EFFECT OF NON CHEMICAL TREATMENTS AND SO_2 SOURCES ON KEEPING QUALITY OF THE DELAYED HARVEST THOMPSON SEEDLESS GRAPES DURING COLD STORAGE

BY

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ABSTRACT

This experiment was conducted during the 2002 and 2003 seasons on seven-year old Thompson seedless grapevines, head-trained and cane pruned, located in a vineyard at El-Santa, Gharbia governorate. The clusters were harvested, in the first week of October at late maturity stage, where soluble solid content was 19.9 and 19.0 % in the two seasons, respectively. The trimmed clusters were treated by one of the following treatments: exposure to Ultraviolet irradiation (UV-C) (254 nm) for 2 min at 22 °C, exposure to hot air 38 °C and 85 % RH for 2 h and brief immersion in 35 % ethanol for 30 s at 22 °C. The treated clusters were stored at 0 °C and 90- 95% RH for 4 and 8 weeks plus 3 days at 22 °C and 80-85 % RH.

The clusters quality parameters were decreased by advancing the storage period. Clusters brief immersion in 35 % ethanol for 30 s at 22 °C maintained all of the cluster general appearance, overall quality index, cluster parameters and reduced berry shattering. Sodium metabisulfite, as SO_2 generating source, is better than sodium thiosulphate pentahydrate, where it maintained all of the clusters quality parameters.

It is recommended to brief emersion of Thompson Seedless grape clusters in 35 % ethanol for 30 s at 22 °C, use sodium metabisulfite, as SO_2 generating source, and cold storage at 0 °C and 90-95 % RH for four weeks to maintain the delayed harvest Thompson Seedless grapes quality for good marketing during November.

Key words: *Vitis Venefera*, cold storage, fruit quality, SO_2 source, UV-C, ethanol, heat treatment, delayed harvest.

INTRODUCTION

As postharvest chemical treatments are restricted in most countries and increasing concern about residues on the fruits, safe alternative control methods need to be developed. Physical methods that do not leave any residue on the treated produces are more appropriate in this case. Application of Ultraviolet-C light, heat and ethanol treatments offer new possibilities.

Ultraviolet-C light had mainly been used for surface disinfestations (El-Gaouth and Wilson, 1995). More specifically, UV-C has been shown to reduce *Botrytis* rot, induce resistance against gray mold of grape berries and reduce the development of the spoilage fungi *Botrytis cinerea* and *Monilinia fructigena* on strawberry and sweet cherry (Marquenie *et al.*, 2002).

Thermal methods have been proposed to inhibit ripening, prevent chilling injury, and delay fungal growth and control postharvest diseases and insect pests in fruits (Fallik *et al.*, 1993; Lurie *et al.*, 1993 and Marquenie *et al.*, 2002). Postharvest exposure to temperature less than 40-42 °C often increases life and improves the flavor of a number of fruits (Shellie and Magnan, 1998).

Ethanol dips and vapors were reported to control postharvest diseases of peaches and table grapes (Feliciano *et al.*, 1992 and Mlikota Gabor and Smilanick, 2001). Immersion of grapes in ethanol at ambient temperature significantly controlled postharvest gray mold and completely inhibited *Botrytis cinerea* spore germination of table grapes (Karabulut *et al.*, 2004).

Sulfur dioxide (SO_2) is used worldwide for the control of gray mold, caused by *Botrytis cinerea* during long-term cold storage and/or export shipment of grapes. However, high levels can result in fruit damage, unpleasant aftertaste, and allergies. Both preharvest fungicide applications and SO_2, applied as SO_2-generating pads, effectively reduced decay of table grapes caused by *P. expansum* and *B. cinerea* during the transportation and in long term cold storage (Crisosto *et al.*, 2002; Palou *et al.*, 2002 and Franck, *et al.*,2005)

This work was conducted to evaluate the efficacy of the non chemical treatments, Ultraviolet-C light, heat and brief immersion in ethanol, as well as SO_2 generating sources, sodium metabisulfite and sodium thiosulphate pentahydrate, on the keeping quality of the delayed harvest Thompson Seedless grapes thought the different storage periods to achieve another marketing window with good quality.

MATERIALS AND METHODS

The trials were performed on table grapes (Thompson Seedless) in 2002 and 2003 seasons. The clusters were harvested, from seven-year old grapevines planted in a vineyard at EL-Santa, Gharbia Governorate. The clusters were harvested, at the first week of October, at a late stage of maturity where soluble solids content was 19.4 & 19.0 %, in the two seasons, respectively.

The clusters were harvested in early morning and transported within two hours, at ambient temperature (22 °C) to the laboratory of, Hort. Dpt. Fac. Agric. Kafer El-Sheikh, Tanta Univ. Trimmed clusters were exposed to one of the following treatments:

1. The first treatment was exposure to hot air (38 °C and 85 % RH for 2 h).
2. The second one, exposure to UV lamp with a normal power 20 W, a peak wave length emission of 254 nm and UV-C field area under the lamp was 25 x 80 cm. The clusters were placed, in a single layer, 12 cm from that light source and treated with UV-C light for 2 min at 22 °C.
3. The third treatment was brief immersion of the clusters in 35 % ethanol for 30 s at 22 °C, and completely air dried under shade for about 30 min.

Each of the previous three treatments was divided into two groups. The first group was pagged in tight perforated polyethylene liner containing 2 g sodium metabisulfite salt ($Na_2S_2O_5$) / 5 kg clusters, the second one was pagged in tight perforated polyethylene liner containing 2 g sodium thiosulphate pentahydrate salt ($Na_2S_2O_3$ $5H_2O$) / 5 kg clusters, as sources of SO_2 generators. The SO_2 sources were renewed every two weeks for each group.

Every treatment had three replications (three polyethylene bags X 1 kg) for each storage period. All the bags were stored at 0 °C and 90- 95 % RH. At the beginning of the trials, after 3 days at 22 °C & 80-85 % RH, and after 4 and 8 weeks, at 0 °C & 90 - 95 % RH, plus 3 days at 22 °C & 80-85 % RH, samples of each treatment (represented by three perforated polyethylene bags X 1 kg) were taken out to evaluate the quality parameters of Thompson Seedless grapes as affected by the studied treatments.

Cluster general appearance was visually evaluated and given a score 5, 4, 3, 2, 1 which corresponds to a rating of very good, good, fair, bad and very bad, respectively. Shuttering was determined by shaking the individual cluster in the sample two light shakes by hand, and then weights of the shattered berries for every sample were recorded and expressed as percentage in relation to the weight before shaking.

Decayed berries were separated, weighted and expressed as percentage in relation to weight of each sample.

Marketable cluster was recorded and expressed as the percentage of the sound cluster weight, without any decayed berries, related to the initial fresh weight before the storage period.

The rachis properties were evaluated by determining the moisture content, as a percentage, and color of both the main and lateral branches of the rachis. The color of the branches was evaluated by applying 5 parameters and scores as follows: green : 4, yellowish green :3, yellow : 2, brownish yellow : 1 and brown: 0.

Berry firmness was measured in the equatorial zone of 20 sound berries for each replicate of every treatment and expressed as Newton, using a dynamometer with Gr 7 accessory plunger.

One hundred and fifty grams of sound berries for each replicate per treatment was juiced to determine: soluble solid content (SSC), by hand refractometer (ATAGO N-1E), titratable acidity (TA) as tartaric acid by 0.1 N NaOH. SSC: acid ratio was calculated. The juice pH was measured by using pH meter (HANNA model 8519).

Cluster overall quality index (OQI) was calculated as a sum of the absolute units for the values of SSC: acid ratio, marketable cluster (MC), cluster general appearance (GA), berry firmness (F) and non shattered cluster weight percentage (NSC). The absolute unit of the value was calculated by dividing the measured parameter value by the highest recorded value for the same parameter in the same season. The author supposed that the cluster overall quality index equal: 20% absolute unit (SSC: acid ratio) + 20% absolute unit of MC + 20 % absolute unit of GA + 20 % absolute unit of F + 20% absolute unit of NSC.

The obtained data was statistically analyzed as a randomized complete block design with factorial arrangement of treatments according to Byrkit (1987). Data calculated as percentage was transformed to arcsine of square root before analysis. Means were separated using Duncan's multiple range test (DMRT). Irristat program was used and correlation and liner regression were calculated.

RESULTS AND DISSCUSSION

Marketable clusters (MC) showed a significant reduction by advancing the storage period, at the rates of 0.95 and 0.27 % per week, while it significantly improved in the presence of NaMS (86.51 & 96.35 %) comparing with NaThS (80.88 & 77.76 %) in the two seasons, respectively (Table, 1). UV-C and hot air treatments slightly reduced the marketable clusters comparing with other treatments, especially in the second season as a result of increasing decayed berries. The present data reveals that MC was associated to the decayed berries ($r = -0.99$) more than the cluster weight loss ($r = -0.28$).

Cluster weight loss percentage was significantly increased after two months storage (3.43 & 2.03) comparing with the loss before cold storage (1.44 & 0.98), after 3 days at 22 ^{o} C, in the two seasons, respectively. However SO_2 sources and the non chemical treatments showed non significant effect in this respect.

Shattering was significantly increased, at the rates of 0.01 and 0.19 % per week in the two seasons, respectively (Table, 1), while showed non significant difference with SO_2 sources. Ethanol treatment significantly decreased shattering (6.78 & 5.30 %) compared with the control treatment (9.40 & 8.54 %) in the two seasons, respectively. The present data shows that there are significant correlations between the shattering and the moisture content of both the lateral branches ($r = -0.35$) and the main branch ($r = -0.27$) of the clusters.

Decayed berries (Table, 1) increased, at rates of 0.83 and 0.10 % per week, by advancing the storage period, in the two seasons, respectively. NaMS significantly reduced the decayed berries (2.94 & 2.10 %) compared with NaThS (5.76 & 5.15 %) in the two seasons, respectively and might be due to that NaMS salt have higher sulfur percentage then NaThS. The description of low and

Table (1). Effect Of UV-C, Hot Air, Ethanol Immersion Treatments, And SO_2 Source On Some Quality Parameters Of Thompson Seedless Grapes After Cold Storage (0 °C) plus 3 days at 22 °C

	Marketable Clusters (By weight) (%)		Weight loss (%)		Shattering (By weight) (%)		Decayed berries (By weight) (%)		Overall Quality Index (%)	
	2002	2003	2002	2003	2002	2003	2002	2003	2002	2003
Storage period										
3 days 20 °C	92.13 a	95.70 a	1.44 b	0.98 b	7.07 b	5.48 b	1.93 c	3.43 a	80.58 a	86.02 a
Four weeks 0 °C + 3 days 22 °C	82.10 b	95.42 a	1.64 b	1.19 b	9.55 a	8.30 a	4.13 b	3.17 a	72.82 b	87.08 a
Eight weeks 0 °C + 3 days 22 °C	76.86 c	70.06 b	3.43 a	2.03 a	7.12 b	7.00 ab	7.26 a	4.26 a	68.72 c	65.30 b
SO_2 Sources@										
NaMS	86.51 a	96.35 a	2.31 a	1.52 a	8.65 a	6.36 a	2.94 b	2.10 b	77.16 a	83.04 a
NaThS	80.88 b	77.76 b	2.02 a	1.28 a	7.17 a	7.29 a	5.76 a	5.15 a	70.92 b	75.89 b
Sig.	**	**	NS	NS	NS	NS	**	**	**	**
Treatments										
Control	85.60 a	88.14 a	2.30 a	1.63 a	9.49 a	8.54 a	3.93 a	2.43 b	73.00 b	77.61 b
UV-C light / 2 min	81.93 c	85.07 a	2.44 a	1.11 a	7.43 ab	5.47 b	4.62 a	4.26 a	73.38 b	79.81 a
Hot air 38 °C/ 2 h	82.26 bc	85.24 a	2.46 a	1.11 a	7.95 ab	8.40 a	4.97 a	4.94 a	71.99 b	79.19 ab
Ethanol 35 % / 10 s	85.26 bc	89.78 a	1.48 a	1.75 a	6.78 b	5.30 b	3.87 a	2.88 b	77.79 a	81.26 a
Interaction significant										
S * T	**	NS	NS	NS	NS	NS	**	NS	**	*
S * P	*	*	*	NS	NS	NS	**	**	NS	**
T * P	**	NS	*	NS	*	**	NS	NS	*	NS
S * T * P	**	NS	NS	NS	NS	*	NS	*	*	NS

In a column, means in each group followed by a common letter are not significantly different at 5% level according to DMRT.

@ NaMS = Sodium metabisulfite NaThS = Sodium thiosulphate pentahydrate.

more stable SO_2 emission rate from the generator should explain the relative unsatisfactory çontrol of *B. cinerea* Franck *et al.*, (2005). While UV-C and hot air treatments increased the decayed berries, especially in the second season, compared with the other treatments. These results are in contrast to the results of Liu *et al.*, 1993 and Marquenie *et al.*, 2002 and might be due to the used dose of UV-C was high for this late maturity stage of clusters. Ultraviolet has been reported to damage the surface of several fruits, such as peaches (Crisosto *et al.*, 1998) and strawberry (Marquenie *et al.*, 2003). Also microorganisms have mechanisms to repair DNA-damage caused by UV (Sommer *et al.*, 2000). The damage caused by the hot air treatment can be probably accounted for the increase in fungal growth (Marquenie *et al.*, 2003).

Data in Table (1), shows that overall quality index (OQI) was significantly decreased, at the rates of 1.44 and 2.59 % per week, with the prolonged storage period in the two seasons, respectively. OQI showed the higher values in the presence of NaMS (76.89 & 83.04 %) comparing with NaThS (70.36 & 75.89 %) in the two seasons, respectively. Ethanol treatment gave the highest positive effect on OQI (77.79 & 81.26 %) comparing with non chemical treatments in the two seasons, respectively.

The linear regression for the present data clears the following standardized coefficients:

$OQI = 0.47\ GA + 0.34\ MF + 0.28\ F + 0.19\ NSC + 0.001\ SSC: acid$

Cluster general appearance (GA), as shown in Table (2), was significantly decreased by prolonging the storage period and showed the highest values in the presence of sodium metabisulfite (NaMS) (2.86 & 2.75) compared with sodium thiosulphate pentahydrate (NaThS) (1.83 & 1.75) in the two seasons, respectively. All of the non chemical treatments improved GA, especially in the second season, comparing with the control. GA was associated to the decayed berries ($r = -0.64$) more than the cluster weight loss ($r = -0.16$).

The present data (Table, 2) reveals that the color of the main and lateral branches of the rachis was significantly decreased (browning increased), associated with significant reduction in the moisture content of them, by advancing the storage period. Whereas, there were significant positive correlations between the

Table (2). Effect Of UV-C, Hot Air, Ethanol Immersion Treatments, And SO_2 Source On Thompson Seedless Grape Rachis Prosperities After Cold Storage (0 °C) plus 3 days at 22 °C

	** General appearance (3-0)		# Main branches color (5-0)		#Lateral branches color (5-0)		Main branches moisture content (%)		Lateral branches moisture content (%)	
	2002	2003	2002	2003	2002	2003	2002	2003	2002	2003
Storage period										
3 days 20 °C	2.75 a	2.54 a	2.21 a	2.96 a	1.46 a	2.25 a	75.33 a	75.12 a	60.38 a	63.41 a
Four weeks 0 °C + 3 days 22 °C	2.38 b	2.50 a	2.08 a	2.67 b	1.17 b	1.79 b	70.11 b	73.54 a	55.44 b	61.11 a
Eight weeks 0 °C + 3 days 22 °C	1.92 c	1.71 b	1.63 b	2.04 c	0.92 b	1.21 c	63.78 c	72.12 a	44.16 c	55.21 b
SO_2 Sources @										
NaMS	2.86 a	2.75 a	2.14 a	2.67 a	1.52 s	2.03 a	70.51 a	75.86 a	54.72 a	58.80 a
NaThS	1.83 b	1.75 b	1.81 b	2.44 b	0.86 b	1.47 b	68.96 a	71.91 b	51.93 b	61.02 a
Sig.	**	**	*	**	**	**	NS	*	*	NS
Treatments										
Control	2.22 b	2.11 a	2.00 a	2.44 b	1.17 a	1.89 a	69.75 a	75.66 a	53.96 a	63.93 a
UV-C light / 2 min	2.28 ab	2.22 a	1.17 b	2.56 ab	1.06 a	1.89 a	70.54 a	69.02 b	52.41 a	58.18 ab
Hot air 38 °C/ 2 h	2.28 ab	2.28 a	1.17 b	2.50 ab	1.17 a	1.50 b	68.52 a	77.68 a	52.11 a	54.48 b
Ethanol 35 % / 10 s	2.61 a	2.39 a	2.17 a	2.72 a	1.33 s	1.70 ab	70.15 ab	73.18 ab	54.84 a	63.05 a
Interaction significant										
S * T	NS	*	NS	**	**	**	NS	NS	NS	NS
S * P	**	**	NS	**	NS	**	NS	**	NS	NS
T * P	*	**	NS	NS	NS	NS	NS	NS	NS	NS
S * T * P	NS	NS	**	*	*	*	NS	NS	NS	NS

In a column, means in each group followed by a common letter are not significantly different at 5% level according to DMRT.

@ NaMS = Sodium metabisulfite NaThS = Sodium thiosulphate pentahydrate

** Evaluated by applying 4 parameters and scores: 3= very good, 2 = good, 1 = fair and 0 = bad.

#. Evaluated by applying 5 parameters and scores as flows: green : 4, yellowish green :3, yellow : 2, brownish yellow : 1 and brown : 0

color of the main and lateral branches of the rachis and the moisture content of them (r = 0.26 & 0.24), respectively. This result confirmed the results reported by Crisosto *et al.,* 1994 and Artes-Hernandez *et al*, 2004. However, it was found that NaMS, as SO_2 generating source, were the most effective in maintaining the color and moisture content of both the main and lateral branches of the cluster. Ethanol treatment showed a better effect than the other treatments, in this respect.

Soluble solids content (SSC) showed non significant differences through the different storage periods, except the third period in the second season where it showed significant increase. SSC had higher values in the presence of NaMS, especially in the first season (Table, 3). It showed non significant differences with non chemical treatments except hot air treatment in the first season.

Titratable acidity (TA) as shown in Table (3), was significantly decreased by advancing the storage period and had the higher values in the presence of NaMS (0.34 & 0.39 %) comparing with NaThS (0.32 & 0.34 %) in the two seasons, respectively. However, it showed unclear trend as affected by non chemical treatments.

SSC: acid ratio (Table, 3) was significantly increased by advancing the storage periods and showed the highest values (63.05 & 63.32 %) in the presence of NaThS treatment in the two seasons, respectively. SSC showed non significant differences in the presence of non chemical treatments, except the hot air treatment, in the second season. The change in SSC: acid was associated to the change in TA (r = - 0.88) more than SSC (r = 0.37).

Juice pH was increased by advancing the storage period especially in the second season. This increase might be due to the reduction of TA (r = - 0.5). SO_2 generating sources showed different effect, in this respect, in the two studied seasons. The non chemical treatments showed no different effect on juice pH in both seasons.

Berries firmness (BF), as shown in Table (3), was significantly decreased, at the rate of 0.05 and 0.15 N per week, by advancing the storage period. This reduction might be due to water loss as reported by Artes-Hernandez *et al.*, 2004. All of SO_2 generator sources and non chemical treatments showed different effects, in this respect, in the two seasons.

Table (3). Effect Of UV-C, Hot Air, Ethanol Immersion Treatments, And SO_2 Source On Some Quality Parameters Of Thompson Seedless Grapes After Cold Storage (0 °C) Plus 3 days at 22 °C

	Soluble solid content (%)		* Titratable acidity (%)		SSC : acid ratio		Juice pH		Berry firmness (N)	
	2002	2003	2002	2003	2002	2003	2002	2003	2002	2003
Storage period										
3 days 20 °C	19.25 b	20.83 a	0.36 a	0.37 a	60.07 a	56.43 c	3.55 a	2.83 c	1.69 a	1.84 a
Four weeks 0 °C + 3 days 22 °C	19.23 b	20.89 a	0.32 b	0.30 a	61.84 a	69.63 a	3.78 a	3.07 b	1.44 b	1.67 b
Eight weeks 0 °C + 3 days 22 °C	20.97 a	20.78 a	0.31 b	0.34 a	60.96 a	63.00 b	3.87 a	3.55 a	1.32 c	0.68 c
SO_2 Sources@										
NaMS	20.15 a	20.93 a	0.34 a	0.36 a	60.07 a	59.27 b	3.73 a	3.08 b	1.50 a	1.34 b
NaThS	19.49 b	20.74 a	0.32 b	0.31 b	60.84 a	67.44 a	3.73 a	3.22 a	1.47 a	1.45 a
Sig.	*	NS	NS	**	NS	**	NS	*	NS	**
Treatments										
Control	20.21 a	20.58 a	0.32 a	0.34 a	60.29 a	61.57 a	3.80 a	3.16 a	1.39 b	1.41 a
UV-C light / 2 min	20.11 a	20.54 a	0.32 b	0.32 a	64.09 a	65.20 a	3.74 a	3.14 a	1.62 a	1.40 a
Hot air 38 °C / 2 h	18.99 b	20.88 a	0.34 a	0.33 a	56.33 b	63.62 a	3.69 a	3.18 a	1.60 b	1.39 a
Ehanol 35 % / 10 s	19.82 a	21.34 a	0.32 b	0.36 a	63.12 a	63.04 a	3.70 a	3.12 a	1.53 ab	1.39 a
Interaction significant										
S * T	*	NS	**	*	*	NS	NS	NS	NS	NS
S * P	NS	NS	NS	**	NS	NS	NS	NS	*	**
T * P	NS	NS	*	NS	NS	NS	**	NS	**	**
S * T * P	**	NS	**	**	*	NS	**	NS	NS	NS

In a column, means in each group followed by a common letter are not significantly different at 5% level according to DMRT. * Calculated as tartaric acid.

@ NaMS = Sodium metabisulfite NaThS = Sodium thiosulphate pentahydrate.

Further studies are required to assess the efficacy of UV-C at different doses on additional maturity stages and on the elimination of other potential food borne pathogens that might occasionally contaminate table grapes.

REFERENCES

Artes-Hernandez F., E. Aguayo and F. Artes, (2004). Alternative atmosphere treatments for keeping quality of 'Autumn seedless' table grapes during long-term cold storage. Postharvest Biol. Technol. 31, 59-67.

Byrkit D. R. (1987). Statistics Today, A Comprehensive Introduction. The Benjamin / Cummings Publishing, Inc. 850 pp. Menlo Park, California 94025.

Crisosto, C. H, J. L. Smilanick, N. K. Dokoozlian and D. A. Luvisi, (1994). Maintaining table grape postharvest quality for long distant markets. In: Proceeding of International Symposium on Table Grape Production. Anaheim. California, pp. 195-199.

Crisosto, C. H., X. Seguel and T. J. Micalilides, (1998).Comparing pulsated ultraviolet light and postharvest fungicide for peach fruit decay control. Acta Hortic. 465, 671-479.

Crisosto, C, H., L. Palou, D. Garner and D.A. Armson, (2002). Concentration by time product and gas penetration after marine container fumigation of table grapes with reduced doses of sulfur dioxide. Hort. Technol. 12, 241–245.

El-Gaouth, A, and C. L. Wilson, (1995). Biological-based technologies for the control of postharvest diseases. Postharvest News Inf. 6(1) 5-11.

Fallik E., J. Klein, S.Grinberg, E. Lomaniec, S. Lurie and A. Lalazar, (1993). Effect of postharvest heat treatment of tomatoes on fruit ripening and decay caused by *Botrytis cineria*. Plant Dis. 77(10). 985-988.

Feliciano, A., J. Feliciano, J. Vendruscuolo, J. Adaskaveg and J. M. Ogawa. (1992). Efficacy of ethanol in postharvest benomyl-DCNA treatments for the control of brown rot of peach. Plant Dis. 76, 226-229.

Franck J., B. A. Latorre, R. Torres and J. P. Zoffoli, (2005). The effect of preharvest fungicide and postharvest sulfur dioxide use on postharvest decay of table grapes caused by *Penicillium expansum.* Postharvest Biol. Technol. 37, 20 –30.

Karabulut O. A.. F: M. Gabler, M. Mansour and J. L. Smilanick (2004). Postharvest ethanol and hot water treatments of table grapes to control gray mold. Postharvest Biol. Technol. 34, 169 – 171.

Liu, J., C. Stevens, V. A. Khan, J. Y. Lu, C. L. Wilson, O. Adeyeye, M. K. Kawe, P. L. Pusey, E. Chalutz; T. Sultana and S. Dorby (1993). Application of Ultraviolet –C light on rots and ripening of tomatoes. J. Food Prot. 56 (10) 868-873.

Lurie, S., J, D C. Watkins, G. P. Boss. and J. D. Klein (1993). Prestorage heat treatment of tomatoes prevent chilling injury and reversibly inhibits ripening. Acta Hortic. 343, 283-285.

Marquenie D., C. W. Michieels, A. H. Geeraeed, A. Schenk; C. Soonjens, J. F. Van Impe and B. M. Nicolai (2002). Usage survival analysis to investigate the effect of UV-C and heat treatment on storage rot of strawberry and sweet cherry. International journal of food microbiology. 73, 187-196.

Marquenie D., C. W. Michiels, J. F. Van Impe, E. Schrevens and B. N. Nicolai (2003). Pulsed white light in combination with UV-C and heat to reduce storage rot of strawberry. Postharvest Biol. Tech. 28, 455-461.

Mlikota Gabor F. and J. I. Smilanick (2001). Postharvest control of table grape gray mold on detached berries with carbonate and bicarbonate salts and disinfectants. Am. J. Enol. Vitic. 52, 12-20.

Palou, L., C H. Crisosto, D. Garner, L.M. Basinal, J. L. Smilanick, J. P. Zoffoli (2002). Minimum constant sulfur dioxide emission rates to control gray mold of cold-stored table grapes. Am. J. Enol. Vitic. 53, 110–115.

Sommer, R., M. Lhotsky, T. Haider and A. Cabag, (2000). UV inactivation, liquid-holding recovery, and photoreaction of Eschrichia coli 0157 and other pathogenic Escherichia coli strains in water. J. Food Protect, 63, 1015-1020.

الملخص العربي

تأثير المعاملات الغيركيماوية وكذلك مصدر غاز ثاني أكسيد الكبريت على الحفاظ على جودة ثمار العنب البناتي طومسون سيدلس المتأخرة الجمع أثناء التخزين المبرد

أجريت هذة الدراسة خلال موسمي ٢٠٠٢ & ٢٠٠٣ على كرمات عنب بناتي طومسون سيدلس ذات عمر ٧ سنوات ومرباة تربية قصبية بكروم مزرعة خاصة بمركز السنطة – محافظة الغربية. تم جمع العناقيد الثمرية في الأسبوع الأول من شهر أكتوبر حيث كانت نسبة المواد الصلبة الكلية ١٩,٩ & ١٩,٠ % في الموسمين على التوالي. تمت معاملة العناقيد الجيدة– بعد إزالة الحبات التي بها أي عيوب– بإحدى المعاملات الآتية : المعاملة بالأشعة الفوق بنفسجية بطول ٢٥٤ نانوميتر لمدة دقيقتين على درجة حرارة ٢٢ ° م والمعاملة بالهواء الساخن على درجةحرارة ٣٨ ° م لمدة ٢ ساعة ورطوبة نسبية ٨٥ % و الغمس في كحول الإيثانول ٣٥ % على درجة ٢٢ ° م لمدة ٣٠ ثانية. تم تخزين العناقيد الثمرية تحت ظروف التخزين المبرد (صفر ° م & ٩٠ – ٩٥ % رطوبة نسبية).

لوحظ انخفاض مواصفات جودة العناقيد الثمرية بإطالة فترة التخزين المبرد. كما وجد أن غمس العناقيد الثمرية في كحول الإيثانول ٣٥ % لمدة ٣٠ ثانية على درجة حرارة ٢٢ ° م قد حافظت على كل من المظهر العام للعناقيد الثمرية والدليل العام للجودة وخصائص العنقود كما أنها ادت الى انخفاض نسبة الفرط. وقد جد أن ملح الصوديوم ميتاباي سلفات – كمصدر لغاز ثاني أكسيد الكبريت– أفضل من ملح الصوديوم ثيوسلفات بنتاهيدرات حيث أنه حافظ على معظم صفات الجودة أثناء التخزين.

ويوصى بغمس العناقيد الثمرية للعنب البناتي طومسون سيدلس المتأخر الجمع في كحول الإيثانول ٣٥ % لمدة ٣٠ ثانية واستخدام ملح الصوديوم ميتابيسلفات والتخزين المبرد على درجة الصفر المئوي ورطوبة نسبية ٩٠–٩٥ % لمدة أربع أسابيع فقط وذلك للحفاظ على جودة العناقيد الثمرية للعنب البناتي طومسون سيدلس المتأخر الجمع وذلك لتسويقة خلال شهر نوفمبر.