	0.3951	0.9723

[z] When ripe, internal fruit quality was evaluated for abnormalities and discoloration. Vascularization (presence of vascular bundles and associated fibers) of the flesh was also determined. Fruit quality parameters were visually rated on a scale from 0 (green peel or normal, respectively) to 4 (black peel or high incidence of vascularization, discoloration or decay, respectivley).

[y] Values in a vertical column followed by different letters are significantly different at specified *P* levels by Fisher’s Protected LSD Test.

Table 14. Effect of AVG, 2,4-D and 3,5,6-TPA on harvest of ‘Hass’ avocado in Irvine, Calif. in 2006.

		Packing carton size										
Treatment	Total	84	70	60	48	40	36	32	> 32	60+48+40	84+70	> 60
	Total kg/tree											
AVG												
Cauliflower stage	104.56 ab[z]	5.20	22.85	32.72	33.86 b	8.38	1.20	0.23	0.12	74.96 ab	28.05	76.51 ab
Full bloom (*a*)	88.78 bc	2.57	13.70	25.03	33.55 b	11.99	1.63	0.27	0.04	70.57 b	16.27	72.51 b
Exp. Fruit growth (*b*)	95.54 abc	4.82	20.29	28.19	30.35 bc	9.82	1.46	0.41	0.20	68.36 b	25.11	70.43 bc
(*a*) + (*b*)	87.63 bc	3.94	17.05	23.97	31.32 b	9.42	1.48	0.46	0.00	64.70 bc	20.99	66.64 bc
2,4-D	110.38 a	4.16	17.25	32.64	46.50 a	8.68	0.99	0.16	0.00	87.82 a	21.40	88.98 a
3,5,6-TPA	88.42 bc	2.52	12.64	22.38	33.08 b	14.05	2.22	0.92	0.61	69.50 b	15.16	73.26 ab
Control	82.13 c	6.17	21.45	25.10	19.32 c	6.86	1.82	1.16	0.25	51.28 c	27.62	54.51 c
P-value	0.0561	0.2497	0.2792	0.2051	0.0013	0.3709	0.9411	0.4009	0.5999	0.0049	0.2256	0.0073

[z] Values in a vertical column followed by different letters are significantly different at specified *P* levels by Fisher’s Protected LSD Test.

Table 15. Effect of AVG, 2,4-D and 3,5,6-TPA on harvest of 'Hass' avocado in Irvine, Calif. in 2006.

Treatment	Total	Packing carton size 84	70	60	48	40	36	32	> 32	60+48+40	84+70	> 60
	Total fruit no./tree											
AVG												
Cauliflower stage	532	45	146	168	141 b[z]	28	4	1	0	336 ab	191	341 ab
Full bloom (*a*)	423	22	88	128	139 b	40	5	1	0	308 b	110	313 bc
Exp. Fruit growth (*b*)	481	41	130	145	126 bc	33	4	1	0	304 bc	171	309 bc
(*a*) + (*b*)	433	34	109	123	130 b	32	4	1	0	285 bc	143	290 bc
2,4-D	539	36	111	167	193 a	29	3	0	0	390 a	146	393 a
3,5,6-TPA	412	22	81	115	137 b	47	7	2	1	299 bc	103	310 bc
Control	431	53	137	129	80 c	23	5	3	1	232 c	190	241 c
P-value	0.1349	0.2497	0.2792	0.2051	0.0013	0.3709	0.9411	0.4009	0.5999	0.0062	0.2176	0.0066

[z] Values in a vertical column followed by different letters are significantly different at specified *P* levels by Fisher's Protected LSD Test.

Table 16. Effect of AVG, 2,4-D and 3,5,6-TPA on fruit quality parameters[z] of 'Hass' avocado in Irvine, Calif. in 2006.

Treatment	Days to ripen	Fruit length	Fruit width	Seed diameter	Flesh width	Peel color	Flesh quality: Vascularization	Discoloration	Decay	Seed germination
AVG										
Cauliflower stage	11.0	95.24	64.95	34.69	30.26	3.9	0.6	0.3	0.2	0.8
Full bloom (*a*)	10.9	94.87	67.01	35.95	31.06	3.9	0.2	0.1	0.1	0.7
Exp. Fruit growth (*b*)	10.5	97.56	67.30	36.56	30.74	3.9	0.5	0.2	0.1	0.6
(*a*) + (*b*)	10.7	97.73	66.70	35.34	31.35	3.9	0.4	0.3	0.1	0.5
2,4-D	10.8	97.12	65.59	34.92	30.66	3.8	0.6	0.4	0.2	0.4
3,5,6-TPA	11.0	99.74	67.63	35.74	31.89	3.9	0.8	0.5	0.3	0.8
Control	10.2	97.12	66.08	35.14	30.94	3.8	0.4	0.2	0.1	0.8
P-value	0.6015	0.4842	0.5299	0.6542	0.7203	0.4078	0.4737	0.1207	0.4222	0.7327

[z] When ripe, internal fruit quality was evaluated for abnormalities and discoloration. Vascularization (presence of vascular bundles and associated fibers) of the flesh was also determined. Fruit quality parameters were visually rated on a scale from 0 (green peel or normal, respectively) to 4 (black peel or high incidence of vascularization, discoloration or decay, respectivley).

Table 17. Effect of AVG, 2,4-D and 3,5,6-TPA on 2-year cumulative harvest of 'Hass' avocado in Irvine, Calif. in 2005-2006.

Treatment	Total	Packing carton size										
		84	70	60	48	40	36	32	> 32	60+48+40	84+70	> 60
	Total kg/tree											
AVG												
Full bloom (*a*)	98.30	1.99	11.01	20.40	32.85 ab[z]	22.83	6.94	2.22	0.07	76.08 ab	13.00	85.30 ab
Exp. Fruit growth (*b*)	103.77	4.08	16.09	23.40	31.50 b	20.88	5.05	2.27	0.50	75.78 ab	20.18	83.60 ab
(*a*) + (*b*)	94.95	3.28	14.21	20.96	30.53 b	17.63	5.66	2.30	0.40	69.11 b	17.49	77.46 b
2,4-D	116.02	3.64	14.67	28.56	43.65 a	17.97	4.82	2.40	0.31	90.18 a	18.31	97.72 a
3,5,6-TPA	95.79	2.21	10.96	20.26	32.87 ab	20.29	5.59	2.67	0.95	73.42 ab	13.17	82.62 ab
Control	90.89	5.31	17.32	21.55	23.61 b	15.74	4.18	2.68	0.51	60.90 b	22.63	68.26 b
P-value	0.2344	0.1257	0.5037	0.3737	0.0222	0.5955	0.7131	0.9961	0.7875	0.0625	0.3375	0.0828

[z] Values in a vertical column followed by different letters are significantly different at specified *P* levels by Fisher's Protected LSD Test.

Table 18. Effect of AVG, 2,4-D and 3,5,6-TPA on 2-year cumulative harvest of 'Hass' avocado in Irvine, Calif. in 2005-2006.

Treatment	Total	Packing carton size										
		84	70	60	48	40	36	32	> 32	60+48+40	84+70	> 60
	Total fruit no./tree											
AVG												
Full bloom (*a*)	432	17	71	105	136 ab[z]	77	20	6	0	318 ab	88	344 ab
Exp. Fruit growth (*b*)	481	35	103	120	131 b	70	15	6	1	321 ab	138	343 ab
(*a*) + (*b*)	436	28	91	107	127 b	59	17	6	1	293 b	119	317 b
2,4-D	535	31	94	146	181 a	60	14	6	1	388 a	125	409 a
3,5,6-TPA	423	19	70	104	136 ab	68	16	7	2	308 b	89	334 ab
Control	439	46	111	111	98 b	53	12	7	1	261 b	157	282 b
P-value	0.3110	0.1257	0.5037	0.3737	0.0222	0.5955	0.7131	0.9961	0.7875	0.0562	0.3049	0.0588

[z] Values in a vertical column followed by different letters are significantly different at specified *P* levels by Fisher's Protected LSD Test.

Table 19. Effect of AVG, 2,4-D and 3,5,6-TPA on harvest averaged over 2 years of 'Hass' avocado in Irvine, Calif. in 2005-2006.

		Packing carton size										
Treatment	Total	84	70	60	48	40	36	32	> 32	60+48+40	84+70	> 60
	------ *Total kg/tree* ------											
AVG												
Full bloom (*a*)	49.15	1.29	6.87	12.59	17.71 b[z]	8.42	1.82	0.42	0.03	38.72 ab	8.16	41.00 ab
Exp. Fruit growth (*b*)	51.89	2.41	10.17	14.20	16.20 bc	6.89	1.32	0.54	0.15	37.29 ab	12.58	39.31 abc
(*a*) + (*b*)	47.48	1.97	8.54	12.12	16.49 bc	6.38	1.42	0.50	0.06	34.99 b	10.51	36.97 bc
2,4-D	58.01	2.08	8.63	16.39	23.72 a	5.74	1.04	0.37	0.05	45.84 a	10.71	47.30 a
3,5,6-TPA	47.90	1.26	6.37	11.47	17.38 b	8.47	1.68	0.81	0.45	37.32 ab	7.63	40.26 abc
Control	45.45	3.11	10.77	12.84	11.31 c	5.24	1.24	0.79	0.15	29.39 b	13.88	31.56 c
5 Apr. 2005	7.81 b	0.01 b	0.05 b	0.32 b	1.92 b	3.58 b	1.24	0.58	0.11	5.81 b	0.06 b	7.75 b
24 May 2006	92.15 a	4.03 a	17.06 a	26.22 a	32.35 a	10.14 a	1.60	0.56	0.18	68.71 a	21.09 a	71.05 a
P-value												
Treatment (T)	0.0580	0.2487	0.1549	0.1045	0.0050	0.2925	0.8685	0.8545	0.6211	0.0132	0.1405	0.0168
Year (Y)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.3066	0.8923	0.3048	<0.0001	<0.0001	<0.0001
T x Y	0.0953	0.2108	0.4148	0.3515	0.0008	0.4764	0.7414	0.2476	0.4387	0.0078	0.3008	0.0138

[z] Values in a vertical column followed by different letters are significantly different at specified *P* levels by Fisher's Protected LSD Test.

Table 20. Effect of AVG, 2,4-D and 3,5,6-TPA on harvest averaged over 2 years of 'Hass' avocado in Irvine, Calif. in 2005-2006.

Treatment	Total	Packing carton size										
		84	70	60	48	40	36	32	> 32	60+48+40	84+70	> 60
	Total fruit no./tree											
AVG												
Full bloom (*a*)	228	11	44	65	74 b[z]	28	5	1	0	166 ab	55	173 ab
Exp. Fruit growth (*b*)	255	21	65	73	67 bc	23	4	1	0	163 ab	86	169 ab
(*a*) + (*b*)	229	17	55	62	68 bc	21	4	1	0	152 b	72	158 b
2,4-D	279	18	55	84	98 a	19	3	1	0	202 a	73	206 a
3,5,6-TPA	219	11	41	59	72 b	28	5	2	1	159 b	52	168 ab
Control	232	27	69	66	47 c	18	4	2	0	130 b	96	136 b
5 Apr. 2005	27 b	0 b	0 b	2 b	8 b	12 b	4	2	0	22 b	0 b	27 b
24 May 2006	453 a	35 a	109 a	134 a	134 a	34 a	5	1	0	303 a	144 a	309 a
P-value												
Treatment (T)	0.0881	0.2487	0.1549	0.1045	0.0050	0.2925	0.8685	0.8545	0.6211	0.0122	0.1405	0.0118
Year (Y)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.3066	0.8923	0.3048	<0.0001	<0.0001	<0.0001
T x Y	0.2234	0.2108	0.4148	0.3515	0.0008	0.4764	0.7414	0.2476	0.4387	0.0098	0.2801	0.0120

[z] Values in a vertical column followed by different letters are significantly different at specified *P* levels by Fisher's Protected LSD Test.

Table 21. Effect of AVG, 2,4-D and 3,5,6-TPA on fruit quality parameters[z] averaged across 2 years of 'Hass' avocado in Irvine, Calif. in 2005-2006.

Treatment	Days to ripen	Fruit length	Fruit width	Seed diameter	Flesh width	Peel color	Flesh quality: Vascularization	Flesh quality: Discoloration	Flesh quality: Decay	Seed germination
AVG										
Full bloom (*a*)	10.2	97.04	69.61	37.70	31.91	3.8	0.4	0.2 b[y]	0.1	0.6
Exp. Fruit growth (*b*)	10.0	98.49	70.06	38.48	31.59	3.8	0.5	0.1 b	0.1	0.5
(*a*) + (*b*)	10.2	98.41	69.69	36.85	32.84	3.8	0.5	0.3 ab	0.3	0.5
2,4-D	10.3	98.19	69.39	37.78	31.61	3.8	0.7	0.3 ab	0.2	0.5
3,5,6-TPA	10.5	99.64	69.72	36.75	32.97	3.8	0.7	0.5 a	0.3	0.6
Control	9.9	97.43	69.10	37.16	31.94	3.7	0.5	0.2 b	0.1	0.6
5 Apr. 2005	9.6 b	99.11	72.70 a	39.45 a	33.26 a	3.7 b	0.6	0.3	0.2	0.4 b
24 May 2006	10.7 a	97.36	66.72 b	35.61 b	31.11 b	3.9 a	0.5	0.3	0.1	0.6 a
P-value										
Treatment (T)	0.8068	0.4613	0.6558	0.2069	0.2505	0.9633	0.5254	0.7837	0.9234	0.9574
Year (Y)	<0.0001	0.1171	<0.0001	<0.0001	<0.0001	0.0003	0.2378	0.8228	0.1266	0.0410
T x Y	0.7218	0.6943	0.3955	0.2245	0.7678	0.4820	0.6552	0.4165	0.2692	0.4932

[z] When ripe, internal fruit quality was evaluated for abnormalities and discoloration. Vascularization (presence of vascular bundles and associated fibers) of the flesh was also determined. The internal fruit quality parameters were visually rated on a scale from 0 (normal) to 4 (high incidence of abnormalities, discoloration, or vascularization).

[y] Values in a vertical column followed by different letters are significantly different at specified *P* levels by Fisher's Protected LSD Test.