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Effect of Some Pruning Applications on Leaf to Fruit Ratio, Yield and Fruit Quality of 'Florda Prince' Peach Trees

[1]Samira, M. Mohamed, [1]T.A. Fayed, [2]A.M. Hussein and [2]Safaa M. Maged

[1]Pomology Department, Faculty of Agricultural, Cairo University, Egypt
[2]Deciduous Fruits Research Department,
Agricultural Research Institute, Agricultural Research Center, Egypt

Abstract: This study was carried out during two successive seasons of 2011/2012 and 2012/ 2013 on seven years old 'Florda Prince' peach trees budded on Nemagard rootstock. The trees were grown in sandy soil at private orchard, in Regwa district at Giza governorate, Egypt. Four thinning pruning levels were applied on the 1st November by leaving 70, 85 and 100 one-year-old shoots/ tree beside control trees (unpollarded trees), with or without three heading back cut level treatments (on the same shoots) by removing 25, 50 and 75% from the terminal shoot length. Concerning the effect of thinning pruning levels applications, 70 shoots/tree gave the highest significant leaf to fruit ratio and both fruit physical and chemical characters followed by 85 & 100 shoots/ tree then control treesin both seasons, respectively. In addition, heading back pruning level treatment 75% gave the best leaf to fruit ratio, fruit physical and chemical characters in both seasons. Moreover, the interaction between thinning applications and heading back treatments indicated that 70 shoots/ tree + 75% heading back treatment increased leaf to fruit ratio value (35.63:1 & 35.48:1) and fruit quality in both seasons. On the other hand, control treatment gave the highest average of yield and the lowest leaf to fruit ratio value (20.06:1 & 20.14:1) and fruit quality in both seasons.

Key words: Pruning · Heading back · Leaf to fruit ratio · Yield · Fruit quality

INTRODUCTION

Peaches have a habit to set a large number of fruits under optimum growing conditions and thereby reduce the possibility of getting commercial fruit size with quality fruit at harvest [1-3]. Peach trees are pruned to maintain tree size and shape, to improve light distribution throughout the canopy and improve spray penetration and drying conditions for pest control and to reduce the number of flower buds per tree [4]. Heading back all fruiting shoots by 50% during dormant pruning slightly reduced fruit set and fruit thinning cost and sometimes improved fruit size compared to non-headed fruiting shoots [5]. Heading by removing more than 50% of each shoot further reduced crop load and fruit thinning cost, but negatively affected fruit size. The reason for severe heading back did not adequate to reduce crop load is, that flower bud density is maximum at the base of the fruiting shoot [6, 7]. Therefore, removing entire shoots may be more effective for reducing the initial crop load. Fruit size is dependent on the leaf to fruit ratio and their association with canopy size and bearing capacity [8]. The indexes for estimating thinning amount were reported to be leaf to fruit ratio, total number of fruits per tree, fruit size and distance between fruits within a branch [9]. No information is available on appropriate thinning practice to be followed to maintain optimum leaf to fruit ratio in Flordasun peach for quality fruit production [10].

The purpose of this study was to determine the effect of different pruning applications on leaf to fruit ratio, yield and fruit quality of 'Florda Prince' peach.

MATERIALS AND METHODS

This study was carried out during two successive seasons of 2011- 2012 and 2012- 2013on seven years' old trees of 'Florda Prince' peach cultivar budded on Nemagard rootstock. The trees were grown in sandy soil at private orchard in Regwa district at Giza governorate, Egypt. Trees were spaced at 4x5 m apart, trained as open

Corresponding Author: Samira, M. Mohamed, Pomology Department, faculty of Agricultural, Cairo University, Egypt.

center shape and irrigated by drip irrigation and subjected to the recommended agricultural practices. This study conducted forty-eight trees similar in shape, vigor and uniform of growth. All trees were sprayed with Hydrogen Cyanamid (commercial product of Dormex contained 49% H_2CN_2) at 1.5% on 15 November in both seasons. Four dormant thinning pruning levels were applied on one-year-old shoots on the 1st November by leaving 70, 85, 100 shoots/ tree beside control trees (unpollarded trees), with or without the three cut level treatments, also, on the same shoots, heading back by removing 25, 50 and 75% from the shoot length. Each treatment contained three replicates (one tree per replicate). The following parameters were estimated and recorded as follows;

Nine branches as similar as possible were chosen at the four cardinal parts of each treated tree, tagged and the average of leaves number and fruits number per shoot was counted, leaf to fruit ratio (LFR) was calculated by dividing leaves number / fruit.

Yield was estimated (kg/tree) after fruit harvest; at maturity stage (during the 2nd week of April). Ten random selected fruits from each treatment were used to determine the fruit physical characters i.e., fruit weight (gm.), fruit size (cm^3), fruit diameter (cm), fruit length (cm), L/D ratio, fruit firmness ($Lb/inch^2$) using pressure tester and fruit chemical characters i.e., juice fruit total soluble solids (TSS%) using refractometer, total acidity (%) determined in terms of anhydrous malic acid as a percentage after titration against 0.1 sodium hydroxide using phenolphthalein as an indicator according to A.O.A.C. [11], total sugars content (%) was determined according to the procedures out lined by Malik and Singh [12], Vitamin C content(mg/100g f w) was determined by using 2, 4- dichlorophenol indophenol dye according to the A.O.A.C. [11] and peel anthocyanin content (mg/ 100 g f w) was determined according to method of Husia *et.al*. [13].

The obtained data were tabulated and statistically analyzed according to a factorial analyzed as randomize complete block design [14]. The mean values were compared by using L.S.D. method at 5% level. The percentage was transferred to the arcsine to find the binomial percentage according to Steel and Torrie [15].

RSULTS AND DISSCUSION

Leaves Number per Shoot: Data in Table (1) showed that leaves number per shoot was significantly decreased by increasing the severity of pruning treatment. Concerning the effect of thinning pruning levels, control trees gave the highest leaves number per shoot (140.0 and 138.8) followed by 100 shoots/ tree (130.3 and 130.8), 85 shoots/ tree (125.0 and 125.9) then 70 shoots/ tree (123.8 and 123.8) in the 1st and the 2nd seasons, respectively. Also, heading back pruning treatments showed that, the trees without any heading backgave the highest leaves number/ shoot followed by 25%, 50% then 75% (129.7, 113.9, 98.3 & 95.9 and 129.8, 114.1, 98.6 & 96.02) in 1st and 2nd seasons, respectively. Concerning the interaction between thinning and heading back applications, the highest number of leaves (140.0 and 138.8) was recorded from the untreated control trees in both seasons, but the lowest number of leaves per shoot (95.85 and 95.97) was recorded from the combination between 70 shoots/ tree + 75% heading back treatment in both seasons, respectively. Other treatments occupied intermediate position between them.

These results are in harmony with Said *et al.* [16] that the control treatment was significantly the highest in number of leaves per shoot in "Canino" apricot trees. Also, Mikhael *et al.* [17] who reported that the highest number of leaves per shoot was recorded from moderate thinning (thinning out 30 %) compared with other treatments in "Desert Red" peach trees.

Fruits Number per Shoot: Tabulated data in Table (1) revealed that fruits number per shoot was significantly affected by pruning severity. Data showed that fruits number per shoot was significantly decreased by increasing the severity of pruning treatment. Concerning the effect of thinning pruning levels, control trees gave the highest fruits number per shoot (6.98 and 6.88) followed by 100 shoots/ tree (6.37 and 6.57), 85 shoots/ tree (6.07 and 6.18) then 70 shoots/ tree (5.23 and 5.42) in the 1st and 2nd seasons, respectively. About heading back pruning treatments, trees without any heading back gave the highest fruits number/ shoot followed by 25%, 50% then 75% (6.16, 4.81, 3.34 & 3.00 and 6.24, 4.81, 3.42 & 3.02) in both seasons, respectively. However, the interaction between thinning and heading back applications, the maximum number of fruits/ shoot (6.98 and 6.88) was obtained from the untreated control trees in both seasons, but the minimum number of fruits (2.69 and 2.70 per shoot) was obtained from the combination between 70 shoots/ tree + 75% heading back treatmentin both seasons, respectively.

The reduction in fruits number due to increase pruning severity is in harmony with the findings of Richard [18], Zayan [19], Rathi *et al*. [20] and Siham *et al*. [21] who found that removing high amounts of bearing

Table 1: Effect of different pruning applications on leaves number per shoot, fruits No. per shoot, leaf to fruit ratio and yield of Florda Prince peach trees (2011/ 2012 and 2012/ 2013 seasons).

Thinning pruning applications	Heading back	Leaves No./shoot		Fruits No./shoot		Leaf/ fruit ratio		Yield (kg)	
		1st season	2nd season	1st season	2nd season	1st season	2nd Season	1st season	2nd season
70 shoots /tree	25%	105.55	105.98	4.08	4.09	25.87	25.91	28.00	28.20
	50%	97.21	97.82	2.90	3.15	33.40	31.03	20.33	21.87
	75%	95.85	95.97	2.69	2.70	35.63	35.48	19.69	19.90
	Without	123.8	123.8	5.23	5.42	23.64	24.79	33.00	34.62
	AV.	*105.6*	*105.8*	*3.72*	*3.84*	*29.63*	*29.30*	*25.25*	*26.14*
85 shoots/ tree	25%	110.3	110.5	4.18	4.26	26.39	25.98	34.18	34.87
	50%	97.95	97.98	3.16	3.17	30.95	30.91	26.11	26.38
	75%	95.88	96.00	2.97	2.99	32.27	32.13	24.82	24.65
	Without	125.0	125.9	6.07	6.18	20.59	20.27	46.22	47.03
	AV.	*107.2*	*107.6*	*4.10*	*4.15*	*27.71*	*27.32*	*32.83*	*33.23*
100 shoots/ tree	25%	119.8	119.7	5.29	5.27	22.65	22.74	47.50	47.87
	50%	98.11	98.81	3.29	3.30	29.82	29.96	29.66	29.69
	75%	95.91	96.11	3.00	3.01	31.96	31.82	27.32	27.78
	Without	130.3	130.8	6.37	6.51	20.45	20.07	51.03	52.81
	AV.	*111.0*	*111.3*	*4.49*	*4.52*	*26.22*	*26.14*	*38.88*	*39.53*
Control	25%	120.0	120.3	5.70	5.64	21.01	21.31	57.42	57.30
	50%	99.85	99.90	4.01	4.07	24.83	24.57	42.26	43.08
	75%	96.00	96.03	3.37	3.40	28.46	28.16	36.38	36.93
	Without	140.0	138.8	6.98	6.88	20.06	20.14	58.72	58.81
	AV.	*113.9*	*113.7*	*5.01*	*4.99*	*23.59*	*23.54*	*48.69*	*49.03*
AV. of Heading back	25%	113.9	114.1	4.81	4.81	23.98	23.98	41.78	42.06
	50%	98.28	98.62	3.34	3.42	29.75	29.11	29.59	30.25
	75%	95.91	96.02	3.00	3.02	32.08	31.89	27.05	27.31
	Without	129.7	129.8	6.16	6.24	21.18	21.31	47.24	48.31
L.S.D. at 0.05	Thinning	1.4254	0.9159	0.4061	0.3455	1.3589	1.3026	1.0960	1.0871
	Head. back	1.2463	0.8948	0.3951	0.3161	1.1909	1.1824	1.1861	1.2560
	Thin.*Head.	2.8508	1.8318	0.8122	0.3910	2.3979	2.4052	2.3722	2.5722

wood led to a marked reduction in yield and fruits number per tree of peach trees. Also, these results are in agreement with the findings of Gabr *et al.* [22], Atef *et al.* [23] and Mikhael *et al.* [17] on different peach cvs. since they reported that pruning treatment significantly reduced fruit number and the reduction was increased as the severity of pruning increased.

Leaf Fruit Ratio (LFR): Leaf/ fruit ratio showed a significant variation among all treatments. The result depicted in Table (1) revealed that treatment of 70 shoots/ tree gave the highest leaf/ fruit ratio (23.64 and 24.79) followed by 85 shoots/ tree (20.59and 20.27), 100 shoots/ tree (20.45 and 20.07) then untreated control trees (20.06 and 20.14) in the 1st and 2nd seasons, respectively. Also, heading back pruning trees with 75% gave the highest leaf/ fruit ratio followed by 50%, 25% then control trees (32.08, 29.75, 23.98 & 21.18 and 31.89, 29.11, 23.98 & 21.31) in both seasons, respectively. While, the interaction between thinning and heading back applications indicated that the highest leaf/ fruit ratio (35.63 and 35.48) was obtained from the treatment of 70 shoots/tree + 75% heading back in both seasons, while the lowest number of leaf/ fruit ratio (20.06 and 20.14) was obtained from the untreated control trees in both seasons, respectively.The other treatments occupied intermediate effect.

These results can be interpreted in light of that pruning leads to a reduction in number of fruits per shoot rather than leaves number per shoot that resulted in increased leaf to fruit ratio.

Yield: Yield per tree was also decreased by increasing severity of pruning (Table, 1). Regarding the effect of thinning pruning level applications, control trees gave the highest average of yield (58.72 and 58.81 kg) followed by 100 shoots/ tree (51.03 and 52.81kg), 85 shoots/ tree (46.22 and 47.03kg) then 70 shoots/ tree (33.00 and 34.62 kg) in the 1st and 2nd seasons, respectively. In addition, trees without any heading back gave the maximum average of yield followed by 25%, 50% then 75% heading

Table 2: Effect of different pruning applications on fruit weight, fruit size and fruit length and diameter of Florda Prince peach trees (2011/ 2012 and 2012/ 2013 seasons).

Thinning pruning applications	Heading back	Fruit weight (gm)		Fruit size (cm^3)		Fruit length (cm)		Fruit diameter (cm)	
		1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season
70 shoots /tree	25%	98.05	98.50	97.32	97.31	5.58	5.62	5.69	5.70
	50%	99.81	99.12	98.91	98.61	5.60	5.63	5.72	5.72
	75%	104.6	105.1	103.2	104.9	5.87	5.88	5.92	5.93
	Without	90.03	91.20	89.18	90.81	5.05	5.13	5.18	5.19
	AV.	*98.11*	*98.48*	*97.1*	*97.9*	*5.52*	*5.57*	*5.62*	*5.63*
85 shoots/ tree	25%	96.21	96.40	95.03	95.28	5.39	5.43	5.48	5.56
	50%	97.08	97.83	96.12	97.10	5.43	5.48	5.51	5.59
	75%	98.31	99.80	97.00	98.20	5.49	5.52	5.53	5.60
	Without	89.60	89.57	88.38	89.21	5.01	5.18	5.19	5.21
	AV.	*95.30*	*95.90*	*94.13*	*94.94*	*5.33*	*5.40*	*5.42*	*5.49*
100 shoots/ tree	25%	89.81	90.91	88.12	89.11	5.02	5.12	5.20	5.23
	50%	90.17	91.60	90.88	91.01	5.10	5.14	5.23	5.21
	75%	91.09	92.30	90.93	91.36	5.17	5.21	5.24	5.30
	Without	80.11	81.04	79.81	80.35	4.54	4.59	4.89	5.01
	AV.	*87.80*	*88.96*	*87.43*	*87.96*	*4.96*	*5.01*	*5.14*	*5.19*
Control	25%	83.81	84.60	82.81	84.16	4.80	4.83	4.98	5.04
	50%	87.61	88.3	86.83	87.11	5.00	5.06	5.13	5.12
	75%	89.90	90.36	89.07	90.05	5.09	5.12	5.16	5.20
	Without	70.11	71.14	70.02	70.89	3.97	3.98	4.12	4.10
	AV.	*82.86*	*83.60*	*82.10*	*83.00*	*4.71*	*4.74*	*4.84*	*4.86*
AV. of Heading back	25%	91.97	92.60	90.82	91.47	5.20	5.25	5.33	5.38
	50%	93.67	94.21	93.19	93.46	5.28	5.32	5.40	5.41
	75%	95.97	96.89	95.05	96.12	5.39	5.43	5.46	5.50
	Without	82.46	83.23	81.85	82.80	5.16	4.72	4.84	4.88
L.S.D. at 0.05	Thinning	1.1280	1.2612	1.9231	1.4095	0.5262	0.5362	0.2977	0.5989
	Head. back	1.0291	1.0830	1.2051	1.2074	0.5357	0.6351	0.2977	0.5989
	Thin.*Head.	2.2581	3.3664	3.8302	2.8150	0.8504	0.0.872	0.5954	1.1977

back (47.24, 41.78, 29.59 & 27.05and 48.31, 42.06, 30.25 & 27.31 kg) in both seasons, respectively. In respect tothe interaction between thinning and heading back applications, the maximum average of yield (58.72 and 58.81 kg) was recorded from the untreated control trees in both seasons, while the minimum average of yield (19.69 and 19.90 kg) was recorded from the combination between 70 shoots/ tree + 75% heading back treatmentin both seasons, respectively andthe other treatments occupied intermediate position between control and sever pruning treatment (70 shoots/ tree + 75% heading back).

Similar findings were reported by Schneider and Correll [24], Badiyala and Awasthi [25], Chitkara *et al*. [26], Rathi *et al*. [20], Gabr *et al*.[22] and Mikhael *et al*. [17] who also registered that, lower yields were obtained with the increase of pruning severity on peach trees.

Fruit Physical Characters:

Fruit Weight: Fruit weight was significantly increased by increasing severity of pruning treatments (Table 2). As for the effect of only thinning pruning levels application, 70 shoots/ tree gave the highest fruit weight (90.03 and 91.20 gm.) followed by 85 shoots/ tree (89.60 and 89.57 gm.), 100 shoots/ tree (80.11 and 81.04 gm.) then untreated control trees (82.86 and 83.60 gm.) in the 1st and 2nd seasons, respectively. In addition, trees with 75% heading back gave the highest fruit weight followed by 50%, 25% then control trees (95.97, 93.67, 91.97& 82.46 and 96.89, 94.21, 92.60& 83.23 gm.) in both seasons, respectively. The interaction between thinning and heading back applications, revealed that maximum fruit weight (104.6 and 105.1 gm.) was recorded from severe pruning treatment (70 shoot/tree + 75% heading back) and the minimum fruit weight (70.11 and 71.14 gm.) was recorded from control trees in both seasons, respectively.

These results could be attributed to the positive effect of dormant pruning severity on leaf/ fruit ratio and increased carbohydrate synthesis as well as the negative effect on number of fruits by reducing the number of shoots bearing fruits. Similar results were obtained by

Zayan [19], Bussi *et al.* [27], Siham *et al.* [21], Bussi *et al.* [28] and Mikhael *et al.* [17] on peach, who found that dormant pruning increased fruit weight.The highest fruit weight was obtained from 35:1 leaf/ fruit ratio by 70 shoot/tree plus 75% heading back treatment, while the lowest fruit weight was obtained from 20:1 leaf/ fruit ratio in control trees in both seasons, respectively. These results are in line with Deshmukh *et al*. [10] who reported that, fruit weight showed an increasing trend with LFR that varied from 15:1 to 55:1. The highest fruit weight was recorded in treatment 55:1 LFR (49.21 g) followed by 45:1 (48.84 g) while the lowest was obtained in control trees (39.28 g).

Fruit Size: Data in Table (2) showed the significant effect of pruning applications on fruit size. About the effect of thinning pruning levels application, 70 shoots/ tree gave the highest fruit size (89.18 and 90.81 cm^3) followed by 85 shoots/ tree (88.38 and 89.21cm^3), 100 shoots/ tree (79.81 and 80.35cm^3) then untreated control trees (70.02 and 70.89cm^3) in the 1st and 2nd seasons, respectively. Also, trees with 75% heading back gave the highest fruit size followed by 50%, 25% then control trees (95.05, 93.19, 90.82 & 81.850 and 96.12, 93.46, 91.47 & 82.80cm^3) in both seasons, respectively. About the interaction between thinning and heading back applications, the highest fruit size (103.2 and 104.9cm^3) was recorded from the treatment of 70 shoots/tree + 75% heading backand the lowest fruit size (81.85 and 82.2cm^3) was recorded from control trees in both seasons, respectively.

Presented data are in harmony with Zayan [19], Bussi *et al.* [27], Bussi *et al.* [28] and Mikhael *et al.* [17] who found that, dormant pruning increased fruit size of peach trees.

Fruit Length and Diameter: In regard to the effect of thinning pruning levels on fruit length and diameter, Table (2) showed that leaving only70 shoots/ tree gave the highest fruit length (5.05 and 5.13cm) and diameter (5.18 and 5.19cm), followed by 85 shoots/ tree (5.01 and 5.18cm) and (5.19 and 5.21cm), 100 shoots/ tree (4.54 and 4.59cm) and (4.89 and 5.01 cm), then untreated control trees (3.97 and 3.98 cm) and(4.12 and 4.10 cm) in the 1st and 2nd seasons, respectively. Also, trees with 75% heading back gave the highest fruit length and diameter followed by 50%, 25% then control trees (5.39, 5.28, 5.20 & 5.16 and 5.43, 5.32, 5.25 & 4.72) (5.46, 5.40, 5.33& 4.84 and 5.50, 5.41, 5.38 & 4.88) in both seasons, respectively. Concerning the interaction between thinning and heading back applications, the maximum fruit length (5.87 and 5.88 cm) and diameter (5.92 and 5.93 cm) were recorded from severe pruning treatment (70 shoots/tree + 75% heading back) while the minimum fruit length (3.97 and 3.98 cm) and diameter (4.12 and 4.10 cm) were recorded from control trees in 1st and 2nd seasons, respectively.

These data are in line with Zayan [19], Bussi *et al.* [27], Bussi *et al.* [28] and Mikhael *et al.* [17] on peach who found that dormant pruning increased fruit dimensions (length and diameter).

L/D ratio: As for L/D ratio, Table (3) reveal thatL/D ratio was not affected by all pruning treatments under study compared with the untreated control trees.

Fruit Firmness: As shown in Table (3), fruit firmness was significantly decreased by increasing severity of pruning treatment. Regarding the effect of only thinning pruning levels, control trees gave the highest fruit firmness(16.08 and 16.13 lb/in^2) followed by 100 shoots/ tree (14.93 and 15.03 lb/in^2), 85 shoots/ tree (13.28 and 13.96 lb/in^2) then 70 shoots/ tree (12.35 and 12.50 lb/in^2) in the 1st and 2nd seasons, respectively. Also, trees without any heading back gave the highest fruit firmness (14.16 and 14.40 lb/in^2) followed by 25% (13.94 and 14.06 lb/in^2), 50% (13.28 and 13.49 lb/in^2) then 75% (12.69 and 12.96 lb/in^2) in both seasons, respectively. Concerning the interaction between thinning and heading back applications, the firmest fruits (16.08 and 16.13 lb/in^2) was recorded from the untreated control trees in both seasons, but the lowest fruit firmness(11.52 and 11.68 lb/in^2) was obtained from the combination between 70 shoots/ tree + 75% heading back treatment in both seasons, respectively. The other treatments occupied intermediate results between the control and severe pruning treatment (70 shoots/ tree + 75% heading back).

The reductionin fruit firmness might be due to the increment of fruit size andpossibly the reduction of its Ca concentration. These findings confirmed with those obtained by Stino [29], Mikhael [30] and Saini and Kaundal [31] who found that, fruits from severe dormant pruned trees had large size, low Ca concentration and less firmness than fruits from light pruned trees. Moreover, the results showed decreasing in fruit firmness with the increasing of LFR. The reduction in fruit firmness might be due to larger fruit size that in tune decreases the strength of cell wall and lesser cohesion between the cells as detected by Deshmukh *et al*. [10].

Table 3: Effect of different pruning applications on L/D ratio and fruit firmness of Florda Prince peach trees (2011/ 2012 and 2012/ 2013 seasons).

		L/D Ratio		Fruit firmness(lb/in^2)	
Thinning pruning applications	Heading back	1st season	2nd season	1st season	2nd season
70 shoots /tree	25%	0.98	0.98	12.62	12.70
	50%	0.98	0.98	12.21	12.93
	75%	0.99	0.99	11.52	11.68
	Without	0.97	0.98	12.35	12.50
	AV.	*0.98*	*0.98*	*12.18*	*12.45*
85 shoots/ tree	25%	0.98	0.97	13.98	14.03
	50%	0.99	0.98	13.60	13.51
	75%	0.99	0.99	12.98	13.13
	Without	0.96	0.99	13.28	13.96
	AV.	*0.98*	*0.98*	*13.46*	*13.66*
100 shoots/ tree	25%	0.97	0.97	14.18	14.41
	50%	0.98	0.98	13.62	13.68
	75%	0.99	0.98	13.19	13.51
	Without	0.92	0.91	14.93	15.03
	AV.	*0.97*	*0.96*	*13.98*	*14.16*
Control	25%	0.96	0.95	14.98	15.09
	50%	0.97	0.98	13.70	13.85
	75%	0.98	0.98	13.08	13.50
	Without	0.96	0.97	16.08	16.13
	AV.	*0.96*	*0.97*	*14.46*	*14.64*
AV. of Heading back	25%	0.95	0.96	13.94	14.06
	50%	0.98	0.98	13.28	13.49
	75%	0.99	0.99	12.69	12.96
	Without	0.93	0.96	14.16	14.40
L.S.D. at 0.05	Thinning	0.0962	0.0993	0.7649	0.9649
	Head. back	0.0874	0.0951	0.6548	0.6857
	Thin.*Head.	0.1923	0.2885	1.5297	1.9298

Table 4: Effect of different pruning applications on fruit chemical characters of Florda Prince peach trees (2011/ 2012 and 2012/ 2013 seasons).

		T.S.S.%		Total acidity %		Total sugars %		Vit. C(mg/100gfw)		Peel anthocyanincontent (mg/100g)	
Thinning pruning applications	Heading back	1stseason	2ndseason	1st season	2ndseason	1st season	2ndseason	1st season	2ndseason	1st season	2ndseason
70 shoots /tree	25%	12.10	12.30	0.61	0.65	5.18	5.17	18.50	18.76	4.62	4.81
	50%	12.60	13.00	0.83	0.60	5.31	5.33	18.93	19.00	5.30	5.36
	75%	13.50	13.30	0.53	0.68	5.58	5.61	20.92	21.85	5.67	5.51
	Without	11.60	11.50	0.70	0.68	4.81	4.50	18.21	18.50	4.08	4.19
	AV.	12.45	12.52	0.55	0.65	5.22	5.15	19.14	19.52	4.91	4.97
85 shoots/ tree	25%	11.20	11.50	0.35	0.34	4.90	5.01	18.20	18.50	3.81	3.90
	50%	1.90	12.20	0.48	0.43	5.08	5.13	18.93	19.02	4.11	4.32
	75%	12.80	12.60	0.56	0.60	5.21	5.50	19.67	19.82	4.92	5.08
	Without	10.90	11.10	0.61	0.65	4.12	4.11	18.11	18.15	3.87	3.91
	AV.	11.70	11.85	0.50	0.36	4.82	4.93	18.72	18.87	4.18	4.30
100 shoots/ tree	25%	11.00	11.50	0.36	0.41	4.38	4.29	17.50	17.79	3.21	3.31
	50%	11.40	11.80	0.49	0.51	4.61	4.50	18.08	18.50	3.79	3.80
	75%	11.60	11.90	0.58	0.56	4.98	5.00	18.93	18.98	3.98	3.76
	Without	10.90	11.30	0.62	0.63	4.03	4.11	18.00	18.06	2.97	2.21
	AV.	11.22	11.62	0.49	0.52	4.50	4.48	18.12	18.33	3.49	3.27
Control	25%	11.00	11.30	0.56	0.57	4.19	4.26	16.96	17.01	2.98	3.00
	50%	11.20	11.50	0.68	0.68	4.23	4.50	17.98	18.00	3.18	3.21
	75%	11.50	12.00	0.72	0.70	4.51	4.60	18.31	18.50	3.70	3.86
	Without	10.80	10.90	0.99	0.97	3.38	3.50	16.50	16.38	2.50	2.68
	AV.	11.12	11.42	0.73	0.73	4.08	4.21	17.43	17.47	3.09	3.19
AV. of Heading back	25%	11.32	11.65	0.47	0.49	4.88	4.68	17.79	18.01	3.66	3.76
	50%	11.11	12.12	0.62	0.56	4.80	4.87	18.48	18.63	4.10	4.17
	75%	12.35	12.45	0.60	0.63	5.07	5.18	19.46	19.79	4.57	4.55
	Without	11.05	11.20	0.73	0.73	4.09	4.06	17.70	17.77	3.36	3.29
L.S.D. at 0.05	Thinning	0.7382	0.6885	0.1002	0.0797	0.4730	0.4070	0.5131	0.5100	0.3270	0.4306
	Head. back	0.6071	0.6984	0.2012	0.0856	0.4852	0.4970	0.4250	0.4634	0.2285	0.3610
	Thin.*Head.	1.4745	1.3969	0.2004	0.1594	0.9704	0.6141	0.6481	1.0268	0.4569	0.9232

Fruit chemical characters:

Total soluble solids (T.S.S): Data presented in Table (4) showed that, TSS value take the same trend of fruit weight as affected by pruning applications. About the effect of thinning pruning levels, 70 shoots/ tree gave the highest fruit T.S.S (11.60 and 11.50 %) followed by 85 shoots/ tree (10.90 and 11.10 %), 100 shoots/ tree (10.90 and 11.30 %) then untreated control trees (10.80 and 10.90 %) in the 1st and 2nd seasons, respectively. Also, trees with 75% heading back gave the highest fruit T.S.S followed by 50%, 25% then control trees (12.35, 11.32, 11.11 & 11.05 %) in the 1st season and (12.45, 12.12, 11.65 & 11.20 %) in the 2nd season, respectively. In this respect, the interaction between thinning and heading back applications, appeared that the maximum fruit T.S.S value (13.50 and 13.30%) was obtained from the treatment 70 shoots/tree + 75% heading backwhile the minimum fruit T.S.S value(10.80 and 10.90%) was obtained from control trees in both seasons, respectively.

These results my due to the positive role of pruning in reducing shading and increasing the percentage of light penetration which enhanced the net photosynthesis and accumulated more carbohydrate substances.

These results supported the finding of Zayan [19] that dormant pruning treatment significantly increased the percentage of T.S.S in the juice of "MitGhamr" peach fruits. Chanana *et al*. [32] and Saini and Kaundal [31] reported that, the highest value for T.S.S. was obtained with hand thinning. Also, Deshmukh *et al*. [10] observed that, the highest T.S.S value was recorded in LFR of 55:1 (12.17%) followed by 45:1 (12.03%) and 35:1 (11.96%), while it was the lowest in control (10.11%).

Total Acidity: As shown in Table (4), total acidity of juice was not affected by all pruning treatments under study. Similarly, Fady [33] on peach, Ferree and Forshey [34] on apple, El-Ansary [35] on guava, Zayan *et al*. [36] on apple and Gonkiewicz [37] on peach found that, total acidity was not significantly affected by pruning severity.

Total Sugars: Data presented in Table (4) revealed that total sugars % increased by increasing pruning severity. In this respect 70 shoots/ tree treatment gave the highest fruit total sugars % (4.81 and 4.50) followed by 85 shoots/ tree (4.12 and 4.11), 100 shoots/ tree (4.03 and 4.11) then untreated control trees (3.38 and 3.50) in the 1st and 2 nd seasons, respectively. While, trees with 75% heading back gave the highest fruit total sugars % followed by 50%, 25% then control trees (5.07, 4.88, 4.80 & 4.09) in the 1st season and (5.18, 4.87, 4.68 & 4.06) in the 2ndseason, respectively. About the interaction between thinning and heading back applications, the highest fruit total sugars % (5.58 and 5.61) were recorded from the treatment of 70 shoots/tree + 75% heading backand the lowest fruit total sugars % (3.38 and 3.50) were recorded from control trees in both seasons, respectively.

The improvement in quality traits of fruit might be due to the reduction of crop load due to thinning by pruning, resulting in more synthesis, transport and accumulation of nutrients in the remaining fruits. These results are parallel with the data of Chanana *et al*. [32] and Saini and Kaundal [31] on peach who obtained that, the highest value for fruit total sugars was obtained with hand thinning. Also, Deshmukh *et al*. [10] who found that, the total sugars were the highest in treatment of 55:1 LFR (6.20%) followed by 45:1 (6.13%) and 35:1 (6.06%) on 'Flordasun' peach.

Vitamin C: Ascorbic acid content (Vit C) was significantly increased by increasing pruning severity as shown in Table (4). About the effect of thinning pruning level applications, it was found that 70 shoots/ tree gave the highest vitamin C content (18.21 and 18.50 mg/ 100gfw) followed by 85 shoots/ tree (18.11 and 18.15 mg/ 100g fw), 100 shoots/ tree (18.00 and 18.06 mg/ 100gfw) then untreated control trees (16.50 and 16.38 mg/ 100g fw) in the 1st and 2nd seasons, respectively. However, trees with 75% heading back gave the highest vitamin C content (19.14 and 19.52 mg/ 100g fw) followed by 50% (18.72 and 18.87 mg/ 100g fw), 25% (18.12 and 18.33 mg/ 100g fw) then control trees (17.43 and 17.47 mg/ 100g fw) in both seasons, respectively. About the interaction between thinning and heading back applications, the highest vitamin C content(20.92 and 21.85 mg / 100g fw) was recorded from the treatment of 70 shoots/tree + 75% heading back while the lowest vitamin C content (16.50 and 16.38 mg/ 100g fw) was recorded from control trees in both seasons, respectively.

These results are in line with Deshmukh *et al*. [10] who found that, the ascorbic acid content was recorded the highest value in 55:1 LFR treatment (6.57 mg/ 100g) followed by 45:1 (6.34 mg/ 100g) while the lowest content was recorded in control (5.69 mg/ 100g).

Peel Anthocyanin Content: Table (4) indicated that, the value of anthocyanin content in peach fruit skin was increased by increasing pruning severity.Concerning the effect of thinning pruning levels application, 70 shoots/ tree gave the highest peel anthocyanin content (4.08 and 4.19 mg/100g) followed by 85 shoots/ tree (3.89 and

3.91 mg/100g), 100 shoots/ tree (2.97 and 2.21 mg/100g) then untreated control trees (2.50 and 2.68 mg/100g) in the 1st and 2nd seasons, respectively. While, trees with 75% heading back gave the highest peel anthocyanin content followed by 50%, 25% then the control trees (4.57, 4.10, 3.66 & 3.36 mg/100g) in the 1st season and (4.55, 4.17, 3.76 & 3.29 mg/100g) in the 2nd season, respectively. About the interaction between thinning and heading back applications, the highest peel anthocyanin content (5.67 and 5.51 mg/100g) was recorded from the treatment of 70 shoots/tree + 75% heading back and the lowest peel anthocyanin content (2.50 and 2.68 mg/100g) was recorded from control trees in both seasons, respectively.

These results are in accordance with those reported by Hayden and Emerson [38] who found that, the advantage gained by pruning was improved light penetration of the canopy, in which light play an important role in the coloration of peach fruits. In addition, Mika [39] concluded that, dormant thinning out treatments facilitate light penetration into the interior part of the canopy and increase the rate of photosynthesis, this may increase the content of soluble solids in fruits and indirectly improve fruit coloration. Also, Deshmukh *et al*. [10] reported on Flordasun peach reported that, 45:1followed by 55:1 leaf to fruit ratio was the optimum for improving fruit characteristics, although control (unthinned) trees gave much higher yield, but the quality of such fruits was much inferior.

CONCLUSION

It could be concluded that, 70 shoots/ tree + 75% heading back/ tree treatment, gave the highest leaf to fruit ratio and the better fruit quality under this study conditions.

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