Assiut Journal of Agricultural Sciences 54 (3) 2023 (93-106) Website: http://ajas.journals.ekb.eg/
ISSN: 1110-0486 / EISSN: 2356-9840 E-mail: ajas@aun.edu.eg

(Original Article)

Effect of Soil Conditioners on Growth and Fruiting of Manfalouty Pomegranate Trees Grown in New Reclaimed Region

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DOI: 10.21608/ajas.2023.209696.1250

Abstract

This study was conducted at a special farm existing at Banu Aday, Manfalout city, Assiut Governorate, Egypt, to study the impact of soil conditioners on growth and fruiting of Manfalouty pomegranate trees during 2020 and 2021 seasons. Hundz soil, bentonite and compost were applied in January of each season. This study designed as a randomized complete block system with four transactions and three replicating's two trees for each.

Data indicated that using hundz soil, bentonite or compost considerably raised the shoot length, leaf area, chlorophyll, relative water contents, leaf-N, P and K%. However, all treatments considerably reduced the leaf proline content. All soil conditioners used considerably increased the yield/tree and commercial fruit % and considerably reduced the percentages of fruit splitting and sunburn compared to use check treatment. Moreover, all treatments used caused a significant improvement the fruit traits represented by increasing weight, arils percentage of fruits, total soluble contents as well as reducing sugar, vitamin C and anthocyanin contents and lack the total acidity in comparison with control.

Using hundz soil and compost as soil conditioners recorded the highest units of general evaluation these values were 99.6 and 97.2, respectively.

In general view, obtained results ensure the importance of using soil conditioners i.e., hundz soil or compost to produce pomegranate trees as improving the characteristics of fruit and thus increasing the marketing value of yield. In addition, these soil conditioners treatment used lead to soil improvement, growth and increase production yield, then reduce production cost.

Keywords: *Hundz soil, Compost, Pomegranate, Yield, Nutrient status*

Introduction

Pomegranate trees are a commercial importance fruit tree species belonging to family Punicaceae. The pomegranate tree is indulgent of aridity and robust winter and can grow completely beneath the fatigue of desert status. All parts of tree are useful, the fruits had many medical purposes that used to treat several causes, i.e., diarrhea, hyperacidity, tuberculosis, leprosy, abdominal pain and fever

Received: 10 May 2023/ Accepted: 18 June 2023/ Published online: 1 July 2023

as well as used as functional food industry (Paranjpe, 2001 and Martins *et al*., 2006). Juice of fruit has antioxidants i.e., polyphenols, tannins and anthocyanins, and then can be used to treat cancer and chronic inflammation (Michel *et al*., 2005 and Ephraim and Robert, 2007). In Egypt, the total cultivated area attained 76924 feddans due to M.A.L.R. (2020).

Newly, the overall world request to organic production that without fertilizers chemicals and pesticides as well as artificial soil improvers, etc., is of very worry at the minute to save the environmental system from their reverse effects hence, normal soil conditioners are the most effective agents in stabilizing soil organic matter (El-Aggory and Abd El- Rasoul, 2002). Using the combinations of organic source and natural soil conditioners raised soil hydraulic conductivity and water diffusionism of sandy soil as well as swell the growth and fruiting of trees (Khalifa *et al*., 1997 and Ali *et al.,* 2009).

Hundz soil is a normal soil improves that is make out of dry pressured cellulose and recycles agricultural matter, formed in grains and alter in bulk (0.2-2.0 mm) that is eligible to infiltrate throughout the sand grains, formation a suitable environment to grow and development of plants due to normal sources, such as bentonite, compose one of the ecophysiological ways to restorate the soil fertility and to advise a comrade crops system, as cereals-leguminous several dings imported that bentonite get better the characteristics of sandy soils by excessing their resources clay (Benkhelifa, 1997). Adding hundz soil or bentonite to sand soil led to the improve of the physiochemical and hydrous properties at the expense of its high capacity to save back the water and its strong exchange cationic capacity and to raise the final yield (Dejou, 1987 and Abdel-Aleem *et al*., 2000).

Finally, using the normal substances to improve the soil was onset in the last years to place the demands of prospective production. Using natural soil amendments for acidic sandy soils can arrange into three groups; 1- green manure and other organic matter, 2- farmyard manure and different composts, 3- mining soil improving material originating from mining industry e.g., alginate (Yassad and Belkhodja, 2007 and Ali *et al*., 2009).

Organic fertilizers such as compost are topic various reactivity, while they have their main effects generally in the long term and play a direct role in plant growth as a source of all necessary nutrients in obtainable and improving physiochemical characteristics of soil. It has been used to raise soil fertility, raise water holding capacity, changes soil pH and reduce of plant diseases (Marathe *et al*., 2017).

Many investigations have focused on the impact of using soil conditioners on vegetative growth and fruiting of pomegranate trees (Khalifa *et al*., 1997; Aseri *et al*., 2008; Ali *et al*., 2009; Abd-Ella Eman *et al*., 2010; Abd-Ella, 2011and El-Salhy *et al*., 2015). So, the objective of the current study was designed to study the effect of different soil conditioners in growth and fruiting of pomegranate trees.

Materials and Methods

This research was conducted through the two consecutive years of 2020 and 2021 on Manfalouty pomegranate trees grown at a special farm existing at Banu Aday, Manfalout region, Assiut Governorate, Egypt, where the soil has a sandy loam texture and its features were existed in Table (1), accordingly to Wilde *et al*. (1985).

Table 1. Some physical and chemical characteristics of soil (0-90 cm deep) of the experimental site

Soil characteristics	Rate	Soil characteristics	Rate
Sand (%)	79.52	Organic matter (%)	0.53
Silt (%)	10.0	Total nitrogen (%)	0.16
Clay (%)	10.48	Mg (ppm)	194.4
Texture grade	Sandy loam	K (ppm)	15.60
Field capacity, FC (%)	27.91	Na (ppm)	172.5
pH (1-2.5)	7.75	Cl (ppm)	667.4
EC (ds m^{-1})	0.98	HCO_3 (ppm)	610.0
Ca (ppm)	376.0		

The annual fertilization of trees was formed of 15 m^3/feddan of farmyard in December every season by 1.0 Kg/tree calcium superphosphate (15.5% P_2O_2). Also, 2.0 Kg/tree ammonium sulphate (20.6% N) and 1.0 Kg/tree of potassium sulphate (48% K_2O) were funded in three dosages in February, April and June.

Twenty-four healthy trees, 8 years old, grown at 3.5x3.5 m apart under drip irrigation system with no apparent nutrient symptoms of deficiency were selected and assigned to carry out for this research. The taken trees under the same horticulture practices except soil conditioners. Four soil conditioner levels were arranged as follows:

T1- 100% of recommended fertilization only (check treatment).

T2- 100% of the recommended fertilization plus 10 kg/tree hundz soil.

T3- 100% of recommended fertilization plus 10 kg/tree bentonite.

T4- 100% of recommended fertilization plus 20 kg/tree compost.

Hundz soil, bentonite and compost were dressing to the soil under drip irrigation lines in January of each year. The physical and chemical properties of hundz soil, compost and bentonite are shown in Tables (2 and 3).

Table 2. Some physiochemical characteristics of hundz soil and compost.

	Density kg/m^3	pH	Ec	Sp	total N%	Total P%	Total K%	organic matter %	Carbon %	Ash %	C/N ratio
Hundz soil	255	7.4	1.4	278	1.29	0.077	0.11	87.16	45.33	21.84	1:35.4
Compost	-	7.6	1.42	-	1.30	0.080	0.11	78.20	45.30	-	1:35.4

Table 3. Bentonite composition.

$SoiO_2$	Al_2O_3	Na_2O	CaO	MgO	K_2O	Fe_2O_3	Sio_2	Clay %	Silt %	Sand %
73.20%	11.40	0.31	2.67%	1.05%	2.58%	0.29%	59.39%	83.75	8.69	3.53

The study was put up as a complete randomized block design with three replications (two trees/replicate).

The next parameters were estimated throughout the two seasons.

A- Characteristics of vegetative growth

Four main shoots almost equal in growth and spread on four directions of the tree were chosen and labeled in April for the following vegetative mensurations:

1- Shoot length (cm).

2- Area of leaf (cm2), was calculated as according to Ahmed and Morsy (1999) and then estimated the total leaf area/shoot.

3- Total chlorophyll of leaf was measured with chlorophyll meter (Minolta SPAD 502 plus).

B- Nutritional status, proline of leaves and relative water content

Specimens of fifty mature leaves were looked random from the spring shoots in mid-September to measurement N, P and K as well as leaf contents of proline and relative water of using of digestion solution with a mixture of sulfuric acid and hydrogen peroxide (Wilde *et al.,* 1985). Nitrogen was determined by the micro-kjeldahl methods (Bremner and Mulvaney, 1982), phosphorus and potassium were measured by colorimetrically and flame photometer, respectively (Jackson, 1958). Also, leaf proline concentration was estimated on basis of dry weight accordingly to Singh *et al*. (1973) and the relative water content of leaf determined and estimated according to Smart and Bingham (1974).

C- Yield components

Fruits were gathered harvested and yield/tree (sound, splitting and sunburned fruits) was counted. The infamous fruits were disconnected to calculate the percentage of splitting and sun-burning fruits as a percentage of the total number of fruits/tree.

D- Fruit quality

Specimens of 10 fruits were taken random from every tree to measure the quality of fruit. The weight, arils % of fruit, juice percentage and the chemical fruit quality, i.e., total soluble contents, total acidity (expressed as g citric acid/100 ml juice), ascorbic acid (mg/100 ml juice) and reducing sugar were estimated due to A.O.A.C. methods (1985). Also, the peel and juice anthocyanin content were estimated according to Rabino and Mancinelli (1986).

E- Overall valuation of used soil conditioners

Scoring valuation of used soil conditioners were estimated on the criterion of 100 units that were divided into between the growth of vegetative, yield and fruit

quality. Hundred units were shared between the studied treatments 40 units for vegetative growth (leaf area/shoot, proline and relative water contents and chlorophyll), 30 units for the yield component (yield/tree, fruit splitting % and marketable fruit %) and 30 units for quality of fruit (fruit weight, TSS and juice anthocyanin contents) 10 units for each. Inside every of these traits, the trait that recorded the highest values given 10 units for it. Relative values due to the other tested treatments were calculated. The next equation was used to estimate these traits.

$$\text{Trait} = \sum \frac{B}{A} \text{x10}$$

Where:

A= the highest values registered for studied traits.

B= registered value for the specific trait of considered treatments.

The currented data were statistically analyzed according to Gomez and Gomez (1984) and Mead *et al*. (1993) using the L.S.D. values at 5% to definitive the significance of the differences among different treatment means.

Results

1- Effect of soil conditioners on growth and nutritional status

Existing in Tables (4, 5 and 6) exhibited the impact of various soil conditioners on shoot length, leaf traits and the percentage of N, P and K in leaves throughout 2020 and 2021 seasons. It is clear from the results that the data took identical trend during the two studied seasons.

Data exhibited that the shoot length, leaf parameters and leaf-N, P and K percentage considerably effects to different sources of soil conditioners comparing with untreated ones (check treatment). All used soil conditioners significantly raised shoot length, leaf area and the percentage of total chlorophyll as well as relative water content and N, P and K in leaves compared to untreated ones. On contrary, these soil conditioners significantly reduced the leaf proline content comparing with untreated ones. Moreover, using the hundz soil recorded the highest shoot and leaf traits than compost or bentonite. No significant various on these studied parameters due to soil amendments with hundz soil or compost.

Percentage of increasing the leaf area/shoot (10.77, 9.36 and 13.85%), chlorophyll (19.98, 16.51 and 23.76%) for average of the two seasons) due to hundz soil (T_2), bentonite (T_3) and compost (T_4) compared to the check treatment (T_1), respectively. The corresponding increment percentages of N% were (7.65, 5.88 and 9.41%, respectively. Highest values of vegetative parameters were recorded on pomegranate trees due to amendment by hundz soil comparing with other treatments. No significant various due to the use hundz soil or compost. The decrement percentage of leaf proline attained (6.61, 4.11 and 5.73 as an average of the two seasons) due to use hundz soil, bentonite and compost compared to untreated one, respectively.

Table 4. Impact of some soil conditioners on shoot length, leaf area and leaf area/shoot of Manfalouty pomegranate trees in 2020 and 2021 seasons.

Treatments	Length of shoot (cm)			Area of leaf (cm^2)			Area of leaf /shoot (cm^2)		
Seasons	2020	2021	Mean	2020	2021	Mean	2020	2021	Mean
Control	58.21	62.18	60.20	6.17	6.24	6.21	257.8	267.8	262.8
Hundz soil	67.58	69.72	68.65	7.28	7.20	7.24	291.6	306.8	299.2
Bentonite	63.84	66.88	65.36	6.87	6.79	6.83	281.6	293.2	287.4
Compost	65.20	67.64	66.42	7.11	6.91	7.01	285.3	296.9	291.1
L.S.D.	2.91	3.11		0.29	0.26		9.92	10.38	

Table 5. Impact of some soil conditioners on leaf chlorophyll, proline and relative water contents of Manfalouty pomegranate trees in 2020 and 2021 seasons.

Treatments	Chlorophyll SPAD value			Proline mg/g			Relative water %		
Seasons	2020	2021	Mean	2020	2021	Mean	2020	2021	Mean
Control	60.84	58.85	59.85	14.27	13.54	13.81	77.13	75.68	76.41
Hundz soil	73.89	74.25	74.07	13.18	12.26	12.72	83.32	83.86	83.59
Bentonite	69.58	69.88	69.73	13.49	12.61	13.05	80.86	81.42	81.14
Compost	71.88	71.73	71.81	13.28	12.38	12.83	81.66	82.46	82.06
LSD	2.42	2.18		0.28	0.31		2.32	2.11	

Table 6. Impact of some soil conditioners on leaf N, P and K% of Manfalouty pomegranate trees in 2020 and 2021 seasons.

Treatments	N%			P%			K%		
Seasons	2020	2021	Mean	2020	2021	Mean	2020	2021	Mean
Control	1.63	1.77	1.70	0.291	0.311	0.301	1.38	1.47	1.43
Hundz soil	1.79	1.93	1.86	0.310	0.332	0.321	1.50	1.62	1.56
Bentonite	1.72	1.87	1.80	0.307	0.329	0.318	1.47	1.60	1.54
Compost	1.75	1.91	1.83	0.311	0.335	0.323	1.46	1.59	1.53
LSD	0.07	0.07		0.018	0.016		0.06	0.07	

2- Effect of different soil conditioners on yield components:

Results presented in Tables (7 and 8) declared that amendment soil by hundz soil bentonite or compost considerably raised yield/tree and percentage of commercial fruit comparing with untreated one. On the other hand, these soil conditioner treatments considerably reduced the percentages of fruit cracking and sunburn comparing with check treatment.

The recorded yield/tree was (27.86, 34.18, 32.57 and 33.59 kg/tree, as an average of the two seasons) and marketable fruit percentage (78.48, 85.40, 83.22 and 83.31% due to control, hundz soil, bentonite and compost, respectively.

The percentage of increasing of yield/tree and marketable fruit percentage were attained (22.68, 16.91 and 20.58) and (8.82, 6.04 and 6.15%) due to use hundz soil, bentonite and compost compared to check treatment, respectively. Also, the percentages of cracking and sunburn were (11.21, 7.48, 8.61 and 8.48%) and (10.36, 7.13, 8.16 and 8.21% as an average of two seasons due to T1 to T4, respectively. The percentage of decreasing of splitting and sunburn of fruits for using hundz soil (T2), bentonite (T3) and compost (T4) under control (T1) attained

(33.27, 23.19 and 24.35%) and (31.18, 21.24 and 20.75 as an av. of the two seasons due to T2, T3 and T4), respectively.

Table 7. Impact of some soil conditioners on yield components of Manfalouty pomegranate trees in 2020 and 2021 seasons.

Treatments	Yield (kg/tree)			Splitting fruit %			Marketable fruit %		
Seasons	2020	2021	Mean	2020	2021	Mean	2020	2021	Mean
Control	26.62	29.10	27.86	11.62	10.80	11.21	77.60	79.36	78.94
Hundz soil	32.10	36.25	34.18	8.31	6.65	7.48	83.64	87.15	85.40
Bentonite	30.60	34.53	32.57	9.23	7.98	8.61	81.60	84.83	83.22
Compost	31.43	35.75	33.59	9.20	7.75	8.48	81.47	85.14	83.31
L.S.D.	0.89	0.98		0.71	0.60		1.98	1.85	

Table 8. Impact of some soil conditioners on sunburn %, arils % and juice volume of Manfalouty pomegranates in 2020 and 2021 seasons.

Treatments	Sunburn %			Arils %			Juice volume (cm^3)		
Seasons	2020	2021	Mean	2020	2021	Mean	2020	2021	Mean
Control	10.88	9.84	10.36	56.93	57.63	57.28	63.1	62.2	62.7
Hundz soil	8.05	6.21	7.13	60.70	61.00	60.90	68.3	66.7	67.5
Bentonite	9.14	7.18	8.16	59.08	59.85	59.47	66.4	65.2	65.8
Compost	9.31	7.11	8.21	58.83	59.66	59.25	66.8	65.2	66.0
L.S.D.	0.63	0.56		1.39	1.36		1.37	1.37	

The highest weight yield/tree and minimum infamous fruits percentage were found due to use hundz soil followed by compost as soil conditioner. Therefore, it is clear that amending the soil with soil conditioners, especially hundz soil or compost has advantageous actions on pomegranate production.

3- Effect of soil conditioners on quality of fruits:

It is seen from the current data existing in Tables (9 to 11) that the amendment the soil with hundz soil, bentonite or compost significantly improved the fruit quality in expression of rising the fruit weight, arils percentage and their contents of soluble solids, reducing sugar, anthocyanin and V.C contents and lessening the total acidity comparing with untreated one. No significant variation in these characteristics due to amendment by hundz soil, bentonite or compost as a soil conditioner sources. Using compost recorded maximum values of most studied parameters. The obtained fruit weight was (350.2, 397.2, 394.8 and 407.5 g. as an average of the two seasons due to T1 to T4, respectively. The identical TSS and vitamin C contents were (16.37, 16.83, 16.74 and 16.99%) and (22.50, 23.93, 23.81 and 24.57 mg/100g as an average of two seasons), respectively. The percentage of increasing of fruit weight was (13.42, 12.74 and 16.36% as an average of the two studied seasons due to use hundz soil, bentonite and compost over the untreated one (control), respectively. Also, the conforming percentage of increasing of TSS% and V.C contents were (2.81, 2.26 and 3.78) and (6.36, 5.82 and 9.20% as an average of the two seasons), respectively.

No significant differences in these traits due to use of hundz soil or compost as a soil conditioner.

These used soil conditioners programs are very substantial of pomegranate trees production in order to improve of fruit quality, induce an increases of marketing yield. Additionally, these used soil amending treatments decrease the production cost and promote the soil fertility.

Table 9. Impact of some soil conditioners on fruit weight and dimension of Manfalouty pomegranates during 2020 and 2021 seasons.

Treatments	Weight of fruit (g)			Length of fruit (cm)			Diameter of fruit (cm)		
Seasons	2020	2021	Mean	2020	2021	Mean	2020	2021	Mean
Control	321.2	379.1	350.2	8.12	8.55	8.34	8.46	8.86	8.66
Hundz soil	363.8	430.6	397.2	8.62	9.17	8.90	8.94	9.34	9.14
Bentonite	358.1	431.5	394.8	8.38	9.00	8.69	8.73	9.13	8.93
Compost	373.5	441.5	407.5	8.41	8.98	8.70	8.75	9.14	8.95
L.S.D.	8.68	6.96		0.22	0.18		0.18	0.16	

Table 10. Impact of some soil conditioners on TSS, reducing sugars and acidity of Manfalouty pomegranates during 2020 and 2021 seasons.

Treatments	TSS%			Reducing sugars %			Acidity %		
Seasons	2020	2021	Mean	2020	2021	Mean	2020	2021	Mean
Control	16.68	16.06	16.37	12.80	12.41	12.61	1.33	1.28	1.31
Hundz soil	17.10	16.55	16.83	13.09	12.82	12.96	1.22	1.21	1.22
Bentonite	16.99	16.49	16.74	13.15	12.69	12.92	1.23	1.22	1.23
Compost	17.24	16.75	16.99	13.33	12.93	13.13	1.21	1.20	1.21
L.S.D.	0.21	0.19		0.19	0.17		0.07	0.06	

Table 11. Impact of some soil conditioners on vitamin C and anthocyanin contents of Manfalouty pomegranates during 2020 and 2021 seasons.

Treatments	Vitamin (C) (mg/100 ml)			Peel anthocyanin (mg/100g)			Juice anthocyanin (mg/100g)		
Seasons	2020	2021	Mean	2020	2021	Mean	2020	2021	Mean
Control	22.10	22.90	22.50	44.25	50.99	47.62	47.73	46.88	46.11
Hundz soil	23.58	24.27	23.93	52.62	55.60	54.11	51.96	53.24	52.60
Bentonite	23.62	24.00	23.81	50.41	53.12	51.77	51.63	50.68	51.16
Compost	24.35	24.78	24.57	52.47	55.13	53.80	51.48	51.48	51.48
L.S.D.	0.48	0.53		1.36	1.45		1.38	1.34	

Overall valuation of the used soil improving

The numerically valuation of amending soil treatments, tables (12 and 13) declared that, using hundz soil or compost gave the maximum units due to the valuation, as it gained the maximum score units (99.6 and 97.2) followed by bentonite which occupied the third rank (95.6).

The overall score (30 units) for pomegranates quality (fruit weight, TSS, and anthocyanin) was significantly varied according to use various soil ameliorates. Using compost recorded the maximum values comparing with use hundz soil, bentonite or untreated one. The studied treatment could be arranged descending based on total score (30) for fruit quality as follows: 29.8, 29.2, 29.6 and 27.0 units for use compost, hundz soil, bentonite and untreated one (control), respectively.

Table 12. General evaluation of soil conditioners effects on vegetative growth and yield components of Manfalouty pomegranates as average of two studied season.

	Vegetative growth					Yield components			
Charact.	**Leaf area (cm^2)**	**Chloro-phyll**	**Proline %**	**RWC %**	**Total**	**Yield kg/ tree**	**Splitting fruit %**	**Marketable %**	**Total**
Score	10	10	10	10	40	10	10	10	30
Control	8.8	8.1	9.3	9.1	35.3	8.1	6.6	9.2	23.9
Hundz soil	10	10	10	10	40.0	10	10	10	30.0
Bentonite	9.6	9.4	9.7	9.7	38.4	9.5	8.8	9.7	28.0
Compost	9.7	9.7	9.9	9.8	39.1	9.8	8.7	9.8	28.3

Table 13. General evaluation of soil conditioners effects on fruit quality of Manfalouty pomegranates as an average of two studied season.

Charact.	Fruit weight (g)	TSS (%)	Anthocyanin (mg/100g)	Total	G. Total
Score	10	10	10	30	100
Control	8.6	9.6	8.8	27	86.2
Hundz soil	9.7	9.9	10	29.6	99.6
Bentonite	9.7	9.8	9.7	29.2	95.6
Compost	10	10	9.8	29.8	97.2

In general view, it finds that amendment via hundz soil or compost led to an increase, the growth and yield components about (13.31 and 10.76%) and (25.52 and 18.46%) and fruit quality about (9.63 and 10.37% as an average of the two seasons, respectively. This means an increase the fertilization used and irrigation water efficiency induced improving soil fertility with decrease the production cost resulting for soil conditioners used.

Hence, such results showed clearly that soil conditioners treatments are considered promising tool to production the pomegranates trees which improving the yield with good quality of fruits, additionally, reducing the cost of production. Variations among these treatments could be original due to their effects on soil fertility, vegetative growth, nutritional status and fruiting. Hence these results are important from economic and horticultural points of view.

Discussion

In general, the currented results, indicated the importance of using soil conditioners to improve the morphology traits in trees of pomegranate, where using Hundz soil may be induce an increase cations exchange capacity and nutrients, that stimulated the plant growth. In this regard, Kay-Shoemake *et al.* (2000) setup that using the soil conditioner raised the obtainability of nutrients, particularly N via promoting the action of soil enzymes (urease and amidase), which included in N cycling. Additionally, the efficient of soil conditioners on lessening the leaked amount of NH_4 and NO_3 (Bres and Weston, 1993), particularly under higher period of irrigation. Then, the biogenesis of proteins DNA and RNA would be promoted major to more initiation and division of the apical meristem cells; consequently, the plant height could be raised. An analogous

trend of results was setup by Khalil (2005), Abd-Ella (2006), Yassad and Belkhodja (2007), Abd-Ella Eman *et al*. (2010) and Abd-Ella (2011).

The preferable effects of organic amending on yield components could be due to the necessary role in raising the obtainability of nutrient feeding, improving the effectiveness of macro-nutrients and its capacity to meet some micro-nutrients requests of crop, which in mutation, should be contemplate on production of high yield.

These results emphasized the necessary importance of organic fertilizers make efficient soil fertility due to give the maximum of superfluity nutrient elements promoting the dissoluble of nutrients and increase the efficiency of microorganisms. Additionally, compost soil application significantly increased the nutritional status of trees and decreased the leaf proline content compared to untreated pomegranate trees. The promotive of soil conditioners on growth, nutritional status and fruiting was emphasized by David (2002), Abd-Ella (2006), Abd-Ella Eman *et al*. (2010), Fayed (2010), Abd-Ella (2011), El-Salhy *et al*. (2015) and El-Salhy *et al*. (2022). Moreover, leaf proline content decreased due to use soil conditioners that decreased the leaked amount of N as NH_4+ and less as NO_3, avails as a nitrogen source and involved the improvements of soil which promoted the infection of organic matter (Wallace and Wallace, 1986) with raising the action of soil enzymes such as urease and amidase (Kay-Shoemake *et al*., 2000) thus N obtainability moving would be raised.

These results are partial corresponding with those lake out by Wallace and Wallace (1986) who setup that using organic source as soil conditioner gave major promoting the growth of plants and raising water holding capacity that decreasing the recurrence and total amount of irrigation required for freelance crops. Analogous, Abbas (1999) showed that adding sulfur fertilizer combined with Nile fertile raised growth traits seedlings due to hold salt cumulation round the roots and sustained the growth and yield (Badr, 1992).

The results illustrated the advantages effect of such soil conditioners in increasing hydraulic conductivity and water diffusion of sandy soils which related on yield and fruit quality (Ali *et al*., 2009).

Conclusion

The nutritional status and yielding of pomegranate trees were improved due use soil conditioners especially hundz soil or compost.

finally, it could be recommended that to increase the production of pomegranate trees in the newly reclaimed area should be added 10 Kg/tree of hundz soil or 20 kg/tree of compost.

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تأثير محسنات التربة على نمو وإثمار أشجار الرمان المنفلوطي النامية في مناطق الاستصلاح الجديدة

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الملخص

أجريت هذه الدراسة خلال موسمي 2020، 2021 بمزرعة خاصة بمنطقة بني عدي – منفلوط– محافظة أسيوط – مصر لدراسة تأثير محسنات التربة على النمو الخضري والحالة الغذائية والمحصول وخصائص ثمار أشجار الرمان المنفلوطي مقارنة بعدم استخدام محسنات التربة. حيث تم إضافة الهانز سويل والبنتونيت والكمبوست كمحسنات للتربة مرة واحدة وذلك خلال شهر يناير.

وقد أظهرت النتائج ما يلي:

أدي استخدام محسنات التربة زيادة معنوية في طول الأفرع ومساحة الأوراق ومحتواها من الكلوروفيل والماء النسبي والعناصر الغذائية مع نقص معنوي في محتوي الأوراق من البرولين مقارنة بعدم استخدام محسنات التربة (المقارنة). كما أدت المعاملات المستخدمة إلي تحسين المساحة الكلية للأوراق والحالة الغذائية للأشجار. أدي استخدام محسنات التربة إلي زيادة المحصول بينما حدث نقص معنوي في نسبة تشقق الثمار ولسعة الشمس وبالتالي زيادة نسبة الثمار الجيدة الصالحة للتسويق مقارنة بعدم استخدام محسنات التربة. وسجل أعلي محصول وأقل نسبة للثمار الغير جيدة بالأشجار المضاف إليها 10 كجم هانز سويل/شجرة ويليها استخدام 20 كجم كمبوست/شجرة. لم تسجل فروق معنوية في النمو والإثمار نتيجة استخدام أي من هانز سويل أو الكمبوست. أدت جميع المعاملات إلي تحسين خصائص الثمار من حيث زيادة وزن الثمرة ونسبة اللب وكذلك زيادة محتواها من السكريات والأنثوسيانين وفيتامين (C) مع نقص نسبة الحموضة الكلية. وذلك مقارنة بدون محسن التربة. أوضحت نتائج تقييم المعاملات المستخدمة أن أفضلها هي استخدام الهانز سويل أو الكمبوست والتي سجلت 97,2;99,6 وحدة للتقييم الرقمي على التوالي.

من نتائج هذه الدراسة يمكن التوصية بأهمية استخدام محسنات التربة خاصة الهانز سويل أو الكمبوست حيث يؤدي ذلك إلي تحسين النمو الخضري والحالة الغذائية للأشجار مع إنتاج محصول عال وثمار جيدة.