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EFFECT OF ORGANIC FERTILIZER AND FOLIAR APPLICATION WITH GARLIC EXTRACT, WHEY AND BIO FERTILIZER OF BREAD YEAST IN AVAILABILITY OF NPK IN SOIL AND PLANT, GROWTH AND YIELD OF TOMATO (*LYCOPERSICON ESCULENTUM MILL*)

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Abstract

A field experiment was conducted to study the effect of adding organic fertilizer to the soil and spraying with garlic extract, whey and bio fertilizer of bread yeast in availability of NPK in soil and plant, growth and yield of tomato (Nora) in Silty loam texture soil in one of the agricultural engineering sciences collage, University of Baghdad during the spring season 2016. A randomized complete block design RCBD was used with three replicates. Organic fertilizer (sheep manure) was added to the soil before planting at three levels (0, 15, 30) $Mg.ha^{-1}$. Extract of garlic was sprayed at 5 $ml.L^{-1}$ water, with whey at 20 $ml.L^{-1}$ water. Bio Fertilizer of bread yeast (*Saccharomyces cerevisiae*) was sprayed at 5 $g.L^{-1}$ water on plants. Results showed significant effect of adding of organic fertilizer to the soil and spraying with extract of garlic, whey and bio fertilizer of bread yeast and their interactions, the highest nutrient concentration of nitrogen, phosphorus and potassium in leaves was at 30 $Mg.ha^{-1}$ of organic fertilizers and spraying with bio fertilizer of bread yeast at 5 $g.L^{-1}$ on plants reached (3.4, 0.51, 3.3) %, respectively. And highest dry weight of the plant reached 177 $g.plant^{-1}$, However, the highest chlorophyll content in the plant reached 68 SPAD, and the highest number of fruits per plant reached 37 $fruit.plant^{-1}$ and highest fruit weight reached 84 $g.fruit^{-1}$ and highest plant yield reached 2.952 $kg.plant^{-1}$ with an increase of 165.22 % compared to control treatment.

Keyword: Organic Fertilizer; Garlic; Whey; Bio Fertilizer; Bread yeast; Tomato.

Introduction

Basal calcareous soils suffer from multiple problems, especially the soil of dry and semi-arid areas and the lack of rainfall, which increases salinization and high pH values in these soils, especially soils that suffer from lack of organic matter, So research accelerated to find solutions to such soils. The addition of organic fertilizers is essential for plant growth and for increasing agricultural production, but high, unexamined and frequent additives have poor consequences and can cause many problems for soil and the environment (Hassanein and Kandil, 2004).

Organic fertilizers of various kinds are used as a complement to mineral fertilizers, because they are a practice that reduces the excessive use of mineral fertilizers costly for production (Victor *et al.*, 2013). Researchers are interested in the study of organic materials in terms of decomposition and usefulness of soil and plant and the application of practical use in agricultural programs and plans, especially that the maximum yield of the crop can be easily achieved only when the availability of good content of this substance in the soil, The beginning of the twenty-first century witnessed rapid development at various levels, including the laws and determinants of organic agriculture, and a number of countries in the world carried out extensive studies in which valuable efforts were made to improve the systems of organic agriculture.

Dodson *et al.*, 2002 and Hao *et al.*, 2008 explained that the addition of organic residues to the soil increases the organic matter and increases the number of microorganisms and their activity, as well as working to add nutrients to the soil continuously, which rebalances the nutrients. Mahmoud *et al.*, 2019 found that the addition of organic fertilizer to the soil increased the concentration of nitrogen, phosphorus and potassium in cauliflower leaves.

Most recent studies and researches in the field of plant nutrition indicate that spraying nutrients on the vegetative is an effective way to process the nutrients of the plant by absorbing directly by the plant tissue and reduce the use of mineral fertilizers because of its negative effects on the environment and the plant and resort to natural extracts, which usually They are non-polluting and inexpensive to the environment (Ibriham *et al.*, 2009; Ahmed, 2006 and Aldilaimi *et al.*, 2011).

Garlic is characterized by a high content of amino acids, which contain sulfur such as Methionime and Cysteine and contains vitamins, hormones and disinfectants that are concentrated in lobes such as Allicin, which falls within the therapeutic substances. Allicin is an active ingredient in garlic that is released as a result of the decomposition of Alliin by the enzyme Alliinase when crushing the garlic clove during extraction (Krest and Keusgen, 1999). Whey is the by-product of cheese making and is one of the most important nutrients in leaf fertilization because it contains water, whey proteins, lactose sugar, fat, nutrients and a few vitamins (Aati and Fadel, 2007).

Bread yeast is an enormous store of important nutrients (calcium, magnesium, iron, nitrogen, phosphorus, potassium, sulfur, sodium, zinc and silicon), amino acids, proteins, and plant hormones such as gibberellins, cytokines and oxins, and has the ability to produce a range of enzymes that have The ability to convert monosaccharides into alcohols and CO_2, which are used by plants in photosynthesis (Musallat *et al.*, 2012). Bread yeast plays an important role in increasing vegetative and fruit growth as well as accelerating carbohydrate accumulation and in promoting cell division and elongation, protein synthesis, nucleic acids and chlorophyll industry (Khedr *et al.*, 2000; Heikal, 2005; EL-Desouky *et al.*, 2007).

Tomato (*Lycopersicon esculentum Mill*) is one of the important vegetable crops in the world nutritionally because its fruit contains many minerals, carbohydrates, proteins, fats and vitamins. Each 100 grams of fruit contains 93.1 g water, 0.7 g protein, 0.2 g fat, 3.1 g carbohydrate, 17 mg vitamin C

and Many minerals, such as iron, phosphorus and magnesium, also contain antioxidants, especially lycopene, which reduce the damage to body tissues from chemicals that act on the risk of chronic and cancerous diseases (Gerster, 1997; Wongsa-Ngasir, 2004).

Due to the lack of studies in Iraq on tomoto feeding using whey, garlic extract and bread yeast under open cultivation conditions, this study was conducted with the aim of studying the effect of adding organic fertilizer to the soil and spraying with garlic extract, whey and bio fertilizer of bread yeast in availability of NPK in soil and plant, growth and yield of tomato.

Materials and Methods

A field experiment was carried out in one of the fields of agricultural engineering sciences collage-University of Baghdad during the spring season 2016-2017 to study the effect of adding organic fertilizer to the soil and spraying with garlic extract, whey and bio fertilizer of bread yeast in availability of NPK in soil and plant, growth and yield of tomato in silty loam texture soil, a randomized complete block design RCBD was used with three replicates, Soil samples were taken from the surface layer of soil 0-30 cm from different locations of the field to measuring physical, chemical and fertility properties before transplantation (Table 1).

Field was divided into three blocks, each block was divided to 12 experimented plots, The experimental unit area was 15.75 m^2 (length is 2.4 m and a width is 5.25 m), Tomato seedlings were planted at 10/3/2016 on one side of the row and planted with the spacing of 40 cm with 15 plants per experimental unit.

Organic fertilizer (sheep manure) was added to the soil before planting at three levels (0, 15, 30) $Mg.ha^{-1}$. Nitrogen was added at 200 kg $N.ha^{-1}$ using urea fertilizer (46% N) in three batches after 20, 40 and 60 days of seedling planting. Phosphorus was added at 80 kg $P.ha^{-1}$ using superphosphate fertilizer (21% P) in two batches and potassium was added at 150 kg $K.ha^{-1}$ using potassium sulfate fertilizer (41.5% K) and in two batches. Garlic extract was prepared from peeled garlic cloves weighing 250 g and mixed with 250 ml of distilled water and mixed with an electric mixer for three minutes and filtered using a multi-layer cloth and sprayed at 5 $ml.L^{-1}$ water. Whey was obtained from the dairy laboratory of the agricultural engineering sciences / University of Baghdad and sprayed at 20 $ml.L^{-1}$ water (Table 2). Bread yeast (Saccharomyces cerevisiae) was prepared by dissolving the dry yeast (Bakmaya) in 1 liter of warm water plus the same weight of sugar 1: 1 and left for 12 hours, Its properties are shown in (Table 3) (Mahmoned, 2001) and sprayed at 5 $g.L^{-1}$.

Table 1 : Chemical, Physical and fertility properties of the study soil

Textural class	EC (1:1) $ds.m^{-1}$	pH (1:1)	O.M $g.kg^{-1}$ Soil	CEC c $mol.c.kg^{-1}$ Soil	Carbonate minerals $gm.Kg^{-1}$	Available $mg.Kg^{-1}$ Soil		
						N	P	K
Silty Loam	2.8	7.67	**12.3**	**16.1**	**182.52**	25	11	**180**

Table 2 : Characteristics of whey

N %	P PPM	K PPM	Ca PPM	Mg PPM	Mn PPM	Lactose %	Lactic acid %	Protein %	Ash %	Dry Matter %	pH	Fat %
0.17	**50.00**	**1261.31**	**385.73**	**105.69**	**0.01**	**4.88**	**0.18**	**1.09**	**0.56**	**7.19**	**6.34**	**0.55**

Table 3 : Characteristics of bread yeast

Bread Yeast							
Vitamins Mg 100 g^{-1} Dry weight		Vitamins Mg 100 g^{-1} Dry weight		Amino acid Mg 100 g^{-1} Dry weight		Amino acid Mg 100 g^{-1} Dry weight	
39.88	Nicotinic	2.23	Vit.B1	0.45	Tryptophan	1.99	Arginine
19.56	Panthothenic acid	1.33	Vit.B2	2.19	Valine	2.31	Histamine
9.23	Paminobenzioc acid	1.25	Vit.B6	2.00	Glutamic	2.31	Isoleucine
4.36	Folic acid	0.15	Vit.B12	1.59	Serine	3.09	Leucine
2.09	Pyridoxine	2.71	Thiamin	1.33	Aspartic	2.95	Lysine
Carbohydrates Mg $100g^{-1}$ Dry weight		4.96	Riboflavin	0.23	Cysteine	0.72	Methionine
23.2	Carbo.	0.26	Inositol	1.53	Proline	2.01	Phenylalanine
13.33	Glucose	0.09	Biotin	1.49	Tyrosine	2.09	Threonine

Results and Discussion

Available NPK in soil

Results of table 4, 5 and 6 showed an increase in available NPK in soil by increasing the level of organic fertilizer in soil. The highest available NPK was ready in soil when adding 30 $Mg.ha^{-1}$ of organic fertilizer at (32.50, 15.00, 196.50) PPM respectively compared to control treatment which gave the lowest available NPK in soil at (22.25, 10.50 and 176.70) PPM respectively with an increase of 46.06%, 42.85 % and 11.20% respectively, the increase in ready available nitrogen in the soil may be due to the organic fertilizer content of total nitrogen, in addition, organic fertilizer increases the activity of microorganisms in the soil,

which works to increase decomposition in addition to the production of organic acids and amino acids in the soil, which increases the readiness of nitrogen in the soil in addition to its role in nutrient chelation and processing of the plant and the results are consistent with (Hao *et al*., 2008 and Meida *et al.*, 2017).

The increase in the concentration of ready phosphorus in the soil is due to the organic matter content of phosphorus, and the decomposition of organic matter by mineralization process produces carbon dioxide which when dissolved in water produces carbonic acid, which contributes to the solubility of phosphate compounds in the soil as well as the role of organic fertilizers in The ions, such as calcium and magnesium, chelate, blocking the adsorption of phosphorus, In addition, there are many organic acids such as folic acid, humic and oxalic, which increase the release of phosphorus as a result of preserving the degree of soil reaction and dissolving some of the compounds deposited in the soil and release phosphorus from them and the results are consistent with (Nasser and Ahmed, 2015).

The increase in the concentration of ready potassium in the soil is attributed to the role of organic acids resulting from the decomposition of organic fertilizers in the release of potassium from soil minerals by replacing the H^+ ion resulting from the dissolution of these organic acids in addition to the fact that the organic material is a good storage of potassium.

As for the spraying of organic extracts on tomato plant, the treatment spraying with whey achieved the highest concentration of NPK in soil (29.66, 13.66 and 190.66) PPM respectively compared to the treatment of spraying bread yeast at a concentration of 5 $g.L^{-1}$ water, which gave the lowest concentration of NPK In soils (28.00, 12.30, 185.00) PPM respectively with an increase of 5.92 %, 11.05 % and 3.05 % respectively, This is due to the fact that good nutrition with NPK led to good vegetative and island growth which leads to increased absorption efficiency by the plant fewer residues of nutrients ready in the soil.

The interaction between the addition of organic fertilizer to the soil and spraying with organic extracts, the treatment (addition of 30 $Mg.ha^{-1}$ organic fertilizer + spraying with whey) achieved the highest concentration of NPK in the soil was (34, 16, 200) PPM respectively compared to treatment (Spraying bread yeast at a concentration of 5 $g.L^{-1}$ water) which gave the lowest concentration of NPK in the soil was (21, 10, 170) PPM respectively with an increase of 61.90 %, 60.00 % and 17.64 % respectively.

Table 4 : Effect of adding organic fertilizer to the soil and spraying with garlic extract, whey and bio fertilizer of bread yeast on availability of Nitrogen in Soil PPM.

Organic Fertilizer $Mg.ha^{-1}$	Extract				Mean
	0	Garlic Extract	Whey	Bread yeast	
0	21	24	22	22	22.25
15	30	32	33	31	31.50
30	33	31	34	32	32.50
Mean	28.00	29.00	29.66	28.33	
L.S.D	**O**		**F**		**O×F**
(0.05)	2.00		3.00		4.00

Table 5 : Effect of adding organic fertilizer to the soil and spraying with garlic extract, whey and bio fertilizer of bread yeast on availability of phosphorus in Soil PPM.

Organic Fertilizer $Mg.ha^{-1}$	Extract				Mean
	0	Garlic Extract	Whey	Bread yeast	
0	10	10	11	11	10.50
15	13	13	14	12	13.00
30	15	15	16	14	15.00
Mean	12.60	12.66	13.66	12.30	
L.S.D	**O**		**F**		**O×F**
(0.05)	1.00		2.00		3.00

Table 6 : Effect of adding organic fertilizer to the soil and spraying with garlic extract, whey and bio fertilizer of bread yeast on availability of Potassium in Soil PPM

Organic Fertilizer $Mg.ha^{-1}$	Extract				Mean
	0	Garlic Extract	Whey	Bread yeast	
0	180	170	177	180	176.70
15	190	190	195	185	190.00
30	200	196	200	190	196.50
Mean	190.00	185.33	190.66	185.00	
L.S.D	**O**		**F**		**O×F**
(0.05)	4.00		5.00		7.00

NPK in leaves %

The results of Table 7, 8 and 9 showed an increase in the concentration of NPK nutrients in the plant by increasing the level of organic matter in soil, the highest concentration of NPK in the plant at the addition of 30 $Mg.ha^{-1}$ of organic fertilizer was (3.12, 0.44 and 3.10) % respectively compared to the control treatment (without addition of organic fertilizer) which gave the lowest concentration of NPK elements (2.52, 0.31, 2.45) % respectively with an increase of 23.80%, 41.93% and 26.53% respectively, The increase in nitrogen concentration in the leaves may be attributed to the fact that organic additives changed the percentage of organic matter in the soil, which improved its properties through the release of nitrogen when decomposed and oxidized organic fertilizer by microorganism, which led to increased soil readiness (Table 4). Its absorption by the plant is consistent with the results (Appireddy *et al.*, 2008, al-Amiri and Matloub, 2012).

The increase in phosphorus concentration in the leaves may be attributed to the high phosphorus content in these residues which decompose in the soil. Soil reactivity leads to the dissolution of some phosphorus-containing compounds and increases their readiness in soil solution and absorption by the plant (Havlin *et al.*, 2014; Taj-al Deen *et al.*, 2014; Nasir and Ahmad, 2015; Ahmad, 2016).

The increase in the potassium concentration in the leaves may be due to the high content of potassium found in the organic fertilizer. To the soil solution and increased readiness of potassium in the soil (Table 6) and therefore absorbed by the plant (Havlin *et al.*, 2014 and Jasim *et al.*, 2014).

The results of the same tables also indicate a significant increase in the concentration of NPK in the leaves, the treatment of spraying with bread yeast achieved the highest concentration of NPK in leaves was (3.06, 0.40 and 3.00),

respectively compared to the treatment (water spraying) with an increased 19.53%, 21.21% and 21.95% respectively, this is due to the fact that the yeast positively affected the increase of photosynthesis process through its effect on the leaves content of chlorophyll and dry matter. Enzymes, production of certain plant hormones, improved nutrient absorption, conversion of phosphorus from insoluble to dissolved form and increased readiness for absorption by plants , It may also be due to the yeast containing some of the major nutrients such as nitrogen, phosphorus and potassium, which leads to the increase of these elements in the leaves (Mustafa, 2003; Abbas, 2013).

Table 7 : Effect of adding organic fertilizer to the soil and spraying with garlic extract, whey and bio fertilizer of bread yeast on availability of Nitrogen in leaves %.

Organic Fertilizer Mg.ha^{-1}	Extract				Mean
	0	Garlic Extract	Whey	Bread yeast	
0	2.3	2.5	2.6	2.7	2.52
15	2.6	2.9	2.7	3.1	2.82
30	2.8	3.2	3.1	3.4	3.12
Mean	2.56	2.86	2.80	3.06	
L.S.D	**O**		**F**		**O×F**
(0.05)	0.1		0.2		0.3

Table 8 : Effect of adding organic fertilizer to the soil and spraying with garlic extract, whey and bio fertilizer of bread yeast on availability of phosphorus in leaves %.

Organic Fertilizer Mg.ha^{-1}	Extract				Mean
	0	Garlic Extract	Whey	Bread yeast	
0	0.27	0.32	0.31	0.37	0.31
15	0.34	0.36	0.35	0.34	0.34
30	0.40	0.42	0.44	0.51	0.44
Mean	0.33	0.36	0.36	0.40	
L.S.D	**O**		**F**		**O×F**
(0.05)	0.01		0.02		0.03

Table 9 : Effect of adding organic fertilizer to the soil and spraying with garlic extract, whey and bio fertilizer of bread yeast on availability of Potassium in leaves %.

Organic Fertilizer Mg.ha^{-1}	Extract				Mean
	0	Garlic Extract	Whey	Bread yeast	
0	2.2	2.4	2.5	2.7	2.45
15	2.4	2.7	2.6	3.0	2.67
30	2.8	3.2	3.1	3.3	3.10
Mean	2.46	2.76	2.73	3.00	
L.S.D	**O**		**F**		**O×F**
(0.05)	0.1		0.2		0.3

The interaction between the addition of organic fertilizer to the soil and spraying with organic extracts interaction treatment (addition of 30 Mg.ha^{-1} organic fertilizer + spraying with bread yeast at a concentration of 5 g.L^{-1} water) achieved the highest concentration of NPK in the leaves (3.4, 0.51, 3.3) %, respectively compared to the treatment (addition of 30 tons Mg.ha^{-1} organic fertilizer + water spray only which gave the lowest concentration of NPK in the leaves was (2.3, 2.27, 2.2) % respectively with an increase of 47.82 %, 88.88% and 50.00 % respectively.

Dry weight of plant:

The results of Table 10 show that the organic fertilization and spraying of extracts and their interactions had a significant effect on the yield indicators, where the treatment of the addition of organic fertilizer 30 Mg.ha^{-1} achieved the highest dry weight of the plant was 170.50 g.plant^{-1} compared to the control treatment (without the addition of organic fertilizer) which gave the lowest weight Dry plant reached 143.25 g.plant^{-1} with an increase of 19.02 %. This may be due to the role of organic fertilizer in improving the physical and chemical properties of soil, increasing the proportion of organic matter in the soil and increasing the activity of microorganisms in it, which increases the readiness of nutrients in the soil (Ghosh *et al.*, 2004), These elements increase the vegetative growth characteristics of the plant by increasing the formation of proteins, nucleic acids and protoplasmic structure through the formation of DNA and RNA necessary for cell division, as well as its role in carbonation and respiration and the provision of energy necessary for the formation of new cells thus increasing growth Plant (Taiz and Zeiger, 2006, Nasser and Ahmed, 2015 and Mahmoud *et al.*, 2019).

The same table also indicates a significant increase in dry weight of the plant as a result of spraying with extracts, the treatment of bread yeast achieved the highest dry weight of the plant reached 161.33 g.plant^{-1} compared to the control treatment with an increase of 7.08% due to the role of cytokines in yeast extracts to stimulate cell division and increase the size and activation of nutrients and aggregation in the treated parts, they contain many nutrients necessary for growth, sugars, proteins and amino acids that increase the rate of growth and thus increase the efficiency of food processing and net carbon representation which is reflected by increasing the dry weight of the plant (Muslet, 2012, Ani and AL-Obeidi, 2017).

Table 10 : Effect of adding organic fertilizer to the soil and spraying with garlic extract, whey and bio fertilizer of bread yeast on dry weight of plant g.plant^{-1}

Organic Fertilizer Mg.ha^{-1}	Extract				Mean
	0	Garlic Extract	Whey	Bread yeast	
0	136	146	142	149	143.25
15	150	157	153	158	154.50
30	166	171	168	177	170.50
Mean	150.66	158.00	154.33	161.33	
L.S.D	**O**		**F**		**O×F**
(0.05)	3.00		4.00		6.00

The interaction between the addition of organic fertilizer to the soil and spraying with organic extracts, the treatment of interaction (addition of 30 Mg.ha^{-1} organic fertilizer + spray yeast bread at a concentration of 5 g.L^{-1} water) achieved the highest dry weight of tomato plant reached 177 g.plant^{-1} compared to the comparison treatment (without adding organic fertilizer + spraying with water), which gave the lowest dry weight of the plant amounted to 136 g. plant^{-1} with an increase of 30.14%.

Chlorophyll content SPAD:

The results of Table 11 showed that organic fertilization and spraying of extracts and their interactions had a significant effect on the outcome indicators, the treatment of

the addition of organic fertilizer 30 Mg.ha^{-1} achieved the highest chlorophyll content in the plant was 64.50 SPAD compared to the control treatment without the addition of organic fertilizer, which gave the lowest chlorophyll content of 52.00 SPAD with an increase of 24.03 %, the reason may be due to the role of organic matter in the abundance and readiness of many nutrients and absorption by the plant, especially nitrogen and magnesium, which have an effect in the center of the chlorophyll molecule, which leads to an increase in the rate of photosynthesis, which is reflected in the increase of the total root and vegetative shows its effect by increasing the leaf area through building Proteins are important in increasing cell division speed and breadth and increasing plant chlorophyll content (Altomar *et al.*, 1999).

As for the spraying of organic extracts on tomato plant, the spray treatment with bread yeast achieved the highest chlorophyll content in the plant reached 62.33 SPAD compared to the control treatment with an increase of 17.60 % due to its content of amino acids and some nutrients such as nitrogen, zinc, iron, magnesium and copper which play an important role. In addition, yeast is a natural source of cytokines that play a major role in cell division, regeneration and increase in size. It also controls branching, root formation and maturation of chloroplasts green (Ezz El-Din *et al.*, 2010), Amino acids account for 7.5% of the components involved in the synthesis of many photosynthesis enzymes (El-Sayed, 2002), Or, the reason for the activation of vegetative growth is due to the effect of yeast extracts by giving the signal of nutrient transformation to the production of growth regulators and suppressing the role of pathogenic organisms, which results in the increase and accumulation of processed products and its effect on the increase of chlorophyll content in the plant (Eid, 2003; AL-Shammary *et al.*, 2017).

Table 11 : Effect of adding organic fertilizer to the soil and spraying with garlic extract, whey and bio fertilizer of bread yeast on chlorophyll content.

Organic Fertilizer Mg.ha^{-1}	Extract				Mean
	0	Garlic Extract	Whey	Bread yeast	
0	45	54	52	57	52.00
15	53	58	56	62	57.25
30	61	66	63	68	64.50
Mean	53.00	59.33	57.00	62.33	
L.S.D	**O**		**F**		**O×F**
(0.05)	2.00		3.00		5.00

The interaction between the addition of organic fertilizer to the soil and spraying with organic extracts, the treatment of interaction (addition of 30 Mg.ha^{-1} organic fertilizer + spraying with bread yeast at a concentration of 5 g.L^{-1} water) achieved the highest chlorophyll content in the plant was 68.00 SPAD compared to the control treatment (without adding organic fertilizer + spraying with water) which gave The lowest chlorophyll content in the plant was 45.00 SPAD with an increase of 51.11%.

Number of Fruits:

The results of Table 12 showed significant differences in the number of fruits per plant by increasing the level of organic fertilizer application, the level of addition of 30 Mg.ha^{-1} achieved the highest number of fruits of the plant amounted to 33.25 fruit.Plant^{-1} compared to the control treatment without the addition of organic fertilizer with an increase of 41.48%, the reason may be due to the importance of organic matter in decomposition to humus, which is essential in the cycle of carbon and nitrogen, sulfur, phosphorus and most of the mineral ions important for plant growth (Ali and Salem, 2012) in addition to the contribution of nutrients found in these fertilizers to increase the leaf content of chlorophyll and increase The activity of the plant and the organization of vital activities and increase the size of the vegetative total by increasing the number of leaves, which is reflected on the increase of the number of flowers and improve the proportion of the contract and the lack of rainfall and thus increase the number of fruits in the plant (Saud, 2013, Shammari, 2018).

As for the spraying of organic extracts on tomato plant, the treatment of bread yeast achieved the highest number of fruits of the plant amounted to 32.00 fruit. Plant^{-1} compared to the control treatment with an increase of 28% due to the content of yeast extract of amino acids and its role in activating enzymes and increase the number of flowers Pollination and fertilization leading to an increase in the number of fruits.

As for the interaction between the addition of organic fertilizer to the soil and spraying with organic extracts, the treatment of interaction (addition of 30 Mg.ha^{-1} organic fertilizer + spraying yeast bread at a concentration of 5 g.L^{-1} water) achieved the highest number of fruits of tomato plant amounted to 37 fruit, compared to the control treatment (without the addition of organic fertilizer + spray only with water), which gave the lowest number of fruits amounted to 21 fruits.plant^{-1} with an increase of 76.19%.

Table 12 : Effect of adding organic fertilizer to the soil and spraying with garlic extract, whey and bio fertilizer of bread yeast on number of fruits.

Organic Fertilizer Mg.ha^{-1}	Extract				Mean
	0	Garlic Extract	Whey	Bread yeast	
0	21	24	23	26	23.50
15	24	30	28	33	28.75
30	30	34	32	37	33.25
Mean	25.00	29.33	27.66	32.00	
L.S.D	**O**		**F**		**O×F**
(0.05)	1.00		2.00		3.00

Fruit Weight

The results of Table 13 show significant differences in fruit weight by increasing the level of organic fertilizer application, the level of addition of 30 Mg.ha^{-1} achieved the highest level of fruit yield was 77.50 g.fruit^{-1} compared to the control treatment without adding organic fertilizer with an increased 35.96%, this may be due to the fact that organic fertilizers provided good conditions for plant growth and water absorption and nutrients as they Improved soil qualities, increased fertility, increased nutrient readiness and absorption by plants and improved vegetative growth, which was reflected in the increase in the carbonation process and the accumulation of the products (carbohydrates and proteins) in the plant (Mohammadi, 2009, Hussein and Jamal, 2017).

As for the spraying of organic extracts on tomato plant, spray treatment with bread yeast achieved the highest fruit

amounting to 74.00 g.fruit^{-1} compared to the control treatment and by an increase of 15.62%, this is due to the increased efficiency of transport and storage from leaves to fruits and the role of P, K and Mg in increasing the efficiency of photosynthesis process and increase the transfer of nutrients from leaves to fruits, which leads to increase the average weight of the fruit.

Table 13 : Effect of adding organic fertilizer to the soil and spraying with garlic extract, whey and bio fertilizer of bread yeast on fruit weight.

Organic Fertilizer Mg.ha^{-1}	Extract				Mean
	0	Garlic Extract	Whey	Bread yeast	
0	53	58	56	61	57.00
15	66	70	68	77	70.25
30	73	77	76	84	77.50
Mean	64.00	68.33	66.66	74.00	
L.S.D	**O**		**F**		**O×F**
(0.05)	4.00		3.00		6.00

The interaction between the addition of organic fertilizer to the soil and spraying with organic extracts, the treatment of interaction (addition of 30 Mg.ha^{-1} organic fertilizer + spraying yeast bread at a concentration of 5 g.L^{-1} water) achieved the highest fruit weight of 84 g.fruit^{-1} compared to the control treatment (without the addition of organic fertilizer + spray only with water) Which gave the lowest weight of the fruit amounted to 53 g.fruit^{-1}, an increase of 39.62%.

Plant yield

The results of Table 14 showed significant differences in the yield of the plant by increasing the level of organic fertilizer application, the level of addition of 30 Mg.ha^{-1} achieved the highest plant yield was 2.533 kg.plant^{-1} compared to the control treatment (without adding organic fertilizer), which gave the lowest plant yield of 1.344 kg.plant^{-1} with an increase of 88.46%, this is due to the contribution of nutrients found in organic fertilizers, especially nitrogen, phosphorus and potassium, which have a key role in increasing plant activity and organizing vital activities. The number of fruits and then increase the yield per plant, In addition, it improved the chemical and physical properties of the soil (Al-Shaibani, 2005, Saud, 2013 and Al-Shammari, 2018).

As for the spraying of organic extracts on tomato, the treatment of sprinkling with bread yeast achieved the highest plant yield of 2.359 gm.plant^{-1} plant compared to the control treatment with an increase of 43.92 %, this is due to the role of yeast as a leaf fertilizer and its effect in increasing carbon dioxide, which is reflected in the improvement of net photosynthesis as well as its content of amino acids, which are the basis of building protein in the cell and thus increase the plant ration (Heikal, 2005).

The interaction between the addition of organic fertilizer to the soil and spraying with organic extracts, the treatment (addition of 30 Mg.ha^{-1} organic fertilizer + spraying with bread yeast at a concentration of 5 g.L^{-1} water) achieved the highest yield of 2.952 kg Which gave the lowest plant yield of 1.113 kg. Plant^{-1} with an increase of 165.22%.

Table 14 : Effect of adding organic fertilizer to the soil and spraying with garlic extract, whey and bio fertilizer of bread yeast on Plant yield

Organic Fertilizer Mg.ha^{-1}	Extract				Mean
	0	Garlic Extract	Whey	Bread yeast	
0	1.113	1.392	1.288	1.586	1.344
15	1.584	2.100	1.904	2.541	2.032
30	2.220	2.618	2.342	2.952	2.533
Mean	1.639	2.036	1.844	2.359	
L.S.D	**O**		**F**		**O×F**
(0.05)	0.37		0.25		0.63

Conclusions

The results of this study showed that the addition of organic fertilizer to the soil and spraying garlic extract, whey and bread yeast in tomato has increased the concentration of nitrogen, phosphorus and potassium in the soil and leaves as well as significant increase in the dry weight of the plant, chlorophyll content, number of fruits, fruits weight and plant yield, this is due to the fact that the organic additives changed the proportion of organic matter in the soil, which improved their qualities through the release of nutrients when decomposed and oxidized organic fertilizer by microorganism revitalization, which led to increased readiness in the soil and thus increased absorption Pour it by the plant.

Bread yeast spray has excelled in many growth traits, due to its cytokines and its role in stimulating cell division and increasing the size and activation of nutrients and aggregation in the vegetative parts as well as many nutrients necessary for growth such as sugars, proteins and amino acids that increase the rate of growth and thus increase Efficiency of food processing and net carbon representation which is reflected by increasing dry weight of the plant.

References

Aati, A.S. and Al-Sahaf, F.H. (2007). Potato production by organic farming. 2-The role of organic fertilizer and whey in the readiness of the major elements of the plant and the rate of infection Micaurizi. 38(4): 52-64.

Abbas, S.M. (2013). The influence of biostimulants on the growth and on the biochemical composition of Vicia faba cv. Giza 3 beans. Romanian Biotech. Letters, 18(2): 8061-8068.

Ahmed, Firas Wa`dallah (2006). Effect of Fertilizers Addition of K and Mg in Soil and Foliar Application on Tomato Growth and Yeild Under Plastic House Conditions. M.Sc. Thesis, College of Agriculture - University of Baghdad. Iraq.

Ahmed, F.W.A. (2016). Effect of Time and the Level of Agricultural Sulfur Application on the Uptake of (P, Fe, Zn) in Plant on Growth and Yield of Two Genotypes of Maize (Zea mays L.). Journal of Qadisiyah for Agricultural Sciences. 6(2): 136-150.

Al-Amri, N.J.K. and Adnan, N.M. (2012). Effect of organic fertilizers on growth and production of tomatoes under heated greenhouse conditions. 4(3): 21-38.

Al-Ani, Moayad H.I. and AL-Obeidi, N.D.A. (2017). Response of varieties of maize to bio-fertilization of

Bread east (*Saccharomyces cerevisiae* L.). Anbar Journal of Agricultural Sciences. 15(2): 471-483.

Aldilaimi, H.Y.; Ali, M.S.; Firas, W.A. (2011). Effect of Fertilizers addition of potassium and magnesium in soil and Foliar application tomato growth and yield under plastic house condaitions. Al taqani Journal, 24(1): 205-223.

Al-Mohammadi, O.H.M. (2009). The use of organic fertilizers and whey as a method of organic farming in the growth and production of potatoes. Doctoral dissertation. faculty of Agriculture. Baghdad University. Iraq.

Al-Shammari, A.M.A. (2018). Effect of organic fertilizer and method of training in some of the yield characters quantitative three genotypes of tomato (*Lycopersicon esculentum* Mill (grown under greenhouse conditions. Mesopotamia J. of Agric., 46(2): 23-32.

Al-Shammary, Aziz M.A.; Zinab, H.A. and Athear, A.K. (2017). Effect Of Genotype And Spraying Leaves With Arginine And Yeast In Some 1 - Vegetative Growth Characteristics of Potatoes (*Solanum tuberosum* L.). Diyala Journal of Agricultural Sciences, 9(2): 158-169.

Altomar, C.; Nervell, W.A.; Bjorkman, T. and Harman, G.E. (1999). Solubilization of phosphates and micronutrients by the plant growth promoting and biocontrol fungus *Trichoderma harzinum* Rifai. App. Environ. Microbiol. 65: 2926-2933.

Appireddy, G.K.; Saha, S.; Mina, B.L.; Kundu, S.; Selvakumar, G. and Gupta, H.S. (2008). Effect of organic manures and integrated nutrient management on yield potential of ball pepper (*Capsicum annuum*) varieties and on soil properties. Arch. Agron. Soil Sci., 24: 127- 137.

Dodson, M.; Bachmahnn, J. and Willamis (2002). Organic Greenhouse Tomato production. Attra. Horticulture production Guide.

Eid (2003). Effect of foliar spraying with active dry yeast and complete fertilizer (sengral) on growth, yield and fixed oil of (*Ricinus communis*) Egypt. Pharm. J. 55-66 .

EL-Desouky, S.A.; Wanas, A.L.; Khedr, Z.M. and Kandiann, K. (2007). Utilization of parthasara the horticulture. Vegetable some natural plant extracts (of garlic and yeast) as seed soaked materials to squash (*Cucurbatia pepo* L.) 1.Effect on growth, sex expression and fruit yield and quality. J. Agric. Sci. Moshtohor, Zagaziguniv., 35(2): 839-854.

El-Sayed, H.A. (2002). Relation between yeast and nitrogen application in flame vine. Annals of Agric. Sci. Moshtoher. 40(5): 2415-2427.

Ezz El-Din, A.A. and Hendawy, S.F. (2010). Effect of dry yeast and compost tea on growth and oil content of Borago officinalis plant. Research J. of Agric. and Biological Sci., 6(4): 424-430.

Gerster, H. (1997). The potential role of lycopene for human health. Journal of the American College of Nutrition, 16: 109-126.

Ghosh, P.K.; Ramesh, P.; Bandyopadhyay, K.K.; Tripathi, A.K.; Hati, K.M.; Misra, A.K. and Acharya, C.L. (2004). Cooperative effectiveness of cattle manure, poultry manure, phosphor compost and fertilizers NPK on three cropping systems in vertisols of semi-arid tropics. I. Crop yields and system performance Indian Institute of Soil Science. Bioresource Technology. 95: 77-83.

Hao, X.; Liu, H.S.L.; Wn, J.S.; Hu, R.G.; Tong, C.L. and Su, Y.Y. (2008). Effect of Long-term application of inorganic fertilizer and organic amendments on soil organic in three sub tropical paddy soils. Nutr. Cycling in Agroeco System 81(1): 17-24.

Hassanein, S.A.; Nabil Fathi El-Sayed Kandil (2004). Clean Agriculture, Center for Agricultural Research and Central Agricultural Extension, Ministry of Agriculture and Land Reclamation of the Arab Republic of Egypt.

Havlin, J.K.; Beaton, J.D.; Tisdale, S.L. and Nelson, W.L. (2014). Soil fertility and fertilizers, An introduction to nutrient management.8th edition. Upper Saddle river, newjersay. Indian Reprint. 516.

Heikal, A.E. (2005). Effect of Organic and Bio-fertilization on Growth, Production and Compostion of (*Thymus vulgaris* L.) Plants. M.Sc. Thesis, Coll. of Agric. Univ. of Cairo, Egypt. 101.

Husien, M.J. and Amal, A.A. (2017). Effect of Organic and Chemical Fertilization on some Growth parameters and Yield of Potato plant *Solanum tuberosum* L. CV. Safrane. Jordan Journal of Agricultural Sciences. 13(2): 515-524.

Ibriham, F.H. and Abed AL-Hussain, R.M. (2009). Effect of spraying whey and mineral nutrition in growth and yield per plant of tomato (*Lycopersicon esculentum* Mill). Tikrit J. 9(2): 248-258.

Jasim, A.A.J.; Nabil, J.Al-a'amry and Hussain, A.F. (2014). Responsible of tomato for phosphor and organic fertilization and bio-fertilizer. Euphrates Journal of Agricultural Sciences, 6(1): 30-47.

Khedr, Z.M. and Farid, S. (2000). Response of naturally virus infected plants to yeast extract and phosphoric acid application. Ann. Sci. Moshtohor, Egypt. 38: 927-939.

Krest, I. and Keusgen, M. (1999). Stabilization and pharmaceutical use of alliinase. Pharmazie 54(4): 89-93.

Mahmood, Y.A.; Firas, W.A.; Sinan, S.J.; Al-Arazah, A.A. (2019. Effect of solid and liquid organic fertilizer and spray with humic acid on growth, yield of Cauliflower and nutrient uptake of nitrogen, phosphorus and potassium. Plant Archives. Special Issue Vol. 19, Supplement (2), July.

Mahmoned, T.R. (2001). Botanical studies on the growth and germination of mahnolia (*Magnolia grandiflora* L.) plants. M.Sci. Thesis. Fac. of Agric. Moshtohor, zagazig univ., Egypt.

Mostafa, E.A.M. and Abou Raya, M.S. (2003). Effect of soil application of active dry yeast on growth, yield and fruit qulity of Grand Nain banana cv. Arab Univ. J. of Agric. Sci., 12(2): 693-704.

Muslet, M.M. and Al-Mohammadi, O.H.M. (2012). Fundamentals of Organic Agriculture. Republic of Iraq, Ministry of Higher Education and Scientific Research, Anbar University. faculty of Agriculture. Al-Simaa Press. 258.

Naser, K.M. and Firas, W.A. (2015). Effect of Sources of organic Residues on Release of phosphorus from rock phosphate in calcareous soil planted with wheat. Journal of Agricultural Chemistry and Environmental Protection Society. 10(3).

Saud, O.G.Y. (2013). Effect of spraying with some organic nutrients and breeding methods on growth and yield of

three *Cucumis sativus* hybrids in greenhouses. Master Thesis. University of Diyala. collage of Agriculture.

Taj-alden, M.M.; Firas, W.A. and Alaa, Sh.N. (2014). Effect of organic and mineral fertilizer on the yield of Cauliflower and nutrient content of Nitrogen, Phosphorus and Potassium. Egypt. J. of Appl. Sci., 29(7B): 577-588.

Taiz, L. and Zeiger, E. (2006). Plant physiology. 4th. ed. Sinauer Associates, Inc. publisher Sunderland, Massachus- AHS. U.S.A.

Victor, M.S.; Teixeira, A.F.R.; Reis, E.F.D. and Mendonca, E.S. (2013). Yield and nutritional status of the conilon coffee tree in organic fertilizer systems. Rev. Cienc. Agron., 44(4): 773-781.

Wongsa-Ngasir, P.M.S. (2004). Ohmic heating of biomaterials: Peeling and effect of rotating electric field. The Ohio State University. Ph.D. Thesis.