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EFFECT OF SOWING DATES AND MICRO-ELEMENTS ON THE PRODUCTIVITY AND QUALITY OF SOME SNAP BEAN CULTIVARS

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ABSTRACT

This work was conducted to study the effect of four sowing dates (15th Jul., 15th Aug., 15th Sept., 15th Oct.), three cultivars (Bronco, Paulista and Xera) and three micro-elements (Zn, Fe or Mn) on growth, pods yield quantity and quality and pods chemical constituents of snap bean grown under sandy soil conditions. It was carried out at the Experimental Farm of El Kassasein Research Station, Ismailia Governorate, during two consecutive seasons (2005 and 2006).

Plant growth characters (plant height, number of leaves and branches/plant and dry weight/plant), yield quantity and quality and pods chemical constituents (NPK and protein) were significantly increased with sowing plants at 15th Sept. or 15th Oct. Meanwhile, sowing date at 15th Oct. recorded the least value for white pods percentage compared with other sowing dates.

Paulista cultivar gave the highest values of vegetative growth and yield quantity, while Xera cultivar was the best cultivar which showed the least appearance of white pods and high values of pods chemical constituents (NPK and protein), while Bronco cultivar exhibited maximum appearance of white pods under study.

Spraying plants with Zn, Fe and Mn did not show any significant effect on growth and yield quantity and quality as well as pods chemical constituents.

In general, sowing Paulista cultivar on Sept. 15th or Oct. 15th gave the highest values of growth and yield quantity. Meanwhile, sowing Xera cultivar on Sept. 15th or Oct. 15th gave the least value of white pods percentage and high value of pods chemical constituents (NPK and protein).

INTRODUCTION

Snap bean *Phaseolus vulgaris*, L. is one of the most important member of *Fabaceae* crops in Egypt, for local consumption and export as an out of vegetable season to European countries. In recent years, production of snap bean faced some problems, which reduced export amounts of this crop. White green pods is one of the most problem caused such a reduction in the exportation of this crop.

The present work aimed to study the effect of some agriculture practices (sowing dates, cultivars and micro elements) which will be considered an attempt to solve this problem.

view, great attention has been focused recently on the possibility of using natural and safe substitute of stimulants in viticulture in order to improve plant growth, flowering, fruit setting and total yield as a result of their useful effect (Russo and Berlyn, 1990).

This investigation was carried out to study the effect of spraying some natural organic biostimulants including yeast, seaweed extract (Acadian), ascorbic acid and citric acid on the vegetative growth, yield and berry quality of Thompson seedless grapevines. Seasonal changes of NPK during different stages of grapevine in two successive growing seasons were also studied.

MATERIALS AND METHODS

The present investigation was conducted during the three seasons of 2003, 2004 and 2005 in a private vineyard of Thompson seedless grapevines *(Vitis vinifera,* L.) near Mansoura city, Dakahlia Governorate, Egypt. The vines were 15-year-old, cultivated at 2 m within rows and 2.5 m between rows. The vines are grown in clay soil under surface irrigation system, all vines trained to cane pruning under canes trellis system. An equal number of buds were left on 5 canes per vine, with maximum 12 buds each, along with 5 renewal spurs.

This study was carried out to study the effect of spraying some natural organic biostimulants including yeast, seaweed extract (Acadian), ascorbic acid and citric acid on the vegetative growth, yield and berry quality of Thompson seedless grapevines. Seasonal changes of NPK during different stages of grapevine in both growing seasons (2004 and 2005) were also studied.

Eighty one vines were chosen for this study apparently uniform in vigor as possible, all the chosen vines received the common cultural management, such as fertilization, irrigation, diseases and pests control that performed in that district.

The experimental design was complete randomized block design in both years of study. The vines subjected to 9 treatments with 3 replicates, 3 vines each and borders were left around and between each replicate and treatment as well as between blocks. These treatments are shown in Table (1).

These treatments were sprayed on the vines in early morning at three times during growing season, growth onset, full bloom and two weeks later.

The whole vines under study were full sprayed. The citric acid in treatments (T3, T5, T7 and T9), was sprayed firstly. As for the treatments used ascorbic acid (T4, T5, T8 and T9), it was sprayed the next day. In the day after all the treated vines were sprayed with yeast or seaweed extract (T2 to T9).

Table (1): Tested treatments on Thompson seedless grapevines in 2004 and 2005 seasons.

Symbol	Treatment
T_1	Control (sprayed with water only)
T_2	Yeast extract at 2.5 gm/L
T_3	Yeast + Citric acid at 100 ppm
T_4	Yeast + Ascorbic acid at 100 ppm
T_5	Yeast + Citric acid + Ascorbic acid
T_6	Seaweed extract at 3 ml/L
T_7	Seaweed extract + Citric acid at 100 ppm
T_8	Seaweed extract + Ascorbic acid at 100 ppm
T_9	Seaweed extract + Citric acid + Ascorbic acid

1-Yeast

Yeast extract sprayed on all related treatments at the concentration of 2.5 g/L. The aqeous extract was prepared by activating 500 g of active dry yeast with 500 g of molasses in 3 liter of water and left for fermentation at room temperature for 24 hours in order to get the highest vegetative production of yeast (each ml of yeast contained about 2.5 x 10^7 of yeast cells). Then the media was frozen for 48 hours for disruption of yeast tissue and releasing their content and thawed directly before usage in water to reach the volume of 200 liter and sprayed on the treated vines, according to the procedure described by (El-Ghamriny *et al.,* 1999; Attala *et al.,* 2000 and Ismaeil *et al.,* 2003) with some modification.

2-Seaweed extract (Acadian)

Seaweed extract sprayed on all related treatments in the commercial form called Acadian, which consists of liquid seaweed concentrate. Treated vines were sprayed with the concentration of 3 ml/L.

Sea plants liquid seaweed concentrate is a modified *Ascophyllum nodosum* marine plant (alga) extraction composed of alginate, protein, fats, carbohydrates, marine salts and trace elements (A.S.L., 2000).

3-Ascorbic acid

All vines under the concerned treatments were sprayed with ascorbic acid at concentration of 100 ppm.

4-Citric acid

All vines under the concerned treatments were sprayed with citric acid at concentration of 100 ppm.

Determinations were carried out to clear the effect of the tested treatment on berry and cluster qualities as well as the produced yield as follows:

1- leaf petioles were subjected to elemental analysis to determine their contents of NPK.
2- Certain berry juice chemical characteristics were determined included, soluble solids percentage (SSC%), total acidity%, SSC/acid ratio, total sugars% and nitrate (ppm) contents in berry juice.

3- Clusters were subjected to measure four physical characteristics, cluster weight (g), cluster volume (cm^3), berries number/ cluster and clusters number/ vine.
4- Yield (kg/vine).

The obtained data were statistically tested for analysis of variance using Mstat Package (1998) and significant differences among various treatments were compared using LSD values at probability of 0.05 according to Gomez and Gomez (1984).

RESULTS AND DISCUSSION

NPK content in leaf petioles

The amount of these nutrients was estimated by determining seasonal changes of N, P and K in leaf petioles of the treated grapevines at three successive stages of growing seasons, growth onset, full bloom and one week to harvest time. The obtained results were illustrated in Figures (1,2 and 3). Such results can be presented as follow:

I-Nitrogen seasonal changes

Diagram in figure (1) clearly showed that N behavior during the growing season had two opposite trends. The first trend was cleared at growth onset stage and continues till full bloom. It was characterized by a gradual increase in leaf petioles content of N. As the growing season advanced a gradual decrease was observed till the third growing stage. The same figure also revealed that N peak uptake by grapevines was at full bloom stage and the best treatment to meet vines N requirement was to spraying yeast extract, citric and ascorbic acids (T5).

The positive effects of spraying active dry yeast on nutritional status of the vines was attributed to its own different micro and macro nutrients, vitamins, amino acids, enzymes, carbohydrates, auxins and cytokinins. Yeast applications are probably responsible for facilitating leaf stomata opening (Kamelia *et al.,* 2000b; Abd El-Ghany *et al.,* 2001 and Hassan, 2002), to release carbon dioxide which improves net photosynthesis rate (Larson *et al.,* 1962; Wareing and Phillips, 1973; Moor, 1979; Ferguson *et al.,* 1987; Idso *et al.,* 1995 and Mansour, 1998). In addition it is a natural source for most of nutritional elements as well as, other growth promoting substances (Muller and Leopold, 1966; Nagodawitana, 1991 and Abd El-Galil *et al.,* 2003). This i n turn may leads to an increase in the uptake of elements as a result of increasg root distribution (Subba-Rao, 1984).

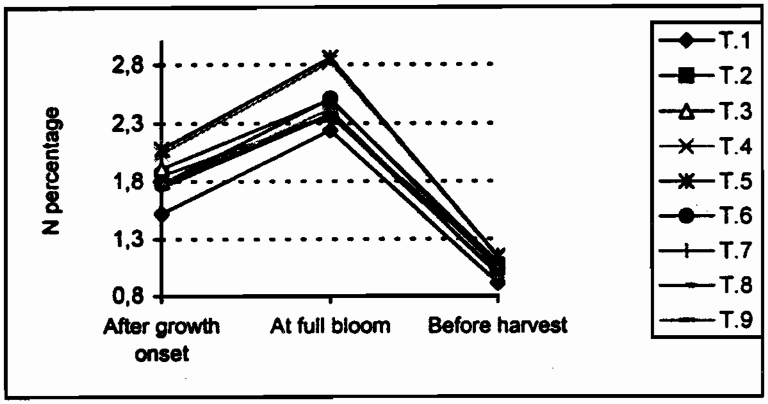


Fig (1): Nitrogen seasonal changes in Thompson seedless grapevine leaf petioles during growing season (As average of the two seasons of study).

II-Phosphorus seasonal changes

Diagram in figure (2) clearly showed that P behavior during the growing season had two opposite trends. The first trend was cleared at growth onset stage and continue till full bloom, it was characterized by a gradual increase in leaf petioles content of P. As the growing season advanced a gradual decrease was observed till the third growing stage.

The increasing need for P by grapevines at rapid shoot growth stage in spring and early berries development stage is considered logic. Since such period is characterized by a high rate of growth and the biological activities of cell are in peak for optimum cell division and elongation. Phosphorus plays an effective role in that respect. It keeps the continuous formation of pyrophosphate bonds (ATP), which allow energy transfer and synthesis of other nucleotide triphosphates, which is essential to synthesize sucrose phospholipids and cellulose. Moreover, it is involved in the synthesis of nucleic acids (DNA and RNA). These organic compounds are required for make up the basic living parts of cell (protoplasm) and nucleus as well as cell walls. The high mobility of phosphorus ions in the plant and their capability to translocate upward or downward greatly support these effective functions of phosphorus in plant cells. The present results are in agreement with those reported by Bouma (1967), Clarkson *et al.* (1968), Morard (1970) and Hall and Baker (1972).

III-Potassium seasonal changes

In figure (3) K pattern showed that K concentration in leaf petioles gradually decreased as the season advanced. Potassium behavior during the growing season had one trend. Such seasonal changes in leaves clearly indicated that its content was differed according to the physiological stage of the growing season. These findings greatly reflects the need of Thompson seedless grapevine for potassium fertilization throughout the growing season and such need was differed among the different physiological stages of development.

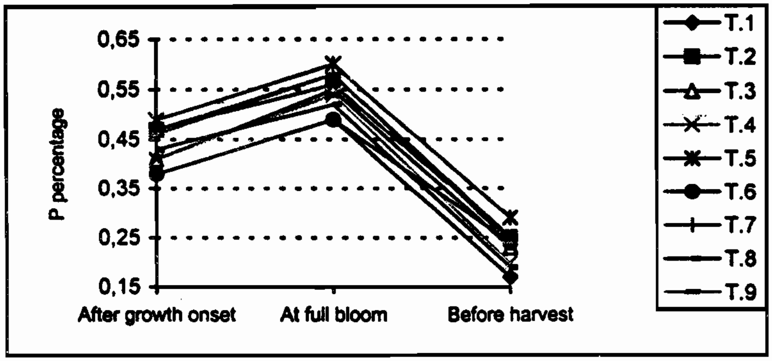
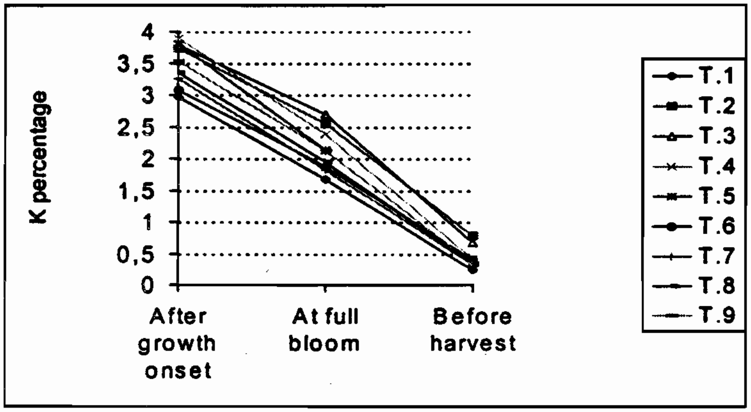


Fig (2): Phosphorus seasonal changes in Thompson seedless grapevine leaf petioles during growing season (As average of the two seasons of study).



Fig(3):Potassium seasonal changes in Thompson seedless grapevine leaf petioles during growing season (As average of the two seasons of study).

From the data obtained, it worth to note that, Thompson seedless grapevines utilize a considerable amount of potassium from the stage of full bloom till harvest stage. This may be due to the effecte of potassium ions on most biological activities in plant such as metabolic and photosynthesis processes as well as it helps in building up carbohydrates and partially in protein synthesis (Mengel and Kirkby, 1987).

According to the great similarity between the trend of data resulted in the first season and the second one, the obtained results could be presented as an average of both seasons for this part of study. This part included the effect of treatments on the following berry, cluster and yield characteristics.

I-Soluble solids content percentage (SSC%), Total acidity content (%) and soluble solids content / acid ratio in berry juice

Data in Table (2) clearly showed that spraying yeast extract, citric and ascorbic acids (T5) gave the best results, it was average of the highest SSC value 19.57 % , the lowest acidity 0.61 % and the highest SSC/acid ratio 32.76. The next values in that respect were recorded in yeast extract plus ascorbic acid treatment (T4) which recorded the average values 18.57 % for SSC, 0.64 % for acidity and 29.51 for SSC/acid ratio. These values are of significant differences compared with the control treatment (T1) which gave the lowest average value for SSC (15.80 %). And for acidity %, the highest average value (0.69%). Moreover, this control treatment gave the lowest values for SSC/acid (23.00) in 2004 and 2005 seasons.

The affirmative effect of spraying yeast extract on SSC % could be attributed to its increasing effect on photosynthesis process and promoter hormones such as cytokinins. These hormones induced a considerable increase in sugars content, and consequently caused an increase in SSC % in grape juice (Kamelia *et al.,* 2000b), this attribution can be also related to the effect of yeast on the photosynthesis enhancement, hormone promotion and synthesis of total carbohydrates (Abd El-Galil *et al.,* 2003). Decreasing total acidity percentage in grape juice in response to yeast application could be due to enhancing cytokinin like substances biosynthesis by yeast. Thus, cytokinins synthesized by yeast decreased total acidity percentage in grape juice. Therefore, the increase induced in SSC/acid ratio could be attributed not only to considerable increase in SSC % but also to the decrease in total acidity percentage (kamelia *et al.,* 2000b).

In the meantime, ascorbic acid is considered one of the antioxidants which protects the plants from damage and this in turn increase the carbohydrates production and translocation to the developing parts (El-Ghamriny *et al.,* 1999).

The obtained data also are in accordance with those of Abd El-Ghany *et al.* (2001) with Thompson seedless grapevines, who found that yeast treatments increased total soluble solids and reduced acidity. Furthermore, Ismaeil *et al.* (2003) found an increment in juice percentage of Thompson seedless berries. However, Red Roomy juice content of soluble solids (SSC) and SSC/acid ratio were increased, while acidity was significantly decreased as a result of spraying yeast extract. Likewise, Omran *et al.* (2005) with Thompson seedless grapevines found that yeast application increased TSS/acid ratio and decreased total acidity. Moreover, Akl *et al.* (1997) with Red Roomy grapevines found an improvement of total soluble solids and total acidity in juice by active dry yeast treatment.

In addition, Ahmed and Abd El-Hameed (2004) found that spraying citric and ascorbic acids on Thompson seedless grapevines caused a promotion on total soluble solids %, while it was responsible for reducing total acidity %. Ascorbic acid treatment was better than citric acid in this promotion. On the contrary, Gujar *et al.* (2000) found that ascorbic acid applied during pre-bloom, bloom, fruit setting and fruit development reduced The total soluble solids content in grape cv Tash-A-Ganesh.

As for the effect of seaweed extract Kose and Guleryuz (1999) with table grape cv. Karaerik found that seaweed treatments decreased the content of soluble solids (TSS). Also, Norrie *et al.* (2002) with Thompson seedless grapes found that Brix levels tend to be lowered when the vines were sprayed with Acadian seaweed.

Table (2): Effect of yeast extract, seaweed extract, citric acid and ascorbic acid on SSC %, acidity% and SSC/acid ratio in berry juice of Thompson seedless grapevines in 2004 and 2005 seasons.

Treatment \ Character		SSC %			Acidity %			SSC / acid ratio		
		2004	2005	Mean	2004	2005	Mean	2004	2005	Mean
T1	Control	16.10	15.50	15.80	0.68	0.70	0.69	23.85	22.14	23.00
T2	Yeast extract	17.70	16.87	17.29	0.60	0.71	0.66	29.44	23.92	26.68
T3	Yeast + Citric	18.53	17.33	17.93	0.59	0.69	0.64	31.29	25.27	28.28
T4	Yeast + Ascorbic	19.07	18.07	18.57	0.59	0.68	0.64	32.59	26.42	29.51
T5	Yeast + Ci. + As.	20.40	18.73	19.57	0.54	0.68	0.61	37.74	27.78	32.76
T6	Seaweed extract	17.93	16.33	17.13	0.64	0.71	0.68	28.81	23.02	25.92
T7	SWE + Citric	17.33	16.73	17.03	0.64	0.71	0.67	27.29	23.82	25.56
T8	SWE + Ascorbic	17.07	16.40	16.74	0.65	0.71	0.68	26.33	23.18	24.76
T9	SWE + Ci. + As.	17.87	17.20	17.54	0.59	0.70	0.65	30.34	24.44	27.39
L.S.D 5%		2.29	2.35		N.S	N.S		N.S	4.12	

SWE = Seaweed Extract (Acadian) Ci. = Citric acid As. = Ascorbic acid

II-Total sugars % and nitrate content (ppm) in berry juice

Data in Table (3) clearly showed that spraying yeast extract, citric and ascorbic acids (T5) significantly increased the percentage of total sugars in berries juice in 2004 and 2005, followed by the combined treatment between yeast extract and ascorbic acid (T4) in 2005 only as compared with that of control treatment (T1), which recorded the lowest values in both 2004 and 2005 seasons. Moreover seaweed extract treatment (T6) significantly decreased total sugars in berries luice as compared with T5 in 2005 only.

The constructive effect of spraying yeast extract on total sugars % could be attributed to the enhancement of photosynthesis processes and increasing the promoter hormones as cytokinins. Since, it is well known that these hormones induced a considerable increase in sugars contents (Kamelia *et al.*, 2000b and Abd El-Galil *et al.*, 2003). At the same time, ascorbic acid protects the plants from damage, which in turn increases the carbohydrates production and translocation to the developing parts (El-Ghamriny *et al.*, 1999).

The same table also clearly showed that spraying yeast extract, citric and ascorbic acids treatment (T5) gave a significant lower value of juice – nitrate content followed by spraying yeast extract with ascorbic acid treatment (T4) as compared with that of control treatment (T1), which recorded the highest values in the two seasons of study. In addition, seaweed extract treatment (T6) recorded higher values as compared with those of T4 and T5 but the significant differences were detected in 2005 only.

Table (3): Effect of yeast extract, seaweed extract, citric acid and ascorbic acid on total sugars % and nitrate (ppm) in berries juice of Thompson seedless grapevines in 2004 and 2005 seasons.

Treatment \ Character		Total sugars %			Nitrate (ppm)		
		2004	2005	Mean	2004	2005	Mean
T1	Control	15.12	14.19	14.66	5.72	5.24	5.48
T2	Yeast extract	15.97	15.50	15.74	4.85	4.42	4.64
T3	Yeast + Citric	16.44	16.36	16.40	4.59	4.15	4.37
T4	Yeast + Ascorbic	16.58	16.60	16.59	4.85	3.90	4.38
T5	Yeast + Ci. + As.	16.71	17.14	16.93	4.44	3.89	4.17
T6	Seaweed extract	15.78	14.41	15.10	5.44	4.92	5.18
T7	SWE + Citric	15.89	15.42	15.66	4.90	4.72	4.81
T8	SWE + Ascorbic	15.78	15.37	15.58	5.06	5.07	5.07
T9	SWE + Ci. + As.	15.99	16.32	16.16	4.62	4.33	4.48
L.S.D 5%		1.02	2.16		0.86	1.17	

SWE = Seaweed Extract (Acadian) Ci. = Citric acid As. = Ascorbic acid

III-Cluster weight (g) and volume (cm^3)

The concerned results in Table (4) clearly indicated that the treatment of spraying yeast extract, citric and ascorbic acids (T5) had the highest average value of 594.24 g for average cluster weight and 536.67 cm^3 for average cluster volume followed by spraying yeast extract with ascorbic acid (T4), which recorded an average of 554.29g for cluster weight and 501.67 cm^3 for cluster volume. These values significantly differed as compared with those of control treatment (T1), which were 438.08 g for cluster weight and 377.67 cm^3 for cluster volume.

The positive effect of spraying yeast extract could be due to the enhancing effect of yeast on increasing berry weight. In addition, yeast application play an important role in increasing endogenous content of cytokinin like substances, IAA, and GA3, meanwhile, produced more vegetative growth of vines, as well as, yeast induced a balance between vegetative and generative growth of the treated vines as demonstrated by Omran (2000). This beside the effect of yeast on activating the synthesis of total carbohydrates and proteins, which enhances cell division and enlargement leading to an increment in berry weight (Abd El-Galil *et al.*, 2003).

As for ascorbic acid it has a considerable stimulating effects on growth of different plants and cell physiological processes led to activate cell division and elongation (Liso *et al.*, 1984; Oertli, 1987 and De Tullio *et al.*, 1999).

The obtained data in general are in accordance with those found by Abd El-Ghany *et al.* (2001) and Ismaeil *et al.* (2003), who found that yeast treatments increased cluster weight of Thompson seedless grapevines. More recent, Omran *et al.* (2005) came to the same results with Thompson seedless grapevines. In the same line, Kamelia *et al.* (2000a) with King Ruby grapevines, observed a significant increase in cluster weight of the vines treated with yeast.

As for ascorbic acid effect , Harish and Chohan (1989) found that spraying ascorbic acid alone on Perlette grapevines gave the highest cluster weight. Moreover, Ahmed and Abd El-Hameed (2004) found that spraying citric and ascorbic acids on Thompson seedless grapevines increased cluster weight but ascorbic acid was better than citric acid in this promotion.

In respect of spraying seaweed extract, Colapietra (1999) found an increment in cluster weight of grapes cv. Black Magic when grapevines were sprayed with seaweed extracts (containing IAA, cytokinins, ABA, betaine and alginic acid). Also, Norrie *et al.* (2002) with Thompson seedless grapes found that spraying Acadian seaweed increased cluster weight.

Table (4): Effect of yeast extract, seaweed extract, citric acid and ascorbic acid on cluster weight (g) and volume (cm^3) of Thompson seedless grapevines in 2004 and 2005 seasons.

Treatment \ Character		Cluster weight (g)			Cluster volume (cm^3)		
		2004	2005	Mean	2004	2005	Mean
T1	Control	403.11	473.05	438.08	346.67	408.67	377.67
T2	Yeast extract	455.90	495.19	475.55	350.00	448.00	399.00
T3	Yeast + Citric	490.07	577.80	533.94	423.33	516.67	470.00
T4	Yeast +Ascorbic	514.74	593.84	554.29	476.67	526.67	501.67
T5	Yeast + Ci. + As.	582.43	606.05	594.24	533.33	540.00	536.67
T6	Seaweed extract	476.37	471.64	474.01	416.33	400.00	408.17
T7	SWE + Citric	434.16	473.35	453.76	363.33	423.33	393.33
T8	SWE + Ascorbic	423.80	547.55	485.68	350.00	466.67	408.32
T9	SWE + Ci. + As.	468.61	532.72	500.67	391.67	470.00	430.84
L.S.D 5%		110.31	103.13		N.S	105.38	

SWE = Seaweed Extract (Acadian) Ci. = Citric acid As. = Ascorbic acid

IV-Number of berries per cluster

The concerned results in Table (5) revealed that among the tested treatments spraying yeast extract, citric and ascorbic acids treatment (T5) had relatively the highest effect on berries number/cluster with an average value of 530.26. This value is significantly differed as compared with control one which was the lowest value as in that respect with 487.97 berries/cluster.

The positive effect of spraying active dry yeast on the vines productivity was ascribed to its own different micro and macro nutrients, large amount of vitamins, amino acids, enzymes, carbohydrates, auxins and cytokinins, facilitating leaf stomata opening (Kamelia *et al.*, 2000b; Abd El-Ghany *et al.*, 2001 and Hassan, 2002), releasing carbon dioxide which improves net photosynthesis (Larson *et al.*, 1962; Wareing and Phillips, 1973; Moor, 1979; Ferguson *et al.*, 1987; Idso *et al.*, 1995 and Mansour, 1998). Moreover, yeast has a role in promoting the initiation of flowers and fruit set (Omran, 2000).

The present results are in harmony with those obtained by Akl *et al.* (1997) who found an improvement occurred in berry set of Red Roomy grapevines treated with active dry yeast. Similar results mentioned by Ismaeil *et al.* (2003) who found that spraying yeast extract significantly increased number of berries/cluster on the tested Red Roomy grapevines. Moreover, Omran *et al.* (2005) with Thompson seedless grapevines came to the same results.

V-Number of clusters per vine

The obtained results were tabulated in Table (5). From this table, it was cleared that grapevines sprayed with yeast extract + citric acid + ascorbic acid (T5) recorded the highest values of clusters number/vine in both seasons of study with a mean of 24.25 clusters/vine followed by those under yeast extract + ascorbic acid (T4) with an average value of 24.00 clusters/ vine, while the lowest values were found in control (T1) and seaweed extract with ascorbic acid (T8) but the differences between these two treatments were significant in 2004 season only.

The constructive effects of spraying active dry yeast on the vines productivity may be due to its role in promoting the initiation of flowers and fruit set (Omran, 2000).

These findings are in accordance with those found by Ismaeil *et al.* (2003) with Thompson seedless and Red Roomy grapevines, who found that the number of clusters/vine of both cvs was increased significantly as a result of spraying yeast extract.

As for organic acids, Ahmed and Abd El-Hameed (2004) found that spraying citric and ascorbic acids on Thompson seedless grapevines caused a material promotion on number of clusters/vine and ascorbic acid was better than citric acid in this promotion.

VI-Yield (kg/vine)

It is noticeable from data in Table (5) that spraying yeast extract, citric and ascorbic acids treatment (T5) once again recorded the highest mean value of 14.44 kg/vine followed by spraying yeast extract with ascorbic acid treatment (T4) with the mean value of 13.28 kg/vine. These values significantly were differed than that of the control (T1), seaweed extract (T6) and seaweed extract with citric acid (T7), which gave the lowest values in that respect 7.33, 9.11 and 8.90 Kg/vine, respectively.

The superiority of applying yeast on the yield productivity of the treated vines could be related to the high contents of proteins, vitamin B, auxins and cytokinins in yeast as well as it released carbon dioxide which improves net photosynthesis. This in turn may lead to an increase in the accumulation and assimilation of carbohydrates (Larson *et al.,* 1962; Wareing and Phillips, 1973; Moor, 1979; Ferguson *et al.,* 1987; Nagodawitana, 1991; Idso *et al.,* 1995). Moreover, yeast has a role in translocation of produced assimilates to the berries (Omran *et al.,* 2005). Furthermore, it is considered as a source of tryptophan (Abd El-Latif, 1987), which is the precursor of IAA (Wareing and Phillips, 1973 and Moor, 1979).

These findings are in agreement with those reported by El-Mogy *et al.* (1998) who worked with Thompson seedless grapevine and found that yield increased significantly with yeast extract application. Kamelia *et al.* (2000a) with King Ruby grapevines noticed a significant increase on yield. Likewise, Ismaeil *et al.* (2003) found an increment in Thompson seedless yield and yield components as a result of spraying yeast extract. Omran *et al.* (2005) with Thompson seedless grapevines found that yeast application increased fruitful buds and total yield. Similar results were recorded by Mansour (1998), who found that spraying Anna apple trees with active dry yeast gave the best results with regard to yield.

Table (5): Effect of yeast extract, seaweed extract, citric acid and ascorbic acid on number of berries/cluster, number of clusters/vine and yield (kg/vine) of Thompson seedless grapevines in 2004 and 2005 seasons.

Character / Treatment		Number of berries/cluster			Number of cluster/vine			Yield (kg / vine)		
		2004	2005	Mean	2004	2005	Mean	2004	2005	Mean
T1	Control	470.56	505.38	487.97	17.83	17.10	17.47	7.20	7.45	7.33
T2	Yeast extract	469.27	517.59	493.43	20.50	21.23	20.87	9.37	10.48	9.93
T3	Yeast + Citric	471.34	587.34	529.34	21.00	23.00	22.00	10.29	13.33	11.81
T4	Yeast + Ascorbic	482.74	562.70	522.72	24.00	24.00	24.00	12.34	14.21	13.28
T5	Yeast + Ci. + As.	539.89	520.62	530.26	23.83	24.67	24.25	13.91	14.97	14.44
T6	Seaweed extract	475.48	552.50	513.99	19.99	19.00	19.50	9.27	8.94	9.11
T7	SWE + Citric	473.89	504.82	489.36	20.33	18.87	19.60	8.83	8.97	8.90
T8	SWE + Ascorbic	491.30	553.20	522.25	17.78	17.05	17.42	7.53	9.35	8.44
T9	SWE + Ci. + As.	468.48	554.71	511.60	21.00	25.43	23.22	9.83	13.54	11.69
L.S.D 5%		59.36	77.12		4.19	N.S		4.13	5.21	

SWE = Seaweed Extract (Acadian) Ci. = Citric acid As. = Ascorbic acid

As for the effect of organic acids , Ahmed and Abd. El-Hameed (2004) found that spraying citric and ascorbic acids on Thompson seedless grapevines caused a material promotion on yield/vine and ascorbic acid was better than citric acid in this promotion. Also, Elham and Shahin (2006) found that spraying ascorbic acid on apricot cv Canino was favorable for improving yield.

In respect of spraying seaweed extract, Bentchikou *et al.* (1992) found that spraying grapevines cv. Merlot with seaweed extract caused an increase on the obtained yield. Koo and Mayo (1996) found that seaweed sprays increased fruit production of Hamlin, Washington Navel, Pineapple orange and Ruby Red grapefruit.Colapietra (1999) came to the same result with grapevines of the cv. Black Magic, when they were sprayed with seaweed extracts (containing IAA, cytokinins, ABA, betaine and alginic acid). More recent, Norrie *et al.* (2002) with Thompson seedless grapes found that spraying Acadian seaweed increased yield.

On the contrary, Villiers *et al.* (1983) with peach trees cv. Van Riebeeck, apple trees cvs. Golden Delicious and Starking and grapevines cvs. Alphonse Lavallee and Barlinka, found that the yields and fruit quality were not enhanced by spraying with two different seaweed products. In the same trend Notodimedjo (1995) did not notice any effect on fruits yield or quality of Manalagi as a result of spraying apple trees with seaweed extract.

CONCLUSION

Referring to the forecited results, it was proved that the treatment contained yeast extract at 2.5 gm/L combined with the two organic acids citric and ascorbic acids each at 100 ppm (T5) was the most effective treatment among the tested ones. It caused an obvious increase in most berry, cluster and yield characteristics measured of the treated Thompson seedless grapevines under study. Otherwise, this treatment recorded the lowest values for berry juice acidity and nitrate contents. Furthermore, a positive effect was also detected on NPK seasonal changes in leaf petioles specially those indicated in N and P patterns.

Consequently, the investigators recommended the growers of Thompson seedless grapes, may be extended to other grape cultivars, to follow this treatment in their viticultures to raise the net income through increasing yield and improving berry qualities.

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تأثير المنشطات الحيوية على المحصول وصفات الثمار فى العنب

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أجريت هذه الدراسة خلال مواسم ٢٠٠٣ , ٢٠٠٤ و ٢٠٠٥ فى مزرعه خاصه للعنب البناتى بقرية بجوار مدينه المنصورة- محافظه الدقهلية - بجمهورية مصر العربية. تم اخذ النتائج لموسمي ٢٠٠٤و ٢٠٠٥ و اعتبر الموسم الأول تمهيدي . الشجيرات عمر ١٥ سنه مزروعه في تربه طينيه على مسافات زراعه ٢ X ٢,٥ تحت نظام الرى السطحي و تخضع لنظام التربية القصبيه . و كان الهدف من هذا البحث دراسة تأثير رش مجموعه من المنشطات الحيويه و تشمل مستخلص الخميرة بتركيز (٢,٥ جم / لتر) و مستخلص الأعشاب البحرية المعروف تجاريا باسم الاكاديان بتركيز (٣ مل/ لتر) و حمضى الاسكوربيك و الستريك بتركيز (١٠٠ جزء فى المليون) على النمو الخضري و المحصول و جوده الثمار لصنف العنب البناتى . أيضا تم دراسة التغيرات الموسمية لمحتوى العناصر(النيتروجين , الفوسفور , البوتاسيوم) فى أعناق الأوراق. و أظهرت النتائج أن معاملة التفاعل رقم ٥ و هي رش مستخلص الخميرة بتركيز ٢,٥ جم / لتر و حمضي الاسكوربيك و الستريك بتركيز ١٠٠ جزء فى المليون كمنشطات حيوية أعطت نتائج ايجابيه على زياده محتوى المواد الصلبه الذائبه الكليه و النسبه بينها و بين الحموضه و السكريات الكليه ووزن و حجم العنقود و عدد الحبات فى العنقود و عدد العناقيدعلى الشجيرة و كذلك المحصول . كذلك أعطت نتائج ايجابيه لمحتوى العناصر فى الأوراق و خاصه النيتروجين و الفوسفور. على جانب آخر اعطت هذه المعاملة اقل النتائج للنسبة المئوية للحموضة و كذلك محتوى النترات في عصير الحبات.