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The effect of chemical fertilizer, yeast and vitamin C treatments on the growth and quality 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 of 2019 to test the effect of chemical fertilizers, yeast, and vitamin C on the growth, flowering, and quality 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: Chemical fertilizer, yeast treatment, vitamin C treatment, growth, quality of Mido cucumber

Results:

1. The results revealed that the individual treatment of chemical fertilizers balanced NPK 20-20-20 or unbalanced 15-30-15 led to an improvement of the studied characteristics compared to the control.
2. Single treatment of dry yeast with two concentrations (3 g/l - 6 g/l) had a significant effect on the studied traits compared to the control.
3- Also spraying with vitamin C (ascorbic acid) at a concentration (300 mg / liter) as a single treatment caused an increase in the percentage of carbohydrates as well as a plant height.
4. The combined interaction between the studied treatments achieved the highest rate in vegetative growth characteristics (number of leaves, leaf area, leaf neck length, fruit length, diameter, size, fresh weight as well as the sexual ratio of flowers where the female flowers increased at the expense of male flowers and thus increased Production and nutritional value of fruits.

Conclusion: Biofertilization 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.

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 causes 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) shows the components of cucumber contained in 100 grams. [(1)]

Table (1) shows the nutritional elements per 100 grams of cucumber US Department of Agriculture (2018)

Energy	**10 Calories**
Fats	0.2 gram
Sodium	2 Milligram
Carbohydrate	2.2 gram
Protein	0.6 gram
Calcium	1% of the recommended daily serving

Cucumber contains an amount of salts and vitamins, which makes it of great medical importance, as it is one of the filling and moisturizing substances for the stomach that gives a feeling of fullness, so it is recommended for diabetics. Cucumber also helps relieve pain and bloating resulting from skin irritation. [2] It is also recommended for maintaining healthy skin, hydrating the body, losing weight, preventing chronic diseases, maintaining bone health, maintaining cardiovascular health, and alleviating stomach acidity. It was also found that it has a role in preventing cancerous diseases because it contains many antioxidants, such as cucurbitacin and lignans, which were found to have a role in stopping the growth and reproduction of cancer cells. These antioxidants also help relieve many nervous disorders and headaches, contribute to purifying toxins from the body, and reduce the feeling of thirst. Cucumbers are also useful in balancing high and low blood pressure. [3] According to what was mentioned previously, the demand for the fruits of the cucumber plant increased, which prompted farmers to increase its production by increasing the use of various types of fertilizers because of their major role in the growth, vitality, and survival of the fruits of the cucumber plant. The primary goal of fertilization is to improve the physical, chemical, and biological properties of the soil. In order to provide suitable conditions for vegetative growth and thus obtain more production of better quality. [4, 5] The study conducted by Creste & Lima in 1995 showed that fertilization field experiments had an impact on the production rate of cucumber plants, as the quantity and quality of production varied from one fertilizer to another and from one region to another. This study also showed that there are two types of field experiments depending on the type of soil used: the first is a long-term type of experiment, aiming to study the effect of fertilizer on the plant and its production, in addition to its effect on the soil and its physical and chemical properties. The second type of field experiment is a short field experiment that aims to study the effect of fertilizer on cucumber fruit only. [6]

Chemical fertilizers are the most common fertilizers used, as they are added to the soil or sprayed directly on the plant. They increase the ability of the plant to directly absorb nutrients, so their effect is rapid on growth and fruiting. [7] In addition to chemical fertilizers as sources of mineral elements, yeast is one of the important types of biofertilizers rich in mineral elements, as it has the ability to store phosphate and amino acids such as arginine. [8] In addition to that, yeast has the ability to produce essential materials for plant growth such as auxins, gibberellins, cytokinins, and sugars. Many studies have proven that it is also possible to treat the soil with ascorbic acid. The use of ascorbic acid has increased nowadays because it is an antioxidant substance that works to stimulate and encourage the vegetative and fruitful growth of many plants. [9, 10] Ascorbic acid also has an effective role in increasing the rate of seed germination and vegetative growth and increasing plant tolerance to excess salinity. (1 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 (2).

Table (2) 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) .

Agriculture

The seeds were planted inside one ofthe nurseries south of Zawiya city on 1/5/2019, and they were transported inside the study field on 18/5/2019**.**

Characteristics of vegetative growth:

The field study was conducted during the period 21/7/2019 and 28/7/2019, where five plants were collected to measure each trait, where the traits studied were as follows :

Plant Height (cm):

The height of the plant was measured by a measuring tape, from ground level to the highest peak in the plant, and five plants were randomly selected for each experimental unit.

Number of sheets:

The number of papers was calculated from the appearance of the first paper to the end of the exit of the last paper, that is, the end of the trial period.

Vegetative Total (g):

Five plants were randomly taken from each experimental unit, their roots were removed, then cleaned and their soft weight was measured by a sensitive scale, and the reading was recorded.

Dry weight of vegetative total (g):

After taking the soft weight of the vegetative total, it was placed in the electric oven at a temperature of 65 ° C for 48 hours, then I took the weight and I read .

Soft weight of root sum (g):

Five roots were taken from the plants for each experimental unit, the roots were cleaned of dust, then weighed by a sensitive scale and the reading was carried out.

Dry weight of root sum (g):

After taking the soft weight of the roots, they dried in an electric oven at a temperature of 65 ° C for 48 hours, then took the weight and read .

Surface area of the sheet:

L x W x Fixed Ratio (0.75).

Sheet Neck Length (cm):

Measured by ruler from the beginning of the stem to the end of the paper .

Flowering qualities:

The number of feminine flowers and the number of masculine flowers were calculated from the beginning of flowering until the end of the season.

Quality Attributes:

Fruit Length (cm):

The length of the fruit was measured by the ruler.

Diameter of the fruit (cm) :

Its diameter was measured by dividing it in half, and measured by the ruler.

Fruit Weight (g):

Measured by a sensitive scale.

Fruit Size:

Place the fruit in a graduated container containing 200 ml of water, where the displaced product of the water is the size of the fruit.

weight of fruit (g):

Cutting cucumbers into slices and placing them in a nursery during the period 1.8.2019 to 8.8.2019 and measuring their weight with a scale.

Static 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]

Results

1 Effect of treatments on vegetative growth characteristics

It is clear from Table (3) that the fertilization treatments studied significantly affected the vegetative growth characteristics represented in the number of leaves and leaf surface area. also shows that there are significant differences between the study's coefficients at the significance level of 0.05. Through the results in Table No. (3), we find that the treatment (yeast 6 g/liter + 2 g/liter chemical fertilizer 15-30-15 + vitamin C) outperformed with an average of (92.8 leaves), then the treatment (with yeast 3 g/ per liter + 2 g/liter chemical fertilizer 20-20-20 +vitamin C), With an average of (83.6 leaves), while the least significant effect was when the treatment (yeast 3 g/liter + 2 g/liter 15-30 - 15) amounted to (55.4 leaves), then the treatment (3 g/liter yeast with an average of (60 leaves).) when compared to a control, and thus the comparison between the treatments was very high (P=0.000).

As for leaf area, fertilization treatments showed a significant effect on the leaf surface area variable at a level of significance less than 0.05. In Table No. (3) the lowest effect was recorded in the (control) treatment by (64.8 dm2), followed by the control treatment. (3 g/per liter yeast + vitamin C) amounting to (69 dm2), then the treatment (6 g/per liter yeast + 2 g/per liter chemical fertilizer 15-30-15), amounting to (73.05 dm2), while the treatment recorded (6 g/per liter) Yeast + 2 g/liter chemical fertilizer 15-30-15 + vitamin C) the highest increase was (109 dm2), followed by the treatment (6 g/liter yeast + 2 g/liter chemical fertilizer 20-20-20 + vitamin C) by (107.5 dm2), then the treatment (3 g/liter yeast + 2 g/liter chemical fertilizer 15-30-15 + vitamin C) amounted to (103.8 dm2), and thus the increase was significant when comparing the treatments (P = 0.039).

The results also indicated that there was no significant effect between the treatments on the variable leaf petiole length, as in Table No. (3), where the treatments (6 g/liter yeast + 2 g/liter chemical fertilizer) achieved 15 - 30 - 15 + Vitamin C), and (3g/liter yeast + 2g/liter chemical fertilizer 15- 30- 15 + vitamin C) had the highest effect with an average of (9.8), followed by the treatment (6g/liter yeast + 2g/liter chemical fertilizer 20 - 20- 20 + Vitamin C) with an average amount of (9.6), then the treatment (3 g/liter yeast + 2 g/liter chemical fertilizer 15-30-15) with an average amount of (9.3), and the treatment (2 g/liter chemical fertilizer 15- 30-15 +Vitamin C), and

the treatment (3 g/liter yeast + 2 g/liter chemical fertilizer 20-20-20) had an average of (9.2), while the treatment (control) achieved the least significant effect with an average of (7), followed by The treatment (6 g/liter yeast + 2 g/liter chemical fertilizer 15-30-15) had an average of (7.4), then the treatment (6 g yeast + vitamin C) with an average of (7.6). We can see from Table (3). The addition of the different fertilizer treatments did not give a significant difference between the treatments for the plant height variable among the studied treatments. The significant increase was greater than 0.05, but the treatment (vitamin C) was superior with an average of (112), followed by the treatment (3g yeast + 20-20-20).) with an average of (108), followed by the treatment (3 g yeast + 15 - 30-15) with an average of (107.6), while the least effect was with the (control) treatment, with an average of (78.8), followed by the treatment (6 g yeast + vitamin C).), with an average of (85.4), then the treatment (15-30-15+ vitamin C) with an average of (84), which was at a significant level of 0.200.

Table No. (3) shows the effect of treatments on vegetative growth characteristics

Transaction	Number of leaves			Surface area of the leaf			Leaf necklength			Plant height		
Control	38.0	±	4.94	64.8	±	13.47	7	±	1.22	78.8	±	45.43
3 gm yeast	60.0	±	11.18	91.3	±	17.87	8.3	±	1.48	101	±	4.18
6 gm yeast	71	±	11	74.2	±	19.16	7.8	±	1.78	93	±	12.54
20-20-20	67.6	±	20.25	79.2	±	15.19	8.3	±	1.48	96.6	±	14.41
3 gm yeast + 20-20-20	68.0	±	12.22	88.8	±	25.55	9.2	±	83.	108	±	18.9
6 gm yeast + 20-20-20	71.6	±	19.88	85.7	±	26.85	7.8	±	2.88	98.2	±	6.87
15-30-15	67.6	±	20.77	99.8	±	14.31	9.3	±	2.1	91	±	25.34
3 gm yeast + 15-30-15	55.4	±	15.64	92.2	±	26.58	8.2	±	1.3	107.6	±	24.82
6 gm yeast + 15-30-15	65.2	±	13.7	73.05	±	11.31	7.4	±	1.14	104	±	11.4
Vitamin C	82	±	9.08	79.8	±	11.97	8.2	±	1.3	112	±	12.04
3 gm yeast + Vitamin C	64	±	12.7	69	±	11.81	8.4	±	1.08	99	±	14.31
6 gm yeast + Vitamin C	68.6	±	15.58	77.2	±	30.51	7.6	±	1.14	85.4	±	9.39
20-20-20 + Vitamin C	82.8	±	10.1	103.8	±	15.15	8.2	±	1.44	102.4	±	7.82
3 gm yeast + 20-20-20+ Vitamin C	86.8	±	14.78	87	±	33.42	9	±	2.73	100	±	14.57
6 gm yeast + 20-20-20+ Vitamin C	83.6	±	5.36	107.5	±	37.37	9.6	±	1.67	102.4	±	7.5
15-30-15 + Vitamin C	67.8	±	19.91	96.9	±	16.42	9.2	±	0.83	84	±	13.87
3 gm yeast + 15-30-15+ Vitamin C	83.6	±	10.92	100.8	±	21.34	9.8	±	0.44	92.8	±	11.9
6 gm yeast + 15-30-15+ Vitamin C	92.8	±	9.67	109	±	24.95	9.8	±	1.64	105.2	±	7.42

2 The effect of treatments on the weight, size and diameter of the fruit of cucumber plants:

The results in Table (4) indicate that the different fertilization treatments had a significant effect on some characteristics such as the length, size and diameter of the fruit, which led to an increase. The increase was significant at the 0.05 level. The results also indicate that the use of different fertilizers did not give a significant difference between the studied treatments for the variable wet weight of the fruit. Through Table No. (4), the least effect of the variable wet weight of the fruit was recorded in the treatment (control) with an average of (105 grams), followed by the treatment (vitamin C) with an average of (144.2). grams), then the treatment (2 g/liter chemical fertilizer 20-20-20) with an average of (153.2 grams), while the treatment (2 g/liter chemical fertilizer - 15-30 + vitamin C) excelled with an average of (246.4 grams), The treatment is (3 g/liter yeast + 2 g/liter chemical fertilizer 15-30-15 + vitamin C) with an average of (244.2 grams), and the treatment is (6 g/liter yeast + 2 g/liter chemical fertilizer 15-30-15).), with an average of (243.6 grams), respectively, followed by the treatment (6 g/liter yeast + vitamin C) and the treatment (6 g/liter yeast + 2 g/liter chemical fertilizer 15-30-15 + vitamin C) with an average of (235.8 grams, 235.4 grams), then the treatment (6 g/liter yeast + 2 grams/liter chemical fertilizer 20-20-20 + vitamin C), with an average of (229.6 grams).

The results from Table (4) also indicated that there were highly significant differences (P = 0.000) in the comparison between the treatments in fruit length, as the treatment (6 g/liter yeast + 2 g/liter chemical fertilizer) outperformed 15-30. - 15 + Vitamin C) significantly by giving it the highest average fruit length of (18.4 cm), followed by the treatment (6 g/liter yeast + 2 g/liter chemical fertilizer 20-20-20 + vitamin C) with an average of (17.8 cm), then Treatment (2 g/liter chemical fertilizer 15-30-15 + vitamin C) (3 g/liter yeast + 2 g/liter chemical fertilizer 15-30-30 + vitamin C) with an average of (17.4 cm), while this decreased The value was recorded in the control treatment, and the lowest value was recorded among the treatment values as it amounted to (9.6 cm), followed by the treatment (3 g/liter yeast + 2 g chemical fertilizer 20-20-20 + vitamin C) with an average of (14.6 cm), then the treatment (3 g/liter yeast + 2 g/liter chemical fertilizer 15-30-15, with an average of (15 cm). As shown in Table (4) for the size variable The result is that there is a significant difference between the different treatments at the level of significance of 0.05, as the treatment (6 g/liter yeast + 2 g/liter chemical fertilizer 15-30-15 + vitamin C) excelled, with an average of (246 ml), followed by treatment (2 g/per liter chemical fertilizer 15-30-15+ Vitamin C) (3 g/per liter yeast + 2 g/per liter chemical fertilizer 15-30-15+ vitamin C), with an average amount of (236 ml) then treatment (6 g/per liter) Yeast + 2 g/liter of chemical fertilizer 20-20-20 + vitamin C, with an average of (233 ml), where the least effect was recorded in the treatment (control) and the treatment (6 g/liter of yeast), with an average of (98 ml), and the treatment. (6 g/liter yeast + 2 g/liter chemical fertilizer 15-30-15), with an average of (101 ml), followed by the treatment (6 g/liter

yeast + vitamin C), with an average of (153 ml), then the treatment (3 g/per liter yeast + 2 g/per liter chemical fertilizer 20-20-20 + vitamin C, with an average of (156 ml). The results of the same table indicate that there are significant differences between the treatments in the fruit size characteristic, which is very high (P = 0.000).

As for the fruit diameter variable, it was found that there was a significant difference between the studied treatments at the significance level of 0.05, Table No. (4), where the treatment (control) recorded the least effect, with an average of (3.2 cm), followed by the treatment (6 g). /per liter of yeast), with an average of (3.5 cm), then the treatment (vitamin C), with an average of (3.8 cm), while the highest increase was given by the treatment (6 g/per liter of yeast + 2 g/per liter of chemical fertilizer 15-30-15 + Vitamin C), with an average of (4.7 cm), and the treatment (3 g yeast), with an average of (4.6 cm), followed by the treatment (2 g/liter chemical fertilizer + Vitamin C), with an average of (4.5 cm), then the treatment (6 g/per liter yeast + 2 g/per liter chemical fertilizer 20-20-20 + vitamin C) (3 g/per liter yeast +2 g/per liter chemical fertilizer 20-20-20), with an average of 4.48 and 4.46 cm, respectively. Thus, the comparison between coefficients was at a significant level (P = 0.004).

Table No. (4) shows the effect of treatments on the characteristics of weight, length, size and diameter of the fruit of the cucumber plant

Transaction	Weight of fruit	Fruit length	Fruit size	Fruit diameter
Control	105 ± 54.77	9.6 ± 2.7	98 ± 46.58	3.2 ± 0.896
3 gm yeast	214.4 ± 68.69	17.2 ± 0.836	206 ± 73	4.6 ± 0.58
6 gm yeast	176.2 ± 39.71	15.4 ± 2.4	98 ± 40.86	3.5 ± 0.4
20-20-20	153.2 ± 68.34	15.8 ± 1.78	195 ± 60.31	4.2 ± 0.4
3 gm yeast + 20-20-20	205 ± 123.4	16.8 ± 3.34	215 ± 61.03	4.46 ± 0.384
6 gm yeast + 20-20-20	225.6 ± 77.58	17.2 ± 2.16	237 ± 72.93	4.3 ± 0.35
15-30-15	219 ± 115.64	15.8 ± 2.58	169 ± 83.47	3.9 ± 0.94
3 gm yeast + 15-30-15	183.8 ± 52.55	15 ± 2.34	178 ± 45.08	3.9 ± 0.45
6 gm yeast + 15-30-15	243.6 ± 63.64	17 ± 1.87	101 ± 46.69	4.4 ± 0.36
Vitamin C	144.2 ± 67.29	17 ± 3.16	182 ± 67.6	3.8 ± 0.54
3 gm yeast + Vitamin C	208.6 ± 85.03	17.2 ± 1.78	183 ± 77.1	4.3 ± 0.39
6 gm yeast + Vitamin C	235.8 ± 109.179	16.4 ± 3.78	153 ± 60.78	4.3 ± 0.75
20-20-20 + Vitamin C	185.2 ± 48.42	16 ± 2.54	158 ± 53.1	4.06 ± 0.24
3 gm yeast + 20-20-20 + Vitamin C	180 ± 44.96	14.6 ± 2.6	156 ± 31.89	4.4 ± 0.42
6 gm yeast + 20-20-20 + Vitamin C	229.6 ± 76.81	17.8 ± 1.3	233 ± 36.33	4.48 ± 0.41
15-30-15 + Vitamin C	246.4 ± 79.44	17.4 ± 2.07	236 ± 90.16	4.5 ± 0.76
3 gm yeast + 15-30-15 + Vitamin C	244.2 ± 51.95	17.4 ± 1.81	236 ± 37.81	4.36 ± 0.28
6 gm yeast + 15-30-15 + Vitamin C	235.4 ± 34.14	18.4 ± 1.51	246 ± 35.07	4.7 ± 0.479

It is clear from Table (5) that there is a significant difference between the sex ratio (female flowers and male flowers) at a significance level of 0.05, as the number of female flowers exceeded the number of male flowers in the treatment (2 g/liter of fertilizer water).

Chemical (20-20-20 + Vitamin C), with an average of (17.4, 11.2), respectively, followed by the treatment (3 g yeast) with an average of (14.8, 11.2), then the treatment (3 g/liter of yeast + vitamin C) and (3 g/liter of water yeast + 2 g/liter of chemical fertilizer 20-20-20 + vitamin C, with an average of (12.8, 10) respectively, then treatment (2 g/liter of chemical fertilizer 15-30-15 + vitamin C).), with an average of (12.6, 8.4), respectively, where the least effect was recorded in the treatment (control), with an average of (7.8, 5.4), respectively, followed by the treatment (6 g/liter yeast + 2 g/liter water, chemical fertilizer 15-30 - 15), with an average of (9.4, 7.2), respectively, then the treatment (6 g/liter yeast), with an average of (11, 7.8), and the treatment (3 g yeast + 15-30-15), with an average of (11, 9.4). The treatment (6 g yeast + vitamin C), with an average of (11, 7.8), respectively. Table (5).

Table No. (5) shows the effect of treatments on flowering characteristics (female flowers and male flowers) of cucumber plants

Transaction	Number of female flowers	Number of male flowers
Control	7.8 ± 1.3	5.4 ± 1.51
3 gm yeast	14.8 ± 3.89	11.2 ± 3.56
6 gm yeast	11 ± 1	7.8 ± 1.09
20-20-20	12 ± 3.74	8.6 ± 3.43
3 gm yeast + 20-20-20	12.4 ± 3.91	9.4 ± 1.14
6 gm yeast + 20-20-20	12.4 ± 2.5	8.4 ± 1.14
15-30-15	11.2 ± 2.16	9.8 ± 2.77
3 gm yeast + 15-30-15	11 ± 3.6	9.4 ± 1.67
6 gm yeast + 15-30-15	9.4 ± 0.89	7.2 ± 1.48

Vitamin C	11.2 ± 3.63	8.6 ± 0.89
3 gm yeast + Vitamin C	12.8 ± 4.14	9.2 ± 3.49
6 gm yeast + Vitamin C	11 ± 1	7.8 ± 1.3
20-20-20 + Vitamin C	17.4 ± 3.6	11.2 ± 1.64
3 gm yeast + 20-20-20 + Vitamin C	12.8 ± 2.58	10 ± 3.67
6 gm yeast + 20-20-20 + Vitamin C	11.6 ± 2.88	10.2 ± 0.83
15-30-15 + Vitamin C	12.6 ± 2.19	8.4 ± 1.34
3 gm yeast + 15-30-15 + Vitamin C	12.2 ± 1.09	8 ± 1.41
6 gm yeast + 15-30-15 + Vitamin C	11.4 ± 0.89	10 ± 3.08

3. The effect of treatments on the weight of the shoot and root system (wet and dry) of cucumber plants:

The results in Table (6) indicate that adding different fertilizers with different combinations to the weight of the vegetative soil did not give a significant difference between the studied treatments, but according to Table (6), the treatment (6 g/liter yeast + 2 g/liter) outperformed the A liter of chemical fertilizer (15 - 30 - 15 + vitamin C), with a wet weight of (344.7333 g), and a dry weight of (81.4 g), followed by treatment (6 g/liter yeast + 2 g/liter chemical fertilizer 20-20-20) With a wet weight of (291.4167), and a dry weight of (80.1 g), then the treatment (6 g/liter yeast + 2 g/liter chemical fertilizer 15-30-15), with a wet weight of (273.7067 g), and a dry weight of (30.5 g).), but it was less effective in the treatment (control), with a wet weight of (82.33 g) and a dry weight of (18.3 g), and the treatment (3 g/liter yeast + vitamin C), with a wet weight of (84.73 g) and a dry weight of (57.5 g), followed by the treatment (3 g/liter yeast + 2 g/liter chemical fertilizer 20-20-20) with a wet weight of (166.27 g) and a dry weight of (88.2 g), then the treatment (2 g/liter fertilizer). Chemical 20-20-20, with a wet weight of (194.76 g) and a dry weight of (58.1 g). The results also showed that there is no significant effect on the variable wet weight of the root system (Table (6). The treatment (6 g/liter of yeast + 2 g/liter of chemical fertilizer 15-30-15+vitamin C), with a wet weight of (24.1 g), and a dry weight of (7.6 g), followed by the treatment (2 g/liter of chemical fertilizer 20). - 20-20+ Vitamin C), with a wet weight of (23.6 g), and a dry weight of (8.9 g), and the treatment (6 g/liter yeast + 2 g/liter chemical fertilizer 20-20-20), with a weight of (20-20+). 23.3 g), and a dry weight of (7.9 g), then the treatment (3 g/liter yeast + 2 g/liter chemical fertilizer 20-20-20), with a wet weight of (21.5 g) and a dry weight of (9.2 g), in While the treatment (Control) recorded the lowest wet weight, which reached (10.1 g), and dry weight (1.3 g), followed by the treatment (Vitamin C) with an average of (14.2 g), and dry weight of (5.5 g), then the treatment (2 g). /per liter chemical fertilizer 20-20-20) with a wet weight of (15.05g) and a dry weight of (6.5g) and the treatment (3g/per liter yeast + 2g/per liter chemical fertilizer 15-30-15), with a wet weight of (15.05). g), and a dry weight of (3.8 g).

Table No. (6) shows the effect of treatments on the weight of the shoot and root system (wet and dry) of cucumber plants

Transaction	Wet weight of shoot system	Dry weight of shoot system	Wet weight of root system	Dry weight of root system
Control	82.3 ± 15.69	18.3 ± 3.78	10.1 ± 1.54	1.3 ± 0.5
3 gm yeast	235.06 ± 87.91	69.4 ± 26.87	20.08 ± 4.02	7.9 ± 3.57
6 gm yeast	223.1 ± 218.39	30.5 ± 17.94	15.19 ± 6.42	3.1 ± 2.56
20-20-20	194.7 ± 153.48	58.1 ± 49.68	15.05 ± 7.27	6.5 ± 5.25
3 gm yeast + 20-20-20	166.2 ± 44.5	88.2 ± 69.56	21.5 ± 10.85	9.2 ± 4.48
6 gm yeast + 20-20-20	291.4 ± 95.43	80.1 ± 26.3	23.3 ± 6.89	9.7 ± 3.84
15-30-15	208.9 ± 64.6	61.4 ± 23.2	18 ± 3.78	6.07 ± 5.5
3 gm yeast + 15-30-15	231.2 ± 68.21	57.5 ± 18.24	15.05 ± 0.69	3.8 ± 0.31
6 gm yeast + 15-30-15	273.7 ± 89.11	30.5 ± 17.94	16.1 ± 2.12	4.4 ± 0.88
Vitamin C	247.9 ± 117	60.3 ± 23.38	14.2 ± 2.98	5.5 ± 5.61
3 gm yeast + Vitamin C	84.7 ± 4.16	57.5 ± 19.31	7.2 ± 5.19	3.07 ± 0.96
6 gm yeast + Vitamin C	214.5 ± 31.38	61.5 ± 15.78	17.8 ± 5.98	4.4 ± 1.81
20-20-20 + Vitamin C	260.9 ± 191.38	72.2 ± 55.23	23.6 ± 7.75	8.9 ± 3.7
3 gm yeast + 20-20-20 + Vitamin C	233.8 ± 106.83	68.2 ± 18.53	20.6 ± 4.47	7.1 ± 4.31
6 gm yeast + 20-20-20 + Vitamin C	250.2 ± 44.48	81.8 ± 19.54	18.4 ± 2.96	6.8 ± 4.49
15-30-15 + Vitamin C	248.9 ± 40.57	69.3 ± 19.04	16.6 ± 2.61	4.4 ± 0.88
3 gm yeast + 15-30-15 + Vitamin C	263.9 ± 53.03	79.6 ± 8.53	21.1 ± 5.51	5.4 ± 2.47
6 gm yeast + 15-30-15 + Vitamin C	344.7 ± 50.66	81.4 ± 6.07	24.1 ± 9.52	7.6 ± 5.04

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

The results from Table (7)) 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 (7) 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. (7) 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 (7) 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 (7).

Table No. (7) 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

Discussion

The results shown in Table (2, 3, 4) showed that the different fertilization treatments had a significant effect on the characteristics of vegetative growth, represented by the number of leaves, the surface area of the leaf, the number of female and male flowers, and the quality of the fruit represented by the length, diameter, weight, and size of the fruit and the shoot. As well as the root system (wet and dry) of the cucumber plant, we find that the best treatments led to a significant increase in the vegetative growth characteristics represented in (the number of leaves, the surface area of the leaf, the length of the leaf neck, the length of the fruit, the weight of the fruit, and Fruit size) which led to an increase in yield and improvement in the nutritional value of the fruits are, respectively: - Treatment of active dry yeast 6 grams with NPK complex fertilizer 15-30-15 and vitamin C, followed by treatment of dry yeast 3 grams with NPK complex fertilizer 15-30-15. And vitamin C, and these results obtained are similar to the results conducted by, [12, 13] and the reason for this may be due to the joint interaction between the fertilizers, which led to an increase in biological activity, which in turn increased From the plant's ability to absorb nutrients, which have a major role in improving vegetative and root growth, improving the sexual ratio, and increasing yield. [14, 15] While the height of the plant and the weight of the fruit, it did not have a moral effect.

While Table (5) 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

Biofertilization 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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