Controlling Cropping and Improving Fruit Quality in Flordaprince Peaches by Pruning Intensity and GA Spray

Attia, M.M., H.A. Marzouk, and H.A. Kassem
Pomology Department, Faculty of Agriculture (El- Shatby), Alexandria, Egypt.

ABSTRACT

In the present study three pruning regimes (L, M & S) and GA3 sprays (0, 60 &120 ppm) in two different dates and their interaction effect on Flordaprince peach were investigated. Severe pruning gave the highest effect on fruit set, fruit size distribution, fruit weight and diameter, color, anthocyanin content , firmness and TSS content at harvest. However, yield was increased by light pruning. Spraying GA3 decreased flower density, fruit set, fruit firmness at harvest and number of decayed fruits. 120 ppm GA3 on June gave the highest fruit weight and diameter, TSS content (at harvest and after storage), anthocyanin and sugar contents. Spraying 60 or 120 ppm GA3 on July increased the number of undersized fruits. GA3 alone had no effect on fruit color, weight loss and firmness after storage. A great interactive effect between pruning and GA3 sprays was stated giving the best results with the treatments; 120 ppm GA3 on June + L, M or S pruning compared with zero GA3 spray + L, M or S pruning ; as flower density and fruit set were decreased and fruit size distribution, fruit weight and diameter and firmness at harvest were increased. The application of 60 ppm GA3 on July + L, M or S pruning increased the number of undersized fruit

INTRODUCTION

Peach trees generally set heavily due to self – fertility and good weather at bloom. Thus, it responds well to pruning and thinning procedures in comparison with other deciduous fruit trees. Pruning helps in balancing the vegetative growth and fruit productivity and thinning aim to achieve probable marketable yield. The importance of pruning in regulating growth, yield and quality of peach is well established and the different pruning regimes were reported (Kaundal *et al.*, 1997; Mizutani *et al.*, 1997; Singh *et al.*, 1997 and Grossman and De Jong, 1998). In addition, thinning of peach trees whether mechanical or chemical was reported (Southwick *et al.*, 1996 and 1997 and Bilgener *et al.*, 1998). However, time of thinning plays an important role as fruit size can be negatively affected if peach thinning is delayed (Parker, 1998). Results from chemical thinning studies often vary with location, researchers and from year to year within a location (Marini, 1998). Gibberellic acid is one of the sprayed chemicals used as thinning agents (Southwick *et al.*, 1995 and1997, Howard and Taylor, 1998, Parker, 1998). Taylor and Geisler-Taylor (1998) recommended the use of GA3 as a reliable peach thinning tool. Gibberellic acid prevents flower initiation and causes partial reversion of the flower primordial to a vegetative one. Moreover, the presence of an interaction effect of both pruning and thinning was reported (Mizutani *et al.*, 1997 and Abdel-Hamid, 1999). In the present study GA3 was sprayed at flower initiation in order to reduce flowers of the next season. Gibberellic acid inhibits flower bud

differentiation in deciduous fruit (Li *et al.*, 1989). The objective of this study was to evaluate the effect of three pruning regimes accompanied by different gibberellic acid sprays on fruit distribution, fruit set, yield, fruit quality and fruit storage ability. This information will be useful in establishing an optimum combination between pruning and GA3 application to obtain optimum yield productivity.

MATERIALS AND METHODS

The present study was conducted during 2001- 2002 and 2002- 2003 seasons. Six years old Flordaprince peach trees growing on Nemagard rootstock were selected for this study in an orchard at Abou-El Matameer region, El-Behera governorate. The soil was classified as calcareous sandy clay. The experiment trees were planted at 3x5 m and were selected as uniform as possible having similar number of fruiting shoots (180-200 shoot /tree). The number of fruiting shoots on each tree was counted at spraying date of both 2001 and 2002 growing seasons. Geberrellic acid sprays were as follow; 0, 60 and 120 ppm on June and July of both seasons. Trees were pruned in November of both 2001 and 2002 seasons and included; removing 25% of the previously counted fruiting shoots (Light pruning ,L), 40% (Medium pruning, M) and 55% (severe pruning, S). The experiment was designed as randomized complete block design (RCBD as described by Steel and Torrie (1980) with four single tree replications. There were 15 treatments (3 pruning x 5 spraying) and 60 trees (15x4). The non sprayed trees were hand thinned before pit hardening at a distance of 12.5 - 15 cm and the following measurements were estimated:

Flower density and fruit set

Five current season shoots were randomly selected on each tree and their length were measured. At full bloom, the flowers on each shoot were counted and flower density was expressed as the number of flowers per centimeter of shoot length. After fruit set (before hand thinning of non-sprayed controls); fruit set was determined by counting fruits on these same shoots.

Yield, fruit size distribution and fruit quality

At harvest (early May), the number of fruits on every tree were counted and the yield was expressed as number and weight of fruits/ tree. The fruits were distributed according to their diameter to four categories; fruits over 25 - 35, over 35 - 45, over 45 mm and fruits less than 25 mm (undersize fruit). Fruits of each group were weighed and fruit size distribution was calculated as percent from the total crop weight. Twenty five fruits were picked randomly at harvest from each tree and their diameter and firmness were measured. Ground color was estimated as follow;1) zero red, 2) 25% red, 3) 50% red, 4) 75% red and 5) 100% red. Split pits in fruits were counted. Total soluble solids

(TSS), acidity (A.O.A.C, 1980), total sugars (Malik and Singh, 1980) and anthocyanin (Rabino *et al.*, 1977) contents were determined.

Storage measurements

A sample of 50 fruits from each tree was collected and stored at 0°C and 85-90% R.H. for storage life, fruit firmness, weight loss, total soluble solids and the percent of fruit decay were determined after storage life of 18 days.

RESULTS AND DISCUSSION

FLOWER DENSITY

The data in Table 1 showed that flower density was not affected by any of the three pruning regimes in both seasons. In contrast, Mizutani et al (1997) reported that severe pruning promoted vegetative bud formation. Moreover, 60 ppm GA3 on June and 120 ppm GA3 on June and July gave a significantly lower flower density than the non sprayed trees in both seasons (Table 1). GA3 inhibits flower formation, particularly stone fruits such as cherry, peach and apricot (Metzger, 1995). The action of gibberellin in reducing floral buds is such that transition into a floral state is inhibited by GA3 before the inductive period (Painter and Stembridge, 1972). Additionally, similar results were obtained by Southwick *et al.*, 1995, Parker, 1998 and Howard and Taylor, 1998. Also Southwick *et al.*, 1995 and Taylor and Geisler Taylor, 1998 stated that the early sprays of GA3 on June were more effective on reducing flower bud formation. Spraying 60 or 120 ppm GA3 on June or July + L, M or S pruning gave a significantly lower flower density than zero GA3 + L, M or S pruning in the first season only. Similar interactive effect was reported by Mizutani *et al.* (1997). They reported that GA3 application and pruning were effective factors for enhancing vegetative bud formation; thus reducing flower density.

Fruit set

Data in Table 1 indicated that severe pruning gave a significantly higher fruit set percent, in both seasons, as compared with light and medium pruning (except for medium pruning in the second season). In contrast, Singh et al, 1997 reported that heavy pruning reduced fruit set. In addition, application of GA3 in the first season had no effect on fruit set, whereas in the second season fruit set was significantly reduced with all GA3 sprays as compared with zero GA3 (Table 1). These data might be attributed to that reduction of flower formation could lead to fewer fruit present to set. The data of the second season agreed with those of Abdel- Hamid (1999) on peach. He found that chemical thinning with ethrel and urea greatly affected fruit set. Also, Dennis (1998) stated that thinning chemicals are used either to prevent fruit set or to increase the proportion of fruits that fall in the June drop. Moreover, 60 and 120 ppm GA3 on June or July + M or S pruning significantly decreased fruit set than

zero GA3 + M or S pruning in the second season only (Table 1). This follows the same results of GA3 alone.

Yield

The yield expressed as number and weight of fruits per tree was significantly higher with light pruning than medium and severe pruning in both seasons (except for medium pruning in the second season on fruit weight) (Table1). Sourour and El-Deeb (2002) working on peach reported that crop load was inversely proportional to the pruning severity level. However, Mathieu *et al.* (1998) found that two pruning regimes did not affect peach tree yield. Moreover, spraying 120 ppm GA3 in June decreased number of fruits per tree when compared with the non sprayed treatment in both seasons (Table 1). These results agreed with those of Farmahan and Dhiman (1998)on apricot. On the other hand, the yield as Kg/tree was not affected by any of the GA3 rates as compared with the non sprayed treatment in both seasons.

In addition , the data in Table 1 showed that spraying 60 ppm GA3 on July + L, M or S pruning gave a significantly higher fruits number than 120 ppm GA3 on June + L, M or S pruning in both seasons. These results are in line with those of Sourour and El-Deeb (2002).

Table 1. Effect of pruning regimes and GA_3 thinning application in 2001 and 2002 on flowering density, fruit set and yield of Flordaprince peaches in 2002 and 2003 seasons.

GA_3 spray (T)	Flowers/cm shoot length				Fruit set (%)				Yield							
									No. of fruits/tree				(kg/tree)			
	Pruning (P)															
	L	M	S	Av.	L	M	S	Av.	L	M	S	Av.	L	M	S	Av.
2002 season																
zero	0.48	0.52	0.62	0.54	82	80	90	84	552	429	330	437	39	35	30	35
60 ppm in June	0.31	0.28	0.29	0.29	74	80	93	82	568	421	276	422	40	34	28	34
120 ppm in June	0.19	0.23	0.22	0.21	76	78	83	79	430	316	220	322	35	30	25	30
60 ppm in July	0.32	0.36	0.40	0.36	79	80	80	80	636	560	492	563	41	38	32	37
120 ppm in July	0.28	0.32	0.29	0.30	72	80	83	78	567	522	426	505	38	34	31	34
Average	0.32	0.34	0.36		77	80	86		551	450	349		39	34	29	
$L.S.D_{0.05}$	P	T	P x T		P	T	P x T		P	T	P x T		P	T	P x T	
	0.06	0.08	0.13		5	6.5	11		67	87	148		5	7	12	
2003 season																
zero	0.40	0.39	0.42	0.40	78	86	91	85	480	400	304	395	37	33	28	33
60 ppm in June	0.25	0.24	0.18	0.22	70	72	74	72	468	390	286	381	37	33	29	33
120 ppm in June	0.12	0.16	0.14	0.14	70	74	76	73	360	277	191	276	33	27	22	27
60 ppm in July	0.27	0.30	0.34	0.30	68	70	73	70	598	500	406	501	39	33	29	34
120 ppm in July	0.20	0.16	0.14	0.17	65	67	70	67	540	456	353	450	36	31	26	31
Average	0.25	0.25	0.24		70	74	77		489	405	308		36	31	27	
$L.S.D_{0.05}$	P	T	P x T		P	T	P x T		P	T	P x T		P	T	P x T	
	0.09	0.12	0.20		4.5	5.8	9.9		54	70	120		6	7	13	

Fruit size distribution

The data in Table 2 showed that severe pruning in the second season only significantly increased the percent of fruits over 25-35, over 35 - 45 and over 45 mm, whereas decreased the percent of undersized fruits at harvest in both seasons (Table 2). These data disagreed with those of Mathieu *et al.*(1998). They reported that pruning regimes had no effect on size distribution of peach fruits. Moreover, spraying 120 ppm GA3 on June increased the percent of the above-mentioned sizes and decreased undersized fruit percent in both seasons as compared with zero GA3 spray. The same treatment decreased flower bud density. The early reduction of flower bud by bloom thinning maximizes the trees ability to increase fruit size (Southwick *et al.*, 1995). On the other hand, 60 or 120 ppm GA3 on July increased the percent of undersized fruits as compared with the non sprayed treatment in both seasons (Table 2). Farmahan and Dhiman (1998) working on apricot found that thining with 300 ppm ethephon produced the largest fruit size. In Addition, the percent of fruits over 25-35, over 35-45 and over 45 mm was significantly higher by spraying 120 ppm GA3 on June + L or S pruning in the second season than all GA3 sprays + L or S pruning. However, 60 ppm GA3 on July + M or S pruning increased undersized fruits percentage as compared with all GA3 sprays + M or S pruning in both seasons (Table 2).

Fruit weight and diameter

Data in Table 3 showed that average of fruit weight and diameter were significantly increased by severe pruning as compared with light and medium pruning in both seasons. Mizutani *et al.*, 1997 stated that severe pruning promoted vegetative bud formation, thus leading to an increase in vegetative growth and number of leaves obatined. According to Marini and Sowers (1994) fruit size depends on leaf to fruit ratio; thus any increase in this ratio leads to higher fruit size. Also, Sourour and El-Deeb (2002) stated that fruit size was positively proportional to pruning severity. Application of 120 ppm GA3 on June increased fruit weight and diameter as compared with the non sprayed treatment in both seasons. This might be connected to the decrease in number of fruits per tree with the same treatment. These results are in line with those of Srivastava *et al.*, 1973. They reported that chemical thinning of peach increased fruit weight and diameter. Moreover, fruit weight (in both seasons) and fruit diameter (in the second season) were significantly decreased by spraying 60 or 120 ppm GA3 on July + L, M or S pruning as compared with 120 ppm GA3 on June + L, M or S pruning in both seasons. However, fruit weight was significantly increased by spraying 120 ppm GA3 on June + S pruning as compared with zero GA3 + S pruning in both seasons. This significant interaction effect between severe pruning and spraying 120 ppm GA3 on June; might be attributed to the above mentioned results when each of both factors were estimated.

Table 2. Effect of pruning regimes and GA_3 thinning application in 2001 and 2002 on fruit size distribution of Flordaprince peaches in 2002 and 2003 seasons.

GA_3 spray (T)	% of fruits over 25-35 mm diameter				% of fruits over 35-45 mm diameter				% of fruits over 45 mm diameter				% of fruits less than 25 mm diameter			
	Pruning (P)															
	L	M	S	Av.	L	M	S	Av.	L	M	S	Av.	L	M	S	Av.
								2002 season								
zero	84.6	88.2	93.3	88.7	70.2	79.4	82.6	77.4	49.8	60.2	68.6	59.5	15.4	11.8	6.7	11.3
60 ppm in June	86.3	91.2	96.4	91.3	69.4	80.3	86.4	78.7	51.6	54.6	63.7	56.6	13.7	8.8	3.6	8.7
120 ppm in June	92.7	95.6	97.8	95.4	86.3	90.7	91.3	89.5	67.5	70.2	79.7	72.5	7.3	4.4	2.2	4.6
60 ppm in July	78.7	80.6	83.7	81.0	68.7	73.2	77.5	73.1	43.8	48.2	60.2	50.7	21.3	19.4	16.3	18.0
120 ppm in July	80.0	82.7	84.2	82.3	70.2	76.7	78.7	75.2	46.8	56.7	63.6	55.7	20.0	17.3	15.8	17.7
Average	84.5	87.7	91.1		73.0	80.1	83.3		51.9	58.0	67.2		15.5	12.3	8.92	
$L.S.D_{0.05}$	P	T	P x T		P	T	P x T		P	T	P x T		P	T	P x T	
	3.7	4.8	8.1		5.8	7.5	12.7		6.2	8.0	13.6		3.0	3.9	6.6	
								2003 season								
zero	85.7	87.2	91.7	88.2	71.7	76.7	81.3	76.6	51.7	62.7	70.1	61.5	14.3	12.8	8.3	11.8
60 ppm in June	83.8	90.4	95.7	90.0	72.3	81.2	85.6	79.7	52.8	63.2	71.6	62.5	16.2	9.6	4.3	10.0
120 ppm in June	93.6	96.2	99.0	93.1	86.7	90.2	96.7	91.2	70.6	79.8	83.8	78.1	4.4	3.8	1.0	3.1
60 ppm in July	79.5	81.3	82.6	81.1	70.2	74.3	79.6	74.7	52.7	52.7	63.7	56.4	20.5	18.7	17.4	18.9
120 ppm in July	81.7	83.2	84.8	83.2	73.6	78.6	81.3	77.8	55.8	56.5	63.8	58.7	18.3	16.8	15.2	16.8
Average	84.9	87.7	90.8		74.9	80.2	84.9		56.7	63.0	70.6		14.7	12.3	9.2	
$L.S.D_{0.05}$	P	T	P x T		P	T	P x T		P	T	P x T		P	T	P x T	
	1.9	2.5	4.2		4.2	5.4	9.2		4.2	5.4	9.2		1.8	2.3	4.0	

Table 3. Effect of pruning regimes and GA_3 thinning application in 2001 and 2002 on fruit weight, fruit diameter, split pits, firmness and ground colour of Flordaprince peaches at harvest in 2002 and 2003 seasons.

GA_3 spray (T)	Fruit weight (g)				Fruit diameter (mm)				Split pits (%)				Firmness (L/in^2)				Ground colour			
	Pruning (P)																			
	L	M	S	Av.	L	M	S	Av.	L	M	S	Av.	L	M	S	Av.	L	M	S	Av.
											2002 season									
zero	71	82	90	81	45.4	48.6	52.3	48.8	0.84	0.63	1.23	0.90	11.7	11.0	11.0	11.2	3.6	4.0	4.6	4.1
60 ppm in June	70	80	100	83	46.2	48.3	53.7	49.4	1.02	0.85	2.74	1.54	10.2	10.1	9.8	10.0	3.3	4.0	4.3	3.9
120 ppm in June	82	92	111	95	50.3	54.6	57.9	54.3	2.09	2.22	3.18	2.50	10.0	10.0	9.2	9.7	4.0	4.5	5.0	4.5
60 ppm in July	63	65	68	65	30.2	32.8	43.6	35.5	2.22	2.09	1.53	1.95	10.2	9.1	8.6	9.3	3.4	4.1	5.0	4.2
120 ppm in July	65	67	73	68	31.5	32.6	46.2	36.8	1.07	2.66	2.45	2.06	9.8	9.7	8.8	9.4	4.0	4.4	4.8	4.4
Average	70	77	88		40.7	43.4	50.7		1.45	1.69	2.22		10.4	10.0	9.5		3.7	4.2	4.7	
L.S.$D_{0.05}$	P	T	P x T		P	T	P x T		P	T	P x T		P	T	P x T		P	T	P x T	
	7	9	15		2.0	2.6	4.4		1.06	1.37	2.3		0.70	0.90	1.5		0.62	0.80	1.46	
											2003 season									
zero	77	82	92	84	49.7	51.6	53.2	51.5	1.09	1.85	1.76	1.57	11.3	11.0	10.6	11.0	3.6	4.2	4.8	4.2
60 ppm in June	78	83	102	88	48.2	52.3	55.7	52.1	1.35	1.54	2.50	1.80	10.8	10.9	9.8	10.5	3.4	3.2	4.6	3.7
120 ppm in June	90	98	115	101	52.2	54.3	58.7	55.1	2.15	2.53	3.93	3.04	10.6	10.0	9.0	9.9	4.0	4.8	5.0	4.6
60 ppm in July	65	67	72	68	38.5	40.1	42.5	40.4	1.97	2.75	2.82	2.51	11.2	10.0	9.7	10.3	4.0	3.8	4.8	4.2
120 ppm in July	66	68	75	70	40.2	43.2	45.6	43.0	2.39	2.52	3.38	2.76	10.2	10.0	9.2	9.8	3.8	4.6	5.0	4.5
Average	75	80	91		45.8	48.3	51.1		1.89	2.24	2.88		10.8	10.4	9.7		3.8	4.1	4.8	
L.S.$D_{0.05}$	P	T	P x T		P	T	P x T		P	T	P x T		P	T	P x T		P	T	P x T	
	6	8	13		2.7	3.5	6.0		1.00	1.28	2.18		0.90	1.2	2.0		0.80	1.03	1.75	

Ground color

Data in Table 3 showed that fruit ground color was significantly increased by severe pruning than light pruning in both seasons. Kappel and Bouthillier (1995) and Walsh *et al.*(1989) found that the amount of red color on peach fruits was increased by pruning. Moreover, the two GA3 rates did not affect fruit color as compared with the non-sprayed treatment in both seasons. These results disagreed with those of Srivastava *et al.* (1973) on peach. They indicated that fruit color was improved by chemical thinning. Also, no significant interaction effect between pruning and GA3 sprays on fruit color was obtained in both seasons (Table 3).

Split pits and fruit firmness

In both seasons no significant differences between the three pruning regimes on split pits and fruit firmness were obtained (Table 3). In addition spraying 120 ppm GA3 on June significantly increased split pits in both seasons, whereas fruit firmness was decreased by spraying GA3 as compared with the non sprayed treatment in the first season (Table 3). Southwick *et al.* (1995) reported that application of GA3 on July increased peach firmness. Moreover, no interaction effect on split pits between pruning and GA3 treatments was obtained in both seasons. However, all GA3 sprays + L pruning decreased fruit firmness as compared with zero GA3 + L pruning in the first season only (Table 3). This might be according to the effect of GA3 sprays of this season only.

TSS, acidity, total sugars and anthocyanin contents

Data in Table 4 showed that severe pruning significantly increased the total soluble solids (in the first season)and total sugars content (in the second season) as compared with medium and light pruning. In both seasons, severe and medium pruning gave a significantly higher anthocyanin content than light pruning. Grossman and DeJong (1998) reported that plant dry matter production is proportional to light interception. Pruning might have led to an increase of light interception thus; increase in TSS, sugars and anthocyanin contents. Moreover, acidity was not affected by any of the pruning regimes in both seasons. Similar findings were obtained by Sourour and El-Deeb (2002). In contrast, Morris *et al.*, (1962) found that acidity was increased by severe pruning. In addition, spraying 120 ppm GA3 on June increased total soluble solids and anthocyanin contents in the second season only as compared with zero GA3 (Table 5). Acidity was increased by spraying 60 ppm GA3 on June or 120 ppm on July in the first season only as compared with non sprayed treatment. Moreover, sugar content increased significantly by spraying 120 ppm GA3 on June or on July in the second season only. On the other hand, 60 ppm GA3 on July decreased sugar content in the second season only as compared with the non-sprayed trees (Table5). The above data are in line with those of Srivastava *et al.* (1973) and Ezz and El-Kobbia (2000). Moreover, no interaction

Table 4. Effect of pruning regimes and GA_3 thinning application in 2001 and 2002 on fruit TSS, acidity, total sugars and anthocyanin contents of Flordaprince peaches at harvest in 2002 and 2003 seasons.

GA_3 spray (T)	TSS (%)				Acidity (%)				Total sugars (%)				Anthocyanin (mg/100 g)			
	Pruning (P)															
	L	M	S	Av.	L	M	S	Av.	L	M	S	Av.	L	M	S	Av.
2002 season																
zero	8.27	8.66	9.80	8.91	1.06	1.01	1.00	1.02	6.81	6.92	7.06	6.93	11.82	13.77	16.84	14.14
60 ppm in June	8.70	8.92	9.70	9.11	1.12	1.26	1.10	1.16	6.72	7.00	7.10	6.94	11.96	14.08	17.07	14.37
120 ppm in June	9.86	9.78	10.21	9.95	0.98	0.86	0.96	0.93	7.08	7.14	7.82	7.35	13.72	16.23	18.21	16.05
60 ppm in July	8.87	9.86	9.82	9.52	1.10	1.16	0.98	1.08	6.64	7.21	6.86	6.90	12.01	15.06	16.86	14.64
120 ppm in July	9.28	9.92	10.0	9.73	1.16	1.21	1.10	1.16	7.10	7.32	7.21	7.21	13.08	15.46	16.48	15.01
Average	9.00	9.43	9.91		1.08	1.10	1.01		6.87	7.12	7.21		12.52	14.92	17.09	
L.S.$D_{0.05}$	P	T	P x T		P	T	P x T		P	T	P x T		P	T	P x T	
	0.87	1.12	1.91		0.10	0.13	0.22		0.52	0.67	1.14		1.76	2.27	3.86	
2003 season																
zero	8.62	9.03	9.12	8.92	1.10	1.02	1.04	1.05	6.72	6.82	7.00	6.85	12.46	14.10	16.46	14.34
60 ppm in June	8.46	9.13	9.07	8.89	1.12	1.10	1.06	1.09	6.86	6.86	7.01	6.91	13.06	15.36	16.86	15.09
120 ppm in June	9.89	10.26	10.46	10.20	1.00	0.96	0.94	0.97	6.80	7.21	7.42	7.14	14.21	17.63	18.73	16.86
60 ppm in July	8.54	9.28	9.28	9.03	1.10	1.12	1.00	1.07	6.46	6.43	6.82	6.57	14.00	16.12	16.07	15.40
120 ppm in July	9.14	9.83	10.21	9.73	1.01	1.02	0.92	0.98	7.00	7.12	7.31	7.14	15.36	16.63	16.72	16.24
Average	8.93	9.51	9.63		1.07	1.04	0.99		6.77	6.89	7.11		13.82	15.97	16.97	
L.S.$D_{0.05}$	P	T	P x T		P	T	P x T		P	T	P x T		P	T	P x T	
	0.92	1.19	2.02		0.09	0.12	0.20		0.21	0.27	0.46		1.63	2.10	3.57	

Table 5. Effect of pruning regimes and GA_3 thinning application in 2001 and 2002 on weight loss, firmness, TSS and decay after 18 days of cold storage at 0°C of Flordaprince peaches in 2002 and 2003 seasons.

GA_3 spray (T)	Weight loss (%)				Firmness (L/in^2)				TSS (%)				Decay (%)			
	Pruning (P)															
	L	M	S	Av.	L	M	S	Av.	L	M	S	Av.	L	M	S	Av.
2002 season																
zero	11.05	13.36	15.74	13.38	6.13	5.00	3.18	4.77	9.35	9.86	10.95	10.05	17.50	17.86	18.31	17.89
60 ppm in June	11.51	14.14	15.65	13.77	5.06	4.78	3.21	4.35	9.78	10.12	10.84	10.25	16.86	17.06	16.76	16.89
120 ppm in June	12.86	15.84	18.86	15.85	4.36	4.12	2.13	3.54	10.96	10.98	11.46	11.13	15.68	16.60	16.66	16.31
60 ppm in July	11.62	14.09	16.03	13.91	6.10	4.42	4.00	4.84	9.97	11.07	11.09	10.71	17.06	17.12	17.31	17.16
120 ppm in July	12.36	14.86	16.21	14.48	5.13	4.06	3.26	4.15	10.18	10.96	11.12	10.75	16.82	16.73	16.62	16.72
Average	11.88	14.46	16.50		5.36	4.48	3.16		10.05	10.60	11.09		16.78	17.07	17.13	
$L.S.D_{0.05}$	P	T	P x T		P	T	P x T		P	T	P x T		P	T	P x T	
	3.76	4.85	8.25		1.83	2.36	4.01		0.83	1.07	1.82		1.52	1.96	3.33	
2003 season																
zero	15.62	16.51	18.41	16.58	4.36	3.86	3.07	3.76	10.72	11.13	11.52	11.12	18.36	18.04	18.12	18.17
60 ppm in June	14.84	16.42	18.73	16.66	4.86	4.00	3.12	3.99	10.56	11.23	11.27	10.99	16.16	16.32	16.72	16.40
120 ppm in June	16.36	18.76	21.01	18.17	3.12	2.63	2.31	2.69	12.09	12.62	12.81	12.51	16.06	15.86	15.61	15.84
60 ppm in July	15.08	16.82	18.36	16.75	4.62	3.82	3.13	3.86	11.13	11.52	11.63	11.43	17.00	16.90	17.36	17.09
120 ppm in July	15.22	17.01	19.42	17.22	3.82	3.27	2.71	3.27	11.26	11.92	12.06	11.75	16.46	16.83	17.21	16.83
Average	15.42	17.10	19.19		4.16	3.52	2.87		11.15	11.68	11.86		16.81	16.79	17.00	
$L.S.D_{0.05}$	P	T	P x T		P	T	P x T		P	T	P x T		P	T	P x T	
	1.46	1.88	3.20		1.15	1.48	2.52		0.95	1.23	2.08		0.84	1.08	1.84	

effect between the three pruning regimes and GA3 sprays on TSS and anthocyanin contents was obtained. Acidity was higher with 60 ppm GA3 on June + M pruning than zero + M pruning or 120 ppm GA3 on June + M pruning in the first season only. Also, Morris *et al.*(1962) stated that acidity was increased by the thinning x pruning interaction. Sugar content was significantly increased by 120 ppm GA3 on July + L, M or S pruning as compared with 60 ppm GA3 on July + L, M or S pruning in the second season only (Table 4).

Measurements after storage

Data in Table 5 showed that the percent of weight loss after storage was higher by severe than light and medium pruning (except for medium pruning in the first season) in both seasons. Light pruning increased fruit firmness after storage as compared with severe pruning in both seasons. In contrast, Morris et al (1962) reported that light pruning reduced fruit firmness after storage. In addition, no significant differences between all pruning regimes on total soluble solids content (except S pruning which gave higher TSS content than L pruning in the first season) were obtained in both seasons (Table 5). However, percent of fruit decay did not significantly differ with the 3 pruning patterns in both seasons.

Also, the data in Table 5 indicated that, all GA3 sprays did not significantly affect weight loss in both seasons as compared with the non sprayed treatment. Firmness was not significantly affected by any of GA3 sprays in both seasons. However, TSS content was significantly increased by spraying 120 ppm GA3 on June in both seasons (Table 5).The percent of decayed fruits was decreased by 60 or 120 ppm GA3 on June and July as compared with zero GA3 in the second season only (Table 5).

No significant interaction effect between all GA3 sprays and the 3 pruning regimes on weight loss, TSS and firmness was found in both seasons. However, 120 ppm GA3 on June + L, M or S pruning decreased the percent of decayed fruits than zero GA3 + L, M or S pruning in the second season only (Table 5).

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الملخص العربى

إنتاجية وتحسين جودة ثمار الخوخ فلوردابرينس بواسطة شدة التقليم والرش بحامض الجبريلليك

محمد محمد عطية ، هند على مرزوق ، حسن على قاسم

قسم الفاكهة – كلية الزراعة (الشاطبى) – جامعة الاسكندرية

استهدف هذا البحث دراسة تأثير ثلاث معاملات تقليم شتوى والرش بتركيزين من حامض الجبريلليك أثناء ميعاد تكشف البراعم الزهرية على الكثافة الزهرية والمحصول والعقد وجودة الثمار فى أشجار الخوخ صنف "فلوردابرينس". ويمكن تلخيص النتائج فيما يلى:

- أدى التقليم الجائر إلى زيادة معنوية فى كل من عقد الثمار والتوزيع الحجمى للثمار ووزن وقطر الثمرة والتلوين والمحتوى من صبغة الأنثوسيانين. كما أدى إلى زيادة صلابة الثمار ونسبة المواد الصلبة الذائبة الكلية عند الجمع.
- تأثر المحصول بالزيادة بمعاملة التقليم الخفيف فقط.
- أدى الرش بحامض الجبريلليك إلى إنخفاض كثافة الأزهار والعقد وصلابة الثمار عند الجمع ونسبة الثمار الفاسدة بعد التخزين.
- المعاملة ١٢٠ جزء فى المليون حامض جبريلليك فى يونيو أعطت أعلى وزن وقطر الثمار وأعلى محتوى من المواد الصلبة الذائبة الكلية عند الجمع وبعد التخزين. كما أدت إلى زيادة المحتوى من الأنثوسيانين والسكريات.
- كما أظهرت النتائج تأثير واضح لمعاملات التقليم والرش معاً حيث وجد أن الرش بـ ١٢٠ جزء فى المليون حامض جبريلليك فى يونيو مع التقليم الجائر والمتوسط والخفيف أدى إلى إنخفاض الكثافة الزهرية وعقد الثمار بينما زاد وزن وقطر الثمار والصلابة عند الجمع.