Response of Wheat Crop to Biofertilizer Combined with Chemical Fertilizer Under Salinity Stress

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Abstract. This study was done to evaluate the PGPMs (Rhizobium ciceri CP-93 + Azospirillum brasilense + Trichoderma harzianum. + Pseudomonas fluorescense + Bacillus megaterium) + 25% chemical fertilizer under salinity stress for four levels S0 ((2.7 – 3.4) dS/m , S1(4.5 – 5 ) , S2 ( 7 – 9 ) and S3 (10 – 15 ) dS/m). Field and laboratory experiments were carried out in the plant protection directorate / ministry of agriculture / Abu – gheeb / Baghdad. In 2018 – 2019, using IPA 99 wheat cultivar. laboratory Experiment demonstrated, the ability of the microorganisms used in this study, to growth and survive normally and similar to the control treatment under salinity stress in vitro for three concentration of drainage water (5, 10, 15) dS/cm. Results of field experiment showed , T6 (Rhizobium ciceri CP-93 + Azospirillum brasilense + Trichoderma harzianum. + Pseudomonas fluorescense + Bacillus megaterium + 25% chemical fertilizer) and T4(Rhizobium ciceri CP-93 + Azospirillum brasilense + Pseudomonas fluorescense + Bacillus megaterium +25% chemical fertilizer) recorded significant increased in the number of spike, number of spikletes, number of tillers and length of spike in the S1 and S2, comparison with other treatments. T6 recorded significant increase in the weight of 1000 seed in both S1 and S2 with ( 38.5 , 38 ) g respectively ,and in the yield of crop of one meter T6 and T4 recorded significant increase over other treatments ,with 435 g/m² and 421 g/m² respectively in S1and (335, 330 ) g/m² in S2.T6 also recorded significant increase in harvest index in both levels 27.23 % in S1 and 26 % in S2.results also showed there were no seed germination in S3 , and there are not any data had been taken.

1. Introduction

Wheat it's the principle staple food in most countries of the north Africa , central and west Asia including Iraq. Wheat crop is considered the most important cereal crop. PGPMs are group of bacteria and fungi that enhance growth and yield of plant, directly as a biofertilizer , which applied to the plants seed or soil and providing plant with nutrient that they need[1].

Growth of plants may be inhibited by different a biotic stresses [2]. Salinity is one of the major a biotic stresses which affect on plant growth , development and yield. Salt tolerant PGPMs reduced the effect of salinity on plant and improve productivity , because they can play an important role in alleviating salinity stress of the soil and reducing the content of Na⁺ available for plant uptake by several mechanisms .such as increase osmolytes (proline and sugare) [3], biofilm formation strategy by PGPMs , which actually is a means to protect and enhance PGPMs survival under non – suitable environment condition , which is contributing in directly to tolerance of the plant to salinity stress [4]. Another mechanism of PGPMs to tolerant salinity stress is exclusion of Na from the plant root,
stimulate the antioxidant within the tissue of the plant, produce ACC-deaminase, production of gibberellins and IAA, inhibit the absorption of toxic ions such as Na⁺ and Cl⁻ from soil [5].

The use of PGPMs as a biofertilizer under normal or stress (a biotic) conditions as a complementary or alternative solutions to the chemical fertilizer and pesticides, is a eco-friendly, economical and potential approach to improve crops yield [6].

2. Materials and methods

2.1 Materials

All the microorganisms used in this study showed in table (1).

| Microorganisms                  | source                                      |
|--------------------------------|---------------------------------------------|
| *Rhizobium cicer* CP-93 (Rh.)   | biofertilizer laboratory / plant protection directory |
| *Azospirillum brasilense* (Az.) | biofertilizer laboratory / plant protection directory |
| *Pseudomonas fluorescens* (P.f) | biofertilizer laboratory / plant protection directory |
| *Bacillus megaterium* (B.m)    | biofertilizer laboratory / plant protection directory |
| *Trichoderma harzianum* (Tr.)  | plant pathology laboratory / plant protection directory |

2.2 Laboratories experiments:

2.2.1. Tolerance of microorganisms to the salinity stress:
In this test three level of salinity were prepared (5, 10 and 15) dS/m by diluting drainage water with EC of 22 dS/m. The electrical conductivity (EC) of each concentration estimated according to [7] by using EC meter.

A 250 ml from potato dextrose agar (PDA) medium and 500 ml from nutrient agar N.A. has been prepared for each concentration, by adding powder of each medium to the conical flask containing (250 and 500) ml for each concentration of drainage water. The media were sterilized by autoclave, then putted in Petri dishes.

Each genera of bacteria has been cultured on Petri dishes of 10 ml nutrient agar for each concentration, by streaking methods with three replication for each bacteria, in addition to plates containing normal nutrient agar inoculated with each bacteria, as a control treatment. The plates incubated in 28°C ± 2 for two days.

Petri dishes containing 10 ml from PDA medium for each concentration has been inoculated with (5 mm diameter) of *T. harzianum* from 7 days old culture, in the center of the plate, and plates with normal PDA inoculated with *T. harzianum* as a control treatment, with three replication for each treatment. All the plates incubated in the incubator at 26°C ± 1 for 5 days [8].

2.3 Field experiments:
The treatments: treatment of this study show in table (2):
This experiment was conducted to determine the effect of salinity stress on the effective of biofertilizers and their role in the enhancing and improving wheat crop. This experiment was done under four level of salinity, where each level contained all the previous treatments, in the Randomized Complete Blok Design in systemic arrangement with three replications.

Control level S0: (2.7–3.4) dS/m.
First level S1: (4.5–6) dS/m.
Second level S2: (7–9) dS/m.
Third level S3: (12–15) dS/m.
Field experiment was carried out in the plant protection directorate / ministry of agriculture / Abu-Ghreeb/ Baghdad. In 2018–2019, using IPA 99 wheat cultivar.
Bacteria were grown and activated in 1000 ml of nutrient broth, incubated at 28°C in cool shake incubator for 2 days to attain uniform cell density $10^{7–8}$ cfu / ml. Concentration of bacteria were
determined by using a viable count method. Bacteria were carried on sterilized specific carrier (charcoal, peat, 3:1 and 10% Arabic gum,) at 105°C for 55 min. at 1 bar and incubation for three days at 28°C with daily shaking. Seed coating was by mixing the seed with biofertilizer, and sugar solution (10%) was added to the seeds before mixing to get perfect coating with carrier. The Coated seeds were air dried, under shade for 1–1.5 h. [9].

Table 2. Treatment used in field experiment.

| No. | treatments |
|-----|-------------|
| T1  | Rhizobium ciceri CP-93 + Azospirillum brasílense + Trichoderma harzianum. + 25% chemical fertilizer. |
| T2  | Rhizobium ciceri CP-93 + Azospirillum brasílense + Trichoderma harzianum. + Bacillus megaterium +25% chemical fertilizer. |
| T3  | Rhizobium ciceri CP-93 + Azospirillum brasílense + Pseudomonas fluorescence + 25% chemical fertilizer |
| T4  | Rhizobium ciceri CP-93 + Azospirillum brasílense + Pseudomonas fluorescence + Bacillus megaterium +25% chemical fertilizer. |
| T5  | Rhizobium ciceri CP-93 + Azospirillum brasílense + Trichoderma harzianum. + Pseudomonas fluorescence + 25% chemical fertilizer. |
| T6  | Rhizobium ciceri CP-93 + Azospirillum brasílense + Trichoderma harzianum. + Pseudomonas fluorescence + Bacillus megaterium + 25% chemical fertilizer. |
| T7  | Seed ++ 25% chemical fertilizer control |
| T8  | Seeds + 60kg Dap+75kg urea(chemical fertilizer) (control) |

The seeds were sown in plots of 4m² (2*2m) in diameter at three replication to each treatment in straight lines (8 lines for each plot) separates with 10 cm from each other, the field was irrigated immediately after sowing.

Number of spikes/ m², number of spikelet’s/ spike, number of tillers/ plant, weight of 1000 grain, yield of one square meter, biological yield and harvest index has been calculated at the end of the growth season. Using the standard procedure.

Harvest Index (HI) = Grain yield / Biological yield * 100

3. Results and discussion

3.1. Laboratory experiment:

3.1.1. Tolerance of microorganisms to the salinity stress:

The results of this experiment showed the ability of all microorganisms (bacteria and fungous) to grow and survive under all salinity level tested. Thus all microorganisms could grow normally on the plats (nutrient and PDA) containing drainage water with three concentrations (5 – 10 – 15) dS/m. The growth was similar to that on the control plats (non-saline) without any inhibition or suppression in growth compared with control figures (1) and (2) .
3.2. Field experiment:

3.2.1. The effect of salinity stress on the effective of PGPR as a biofertilizer:
First results of this experiment showed that, there was no seed germination in the plots of salinity level (10-15) dS/m, thus there was no data on the all tested traits were recorded.

The results of this experiment demonstrated, precede the treatments with biofertilizer over chemical fertilizer treatments in the most treatments, due to the beneficial effect of biofertilizer. Also because biofertilizer can provides protection against a biotic stress e.g. salinity and drought [10]. The results presented in table 3 that, T4 and T6 were the best treatment in the number of spikes in the two salinity levels S1 and S2. Which gave 403 and 400 spike/ m² respectively in S1, and 301 and 295 spike/ m² respectively in S2, without significant differences between them.
Table 3. Effect of PGPMs combined with 25% chemical fertilizer on the number of spike/m² of wheat crop under salinity stress.

| N.  | Treatments                  | Salt level dS/m |       |       |       |
|-----|------------------------------|-----------------|-------|-------|-------|
|     |                              | S0(2–3) control | S1(4.5–6) | S2(7–9) | Average |
| T1  | Rh. + Az. + Tr. +25%         | 394             | 355   | 275   | 341.4 |
| T2  | Rh. + Az. + Tr. + B.m +25%   | 440             | 370   | 281   | 363.7 |
| T3  | Rh. + Az. + P.f +25%         | 370             | 362   | 231   | 320.9 |
| T4  | Rh. + Az. + P.f + B.m +25%   | 407             | 403   | 301   | 370.2 |
| T5  | Rh. + Az. + Tr. + P.f +25%   | 349             | 338   | 270   | 319.0 |
| T6  | Rh. + Az. + Tr. + P.f + B.m 25% | 415           | 400   | 295   | 370.0 |
| T7  | Seed + 25% chemical fertilizer (control) | 303           | 291   | 221   | 271.7 |
| T8  | Seed + chemical fertilizer (control) | 339           | 310   | 252   | 300.3 |
|     | Average                      | 377.13          | 353.62| 265.75|

L.S.D ≤0.05 L.S.D treatment : 9.8 L.S.D salt. treatment : 17.01

The results in table 4 showed supremacy to the T6 in both salt levels, which recorded (17) spikelet's/spike in S1 and (16.5) spikelet's/spike in S2. T6 precede significantly over other treatments of biofertilizer and treatment of full dose of chemical fertilizer T8.

Our results are similar to Abed – Mohamed [8] who used this test as indicator to select four isolates of Sinorhizobium meliloti (Sm1, Sm8, Sm10 and Sm12) which could grow under different levels of NaCl concentration in vitro, thus Sm1 could tolerate 1.5% NaCl, whereas other isolates grew up to 0.6% NaCl.

Table 4. Effect of PGPMs combined with 25% chemical fertilizer number of spikelet's/ spike of wheat crop under salinity stress.

| N.  | Treatments                              | Salt level dS/m |       |       |       |
|-----|-----------------------------------------|-----------------|-------|-------|-------|
|     |                                         | S0(2–3) control | S1(4.5–6) | S2(7–9) | Average |
| T1  | Rh. + Az. + Tr. +25%                    | 18.3            | 14.0  | 13.0  | 15.1  |
| T2  | Rh. + Az. + Tr. + B.m +25%              | 18.0            | 15.0  | 14.0  | 15.7  |
| T3  | Rh. + Az. + P.f +25%                    | 17.5            | 14.0  | 14.0  | 15.2  |
| T4  | Rh. + Az. + P.f + B.m +25%              | 17.5            | 15.0  | 14.5  | 15.7  |
| T5  | Rh. + Az. + Tr. + P.f +25%              | 17.0            | 14.0  | 14.0  | 15.0  |
| T6  | Rh. + Az. + Tr. + P.f + B.m +25%        | 19.0            | 17.0  | 16.5  | 17.5  |
| T7  | Seed + 25% chemical fertilizer (control) | 14.0            | 13.0  | 10.0  | 12.3  |
| T8  | Seed + full dose Chemical fertilizer(controlled) | 16.0           | 13.0  | 13.0  | 14.0  |
|     | Average                                 | 17.10           | 14.44 | 13.94 |       |

L.S.D ≤0.05 L.S.D treatment : 1.5 L.S.D salt. treatment : 2.2

The length of spike/cm of wheat crop under two level of salinity, showed in table 5. T6 and T4 precede over other treatments in the first level of salinity S1, with (11, 10.5) cm respectively, without significant differences between them. T6 (10.3) cm recorded significant differences above all other treatments, except T4 and T5 with (10) cm, but with significant differences from T3, T7 and T8 (8, 6.5, 8) cm respectively.
Table 5. Effect of PGPMs combined with 25% chemical fertilizer on the length of spike / cm of wheat crop under salinity stress.

| N. | Treatments                          | Salt level dS/m | Average |
|----|------------------------------------|-----------------|---------|
|    |                                     | S0(2 – 3)       | S1(4.5 – 6) | S2(7 – 9) |       |
| T1 | Rh.+Az.+Tr. +25%                    | 10.7            | 9.0      | 9.0 | 9.6 |
| T2 | Rh.+Az.+Tr.+B.m+25%                | 11.0            | 9.0      | 9.0 | 9.7 |
| T3 | Rh.+Az.+P.f+25%                    | 10.7            | 9.0      | 8.0 | 9.2 |
| T4 | Rh.+Az.+P.f+B.m+25%                | 11.0            | 10.5     | 10.0 | 10.5 |
| T5 | Rh.+Az.+Tr.+P.f+25%                | 10.6            | 10.0     | 10.0 | 10.2 |
| T6 | Rh.+Az.+Tr.+P.f+B.m+25%             | 11.5            | 11.0     | 10.3 | 11.0 |
| T7 | Seed +25% chemical fertilizer(control) | 8.2        | 7.0      | 6.5 | 7.6 |
| T8 | Seed + full dose chemical fertilizer(control) | 9.7       | 8.7      | 8.0 | 8.8 |
|    | Means of salt                       | 10.42           | 9.27     | 8.85 |       |

L.S.D ≤ 0.05   L.S.D treatment : 1.2   L.S.D salt. treatment : 1.7

Table 6. Effect of PGPMs combined with 25% chemical fertilizer on the number of tiller/ plant of wheat crop under salinity stress.

| N. | Treatments                          | Salt level dS/cm | Average |
|----|------------------------------------|------------------|---------|
|    |                                     | S0(2 – 3) control | S1(4.5 – 6) | S2(7 – 9) |       |
| T1 | Rh.+Az.+Tr. +25%                    | 6.9              | 5.0      | 5.0 | 5.6 |
| T2 | Rh.+Az.+Tr.+B.m +25%                | 7.2              | 6.0      | 5.5 | 6.2 |
| T3 | Rh.+Az.+P.f+25%                    | 7.1              | 5.7      | 5.0 | 5.9 |
| T4 | Rh.+Az.+P.f+B.m+25%                 | 7.2              | 6.5      | 5.5 | 6.4 |
| T5 | Rh.+Az.+Tr.+P.f+25%                 | 7.0              | 5.5      | 4.5 | 5.7 |
| T6 | Rh.+Az.+Tr.+P.f+B.m                 | 7.3              | 6.6      | 5.7 | 6.5 |
| T7 | Seed +25% chemical fertilizer(control) | 4.6        | 3.0      | 2.7 | 3.4 |
| T8 | Seed + full dose chemical fertilizer (control) | 5.8       | 5.0      | 3.7 | 4.8 |
|    | Means of salt                       | 6.7              | 5.4      | 4.7 |       |

L.S.D ≤ 0.05   L.S.D treatment : 0.8   L.S.D salt. treatment: 1.4

The results in table 7 indicated that, T6 recorded the best result in the weight of 1000 grain in the two salinity levels (38.5) g in S1 and (38)g in S2, and then T2 with 37.3 g in S1 and 36 g in S2, with a significant differences from other treatments and without significant differences between them.
Table 7. Effect of PGPMs combined with 25% chemical fertilizer on weight of 1000 grain (g) of wheat crop under salinity stress.

| N.  | Treatments           | Salt level dS/m | Average |
|-----|----------------------|-----------------|---------|
|     |                      | S0(2 – 3)       | S1(4.5 – 6) | S2(7 – 9) |
| T1  | Rh. + Az. + Tr. +25% | 37.0            | 35.0     | 34.0     | 35.4     |
| T2  | Rh. + Az. + Tr. + B.m +25% | 38.0       | 37.3     | 36.0     | 37.1     |
| T3  | Rh. + Az. + P.f +25%  | 36.0            | 34.0     | 34.0     | 34.7     |
| T4  | Rh. + Az. + P.f + B.m +25% | 37.0        | 35.3     | 34.7     | 35.7     |
| T5  | Rh. + Az. + Tr. + P.f +25% | 36.5        | 34.7     | 34.0     | 35.1     |
| T6  | Rh. + Az. + Tr. + P.f + B.m +25% | 39.5       | 38.5     | 38.0     | 38.8     |
| T7  | Seed +25% chemical fertilizer(control) | 31.0       | 29.3     | 29.0     | 29.7     |
| T8  | Seed + full dose Chemical fertilizer(control) | 36.5       | 34.3     | 32.3     | 34.3     |
| Average |                      | 36.44         | 34.80    | 34.00    |

L.S.D ≤ 0.05 L.S.D treatment : 1.28 L.S.D salt. treatment: 1.7

In this experiment table 8, showed the grain yield of m² of the wheat crop under salinity stress in S1, T6 and T4 recorded the best results 435, and 421 g. m² respectively, with a significant differences compared with all other treatments, and without significant differences between them. In the second salinity level T6, T4 and T2 recorded the best results 335, 330, and 326 g respectively, over other treatments. All the biofertilizer treatments recorded significant differences in the grain yield. m² especially treatments with B. megaterium T6, T4 and T2 compared with the full dose of chemical fertilizer T8 in the both salt level.

Table 8. Effect of PGPMs combined with 25% chemical fertilizer on Crop yield / m² (g) of wheat crop under salinity stress.

| N.  | Treatments                      | Salt level dS/m | Average |
|-----|---------------------------------|-----------------|---------|
|     |                                 | S0(2 – 3)       | S1(4.5 – 6) | S2(7 – 9) |
| T1  | Rh. + Az. + Tr. +25%            | 431             | 300     | 284     | 338.7    |
| T2  | Rh. + Az. + Tr. + B.m +25%      | 461             | 335     | 326     | 374.0    |
| T3  | Rh. + Az. + P.f +25%            | 420             | 278     | 240     | 310.8    |
| T4  | Rh. + Az. + P.f + B.m +25%      | 452             | 421     | 330     | 401.0    |
| T5  | Rh. + Az. + Tr. + P.f +25%      | 375             | 340     | 247     | 320.8    |
| T6  | Rh. + Az. + Tr. + P.f + B.m +25% | 457           | 435     | 335     | 409.1    |
| T7  | Seed +25% chemical fertilizer(control) | 255         | 211     | 199     | 221.7    |
| T8  | Seed + full dose Chemical fertilizer(control) | 341       | 292     | 240     | 291.0    |
| Average |                                 | 399.00         | 325.63  | 275.25  |

L.S.D ≤ 0.05 L.S.D treatment : 9.06 L.S.D salt. treatment: 15.69

Result presented in table 9 indicated that maximum average number of biological yield was recorded in treatment T4 in both salinity level S1 and S2. T7 has recorded the lowest results in the biological yield in both level of salinity.
Table 9. Effect of PGPMs combined with 25% chemical fertilizer on the biological yield of wheat crop under salinity stress.

| N  | Treatments                                  | Salt level dS/m | Average |
|----|---------------------------------------------|-----------------|---------|
|    |                                             | S0(2 – 3) control | S1(4.5 – 6) | S2(7 – 9) |       |
|    |                                             |                 |          |          |       |
|    |                                             | 1796            | 1310    | 1292    | 1466  |
|    |                                             | 1770            | 1256    | 1368    | 1465  |
|    |                                             | 1909            | 1263    | 1205    | 1459  |
|    |                                             | 1738            | 1619    | 1467    | 1608  |
|    |                                             | 1640            | 1554    | 1225    | 1473  |
|    |                                             | 1828            | 1597    | 1288    | 1571  |
|    |                                             | 1342            | 1100    | 1176    | 1206  |
|    |                                             | 1624            | 1390    | 1265    | 1426  |
|    |                                             |                 |          |          |       |
|    |                                             | 1705.87         | 1386.12 | 1285.75 |       |

L.S.D ≤ 0.05  L.S.D treatment : 14.26  L.S.D salt. treatment:27.11

The results of the harvest index can shows in the table10 was in the S1 supremacy to the T6 (27.23%), then T2 (26.67) % and T4 (26) % with significant differences compared with other treatments and without significant differences between them. In the S2 T6 recorded the best results with 26% with significant differences compared with all other treatments.

Table 10. Effect of PGPMs combined with 25% chemical fertilizer on the harvest index% of wheat crop under salinity stress.

| N. | Treatments                        | Salt level dS/m | Average |
|----|-----------------------------------|-----------------|---------|
|    |                                   | S0(2 – 3) control | S1(4.5 – 6) | S2(7 – 9) |       |
|    |                                   |                 |          |          |       |
|    |                                   | 24.00           | 23.00    | 22.00    | 23.00  |
| T1 |                                   | 23.63           | 26.67    | 23.83    | 25.61  |
| T2 |                                   | 22.00           | 22.00    | 20.00    | 21.33  |
| T3 |                                   | 26.00           | 26.00    | 22.50    | 25.83  |
| T4 |                                   | 22.67           | 22.00    | 20.00    | 21.56  |
| T5 |                                   | 29.00           | 27.23    | 26.00    | 26.74  |
| T6 |                                   | 19.00           | 19.00    | 17.00    | 18.33  |
| T7 |                                   | 21.33           | 21.00    | 19.00    | 20.44  |
| T8 |                                   | 23.87           | 23.36    | 21.29    | 23.52  |

L.S.D ≤ 0.05  L.S.D treatment : 1.61  L.S.D salt. treatment: 2.79

The benefit using of PGPMs as a biofertilizer under saline condition, on the growth of plant has been reported by many researchers’ works. Different PGPMs were produce polysaccharide molecules as a mean to protect themselves from ion toxicity and drought, have a charged part that react with free Na + ion and chelated them. This contributes to the reduced the abundance and toxicity of Na+ ions in the rhizosphere, thereby the soil become suitable for root growth and development[11]. Some PGPMs like Bacillus spp. and Trichoderma spp. contributed in the tolerance to the salt condition in maize and wheat by enhancing the level of chlorophyll production, colonization and interacting with the root of plants, and stimulates the antioxidant and sugars production within plant tissues [12].
Different PGPMs such as *Pseudomonas*, *Bacillus* and *Rhizobium* could be produced phytohormones like Gibberelline under salt stress. That is can provide adequate adaptation to salt influenced stress, and crop yield improving[5]. PGPMs can also produced IAA and ACC de-amenase, which promote plant growth under a biotic stress such as salinity, the plant roots exclude tryptophan amino acid, which is taken up by PGPMs present in the roots, where its converted into indol acetic acid, the bacteria also produced IAA and to gathers stimulate auxin signal transduction pathway to produce auxin and promoting plant growth under salinity stress [3]. The microorganisms which find in the root are taking ACC and degrading to α-ketobutyrate and ammonia, PGPMs which is produced ACC-deaminase act as a sink for ACC, thereby the level of ethylene production will decrease in the plant, and the response of the salinity stress will decrease also[13]. Inoculated plants with some PGPMs under salt stress could be increased concentration of carotenoid and osmolytes like prolin and sugars [14].

Biofilm formation is a suitable strategy in which the PGPMs can facilitate plant tolerance to salinity. This by reversal or aversion of the harmful effect of salinity on some growth parameters such as fresh and dry weight of the plant, seedling length and relative water content of the plant leaf. Bacteria and fungi do this biofilm formation strategy as a mean of protecting themselves from an unsuitable environmental condition they found themselves in, and that enhancing indirectly the ability of plants to tolerance stress [4].

Plant growth promoting microorganisms have the ability to reduce other harmful effect to the salt stress like potassium depletion and looses of water [15].

Our results supported by Orhan [16] who found inoculated wheat plant with PGPMs under salt stress, enhanced shoot and root growth in the growth rate from (62.2) to (78.1) %, and weight of fresh tissue component of the wheat plants.

Our results in the same harmony with Zhang, [17] who found, inoculation *Trichoderma longibrachiatum* T6 can increase wheat plant tolerance to salinity stress, so its enhanced wheat seedling height from (11.03) cm in the control to (12.7) cm in the inoculated plant, and also can increased root length from (10.18) cm in control to (13.62) cm in the treatment, and also inoculated with T6 can target on the content of protein from (15.58) mg/g in the control, to the (17.25) mg/g in the inoculated plants, and soluble sugar (20.58) mg/g in control, to (22.85) mg/g in the seedling of wheat inoculated with T6 under salt stress.

Our results also similar to Sapra, [18] who reported using *Klebsiella sp*. on Oat under salt condition (100) mM NaCl, caused enhancement plant seedling biomass (20%) compared with control, dry shoot weight from (28.8) mg in the control, to (35) mg in the inoculated plants, root dry weight from (5.1) mg in control, to the (6) mg in inoculated plants, total chlorophyll, from (0.42) mg/g in control, to (0.47) mg/g in treatment, and Auxin content from (256.28) µg/g in the control treatment, to the (455.81) µg/g.

This results also in the same line with Basavesha and Savalgi [19] who demonstrated that using of nitrogen fixing *Paenebacillus*, influence the growth of maize in calcareous soil under green house condition.

4. Conclusion
The microorganisms used in this study can tolerate different salinity levels up to 15 dS/m *in vitro*. The microorganisms could grow and survive in the soil under diver’s levels of salinity stress. The ability to use them as biofertilizer in the field under salt stress, because these microorganisms can reduce the effect of saline condition. These microorganisms success in the increased the yield and growth of the plants compared with chemical fertilizer.

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