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Effect of using vermicompost and biofertilizers as partial alternatives for chemical fertilizers on growth and fruiting of Superior grapevines

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ABSTRACT

This investigation was conducted during two successive seasons of 2018 & 2019 on Superior seedless grapevines cultivar grown in the experimental farm of faculty of agriculture, South Valley University. Qena Governorate, Egypt, where the soil is sandy loam in attempt to reduce the application of N P K chemical fertilizers through partially substitute of chemical fertilizers with vermicompost and biofertilizers at rate of 25 -75 % to control chemical fertilization and reduce environmental pollution and improve growth, yield and fruit quality of Superior grapevine besides improving the physical and chemical characteristics of the soil. Seven treatments of mineral NPK, vermicompost and biofertilizers were applied to study the impact of them on growth characteristics and fruiting of Superior seedless grapevines as well as soil nutrient status. The results indicated that supplying Superior vine with NPK *via* mineral sources at 50% plus 860 g vermicompost (approximately 25 % from the recommended dose of NPK) and 150 Ml biofertilizaers (mixed from strains bacteria nitrogen-fixing, Phosphate dissolvers and Silicate dissolver) or 50 % *via* mineral sources plus 1720 g vermicompost (approximately 50 % from the recommended dose of NPK) was very effective in improving all growth properties, *i.e.* length of shoot, leaf area, number of leaves /shoot, leaf mineral contents and gave the highest yield and fruit quality of Superior grapevines and improve physical and chemical properties of the soil and reducing environmental pollution. Furthermore, reduction of mineral fertilization may help to produce fruits safe for human as well as decreasing environment pollution.

KEYWORD*:* Vermicompost, Microorganisms, Bio-fertilization Growth, Yield, Fruit quality and Superior grapevine

1. INTRODUCTION

Grapes (*Vitis vinifera* L.) is considered one of the most important fruit crops and the most preferred fruits in all over the world and Egypt, for being of a high nutritional value, nice taste and excellent flavor, so they are suitable for local consumption and export. In Egypt, grapes rank second among fruit crops after citrus. (Shaheen, *et al* 2013).Superior grapevine cultivar grown successfully under Egypt conditions and is considered a prime grapevine cultivar where it ripens early (last week of May) under sandy soil conditions (Shaheen, *et al* 2013).

Fertilization is considered as important tool amelioration soil fertility and improving crop yield (Mengel and Kirkby, 1987). However, the use of mineral fertilizers in high intensity in agricultural production increase the risk of environment pollution and has harmful effects on the human health as well as can decrease the fruits contents from useful compounds such as minerals and vitamins and increase harmful residues which remain in food. In addition to causing a decrease in soil fertility, increasing groundwater pollution and weakening plants resistance to diseases (Bogatyre, 2000 and Fornes *et al*., 2002).

Due to the energy crisis, high costs of fertilizers, pollution of the soil and water, killing microorganisms, reduced soil fertility as a result of indiscriminate and excessive use of manufacturer fertilizers. It led to increase the interest towards the use of organic and bio-fertilizers as a promising alternative for chemical fertilizers (Mishra *et al.*, 2013 and Pawar *et al.*, 2020) the organic fertilizers are a good source of nutrients to improve growth, yield and fruit quality as well as is crucial for maintaining soil fertility, improve soil structure, aeration and retention of moisture, reduce soil pH and have positive impact on encouraging proliferation of microorganisms and increases its activity in the soil. So using of organic fertilizers extremely important because of the harmful effects of mineral fertilizers and advantages of organic fertilizers (Miller *et al*., 1990; Darwish *et al.*, 1995;

Nasser, 1998; Abdel-Nasser and Harhash, 2000; Al-Wasfy *et al.*, 2006; Shaheen *et al*., 2012; Shaheen *et al*., 2013; Shaaban, 2014 and Abo-baker, 2017). Furthermore, using organic materials such as cow manure humus and vermicompost led to improve the vegetative growth and fruit production in many different fruit trees (William, 2012; Mosa *et al.*, 2014; Torshiz *et al.*, 2017; Pawar *et al.*, 2020 and Jatin *et al.*, 2020).

In the recent year's application of bio-fertilization play a very significant role in increment of soil fertility, improve resistance of plants to diseases in addition to promotion the growth, yield and fruit quality for many fruit tree species. As well as its very safe for human and animals (Abd el-Hamid, 2002; Samah, 2002 and Mishra *et al*., 2013). Bio-fertilizers are a preparations from cells of efficient strains, the most important of which are prepared from nitrogen-fixing *(Azotobacter chroococcum*) or Phosphate dissolvers (*Bacillus Megaterium*) and Silicate dissolvers bacteria (*Bacillus criculans*) that works on amelioration the number of microorganisms in the soil and increase microbial processes and therefore increase the availability of nutrients to plants (Samah, 2002; Venkatashwarlu, 2008 and Hiwale, 2015).

Therefore, this investigation target to studied the possibility of partial replacement for manufactured fertilizers by using vermicompost and microorganisms and select the best blend of mineral fertilizers, organic and biofertilizers to enhance growth, yield and fruit quality of Superior grapevine as well as improve the sandy soil properties.

2. MATERIAL AND METHODS

This investigation was executed during two seasons (2018 & 2019) on 63 vines of 13- years old similar in growth Superior seedless grapevines grown in farm of faculty of agriculture, South Valley University, Qena Governorate, Egypt. Vines were planted in sandy loam soils and spaced at 3x2 m under drip irrigation system and trained according to Spanish Barron system. Vines were pruning during the first week of January for the two seasons. Vine load was 84 eyes (6 canes x 12 buds/cane) plus six renewals spurs of two buds per each. Characteristics of soil and Vermicompost were estimated according to (Wilde *et al*., 1985) as presented in Table (1-A & 1-B).

Table 1.A. Physical and chemical characteristics of the orchard soil.

Character	Values
Sand (%)	52.1
Silt (%)	35.8
Clay (%)	12.1
Texture	Sandy loam
ECe (mS/cm)	1.98
pH (1:1 suspension)	7.89
Organ mater (%)	0.91
Total N (g/kg)	0. 31
Available P (mg/kg^{-1})	7.01
Available K (mg/kg^{-1})	8.92

Table 1.B. Chemical properties of Vermicompost

pH	EC (dS/m)	Conductivity mmhos/cm	Organic matter%	N %	P %	K %
6.3	3.45	4.8	33.8	2.35	0.82	1.52

The experiment aimed to work on the partial replacement of mineral fertilizers with organic or biological fertilizers or a mixed of them, so we used ammonium nitrate (33.5 % N), calcium super phosphate (15.5 % P_2O_5) and potassium sulphate (48 % K_2O) as sources of NPK mineral fertilizers. Use a vermicompost (2.35% N, 0.82% P and 1.52% K) as a source of organic fertilizers. While bio-fertilizers liquid cultures of 7-days old were used from bacteria (*Azotobacter chroococcum, Bacillus Megaterium and Bacillus circulans)* which containing ($2.6x10^7$ cells ml), ($4x10^7$ cells ml) and ($6.5x10^6$ cells ml), respectively. The bacterial strains were obtained from the biofertilization unit, faculty of agriculture, South Valley University.

The ammonium nitrate was added in three batches (growth start, after setting and two months later). The potassium sulphate was added on two equal doses (after setting and one month later). The phosphorus was added at once during winter at the end of December. The organic fertilizer (vermicompost) was applied at once in the first of February. The biofertilizers were added twice (at first of February and middle of March).

Recommended doses of NPK for Superior seedless by the Ministry of Agriculture, Egypt as (80g N, 30g P_2O_5 and 100 g K_2O /vine/year).

The experiment included seven treatments as a follows:

1- 100% mineral N P K (240 g ammonium nitrate +194 g calcium super phosphate+206 g potassium sulphate /vine).
2- 75% mineral NPK (180 g ammonium nitrate +145.2 g calcium super phosphate+154 g potassium sulphate) + (860 g vermicompost approximately 25 % from the recommended dose of NPK) /vine).
3- 75% mineral NPK (180 g ammonium nitrate +145.2 g calcium super phosphate+154 g potassium sulphate) + 150 Ml biofertilizers (50 Ml from each bacterial strain) /vine).
4- 50% mineral NPK (120 g ammonium nitrate +97 g calcium super phosphate+103 g potassium sulphate) +(1.72 kg vermicompost approximately 50 % from the recommended dose of NPK) /vine).
5- 50% mineral NPK (120 g ammonium nitrate +97 g calcium super phosphate+103 g potassium sulphate) + 300 Ml biofertilizers (100 Ml from each bacterial strain /vine).
6- 50% mineral N P K (120 g ammonium nitrate +97 g calcium super phosphate+103 g potassium sulphate) + (860 g vermicompost approximately 25 % from the recommended dose of NPK) + 150 Ml biofertilizers(50Ml from each bacterial strain) /vine).
7- 25 % mineral N P K (60 g ammonium nitrate +49 g calcium super phosphate+52 g potassium sulphate) + (1.72 kg vermicompost approximately 50 % from the recommended dose of NPK) + 150 Ml biofertilizers (50Ml from each bacterial strain)/vine).

The experimental were arranged in a completely randomized block design there were three replicates per each treatment and three vines per replication.

The normal horticultural practices were applied in the orchard except fertilization on the all selected vines.

2.1. Measurements which appreciated during the two seasons

1- Average main length of shoot (cm):
In the end of each season five main shoots /vine were randomly selected to measured shoot length (cm).
2- Leaf area, (cm^2) :
A sample of twenty mature leaves were taken for each replicated (6^{th} or 7^{th} leaf) to measure the average leaf area according to Montero *et al.*, (2000).
3- Average number of leaves/shoot was recorded.
4- Leaf contents of N. P and K:
Sample of 20 leaves per each replicate were taken from the fully mature leaves (5 – 7^{th} leaves) in middle of July in both seasons and leaf petioles were separated and dried at 70°C. Percentages of N, P and K were determined according to method described by Wild *et al.* (1985).
5- Yield and its components
Harvesting took place in the last week of May when total soluble solids percentage of berry juice in the cheek treatment reached about 15-16%. The clusters number / vine have been recorded and three clusters were randomly collected from each vine for determined the average weight of cluster (g) and recorded the yield per vine (kg).
6- Berries quality *i.e.* T.S.S. %, reducing sugars and percentage of acidity were estimated according to A.O.A.C. (1995).
7- In the end of the investigation has been done analysis of soil to study the effect of vermicompost and biofertilizers on the physical and chemical characteristics of soil according to Wilde *et al.*, (1985).

2.2. Statistical Analysis

Analyzed all the obtained data were statistically according to the procedure by Mead *et al.*, (1993) and treatment means were compared using new L.S.D. at 5%.

3. RESULTS

3.1. Effect of using vermicompost and biofertilizers as partial alternatives chemical fertilizers on Growth vegetative criteria:

Data presented in Tables (2&3) reveal that vegetative growth characters *i.e.* length of shoot, leaf area, No. of leaves / shoot and leaf mineral contents (N, P, K) of ‘Superior seedless’ grapevines were

Table 2. Effect of using vermicompost and biofertilizers as partial alternatives for chemical fertilizers on shoot length, leaf area and No. of leaves / shoot of Superior grapevines during 2018&2019 seasons.

Treatments	Length of shoot (cm)		Leaf area (cm^2)		No. of leaves /shoot	
	2018	2019	2018	2019	2018	2019
T1- 100% Mineral NPK	148.5	151.7	158.6	161.3	27.9	28.6
T2-75% Mineral NPK + 860 g Vermicompost	166.9	168.9	171.4	172.3	29.5	29.8
T3-75% Mineral NPK +150 Ml bio	159.8	163.4	165.7	168.5	28.1	28.6
T4-50% Mineral NPK + 1720 g Vermicompost	175.3	179.5	179.3	181.6	31.2	31.9
T5-50% Mineral NPK + 300 Ml bio	165.4	167.7	168.5	170.2	28.2	28.9
T6-50% Mineral NPK + 860 g vermlcompost + 150 Ml bio	180.1	182.9	181.6	182.8	31.4	32.8
T7 25 % Mineral NPK + 1720 g vermlcompost + 150 Ml bio	169.6	173.6	175.2	178.4	30.6	30.9
New LSD 0.05 %	5.2	5.5	6.9	7.1	0.7	0.8

Table 3. Effect of using vermicompost and biofertilizers as partial alternatives for chemical fertilizers on leaf chemical composition of Superior grapevines during 2018&2019 seasons.

Treatments	N %		P %		K %	
	2018	2019	2018	2019	2018	2019
T1- 100% Mineral NPK	1.89	1.93	0.18	0.17	1.26	1.31
T2-75% Mineral NPK + 860 g Vermicompost	2.02	2.05	0.22	0.24	1.37	1.40
T3-75% Mineral NPK +150 Ml bio	1.98	1.99	0.24	0.25	1.36	1.42
T4-50% Mineral NPK + 1720 g Vermicompost	2.06	2.09	0.26	0.28	1.39	1.45
T5-50% Mineral NPK + 300 Ml bio	1.92	1.96	0.23	0.24	1.38	1.41
T6-50% Mineral NPK + 860 g vermlcompost + 150 Ml bio	2.16	2.19	0.28	0.30	1.40	1.46
T7 25 % Mineral NPK + 1720 g vermlcompost + 150 Ml bio	2.05	2.08	0.26	0.27	1.38	1.42
New LSD 0.05 %	0.72	0.76	0.03	0.04	0.06	0.07

significantly affected by using vermicompost and microorganisms a partial substitute for mineral fertilizers in the two seasons of the study. From the obtained data it was found that supplying vines of NPK fertilizers with using 25, 50 or 75 % of the recommended dose of NPK *via* mineral fertilizers in combination with 75, 50 or 25% vermicompost or microorganisms significantly increased such traits compared to using the recommended dose of NPK as a mineral fertilizer (100%) only. The results took the same trend during the two seasons of study. The maximum values of shoot length, leaf area and No. of leaves / shoot as well as leaves N, P and K percentages were recorded in the vines that received NPK fertilizers with combination of (50% mineral+ 860 vermicompost+150 Ml biofertilizers).While the lowest values of the vegetative growth characters were recorded in the vines fertilized by mineral N. P. K fertilizers at 100% (check treatment). It can be stated from the obtained data that using two forms of fertilizers together (organic and biofertilizers) with inorganic superior than using with inorganic fertilizer only. The highest values of shoot length (180.1 & 182.9 cm), leaf area (181.6 & 182.8 cm), number of leaves/shoot (31.4 & 32.8 leaf), leaf content of nitrogen (2.16& 2.19%), phosphorus (0.28&0.30) and potassium (1.40& 1.46%) were recorded in the vines that supplying fertilizers NPK at (50% inorganic plus 860 g vermicompost and 150 Ml biofertilizers). The lowest values of shoot length (148.5 & 151.7 cm), leaf area (158.6 & 161.3 cm) , number of leaves/shoot (27.9 & 28.6 leaf), leaf content of nitrogen (1.89& 1.93%), phosphorus (0.18 & 0.17%) and potassium (1.26 & 1.31) were recorded in the vines that fertilized NPK *via* mineral source only in 2017 and 2018 seasons, respectively.

3.2. Effect of using vermicompost and biofertilizers as partial alternatives for chemical fertilizers on the yield and its components:

Yield/ vine and its components of Superior seedless grapevines during 2018&2019 seasons in response to for using vermicompost and biofertilizers as a partial substitute for mineral fertilizers are given in Table (4). It is obvious from the data that cluster weight (g), cluster number and yield/vine (kg) of Superior grapevine were significantly affected by using vermicompost and microorganisms in different proportions as a partial substitute for mineral fertilizers compared to using recommended dose of NPK *via* mineral source only. This was true, except for the use of 50% NPK mineral fertilizers with 300 Ml biofertilizers where no significant difference was shown on these traits in comparison with control treatment in the two seasons of the study. In general view results took approximately the same trend during the two seasons of study. Clusters number / vine did not affected by using different forms of fertilizers in the first season. The highest values of cluster weight, number of clusters and yield per vine (585 & 590 g), (23.33& 25.22) and (13.65 & 14.88 kg), respectively, in the two seasons of study was recorded in vines that fertilized by NPK through 50 % mineral + 860 g vermicompost + 150 Ml biofertilizers followed by the vines that fertilized by NPK through 50 % mineral + 1720 g vermicompost which recorded values of cluster weight, number of clusters and yield per vine (575 & 583 g), (23.33.& 24.33)and (13.41 & 14.18 kg), respectively. Contrarily, the lowest values of cluster weight, number of clusters and yield / vine (480 & 405 g), (22.11& 23.11) and (10.61 & 11.67 kg), respectively in the two seasons of the study was recorded for vines that fertilized by NPK completely *via* mineral sources.

Table 4. Effect of using vermicompost and biofertilizers as partial alternatives for chemical fertilizers on yield and its components of superior grapevines during 2018&2019 seasons.

Treatments	Cluster weight (g)		No. of Cluster / vine		Yield / vine (kg)	
	2018	2019	2018	2019	2018	2019
T1- 100% Mineral NPK	480	505	22.11	23.11	10.61	11.67
T2-75% Mineral NPK + 860 g Vermicompost	535	550	23.22	24.00	12.42	13.20
T3-75% Mineral NPK +150 Ml bio	525	545	22.33	23.22	11.72	12.65
T4-50% Mineral NPK + 1720 g Vermicompost	575	583	23.33	24.33	13.41	14.18
T5-50% Mineral NPK + 300 Ml bio	490	510	22.11	23.22	10.83	11.84
T6-50% Mineral NPK + 860 g vermlcompost + 150 Ml bio	585	590	23.33	25.22	13.65	14.88
T7 25 % Mineral NPK + 1720 g vermlcompost + 150 Ml bio	570	575	23.33	24.33	13.30	13.99
New LSD 0.05 %	28	32	N.S	0.5	0.8	0.9

3.3. Effect of using vermicompost and biofertilizers as partial alternatives for chemical fertilizers on chemical compositions of berry juice.

It was lucid from the data presented in Tables (5) that using vermicompost and microorganisms as partially substitute for NPK mineral fertilizers significantly effected on the contents of TSS, reducing sugars and percentages of acidity in the berry juice of Superior grapevine during 2018 &2019 seasons. The obtained data show that TSS and reducing sugars significantly improved while total acidity were significant decrease by replacing the vermicompost or

Table 5. Effect of using vermicompost and biofertilizers as partial alternatives for chemical fertilizers on berry quality of superior grapevines during 2018&2019 seasons.

Treatment	TSS (%)		Acidity (%)		Reducing sugars %	
	2018	2019	2018	2019	2018	2019
T1- 100% Mineral NPK	15.4	15.1	0.70	0.72	13.6	13.2
T2-75% Mineral NPK + 860 g Vermicompost	16.2	15.8	0.64	0..66	14.1	13.8
T3-75% Mineral NPK +150 Ml bio	15.9	15.5	0.66	0.68	13.9	13.6
T4-50% Mineral NPK + 1720 g Vermicompost	16.8	16.3	0.62	0.65	14.9	14.7
T5-50% Mineral NPK + 300 Ml bio	15.7	15.3	0.63	0.66	14.6	14.4
T6-50% Mineral NPK + 860 g vermlcompost + 150 Ml bio	17.9	17.4	0.60	0.61	15.1	14.9
T7 25 % Mineral NPK + 1720 g vermlcompost + 150 Ml bio	17.2	16.8	0.61	0.63	15.0	14.8
New LSD 0.05 %	0.5	0.4	0.03	0.04	0.5	0.6

microorganisms partially instead of the minerals fertilizers at rate of 25 to 75 % comparing with using recommended dose of NPK completely via mineral sources. In this regard, the best treatment is application of NPK at 50% *via* mineral sources + 860 g vermicompost + 150 Ml biofertilizers. The highest values of TSS , total sugars and the lowest total acidity percentages in the berries of Superior grapevine (17.9&17.4 %),(15.1&14.9%) and (0.60 &0.61 %) were recorded when vines received NPK at 50% *via* mineral sources + 850 g vermicompost + 150 Ml biofertilizers followed by the vines received NPK at 25% *via* mineral sources + 1720 g vermicompost + 150 Ml biofertilizers where recorded(17.2&16.8 %), (15.0&14.8%) and (0.61 &0.63 %) respectively, during the two seasons of study. While the lowest values of TSS, reducing sugars and the highest percentages of total acidity (15.4&15.1%), (13.6&13.2%) and (0.70 &0.72 %) were recorded when vines received NPK at 100% *via* mineral sources only during the two seasons of study, respectively.

3.4. Soil physical and chemical properties and their impacted by different sources of fertilizers.

For study the impact of using vermicompost and microorganismis as partial alternatives for mineral fertilizers on the some soil properties. In the end of the investigation samples were taken from soil per each treatment at roots zone at (0 – 60 cm depth) and their analysis according to (Wilde *et al.*, 1985).

The effect of using vermicompost and microorganisms as partial alternatives for synthetic fertilizers on characteristics of soil is shown in Table (6). The results showed a marked improve in the physical and chemical properties of soil which fertilized by vermicompost and microorganisms as partial alternatives for mineral fertilizers compared to the soil witch fertilized by mineral fertilization only. This increment varied according to the application rate of vermicompost and microorganisms. The applying of vermicompost and biofertilizers led to increase the available of NPK, content of organic matter and decreasing the electric conductivity and pH of the soil Generally, the better physical and chemical properties of soil were appeared for soil fertilized by (25% mineral fertilizers + 1720 g vermicompost + 150 Ml biofertilizers) follwed by the soil fertilized by (50% mineral fertilizers + 860 g vermicompost + 150 Ml biofertilizers compared to the soil fertilized by mineral fertilization completely.

4. DISCUSSION

Fertilization especially nitrogen, phosphorus and potassium considered one of the major tools for improvement the soil fertility and increasing the yield for all crops. The beneficial effect of organic and biofertilizers can be attributed to its vital roles for improve soil fertility and amelioration the soil physical and chemical characteristics and which their influence reflected in increment the organic matter, enhancing water holding capacity, soil structure aggregation, and humid substances and reduce soil pH and salinity all these led to may enhance the availability of macro and micronutrients in the soil (Darwish *et al.*, 1995; Simon *et al.*, 1999; Lee *et al.*, 2004 Zhang *et al.*, 2010 and Asgharzade and Babaeian, 2012).

Moreover, they enhance the uptake and translocation of most nutrients, which is reflected on increasing carbohydrate and protein synthesis,

Table 6. Soil physical and chemical properties and their impacted by different sources of fertilizers.

Characters	Treatment						
	T_1	T_2	T_3	T_4	T_5	T_6	T_7
Sand (%)	62	60.3	60.9	58.6	59.7	59.4	58.3
Silt (%)	25.8	26.7	26.3	27.1	26.8	27.4	27.2
Clay (%)	12.2	13	12.8	14.3	13.5	13.2	14.5
Texture	Sandy loam	Sandy loam	Sandy loam	Sandy loam	Sandy loam	Sandy loam	Sandy loam
Soil pH (1:1)susp.	7.89	7.65	7.63	7.58	7.59	7.51	7.35
ECe (1:5)water extract	1.98	1.94	1.95	1.91	1.92	1.89	1.90
Organic matter (%)	0.71	0.74	0.72	0.78	0.75	0.79	0.80
CaCO3 (%)	7.84	7.65	7.63	7.58	7.59	7.35	7.51
Total N(g/kg)	0.32	0.38	.37	0.39	0.38	0.41	0.41
Available P (mg kg)	7.01	7.09	7.08	7.12	7.10	7.14	7.15
Available K (mg kg)	8.91	9.01	9.02	9.08	9.15	9.12	9.16

encourage cell division and development of tissues as well as induces resistance of plant to root diseases and increasing the production of natural hormones i.e. IAA, GA3 and cytokinins, which in turn improve root development and increasing vegetative growth of plant and therefore improving productivity and quality of fruits (Gaur *et al.*, 1980; Suba Rao, 1984 and Kannaiyan, 2002).

The use of organic and biofertilizers leads to an improvement in the physical and chemical of soil properties It is different improves varied according to the application rate (Hamed *et al*., 2014 and Muhammad and Sharif, 2019).Moreover, application of organic and biofertilizers leads to increase the availability of NPK, organic matter and decreasing pH of the soil (Yang *et al.,* 2019).

Results of these study were in agree the results found by (Abdel-Monem *et al*., 2008; Mostafa, 2008; Madian, 2010; El-Sabagh, *et al.*, 2011; Refaai, 2011; Uwakiem, 2011; Aly-Samar, 2015; Motawea, 2016 and El-Salhy *et al.*,2017).

5. CONCLUSION

On the basis of the obtained data from this study we can be concluded that to reduced the pollution of soil and environmental as a result of excessive use of mineral fertilizers. it could be use the vermicompost and biofertilizaers as partial alternatives for N P K chemical fertilizers at from 50 to 75% (In a combination consisting with of 50 % mineral sources plus 25% from vermicompost and biofertilizaers per each) or (50 % mineral sources plus 50 % vermicompost) to get the best vegetative growth as well as yield and fruit quality of Superior grapevine besides improving the physical and chemical characteristics of the soil.

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الملخص العربى

تاثير استخدام السماد الدودي والاسمدة الحيوية كبدائل جزئية للأسمدة الكيميائية على نمو واثمار كروم العنب السوبيريور.

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تم إجراء هذا البحث في الموسمين المتتاليين لعامي ٢٠١٨ و ٢٠١٩ في التربة الطميية الرملية على صنف العنب السوبيريور الخالي من البذور المزروع في مزرعة مركز البحوث الزراعية– كلية الزراعة ، جامعة جنوب الوادي. محافظة قنا ، مصر. في محاولة للتقليل من الأسمدة الكيماوية NPK عن طريق استخدام السماد الدودي والأسمدة الحيوية كبديل جزئي للأسمدة الكيماوية بنسبة تتراوح من ٢٥ إلى ٧٥٪ للتحكم في التسميد الكيميائي للحد من التلوث البيئي والحصول على أفضل نمو ومحصول وجودة لثمار العنب السوبيريور بالإضافة إلى تحسين الخصائص الفيزيائية و الكيميائية للتربة. تم تطبيق سبعة معاملات من NPK المعدني و السماد الدودي و والأسمدة الحيوية لدراسة تأثيرها على النمو الخضري واثمار العنب السوبيريور و الحالة الغذائية للتربة. أشارت النتائج إلى أن تسميد كرمات العنب السوبيريور باسمدة NPK من مصادر معدنية بنسبة ٥٠٪ بالإضافة إلى ٨٦٠ جم سماد دودي(تمثل تقريبا ٢٥% من الجرعة الموصى بها من الأسمدة NPK) و ١٥٠ مل أسمدة حيوية أو ٥٠٪ مصادر معدنية و١٧٢٠ جم سماد دودي (تمثل تقريبا ٥٠% من الجرعة الموصى بها من الأسمدة NPK) كان فعالاً للغاية في تحسين جميع خصائص النمو مثل طول الساق و مساحة الورقة و عدد الأوراق لكل فرخ و النسب المئوية للمحتويات المعدنية فى الاوراق (NPK) وكذلك اعطت افضل محصول وجودة ثمار من العنب السوبيريور بالإضافة إلى تحسين الخواص الفيزيائية والكيميائية للتربة و تقليل التلوث البيئ.