Journal

J. Biol. Chem. Environ. Sci., 2010, Vol. 5(3):697-715
www.acepsag.org

OPTIMIZING ROLE OF BIOCHEMICAL FERTILIZATION ON GROWTH, YIELD AND FRUIT QUALITY OF THOMPSON SEEDLESS GRAPEVINE.

Abd El – Rhman, I.E

Plant Production Department, Desert Research Center, Cairo , Egypt

ABSTRACT

This experiment was carried out during two successive seasons (2008 and 2009) in private farm at Egypt – Alex. Desert Road to study the effect of minimizing the use of mineral fertilization alone as 100 % recommended mineral fertilizers to only 75% or 50% with combination by biofertilization i.e., (Azotobacter ssp., Azospirillum ssp. and Bacillus ssp., [(PDB) phosphate dissolves bacteria] on vegetative growth, yield and fruit quality of Thompson seedless grapevine under drip irrigation system. Results indicated that, all treatments had no significant effect of all vegetative growth parameters (number of leaves per shoot, leaf area, total chlorophyll and shoot length) as compared with (control) 100 % of recommended mineral fertilization. T5 (75%) of recommended mineral fertilization with 25% mixed biofertiliers (Azotobacter, Azospirillum and phosphate dissolves bacteria (PDB) gave the highest values of yield as number of cluster per vine and cluster weight (g) in both seasons. Fruit quality was improved in terms of berry length, diameter, and weight, weight of 100 berries and juice volume /100 berries (m^3) and also TSS %, total sugars % and TSS % : Acid ratio while total acidity percentage were significantly reduced through using all treatments. On the other hand, T5 as 75% mineral fertilizers with 25 % mixed inoculation biofertilizers (Azotobacter, Azospirillum and Bacillus ssp., (PDB) gave the high values of leaf N % and K % content compared with other treatments and compared with T1(control) 100 % recommended mineral fertilizers without biofertilizers while P leaf content was no significantly affected by treatments. Generally, fertilizing Thompson seedless grapevine with 75% recommended mineral fertilization + 25% mixed biofertiliers (Azotobacter ssp.,

Azospirillum ssp. and Bacillus ssp., (PDB) phosphate dissolves bacteria gave the highest values and greatly improved in growth, yield and fruit quality.

Key words: Grapevines mineral fertilizers, biofertilization, vegetative growth, yield azotobacter and azospirillum.

INTRODUCTION

Grapevine is suggested to be one of the most important fruits for local consumption and export. It is the first fruit crop allover the world with a total cultivated area more than 7408127(Ha) produced more than 67708587 tons of fruits according to FAO statistics 2008. More than 60% of grape is utilized in wine production while the rest 40% is used in other purposes as table grapes, raisin grapes, fresh juice and other used.

In the Egypt, grape is considered the second major fruit crop after citrus owing to its acreage which attained 384980 feddan produced more than 1531418 tons of fruits according to FAO statistics 2008. Pollution is one of the most problems affecting human health, especially when the edible part of the plant is polluted with any of pollution sources. In this respect, mineral nitrogen fertilization cusses the accumulation of harmful residual substances like NO_3 and NO_2 in the edible portion, berries or leaves, of grapevines. On the other hand, pollution is considered the major problem faces the exported process.

Ibraheam 1994 and Montasser et al 2003. Application of biofertilizars with mineral or organic fertilizers proved to be highly effective in improving growth, nutritional status, fruiting and fruit quality of various grapevines,El-Shenawy, and Fayed(2005a ,b), Rizk-Alla.2006 Kassem and Marzouk 2002).

Also, using banana compost, chicken manure and biofertilizers induced similar results with the recommended dose of mineral nitrogen fertilizer and gave the best fruit characteristics, (Al-Ashkar et al, 2007 and Selvamani and Manivannan, 2009). In addition biofertilization is very safe for human, animal and environmental to get lower pollution and reduced soil salinity and decreased mineral usage fertilization as well as saving fertilization cost. Finally, Smith (1998) recorded that, the effect of NPK and biofertilizers increased cell division and enlargement and consequently increased vegetative growth which effected on increasing the yield components as finally

results from the physiological processes. Getha and Nair (2000) found that, the enhancement of plant growth due to inoculation with biofertilizers N- fixing bacteria could be attributed to the capability of these organisms to produce growth regulators such as auxins, cytokines and gibberellins which effect production of root biomass and nutrients uptake. This study was planed to evaluate minimizing the use of the chemical fertilization partially through using biofertilization on growth, yield and fruit quality of Thompson seedless grapevine.

MATERIALS AND METHODS

The experiment was carried out in 2008 and 2009 seasons on mature Thompson seedless grapevines planted on sandy soil in private farm at Egypt – Alex. Desert Road. The vine spacing 2m between vine x 2.5m between row, and vine were chosen using modified Y shape supporting system. Pruning was carried out at the second week of December in both seasons by retaining 72 buds / vine (6cans x 12 bud/cans).Soil physical and chemical characteristics samples were determined. The obtained data are shown in Table (1):

Table (1): Some physical and chemical Analysis of soil sample from the experimental orchard:

characters	Clay %	Silt %	Sand %	texture	pH	Ec (ds/m)	O.m %	N %	P %	K %	Zn %	Cu %	Fe %
value	4.95	2.15	92.9	Sand	8.12	0.9	0.18	1.79	0.65	1.71	300	130	1630

Treatments under studied included combined application of chemical fertilization as and biofertilization i.e., Azotbacter ssp., Azospirillum ssp., and Bacillus ssp., phosphate dissolves bacteria(PDB).The recommended dose of mineral fertilization was used at 100% chemical fertilization Drip irrigation was employed and the fertilization program consisted of applications of 750 g ammonium sulphate / vine/year, 1kg calcium super phosphate/vine/year and 1kg potassium sulphate/vine/year by means of fertigation , $^{2}/_{3}$ fertilizers dose were applied in the spring and early summer while $^{1}/_{3}$ fertilizers dose were applied after harvesting date to before stopped irrigation.

On the other hand, application biofertilizers produced by microbiological unit, desert research center .The resultant cultures contained 6.2x105cell ml-1 for each biofertilizer (Azotobacter ssp., Azospirillum ssp. and Bacillus ssp., phosphate dissolves bacteria PDB, which add at rate of one liter of each per tree in first week of February.

60 vines similar size and vigor was chosen and the experiment treatments were arranged in randomized complete block design arrangement with three replicates and two vines per each replicate. The treatments were as follows:-

T1. 100% mineral recommended fertilization (control).

T2. 75% mineral recommended fertilization +25% bacteria Azotobacter

T3. 75% mineral recommended fertilization +25% bacteria Azospirillum

T4. 75% mineral recommended fertilization +25% phosphate dissolved bacteria (PDB).

T5. 75% mineral recommended fertilization + 25% bacteria Azotobacter, Azospirillum and PDB.

T6. 50% mineral recommended fertilization +50% bacteria Azotobacter

T7. 50% mineral recommended fertilization +50% bacteria Azospirillum

T8. 50% mineral recommended fertilization +50% phosphate dissolved bacteria (PDB).

T9. 50% mineral recommended fertilization + 50% bacteria Azotobacter, Azospirillum and PDB.

T10.100% biofertilization bacteria Azotobacter , Azospirillum and phosphate dissolves bacteria (PDB).

The following parameters were recorded in both seasons:

Vegetative growth parameters:

- **Average number of leaves / shoot:** All the leaves/shoot on May were counted and presented**.**
- **Average leaf area (cm^2):** Twenty leaves from those opposite to the basal cluster were measured according to Sourial et al 1985. Using following formula:

$$\textbf{Leaf area} = \frac{(\text{diameter})^2 \times 3.14}{4}$$

- **Average total chlorophyll content:** Total chlorophyll content in fresh leaves was measured in the field by using Minolta chlorophyll meter SPAD-502.

- **Average shoots length (cm^2):** At the end of the growing season, the length of ten shoots distributed around the vine head was measured and the average was recorded.

-Yield / vine (kg):- At harvesting time the yield expressed in weight (kg) and cluster number /vine were recorded, while the average weight of cluster was estimated.

-Leaf mineral contents analysis:-leaf content of N, P and K was determined in petioles from leaves opposite to basal clusters, according to methods outlined by Wilde et al.1985.

- **Berries physical and chemical characteristics:** A sample of cluster per each treatment (3cluster from each replicate) were randomly taken and a sample of 100berries were randomly chosen from each replicate to determine berries quality in terms of berry weight (g) , berry length(cm2), berry diameter$(cm)^3$and juice volume per 100berries were determined and recorded .Also, total soluble solids (TSS)in juice using hand refractometer ,total acidity in juice as percentage of tartaric acid and total soluble solids/acid ratio calculated according to A.O.A.C.1995. All the obtained data were tabulated and statistically analyzed according to Snedecor and Cochran 1980. Using the L.S.D. test at 5% level to recognize the significance of the differences between various treatment means.

RESULTS AND DISCUSSION

Vegetative characteristics:

The results presented in Table (2) show the application of NPK mineral fertilization or bio fertilization form as Azotobater, Azospirillum and Bacillus ssp., (PDB) phosphate dissolved bacteria of grapevine Thompson seedless in both studied seasons 2008 and 2009. The results show that all treatments except T5 were not significant effect of all vegetative growth parameters(number of leaves per shoot ,leaf area, total chlorophyll and shoot length)compared with control 100% of recommended mineral fertilization, on the other hand, T5, 75% of recommend mineral fertilization with mixed biofertilization (Azotobacter, Azospirillum and Bacillus ssp.,phosphate dissolves

bacteria (PDB) increased significantly vegetative growth parameters and gave the highest value of number of leaves / shoot (36.90 and 36.56),leaf area (298.4 and 313.6) ,total chlorophyll (44.08 and 44.67) and shoot length (222.1 and 224.9)in both studied seasons as compared with the control and other treatments. Whereas, T10, 100% biofertilization gave the lowest values of vegetative growth parameters number of leaves per shoot (24.10 and25.26),leaf area (191.8 and 196.4), total chlorophyll (36.04 and 36.67) and shoot length (169.0 and 171.2) in both seasons respectively. Meanwhile, it is observed that the T(2,3,4) included 75%of recommended mineral fertilization + 25% Azotobacter , Azospirillum and Bacillus ssp., (PDB) phosphate dissolve bacteria gave the highest values of number of leave per shoot (30.96, 30.01- 29,59 , 30.27and 30,61,26.49) , leaf area (218.8,228.5 - 220.9 , 229.1 and 221.2 , 231.8) , total chlorophyll (40.41, 40.58 - 38.93, 39.74 and 38.83, 39.57) and shoot length (189.5,198.0 - 193.4 , 201.9 and 175.2,184.7) in the both studied season respectively as compared with T(6,7,8) included 50% of recommended mineral fertilization+50% Azotobacter , Azospirillum and Bacillus ssp., (PDB) phosphate dissolve bacteria of number of leave per shoot (28.60, 28.94 – 26.81 , 27.03 and 25.33 , 27.68) , leaf area (193.0 , 201.2 - 196.3 , 202.6 , and 199.8 , 202.7) , total chlorophyll (38.08 , 38.84 - 38.34 , 39.20 and 36.24 , 36.76) and shoot length (183.3 , 192.2 - 189.4 ,198.4 and 179.9,188.3) in the both studied season respectively. The effect of chemical fertilizers and biofertilization on vegetative growth could be attributed to its role in increasing amino acids content which considered as a constituent of proteins and other compounds that shore in the development of new tissues Fawzi and Eman Abad El-Monem (2004) on flame seedless grapevine.

These results are in agreement with those reported by Eman and Abd-Allah (2008) studied the effect of green alga on nutrient status, growth and yield of Superior grapevines as compared with micronutrients foliar fertilizer. Results recorded that the growth namely leaf area and number of leaf / shoot were greatly stimulated in response to application of Algal extract at concentration above 50%. Fawzi and Eman Abad El-Monem (2004) used foliar active dry yeast 0.1% and three micronutrients in flame seedless grapevine. Results indicated that, the great stimulation on growth criteria (shoot and

internodes length, number of leaves per shoot and leaf area). Omran and Ali (2003) In "Roomy Red" grapevine recorded that, some genetically improved yeast strains gave more effective on total shoots number, shoot diameter and leaf area. Hegazi et al. (2007) used N mineral fertilization, organic manure and biofertilization (Azotobacter and Azospirillum) on Picual olive trees. They recorded that, the highest value of the studied growth parameters were obtained with 100% organic fertilizations (poultry manure) and biofertilization. These results agree with those reported by El-Shenawy. and Fayed (2005a) on crimson seedless grapevines Mansour and shaban, (2007), Zaied et al, (2006) on Washington novel orange, Al-Ashkar et.al, (2007). On Grand Nain Banana , Gabr and Nour El-Dein (2005) on Apple.

Fruiting:

Cluster number / vine:

It is clear from the obtained data in Table (3) that, Cluster number vine were no significantly affected of cluster number/ vine in both studied seasons. The highest value of cluster number per vine was obtained when vine fertilized with 100% of recommended mineral fertilization (25.13, 24.87) in two studied seasons 2008 and 2009. On the other hand, all treatments fertilizers with 75% mineral fertilization + 25% of biofertilization or 50% mineral fertilization +50% of biofertilization failed to gave enhancing of cluster number / vine compared with the T1, 100% mineral fertilizations. The lowest value of cluster number / vine was obtained when grapevines received 100% of biofertilization (19.03) in the first season 2008 and (19.05) in the second season 2009.

Cluster weight (g):

The results in Table (3) cleared that, the highest values of cluster weight were obtained with T5, 75% of recommended mineral fertilization + inoculation by 25% of Azotobacter , Azospirillum + Bacillus ssp., PDB (phosphate dissolves bacteria) (512.8 and 522.7) in both studied seasons compared with 100% of recommended mineral fertilizations or compared with other treatments. Meanwhile, T1, 100% recommended mineral fertilization was gave the best value of cluster weight (460.0 and 485.2) compared with other treatment except T5 in both seasons

Yield (kg) / Vine:

Data in Table (3) revealed that, yield (kg)/ vine followed more or less the same trend obtained in cluster weight (kg) respectively. T5 as 75% of recommended mineral fertilization with 25% mixed biofertiliers (Azotobacter, Azospirillum and Bacillus ssp., phosphate dissolves bacteria (PDB) gave the highest values of yield / vine (kg) (12.67 and 12.45) in both seasons. (12.67 and 12.45), followed descending by T1 as 100% of recommended mineral fertilization (11. 40 and 12.04) in both seasons respectively. Beside, other treatments (T2, 3, 4 and T6, 7, 8) gave the similar values and failed to enhancement yield/vine in two studied seasons. Compared with T5 and T1.Finally, T10 as100% biofertlizers obtained the lowest values of yield/ vine (8.07 and 7.12) in the first and second seasons respectively.The increase of yield was largely as a consequence of the cumulative effect of vigorous plant growth characters. This improved growth parameter in turn resulted is higher yield parameters.

The previous results are agreed with those obtained by saleh et al., (2006) Indicted that, applying HA and (MSW) (humic acid HA and composted municipal solid waste MSW) on Thompson seedless grapevine increased yield significantly that those fertilized with (MSW)) alone. However, adding biofertilizer with humic acid slightly and not significantly increased yield than without adding it. On the other hand, results did no show a constant trend due different treatments in respect with cluster weight and berry weight. Eman and Abd-Allah (2008) and Eman et al (2008) They found that, the effect of green alga as foliar spray on yield of Superior grapevines as compared with micronutrients foliar fertilizer and recorded that the yield expressed in weight and number of cluster as well as berry weight were gradually improved in response to increasing algal extract concentrations.These hidings are in harmony with those obtained by Fawzi and Eman (2004) on flame seedless, El-Shenawy. and Fayed (2005b) on crimson seedless grapevines,Omran and Ali (2003) on Red Roomy grapevines.

Table (2): Effect of bio and chemical fertilization on vegetative growth parameters of Thompson seedless grapevines during 2008 and 2009.

Treatment	Number of leave/shoot		Leaf area(cm^2)		Total chlorophyll		Shoot length (cm^2)	
	2008	2009	2008	2009	2008	2009	2008	2009
T1-100% M.F	31.32b	31.04b	241.5c	247.4c	38.59bc	41.56b	203.1b	213.0b
T2- 75% M.F + 25% +Azotobacter	30.96b	30.01bc	218.8d	228.5e	40.41b	40.58bc	189.5de	198.0de
T3- 75% M.F + 25% +Azospirillium	29.59bc	30.57b	220.9d	229.1e	38.93bc	39.74bc	193.4cd	201.9cd
T4- 75% M.F + 25% (PDB)	30.61bc	26.49de	221.2d	231.8d	38.83bc	39.57bc	175.2fg	184.7f
T5- 75% M.F + 25% + T(2,3,4)	36.90a	36.56a	298.4a	313.6a	44.08a	44.67a	222.1a	224.9a
T6- 50% M.F + 50% + Azotobacter	28.60bc	28.94c	193.0e	201.2g	38.08bc	38.84cd	183.3ef	192.2ef
T7- 50% M.F + 50% + Azospirillium	26.81cd	27.03d	196.3e	202.6f	38.34bc	39.2bc	189.4de	198.4de
T8- 50% M.F + 50% + (PDB)	25.33cd	27.68d	199.8e	202.7f	36.24c	36.76d	179.9f	188.3ef
T9- 50% M.F + 50% + T(2,3,4)	27.63cd	24.31f	263.9b	257.5b	36.33c	36.83d	199.5bc	209.4bc
T10- 100% biofertilizer	24.10d	25.67e	191.8	196.4h	36.04c	36.67d	169.0g	171.2g

Means having the same letters within a column for each cultivar are not significantly different at 5%level.

Table(3):Effect of bio and chemical fertilization on fruiting parameters and Juice volume $(cm)^3$ of Thompson seedless grapevines during 2008 and 2009.

Treatment	Cluster number/vine		Cluster weight (g)		Yield /vine (kg)		Juice volume(cm^3)	
	2008	2009	2008	2009	2008	2009	2008	2009
T1-100% M.F	25.13a	24.82a	460.0b	485.2b	11.56b	12.04a	187.6b	213.6b
T2- 75% M.F + 25% +Azotobacter	23.77abc	24.07ab	404.8bcd	437.6c	9.626c	10.53b	182.7c	193.8cd
T3- 75% M.F + 25% +Azospirillium	23.43bcd	23.79ab	442.3bc	406.0d	9.58cd	9.99bc	180.2c	190.8d
T4- 75% M.F + 25% (PDB)	21.77ef	21.47c	440.4bc	428.5c	9.54cd	9.20bcd	176.5d	185.7e
T5- 75% M.F + 25% + T(2,3,4)	24.71ab	23.81ab	512.8a	522.7a	12.67a	12.45 a	190.4a	237.5a
T6- 50% M.F + 50% + Azotobacter	22.80cde	22.49bc	381.4 d	400.4d	8.69cd	9.00cd	180.5c	192.9cd
T7- 50% M.F + 50% +Azospirillium	22.10def	22.49bc	391.9 d	365.7f	8.66cde	8.23de	181.8c	196.2c
T8- 50% M.F + 50% + (PDB)	22.03def	22.61bc	390.0cd	399.6d	8.57de	9.03bcd	180.5c	191.0d
T9- 50% M.F + 50% + T(2,3,4)	20.73 f	21.79c	436.2bcd	390.0df	9.03cde	8.47cde	186.2b	194.6cd
T10- 100% biofertilizer	19.03g	19.05d	424.2bcd	372.8ef	8.07 e	7.10 e	180.6c	190.7d

Means having the same letters within a column for each cultivar are not significantly different at 5%level.

They found that, yield was increased as result of cluster weight, length and berries weight, number of berries and number of berries / cluster, also improved significantly by yeast + GA3 and yeast extract treatment alone for Thompson seedless and Roomy Red grapevine respectively.Al- Ashkar et al*;* (2007) on grand Nain Banana, El-Kramany et al; (2007), Zaied et al, (2006) on Washington navel orange. Gabr and Nour El- Dein, (2005) on Apple and Housseny and Ahmed (2009) on Olive tree. Finally, Dhanapal et al,(1978)reported that Azospirillm produces bio- active substances, also it con be attributed to the fact that enhanced uptake level of nutrients such as N and auxins due to Azospirillum which may divert the photo assimilate to the developing flower bud and helped in the conversions of flower to more femaleness to produce higher number of cluster which in turn also increase the clusters weight and yield.

Fruit quality

Fruit physical characteristics:

Data in Table (3, 4) show the effect of some fertilization treatments on fruit physical characteristics of Thompson seedless grapevine in 2008 and 2009 season. The results show that fertilization treatments had no significant effect on berry length, berry diameter, berry weight of berries and juice volume /100 berries (ml) in both studied seasons except T5. Concerning, data in Table (3, 4) indicated that, fertilization with 75% of recommendation mineral fertilizations +25% of mixed inoculation by biofertilization (Azotobacter, Azospirillum, and Bacillus ssp., phosphate dissolves bacteria (PDB)) T 5, was gave the highest values of all physical fruit parameters, berry length, diameter, weight, weight of 100 berries and juice volume /100 berries (m/3). (2.107, 2.147 -1.690, 1.747 – 2.167, 2.433 – 251.6, 267.7 and 190.4 , 237.5) in the first and second seasons 2008 and 2009 respectively compared with control T1 as100% mineral fertilization and compared with other treatments. In general, the lowest values of berry length, diameter, weight , 100 berries weight and juice volume /100 berries (m/3) were obtained with fertilizers Thompson seedless grapevine with T10 as100% of biofertilizers which recorded (1.747,1.990 – 1.550 , 590 – 1.600 , 1.867 – 232.7 , 236.5 and 180.6 , 190.7) in the both studied season respectively. The pronounced positive action of the NPK and biofertilization on the fruit quality of fruits could be attributed to their effect on improving the

chemical and physical properties of sail and improving carbohydrate biosynthesis.These results are in agreement with those obtained by Faten Ismail et al (2003) recorded that, yeast extract (100 and 200 ml/l) and GA3 (20 and 40 PPM) were foliar sprayed on Thompson seedless and Roomy Red cultivars. All treatments increased cluster length, cluster weight, berries weight and number of berries/ cluster. Abd El- Migeed et al, (2007) studied the minimizing mineral nitrogen fertilization and /or Azospirillum lipofaram as biofertilizer sources on Washington navel orange trees. The obtained results showed that, significantly increase of number of fruit, fruit weight. Al- Ashkar et al, (2007) on grand Nain Banana and Abd El Miged et al, (2006) on Thompson seedless grapevines and El-Shenawy. and Fayed(2005b) on crimson seedless grapevines .

Chemical characteristics:

Data presented in Table (5) showed that, fertilization NPK as a mineral fertilizers with inoculation by Azotobacter or Azospirillum or PDB (phosphate dissolves bacteria), all treatments had no significant effect on all fruit chemical parameters (TSS%, total sugars% and TSS: Acid ratio) in both studied seasons except T5 compared with T1 (control). Besides, T1 (control) as100% of recommended mineral fertilized were gave the best value on TSS, (18.60 and 20.57) total sugar (16.87 and 19.05) and TSS: acid ratio (39.32 and 43.58) in both studied seasons respectively compared with all other treatments except T5.On the other hand, T5 (75% recommended mineral fertilization and inoculation with mixed Azotobacter and Azospirillum and Bacillus ssp.,(PDB) phosphate dissolves bacteria, recorded the highest values of TSS% (19.53 and 22.84), total sugars (17.70 and 19.90) and TSS: acid ratio (44.09 and 56.17) in the first and second season respectively. Additionally, acidity percentage in juice was not significantly affected and no constant trend detected in both studied seasons. Besides, 100% of bio fertilizers (Azotobacter, Azospirillum and Bacillus ssp., phosphate dissolves bacteria (PDB) obtained gave the lowest values of TSS%, total sugars%, TSS: acid ratio (15.83 and 16.67), (13.93 and 15.50) and (31.02 and 33.35) in the first and second seasons.

In addition to the role of the biofertilizer in increasing the uptake of nutrients which advanced fruit ripening in terms of a decrease in acidity and an increase in TSS and total sugars. The results of this

respect going line with the findings by, Saleh et al, (2006) on Thompson seedless grapevines recorded that, TSS% was not affected, while acidity was decreased only in the second seasons by different treatments than 100%. Mineral N (control).Eman and Abd-Allah(2008) on superior grapevines and Eman et al (2008) They found that, the using algal extract above 50% increased TSS%, TSS/Acid ratio and total sugars and decreasing total acidity rather than control of Thompson seedless grapevines. Besides; Fawzi and Eman (2004), Faten ismail et al, (2003) and Omran et al, (2003) they found that on flame seedless, Thompson seedless and Roomy Red grapevines, all treatments increased juice percentage of berries and increase TSS, TSS: acid ratio and total sugars, but acidity decreased significantly for all cultivars. These results agreed with those obtained by Umesh et al, (1988) studied the effects of N (50 and 100% of the recommended rate) and phosphate (50 and 100%) combined with Azospirillum and phosphobacterin inoculation on suckers, on Cavendish banana. They indicated that Azospirillum inoculation coupled with 50% N resulted in the most pronounced increase in the amount of total soluble solids as well as the most pronounced increase in the amount of total soluble solids as well as the reduction in the sugar content of fruit. The combined inoculation of Azospirillum and phosphobacterin considerably improved the total sugar content where supplied with N and Kat 100% inoculation with either Azospirillum and phosphobacterien had no effect on acidity of fruits.

Leaf mineral content:

-Leaf nitrogen content (%):

Tale (6) showed leaf mineral content of Thompson seedless grapevine as affected by mineral fertilization and bioferlilization. Regarding leaf content was found significantly affected by different treatment epically T5 as compared with control, T1 as100% recommended mineral fertilizers without biofertilization and compared other treatments.On the other hand, T5 as 75% mineral fertilizers with 25% mixed inoculation biofertilizers (Azotobacter, Azospirillum and Bacillus ssp.,(PDB) gave the highest values of leaf nitrogen content compared with other treatments followed descending order by

Table(4):Effect of bio and chemical fertilization on fruit physical parameters of Thompson seedless grapevines during 2008 and 2009.

Treatment	Berry length(cm)		Berry width(cm)		Berry weight(g)		100berry weight(g)	
	2008	2009	2008	2009	2008	2009	2008	2009
T1-100% M.F	1.98ab	1.88d	1.44d	1.48d	2.00b	2.23ab	240.1c	247.9b
T2- 75% M.F + 25% + Azotobacter	1.98ab	1.92cd	1.48cd	1.52cd	1.73cd	2.00c	234.6d	239.1c
T3- 75% M.F + 25% Azospirillium	2.03ab	1.94bcd	1.51bc	1.54bcd	1.76c	2.08bc	236.3cd	238.7c
T4- 75% M.F + 25% (PDB)	1.73b	1.98bc	1.54bc	1.58bc	1.73cd	2.05bc	234.9 d	238.4c
T5- 75% M.F + 25% +T(2,3,4)	2.10a	2.14a	1.69a	1.74a	2.16a	2.43a	251.6a	267.7a
T6- 50% M.F + 50% +Azotobacter	1.87ab	1.99bc	1.57b	1.59bc	1.70cde	1.96c	235.3 d	239.2c
T7- 50% M.F + 50% + Azospirillium	1.82ab	1.99bc	1.55b	1.59bc	1.70cde	1.97c	233.0 d	237.8c
T8- 50% M.F + 50% + (PDB)	1.81ab	1.94bcd	1.51bc	1.54bcd	1.56e	1.90c	235.3 d	238.8c
T9- 50% M.F + 50% + T(2,3,4)	1.89ab	2.02b	1.64a	1.62b	1.80c	2.10bc	246.0 b	249.4b
T10- 100% biofertilizer	1.74 b	1.99bc	1.55b	1.59bc	1.60de	1.86c	232.7d	236.5c

Means having the same letters within a column for each cultivar are not significantly different at 5%level.

Table(5):Effect of bio and chemical fertilization on fruit chemical parameters of Thompson seedless grapevines during 2008 and 2009.

Treatment	TSS %		Acidity %		Total sugars %		Tss/acid :ratio	
	2008	2009	2008	2009	2008	2009	2008	2009
T1-100% M.F	18.60b	20.57b	0.47ab	0.47a	16.87b	19.05b	39.32b	43.58b
T2- 75% M.F + 25% +Azotobacter	17.30c	19.13c	0.48ab	0.46a	15.23c	16.84cd	35.79c	41.30bc
T3-75% M.F+ 25% Azospirillium	17.33c	19.22c	0.49ab	0.48a	15.07c	17.14 c	35.15cd	40.09cd
T4- 75% M.F + 25% (PDB)	16.83d	18.66c	0.50ab	0.49a	14.83cd	16.26de	33.45de	37.83de
T5- 75% M.F + 25% + T(2,3,4)	19.53a	22.84a	0.44b	0.40b	17.70a	19.90 a	44.09a	56.17a
T6- 50% M.F + 50% +Azotobacter	16.17e	18.54c	0.50ab	0.48a	14.27def	15.60fg	32.34ef	38.11de
T7- 50% M.F + 50% +Azospirillium	15.87f	17.70d	0.49ab	0.48a	13.77f	15.42fg	31.95ef	36.37ef
T8- 50% M.F + 50% + (PDB)	15.80g	17.43de	0.50a	0.49a	14.13ef	15.45fg	31.25ef	35.62efg
T9- 50% M.F + 50% +T(2,3,4)	16.20e	17.25de	0.51a	0.50a	14.70cde	15.87ef	31.59ef	34.52fg
T10- 100% biofertilizer	15.83fg	16.67a	0.51a	0.50a	13.93f	15.20g	31.02f	33.35g

Means having the same letters within a column for each cultivar are not significantly different at 5%level.

T1(control) 100% recommended mineral fertilizers without biofertilizers in the two studied seasons. Finally, the lowest leaf N content was recorded by T10 as100 % combination biofertilization in both studied seasons.

- Leaf phosphate content (%):

It in noticed from the obtained results in Table (6) that, phosphate content in the leaf had no significantly affected in the two studied seasons of Thompson seedless grapevine.

-Leaf potassium content (%):

Data in Tale (6) showed that, T5 as 75% mineral fertilizers with 25% mixed inoculation biofertilizers (Azotobacter, Azospirillum and Bacillus ssp PDB) gave the highest values of leaf potassium content compared with other treatments followed descending order by T1(control) 100% recommended mineral fertilizers without biofertilizers in the two studied seasons.

These results are in harmony with those obtained by Eman and Abd-Allah (2008) recorded the increasing on percentages of N, P, K in the leaves was observed as a result of increasing concentration of algal extract till 50%. Saleh et al, (2006) Studied the replacement of mineral nitrogen fertilization trough using organic source (composted municipal solid waste MSW and humic acid HA) at 0.5,1 and 2% with or without biofertilizers.They indicated that, (MSW) compared with 100% mineral N fertilization, while p content was not affected in Thompson seedless grapevine. Umesh et al., (1988) indicated that, nitrogen, phosphate out potassium, were increased when banana plants were inoculated with biofertilizers.Abd El Miged et al, (2007) on Washinton navel orange Hegazi et al, (2007), El – Kramany et al ,(2007) on groundnut , Abd El Miged et al, (2006) on Thompson seedless grapevines , El-Shenawy. and Fayed(2005a) on crimson seedless grapevines and Gabr and Nour EL Dein, (2005) on apple found that one apple trees microbial biofertilization and mineral fertilization were increases leaf concentrations N,P Ca, Fe and Zn.

Table (6): Effect of bio and chemical fertilization on leave N,P,K percentage of Thompson seedless grapevines during 2008 and 2009.

Treatment	N%		P%		K%	
	2008	2009	2008	2009	2008	2009
T1-100% M.F	1.697b	1.733b	0.1233a	0.1383ba	1.370de	1.383bc
T2- 75% M.F + 25% + Azotobacter	1.467c	1.507c	0.1433a	0.1387a	1.383bcd	1.387bc
T3- 75% M.F + 25% Azospirillium	1.413cd	1.467cd	0.1400a	0.1387a	1.373cde	1.387bc
T4- 75% M.F + 25% (PDB)	1.353ef	1.423de	0.1400a	0.1390a	1.377cde	1.390b
T5- 75% M.F + 25% + T(2,3,4)	1.757a	1.800a	0.1700a	0.1433a	1.420 a	1.433a
T6- 50% M.F + 50% + Azotobacter	1.377def	1.413de	0.1333a	0.1400a	1.390bc	1.400b
T7- 50% M.F + 50% + Azospirillium	1.397de	1.410de	0.1267a	0.1370a	1.367de	1.370cd
T8- 50% M.F + 50% + (PDB)	1.390de	1.400e	0.1300a	0.1383a	1.370de	1.383bc
T9- 50% M.F + 50% + T(2,3,4)	1.427cd	1.420de	0.1300a	0.1397a	1.397 b	1.397b
T10- 100% biofertilizer	1.327f	1.337f	0.1167a	1.357a	1.360 e	1.357d

Means having the same letters within a column for each cultivar are not significantly different at 5%level.

REFERENCES

Abd El - Migeed, M.M.M., M.M. S. Saleh and E.A. M. Mostafa, 2007. The beneficial effect of minimizing mineral nitrogen fertilization on Washington navel orange tree by using organic and biofertilizers. World Journal of agricultural Science 3 (1): 80- 85.

AbdEl-Miged, M.M.S., S.El-Ashry and A.M.Gomaa., 2006.The integrated fertilization of Thompson seedless grapevines with organic anures, biofertilizers and low dose of mineral nitrogen. Research J. of Agric. And Biolo. Scie. 2 (6): 460 – 466.

Al. Ashkar, R.A., A.E.M. Mansour and M.M. Merwd, 2007. Effect of some organic and biofertilization treatments on growth and productivity of grand Nain Banana plants. Egypt. J. of Appl. Sci, 22 (1)

Association of Official Agricultural Chemists, 1995. Official Methods of Analysis A.O.A.C. 15 Th Ed. Published by A.O.A.C. Washington, D.C. (U.S.A.).

Dhamapal.ND. D. Purushothaman and M. Nandan, 1978. Effect of seed inoculation with Azospirillum lepoferum on pearl millet and sorghum. Food Agric. 10:85- 86.

El. Kramany M.F., Amany A. Bahr., Manal F. Mohamed and M.O Kabesh, 2007. Utilization of biofertilizers in field crops production 16. Groundnut yield, it

El-Shenawy, F.E. and T.A.Fayed, 2005a.Evaluation of the congenital to organic and biofertilizers on Crimson seedless grapevine in comparison with chemical fertilization 1-Vegetative growth and nutrition status. Egypt, J.Appl.Sci.20:192- 211.

El-Shenawy, F.E. and T.A.Fayed, 2005b. Evaluation of the congenital to organic and biofertilizers on Crimson seedless grapevine in comparison with chemical fertilization 2-yield and fruit quality. Egypt, J.Appl.Sci. 20:192- 211.

Eman,A,A, Abd El Monem., M.M.S Saleh and E.A.M, Mostafa, 2008. Minimizing the quantity of mineral nitrogen fertilizers on grapevine by using humic acid, organic and biofertilizers. Res. J. of Agric. And Biolog. Scie. 4(1):4- 50.

Eman, A., Abd El Moniem and A.S.E. Abd allah, 2008. Effect of green alga cells Extract as foliar spray on vegetative growth, yield and berry quality of superior grapevines. American. Eurasian j. Agric. Environ. Sci., 4, 4): 427- 433.

Faten, H, M, ismaeil.., M. T. Wahdan and A. F El Sheikh, 2003. Response of Thompson seedless and Roomy Red grapevine cultivars to foliar sprays with yeast extract and GA_3. J. Agric. Scei. Mansoura Univ., 28 (8): 6321- 6334.

Fawzi, M.1 F., and Eman A. A. Abd El- Moneum, 2004. The effect of foliar application of some trace elements and active dry yeast on vegetative growth, Yield, fruit quality and leaf chemical composition of flame seedless grapevine grown in calcareous sail conditions. Minufia J. Agric. Res. Vol. 2 No 29:43-475-8.

Gabr M.A., Nour El- Dein, 2005. Effect of microbial bioferotilization on reducing chemical fertilizers, vegetative growth, nutritional status, yield and fruit quality of Apple. Alex. J. Agric. Res. 50 (3) 121- 129, 2005.

Getha, K. and R.R.Nair, 2000. Integrated plant nutrition system (IPNS) for banana. Ann. Of Agric.Res. (India) 21(4):499-503.

Hegazi, E.S., M.R. El- Sonbaty, M.A., Eissa, Dorria, M. Ahmed and T.F.El –Sharony, 2007. Effect of organic and bio fertilization on vegetations growth and flow erring of picual olive trees. World Journal of Agricultural Science 3(2): 210- 217.

Hosseny,M.H and M.M.M., Ahmed, 2009. Effect of nitrogen, organic and biofertilizatior on productivity of lettuce (cv. Romanie) in sandy soil under Assiut conditions Ass. Unit. Bull. Environ. Res. Vol. 12 No 1.

Ibraheam, t., 1994.Water polluation.Part 1.Science and life Series. Egyptian organization for Boods. Cairo.Eypt, pp: 58- 61. (In Arabic).

Kassem, H.A. and H.A. Marzouk, 2002. Effect of organic and/or mineral nitrogen fertilization on the nutritional status, yield and fruit quality of Flame seedless grapevines grown in calcareous soils. J. Adv. Res., 7(3): 117-126.

Mansour. A.E.M and E.A Shaban, 2007. Effect of different sources of mineral N applied with organic and biofertilizers on fruiting of Washington Navel orange trees. J.of Applied Sciences Research, 3 (8): 74- 79.

Montasser, A.S., N. El shahat, G.F. Ghobreial and M.Z.EL- Wadoud, 2003. Residual effect of nitrogen fertilization on leaves and fruits of Thompson seedless grapes. J. Environ. Sci., 6: 45-484.

Omran, Y.A. M.M and A.H.A Ali, 2003. Examining of some genetically improved yeast strains on vine vigor, yield component and fruit quality of “Roomy Red” grapevines. Assiut Journal of Agricultural Science, 34 (1):33-43

Rizk-Alla, M.S., 2006. Minimizing mineral nitrogenous fertilizers in Flame seedless vineyards through the application of some biofertilizers to reduce nitrate and nitrite residues in the berries. Egypt, J.Appl.Sci. 21(2).

Saleh, M.M.S, S. El- Ashry and A.M Gomaa, 2006. Performance of Thompson seedless grapevine as influenced by organic fertilizer, humic acid and biofertilizers under sandy sail conditions. Research journal of Agriculture and Biological Sciences, 2 (6): 47- 471.

Selvamani, P., K. Monivannan, 2009. Effect of organic manure, inorganic fertilizers and brofertilizers on the nutrient concentration

in leave at different growth stage of Banana cv. Poovan. Journal of Phytology 1 (6): 381- 387.

Smith. B.L., 1998. Microorganism in soil benefits growth and yield of banana. Netropilca Bulletin (299): 22-25.

Snedecor, G.W. and W.G.Corhran, 1980. Statistical me thuds 6th ed., the Iowa state Univ. press Amers Iowa, USA, pp: 593.

Sourial , G.f. , M.A. Meigi ; MA.E. Kamal and A.M.Mohsen , 1985. Means of grapevines production. Arabic publishing and Distribution co. pp 4, 214 (4) 499 -503.

Umesh, K.C., Krishnappa and D.J.Bagyaraj, 1988. Interaction of burrowing nematode, Radopholus similes (Cobb, 1893) Thorne 1949 and VA mycorrhizae glomus fascicalatum (thax) gerd and Trappe in banana (musa acuminate colla) Indian journal of Nematology, 18 (1):6-11.

Wilde, S.A., R.B Corey, J.C. Layer and G.k Voigt. , 1985. soil and plant analysis per tree culture published by Mohan prim law, oxford and IBH Publishing co., New Delhi, pp: 44- 1.05

Zaied N.S., S.A.A. Khafagy and M.A. Saleh, 2006. Effect of nitrogen and potassium fertilization on vegetative growth, fruit set and quality of washing ton navel orange trees. Journal of Applied Science Research, 2 (11): 851: 857.

تعظيم دور الأسمدة الحيوية على النمو والمحصول وصفات الجودة فى ثمار العنب البناتى

عبدالرحمن ابراهيم السيد

قسم الأنتاج النباتى – مركز بحوث الصحراء

اجريت هذه الدراسة خلال موسمى2008 و2009 فى مزرعة خاصة على طريق مصر – الأسكندرية الصحراوى لدراسة تأثير تقليل استخدام الأسمدة المعدنية وحدها بنسبة 100%(المعدل الموصى به) اى 75 و50% بجانب اضافة الأسمدة الحيوية (بكتريا الأزوتوباكتر وبكتريا الأزوسبيريلام و البكتريا المذيبة للفسفور) كلا على حده او مخلوطة كلها مع 75 و50% من الأسمدة المعدنية الموصى بها على النمو والمحصول وصفات جودة الثمار العنب البناتى (طومسون سيدلس) تحت نظام الرى بالتنقيط. اوضحت النتائج ان كل المعاملات لم يكن لها تأثير معنوى على النمو الخضرى من حيث عدد الأوراق/فرع ، المساحة الورقية ، الكلوروفيل الكلى وكذلك طول الأفرع وذلك بالمقارنة بالكنترول (100% سماد معدنى).

المعاملة رقم(5) (75% سماد معدنى من الموصى به + 25% من مخلوط الأسمدة الحيوية (بكتريا الأزوتوباكتر وبكتريا الأزوسبيريلام و البكتريا المذيبة للفسفور) اعطت افضل نتائج بالنسبة للمحصول (كجم) ومتمثل فى عدد العناقيد ووزن العنقود بالجرام خلال الموسمين. تحسنت جودة الثمار سواء الطبيعية مثل طول الحبة ، قطر الحبة ، وزن الحبة ووزن ال100حبة بالجرام وكذلك حجم العصير /100حبة او الكيماوية مثل نسبة المواد الصلبة الكلية وكذلك زادت نسبة السكريات الكلية ونسبة الحموضة الكلية الى المواد الصلبة الكلية ، بينما قلت النسبة المئوية للحموضة الكلية بالنسبة لكل المعاملات.

من ناحية اخرى وجد ان المعاملة رقم (5)(75% سماد معدنى من الموصى به + 25% من مخلوط الأسمدة الحيوية (بكتريا الأزوتوباكتر وبكتريا الأزوسبيريلام و البكتريا المذيبة للفسفور) اعطت افضل النتائج بالنسبة الى محتوى الأوراق من النيتروجين والبوتاسيوم كنسبة مئوية وذلك بالنسبة للمقارنة بباقى المعاملات وكذلك بالمقارنة بالكنترول 100% سماد معدنى (المعدل الموصى به) بينما وجد ان محتوى الفوسفور فى الأوراق لم يتأثر معنويا فى كلا الموسمين.

بصفة عامة ، تسميد العنب البناتى بمعدل 75 % سماد معدنى من الموصى به + 25% من مخلوط الأسمدة الحيوية (بكتريا الأزوتوباكتر وبكتريا الأزوسبيريلام و البكتريا المذيبة للفسفور اعطت افضل نتائج وادت الى تحسن كبير وملحوظ فى النمو والمحصول وصفات الجودة فى العنب البناتى.