Plant Archives Volume 20 No. 1, 2020 pp. 2457-2464 **e-ISSN:2581-6063 (online), ISSN:0972-5210**

RESPONSE OF GREEN BEANS PLANTED IN THE PLASTIC HOUSE TO NITROGEN FIXING BACTERIAL INOCULATION AND MOLYBDENUM

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Abstract

The experiment was carried out in the green houses research station (B) in the College of Agriculture, University of Baghdad, Al-Jadrya campus during the spring season of 2016 to study the response of nitrogen fixing bacterial biofertilizers which including *Rhizobium phaseoli*, *Azotobacter chroococcum* and *Azospirillum brasilense* and molybdenum on growth and yield of green beans in The plastic house. The experiment was conducted according to the randomized complete block design (RCBD) with three replications each included 11 treatments represent the interactions between nitrogen fixing bacteria isolates, molybdenum solo application, molybdenum and bacteria isolates interactions, in addition to the recommended nitrogen application and control treatment. Results were analyzed using the least significant differences (LSD) test at 5% level of significance. Results showed significantly increase N% in the pods (2.73 %) in T7, Treatment included all bacteria isolates and Mo (T11) gave the most significant percentage of p in the pods (0.21%) and root nodular fresh weight of 2920.00 mg.plant^{-1}, treatment (T5) gave the highest K % in the pods (1.46%), As for the T10, results showed significant concentration of Mo in the pods (0.63 mg.kg^{-1}), Moreover, T3 significantly increased percentage of carbohydrate (3.74%), As for the T9, results showed significant percentage of Dry matter 21.38%, T6 gave the most significant T.S.S. (8.17 %). Solo treatment (T2) gave the highest concentration of Fe in the pods (55.58 mg.kg^{-1}), root branches (11.56 branch. plant^{-1}), root dry weight (9.11 g. plant^{-1}), shoot branches per plant, leaf area and leaf chlorophyll concentration that reached 4.00 branch. plant^{-1}, 63.15 dm^2. plant^{-1} and 210.97 mg.100g^{-1} fresh weight respectively, weight of pods (9.76 g.pod^{-1}) and total production (633.74 Kg. house^{-1}) with an area of 418.5 m^2.

Key words: Bean, Nutrients in pods, Growth, Yield, Quality of pods.

Introduction

Most types of kidney beans ripen in a range of 65 to 110 days from sprung to physiological ripening. It is considered to be of short seasoned product (Buruchara, 2007) so; it is preferred to be planted in plastic house for two times or more during the season to increase the economic output (Al-Jebouri and Shather, 1990). It is from the profitable products in protected planning (Hassan, 1997). Although that the short types of green beans can be planted in protected houses, but it is preferred to use the climbing long types to achieve the largest possible benefit from the area that can planted in the protected houses. Hence, it can be produced in other than its seasons if the protected houses provide the environmental factors that suit it like suitable temperature, light, with special care for the root growth environment and plant nutrition (Hassan, 2012). It is constant that the leguminous plants are in cooperation with Rhizobia bacteria as the later has the ability of transforming atmospheric nitrogen to available nitrogen for the plant (Ndakidemi *et al.*, 2006). Nitrogen fixation process is considered one of the most important processes that occurs in nature which follows the carbonic metabolism process. It is in the second rank of importance for the continuity of life on earth (Al-Shebini, 2004). The microbes that fix atmospheric nitrogen all have a special trait which is its use for inerting nitrogen. They are able to break the triple bond of nitrogen during its growth. The enzyme that is responsible for activating such inert gas helping on its combination with the other cell compounds is called nitrogenase enzyme (Alexander, 1982). There are a lot of bacteria that do this role like *Rhizobium phaseoli*,

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Azotobacter Spp. and *Azospirillum* Spp. They fix nitrogen in their cells and when they died, nitrogen gets back to the culture where they live in. The efficiency of bio-fixation for nitrogen can be increased by the use of some factors that increase the efficiency of nitrogenase enzyme like the use of molybdenum. Due to the participation of molybdenum in atmospheric nitrogen fixation, reducing of nitrates and nitrogen's compounds transmission in the plants, it has an important role in nitrogen formulation in the plants (Ali *et al.*, 2014). (Badawy *et al.*, 2003) have studied the response of tomato plants to the single bacterial inoculation by dipping the roots of the plantations before planting in an inoculation which is composed of different species of *Azotobacter chroococcum*. They got an real observable increase in the weight of fresh and dry plant of the green parts, roots and number of branches.plant^{-1} in comparison with the measure's treatment. Also (Bambara and Ndakidemi, 2010) have done a field experiment and a plastic house. They used Rhizobia inoculation with or without the addition of Lime in the ranges of (0, 2 and 3) t.ha^{-1} and Molybdenum in the ranges of (0, 6 and 12) g\ kg^{-1} on green beans plants. The two researchers observed that the *Rhizobuim* Spp. Inoculation leaded to an observable increase in the plants pods' number, seeds' number, the weight of 100 seed and the product of seeds in comparison with treatment measurement. On the basis of the above presented experiences, the research aims at studying the response of green beans which is planted in the plastic house to the addition of the nitrogen fixation inoculation that is represented by the bacteria of *Rhizobium phaseoli*, *Azotobacter chroococcum* and *Azospirillim brasilense*, as well as Molybdenum taking in consideration their interactions and its resulted effect on the growth and product of beans.

Materials and Methods

This research is carried out on the protected agriculture research station (B) in the College of Agriculture, University of Baghdad, Al-Jadrya campus for studying the response of the green beans for the addition of fixing nitrogen inoculation and molybdenum under the circumstances of the protected environment for the season of 2016. A non- heated plastic house of 46.5 m length, 9 m of width and 3.20 m of height was prepared. Its area was 418.5 m^2 of semi- cylindrical type (quonest) (tunnel) and it was composed of 20 arc. Then, the seeds of green beans were planted for a climbing crossbred (Polo) of Spanish origin, in cork planes of 84 of sample capacity in a plantation that belongs to private sector which is located in the center of the tunnel north Baghdad on 16\12\2015. The seedlings were moved (when they formed two real leaves) to be planted in the plastic house on 7\1\2016 after thirstiness of 7 days.

Tests were done in the central soil tests laboratory in the college of Agriculture\ University of Baghdad.

The distance between one plant and the other was 0.30 m. The places of planting were exchanged on two lines on the sides of Drip irrigation lines (duck's feet method). This was of five terraces of 0.80 m in width along the house. The three middle terraces represents three repeated ones while the two side terraces were considered protecting lines with four paths, 1 m in width, (separating tunnels between the terraces) that facilitate the processes of serving the plant. Also, 1 m was left in the beginning and the end of the plastic house with an isolation distance of 1 m which is lined with polyethylene in the depth of 30-40 cm among the experiential units. This prevents the transmission the nutrition and inoculations. The total number of the units is 33 units with area of single experimental unit 5.4 m^2 (3m length, 1.8m width). Twenty plants was provided for each experimental unit. Nine random samples were taken from the soil of the house from different areas of the surface layer 0-30 cm before planting process. Necessary tests were done for them (Table 1). Furthermore, the field was fertilized with (P, K) manure which is recommended in the range of 60 kg.h^{-1} for each field (Abu-Gulul, 2000) total treatment including the treatment measurement (control). Phosphorus (P) was added on a high phosphorus manure in the structure of P_2O_5 (13% P). as for Potassium (K) was added in a form of high potassium manure in the structure of K_2O (41.5% K). This addition was done to

Table 1: Some chemical, physical and biological traits of the plastic house's soil before planting of the season 2016.

Soil Reaction Degree pH	Electric Conductivity ds.m^{-1}	Available Nitrogen mg.kg^{-1}	Available Phosphorus mg. kg^{-1}	Available Potassium mg, kg^{-1}	Available Molybdenum mg. kg^{-1}	Mud g.kg^{-1}	Silt g.kg^{-1}	Sand g.kg^{-1}	Tissue Type	Biological evaluation of each g. soil (CFU)		
										Azotobacter Spp.	*Azospirillum* Spp.	*Rhizobium* Spp.
7.61	2.6	101.00	52.45	134.40	0.52	10.80	34.00	55.20	Sandy loam	3.5×10^5	1.3×10^4	0.5×10^4

the soil in two parts; the first was on the vegetative growth period (a month after planting), while the second on the period of flowering (20 days from the first part).

The experiment involved 11 treatment in the following symbols:

T1. Treatment measurement (control)

T2. Chemical Nitrogen manure (urea)

T3. Molybdenum (Mo)

T4. *Rhizobium phaseoli*

T5. *Rhizobium phaseoli* and *Azotobacter chroococcum*

T6. *Rhizobium phaseoli* and *Azospirillum brasilense*

T7. *Rhizobium phaseoli, Azotobacter chroococcum* and *Azospirillum brasilense.*

T8. *Rhizobium phaseoli* and Mo

T9. *Rhizobium phaseoli, Azotobacter chroococcum* and Mo

T10. *Rhizobium phaseoli, Azospirillum brasilense* and Mo

T11. *Rhizobium phaseoli, Azotobacter chroococcum, Azospirillum brasilense* and Mo.

Nitrogen was added in the level of 40 $kg.h^{-1}$ in the form of urea (46% N) (4) for the chemical nitrogen for the manure treatment (T2) and Molybdenum in the form of Ammonium Molybdate (54% Mo) in the level of 1 $kg.h^{-1}$. This is used for the treatment of molybdenum T3 (Abdul-Rtha, 1997) as well as the other treatments that have got Molybdenum addition. The addition was done to the soil into two parts; the first one was in the period of vegetative growth (a month after planting), while the second is during the flowering period (after 20 days from the first part). Pure isolated samples for the bacteria of *Rhizobium phaseoli*, *Azotobacter chroococcum* and *Azospirillum brasilense* with biological intensity 10^7 for each (CFU) colony forming unit\ gram of inoculation which was got from biological technology center laboratories, Agricultural Researches Office, the Ministry of Science and Technology previously in Zafaraniyah. The pure isolated sample was increased by dissolving 20 g from the growth media in 1 liter of distilled water. It is closed with a tight stopper and put in the autoclave for an hour, with 121°C and 1.5 bar pressure. Then, it is left to be cold. When the prepared growth media had reached 25°C of temperature, $5cm^3$\ L^{-1} from the pure isolated sample was taken and put in the growth media. It was well concussed and put in the electric incubator for 48 hour for the Rhizobia and Azotobacter while 72 hour for Azospirillum. The bacterial culture that contains *Azotobacter chroococcum*, *Rhizobium phaseoli* and *Azospirillum brasilense* was prepared individually. Then, the bacterial broth inoculation was transformed to a flat plastic vessel. The Arabic clue was added in 10% of concentration to guarantee the angulation of the bacterial inoculation in the roots of the plantings, as well as the success of the inoculation process. These plantings wanted to be inoculated were put on the sides of the vessel for 10 minutes away from the sun's rays. The roots of the seedlings were submerged in the bacterial culture. After that, they were took off from the vessel and left in the shade for 10 minutes. Then, they were planted in the allocated place in the plastic house. This experiment was executed according to the design of random complete block design (RCBD) in three repetitions. The results were analyzed according to the Genstat statistics program. The averages were compared by testing the minimum L.S.D difference with probability level 5% (Al-Mohammadi *et al.*, 2012). After taking the plan sample, the chemical indicators were measured in accordance with what was mentioned by (Al-Sahaf, 1989). The process of wet digestion was made in accordance with the suggested process by Cresser and Parsons (Cresser and Parsons, 1979). The elements of N, P, K, Fe and Mo in the pods were evaluated in accordance with what was mentioned by (Al- Sahaf, 1989). The indicators of roots' growth were measured which represented by the number of root branches, the dry weight for the root group (g) and the fresh weight for the total root nodes (mg). The indicator of vegetative growth were measured which are represented by the number of the green branches in the plant and the surface leaves area (dcm^2) as well as the chlorophyll concentration in the leaves (mg. $100gm^{-1}$ fresh weight). The indicators of the product were measured which is represented by the number of seeds in one pod, the weight of the pod (g) and the total product for the plastic house ($Kg.House^{-1}$). The indicators of pod's quality were measured that were represented by the percent of Carbohydrates, percent of the dry matter and the percent of the total soluble solids (T.S.S.).

Results and Discussion

The effect of the biofertilizers and Molybdenum in percentage for N, P, K and the concentration of Fe and Mo in the pods

It observed from the results of table 2 that there is a significant for the treatments for the percentage to the elements N, P, K, as well as the concentration of Fe and Mo in the pods. The treatment of the triple bacterial inoculation has excelled (T7) in giving the maximum highest percentage N 2.73% which does not differ in the

Table 2: The effect of biofertilizers and Molybdenum in percentage for macro elements and micro elements concentration in the pods for green beans which are planted in the plastic house for the season of 2016.

Treatments	N %	P %	K %	Femg.kg^{-1}	Momg.kg^{-1}
T1	1.57	0.13	1.24	30.49	0.22
T2	1.68	0.16	1.39	55.58	0.31
T3	2.27	0.20	1.34	48.01	0.48
T4	2.15	0.20	1.33	48.21	0.35
T5	2.62	0.20	1.46	44.34	0.39
T6	2.50	0.14	1.33	39.38	0.46
T7	2.73	0.15	1.29	40.78	0.45
T8	1.80	0.14	1.25	35.92	0.47
T9	2.03	0.15	1.34	37.84	0.48
T10	2.15	0.14	1.33	45.41	0.63
T11	2.27	0.21	1.30	43.45	0.54
L.S.D 5%	0.68	0.06	0.11	10.53	0.17

significant from T5, T11. The treatment of the triple bacterial inoculation has excelled with Mo (T11) in its giving the highest percentage P 0.21 % which does not differ in significant from T2 and T5. The treatment of the dual bacterial inoculation has excelled between Rhizobium and Azotobacter (T5) in its giving the highest percentage K 1.46% which does not differ with the significant from T2. The treatment of chemical nitrogen has excelled (T2) in its maximum concentration of Fe 55.58 mg.Kg^{-1}, which does not differ in the significant from T4, T3 and T10. The dual inoculation treatment has excelled between Rhizobia and Azospirilluim with Mo (T10) in its highest concentration of Mo 0.63 mg.kg^{-1} which significantly does not differ from T11 in comparison with the treatment measurement that gave the lowest values for the indicated elements previously in the pod that was 1.57%, 0.13%, 1.24%, 30.49 mg.kg^{-1} and 0.22 mg.Kg^{-1} respectively.

The results refer to the positive role for the triple bacterial inoculation (T7) in increasing the percentage of nitrogen in the pods through the role of these biological bacterial fertilizers in nitrogen atmospheric nitrogen fixation and the increase of available nitrogen for the plant and then the increase of its absorption by the roots as well as its transforming and metabolism inside the plant. The increase of the percentage of phosphorus in the legume is attributed to the positive effect of the triple bacterial inoculation with Molybdenum (T11) in biological nitrogen fixation. The element N is important in stimulating and encouraging the phosphorus absorption by the roots of the plant. It also increases the vegetative growth of the plant, roots, plant's biological activities and increase of the availability and solubility of phosphorus (Ali, 2012).

Also, it is thought that the molybdenum has a role in phosphorus metabolism, yet the mechanism in which this element effects on the process of phosphorus metabolism is unknown yet (Al-Sahaf, 1989). As for the increase of Potassium percentage in the pod while treatment with the dual inoculation between Rhizobia and Azotobacter (T5), leads to the increase available N and then the increase of nitrogen absorption from the roots. This goes in the benefit of the vegetative growth and the increase of the absorption of other elements like Potassium (Tisdale *et al.*, 1985). Furthermore, the biofertilizers have a role in the absorption of the nutrition elements and secretion of plant growth regulators.

The increase of Fe concentration in the pod when adding the chemical nitrogen manure (T2) is attributed to the absorption of the plant for nitrogen which reflects positively in the increase of absorption of the other nutrition elements like Fe by the plant. The results have shown that the addition of the Molybdenum to the dual bacterial inoculation between Rhizobia and Azospiriluim (T10) lead to the increase of molybdenum concentration in the pod. This is attributed to the importance of molybdenum in the increase of the efficiency of biological nitrogen fixation process as it participates in the composition of nitrogenase enzyme which is found in the biological bacterial fertilizers. This goes in the benefit in the increase of available molybdenum for the plant. These results agree with what (Abdul- Rtha, 1997) had found when the Molybdenum and Rhizobia are added to the soybean. Also, the results agree with (Al-Sheibany, 2005) when tomato was inoculated with Azobacter bacteria.

The effect of biofertilizers and molybdenum on the indicators of root growth

The results of table 3 show the presence of significant effect for the treatments in the indicators of root growth. The treatment of N chemical manure (T2) has excelled, in significant in giving the highest number for root branches in the plant which reached 11. 56 while the mono bacterial inoculation treatment, with no significant (T4), comes after. The chemical nitrogen manure treatment (T2) comes after to excel in giving the highest dry weight for the roots which reaches 9.11 gm. Then the triple bacterial inoculation T7 follows it with no significant, then the dual bacterial inoculation T6 and T5 respectively. Triple bacterial inoculation treatment and Mo (T11) with significant have given the highest fresh weight for the root nodes for the plant which reached 2920.00 mg. plant^{-1} which does not differ in the significant from T5. This is in comparison with the treatment measurement that gave less values for the indicators mentioned previously; 6.33 branch. Plant^{-1} and 6.03 gm and 588.33 mg. plant^{-1} respectively.

Table 3: The effect of biofertilizers and Molybdenum in the indicators of root growth for green beans which are planted in the plastic house for the season of 2016.

Treatments	The number of roots branches for the plant	The dry weight to the roots (gm)	Fresh weight of root nodes (mg)
T1	6.33	6.03	588.33
T2	11.56	9.11	650.00
T3	7.33	6.66	758.33
T4	10.22	6.96	1086.67
T5	8.44	7.68	1881.67
T6	8.11	7.57	655.00
T7	8.56	7.93	1123.33
T8	7.00	6.48	675.00
T9	7.78	6.62	753.33
T10	6.44	6.49	763.33
T11	7.83	6.77	2920.00
L.S.D 5%	2.30	1.65	1370.09

Table 4: The effect of the biofertilizers and molybdenum on the indicators of vegetative growth of green beans planted in the plastic house for the season 2016.

Treat-ments	Branches number	The area of the leaves (dcm^2. $plant^{-1}$)	The concentration of chlorophyll in the leaves (m g. 100 gm^{-1} of fresh Weight)
T1	1.53	21.85	152.39
T2	4.00	63.15	210.97
T3	3.27	30.47	195.79
T4	2.80	30.07	209.94
T5	3.13	34.18	187.40
T6	2.53	35.06	201.18
T7	3.80	39.36	201.31
T8	1.60	32.19	193.65
T9	2.07	26.67	183.61
T10	2.73	24.16	190.71
T11	2.13	26.83	153.10
L.S.D 5%	1.38	14.32	32.25

The positive role of the chemical nitrogen manure in the increasing of the indicators of root growth which are represented in the number of the root branches and dry weight for the roots can be attributed to the increase of nitrogen absorption by the plant. Then, the nitrogen is transformed to Amino acids and Protein compounds which lead to the improvement of plant's growth. This goes positively in the benefit of the increase of root growth of the plant. The positive effect of the triple bacterial inoculation with molybdenum in increasing the fresh weight of the root nodes attributed to the role of Rhizobia bacteria in forming the root nodes. The Rhizobia encourages the formation of root nodes in the legumes (Taiz and Zeiger, 2010), the role of Azotobacter in the secretion of plant growth regulators, as well as the role of Azospiriluim bacteria in encouraging the increase of root hairs intensity for the roots due to their producing of gibberellin (Bashan *et al.*, 2004) and producing the hormones of the plants that stimulates the growth of the plant (Spaepen *et al.*, 2008).

The effect of biofertilizers and molybdenum on the indicators of vegetative growth

It noticed from the results of table 4 that there is a significant for the treatments in the indicators of vegetative growth. The chemical manure N treatment (T2) has excelled in giving the largest number of vegetative shoots that reaches 4 $branches.Plant^{-1}$. The triple bacterial treatment T7 comes after without significant to reach (3.8 $branch.plant^{-1}$). The chemical nitrogen treatment (T2) gives the highest leaf area which reached 63.15 $dcm^2.plant^{-1}$ and highest concentration of the total chlorophyll in leaves which reached 210.97 mg. 100 gm^{-1} of fresh weight. The single bacterial inoculation comes after, for (Rhizobia) without significant T4 and the triple bacterial inoculation (T7) respectively. This was made in comparison with the treatment measurement that gave the least values 1.53 $branches. plant^{-1}$, 21.85 $dcm^2.plant^{-1}$ and 152.39 mg.100 gm^{-1} of fresh weight respectively.

The positive role of chemical nitrogen manure in the increasing of the number of branches, the leave's area and the concentration of chlorophyll in the leaves may belong to the role of nitrogen to stimulate the plant to produce Auxins and proteins encouraging the cell division and its elongation (Taiz and Zeiger, 2006). Also, it is necessary for the growth of the stem and leaves as well as making chlorophyll (Al-Batal, 2010). Nitrogen greatly affects the growth of leaves, sustainability of leave's area and the average of carbonic metabolism for the leave's area unit to control the producing of carbohydrates and other products of carbonic metabolism, it also affects on size of vegetative growth (Abdul-Hamid, 2014).

The effect of biofertilizers and molybdenum in the total product and its components

It noted from the table 5, that there are significant differences for the treatments in most of the product 's indicators, but the pods did not reach the significance in the number of seeds in each pod. The chemical manure N treatment (T2), in significant, is excellent in giving the greatest weight for a pod 9.76 $g.pod^{-1}$. The treatments of the biofertilizers (T5, T7, T6, T11, T8, T10) come after without any significant The chemical nitrogen manure treatment (T2) is excellent in giving the highest total yield that reached 633.74 $kg.house^{-1}$. This is followed by the triple bacterial inoculation treatment (T7) that reached

Table 5: The effect of biofertilizers and molybdenum on the indicators of the plant's product for beans that are planted in the plastic house for the season 2016.

Treatments	Number of seeds in a pod	The weight of pod.g	The total product kg.house^{-1}
T1	5.07	8.56	308.96
T2	5.51	9.76	633.74
T3	5.20	8.92	366.30
T4	5.36	8.84	356.41
T5	5.49	9.66	436.00
T6	5.07	9.41	425.13
T7	5.51	9.42	523.00
T8	5.18	9.33	401.40
T9	5.56	8.90	342.08
T10	5.58	9.29	352.95
T11	5.29	9.36	430.07
L.S.D 5%	N.S	0.71	88.24

523.00 kg.house^{-1} in comparison with treatment measurement that gave the least values of 8.56 g.pod^{-1} and 308.96 kg.house^{-1} respectively.

The positive role of the chemical nitrogen manure (T2) in the increase of the product indicators that are represented in the weight of the pod and the total product is attributed to the role of nitrogen in giving a good root average (Table 3) and green average (Table 4) due to the easy absorption for the nutrition elements which leads to the increase of carbonic metabolism efficiency. Also, this helps in synthesizing sugar that help in increasing cells' division and growth (Hopkins, 1995). This reflects positively on the increase of product's indicators as nitrogen is considered one of the most important and necessary nutrition elements for plant's development and growth achieving high productivity (Abdul-Hamid, 2014). These results agree with what was found by (Al-Sahaf,1996) concerning the increasing of the pod weight when adding nitrogen to broad bean.

The effect of biofertilizers and molybdenum on the quality of pod

It noted from the table 6, that there is significant for the treatments in the indicators of pods' quality. The treatment of Mo (T3) gives the highest percentage of carbohydrates 3.74% which did not differ in significant from T5. The dual inoculation treatment on Rhizobia and Azotobacter with molybdenum (T9), with significant, has excelled the highest percentage of the dry matter 21.38%. Also, the dual inoculation treatment between Rhizobia and Azospirillum (T6) has excelled the highest percentage of the soluble solids 8.17% respectively and in comparison with the treatment measurement that gave the least values 1.34%, 17.72%, 5.67% respectively.

Table 6: The effect of the biofertilizers and molybdenum on the indicators of pods' quality of the beans that are planted in the plastic house for the season 2016.

Treat-ments	The percentage of Carbodydrates (%)	The percentage of The dry matter (%)	The percentage of Total soluble solids (T.S.S.)
T1	1.34	17.72	5.67
T2	2.06	18.29	7.33
T3	3.74	19.37	6.83
T4	2.19	18.97	7.00
T5	3.22	17.77	6.00
T6	1.72	21.03	8.17
T7	1.80	18.63	6.00
T8	2.42	18.45	6.50
T9	2.34	21.38	6.83
T10	3.73	19.30	5.83
T11	2.55	18.56	7.67
L.S.D 5%	1.09	1.69	1.48

The positive role for molybdenum in increasing the percentage of carbohydrates is the role of this element in increasing the avail of nitrogen for the plant which develops the nutrition of the plant. Nitrogen is the determining element for many qualitative features of the plant which represents the outcome of the absorption of nutrition elements from the soil. As for the positive effect of the dual bacterial inoculation between Rhizobia, Azotobacter and Mo (T9) in increasing the percentage of dry matter is attributed to the increase of nutrition element's absorption. Due to the role of biofertilizers in the increase of available nitrogen contributes in composing carbohydrates and protein components which increases the percentage of the dry matter of the plant. The percentage of the dry matter gives an indicator for its content of nutrition elements because most of the elements are proportional to the Vegetable 's contents of dry matter. Yet, this rule does not apply for all nutrition element (Boras *et al.*, 2011).

This represents the main activities for the process of carbonic metabolism and protein metabolism. The dry matter involves glucose, starch, cellulose, amino acids, protein and other organic components (Akita, 1995). As for the positive effect for the dual bacterial inoculation between Rhizobia and Azospirillum in increasing the percentage for the total soluble solids increase (T.S.S.) is attributed to the role of biofertilizers. *Azospirillum* Spp. increases the elongation of the root by increasing the side branches of the root. It enforces the formulation of root bristles to provide a good root surface area by producing plants' hormones like Auxines (Mehdipour - Moghadam *et al.,* 2012). This enforces the growth of roots and increases its ability of water absorption and nutrition elements that keep the root a life (Abdel -Ghany *et al.*, 2013). The results agree with what was found by (Abu-Gulul, 2000) for beans' inoculation by Rhizobia. Also, they agree with what was found by Saeed (Saeed, 2015) for cucumber inoculation with *Azotobacter bacteria*.

It is concluded from this experiment that the role of the dual and triple inoculation is better than the single inoculation for the biological bacterial and nitrogen fixing fertilizers for most of the indicators of growth and plant's yield. Nitrogen mineral manure is the best for most measured indicators. Molybdenum addition for most of the experiment's treatments did not give significant due to the soil sufficient content of it before addition. So, it is recommended to do a measurement for the activity of nitrogenase enzyme during different stages of the plant's growth. This aims to know the efficiency of biological fixation of nitrogen. Some other studies tested the levels of interaction of nitrogen mineral manure with half of the recommended manure (50%) and the whole recommended manure (100%) with the bacterial inoculation. Furthermore, compounds of organic manures and biofertilizers make the best growth and beans product. Nitrogen mineral manures are used in few quantities in the beginning of the planting process as an activation dosage with biofertilizers to increase the product. Yet, the use of mineral nitrogen with large quantities has a negative effect especially during the flowering stage of the plant.

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