Thinning Peaches with Gibberellic Acid

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Fruitlet thinning is necessary to obtain peach fruit of commercially acceptable size. Farmers expend a significant amount of time and money thinning fruitlets by hand in the late spring and early summer. Much research has searched for techniques that make this process more cost effective. These techniques have included high-pressure water sprays and more recently have focused on mechanical approaches to physically knock flowers off the tree before fruit set. Some of these techniques are used commercially, but equipment can be expensive.

Chemicals caustic to flowers have been used with some success as a way to chemically thin peaches. Ammonium thiosulfate (fertilizer), for instance, can be used if timed properly to stop fruit set at a specific time, allowing only those fruit that have already set to remain. Some research has

Table 1. Effects of varying ProGibb application rates in 2010 on Jersey peach fruit quality at harvest in 2010 and return bloom in 2011 in Massachusetts and New Jersey.

ProGibb (g/acre)[z]	Average fruit weight (g)	Average fruit diameter (cm)	Flesh firmness (N)	Soluble solids concentration (%)	Return bloom (2011, no./cm of shoot)
			UMass Cold Spring Orchard		
0	235	7.59	47.2	11.1	0.42
80	223	7.42	57.1	10.9	0.28
160	221	7.40	57.6	10.7	0.16
Statistical significance	ns	ns	Lin**Quad*	ns	Lin**Quad*
			Rutgers Snyder Farm		
0	136	6.31	48.8	11.0	0.29
80	126	6.16	52.5	10.7	0.25
160	132	6.23	51.2	10.8	0.23
Statistical significance	ns	ns	Lin**Quad*	ns	Linear**

**, *, ns: Significant at P = 0.01, 0.05, or nonsignificant, respectively.

[z] Treatments were applied about 4 weeks before harvest and when there were approximately 20 buds per new shoot. All treatments included 0.1% Regulaid. In both Massachusetts and New Jersey, ProGibb resulted in a linear increase in flesh firmness and a linear decrease in return bloom.

Table 2. Effects of varying ProGibb application rates in 2010, 2011, or 2010 and 2011 on Jersey peach fruit quality in 2011 and return bloom in 2012 in Massachusetts.

Year of treatment[z]	ProGibb (g/acre)	Average fruit weight (g)	Average fruit diameter (cm)	Flesh firmness (N)[y]	Soluble solids concentration (%)	Return bloom (2012, no./cm of shoot)[x]
2010	0	279	10.4	42.6	10.0	0.47
2010	80	313	10.8	36.6	10.2	0.48
2010	160	316	10.8	36.2	9.9	0.53
2011	0	274	10.3	42.3	10.3	0.48
2011	80	275	10.4	48.7	10.0	0.19
2011	160	276	10.4	51.1	9.7	0.11
2010+2011	0	292	10.6	39.4	10.1	0.48
2010+2011	80	293	10.6	47.0	9.7	0.25
2010+2011	160	303	10.7	45.6	9.8	0.08
Statistical significance						
Year		**	**	**	ns	**
GA		ns	ns	ns	ns	**
Year x GA		ns	ns	**	ns	**
GA within 2010				ns		ns
GA within 2011				Linear**		Lin**Quad**
GA with 2010+2011				Linear**		Linear**

**, *, ns: Significant at P = 0.01, 0.05, or nonsignificant, respectively.

[z] In both years, treatments were applied about 4 weeks before harvest and when there were approximately 20 buds per new shoot. All treatments included 0.1% Regulaid. Overall differences among the three year treatments were significant in most cases. With fruit weight and diameter, fruit size was larger when treatments were applied in 2010 (either alone or with 2011). With return bloom, bloom density was greater for those treated only in 2010 versus those treated in 2011 (alone or with 2010).

[y] The effects of GA application on fruit size were prominent. The negative linear effect of GA on flesh firmness in 2011 after treatment in 2010 can be attributed to that effect on fruit size. Analysis of covariance showed fruit size to be a significant covariate, and when the interaction was separated, there was no difference in flesh firmness resulting from the 2010 application.

[x] The effects of GA application on return bloom also were prominent. Treatments in 2010 did not impact return bloom in 2012, but treatments in 2011 (either 2011 only or 2010 plus 2011) resulted in a significant negative relationship with return bloom. Although a quadratic relationship accounted for significantly more sums of squares than a linear relationship for the 2011 only treatments, the effects was substantially linear.

studied plant growth regulators as potential thinners, but none have proved effective when applied at bloom or soon after to reduce the current season's crop. In the 1990's, gibberellic acid (GA) was evaluated as a potential thinner, but it was applied the season before, reducing flower bud formation. Interest in the California peach industry declined when it was observed that GA affected growth after a low-chill winter, a problem that is not a concern in Northeast peach growing.

The objective of our study was to determine the effectiveness of GA applications on fruit quality the year of application and on return bloom the following year.

Materials & Methods

In 2010, 45 trees were selected at the Rutgers Snyder Farm (Pittstown, NJ) and at the UMass Cold Spring Orchard (Belchertown, MA). Trees were divided randomly among three rates of GA in the form of ProGibb (0, 80, and 160 g/acre). All treatments were applied about 4 weeks before harvest, when there were approximately 20 buds per new shoot. All treatments included 0.1% Regulaid. At harvest fruit were weighed and diameter was measured. Flesh firmness was measured with a penetrometer, and the soluble solids concentration of the juice was measured with a hand refractometer. The density of return bloom was measured in 2011 by counting the number of flowers on 10 new 1-year-old shoots of similar vigor per tree (reported

Table 3. Effects of GA applications rates in 2011 or 2010 and 2011 on Jersey peach fruit quality in 2011 and return bloom in 2012 in New Jersey.

Year of treatment[z]	ProGibb (g/acre)	Average fruit weight (g)	Average fruit diameter (cm)	Flesh firmness (N)	Soluble solids concentration (%)	Return bloom (2012, no./cm of shoot)[x]
2011	0	187	7.0	38.8	11.7	0.36
2011	80	174	6.7	43.2	11.0	0.31
2011	160	172	6.7	43.6	10.7	0.21
2010+2011	0	181	6.9	40.3	11.3	0.36
2010+2011	80	184	6.9	40.6	11.2	0.32
2010+2011	160	190	7.0	41.2	11.2	0.23
Statistical significance						
Year		*	*	ns	ns	ns
GA		ns	ns	Linear*	**	Linear**
Year x GA		*	*	ns	*	ns
GA within 2011		Linear**	Linear*		Linear**	
GA with 2010+2011		ns	ns		ns	

**, *, ns: Significant at *P* = 0.01, 0.05, or nonsignificant, respectively.

[z] In both years, treatments were applied about 4 weeks before harvest and when there were approximately 20 buds per new shoot. All treatments included 0.1% Regulaid. Overall differences between treatment in 2011 and in 2010 plus 2011 were significant for fruit weight and diameter, with trees treated both in 2010 and 2011 producing larger fruit. This difference likely occurred because of the reduction in 2011 return bloom from the 2010 treatments. With all fruit measurements, the interaction of GA and year was significant. Separating that interaction as GA treatments within each year treatment showed a significant negative linear relationship between GA concentration and fruit size and soluble solids and a positive relationship with flesh firmness only when the trees were treated in 2011 and not 2010. The lack of a relationship within the data from trees treated in both 2010 and 2011 likely resulted from the confounding effects of a negative linear relationship between GA in 2010 and return bloom in 2011.

as the average number of flowers per cm of shoot length).

In the same trees as used in 2010, 21 trees which had not been treated with GA in 2010 were selected, and divided randomly among three ProGibb rates (0, 80, and 160 g/acre) and treated similarly to 2010. Further, seven trees each previously treated with 0, 80, or 160 g ProGibb/acre were selected and treated in 2011 with the same rates. In Massachusetts only, seven additional trees each treated with 0, 80, or 160 g ProGibb/acre in 2010 were selected and not treated in 2011. Fruit assessment in 2011 and return bloom in 2012 were completed similarly to the previous year.

Results

In both New Jersey and Massachusetts, increasing concentration of GA applied in 2010 resulted in increasing flesh firmness in 2010 and decreasing return bloom in 2011 (Table 1), achieving both of our goals. Both effects were more pronounced in Massachusetts than in New Jersey. Fruit size and soluble solids concentration were not affected by GA.

In the 2011 experiment in Massachusetts, fruit size in 2011 was generally larger if the fruit had been treated in 2010 (Table 2). This result is expected because of the reduced return bloom in these treatments. Similar effects were observed in 2011 on flesh firmness as in 2010, but only if treated in 2011. Return bloom in 2012 was decreased with increasing concentrations of GA applied in 2011 but was not affected by 2010 applications.

In the 2011 experiment in New Jersey, increasing GA rate resulted in declining fruit size and declining soluble solids concentration when the treatment occurred only 2011 (Table 3). If trees were treated with the same rate in both 2010 and 2011, there was no impact on fruit size or soluble solids. Flesh firmness was increased with increasing concentrations of GA, regardless of whether it was applied just in 2011 or both years. Increasing GA application rate resulted in reductions in return bloom, which were the desired results.

Conclusions

Applications of gibberellic acid in the summer can significantly reduce bloom the following year. The reductions result in less fruit-to-fruit competition at the very earliest developmental stages. There are risks with this approach, however. Application at too high a rate can reduce return bloom to levels less than commercially acceptable. Also, factors with further reduce bloom, such as cold winter temperatures or early spring frosts, can result levels with are less than commercially acceptable.

Further work must be completed to determine the expected degree of variability in response. We plan additional experiments in 2013 to fine tune the GA timing for maximum results in the Northeast and Mid Atlantic Regions. It probably will require different applications timed to (1) maximize fruit firmness and (2) to reduce bloom to aid in peach thinning.