Effect of cow residues, nitropene, phosphate, potassium and NPK fertilizers on the chemical qualities of tomato fruits (*Solanum lycopersicum L*)

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Abstract
This field study was conducted on tomato cultivar (narcissus) in the city of Zawiya, Abusra region, during the spring season 2019 to compare the effect of organic fertilizer, cow residues, chemical fertilizer NPK (18-46), nitropene fertilizer, phosphatine and potassium on the chemical qualities of tomato fruits.The results also summarized the existence of a moral superiority between the treatment factors (chemical fertilizer (18 - 46) 10 g/plant + organic fertilizer cows 10 tons/hectare + potassiumage 0.3 g/m^2) for the solids variable, while the total acidity variable (organic fertilizer cows 10 tons/hectare + nitropine 0.3 g/m^2) compared to a witness, while the vitamin C variable treatment (chemical fertilizer (18 - 46) 10 g/plant + organic fertilizer cows 20 tons/hectare when compared to the witness.

Keywords: cow residues, fertilizers, vegetative qualities of tomato fruits, chemical qualities of tomato fruits

Introduction

The tomato plant is one of the seasonal dendritic plants with two cotyledons, self-pollinated (Naika. et al., (2005). It has different shapes, its stems branch from the fixed sphenoid stem in the soil, and its cultivation is renewed annually. The plant belongs to short day plants and cold season crops of tercarbon plants with aerobic germination). (Cutter, 1978) and

Tomatoes are one of the important strategic crops as they constitute a mainstay in the daily food of man because of their nutritional importance as they contain large proportions of nutrients such as carbohydrates, proteins and fats. It is also some vegetable rich in mineral elements, including phosphorus, calcium and potassium, and is also characterized by containing antioxidants such as lycopene, which is a protective agent against cancer (Al-Wakil, 2010).

Tomatoes are classified among the most important vegetables because they contain foodstuffs that are recommended to be eaten daily in sufficient quantities because of their role in the continuity of various vital functions (Ayrani, 2012), where the global production of tomatoes was estimated at 182,301,395 tons with an area of 4,848,384 hectares. Tomatoes also play a very important role in human nutrition (Arab, Steck, 2000) For their content of sugars, acids, vitamins, minerals, and fibers (2003, Bradley) Water represents about 94% and has a relatively low caloric value estimated at 20 calories per 100grams. It is cholesterol-free, and also has a low amount of fat (Agarwal and Rao, 2000). It also contains a significant group of dietary carotenoids, including the most active lycopene and antioxidant (1989., al et Dimascio), which is responsible for the coloration of its fruits in red (2000)., LeMaguer et Shi. Many of the compounds contained in tomatoes also contribute to the prevention of serious diseases such as cancer, cardiovascular diseases (Juroszek, 2009)

Material and methods

This study was conducted in one of the exposed fields of the Abu Sara area in the city of Al-Zawiya in western Libya on the tomato plant (Al-Narjis). Agriculture relied entirely on groundwater through drip irrigation. The distance between the line and the other 75 cm^2 and the distance between the points was 40 cm^2 and a distance of one meter was left between each pilot unit and another. The distance between the sapling and the other was (50cm). The experiment was carried out according to the RCBD design with three iterations (I, II, III. The total area of the experimental unit was about (6 ^{m2}). Table (1) shows the types of fertilizers used in the study and their quantities.

Table (1) shows the fertilizer transactions included in the study

Fertilizers	Comparison
Organic fertilizer (cows)	0 tons/hectare
	10 tons/hectare
	20 tons/hectare
Chemical Fertilizer (18 - 46)	0 g
	plant
	plant
Biofertilizer Nitropin	0.3 g/m^2
Biofertilizer Phosphatine	0.3 g/m2
Bio fertilizer potassium	0.3 g/m2

Organic fertilizers:

Organic waste (cow waste) **was** fermented for a year, where it was placed in the form of a pile and sprayed with water and covered with a plastic cover to increase the percentage of moisture and beam under the dirt for two months. Use after fermentation by mixing it with the soil and adding it according to the map key for some plants at a rate of (10 tons/e and 20 tons/e) for each section (pilot unit) and the second batch was 23 days after the first batch was placed and the addition was in the amount of (5 g and 10 g).

Addition of fertilizers

After the seedlings reached the age of 50 days, chemical fertilizer (18-46) was added directly to some plants according to the map key. The amount added was 10 g/plant and 20 g/plant. The amount added was divided into two groups, the first batch (5 g and 10 g). The second batch was 24 days after the application of the fertilizer of the first batch (the first dose) in the same amount (5 g and 10g), as the age of the seedlings on this date reached 73 days and the total addition rate per hectare was (5 kg).

Bio Fertilizer

It was prepared by adding and mixing a bag of both nitropene fertilizer and phosphatine fertilizer with an amount of (5 kg) dirt. Also, add and mix a bag of potassium fertilizer in (4 ml of water). The addition of the three bio fertilizers (nitropene, phosphatine, potassiumag) at a rate of (0.3 $g/^{m2}$) of each type of fertilizer and this addition was made according to the map key for the three refineries.

Percentage of Dissolved Solids (%TSS) (g):

Total dissolved solids represent sugars, organic acids and other soluble substances in the fruit. The percentage of these substances was calculated by taking drops of fruit liquid and placing it on the hand refractometer to read them. The reading was repeated twice from each sample (AOAC., 1990)

Total Acid Estimation (%TA):

The total acids of the titrated samples were estimated by standardized sodium hydroxide (N0.1) and phenolphthalein used as colorless evidence in the acidic medium. The result was expressed in % for citric acid (AOAC., 2000).

Sample Preparation:

1. Preparation of sodium hydroxide (4 g sodium hydroxide + 100 ml distilled water – 10 ml of solution + 100 ml distilled water).
2. Add to each sample (5 ml of tomato juice) 3.2 drops of phenolvitalin directory and this directory is colorless in the acidic medium and using the standard known sodium hydroxide solution 0.1 is dripped directly on it with the burette
3. The break-even point is the turning of the color into a light pink color, from which it calculates the number of millimeters of sodium hydroxide that is required to neutralize the acid in the sample

$$\mathbf{Wt}\ \frac{C*V*MWt}{no\ of\ H}$$

where wt weight of citric acid
The v volume consumed of sodium hydroxide
Mwt Molecular Weight of Acid
The no of H number of alternative hydrogen ions 3

$$100*\frac{\text{Wt}}{\text{W sample}} = \%$$

Estimation of Vitamin C Concentration:

It was estimated for each experimental unit and ascorbic acid was measured by titration with 2,6 Dichlorophenol indophenols (Mazumdar et al., 2003 & Albalasmeh et al., 2013).

Where it was prepared in the laboratory 0.25 ml of the manual (phenol) placed in a cup with a capacity of 100 ml, where 70 ml of distilled boiling water was added to it and then dissolved by continuous stirring and then placed in a standard beaker 100 ml and complete the volume with distilled water. Then the calibrated material is placed in a burette to the specified level and we record as a starting point and then take 5 ml of tomato juice in a clean cup and then start calibrating and record the first point at which the color changed, where the consumed volume is recorded by subtracting the starting point from the end point at which the color changed and then repeated with each sample.

$$*C\ standred\ \ C=\frac{\text{V sampl}}{\text{V vit c}}$$

V sample The volume consumed from the sample

V vit Consumed volume of standard vitamin C titration

C stander Standard sample concentration

Results:

Table 1: The effect of coefficients on the percentage of dissolved solids, total acidity and vitamin C in the fruits of the tomato plant

TRANSACTION	TotalDissolved Solids (TDS)	Total acidity	Vitamin C
	Means ± SE	Means ± SE	Means ± SE
control	3.4 ± 0. 0	3.20. ± 0.10	8.80 ± 0.20
Biofertilizer Nitropin 0.3 g/m^2.	3.0 ± 0.0	1.80 ± 0.86	11.9 ± 0.05
Biofertilizer phosphatine 0.3 g/m^2.	3.9 ± 0.0	2.20 ± 0.15	8.90 ± 0.10
Bio fertilizer potassiumage 0.3 g/m^2	4.8 ± 0.0	1.90 ± 0.11	9.00 ± 0.01
Chemical fertilizer (18 - 46) 10 g/plant.	4.1 ± 0.0	2.00 ± 0.11	9.90 ± 0.15
Chemical fertilizer (18- 46) 10 g/plant + nitropine 0.3 g/m^2.	4.0 ± 0.0	2.40 ± 0.49	6.90 ± 0.05
Chemical fertilizer (18 - 46) 10 g/plant + phosphatine 0.3 g/m^2.	3.9 ± 0.0	2.20 ± 0.15	8.00 ± 0.15
Chemical fertilizer (18 - 46) 10 g/plant + potassiumag 0.3 g/m^2.	4.0 ± 0.0	2.60 ± 0.15	9.90 ± 0.10
Chemical fertilizer (18 - 46) 20 gymnases.	4.0 ± 0.0	1.40 ± 0.66	9.8 ± 0.05
Chemical fertilizer (18 - 46) 20 g/plant + nitropine 0.3 g/m^2.	4.0 ± 0.0	2.00 ± 0.05	6.90 ± 0.01
Chemical fertilizer (18 - 46) 20 g/plant + phosphatene 0.3 g/m^2.	3.7 ± 0.0	1.90 ± 0.15	7.90 ± 0.05
Chemical fertilizer (18 - 46) 20 g/plant + potassiumag 0.3 g/m^2.	4.0 ± 0.0	1.20 ± 0.05	10.9 ± 0.01
Organic fertilizer for cows 10 tons/hectare	4.0 ± 0.0	2.60 ± 0.25	7.70 ± 0.15
Organic fertilizer for cows 10 tons/hectare + nitrobin 0.3 g/m^2.	4.0 ± 0.0	2.90 ± 0.05	9.20 ± 0.05
Organic fertilizer for cows 10 tons/hectare + phosgateen 0.3 g/m^2.	4.8 ± 0.0	2.70 ± 0.10	9.00 ± 0.01
Organic fertilizer for cows 10 tons/hectare + potassiumag 0.3 g/m^2.	4.7 ± 0.0	2.20 ± 0.15	9.00 ± 0.01
Chemical fertilizer (18 - 46) 10 g/plant + organic fertilizer for cows 10 tons/hectare.	4.6 ± 0.0	2.10 ± 0.20	10.00 ± 0.15
Chemical fertilizer (18 - 46) 10 g/plant + organic fertilizer for cows 10 tons/hectare + nitropene 0.3 g/m^2.	3.9 ± 0.0	2.00 ± 0.11	8.90 ± 0.05
Chemical fertilizer (18 - 46) 10 g/plant + organic fertilizer for cows 10 tons/hectare + phosphate 0.3 g/m^2.	3.9 ± 0.0	2.20 ± 0.41	8.90 ± 0.01
Chemical fertilizer (18 - 46) 10 g/plant + organic fertilizer for cows 10 tons/hectare + potassiumag 0.3 g/m^2.	5.0 ± 0.0	2.30 ± 0.25	0.10 ± 8.9
Chemical fertilizer (18 - 46) 20 g/plant + organic fertilizer for cows 10 tons/hectare.	4.0 ± 0.0	1.9 ± 0.11	10.0 ± 0.01
Chemical fertilizer (18 - 46) 20 g/plant + organic fertilizer for cows 10 tons/hectare + nitropene 0.3 g/m^2.	4.0 ± 0.0	2.50 ± 0.30	8.90 ± 0.10
Chemical fertilizer (18 - 46) 20 g/plant + organic fertilizer for cows 10 tons/hectare + phosphatene 0.3 g/m^2.	4.0 ± 0.0	1.80 ± 0.32	9.90 ± 0.10
Chemical fertilizer (18 - 46) 20 g/plant + organic fertilizer cows 10 tons/hectare + potassiumag 0.3 g/m^2.	3.9 ± 0.0	1.80 ± 0.28	6.70 ± 0.05
Organic fertilizer for cows 20 tons/hectare.	4.0 ± 0.0	1.70 ± 0.28	6.90 ± 0.05
Organic fertilizer for cows.20 tons/hectare + nitrobin 0.3 g/m^2.	4.2 ± 0.0	2.60 ± 0.25	10.0 ± 0.11
Organic fertilizer for cows 20 tons/hectare + phosphatine 0.3 g/m^2.	3.7 ± 0.0	2.20 ± 0.23	6.80 ± 0.05
Organic fertilizer for cows 20 tons/hectare + potassiumag 0.3 g/m^2.	4.0 ± 0.0	2.1 ± 0.11	11.0 ± 0.10
Chemical fertilizer (18 - 46) 10 g/plant + organic fertilizer for cows 20 tons/hectare.	4.0 ± 0.0	1.60 ± 0.10	12.0 ± 0.10
Chemical fertilizer (18 - 46) 10 g/plant + organic fertilizer 20 tons/hectare + nitropene 0.3 g/m^2.	3.5 ± 0.0	2.10 ± 0.11	10.0 ± 0.10
Chemical fertilizer (18 - 46) 10 g/plant + organic fertilizer for cows 20 tons/hectare + phosphatene 0.3 g/m^2.	3.5 ± 0.0	0 2.30 ± 0.30	9.90 ± 0.05
Chemical fertilizer (18 - 46) 10 g/plant + organic fertilizer 20 tons/hectare + potassiumag 0.3 g/m^2.	3.7 ± 0.0	2.2 ± 0.10	6.90 ± 0.05
Chemical fertilizer (18 - 46) 20 g/plant + organic fertilizer for cows 20 tons/hectare.	4.0 ± 0.0	1.7 ± 0.10	6.40 ± 0.10
Chemical fertilizer (18 - 46) 20 g/plant + organic fertilizer for cows 20 tons/hectare + nitropene 0.3 g$^{/m2.}$	3.0 ± 3.0	01.2 ±	**11.0 ± 0.10**
Chemical fertilizer (18 - 46) 20 g/plant + organic fertilizer for cows 20 tons/hectare + phosphatene 0.3 g/m^2.	4.9 ± 4.9	02.0 ±	**6.9 ± 0.05**
Chemical fertilizer (18 - 46) 20 g/plant + organic fertilizer cows 20 tons/hectare + potassiumag 0.3 g/m^2.	4.0 ± 4.0	2.0 ±	**6.9 ± 0.5**
Nitropine fertilizer 0.3 g$^{/m2}$ + phosphatine 0.3 g$^{/m2}$ + potassiumag 0.3 g$^{/m2}$.	4.5 ± 4.5	02.5 ±	**10.1 ± 0.40**

The results from **Table (1)** indicate that there are significant differences between the coefficients at the level of statistical significance 0.05 in the percentage of moisture, total acidity and vitamin C for all coefficients in which fertilizers were used.

Table (1) indicated the variable of the percentage of dissolved solids with the highest effect when treating chemical fertilizer (18 - 46) 10 g/plant + organic fertilizer cows 10tons/hectare + potassiumage 0.3 g/m^2) as well as chemical fertilizer (18 - 46) 20 g/plant + organic fertilizer cows 20 tons/hectare + phosphatene 0.3 g/m^2) with an average of (5.0, 4.9) respectively. Followed by the treatment (bio-fertilizer potassiumag 0.3 g/m^2) and the treatment (organic fertilizer cows 10 tons/hectare + phosgatin 0.3 g/m^2) with an average of (4.8) and then the treatment (organic fertilizer cows 10 tons/hectare + potassiumag 0.3 g/m^2) and the treatment (18 - 46) 10g/plant + organic fertilizer cows 10 tons/hectare) with an average of (4.7, 4.6) respectively. While the least impact of the treatment of chemical fertilizer was (18 - 46) 20 g/plant + organic fertilizer for cows 20 tons/hectare + nitrobin 0.3 g/m^2) and the treatment (nitrobin biomass 0.3 g/m^2) with an average of (3.0) followed by the treatment (chemical fertilizer (18 - 46) 10 g/plant + organic fertilizer for cows 20 tons/hectare + nitrobin 0.3 g/m^2) and the treatment (organic fertilizer for cows 20 tons/hectare + phosphatine 0.3 g/m^2) with an average of (3.5) and then the treatment (chemical fertilizer (18 - 46) 20 g/plant + phosphatine 0.3 g/m^2) and the treatment (organic fertilizer for cows 20 tons/hectare + phosphatine 0.3 g/m^2) and the treatment (chemical fertilizer (18 - 46) 10 g/plant + organic fertilizer for cows 20 tons/hectare + potassiumgumag 0.3 g/m^2) with an average of (3.7). While the lowest effect of chemical fertilizer treatment (18 - 46) was 20 g/plant + organic fertilizer (cows 20 tons/hectare + nitropine 0.3 g/m^2).The treatment was (Bio-nitropine fertilizer 0.3 g/m^2) with an average of (3.0), then the treatment was chemical fertilizer (18 - 46) 10 g/plant + organic fertilizer cows 20 tons/hectare + nitropine 0.3 g/m^2) and the treatment was (18 - 46) 10 g/plant + organic fertilizer cows 20 tons/hectare + phosphatine 0.3 g/m^2) with an average of (3.5) and then the treatment was (chemical fertilizer (18 - 46) 20 g/plant + phosphatine 0.3 g/m^2) followed by the treatment (organic fertilizer cows 20 tons/hectare + phosphatine 0.3 g/m^2)and the treatment was chemical fertilizer (18 - 46) 10 g/plant + organic fertilizer cows 20 tons/hectare + potassiumage 0.3 g/m^2) with an average of (3.7) compared to the control. Table (1.1) of the total acidity variable showed that the treatment (organic fertilizer for cows 10 tons/hectare + nitrobin 0.3 g/m^2) gave the highest value with an average of (2.93) and then the treatment (organic fertilizer for cows 10 tons/hectare + phosgatein 0.3 g/m^2) and the treatment (chemical fertilizer (18 - 46) 10 g/plant + potassiumag 0.3 g/m^2) and the treatment (organic fertilizer for cows 20 tons/hectare + nitrobin 0.3 g/m^2) with an average of (2.63, 2.66 and2.70) respectively. While the lowest effect resulting from the treatment was (chemical fertilizer (18 - 46) 20 g/plant + potassiumag 0.3 g/m^2), chemical fertilizer treatment (18 - 46) 20 g/plant + organic fertilizer cows 20 t/ha + nitropene 0.3 g/m^2) with an average of (1.23), followed by treatment (chemical fertilizer (18 - 46) 20 g/plant), chemical fertilizer treatment (18 - 46) 10 g/plant + organic fertilizer 20 t/ha) and chemical fertilizer treatment (18 - 46) 20 g/plant + organic fertilizer cows 20t/ha) with an average of (1.70, 1.60 and1.46) respectively. While the results of Table (1) and Figure (19.4) of the vitamin C variable indicate that the treatment is a chemical fertilizer (18 - 46) 10 g/plant + organic fertilizer for cows 20 tons/hectare) gave the highest effect with an average of (12.00) and then the treatment (nitropine bio fertilizer 0.3 g/^{m2}) with an average of (11.93), followed by the treatment (organic fertilizer for cows 20 tons/hectare + potassiumage 0.3 g/^{m2}) and the treatment (18 - 46 g/hectare) with an average of (10.96) and then the treatment (nitropine fertilizer 0.3 g/^{m2} + phosphate 0.3 g/^{m2}) with an average of (10.26) and the treatment.Chemical fertilizer (18 - 46) 20 g/plant + organic fertilizer 20 tons/hectare + potassiumag 0.3 g/m^2) with an average of (10.13), and the least effect resulting from the addition of the treatment was chemical fertilizer (18 - 46) 20 g/plant + organic fertilizer 20 tons/hectare) with an average of (6.40) followed by the treatment chemical fertilizer (18 - 46) 20 g/plant + organic fertilizer 10 tons/hectare + potassiumag 0.3 g/m^2) with an average of (6.76) and the treatment (organic fertilizer for cows 20 tons/hectare + phosphatine 0.3 g/m^2) with an average of (6.86) And the treatment (chemical fertilizer (18 - 46) 20 g/plant + nitrobin 0.3 g/m^2) with an average of (6.90) and the treatment (chemical fertilizer (18 - 46) 10g/plant + nitrobin 0.3 g/m^2), and the treatment (chemical fertilizer (18 - 46) 10 g/plant + organic fertilizer cows 20 tons/hectare + potassiumag 0.3 g/m^2) and the treatment (chemical fertilizer (18 - 46) 20 g/plant + organic fertilizer cows 20 tons/hectare + phosphatine 0.3 g/m^2) with an average of (6.93) and the treatment(organic fertilizer Cows 20 tons/hectare.) with an average of (6.96).

Discussion

Table (1) showed us that the treatment (chemical fertilizer (18-46) 10 g/plant + organic fertilizer, cows 10 tons/hectare + potassiumage 0.3 g/m^2) of the solids variable gave the highest effect on the percentage of total dissolved solids in tomato juice with high significant differences compared to the rest of the transactions, and this result was compatible with (Song *et al*., 2004), the reason may be due to the increase in the process of food processing in leaves and the increase in the transfer of processed materials to fruits as a result of the use of fertilizers (patrik *et al*., 2001), as the percentage of solids in fruits increases with the increase in the area of the leaf (Qatana et al., 1989) and the role of bronze released from organic fertilizers in the transport of solids (Devlin, 2001). As for the total acidity and vitamin C variable, Table (1) (19.4,18.4) show us the existence of significant differences and superiority of organic fertilizer, cows 10 tons/hectare + nitropine 0.3 g/^{m2} for the total acidity variable and chemical fertilizer (18-46 g/plant + organic fertilizer, cows 20 tons/hectare for the vitamin C variable, respectively, as this was explained to the increase in the juice content of vitamin C ,to the effect of nitrogen released from fertilizers in the soil, and was also compatible (where he stressed the important role played by potassium in the manufacture of vitamins in grapes, as potassium is released from inverted fertilizers in the soil (Gibson, 1993).

Conclusions

Fertilizers have an important role in the quality of the qualities of the tomato plant, and fertilization has effectively contributed to improving the chemical qualities of the plant, thus increasing productivity.

Recommendations Future Work

- Expanding in the future with research that includes co-fertilization, organic fertilizers, chemical and biological fertilizers to study the mutual impact between them on the chemical and productive qualities of the tomato plant.
- This study can be considered as the beginning of more in-depth studies in the field of agriculture and product quality improvement.

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