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**EFFECT OF SOME PREHARVEST TREATMENTS ON THE STORAGE  
ABILITY OF "ROUMY AHMER" GRAPES**

**BY**

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**ABSTRACT**

In 2001 and 2002 "Roumy Ahmer" grapevines fifteen years old, planted in El Fashn Ban Swaif governorate, Egypt, were treated by GA<sub>3</sub> at (25, 50, 75 and 100 p.p.m) and girdling, separately or in combination. GA<sub>3</sub> was applied at the third week after fruit set will girdling at various times. All treated fruits were picked at maturity stage and stored at 0 °C and relative humidity 95 % for 60 days. The results on harvest time indicated that GA<sub>3</sub> significantly increased cluster weight, berry weight and berry size, and diameter, while decreased shot berries percentage. Berry adherence strength and firmness were increased significantly with increasing GA<sub>3</sub> concentration. Girdling increased T.S.S %, total sugars, anthocyanin content and decreased acidity percentage. The percentage of decay and weight loss increased with the advancing of cold storage. The treatments of GA<sub>3</sub> 50 p.p.m + Girdling and GA<sub>3</sub> 75 p.p.m decreased significantly the percentages of weight loss and decay compared to the control and other treatments. No decay for a period of 40 days storage in berries treated with GA<sub>3</sub> alone or with Girdling. Berry firmness and adherence strength decreased with advanced storage period. Berry firmness and adherence strength were higher in berries treated with GA<sub>3</sub> 100 p.p.m alone or with Girdling than other treatments. On the other hand, the control fruits and treatments with Girdling showed a significant decrease in berry firmness and adherence strength. Girdling alone and GA<sub>3</sub> 25 p.p.m + girdling improved quality of berries (increased total soluble solids % and total sugars %, anthocyanin content and decreased total acidity %), during cold storage.

**INTRODUCTION**

Roumy Ahmer grape is one of the old local seedy cultivars planted on wide area in the south of Egypt. Roumy Ahmer cluster is loose with shot and cracked berries in addition to less fresh rachis which cause problems in marketing. Many investigations were done to improve the quality of these cultivars such as GA<sub>3</sub> and Girdling. The application of GA<sub>3</sub> has been extensively practiced as a commercial mean to increase the vine crop through the large cluster bearing and heavy weight of berries (Abd El Ghany 1981, El - Sayed (1986) and Hassan (1997) on Roumy Ahmer cultivar. In addition GA<sub>3</sub> increased berry

firmness and adherence, less decay and weight loss percentage which improve berry quality and storability Omar and El Morsy (2000), Aisha *et al.* (1998), (Al – JuBoory *et al.*, 1990, Medhi and Singh (1982), El – Nabawy *et al.*, (1979), Hifny and Abdel – All (1977), and Rizk *et al.*, (1974). Girdling is widely used in viticulture to increase berry size and enhance color, development the quality of grapes depends on the cultivar and time of girdling (Gonzalo *et al.* 1984). Girdling at the beginning of the ripening phase enhance fruit color of Red cvs, Red Malaga and crimson seedless (Peacock *et al.* 1977; Dokoozian *et al.*, (1995). In (1998), Carreno *et al.* found that girdling at the beginning of ripening significantly increased soluble solids. In addition, girdling increased total sugars, and anthocyanin content which improves berry quality and storage ability of Roumy Ahmer grape (Sanghavi and Phadnis., 1973; and Carreno *et al.*, 1998). Ibrahim and Gabr (2005) on “Floredaprince” peach, who found that trees when treated with summer pruning, ringing and girdling reduced fruit weight loss %, decay %, and increased T.S.S % and Anthocyanin content during storage at 0 °C and 85 – 90 % relative humidity. The aim of this investigation was to study the effect of different concentrations of GA<sub>3</sub> and girdling on fruit quality and storageability of Roumy Ahmer grapes.

#### MATERIALS AND METHODS

In two successive seasons 2001 and 2002 this experiment was carried out on fifteen (15) year – old Roumy Ahmer grapevines, in El – Fashn, Ban swaif governorate, Egypt.

The grapevines were nearly uniform, planted in clay loamy soil, spaced 2 x 2 meter apart (2 meter between rows and 2 meter between trees), head trained with total bud load 72 buds per vine, (12 fruiting spurs 5 buds and 6 replacement spurs 2 buds). Vines were subjected to similar cultural practices and irrigated with surface irrigation. In the third week after fruit set the cluster was treated with GA<sub>3</sub> and girdling was done at various times (at the beginning of color) as the following treatments:

- |                                     |   |
|-------------------------------------|---|
| 1. Control: sprayed with tap water. | 2. Girdling:                              |
| 3. GA <sub>3</sub> 25 p.p.m.        | 4. GA <sub>3</sub> 25 p.p.m + Girdling.   |
| 5. GA <sub>3</sub> 50 p.p.m.        | 6. GA <sub>3</sub> 50 p.p.m + Girdling.   |
| 7. GA <sub>3</sub> 75 p.p.m.        | 8. GA <sub>3</sub> 75 p.p.m + Girdling.   |
| 9. GA <sub>3</sub> 100 p.p.m.       | 10. GA <sub>3</sub> 100 p.p.m + Girdling. |

Each treatment was replicated three times and each single replicate was consisted of six vines.

The study included:

##### A): At harvest studies:-

Six clusters were taken at random from each vine. to determine the following data:-

- Average weight of cluster.
- Shot berries percentage (by counting the number of small berries and expressed as percentage from the total number of berries in the cluster).

- Average berry weight and size.
- Average berry length and diameter.
- Berry firmness and adherence strength were determined by using Shatilon's instrument, measuring as (gm / sq. cm).
- Total soluble solids (T.S.S %) in berry juice using a hand refractometer.
- Acidity was determined by titration of the juice with N / 10 Na OH. Acidity was expressed as grams tartaric acid per 100 ml of juice according to the A.O.A.C (1990).
- Total sugars % was determined by using the phenol, sulphuric acid method (Smith *et al.* 1956)
- Total anthocyanin content: One gram from berry skin was blended with 95 % ethyl alcohol and 1 % Hcl. The mixture was then filtrated through a catered glass funnel G – 3 and extract was transferred to 25 ml volumetric flask and completed to volume with the acidified alcohol then measured on spectrophotometer at wave length 535 according to the method of Husia *et al.*, (1965).

**B): Postharvest studies:-**

Grape clusters representing the dominating maturity stage of each treatment were picked when T.S.S reached about 15 % according to Rizk (1993), and transported to Postharvest laboratory where 25 – 30 clusters, free from damage or spoiled berries, were selected for each treatment, packed in carton boxes covered with polyethylene 30 mm. All grape clusters were stored at 0 °C and 90 – 95 % relative humidity (R.H) for 60 days. Samples containing 3 bunches from each replicate were taken every twenty days intervals for carrying out the following estimations:

**Physical properties:**

- 1- Percentage of decay: The decay percentage was determined for each treatment according to Mccornak and Brown (1973).
- 2- Percentage of weight loss: Weight of grape bunch was recorded periodically and the percentage of weight loss was calculated.
- 3- Berry firmness and adherence strength were determined by using Shatilon's instrument measured as (gm / sq. cm).

**Chemical properties:**

- 1- Total soluble solids (T.S.S %):
- 2- Titratable acidity (%):
- 3- Total sugars %:
- 4- Total anthocyanin content:

The methods of determining the four items are mentioned before (page).

**Statistical analysis:**

From the statistical point of view, the completely randomized design was adopted.

The obtained data were statistically analyzed according to Snedecor Cochran (1990) using the new L.S.D values.

## RESULTS AND DISCUSSION

### A): Harvest studies:-

#### Physical characteristics:-

#### Cluster weight and shot berries:-

Data present in table (1) showed that Roumy Ahmer grapevine treated with different concentrations of GA<sub>3</sub> 25, 50, 75 and 100 p.p.m alone or combined with Girdling increased significantly cluster weight than untreated one in the two seasons. The highest value of cluster weight was obtained from GA<sub>3</sub> 50 p.p.m + Girdling in the first season and GA<sub>3</sub> 25 p.p.m + Girdling in the second season while the lowest value of cluster weight was for the control in the two seasons.

There was a significant decrease of shot berries percentage with increasing GA<sub>3</sub> concentration, but when combined with girdling, it gave the best result in decreasing this percentage. The role of GA<sub>3</sub> in decreasing the shot berries (small berries) could be attributed to pushing them to become normal berries by activating cell elongation.

The above results were in line with Youssef *et al.*, (1985) on Fayoumi cv., El – Sayed (1986), Abd Elghany (1989) on Roumy Ahmer.

#### Average berry weight and size:-

Data illustrated in table (1) demonstrate that treatment of Roumy Ahmer with GA<sub>3</sub> alone or in combined with girdling, produced significant increased in the average berry weight and size in the two seasons. Increasing GA<sub>3</sub> concentration increased berry weight and size. Girdling alone also increased the same parameters than control. These results might be attributed to the effect of GA<sub>3</sub> on growth which can stimulate both cell division and cell enlargement while girdling accelerate cell division in the pericarp that occurred due higher level of available carbohydrate. The above data are in agreement with El – Said (1986) and Carreno *et al.* (1998).

#### Average berry length and diameter:-

Berry length showed a significant difference by using GA<sub>3</sub> or girdling as compared to the control in the two seasons. There were significant differences in berry length by using 25 and 50 p.p.m GA<sub>3</sub> (2.13 and 2.27) at first and second season respectively. There were no significant differences by increasing GA<sub>3</sub> concentration above 50 p.p.m. when combining GA<sub>3</sub> with girdling it gave the best results in all treatments.

Increased GA<sub>3</sub> concentration alone or when combined with girdling, increased berry diameter than the control in the first and second seasons.

The above data are in line with the findings of El – Said (1989) on Roumy Ahmer, Aisha *et al.* (1998) on Flame seedless and Omar and El – Morsy (2000) on Ruby seedless

**Berry adherence strength and firmness:-**

Data from table (1) show that berry firmness ( $\text{gm} / \text{cm}^2$ ) was different significantly between all treatments, and it was increased as the  $\text{GA}_3$  concentration increased, the lowest berry firmness was at control (308 - 33 & 300) while the highest one at  $\text{GA}_3$  100 p.p.m (491.67 & 500.00) in the two seasons respectively. Girdling alone decreased the firmness than when combined with  $\text{GA}_3$  at different concentrations.

Berry adherence strength ( $\text{gm} / \text{cm}^2$ ) showed the highest value (500.0 & 475.0) at the application of  $\text{GA}_3$  100 p.p.m, the lowest value was obtained at control and girdling (250.0 & 333.3) and (300.0 & 316.67), in the two seasons respectively.  $\text{GA}_3$  + girdling at different concentrations were inbetween. The above data is in line with (Singh *et al.* 1979, Youssef *et al.* 1983 and Omar and El - Morsy 2000) who found that  $\text{GA}_3$  application increased berry adherence and firmness.

**Chemical characteristics:-**

**Acidity percentage:-**

Table (2) show that  $\text{GA}_3$  increased acidity % than control while girdling decreased it. Increasing  $\text{GA}_3$  concentration increased acidity percentage and the highest value was (0.57 and 0.59) in the first and second season respectively when the clusters were sprayed by  $\text{GA}_3$  100 p.p.m. These results may be due to the effect of  $\text{GA}_3$  on delaying ripening that was in agreement with Abd El - Ghany (1981) on Roumy Ahmer and Aisha *et al.* (1998) on Flame Seedless.

**Total soluble solids (T.S.S %):-**

Total soluble solids decreased gradually by the increased concentration of  $\text{GA}_3$ , while the highest values were obtained when using girdling and the lowest were the results of using 100 p.p.m of  $\text{GA}_3$ .

**Total sugars:-**

Data in table (2) indicated that spraying cluster with  $\text{GA}_3$  decreased the total sugar contents, while girdling increased it. These results may be due to the effect of  $\text{GA}_3$  on delaying ripening. This result is in line with Abd El - Ghany (1981). Girdling alone increased significantly total sugars (16.10 & 15.90) in the two seasons respectively.

**Anthocyanin contents:-**

Anthocyanin contents significantly increased with girdling treatments (1.99 & 1.99) in the two seasons. The negative effect was obtained with  $\text{GA}_3$  treatments especially when the  $\text{GA}_3$  increased. The best results were obtained by the combination of  $\text{GA}_3$  25 p.p.m + girdling (2.11 & 2.23) in the two seasons respectively. The same results were obtained by El - Said (1989), Carreno *et al.* (1998), Aisha *et al.*, (1998) and Omar and El - Morsy (2000).

**Table (1) : Effect of GA<sub>3</sub> and Girdling on physical characteristics of Roumy Ahmer clusters and berries during 2001 and 2002 seasons.**

Characteristics	Cluster weight (gm)		shot berries %		AV. Berry weight (gm)		AV. Berry size (cm)		AV. Berry length (cm)		AV. Berry Diameter (cm)		Berry adherence Strength (gm/cm <sup>2</sup> )		Firmness (gm / cm <sup>2</sup> )	
	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season
Control	566.7	580.0	5.63	5.07	4.60	4.50	4.27	4.10	2.00	2.00	1.87	1.87	250.00	333.33	308.33	300.00
Girdling	583.3	610.0	3.43	4.03	4.87	4.77	4.63	4.33	2.17	2.10	2.00	1.90	300.00	316.67	283.33	283.33
GA <sub>3</sub> 25 p.p.m	618.3	631.0	3.17	3.40	5.30	5.03	5.00	4.70	2.27	2.13	2.00	2.00	400.00	366.76	355.00	350.00
GA <sub>3</sub> 25 p.p.m + Girdling	646.7	670.0	2.67	2.97	5.50	5.33	5.00	5.00	2.40	2.47	2.13	2.23	383.33	325.00	325.00	375.00
GA <sub>3</sub> 50 p.p.m	639.3	636.7	2.20	2.50	5.63	5.50	5.20	5.00	2.40	2.47	2.05	2.27	433.33	450.00	408.33	391.67
GA <sub>3</sub> 50 p.p.m + Girdling	673.3	657.7	1.73	1.93	5.83	5.80	5.40	5.47	2.43	2.50	2.17	2.30	408.33	400.00	400.00	358.33
GA <sub>3</sub> 75 p.p.m	636.7	641.0	1.50	1.73	5.83	5.73	5.50	5.20	2.40	2.47	2.10	2.18	450.00	466.67	450.00	475.00
GA <sub>3</sub> 75 p.p.m + Girdling	650.7	653.3	1.40	1.50	6.20	6.00	5.60	5.60	2.33	2.50	2.13	2.22	433.33	441.67	433.33	450.00
GA <sub>3</sub> 100 p.p.m	639.0	644.3	1.50	1.33	6.40	6.30	6.13	5.93	2.50	2.50	2.13	2.27	500.00	475.00	491.67	500.00
GA <sub>3</sub> 100 p.p.m + Girdling	649.0	653.0	1.37	1.37	6.60	6.50	6.37	6.10	2.47	2.50	2.17	2.20	466.67	450.00	466.67	466.67
L.S.D at 5 %	25.910	33.020	0.307	0.203	0.224	0.271	0.277	0.254	0.109	0.077	0.133	0.077	24.620	33.420	32.640	20.380

**Table (2) : Effect of GA<sub>3</sub> and Girdling on chemical characteristics of Roumy Ahmer grapes during 2001 and 2002 seasons.**

Characteristics	Total Acidity %		T.S.S %		Total Sugar %		Anthocyanin contents	
	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season
Control	0.51	0.53	17.6	18.3	15.90	15.80	1.43	1.46
Girdling	0.49	0.50	18.0	18.6	16.10	15.90	1.99	1.99
GA <sub>3</sub> 25 p.p.m	0.52	0.56	17.4	18.0	15.70	15.50	0.92	0.90
GA <sub>3</sub> 25 p.p.m + Girdling	0.50	0.54	17.5	18.2	15.80	15.60	2.11	2.23
GA <sub>3</sub> 50 p.p.m	0.54	0.57	17.2	17.8	15.50	15.30	0.89	0.80
GA <sub>3</sub> 50 p.p.m + Girdling	0.50	0.55	17.3	17.9	15.60	15.40	1.96	1.16
GA <sub>3</sub> 75 p.p.m	0.56	0.58	17.0	17.6	15.30	15.20	0.80	0.77
GA <sub>3</sub> 75 p.p.m + Girdling	0.53	0.54	17.1	17.7	15.40	15.35	1.82	1.16
GA <sub>3</sub> 100 p.p.m	0.57	0.59	16.8	17.4	15.00	15.10	0.75	0.76
GA <sub>3</sub> 100 p.p.m + Girdling	0.55	0.57	16.93	17.5	15.10	15.00	1.74	1.15
L.S.D at 5 %	0.052	0.049	0.224	0.266	0.094	0.094	0.094	0.077

**B: - Postharvest studies:**

**Physical characteristics:**

**Loss in bunch weight percentage.**

As shown in Table (3) weight loss percentage in berries increased with advanced storage period in all treatments and the control in both seasons. The percentage of weight loss in the control and the treatment of Girdling was higher than other treatments during storage at 0 °C (9.21 & 9.08) & (9.14 & 8.74) in both seasons, respectively. On the other hand, the treatments of GA<sub>3</sub> 50 p.p.m + Girdling and GA<sub>3</sub> 75 p.p.m decreased significantly the percentages of weight loss compared to the control and other treatments (6.38 & 6.27) & (6.71 & 6.55) in both seasons, respectively. The present results are in agreement with those of Aisha *et al.* (1998) who found that berries of "Flame Seedless" resulted from the treatment of GA<sub>3</sub> at 15 and 40 p.p.m showed significant less weight loss during storage at 0 °C. Al – JuBoory *et al.*, (1990) on "Thompson Seedless" who found that berries treated with GA<sub>3</sub> 25 p.p.m applied one week after set showed significant less weight loss during storage.

**Decay percentage:**

Generally, it is clear from data presented in Table (4), that the rate of decay increased as the storage period advanced. During 2<sup>nd</sup> season, results clearly showed that there was no decay for a period 40 days storage in berries treated with GA<sub>3</sub> at different concentrations alone or with Girdling. The highest percentage of decay was recorded in the control (21.38 & 11.73) followed by the treatment of Girdling (17.4 & 10.57) in both seasons, respectively. Berries treated with GA<sub>3</sub> at 50 p.p.m + Girdling and GA<sub>3</sub> at 75 p.p.m decreased the percentage of decay as compared to the control and the other treatments. The obtained results are in agreement with the findings of El – Nabawy *et al.*, (1979) who found that "Banaty Seedless" grapes sprayed with GA<sub>3</sub> at 50 p.p.m after fruit set, the percentage fruit rot amounted to only 7 % after 7 weeks storage at 0 °C. Also, Aisha *et al.*, (1998) who found that berries of "Flame Seedless" treated with GA<sub>3</sub> decreased the percentage of decay during storage at 0 °C.

**Firmness and adherence strength:**

Results presented in Tables (5 & 6) clearly showed that berry firmness and adherence strength decreased with advanced storage period. Berry firmness and adherence strength in berries treated with GA<sub>3</sub> 100 p.p.m and GA<sub>3</sub> 100 p.p.m + Girdling were higher than those of the other treatments and the control in the two seasons of study. On the other hand, berries treated with Girdling followed by the control showed a significant decrease of berry firmness and adherence strength as compared with other treatments in the two seasons of study.

These results agree with those of El – Nabawy *et al.*, (1979) who found that when Banaty (Seedless) grapes was sprayed with GA<sub>3</sub> 50 p.p.m after fruit set, berry firmness was the highest after 7 weeks storage at 0 °C. Also, Omar and El – Morsy (2000) who found that GA<sub>3</sub> at 20 p.p.m significantly increased berry firmness and adherence strength.

Table (3): Effect of GA<sub>3</sub> and Girdling on weight loss % of Roumy Ahmer grapes after different periods of storage under 0 °C during 2001 and 2002 seasons.

Treatments Days from storage	1 <sup>st</sup> season										
	Cont T <sub>0</sub>	Gird T <sub>0</sub>	GA <sub>3</sub> 25 p.p.m	GA <sub>3</sub> 25 p.p.m +Girdling	GA <sub>3</sub> 50 p.p.m	GA <sub>3</sub> 50 p.p.m +Girdling	GA <sub>3</sub> 75 p.p.m	GA <sub>3</sub> 75 p.p.m +Girdling	GA <sub>3</sub> 100 p.p.m	GA <sub>3</sub> 100 p.p.m +Girdling	Aver age
After 20 days	4.45	3.13	3.29	4.44	4.10	3.69	3.86	2.95	4.73	3.62	3.83
After 40 days	8.38	8.40	8.40	7.93	7.88	5.50	6.98	8.22	8.04	10.68	8.04
After 60 days	14.80	15.90	14.95	13.90	10.60	9.95	9.30	11.80	12.10	10.98	12.43
Average	9.21	9.14	8.88	8.76	7.53	6.38	6.71	7.66	8.29	8.43	8.10
L.S.D. at 5 %	A 0.644			B 1.176			A x B 2.037				
Treatments Days from storage	2 <sup>nd</sup> season										
	Cont T <sub>0</sub>	Gird T <sub>0</sub>	GA <sub>3</sub> 25 p.p.m	GA <sub>3</sub> 25 p.p.m +Girdling	GA <sub>3</sub> 50 p.p.m	GA <sub>3</sub> 50 p.p.m +Girdling	GA <sub>3</sub> 75 p.p.m	GA <sub>3</sub> 75 p.p.m +Girdling	GA <sub>3</sub> 100 p.p.m	GA <sub>3</sub> 100 p.p.m +Girdling	Aver age
After 20 days	3.36	2.77	2.66	3.15	3.31	2.78	3.04	2.10	3.06	3.61	2.984
After 40 days	9.38	8.73	7.70	7.70	6.87	6.62	6.80	9.47	9.15	8.17	8.059
After 60 days	14.5	14.72	15.20	13.60	11.23	9.42	9.80	11.38	11.39	12.26	12.353
Average	9.08	8.74	8.52	8.15	7.14	6.27	6.55	7.65	7.87	8.02	7.80
L.S.D. at 5 %	A 1.879			B 3.431			A x B 5.943				

Table (4): Effect of GA<sub>3</sub> and Girdling on Decay % of Roumy Ahmer grapes after different periods of storage under 0 °C during 2001 and 2002 seasons.

Treatments Days from storage	1 <sup>st</sup> season										
	Cont T <sub>0</sub>	Gird T <sub>0</sub>	GA <sub>3</sub> 25 p.p.m	GA <sub>3</sub> 25 p.p.m +Girdling	GA <sub>3</sub> 50 p.p.m	GA <sub>3</sub> 50 p.p.m +Girdling	GA <sub>3</sub> 75 p.p.m	GA <sub>3</sub> 75 p.p.m +Girdling	GA <sub>3</sub> 100 p.p.m	GA <sub>3</sub> 100 p.p.m +Girdling	Aver age
After 20 days	3.27	1.96	1.31	0.00	0.00	0.00	1.14	0.73	1.29	1.44	1.11
After 40 days	27.94	14.98	6.72	6.45	3.64	1.96	5.59	7.53	7.43	8.33	9.06
After 60 days	32.94	35.52	20.65	22.97	18.41	14.98	19.28	23.95	23.92	24.58	23.72
Average	21.38	17.49	9.56	9.81	7.35	5.65	8.67	10.74	10.88	11.45	11.30
L.S.D. at 5 %	A 1.903			B 3.474			A x B 6.017				
Treatments Days from storage	2 <sup>nd</sup> season										
	Cont T <sub>0</sub>	Gird T <sub>0</sub>	GA <sub>3</sub> 25 p.p.m	GA <sub>3</sub> 25 p.p.m +Girdling	GA <sub>3</sub> 50 p.p.m	GA <sub>3</sub> 50 p.p.m +Girdling	GA <sub>3</sub> 75 p.p.m	GA <sub>3</sub> 75 p.p.m +Girdling	GA <sub>3</sub> 100 p.p.m	GA <sub>3</sub> 100 p.p.m +Girdling	Aver age
After 20 days	4.66	0.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.51
After 40 days	11.17	12.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.32	2.42
After 60 days	19.36	18.57	9.83	10.03	8.33	7.26	8.12	11.81	10.92	13.16	11.74
Average	11.73	10.57	3.28	3.34	2.78	2.42	2.71	3.94	3.64	4.49	4.89
L.S.D. at 5 %	A 0.989			B 1.807			A x B 3.129				



**Table (5): Effect of GA<sub>3</sub> and Girdling on Firmness (gm /cm<sup>2</sup>) of Roumy Ahmer grapes after different periods of storage under 0 °C during 2001 and 2002 seasons.**

1 <sup>st</sup> season											
Treatments	Cont	Gird	GA <sub>3</sub>	GA <sub>3</sub>	GA <sub>3</sub>	GA <sub>3</sub>	GA <sub>3</sub>	GA <sub>3</sub>	GA <sub>3</sub>	GA <sub>3</sub>	Aver
Days from storage	Vol	ling	25	25	50	50	75	75	100	100	age
			p.p.m	p.p.m	p.p.m	p.p.m	p.p.m	p.p.m	p.p.m	p.p.m	
				+Girdling		+Girdling		+Girdling		+Girdling	
Zero time	308.33	283.33	355.00	325.00	408.33	400.00	450.00	433.33	491.67	466.67	392.17
After 20 days	275.00	250.00	300.00	291.67	383.33	375.00	416.67	408.33	441.67	425.00	358.67
After 40 days	258.33	225.00	275.00	266.67	358.33	350.00	400.00	383.33	425.00	408.33	335.00
After 60 days	233.33	200.00	250.00	241.67	308.33	291.67	341.67	300.00	366.67	350.00	288.33
Average	268.75	239.58	295.00	281.25	364.58	354.17	402.09	381.25	431.25	412.50	343.04
L.S.D. at 5 %	A			B			A x B				
	9.545			15.090			30.180				
2 <sup>nd</sup> season											
Zero time	300.00	283.33	350.00	375.00	391.67	358.33	475.00	450.00	500.00	466.67	395.00
After 20 days	275.00	250.00	300.00	275.00	341.67	291.67	433.33	400.00	458.33	441.67	346.67
After 40 days	241.67	200.00	258.33	250.00	300.00	266.67	400.00	333.33	408.33	391.67	305.00
After 60 days	200.00	166.67	216.67	208.33	241.67	241.67	350.00	308.33	383.33	366.67	268.33
Average	254.17	225.00	281.25	277.08	318.75	289.59	414.58	372.92	437.50	416.67	328.75
L.S.D. at 5 %	A			B			A x B				
	7.295			11.530			23.070				

**Table (6): Effect of GA<sub>3</sub> and Girdling on Berry adherence strength (gm/cm<sup>2</sup>) of Roumy Ahmer grapes after different periods of storage under 0 °C during 2001 and 2002 seasons.**

1 <sup>st</sup> season											
Treatments	Cont	Gird	GA <sub>3</sub>	GA <sub>3</sub>	GA <sub>3</sub>	GA <sub>3</sub>	GA <sub>3</sub>	GA <sub>3</sub>	GA <sub>3</sub>	GA <sub>3</sub>	Aver
Days from storage	Vol	ling	25	25	50	50	75	75	100	100	age
			p.p.m	p.p.m	p.p.m	p.p.m	p.p.m	p.p.m	p.p.m	p.p.m	
				+Girdling		+Girdling		+Girdling		+Girdling	
Zero time	250.00	300.00	400.00	383.33	433.33	408.33	450.00	433.33	500.00	466.67	402.50
After 20 days	190.67	258.33	350.00	325.00	391.67	333.33	416.67	408.33	466.67	416.67	355.73
After 40 days	175.00	216.67	283.33	275.00	341.67	300.00	383.33	350.00	408.33	375.00	310.83
After 60 days	150.00	183.33	241.67	216.67	275.00	250.00	308.33	291.67	333.33	308.33	255.83
Average	181.42	239.58	318.75	300.00	360.42	322.92	389.58	370.83	427.08	391.67	331.22
L.S.D. at 5 %	A			B			A x B				
	8.865			14.020			28.030				
2 <sup>nd</sup> season											
Zero time	333.33	316.67	366.67	325.00	450.00	400.00	466.67	441.67	475.00	450.00	402.50
After 20 days	291.67	275.00	316.67	291.67	400.00	358.33	416.67	400.00	433.33	408.33	359.17
After 40 days	250.00	233.33	291.67	266.67	341.67	316.67	366.67	325.00	366.67	341.67	310.00
After 60 days	208.33	191.67	258.33	241.67	308.33	283.33	316.67	266.67	325.00	300.00	270.00
Average	270.83	254.17	308.34	281.25	375.00	339.58	391.67	358.34	400.00	375.00	335.42
L.S.D. at 5 %	A			B			A x B				
	13.850			21.900			43.810				

**Chemical characteristics:****Total acidity:**

Data of total acidity shown in table (7) clearly revealed that the period of storage affect significantly acidity % in both seasons, it decreased gradually according to the extension of storage period in all treatments and the control. The lowest percentage of acidity in berries was recorded by the treatment of girdling followed by the untreated berries. On the other hand, the highest percentage of acidity was observed in the treatment GA<sub>3</sub> 100 p.p.m followed by GA<sub>3</sub> 75 p.p.m in both seasons at 0 °C. The present results are in harmony with those of Hifny and Abdel – All (1977) who found that GA<sub>3</sub> at 50 p.p.m was sprayed on Thompson Seedless grapevines one week after full bloom, total acidity % of the juice increased with storage at 0 °C, due probably to water loss. Also, Aisha *et al.*, (1998) on “Flame Seedless” grapes treated with GA<sub>3</sub> found that the highest percentage of total acidity was at harvest date and then, decreased during storage at 0 °C and 5 °C.

Carreno *et al.*, (1998) on “Italia” grapes found that Girdling at the beginning of ripening significantly decreased titratable acidity. Similar results at this time of girdling were obtained in other varieties (Ganzalo *et al.*, 1984; DoKoozlian *et al.*, 1995).

**Total soluble solids (T.S.S %):**

Results in table (8) clearly showed that T.S.S % increased gradually with advanced storage period in both seasons. Data illustrated that the difference in T.S.S % among treatments and control was statistically significant. The highest percentage of T.S.S was recorded in the treatment of Girdling alone (18.17 & 18.70) followed by the treatment of GA<sub>3</sub> at 25 p.p.m + Girdling (17.73 & 18.30) as compared to the control (17.70 & 18.37) in both seasons, respectively. The lowest percentage of T.S.S % were obtained by the treatment of GA<sub>3</sub> at 100 p.p.m followed by GA<sub>3</sub> at 75 p.p.m either alone or with Girdling.

These results agree with those of Aisha *et al.*, (1998) who found that “Flame Seedless” grapes treated with GA<sub>3</sub> showed the lowest percentages of T.S.S during storage at 0 °C or 5 °C. Carreno *et al.*, (1998), found that Girdling at the beginning of ripening significantly increased total soluble solids. Hifny and Abdel – All (1977) found that GA<sub>3</sub> at 50 p.p.m when sprayed on Thompson Seedless grapevines one week after full bloom, T.S.S % of the juice increased with storage at 0 °C, which may be due to water loss.

Similar results with this time of girdling were obtained in other varieties (Gonzalo *et al.*, 1984; DoKoozlian *et al.*, 1995).

**Table (7): Effect of GA<sub>3</sub> and Girdling on Acidity % of Roumy Ahmer grapes after different periods of storage under 0 °C during 2001 and 2002 seasons.**

1 <sup>st</sup> season											
Treatments	Cont. %	Girdling	GA <sub>3</sub> 25 p.p.m	GA <sub>3</sub> 25 p.p.m +Girdling	GA <sub>3</sub> 50 p.p.m	GA <sub>3</sub> 50 p.p.m +Girdling	GA <sub>3</sub> 75 p.p.m	GA <sub>3</sub> 75 p.p.m +Girdling	GA <sub>3</sub> 100 p.p.m	GA <sub>3</sub> 100 p.p.m +Girdling	Average
Zero time	0.51	0.49	0.52	0.50	0.54	0.50	0.56	0.53	0.57	0.55	0.53
After 20 days	0.48	0.45	0.50	0.46	0.52	0.49	0.54	0.52	0.55	0.53	0.50
After 40 days	0.45	0.42	0.48	0.45	0.51	0.47	0.52	0.50	0.53	0.50	0.48
After 60 days	0.42	0.40	0.44	0.43	0.49	0.45	0.50	0.46	0.51	0.48	0.46
Average	0.47	0.44	0.49	0.46	0.52	0.48	0.53	0.50	0.54	0.52	0.49
L.S.D. at 5 %	A 0.015			B 0.024			A x B 0.048				
2 <sup>nd</sup> season											
Zero time	0.53	0.50	0.56	0.54	0.57	0.55	0.58	0.54	0.59	0.57	0.55
After 20 days	0.50	0.48	0.51	0.48	0.53	0.50	0.55	0.51	0.57	0.56	0.52
After 40 days	0.48	0.46	0.47	0.46	0.51	0.48	0.52	0.49	0.54	0.53	0.49
After 60 days	0.43	0.42	0.45	0.44	0.48	0.47	0.50	0.46	0.51	0.50	0.47
Average	0.49	0.47	0.50	0.48	0.52	0.50	0.54	0.50	0.55	0.54	0.51
L.S.D. at 5 %	A 0.015			B 0.023			A x B 0.046				

**Table (8): Effect of GA<sub>3</sub> and Girdling on T.S.S % of Roumy Ahmer grapes after different periods of storage under 0 °C during 2001 and 2002 seasons.**

1 <sup>st</sup> season											
Treatments	Cont. %	Girdling	GA <sub>3</sub> 25 p.p.m	GA <sub>3</sub> 25 p.p.m +Girdling	GA <sub>3</sub> 50 p.p.m	GA <sub>3</sub> 50 p.p.m +Girdling	GA <sub>3</sub> 75 p.p.m	GA <sub>3</sub> 75 p.p.m +Girdling	GA <sub>3</sub> 100 p.p.m	GA <sub>3</sub> 100 p.p.m +Girdling	Average
Zero time	17.6	18.0	17.4	17.5	17.2	17.3	17.0	17.1	16.8	16.93	17.28
After 20 days	17.7	18.2	17.6	17.7	17.4	17.4	17.2	17.0	17.0	17.0	17.42
After 40 days	17.8	18.3	17.7	18.0	17.5	17.6	17.2	17.0	17.1	17.2	17.54
After 60 days	17.9	18.4	17.8	18.2	17.6	18.0	17.4	17.8	17.2	17.6	17.79
Average	17.75	18.23	17.63	17.85	17.43	17.58	17.20	17.23	17.03	17.18	17.51
L.S.D. at 5 %	A 0.067			B 0.106			A x B 0.212				
2 <sup>nd</sup> season											
Zero time	18.3	18.6	18.0	18.2	17.8	17.9	17.6	17.7	17.4	17.5	17.90
After 20 days	18.4	18.7	18.1	18.3	17.9	18.0	17.7	17.8	17.5	17.6	18.00
After 40 days	18.4	18.8	18.2	18.4	18.0	18.1	17.8	17.9	17.6	17.7	18.09
After 60 days	18.6	18.8	18.3	18.5	18.1	18.2	17.9	18.0	17.7	17.8	18.19
Average	18.43	18.73	18.15	18.35	17.95	18.05	17.75	17.85	17.55	17.65	18.05
L.S.D. at 5 %	A 0.073			B 0.115			A x B 0.229				

**Total sugars %:**

Data in table (9) show the changes in total sugars percentage as affected by applying Girdling alone and GA<sub>3</sub> either alone or + Girdling at different storage periods during 2001 & 2002 seasons. Total sugars % increased with prolonged storage for all treated berries except those treated with Girdling or untreated. The percentage of total sugars decreased after 40 days from storage. Data showed that berries treated with Girdling alone were more effective in increasing the total sugars % than other treatments, as it was (16.13 & 15.95) followed by untreated berries showing the values of (15.95 & 15.85) and berries treated with GA<sub>3</sub> 25 p.p.m + Girdling showing the values of (15.93 & 15.70) in 2001 and 2002, respectively. On the contrary, berries treated with GA<sub>3</sub> 100 p.p.m followed by GA<sub>3</sub> 75 p.p.m and or without Girdling showed the lowest values of sugars.

The above mentioned results are in agreement with those obtained by Carreno *et al.*, (1998) on "Italia" grapes who found that Girdling at the beginning of ripening significantly increased total sugars. Also, Sanghavi and Phadnis (1973), who found that girdling of Bhokari grape improved fruit quality.

**Anthocyanin content (mg/g fresh weight):**

Results in table (10) during 2001 and 2002, show a gradual and continuous increase in Anthocyanin content with advanced time in storage till 40 days then it was decreased in all treated and untreated berries. Also, there was a significant difference of the Anthocyanin contents between all treatments and untreated berries. The treatment of Girdling alone followed by GA<sub>3</sub> 25 p.p.m + Girdling increased the average of Anthocyanin content than the other treatments and the untreated berries. The treatments of GA<sub>3</sub> 25, 50, 75 and 100 p.p.m alone accounted for the lowest significant Anthocyanin content as compared to the treatments of GA<sub>3</sub> 25, 50, 75 and 100 p.p.m + Girdling.

The present results are in harmony with those of Aisha *et al.*, (1998) who found that "Flame Seedless" grapes treated with GA<sub>3</sub> accounted for the lowest significant Anthocyanin content at harvest, and then it increased gradually according to the extension of storage period.

Also, Carreno *et al.*, (1998) on "Italia" grapes found that Girdling at the beginning of ripening significantly increased berry color. Similar results were obtained in other varieties (Gonzalo *et al.*, 1984; DoKoozlian *et al.*, 1995). Also, Sanghavi and Phadnis (1973) on Bhokari grapevine, who found that GA<sub>3</sub> treated at 5, 10, 20 or 25 p.p.m delayed color development slightly and this effect was enhanced by girdling.

**Table (9): Effect of GA<sub>3</sub> and Girdling on Total sugars % of Roumy Ahmer grapes after different periods of storage under 0 °C during 2001 and 2002 seasons.**

Treatments	1 <sup>st</sup> season										
	Cont %	Girdling	GA <sub>3</sub> 25 p.p.m	GA <sub>3</sub> 25 p.p.m +Girdling	GA <sub>3</sub> 50 p.p.m	GA <sub>3</sub> 50 p.p.m +Girdling	GA <sub>3</sub> 75 p.p.m	GA <sub>3</sub> 75 p.p.m +Girdling	GA <sub>3</sub> 100 p.p.m	GA <sub>3</sub> 100 p.p.m +Girdling	Average
Zero time	15.90	16.10	15.70	15.80	15.50	15.60	15.30	15.40	15.00	15.10	15.54
After 20 days	15.95	16.15	15.75	15.90	15.50	15.70	15.30	15.60	15.10	15.20	15.62
After 40 days	16.00	16.15	15.80	16.10	15.60	15.75	15.40	15.65	15.20	15.30	15.70
After 60 days	15.90	16.00	15.90	16.20	15.60	15.80	15.50	15.70	15.30	15.40	15.73
Average	15.94	16.10	15.79	16.00	15.55	15.71	15.38	15.59	15.15	15.25	15.65
L.S.D. at 5 %	A			B			A x B				
	0.028			0.045			0.089				
Treatments	2 <sup>nd</sup> season										
	Cont %	Girdling	GA <sub>3</sub> 25 p.p.m	GA <sub>3</sub> 25 p.p.m +Girdling	GA <sub>3</sub> 50 p.p.m	GA <sub>3</sub> 50 p.p.m +Girdling	GA <sub>3</sub> 75 p.p.m	GA <sub>3</sub> 75 p.p.m +Girdling	GA <sub>3</sub> 100 p.p.m	GA <sub>3</sub> 100 p.p.m +Girdling	Average
Zero time	15.80	15.90	15.50	15.60	15.30	15.40	15.20	15.35	15.10	15.00	15.42
After 20 days	15.85	15.90	15.55	15.70	15.40	15.50	15.30	15.45	15.20	15.10	15.50
After 40 days	15.90	16.00	15.60	15.80	15.50	15.60	15.35	15.55	15.30	15.20	15.58
After 60 days	15.80	15.90	15.65	15.93	15.60	15.70	15.40	15.60	15.40	15.30	15.63
Average	15.84	15.93	15.58	15.78	15.45	15.55	15.31	15.49	15.25	15.15	15.53
L.S.D. at 5 %	A			B			A x B				
	0.023			0.036			0.073				

**Table (10): Effect of GA<sub>3</sub> and Girdling on Anthocyanin content (mg/g) in peel of Roumy Ahmer grapes after different periods of storage under 0 °C during 2001 and 2002 seasons.**

Treatments	1 <sup>st</sup> season										
	Cont %	Girdling	GA <sub>3</sub> 25 p.p.m	GA <sub>3</sub> 25 p.p.m +Girdling	GA <sub>3</sub> 50 p.p.m	GA <sub>3</sub> 50 p.p.m +Girdling	GA <sub>3</sub> 75 p.p.m	GA <sub>3</sub> 75 p.p.m +Girdling	GA <sub>3</sub> 100 p.p.m	GA <sub>3</sub> 100 p.p.m +Girdling	Average
Zero time	1.43	1.99	0.92	2.11	0.89	1.96	0.80	1.82	0.75	1.74	1.44
After 20 days	1.48	2.08	0.92	2.15	0.89	1.97	0.81	1.84	0.75	1.77	1.47
After 40 days	1.50	2.16	0.94	2.13	0.90	2.04	0.81	1.85	0.77	1.77	1.49
After 60 days	1.47	2.02	0.93	2.10	0.89	1.98	0.81	1.84	0.76	1.76	1.46
Average	1.47	2.06	0.93	2.12	0.89	1.99	0.81	1.84	0.76	1.76	1.46
L.S.D. at 5 %	A			B			A x B				
	0.023			0.036			0.073				
Treatments	2 <sup>nd</sup> season										
	Cont %	Girdling	GA <sub>3</sub> 25 p.p.m	GA <sub>3</sub> 25 p.p.m +Girdling	GA <sub>3</sub> 50 p.p.m	GA <sub>3</sub> 50 p.p.m +Girdling	GA <sub>3</sub> 75 p.p.m	GA <sub>3</sub> 75 p.p.m +Girdling	GA <sub>3</sub> 100 p.p.m	GA <sub>3</sub> 100 p.p.m +Girdling	Average
Zero time	1.46	1.99	0.90	2.23	0.80	1.16	0.77	1.16	0.76	1.15	1.24
After 20 days	1.49	2.00	0.91	2.24	0.82	1.18	0.78	1.16	0.76	1.15	1.25
After 40 days	1.50	2.07	0.92	2.25	0.83	1.18	0.78	1.17	0.77	1.16	1.26
After 60 days	1.49	1.99	0.90	2.24	0.81	1.07	0.77	1.16	0.76	1.16	1.24
Average	1.49	2.01	0.91	2.24	0.82	1.15	0.78	1.16	0.76	1.16	1.25
L.S.D. at 5 %	A			B			A x B				
	0.016			0.026			0.052				

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تأثير بعض معاملات ما قبل الحصاد على القدرة التخزينية  
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فاطمة عصمت إبراهيم محمد - عائشة صالح عبد الرحمن جاسر  
معهد بحوث البساتين - مركز البحوث الزراعية - الجيزة .

أجريت الدراسة فى عام ٢٠٠١ و ٢٠٠٢ على صنف الغضب الرومى الأحمر أشجار عمر ١٥ سنة . أجريت المعاملات بالرش بالجبرلين ٢٥ ، ٥٠ ، ٧٥ ، ١٠٠ جزء / مليون وأيضا التحليق كلا بمفرده أو بالدمج بينهما. أجرى الرش بالجبرلين فى الأسبوع الثالث بعد العقد بينما أجرى التحليق فى مرحلة بداية الطراوة (دخول الماء الحبة) جميع المعاملات جمعت فى مرحلة إكمال النمو ثم خزنت على درجة الصفر المئوى والرطوبة ٩٥ % لمدة ٦٠ يوم .

أظهرت النتائج وقت الجمع أن المعاملة بالجبرلين أدت إلى زيادة وزن العنقود ووزن وحجم الحبة وطول وقطر الحبة بينما إنخفضت النسبة المئوية للحبات الصغيرة. كذلك أدى إلى زيادة الصلابة وقوة الشد للحبات. التحليق أدى إلى زيادة نسبة المواد الصلبة الذائبة الكلية والسكريات الكلية وصبغة الأنثوسيانين بينما إنخفضت نسبة الحموضة. زادت النسبة المئوية للتالف والفقد فى الوزن بزيادة فترة التخزين البارد. وأظهرت النتائج أن المعاملة بالجبرلين ٥٠ جزء / مليون + التحليق والجبرلين ٧٥ جزء / مليون منفردا أدى إلى إنخفاض النسبة المئوية للتالف والفقد فى الوزن بالمقارنة بشار الكنترول وباقى المعاملات. لا يوجد تالف حتى ٤٠ يوم من التخزين فى الحبات المعاملة بالجبرلين منفردا أو مع التحليق. إنخفضت صلابة وقوة الشد للحبات مع زيادة فترة التخزين البارد.

كما ثبت أن المعاملة بالجبرلين بتركيز ١٠٠ جزء / مليون منفردا أو مع التحليق أدت إلى زيادة صلابة وقوة الشد للحبات عن باقى المعاملات وعلى العكس كانت المعاملة بالتحليق والكنترول أقل فى صلابة وقوة الشد للحبات كما أظهرت النتائج زيادة فى نسبة المواد الصلبة الذائبة والسكريات الكلية وصبغة الأنثوسيانين وتقل نسبة الحموضة الكلية بالمعاملة بالتحليق منفردا أو الجبرلين بتركيز ٢٥ جزء / مليون + التحليق خلال فترة التخزين البارد.