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Promising Impacts of Humic Acid and Some Organic Fertilizers on Yield, Fruit Quality and Leaf Mineral Content of Wonderful Pomegranate (*Punica granatum* L.) Trees

Noha A.I. Mansour
Department of Horticulture, Faculty of Agriculture, Ain Shams University, Cairo, Egypt.

THE AIMS of this research were to minimizing mineral nitrogen fertilizers and evaluate the efficiency of some organic fertilizers individually or combined with humic acid on yield, fruit quality and leaf mineral content of "Wonderful" pomegranate trees. This research was carried out through three successive seasons (2015, 2016 and 2017) in Hegazi private orchard located at 57 kilometer from Cairo on the desert road to Alexandria, Egypt on eight years old pomegranate trees "Wonderful" cv. The experiment consists of two levels of humic acid (0 and 50 g/tree/season) and five nitrogen fertilizers form [chicken manure, compost, cattle manure, mineral nitrogen as experiment control 40 kg actual N/fed and mineral nitrogen as orchard control 80kg actual N/fed] .The experiment was designed in factorial experiment in a randomized complete block design. All organic nitrogen sources applied at a rate of 40kg actual N/fed. It could be concluded that, humic acid addition affected lack significant on yield, fruit physical and chemical properties and leaf nutrient content. Generally chicken manure and compost gave the highest values of most characters followed closely by two mineral treatments. When compared between two mineral N treatments the data revealed that 40kg N/fed /year was sufficient to give the highest values of most studied parameters and was equaled by 80kg N/fed /year. Regarding the combination between humic acid and nitrogen fertilizers the data showed that chicken manure and compost without addition of humic acid gave the highest values of yield and fruit characters followed closely by two mineral treatments. Thus it could be safely recommended by fertilizing with (40kg N/fed /year) instead of (80kg N/fed /year) on the other hand, fertilizing by chicken manure or compost (40 g N/tree/year) with or without humic addition (50 g /tree/year) improved yield ,fruit physical & chemical properties and reduce environmental pollution.

Keywords: Chicken manure, Compost, Cattle manure, Fruit quality, Leaf mineral content, Mineral nitrogen, Wonderful pomegranate trees, Yield.

Introduction

The pomegranate (*Punica granatum* L.) was cultivated about 5000 years ago native to central Asia, following to the (Family: punicaceae). In Latin language pomegranate meaning "seeded apple". It is a small tree or shrub with fantastic spring red flowers(Lansky and Newman 2007). The fruit of the pomegranate, actually a berry, naturally divides into small bits of seed and pulp called "arils". Pomegranate are cultivated in tropical, sub-tropical and Mediterranean region since ages especially in Spain, Morocco, Egypt and the drier parts of California. Pomegranate species includes many cultivars such as Manfaloty, El hamede , Panaty, El sokry and Wonderful. Wonderful variety is well known in the world and it is one of the most cultivated species in California and usually used as a commercial juice with high potential health benefits. The fruit is red, big, with a bright appearance, its peel thickness is moderate, arils are small, red and present a good juice yield with high soluble solids content, high acidity (classified as sweet and sour variety) and a dark red color due to the high content of anthocyanins. For these characteristics, it is considered as a good variety for fresh market and also to be processed (Roy and Waskar, 1997).

Humic substances, such as organic matter, humus, humate, humic acid, fulvic acid and humin are play a main role in soil fertility and plant nutrition. Plants grown on soils which contain adequate humin, humic adds (HAs), and fulvic

Corresponding author: e-mail: nosy_2010@yahoo.com
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adds (FAs) are less subject to stress, healthy, gave high yield; and produced crops with high nutritional value. Humic acid (polymeric poly hydroxy acid) is the most important ingredient of organic substances in biological systems. Humic acid is high beneficial to plant and soil; it is play a significant role for increasing microbial activity. It is known as a plant growth bio-stimulate, it promotes nutrient uptake as chelating agent and improves vegetative characteristics and nutritional status (Eissa Fawzia et al., 2007 and Ismail et al., 2007). Humic acid is a complex compound derived from organic matter decomposition. Humic substances have indirect roles involve enhances of soil properties such as aggregation, permeability, aeration, water holding capacity, micronutrient transport and availability (Tan, 2003).

The old Egyptian growers knew an important deal about the value of certain material to plant growth, for they purposely applied both animal manure and ashes from burnt plants and weeds to the soil. The Egyptians had the great luck that their soil was continually renewed with alluvial deposits and flooded by regular inundation from the Nile (Lowrison, 1993). Nitrogen is one of the essential nutrients for plant nutrition; this fact was known in 19^{th} century. Nitrogen is added to plants through mineral and organic fertilization. However, part of mineral fertilizers used in crop production leaching to underground water causing disturbance in the biological balance and polluted underground water which in turn causes harmful effects for humans and animals (Postagate, 1978). Organic farming is a new technique for agriculture production to avoid chemical fertilizers addition. Eco-friendly effects on animal and human health encouraged farmers to convert to organic production (Fayed, 2005). Organic manure is derived from animal or plant residues. It is an excellent source of organic matter, macro- & micro-nutrients, improves aeration, physical condition of soil, promotes root growth and production. It is a sound practice for sustainable agriculture base on low synthetically input. Integrated nutrient management is a production system which favors the maximum use of organic material and inhibits the use of chemical produced inputs for maintain soil productivity and fertility (Sudhakar et al., 2002). Compost application improved the soil chemical composition by increasing cation exchange capacity and soil nutrient content (Shiralipour et al., 1992). Chicken manure may be added as most available and economic alternate for compost to increase Superior grapevine yield, fruit quality and nutrients status as well as reducing pollution (Ahmed Abdelraheem et al., 2015).

Therefore, the targets of this study was to minimizing mineral nitrogen fertilizers and evaluate the efficiency of some organic fertilizers namely (chicken manure, compost and cattle manure) individually or combined with humic acid on the yield, fruit quality and leaf mineral content of Wonderful pomegranate trees

Materials and Methods

The experiment was carried out in three successive seasons (2016, 2017 and 2018) in Hegazi private orchard located at 57 kilometer from Cairo on the desert road to Alexandria, Egypt on eight years old pomegranate trees “Wonderful” cv., planted at 2 × 5m apart around (420 trees / Fed) grown under saran shading net and drip irrigation system was used. Forty uniform and healthy trees with no visual nutrient deficiency symptoms were selected and devoted for carrying out this experiment. The selected trees had the same agricultural treatments during three seasons of study. The orchard soil was sandy loam, the soil was analyzed according to Wilde et al. (1985). (pH = 8.22, ECe =8.0 dS/m, $CaCO_3$ =11.5%, N= 108.6 ppm, P= 26.3 ppm and K= 100.0ppm),

Under this farm conditions nitrogen fertilizers were added at the rate of 80 kg actual N/fed (190.5 g N/tree/season). The study consist of two levels of humic acid (0 and 50 g/tree/season) and five nitrogen fertilizers form , namely (chicken manure, compost, cattle manure, two mineral nitrogen treatments 40 and 80 kg actual N/fed Thus the experiment was laid out in factorial experiment in a randomized complete block design included ten treatments with four replicates and each replicate was represented by one tree.

Regarding humic treatments, the dose 50 g/tree/season (85% potassium humates) was added for selected trees around the dripper area in three equal doses at first week of March, May and July by dissolving humic dose in one liter of water. Control treatments (without humic acid) were irrigated with water.

Organic nitrogen from (chicken manure, compost and cattle manure, it was applied at 40 kg N/fed, each tree received (95.5 g N/tree/season). Mineral nitrogen treatments were added through drip irrigation system from different sources of common mineral nitrogen fertilizers like [calcium nitrate (15.5%) ammonium sulfate (20.5%) and ammonium nitrate (33.5%)] according to the growth stage through the growing season, while organic nitrogen sources (chicken manure, compost and cattle manure) were added once in the second week of February in each season as a trench (30cm depth) under the drippers for each selected tree. All organic nitrogen sources obtained from the same place for each season, chemical analysis (average of three seasons) of the organic fertilizers was presented in Table 1.

Measurements

Chlorophyll content and leaf dry matter %: Twenty fully expanded leaves 3 to 4-month old from nonfruiting shoots at the middle third of the branch 5-7th leaves from plant top were collected in mid-July to measure chlorophyll content and leaf dry matter. Chlorophyll content was measured by using a Soil Plant Analysis Division (SPAD) – 502 MINOLTA chlorophyll meter (Konica Minolta Business Solutions, Tokyo, Japan). Leaves were washed then weighted after air dried (fresh weight). Then leaves were oven dried at 60-70$^{.}$ till a constant weight (dry weight) and leaf dry matter % was calculated.

Yield

At maturity on the first week of October in each season the average number of fruits / tree was counted. Twenty fruit from each tree (replicate) were harvested to get the average fruit weight of each treatment. Such average was multiplied by the average number of fruits / tree to get the average yield/tree (kg).

TABLE 1. Characteristics of different organic fertilizers sources.

Properties	Chicken manure	Compost	Cattle manure
Weight of m^3 (kg)	460.00	630.00	900.17
Moisture content (%)	24.30	35.60	22.84
pH value (1:10)	8.60	8.60	8.40
EC value (1:10) (mmohs/cm)	5.00	6.50	4.00
Organic matter (%)	63.66	37.58	9.00
Total nitrogen (%)	2.70	1.45	1.20
C/N ratio	11.89	13.38	3.80
K (%)	0.87	1.23	0.90
P (%)	0.60	0.50	0.40

Fruit quality

For each season, sample of six fruit / tree were randomly taken for the evaluation of physical and chemical fruit properties:

Peel thickness (mm), peel weight (g), arils weight (g), juice weight (g), juice volume (ml) were determined and estimated percentages of arils /fruit weight, juice/fruit weight and juice / arils weight were calculated.

The ascorbic acid content was determined by using 2, 6 dichlorophenolindophenol dye and 3% oxalic acid as substrate. Ascorbic acid was calculated as milligrams /100 milliliters of juice (AOAC 1995). Total acidity (TA) was determined by titrating10 ml of juice with 0.1 mol/L NaOH to pH8.1 (AOAC 1984). The acidity percentage was calculated as mg anhydrous citric acid per 100 milliliters of juice .The total soluble solids (TSS) was determined as % in juice by means of hand refractometer. The TSS / Acid ratio was calculated.

Leaf mineral content

Dry leaves which collected to determine chlorophyll content and leaf dry matter % were grounded and digested using sulphoric acid and oxygen peroxide to determine N, P, K, Fe, Zn and Mn. Nitrogen was determined by the Micro-Kjeldahlmethod ,phosphorus was determined by the spectrophotometer, potassium was determined by a flame photometer (Jackson, 1973). Iron, zinc and manganese were estimated by using an atomic absorption according to the method of (Cottenie et al., 1982).

Statistical analysis

The obtained data were statistically analyzed by using the analysis of variance as reported by (Snedecor and Cochran, 1980). Means were differentiated by using Duncan's multiple range tests at 5 % (Duncan, 1955).

Results and Discussion

Effect on leaf chlorophyll content and leaf dry matter (%) of wonderful pomegranate

Results in Table 2 show that, the effect of humic acid, nitrogen fertilizers sources and their interaction on chlorophyll content and leaf dry matter % during 2015, 2016 and 2017 seasons. Results concerning chlorophyll content revealed that, chlorophyll content was affected significantly by humic acid in the second and third seasons only, but with contrary effect. Whereas, chlorophyll content it was affected by nitrogen sources in the three seasons, while cattle manure recorded the least values in the three seasons. On the other hand the highest values were obtained by mineral nitrogen (treatments 1 & 2; 40 and 80 kg N/fed / year). Regarding the interaction, in most cases, two mineral nitrogen treatments without humic acid gave the highest values of chlorophyll content. Whereas, cattle manure without humic gave the lowest values in the three seasons.

Leaf dry matter percentage was significantly affected by humic acid, the highest significant values observed by control trees especially in the first and third seasons. Regarding the effects of nitrogen sources and the interaction it was difficult to observe a constant trend.

In this respect, (Eman et al., 2010), who reported that the combination between 50% of the recommended rate of mineral nutrients (1Kg ammonium sulphate+0.5Kg potassium sulphate +0.5 Kg super phosphate /tree) +humic acid 25g/tree gave the best results for all vegetative growth measurements of Arabi pomegranate trees while when this treatment was combined with humic acid at lower concentration 12.5 g / tree or compost at rate of 25Kg /tree the results showed intermediate values of vegetative growth parameters .

Effect on fruit weight, fruit number and yield of wonderful pomegranate

Results in Table 3 show that, the effect of humic acid, nitrogen fertilizers sources and their interaction on fruit weight, fruit number and yield

TABLE 2. Effect of humic acid and some nitrogen fertilizers sources on leaf chlorophyll and leaf dry matter of wonderful pomegranate trees during 2015, 2016 and 2017seasons.

Nitrogen fertilizers sources	Humic acid (50g/tree/year)					
	Without	With	Mean	Without	With	Mean
	Leaf chlorophyll (SPAD)			Leaf dry matter %		
			2015 season			
Chicken manure	63.6c	62.6cd	63.1BC´	45.5de	45.5de	45.5B´
Compost	58.7cd	61.2cd	60.0C´	44.5e	43.9e	44.2B´
Cattle manure	55.9d	63.2c	59.5C´	54.5a	43.4c	49.0A´
Mineral 1	71.1a	64.4bc	67.8A´	51.3bc	49.0c	50.2A´
Mineral 2	70.5ab	63.3 c	66.9AB´	53.3ab	47.3cd	50.3A´
Mean	64.0A	63.0A		50.0A	45.8B	
			2016 season			
Chicken manure	59.4ab	60.0a	59.7A´	29.8b	54.6a	42.2A´
Compost	57.3ab	58.9ab	58.2AB´	31.8ab	42.5ab	37.2A´
Cattle manure	52.3b	55.0ab	53.7B´	49.9ab	33.5ab	41.7A´
Mineral 1	56.4ab	60.0a	58.2AB´	36.2ab	44.2ab	40.2A´
Mineral 2	54.1ab	58.7ab	56.4AB´	37.3ab	43.2ab	40.2A´
Mean	55.9B	58.5A		37.0A	43.6A	
			2017 season			
Chicken manure	64,6b	61.5bc	63.0B´	48.3bc	42.8de	44.2A´
Compost	61.8bc	60.7bc	61.3B´	45.5b-d	41.5e	43.7B´
Cattle manure	56.1d	59.3cd	57.7C´	45.9d-d	40.7e	43.0B´
Mineral 1	64.0bc	61.7bc	62.8B´	49.0b	48.3bc	48.7A´
Mineral 2	69.3a	64.0bc	66.7A´	53.3a	46.3b-d	48.8A´
Mean	63.2A	61.4B		47.8A	44.0B	

In each season, means of each of humic acid and nitrogen fertilizers sources or their interactions having the same letters are not significantly different at 5% level.

TABLE 3. Effect of humic acid and some nitrogen fertilizers sources on fruit weight, fruit number /tree and yield of wonderful pomegranate trees during 2015, 2016 and 2017seasons

Nitrogen fertilizers sources	Humic acid (50g/tree/year)								
	Without	With	Mean	Without	With	Mean	Without	With	Mean
	Fruit weight (g)			Fruits number /tree			Yield (kg /tree)		
				2015 season					
Chicken manure	498.9ab	508.9ab	503.9A´	71.7a	61.7ab	66.7A´	34.9a	30.0b	32.9A´
Compost	546.7ab	454.4b	500.6A´	63.5ab	67.9ab	65.7A´	34.7a	30.8b	32.8A´
Cattle manure	565.6ab	540.0ab	552.8A´	40.5c	41.2c	40.8C´	22.3f	22.0f	22.3C´
Mineral 1	570.0a	487.4ab	528.7A´	44.3c	58.7ab	49.3B´	25.2de	28.3c	26.7B´
Mineral 2	558.9ab	480.0ab	519.4A´	42.07c	56.6b	51.5B´	24.2ef	27.0cd	25.6B´
Mean	548.0A	494.2B		52.4A	57.2A		28.3A	27.8A	
				2016 season					
Chicken manure	536.7a	480.4ab	508.5A´	53.7cd	62.7b	58.2B´	32.3a	30.2ab	31.2A´
Compost	532.5a	494.2ab	513.3A´	57.0c	57.3c	57.2B´	30.3ab	28.3a-c	29.3AB´
Cattle manure	424.2bc	389.2ab	406.7B´	50.0d	56.7c	53.3C´	21.2d	22.02cd	21.6C´
Mineral 1	430.8bc	390.0c	385.4B´	57.7c	67.3a	62.5A´	24.8b-d	26.3a-d	25.6BC´
Mineral 2	420.8bc	350.0c	410.5B´	54.3cd	66.0ab	60.2AB´	22.9cd	23.2cd	23.0C´
Mean	469.0A	420.8B		54.5B	62.0A		26.3A	26.0A	
				2017 season					
Chicken manure	485.6a-c	570.0a	527.8A´	59.7a	54.0a-d	56.8A´	28.9a-c	30.6ab	29.8A´
Compost	546.7ab	505.6a-c	526.1A´	57.7ab	56.7a-c	57.2A´	31.2ab	28.6a-c	29.9A´
Cattle manure	400.0bc	393.3c	396.7B´	52.0b-d	51.3b-d	51.7B´	20.7d	20.3d	20.5B´
Mineral 1	515.6a-c	457.8a-c	486.7AB´	50.3cd	51.3b-d	50.8B´	26.0a-d	23.5b-d	24.8B´
Mineral 2	504.4a-c	453.6a-c	470.0AB´	50.0d	49.7d	49.8B´	25.2a-d	21.7cd	23.5B´
Mean	490.4A	472.5A		53.9A	52.6A		26.4A	25.0B	

In each season, means of each of humic acid and nitrogen fertilizers sources or their interactions having the same letters are not significantly different at 5% level.

of pomegranate trees during 2015, 2016 and 2017 seasons.

Results showed that in the first and second seasons only fruit weight was affected significantly by humic acid whereas, control trees gave the higher values than treated one. Fruit weight was affected significantly by nitrogen fertilizers sources especially in the second and third seasons whereas, chicken manure and compost gave the higher values than other treatments, followed closely by mineral nitrogen treatments (1and 2) in the third season. Regarding the interaction, the results indicated that, combining compost or chicken manure with or without humic gave the highest value as compared with other combinations especially in the second and third seasons.

Fruit number was significantly affected by humic acid levels in second season only and treated trees gave the highest values. The results showed that, in the three seasons fruit number was significantly affected with nitrogen fertilizers sources whereas, chicken manure and compost gave the higher values than other treatments epically, in the first and third season. On the other hand, cattle manure gave the lowest significant values especially in the first and second seasons. Regarding the interaction the trend was clearer in first and third seasons whereas, chicken manure and compost with or without humic treatments gave the highest significant values. On the other hand, in most cases cattle manure with or without humic treatments gave lower values than other treatments.

Yield was insignificantly affected by humic acid levels while in the third season control trees gave the highest significant value as compared with treated one. Regarding nitrogen fertilizers sources it was clear that, in three seasons chicken manure and compost gave the highest significant values. On the other hand, cattle manure gave

TABLE 4. Effect of humic acid and some nitrogen fertilizers sources on fruit physical properties of wonderful pomegranate trees during 2015, 2016 and 2017seasons.

Nitrogen fertilizers sources	Humic acid (50g/tree/year)														
	Without	With	Mean	Without	With	Mean	Without	With	Mean	Without	With	Mean	Without	With	Mean
	Peel weight(g)			Peel thickness (mm)			Arils weight(g)			Juice weight (g)			Juice volume (ml)		
2015 season															
Chicken manure	229.4bc	208.9bc	219.2B′	8.21bc	6.89d	7.55B′	242.8a	277.2a	260.0A′	190.6a	216.7a	203.6A′	179.4a	208.9a	194.2A′
Compost	255.6ab	190.5c	223.1A′	9.22a	8.98ab	9.11A′	245.6a	237.8a	241.7A′	183.9a	181.7a	182.8A′	178.9a	172.8a	175.8A′
Cattle manure	292.2a	242.8a-c	267.5A′	7.84c	6.77de	7.31B′	263.3a	258.3a	260.8A′	173.9a	180.6a	177.2A′	167.8a	172.2a	170.0A′
Mineral 1	250.0ab	223.9bc	237.0AB′	6.30de	6.03de	6.17C′	278.9a	252.8a	265.8A′	206.1a	168.9a	187.5A′	185.6a	161.6a	173.6A′
Mineral 2	248.9ab	211.1bc	230.0B′	6.37de	5.90e	6.13C′	262.2a	242.8a	252.5A′	187.2a	178.9a	183.1A′	172.2a	168.9a	170.6A′
Mean	255.2A	215.5B		7.59A	6.92B		258.6A	253.8A		188.3A	185.3A		176.8A	176.9A	
2016 season															
Chicken manure	268.9a	188.9bc	228.9A′	5.21a	3.89bc	4.55BC′	278.3a	229.4bc	253.9A′	190.0a	138.3cd	164.2A′	185.56a	136.1b	160.8A′
Compost	227.8ab	226.7ab	227.2A′	5.74a	5.48a	5.61AB′	256.1ab	196.1c-e	226.1A′	175.0ab	131.7cd	153.3A′	172.8a	128.9b-d	150.8A′
Cattle manure	218.9ab	187.2bc	203.1A′	6.23a	6.18a	6.21A′	173.3de	180.0de	176.7B′	111.1de	119.4c-e	115.3B′	118.3b-d	117.2b-d	117.8B′
Mineral 1	155.6c	151.6c	153.6B′	3.28c	3.64bc	3.46C′	203.9cd	172.2de	188.1B′	147.2bc	96.7e	113.6B′	135.6b-c	103.0d	119.1B′
Mineral 2	178.9bc	148.3c	163.6B′	3.57bc	3.52c	3.55C′	201. c-e	155,6e	178.3B′	137.2cd	90.0e	122.0B′	133.3b-d	105.0cd	119.1B′
Mean	210.0A	180.5A		4.81A	4.54A		222.6A	186.7B		152.1A	115.2B		149.1A	118.1B	
2017 season															
Chicken manure	205.6a	257.2a	231.4A′	4.89ab	4.83ab	4.86A′	197.8ab	268.3a	233.7A′	141.1ab	192.8a	167.0A′	128.3ab	170.0a	149.2A′
Compost	260.6a	240.6a	250.6A′	3.73b	5.37ab	4.55A′	235.0ab	204.4ab	219.7A′	178.9a	145.0ab	162.0A′	167.2a	134.4ab	150.8A′
Cattle manure	198.3a	184.4a	191.4A′	5.78a	4.85ab	5.32A′	175.6b	182.8b	179.2A′	115.6b	117.8b	116.7B′	108.9b	110.0b	109.5B′
Mineral 1	212.7a	188.7a	200.7A′	4.90ab	4.66ab	5.32A′	244.4ab	216.7ab	230.6A′	168.3ab	164.2ab	166.3A′	152.2ab	151.1ab	151.6A′
Mineral 2	217.8a	168.3a	193.1A′	5.22ab	5.42ab	4.78A′	230.0ab	208.3ab	219.2A′	159.4ab	152.2ab	155.8A′	148.9ab	144.4ab	146.7A′
Mean	219.0A	207.8A		4.91B	5.03A		216.6A	216.1A		152.7A	154.4A		141.1A	142.0A	

In each season, means of each of humic acid and nitrogen fertilizers sources or their interactions having the same letters are not significantly different at 5% level.

the least values. The data of interaction revealed that, combining compost or chicken manure with or without humic gave higher values than other combinations especially in the second and third seasons. While, cattle manure with or without humic gave lower values than mineral treatments (40 and 80 kg N/fed /year).

These results are in line with those obtained by (Altieri and Nicholls, 2003), who reported that, soil organic matter has been positively correlated to the soil fertility and crops productivity. Soils with high organic matters, in most cases exhibit good soil fertility and crops grown in such soils generally exhibit lower abundance of several insect. Moreover, (Eman et al., 2010) revealed that, 50% of the recommended rate of NPK (1Kg ammonium sulphate + 0.5Kg potassium sulphate +0.5 Kg super phosphate) /tree) + humic acid at 25g /tree gave the highest significant values of fruit numbers, fruit weight and yield of Arabi pomegranate trees than other treatments. On the other hand, Marzouk and Kassem (2011) found that, the application of organic manures (chicken manure, cow dung and composted domestic refuse either alone or in combinations with mineral NPK on Zaghloul dates did not differ from each other in their effect on yield and fruit quality. While, Magda et al., (2012) found that, increasing humic acid doses from 32 to 48g/tree enhanced vegetative growth and all yield and fruiting parameters of Manfalouty pomegranate trees.

Effect on fruit physical properties of wonderful pomegranate

Results in Tables 4 and 5 show the effect of humic acid, nitrogen fertilizers sources and their interactions on some fruit physical properties of pomegranate in 2015, 2016 and 2017 seasons.

Concerning, peel weight was affected significantly by humic acid levels in first season only and control trees gave higher values than treated one. On the other hand, peel weight was affected significantly by nitrogen fertilizers sources in the first and second seasons only and in general different organic nitrogen sources (chicken manure, compost and cattle manure) gave the highest values followed by mineral treatment (40kg N/fed /year). Regarding the interaction, the peel weight affected significantly by interaction in the first and second seasons only whereas, compost and cattle manure without humic gave the higher values than most other treatments in both seasons expect chicken manure in the second season.

Peel thickness was affected significantly by humic acid levels in the first season and the third seasons but with contrary trend. Regarding nitrogen fertilizers sources the highest significant values were obtained by compost in the first and the second seasons followed by chicken manure and cattle manure in the second season. Other treatment gave more or less similar values with the same statically stand point. The interaction was clearer in the first and in the second seasons and compost with or without humic gave the highest values in both season followed by cattle manure with or without humic treatments and chicken manure without humic treatment in the second season.

Arils weight was affected significantly by humic acid levels in the second season only, whereas untreated trees gave the higher value than treated one. Arils weight was significantly affected by nitrogen fertilizers sources in the second season only, whereas chicken manure gave the highest significant followed closely by compost. Other treatment gave more or less similar values with the same statically stand point. The effect of interaction was clear in the second season whereas chicken manure and compost without humic gave the highest significant values.

Results concerning juice weight and juice volume indicated that, two characters were significantly affected by humic acid levels in the second season only, whereas untreated trees gave the higher value than treated one. It was observed that, the highest values of juice weight and juice volume were obtained by chicken manure and compost in the second and the third season followed closely by mineral treatments (40 and 80 kg N/fed /year) especially in the third season. Results revealed that the interaction was significant in the second and the third seasons. Whereas, the highest significantly values were obtained by (chicken manure, compost and mineral 1 &2) with or without humic application.

From the results in Table 5, it could be concluded that humic acid addition in most cases was lacked significance on physical properties percentage of wonderful pomegranate fruit (arils/ fruit weight%, juice/fruit weight% and juice /arils weight). On the other hand, physical properties percentage of fruit were significantly affected by nitrogen fertilizers sources especially in the first and in the third seasons and the highest values were obtained by chicken manure and compost fertilizers followed by two mineral levels (40 and 80 kg N/fed /year) . While, cattle manure fertilizer gave the lowest significant values in most cases.

Regarding the combination between humic and nitrogen fertilizers in most cases, it is clear that physical properties percentage of wonderful pomegranate were increased by chicken manure and compost fertilizers followed by two mineral treatments under both humic levels.

In this respect (Abd El-Rhman, 2017) studied on, Manfalouty pomegranate trees and pointed out that magnetic iron at 100g or 200g/tree and potassium humate at 25g or 50g/tree treatment gave the highest significant values of fruit grain percentage while the lowest values were obtained from untreated trees in both seasons.

Effect on some fruit chemical properties of wonderful pomegranates: Results in Table 6 show that, the effect of humic acid, nitrogen fertilizers sources and their interactions on fruit chemical properties of wonderful pomegranates trees in 2015, 2016 and 2017seasons.

TSS was significantly affected by humic acid levels in the second and in the third seasons but with contrary trend. On the other hand, TSS was significantly affected by nitrogen fertilizers sources whereas, compost gave the highest values of TSS in the three seasons followed closely by mineral treatments (40 and 80 kg N/fed /year) in the first and in the second seasons and with chicken manure fertilizer in the third season. Regarding the interaction the lowest values were obtained when combing cattle manure with humic (50 g humic /tree/year). In most cases, the highest values were obtained by chicken manure and compost fertilizers followed closely by two mineral treatments under both humic levels.

Acidity was significantly affected by humic application and 50 g humic/tree/year gave the highest significant values especially in the second and in the third seasons. In the most cases, chicken manure fertilizer gave the lowest values

TABLE 5. Effect of humic acid and some nitrogen fertilizers sources on some fruit physical properties percentage of wonderful pomegranate trees during 2015, 2016 and 2017seasons.

Nitrogen fertilizers sources	Humic acid (50g/tree/year)								
	Without	With	Mean	Without	With	Mean	Without	With	Mean
	Arils /fruit weight (%)			Juice/fruit weight (%)			Juice /arils weight (%)		
	2015 season								
Chicken manure	48.8b-d	54.2a	51.5A´	38.3bc	42.2a	40.2A´	78.39a	77.8a	78.0A´
Compost	45.0d	52.4ab	48.7AB´	33.7d-f	40.0ab	36.8B´	74.9ab	76.3a	75.6AB´
Cattle manure	46.6d	47.9b-d	47.2B´	30.8f	33.4d-f	32.1C´	66.1d	69.8cd	68.0C´
Mineral 1	48.7b-d	52.1ab	50.4AB´	36.1b-e	34.4c-f	35.3B´	74.1a-c	71.5bc	72.8B´
Mineral 2	46.6cd	50.7a-c	48.6AB´	33.2ef	37.4b-d	35.3B´	71.3bc	73.7a-c	72.5B´
Mean	47.1B	51.5A		34.4B	37.5A		73.0A	73.8A	
	2016 season								
Chicken manure	46.5a	47.7a	47.1A´	31.8ab	28.8a-c	30.3A´	68.4ab	60.2c-e	64.3A´
Compost	47.9a	39.5a	43.7A´	32.8ab	26.5bc	29.7A´	68.4ab	67.1a-c	67.8A´
Cattle manure	41.2a	46.7a	44.0A´	26.5bc	31.1a-c	28.8A´	64.4b-d	66.3a-c	65.4A´
Mineral 1	47.4a	44.2a	45.8A	34.2a	24.8c	29.5A´	72.4a	56.2e	64.3A´
Mineral 2	47.9a	45.0a	46.5A´	32.8ab	26.4bc	29.6A´	68.3ab	58.5de	63.3A´
Mean	46.2A	44.6B		31.6A	27.5B		68.4A	61.7B	
	2017 season								
Chicken manure	40.5a	47.3a	43.9AB´	28.9b	34.1ab	31.5AB´	71.5a-c	71.6a-c	71.5A´
Compost	42.8a	40.3a	41.5B´	32.7ab	28.6b	30.6AB´	76.7a	70.1a-c	73.7A´
Cattle manure	48.9a	45.8a	44.9AB´	29.0b	29.5b	29.2B´	65.8bc	64.3c	65.1B´
Mineral 1	47.4a	47.4a	47.4A´	32.7ab	35.9a	34.3A´	69.0a-c	76.1a	72.5A´
Mineral 2	45.6a	48.2a	46.9AB´	31.6ab	35.0ab	33.3AB´	69.3a-c	73.4ab	71.3A´
Mean	44.0A	45.8A		31.0A	32.6A		70.4A	71.2A	

In each season, means of each of humic acid and nitrogen fertilizers sources or their interactions having the same letters are not significantly different at 5% level.

TABLE 6. Effect of humic acid and some nitrogen fertilizers sources on chemical properties of wonderful pomegranate trees during 2015, 2016 and 2017seasons.

Nitrogen fertilizers sources	Humic acid (50g/tree/year)											
	Without	With	Mean	Without	With	Mean	Without	With	Mean	Without	With	Mean
	TSS%			Acidity%			TSS / acid ratio			Ascorbic acid (mg/ 100ml juice)		
2015 season												
Chicken manure	15.6ab	15.4ab	15.5BC´	0.83b	0.90ab	0.87A´	18.8a	17.2ab	18.0A´	9.00bc	9.30a-c	9.15B´
Compost	16.3ab	16.3ab	16.3A´	0.96ab	0.92ab	0.94A´	17.3ab	17.7ab	17.5A´	10.50a	9.75ab	10.13A´
Cattle manure	15.4ab	15.2b	15.3C´	0.87ab	1.06a	0.97A´	17.7ab	14.3b	16.0A´	9.60ab	8.70bc	9.15B´
Mineral 1	15.8ab	16.5a	16.1AB´	0.93ab	1.01ab	0.97A´	17.2ab	17.6ab	16.6A´	8.7bc	8.03c	8.35B´
Mineral 2	15.4ab	16.1ab	15.8A-C´	0.97ab	0.96ab	0.96A´´	15.9ab	16.0ab	16.7A´	9.57ab	8.10c	8.84B´
Mean	15.7A	15.9A		0.91A	0.97A		17.4A	16.6A		9.47A	8.78B	
2016 season												
Chicken manure	14.8cd	14.2de	14.5B´	0.93b	0.94b	0.94BC´	16.1ab	15.0a-c	15.5AB´	9.33b	8.33b	8.83B´
Compost	14.8cd	15.3bc	15.1A´	1.1a	0.94b	1.01AB´	13.9c	16.3a	15.1AB´	12.3a	9.33b	10.83A´
Cattle manure	15.3bc	13.7e	14.5B´	0.94b	0.87b	0.91C´	16.3a	15.8a-c	16.0A´	8.00b	9.00b	8.50B´
Mineral 1	14.4de	16.2a	15.3A´	0.90b	1.2a	1.04A´	16.1ab	13.7c	14.9AB´	10.0ab	9.60b	9.80AB´
Mineral 2	14.0de	15.8ab	14.9AB´	0.94b	1.1a	1.04A´	15.0a-c	14.0bc	14.5B´	9.33b	9.00b	9.17AB´
Mean	14.7B	15.6A		0.96B	1.02A		15.5A	15.0A		9.80A	9.05A	
2017 season												
Chicken manure	17.3a	17.3a	17.3A´	1.15ab	0.73c	0.94B´	16.03bd	24.4a	20.2A´	8.10c	10.8ab	9.45A´
Compost	17.8a	17.4a	17.6A´	0.75c	1.30a	1.02AB´	24.1a	13.4c-e	18.8A´	12.0a	9.60a-c	10.80A´
Cattle manure	15.5bc	14.9c	15.2B´	1.13ab	0.98bc	1.05AB´	14.1b-e	15.1b-d	14.5B´	10.5a-c	8.40bc	9.45A´
Mineral 1	16.6ab	14.2cd	15.4B´	0.89bc	1.26a	1.07AB´	18..7b	11.29de	15.0B´	9.63a-c	9.17bc	9.40A´
Mineral 2	16.5ab	13.4d	15.0B´	0.92bc	1.41a	1.16A´	18.0bc	9.68e	13.8B´	9.54a-c	9.00bc	9.27A´
Mean	16.7A	15.4B		0.97B	1.13A		18.2A	14.8B		9.95A	9.39A	

In each season, means of each of humic acid and nitrogen fertilizers sources or their interactions having the same letters are not significantly different at 5% level.

of acidity. On the other hand, mineral (1 and 2) treatments gave the highest values followed by compost. Regarding the interaction, the highest values were obtained when combing mineral (1 or 2) with humic (50 g humic /tree/year) especially in the second and third seasons.

Humic acid application did not affect TSS / acid ratio in the first and second seasons, but it reduced TSS / acid ratio markedly in the third season. On the other hand, TSS / acid ratio was significantly affected by nitrogen fertilizers sources especially in the second and third seasons and the highest values were obtained by chicken manure and compost fertilizers compared with two mineral levels (40 and 80 kg N/fed /year). Regarding the interaction, it was difficult to find a specific trend.

Data concerning ascorbic acid showed that, humic acid affected significantly on ascorbic acid in the first season only and the highest significant values were obtained by untreated trees compared to treated one . The highest values of ascorbic acid were obtained by compost fertilizer. With respect to combination between humic acid and nitrogen fertilizers sources, it is observed that, in the three seasons the highest values were obtained by compost under the first level of humic treatment. Some other treatments gave more or less similar values with the same statistical stand point.

In this respect, Fathy et al. (2010) pointed out that, humic acid (foliar and soil applications) treatments gave the highest values of yield and fruit physical and chemical properties (fruit firmness, juice SSC and SSC/acidity ratio) of 'Canino' apricot. On the other hand, Duttaray et al. (2014) reported that, pomegranate cultivar "Ganesh" trees treated with 300g nitrogen in the form of urea + 1kg neem cake plant $^{-1}$ gave highest values of TSS, total sugar, reducing sugar, non-reducing sugar and ascorbic acid. Acidity was also recorded the least values with this treatment.

Effect on leaf macronutrients content

Results in Table 7 showed that, the effect of humic acid, nitrogen fertilizers sources and their interactions on N, P and K content in leaves of wonderful pomegranates trees in 2015, 2016 and 2017seasons.

Results proved that, nitrogen content was insignificantly affected by the humic acid addition except in the first season. It was clear that, chicken manure and compost gave the highest values of nitrogen in three seasons, respectively. Regarding the interactions, the highest values of nitrogen content were obtained by chicken manure and compost with or without humic treatments especially in the second season. In the most cases, cattle manure with or without humic treatments gave the least values of nitrogen content. On the other hand, mineral treatments (40 and 80 kg N/ fed /year) with or without humic gave intermediate values between above treatment.

Concerning, phosphorus content the data revealed that P content was significantly affected by humic levels and 50 g humic /tree/year level gave the least values of P content during three seasons. On the other hand, compost gave the higher values of phosphorus content than other treatments except in the second season. Regarding the interaction, in the first and in the third seasons, chicken manure with humic acid at 50 g /tree/ year gave the least significant values of P content. Other treatment gave more or less similar values with the same statically stand point.

Potassium content was insignificantly affected by humic levels in the three seasons. On the other hand, mineral treatments (40 and 80 kg N/fed / year) gave the highest values of K content followed closely by chicken manure and compost in the first and in the second season, respectively. Results revealed that the interaction was significant in the three seasons. The trend was clearer in the second season than other seasons whereas, the highest values of K were obtained by chicken manure and compost under any level of humic.

In this respect, Fayed (2005) pointed out that application of different organic manures on "Anna" apple trees increased leaf NPK contents as compared with control trees. Moreover, Fawzi et al., (2010) reported that individual addition of compost and cow manure as well as their combinations with biofertilizer increased N, P, K, and Mg contents of "Le-Conte" pear leaves. Also, Barakat et al., (2012) reported that, organic fertilizers plus humic acid or EM increasing NPK content in Newhall navel orange leaves compared with the chemical fertilizers.

Effect on leaf micronutrients content

Results in Table 8 showed that, the effect of humic acid, nitrogen fertilizers sources and their interactions on Fe, Zn and Mn content in leaves of wonderful pomegranates trees in 2015, 2016 and 2017seasons.

Results concerning, iron content was affected by humic addition in second season only whereas; untreated trees gave the higher values than treated one. It is obvious that iron content was increased by fertilizing with compost which gave the highest values especially in the first and in the third seasons. From the interactions values in three seasons it could be concluded that the highest values of iron content were obtained by compost without humic acid application in the three seasons In most cases other treatments gave more or less similar values with the same statically stand point especially in the first and third seasons.

Results revealed that, zinc content was significantly affected by humic addition in the second season only whereas, untreated trees gave the highest significant value of leaf zinc content. On the other hand, zinc content was affected significantly by nitrogen sources in the first two seasons whereas, compost gave the highest values followed by cattle manure and (chicken manure & mineral 1) in the first and second season, respectively. It is observed that, all organic nitrogen fertilizers gave the highest values of leaf zinc content under any level of humic especially in the first and in the third seasons.

Values of manganese content were significantly affected by levels of humic in the first season only. With respect to nitrogen fertilizers sources the highest values of manganese content were obtained by chicken manure and compost fertilizers followed closely by mineral 1 and mineral 2 in the second and in the third seasons. Interactions results were varied from season to another but the trend was clearer in the first season whereas, chicken manure and compost with humic at 50 g /tree/year gave the highest significant values of manganese content in leaf.

Ali et al., 2017 revealed that, granule humic (2 kg/tree) application on six years old pomegranate trees cv. 'Bajestani' effectively promoted nutrient uptake from soil and gave the highest values of N, K, Mg, Fe, and Zn content in the leaves of treated plants.

TABLE 7. Effect of humic acid and some nitrogen fertilizers sources on N, P and K content in leaves of wonderful pomegranate trees during 2015, 2016 and 2017seasons.

Nitrogen fertilizers sources	Humic acid (50g/tree/year)								
	Without	With	Mean	Without	With	Mean	Without	With	Mean
	N%			P%			K%		
				2015 season					
Chicken manure	1.88ab	1.71a-c	1.79AB´	0.16ab	0.12b	0.14B´	0.62a-c	0.66ab	0.64AB´
Compost	1.97a	1.80a-c	1.88A´	0.26a	0.24a	0.25A´	0.64ab	0.53c	0.58B´
Cattle manure	1.58a-c	1.54bc	1.56B´	0.16ab	0.16ab	0.16B´	0.59bc	0.62a-c	0.60B´
Mineral 1	1.67a-c	1.41c	1.54B´	0.17ab	0.16ab	0.17B´	0.67ab	0.72a	0.70A´
Mineral 2	1.80a-c	1.58a-c	1.69AB´	0.17ab	0.15ab	0.16B´	0.61bc	0.66ab	0.63AB´
Mean	1.78A	1.61B		0.18A	0.17B		0.63A	0.64A	
				2016 season					
Chicken manure	1.80a	1.58a-c	1.69A´	0.14e	0.14e	0.14C´	0.77a	0.70a-c	0.74A´
Compost	1.75a	1.67ab	1.71A´	0.18a	0.15d	0.16B´	0.76ab	0.68a-c	0.72A´
Cattle manure	1.38bc	1.34c	1.36B´	0.17c	0.17c	0.17A´	0.62c	0.63c	´0.62B´
Mineral 1	1.36c	1.31c	1.34B´	0.17c	0.17c	0.17A´	0.65bc	0.61c	0.63B´
Mineral 2	1.38bc	1.36bc	1.37B´	0.17c	0.18b	0.17A´	0.62c	0.61c	0.61B´
Mean	1.54A	1.45A		0.17A	0.16B		0.68A	0.65A	
				2017 season					
Chicken manure	1.71a	1.62ab	1.67A´	0.18ab	0.14b	0.16B´	0.66b	0.73a	0.70A´
Compost	1.67a	1.58ab	1.62A´	0.20ab	0.21a	0.20A´	0.71ab	0.73a	0.72A´
Cattle manure	1.34b	1.40ab	1.37B´	0.17ab	0.15ab	0.16B´	0.69ab	0.69ab	0.69A´
Mineral 1	1.40ab	1.52ab	1.46AB´	0.19ab	0.17ab	0.18AB´	0.73a	0.73a	0.73A´
Mineral 2	1.34b	1.45ab	1.39B´	0.19ab	0.16ab	0.18AB´	0.69ab	0.71ab	0.70A´
Mean	1.49A	1.52A		0.18A	0.17B		0.70A	0.72A	

In each season, means of each of humic acid and nitrogen fertilizers sources or their interactions having the same letters are not significantly different at 5% level.

TABLE 8. Effect of humic acid and some nitrogen fertilizers sources on Fe, Zn and Mn content in leaves of wonderful pomegranate trees during 2015, 2016 and 2017seasons.

Nitrogen fertilizers sources	Humic acid (50g/tree/year)								
	Without	With	Mean	Without	With	Mean	Without	With	Mean
	Fe (ppm)			Zn (ppm)			Mn (ppm)		
	2015 season								
Chicken manure	126.8bc	82.1c-e	104.5B′	18.3a-d	17.9a-d	18.1BC′	49.1a	47.4a	48.3A′
Compost	134.6ab	173.8a	154.2A′	26.4a	25.6a	26.0A′	45.0ab	48.6a	46.8A′
Cattle manure	125.8bc	112.0b-d	118.9B′	21.8a-c	25.2ab	23.5AB′	42.3bc	39.3c-e	40.8B′
Mineral 1	64.1e	72.1de	68.1C′	15.7cd	13.9cd	14.8C′	41.8b-d	35.7e	38.8B′
Mineral 2	63.0e	69.7de	66.4C′	16.8b-d	12.9d	14.9C′	42.3bc	37.7d-e	40.0B′
Mean	102.9A	102.0A		19.8A	19.1A		44.1A	41.7B	
	2016 season								
Chicken manure	139.2a	67.6c	103.4A′	15.5b	14.7b	15.1AB′	43.8a	42.2a	43.0AB′
Compost	110.9ab	97.8bc	104.4A′	22.1a	13.3b	17.7A′	40.8a	44.8a	42.8AB′
Cattle manure	84.2bc	85.9bc	85.1A′	13.6b	11.4b	12.5B′	39.6a	37.2a	38.4B′
Mineral 1	91.8bc	88.5bc	90.2A′	15.4b	14.6b	15.0AB′	46.9a	47.0a	47.0A′
Mineral 2	88.8bc	87.2bc	88.0A′	14.1b	12.8b	13.5B′	45.6a	45.0a	45.3AB′
Mean	103.0A	85.4B		16.1A	13.4B		43.4A	43.2A	
	2017 season								
Chicken manure	78.5bc	77.6bc	78.1B′	17.6ab	24.7a	21.2A′	44.0ab	42.4ab	43.1AB′
Compost	120.9a	107.8ab	114.4A′	19.3ab	19.0ab	19.2A′	42.8ab	42.6ab	42.7AB′
Cattle manure	64.2c	92.6a-c	78.4B′	13.7b	16.3ab	15.0A′	41.4ab	37.6b	39.5B′
Mineral 1	71.7bc	78.7bc	75.2B′	17.5ab	12.8b	15.2A′	48.2a	45.0ab	46.6A′
Mineral 2	68.8bc	77.2bc	73.0B′	16.6ab	12.8b	14.7A′	45.6ab	38.7b	42.1AB′
Mean	80.8A	86.8A		17.0A	17.1A		44.4A	41.3A	

In each season, means of each of humic acid and nitrogen fertilizers sources or their interactions having the same letters are not significantly different at 5% level.

Conclusion and Recommendation

From the foregoing results, it could be concluded that under our experiment conditions, humic acid addition affected lack significant on yield, fruit physical and chemical properties and leaf nutrient content. This results are in line with those obtained by El-wakeel and Eid (2011) who reported that, highest stem thickness of three years old Navel orange trees budded on sour orange rootstock on clay loam soil increment percentage was recorded by mixed nitrogen form (50% mineral N + 50% organic N) at 300 g/tree/year without K humate, leaf dry matter percentage gave higher significant value without K humate addition than that of with K humate, and also mixed nitrogen source at 300 g/tree/year without K humate recorded higher significant values of, leaf potassium content compared with some other treatments. In most cases, all nitrogen fertilizers increased yield, fruit physical and chemical properties when compared with cattle manure whereas, chicken manure and compost gave the highest values of most characters such yield, arils weight, TSS and leaf mineral content followed closely by two mineral treatments. When compared between two mineral treatments it could be concluded that mineral 1 (40kg N/fed /year) was sufficient for gave the high values equaled by mineral 2 (80kg N/fed /year). That is according with (Eman et al., 2010) who concluded that, 50% of the fertilized Arabi pomegranate trees with recommended rate of NPK + humic acid 25g/ tree is the promising treatment. Moreover, it reduced half the amount of the recommended mineral fertilizers as well as soil pollution. Regarding the combination between humic acid and sources of nitrogen fertilizers the data showed that chicken manure and compost under any level of humic gave the highest values of yield and fruit characters followed closely by two mineral treatments under any level of humic.

Thus it could be safely recommended by

- For the conventional orchard of “Wonderful” cv. pomegranate fertilizing by (40kg N/

fed /year) instead of (80kg N/fed /year) was sufficient for yield, fruit quality and leaf mineral content and save cost.

- For the organic orchard of "Wonderful" cv. pomegranate fertilizing by chicken manure or compost (40kg N/fed /year) with or without humic addition (50 g /tree/year) improved yield, fruit physical and chemical properties and reduce environmental pollution.
- Therefore, "Wonderful" cv. pomegranate production in Egypt can depend on organic manure as an alternative to nitrogen mineral fertilizers, or at least save its use in the production of organic "Wonderful" cv. pomegranate as well as increasing in yield and fruit quality.

Concerning the above observation of the study, further researches are needed to verify the final recommendation. May be pomegranate growers need another study on some different mixtures of organic fertilizers and between organic and mineral fertilizers.

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Conflicts of interest

There are no conflicts of interest during this research.

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التاثيرات الواعدة لحمض الهيوميك وبعض الاسمدة العضوية علي المحصول وجودة الثمار والمحتوى المعدنى لاوراق أشجار الرمان صنف "وندرفول

نـهى أحمد ابراهيم منصور
قسم البساتين - جامعة عين شمس - كلية الزراعة - شبرا الخيمة - القاهرة - مصر.

يهدف هذا البحث لدراسة أمكانية خفض استخدام الاسمدة المعدنية النتروجينية وتقييم استخدام بعض الاسمدة العضوية مفردة أو مع أضافة الهيوميك علي المحصول وجودة الثمار والمحتوى المعدنى لاشجار الرمان صنف «وندرفول». حيث أجريت الدراسة خلال ثلاثة مواسم متعاقبة (٢٠١٥- ٢٠١٦ – ٢٠١٧) فى مزرعة حجازى بالكيلو ٥٧ طريق القاهرة اسكندرية الصحراوى علي أشجار الرمان صنف وندرفول عمر ٨ سنوات. وقد اشتلمت الدراسة علي مستويان للهيوميك (صفر ، ٥٠ جم /شجرة/سنة) وخمسة صور للتسميد النتروجيني (سماد دواجن- كمبوست- سماد الماشية- معاملة الكنترول المعدنى للتجربة ٤٠ كجم ن صافى /فدان/سنة - معاملة الكنترول المعدنى للبستان ٨٠ كجم ن صافى /فدان/سنة) وعليه كانت التجربة عاملية ووزعت فى تصميم قطاعات كاملة العشوائية. تمت أضافة جميع الاسمدة العضوية بمعدل ٤٠كجم ن صافى /فدان/سنة .وقد أوضحت النتائج أن : أضافة الهيوميك أعطت تاثيرات ضعيفه معنويا على المحصول وجودة الثمار والمحتوى المعدنى للاوراق ومن جهة أخرى أعطى سماد الدواجن والكمبوست أعلي القيم لمعظم للصفات المدروسة متبوعة مباشرة بمعاملتي التسميد المعدنى. وعند مقارنة معاملتي الكنترول المعدنى معا وجد أن المعاملة ٤٠ كجم ن صافى / فدان/سنة كانت كافية لاعطاء قيم عالية ومساوية للمعاملة ٨٠ كجم ن صافى /فدان/سنة لاغلب الصفات. وبالنسبة للتفاعل بين الهيوميك ومصادر التسميد النتروجينى وجد أن سماد الدواجن والكمبوست تحت أى مستوي من مستويات الهيوميك أعطت أعلي القيم للمحصول وصفات الجودة للثمار متبوعة مباشرة بمعاملتي الكنترول المعدنى تحت أى مستوى من مستويات الهيوميك. وعلى ذلك يمكن التوصية بالتسميد بـ ٤٠ كجم ن صافى /فدان/ سنة بدلا من ٨٠ كجم ن صافى /فدان/سنة ومن جهة أخرى وجد أن التسميد بسماد الدواجن أو الكمبوست بمعدل ٤٠ كجم ن صافى /فدان/سنة سواء مع أضافة الهيوميك أو بدون أضافة عمل على تحسين المحصول وخصائص الجودة للثمار وتقليل التلوث البيئ.