Effect of some Compounds Spraying on Fruiting of Superior Seedless Grapevines under Assiut Conditions

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ABSTRACT

This investigation was carried out during two seasons i.e. 2016 and 2017 on Superior Seedless grapes cultivar grown at the Experimental Orchard, Faculty of Agriculture, Assiut University, Egypt. Ten combined treatments of GA3, urea, roselle and active dry yeast spraying at various stage of berry development were evaluated. The experimental vines were arranged in a complete randomized design. From the results of this investigation, it could be concluded that spraying with GA3 seven times, once at pre-bloom (5 ppm), thrice at full-bloom (5 and 10 ppm) and other thrice when the berry at (6 mm) pea stage (30 ppm). In addition, combined spraying GA3 four times once at pre-bloom and thrice at full-bloom plus 1.5% active dry yeast when the berry at pea stage, as well as roselle at 0.2% three times to obtain heavy and less compact cluster and hasten the ripening with fairly good Superior Seedless berries quality. In addition, it could be used urea and yeast as well as roselle extract instead of GA3 in grape production to overcome the adverse GA3 effects.

Keywords: Growth regulators, GA3, urea, yeast, roselle and grapes.

INTRODUCTION

Grapes (Vitis vinifera L.) are considered the first major fruit crop in its production all over the world, for being of an excellent flavor, nice taste and high nutritional value. In Egypt grapes rank second among fruit crops while citrus being the first. The total planted area attained about 188543 Fed with an average of 1378815 tons M.A.L.R., (2015).

The improving early grapes are very important either for local consumption markets or exportation to external markets. Berry thinning has been used to obtain a good cluster with highest berry weight and fastest ripening. Bunch thinning is done as a regular cultural treatment or spray of chemicals at pre-bloom, peak bloom and fruit set stages. The practice is done to reduce cluster compactness and to improve the productivity and berry quality. The thinning necessary depended on the cultivar as well as sunshine, temperature and nutrient supply Dhillon et al., (1992); Poni, (2003); Ahmed et al., (2004) and El-Salhy et al (2009).

Plant growth substances play a major role in plant growth and development GA3 still used to increase cluster length, thinning bunch berries as well as berry size in Seedless grape cultivars Orth, (1990); Colapietra et al., (1995); El-Hammady et al., (1998); Williams and Ayars, (2005); Selim, (2007); Zoffoli et al., (2009) and El-Halaby et al (2015).

Recently urea spraying at pre-bloom or full bloom has been used to reduce the berry set percentage and consequently to induce berry thinning Ahmed et al., (2004); El-Salhy et al., (2009); Fawzi et al., (2014) and El-Halaby et al (2015). The bio-fertilizer active dry yeast was enhanced grape yield and berry quality where, yeast contains some natural growth regulators, some important nutrients and some common amino acids Moor, (1979); Idso et al., (1995); El-Salhy et al., (2011) and Fawzi et al., (2014).

Plant extracts as a natural products were used in many ways. The natural products were used in improving growth, nutritional status, production and as pesticides for public health and environmental safety. The higher content of plant extracts from phenolic and another chemical constituent seem to have synergistic effects on growth and fruiting of fruit trees Paik and Chung, (1997) and Srivastava and Lal, (1997).

Roselle (Hibiscus sabdariffa), extract contains higher amount of anthocyanin, organic acids, ascorbic acid, calcium oxalate and herbicide hydrochloride Raffauf, (1970). The own higher content of plant extracts from antioxidants especially phenolic compounds, nutrients and plant pigments which in turn stimulating the growth and fruiting of fruit trees Srimal, (1997) and Pons, (2003).


This study aimed to recognize the benefit of spraying GA3 and urea as well as active dry yeast and roselle in fruiting Superior Seedless grapes cultivar.

MATERIALS AND METHODS

The present work was conducted through two successive seasons of 2016 and 2017 on 60 uniform vigour seven years-old superior Seedless grapevines. The vines were grown the Experimental Orchard, Faculty of Agriculture, Assiut University, Egypt. They had grown in clay soil at 2x2.5 meters. All vines received the standard agricultural practices that are used in the vineyard including soil fertilization, irrigation and pest control. The vines were cane pruned (68 eyes/vine were left, 10 canes x 6 buds/cane plus 4 renewal spurs with 2 buds). The pruning was done during the second week of January each season. Crop load at all vines was adjusted to 25 clusters/vine after berry set. The chosen vines were divided into ten different treatments including the control. The experimental vines were arranged in a complete randomized block design with three replications per treatment two vines in each. Thus, the treatments were as follow:

1- Control (sprayed with water only).
2- GA3 at 5 ppm sprayed when cluster length was about (10-12 cm) for elongation.
3- Urea at 1.5 % sprayed when cluster length was about (10-12 cm) for elongation.
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4- GA3 at 5 ppm plus 10 ppm sprayed during full bloom, the successive three days, respectively for berry thinning.

5- Urea at 1.5 two times spraying for elongation berry thinning.

6- GA3 seven times spraying, once at 5 ppm for elongation, followed by thrice GA3 at 10 ppm for thinning and other thrice 30 ppm of GA3 when berry diameter reached about 6 mm (pea stage) for sizing.

7- GA3 four times spraying, once at 5 ppm for elongation, followed by thrice GA3 at 10 ppm for thinning and spraying once of 0.2% yeast when berry diameter reached about 6 mm (pea stage) for sizing.

8- Urea twice sprays once at 1.5% for elongation, followed by other at 1.5% for thinning and then of 0.2% yeast spraying when berry diameter reached about 6 mm (pea stage) for sizing.

9- GA3 once spraying at 5 ppm for elongation, followed by once urea at 1.5% for thinning and then of 0.2% yeast was spraying at pease stage for sizing.

10- Roselle at 0.2% three times spraying, once for elongation followed by once for berry thinning and once for sizing.

GA3 (Gibberelic acid), and low biuret urea (46%) and roselle extract were prepared before spraying by dissolved the define amount in warm water (38°C) followed by addition of 0.3% Egyptian treacle (as source of sugar) and left for two hours for activating before spraying. All chemicals were sprayed at same date by using a hand sprayer to the run off.

The percentage of berry set was estimated by counting two clusters per vine in perforated white cheese bags after the first spraying. Such bags were removed for chemical spraying at blooming; the percentage of berry set was calculated as follow:

$$\text{Berry set} \% = \frac{\text{No. of berries/cluster}}{\text{No. of total flowers/cluster}} \times 100$$

At harvest time (when TSS of berry juice in the check treatment reached 13-14% brix), the clusters were harvested, weighed and yield/vine (kg) was recorded. Two clusters were taken at random from yield of each vine and the following characteristics were determined.

Cluster weight (g), cluster length (cm) and number of berries per each cluster, then cluster compactness coefficient according to Winkler et al. (1974), as well as shot berries percentage were recorded.

In addition berry quality in terms of berry weight, TSS, total titratable acidity and reducing sugars % according to A.O.A.C. (1985).

All obtained data were tabulated and statistically analyzed according to Gomez and Gomez (1984) and Snedecor and Cochran (1990) using the New L.S.D. test for distinguishing the significance differences between various treatment means.

**RESULTS**

1- Berry set percentage and yield:

Data presented in Table (1) shows the effect of spraying with GA3, low biuret urea, active dry yeast and roselle on berry set percentage, shot berries percentage, yield/vine and cluster weight of Superior Seedless grapevines in 2016 and 2017 seasons. It is obvious from the obtained data that the results took similar trend during the two studied seasons. Spraying of GA3 or urea at full bloom decreased the berry set and shot berries percentages compared to untreated vine. The lowest values of berry set percentage was recorded due to spray GA3 or urea ,whereas, shot berries percentage was recorded due to spray GA3 or urea combined with yeast as well as roselle compared to unsprayed ones.

On other hand most treatments insignificantly affected on cluster weight and yield/vine compared to unsprayed ones. Spraying roselle significantly increased the cluster weight and yield/vine compared to unsprayed ones (control).The increment of the cluster weight and yield/vine due to roselle over unsprayed ones (control) attained 9.56 and 5.89% as an av. the two studied seasons respectively. Contrarily, GA3 or urea spraying for thinning significantly decreased the cluster weight and yield/vine compared to control. The decrement percentage of yield/vine attained 11.56 and 9.27 % as an av. of the two studied seasons due to GA3 or urea spraying compared to unsprayed ones, respectively.

<table>
<thead>
<tr>
<th>No</th>
<th>Berry set (%)</th>
<th>Shot berries (%)</th>
<th>Yield/vine (kg)</th>
<th>Cluster weight (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>15.60</td>
<td>15.11</td>
<td>15.35</td>
<td>12.68 14.56 13.62 9.15 9.19 9.17</td>
</tr>
<tr>
<td>T2</td>
<td>15.23</td>
<td>14.89</td>
<td>15.06</td>
<td>5.64 6.28 5.96 9.41 9.71 9.56</td>
</tr>
<tr>
<td>T3</td>
<td>15.86</td>
<td>15.13</td>
<td>15.50</td>
<td>5.58 6.34 5.96 9.57 9.81 9.69</td>
</tr>
<tr>
<td>T4</td>
<td>11.18</td>
<td>11.33</td>
<td>11.25</td>
<td>3.28 3.61 3.44 8.01 8.21 8.11</td>
</tr>
<tr>
<td>T5</td>
<td>12.05</td>
<td>11.53</td>
<td>11.79</td>
<td>3.61 4.15 3.88 8.21 8.43 8.32</td>
</tr>
<tr>
<td>T6</td>
<td>11.72</td>
<td>11.57</td>
<td>11.65</td>
<td>2.26 2.68 2.47 9.42 9.72 9.57</td>
</tr>
<tr>
<td>T7</td>
<td>11.24</td>
<td>10.98</td>
<td>11.11</td>
<td>2.49 3.05 2.77 9.24 9.48 9.36</td>
</tr>
<tr>
<td>T8</td>
<td>11.75</td>
<td>11.32</td>
<td>11.53</td>
<td>2.35 2.56 2.45 9.47 9.76 9.51</td>
</tr>
<tr>
<td>T9</td>
<td>11.54</td>
<td>11.21</td>
<td>11.37</td>
<td>2.34 3.46 2.90 9.35 9.60 9.47</td>
</tr>
<tr>
<td>T10</td>
<td>13.18</td>
<td>13.09</td>
<td>13.13</td>
<td>3.88 4.96 4.42 9.63 9.80 9.71</td>
</tr>
</tbody>
</table>

N.L.S.D 1.28 1.43 0.68 0.54 0.56 0.63 22.62 20.48

T4= GA3 (5 + 10 ppm) T5= Urea (1.5 + 1.5 %) T6= GA3 (5 + 10+ 30 ppm)
T7= (GA3 5 + 10 ppm) + (Yeast 0.2 %) T8= (Urea 1.5 + 1.5 %) + (Yeast 0.2 %)
T9= (GA3 5 ppm) + (Urea 1.5) + (Yeast 0.2 %) T10= Roselle (0.2 +0.2 +0.2 %)
Therefore, it can be concluded that three spraying of roselle (T10) as well as combined GA$_3$ plus urea and yeast (T9) or urea twice plus yeast (T8) at pre-bloom, full bloom and when berry at pea stage were the best tool to produce heavy weight of clusters and yield/vine.

### 2- Cluster characteristics:

The effects of tested treatments on cluster characteristics during the two studied seasons are presented in Table (2). It is evident that all treatments improved the cluster traits. Using GA$_3$ or urea as well as roselle at pre-bloom significantly increased the cluster length, whereas, using them at full-bloom significantly decreased the berries number per cluster compared to untreated one (control). Hence, all spraying significantly decreased compactness coefficient of cluster and produced loose clusters. No significantly differences were detected due to use either GA$_3$, urea or roselle extracts. The decrement of cluster compactness coefficient was attained (35.87, 35.87 and 30.00% as av. of the two studied seasons) due to GA$_3$ (T4), urea (T5) and roselle(T10) spraying compared to unsprayed ones, (control) respectively. Also, these treatments significantly increased the berry weight compared to untreated one (control). The increment of berry weight was attained 38.31 , 35.13 and 36.07% as an av. of the two studied seasons due to spray seven times GA$_3$ (T6), urea twice and yeast (T8) and roselle extracts three times(T10), compared to untreated one respectively.

<table>
<thead>
<tr>
<th>No. berries/cluster</th>
<th>Cluster length (cm)</th>
<th>Compactness coefficient (%)</th>
<th>25 berries weight (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016 Mean</td>
<td>2016 Mean</td>
<td>2016 Mean</td>
<td>2016 Mean</td>
</tr>
<tr>
<td>T1</td>
<td>138.1</td>
<td>143.8</td>
<td>140.9</td>
</tr>
<tr>
<td>T2</td>
<td>136.1</td>
<td>141.3</td>
<td>138.7</td>
</tr>
<tr>
<td>T3</td>
<td>138.3</td>
<td>140.8</td>
<td>139.5</td>
</tr>
<tr>
<td>T4</td>
<td>102.2</td>
<td>107.1</td>
<td>104.7</td>
</tr>
<tr>
<td>T5</td>
<td>101.6</td>
<td>104.3</td>
<td>102.9</td>
</tr>
<tr>
<td>T6</td>
<td>100.8</td>
<td>107.2</td>
<td>104.0</td>
</tr>
<tr>
<td>T7</td>
<td>101.8</td>
<td>105.8</td>
<td>103.8</td>
</tr>
<tr>
<td>T8</td>
<td>103.6</td>
<td>106.2</td>
<td>104.9</td>
</tr>
<tr>
<td>T9</td>
<td>103.8</td>
<td>105.3</td>
<td>104.5</td>
</tr>
<tr>
<td>T10</td>
<td>109.4</td>
<td>111.9</td>
<td>110.6</td>
</tr>
</tbody>
</table>

Using singly GA$_3$ spraying or GA$_3$ plus active dry yeast for sizing had the highest berry weight and size with good cluster traits compared to control. No significant differences were observed between used GA$_3$ or urea for cluster elongation and berry thinning, as well as used GA$_3$ or yeast after berry set for sizing. In addition, roselle spraying three times gave the same positives effecting of GA$_3$, urea and yeast on cluster attributes and berry weight.

### 3- Chemical constituents:

Data of various berry characteristics as affected by different studied treatments during 2016 and 2017 seasons are presented in Tables (3).

### Table 2. Effect of GA$_3$, urea, yeast and Roselle spraying on No. of berries/cluster, cluster length, compactness coefficient, and 25 berries weight of Superior Seedless grapesvines during 2016 and 2017 seasons.

### Table 3. Effect of GA$_3$, urea, yeast and Roselle spraying on TSS, reducing sugars and titratable acidity of Superior Seedless grapes during 2016 and 2017 seasons.
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pared to untreated ones. No significant differences were found due to use GA$_3$ or urea plus yeast or roselle extracts. The increment percentage of total soluble solids was (17.69, 17.84, 19.63 and 17.46% an av. of the two studied season) due to use GA$_3$ twice plus yeast (T7), urea twice plus yeast (T8), GA$_3$ and urea plus yeast (T9) or roselle three times (T10) compared to unsprayed ones (control, T1), respectively. Hence, it can be concluded that could be used urea, yeast and roselle instead of GA$_3$ to overcome the adverse effects due to GA$_3$ in grape production, i.e. delaying the berry ripening and reduction berry quality.

Discussion and Conclusion:

GA$_3$ has been routinely used for Seedless grape production to increase berry and cluster weight, and cause thinning of clusters. The effect of GA$_3$ depends on date of application and concentration applied. GA$_3$ spraying at full bloom decreased berry set since its role in flower dropping, causing a reduction of berries number of cluster. The positive action of GA$_3$ on stimulating cell elongation process, enhancing the water absorption and stimulating the biosynthesis of proteins which will lead to increase the cluster length, as well as, berry size and weight. Roper and Williams, (1989); Lu et al., (1995); Perez et al. (2000), Dokoozlian and Peacock (2001), Selim (2007), El-Salhy et al. (2009) and Abu-Zahra, (2010).

The results are on line with those obtained by the investigators, Ezzahouami et al. (1985), Orth (1990), Lu et al. (1995), and El-Halaby et al., (2015).

In addition, the positive action of urea as nitrogen source and producing new tissues that water and nutrients absorption induce more vegetative growth that shifted the balance of competition between reproductive growth and vegetative organs in favor of the latter. Low biuret urea differed significantly from control in term of fruit set and fruit thinning percentage. The reasons may be the interference with fertilization of the ovary of phytotoxicity in the peduncle region Byers and Lyons, (1985); Guirguis et al., (1996) and Ahmed et al., (2004). There was a remarkable improving on berry quality expressed on increasing the berry weight, total soluble solids, reducing sugars and anthocyanin contents as berry thinning. The results of urea on improving yield and berry quality of grapevines was supported by many authors such as El-Moursy et al. (1993), Abdel-Hady (1995), Ahmed et al. (2004), El-Salhy et al. (2009), Fawzi et al. (2014) and El-Halaby et al. (2015).

The improving effect of yeast application was attributed to auxins, hormones, vitamins, chelating agents and enzyme produced which have stimulatory effects on cell division and enlargement, nutrient uptake, protein synthesis and improves net photosynthesis Moor, (1979) and Idso et al. (1995). These effects induce advancing of the berry ripening. It known that the earliest productions are the most important target for export and marketing. The results are in harmony with those of Hassan (2002), Omran and Abdel-Latif (2003), El-Akkad (2004), Omran et al. (2005), El-Salhy et al. (2011), Fawzi et al. (2014) and El-Halaby (2015).

The higher own content of roselle extracts from different antioxidant as well as nutrients surely reflected on enhancing cell division, building organic foods and the tolerance of plants to biotic and abiotic stresses could explain the positive effects on growth and fruiting of fruit trees, Paik and Chung (1997); Pons, (2003) and Okigobo and Emoghene, (2003).

These effects surely reflected on enhancing growth, nutritional status and fruiting of vines. These results were reported by Vargas et al. (2008), Gadel-kareem and Abdel-Rahman (2013), Ahmed et al (2014), Gouda. Fatma El-zahraa (2016) and El-Salhy (2017).

On the light of the previous results, it could be recommended that spraying of GA$_3$ seven times, once at pre-bloom, thrice at full-bloom and thrice (5, 10 & 30 ppm) when the berry of pea stage plus 0.2% active dry yeast when the berry diameters about 6 mm (pea stage). In addition, can be used either 1.5% low biuret urea at pre-bloom and full bloom, Plus 0.2% active dry yeast when the berry at pea stage or roselle three times. Using urea and yeast as well as roselle more effective to overcome the adverse effective of using GA$_3$ at high concentration i.e. delay the berry ripening. These treatments very necessary to produce heavy and less compact cluster and hasten the ripening as well as improving the weight, size and taste of Superior Seedless berries. These advantages will eventually enable growers to obtain highly marketable surrounding and overseas markets.

REFERENCES


El-Akkad, M.M. (2004): Physiological studies on vegeta-
tive growth and fruit quality in some grapevine cul-
pp. 262.

El-Halaby, E.H.S.; A.M. El-Salhy; M.M. Al-Wasfy and
Spraying on Fruiting of Flame Seedless
Grapevines under Sandy Soil Conditions. Assiut J.

El-Hammady, A.M.; A.D. Shaltout; N. Abdel-Hamid and
A.M.H. El-Kereamy (1998): Effect of GA3 treat-
ments on fruit quality of "Flame Seedless" grape
cv. Arab Univ. J. Agric. Sci., Ain Shams Univ.,
Cairo, 6 (2): 531-542.

El-Moursy, F.M.; F.F. Ahmed and F.A. Abdel-Aziz
roomy grapevines. Minia First Conf. for Hort.
Crop.

El-Salhy, A.M.; K.I. Ahmed-Amin; A.A.B. Masoud and
A.A. Abozeed (2009): Effect of berry thinning, CPPU
spraying and pinching on cluster and berry
quality of two grapevine cultivars. Assiut J. of

El-Salhy, A.M.; K.I. Ahmed-Amin; A.A.B. Masoud and
A.A. Abozeed (2015). Response of Ruby Seedless
and Red Roomy grapevines to application of some
bio fertilizers. Assiut J. of Agric. Sci., 41 (5): 125-
142.

El-Salhy, A.M.; R.A. Ibrahim; M.A. Mgawer and G.N. Abd
El-Hafiz (2017): Effect of some plant extracts spra-
ying on growth and fruiting of Flame seedless grape-

Effects of gibberellic acid and girdling on Thompson
Seedless and Ruby Seedless table grapes in Moroc-

Fawzi, M.I. f.; Laila F. Haggag; M.F. Shahin; M.A. Mer-
wad and E.A. Genaidy (2014): Influence of spraying
urea, boron and active dry yeast on growth, yield,
leaf chemical composition and fruit quality of Superior
grapevines growth in sandy soil conditions.

Response of Ruby Seedless grapevines to foliar
application of seaweed extract, salicylic acid and ros-
elle extract. Hortsscience J. of Suez Canal Univ.,
pp. 299-303.

Gomez, K.A. and A.A. Gomez (1984): Statistical Proce-
dures for Agricultural Research 2nd Ed. Wily, New
York.

Gouda-Fatma El-Zahraa, M. (2016): Effect of GA3 and
lemongrass oil spraying on fruiting of Ruby Seedless

Guirguis, N.S.; A.H. Gumana; R.G. Stino and A.M.
Merheki (1996): Effect of carbonate, urea and cy-
avamide on thinning and apical blooms under arid

Hassan, A.S.A. (2002): Effect of some GA3, yeast, nitro-
gen, and potassium foliar spray treatments on yield,
fruit quality and leaf characteristics of Thompson Seedless. Zagazig J. Agric. Res., Vol. 29 (1): 73-
97.

Idso, S.B.; K.E. Idso, R.L. Garcia; B.A. Kimball and J.K.
Hoover (1995): Effect of atmospheric CO2 enrich-
ment and foliar methanol application on net photo-
synthesis of sour orange trees (Citrus aurantium,
Rutaceae) leaves. Amer. J. of Botany, 82 (1): 26-
30.

Lu, J.; O. Lamikanra and S. Leong (1995): Effect of gib-
berellic acid on muscan dine grape production. Proc.

M.A.L.R. (2015): Ministry of Agriculture and Land Recl-
amation. Bulletin of the Agricultural Statistics Part
(2). Summer & Nili Crops.

Moore, T.C. (1979): Biochemistry and physiology of plant
hormones. Pub. By Springer-Verlag New York,
USA.

ectract of three plant species on Mycosphaerella fi-
fiensis Morelet, the casual organism of black siga-
toka disease of banana (Musa acuminata) Nigeria

of some genetically improved yeast strains on vine
vigor, yield components and fruit quality of Red
Roomy grapevines. Assiut J. Agric. Sci., 34 (1): 33-
42.

Omran, Y.A.M.; T. Ramadan and F.M. El-Borai (2005):
Application of yeast and/or hydrogen cyanamide for
improving vine vigor, bud behavior and fruit quality
of Thompson Seedless grapevines. J. Agric. Sci.
Mansoura Univ., 30 (7): 4055-4071.

Seedless with gibberellic acid at different flowering
stage on berry set and berry size. Deciduous Fruit

extracts on apple storage disease. Korean J. of

gibberellins in seeded and Seedless grapes; identifi-
cation and changes in content during berry devel-

and cultural aspects. Informatore Agrario, 59 (26):
37-49.

146.

containing plants. Willy & Sons, pp.10-20.

i
ammoniation. Bulletin of the Agricultural Statistics Part
(2). Summer & Nili Crops.

Methods 7th Ed. The Iowa State Univ., Press.

Srimal, R.C. (1990): Turmeric a brief review of medicinal
properties of leaf extract of some plants. Indian
Phytopath. 50 (3): 408-5011.
تأثر رش بعض المركبات على إمتصاص شجيرات النبيذ السوبيروي الابيذي تحت ظروف اسپوط

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1 قسم البستات - كلية الزراعة - جامعة الوادي الجديد
2 قسم البستات - كلية الزراعة - جامعة الأزهر - اسپوط

أجريت هذه الدراسة خلال موسمين متتاليين 2016، على شجيرات النبيذ السوبيروي الابيذي بمزرعة كلية الزراعة جامعة اسپوط محافظة اسپوط - جمهورية مصر العربية. تهدف دراسة تأثير رش حمض الجبريلك والبوبوريا والخمرة الظهيرة النشطة والكرنكية على المحصول وخصائص العقول والحبات. وقد تم رش حمض الجبريلك قبل الزهرة وأثناء اكتمال الزهرة، وعندما وصل قطر الحبات 6 مم بينما تم رش البوبوريا قبل الزهرة وأثناء اكتمال الزهره وتم رش الخمرة النشطة عندما وصل قطر الحبات 6 مم في ماويح رش حمض الجبريلك بينما تم رش مستخلص الكرنكية ثلاث مرات في الماويح السابقة وعندما وصل قطر الحبات مستخلص الكرنكية. وكما تم التحقؤ acheن الأداء فيما يلي: رش حمض الجبريلك والبوبوريا أو الكرنكية إلى زيادة محصول في طول وزن العقول والحصولب كل نسبة العقول. عند الحبات والحبات الصغرى والكبيرة. تم تحصين صفات العقول وزن الحبات. أدى رش الخمرة في المرحلة الثالثة (قطر الحبات 6 مم) منقش رش حمض الجبريلك أو البوبوريا أو الكرنكية إلى زيادة محصول في طول وزن العقول والحصولب كل نسبة العقول. عند الحبات والحبات الصغرى والكبيرة. من نتائج هذه الدراسة يمكن التوصية برش حمض الجبريلك في المراحل الثلاثة للحصول على محصول عال وعقول حبات مفيدة - كذلك يمكن استبدال رش حمض الجبريلك البوبوريا أو الكرنكية لاسترخاء العقول والحبات. باستخدام الخمرة بدلًا من حمض الجبريلك في المرحلة الثالثة كذلك يمكن رش مستخلص الكرنكية ثلاث مرات بدلًا عن حمض الجبريلك للمراحل الثلاثة وذلك لتلاقي أضرار رش الجبريلك. وبالتالي الحصول على محصول عال مبكر ذو عقول حبات ذات خصائص متطرفة تتفق مع سوق التصدير والقدرة التنافسية بالأسواق الخارجية.