

# The role of single inoculation and double and triple bacterial interaction *Azospirillum brasilense* and VAM *Glomus Mossea* and phosphate rock in availability NPK In the Rhizosphere Cucumber ( *Cucumis stivease* L. )

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**ABSTRACT:** Use biofertilizer forming for quantity Bacterial *Azospirillum brasilense* and VAM *Glomus mossea* and four levels of rock phosphate ( 0 , 80 , 140 , 200 Kg . ha <sup>-1</sup> ) to study the single effect and double and triple interaction in the availability NPK In the Rhizosphere ( *Cucumis stivease* L. ) . Although the yield contains few nutrients but is considered one of the most important crops in Iraq ( 36) . It is fast growing and needs high fertilization of NPK ( 38) .

It gave a solo biofertilizer bacterial and fungal and the level of rock phosphate 140 Kg ha <sup>-1</sup> on characters NPK Measured in soil , achieving the highest significant increase in the values of treatments 50.43 , 49.52 , 50.70 mg N .kg <sup>-1</sup> and 16.02 , 15.51 , 16.26 mg P .kg <sup>-1</sup> and 191.54 , 192.26 , 192.32 mg K .kg <sup>-1</sup> On the sequence compared with Control. The results of the double interaction in bacterial with fungal , bacterial interaction with phosphate rock, and fungi interaction with phosphate rock at 140 Kg <sup>-1</sup> .ha Increase in characters NPK Measured in soil , , As it achieved the highest significant increase in treatments values 51.04 , 52.5 , 51.41 mg N .kg <sup>-1</sup> 16.28 , 16.47 , 16.81 mg P .kg <sup>-1</sup> and 192.59 , 192.24 , 193.29 mg K .kg <sup>-1</sup> On the sequence in relation to its control.

The results of the triple interaction Bacterial, fungal, and phosphate rock was given at the level of phosphate rock 140 Kg . Ha <sup>-1</sup> increase in characters NPK Measured in soil , if triple interaction achieves the highest significant increase in the values of treatments 52 . 84 mg N .kg <sup>-1</sup> and 16.92 mg P .kg <sup>-1</sup> and 193.29 mg K .kg <sup>-1</sup> On the sequence in relation to its control.

The results showed that the triple interaction ( *A. brasilense* + *Glomeas mossea* + Phosphate rock ) at level 140 Kg . Ha <sup>-1</sup> Phosphate rock gave the highest significant increase in the values of nitrogen, phosphorus and potassium in the soil of the plastic house . As the interaction between these microorganisms was positive and the impact of living one on the other was a catalyst in the increase of availability NPK .

**Key word:** *Azospirillum brasilense* , *Glomus Mossea* , phosphate rock , Cucumber , NPK.

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## I. INTRODUCTION

Headed for food, agriculture and global development organizations late in the last century to the need for the use of bio - fertilization, especially bio - system for nitrogen fixation in soil mechanics and increase the absorption of phosphorus availability to improve the nutritional status of the plant and increase production . he (38) That the biological fertilizers provide about 25 % 35 % of the plant's need for the nitrogen element as well as the bacteria *Azospirillum* Nitrogen fixation can be stabilized at a rate 48 Kg N . h a<sup>-1</sup> . year .

She showed (14) These bacteria prove nitrogen in the soil . (5) That VAM *Glomeas mossea* Extracts NH<sup>+</sup><sub>4</sub> From the soil minutes . Phosphorus released from phosphate rock increases the root mass and thus increases the surface area of the bacteria, which helps to increase the number of bacteria ( 4) .

The intraction ( *A. brasilense* + *Glomeas mossea* ) It increases nitrogen uptake in soil (31) . And either the bilateral intraction ( *A. brasilense* + Phosphate rock ) It increases the nitrogen fixation (3) . and also intraction ( *Glomeas mossea* + Phosphate rock ) it increases the nitrogen in its form NH<sup>+</sup><sub>4</sub> (11) . Studies have shown that the fungi *Glomus mossea* Compensates its value 50 % Of the plant needs for phosphorus by

increasing its availability in the soil (30). Some studies have indicated the ability of the Azo Spiralumbacteria to increase phosphorus by solubling the rocks on it (10).

That fertilization with moderate levels of phosphate rock increases the phosphorus selubling. The intraction duble( *A. braslieanse* + *Glomeas mossea*) He pointed out (16)It increases the availability phosphorus readiness. The intraction ( *A. braslieanse* + Phosphate rock ) Increases availability the phosphorus( Bashan,1989).

Theintraction duble ( *Glomeas mossea* + Phosphate rock ) resulted in increased phosphorus( 27). As for soil content of potassium studies have confirmed that bacteria *A. braslieanse* Increase the uptake and availability of potassium. And that VAM *Glomeas mossea* Increases the availability of potassium (34). Phosphate rock at moderate levels increases potassium uptake. The intraction ( *A. braslieanse* + *Glomeas mossea*) This intraction increases the availability of potassium. (2)the intraction ( *A. braslieanse* + Phosphate rock ) Increases of availability potassium. (23) intraction ( *Glomus mossea* + Phosphate rock ) Increases the potassium uptake and tells the studies published in cases of triple intraction between bacteria *A. braslianse* and VAM *Glomus mossea* Phosphate rock and its effect in stimulating the biomass that is processed NPK In soil, so this research aims to know the state of intraction between the biology and phosphate rock in the increase of availability NPK In the soil.

## II. Material and Methods

This is experiment Factorial was using the design of complete randomized Block Design ( C.R.B.D ) In the province of Qadisiyah -college of Agriculture in the soil of clay loom. Table (1) shows the physical properties and chemical, biological and soil study included the experience (48) Treatment as a result of the interaction between three factors: factor(1)bacteria *A.braslieanse* Two levels ( add and add ) and factor(2) *Glomus Mossea* (do not add and add) factor(3) rock phosphate with four levels ( 0 , 80 , 140 and 200) Kg . ha<sup>-1</sup>.The following chart it show the of the Treatment experiment.

**Table1. show the of the Treatment experiment.**

The Number	Treatment
1	PR <sub>0</sub> + Az <sub>0</sub> + G <sub>0</sub>
2	PR <sub>1</sub> + Az <sub>0</sub> + G <sub>0</sub>
3	PR <sub>0</sub> + Az <sub>1</sub> + G <sub>0</sub>
4	PR <sub>0</sub> + Az <sub>0</sub> + G <sub>1</sub>
5	PR <sub>2</sub> + Az <sub>0</sub> + G <sub>0</sub>
6	PR <sub>3</sub> + Az <sub>0</sub> + G <sub>0</sub>
7	PR <sub>0</sub> + Az <sub>1</sub> + G <sub>1</sub>
8	PR <sub>1</sub> + Az <sub>1</sub> + G <sub>0</sub>
9	PR <sub>2</sub> + Az <sub>1</sub> + G <sub>0</sub>
10	PR <sub>3</sub> + Az <sub>1</sub> + G <sub>0</sub>
11	PR <sub>3</sub> + Az <sub>0</sub> + G <sub>1</sub>
12	PR <sub>3</sub> + Az <sub>1</sub> + G <sub>1</sub>
13	PR <sub>1</sub> + Az <sub>0</sub> + G <sub>1</sub>
14	PR <sub>1</sub> + Az <sub>1</sub> + G <sub>1</sub>
15	PR <sub>2</sub> + Az <sub>0</sub> + G <sub>1</sub>
16	PR <sub>2</sub> + Az <sub>1</sub> + G <sub>1</sub>

The land was prepared, as it carried out plowing, clearing and clearing operations, and was divided into three large Block, then divided each Block into 16 Only the treatment of its dimensions 2.5 \* 1 Meters and left the isolation distance between units 0.57 M and between Block 2 Meters. Is isolated( 8) Isolated from the fields of cucumber and barley crops A local variety cultivated in various crops in Afak district - Qadisiyah Governorate was selected as the most stable nitrogen insulation and was the density of the bacterial used 1.5 \* 10<sup>8</sup> Bacteria<sup>-1</sup> A vaccine was used *Glomus mossea* It was obtained from the Department of Research at the Ministry of Science and Technology, As the number of fungi inoculation spores 3348 at 100 gm soil. After removing the sterile substance from the seed cucumber class( star) using Hgcl<sub>2</sub> and Ethyl cohool 95 % As mentioned( 30) and

then the Arabic Gum 8 % and for it 7 Minutes of adhesion of the bacteria were left in the farm of liquid bacteria *A.braslianse* Duration 15 mineat ( 4 ) . seeds were planted with bacteria first to inoculation contamination of either inoculation *Glomus mossea* It was added to mix with Ptemus in the dishes of Flint and then transferred the plants after 10 days to the soil of the plastic house by 12 An experimental unit on each side of the flat between the plant and another 40 cm and thus became the number of plants 576 Plant in the green plastic, the plant breeding on one leg, ended with the experience and the age of the plant 105 Day .After the experiment was completed, samples were taken from the Rhisosphere soil to estimate the nitrogen prepared according to its method Keeny and Nilsian (16) and imported into ( 6 ) And to estimate the phosphorus of availability soil using a Spectrophatomeater by his way (olsen and sommers) Contained in (21) and to estimate potassium according to its method Knudsen Contained in (21).

### III. Results and Discussion

The results of Table (1) :That the soil content of nitrogen at the end of the season increased significantly with the use of bacterial and fungal fertilizers and levels of phosphate rock at the single, double and triple, despite the low level of absorption by the plant to Making its vital activities and production (35). If the highest content of Nitrogen Labile in the soil 50.43 (mg N . Kg<sup>-1</sup>) compared to the lowest content of the Nitrogen Labile in the soil for its control 47.63 (Mg) N . Kg<sup>-1</sup>) become to the role of bacteria *A.brasilense* In the fixation Nitrogen in the soil and supply the plant with promoting it to grow like IAA Glycerol, cytosines and oxins that improve root growth (14) Agreed with the results( 9) .

The results of the table show that added VAM *Glomus mossea* Resulted in a significant increase , reaching the highest content of the soil of nitrogen 49.52( mg N . Kg<sup>-1</sup> ) compared with control coefficient and reason attributed to the role of VAM *Glomus mossea* In increasing the absorptive capacity of the plant through the development of the root and the extension of hyphia and extract nutrients, including nitrogen( 18), These results are consistent with the(22) .

The results are added by phosphate rock , It gave a significant increase in nitrogen content in the soil at the level of phosphate rock 140 Kg . ha<sup>-1</sup> . As the highest content of the soil of nitrogen 50.70 ( Mg N . Kg<sup>-1</sup> ) compared with the control treatment, because to the role of phosphorus released from the rock phosphate to increase root and that the roots of the Release of ammonium adsorbed on the surfaces ,These results are consistent with (20) . The results of the table role of double intrction (*A+ brasilense*) *Glomus mosseae* ) Has increased significantly in its Lablie to Neitrogen in the soil, if it reached the highest content of the soil of nitrogen - ready 51.04 ( mg N . Kg<sup>-1</sup> ) compared with his control because to the role of bacteria *A.brasilense* The feixation Neitrogen in the soil about the role of fungi *Glomus mosseae* In supplying the bacteria with the necessary materials for the growth of bacteria and to meet the need of energy necessary in the process of the installation of the nitrogen( 15) These findings are consistent with the(31) .

The results of the table showed that the duble intraction (*A.brasilense* + Phosphate rock ) gave significant difference in neitrogen content in the soil at the level of phosphate rock 180 (Kg . ha<sup>-1</sup>) . As the highest content of the soil of nitrogen 51.41( mg N . Kg soil<sup>-1</sup> ) Compared with its control factor , because to the role of the phosphorus element in the cellular metabolism of bacteria, which leads to their Berrding and thus increase the amount of nitrogen faxation in the soil, *A.brasilense* In increasing the root total of the plant ( 33). The results are consistent with ( 34). The table the intraction duble G\* RP ( *Glomus mosseae* + Rock phosphate) gave significantly increased its nitrogen content in the ready - soil at the level of rock phosphate 180 Kg . Ha<sup>-1</sup> . As the highest content of the soil of neitrogen 52.5 ( mg N . Kg soil<sup>-1</sup> ) compared with its control coefficient , because to the role of fungi *Glomus mosseae* In the extraction of nitrogen from its sources, which is not able and away from the root system, is completely absent from its main role of increasing the absorption of water and nutrients ( 27) . These results are consistent with( 34).

The Table results Refers to triple interaction A \* G ( *A.brasilense* + *Glomus mosseae* + Rock phosphate) gave significantly increased its nitrogen content in the labile soil at the level of rock phosphate 180 Kg . h a<sup>-1</sup> . As the highest content of the soil of Nitrogen 52.84 mg N . Kg soil<sup>-1</sup> Comparison with control .

**Table ( 1 ): Effect of biofertilizer and phosphate rock levels on soil content of end-of-season nitrogen ( mg N . Kg soil -1 ).**

Mycorrhiza G	A.brasilense A	Phosphate rock levels PR Kg . h a <sup>-1</sup>				Mean	
		0	80	140	200	G * A	G
Without adding	Without adding	46.35	47.02	47.75	47.91	47.26	48.54
	addition	47.91	51.47	52.25	47.68	49.82	
addition	Without adding	47.26	47.60	49.97	47.19	48.00	49.52
	addition	50.96	50.90	52.84	49.45	51.04	
LSD RP * A * G 1.34						LSD GA 1.3	LSD G 0.4
G * PR	Without adding	47.13	49.24	50.002	48.32	LSD G * PR 2.2	
	addition	49.11	49.25	51.41	47.79	Mean A	
A * PR	Without adding	46.80	47.31	48.86	47.55	47.63	
	addition	49.43	51.18	52.5	48.56	50.43	
LSD A * RP 1.33						LSD A 0.47	
PR		48.12	49.25	50.70	48.05	LSD PR 0.67	

It showed the results of the table ( 2 ) That the soil content of phosphorus at the end of the season a significant increase in all the study, but it decreased in comparison with the period of the first growth ( flowering period ) , as a result of the Exhausting of plant nutrients in the soil Abutting to the Rhizosphere before the plant . , If the inoculation a bacterial *A.brasilense* Top of phosphorus content in soil 16.02 ( mg p . Kg soil<sup>-1</sup> ) comparison With its control and is to the amount of bictiria nitrogen-fixing bacteria *A.brasilense* On the production of promontion growth, which lead to the change of the root morphologically and functionally, making it more intensive and able to extract nutrients, including phosphorus ( 17). The results are consistent with ( 1).

The results of the table show that the added VAM *Glomus mosseae* Led to a significant increase content of phosphorus in soil 15.51 ( mg P . Kg soil<sup>-1</sup> ) is compared with its control, because to the role of the fungi *Glomus mosseae* Which absorbed nutrient elements from areas far from the root and transported to it completely from the secrred of organic acids that lead to increase the phosphorus availability (23). These results are consistent with (11).

The results are added by phosphate rock RP It gave a significant increase in phosphorus content in the soil at the level of phosphate rock 140 Kg . Ha<sup>-1</sup> . As it reached the highest content of the soil of phosphorus 16.26 ( mg p . Kg soil<sup>-1</sup> ) as compared to its control . because to the role of phosphorus released from phosphate rock in the formation of a strong root that secrete some organic materials that help solbiling the phosphate rock ( 37) These findings are consistent with ( 27).

The results of the table showed that the duple interaction\* A\*RP (*A.brasilense* + Rock phosphate) gave a significant increase in its content in the soil at the level of rock phosphate 140 Kg . ha<sup>-1</sup> . As it reached the highest content of the soil of phosphorus 16.47 gm P . Kg soil<sup>-1</sup> Compared to its control , because to the role of bacteria (PGRP) Which they called bacteria *A.brasilense* is the grow prometing that working on the development of the group root wich increased labile phosphorus is the souree of phosphorus in the soil (7) These results are consistent with (12). Notes from the table that interaction G \* RP ( + *Glomus mossea* Rock phosphate) gave significantly increased its in phosphorus content

in the soil at the level of rock phosphate 140 Kg . Ha<sup>-1</sup> . As it reached the highest content of the soil of phosphorus 16.81( gm P . Kg soil<sup>-1</sup> ) Compared to the control because to the reason for the ability of fungi to melt rock phosphate compounds and increase the phosphorus labile absorbable and transported to the inside of the plant (31) . And agree with( 27). Table results refers ot that triple interaction A \* G \* RP ( *A.brasilense* + *Glomus mosseae* + Phosphate rock ) gave a significant increase in phosphorus content in the soil at the level of phosphate rock 140 Kg . ha<sup>-1</sup> . As it reached the highest content of the soil of phosphorus 16.92( mg P . Kg soil<sup>-1</sup>) compared to its control .

**Table ( 2 ) :Effect of interaction biofertilizer and phosphate rock levels on phosphorus at the end of the season ( mg P . Kg soil -1 ).**

Mycorrhizae G	A.brasilense A	Phosphate rock levels kg . h a <sup>-1</sup>				Mean	
		0	80	140	200	G * A	G
Without adding	Without adding	14.98	15.23	15.39	15.44	15.26	16.20
	addition	15.16	15.78	16.02	16.07	15.76	
addition	Without adding	15.30	16.41	15.39	16.10	16.13	15.51
	addition	15.48	16.52	16.92	16.21	16.28	
LSD RP * A * G 0.16						LSD GA 0.37	LSD 0.059 0
G * RP	Without adding	15.07	15.50	15.70	15.75	LSD G * RP 0.27	
	addition	15.39	16.46	16.81	16.15	Mean A	
A * RP	Without adding	15.14	15.77	16.05	15.77	15.69	
	addition	15.32	16.15	16.47	16.14	16.02	
LSD A * RP 0.53						LSD A 0.059	
RP		15.23	15.98	16.26	15.95	LSD RP 0.08	

Results of Table No( 3 ) : That the soil content of the availability potassium( mgK . Kg soil<sup>-1</sup> ) at the end of the season achieved a significant increase in the individual and single and duple interaction , although low soil content of potassium Labile compared to its content in the period of the first growth because of the absorption of potassium by the plant ( 37). If the highest content of potassium Labile in the soil 192.04 ( mg k . Kg soil<sup>-1</sup>) in comparison with the control treatment because to the role of bacteria *A.brasilense* In the secretion of growth-promoting substances that formation to increase the total root density and by increasing the release of potassium in the soil (13). The results are consistent with (2).

The results indicate that the added fungi *Glomus mosseae* Has led to a significant increase, if the highest content of potassium Labile in the soil 192.59 ( mg k . Kgsoil<sup>-1</sup>) in comparison with the control treatment, beacouse to the reason of to VAM *Glomus mossea* On the secretion of some organic acids such as carboxylic and amino and phenolic compounds, which improve and regulated the absorption of nutrients, just from the growth promoting produced by the fungi, which stimulates the root hairs on the release of nutrients, including potassium ( 28). These results are consistent with( 12).

The results are added by phosphate rock RP Has given significantly increased its potassium content ready in the soil at the level of rock phosphate 140 Kg . h a<sup>-1</sup> . As it reached the highest content of the soil of potassium ready 192.32 ( mg k . Kg soil<sup>-1</sup> ) by comparison With its control factor , due to the role of phosphorus released from phosphate rock over time in the construction of a large radical group H<sup>+</sup> Which contributes to the release of potassium from the minerals containing it (4). These results are consistent with (34).

The results of the table indicated that the duple interaction A \* G (*A.brasilense* + *Glomus mosseae*) Gave a significant difference in the content of potassium Lablie in the soil at the level of phosphate rock 140 Kg . Ha<sup>-1</sup> . As it reached the highest content of the soil of potassium Lablie 192.32 ( mg K . Kg soil<sup>-1</sup> ) compared with control ,because to the role of fungus (*Glomus mosseae*) In the processing of food elements, including potassium as well as bacterial secretions *A.brasilense* Which lead to the formation of a large root group contribute to the increase of the Lablie nutrients, including potassium ( 25). These results are consistent with( 1).

The results of the table indicated the duple A \* RP (*A.brasilense* + Phosphate rock ) increased significantly at the level of Phosphate rock 140 Kg . Ha<sup>-1</sup> . As it reached the highest content of the soil of potassium lablie 192.24 ( mg K . Kg soil<sup>-1</sup> ) compared to its control , because to Bacteria *A.brasilense* Which increases the uptake of elements and potassium (27) as well as the role of phosphorus released from phosphate rock in increasing the root total ( 37) These findings are consistent with (31).

Table results showed interaction G \* RP (*Glomus mosseae* + Phosphate rock ) gave a significant increase in the content of potassium labile in soil at the level of phosphate rock 140 Kg . Ha<sup>-1</sup> . As it reached the highest content of the soil of potassium labile 193.29 ( mg K . Kg of soil<sup>-1</sup> ) compared to control ,because to the reason that the fungi hyphia to the surface of the metal is replacing the potassium found there organic acids and thus work to increase the readiness of potassium ion ( 26) These findings are consistent with ( 2).

Table results confirmed that triple interaction A \* G \* RP (*A.brasilense* + *Glomus mosseae* + Phosphate rock ) gave a significant increase in the content of potassium able in soil at the level of phosphate rock 140 Kg . Ha<sup>-1</sup> . As it reached the highest content of the soil of potassium ready 193.29 ( mg K . Kg soil<sup>-1</sup> ) compared to its control.

**Table ( 3 ): Effect of interaction biofertilizer and levels of phosphate rock on soil content of labile potassium ( mg K . Kg -1 soil ). At the end of the season**

Mycorrhiza G	A.brasilense A	Phosphate rock levels kg . ha <sup>-1</sup>				Mean	
		0	80	140	200	G * A	G
Without adding	Without adding	190.82	191.29	191.33	191.28	191.16	191.32
	addition	191.69	191.62	191.38	191.28	191.49	
addition	Without adding	191.32	191.79	193.20	191.32	191.93	192.26
	addition	192.02	192.87	193.29	192.17	192.59	
LSD RP * A * G 0.74						LSD GA 0.53	LSD G 0.26
G * RP	Without adding	191.25	191.35	191.35	191.24	LSD G * RP 0.62	
	addition	191.67	192.33	193.29	191.74	Mean A	
A * RP	Without adding	191.07	191.54	191.72	191.26	192.04	
	addition	191.86	191.86	192.24	192.31	191.54	
LSD A * RP 0.88						LSD A 0.26	
RP		191.46	191.89	192.32	191.46	LSD RP 0.37	

The Interaction Triple ( A.brasileanse +G. mossea + Rock phosphate ) at the level of phosphate rock 140 Kg . ha<sup>-1</sup> gave the highest significant increase in soil content of neitrogen, phosphorus and potassium 52.84 , 16.92 and 193.29 ( mg N . Kg soil<sup>-1</sup>), ( mg P . Kg soil<sup>-1</sup>) and (mg K . Kg of soil<sup>-1</sup>), consecutive , and the interaction between these microorganisms was positive and the effect of living one on the other was a catalyst to increase NPK In the soil .

#### Reafreanse

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