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The effect of chemical fertilizer, yeast and vitamin C treatments on the chemical charataresticies of *Mido cucumber*

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Abstract

Bachground: Around the world, cucumbers (*Cucumis sativus L.)* are a significant vegetable crop. Following tomato, cabbage, and onion as the most important vegetable crops, cucumber comes in fourth. Despite having very few calories and nutrients, it is the main source of vitamins and minerals in the diet of humans. In addition to its delicious taste and fairly good caloric value, it has a high medicinal value for human beings. It is well known as a natural diuretic and thus can serve as an active drug for secreting and promoting the flow of urine. Due to its high potassium content, cucumber can be highly useful for both high and low blood pressure. **Aim:** The study was conducted in Zawia City, Abu Surra region, during the spring season to test the effect of chemical fertilizers, yeast, and vitamin C on the chemical characteristic of the cucumber fruits of the *Mido* variety of cucumber. **Methods:** The experiment was designed according to randomized complete blocks (RCBD) with three replications, and the distance between the lines was (100 cm) and the distance between one seedling and the other (50 cm). Then add chemical fertilizer 12-24-12 and chemical fertilizer 15-30-15 (2 g/l), as well as dry yeast (3-6 g/l) and vitamin C (300 mg/l) in three batches. The data were collected and analyzed statistically and the significant differences between the treatments were compared with the L.S.D test at a probability level of 5% and from the results obtained.

Keywords: Cucumber plant, Chemical fertilizer, Yeast, Vitamin C

Introduction

The cucumber plant ***(Cucumis sativus L.)*** belongs to the ***Cucurbitaceae*** family. It is one of the most important and widespread food plants in Libya and around the world. In Libya, cucumbers are grown in open fields in spring and autumn. In addition, it is also cultivated in a protected environment under tunnels and plastic and glass houses. According to United Nations Food and Agriculture Organization (FAO) data, China was the world's first in production of cucumber, producing only about 77% of total world production, followed by Russia, Turkey, Iran, Ukraine, Uzbekistan, Mexico, the United States, and Spain, followed by Egypt. (FAO, 2019).

The cucumber plant is considered one of the plants that is very sensitive to temperature. The optimum temperature for its growth is 25–300 ^{o}C. It cannot tolerate a temperature drop below the mentioned limit for a long time. Whereas, low temperatures can lead to delayed seed germination and cessation of seedling growth. While high temperatures cause slow growth and burning of the edges of the leaves, leading to the wilting of the crop and stunting of the plant. Cucumbers also need relatively regular irrigation, as thirst leads to a reduction in yield and a slight bitterness in the taste of the fruits. While irrigating cucumbers regularly and in appropriate quantities led to an increase in the quality of the crop in terms of quantity and quality, Cucumber fruits have a high nutritional value. They are consumed fresh in salads, cooked, and as pickles. They are an essential nutritional component of an ideal healthy meal for many people. Table (1.1) shows the components of cucumber contained in 100 grams. [(1]

Material and methods

Location of the experiment

This study was conducted on one of the farms in the city of Zawiya in the area of (A Bosra),during the spring season 2019 on the cucumber plant using chemical fertilizer, spraying with dry yeast , and vitamin C. The soil of the field was prepared from plowing, smoothing, and leveling, as agriculture relied entirely on groundwater by drip irrigation method, and the distance between the lines was (100 cm), and the distance between the seedlings was (50 cm), where the experiment was carried out according to the design of the complete random sectors (RCBD) with three iterations with a total area of about (500 ^{m2}) Table (1).

Table (1) shows the transactions included in the study

The alchemist.	Yeast	Vitamin C	vitamin C
0	0	1	10
	3	2	11
	6	3	12
20-20. 20	0	4	13
	3	5	14
	6	6	15
15 .30 .15	0	7	16
	3	8	17
	6	9	18

Preparation of biofertilizers (dry yeast)

The preparation process was added and dissolved with a liter of water and sucrose and left for two hours in order to activate it and then the vegetative total was sprayed with the following concentrations:

1. First treatment 3 g/L
2. 2nd Transaction 6g/L

Preparation of chemical fertilizers

1. Balanced fertilizer from NPK(20. 20 .20) prepared 2 g/l

2. Compound fertilizer of NPK (15 30 15) 2 g/l

Field Site Configuration

The soil of the field was prepared from plowing, smoothing and leveling. Other samples of the study soil were randomly taken at a depth of (0-30) and the samples were mixed with each other and taken directly for analysis in the laboratory of the Medical Research Center. The soil of the study site was classified as (sandy) soil. The agriculture also relied entirely on groundwater by drip irrigation method. To know its physical and chemical properties, a sample of water was taken for analysis. The experiment was carried out according to the design of the complete random sectors (RCBD) with three iterations. The distance between the lines was (100 cm), and the distance between the saplings was (50 cm), with a total area of about (500 m^2) .

Chemical Qualities :

Percentage of moisture in fruit (%):

Form according to the following equation :

$$\frac{Ww-Wd}{Ww}\times 100$$

Weight : W, Wet d : Drying,Dry w: winery

Percentage of Total Soluble Solids (TSS) :

Total dissolved solids, which represent sugars, organic acids, and other dissolved substances in the fruit . It was calculated by taking several drops of fruit liquid to be placed on the hand refractometers to read it , and the reading was repeated twice from each sample (A.O.A.C.1990) .

Total Acid Estimation (TA%) Total Acidity :

Calibrated with standardized sodium hydroxide (N 0.1), phenolphthalein, and expressed as % citric acid (AOAC 2000)

Sample Preparation :

1. Preparation of sodium hydroxide (4 g sodium hydroxide + 100 ml distilled water - 10ml of solution + 100 ml distilled water).
2. For each sample, add (5 ml of cucumber), and 3.2 drops of phenolvitalin guide, and this guide is colorless in the acidic medium, and using the standard known sodium hydroxide solution 0.1, direct drip on it with the burette .
3. The break-even point is the color shift to light pink, from which it calculates the number of millimeters of sodium hydroxide recorded to neutralize the acid in the sample

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

where Wt weight of citric acid, V volume consumed of sodium hydroxide, Mwt molecular weight of acid, no of H number of ahydrogen ion **substitute 3**

$$\frac{Wt}{Wsample}100\%$$

Estimation of Vitamin C Concentration

It was estimated for each experimental unit, and ascorbic acid was measured by titration with 2,6 Dichlorophenol indophenols and Ammar *A. et al*, 2013)2003 *et al* ,. (Mazumdar B C, where it was prepared in the laboratory 0.25 ml of the directory (phenol), placed in a 100 ml capacity KaC, where 70 ml of boiled distilled water was added to it, and then dissolved, by continuous stirring, then placed in a standard 100 ml beaker, 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, then take 5 ml of the cucumber sample in a clean cup, then start calibrating and record the first point at which the color changes, where the consumed volume is recorded, by subtracting the starting point from the end point at which the color changed, and so it is repeated with each sample.

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

V sample Consumed volume of sample, V vit Consumed volume of standard vitamin C titration, C standre Standard sample concentration

Percentage of carbohydrates (total sugars) in the fruit :

The total amount of carbohydrates in the fruit was estimated, as 1 ml of the sample was taken, and 3 ml of concentrated sulfuric acid solution was added to it, then shaken well and the sample was placed in a cold water bath for two minutes, and placed at room temperature, then 1 ml of the sample was taken, and 5 ml of distilled water was added to it, and the sample was placed in a spectrophotometer to read the absorption at a wavelength of 380 nm,. The same method was applied to the standard solution of sucrose in different concentrations .

20gm/1ml10mg/1ml5mg/1ml,2.5mg/1,1.4mg/1ml,0.7mg/1ml,0.35mg/1ml0.175mg/1ml ,0.087mg/1ml (A. Ammar et al, 2013) .

Statistically analysis

The experiment was designed according to the RCBD Randomized Complete Block Design, collected data, analyzed statistically, and tested the differences between transaction rates according to the lowest moral difference under the probability level of 0.05 L.S.D.[18]

Result

The effect of treatments on the chemical characteristics of cucumber fruits:

The results from Table (2) indicate that there are no significant differences in the moisture content for all treatments in which different fertilizers were used. The treatment (15 - 15 - 30) gave an average of (98.2%), followed by the treatment (6 grams of yeast). + Vitamin C), with an average of (97.99%), then the treatment (20-20-20) with an average of (97.91%), while the least effective was the (control) treatment, with an average of (96.49%), followed by the treatment (3 g). Yeast +20-20-

20, with an average of (96.94%), then the treatment (6 g of yeast +20-20-20 + vitamin C), with an average of (97.14%), as shown in the results of Table (2). There is an effect of fertilization treatments, as they gave a significant effect on the dissolved solids variable at a significance level of 0.05, where the highest effect was recorded in the treatment (6 g/liter yeast + 2 g/liter chemical fertilizer 15-30-15+ vitamin C), with an average of (4.02%), followed by the treatment (6 g/liter yeast + 2 g/liter chemical fertilizer + 20-20-20 vitamin C), with an average of (3.8), and the treatment (3 g/liter yeast + 2 g/liter chemical fertilizer 20-20-20), with an average of (3.8), and the treatment (3 g/liter yeast + 2 g/liter chemical fertilizer 15-30-15+ vitamin C), with an average of (3.8%), then the treatment (6 g yeast + 15 - 30 - 15) and (6 g yeast + vitamin C) and the treatment (3 g yeast + 20 - 20 - 20 + vitamin C), with an average of (3.7%), while the (control) treatment recorded the least significant effect, with an average An amount of (2.6%), followed by the treatment (3 g/liter yeast), with an average of (3.2%), and the treatment (2 g/liter chemical fertilizer 20-20-20+ vitamin C), with an average of (3.2%), then the treatment (6 g/l yeast), with an average of (3.3%). On the other hand, the results of Table No. (5.4) regarding the vitamin C variable indicate that there is a significant difference between the study treatments at the significance level of 0.05, where the treatment (6 g yeast + 20-20-20) outperformed, with an average of (3.13%), followed by the treatment (20-20-20), with an average amount of (3.03%), then the treatment (3 g yeast + vitamin C), the treatment (6 g yeast + vitamin C), and the treatment (6 g yeast + 20 -20-20+vitamin C), with an average of (2.966%), with the highest rates of vitamin C, followed by the treatment (3 g yeast) (3 g yeast + 15-30-15+ vitamin C), with an average of (2.36%), then the treatment (6 grams of yeast), with an average of (2.03%), while the (control) treatment recorded the lowest value with an average of (1.98%) at a significance level of 0.05.

The results showed in Table (2) that the fertilization treatments did not give a significant effect on the total acids variable at the significance level of 0.05, as the treatment achieved (6 g/liter yeast + 2 g/liter chemical fertilizer 20-20-20+ vitamin C), with an average amount of (7.6%), followed by the treatment (3 g yeast + 15-30-15)(3 g yeast + vitamin C), with an average amount of (7.1%), then treatment (15-30-15), with an average (7%), but the treatment (6 g yeast) recorded the lowest rate, with an average of (4.9%), followed by the (control) treatment, with an average of (5%), then the treatment (3 g yeast + 2 g/liter chemical fertilizer 20). -20-20+ Vitamin C (2 g/liter chemical fertilizer 15-30-15+ Vitamin C) with an average amount of (5.3%). As for the carbohydrate variable, it was found that there was a significant difference between the studied treatments at the significance level of 0.05. The treatment also recorded the highest rate (vitamin C) (15-30 - 15 + vitamin C), and the treatment (3 g yeast + 15-30 -15+Vitamin C), with an average of (9.9%), followed by the treatment (6 g yeast +15-30-15+Vitamin C), with an average of (9.8%), then the treatment (6 g yeast +20-20-20), with an average of (9.6%), followed by the treatment (15-30-15), with an average of (8.06), then the treatment (6 g of yeast), with an average of (8.17) at a significance level of 0.05, while the treatment (control) recorded less Reading, with an average of (6.6%), Table (2).

Table No. (2) shows the effect of treatments on the chemical characteristics of cucumber fruits

Transaction	Humidity percentage	Percentage of dissolved \solids	Vitamin C percentage	Percentage of total acids	Percentage of carbohydrate
Control	96.4 ± 0.44	2.6 ± 0.38	1.9 ± 0.49	5 ± 1.5	6.6 ± 0.2
3 gm yeast	97.8 ± 0.31	3.2 ± 0.18	2.3 ± 0.3	5.8 ± 0.96	8.27 ± 2.29
6 gm yeast	97.7 ± 0.04	3.36 ± 0.29	2.03 ± 0.3	4.9 ± 1.21	8.17 ± 1.06
20-20-20	97.9 ± 0.41	3.46 ± 0.24	3.03 ± 0.6	6.5 ± 1.15	8.8 ± 1.51
3 gm yeast + 20-20-20	96.9 ± 1.6	3.8 ± 0.24	2.7 ± 0.2	6.7 ± 0.62	8.6 ± 1.14
6 gm yeast + 20-20-20	97.8 ± 0.08	3.6 ± 0.35	3.1 ± 0.25	6.3 ± 1.08	9.6 ± 0.67
15-30-15	98.2 ± 0.53	3.6 ± 0.39	2.6 ± 0.41	7 ± 0.45	8.06 ± 1
3 gm yeast + 15-30-15	97.5 ± 0.37	3.5 ± 0.23	2.9 ± 0.66	7.1 ± 2.17	8.7 ± 1.06
6 gm yeast + 15-30-15	97.2 ± 0.63	3.7 ± 0.23	2.6 ± 0.41	6.8 ± 1.31	8.5 ± 0.71
Vitamin C	97.8 ± 0.92	3.5 ± 0.35	2.7 ± 0.0	6.5 ± 0.86	9.9 ± 0.61
3 gm yeast + Vitamin C	97.7 ± 0.25	3.8 ± 0.29	2.9 ± 0.23	7.1 ± 2.17	8.4 ± 0.83
6 gm yeast + Vitamin C	97.9 ± 0.38	3.7 ± 0.22	2.9 ± 0.5	6.8 ± 1.33	8.2 ± 1.53
20-20-20 + Vitamin C	97.7 ± 0.49	3.2 ± 0.18	2.5 ± 0.15	6.3 ± 0.57	8.5 ± 1.37
3 gm yeast + 20-20-20 + Vitamin C	97.2 ± 0.26	3.7 ± 0.21	2.4 ± 0.23	5.3 ± 1.15	9.1 ± 0.16
6 gm yeast + 20-20-20 + Vitamin C	97.1 ± 0.67	3.8 ± 0.15	2.9 ± 0.83	7.6 ± 69.	9.2 ± 0.63
15-30-15 + Vitamin C	97.4 ± 0.13	3.5 ± 0.38	2.7 ± 0.2	5.3 ± 0.3	9.9 ± 0.39
3 gm yeast + 15-30-15 + Vitamin C	97.7 ± 0.8	3.8 ± 0.15	2.3 ± 0.3	6.1 ± 1.25	9.9 ± 0.57

6 gm yeast + 15-30-15 + Vitamin C	**97.7 ± 0.58**	**4 ± 0.16**	**2.9 ± 0.72**	**6.6 ± 0.28**	**9.8 ± 1.04**

While Table (2) shows us that, the various treatments (vitamin C, carbohydrates, soluble solids, total acids, and moisture percentage) have a significant impact on the studied traits and crop productivity, as the best treatments that led to increasing the yield and improving the nutritional value of the fruits were Treatment of the interaction or co-interaction of the compound fertilizer NPK 15-30-15 with dry yeast and vitamin C, compared to the rest of the treatments, and these results are consistent with what scientists mentioned that dry yeast and its activity with fertilizers has a very large role in improving the quality and value of production, through its production of many substances that work to increase vegetative growth and improve the sex ratio of the plant, by increasing the plant's ability to increase female flowers, decreasing the number of male flowers, thus increasing productivity, and improving vegetative and fruiting characteristics. [16, 17]

Conclusion: Bio fertilization with dry yeast sprayed on the vegetative system has a role in the growth and productivity of cucumbers, but it did not reach the limits of significance. Also, spraying with chemical fertilizer and vitamin C contributed effectively to increasing the rate of vegetative growth characteristics and thus increasing productivity.

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