Annals of Agricultural Science, Moshtohor (ASSJM)
https://assjm.journals.ekb.eg/
www.fagr.bu.edu.eg

ISSN:1110-0419
Original Article Vol. 63(1) (2025), 115 – 126 DOI: 10.21608/assjm.2025.352228.1341

The Implications of Decreasing Npk Mineral Fertilizers on the Fruit Quality of Valencia Orange Trees

M.G. Abo-Gabien*[1], H. E. M. El-Badawy[2], S. F. El-Gioushy[2] and S. M. Bakeer[1]
[1]Plant Production department, Desert Research center, Egypt.
[2] Horticulture Department, Faculty of Agriculture, Benha University, Egypt.
Corresponding author: mohamed.gomaa1997214@gmail.com

Abstract

This study was conducted during two successive seasons (2022 and 2023) to know the effect of using organic compost fertilizer and effective microorganisms in improving productivity and fruit quality of Valencia orange trees for reducing NPK fertilizer Experiment were included as follows: (7.5, 15, 22.5, 30 kg compost / tree) and biovit fertilizer at a rate of 36 ml/tree of Valencia orange trees. Analysis of the data collected during the study showed that there was a statistical significance in increasing fruit quality different doses of organic and biological fertilization treatments. in this concern 15 kg compost/tree + biovit 36 ml/tree had the best results and improved productivity and fruit quality and it had a significant effect in reducing the added NPK chemical fertilizer by 50% in Valencia orange trees.

Key words: Valencia orange trees – Bio-Fertilizer – Organic fertilizer – fruit quality.

Introduction

The importance of citrus fruits is due to their high nutritional value and their superiority over other fruits in vitamins and salts necessary for humans, as well as their ease of marketing and storage total cultivated area is of the Valencia orange trees 140,194 Fadden the productive area is 126,907 Fadden, and productivity is 1,299,685 tons, with an average productivity of 10.24 tons/ Fadden. According to statistics from the Ministry of Agriculture 2021 The cost of mineral fertilizers has been rising dramatically as a result of the overuse of chemical fertilizers, which have a detrimental effect on both the soil and plantsTherefore, it is now vital to look for alternatives that would provide the poor soil with more affordable fertilizer supplies. **(Wardowski *et al.*, 1985).** Bio-fertilizers are organisms that enrich the nutrient quality of soil and plant, the main sources of bio-fertilizers are bacteria, fungi and cyano bacteria (blue-green algae). Using bio-fertilizers is considered a promising alternative for chemical fertilizers under Egyptian soil conditions **(El-Haddad *et al.*, 1993).** Organic and bio-fertilizers are used, which will maximize the benefit from chemical fertilizer from small quantities of it and thus improve productivity as well as the quality of fruits. **Hegazi *et al.*, (2007) , Eman *et al.*, (2008) ,Shaban and Mohsen (2009) , Osman *et al.*, (2010) , El-Sisy *et al.*, (2011), Abd El-Razek *et al.*, (2012), Grzyb *et al.*, (2012) , Mustafa *et al.*, (2014), Khamis *et al.*, (2017).** Bio-fertilizers i.e. phosphorein proved to be favorable in enhancing the growth and flowering of the trees. Adding organic fertilizers to the soil in citrus crops leads to achieving providing the soil with macro and micro-elements. Organic matter contains nitrogen, phosphorus, and potassium in their easy-to-decompose and slow-to-decompose form, and they remain continuous throughout the life of the plant, and their effect may extend to the next crop, **Moustafa (2002), Abd Ella (2006)**, **Osman *et al.* (2010)**, Organic matter also contains microelements such as iron, manganese, copper, zinc, and others. Elements are released from organic fertilizers in quantities that suit the plant's needs as a result of microbial activity in the soil, decomposition of organic matter and the synthesis of biological nitrogen, which is considered the best type of nitrogen for plants. It was found that adding biofertilizers has a very important role in producing organic and inorganic acids that dissolve the elements present in natural rocks and make them easy for absorption **Kurer *et al.*, (2017),** Providing **Sau *et al.*, (2017), Abd El-Migeed *et al.*, (2006).** Azotobacter bacteria fix atmospheric nitrogen, and basil bacteria help facilitate the elements phosphate and potassium, transforming them from the form that is not easy for absorption to the dissolved form that is easy for absorption by the plant in the area of the spread of the root system **Mostafa (2008), Osman *et al.*, (2010).** The application of bio-fertilizers achieved the following merits according to **Kannaiyan, 2002). El-Kinany *et al.*, (2018) Ahmed and Mohamed (2018) El-Gioushy and Eissa (2019),** reducing plant requirements of N by 25%, 30% of mineral nitrogen sources and makes the absorption of mineral elements in plants easier.

Moreover, it gives the greatest outcomes in terms of fruit yield, natural properties, and chemical makeup accessibility of various nutrients. Stimulating root growth. Enhancing the resistance of plants to root diseases, increasing the benefit from adding organic and biological fertilizers in the production of Valencia oranges and improving the quality characteristics of Valencia oranges. . Thus, the current study aims to use organic compost fertilizer and effective microorganisms in improving productivity and fruit quality of Valencia orange trees to reduce NPK fertilizer to enhance sustainable development, preserving human health and reducing environmental**.**

Materials and Methods

The present study was conducted during two successive experimental seasons (2021–2022) and (2022–2023) on Valencia orange trees (Citrus sinensis L.), trees. grown in a private orchad, which was located at Wady Elntron, El Behera Governorate, Egypt. 10 years old trees of Valencia orange trees (Citrus sinensis L.), "cv. budded on Volkameriana lemon rootstock (citrus volkameriana) 54 Valencia trees were chosen as test plants because they were healthy, almost consistent in size and shape, productive, and subjected to the same horticultural techniques. The chosen trees were planted five meters apart on sandy soil, and were watered by a drip irrigation system from a well. Tables 1 and 2 list the soil's chemical characteristics as well as the irrigation water used in this investigation.

Table 1. chemical analysis of irrigation water:

pH	EC ds/m	Soluble Cations, meq/L				Soluble Anions, meq/L			
		Ca^{++}	Mg^{++}	Na^{+}	K^{+}	CO_3^{--}	HCO_3^{-}	SO_4^{--}	Cl^{-}
6.76	1.70	7.5	4.3	4.4	0.8	0	4.4	0.4	12.2

Table (2): Some chemical properties of the experimental soil.

Soil depth cm)	pH	EC ds/m	Soluble Cations, meq/L				Soluble Anions, meq/L			
			Ca^{++}	Mg^{++}	Na^{+}	K^{+}	CO_3^{--}	HCO_3^{-}	SO_4^{--}	Cl^{-}
0 – 30	7.09	2.7	1.93	3.86	20.33	0.9	0	3.5	2.00	**21.5**
30 – 90	6.83	2.82	2	4.1	21.3	0.8	0	3.7	2.2	**22.5**

Minimizing NPK mineral fertilizers by compost and effective microbes and how they affect Valencia orange trees' fruit quality.

To study the possibility of reducing the high cost of chemical fertilizers (NPK) which directly impacts human health by cheaper alternatives and environmentally friendly. By using compost as a source for organic fertilizer and using effective microorganisms as a source for bio fertilization.
The nine treatments involved in this study were summarized as follows:

As per the Ministry of Agriculture's recommendation (Control or recommended doses RD), T1: 100% NPK mineral (as fertilization program applied at 4, 3, and 1 kg/tree from $(NH_4)_2SO_4$, superphosphate, and K_2SO_4, respectively).

Investigated treatments:

T1: Control 100% NPK mineral

T2: 75% NPK mineral + 25% organic compost (7.5Kg)/tree

T3: 50 % NPK mineral + 50% organic compost (15Kg)/tree

T4: 25% NPK mineral + 75% organic compost (22.5Kg)/tree

T5: 100 % organic compost (30Kg)/tree

T6: 75% NPK mineral + 25% organic compost (7.5Kg)/ + bio (36ml /tree)

T7: 50 % NPK mineral + 50% organic compost (15Kg)/+ bio (36ml /tree)

T8: 25% NPK mineral + 75% organic compost (22.5Kg)/+ bio (36ml /tree)

T9: 100 % organic compost (30Kg) + bio (36 cm/tree)

Sources of chemical fertilizers:

The nitrogen source was ammonium sulfate (20.5% N), the P source was calcium superphosphate (15 % P_2O_5), and the K source was potassium sulphate (48% K_2O).

Organic fertilization (compost):

Table 3. An examination of the utilized composting substance**:**

Analysis	Value	Analysis	Value	Analysis	Value
m3 weight	790 kg	**C:N ratio**	17.6	**T. Ca%**	1.93
Moisture %	30	**Organic carbon %**	26.4	**T.Mg%**	0.90
PH (1:10)	9.3	**Total N%**	1.5	**T.l Fe (ppm)**	1012
EC (dS/m)	3.4	**T. P%**	0.6	**T.Mn (ppm)**	116
Organic matter	35.6	**T.K%**	1.32	**T. Zn (ppm)**	28

Effective Microorganisms (Bio vit):

Phosphorene**:** A commercial phosphor bio-fertilizer, which contains some active fungi strains (*Arbuscalar mycorrhiza*). Nitrobein: A commercial nitrogen bio-fertilizer contains special bacteria (*Azotobacter choroccocum*) Potassein: A commercial potassium bio-fertilizer contains special bacteria (*Bacillus pasteurii).* preparation, which was provided by the Department of Microbiology, Agric. Res. Inst., Giza, was utilized in this study as biological activators. It was applied as a soil drench once, at a rate of 36 ml per tree (6 liters/feddan), in December early of both seasons

Fruit characteristics:

Ten fruits were randomly selected from each tree (replicate) at harvest time, and the following physical and chemical characteristics were determined.

Fruit physical characteristics:

Fruit weight (g), fruit volume (cm^3) fruit length (cm), fruit diameter (cm), fruit shape index, and peel thickness (mm) are the average values. During the two study seasons, the physical characteristics of Valencia orange fruits in reaction to several anti-substances were examined.

Fruit juice chemical properties:

The following fruit chemical properties were determined according to (**A.O.A.C, 2005**). Utilizing a Zeiss hand refractometer, the percentage of total soluble solids (T.S.S.) was calculated. Fruit juice's total titratable acidity percentage was calculated as the proportion of anhydrous citric acid. By dividing the percentage of total soluble solids by the percentage of total acidity, the total soluble solids/total acidity ratio (T.S.S/acid ratio) was determined. Using 2.6 dichlorophenol indol phenol dye as an indicator, the amount of ascorbic acid (Vitamin C) in fruit juice was discovered. Additionally, the percentage of total sugars in fruit juice was calculated using the technique outlined by **Smith *et al.*, (1956).**

Statistical analysis:

According to Snedecor and Cochran (1990), analysis of variance was used to all data collected over both seasons. Additionally, significant differences between means were distinguished using the Duncan multiple test range **(Duncan, 1955),** in which the means of several treatments for each attribute under investigation were distinguished using a letter or letters.

Results and Discussion:

Effectiveness of various NPK fertilization mineral fertilizers when applied with compost and sources of beneficial microbes. Valencia orange trees' fruiting characteristics and quality. The number of responses to the different therapies in this regard These are data collected in the 2022 and 2023 seasons. Fruit production per tree, average fruit weight (g), yield per tree (kg), and yield per feddan (kg) during the two study seasons.

Quantity of crop/tree (kg):

According to the results presented in Table 4, on Number of fruits /tree, average fruit weight (g), yield per tree (kg), and yield per feddan (kg) on Valencia orange tree, where the first treatment (control) and the seventh treatment (50% mineral fertilization + compost at a rate of 15 kg/tree + biofertilizer at a rate of 36 ml/tree) were the most superior over all. Other coefficients are statistically significant during the two seasons of the study. However, the sixth treatment (75% mineral fertilization + compost at a rate of 7.5 kg/tree + biofertilizer 36 ml/tree) ranked second statistically. on the contrary, the fifth treatment (0% mineral fertilization + compost at a rate of 30 kg/tree) ranked last statistically in this regard during the two study seasons

Table (4). The effectiveness of reducing mineral fertilizer NPK by using organic compost fertilizer and effective microorganisms on Number of fruits /tree, average fruit weight (g), yield per tree (kg), and yield per feddan (kg) on Valencia orange tree during the trial seasons of 2022 and 2023.

Treatments / Parameters	Number of fruits /tree		Average fruit weight (g)		Yield /tree (kg)		Yield / Feddan (kg)	
	2022	2023	2022	2023	2022	2023	2022	2023
T1: Control100% NPK mineral	334.0A	348.33B	198.33A	196.33C	66.240A	68.395C	11.128A	11.490C
T2: 75% NPK mineral + 25% organic	304.0B	322.67C	187.33B	186.67DE	56.940B	60.232D	9.5653B	10.119D
T3: 50 % NPK mineral + 50% organic	296.0BC	301.00D	183.67BC	183.33E	54.376BC	55.886E	9.1347BC	9.388E
T4: 25% NPK mineral + 75% organic	284.0C	284.33E	181.00CD	182.00G	51.40CD	51.747F	8.6347CD	8.6930F
T5: 100 % organic. Compost	228.0E	257.00 G	177.00D	180.17F	40.348E	46.302G	6.7780 E	7.773 G
T6: 75% NPK mineral + 25% organic compost + bio	328.00A	351.33AB	199.00A	201.00B	65.268A	70.616B	10.964A	11.863B
T7: 50 % NPK mineral + 50% organic compost + bio	335.50A	356.17A	201.67A	203.33A	67.660A	72.420A	11.348A	12.165A
T8: 25% NPK mineral + 75% organic compost + bio	300.0BC	304.33 E	183.67BC	184.33F	55.073B	56.037E	9.2533B	9.414E
T9: 100 % organic compost + bio	256.0D	271.00F	187.67B	188.67D	48.072D	51.129F	8.0653D	8.589F

Means followed by the same letter/s within each column didn't significantly differ at 5% level

Fruiting aspects and quality:

The results showed that the natural characteristics of Valencia orange fruits increased significantly with the use of any of the fertilization treatments studied compared to the fifth treatment (0% mineral fertilization + compost at a rate of 30 kg/tree) during the two seasons of the study. however, the largest increase from a statistical standpoint was achieved from the first treatment (control) and the seventh treatment (50% mineral fertilization + compost at a rate of 15 kg/tree + Biovit at a rate of 36 ml/tree), where both effective treatments showed almost the same values in the various studied natural characteristics of the fruits. Moreover, the sixth treatment (75% mineral fertilization + compost at a rate of 7.5 kg/tree + Biovit at a rate of 36 ml/tree) ranked second statistically, followed by the second treatment (75% mineral fertilization + compost at a rate of 7.5 kg/tree). This trend was correct during the two seasons of the study, with a few exceptions, especially with the average fruit shape and with regard to the average fruit shape (fruit length/fruit width) for the summer orange variety and the response to the treatments. The results of the study clearly showed that the differences were relatively small that it cannot be taken into account from a statistical point of view during the two study seasons.

Table 5. The effectiveness of reducing mineral fertilizer NPK by using organic compost fertilizer and effective microorganisms on Polar diameter (cm), Equatorial diameter (cm), Fruit Volume (ml), and Fruit shape index on Valencia orange tree during the trial seasons of 2022 and 2023.

Treatments Pa	Polar diameter (cm)		Equatorial diameter (cm)		Fruit Volume (ml)		Fruit shape index	
	2022	2023	2022	2023	2022	2023	2022	2023
T1: Control100% NPK mineral	9.35A	9.11B	8.420A	8.25BC	237.67A	234.67AB	1.109A	1.104B
T2: 75% NPK mineral + 25% organic.	9.13BC	9.02C	8.21BC	8.02DE	226.00BC	224.33C	1.112A	1.124A
T3: 50 % NPK mineral + 50% organic..	8.91D	8.70D	8.02D	7.91E	222.67 C	220.33D	1.111A	1.099 BC
T4: 25% NPK mineral +	8.47E	8.08E	7.58E	7.60G	220.33C	223.00CD	1.116A	1.062D

75% organic.								
T5: 100 % organic. Compost	7.66G	7.78G	7.33F	7.18H	196.67D	200.00F	1.045B	1.083C
T6: 75% NPK mineral + 25% organic compost + bio	9.21AB	9.33A	8.29AB	8.37AB	231.33AB	232.33B	1.110A	1.115AB
T7: 50 % NPK mineral + 50% organic compost + bio	9.35A	9.37A	8.420A	8.44A	234.67A	236.67A	1.110A	1.109AB
T8: 25% NPK mineral + 75% organic compost + bio	9.01CD	9.14B	8.06CD	8.13 CD	219.33C	223.33C	1.118A	1.123A
T9: 100 % organic compost + bio	7.90F	8.00F	7.71E	7.75F	202.00D	204.00E	1.023B	1.032E

Means followed by the same letter/s within each column didn't significantly differ at 5% level.

Fruit Peel thickness (mm), Juice Weight (gm), Juice volume (cm3) and Juice%(w/w) :

The results showed that the natural characteristics of Valencia orange trees fruits increased significantly with the use of any of the fertilization treatments studied compared to the fifth treatment (0% mineral fertilization + compost at a rate of 30 kg/tree) during the two seasons of the study. However, the largest increase from a statistical standpoint was achieved from the first treatment (control) (100% NPK) mineral fertilization and the seventh treatment (50% mineral fertilization + compost at a rate of 15 kg/tree + Biovit at a rate of 36 ml/tree) Both effective treatments showed almost the same values in the various studied natural characteristics of the fruits. Moreover, the sixth treatment (75% mineral fertilization + compost at a rate of 7.5 kg/tree + Biovit at a rate of 36 ml/tree) ranked second statistically, followed by the second treatment (75% mineral fertilization + compost at a rate of 7.5 kg/tree), and this was The trend is correct during the two seasons of the study, with few exceptions, especially with regard to the average fruit shape and with regard to the average fruit shape. Juice%(w/w), peel thickness (cm)) and Juice Weight (gm) for the summer orange variety and response to the tested treatments. The results of the study clearly showed that the differences were relatively small and could not be taken into account from a statistical point of view during the two seasons of the study.

Table 6. Effectiveness of different NPK fertilization mineral fertilizers by using compost and effective microorganisms sources on Fruit Peel thickness (mm), Juice Weight (gm), Juice volume (cm^3) and Juice%(w/w) of Valencia orange trees during 2022 and 2023 experimental seasons.

Parameters / Treatments	Peel thickness (cm)		Juice Weight (gm)		Juice Volume (ml)		Juice%(w/w)	
	2022	2023	2022	2023	2022	2023	2022	2023
T1: Control100% NPK mineral	0.463AB	0.473B	92.00A	90.33B	96.33A	94.33B	46.72A	46.01B
T2: 75% NPK mineral + 25% organic.	0.440BCD	0.446CD	86.33B	85.00CD	90.83B	87.50D	46.08A	45.87B
T3: 50 % NPK mineral + 50% organic..	0.426CDE	0.430DE	85.66BC	84.33D	89.33BC	88.00D	46.64A	46.00B
T4: 25% NPK mineral + 75% organic.	0.436CDE	0.433D	85.66BC	86.00C	88.83BC	89.33CD	47.33A	47.25A
T5: 100 % organic. Compost	0.413E	0.406E	83.33D	84.66CD	86.00C	86.66D	45.75AB	46.99A
T6: 75% NPK mineral + 25% organic compost + bio	0.480A	0.470BC	91.33A	92.00A	96.00A	97.00AB	45.89AB	45.77B
T7: 50 % NPK mineral + 50% organic compost + bio	0.486A	0.503A	92.00A	93.00A	98.83A	99.50A	46.50A	47.40A
T8: 25% NPK mineral + 75% organic compost + bio	0.450BC	0.460BC	84.00CD	85.00CD	89.00BC	89.66CD	45.74AB	46.11B
T9: 100 % organic compost + bio	0.420DE	0.426DE	83.00D	84.33D	91.33B	92.66BC	44.27B	44.69C

Means followed by the same letter/s within each column didn't significantly differ at 5% level

T.S.S. (%), total acidity (%), and TSS: Acid ratio:

In this regard, the percentage of total dissolved solids, the percentage of total acidity, the percentage of soluble solids/acidity, the percentage of total sugars, and the content of fruit juice are the chemical properties studied for the Valencia orange trees during the two studied seasons. Regarding their response to the different tested treatments, the results showed that the response of the chemical characteristics of summer orange fruit juice. The different treatments studied largely followed the same trend as previously observed with the natural traits of the fruits. However, the differences were relatively more constant with the natural traits of the fruits. The results showed that the first treatment (100% mineral fertilization) and the seventh treatment (50% mineral fertilization + compost at a rate of 15 kg/tree + biovit at a rate of 36 ml/tree) respectively. They were the most effective in this regard during both the 2022 and 2023 experimental seasons. Moreover, the sixth treatment (75% mineral fertilization + compost at a rate of 7.5 kg/tree + Biovit at a rate of 36 ml/tree) ranked second statistically. In terms of the effect on the chemical properties of fruit juice. While the opposite was true with the fifth treatment (0% mineral fertilization + compost at a rate of 30 kg/tree), which significantly caused the lowest values of the chemical characteristics of fruit juice during the two experimental seasons of 2022 and 2023. In addition, the other parameters that were examined between the two parameters mentioned above were in the same direction during the two seasons of a few exceptions to the study, particularly with regard to the ratio of dissolved solids to acidity, which was marginally impacted by the parameters examined during the course of the two study seasons.

Table 7. Effectiveness of different NPK fertilization mineral fertilizers by using compost and effective microorganisms sources on T.S.S. (%), total acidity (%), and TSS: Acid ratio of Valencia orange trees during 2022 and 2023 experimental seasons.

Parameters / Treatments	T.S.S (%)		Total Acidity(%)		TSS: Acid ratio	
	2022	2023	2022	2023	2022	2023
T1: Control100% NPK mineral	10.50A	10.86A	1.183A	1.226A	8.873AB	9.457AB
T2: 75% NPK mineral + 25% organic.	10.20A	10.46AB	1.113AB	1.113CDE	8.785AB	9.462AB
T3: 50 % NPK mineral + 50% organic..	9.90AB	10.06BC	1.166A	1.190AB	8.545AB	9.327BC
T4: 25% NPK mineral + 75% organic.	9.43BC	9.80CD	1.110AB	1.140C	8.496AB	9.796AB
T5: 100 % organic. compost	8.53D	9.26E	1.050BC	1.073E	8.134B	8.945C
T6: 75% NPK mineral + 25% organic compost + bio	10.40A	10.80A	1.170A	1.200AB	8.892AB	9.666AB
T7: 50 % NPK mineral + 50% organic compost + bio	10.20A	10.80A	1.133AB	1.156BC	9.004A	9.740AB
T8: 25% NPK mineral + 75% organic compost + bio	9.23BC	10.60A	1.110AB	1.126CD	8.314AB	9.822A
T9: 100 % organic compost + bio	8.83CD	9.60DE	0.986 C	1.090DE	8.479AB	9.419ABC

Means followed by the same letter/s within each column didn't significantly differ at 5% level.

total sugars (%) and V.C. (mg/100ml juice. :

In this context, the percentage of total soluble solids, the Total sugars and the content of fruit juice of ascorbic acid (vitamin C) are the chemical properties studied for the summer season. oranges during the two study seasons. Regarding their response to the different tested treatments, the results showed that the response of the chemical characteristics of Valencia orange trees fruit juice. The different treatments studied largely followed the same pattern with the fruits' inherent qualities as previously noted. However, the differences were relatively more constant with the natural traits of the fruits. the results showed that the first treatment (100% mineral fertilization) and the seventh treatment (50% mineral fertilization + compost at a rate of 15 kg/tree + Biovit at a rate of 36 ml/tree) respectively. They were the most effective in this regard during both the 2022 and 2023 experimental seasons. Moreover, the sixth treatment (75% mineral fertilization + compost at a rate of 7.5 kg/tree + Biovit at a rate of 36 ml/tree) ranked second statistically. In terms of the effect on the chemical properties of fruit juice. While the opposite was true with the fifth treatment (0% mineral fertilization + compost at a rate of 30 kg/tree), which significantly caused the lowest values of the chemical characteristics of fruit juice during the two experimental seasons of 2022 and 2023. In addition, the other parameters that were examined between the two parameters mentioned above were in the same direction during with a few exceptions, particularly in regard to the ratio of soluble solids to acidity, which was marginally impacted by the factors examined over the course of the study's two seasons.

Table 8. Effectiveness of different NPK fertilization mineral fertilizers by using compost and effective microorganisms sources on total sugars (%) and V.C. (mg/100ml juice) of Valencia orange trees during 2022 and 2023 experimental seasons.

Parameters	Total sugars (%)		V.C (mg/100ml juice)	
Treatments	2022	2023	2022	2023
T1: Control100% NPK mineral	10.10A	10.66A	42.13A	45.46A
T2: 75% NPK mineral + 25% organic.	9.76AB	9.96BC	39.13B	40.76 B
T3: 50 % NPK mineral + 50% organic..	9.50BC	9.73CD	37.06 CD	38.26BC
T4: 25% NPK mineral + 75% organic.	9.26C	9.63D	35.63DE	36.60CD
T5: 100 % organic. Compost	8.70D	9.06 E	34.36E	34.60D
T6: 75% NPK mineral + 25% organic compost + bio	9.96A	10.20B	43.06A	45.60A
T7: 50 % NPK mineral + 50% organic compost + bio	9.93A	10.03BC	39.76BC	39.76BC
T8: 25% NPK mineral + 75% organic compost + bio	9.40BC	9.73CD	36.20D	37.10CD
T9: 100 % organic compost + bio	9.16C	9.80CD	35.96DE	37.90BCD

Means followed by the same letter/s within each column didn't significantly differ at 5% level.

The results are further explained by the fact that when biofertilizer is added to organic compost, the nutrients decompose and become more easily absorbed by plants. Furthermore, adding microbine as a biofertilizer assisted in supplying phosphate and nitrogen, which are necessary for a number of biological functions in the trees. A high ultimate total yield in tons per feddan resulted from the trees being encouraged to utilize the availability of these elements, which is demonstrated in robust vegetative and fruit growth. Comparing Valencia orange trees to the control, **El-Aidy *et al.* (2018**) discovered that treating them with compost, mineral fertilizers, and biofertilizers greatly enhanced the quantity of fruits and yield per tree. Our findings on the rise in Valencia orange fruit yield, fruit weight per tree, and fruit number. All types of soil benefit from organic fertilizer, which also raises plant productivity, alters pH, and enhances the physical, chemical, and biological characteristics of the soil. By changing the soil's pH, adding organic fertilizers raises the quantity of available phosphorus as well as the exchangeable potassium, calcium, and other microelements. It also increases the amount of organic matter in the soil. It also encourages the growth of soil microorganisms and increases the microbial community and microbial enzyme activity. **Abou-Hussein *et al*., 2002)**., production, and fruit quality of citrus trees vegetative growth, production, and fruit quality are all greatly influenced by bio-fertilizers, making them one of the most critical components of plant development and soil productivity. **(Abdelaal *et al*., 2013, El-Khawaga and Maklad, 2013 and El-Khayat and Abdel Rehiem, 2013).** In addition to being easy to apply on the ground, bio-fertilizers are safe for people, animals, and the environment. They can boost crop yields and reduce the expenses associated with some farming operations. Although it significantly lowers the rate of application of mineral fertilizers, it does not replace them. **(Ishac, 1989 and Saber, 1993).** The fundamental objective of efficient microorganisms is to use the genus of microorganisms found in nature to reestablish a balanced environment in both soil and water. In general, EM technology has been used globally and is regarded as a successful and adaptable technique in horticulture and agriculture for systems of crop and animal production.. (**Chamberlain *et al*., 1997**). EM is utilized to improve organic farming conditions and soil fertility. (**Higa and Wididana, 1991**). Our conclusions are corroborated by the outcomes acquired by **Mansour and Shaaban (2007)** and **Abo-Gabien, (2021).** and **Sharaf *et al*., (2011)** on Washington Navel Orange Trees, **Osman, *et al*., (2011) Zaghloul and Knany (2012)** on Newhall naval orange**, Barakat *et al*., (2012)** on Bartamuda date, palm **Salama *et al*., (2014)** on "Hayany" Date Palm**, Baiea *et al*., (2015)** on banana cv. Grande Naine, **Peralta-Antonio *et al*., (2014)** on mango, **EL-Gioushy and Baiea (2015)** on apricot, **EL-Gioushy (2016)** on **pomegranate trees, Mostafa, *et al*., (2016)** Washington navel orange**, El-Badawy, (2017)** on Valencia orange**, Samra *et al*.**, **(2017)** Washington navel orange,, **El-Badawy *et al*., (2017)** Washington navel orange**,** Trees, **Baiea *et al*., (2017)** on Wonderful pomegranate trees, **El-Gioushy *et al*., (2018)** on Fagri Kalan Mango trees**, El-Gioushy and Eissa (2019)** on Washington Navel Orange and **Fikry *et al*., (2020)** on Murcott tangerine trees. The nutritional value and edibility of the fruit are impacted by the ongoing use of chemical fertilization, which also degrades soil fertility and features and deposits heavy metals in plant tissues.

(Tamara *et al.*, 2005). Everyone agrees that one of the most important aspects influencing tree growth, productivity, and fruit quality is nutrition., **(Kassem and Marzouk, 2002)**, Nonetheless, a significant issue for fruit tree producers is the high expense of mineral fertilizer. According to a recent study, mineral fertilizers can contribute to environmental deterioration and health problems. Furthermore, agrochemicals must be administered in high quantities due to the poverty of agricultural land, which over time significantly pollutes the environment. Organic farming and other accessible natural resources should be used responsibly and in balance to make agriculture sustainable **(Kabeel *et al.*, 2005).**

Conclusion

From the results obtained, it can be recommended, to reduce 50% of NPK chemical fertilizers that have harmful effects on human health and the environment with other environmentally friendly and cheap sources, through organic fertilizer (compost) at a rate of 15 kg/compost tree + Biovit compound at a rate of 36 ml. /Tree to, fruit quality of Valencia orange trees Which also works to reduce the cost of production and produce high-quality fruits suitable during the two experimental seasons of Valencia orange trees.

Reference

A.O.A.C. (2005) Association of Offcial Agricultural Chemists, Offcial Methods of Analysis, 14th ed., Benjamin Franklin Station, Washington D.C., U.S.A. pp. 490 – 510.

Abd Ella, E.E.S.K.A. (2006). Effect of biofertilization on reducing chemical fertilizers, vegetative growth, nutritional status, yield and fruit quality of Arabi pomegranate trees. J. Agri. & Env. Sci. Alex. Univ., Egypt, 5(3): 1-23.

Abd El-Migeed, M.M., S. El-Ashry and A.M. Gomaa (2006). The integrated fertilization of Thompson seedless grapevines with organic manures, biofertilizers and low dose of mineral nitrogen. Res. J. Agri. & Biol. Sci., 2: 460-466.

Abd El-Razek, E., A.S.E. Abd-Allah and M.M.S. Saleh (2012). Yield and fruit quality of Florida Prince peach trees as affected by foliar and soil applications of humic acid. J. Appl. Sci. Res., 8(12): 5724-5729.

Abdelaal, A.H.; F.F. Ahmed; S.E. El-Masry and A.A. Abdallah (2013): Using potassium sulphur as well as organic and bio fertilization for alleviating the adverse effects of salinity on growth and fruiting of Valencia orange trees. Stem Cell 4(4):27-32.

Abo-Gabien, M. G. (2021). Effect of Magnetic Iron and Potassium Humate on Some Flowering and Fruiting Characteristics of Olive Trees . Annals of Agricultural Science, Moshtohor, 59(5), 711-722.

Abou-Hussein, S. D.; El-Oksha, I.; El-Shorbagy, T. and Gomaa, A. M. (2002): Effect of cattle manure, biofertilizers and reducing mineral fertilizer on nutrient content and yield of Potato plant. Egypt. J. Hort., 29 (1): 99-115.

Ahmed, M.F. and M.N. Mohamed (2018). Improved productivity of Superior Seedless grapevines using irradiated compost and bio-fertilization in the desert land. Arab. J. Nucl. Sci. Appl., 51(3): 94-103.

Baiea, M. H. M.; Abdel Gawad-Nehad, M. A. and Abedelkhalek, A. (2017): Influence of natural alternative NPK and biofertilizations on vegetative growth and nutritional status of young Wonderful pomegranate trees. Asian Journal of Soil Science and Plant Nutrition. 2(3): 1-8.

Baiea, M.H.M., S.F. EL-Gioushy and T.F. El-Sharony (2015). Effect of feldspar and bio-fertilization on growth, productivity and fruit quality of banana cv. Grande Naine. International Journal of Environment, 4(4): 210-218.

Barakat, M.R.; T.A. Yehia and B.M. Sayed (2012): Response of Newhall naval orange to bio-organic fertilization under newly reclaimed area conditions i: vegetative growth and nutritional status. Journal of Horticultural Science & Ornamental Plants 4 (1): 18-25.

Chamberlain, T.P.; Daly; M.J. and C.N. Merfield (1997): Utilization of Effective Microorganisms in commercial organic agriculture: A Case Study from New Zealand. Proc. 5th InternationalKyusei Nature Farming Conference, pp: 120–123. Bangkok, Thailand.

Duncan, D. B. (1955): Multiple ranges and multiple F. test. Biometrics, 11: 1- 42.

El-Aidy, A., Esa, W. and Alam-Eldein, S. (2018) Effect of organic and bio-fertilization on vegetative growth, yield, and fruit quality of 'Valencia 'orange trees. Journal of Productivity and Development, 23(1), 111-134

El-Badawy, H.E.M. (2017): Partial substitution of Valencia orange chemical fertilization by bio-organic fertilization conjoint with algae extract foliar spray. Middle East Journal of Applied Sciences, 7(4): pp, 1016-1030.

EL-Gioushy, S. F. (2016): Productivity, fruit quality and nutritional status of Washington navel orange trees as influenced by foliar application with salicylic acid and potassium silicate combinations. Journal of Horticultural Science & Ornamental Plants 8 (2): 98-107.

El-Gioushy, S. F. and M. A. Eissa (2019): Effectiveness of different NPK fertilization sources on growth, Nutritional status, productivity and fruit quality of Washington navel orange trees. Journal of Horticultural Science & Ornamental Plants, 11 (2): 134-143.

EL-Gioushy, S. F. and M. H. M. Baiea (2015): Partial Substitution of Chemical Fertilization of Canino Apricot by Bio and Organic Fertilization. Middle East Journal of Applied Sciences. 5(4): 823-832.

El-Gioushy, S.F.; A.A bedelkhalek and A.M.R.A. Abdelaziz (2018): Partial replacement of mineral NPK by organic and bio-fertilizers of Fagri Kalan mango trees. Journal of Horticultural Science & Ornamental Plants, 10(3): 110-117.

El-Haddad, M.E.; Y.Z. Ishac, and M. L. Mostafa (1993): The role of bio-fertilizers in reducing agricultural costs, decreasing environment pollution and raising crop yield, Arab Univ. J. Agric. Sci. Ain Shams Univ., 1 (1): 147-195.

El-Khawaga, A.S. and M.F. Maklad (2013): Effect of combination between bio and chemical fertilization on vegetative growth, yield and quality of Valencia orange fruits. HortScience Journal of Suez Canal University, 1: 269-279.

El-Khayat, H.M. and S.M. Abdel Rehiem (2013). The use of biofertilizerto enhance fruit quality and productivity Zaghloul and Samani date palms. Alex. J. Agri. Res., 58(2): 131-140.

El-Kinany, S., E. Achbani, M. Faggroud, L. Ouahmane, R. El Hilali, A. Haggoud and R. Bouamri (2018). Effect of organic fertilizer and commercial arbuscular mycorrhizal fungi on the growth of micropropagated date palm cv. Feggouss. J. the Saudi Society of Agri. Sci., 18(4): 411-417.

El-Sisy, W.A., M. Sourour and E. El-Said (2011). Effect of using bio and mineral fertilizers on growth, yield and fruit quality of guava cv. Seedy Montkhab. Alexa. Sci. Exchange J., 32(1): 76-84.

Eman, A. Abdel-Moniem; A. S. E. Abd-Allah and M. A. Ahmed (2008): The combined effect of some organic manures, mineral N fertilizers and algal cells extract on yield and fruit quality of Williams banana Plants. American Eurasian J. Agric. & Environ. Sci., 4 (4): 417- 426.

Fikry, A. M.; Abou-Sayed; T.A.M. Ahmed; F.S. Mohsen and M.M. Ibrahim (2020): Effect of nitrogen fertilization through inorganic, organic and biofertilizers sources on vegetative growth, yield and nutritional status in Marcott tangerine trees. Plant Archives Volume 20 No. 1, pp. 1859-1868.

Grzyb, Z.S., W. Piotrowski, P. Bielicki, L.S. Paszt and E. Malusà (2012). Effect of different fertilizers and amendments on the growth of apple and sour cherry rootstocks in an organic nursery. J. Fruit Ornam. Plant Res., 20(1): 43-53.

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 vegetative growth and flowering of Picual olive trees. World Journal of Agricultural Sciences 3 (2): 210-217.

Higa, T. (1991). Effective microorganisms: A biotechnology for mankind. In: Parr, J.F., S.B. Hornick and C.E. Whitman (eds.), Proc First International Conference on Kyusei Nature Farming, pp: 8–14. U.S. Department of Agriculture, Washington, DC.

Ishac, Y. Z. (1989): Inoculation with associative N2-fixers Egypt. Nitrogen fixation with non-legumes, Kluwer Academic Publishers. Pp. 241-246.

Kabeel, H.; G. S. Abd EL-Latif and A. A. Khalil (2005): Effect of soil application of different mineral and biofertilizer treatments on growth, fruiting parameters, fruit properties and leaf nutrient content of "Canino" apricot trees. J. Agric. Sci. Mansoura Univ., 30(3): 1583-1594.

Kannaiyan, S. (2002): Biotechnology of Bio-fertilizers Alpha Sci. Inter. Ltd. B.O. Box 4067 Pang Boorne R. 68 U.K. pp. 1-275.

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. Advan. Agric. Res., 7 (1): 118-126.

Khamis, M.A., M.M. Sharaf, F.M. Abd-EL-Latif, S.I. Habashy and R. A. Kelani. (2017). Impact of Inorganic and Bio-organic Fertilization on Growth, Yield and Fruit Quality of Young fruitful mango trees "Fajri Kalan cv.". Middle East J. Agri. Res., 6(2): 340-347.

Kurer, B.S., D.R. Patil, K. Gandolkar, R.K. Mesta, M.S. Nagaraj, A.M. Nadaf and D.

P.Prakash (2017). Response of pomegranate to different organic manures under northern dry zone of Karnataka, India. Int. J. Curr. Microbiol. App. Sci., 6(11): 86-90.

Mansour, A.E.M. and E.A. Shaaban (2007): Effect of different sources of mineral N applied with organic and biofertilizers on fruiting of Washington navel orange trees. Journal of Applied Sciences Research, 3(8): 764-769.

Mostafa, M. F. M.; M.S.S. El-Boray; A.M. N. Shalan and A. H. Ghaffar (2016): Effect of magnetized irrigation water levels and compost on vegetative growth, leaf mineral content and water use efficinecy of Washington navel orange trees. J. Plant Production, Mansoura Univ., Vol. 7 (2): 249 – 255.

Mostafa, R.A. (2008). Effect of bio and organic nitrogen fertilization and elemental sulpher application on growth, yield and fruit quality of Flame seedless grapevines Assiut J. Agri. Sci., 39(1): 79-96.

Moustafa, M. H. (2002): Studies on fertilization of Washington navel orange trees. Ph.D. Dissertation Fac. of Agric., Moshtohor, Zagazig University, Benha Branch, Egypt.

Mustafa, A.A.A., M.A.F. Badran, R.A. Ibrahim and T.K.R. El-Mahdy (2014). Response of Sewy date palm to different application of n-fertilizers. Assiut J. Agri. Sci., 45(3): 25-37.

Osman, S. O.A.; F. M. A. Moustafa; H. A. Abd El-Galil and A.Y.M. Ahmed (2011): Effect of yeast and effective microorganisms (EM1) application on the yield and fruit characteristics of Bartamuda date palm under Aswan conditions. Assiut J. of Agric. Sci., 42 (Special Issue) (The 5th Conference of Young Scientists Fac. of Agric. Assiut Univ. May(8): 332-349.

Osman, S.M. and I.E. Abd El-Rhman (2010). Effect of organic and bio Nfertilization on growth, productivity of fig tree (*Ficus carica*, L.). Res. J. Agri. & Biol. Sci., 6(3): 3195-328.

Peralta-Antonio, N.; A. Rebolledo-Martínez; B A. ecerril-Román; E. D. Jaén-Contreras and A. L. del Angel-Perez (2014): Response to organic fertilization in mango cultivars: Manila, Tommy Atkins and Ataulfo. J. Soil Sci. Plant Nutr. 14, 688–700.

Saber, S. M. (1993): The use of multi-strain bio-fertilizer in agriculture. Theory and practice. Proc. Sixth International Symposium on Nitrogen Fixation with Non-legumes, Ismailia, Egypt, p.61.

Salama, A. S.M.; O. M. El- Sayed and O. H.M. El Gammal (2014): Effect of effective microorganisms (EM) and potassium sulphate on productivity and fruit quality of "Hayany" date palm grown under salinity stress. IOSR Journal of Agriculture and Veterinary Science. 7 (6): Ver. I, PP 90-99.

Samra, N. R.; M. I.EL-Kady; A. R. Hikal and M. S. H. Ghanem (2017): Effect of organic fertilization on fruit Set, dropping, yield and fruit quality of Washington navel orange. J. Plant Production, Mansoura Univ., Vol. 8 (8): 853 – 858.

Sau, S., P. Mandal, T. Sarkar, K. Das and P. Datta (2017). Influence of biofertilizer and liquid organic manures on growth, fruit quality and leaf mineral content of mango cv. Himsagar. J. Crop and Weed, 13(1): 132- 136.

Shaban, A.E.A. and A.T. Mohsen (2009): Response of citrus rootstocks and transplants to biofertilizers. Journal of Horticultural Science & Ornamental Plants 1 (2): 39-48.

Sharaf, M.M.; Bakry, Kh. A. and EL- Gioushy, S. F. (2011): The influence of some bio and organic nutritive addenda on growth, productivity, fruit quality and nutritional status of Washington navel orange trees. Egypt.J. of Appl.Sci. 26(9) 253- 268.

Smith, F. Cilles, A.M.; K.J. Hamilton; and A.P. Gedes (1956): Colorimetric methods for determination of sugar and related substances. Anal. Chem.;28(3):350-356.

Snedecor, G.W. and Cochran, W.G. (1990) "Statistical Methods", 7th ed. The Iowa state. Univ. Press. Ames. Iowa. USA. 593p.

Tamara, V. R.; G. K. Nadezhda and A. M. Natalya (2005): Influence of soil application of biological and mineral fertilizers on the growth, yield, and fruit biochemical components of 'Charavnitsa' apple, and on some agrochemical soil characteristics. Acta Scientiarum Polonorum, Hortorum Cultus, 4, 59-67.

Wardowski, W.F.; S. Nagy and W. Grierson (1985). Fresh citrus fruit. Avi. Publ. Co. Inc. Westport, U.S.A.79-83.

Zaghloul, A.E. and Knany, R.E. (2012): Effect of Balanced Fertilization and Fertilizer Levels on Navel Orange Yield and Fruit Quality. Alexandria science exchange journal, Vol.33, No.1january-march, 44-54.

تأثير تقليل الأسمدة النيتروجينية والفوسفاتية والبوتاسية المعدنية على صفات الجودة لثمارالبرتقال الفالنسيا.

محمد جمعه محمد أبوجبين1- حامد الزعبلاوي محمود البدوي2-
1- صابر محمود محمد بكير -شريف فتحي عيد السيد الجيوشي 2
1- قسم الانتاج النباتي – مركز بحوث الصحراء – مصر
2 – قسم البساتين – كليه الزراعة بمشتهر – جامعة بنها – مصر

أجريت هذه الدراسة في مزرعة خاصه بوادى النطرون – محافظة البحيرة – مصر خلال موسمين متتاليين 2022 & 2023 علي أشجار البرتقال الفالنشيا (الصيفى) عمر 10 سنوات المثمرة والمطعومة علي أصل ليمون الفولكاماريانا بغرض تقليل الأسمدة الكيماوية NPK وذلك عن طريق إستخدام التسميد العضوى (الكمبوست) والتسميد الحيوى (مركب البيوفيت) وأثر ذلك على صفات الجودة للبرتقال الصيفى.

قد أجريت هذه التجربة تحت ظروف التصميم التجريبى التجربة كاملة العشوائية.

أظهرت النتائج المتحصل عليها بوضوح أن المعاملة الأولى (الكنترول) والمعاملة السابعة (50% تسميد معدنى + كمبوست بمعدل 15كجم/شجرة + بيوفيت بمعدل 36مل /شجرة) كانتا الأفضل إحصائيًا في هذا الصدد وذلك خلال الموسمين التجريبيين. أما المعاملة السادسة (75% تسميد معدنى + كمبوست بمعدل 7.5كجم/شجرة + حيوى 36 مل /شجرة) فقد احتلت المرتبة الثانية إحصائيًا ، تليها المعاملة الثانية (75% تسميد معدنى + كمبوست بمعدل 7.5كجم/شجرة) خلال موسمي الدراسة. من ناحية أخرى ، كانت المعاملة الأكثر فاعلية لأشجار البرتقال الصيفى التى عوملت بالمعاملة الاولى (الكنترول) و السابعة (50% تسميد معدنى + كمبوست بمعدل 15كجم/شجرة + بيوفيت بمعدل 36مل/شجرة) وذلك خلال الموسمين التجريبيين 2022 و 2023 يمكن التوصية تحت نفس ظروف التجربة بتقليل 50 ٪ من الأسمدة الكيماوية NPK ذات التأثيرات الضارة على صحة الإنسان والبيئة بمصادر أخرى صديقة للبيئة ورخيصة الثمن وذلك عن طريق السماد العضوى (الكمبوست) بمعدل 15كجم/شجرة كمبوست + مركب بيوفيت بمعدل36مل /شجرة لتحسين الإنتاجية وجودة الثمار لأشجار البرتقال الصيفى.