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EFFECT OF SOME PHYSICAL TREATMENTS AND PACKING ON FRUIT QUALITY HOLLIWOOD PLUM C.V DURING COLD STORAGE

Fatma E. Ibrahim and G. F. A. Hassan
Fruit Handling Department, Hort. Res. Inst., Agr. Res.Center

ABSTRACT

This study was carried out during two successive seasons of 2003and 2004 at the Hort, Res.Inst. Fruit Handling Department on Holliwood plum fruits. Fruits were harvested at the early morning at maturity stage from a private farm in kalubia governorate. Fruits were packed in carton boxes capacity of 3 kg and directly transported to the laboratory. Fruits were divided into randomly four treatments, control (untreated fruits), Coating fruit surface with a very thin layer of paraffin oil, dipping the fruit in acetic acid 10% solution for three minutes, and polishing the fruits were used. Fruits were packed in dishes of foam 1kg /dish and covered with polyethylene 10 micron. Then at 0°C and R.H 90-95% for 30 days in both seasons.

Physical and chemical properties of the fruits were estimated every 7 days interval during storage, plus 7 days at room temperature as shelf life for metioned the marketing period .All postharvest treatments used significantly decreased weight loss, decay percentage, fruit softening, darkness, and the changing of total soluble solids and total acidity of fruits during storage compared with the control Also this study confirmed that postharvest treatment with paraffin oil was the best one in order to keep plum fruit quality during storage and marketing.

INTRODUCTION

Plums (*Prunus salicina*) are occupying an important share in the total fruit production of Egypt. Total areas reached about 3603 faddans in 2002.Plums are mainly marketed as fresh consumption as well as for drying. They are also used for canning, freezing, jam and jelly products. (Crisosto, C.H. 1994).

In most of plum cultivars grown in Egypt, harvest time is determined by skin color changes that are described for each cultivar. A color chart guide is used to determine maturity for some cultivars. (Kader. *et al.*1989) & Kader (1986).

Using paraffin oil reduced weight loss from 23% in fruits of the control to around 8.5% in the treated fruits (Singh and Bhargava (1977).

Moreover, dipping fruits in wax emulsion reduced weight loss and prolonged storage life at both room temperature and cold room (Garg *et al.*1976).

Dundar *et al.*(1999) found that, fruits were harvested and stored at 1°C and 85-90% RH for 4 to 9 weeks, weight loss increased with time prolonged during storage for Japanese plum, Black Amber, Climax, Stanley, Beauty and Blue free.

Kotze *et al.* (1989) harvested plum cv Santa Rosa at optimum maturity and stored them for 4 weeks at -0.5 °C followed by 7 days at 3 °C ,13 days at -0.5 °C followed by 15 days at 7.2 °C 14 days at -0.5 °C followed by 1 day at 20 °C and a further 13 days at -0.5 °C. They found that fruits stored

for 13 days at -0.5 °C followed by 15 days at 7.2 °C had the highest incidence of the disorder.

Kader (1986) & (1989) mentioned that, control atmosphere delayed fruit ripening and softening.

Turk *et al.* (1994) reported that, peaches fruits (cv.J.H.Hale) and plums (cv.stanley) were wrapped in polyethylene PE 35mm, polypropylene (pp12mm) or polyvinyl chloride (pvc8omm) and stored at 0°C and 90-95% R.H. They found that, peaches stored for 6-7 weeks with Pvc wrapping had the best firmness for Stanly; the best treatment was pp which resulted in the firmest fruits and the best overall appearance after storage for 6-7 weeks.

The present work , paraffin oil, acetic acid and polishing, were cunducted as a postharvest treatments to prolong the marketing period, keeping quality and appearance of plum fruits Lined with perforated polyethylene 10 mm thickness.

MATERIALS AND METHODS

This study was carried out at the Hort Res Inst., Fruit handling department during two successive seasons of 2003 and 2004. Plum fruits of Holliwood cv were harvested at maturity stage: 90 days from full bloom, and when T.S.S reached about 13%, (Josan and chohan 1982), (Kader and Mitcheli 1998) . In the early morning, Fruits were harvested from a private farm at kalubia Governorate. Then packed in carton boxes (4 kg), and transported directly, to laboratory.

Fruits were washed thoroughly and left to dry except those of intended to be polished. Then fruits were divided randomly into the following treatments

1- Control (untreated).
2- Fruits were coated with ther layer of 2 % Paraffin oil for three minutes.
3- Fruits were dipped in 10 % acetic acid for three minutes.
4- Fruits were cleaned by using velvet cloth without washing (Polishing).

All the fruits were packed in foam plates and covered with polyethylene (thin 10/miceron). Fruits were stored at 0C, and 90-95%.RH.

Physical and chemical characteristics were measured at7 day intervals. Fruits were transferred gradually to room condition (21±2 °C and RH 50 – 60 %) at the end of storage to simulate marketing period.

Fruit physical studies:

Weight loss (%):

Weight loss Percentage was determined for by weighting each replicate (20fruits) separately then weighting it again after every week of storage and the weight loss was calculated to the initial weight as follow:-

[(Initial weight of fruits - weight of fruits at sampling date)/
(Initial weight of fruits) x 100].

Decay percentage:

Decay percentage calculated per 20fruits representing for each replicate.

At 5 % decay, the sample was discarded:-

Decayed fruit weight x 100 /initial weight of all fruits

Peel color measurement:

Peel color was determined by using a Hunter colorimeter type (DP-900) for the estimation of l*, a*, b* values .Color was represented as a*(green-red) and b*(blue-yellow) scale readings and a subsequent calculation of the corresponding hue angle. This angle increases from 90° (yellow) to become more green and reaches dark green at 180° (McGuire, 1992, Voss, 1992).

Fruit texture:

Fruit texture was recorded by Ifra texture analyzer instrument using penetrate cylinder of 1 mm diameter, to constant distance 3, 5 and 7 by constant speeds of 2mm/second. The results were expressed as the resistance force to penetrating tester, in units of pressure per gram

Fruit chemical analysis:

Total soluble solids (TSS %)

TSS %was determined using carl-zeiss hand refractometer

Total acidity %

Total acidity %was estimated according to A.O.A.C method (1990). The results were expressed as percent malic acid per 100ml juice

Shelf-life:-

At the end of storage period, three replicates from each treatment were left gradually at ambient temperature conditions (23 °C and RH 50 – 60 %) for 7 days to simulate the marketing environment. Changes in physical and chemical characteristics of fruits were recorded, at the end of shelf life period i.e.colour transmission, weight loss%, decay%, Hunter (l*, a*, b*), T.S.S%, and total acidity.

Statistical analysis:

All treatment used in this study were arranged as factorial experiment in complete randomized design was used in this study. Each treatment was replicated three times; according to Snedcor and Cochran (1990). Means were compared by LSD test at 5% level.

RESULTS AND DISCUSSION

Weight Loss percentage:-

Data shown in Table (1) cleared that, weight loss percentage significantly increased gradually with increasing in cold storage period, and reached its maximum after four weeks during storage in both seasons. The obtained data also cleared that all treated fruits showed the lowest values of weight loss percentage comparing with untreated fruits, in both seasons, respectively since the loss weight reached (6.96&7.33) after 4 weeks from storage.

These results are in harmony with those obtained by Dundar *et al.*(1997) on Japanese plum, Black ,Amber , Climax, Stanley , Beauty and stored under 1°C and 85-90% R.H for 4-9 weeks. They found that weight loss % increased with increasing storage period. On the other hand. Kaundal *et al.* (2000) they found that wax emulsion (3, 6 and 9 %) increased physiological loss in weight of plum fruits during 30 days of storage.

Table (1): Effect of some postharvest treatments onWeight loss (%) of Holliwood Plum fruits, stored at (0°C) during seasons 2003 and 2004.

Season 2003					
Treatments(B) / Period in weeks(A)	Control	Paraffin	Acetic acid	Polishing	Mean
0	0.00	0.00	0.00	0.00	0.00
1	2.60	0.52	0.75	0.73	1.15
2	4.48	0.81	0.97	0 92	1.80
3	5.30	1.01	1.19	1.20	2.18
4	6.96	1.39	1.40	1.52	2.82
Mean	3.87	0.74	0.86	0.88	1.59
Season 2004					
0	0.00	0.00	0.00	0.00	0.00
1	3.43	0.59	0.79	0.79	1.40
2	4.63	0.83	1.29	0.97	1.93
3	5.84	1.09	1.49	1.35	2.44
4	7.33	1.50	1.54	1.61	2.99
Mean	4.25	0.80	1.02	0.94	1.75

L.S.D at 5 %	A	B	A*B
2003	0.23	0.20	0.45
2004	0.18	0 17	0.37

Decay percentage:-

Decay percentage significantly increased gradually with storage period prolonged (Table2).

Table (2): Effect of some postharvest treatments on decay (%) of Holliwood Plum fruits, stored at (0 °C) during seasons 2003 and 2004.

Season 2003					
Treatments(B) / Period in weeks(A)	Control	Paraffin	Acetic acid	Polishing	Mean
0	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00	0 00
2	0.00	0.00	0.00	0.00	0.00
3	5.00	0.00	0.00	0.00	1.25
4	10.00	0.00	0.00	0.00	2.50
Mean	3.00	0.00	0.00	0.00	0.75
Season 2004					
0	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00	0 00
2	0.9	0.00	0.00	0.00	.22
3	4.5	0.00	0.00	0.00	1.25
4	8.4	0.00	0.00	0.00	2.50
Mean	2.76	0.00	0.00	0.00	0.79

L.S.D at 5 %	A	B	A*B
2003	0.008	0.007	0.017
2004	0 009	0.008	0.017

Obvious the results that all studied postharvest treatments prevented decay incidence of fruits till four weeks under cold storage while 10.0% of the untreated fruits were decayed after the same period of storage. These results are in harmony with those obtained by Goledberg *et al.* (1979) reported that paraffin oil inhibited the development of superficial scald in Australin apples cvs. Also, these results are agree with the findings of Sholberg and Gaunce (1996), which they reported that acetic acid was effective in reducing decay percentage in peaches, nectarine, apricot and cherries.

Fruit color:

Data presented in Table (3, 4) clearly indicated that, color directly changed from green yellow (hue angle >90 °C) to yellow (hue angle < 90°C) with prolonging the storage period.

Also the obtained data of lightness (L*) value indicated that ostharvest for fruits treated with acetic acid and polishing, gave a higher values a* and the highest values of hue angle while fruits treated with paraffin oil followed by untreated fruits showed a lower values of L* and hue angle, respectively in both seasons. On the other hand, data showed that there was no significant differences between all treatments and untreated fruits concerning its effect on L* value in both seasons during storage at 0°C, but L* value decreased gradually during cold storage in all treated and untreated fruits. These results coincided with those obtained by Abdi *et al.* ; (1997) on plums cvs, Radiant, Gulfruby, and Shira when harvested at 3 maturity stage and stored at 0 °C. They found significant differences in skin color during ripening and after cold storage. Kaundal *et al.* (2000) on plum. Moreover they found that fruit color improved from red –purple at harvest to dark purple after 30 days of storage

Table (3): Effect of some postharvest treatments on Hunter (L* value) of Holliwood Plum fruits, stored at (0 °C) during seasons 2003 and 2004.

Season 2003					
Treatments(B) / Period in weeks(A)	Control	Paraffin	Acetic acid	Polishing	Mean
0	47 00	47.00	47.00	47.00	47.00
1	34.13	35.04	36.10	34.53	34.95
2	33.56	32.75	33.04	32.80	33 04
3	26.96	26.94	27.60	28.12	26 99
4	25.38	26.87	25.95	26.28	26.53
Mean	33.40	33.72	33.94	33.75	33.70
Season 2004					
0	50.00	50.00	50.00	50.00	50.00
1	33.33	34.27	35.00	33.55	33.62
2	32.96	32.57	33.32	33.56	33.52
3	27.00	27.82	27.36	28.72	27.31
4	25.32	26.84	26.69	26.84	26 84
Mean	33 72	34.30	34.47	34.53	34.26
L.S.D at 5 %	A		B	A*B	
2003	6.950		N.S	15.54	
2004	2.640		N.S	5.902	

Table (4): Effect of some postharvest treatments on Hunter (hue angel value) of Holliwood Plum fruits, stored at (0 °C) during seasons 2003 and 2004.

Season 2003					
Treatments(B) / Period in weeks(A)	Control	Paraffin	Acetic acid	Polishing	Mean
0	69.24	69.24	69.24	69.24	69.24
1	20.05	26.90	37.81	32.07	29.20
2	19.42	18.40	13.04	24.61	18.86
3	8.21	5.98	5.5	9.59	7.32
4	6.44	5.29	0.45	9.01	5.29
Mean	24.67	25.16	25.08	28.9	25.97
Season 2004					
0	79.95	79.95	79.95	79.95	79.95
1	20.91	26.87	33.81	28.5	27.52
2	16.46	16.85	17.38	23.21	18.47
3	10.00	8.70	13.79	10.92	10.85
4	5.54	6.62	9.51	9.95	7.90
Mean	26.57	27.79	30.88	30.50	28.93
L.S.D at 5 %	A		B	A*B	
2003	2.610		N.S	5.835	
2004	3.121		N.S	6.761	

Texture:

Data in Tables (5, 6 and7), clearly showed that value of fruit texture gradually decreased as the storage period increased in both seasons.

Table (5): Effect of some postharvest treatments on fruit texture (3mm) of Holliwood Plum stored at (0 °C) during2003 and 2004 seasons.

Season 2003					
Treatments(B) / Period in weeks(A)	Control	Paraffin	Acetic acid	Polishing	Mean
0	46.67	46.67	46.67	46.67	46.67
1	21.33	36.33	34.00	35.00	31.67
2	19.47	30.67	27.00	32.00	27.28
3	16.67	19.47	19.47	19.47	18 77
4	15.00	16.00	12.00	15.33	14.58
Mean	23.83	29.83	27.83	29 69	27.79
Season 2004					
0	45.33	45.33	45.33	45.33	45.33
1	26.67	40.67	34.33	34.33	34.00
2	19.00	18.17	27.00	27.67	22.96
3	16.17	19.00	19.00	19.00	18.29
4	11.33	13.33	17.50	15.67	14.46
Mean	23.70	27.30	28.63	28.40	27.01
L.S.D at 5 %	A		B	A*B	
2003	3.323		2.972	6.646	
2004	2.650		2 370	5.300	

Table(6): Effect of some postharvest treatments on fruit texture (5mm) of Holliwood Plum stored at (0 °C) during2003 and 2004 seasons.

Season 2003					
Treatments(B) / Period in weeks(A)	Control	Paraffin	Acetic acid	Polishing	Mean
0	55.67	55.67	55.67	55.67	55.67
1	31.07	44.00	44.67	45.67	41.35
2	27.67	31.07	33.33	35.33	31.85
3	21.67	27.33	31.07	31.07	27.78
4	18.67	23.67	22.67	19.67	21.17
Mean	30.95	36.35	37.48	37.48	35.56
Season 2004					
0	54.00	54.00	54.00	54.00	54.00
1	35.33	43.67	46.33	42 67	42 00
2	25.00	43.33	35.33	35.33	34.75
3	23.17	35.33	23.83	27.33	27.42
4	19.33	28.00	22.33	21.67	22.83
Mean	31.37	40.87	36.37	36.20	36.20
L.S.D at 5 %	A		B	A*B	
2003	4.144		3.706	8.287	
2004	3.768		3.370	7.535	

Table (7): Effect of postharvest treatments on fruit texture (7mm) of Holliwood Plum fruits, stored at (0 °C) during 2003 and 2004 seasons.

Season 2003					
Treatments(B) / Period in weeks(A)	Control	Paraffin	Acetic acid	Polishing	Mean
0	64.67	64.67	64.67	64.67	64.67
1	40.00	50.00	53.67	54.00	49.41
2	29.67	39.00	40.00	44.00	38.17
3	26.67	34.00	37.33	40.00	34 50
4	28.00	29.33	30.00	31.00	29.58
Mean	37.80	43.40	45.13	46.73	43.26
Season 2004					
0	62.33	62.33	62.33	62.33	62.33
1	46.67	55.00	51.33	56.00	52.25
2	22.57	46.67	46.67	46.67	40.64
3	24.67	32.67	33.17	30.00	30.13
4	22.33	30.67	25.33	28.67	26.75
Mean	35.71	45.47	43.77	44.73	42 42
L.S.D at 5 %	A		B	A*B	
2003	5.01		4.48	10 01	
2004	3.73		3.34	7.47	

Also it is obvious that fruits treated with polishing, acetic acid and paraffin had the highest values of texture at 3mm than untreated fruits (control). Plum Fruits texture treated with paraffin gave the highest values of texture at 5mm comparing with the control after 4 weeks under cold storage at 0°C in both seasons. On the other hand .Kaundal *et al.* (2000) on plum fruits, they found that wax emulsion (3, 6 and 9 %) decreased fruit firmness during 30 days of storage.

T.S.S %:

Results of Table (8) showed that total soluble solid percentage of Holliwood plum fruit were nearly constant with prolonged storage in both seasons. The effect of the postharvest treatments were not significant in both seasons. These results partially were in agreement with those obtained by Dundar *et al.* (1997) on Japanese plum, fruits Black Amber, Climax, Stanley, Beauty and Bluefree cvs., harvested and stored at 1 °C and 85-90 % RH for 4-9 weeks. They mentioned that T.S.S % increased as storage period prolonged. Also, Kaundal *et al.*(2000) on plum fruits they found that wax emulsion (3, 6 and 9 %) were not significant affected on T.S.S % during data 20,30 and 40days storage

Table (8): Effect of postharvest treatments on T.S.S. (%) of Holliwood Plum fruits, stored at (0 °C) during2003 and 2004 seasons.

Season 2003					
Treatments(B) / Period in weeks(A)	Control	Paraffin	Acetic acid	Polishing	Mean
0	13.30	13.30	13.30	13.30	13.30
1	13.40	13.35	13.37	13.38	13.37
2	13.50	13.39	13.52	13.43	13.46
3	13.59	13.46	13.59	13.52	13.54
4	13.63	13.52	13.62	13.61	13.60
Mean	13.48	13.40	13.48	13.45	13.45
Season 2004					
0	13.47	13.47	13.47	13.47	13.47
1	13.51	13.50	13.71	13.50	13.56
2	13.58	13.55	13.61	13.57	13.58
3	13.64	13.61	13.68	13.61	13.64
4	13.72	13.68	13.71	13.70	13.70
Mean	13.58	13.56	13.64	13.57	13.59
L.S.D at 5 %	A		B	A*B	
2003	N.S		N.S	N.S	
2004	N.S		N.S	N.S	

Total acidity:-

As shown in Table (9) data indicated that total acidity in fruit juice content of Holliwood plum fruits decreased gradually and significantly with prolonging storage period in both seasons.

Also it is clear from the same table that, all postharvest studied treatments significantly reduced total acidity during cold storage which means

shelf life longer than control fruits. Kaundal *et al.* (2000) on plum fruits, they found that acidity was lowest c1.02-1.10%) with wax emulsion (3, 6 and 9%) at 30 days of storage

Table (9): Effect of postharvest treatments on fruit Acidity of Holliwood Plum stored at (0 °C) during2003 and 2004 seasons.

Season 2003					
Treatments(B) / Period in weeks(A)	Control	Paraffin	Acetic acid	Polishing	Mean
0	1.61	1.61	1.61	1.61	1.61
1	1.30	1.53	1.58	1.59	1.50
2	1.25	1.38	1.49	1.44	1.39
3	1.07	1.23	1.43	1.36	1.27
4	1.02	1.07	1.07	1.07	1.03
Mean	1.25	1.36	1.44	1.41	1.37
Season 2004					
0	1.64	1.64	1.64	1.64	1.64
1	1.31	1.54	1.57	1.63	1.51
2	1.27	1.37	1.54	1.44	1.41
3	1.16	1.21	1.41	1.32	1.27
4	1.05	1.19	1.16	1.16	1.14
Mean	1.29	1.39	1.46	1.44	1.39

L.S.D at 5 %	A	B	A*B
2003	0.045	0.040	0.091
2004	0.046	0.041	0.092

Shelf –life:

Fruit behaviour during the simulating marketing period for 7 days after removal from cold storage gradually at ambient temperature 23°C and RH 50-60 % is shown in Table (10). Fruit decay and weight loss % were the highest values in untreated fruits followed by fruits treated with polishing in the first season and treated with acetic acid in the second season.

In addition, the data presented that fruits treated with paraffin oil gave the highest values in L* value (lightness) than all treatments in both seasons concerning shelf life period.

These results demonstrate a beneficial effect of all treatments, in slowing the changes in fruit texture at (3&5 and 7mm) compared with untreated fruits. Data also indicated that untreated fruits showed the highest values of T.S.S and the lowest of total acidity as compared to other treatments in both seasons

Shelf life of fruits showed are in agreement with those reported by El-Oraby. S. 1991 on guava fruits which found that fruits treated with paraffin oil showed long shelf –life. Shelf life of fruits results are in agreement with those reported by Bhakat *et al.*(1997) on hog plum, they found that fruits treated with wax emulsion stored well up to 12 days with minimum spoilage (33.3%) and physiological loss, while 100% spoilage had occurred for untreated fruits by 12 day of storage the T.S.S % increased , but total acidity reduced during storage under the study.

Table (10): Effect of some physical treatments on Hollywood Plum cv. stored in foam plates 7 days after removal from cold storage at 0 ° C to ambient temperature.

1st season 2003

Properties / Treatments	Decay	Weight Loss	Texture (mm) 3	5	7	Hunter L	Hue angle(h)	T.S.S	Acidity
Control	8.74	5.49	11.67	12.63	17.33	28.36	25.90	14.2	1.01
Parafination	2.01	3.657	29.90	36.98	40.19	31.28	18.60	13.6	1.20
Acetic acid	3.8	3.64	24.31	28.14	33.94	26.94	17.73	13.8	1.10
Polishing	3.9	4.167	22.98	27.21	31.33	25.94	17.19	13.9	1.05
L.S.D at5%	1.16	1.33	4.18	3.25	6.55	N.S	N.S	0.25	0.046

2nd season 2004

Properties / Treatments	Decay	Weight Loss	Texture (mm) 3	5	7	Hunter L	Hue angle(h)	T.S.S	Acidity
Control	7.60	6.15	18.67	20.33	23.33	28.18	22.29	14.0	0.96
Parafination	1.9	3.79	39.33	40.67	46	31.64	19.18	13.8	1.06
Acetic acid	4.01	4.99	28.67	29.33	36.67	29.49	18.15	13.9	1.0
Polishing	4.4	5.02	27.33	32.33	41.67	28.72	17.99	13.6	1.01
L.S.D at5%	1.07	1.13	4.56	5.12	7.09	N.S	N.S	0.19	0.032

REFERENCES

Abdi-N;Holford-P and Mcglasson-WB(1997):Effect of harvest maturity on the storage life of Japanese type Plums. Australian- Journal-Experimental- Agricultura 37 (3):391-397.

Association of official Agricultural chemists (A.O.A.C), (1990). Official methods of analysis. Benjamin Frankline station, Washington 4.D.C. U.S.A.

Bhakat, S.K., Hore, J.K and Sen, S.K (1997): Extension of storage life of hog plum (spondias dulcets)

Crisosto, CH.1994. Stone fruits maturity indices:-a descriptive review. Postharvest.News Info.5 (6):65n-68

Dundar-o; ozguven-Al; Tatli-H; Coskum-M; Daskam –Y; Kuden-AB(Ed); and Demnis-FG Jr. (1999): Investigation on post harvest physiology of some plum varieties grown in Adana, Turkey. Acta- Horticulture 1997, No 441.415-418; Edition Iowa state University press, Ames. Lowa, USA.)

EL-Oraby. S. (1988): physiological studies on storage and marketing of Guava fruit .Egypt .J.Agric. Res, 69 (5): 1089-1095.

Garg, R.C., H.B .Ram and S.K. Singh .1976: Effect of post harvest treatment with indole butyric acid and wax emulsion on the storage behaviour of guava. Prog.Hort. 8(2):85-88. (Hort. Abst., 47(9).

Goldenberg, N.; Hammond, S. and Firth, L. (1979): The bulk shipment of apples inhibition of super-facial scald by oil –impregnated paper. Journal of the science of Food and Agriculture 30(4):377-380. (Hort. Abst .49:7350).

Josan –Js; and Chohan –GS (1982): Maturity studies on plum CV kala Amritsari under sub –tropical conditions. Progressive –Horticulture. 14:1, 11-13.

Kader, A.A and F.G Mitcheli .1998. Post harvest physiology IniJH.LaRue and R.S.Johnson (Eds) peach, plums, nectarines; growing and handling for fresh market. Univ.calif.DANR pub.No.3331.pp.154-164.

Kader, A.A;D.Zagory and EL-Kerbel (1989). Modified atmosphere pacakaging of fruits and vegetables Critical Reviews in Food-Science and Nutration – Volume 28, Issuel :1-30.

Kader, A.A (1986) . Biochemical and physiological basis for effects of coltrolled and modified atmospheres on fruits and vegetables . Food Tecnology ,40 (5): 99-104.

Kaundal .G .S; Khlid-Minhas –PPS; Bal-JS and Mustaq.k (2000): Effect of growth regulators, nutrient and wax emulsion on the storage behaviour of plum (prunus salicina Lindale). Journal of research Punjab Agricultural University 37:1-2 48-55; 13 ref.

Kotze –WAG; Nolte-SH; Dodd-MC; Gwrgen –KH; Andc/Ouse-K (1989): IS; Possible to Restrict the Incidence internal breakdown in plums2. Deciduous-fruit-Grower. 39:2, 64.

McGuire,R.G.(1992).Reporting of objective color measurements .Hort.Sci. 27(12):1254-1260.

Sholberg. p. L. and Gunce, A. P (1996).Fumigation of stone fruit with acetic acid to control post harvest decay. Crop protection. 15:8,681-686.

Singh, A.P and S. CV .Bhargava .1977 Benlate as an effective postharvest fungicide for guava fruit. In. J. Hort., 34(3): 309-312 CeF .(Hort. Abst. 48 (8)).

Snedecor, G.W and W.G. Cochran (1990). Statistical methods. 7th. The Iowa state Univ. Press. Ames, Iowa, USA, P. 593.

Turk-r ; ozkurt – as ; andsass- P(1994) : The storage of some stone fruits in modified atmosphere . International symposium on postharvest treatment of Horticulture crops , Kecskemet , Hungary, 30 Aug-3 Sep. 1993. Acta- Horticultural .1994 No.(368): 850-855.

Voss,H.D.(1992).Relating colormeter measurements of plant color to the Royal Horticultural Society color chart . Hort. Science, 27(12):1256-1260.

Table (1) : Effect of nitrogen fertilization source (mineral, compost, humic acid fertilization and their combinations) on some physical characteristics of grapes and yield/vine of Thompson Seedless grapevines

Season / Treatment	Leaf area (cm^2)				Bud fertility coefficient				Number of clusters/vine				Cluster weight			
	2002	2003	2004	Avg.	2002	2003	2004	Avg.	2002	2003	2004	Avg.	2002	2003	2004	Avg.
Mineral	159.5a	150.1a	153.3a	154.3a	25.7a	25.0a	24.7a	25.1a	18.5a	18.0a	17.5a	18.0a	625a	625a	630a	627a
Compost	123.9e	127.2d	130.1d	127.6d	25.4a	21.7b	23.2b	23.4b	18.3a	12.0d	15.0b	15.1c	602c	602c	600c	601cd
Humic acid	133.2d	134.3c	140.0c	135.8c	25.4a	20.6c	21.4c	22.5b	18.3a	12.0d	15.0b	15.1c	592d	601c	611b	601cd
Mineral + compost	150.1b	141.3b	142.4	143.9	25.8a	24.4a	24.4a	24.9a	18.6a	16.0b	17.0a	17.2a	600c	600c	600c	600cd
Mineral + humic acid	142.8c	145.2a	146.3b	144.6b	26.0a	24.3a	24.3a	24.9a	18.7a	16.0b	16.5a	17.1a	611b	605bc	610b	609c
Compost + humic acid	119.3e	120.9e	128.2d	122.8e	25.3a	21.4b	22.5c	23.1b	18.2a	11.0d	15.0b	14.7c	585e	612b	600c	599d
Mineral+compost+humic acid	140.8c	140.1b	147.2b	142.7b	25.4a	24.0a	24.3a	24.6a	18.2a	14.0c	16.0b	16.1b	610b	623a	615b	616b

Season / Treatment	Yield/vine				Berry firmness (g/cm^2)				Adherance strength (g)			
	2002	2003	2004	Avg.	2002	2003	2004	Avg.	2002	2003	2004	Avg.
Mineral	11.6a	11.3a	11.0a	11.36a	680.1a	672.2a	670.0a	677.1a	550a	566a	576a	564.0a
Compost	11.2a	7.2d	9.0c	9.0c	640.3c	650.0b	666.0a	652.1c	530c	545cd	559c	544.7c
Humic acid	10.8b	7.2d	9.2c	9.0c	645.2c	649.0b	671.0a	655.1c	525c	539d	561bc	541.7c
Mineral + compost	11.2a	9.6b	10.2b	10.3b	660.0b	665.2a	666.1a	663.8b	540b	555b	570ab	555.0b
Mineral + humic acid	11.4a	9.7b	10.1b	10.4b	662.3b	669.4a	667.2a	666.3b	540b	556b	573a	556.3b
Compost + humic acid	10.6b	6.7d	9.0c	8.8c	646.1c	670.0a	670.1a	662.1b	520c	538	569b	542.3c
Mineral+compost+humic acid	11.2a	8.7c	9.8b	9.9b	665.3b	671.5a	670.0a	669.6ab	540b	549bc	574a	554.3b

Values with the same letter (s) do not differ significantly at p≤ 0.05

Table (2) : Effect of nitrogen fertilization source (mineral, compost, humic acid fertilization and their combinations) on some chemical characteristics of Thompson Seedless grapes

Season / Treatment	TSS				Acidity				TSS/acid ratio			
	2002	2003	2004	Avg.	2002	2003	2004	Avg.	2002	2003	2004	Avg.
Mineral	16.6a	16.7a	16.9a	16.7a	0.79a	0.75a	0.73a	0.76a	21.9a	22.1a	23.2a	22.1a
Compost	15.0b	16.0b	16.4a	15.8b	0.78a	0.79a	0.76a	0.78a	19.2b	20.3bc	21.5b	20.3c
Humic acid	15.2b	16.1ab	16.6a	16.0b	0.77a	0.79a	0.76a	0.77a	19.7b	20.4bc	21.8b	20.6bc
Mineral + compost	16.0ab	16.2a	16.4a	16.2a	0.76a	0.77a	0.75a	0.76a	21.1a	21.0bc	21.9b	21.3ab
Mineral + humic acid	16.0ab	16.1ab	16.3a	16.1ab	0.77a	0.78a	0.74a	0.76a	20.8a	20.6bc	22.0b	21.1b
Compost + humic acid	15.4b	15.8b	16.3a	15.8b	0.78a	0.74a	0.76b	0.76a	19.7b	19.8c	21.4b	21.4ab
Mineral+compost+humic acid	16.0ab	16.4a	16.7a	16.4a	0.75a	0.78a	0.75a	0.76a	21.3a	21.0b	22.3a	21.7ab

Season / Treatment	Nitrate ($mgkg^{-1}$ f.w*)				Nitrite ($mgkg^{-1}$ f.w)			
	2002	2003	2004	Avg.	2002	2003	2004	Avg.
Mineral	16a	17a	19a	16.3a	5.0a	6.0a	6.0a	5.70a
Compost	10e	8e	6d	8.0e	0.4d	0.3d	0.2e	0.30e
Humic acid	11d	10d	9c	10.0d	0.6d	0.5d	0.5d	0.530d
Mineral + compost	14b	12b	12a	12.7b	4.0b	3.5c	3.0c	3.5bc
Mineral + humic acid	14b	12b	11b	12.3b	4.0b	4.0b	3.5b	3.80b
Compost + humic acid	10e	8e	6d	8.0e	0.4d	0.3d	0.2e	0.3e
Mineral+compost+humic acid	12c	11c	11b	11.3c	3.4c	3.2c	3.2bc	3.27c

Values with the same letter (s) do not differ significantly at $p \leq 0.05$
* f.w = Fresh weight

All treatments gave values more than 20 in the third season. The same observation was found for the average of the three seasons. Generally, the application of mineral or mineral plus organic fertilizers was effective in raising TSS in first season where organic fertilizers needed more time. Their effect partially appear in the second season and fully in the third one. The same trend was observed for TSS/acid ratio since the applied fertilizers showed no significant effect on acidity. This indicates that the use of organic fertilizers needs at least three seasons of continuous application to show their effect. The results go more or less with those of Elshenawy and Fayad (2005b).

- Nitrate and nitrite residues in berries :

Nitrate and nitrite residues of Thompson Seedless berries as affected by mineral and/or organic N sources is shown in Table (2). During the three seasons of the study the treatment of mineral nitrogen fertilizer resulted in higher nitrate and nitrite values compared with the other treatments. It is clear that the continuous application of organic nitrogen sources is important to reduce the nitrate and nitrite residues of Thompson Seedless grapes. For example, nitrate ($mgkg^{-1}$ grapes f.w) was 16, 17 & 16, respectively in the first, second and third seasons. Nitrite was 5.0, 6.0 & 6.0 $mgkg^{-1}$ grapes f.w, respectively in the first, second and third seasons for mineral N source. The other treatments showed lower values. Nitrate is easily formed from mineral nitrogen whereas it is slowly formed from organic nitrogen (Ibraheem, 1994). The lowest values for nitrate and nitrite were observed when compost alone or plus humic acid treatments were applied to fertilize the vineyard. It is healthy to consume grapes with lower nitrate and nitrite contents. The acceptable daily intake (ADI) of nitrate and nitrite in the European countries which man can daily consume are 5 $mgkg^{-1}$ and 0.07 $mgkg^{-1}$, respectively, of his weight (Abdelhameed, 1999). So, the lower content of these two compounds enable the man to consume safely other foods which may contain the two compounds. From this point of view, little decrease in yield with healthy fruit can be accepted since the fruits produced organically achieve higher prices, than those fertilized with mineral sources.

From the economic point of view, a feddan costed 150 LE of mineral source, 520 LE of compost and 6300 LE of humic acid. Prices of the combinations were lower whereas the lowest were for mineral plus compost (320 LE/feddan). Although the yield/feddan produced by compost was lower than that produced by mineral fertilization, the prices of grapes produced by organic fertilization were 25-50% higher than grapes produced by mineral fertilization (Elshenawy & Fayed, 2005). In addition, grapes produced by organic fertilization (compost) contained lower nitrate and nitrite residues. As long as one of the most important targets of this work is to reduce the residue of nitrate and nitrite in the berries of Thompson Seedless vines, consequently, the use of the compost at the rate of (60 kg N/feddan) to fertilize Thompson Seedless vineyards is recommended.

REFERENCES

Abdelhameed, Z.H. (1999). Food toxicity and chemical pollution. Published by El-Dar El-Arabia for Publishing and Distribution, Cairo, Egypt (In Arabic).

A.O.A.C. (1985). Association of official Agricultural Chemist. Official methods of analysis. 12th Ed. Washington D.C., U.S.A..

De-Ell, J.R. and R.K. Prange (1993). Post harvest physiological disorders, diseases and mineral concentrations of organically and conventionally grown Mcintoch and Cortland apples. Canadian J. Plant Sci., 18 (8B) : 559-574.

Eldosouky, M.M.; K.K. Attia and A.M. Elsalhy (2002). Influence of elemental sulfur application and biological fertilization on nutrient status and fruiting of balady mandarin trees and King Ruby grapevines. Proceedings of 3rd Scientific Conf. Agric. Sci. Assiut 20-22 Oct., 385-403.

Elhaggar, S.M.; B.E. Ali; S.M. Ahmed and M.M. Hamdy (2004). Solubility of some natural rocks during composting. Proceedings of the 2nd Inter. Cpnf. Organic Agric., Cairo, Egypt.

Elshenawy, I.E. and T.A. Fayed (2005a). Evaluation of the conventional to organic and Bio-fertilizers on "Crimson Seedless" grapevines in comparison with chemical fertilizers. I- Vegetative growth and nutritional state. Egypt. J. Appl. Sci., 20 (1) : 192-211.

Elshenawy, I.E. and T.A. Fayed (2005b). Evaluation of the conventional to organic and Bio-fertilizers on "Crimson Seedless" grapevines in comparison with chemical fertilizers. II- Yield and fruit quality. Egypt. J. Appl. Sci., 20 (1) : 212-225.

Ibraheem, T. (1994). Water pollution. Series of science and life. Egypt. Organization for Books, Cairo, Egypt. (In Arabic).

Mba, C.C. (1994). Field studies on two rock phosphate solubilizing actinomycete isolates as biofertilizer sources. Environ. Management, 18 (2) : 236-369.

Montasser, A.S.; N. Elshahate; G.F. Ghobreial and M.Z. Abdelwadoud (2003). Residual effect of nitrogen fertilization on leaves and fruits of Thompson Seedless grapes. J. Environ. Sci., 6 (2) : 465-484.

Schnitzer, M. and S.U. Khan (1972). Humic substances in the environment. Mercel Dekker Inc., New york, U.S.A.

Sen, N.P. and B. Donaldson (1978). Improved colourimetric method for determining nitrate and nitrite. Food J. Assoc. of Anel. Chem. 16 (6) : 1389-1395.

Snedecor, G.W. and W.G. Cochran. (1980). Statistical methods. 7th Ed. IOWA State Univ. Press, U.S.A.

Weaver, R. (1976). Grape growing. John Wiley and Sons. New York, USA.

White, G.B. and R.G. Brumfeild (1996). The economics converting conventionally managed vineyards to organic management practices. Acta Hort., 429 : 377-389.

Yagodin, B.A. (1984). Agricultural chemistry. Vol.2, Mir Pub., Moscow.

تسميد عنب الطومسون اللابذري بالسماد النيتروجيني المعدني والعضوي

أحمد حسين عمر
قسم بحوث العنب – معهد بحوث البساتين – مركز البحوث الزراعية – الجيزة – مصر

أجريت هذه الجربة خلال ثلاث سنوات ٢٠٠٢ ، ٢٠٠٣ ، ٢٠٠٤ علي كرمات عنب طومسون عمر ٧ سنوات مزروع في أرض رملية بمنطقة البستان. سمدت كل كرمة بـ ٦٠ جم نتروجين وهو ما يعادل ١٨١ جرام نترات أمونيوم ، ٣,٧٥٠ كيلوجرام كمبوست أو ٦٠٠ سم٣ من حمض الهيوميك ، أو ٢/١ سماد معدني + ٢/١ كمبوست ، ٢/١ سماد معدني + ٢/١ حمض الهيوميك ، ٣/١ سماد معدني + ٣/١ كمبوست + ٣/١ حمض الهيوميك.

أدت إضافة السماد المعدني منفرداً إلي زيادة مساحة الورقة ، معامل خصوبة البراعم ، عدد العناقيد وكمية المحصول ومتوسط وزن العنقود ، كذلك فإن المعاملات التي احتوت علي السماد المعدني + الكمبوست و/أو حمض الهيوميك أعطت نتائج مساوية للسماد المعدني خصوصاً في عام ٢٠٠٤. وقد كانت قوة الشد والصلابة للحبات الناتجة عن التسميد المختلط من المعدني + الكمبوست و/أو حمض الهيوميك مساوية لتلك الناتجة من التسميد المعدني فقط خصوصاً في الموسم الثالث من التجربة (٢٠٠٤)، إضافة إلي ذلك فإن TSS لم تظهر أي إختلافات معنوية في العام الثالث من التجربة ، أما الحموضة فلم تتأثر بالمعاملات. زادت نسبة الـ TSS/acid في العام الثالث عن ٢٠ (اقل قيمة تكون عندها الثمار مناسبة للإستهلاك). وقد وجد أن تكلفة الفدان من السماد المعدني هي ١٥٠ جنيه ، الكمبوست ٥٢٠ جنيه و ٦٣٠٠ جنيه من حمض الهيوميك.
حققت معاملة الكمبوست أقل القيم بالنسبة لمحتوي الحبات من النترات والنتريت.

وقد استنتج أن تسميد العنب الطومسون اللابذري بمعدل ٦٠ كجم نيتروجين من سملك الكمبوست يعطي ثماراً ذات محتوي منخفض من النترات والنتريت كما يحقق نتائج جيدة علي المدي الطويل.