Impact of Some Soil Organic Improvements on Soil Fertility and Plant Growth on Cucumber Plant (*Cucumis sativus*) under Greenhouse Condition in Sulaimaniyah Governorate

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- **Date of research received 28/2/2022 and accepted 30/3/2022.**

ABSTRACT

For this goal, four types of soil improvements were used (Industrial biological fertilizer, such as dry yeast (*Saccharomyces cerevisiae)* in three concentrations (3, 6, 9 g^{-L}), Biofertilisers with one concentration, organic matter, such as humic acid and folic acid with one concentrations as well as control. These seven applications were administered to Cucumber plant in an R.C.B.D. design with three different replications

The outcomes show that when use the results show that using dry yeast (6 g^{-L}) has a significant difference in ($P_{0.05}$) on the soil PH that decreased to 6.8 as well as Nitrogen contain 4.8%; available phosphorus 40.5ppm; potassium 2.9ppm. Humic acid has a statistically significant ($P_{0.05}$) influence on EC, P, O.M., Biofertilisers have a statistically significant effect ($P_{0.05}$) on Ca (22.04ppm) soluble ,Folic acid made a significant ($P_{0.05}$) effect on soils E.C. (0.73ds^{-m}), A comparison between effects of the treatments on cucumber yield and number of days until harvesting, green group system, root group system, and TSS (total soluble solid) it become clear that Yeast 3g^{-L} give the significant difference ($P_{0.05}$), treatments Humic acid, Biofertilisers, Yeast 3g^{-L} give a significant difference ($P_{0.05}$) on green group system and root group system.

Keywords: Soil Fertility, Organic Fertilizer, soil improvements, Cucumber yield.

تأثير بعض المحسنات العضوية في خصوبة التربة ونمو نبات

الخيار *Cucumis sativus* في ظروف الصوبة البلاستيكية في محافظة السليمانية

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- **تاريخ استلام البحث 2022/2/28 وقبوله 2022/3/30**

الخلاصة

تم استخدام أربعة أنواع من محسنات التربة غيرالكيميائية لايجاد تأثيرها على نمو النبات و خصوبة التربة : مركب بايلوجي مثل الخميرة الجافة (*Saccharomyces cerevisiae*)بثلاث جرعات (3 ، 6 ، 9 جم\لتر) ، سماد حيوي بتركيز واحد ، المواد العضوية (humic acid, Folic acid)بتركيز واحد بالاضافة الى الشاهد،

تم تطبيق هذه التطبيقات السبعة على نباتات الخيار حسب تصميم R.C.B.D. وأظهرت النتائج أن استخدام الخميرة الجافة (6 جم) له فرق معنوي في ($P_{0.05}$) على حموضة التربة والذي انخفض إلى 6.8 وكذلك محتوى النيتروجين البالغ 4.8% ، والفوسفور المتاح 40.5 جزء في المليون ، والبوتاسيوم 2.9 جزء في المليون.

حامض الهيومك كان له تاثيرا معنويا عند المستوى ($P_{0.05}$) على التوصيل الكهربائي لمحلول التربة و كذلك على جاهزية الفسفور والمادة العضوية، السماد الحيوي كان له تأثيرا معنويا عند المستوى ($P_{0.05}$) على تركيز الكالسيوم البالغ 22.04 جزء في المليون ، Folic acid كان له تأثيرا معنويا عند المستوى ($P_{0.05}$) على قدرة التوصيل الكهربائي للتربة والذي بلغ (0.73 ds/m) ، عند مقارنة تأثيرات المعاملات على محصول الخيار وعدد الأيام حتى الحصاد ونظام المجموع الخضري ونظام المجموع الجذري وإجمالي المواد الصلبة القابلة للذوبان نجد أن الخميرة بتركيز(3غم\لتر) أحدث فرقًا معنويًا ($P_{0.05}$) كما أحدث مع الهيومك أسيد والسماد الحيوي، ومعاملة الخميرة (3غم\لتر) نتج عنها فرقًا معنويًا ($P_{0.05}$) في نظام المجموع الخضري ونظام المجموع الجذري.

الكلمات المفتاحية: خصوبة التربة، السماد العضوي، السماد الحيوي، محسنات التربة، الخيار

INTRODUCTION

In recent decades, chemical fertilizers have grown increasingly popular across the world, concentrating on the soil as a dead container for plant roots rather than a dynamic ecosystem in which the crop is just one among hundreds or thousands of interacting species, it is now recognized that there is a steady reduction in production in dense monoculture areas that get high chemical fertilizer treatments alone. Even in irrigated paddy fields, there is a reduction. Ferris et al. (1).

Greenhouse gases like as nitrous oxide and ammonia are emitted as a result of nitrogen fertilizer usage Ammonia, in addition to producing nitrogen, may also raise soil acidity. Excess nitrogen fertilizer use causes insect issues by boosting the natality rate, lifespan, and pests' overall fitness Organic farming does not give enough nutrition on its own., according to experience in tropical Asian nations, and organic fertilizers must be combined with a chemical fertilizer basal dressing. Ingham et al., (2); Zallar & Koepke, (3).

Although soil fertility is acknowledged as a major barrier to agricultural productivity in developing nations, fertilizer use is dropping in Sub-Saharan Africa.

For soil fertility management, smallholder farmers still rely primarily on livestock waste. Data from a sample of 3,330 geo-referenced farm families in Central and Western Kenya were used to investigate the drivers of soil fertility management techniques, including both the use of cow dung and inorganic fertilizer. Sarhan et al., (4).

Cropping strategies for maize, rice, and wheat will determine whether the global dilemma of supplying rising food demand while simultaneously protecting the environment is solved or not. In large-scale particularly in poor nations, small-scale systems, the trade-offs for the optimum produce and environmental preservation is to ensure synchronization between Without a surplus or deficit, nitrogen supply and crop demand are balanced. Despite advances in fundamental biology and ecology. Shiboob, (5). controlling the fate of nitrogen

in cropping systems is becoming increasingly difficult, and while biochemistry and genetics can help, The scientific challenge is not to be taken lightly.

Controlling nitrogen destiny in cropping systems that need to maintain production increases on the world's finite amount of arable farmland is getting increasingly difficult, therefore the scientific problem's complexity should not be underestimated. Cassman et al., (6).

According to Juan et al., (7) applying organic fertilizer had a considerable impact on carbon and nitrogen microbes, with carbon microbes changing from (96.4) to (500.1) mg^{-kg} and nitrogen microbes changing from (35.89) to (101.8) mg^{-kg} Some soil microbial characteristics and soil enzyme activities were significantly different from other treatments that did not employ organic fertilizer while also raising the soil total nitrogen and total phosphor ratios.

Soil organic matter is crucial for biological processes. And chemical activities in the soil, in addition changes in soil organic matter have a big influence on soil nitrogen turnover because microbial immobilization requires available Carbon. Soils with greater organic matter may be able to immobilize more nitrogen and reduce nitrogen loss to the environment. Otherwise, when available Carbon is exhausted, there will be a faster turnover of nitrogen and losses. Soil Carbon turnover can be influenced by changes in nitrogen supply. Gliessman, S.R., (8).
Wu et al., (9). Reported the application of Bioferitlizer, which included three species of nitrogen-fixer (*Azotobacter chroococcum*), Phosphorus solubilizer (*Bacillus megaterium*), and third apply potassium solubilizer (*Bacillus mucilaginous*), on soil Features significantly boosted the development of Z. Mays. When Bioferitlizer was employed, the maximum biomass and seedling height were reached. According to this greenhouse study, Bioferitlizer in half the quantity Application showed equivalent Treatments with organic or chemical fertilizers have different impacts.

Fertilizer combination of nitrogen-fixing bacteria and phosphorus-solubilizing bacteria generated the highest soil organic matter (1.28 %). The majority of nitrogen delivered by chemical fertilizers was leached out of reach of plants; whereas, due to its gradual release and effective consumption by plants, an integrated fertilizer resulted in an increase in nitrogen concentration in soil. The integrated fertilizing method, according to the findings of this study, is more successful in dry farming than other fertilizing systems. Sanchez et al., (10)

Shafeek et al., (11). Reported Plant wastes and natural-raw wastes, depending on their physical and chemical characteristics, are organic and mineral components that are widely diffused and innocuous. High dispersion, which is represented by system particles of colloidal substances spread in diverse settings, determines the specificity of physical condition. Differences in extremely low equilibrium insolubility and chemical composition influence the distinctiveness of physical states. As an example, consider the following circumstance. Carbohydrates, proteins, lipids, and other organic material, as well as a variety of chemical compounds, are abundant in organic wastes. Organic wastes have a high concentration of carbohydrates, proteins, lipids, and other organic material, as well as a range of chemical compounds. Organic wastes have a high percentage of carbohydrates, proteins,

lipids, and other organic compounds, whereas phosphorus gypsum has a high concentration of sulfur and calcium.

Teak seedlings' growth and nitrogen absorption shown to be aided by humic acid. Plant height, monthly growth rates, and total dry matter yield all increased considerably. above the controls in the two soils at the three Humic Acid treatment doses. The addition of HA to the two soils increased their productivity. Seedling absorption of Nitrogen, Phosphorus, Potassium, Magnesium, Calcium, Zinc, Iron, while lowering Manganese uptake. An investigation was conducted out. To investigate the influence of various fertilizers and farming techniques. Lonhienne et al., (12).

Table 1: Elements and contains of dry yeast to each gram.

Elements	**Mg^{-g}**	**component**	**Mg^{-g}**	**Elements**	**Mg^{-g}**
Cupper	0.05	Carbohydrate	82	Magnesium	2
Calcium	0.1	Total Nitrogen	90	Phosphate	1-13
Iron	0.05	Nitrogen Humid acid	40	Potassium	30
Zinc	0.05	Magnesium	2	Sodium	56

Yeast extracts enriched culture medium caused morphological abnormalities, according to Abraham et al., (13) This might be due to the plantlets' stress response to the yeast extract's elicitor, which created an accumulation of secondary metabolites. The fact that the overall phenolic Curcuma mangga plantlets' content increased shows that yeast extract can cause methyl jasmonate to develop, resulting in higher phenolic content. If yeast extract is applied to the growth media, total phenolic content and total phenolic content increased. The production of phenolic was unaffected by increasing the concentration of yeast extract.

However, adding yeast extract to the culture medium did not enhance overall phenolic content. as a phenolic elicitor. Yeast extract was shown to have no effect on the biosynthetic process of plants. It did, however, cause the creation methyl jasmonate and endogenous jasmonic acid, both of which have an impact on secondary metabolite production. shikawa et al., (14).

MATERIAL AND METHODS

Table 2: Before the experiment, soil samples were analyzed and the results were as below.

Analysis element	**Soil texture**	**E.C. / dS/m**	**PH**	**N %**	**Available P** (ppm)	**Soluble K$^+$** (ppm)	**Soluble Na$^+$** (ppm)	**Soluble Ca$^+$** (ppm)	**Soluble Mg$^+$** (ppm)	**Cl** (ppm)	**O.M %**	**$CaCo_3$ %**	**HCO_3** (ppm)	**CO^{-3}** (ppm)
Before	Clay loam	0.24	7.20	0.19	17.54	8.2	7.3	54.1	35.2	24.8	2.9	19	67.1	12

Irrigate the Experiment

Depending on these evaluations below for the water used to irrigate the research have no side effect on the plant growth?

Table 3: results analysis for water use it in irrigation

E.C. / ds/m	**PH**	**Soluble K+** (ppm)	**Soluble Na+** (ppm)	**Soluble Ca+** (ppm)	**Soluble Mg+** (ppm)	**HCO3** (ppm)	**CO^{-3}** (ppm)
0.5	6.8	0.58	3.21	40.08	20.6	237.9	33

The results of the table are in accordance with the recommendations of the US Salinity Research Laboratory, and this water source is valid for agricultural uses, Senthurpandiane t al., (15).

Table 4: Soil analysis procedures

analyses kind	proceedings
Soil Texture	Bouyoucos,(16); FAW, (17)
E.C.	Olsen and Sommers, (18)
PH	McLean, (19)
N%	Kjeldahl, (20)
Available P	Richards, (21)
Soluble K	Richards, (21)
Soluble Na	Richards, (21)
Soluble Ca	Richards, (21)
Soluble Mg	Richards, (21)
Cl	Richards, (21)
O.M. %	Walkley & Black, (22)
$CaCO_3$ %	Nelson, (23)
HCO_3	Chapman, & Pratt, (24)
CO_3	Chapman, & Pratt, (24)

Experiment Design in the Greenhouse.

- This Experiment applied in greenhouses with a total area 450m^2, each terraces have 6 m^2 area, width terraces (unite experiments) = 90cm, the terraces are 25cm high. In the same line, the distance between each plot is 90cm. The number of sow lines in each treatment is two lines. Each plant has a distance of 30 cm between it and the next plant. Treatment distance (sow line) = 3 m, total number of plant= 16 plant, in each treatment 8 Plants chosen for parameters and data.

For statistical analysis, the X.L. STAT program was employed. Design of the research (R.C.B.D)
- (SAIFE F1) is the most Cucumber (*Cucumis sativus*) Variety used.

- 7 Treatment applied with three applications.

Treatments in the Experiment

T1- Control that only requires water.

T2- Use of humic acid (%35 humic acid) as a compost component.

- 2mm humic acid / Plant added to the soil before planting b (7-10 days).

- When irrigated, 2 mm humic acid /plant are added to the soil with the water.

- 2mm humic acid /plant were added to the soil after planting with (three weeks).

- 2mm humic acid / plant added after flowering.

- 2mm humic acid / plant added to the soil when the first fruits appear.

- 2mm humic acid / plant added to the soil after a five week of harvesting.

- 6week after harvesting 2mm humic acid /Plan added.

- After 10 weeks of harvesting, 2mm humic acid / plant add to the soil.

T3- Biological fertilizer: Apply in three stages to the soil.

- With sowing, add the fertilizer with concentration (15g /liter of water).

- In the same concentration after sowing by (3 week).

- Direct concentration after the first harvest (25g/ liter of water).

- Same Concentration after four week from first harvest.

- After six weeks after the initial harvest, the concentration remains the same.

T4- Added Fungus, using the (Commercial dry yeast of bread) to be a source for (*Saccharomyces cerevisiae*), that add it to the soil with three concentrations, (3g/ liter of water).

T5- Add another amount (6g/ liter of water) of Commercial dry yeast of bread.

T6- another amount adds it (9g/ liter of water) of Commercial dry yeast of bread.

T7- Folic acid (18 % folic acid), use in one concentration (3mm/ plant).

RESULTS AND DISCUSSISON

Table 5: Effect OF Fertilizer Treatments on Soil Fertility

Treatment	**Texture of Soil**	**Electrical Conductivity** ds/m	**PH**	**O.M** (%)	**Nitrogen** %	**available Phosphorus** ppm	**Potassium** ppm	**Calcium** ppm
Before sowing	Clay loam	0.8	7.2	1.8	2.5	11.3	1.4	32.06
Biofertilisers	Clay loam	1.2 b	7.4 b	1.8 b	3.0 c	22.7 c	1.95 b	22.04 a
Control	Clay loam	0.85 a	7.5 c	0.4 f	1.8 e	0.8 e	1.17 b	14.02 a
Folic acid	Clay loam	0.73 a	7.2 d	0.5 e	3.2 d	2.1d	1.09 b	20.04 a
Humic acid	Clay loam	0.8 a	7.3 d	2.6 a	4.2 b	38.4a	2.34 b	26.05 a
Yeast 3g^{-L}	Clay loam	1.61 b	7.1 b	0.6 d	3.4 d	14.3 d	1.36 b	18.03 a
Yeast 6 g^{-L}	Clay loam	2.51 d	6.8 a	2.5 a	4.8 a	40.5a	2.93 a	28.05 a
Yeast 9 g^{-L}	Clay loam	2.82 d	7.4 b	0.9 c	3.7cd	30.4b	3.5 a	16.03 a

Duncan's multiple ranges test shows that means with different letters are substantially different at P0.05.

The characteristics of the chosen fertilizers utilized in this study varied depending on the kind of fertilizer (Table 5). Kato et al., (25). The electrical conductivity (EC) of extract Yeast 6g^{-L} was much greater than the other fertilizers (Table 5), which may be related to the fact that the dry yeast decomposes quickly.

According to our findings, the pH of the soil after harvest declined in all treatments, but increased with the administration of control. The drop the addition of a high organic Folic acid to the soil can be connected to a change in PH. Increased microbial activity and reduced inorganic fertilizer input result in complete breakdown of organic materials. could be attributed to the lowering of pH of plots with high organic fertilizer application, whereas organic matter degradation is completed as a result of enhanced microorganism limited inorganic fertilizer use and actions could be attributed Plots with less organic fertilizer application have a lower pH, Agbede, (26)

Table 5 demonstrates that using and yeast $6g^{-L}$ for the plants resulted in a considerable shift in soil pH when compared to the baseline soil pH, the significant number of fungal and plant residues may have contributed to this finding. Other researchers have shown similar results. Materrechera and Mkhabela, (27).

The soil pH, available P, and available K levels were all considerably raised by yeast $6g^{-L}$ treatment. (Table 5) shows that applying Folic acid and Yeast 9 g^{-L} did not lead to a substantial change as compared to the pH of the soil baseline soil pH. (7.2). the significant amount of bases used with the composts may have contributed to this result. Other researchers have shown similar results .Whalen et al., (28).

The activity of acidic and alkaline soils phosphates was modulated use various fertilizers applications. Dick, (29). That adding organic materials to the soil increased the activity of acid phosphates. We detected Acid phosphate activity did not differ significantly between the control and the experimental groups. And folic acid treatments when comparing the phosphates activity of the Yeast $3g^{-L}$ and folic acid treatments to that of the yeast $6g^{-L}$ plots. The highest activity of acid phosphates was seen in soils treated with yeast $6g^{-L}$ and humic acid. Sudduth et al.,(30).

At the same time, the properties of soil humus are reliant on and unique from various soil types. The principal component of soil humus, humic acids, determines its features and, as a result, its role in the natural environment. The amount of humic acids contained in humus, as well as their properties, are known to be altered by the fertilization method utilized. Gonet and Dębska, (31).

The pre-planting soil research (Table 5) demonstrates inadequate soil fertility, requiring fertilizer application to recover nutrients lost during to increase yields, harvest crops and add nutrients.Ayuba and Olatunji, (32). The quantity of total nitrogen in the soil before planting (2.5 ppm) is less than the recommended level (4.8 ppm).

With the use of Yeast 6 g^{-L} and humic acid fertilizer, the total nitrogen status of the soil improved the input of nitrogen to the soil led to a significant increase in nitrogen levels in the soil, resulting in enhanced microbial activity as a result of higher nutrient concentrations. of various fertilizers Adeniyan and Ojeniyi, (33).

Shalaby and El-Ramady, (34) reported that the absence of fertilizer application and nitrogen uptake by component crops may be to blame for the overall N depletion reported in the control.

We utilized dry yeast $6g^{-L}$ and organic fertilizer in our study to increase organic materials in the soil, which was consistently low in areas that did not get any fertilizer. The lack of fertilizer is to blame, because it sped up the breakdown of organic substances according to Taha et al.,(35) soil's organic matter content may be maintained by integrating agricultural wastes and mulching.

Soil amendments using organic and inorganic fertilizers it has been observed that organic matter accounts for up to 90% of the cations exchange capacity of mineral soil surface layers. Stevenson, (36).

Similarly, the amount of accessible P in control treatment dropped, which might be due to nutrient absorption by elements plants and/or component fixation, which normally happens when the soil pH is lower, Brady and Weil, (37). The use of yeast $6g^{-L}$ fertilizer resulted in a greater accumulation of accessible P. The interchangeable bases followed a similar pattern. The rise in viable Phosphoresce is most likely because organic matter releases nutrients into the soil fertilizer treatment. When it comes to plant factors like crop yields, the results obtained at the extract dry yeast 6 g^{-L} and humic acid fertilizer utilized in the study are shown, the increases in soil pH levels that have been seen. Hussain and Khalaf, (38).

Cucumber yield components rose when yeast extract application was raised from 3 g^{-L} to 6 g^{-L} some studies have seen comparable favorable responses of cucumber to humic acid fertilizer application. Also observed a large linear rise in cucumber production in response to nitrogen, Found a strong response of cucumber to fertilizer treatment in the humid rainforest zone in their study using straight nitrogen and potassium fertilizers, concluding that nitrogen alone was particularly successful in improving cucumber production with application. Carpenter et al., (39)

Our investigation also revealed that diverse fertilization treatments had a substantial influence on soil accessible nutrient concentrations, with the exception of Exchangeable Ca^{+2}, which had no effect statically and had no meaningful effect. The nutrients applied by fertilizers were greater than the nutrients absorbed by the vegetables, according to these findings; comparable findings were reported by others. Ayoola, (40).

Another explanation for the quick buildup of nutrients in the soil is that minimal leaching occurs under greenhouse conditions. Chen et al., (41). Exchangeable Ca rose by nearly 21% in plots treated with organic fertilizer after cropping, but decreased in all other plots. The yeast extract, humic acid, and Biofertilisers treatments produce larger levels of Ca than the other treatments. This might be due to the development of a high-solubility Ca & P complex.

Table 6: Impact of soil amendment's on some plants growth properties

Treatments	Yields Ton ha^{-1}	Day to Harvest	Leaf area meter(cm^2)	Green group Weight (kg.)	Root group Weight (kg.)	TSS
Control	8.45 b	69 a	39 b	6.5 a	2.3 ab	5.5 b
Humic acid	7.78 b	72 b	38 b	5.9 a	2.8 ab	6.7 b
Biofertilisers	7.33 c	74 b	32 c	5.9 a	2.7 ab	5.1b
Yeast 3g-L	9.80 a	63 a	45 a	6.8 a	3.3 a	7.9 a
Yeast 6 g-L	7.03 c	71 b	31 c	5.5 b	2.5 b	5.3 b
Yeast 9 g-L	7.13 c	78 b	32 c	5.7 b	2.5 b	5.8 b

Duncan's multiple ranges test shows that means with different letters are substantially different at P0.05 **TSS**= total soluble solids.

The most significant cucumber production was around 39.2 Ton ha^{-1} for yeast-treated (Yeast $3g^{-L}$) plants (table 6) and yeast treatment (Yeast $3g^{-L}$) generated the highest significant (6.8kg) fresh weight. Muwaffaq, (42).

According to Ezz El-Din & Hendawy, (43), utilizing dry yeast at a concentration of ($4g^{-L}$) boosted borage plant development metrics and exhibited significant variations in the mean fresh weight of aerial parts when comparison to the control plot.

When comparison to control, humic acid produced a rise in shot characteristics. Furthermore, as comparison to plot controls, splashed plants by dry yeast concentrations of (3 and 6 g^{-L}) resulted in Plant height and total chlorophyll levels differed in a beneficial way. Sarhan et al.,(44).

The acquired increases in the previously described features might be attributable to the fact that carbon dioxide levels are rising in the soil air caused a drop in soil pH that make interaction with waters soil, which produced carbonic acid, as shown by the equation below. Zaki, (45)

Carbonic acid causes certain soil phosphate compounds to dissolve, Phosphorus levels should be increased compounds in the soil solution. Furthermore,

Reducing the soil PH rise the accessibility of nutritive elements for crops uptake. Proteins, growth factors found in yeast. Abdou, (46).

Thanaa et al., (47). Reported that organic matter effecting on soil microorganisms varies depending on soil type, organic matter supply, and decomposition state, although most soil organism populations increase

According to Guidi et al., (48). Humic acid treatment has a variety of effects on the soil chemical characteristics, and adding Organic matter has the potential to produce a probable increase in available nutrients, including an increase in organic carbon.

Furthermore organic matter alters the amount of accessible nitrogen in the soil; nitrogen availability is determined by the organic source's C/N ratio. The overall biological activities in soil are affected differently by various sources of organic materials. Wood & Edwards, (49)

CONCLUSION

Given the economic limits imposed on production-oriented agricultural systems, nutritional requirements in agriculture will be difficult to meet. Because nutrients are crucial in agro ecosystems, conscious control of fundamental ecosystem processes can help prevent environmental losses. Under this concept, the objective of survey fertility would be to balance nutrient budgets as much as feasible while maintaining these reservoirs.

Management of a healthy agro ecosystem employing organic soil fertility methods can also supply secondary element supplies from time to time. Traditional farming practices, which rely mostly on artificial supplies of N, P, and K, are deficient aside from nutritional concentrations.

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