APPLICATION OF ACTIVATED JASMINE OIL ON NAVEL ORANGE TREES B-IMPROVING STORABILITY AND SHELF-LIFE

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Abstract

The present investigation was carried out on Navel orange trees (twenty year-old) grown in clay loam soil at Kafr El-Sheikh Governorate, Egypt. The selected trees were treated with activated jasmine oil at two rates (0.03 % and 0.06 %) four times during the two study seasons 2008/2009 and 2009/2010 at full bloom, one month later, one month after the second and 1.5 month pre-harvest. At harvest time (mid December), fruit samples representing treatments and control were transported directly to the post-harvest Laboratory of Horticulture Research Institute, ARC. , Giza Governorate. These fruit samples were washed, air dried and divided into two groups, the 1st was stored under room conditions (22 ± 2°c , RH 65 – 75 %) for 40 days the 2nd was stored at cold storage (7°c, RH 90 - 95 %) for 80 days. The initial fruit quality was determined at 0.0 time of storage, and then fruit samples were taken after 20, 40, 60, and 80 days of storage to determine the change in fruit quality during storage period. The obtained data indicated that, fruits of jasmine oil treatment at 0.06 % was the best treatment for keeping quality either in cold storage or in room temperature conditions by reducing the weight loss percentage and decayed fruits % and maintained a higher soluble solids content (S.S.C.) than the other treatments through and by the end of storage periods. This treatment caused a noticeable lowering in the peel color (hue angle), acidity %, and vitamin C content and peel resistance of fruits than the others till the final of storage time. The increase of some fruit characters and the decrease of the others were higher with the increase of storage temperature and the progress of storage time during the different storage stages in both seasons.

Introduction

Citrus occupies the greatest acreage among all fruits trees grown in Egypt. In Egypt the total acreage cultivated is 222236

feddans among which 126653 feddans are cultivated by Navel oranges. The feddan produces, an average of, 9.38 tons per year*.

Navel orange (Citrus sinensis Osbeck) is one of the most popular citrus fruits in Egypt, for its delicious taste and nutrition, besides being rich in vitamin C and minerals. It has a significant importance not only in the local market but also for export. Under Egyptian conditions, it is a common practice to store mature Navel orange fruits on the trees for long time to delay harvest time but this cause some effect on flowering of the following season. Post-harvest changes in fresh fruits can not be stopped, but can be slowed, reduced or delayed down within certain limits with the use of some treatments to ameliorate fruit sanitary state and to disinfect its surface. In addition, citrus fruits that are in contact with waste materials, disease pathogen, fungi, bacteria are not suitable for export (Abd El-Khair and Hafez 2006). Hence, maintaining fruit quality, prolonging shelf life and reducing post-harvest losses of Navel oranges are the most important objectives in Egypt for extending season of Egyptian exports. During the last two decades many investigation were done to try and identify effective natural disinfecting substances which may be acceptable to consumers. Jasmine oil as one of these essential oils is effective in this respect, it may slow some vital processes such as, respiration while enhance juvenility, lowering consumption of sugars by hindering ethylene action and retarding the quick senescence of plant organs and in turn utilization of sugars (Paulin , 1986). In this connection Gonzalez - Aguilar et al. (2000) and (2003), Feng et al. (2003) Sekozawa et al. (2003) , Kondo et al . (2004) and Lindhout (2007) postulated that , the application of methyl jasmonate compounds reduced chilling injury and maintained post-harvest quality , and it may increase chilling resistance in fruits of mango , papays sunrise , peaches , " Kousui " Japanes pear , mangosteen and Navel oranges .

Recently, Creelmain and Mullet (1997) and Takeuchi and Kamuso (1997) observed that, Jasmonates are plant stress hormones that play a prominent role in signaling plant defense. Buta and Moline (1998) on peppers , Sabelis (2001) and Abd El-Khair and Hafez (2006) on " " Navel orange demonstrated that , Jasmonates treatment reduced the use of fungicide , decreased microbial growth ,insect repellant and prolonged storage life .

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* According to Agriculture Directorates of governorates. Economic Affairs Sector, Ministry of Agric. &Soil Reclamation of Egypt (2008).

Materials and Methods

Pre-harvest treatments:

The present study was carried out during the two seasons of 2008/2009 and 2009/2010 on Navel orange trees (*Citrus sinensis* Osbeck) trees. The trees are about twenty years old, grafted on sour orange (*Citrus aurantium*, L) rootstock grown in a private orchard in a clay loamy soil at Ebiana village, Kafr El-Sheikh Governorate, Egypt. The selected trees in this investigation were in a healthy state and have uniform vegetative growth and fruit load. The selected trees were divided into three groups randomly each group was five trees subjected to one of the following treatments:

1) Foliar sprays with tap water (control).
2) Foliar sprays with (0.03 %) of activated Jasmine oil.
3) Foliar sprays with (0.06 %) of activated Jasmine oil.

These treatments were carried out four times during the two studied seasons as follows:

a- During full bloom stage
b- A month from the first sprays
c- A month from the second
d- One month and half pre-harvest

At harvest date (mid December) in both seasons, mature orange fruits of each replicate were picked separately by a caliper to reduce any mechanical injuries and packed in plastic boxes. Selected fruits, which were used for experimental determinations were directly transported to the Laboratory of fruit handling Research Department, Agriculture Research Institute, A.R.C., and Giza. Defective fruits as those injured misshapen or off size were discarded and only sound fruits were used for determining the quality during storage period. Uniform fruits of each treatment were washed with tap water to remove the dust and foreign materials, then air dried and a quick sorting was done to recherché fruit for any defects. Fruits of each replicate were divided into two groups, one group was stored at room temperature (20 ± 2°c) and 65 – 75 % R.H and the second group was stored at 7°c and 90 – 95 % R.H. The fruits were packed in carton boxes in one layer and stored. From each replicate 10 fruits were marked for weight loss determination which was recorded each 20 days during storage period. Fruit characters were determined at 0 time (harvest date), 20, 40, 60 and 80 days throughout the storage period as follow:

At 20 days intervals, samples of 5 fruits of each replicate were taken for the following properties determinations.

1- Fruit physical characteristics:

1-1.Fruit weight loss (%):

This was calculated as a percentage of the average loss in fruit weight under each replicate separately, at examined date in relation to initial weight of the whole fruits.

1-2. Fruit decay percentage:

Fruits affected with either pathological or physiological disorders were counted by visual and calculated as a percentage to the initial number of fruits per each sample (replicate) and treatment too.

1-3.Fruit peel color ((hue angle)):

Peel color of the fruit was measured by averaging two measurements taken on two opposite points of each equator with a Minolta colorimeter (Minolta Co .ltd. Osaka, Japan) on the basis of the CIELAB color system. Color was represented by L (lightness, a (green-red) and b (blue-yellow) scale reading. The hue angle (h°) was calculated from arctangent b/a. The hue was represented as 0° = red purple, 90° = yellow, 180° = bluish – green and 270° = blue. (Mc Guire, 1992 and Voss, 1992).

1-4.Peel puncture resistance:

Fruit firmness of the peel was recorded by Ifra texture analyzer instrument using Penetrating Cylender of 5 mm of diameter to a constant distance 1 Cm inside the skin (to the flesh), and by a constant speed 0.3 mm/sec and the results were expressed as the resistance force to the penetrating tester in units of pressure gm/cm² (Harold, 1985).

2-Fruit chemical quality parameters:

2-1.Soluble solids content (S.S.C) percentage:

S.S.C was determined by using Carl Zeiss hand Refractometer.

2-2. Total acidity percentage:

It was determined in fruit juice as citric acid according to (A.O.A.C, 1985).

2-3.Ascorbic acid (Vitamin C) content:

It was calculated as mg/100 ml juice according to (A.O.A.C, 1985).

Statistical analysis:

Experiment was designed as a complete randomized design and all data obtained throughout this study were tested by analysis of variance (Little and Hills, 1978). Duncan's multiple range tests were used for comparison among the treatments means (Duncan, 1955)

Results and Discussions

4-1- Fruit weight loss percentage:

The results of fruit weight loss percentage as shown in table (1) indicated that, there was a highly significant effect caused by jasmine oil treatments and storage temperatures on fruit weight loss (%) on both seasons till the end of storage time. The higher concentration of jasmine oil reduced the weight loss during storage at the two storage temperatures. There was a stable trend to increase weight loss with the progress of storage time at the two storage temperatures during the two seasons. The increase of weight loss was highest as the storage temperature was higher. Untreated fruits recorded the highest values of (W. L) compared with other treatments (it was 17.12 and 14.96 % and 19.03 and 16.55 % at the end of storage at R.T and 7°c during the two seasons respectively) compared to 13.64 and 11.70 % and 12.41 and 12.82 % with 0.06 % jasmine oil treatments . The previous results are in agreement with those attained by El-Zayat and Hassan (2006) on stone fruits, Hadian and Zolfag harinasab (2007) on Pomegranate fruits (Malas Save) and Nilprapruck *et al.* (2008) on Pine apple fruits (Ananas Comosus).

4-2- Fruit decay percentage:

Data concerning fruit decay percentage are presented in table (2), it was noticed that, jasmine oil treatments were more effective on the reduction of fruit decay percentage compared to the control at the two selected storage temperatures in both seasons. These effects were highly significant at the two storage temperatures during all storage times in both seasons. The increase of decay percentage was concomitant with the increase in storage temperature and prolongation of storage time. Jasmine oil of (0.06 %) concentration showed the lowest increment of decay percentage compared to the other treatment (0.03 %) and control at the two storage temperatures during the two seasons, they recorded 4.17 and 10.42 % and 20.83 and 10.42 % decay at R.T and 7°c during the two seasons, respectively, in contrary to 31.25 and 18.75 % and 33.33 and 20.83 % in untreated fruits.These results are in line with the finding of Moline *et al.* (1997) on strawberries, Buta and Moline (1998) on peppers, Michael *et al.* (1998), Droby *et al.* (1999) on grapefruit, Abow-zeid (2000), Gonzalez – Aguilar *et al* . (2000) on mango and (2003) on papaya sunrise, Sabelis (2001). Kondo *et al.* (2004) on mangosteens, Abd El-Khair and Hafez (2006) on" Navel" orange, El-Zayat and Hassan (2006) on stone fruits, El-Zayat and Allam (2006) on peach and Lindhout (2007) on Navel oranges . Mira and Baldwin (2001) reported that, JA delayed the internal ethylene production in fruits.

4-3- Fruit peel color "hue angle":

Fruit color as shown in table (3) indicated that, jasmine oil treatments delayed the development of peel color compared to control, and the same trend was observed during storage period in the two seasons. Significant differences were recorded among the averages of all treatment at the two storage temperatures in both seasons. A gradual decrease in peel color was noticed in all treatments and control with the advance in storage period in the two seasons. The hue angle of peel color decreased more as storage temperature increased. The differences between treatments in peel color content were highly significant at 0.0 time and during all dates of storage period especially for (0.06 %) treatments which gave the highest values of hue angle at the end time of storage 65.89 and 63.09 at R.T and 66.55 and 64.62 at 7°c during the two seasons, respectively compared with 44.32 and 38.94 at R.T and 45.49 and 42.30 at 7°c with the control. These results are in complete agreement with those of El-Zayat (2005) on delaying maturity of Banana, Vick and Zimmerman (1984), El-Zayat and Hassan (2006) on delaying maturity of peach and apricot fruits and Ahmed Samira, S. *et al.* (2010) Gonzalez – Aguilar *et al.* (2001) found that, Methyl jasmonate enhances color development of mangoes fruits.

4-4- Fruit peel resistance:

It was noticed from table (4) that, there was a highly significant variation among treatments of jasmine oil treatments and control at initial time of storage. A similar trend was found for the interaction between pre-harvest treatments and storage temperatures. It is clear that, peel resistance was gradually decreasing as the storage period advanced and the reduction rate was highly significant in control compared to treated fruits in both seasons. Storage at 7°c and R.H 90-95% was more effective in reducing the decrease in peel resistance during the two seasons. Treatment with (0.06%) jasmine oil scored the highest values of peel resistance during all storage stages either under cold or room conditions as it was 42.54 and 42.20 and 53.23 and 52.26 at the end of storage at R.T and cold storage in the two seasons, respectively compared with 22.02 and 26.70 and 26.51 and 29.32 in control fruits, this may be due to the effect of biological treatments (JO) in delaying fruit ripening and increasing resistance to storage disorder and maintained higher firmness and this proved to be in complete accordance with Vick and Zimmerman (1984), Feng et al . (2003) on peaches, El-Zayat (2005) on Banana, El-Zayat and Allam (2006) on peach and El-Zayat and Hassan (2006) on peach and Apricot.

4-5- Titratable acidity (%):

It is obvious from data in table (5) that, natural treatment of (JO) has significantly increased treated fruits juice acidity than untreated fruits during the two seasons. Acidity decreased with the progress of storage period in both treatments and control fruits. There were significant differences among all treatments and storage temperatures at all stages of storage. Control acidity was significantly lower than the other treatments, and that was clear with (JO) at (0.06%) more than the other treatment (JO at 0.03%) in the two seasons. All treatments reduced the decrease in acidity at the two storage temperatures compared with the control during the two seasons. (JO) treated fruits at (0.06%) contains 1.03% acidity at the initial time of storage in the two seasons respectively, it reached to 0.73 and 0.75 % at the end of storage at R.T (40 days) and 0.82 and 0.81 % at the end of storage at 7°c (80 days) during both seasons, respectively These values of control fruits were 0.95 and 0.96 % and reached 0.66 and 0.67 % and 0.73 and 0.74 %, respectively. These results are in accordance with El-Zayat and Hassan (2006) on Peach and Apricot or on delaying ripening as El-Zayat (2005) on Banana and El-Zayat and Allam (2006) on Peach Nil prapruck *et al.* (2008) noticed that, no differences between methyl jasmonate treated fruits and control of Pineapple in acidity.

4-6- Vitamin C content (mg /100 ml juice):

Results in table (6) indicated, significant differences between the treatments and control in vitamin C content during the two studied seasons. Vitamin C expressed in mg/100 ml juice was decreasing with the advance of storage period in all treatments and control. There was a significant difference among treatments and storage temperatures during different storage stages in both seasons. Treated fruits maintained its vitamin C higher than the control during and at the end of storage time in both storage degrees and seasons, due to the effect of treatments in stopping the decrease in V.C. and the highest values of V.C were obtained from jasmine oil treatment with 0.06 % at the two storage temperatures during the two seasons compared to other treatments. They contained 62.52 and 61.01 mg V.C at (0.0) time of storage and ended by 47.69 and 44.89 mg at the end of storage at R.T for 40 days storage and 52.37 and 50.58 mg at the end of storage at 7°c for 80 days storage during the two seasons, respectively. These values in control fruits were 52.87 and 51.04 mg at initial time and ended 33.42 and 31.72 mg at R.T and 40.72 and 36.10 at 7°c.

High storage temperature (R.T) had the highest decrease in V.C during and at the end of storage in the two seasons.

These results are in agreement with those of Vick and Zimmerman (1984) on delaying ripening and Sebroder (1998) on delaying maturity of applied fruits with Jasmine oil components.

6-7- Soluble solids content (S.S.C) %:

Presented data in table (7) revealed that, treated fruits of Navel oranges contained lower rates of S.S.C % at 0.0 time of storage compared to control in the two seasons. The variations among treatments and control recorded significant differences at the initial times and during storage period in the two seasons .There was an increase of S.S.C. content with the progress of storage time and with the higher storage temperature in both seasons. Jasmine oil treatment gave the maximum enhancement of S.S.C during and at the end of storage period during the two storage seasons. Treatment at 0.06 % (JO) kept its S.S.C higher than the other treatments during and at the final stage of storage, its S.S.C values were 12.63 and 12.67 % at the end of storage at R.T (40 days) and 13.13 and 13.30 at the end of storage at 7°c (80 days) in the two seasons, respectively. Compared with 12.13 and 12.23 % at R.T and 12.43 and 12.67 % at 7°c in control, in both seasons, respectively.

These observations go in line with those obtained by Gonzalez – Aguilar *et al.* (2003) on papaya, and Nil prapruck *et al.* (2008) who mentioned that, no differences were found in S.S.C content in treated and untreated fruits during storage. On contrary El-Zayat and Allam (2006) on peach and El-Zayat and Hassan (2006) on peach and Apricot observed that, treated fruits with jasmine oil recorded the lower values of soluble solids at the end of storage than the control.

Conclusion

Navel orange as the predominant variety in Egypt has many problems during production, harvesting, handling, storage and export. Thus, many investigations were carried out to solve some of these problems. It is recommended to use jasmine oil treatments spray on Navel fruits as a natural (biological) control and produce fruits free from synthetic chemical anti pesticide residues and safe for consumers. It can reduce the infection of soft rot, microbial growth by acting as fungicide and insect repellant and induce some defense mechanism response that indirectly provide protection against chilling damage . On the other hand it decrease weight loss and decay rots rate, delayed ripening, kept fruits in a higher firmness, effective in delaying ripening as expressed by color values of fruits, maintain post-harvest fruit quality in good conditions and longest marketable time at the end of storage period .

Table (1): The effect of activated jasmine oil sprays and storage temperatures interaction on fruitweight loss (%) on Navel orange fruits during 2008/2009 2009/2010 seasons.

Storage days	0.0 day	20 day		Treat.(A)	40 day		Treat.(A)	60 day	80 day
Treatments	Time	R.T	7°c	mean	R.T	7°c	mean	7°c	7°c
1st season									
Control	0	8.56a	2.03c	5.34 A	17.12a	5.89c	11.51 A	9.38A	14.96A
*J. 0.03 %	0	6.20b	1.26c	3.73 B	14.45b	4.71cd	9.58 B	7.86B	13.61B
J.0.06 %	0	4.61b	0.86c	2.74 C	13.64b	3.63d	8.64 B	6.26C	11.70C
mean(B)	0	6.49a	1.38b	3.94	15.07a	4.74b	9.91	7.83	13.42
LSD at 5%		2.50		0.90	2.10		1.53	1.40	1.12
2nd season									
Control	0	9.0a	2.92c	5.96 A	19.03a	7.23d	13.13 A	11.64A	16.55A
J.0.03 %	0	5.38b	2.30c	3.84 B	14.12b	5.26e	9.69 B	9.13AB	13.25B
J.0.06 %	0	4.81b	0.83d	2.82 C	12.41c	3.65f	8.03 C	7.37B	12.82B
mean(B)	0	6.40a	2.02b	4.14	15.19a	5.38b	10.28	9.38	14.21
LSD at 5%		1.35		0.96	1.50		1.24	1.98	2.00

In a column under each data, means followed by a common letter are not significantly the 5 % level by DMRT.
* Jasmine oil

Table (2): The effect of activated jasmine oil sprays and storage temperatures interaction on fruit decay (%) on Navel orange fruits during 2008/2009 2009/2010 seasons.

Storage days	0.0 day	20 day		Treat.(A)	40 day		Treat.(A)	60 day	80 day
Treatments	Time	R.T	7°c	mean	R.T	7°c	mean	7°c	7°c
1st season									
Control	0	16.67a	6.25d	11.46 A	31.25a	8.33c	19.79 A	14.58A	18.75A
*J.0.03 %	0	14.58b	2.09e	8.34 A	29.17a	6.25c	17.71 A	8.33B	14.58A
J.0.06 %	0	12.50c	0.01f	6.26 A	22.92b	4.17c	13.55 B	6.25B	10.42A
mean(B)	0	14.58a	2.78b	8.68	27.78a	6.25b	17.01	9.72	14.58
LSD at 5%		1.85		5.40	5.60		3.51	5.00	9.00
2nd season									
Control	0	16.67a	6.25cd	11.46 A	33.33a	10.42c	21.88 A	14.58A	20.83A
*J.0.03 %	0	12.50ab	2 09de	7 30 B	29.17a	8 33cd	18.75 A	10 42A	12 50B
J.0.06 %	0	10.42bc	0.01e	5.22 B	20.83b	2.09d	11.46 B	8.33A	10.42B
mean(B)	0	13.20a	2.78b	7.99	27.78a	6.95b	17.36	11.11	14.58
LSD at 5%		6.20		2.50	7.51		4.50	6.52	4.00

In a column under each data, means followed by a common letter are not significantly the 5 % level by DMRT.
* Jasmine oil

Table (3): The effect of activated jasmine oil sprays and storage temperatures interaction on peel color ((hue angle)) on Navel orange fruits during 2008/2009 2009/2010 seasons.

Storage days	0.0 day	20 day		Treat.(A)	40 day		Treat.(A)	60 day	80 day
Treatments	Time	R.T	7°c	mean	R.T	7°c	mean	7°c	7°c
1st season									
Control	55.85B	49.90c	53.47c	51.69 C	44.32c	50.26Bc	47.29 C	48.45B	45.49B
*J.0.03 %	71.11A	64.76b	68.44ab	66.60 B	57.02b	65.65a	61.34 B	62.28A	59.28A
J.0.06 %	78.18A	71.72ab	74.73a	73.23 A	65.89a	73.26a	69.58 A	69.49A	66.55A
mean(B)	68.38	62.13a	65.55a	63.84	55.74a	63.06a	59.62	60.07	57.10
LSD at 5%	10.10	9.51		6.00	8.00		7.50	8.20	8.12
2nd season									
Control	53.82B	46.60c	50.62c	48.61 C	38.94e	47.74d	43.34 C	45.44B	42.30B
J.0.03 %	71.57A	63.39b	68.99ab	66.19 B	54.11c	68.29ab	61.20 B	64.89A	61.21A
J.0.06 %	76.61A	69.46ab	72.99a	72.23 A	63.09b	71.15a	67.12 A	67.23A	64.62A
mean(B)	67.36	59.80a	64.20a	62.01	52.05a	62.39a	59.19	59.19	56.04
LSD at 5%	11.00	8.45		5.50	6.00		5.00	3.51	4.22

In a column under each data, means followed by a common letter are not significantly the 5 % level by DMRT.
* Jasmine oil

Table (4): The effect of activated jasmine oil sprays and storage temperatures interaction on peel resistance ((hue angle)) on Navel orange fruits during 2008/2009 2009/2010 seasons.

Storage days	0.0 day	20 day		Treat.(A)	40 day		Treat.(A)	60 day	80 day
Treatments	Time	R.T	7°c	mean	R.T	7°c	mean	7°c	7°c
1st season									
Control	44.30C	32.55f	40.07e	36.31 C	22.02d	36.13c	29.23 B	30.35C	26.51C
*J.0.03 %	66.50B	52.07d	61.54b	56.81 B	36.50c	59.65a	48.08A	53.07B	47.89B
J.0.06 %	71.07A	57.04c	68.08a	62.56 A	42.54b	62.93a	52.74 A	58.35A	53.23A
mean(B)	61.07	47.22b	56.56a	51.89	33.67b	53.00a	47.26	47.26	42.54
LSD at 5%	3.50	3.54		4.71	4.45		5.90	4.00	4.14
2nd season									
Control	50.44B	37.10c	42.44c	39.77 B	26.70c	37.37b	32.04 B	31.68B	29.32B
J.0.03 %	69.19A	52.54b	62.55a	57.55 A	39.41b	56.68a	48.05 A	51.88A	45.53A
J.0.06 %	69.89A	55.71b	63.96a	59.84 A	42.20b	60.08a	51.14 A	53.83A	52.26A
mean(B)	62.07	48.45a	56.32a	52.38	36.10b	51.38a	43.76	45.80	42.37
LSD at 5%	2.45	4.85		5.00	4.15		4.54	5.17	8.00

In a column under each data, means followed by a common letter are not significantly the 5 % level by DMRT.
* Jasmine oil

Table (5): The effect of activated jasmine oil sprays and storage temperatures interaction on titratable acidity (%) on Navel orange fruits during 2008/2009 2009/2010 seasons.

Storage days	0.0 day	20 day		Treat.(A)	40 day		Treat.(A)	60 day	80 day
Treatments	Time	R.T	7°c	mean	R.T	7°c	mean	7°c	7°c
1st season									
Control	0.95A	0.77d	0.90bc	0.84 B	0.66d	0.83b	0.75 B	0.79B	0.73B
*J.0.03 %	0.99A	0.86c	0.93ab	0.90 A	0.70cd	0.86ab	0.78 AB	0.80B	0.77AB
J.0.06 %	1.03A	0.87bc	0.97a	0.92 A	0.73c	0.91a	0.82 A	0.88A	0.82A
mean(B)	0.99	0.83b	0.93a	0.88	0.70b	0.87a	0.78	0.82	0.77
LSD at 5%	0.08	0.08		0.04	0.07		0.06	0.06	0.07
2nd season									
Control	0.96A	0.83b	0.88ab	0.86 a	0.67d	0.85b	0.76 B	0.80A	0.74B
J.0.03 %	1.00A	0.85b	0.91ab	0.88 a	0.73cd	0.86ab	0.80 AB	0.81A	0.71B
J.0.06 %	1.03A	0.86b	0.96a	0.91 a	0.75c	0.92a	0.84 A	0.85A	0.81A
mean(B)	1.05	0.85a	0.92a	0.88	0.72b	0.88a	0.80	0.82	0.75
LSD at 5%	0.10	0.09		0.08	0.07		0.06	0.06	0.05

In a column under each data, means followed by a common letter are not significantly the 5 % level by DMRT.
* Jasmine oil

Table (6): The effect of activated jasmine oil sprays and storage temperatures interaction on Vitamin C content on Navel orange fruits during 2008/2009 2009/2010 easons.

Storage days	0.0 day	20 day		Treat.(A)	40 day		Treat.(A)	60 day	80 day
Treatments	Time	R.T	7°c	mean	R.T	7°c	mean	7°c	7°c
1st season									
Control	52.87C	43.55d	48.89c	46.22 C	33.42d	48.04b	40.75 C	43.14B	40.72B
*J.0.03 %	57.91B	49.58c	54.97b	52.28 B	41.92c	54.64a	48.28 B	51.54A	47.56A
J.0.06 %	62.52A	55.94b	60.06a	58.00 A	47.69b	57.60a	52.65 A	54.56A	52.37A
mean(B)	57.77	49.69a	54.64a	52.17	41.01b	53.43a	47.22	49.74	46.88
LSD at 5%	4.10	4.14		5.00	5.00		3.61	4.24	5.13
2nd season									
Control	51.04C	41.94d	46.96cd	44.45 C	31.72e	43.89c	37.81 C	41.57C	36.10C
J.0.03 %	55.50B	48.02bcd	52.08abc	50.05 B	40.74d	50.69b	45.72 B	46.71B	44.22B
J.0.06 %	61.01A	56.24ab	59.97a	58.11 A	44.87c	57.83a	51.35 A	52.78A	50.58A
mean(B)	55.58	48.73a	53.00a	50.35	39.11b	50.80a	44.95	47.02	43.64
LSD at 5%	3.65	8.40		4.24	3.00		4.15	4.35	5.13

In a column under each data, means followed by a common letter are not significantly the 5 % level by DMRT.
* Jasmine oil

Table (7): The effect of activated jasmine oil sprays and storage temperatures interaction on Soluble solids content on Navel orange fruits during 2008/2009 2009/2010 easons.

Storage days	0.0 day	20 day		Treat.(A)	40 day		Treat.(A)	60 day	80 day
Treatments	Time	R.T	7°c	mean	R.T	7°c	mean	7°c	7°c
1st season									
Control	11.70A	12.27a	12.07ab	12.17 A	12.13a	12.30a	12.22 B	12.60A	12.43B
*J.0.03 %	10.93B	11.93be	11.53d	11.73 B	12.43a	12.20a	12.32 AB	12.70A	13.00A
J.0.06 %	10.90B	11.80bcd	11.70cd	11.75 B	12.63a	12.73a	12.68 A	13.00A	13.13A
mean(B)	11.18	12.00a	11.77a	11.88	12.40a	12.41a	12.41	12.77	12.86
LSD at 5%	0.51	0.30		0.35	0.73		0.40	0.45	0.42
2nd season									
Control	11.80B	12.33a	11.93b	12.13 A	12.23b	12.37ab	12.30 B	12.47B	12.67B
J.0.03 %	11.23A	12.23ab	11.93b	12.08 A	12.70a	12.60ab	12.65A	13.07A	13.13A
J.0.06 %	10.77A	11.50c	11.30c	11.40 B	12.67a	12.30ab	12.49 AB	12.93A	13.30A
mean(B)	11.27	12.02a	11.72a	11.87	12.53a	12.42a	12.48	12.82	13.03
LSD at 5%	0.50	0.35		0.50	0.35		0.23	0.25	0.36

In a column under each data, means followed by a common letter are not significantly the 5 % level by DMRT

* Jasmine oil

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الملخص العربى

استخدام زيت الياسمين المنشط على أشجار البرتقال أبوسره

ب- لتحسين القدرة التخزينية و حياة الرف للثمار

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أجريت هذه الدراسة عل أشجار برتقال أبوسره عمرها عشرون عاما ، ومطعومة على اصل النارنج، نامية فى أراضى طينية طمبية بمحافظة كفرالشيخ – جمهورية مصر العربية – و رشت الأشجار المختارة بتركيزين من زيت الياسمين المنشط هما (٠,٠٣ ٪ - ٠,٠٦ ٪) و ذلك على أربعة مرات خلال موسمى الدراسة ٢٠٠٨/٢٠٠٩ – ٢٠٠٩/٢٠١٠ . فى ميعاد الجمع ((منتصف ديسمبر)) أخذت العينات و تم نقلها إلى معمل بحوث تداول الفاكهة بمعهد بحوث البساتين – مركز البحوث الزراعية بمحافظة الجيزة . تم غسل عينات الثمار للمعاملات ثم جففت هوائيا و قسمت كل منها إلى مجموعتين خزنت إحداها على درجة حرارة الغرفة (٢٢ ± ٢°م) و رطوبة نسبية ٦٥ – ٧٥ ٪ لمدة ٤٠ يوم وخزنت الأخرى على ٧°م و رطوبة نسبية ٩٠-٩٥ ٪ لمدة ٨٠ يوم .

قدرت جودة الثمار فى بداية فترة التخزين (وقت الحصاد) ثم أخذت عينات ثمرية بعد ذلك على فترات ٢٠، ٤٠ ، ٦٠ ، ٨٠ يوم من التخزين لقياس معدل التغير فى جودة الثمار خلال فترة التخزين .

أشارت النتائج المتحصل عليها إلى أن المعاملة بزيت الياسمين ٠,٠٦ ٪ كانت أحسن المعاملات سواء تحت ظروف التخزين المبرد أو درجة حرارة الغرفة حيث أدت الى تقليل الزيادة فى نسبة فقد الوزن ونسبة التلف و احتفظت بمحتواها من المواد الصلبة الذائبة عالياً حتى نهاية فترة التخزين بالمقارنة بالمعاملات الأخرى.

كما أدت هذه المعاملة الى تقليل النقص فى لون القشرة (زاوية اللون) ونسبة الحموضة و المحتوى من فيتامين ج ومقاومة القشرة فى الثمار حتى نهاية فترة التخزين بالمقارنة بالمعاملات الأخرى . زاد معدل النقص فى بعض الصفات الثمرية و معدل الزيادة فى الصفات الاخرى بزيادة درجة حرارة التخزين و كذلك بتقدم فترة التخزين خلال مراحل التخزين فى الموسمين . لكل ما تقدم نوصى برش اشجار البرتقال ابوسره بزيت الياسمين بمعدل ٠,٠٦٪ فى المواعيد المذكوره بالبحث .