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EFFECT OF GIBBERELLIC ACID AND FORCHLORFENTHURON (C P P U) APPLICATION ON PRESERVING THOMPSON SEEDLESS GRAPE BUNCHES QUALITY AFTER STORAGE.

Elzayat, H. E.; Hanaa A. El Helw, Isis A. Rizk
Horticultural Research Institute, ARC

ABSTRACT

Thompson seedless grape bunches from a farm in Kaliobeya governorate treated separately by GA_3(40 ppm), by cppu (3 ppm and 5 ppm) and by a combination of GA_3 and both doses of cppu, were culled at optimum maturity, and wrapped in polyethylene vented bags and kept in cartons. Half of the bags were provided with SO_2 generating sachets. The bags were divided into storage in ambient conditions (3 days) and in cold store (6 weeks at 0°C). By end of storage period, grape quality was evaluated, and exemption of decay was estimated. Joint application of cppu and GA_3 increased markedly cluster and berry weight compared to control, and So_2 generators were effective in limiting decay infection. Application of cppu alone or combined with GA_3 delayed maturity, and decreased total soluble solids after cold storage or ambient stay periods, as compared to control. Acidity was also higher in the above mentioned applications.

INTRODUCTION

Grape production in Egypt increases steadily and reached 1.073 million tons (2002), from which more than 50 % is Thompson seedless variety. Some growth substances are applied on grapes to improve its quality. [Gibberellic acid application is commonly used in vineyards to increase berry size of this variety, and in berry thinning. This application improves berry size and rachis elongation (Hardenburg *et al.* 1986, and Nickell, 1985)].

Other growth substances may be used to overcome some minor problems associated with this grape cultivar productivity, efficiency and quality (Orlh, 1990). Cytokinins known for their effect on enhancing cellular division and growth (Dokoozlian and others, 1994; Elzayat *et al.*, 1996, and Oswald, 1994) were tried to improve grape quality. A new cytokinin related substance (CPPU or N-2 chloro – 4 – pyridyl N- phenylurea), known as cytofex has been tried successfully, either alone or combined with other growth substances to enhance grape quality (Mervat et al 2001; Intrieri et al 1943 and Nickel 1986).

This study aims at evaluating Thompson grape quality and its tolerance to storage in ambient conditions and in cold store as affected by CPPU application alone, and when combined with GA, for grape bunch and berries quality, and to explore its usefulness in exportation operation

MATERIALS AND METHODS

This investigation was carried out during two successive seasons, 1999 and 2000 on Thompson seedless grapes, of 14 years old vineyards, and located in Sanheira, Kaliobeya governorate, Nile Delta. Vines are planted in clay soil, irrigated by furrows and trees are trained in a telephone trellis system. Cultural practices were performed in accordance with standard commercial production practices for this variety. The application of GA_3 at 40 ppm and CPPU at 3PPM and 5 PPM were carried out at pea size (3 – 6 mm) to increase berry size.

The treatments are summarized as follows:

1. GA_3 40 ppm, only application at peasize.
2. GA_3 application, in addition to CPPU 3 PPM.
3. GA_3 application, in addition to CPPU 5 PPM.
4. CPPU 3 ppm only application.
5. CPPU 5 ppm only application.
6. Control.

Each treatment was replicated four times, Each replicate consisted of three vines, with 15 – 18 clusters on each vine. Sample of sixteen clusters were harvested and allocated to each treatment in both seasons, Grape clusters were picked at optimum maturity stage, where total soluble solids of control grapes attained 17 – 18 % -(Kader et al, 1985).

All treatments were applied with hand sprayer; clusters were picked, counted and weighed, then transported to the laboratory, to determine their apparent -quality parameters. The following cluster and berry characteristics were estimated immediately: -

- Average bunch weight for each treatment.
- Bunch compactness coefficient (No of berries per bunch / bunch length).
- Average berry weight, berry width, length, for each treatment, in addition to berry shape (berry length divided by berry width).

Grape clusters were wrapped individually in polyethylene vented bags (30u of thickness). Half of these clusters were provided with sulfur dioxide releasing sachets for sterilization purpose (one per each cluster), and layed separately in specific cartons. Each treatment contained two equal numbers of grape clusters of both kinds (with and without so_2 sachets).

All grape treatments were divided into two equal parts. The first part was stored at ambient temperature of summer (29 - 31°c) for 3 days, while the second part was stored at cold storage (0°c) for 6 weeks.

The following quality parameters were estimated (according to pattee 1985). And recorded as follows: -

- Grape weight loss: - percentage of fresh weight loss after storage, for each cluster.
- Berry firmness: by using a texture analyzer instrument (lera) to determine berry firmness, by the means of a small penetrating cylinder (3 mm of diameter), into a distance of 3 mm inside the berry, by a speed of 0.2 mm / second. The resistance of berry to this penetration force was recorded, and taken as an expression of berry firmness.

- Grape cluster appearance: Judged according to a scale of 3 grades;

1. Complete dryness of cluster stems and many berries with defects or decay, (0 – 4).
2. Partial or slight dryness with few defected berries (4 – 6)
3. Fresh clusters with green stems and sound berries,(6.5 – 10).

Anote corresponding to the degree of appearance was assigned to each cluster.

- Decay evaluation: - Infection severity was estimated by weighting decay berries, in addition to the surface of infected area, compared to the whole cluster. A scale of 4 grades was adapted as follows:

1. Excellent clusters, exempted from decay,
2. Slightly infected clusters (10 % or less),
3. Heavy infected clusters (around 20 – 30 %),
4. And completely infected clusters.

- Berry shattering: -
  Shattered berries percentage (in weight) was estimated for each cluster, by shaking the cluster once and slightly.
- Total soluble solids: -
  T.S.S. percentage of grape juice estimated by a digital refractometer (Abbe refractometers,).
- Acidity: -
  Titratable acidity of clear grape juice was estimated using solution of Naoh/0.1N.
- Organoleptic quality: -

Eating quality was estimated according to a score of three grades; Excellent, acceptable and unacceptable, according to sugar: acid ratio sensation and exemption of abnormal taste.

RESULTS

1- Bunch and Berry characterlstics: -

It's shown from table (1-a and 1-b) that application of Gibberellic acid combined with CPPU 3 or 5 PPM significantly increased bunch weight compared to other treatments in both seasons (an average weight of 457 gm for both conc. of CPPU with GA_3, compared to 351 gm for control in 1999,and of 471 gm compared to 370 gm in 2000). GA_3 treatment alone recorded the least weight increase. The increase in cluster weight is attributed mainly to bigger berry weight, as both treatments GA_3 + CPPU 3 PPM and GA_3 + CPPU 5 PPM, recorded the highest berry weight (both treatments averaged 2.57 gm compared to 1.6 gm for control at 1st season, and averaged 2.35 gm compared to 1.53 gm for control in 2nd season). These results are in harmony with those of Dokoozlian et al (1994). These results were confirmed by data shown in table (1-B), as GA_3 treated clusters had the biggest berry length (2.2 cm) compared to other treatments. But berry diameter, a direct result of cytokinin growth stimulating effect was significantly bigger in case of GA_3 + CPPU 3 PPM or 5 PPM, followed by treatments of CPPU (3and5PPM) alone, while GA_3 treatment alone came after them in both seasons and the control

recorded the least berry diameter. These results were comparable to those mentioned in the work of Nickel 1985 and 1986, and work of Oswald 1994.

Data showed also that combined application of CPPU with GA_3 resulted in more compacted clusters than other treatments. The application of GA_3 only, increased berry length, so the berry becomes longer, while the application of CPPU with or without GA_3 made the berry more rounded (table1).

Table(1-a): Weights of grape bunches and berries for different treatments.

Treatment	Average of bunch weight(gm)		Average of berry weight(gm)	
	1999	2000	1999	2000
GA3	426.00	429.00	2.40	2.00
GA_3 +cppu 3%	455.00	468.00	2.60	2.40
GA3 +cppu 5%	460.00	475.00	2.53	2.30
cppu 3%	433.00	437.00	2.03	1.85
cppu 5%	442.00	457.20	2.03	1.89
Control	351.70	370.00	1.61	1.53
L.S.D	7.70	16.50	0.12	0.14

Table(1-b): Characteristics of berries and bunches in different treatments.

Treatment	Average berry length(cm)		Average berry width(cm)		Compactness coefficient		Shape coefficient	
	1999	2000	1999	2000	1999	2000	1999	2000
GA3	2.21	2.20	1.35	1.45	7.87	7.90	1.64	1.52
GA_3 +cppu 3%	1.90	1.93	1.71	1.78	8.50	8.60	1.11	1.08
GA3 +cppu 5%	1.96	2.10	1.94	2.00	8.62	8.69	1.01	1.05
cppu 3%	1.75	1.81	1.64	1.70	8.12	7.98	1.01	1.06
cppu 5%	1.87	1.90	1.79	1.85	8.20	8.10	1.04	1.03
Control	1.84	1.46	1.20	1.18	6.71	6.92	1.23	1.24
L.S.D	0.13	0.15	0.13	0.16	0.60	0.66	0.11	0.12

Note: Compactness coefficient = nb. Of berries in bunch / length oh that bunch
Berry shape = length / diameter.

2- Weight loss: -

It's noteworthy that grapes of the second year (2000) lost relatively less weight in all treatments than grapes of 1999(as in table 2-a,2-b), this may be due to the difference in climate conditions and cultural practices, between a year and another one. After cold storage, control grapes, either provided or not with So_2 generators recorded the highest weight loss (which was in 1999, when provided with So_2 gen. 11.1%, and in absence of So_2 gen. 12.1%, but this loss in 2000, was 3.8% without So_2 gen. And 4.3% with So_2 gen.). There was no regular pattern for weight less, and presence or absence of So_2 generators had no effect on this parameter (total average of weight loss of

grapes provided with So_2 gen. was 4.4%, while without So_2 generators; it was 4.8%).

In ambient conditions, grape clusters lost weight through higher rates of transpiration, this loss pattern was archaic, and difficult to be explained, and it varied between 1% and 8.9%. Treatment of GA_3 + CPPU 5 PPM in 1st year, provided with or free of So_2 generators recorded a value of 7.6% and 8.1% consequently, comparable only to control weight loss of 8.9% with So_2 gen. and 7.2% without it. In 2nd year samples, CPPU 5 PPM treated clusters had the highest weight loss (5.6% with So_2 gen. and 7.5% without them), while GA_3 had always the lowest weight loss when provided with So_2 gen. (2.2%), but control grape recorded intermediate results among all treatments (3.7% with So_2 gen. and 5% without it). Treatment with CPPU 5 PPM, was associated with big weight loss, due perhaps to a bigger berry surface and by consequence of a higher transpiration rate.

Table(2-a):Effect of different treatments on Weight loss % after 3 days at ambient temperature at seasons 1999 and 2000.

Treatment	In Absence of So2 generator sachets		In presence of So_2 generator sachets		Average of Whole treatment	
	1999	2000	1999	2000	1999	2000
GA3	1.0	2.2	2.2	4.6	1.6	3.4
GA_3 +cppu 3 ppm.	6.6	3.2	3.7	2.0	5.2	2.6
GA3 +cppu 5 ppm.	7.6	3.2	8.1	5.3	7.8	4.3
cppu 3 ppm.	7.4	4.1	4.5	3.0	5.9	3.6
cppu 5 ppm.	3.7	5.6	1.5	7.5	2.6	4.4
Control	8.9	3.7	7.2	5.0	8.1	6.6
L.S.D	5.5	7.1	1.6	2.4	2.4	1.3

Table(2-b): Effect of different treatments on Weight loss % after 6 weeks at 0°c at seasons 1999 and 2000.

Treatment	% Weight loss AV. without So_2		% Weight loss AV. with So_2		Total average	
	1999	2000	1999	2000	1999	2000
GA3	4.0	2.3	3.1	4.8	3.6	3.6
GA_3 +cppu 3 ppm.	7.4	3.3	2.7	2.4	5.1	2.9
GA3 +cppu 5 ppm.	5.9	3.1	6.9	2.2	6.4	2.7
cppu 3 ppm.	8.0	1.4	6.3	0.6	7.7	1.0
cppu 5 ppm.	4.7	1.0	4.6	2.9	4.7	1.9
Control	12.1	3.8	11.1	4.3	11.6	4.1
Average	7.0	2.5	5.8	2.9		
L.S.D	7.6	0.7	5.1	0.9	4.2	0.6

3- Cluster appearance: -

This parameter is influenced by the extent of cluster dryness, willing, stems browning, greenness of the whole cluster and presence of decay. Table (4) showed that most clusters had been subjected to dryness at different levels when stored at 0°c for 6 weeks, and that individual treatments

of CPPU 5 PPM and GA_3 gave the best results in both seasons provided or not with So_2 gen. These results were repeated also after 3 days at ambient temperature (31-32°c), while with the combination of GA_3 and CPPU treated clusters were hardly acceptable. Control clusters recorded the worst appearance in most cases, with notes ranging from 3.6 to 4.0 (Elzayat et al). Avery important observation is clear. The speed of deterioration and wilting for grapes stored, at 0°c for 6 weeks, and for 3 days in ambient conditions is almost equal, and that proves the importance of cooling grapes (or fruits generally) to preserve quality. These results are in agreement with weight loss evaluation (see table3-a,b).

Table(3-a): Effect of different treatments on cluster appearance after 6 weeks at 0°C at seasons 1999 and 2000.

Treatment	Without SO_2		With SO_2		Total average	
	1999	2000	1999	2000	1999	2000
GA3	4.8	4.5	4.7	5.0	4.8	4.8
GA_3 +cppu 3 ppm.	5.0	4.7	4.8	4.5	4.9	4.6
GA3 +cppu 5 ppm.	4.3	4.5	4.3	4.7	4.3	4.6
cppu 3 ppm.	3.6	4.7	4.3	4.8	4.0	4.8
cppu 5 ppm.	4.0	4.7	7.0	4.7	5.5	4.7
Control	4.0	4.8	3.3	3.3	3.7	4.0
L.S.D	1.3	4.8	2.0	0.9	1.1	0.5

Table(3-b):Effect of different treatments on cluster appearance after 3 days at ambient temperature at seasons 1999 and 2000.

Treatment	Without SO_2		With SO_2		Total average	
	1999	2000	1999	2000	1999	2000
GA3	8.0	1.5	5.0	4.5	4.8	5.4
GA_3 +cppu 3 ppm.	4.8	4.5	4.5	4.5	4.6	5.0
GA3 +cppu 5 ppm.	4.3	4.5	3.6	3.0	4.6	5.0
cppu 3 ppm.	5.0	1.5	5.6	3.0	4.8	5.1
cppu 5 ppm.	3.8	3.0	4.8	4.5	4.7	5.4
Control	4.0	3.0	4.3	3.0	4.0	3.6
L.S.D	2.1	1.4	2.8	2.1	0.5	2.0

4- Decay occurrence: -

This quality factor depends on the initial microbial load on grape clusters and on the effectiveness of So_2 gen. (Hardenburg et al, 1986). It's shown in table (4-a,b) for six weeks of cold storage at 0°c, and even in the presence of So_2 generating sachets, that fungal decay was not completely eradicated. Control grapes were badly infected by fungal growth, and they didn't even reach the minimum level of acceptability of note "5". The best results were obtained by grapes treated with CPPU 5 PPM, either alone or combined with GA_3, especially in the 2nd season (2000). Infection after 3 days at ambient conditions, revealed that the 2nd season (2000) grapes were less decayed than that of 1999. Grapes treated with CPPU 3 or 5 PPM, recorded the best results in both seasons, especially when provided with So_2 generators and this may be due to more thickened berry skin by CPPU

application. Control grapes were loudly infected at the 2nd season compared to the 1st (table7).

5- Berry shattering: -

All treated clusters and stored at 0°c, had a significantly less berry shattering (by weight percentage) compared to control clusters. This is clearly revealed in table 8. Treatments CPPU 5 PPM had generally the least berry shattering among all treatments. Hormonal substances (GA_3 and CPPU) enhance growth and therefore cluster's stems and branches were greener and that led to less berry dropping for the former category (Mervat et al 2001). Berry shattering of clusters left 3 days at ambient condition (30°c) had no clear pattern, but treatment of GA_3 + CPPU 3 PPM recorded the highest drop percentage in both seasons (provided or not with So_2 generators). This may be due to bigger weight of berries as observed in table (9), compared to berry weight of control, and this is clear especially in season 1999 (7.97) than in 2000(5.5%).

Table(4-a): Effect of different treatments on exemption of fungal infection after 6 weeks at 0°C at seasons 1999 and 2000.

Treatment	Without SO_2		With SO_2		Total average	
	1999	2000	1999	2000	1999	2000
GA3	5.4	2.8	5.4	2.8	5.4	2.8
GA_3 +cppu 3 ppm.	4.5	6.2	5.4	6.2	5.0	6.0
GA3 +cppu 5 ppm.	5.0	4.4	5.0	5.0	5.0	4.7
cppu 3 ppm.	5.0	6.3	5.2	5.8	5.1	6.1
cppu 5 ppm.	4.8	3.7	5.9	5.3	5.4	4.5
Control	2.7	1.1	4.4	1.4	3.6	1.2
L.S.D	2.7	2.4	3.6	3.0	2.0	1.7

Table(4-b):Effect of different treatments on exemption of fungal infection after 3 days at ambient temperature at seasons 1999 and 2000.

Treatment	Without SO_2		With SO_2		Total average	
	1999	2000	1999	2000	1999	2000
GA3	7.3	5.0	6.2	6.2	6.8	5.6
GA_3 +cppu 3 ppm.	3.7	5.0	4.5	7.0	4.1	6.0
GA3 +cppu 5 ppm.	3.7	4.6	2.8	6.2	3.3	5.4
cppu 3 ppm.	5.4	7.3	4.5	7.0	4.9	7.1
cppu 5 ppm.	6.2	4.9	5.3	8.7	5.8	6.8
Control	7.9	5.0	7.9	5.0	7.9	5.0
L.S.D	3.9	4.8	5.2	1.5	2.7	1.8

6- Berry firmness: -

After 6 weeks of storage at 0°c, control grape firmness had generally lower values than other treatments, with an average of 280gm/cm^2 and 194.3 (in 1999 and 2000 respectively) which is significantly less than firmness of CPPU 5 PPM treated grapes recording 336.5gm/cm^2 and GA_3 + CPPU 3PPM

treated grapes recording 333.8 5gm/cm^2. These results are in agreement with Intrieri et al (1993). The synergistic action of cytofex and Gibberellic GA_3, as growth stimulators may explain a certain delay in maturity and more berry vigor when clusters were treated by these substances.

After 3 days at ambient conditions, as in table (5-a,b), higher temperatures enhanced ripeness and firmness values were generally lowered in cases of grapes treated with GA_3 + CPPU 3PPM and CPPU 5 PPM (with an average value of 250 gm/cm^2), compared to control grapes which had high firmness at 1999. (a note of 344) while at season 2000, it recorded 248 gm/cm^2. Natural variability among clusters played a bigger role. Clusters of CPPU 5 PPM treated grapes had more berry firmness than other treatments at the 1st season (361 gm/cm^2) followed by CPPU 5 PPM + GA treated clusters (329.7 gm/cm^2), but at the 2nd season GA_3 treated clusters recorded the biggest berry firmness (326.2gm/cm^2), and other treatments resulted in softer berries (with no significant differences in values, in a line ranged from 214.8 to 269.5 gm/cm^2).

Table(5-a): Effect of different treatments on berry shattering percentage (by weight) after 6 weeks at 0oC at seasons 1999 and 2000.

Treatment	Without SO_2		With SO_2		Total average	
	1999	2000	1999	2000	1999	2000
GA3	6.6	2.0	6.3	2.7	6.4	2.3
GA_3 +cppu 3 ppm.	3.8	3.2	6.3	4.8	5.1	4.0
GA3 +cppu 5 ppm.	5.2	3.0	6.5	3.0	5.9	3.0
cppu 3 ppm.	4.1	8.1	7.6	3.1	5.9	5.6
cppu 5 ppm.	4.4	4.4	3.7	2.2	4.1	3.3
Control	13.4	20.7	12.9	21.7	13.2	21.2
L.S.D	3.8	3.1	5.5	3.1	3.0	2.1

Table(5-b):Effect of different treatments on berry shattering percentage after 3 days at ambient temperature at seasons 1999 and 2000.

Treatment	Without SO_2		With SO_2		Total average	
	1999	2000	1999	2000	1999	2000
GA3	2.9	2.7	3.2	2.4	3.1	2.5
GA_3 +cppu 3 ppm.	6.7	5.6	9.1	5.4	7.9	5.5
GA3 +cppu 5 ppm.	2.7	2.0	3.2	1.9	3.0	2.0
cppu 3 ppm.	3.8	1.9	5.4	1.9	4.6	1.9
cppu 5 ppm.	2.5	2.8	8.9	2.4	5.7	2.6
Control	5.7	4.6	6.7	5.1	6.2	4.8
L.S.D	4.7	2.8	6.2	3.0	3.6	1.9

Table(6-a): Effect of different treatments on berry firmness (by weight) after 6 weeks at 0°c at seasons 1999 and 2000.

Treatment	Without SO_2		With SO_2		Total average	
	1999	2000	1999	2000	1999	2000
GA3	294.0	370.3	287.7	280.0	292.0	325.2
GA_3 +cppu 3 ppm.	346.0	479.3	321.7	257.7	333.8	368.5
GA3 +cppu 5 ppm.	308.0	377.3	329.7	326.7	318.8	352.0
cppu 3 ppm.	288.3	331.0	317.7	362.0	303.0	346.5
cppu 5 ppm.	295.3	331.0	377.2	315.0	336.5	323.2
Control	303.0	286.7	257.0	122.0	280.0	194.3
L.S.D	71.6	107.4	49.0	73.4	43.1	59.9

Table(6-b):Effect of different treatments on berry firmness after 3 days at ambient temperature at seasons 1999 and 2000.

Treatment	Without SO_2		With SO_2		Total average	
	1999	2000	1999	2000	1999	2000
GA3	333.7	306.3	280.3	346.0	307.0	326.2
GA_3 +cppu 3 ppm.	255.7	249.7	354.3	289.3	305.0	269.5
GA3 +cppu 5 ppm.	328.3	220.3	331.1	209.3	329.7	214.8
cppu 3 ppm.	296.0	250.7	235.3	222.2	265.7	236.5
cppu 5 ppm.	364.0	244.7	358.0	205.7	361.0	227.2
Control	382.0	286.0	307.3	209.0	344.7	247.5
L.S.D	67.3	84.2	67.8	93.1	43.4	57.5

7- Total soluble solids: -

After 6 weeks in cold storage, it's clear from table (7-a,b) that grapes treated with CPPU 5 PPM had the lowest T.S.S. values in both seasons recording 16.7% and 14.8% respectively. This concentration of sitofex had a certain effect in delaying maturity represented by a slow synthesis of soluble sugars. Treatments of GA plus CPPU 3 and 5 PPM had generally higher T.S.S. values, similar to control at the 1st season (recording 19%) and 19.5%. Treatment of GA_3 at the 2nd season resulted in the highest T.S.S. Value (18%) and seconded by control (17%).

Table(7-a): Effect of different treatments on total soluble solids (T.S.S%) after 6 weeks at 0°c at seasons 1999 and 2000.

Treatment	Without SO_2		With SO_2		Total average	
	1999	2000	1999	2000	1999	2000
GA3	17.7	18.5	19.7	17.5	18.7	18.0
GA_3 +cppu 3 ppm.	19.0	17.3	17.3	16.2	18.2	16.8
GA3 +cppu 5 ppm.	18.8	15.0	19.3	17.2	19.1	16.1
cppu 3 ppm.	19.3	17.5	19.7	16.7	19.5	17.1
cppu 5 ppm.	16.3	15.3	17.0	14.4	16.7	14.8
Control	18.3	16.3	20.0	17.7	19.2	17.0
L.S.D	2.1	1.8	3.8	2.6	2.0	1.5

Table(7-b):Effect of different treatments on total soluble solids (T.S.S%) after 3 days at ambient temperature at seasons 1999 and 2000.

Treatment	Without SO_2		With SO_2		Total average	
	1999	2000	1999	2000	1999	2000
GA3	19.3	16.5	19.3	18.4	19.3	17.5
GA_3 +cppu 3 ppm.	18.0	16.4	19.0	18.2	18.5	17.3
GA3 +cppu 5 ppm.	16.7	17.7	16.7	15.3	16.7	16.5
cppu 3 ppm.	20.7	16.6	20.0	16.2	20.3	16.4
cppu 5 ppm.	17.0	18.2	16.0	15.7	16.5	16.9
Control	18.0	16.1	21.3	17.7	19.7	16.9
L.S.D	3.4	1.4	2.6	1.3	2.1	0.9

In ambient conditions, the same trend was observed (as shown in table7). CPPU 5 PPM treated grapes recorded generally low T.S.S. Values (16.5% and 16.9% in 1999 and 2000 respectively), compared to control (14.7% and 16.9%). GA_3 treated grapes had also (19.3% and 17.5% for 1999 and 2000 high T.S.S. values consequently. In the meantime combined treatment of GA and CPPU 5% had lower T.S.S. values (16.7% and 16.5%). That may explain the retarding effect on maturity attributed to CPPU in higher doses (5PPM). These results match perfectly those of joublan et al 1995.

8- Juice acidity: -

As it's shown in table (8-a,b), after 6 weeks at 0°c, grapes treated by CPPU 5 PPM alone had the highest acidity values especially when provided with So2 generators (1.00% and 1.10% in 1999 and 2000 seasons respectively). Combining GA_3 with CPPU 5 PPM, gave also higher acidity values (an average of 0.63% and 0.8% at 1999 and 2000) compared to control grapes, distinguished by its low acidity values (recording 0.48% and 0.5% in both seasons of 1999 and 2000). While GA_3 treated grapes had as a whole the least acidity values (an average of 0.61% and 0.58% at 1999 and 2000 respectively). These results were also mentioned by Mervat s.r. (2000).

Table(8-a): Effect of different treatments on acidity percentage after 6 weeks at 0°c at seasons 1999 and 2000.

Treatment	Without SO_2		With SO_2		Total average	
	1999	2000	1999	2000	1999	2000
GA3	0.61	0.43	0.60	0.73	0.61	0.58
GA_3 +cppu 3 ppm.	0.60	0.67	0.55	0.73	0.57	0.70
GA3 +cppu 5 ppm.	0.59	0.89	0.66	0.74	0.63	0.82
cppu 3 ppm.	0.51	0.67	0.71	0.67	0.61	0.67
cppu 5 ppm.	0.58	1.00	0.59	1.10	0.58	1.05
Control	0.55	0.70	0.40	0.80	0.48	0.75
L.S.D	0.09	0.06	0.08	0.08	0.06	0.05

Table(8-b):Effect of different treatments on acidity percentage after 3 days at ambient temperature at seasons 1999 and 2000.

Treatment	Without SO_2		With SO_2		Total average	
	1999	2000	1999	2000	1999	2000
GA3	0.52	0.70	0.49	0.65	0.51	0.68
GA_3 +cppu 3 ppm.	0.53	0.70	0.47	0.70	0.50	0.70
GA3 +cppu 5 ppm.	0.53	0.64	0.55	0.73	0.54	0.69
cppu 3 ppm.	0.53	0.69	0.56	0.65	0.55	0.67
cppu 5 ppm.	0.47	0.70	0.49	0.73	0.48	0.72
Control	0.56	0.76	0.51	0.65	0.54	0.70
L.S.D	0.01	0.07	0.02	0.06	0.01	0.04

Grapes left 3 days at ambient temperature had lower acidity values, but grapes provided with So_2 generators had always higher acidity values than the others (approximately 0.5% for grapes without So_2 generators against 0.68% for those with So_2 generators), as observed in table 15.

9- Taste: -

It's shown in table (9-a,b), that grapes after 6 weeks at 0°c had as a whole "Just" acceptable taste rate, with a slightly better taste for all treatments in season 2000, than taste of season of 1999. Absence or presence of So_2 generators had no influence on taste judgment rate. Grapes treated with GA_3 and left 3 days at ambient conditions recorded a good taste as shown in table 17, (an average rate of 6.6 and 9 in 1999 and 2000respectively). Control grapes had a hardly acceptable taste, after 3 days in ambient temperature (given a note of 4.5 and 5.3 in 1999 and 2000). Some variable factors like climate and cultural practices such as summer temperature and fertilization programs, had a certain role in enhancing or showing the synthesis of taste composants like sugars, acids, aroma compounds, and that may explain variability in results of taste.

Table(9-a): Effect of different treatments on taste after 6 weeks in cold storage at seasons 1999 and 2000.

Treatment	Without SO_2		With SO_2		Total average	
	1999	2000	1999	2000	1999	2000
GA3	3.33	4.50	4.47	4.83	3.90	4.67
GA_3 +cppu 3 ppm.	3.63	4.67	3.47	8.00	3.55	6.33
GA3 +cppu 5 ppm.	4.73	4.50	3.13	4.67	3.93	4.58
cppu 3 ppm.	3.80	5.67	4.80	4.67	4.30	5.17
cppu 5 ppm.	4.13	4.83	4.97	4.67	4.55	4.75
Control	3.70	4.50	4.13	5.00	3.92	4.75
L.S.D	1.65	1.53	1.01	0.46	0.88	0.74

Table(9-b):Effect of different treatments on taste after 3 days at ambient temperature at seasons 1999 and 2000.

Treatment	Without SO_2		With SO_2		Total average	
	1999	2000	1999	2000	1999	2000
GA3	6.20	8.00	7.03	8.00	6.62	8.00
GA_3 +cppu 3 ppm.	6.20	4.50	6.20	8.00	6.20	6.25
GA3 +cppu 5 ppm.	4.53	4.50	5.37	4.50	4.95	4.50
cppu 3 ppm.	6.20	4.50	5.37	4.50	5.78	4.50
cppu 5 ppm.	2.83	8.00	3.70	4.67	3.27	6.33
Control	1.97	4.50	7.03	6.03	4.50	5.27
L.S.D	2.03	0.74	2.20	1.05	1.39	0.48

CONCLUSION

Combined treatment of cppu and GA_3 had a positive effect in increasing cluster and berry weight compared to control. So_2 generator sachets were effective in protecting grapes from decay, treatments of cppu alone or combined with GA_3 delayed maturity and decreased total soluble solids, either after a cold storage or a keeping period in ambient condition, as compared to control. This delay in maturity was also represented by the higher acidity of cppu treatments (alone or combined with GA_3). Grapes of second year was better from Organoleptic point of view, than first year treated grapes.

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تقييم جودة العنب الناتج عن معاملات هرمونيه بمادتى الجبريلين و السيتوفكس وذلك بعد التخزين بالتبريد

حمدى السيد الزيات – هناء أحمد الحلو – إيزيس رزق
معهد بحوث البساتين – مركز البحوث الزراعية

عوملت أشجار عنب فى مزرعه بالقليوبيه بمواد هرمونيه وهى حمض الجبريليك (GA_3) ٤٠ جزء / مليون وكذلك سيتوفكس (أو cppu) ٣ جزء / مليون و ٥ جزء / مليون ، فى معاملات منفصله وكذلك معاملات مشتركه للجبريلين مع السيتوفكس . قطفت عناقيد عنب فى درجة النضج المناسبه وغلفت فرديا بغلاف من بولى ايثيلين مثقب ووضعت فى كراتين ثم وضع أكياس مولده لغاز ثانى أكسيد الكبريت لتعقيم العنب فى نصف العدد الكلى من المكررات وخزن نصف عدد المكررات فى غرفه مبرده لمدة ٦ أسابيع على درجة صفر ° م والنصف الأخر ترك فى الجو العادى لمدة ثلاثة أيام.

بعد نهاية فترة التخزين أجريت إختبارات الجوده على عناقيد وحبات العنب، وكذلك تقييم مدى الإصابه بالأعفان. وقد وجد أن المعاملات المشتركه من السيتوفكس وحمض الجبريليك قد سببت زياده فى وزن العناقيد والحبات. كما ثبت فاعلية الأكياس المولده لغاز ثانى أكسيد الكبريت فى الحد من الإصابات الفطريه. ووجد أن الرش بمادة السيتوفكس وحدها أو بالإشتراك مع الجبريلين يؤخر من نضج العنب متمثلا فى تكوين كمية مواد صلبه ذائبه كليه T.S.S. أقل مما هو فى المقارنه وفى إرتفاع الحموضه أيضا عن عناقيد المقارنه. وكانت عناقيد عنب السنه الثانيه ذات درجه أعلى فى الطعم عن عناقيد السنه الأولى.