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EFFECT OF FLOWER THINNING ON YIELD, FRUIT SPLITTING AND QUALITY OF MANFALOUTY POMEGRANATE CULTIVAR.

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ABSTRACT

This experiment was carried out during two successive seasons of 2002 and 2003 at the Experimental Orchard of Fruit Section, Faculty of Agriculture, Assiut University. This investigation was executed on Manfalouty pomegranate trees planted in heavy loam soil to explain the effect of flower thinning on the yield, fruit splitting and quality of this cultivar. The flower thinning was manually exercised according to the fruit set times. The first flower thinning level was applied beyond the third time of fruit set (7-13 May), the second level was applied after the forth fruit set time (25 May-1 June) while the third level was applied after the fifth fruit set time (15-21 June) in addition to the control. All the flowers that appear after the previous dates were weekly detached till the end of flowering season.

The obtained results indicated that the flower thinning led to a significant decrease of total number of fruits produced by the tree comparing to the control. The first level of flower thinning gave the lowest number of fruits. On the other hand, the yield (kg/tree) gave an opposite trend where all the treatments caused an increase in yield weight comparing to the control. The increment percentages of yield (kg/tree) were 7.5, 7.1 and 1.6 % for the first, second and third level of flower thinning, respectively compared to the control. However, the reduction percentages of fruit number/tree were 20.7, 13.0 and 8.5 % for such treatments, respectively comparing to the control. All treatments significantly decreased the percentage of fruit splitting comparing to the control. Since, the first level of flower thinning was the best treatment in this respect. The fruit splitting percentage was 11.2, 14.4, 15.4 and 18.7% for the first, second, third level of flower thinning and control, respectively. The flower thinning treatments caused a significant increase in fruit weight comparing to the control trees. So, the average fruit weight reached 415.3, 384.6 and 331.7 g for the three levels of thinning, respectively, while it was 293.8 g in the control. Such increase in fruit weight was reflected to an increase in yield weight (kg/tree) of thinning treatments. Moreover, the flower thinning levels especially the first level led to a significant increase of TSS % and TSS/acid ratio comparing to the control. On the other hand, all the thinning treatments decreased the total acidity percentage.

INTRODUCTION

The pomegranate is associated with the most ancient civilization in the Middle East and it was mentioned in many religion books. It is widely grown for its edible fruits. Pomegranate (*Punica granatum* L) is one of the most important and popular fruit crops in Egypt. The pomegranate prefers a semi-arid mild temperature to subtropical climate and is naturally adapted to regions with cool winter and hot dry summer. A humid climate adversely affects the formation of fruit. Accordingly, Assiut is considered the leader

governorate in area and production because it has the suitable weather for growing and fruiting.

Generally, fruit growers endeavor to obtain an optimum fruit density per tree although it reduces the fruit quality. Subsequently, fruit thinning is an important factor. There are two suitable dates for fruit thinning. The first date is at full bloom and the other one is some weeks after blossom (Bruinsma 1962). Although hormonal and chemical fruit thinning is widely used, it is very important now to rely and depend on the hand fruit thinning to avoid any harmful effects of the chemical and/or to prevent the soil and air pollution. Fruit thinning was reported to improve fruit quality and to increase the yield of many fruit crops. It could enhance fruit quality of Manfalouty pomegranate by using fruit thinning (Hussien *et al* 1994 a,b). Fruit thinning also increased yields of apple trees by 14-33% (Kurennoi and Apolokhov 1982).

In some areas, the bloom periods may last from March until September or later. Accordingly, the fruit does not develop into good size, color and late in maturity (Division of Agricultural Sciences 1977). Earlier fruit set results in large size fruit at harvest. Commercial fruits of Manfalouty pomegranate cultivar were produced from the first three weeks of fruit set. The early fruit set produced larger, first quality and earlier harvested fruits. While later fruit set did not attain their maturity standards and gave inferior and non-commercial fruits. Such fruits are poor in quality because they are not able to ripen in appropriate time and are affected by low temperature during fruit ripening (El-Sese 1988b and Mohamed 2004). The flowers that appear at the beginning of June must be removed to minimize irregular bearing and to improve the fruit quality (El-Sese 1988a).

A common problem encounters pomegranate in the production regions is the fruit splitting. The fruit splits vertically or horizontally at any age of it. Moreover, there is further attack of insects or fungal attack on the cracked fruits, so fruits become unfit for marketing. This problem caused to crack over 40% of fruits in some pomegranate cultivars (Malhotra *et al* 1983). Exposure to bright sun and/or heavy watering during fruit development following a period of drought may cause fruit to split prematurely (Singh 1980). The certain conditions of atmospheric humidity, dehydration by warm winds, insufficient, excessive and/or uneven irrigation may increase the fruit splitting. Saad *et al* (1988) reported that hot dry weather, heredity, variety, fruit growth and cultural practices are the main factors involved in enhancing fruit cracking of pomegranate. Moreover, the later waves of fruit set have more tendency to split than the early ones (Mohamed 2004). Adequate soil moisture must be maintained throughout the growing season, particularly as harvest approaches in late summer and early fall when it helps in reducing the number of split fruits. There are many horticultural practices used to reduce this disorder. Spraying with growth regulators such as GA**3** reduced splitting of pomegranate fruits (Sharifi and Sepahi 1984, El-Kassas *et al* 1989, El-Masry 1995 and Mohamed 2004). It was also found that foliar sprays with paclobutrazol and zinc sulphate could reduce fruit splitting of Manfalouty pomegranate cultivar (El-Khawaga 2003).

The objective of this study was to investigate the effect of flower thinning levels on yield, fruit splitting and quality of Manfalouty pomegranate cultivar under Assiut conditions.

MATERIALS AND METHODS

This investigation was carried out during two successive seasons of 2002 and 2003 at the Experimental Orchard of Fruit Section, Faculty of Agriculture, Assiut University. This investigation was executed on Manfalouty pomegranate trees planted in heavy loam soil. Regular agricultural managements were applied to all experimental trees as recommended. The trees spaces were 5 X 5 m apart and they were 29 years old.

Forty uniform trees were selected and divided into four groups (treatments). Each treatment was executed on ten trees (replicates). Thus, this experiment consists of four treatments including the standard treatment (control). The flower thinning were applied depending upon the time of fruit set. Fifteen fruits from each tree at six times of studies were labeled with colored plaster adhered around their stalks. Each fruit set time had different plaster color to collect samples easily from each fruit set at harvest. During the flowering periods, the thinning treatments were performed as follows:

1- Thinning of all the flowers that appeared beyond the third time of fruit set (7 – 13 May).
2- Thinning of all the flowers that appeared beyond the fourth wave of fruit set (25 May – 1 June).
3- Thinning of all the flowers that appeared after the fifth fruit set time (15 – 21 June).
4- Control trees: without flower thinning.

The previous flower thinning treatments were exercised weekly and lasted till the end of flowering season.

At harvest, all the fruits were picked on october 27 and 23, at the first and second year, respectively. Fruits per tree were counted and weighed to estimate the number of fruits and yield/tree (kg). As well the cracked fruits were sorted and counted, then the percentage of fruit splitting was attributed to the total number of fruits. After fruit picking, the labeled fruits were graded according to the time of fruit set. Then, ten fruits from each fruit set of each tree were collected and directly transported to the laboratory for determining the following physical and chemical properties:

1- Average fruit weight (g).
2- Average fruit rind weight, then calculated the percentage of rind weight attributed to the average fruit weight.
3- Total soluble solids (TSS) were estimated using a hand refractometer.
4-Total acidity by titration NaOH at 0.1 N using phenolphthalene as an indicator, and expressed as citric acid, according to A.O.A.C (1975).
5- TSS/acid ratio was calculated.

The data concerning the total number of fruits, yield/tree (kg) and fruit splitting % were arranged in a complete randomized design (CRD). Due to unequal number of fruit set times within each treatment, the other criteria

were subjected to a selective mean separation program using Nested F. Test fitted by Advanced Statistical Analysis Package (ASAP). The analysis of variance (ANOVA) was conducted according to Snedecor and Cochran (1972). Means were compared using the Least Significant Differences (LSD) values at 5 % level of the probability.

RESULTS AND DISCUSSION

The effect of levels of thinning on fruit number / tree, yield (kg/tree), fruit splitting and quality of Manfalouty pomegranate cultivar are shown in Tables (1- 6).

1-Yield and Fruit splitting %:

Table (1) shows the effect of different levels of flower thinning on fruit number, yield (kg) and fruit splitting percentage.

The results indicated that the treatments led to a significant decrease of total number of fruits produced by the tree comparing to the control. The first level of flower thinning gave the lowest number of fruits followed by the other two levels of flower thinning. The differences between the first and second level of thinning in this respect were significant in the first year and insignificant in the second one. While the differences between the first and third level of flower thinning were significant in the two years of study. The number of produced fruits (average of two years) was 295.1, 323.6, 340.5 and 372.1 fruits/tree for the first, second, third level of flower thinning and control trees, respectively. The decrement percentages of fruit number/tree were about 20.7, 13.0 and 8.5 % for thinning treatments, respectively comparing to the control. On the other hand, the yield weight (kg/tree) behaves an opposite trend to the all treatments caused an increase of yield weight comparing to the control. The average yield was 112.4, 112.0, 106.3 and 104.6 (kg/tree) for such treatments and control, respectively. The increment percentages of yield (kg/tree) were 7.5, 7.1 and 1.6 % for the three thinning levels, respectively compared to the untreated trees. Such increment percentage of yield weight can be attributed to the high increase of average fruit weight resulted from thinning treatments. In this respect, El-Sese (1988b) found that about 15-20 % of total perfect flowers was produced after the full bloom. Such flowers gave a high percentage of fruit set and gave noncommercial fruits, thus they must be removed to enhance the quality of remainder fruits and to avoid the alternate bearing. The results of current study were partially in line with those reported by Hussein *et al* (1994a) on Manfalouty pomegranate trees. They found that the fruit thinning decreased the number of fruits/tree while the total yield (kg/tree) was not affected comparing to the control. On apple trees, yields could be increased by 14-33 % using fruit thinning (Kurennoi and Apolokhov 1982). Moreover, Peerbooms (1984) on apple trees found that the highest yields/tree of Class I fruits were obtained by using some fruit thinning treatments.

Table (1): Effect of flower thinning on the fruit number/tree, yield and fruit splitting percentage of Manfalouty pomegranate during 2002 and 2003 seasons.

Characteristic / Treatment (Flower thinning level)	No. Fruits/ tree		Mean	Yield (Kg/tree)		Mean	Fruit splitting %		Mean
	2002	2003		2002	2003		2002	2003	
First level	352.4	237.7	295.1	124.0	100.7	112.4	15.5	6.9	11.2
Second level	399.6	247.6	323.6	127.3	96.7	112.0	21.5	7.2	14.4
Third level	422.7	258.3	340.5	122.5	90.0	106.3	23.0	7.8	15.4
Control	448.8	295.3	372.1	118.8	90.3	104.6	27.1	10.2	18.7
Mean	405.9	259.7	332.8	123.2	94.4	108.8	21.8	8.0	14.9
LSD 5%	28.3	19.6		N.S	9.2		3.9	2.4	

Data presented in Table (1) also show the effect of flower thinning on the percentage of fruit splitting. It could be observed that all the treatments significantly decreased the percentage of fruit splitting comparing to the untreated trees. The first level of flower thinning was the best treatment followed by the second and third level. The average of fruit splitting percentages were 11.2, 14.4, 15.4 and 18.7% for the first, second, third level of flower thinning and control , respectively. The current study indicated that there was a confirmed relationship between the number of fruits on the tree and the percentage of fruit splitting. Whenever the number of fruits on the tree was increased, the percentage of fruit splitting was increased.

2-Physical fruit properties:

Data presented in Tables (2) and (3) show the effect of flower thinning on the fruit weight and fruit rind percentage. The obtained results (Table 2) indicated that the average fruit weight was gradually decreased from the early to later waves of fruit set in the two studied seasons, however, the differences were significant. The first and second levels of flower thinning caused a significant increase in fruit weight comparing to the control trees. The first level gave the heaviest fruits followed by the second level of flower thinning while there were insignificant differences between the third level of flower thinning and control. The fruit average weight averages were 415.3, 384.6, 331.7 and 293.8 g for above mentioned treatments, respectively. The first flower thinning on the first date of fruit set gave the heaviest fruit (517.2 g) followed by the second flower thinning level on the same date where it produced an average fruit weight of 510.9 g (two seasons). On the other hand, the control trees on the same fruit set time gave average fruit weight of 468.3 g.

The increment of average fruit weight was 41.4, 30.9 and 12.9 % for the three levels of thinning, respectively comparing to the control. On the other hand, the fruit weight calculated as an average of the first three waves of fruit set times was 415.3, 408.5, 383.1 and 367.8 g for the first, second, third level of flower thinning and control, respectively. The increment percentage of such criterion was 12.9, 11.1 and 4.2 % for the first, second and third level of flower thinning treatments, respectively comparing to the control. These results explained that the reason of increasing yield in the

flower thinning treatments whereas the first three waves of fruit set produced the heaviest fruit, indicated that the later two or three waves of fruit set caused a high decrease of the grand average of fruit weight. Subsequently, the yield weight of the thinned trees increased comparing to the control. The current data were in accordance with those reported by Hussein *et al* (1994b) on Manfalouty pomegranate which found that the fruit thinning led to a significant increase of the fruit weight average comparing to the control trees. Also on apple trees, Stan *et al* (1983) found that fruit thinning increased fruit size by 30 %.

Table (2): Effect of flower thinning on the average fruit weight of Manfalouty pomegranate during 2002 and 2003 seasons.

Treatment (T) (Flower thinning level) → Fruit set time ↓(FST)	First Level		Mean	Second level		Mean	Third level		Mean	Control		Mean
	2002	2003		2002	2003		2002	2003		2002	2003	
09/4 – 15/4	493.8	540.6	517.2	485.9	535.8	510.9	456.5	521.5	489.0	433.9	502.6	468.3
23/4 – 29/4	361.4	414.9	388.2	360.8	406.1	383.5	344.8	375.9	360.4	322.8	361.5	342.2
07/5 – 13/5	321.2	359.7	340.5	311.7	350.4	331.1	296.4	303.1	299.8	286.2	299.7	293.0
25/5 – 01/6	-	-	-	297.1	328.3	312.7	268.9	275.2	272.1	257.4	270.1	263.8
15/6 – 21/6	-	-	-	-	-	-	220.2	254.3	237.3	223.1	235.3	229.2
02/7 – 08/7	-	-	-	-	-	-	-	-	-	156.7	176.0	166.4
Mean	392.1	438.4	415.3	363.9	405.2	384.6	317.4	346.0	331.7	280.0	307.5	293.8

LSD 5% →	Treatments	Within whole experiment	Within first level	Within second level	Within third level	Within control
2002	22.4	10.6	25.9	22.0	20.0	18.3
2003	23.0	10.9	26.5	22.7	20.9	18.8

Data presented in Table (3) show the effect of various flower-thinning levels on the rind weight percentage. The obtained results explained that the rind weight percentage did not greatly differ among various fruit set times and/or the treatments. Whenever the fruit set time was delayed the percentage of fruit rind slightly decreased. The first level of flower thinning gave the highest percentage of fruit rind weight followed by the second then the third level of fruit thinning.

The untreated trees produced the lowest percentage of fruit rind. The fruit rind weight % were 42.0, 40.9, 39.5 and 39.1 for the first, second, third level of flower thinning and control trees, respectively as an average of the fruit set times and two years of study. The first and second level of flower thinning on the first date of fruit set gave the highest percentage of fruit rind weight (43.1 and 41.9%, respectively as a average of two seasons). While the control trees on the last date of fruit set time produced the lowest percentage of rind weight (38.4%). The increased percentage of rind weight resulted from the treatments and/or the first waves of fruit set had a positive effect on reducing the fruit splitting percentage. Whereas the fruits that have a thin rind have more tendency to split than the fruits with thicker rind. Such results were in accordance with those noted by Mohamed (2004).

Table (3): Effect of flower thinning on the fruit rind weight percentage of Manfalouty pomegranate during 2002 and 2003 seasons.

Treatment (T) (Flower thinning level) → Fruit set time ↓(FST)	First Level		Mean	Second level		Mean	Third level		Mean	Control		Mean
	2002	2003		2002	2003		2002	2003		2002	2003	
09/4 – 15/4	39.8	46.4	43.1	39.1	44.7	41.9	38.7	43.5	41.1	37.0	42.3	39.7
23/4 – 29/4	39.5	43.1	41.3	38.8	44.6	41.7	38.2	41.8	40.0	37.2	40.5	38.9
07/5 – 13/5	38.7	44.2	41.5	38.4	44.2	41.3	38.1	40.3	39.2	38.0	41.6	39.8
25/5 – 01/6	-	-	-	37.1	40.2	38.7	37.7	39.8	38.8	37.6	39.8	38.7
15/6 – 21/6	-	-	-	-	-	-	37.3	39.6	38.5	38.5	39.4	39.0
02/7 – 08/7	-	-	-	-	-	-	-	-	-	38.7	38.1	38.4
Mean	39.3	44.6	42.0	38.4	43.4	40.9	38.0	41.0	39.5	37.8	40.3	39.1

LSD 5%	Treatments	Within whole experiment	Within first Level	Within second level	Within third Level	Within control
2002	N.S	1.6	N.S	1.9	N.S	N.S
2003	2.3	1.7	2.8	2.3	2.2	1.9

3- Chemical fruit properties:

The obtained results presented in Tables (4), (5) and (6) show the effect of flower thinning levels on the percentage of total soluble solids (TSS%), total acidity percentage and TSS/acid ratio of Manfalouty pomegranates.

Data presented in Table (4) revealed that the flower thinning levels led to a significant increase of TSS % comparing to the control trees. The first level of flower thinning gave the highest percentage of TSS. Data also indicated that TSS % decreased in the later waves of fruit set than the early ones in all flower-thinning levels. The total soluble solids were 16.4, 15.9, 15.3 and 14.8% for the first, second, third level of flower thinning and control trees, respectively as an average of the two years and fruit set times. The first level of flower thinning on the first fruit set time gave the highest percentage of TSS (16.7%) while the control on the later wave of fruit set gave the lowest percentage (13.7%).

Concerning the effect of treatments on the total acidity percentage (Table 5), it could be observed that the total acidity % decreased as a result of the flower thinning treatments. Additionally, it was gradually increased from the early to the later waves of fruit set. The first flower thinning level gave the lowest acidity percentage while the control gave the highest one. The total acidity was 0.969, 1.084, 1.187 and 1.315% for the first, second, third level of flower thinning and control trees, respectively as an average of two years and fruit set times. The first thinning level on the first fruit set time gave the lowest percentage of acidity (0.909%) while the control on the later wave of fruit set gave the highest one (1.582%).

Table (4): Effect of flower thinning on the total soluble solids percentage (TSS%) of Manfalouty pomegranate during 2002 and 2003 seasons.

Treatment (T) (Flower thinning level) → Fruit set time ↓(FST)	First level		Mean	Second level		Mean	Third level		Mean	Control		Mean
	2002	2003		2002	2003		2002	2003		2002	2003	
09/4 – 15/4	16.7	16.7	16.7	16.2	16.0	16.1	16.2	16.4	16.3	16.0	16.0	16.0
23/4 – 29/4	16.4	16.2	16.3	16.0	15.9	16.0	15.8	15.9	15.9	15.4	15.5	15.5
07/5 – 13/5	16.2	16.2	16.2	16.0	15.9	16.0	15.8	15.3	15.6	15.3	15.0	15.2
25/5 – 01/6	-	-	-	15.4	15.6	15.5	14.8	14.8	14.8	14.3	14.6	14.5
15/6 – 21/6	-	-	-	-	-	-	14.6	14.2	14.4	14.0	14.0	14.0
02/7 – 08/7	-	-	-	-	-	-	-	-	-	13.6	13.8	13.7
Mean	16.4	16.4	16.4	15.9	15.9	15.9	15.4	15.3	15.4	14.8	14.8	14.8

LSD 5%	Treatments	Within whole experiment	Within first Level	Within Second level	Within third level	Within control
2002	0.4	0.3	N.S	0.5	0.4	0.4
2003	0.5	0.3	N.S	N.S	0.3	0.3

Table (5): Effect of flower thinning on total acidity percentage of Manfalouty pomegranate during 2002 and 2003 seasons.

Treatment (T) (Flower thinning level) → Fruit set time ↓(FST)	First level		Mean	Second level		Mean	Third Level		Mean	Control		Mean
	2002	2003		2002	2003		2002	2003		2002	2003	
09/4 – 15/4	1.016	0.801	0.909	1.072	0.827	0.950	1.100	0.929	1.015	1.121	1.021	1.071
23/4 – 29/4	1.040	0.822	0.931	1.123	0.912	1.018	1.161	1.049	1.105	1.197	1.084	1.141
07/5 – 13/5	1.132	1.001	1.067	1.191	1.052	1.122	1.238	1.124	1.181	1.286	1.192	1.239
25/5 – 01/6	-	-	-	1.368	1.126	1.247	1.372	1.228	1.300	1.392	1.301	1.347
15/6 – 21/6	-	-	-	-	-	-	1.411	1.261	1.336	1.533	1.487	1.510
02/7 – 08/7	-	-	-	-	-	-	-	-	-	1.664	1.500	1.582
Mean	1.063	0.875	0.969	1.189	0.979	1.084	1.256	1.118	1.187	1.366	1.264	1.315

LSD 5% →	Treatments	Within whole experiment	Within first Level	Within Second level	Within third Level	Within control
2002	0.211	0.112	N.S	0.210	0.198	0.195
2003	0.196	0.101	N.S	0.198	0.192	0.191

Finally, the TSS/acid ratio (Table 6) was increased in the first flower thinning level followed by the second then third level. Since, the ratio were 17.2, 15.0, 13.2 and 11.6 for such treatments and control trees, respectively. The first level of flower thinning on the first fruit set time gave the highest TSS/acid ratio (18.5) while the control on produced the lowest ratio (8.7) as an average of two years. Generally, TSS/acid ratio was significantly decreased in the later than the early waves of fruit set. The best parameter for determining the fruit ripening of juicy fruits is the TSS/acid ratio. In this respect, El-Sese (1988a) reported that the TSS/acid ratio of Manfalouty

pomegranate fruits should not be decreased from 10/1 and the fruits would be unripe if the ratio did not reach such value.

From the above mentioned results and under similar conditions of this experiment it could be stated that the superior fruits of Manfalouty pomegranate were produced when their complete flowers were set during the first week of April till mid and/or end of May. The early flower thinning, although it decreased the number of fruits/tree, it increased the yield weight. It also increased the commercial fruits that are saleable with high price, moreover, it decreased the fruit splitting percentage. Accordingly, all the flowers that appear after the previous dates should be detached till the end of flowering season.

Table (6): Effect of flower thinning on TSS/acid ratio of Manfalouty pomegranate during 2002 and 2003 seasons.

Treatment (T) (Flower thinning level) → Fruit set time ↓(FST)	First level		Mean	Second level		Mean	Third level		Mean	Control		Mean
	2002	2003		2002	2003		2002	2003		2002	2003	
09/4 – 15/4	16.4	20.8	18.5	15.1	19.3	17.2	14.7	17.2	16.0	14.3	15.7	15.0
23/4 – 29/4	15.8	19.7	17.8	14.2	17.4	15.8	13.6	15.2	14.4	12.9	14.3	13.6
07/5 – 13/5	14.3	16.2	15.3	13.4	15.1	14.3	12.8	13.6	13.2	11.9	12.6	12.3
25/5 – 01/6	-	-	-	11.3	13.9	12.6	10.8	12.0	11.4	10.3	11.2	10.8
15/6 – 21/6	-	-	-	-	-	-	10.3	11.3	10.8	9.1	9.4	9.3
02/7 – 08/7	-	-	-	-	-	-	-	-	-	8.2	9.2	8.7
Mean	15.5	18.9	17.2	13.5	16.4	15.0	12.4	13.9	13.2	11.1	12.1	11.6

LSD 5% →	Treatments	Within whole experiment	Within first Level	Within second level	Within third level	Within control
2002	**2.0**	**1.3**	**2.3**	**2.1**	**2.1**	**2.0**
2003	**2.2**	**1.4**	**2.4**	**2.2**	**1.9**	**1.8**

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تأثير خف الأزهار على المحصول وتشقق وجودة ثمار صنف الرمان المنفلوطي٠

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أجريت هذه الدراسة خلال موسمي النمو ٢٠٠٢ ، ٢٠٠٣ على ٤٠ شجرة رمان منفلوطي عمرها ٢٩ عاما،بهدف معرفة تأثير خف الأزهار على المحصول ونسبة التشقق وصفات الجودة للثمار

ومن المعروف أن الرمان يزهر في موجات متتابعة عددها ٥ أو ٦ موجات تستمر من بداية شهر أبريل حتى بداية شهر يوليو لذلك أجري الخف يدويا كالتالي:

١ – إزالة جميع الأزهار التي تظهر بعد الموعد الثالث (٧ – ١٣ مايو) من عقد الثمار٠
٢ – إزالة جميع الأزهار التي تظهر بعد الموعد الرابع (٢٥ مايو – ١ يونيو) من عقد الثمار٠
٣ – إزالة جميع الأزهار التي تظهر بعد الموعد الخامس (١٥ – ٢١ يونيو) من عقد الثمار٠
٤ – أشجار المعاملة القياسية (بدون خف)٠

أوضحت النتائج أن معاملات الخف أدت إلى تقليل عدد الثمار/الشجرة مقارنة بالمعاملة القياسية وبالرغم من ذلك فإن نفس المعاملات أدت إلى زيادة طفيفة في المحصول (كجم/شجرة) حيث نتج عن معاملة الخف الأولى أقل عدد ثمار/الشجرة (٢٩٥,١ ثمرة كمتوسط للموسمين) وفي نفس الوقت أكبر محصول/شجرة (١١٢,٤كجم) مقارنة بباقي المعاملات في حين نتج عن المعاملة القياسية (الكنترول) أعلى عدد من الثمار/شجرة (٣٧٢,١ ثمرة) وأقل محصول/شجرة (١٠٤,٦ كجم). كذلك قلت النسبة المئوية لتشقق الثمار معنويا بعاملات الخف حيث نتج عن معاملة الخف الأولى أقل نسبة مئوية لتشقق الثمار(١١,٢ % كمتوسط للموسمين) بينما بلغت في الكنترول ١٨,٧%٠ كما أوضحت النتائج أن معاملات الخف أدت إلى زيادة كبيرة ومعنوية في متوسط وزن الثمرة حيث نتج عن معاملة الخف الأولى أكبر متوسط لوزن الثمرة (٤١٥,٣ جم) بينما بلغت في الكنترول ٢٩٣,٨ جم/ثمرة٠ هذا الفارق الكبير في وزن الثمرة انعكس إيجابيا على زيادة المحصول في معاملات الخف بالرغم من النقص في عدد الثمار مقارنة بالمعاملة القياسية٠ وكان تأثير المعاملات على وزن القشرة قليلا في موسمي الدراسة وقد حدث لها تناقص تدريجي في مواعيد العقد المتأخرة كما حدث لها زيادة طفيفة بزيادة مستوى الخف٠ من ناحية أخرى أدت معاملات الخف بصفة عامة إلى زيادة النسبة المئوية للمواد الصلبة الذائبة الكلية وانخفاض في الحموضة الكلية وانعكس ذلك على وجود زيادة ملموسة في نسبة المواد الصلبة الذائبة الكلية/الحموضة مقارنة بالمعاملة القياسية٠ كما توضح النتائج أن آخر موعدين لعقد الثمار في أشجار المعاملة القياسية كانت الثمار الناتجة منها ذات جودة رديئة من حيث انخفاض متوسط وزن الثمرة ونسبة المواد الصلبة الذائبة الكلية وارتفاع نسبة الحموضة٠

بناءا على نتائج هذه الدراسة ينصح بإزالة جميع الأزهار التي تظهر على الأشجار بعد الموعد الثالث أو الرابع للعقد حيث أدى ذلك إلى زيادة المحصول وقلل من نسبة التشقق وأدى لزيادة متوسط وزن الثمرة وحسن من خصائص الجودة لثمار الرمان المنفلوطي٠