Assiut J. of Agric. Sci., 39 (3) (101-114)

EFFECT OF SUCKERING AND GIRDLING ON YIELD AND FRUIT QUALITY OF MANFALOUTY POMEGRANATE UNDER ASSIUT ENVIRONMENTS

Hassan Abdel-Kawi Abdel-Galil

Horticulture Department, Fac. Agric., Assiut Univ.

Abstract: This investigation was carried out during 2004, 2005, 2006 and 2007 seasons on Manfalouty pomegranate cultivar (*Punica granatum* L.) to study the effect of removing the suckers and girdling on yield components and fruit quality of Manfalouty pomegranate. The experimental trees were divided into two treatments (non-suckering and suckering), while subtreatments were girdling (G) at a level of 0 (control), 3, 6, 9 mm thickness. The results showed that suckering combined with girdling 3, 6, 9 mm significantly increased the carbohydrate/nitrogen (C/N ratio), fruit set percentage, yield, commercial yield percentage and improved the total soluble solids percentage and reducing sugars. Suckering and girdling 3 mm was the best practice compared with non-suckering. While, suckering monthly and girdling 9 mm decreased the yield and fruit quality during the third and fourth year. Moreover, non-suckering with girdling decreased gradually the yield and fruit quality during experimental seasons.

It can be recommend that suckering combined with girdling have the best effect on C/N ratio, yield and fruit quality of Manfalouty pomegranate. Also, girdling main trunks tree with 3 mm zone was suitable treatment during four studied experimental seasons.

Key words: pomegranate, suckering, girdling, carbohydrate.

Introduction

The processes of fruit bud initiation and differentiation, flowering and fruiting are influenced by orchard practices such as pruning, girdling and fruit thinning.

Girdling is one of the important practices which carried out to improve yield and fruit quality. Ringing is sometimes done to influence fruiting by causing a temporary accumulation of sugar or some other organic compounds in the part of the tree above the ring. Girdling will impede transport of sugars and hormones to various parts of the tree through the phloem. The nitrogen supply above the ring will be reduced although other mineral nutrients such as K and P, seem to pass the ringed area readily. Girdling technique and timing has a great

effect on yield (Hayes, 1970). Shoot length and number of leaves per shoot of pomegranate increased with pruning intensity (Pawar *et al.* (1994). Girdling gave the best results regarding the yield, fruit cracking and improved the Manfalouty pomegranate fruit quality. The beneficial effect of girdling on amending the fruits with their suitable requirements from nutrients whatever needed surely reflected on strengthening their peels and depressing fruit splitting (Ahmed-Amin *et al.*, 2000a&b). El-Kholy (2005) found that carbohydrate % values were paralled to C/N ratio, where girdling lead to the highest C/N ratio.

Removal of a 3 mm - ring of bark from the spur of apple increased the initial fruit set. Ringing reduced the net photosynthesis at petal fall only. The effect of ringing can be very localized on individual spur within a tree. This indicates that fruits are very dependent on the leaves on their own spurs rather than being able to receive carbohydrates from elsewhere in the tree. (Marro and Deveronice, 1981 and Ferree and Palmer (1982)).

Whereas, Williams (1985) found that 10 mm wide ringing to Halfway round apple, induced a higher number of fruits per tree in addition to the increase of higher fruits grades.

Girdling causes injuries in some cultivars as a result of its differences in healing after girdling. The degree of callusing depended on the cv. and girdle width (5 or 10 mm). The peach cv. Springtime was the most tolerant to girdling. A girdle with greater than 5 mm, decreased the callus formation in the other cultivars and even caused the death of some trees of the Armking nectarine cv. (Fernandez-Escobar *et al.*, 1987).

Kubota *et al.* (1993) worked on 2 peach cvs, Sanjo-Suimitsu (on each of *P. tomentosa* rootstocks) and Shimizu-hakuto (on peach rootstocks). They found that girdling advanced fruit maturation and increased fruit weight. Total soluble solids contents were higher in fruits from girdled branches, except for Shimizu-hakuto.

Girdling the peach cv. "Chunlei" trees, where the ring was 5 or 10 mm width, increased the mean fruit weight and fruit soluble solids content (Gao MeiXiau, 1997).

The fruit weight and diameter and its height as well as total soluble solids and sugars content of Teajon and Early Amber peach cvs. were significantly increased by girdling compared to the control. However, fruit firmness and acidity were decreased. These findings may be attributed to the accumulation of carbohydrates and some other

organic compounds in the part of the tree above the ring and resulted in good conditions for fruit growth and its quality (El-Agamy *et al.*, 2001).

On fig, El-Kassas *et al.* (1988) and Valia *et al.* (1994) recorded that the fruit weight and yield/tree increased substantially by all shoot girdling treatments.

Head suckering and pinching main shoots + maintaining laterals of Thompson Seedless grapevines improved the fruit set, cluster length, and cluster weight, 100-berry weight and cluster number. Thus, improved the yield, fruit physical and chemical characteristics (Mohsen, 2004).

Therefore, this study was designed to study the effect of degree of girdling with or without suckering on yield and fruit quality of Manfalouty pomegranate under Assiut environments.

Materials and Methods

This investigation was carried out during 2004, 2005, 2006 and 2007 seasons on Manfalouty pomegranate cultivar (*Punica granatum* L.) grown in the experimental orchard of the Faculty of Agriculture, Assiut University, Egypt.

Twenty-four uniform trees "31 years old" planted at spacing of 5x5 meters and chosen according to their vegetative growth and bearing yield. All trees received the ordinary management practices usually applied in the pomegranate orchard, including irrigation, pest control, hoeing and fertilization. The experimental trees were divided into two groups of suckering (S); the first group was non-suckering and the second was suckering every month per year, in addition to girdling. Each group was divided into four treatments of girdling (G): 0 (control), 3, 6, 9 mm. Suckering is removing suckers and/or watersprouts. The girdling consists of removing a narrow ring of bark at level of 30 cm over the soil surface at the main trunks during 1st June in the first experimental year.

The experiment was set in a split-plot complete randomized blocks design with three replicates, each was represented by one tree.

During full bloom (May 1st until middle of May), all perfect flowers and male flowers were counted weekly on choozen ten old branches/tree thus, the percentage of perfect flowers were calculated relative to the total number of flowers produced. The number of perfect flowers which succeeded to set fruits were calculated till the end of flowering season, then, the fruit set percentage was calculated relative to the total number of such perfect flowers.

Fruits of each treatment were harvested in the first of October, to determine the following:

- Yield in kg per tree.
- Percentage of fruit splitting from total yield per tree was calculated.
- Commercial yield percentage from total yield (the fruits free of undesirable characteristics as cracking and sunburn) was calculated.

Ten fruits were randomly taken from each replicate to study both physical and chemical fruit properties. The average fruit weight (g) and the grains percentage to the whole fruit weight was calculated. As well as chemical fruit constituents were calculated in the juice according to the corresponding methods:

- Total soluble solids percentage by using the hand refractometer.
- Total acidity (expressed as g of citric acid per 100 ml of juice) by titration with 0.1 NaOH and using phenolphthaline as an indicator.
- Total soluble solids/acid ratio was calculated.
- Reducing sugars percentage was calculated according to Lane and Eynon procedure which outlined in A.O.A.C. (1985).

To determine the shoot nitrogen and carbohydrate contents, twenty shoots were randomly taken from each replication in mid of October and defoliated. Shoot samples were washed several times in distilled water, then they were oven dried at 70°C to a constant weight, then ground in a stainless steel mill and kept for chemical analysis (Nijjar, 1985). Samples were analysed for total nitrogen by the semi-microkjeldahl technique (Wild *et al.*, 1985). Whereas, total carbohydrates were determined according to Smith *et al.* (1956).

All the obtained data were tabulated and analyzed according to Snedecor and Cochran (1990) using T-Dunnett test at 5% level for distinguishing the significant differences between various treatment means.

Results and Discussion

1- Shoot total carbohydrate % (C), shoot total nitrogen (N) and C/N ratio

As shown in Table (1) suckering significantly increased the total carbohydrate % (C), nitrogen % (N) and C/N ratio compared with non-suckering. The values were 17.2 and 13.67% (total carbohydrate), 2.59 and 2.43 (total nitrogen), while C/N ratio was 6.65 and 5.63, respectively.

Regarding the effect of girdling, it leads to a significant increase in the carbohydrate /nitrogen percentage on 3 & 6 mm girdling treatments than 0 and 9 mm ones. The values attained 6.31, 6.35, 5.73 and 6.18, respectively. Such

Table(1): Effect of suckering and girdling on shoot total carbohydrate (C), %, shoot total nitrogen (N), % and C/N ratio of Manfalouty pomegranate trees during 2004, 2005, 2006 and 2007 seasons.

Suckering (S)	Year (Y) / Girdling (G)	Shoot total carbohydrate (%)					Shoot total nitrogen (%)					C/N ratio				
		2004	2005	2006	2007	Mean	2004	2005	2006	2007	Mean	2004	2005	2006	2007	Mean
Non-suckering	*Control	13.29	13.20	13.09	13.08	13.17	2.57	2.56	2.55	2.54	2.56	5.17	5.16	5.14	5.15	5.15
	3 mm	13.88	13.88	13.86	13.84	13.87	2.44	2.44	2.42	2.41	2.43	5.69	5.70	5.74	5.74	5.72
	6 mm	13.85	13.84	13.83	13.79	13.83	2.37	2.39	2.38	2.37	2.38	5.84	5.78	5.81	5.81	5.81
	9 mm	13.85	13.83	13.82	13.78	13.82	2.38	2.37	2.37	2.35	2.37	5.82	5.83	5.84	5.85	5.84
Mean		13.72	13.69	13.65	13.62	13.67	2.44	2.44	2.43	2.42	2.43	5.63	5.62	5.63	5.64	5.63
Suckering	0 mm	16.41	16.48	16.50	16.60	16.50	2.64	2.62	2.61	2.58	2.61	6.22	6.28	6.32	6.43	6.31
	3 mm	17.49	17.79	17.80	17.93	17.75	2.57	2.58	2.58	2.57	2.58	6.81	6.90	6.90	6.98	6.89
	6 mm	17.53	17.70	17.70	17.89	17.71	2.58	2.57	2.57	2.57	2.57	6.79	6.89	6.90	6.96	6.89
	9 mm	17.53	17.68	15.73	16.38	16.83	2.58	2.56	2.61	2.58	2.58	6.80	6.91	6.03	6.34	6.53
Mean		17.24	17.41	16.93	17.20	17.20	2.59	2.58	2.59	2.58	2.59	6.66	6.74	6.54	6.68	6.65
Mean	0 mm	14.85	14.84	14.80	14.84	14.83	2.61	2.59	2.58	2.56	2.59	5.69	5.72	5.73	5.79	5.73
	3 mm	15.69	15.84	15.83	15.89	15.81	2.51	2.51	2.50	2.49	2.50	6.25	6.30	6.32	6.36	6.32
	6 mm	15.69	15.77	15.76	15.84	15.77	2.48	2.48	2.47	2.47	2.48	6.32	6.34	6.35	6.39	6.35
	9 mm	15.69	15.75	14.78	15.08	15.32	2.48	2.47	2.49	2.47	2.48	6.31	6.37	5.93	6.10	6.18
Over all mean		15.48	15.55	15.29	15.41	15.44	2.52	2.51	2.51	2.50	2.51	6.14	6.18	6.08	6.16	6.14

T. Dunnett 5%	Year (Y)	Suckering (S)	Girdling (G)	YxS	YxG	SxG	YxSxG
Shoot total carbohydrate (%)	0.19	**	0.19	0.26	0.36	0.261	0.522
Shoot total nitrogen (%)	0.004	**	0.004	0.004	0.009	0.004	0.009
C/N ratio	0.07	**	0.07	0.099	0.139	0.099	0.199

* Non-suckering without girdling

finding may be due to the accumulation of carbohydrates in the part of the tree above the ring..

Interaction between suckering and girdling was significant in most cases. The highest C/N ratio was obtained with suckering combined with girdling 3 mm (6.89%). These results are in accordance with those reported by El-Kholy (2005). He reported that carbohydrate % values were paralled to C/N ratio, where girdling lead to the highest C/N ratio.

2- Fruit set percentage:

Results presented in Table (2) reveal a significant effect on fruit set percentage as influenced by suckering and girdling. A general overlook at the results, it could be stated that suckering had significant effect on fruit set percentage compared to the non-suckering, these percentage were 50.36 and 34.21% (average of the four studied seasons), respectively. Regarding to suckering, the data indicated that girdling 3 mm is the best treatment (43.64%) compared to 0, 6, 9 mm treatments (42.03, 43.27 and 40.19%, average of the four studied seasons, respectively). Mohsen (2004) found that head suckering and pinching main shoots + maintaining laterals of Thompson Seedless grapevines improved the first set.

So, it can be conclude that, the girdling with suckering were able to activate the process of fruit set and induce highly significant values because suckering combined with girdling interrupt the mineral and nutrients to root and increase the carbohydrates above the girdling zone that should be resulted in an increasing in fruit set. Moreover, the girdling with suckering during three and four years were decreased at 6 and 9 mm treatments (46.70 and 45.85%) compared to the second season (56.45%). These results indicated that, the girdling above 6 mm is not suitable for long time. Such results may be attributed to the non healing of bark during the first and second seasons compared with girdling 3 and 6 mm which partially healed.

3 – Yield and its components

Regardless of the effect of girdling, the results illustrated in Tables (2&3) showed that suckering were significantly increased the yield, commercial yield percentage and significantly decreased the fruit splitting percentage compared to the non-suckering during the four seasons. The obtained values of yield were 85.90 and 38.64 kg per tree respectively, whereas commercial yield % were 84.49 and 64.31 respectively, as well as, fruit splitting % were 7.08 and 12.10 respectively (average of four seasons).

Table(2): Effect of suckering and girdling on fruit set percentage, yield (kg/tree) and commercial yield (%) of Manfalouty pomegranate trees during 2004, 2005, 2006 and 2007 seasons.

Suckering (S)	Year(Y) / Girdling (G)	Fruit set (%)					Yield (kg/tree)					Commercial yield (%)				
		2004	2005	2006	2007	Mean	2004	2005	2006	2007	Mean	2004	2005	2006	2007	Mean
Non-suckering	*Control	36.65	34.48	34.85	33.91	34.98	40.83	39.21	35.55	33.32	37.23	65.40	63.31	62.31	61.70	63.18
	3 mm	37.18	33.36	33.35	32.25	34.04	43.61	42.07	38.42	35.20	39.82	66.55	64.36	63.47	61.66	64.01
	6 mm	36.65	33.45	33.26	32.15	33.88	43.13	41.12	37.80	34.12	39.04	67.65	65.35	64.37	60.72	64.52
	9 mm	36.35	33.50	33.55	32.35	33.94	42.83	41.20	36.62	33.21	38.46	67.60	66.48	65.66	62.45	65.55
Mean		36.71	33.70	33.75	32.67	34.21	42.60	40.90	37.10	33.96	38.64	66.80	44.88	63.95	61.63	64.31
Sucker-ing	0 mm	36.50	52.65	53.05	54.15	49.09	77.50	80.20	85.20	90.71	83.40	80.65	85.66	87.35	88.35	85.50
	3 mm	35.85	58.75	59.10	59.25	53.24	82.40	86.30	95.30	100.80	91.20	85.50	87.45	88.54	91.15	88.16
	6 mm	36.70	57.55	58.15	58.25	52.66	83.21	85.40	93.50	98.72	90.21	83.43	86.35	87.20	88.24	86.31
	9 mm	36.75	56.45	46.70	45.85	46.44	83.10	85.39	75.82	70.78	78.77	84.35	85.37	76.48	65.75	77.99
Mean		36.45	56.35	54.25	54.38	50.36	81.55	84.32	87.46	90.25	85.90	83.48	86.21	84.89	83.37	84.49
Mean	0 mm	36.57	43.57	43.95	44.03	42.03	59.16	59.70	60.38	62.02	60.31	73.03	74.49	74.83	75.02	74.34
	3 mm	36.52	46.05	46.22	45.75	43.64	63.01	64.18	66.86	68.00	65.51	76.03	75.91	76.00	76.40	76.09
	6 mm	36.68	45.50	45.71	45.20	43.27	63.17	63.26	65.65	66.42	64.62	75.54	75.85	75.78	74.48	75.41
	9 mm	36.55	44.98	40.12	39.10	40.19	62.97	63.29	56.22	51.99	58.62	75.98	75.92	71.07	64.10	71.77
Over all mean		**36.58**	**45.03**	**44.00**	**43.52**	**42.29**	**62.08**	**62.61**	**62.28**	**62.11**	**62.27**	**75.14**	**75.54**	**74.42**	**72.50**	**74.40**

T. Dunnett 5%	Year (Y)	Suckering (S)	Girdling (G)	YxS	YxG	SxG	YxSxG
Fruit set (%)	0.04	**	0.04	0.06	0.072	0.058	0.10
Yield (kg/tree)	0.10	**	0.10	0.145	0.203	0.145	0.29
Commercial yield (%)	0.017	**	0.017	0.025	0.038	0.025	0.054

* Non-suckering without girdling

Table (3): Effect of suckering and girdling on fruit splitting percentage, fruit weight (g) and grain/fruit weight percentage of Manfalouty pomegranate trees during 2004, 2005, 2006 and 2007 seasons.

Suckering (S)	Year (Y) / Girdling (G)	Splitting (%)					Fruit weight (g)					Grain/fruit weight (%)				
		2004	2005	2006	2007	Mean	2004	2005	2006	2007	Mean	2004	2005	2006	2007	Mean
Non-suckering	*Control	11.28	11.56	11.65	12.18	11.67	354.7	357.3	345.0	344.3	350.3	54.73	54.43	54.37	54.23	54.44
	3 mm	11.78	12.08	12.19	12.45	12.13	337.7	335.3	330.7	328.0	332.9	54.23	54.17	54.13	54.09	54.16
	6 mm	11.87	12.28	12.35	12.55	12.26	332.3	330.0	329.7	321.0	328.3	54.20	54.10	54.02	54.17	54.12
	9 mm	12.08	12.41	12.45	12.50	12.36	331.7	328.7	324.0	320.0	326.1	54.20	54.17	53.68	54.10	54.04
Mean		11.75	12.08	12.16	12.42	12.10	339.1	337.8	332.3	328.3	334.4	54.34	54.22	54.05	54.15	54.19
Sucker-ing	0 mm	7.87	7.78	7.65	7.26	7.64	521.0	525.3	535.0	545.3	531.7	60.92	60.30	60.63	60.60	60.61
	3 mm	6.87	5.82	5.75	5.68	6.03	570.0	575.0	570.0	572.0	571.8	60.42	60.42	60.73	60.60	60.54
	6 mm	6.42	6.80	6.85	6.92	6.75	560.0	555.0	550.0	540.3	551.3	60.57	60.27	60.43	60.10	60.34
	9 mm	6.36	6.72	7.75	10.85	7.92	561.0	560.0	545.3	480.0	536.6	60.78	60.10	59.07	56.30	59.06
Mean		6.88	6.78	7.00	7.68	7.08	553.0	553.8	550.1	534.4	547.8	60.67	60.27	60.22	59.40	60.14
Mean	0 mm	9.58	9.67	9.65	9.72	9.65	437.8	441.3	440.0	444.8	441.0	57.83	57.37	57.50	57.42	57.53
	3 mm	9.32	8.95	8.97	9.07	9.08	453.8	455.2	450.3	450.0	452.3	57.33	57.29	57.43	57.35	57.35
	6 mm	9.15	9.54	9.60	9.73	9.50	446.2	442.5	439.8	430.7	439.8	57.38	57.18	57.23	57.13	57.23
	9 mm	9.22	9.57	10.10	11.68	10.14	446.3	444.3	434.7	400.0	431.3	57.49	57.13	56.38	55.20	56.55
Over all mean		9.32	9.43	9.58	10.05	9.59	446.0	445.8	441.2	431.4	441.1	57.51	57.24	57.13	56.77	57.16

T-Dunnett 5%	Year (Y)	Suckering (S)	Girdling (G)	YxS	YxG	SxG	YxSxG
Splitting (%)	0.015	**	0.39	0.03	0.03	0.03	0.04
Fruit weight (g)	1.31	**	1.31	2.03	3.45	2.03	4.21
Grain/fruit weight (%)	0.26	**	0.26	0.38	0.52	0.38	0.74

* Non-suckering without girdling

Regarding, the effect of girdling, the results indicated that the girdling with 3 and 6 mm were significantly increased the yield compared to the (0) control and 9 mm treatments. The obtained values were 65.51, 64.62, 60.31 and 58.62, average of the four seasons, respectively. The corresponding values of commercial yield percentage were 76.09, 75.41, 74.34 and 71.77% (average of the four seasons), respectively, whereas fruit splitting percentage were 9.08, 9.50, 9.65 and 10.14% average of the four seasons, respectively.

Such results could be attributed to the effect of girdling and suckering combined with girdling which lead to accumulation of carbohydrates above the girdling zone and prevented nutrients from escape to the roots by suckers and consequently increase fruit set, yield per trees, commercial yield % and decrease the fruit splitting percentage. As for the beneficial effect of girdling, Ahmed-Amin *et al.* (2000a) found that girdling increased the Manfalouty pomegranate yield. Mostafa (2000) found that complete girdling type was the best one to increase yield and optimize certain physical and chemical characteristics of fruit quality of Anna apple cultivar. Mohsen (2004) stated that head suckering and pinching main shoots + maintaining laterals of Thompson Seedless grapevines improved the yield.

4- Fruit weight and grain/fruit weight %:

Data presented in Table (3) show that the effect of suckering and girdling was significantly increased fruit weight and grain/fruit weight % as compared to the non suckering and girdling.

The highest fruit weight was obtained as an effect of suckering and girdling 3, 6 m were 571.8, 551.3 g av. of the four seasons, respectively. The corresponding values of grain/fruit weight % were 60.61, 60.54 and 60.34 av. of four seasons due to suckering and girdling 0, 3, 6 mm, respectively. Kubota *et al.* (1993) found that girdling increased fruit weight in peach cv Sanjo-Suimitsu.

These results could be attributed to the accumulation of carbohydrates in the part above the girdling and suckering that enhancing accumulation and transporation of mineral nutrients which in turn cause a suitable condition for fruit growth and increasing the grain weight percentage. Ahmed-Amin *et al.* (2000a,b) stated that the girdling improved the Manfalouty pomegranate fruit, and increased the grain weight percentage. Regardless of the effect of suckering, data in the previous table indicated that, girdling 3 mm cause a significant increase

in fruit weight (452.3 g) compared with other girdling. Also the grain/fruit weight % were 57.53 and 57.33 as av. of four seasons with 0, 3 mm respectively.

The interaction between the studied parameters was also significant, where the best treatment was suckering combined with girdling 3 mm zone.

Head suckering and pinching main shoots + maintaining laterals of Thompson Seedless grapevines recorded the best results concerning cluster length, cluster weight, and 100-berry weight, therefore improved the fruit physical (Mohsen, 2004).

5- Chemical constituents of juice:

Total soluble solids:

It is clear from the obtained data in Table (4) that the percentage of total soluble solids was significantly increased as a results of suckering and girdling. The highest value was due to suckering and girdling as compared to comparable values obtained from non-suckering with girdling. The values of TSS were 16.94 and 14.10 respectively. Regarding the effect of suckering, it was noticed that girdling 3, 6 mm increased T.S.S. % than 0, 9 treatments. Interaction between the two studied factors revealed that suckering with girdling 3, 6 mm gave the highest values of T.S.S. %. Whereas non-suckering and girdling 6, 9 mm exhibited the least T.S.S.% (av. of four seasons).

On the other hand, suckering and all treatments of girdling decreased acidity and increased T.S.S./acid ratio and reducing sugars than non-suckering. Interaction between the suckering and girdling showed significant effects in most cases. These results are in harmony with those of Zhang YanTao (1997) who found that girdling has been shown to increase soluble solids contents in sweet cherry and nectarine.

The same results were found by Kubota *et al.* (1993), Deng FengChan *et al.* (1997) and El-Agamy *et al.* (2001) who found that girdling of peach increased fruit soluble solids. The favourable influence of girdling on improving the sugar contents of fruit juice was emphasized by Gao (1997) and Ahmed-Amin *et al.* (2000a) on peach cv. Chunlei trees and pomegranate, respectively.

The obtained results recommend the necessary effect of suckering combined with girdling on yield and fruit quality of Manflaouty pomegranate. Also girdling tree trunk with 3 mm zone was suitable during four studied of experimental seasons.

Table(4): Effect of suckering and girdling on total soluble solids percentage (TSS), titratable acidity percentage, TSS/acid ratio and reducing sugar percentage of Manfalouty pomegranate trees during 2004, 2005, 2006 and 2007 seasons.

Suckering (S)	Year (Y) / Girdling (G)	TSS (%)					Titratable acidity (%)					TSS/ acid ratio					Reducing sugar (%)				
		2004	2005	2006	2007	Mean	2004	2005	2006	2007	Mean	2004	2005	2006	2007	Mean	2004	2005	2006	2007	Mean
Non-suckering	*Control	14.15	14.07	14.14	14.14	14.12	1.230	1.240	1.250	1.270	1.247	11.50	11.34	11.32	11.13	11.32	11.06	11.06	11.06	11.05	11.06
	3 mm	14.14	14.12	14.07	14.07	14.10	1.240	1.250	1.270	1.267	1.257	11.41	11.30	11.08	11.11	11.22	11.06	11.06	11.06	11.06	11.06
	6 mm	14.13	14.12	14.03	14.03	14.08	1.230	1.240	1.253	1.260	1.246	11.48	11.39	11.20	11.14	11.30	11.06	11.04	11.05	11.04	11.05
	9 mm	14.13	14.11	14.10	14.03	14.09	1.240	1.250	1.277	1.270	1.259	11.39	11.29	11.05	11.05	11.20	11.05	11.05	11.05	11.04	11.05
Mean		14.14	14.11	14.09	14.07	14.10	1.235	1.245	1.263	1.267	1.252	11.45	11.33	11.16	11.11	11.26	11.06	11.05	11.05	11.05	11.05
Suckering	0 mm	16.37	16.40	16.45	16.55	16.44	1.140	1.190	1.197	1.203	1.183	14.36	13.78	13.75	13.76	13.91	11.60	11.64	11.63	11.62	11.62
	3 mm	17.24	17.28	17.28	17.26	17.27	1.097	1.077	1.067	1.060	1.075	15.72	16.05	16.20	16.28	16.06	11.74	11.86	11.84	11.83	11.82
	6 mm	17.18	17.16	17.12	17.11	16.14	1.103	1.087	1.103	1.110	1.101	15.57	15.79	15.52	15.42	15.58	11.75	11.85	11.83	11.84	11.82
	9 mm	17.24	17.20	16.80	16.40	16.91	1.110	1.097	1.177	1.190	1.143	15.53	15.69	14.28	13.78	14.82	11.73	11.76	11.63	11.66	11.69
Mean		17.01	17.01	16.91	16.83	16.94	1.112	1.113	1.136	1.141	1.125	15.30	15.33	14.94	14.81	15.09	11.71	11.78	11.73	11.74	11.74
Mean	0 mm	15.26	15.23	15.30	15.34	15.28	1.185	1.215	1.223	1.237	1.215	12.93	12.56	12.53	12.44	12.62	11.73	11.35	11.35	11.34	11.34
	3 mm	15.69	15.70	15.68	15.67	15.68	1.168	1.163	1.168	1.163	1.166	13.56	13.68	13.64	13.70	13.64	11.40	11.46	11.45	11.44	11.44
	6 mm	15.65	15.64	15.58	15.57	15.61	1.167	1.163	1.178	1.185	1.173	13.53	13.59	13.36	13.28	13.44	11.40	11.45	11.44	11.44	11.43
	9 mm	15.68	15.66	15.45	15.22	15.50	1.175	1.173	1.227	1.230	1.201	13.46	13.49	12.66	12.42	13.01	11.39	11.41	11.34	11.35	11.37
Over all mean		15.57	15.56	15.50	15.45	15.52	1.174	1.179	1.199	1.204	1.189	13.37	13.33	13.05	12.96	13.18	11.38	11.42	11.39	11.39	11.40

T-Dunnett 5%	Year (Y)	Suckering (S)	Girdling (G)	YxS	YxG	SxG	YxSxG
TSS (%)	0.07	**	0.07	0.10	0.131	0.10	0.19
Titratable acidity (%)	0.004	**	0.004	0.004	0.009	0.004	0.013
TSS/acid ratio	0.06	**	0.06	0.09	0.12	0.009	0.17
Reducing sugar (%)	0.00	**	0.00	0.01	0.01	0.01	0.01

* Non-suckering without girdling

References

Ahmed-Amin, K.I.; A.M. El-Salhy; H.A. Abdel Galil and M.S. El-Kholy. 2000a. Effect of girdling and defoliation date on productivity of Manfalouty pomegranate. Proceedings of 2nd Scientific Conference of Agricultural Sciences, Assiut, Egypt. Vol. 1, 217-229.

Ahmed-Amin, K.I.; A.M. El-Salhy; H.A. Abdel Galil and M.S. El-Kholy. 2000b. Effect of girdling fruit thinning and uniconazole spraying on fruiting of Manfalouty pomegranate. Assiut J. Agric. Sci. 31 (4): 177-189, Egypt.

A.O.A.C. Association of Official Analytical Chemists (1985): Official Methods of Analysis (A.O.A.C.) 12th ed. pp. 494-510. Benjamin Franklin Station, Washington, D.C., U.S.A.

El-Agamy, S.Z.; A.M. El-Salhy and M.M. El-Wasfy. 2001. Effect of some rest breaking agents, fruit thinning and girdling on fruiting of some peach cultivars under Assiut environment. The Fifth Arabian Hort. Conf. Ismailia Egypt: Vol. 11: 133-145.

El-Kassas, Sh.E.; S.Z. El-Agmy; A.M. El-Sese and E.A. Mohammed. 1988. Physiological studies on girdling of "Sultani" fig trees. A- Effect of girdling position. Assiut J. of Agric. Sci. 19 (3): 72-83.

El-Kholy, M.S. 2005. Histological and physiological studies on flowering and fruiting of pomegranate (*Punica granatum*) under Assiut environments. Ph.D. Hort. Fac. Agric. Assiut University, Egypt.

Fernandez-Escobar, R.; M. Martin; P. Lopez-Rivares and M. Pazsurarez. 1987. Girdling as a means of increasing fruit size in peach and nectarine cultivars. Journal of Horticultural Science 62 (4): 463-468.

Ferree, D.C. and J.W. Palmer. 1982. Effect of spur defoliation and ringing during bloom on fruiting, fruit mineral level, and net photosynthesis of "Golden Delicious" apple. J. Amer. Soc. Hort. Sci. 107 (6): 1182-1186.

Gao MeiXiou. 1997. Effect of girdling on the extra-early peach variety "Chunlei". Journal of Fruit Science 14 (2): 117-118. (Hort. Abst. 68: 4777).

Hayes, W.B. 1970. Fruit growing in India. 3rd Ed., Published by Kitabistan, Allahabad, India, p. 346-357.

Kubota, N.; N. Nisiyama and K. Shismamura. 1993. Effects of girdling lateral bearing

branches on astringency and phenolic contents of peach fruits. Journal of the Japanese Society for Horticultural Science 62 (1): 69-72. (Hort. Abst. 65: 3783).

Marro, M. and L. Deveronice. 1981. Studies on ringing of apple. Frutticoltura 43 (1): 9-12, Univ. Di Milano, Italy. Hort. Abst. 51 (9): 6725.

Mostafa, M.F.M. 2000. Girdling types in relation to yield and fruit quality of Anna apple trees. J. Agric. Sci. Mansoura Univ., 25 (7): 4451-4457, Egypt.

Mohsen, A.T. 2004. Effect of summer pruning on yield, fruit quality and storage ability of Thompson Seedless and Flame Seedless grapes. Annals Agric. Sci., Moshtohor, Fac. Agric., Zagazig University, Moshtohor, Egypt, 42 (4): 1999-2015.

Nijjar, G.S. 1985. Nutrition of fruit trees. Kalyani Publishers, New Delhi, Ludhiana, pp. 100-150.

Pawar, S.K.; U.T. Desai and S.M. Choudhari. 1994. Effect of pruning and thinning on growth, yield and quality of pomegranate. Annals of Arid Zone 33 (1): 45-47. (CAB Abst., 1993/1994).

Smith, F.; M.A. Giles, J.K. Homilton and P.A. Godes. 1956. Colorimetric methods for determination of sugar and related substances. Annals Chem. 28: 350-356.

Snedecor, G.W. and W.G. Cochran. 1990. Statistical methods. 7th ed, Iowa State Univ. Press Amer., U.S.A., p. 507.

Wilde, S.A.; R.B. Corey; J.G. Lyer and G.K.J. Voigt. 1985. Soils and plant analysis for tree culture. Oxford IBH, New Delhi, India.

Williams, R. 1985. Rediscover ringing a round to improve cropping. Grower 103 (7): 56. (Hort. Abst. 55 (7): 5009).

Valia, R.Z.; J.P. Bhatt; R.G. Jadava and P. Kl. Kapadia. 1994. Effect of horticulture practices and fertilization on the production of fig (*Ficus carica* L.). South Indian Horticulture 42 (5): 321-323.

تأثير السرطنة والتحليق على المحصول وخصائص ثمار الرمان المنفلوطى تحت ظروف أسيوط البيئية

حسن عبد القوى عبد الجليل

قسم البساتين – كلية الزراعة – جامعة أسيوط

أجرى البحث على الرمان المنفلوطى بمزرعة كلية الزراعة – جامعة أسيوط خلال أربع سنوات 2004، 2005 ، 2006 ، 2007 لدراسة تأثير إزالة السرطانات والأفرخ المائية (السرطنة) والتحليق على كمية المحصول وخصائص الثمار للرمان المنفلوطى وكانت المعاملات كالاتى :

أشجار تركت بدون عملية السرطنة مع تحليق الأشجار بسمك صفر (كنترول) ، 3 ، 6 ، 9 ملى وأشجار أجريت لها عملية السرطنة كل شهر مع تحليق الأشجار بسمك صفر ، 3 ، 6 ، 9 ملى .

أوضحت النتائج الآتى :

1- أدت السرطنة كل شهر مع التحليق بسمك 3 ، 6 ، 9 ملى إلى زيادة معنوية فى نسبة الكربوهيدرات إلى النيتروجين ونسبة العقد وكمية المحصول ونسبة المحصول التجارى ونسبة المواد الصلبة الذائبة والسكريات المختزلة ، وكان أفضلها التحليق 3 ملى بالمقارنة بالكونترول.

2- سبب التحليق بسمك 9 ملى مع السرطنة إلى نقص المحصول وخصائص الثمار فى السنة الثالثة والرابعة.

3- أدى عدم السرطنة مع معاملات التحليق إلى نقص تدريجى فى المحصول وخصائص الثمار طوال سنوات التجربة .

توصى نتائج هذه الدراسة بضرورة إجراء السرطنة لأشجار الرمان المنفلوطى المحلقة حيث يؤدى ذلك لتحسين نسبة الكربوهيدرات إلى النيتروجين وبالتالى إنتاج محصول عال ذو خصائص ثمرية جيدة وأن التحليق للجذوع الرئيسية للشجرة بسمك 3 مللى مناسب للنمو والاثمار الجيد لأشجار الرمان .