Effect of acryl covering and bio-organic fertilization on improving growth and production traits of Chilli pepper Capsicum frutescens L.

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Abstract

The experiment was conducted in the fields of the Ministry of Agriculture by the Plant Protection Department during the spring season 2021 in order to study the effect of acryl mulching with bio and organic fertilizers and mulching on the growth and production of cayenne pepper Capsicum frutescens L., The experiment included three factors of acrylic coverage, Bio Fertilization, and included four types of bacteria, Bacillus megaterium and Azospirillum brasilense, and the interaction between them and without adding biofertilizer, while the third factor was organic fertilization at three levels (0%, 50%, 100% kg.ha- 1) .The experiment was designed factorial according to the design of (Nested Desige) and with three replicates, the averages were compared according to the least significant difference (L.S.D) test at a probability level of 5%. branch. plant-1(

The leaf area was 305.25 cm2.plant-1. The highest values of yield indicators were also recorded, where the number of fruits was (118.83 fruits.plant-1) and the cumulative yield was (26.59 tons.ha-1). The bi-interaction treatment of the bio-fertilizer showed significant superiority in growth indicators compared to the addition of the single bio-fertilizer such as plant height, number of branches, number of leaves and area (91.44 cm, 6.00 branches.plant-1,940.8 leaves.plant-1,302.02dm2.plant-1). The number of fruits (134.91 fruits. plant-1) and the cumulative yield (29.96 tons. ha-1). The treatment of organic fertilization with poultry waste was significantly excelled in most vegetative growth traits, such as plant height (89.08 cm) and number of branches (5.50 branch. plant- 1) and leaf area (266.99 dm2.plant-1) The results showed that the interaction between the study factors (organic and biofertilizers and acrylate coverage) had a significant effect in increasing most of the vegetative growth indicators represented by plant height, number of branches, number of leaves and leaf area (126.00 cm, 8.00 branch. plant -1,449.09 dm2.plant-1) respectively and cumulative yield (49.74 tons.ha-1).

Key Words: acryl, growth, production traits, Chilli pepper, Capsicum frutescens L.

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Introduction

Chilli pepper is one of the most important summer vegetable crops of the Solanaceae family, its origin country is Central and South America (Thang, 2007), and it is one of the crops that have nutritional and health importance, Its nutritional importance lies in the fact that its fruits contain carbohydrates and protein compounds in addition to various minerals. Therefore, its fruits are used for fresh consumption, cooking and making pickles (Parle and Kaura, 2012). While its health importance lies in the fact that its fruits are rich in vitamins such as vitamin C and A, as well as containing alkaloid compounds responsible for the spicy taste called Capsaicins. The most famous of these compounds is the Capsaicin compound, which is used in the treatment of rheumatic diseases, improving heart functions, and as a pain reliever. It is also used as anti-bacterial and anti-fungal. The great discrepancy between day and night temperature emerged the idea of using acrylate covering that Bachmann (2005) knew It is a cover made of polypropylene or plastic fibres with small pores, lightweight, withstands ultraviolet rays, and is used as a cover placed directly on plants to protect plants from harsh conditions, especially high temperatures in the summer months, as well as maintaining soil

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moisture and protecting plants from pathogens that are transmitted with insects. The fact that acrylic acts as a barrier that prevents insects from reaching the plants covered with acrylic (Marin et al., 2015).In recent years, biofertilizers have attracted the attention of researchers because they reduce part of the mineral fertilizers added to the soil.Therefore, the researchers used types of bacteria that fix nitrogen, and solvents for phosphorous compounds and release potassium, and they concluded that adding biofertilizers to the soil can reduce about 50% of the chemical fertilizer recommendation, and thus reduce the negative effects of using mineral fertilizers. In addition to these bacteria, they are able to secrete some compounds, enzymes and hormones that encourage plant growth, which is reflected in the outcome, both quantitatively and qualitatively, as they participate in many metabolic processes (Jabr and Taban, 2010). In view of the exacerbation of the pollution phenomenon of food products, soil and water with the remnants of chemical fertilizers and pesticides, this led to the need to use the organic farming method, which relies on the use of natural materials in agriculture instead of chemical fertilizers (Magdoff, 2007).

Materials and methods

The field experiment was conducted in the fields of the Ministry of Agriculture / Plant Protection Department / Abu Ghraib location, for the spring season 2021, under open cultivation conditions. The seeds of cayenne pepper Barbarian-F1 were planted in one of the private nurseries with 209-hole cork dishes on 20/2/2021, and when the seedlings reached 4-5 true leaves, they were transferred to the permanent field on 1/4/2021.The experiment included three factors, the first factor: was the coverage with acrylic and its symbol with the letter A1 and without covering the symbol for it with the letter A0. The second factor: poultry manure symbolized by the letter C and at three levels (0%, 50%, 100% of the fertilizer recommendation of 600 kg. ha-1 Recommended by the company producing summer vegetable crops), and its symbol is C0, C1, C2.The third factor of biofertilization included four types of bacteria (Bacillus megaterium and symbolized by the letter B1 and Azospirillum brasilense and symbolized by the letter B2 and the interaction between Azospirillum brasilense and Bacillus megeterium and symbolized by the letter B3 without adding biofertilizer and symbolized by the letter 0B, as the roots of the seedlings were placed To be inoculated for a period of (15) minutes on the sides of the container and completely submerged in the bacterial culture, the sleepers on the liquid media Nutrient broth for each species of bacteria, As for the inoculum combination, it was prepared in the field by taking one liter of Nutrient broth liquid medium containing the bacteria of each sex and mixing together. Then it was taken out of the container and planted in the allotted place in the field in the early morning to ensure that the living beings are not exposed to direct sunlight (Datta et al. 2011).The experiment was designed according to the Design (Nested) design in a factorial experiment, where the field was divided into terraces in each terrace of two cultivation lines alternately, and the distance between one plant and another was 0.4 m and between one line and another 0.75 m. Ensure complete isolation between the experimental units before planting the seedlings.Each experimental unit included 10 plants, then each terrace was divided into two parts, one of which was covered with p17-acryl and the other part without coverage. The third factor was biological fertilizers (four types) randomly inside and outside the acre cover, and each treatment included three replicates. The study included indicators of vegetative growth, plant height, number of branches and leaf area, while the indicators of yield included the number of fruits and the total yield.

Results and discussion

The role of acrylic covering and bio and organic fertilization in improving the growth and production of Chilli pepper.

1. Plant height (cm)

The results in Table 1 show that covering pepper plants with acryl A1 significantly affected the measured trait, where it achieved the highest height of 89.97 cm, while the control treatment A0 gave the lowest plant height of 63.78 cm. Where , treatment C2 recorded the highest value for plant height of 89.08 cm compared to the control treatment C0, which gave 59.71 cm. The addition of biofertilizers had a significant effect on plant height, as B3 treatment achieved the highest height of 91.44 cm, and excelled in control treatment B0,

which scored 63.78. The highest height of the measured trait was 105.58 cm, while the control treatment A0C0 gave the lowest height of 51.42 cm.The results of Table 1 indicate that the interaction between the two factors of coverage and biological fertilizers had a significant effect on plant height, as the treatment B3 A1 recorded the highest height of 106.67 cm compared to the control treatment B0A0, which recorded a plant height of 53.33 cm. It is also clear that the bi-interaction between bio-fertilizers and poultry manure significantly affected this trait, as B3C2 treatment gave the highest plant height, which amounted to 107.17 cm compared with the control treatment C0 B0 which reached 54.17 cm.

As for the triple interaction, the effect was significant, with the treatment A1B3C2 excelled by giving it the highest plant height of 126.00 cm, excelled on the control treatment A0B0C0, which achieved the lowest plant height of 46.33 cm.

2.2.4. Number of branches (branch. plant-1).

The results of the statistical analysis of Table 2 indicate that there is a significant effect on the number of branches of pepper plants covered with acrylic A1, as it reached 5.40 branches.plant -1, while the number of branches of the control treatment was A0, 4.20 branches.plant -1.The results of the same table show that the addition of poultry manure significantly affected the number of branches, where it gave the largest number of branches when treatment C2 reached 5.50 branches.plant-1, excelled on the control treatment C0, which recorded 3.30 branches.plant-1. As for the effect of bio fertilizer treatment It was also significant in the trait studied, as B3 treatment achieved the highest number of branches, which reached 6.00 branches.plant -1, excelled on the control treatment B0, which gave 3.60 branches.plant -1.The results of Table 5 showed that the bilateral interactions between the coverage with acrylic and poultry manure had a significant effect, as the C2 A1 treatment gave the highest average number of branches per plant 6.20 branches.plant-1 compared with the control treatment 3.40 branch.plant-1.The results of the same table indicate that the interaction between the two factors of coverage and bio fertilizers had a significant effect on the number of branches, where the treatment B3 A1 gave the highest average number of branches per plant amounted to 6.40 branches.plant -1 compared to the control treatment B0A0, which recorded 3.20 branches.plant -1.While the treatment of bi-interactions between bio-fertilizers and poultry manure gave the highest values for the number of branches with 7.20 branches.plant -1 when treating B3C2 compared to the control treatment C0 B0 which recorded 3.10 branches.plant -1.The triple interactions between biofertilizer, organic fertilizer and acrylic covering, the results showed that there were significant differences between (A1B3C2) treatment, which recorded the highest average number of branches per plant amounted to 8.00 branches.plant-1, while the control treatment (A0B0C0) gave 2.90 branches.plant - 1 .

4-Leaf area (dm2.plant-1)

The results in Table 3 show the positive effect of covering with acrylic A1 in increasing the leaf area of pepper plant, which reached 305.25 dm2.plant-1, excelled on that of the control treatment A0, which had a leaf area of 164.80 dm2.plant-1.The results of the same table observed the positive effect of poultry manure on pepper plants, where the largest leaf area was recorded when treatment C2 reached 266.99 dm2.plant-1 compared to the control treatment C0 whose leaf area was 192.79 dm2.plant-1. The results of the table also indicate a significant effect of biofertilizers on pepper plants when treatment B3 reached the highest value of leaf area 302.02 dm2.plant-1 compared to control treatment B0 which gave the lowest value of 187.82 dm2.plant-1.As for the two interactions between the two factors of acrylic coverage and poultry manure, it showed a significantly excelled for C2 A1 treatment, giving it the highest mean of the measured trait amounted to 338.88 dm2.plant-1, while the control treatment A0C0 recorded the lowest value of the measured trait amounting to 128.85 dm2.plant-1. The bi-interaction treatment between mulching and bio-fertilizers had a significant effect when treating B3 A1 as it recorded the highest mean of the measured trait, which amounted to 390.50 dm2.plant-1 fresh weight compared to the control treatment B0A0, which recorded 126.73 dm2.plant-1. As for the pepper plants that were treated with bio-fertilizers and poultry manure, they achieved the largest leaf area when B3C2 treatment amounted to 358.60 dm2.plant-1compared to the control treatment C0 B0 which gave 181.25 dm2.plant-1.It is clear from the same table that the triple interactions between the study factors significantly affected this trait

when treating (A1B3C2), which achieved the largest leaf area of pepper plant amounted to 449.09 dm2.plant-1. It reached 122.17 dm2.plant-1.

Number of fruits (fruit .plant -1).

It is evident from Table 4 that the treatment of acryl coverage A1 was significantly excelled in the number of fruits per plant, reaching 118.83 fruit .plant -1, while it reached 86.89 fruit .plant -1. and 109.10 fruit .plant -1in sequence, while the control treatment C0 gave the lowest rate of 79.23 fruit .plant -1.The results showed that the use of biofertilizers had a significant effect on the average number of fruits, as Table 4 shows the significantly excelled on the biofertilizer treatment when treating B3, B2 and B1 , which amounted to 134.91, 111.59 and 95.35 fruit .plant -1compared to the control treatment B0 by giving it an average It reached 69.58 fruit .plant -1.The study workers had acrylic coverage and poultry manure levels the moral effect in increasing the number of fruits, as the treatment A1C2 recorded the highest number of fruits, which amounted to 138.91 fruits. The levels of poultry manure and bio-fertilizer excelled on the C2B3 treatment, which amounted to 163.74 fruit .plant -1. While the control treatment C0B0 recorded the lowest value of 62.27 fruits. Plant-1. In the bi-interaction between mulching and biofertilizer, the results of Table 4 show that treatment A1B3 excelled by giving it 159.22 fruit .plant -1, compared to treatment A0B0, which amounted to 63.27 fruit .plant -1.The results of the triple interaction between the factors of the study showed an increase in the number of fruits in all treatments, but without significant differences.

Total yield (tons.ha-1)

It is clear from the results of Table 5 that there was a significant increase in the cumulative yield of pepper plants covered with acrylic A1. An increase in the average yield was observed, which amounted to 26.59 tons.ha-1, compared to the plants that were not covered with acrylic A0, which had an average iron yield of 17.85 tons.ha-1. While the results of the same table showed that the C2 treatment, which recorded an average of 28.22 tons.ha-1, was excelled, while the control treatment C0 gave 14.52 tons.ha-1. Table 19 shows the effect of adding bio-fertilizer on the average cumulative yield of Chilli pepper, which amounted to 29.96 tons.ha-1when treating B3, while the control treatment B0 gave a value of 15.05 tons.ha-1.It was also noted from the same table that the treatments A1C2, A1C1 and A0C2 had the highest average cumulative yield, which amounted to 34.10, 28.41 and 22.33 tons.ha-1, respectively, compared to the control treatment A0C0, which achieved 11.79 tons.ha-1Also, treatments C2B3, C1B3 and B22 C excelled by giving them the highest values of 40.62, 32.97 and 29.20 tons.ha-1respectively, while C0B0 recorded the lowest values of 11.46 tons.ha-1.While the bi-interaction between coverage and biofertilizer had a significant effect in increasing the average cumulative yield, which amounted to 36.05 tons.ha-1when treating A1B3, while the control treatment gave the lowest average of 13.24 tons.ha-1.The results of Table 5 indicated that the triple interactions had a significant effect in increasing the average cumulative yield, which achieved 49.74 tons.ha-1when treating A1C2B3, while the lowest average was recorded when the control treatment A0C0B0 amounted to 10.08 tons.ha-1.

Table 1. Effect of biofertilizers and Acryl covering on pepper plant height (cm)

interaction of Covering and bio-fertilizer A * B	poultry manure			Bio Fertilization	Acryl Covering
	C 2	C 1	C 0		
53.33	60.33	53.33	46.33	B0	A0
55.89	63.00	57.67	47.00	B1	
69.67	78.67	75.33	55.00	B2	
76.22	88.33	83.00	57.33	B3	
74.11	86.33	74.00	62.00	B0	A1
85.44	97.67	94.33	64.33	B1	
93.67	112.33	99.33	69.33	B2	
106.67	126.00	117.67	76.33	B3	

1.53	LSDA*B	2.69			LSDA*B*C
		89.08	81.83	59.71	Poultry average C
		0.964			LSDC
Covering and Poultry interaction A*C					
Average Covering A		C2	C1	C0	A
63.78		72.58	67.33	51.42	A0
89.97		105.58	96.33	68.00	A1
0.95	LSDA	1.32			LSDA*C
Poultry interaction and Bio Fertilization B*C					
Bio Fertilization B		C 2	C 1	C 0	B
63.72		73.33	53.33	54.17	B0
70.67		80.33	76.00	55.67	B1
81.67		95.50	87.33	62.17	B2
91.44		107.17	100.33	66.83	B3
1.11	LSDB	1.93			LSD B*C

A0.Without covering with Acryl A1. covering with Acryl
B0. Without adding biofertilizer B1. Add Bacillus megaterium
B2. Add Azospirillum brasilense B3. Add the combination between Bacillus megaterium and Azospirillum brasilense C0. Without adding poultry manure C2 . Add poultry manure at a level of 100%. . C1 Add poultry manure at a level of 50%

Table 2. Effect of biofertilizers and Acryl covering on pepper branches number (cm)

interaction Average Covering and bio fertilizer A * B		poultry manure			Bio Fertilization	Acryl Covering
		C 2	C 1	C 0		
3.20		3.20	3.40	2.90	B0	A0
3.80		4.00	4.40	3.10	B1	
4.40		5.30	4.30	3.70	B2	
5.50		6.50	6.20	3.80	B3	
4.10		4.40	4.40	3.30	B0	A1
5.10		5.80	5.70	3.90	B1	
5.90		6.50	5.80	5.40	B2	
6.40		8.00	7.30	4.00	B3	
0.21	LSDA*B	0.39			LSDA*B*C	
		5.50	5.20	3.80	Poultry average C	
		0.14			LSDC	
Covering and Poultry interaction A*C						
Average Covering A		C 2	C 1	C 0	A	
4.20		4.70	4.50	3.40	A0	
5.40		6.20	5.80	4.20	A1	
0.09	LSDA	0.18			LSDA*C	
Poultry interaction and Bio Fertilization B*C						
Bio fertilizer average B		C 2	C 1	C 0	B	
3.60		3.80	3.40	3.10	B0	
4.50		4.90	5.00	3.50	B1	
5.20		5.90	5.00	4.60	B2	
6.00		7.20	6.70	3.90	B3	
0.17	LSDB	0.29			LSDB*C	

A0.Without covering with Acryl A1. covering with Acryl

B0. Without adding biofertilizer B1. Add Bacillus megaterium
B2. Add Azospirillum brasilense B3. Add the combination between Bacillus megaterium and Azospirillum brasilense C0. Without adding poultry manure C2 . Add poultry manure at a level of 100%. . C1 Add poultry manure at a level of 50%

Table 3. Effect of biofertilizers and Acryl covering on the leaf area of pepper (dm2.plant-1)

interaction Average Covering and bio fertilizer A * B	poultry manure			Bio Fertilization	Acryl Covering
	C2	C1	C0		
126.73	132.25	125.76	122.17	B0	A0
137.49	150.96	136.31	125.21	B1	
181.44	229.04	185.04	130.23	B2	
213.53	268.12	234.67	137.79	B3	
248.91	257.61	248.79	240.33	B0	A1
268.90	291.09	273.05	242.55	B1	
312.71	357.74	330.38	250.00	B2	
390.50	449.09	428.40	294.02	B3	
3.61 LSD A*B	6.46			LSD A*B*C	
	266.99	245.30	192.79	Poultry average C	
	2.33			LSD C	
interaction of Covering and bio-fertilizer A * B					
Average Covering A	C2	C1	C0	A	
164.80	195.09	170.45	128.85	A0	
305.25	338.88	320.16	256.73	A1	
2.03 LSDA	3.08			LSDA*C	
Interaction of poultry and bio-fertilizer B*C					
Bio Fertilizer B average	C2	C1	C0	B	
187.82	194.930	125.760	181.250	B0	
203.20	221.030	204.680	183.880	B1	
247.07	293.39	257.71	190.12	B2	
302.02	358.60	331.54	215.91	B3	
2.69 LSD B	4.66			LSD B*C	

A0.Without covering with Acryl A1. covering with Acryl
B0. Without adding biofertilizer B1. Add Bacillus megaterium
B2. Add Azospirillum brasilense B3. Add the combination between Bacillus megaterium and Azospirillum brasilense C0. Without adding poultry manure C2 . Add poultry manure at a level of 100%. . C1 Add poultry manure at a level of 50%

Table 4. Effect of biofertilizers and Acryl covering on number of fruits of the pepper plant (fruit. plant -1).

interaction Average Covering and bio fertilizer A * B	poultry manure			Bio Fertilization	Acryl Covering
	C2	C1	C0		
63.27	69.04	64.05	56.73	B0	A0
79.25	90.13	85.40	62.21	B1	
94.44	112.94	102.73	67.64	B2	
110.59	134.13	122.96	74.68	B3	
75.90	84.19	75.69	67.82	B0	A1

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111.44		129.20	112.44	93.60	B1	
128.74		148.81	140.44	96.98	B2	
159.22		193.35	170.11	114.21	B3	
6.34	LSDA*B	N.S			LSDA*B*C	
		120.23	109.10	79.23	Poultry average C	
		3.41			LSDC	
Covering and Poultry interaction A*C						
Average Covering A		C2	C1	C0	A	
86.89		101.56	93.78	65.32	A0	
118.83		138.91	124.42	93.15	A1	
5.28	LSDA	5.80			LSDA*C	
Interaction of bio-fertilizer and poultry B*C						
Bio Fertilizer B average		C2	C1	C0	B	
69.58		76.62	64.05	62.27	B0	
95.35		109.71	98.42	77.91	B1	
111.59		130.87	121.59	82.31	B2	
134.91		163.74	146.53	94.45	B3	
3.94	LSDB	6.83			LSDB*C	

A0.Without covering with Acryl A1. covering with Acryl
B0. Without adding biofertilizer B1. Add Bacillus megaterium
B2. Add Azospirillum brasilense B3. Add the combination between Bacillus megaterium and Azospirillum brasilense C0. Without adding poultry manure C2 . Add poultry manure at a level of 100%. . C1 Add poultry manure at a level of 50%

Table 5. Effect of biofertilizers and Acryl covering on the cumulative yield of pepper (ton.ha-1)

interaction Average Covering and bio fertilizer A * B		poultry manure			Bio Fertilization	Acryl Covering
		C2	C1	C0		
13.24		15.75	13.90	10.08	B0	A0
15.79		19.34	16.89	11.14	B1	
18.49		22.75	19.90	12.82	B2	
23.88		31.49	27.02	13.11	B3	
16.85		20.70	17.00	12.84	B0	A1
24.94		30.30	26.47	18.06	B1	
28.51		35.66	31.26	18.62	B2	
36.05		49.74	38.92	19.49	B3	
3.08	LSD A*B	1.30			LSD A*B*C	
		28.22	23.92	14.52	Poultry average C	
		1.42			LSD C	
Covering and Poultry interaction A*C						
Average Covering A		C2	C1	C0	A	
17.85		22.330	19.430	11.79	A0	
26.59		34.100	28.410	17.25	A1	
2.86	LSD A	2.92			LSD A*C	
Interaction of bio-fertilizer and poultry B*C						
Bio Fertilizer B average		C2	C1	C0	B	

15.05		18.23	13.90	11.46	B0
20.37		24.82	21.68	14.60	B1
23.50		29.20	25.58	15.72	B2
29.96		40.62	32.97	16.30	B3
1.64	LSD B	2.84			LSD B*C

A0.Without covering with Acryl A1. covering with Acryl
B0. Without adding biofertilizer B1. Add Bacillus megaterium
B2. Add Azospirillum brasilense B3. Add the combination between Bacillus megaterium and Azospirillum brasilense C0. Without adding poultry manure C2 . Add poultry manure at a level of 100%. . C1 Add poultry manure at a level of 50%

This may be due to the low intensity of the light transmitted through the acrylic cover compared to the plants that are not covered, which led to a defect in the hormonal balance of the plants, which had an effect on increasing the height of the plants (Kraepiel et al. 2001). And paper space (Fadel Abbas, 2019).Fertilizing with poultry waste has a positive effect on most of the traits of vegetative growth, such as plant height, number of branches, and leaf area.In addition, adding organic matter to the soil increases nutrients, especially nitrogen, which plays an important role in stimulating the plant to produce plant growth regulators such as gibberellins, auxins and cytokines that work to elongate cells (Al-Nasrawy and Al-Abadi, 2019). The increase in vegetative growth indicators is due to the role of bio fertilization (nitrogen-fixing bacteria and phosphorous solvent), which secrete enzymes responsible for increasing the rate of decomposition of organic matter and its nutrients and release from it to be a food source for the plant in addition to the nature of the mineral organic matter and the physical ones that contain simple sugars that are exploited by living things as a source of energy and nutrients and their activity in the soil or the rhizosphere, building their cells and then increasing their numbers in the soil, which promotes plant growth and then increases the concentration of nitrogen in the plant. The presence of organic acids increases the radical total and thus enhances the absorption of nutrients, including nitrogen (Al-Shammari et al., 2018). The trait of increasing the number of fruits of the covered plants is a good indicator of the nutritional status of the plant. Which helped to increase the accumulation of carbohydrates and high carbon representation, which was reflected in the increase in the weight of the fruit and then the increase in the yield of one plant, in addition to the fact that the coverage reduces water consumption and thus increases the accumulation of carbohydrates (Juan-juan et al. 2012).The reason for the increase in the yield may also be due to the role of organic fertilizers in improving the physical and chemical properties of the soil by increasing the soil's retention of moisture content, which provided ideal conditions for the formation of a strong root system, as well as the increase in the activity of microorganisms and their numbers, which increased the readiness of nutrients and increased their absorption by the plant. (Diver et al., 1999) Which has a major role in activating the process of carbon metabolism and the transfer of materials from the places of their manufacture in the leaves to the places where they are stored in the fruits, due to its important role in the process of transmission through cell membranes, which positively affected the number of fruits and their weight in the plant (Al-Kazemi, 2017).The increase in the yield may be due to the role of Azospirillum brasilense and Bacillus megaterium for the activity of these bacteria in the rhizosphere, which increased the availability of unready nutrients.As well as encouraging root growth by secreting plant growth regulators that increase cell division and form a strong root system that helps the plant absorb nutrients and carry out vital processes by providing the plant's nutritional needs, which is reflected in the yield quantitatively and qualitatively (Mohammedi et al. 2013).In addition, adding organic matter to the soil increases nutrients, especially nitrogen, which plays an important role in stimulating the plant to produce plant growth regulators such as gibberellins, auxins and cytokines that work to elongate cells (Al-Nasrawy and Al-Abadi, 2019). The increase in vegetative growth indicators is due to the role of bio fertilization (nitrogen-fixing bacteria and phosphorous solvent), which secrete enzymes responsible for increasing the rate of

decomposition of organic matter and its nutrients and release from it to be a food source for the plant in addition to the nature of the mineral organic matter and the physical ones that contain simple sugars that are exploited by living things as a source of energy and nutrients and their activity in the soil or the rhizosphere, building their cells and then increasing their numbers in the soil, which promotes plant growth and then increases the concentration of nitrogen in the plant. The presence of organic acids increases the radical total and thus enhances the absorption of nutrients, including nitrogen (Al-Shammari et al., 2018). The trait of increasing the number of fruits of the covered plants is a good indicator of the nutritional status of the plant. Which helped to increase the accumulation of carbohydrates and high carbon representation, which was reflected in the increase in the weight of the fruit and then the increase in the yield of one plant, in addition to the fact that the coverage reduces water consumption and thus increases the accumulation of carbohydrates (Juan-juan et al. 2012).The reason for the increase in the yield may also be due to the role of organic fertilizers in improving the physical and chemical properties of the soil by increasing the soil's retention of moisture content, which provided ideal conditions for the formation of a strong root system, as well as the increase in the activity of microorganisms and their numbers, which increased the readiness of nutrients and increased their absorption by the plant. (Diver et al., 1999) Which has a major role in activating the process of carbon metabolism and the transfer of materials from the places of their manufacture in the leaves to the places where they are stored in the fruits, due to its important role in the process of transmission through cell membranes, which positively affected the number of fruits and their weight in the plant (Al-Kazemi, 2017).The increase in the yield may be due to the role of Azospirillum brasilense and Bacillus megaterium for the activity of these bacteria in the rhizosphere, which increased the availability of unready nutrients. As well as encouraging root growth by secreting plant growth regulators that increase cell division and form a strong root system that helps the plant absorb nutrients and carry out vital processes by providing the plant's nutritional needs, which is reflected in the yield quantitatively and qualitatively (Mohammedi et al. 2013).

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