



EFFECT OF INOCULATION OF BACTERIA AND FUNGI AND ADDITION OF PHOSPHATE ROCK IN SOME MICROBIOLOGICAL CHARACTERISTIC OF THE RHIZOSPHERE OF CUCUMBER (*CUCUMIS SATIVUS* L.)

J. A. Kamal and H.N. Arabi*

Department of soil science and water Resources, College of Agriculture, University of AL-Qadisiyah, Iraq.

Abstract

Use bio fertilizer inoculation *Azospirillum brasiliense* and the VAM *Glomus mossea* and four levels of rock phosphate (0, 80, 140, 200 Kg.ha⁻¹) to study the effect of single and double and triple interaction in the population of bacteria *A.brasiliense* the roots colonization % of the *Glomus mossea* the number of spores at the end of the season. It showed results that interaction Triple (*A.brasiliense* + *G. mossea* + Rock phosphate) at level 140 Kg. ha⁻¹ gave the highest values of the studied biologic characteristics. The between interaction these microorganisms was positive and the effect of living one on the other was stimulating.

Keys words: *Azospirillum brasiliense*, *Glomus Mossea*, phosphate rock.

Introduction

Biofertilizer means that each organism or group of microorganisms promotes the growth of the plant host and has a role in preserving soil fertility. It is used in combination with mineral fertilizers and is characterized by being an environmental friend (Mishra *et al.*, 2013). That's a bacteria *Azospirillum* Free Living with Plant Roots (Associational) It is one of the successful interaction in nitrogen in soil (Sahu *et al.*, 2017). Bacteria are a biological cover called a Biofilm The result of increasing the number of VAM *Glomus mossea* It is because to role in increasing the availability nutrients (Dutiu and Podile 2010). He (Peryra *et al.*, 2010) that good and effective inoculation Are good to the increase of the number of bacteria *Azospirillum*. Also hyphae VAM Functioned the entry of bacteria *Azospirillum* into the cortex Through its movement (Ishac, 2000). as such The fertilization of phosphate rock at moderate levels promoted by the increase in the number of bacteria nitrogen fixation them *Azospirillum*. The results of studies were as following to dupleinteraction

(*A.brasiliense* + *G. mossea*) Resulted in an increase in the number of bacteria *Azospirillum*(Madhaiyan *et al.*, 2010).

Has also contributed to the interaction of the double (*A. brasiliense* + Rock phosphate) in increasing the number of bacteria *Azospirillum* (Madhaiyan *et al.*, 2010) and also contributedinteraction (*G. mossea* + Rock phosphate) in increasing the number of bacteria *Azospirillum* (Abdlaziaz, 2010). The Root infection percent % have been mentioned in many studies that the plant is inoculation with bacteria *Azospirillum* Increases the inoculated of crop roots VAM *Glomus mossea* settlement (Balota *et al.*, 1995). He said (Orteas, 2010). That the symbiotic relationship easy with plant cucumber when inoculation with an effective fungi (*G. mossea*). He (Yun *et al.*, 2006). That the addition of phosphate rock at moderate levels increases the *G. mossea* of Autochthonous. But the interaction has led double (*A. brasiliense*+*G. mossea*) to increase the Root colonization % (Balota *et al.*,1995). And also led the interaction duple (*A. brasiliense* + Rock phosphate) to increase the increase the Root colonization %

*Author for correspondence: Email: hatam.nahi82@gmail.com

(Klopper, 2003) and gave the interaction has led duble (*G. mossea* + Phosphate) the Root colonization % is inversely to the quantities of phosphate fertilizer (Salman and samarra, 2008).

The number of spore increased when the bacteria were interaction *Azospirillum* and when the bacteria interaction with the fungus *G. mossea* (Samurai and Rahi, 2006) Said (Bashir, 2003) High levels of phosphate rock downplays the number of spores and studies were following to dubl interaction (*A. braslianse* + Rock phosphate) caused the increase in the number of spores (Bashan *et al.*, 1995) as well as interaction (*G. mossea* + Rock phosphate) has also increased the number of spores (Trimle and Knowles, 2003). And the lack of studies in cases Implementing interaction triple (*A. braslianse*+*G. mossea*+Phosphate rock) and its role in fungi the microbiological properties of bacteria *A. braslianse* and VAM *G. mossea* Therefore, this research aims to know the state of the interaction between the biology and phosphate rock in increasing the numbers of bacteria *A. braslianse* and the Root colonization% and number of spores.

Materials 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) Treatments as a result of the interaction between three factors: factor first bacteria *A. braslianse*. Two levels (add and add) and factor second *Glomus Mossea* (do not add and add) factor third rock phosphate with four levels (0, 80, 140 and 200) Kg.ha⁻¹. The following chart it show the of the Treatment experiment.

The soil 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 experience 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 AL- Qadisiyah Governorate was selected as the most stable nitrogen insulation and was the density of the bacterial used 1.5 × 10⁸ Bacteria⁻¹ interaction 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 Hgcl₂ and Ethyl

cohol 95% As mentioned (Vincint, 1970) 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 minuet (Bashan *et al.*, 1995) 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 ten days to the soil of the plastic house by 12 an experimental unit on each side of the flat between the plant and another 40cm 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 soil

Table 1 : Showed the physical and chemical, biological properties to soil studied.

characters		The value	unit
Soil particles	clay	365	gm.k g. soil ⁻¹
	silt	231	
	sand	404	
texture			Clay loam
Bulk density		1.39	gm.cm ⁻³
pH		7.45	-
EC _s		1.26	ds sm.m ⁻¹
CEC		260	Cmol.kg
Organic matter O.M		6.9	gm.kg. soil ⁻¹
Availability ions	Nitrogen	36.10	Mg.kg. soil ⁻¹
	phosphorus	9.34	
	potassium	188.95	
Solbation ions positive	calcium	2.21	C mol.L ⁻¹
	Magnesium	2.75	
	sodium	3.5	
Solbation ions negative	carbonates	Nil	C.mol.L ⁻¹
	Bicarbonates	2.5	
	sulfates	1.50	
Biological estimates	Total fungi	1.9*10 ⁻³	Cfug ⁻¹
	Total bacteria	1.1*10 ⁻⁶	
	<i>Azospirillum braslianeas</i>	0.3*10 ⁻⁶	
	Number of spore Mycorrhiza	53	Spor 100 soil ⁻¹ . dry

of the Rhizosphere and the roots of the plant in order to calculate the number of cells *A.braslieanse* In the MPN Contained in (Black a, 1965) And the Root colonization fungi *Glomus mossea* By way (Kormanink *et al.*, 1980) Calculated numbers of mushroom spores *Glomus mossea* in a way (Grdman and Nicolsan, 1963).

Results and discussion

It showed the results table 2 that single inoculation and interaction double and triple in the end of the season led to an increase in the population of his bacteria *A. brasilanse* ontextual on study Treatments Not with standing the low numbers of bacteria at the end of the season because to the life of plant and Few of secretions resulting from the biological active for to plant which led to the reduction of energy sources and carbon intransitive for the growth of bacteria (Alexander, 1977), As the inoculation was given bacteria *A. brasilanse* 7.91×10^6 CFU lead to the significant increase bacteria *A. brasilanse* Compared to its control, because to the role of inoculation Bacteria *A.brasilanse* Which proved to be an effective inoculation by increasing the soil and plant content of nitrogen in the study Treatments. The results of this study agree with (Barassi *et al.*, 2007). The results of the table indicate an addition to the fungus interaction *Glomus mossea* lad To increase the number of bacteria it gave *A. brasilansethe* with VAM *Glomus mossea* significant increase in the number of bacteria in treatment 4.49×10^6 CFU Comparison with control, because to the role of the fungus secretions increase in the number of bacteria autochthonies and helping them enter into the tissues of the host with the movement hyphae (Abdelaziz, 2010). The results of this study agree with (Samarrai and Tamimi, 2018). But the results of addition of rock phosphate has led to an increase in the population of bacteria at an additional level 140 Kg.Ha⁻¹, as it was given to him 7.42×10^6 CFU Increase In comparison with the control, because to the role of phosphorus released from phosphate rock over time in the formation of a root group that provides the necessary surface area with its excretions to adsorb the bacteria and then enter into the inner membrane

of the root cortex II (Ishac,2000). The results of this study agree with (Vazquez, 2000). The results of the table that interaction (*A.brasilense+Glomus mossea*) lad to increase the number of bacteria *A.brasilense* it gave treatment 7.77×10^6 CFU significant increase compared to its control, because to the role of fungi VAM In the production and of growth predicted IAA The effect in increasing the number of bacteria *A.brasilense* as well as facilitating the penetration of hyphae host roots for the entry of bacteria with it when adsorption of the latter on the surface of Haifa increases the speed of the entry of bacteria into the host tissue (Jaderlund *et al.*, 2008). The results of this study agree with (Manske *et al.*, 2000). Notes from the table that interaction (*A. rasilense+Phosphate rock*) Led to an increase in the number of bacteria at the level of added 140 Kg.ha⁻¹, as it was given to him 8.48×10^6 CFU significant Increase comparison with the control and the reason for because to the role of phosphorus released from the rock phosphate to increase root, which gives greater area adsorption bacteria and biological start its activity (Sultan, 2002). These results are consistent with (Bashir, 2003). The results of the table confirmed that interaction (*Glomus mossea+ Phosphate rock*) resulted in an increase in the number of bacteria at an added level 140 Kg.ha⁻¹, as it was given to him 8.43×10^6 CFU

Table 2: The Effect an biofertilizer and Levels of Phosphate Rock on the number of Bacteria 10⁶ CFU at the end of the season.

Mycorrhiza G	Azospirillum A	Phosphate rock levels kg. ha ⁻¹				Mean	
		0	80	140	200	G * A	G
Without adding	Without adding	5.62	5.89	6.77	3.86	5.53	5.07
	addition	4.2	7.74	7.86	3.51	5.82	
addition	Without adding	5.72	5.93	5.89	4.91	5.61	6.02
	addition	7.76	8.74	9.01	4.47	7.49	
LSD RP * A * G 0.87						LSD GA 1.38	LSD G 0.30
G * RP	Without adding	6.06	6.64	7.31	5.68	LSD G * RP 1.97	
	addition	6.44	6.82	8.40	6.99	Mean A	
A * RP	Without adding	4.99	5.22	5.72	5.6	4.90	
	addition	8.01	8.24	8.43	6.99	7.29	
LSD A * RP 1.01						LSD A 0.30	
RP		6.85	6.73	7.42	5.75	LSD RP 0.43	

significant Increase is compared with its control, because to the role of the enzymes produced by the fungus *Glomus mossea* and most importantly IAA Which promotes bacterial growth *A.brasilense* As well as the amount of water absorbed by the fungi and extend the host plant (Azguez *et al.*, 2000). These results are consistent with (Shibaniy, 2005). gave the triple interaction (*A. brasilense* + Phosphate rock) increase the number of bacteria at an added level 140 Kg.ha⁻¹, as it was given to him 9.01 10⁶ CFU significant Increase is compared with its control.

Table 3: To the effect of inoculation of bacterial and fungal levels of rock phosphate on the of the colonization % end of the season where he led inoculation solo and interaction double and triple to an Significant increase in the colonization % at the end of the season in the this study, as given interaction treated by bacteria *A. brasilense* 50.23% significant increase in colonization% is compared with its control, and the reason is that the rate of infection with Autochthonous, which increases with the age of the plant is no longer the organizations that produce bacteria (*PGPR*) promoting to growth spores (Bashir, 2003). The results are consistent with (Shaibaniy, 2005). The results suggest that the addition of the inoculation *Glomus mossea* Led to an increase in the colonization %, as it gave treatment 72.24% increase significantly compared to control, because to the success of the inoculation and its ability to Autochthonous and achieve increases significant in the characteristics of plant and colonization % During the period of flowering in this study on the cucumber crop and these results are consistent with (Samurai and Rahi, 2006).

And the results of the table indicated that the addition of rock phosphate has increased significantly in its % at the colonization e level of rock phosphate 140 Kg.ha⁻¹, as treatment was given 60.08% compared with the significant increase control treatment, because to the role of moderate phosphorus released from the rock phosphate, which led to the formation of root group with an area these results are consistent with (Valentine, 2002).

Table results indicate Until the interaction duple (*A. rasilense*

+ *Glomus mossea*) led to a significant increase in treatment 74.27 % compared to its control, because to the role of bacteria In *A.brasilense* creasing the spore germin colonization action and growth of mycelium (Azcon and Artash, 1997). These findings are consistent with (Abdalazeaze, 2007).

Notes from the table that interaction duple (*A. brasilense*+ Phosphate rock) led to an increase in the colonization % at an added level 140 Kg.ha⁻¹, as treatment was given 80.67 % a significant increase in comparison with the control, because to the role of bacteria *A. brasilense* its predicted IAA Which increases the growth of spore and the growth of hyphae fungus *Glomus mossea* Autochathon use in the soil of the plastic house and these results are consistent with (Baloto *et al.*, 1995) and agree with (Bashir, 2003) the results of interaction duple (*Glomus mossea* + Phosphate rock) has led to an increase in at an added level 140 Kg.ha⁻¹, as treatment was given 91.69 % A significant increase in comparison with the control, because is the conlozation development over time to reach its conlozation 50 % After passing (5) To reach the maximum after the 10th week (Hu-she *et al.*, 2005). These findings are consistent with (Garmendia *et al.*, 2005).

It was observed from the table results that triple interaction (*A. brasilense*+*Glomus mossea*+Phosphate rock) led to an increase in the at an add it conlozation %

Table 3: Effect of biofertilizer and Phosphate Rock on the number of at the conlozation% end of the season.

Mycorrhiza G	<i>A.brasilense</i> A	Phosphate Rock levels, Kg . ha ⁻¹				Mean	
		0	80	140	200	G * A	G
Without adding	Without adding	25.29	28.49	30.54	36.67	30.25	32.63
	addition	30.54	30.38	38.54	36.81	35.02	
addition	Without adding	75.69	80.56	89.23	35.35	70.21	72.24
	addition	79.57	86.57	89.24	94.15	74.27	
LSD RP * A * G 0.78						LSD GA 13.57	LSD G 0.27
G * PR	Without adding	27.83	39.62	39.54	36.54	LSD G * PR 3.37	
	addition	77.63	83.57	91.69	36.08	mean A	
A * PR	Without adding	50.49	50.90	51.35	36.02	57.20	
	addition	54.98	80.67	55.53	36.61	50.23	
LSD A * RP 30.18						LSD A 0.27	
PR		53.00	60.09	60.12	36.31	LSD PR 0.39	

at additional level 140Kg.ha⁻¹, as treatment was given 89.24%. A significant increase in comparison with the control.

The results of Table 4: That single inoculation and interaction double and triple led to an increase in the number of its spores at the end of the season, if add bacteria (A) *A.brasilens* 187.29 (Spore.100 gm. Soil⁻¹) significantly increased in comparison with the control treatment, because to the role *A.brasilense* In the secretion of grow promoting growth with such as (oxytin, Gebrelins and cytokines), which improve the colonization % and increase the number of spores (Manske *et al.*, 2000) These findings are consistent with (Demir, 2000).

The results indicate that the addition of fungi inoculation (G) *Glomus mossea* Led to an increase in the number of its spores as it has given treatment 254.63 (Spor.100 gm.soil⁻¹) comparison with control, This showed the competition of inoculation with the fungi *Glomus mossea* It did not prove to be a passive rivalry between free living microorganisms (Bashir, 2003) These findings are consistent with (Samarrai and Rahi, 2006).

And results (PR) Added phosphate rock, led to a significant increase in the number of at an added spores level Kg.ha⁻¹ 140 of rock phosphate, if given a treatment 234.56 (Spor.100 gm.soil⁻¹). A significant increase compared with the control treatment because to the reason that the high levels of phosphorus reduced the concentration of carbohydrates in the roots of fertilized plants, this lead to down play conolzation (Salman, 2003). These results are consistent with (Tanwar *et al.*, 2013).

The results of the table were the interaction double (*A. brasilense* +*Glomus mossea*) Led to an increase in the number of spores, as the treatment was given 232.03 (Spor.100 gm. Soil⁻¹) in comparison with the control treatment, beucose to the role of bacteria *A. brasile-nse* Which produces oxin IAA Which promotes the germination and growth of spores hyphae for intimacy between these microorganisms (Bashir, 2003) These results are consistent with (Samurai and Rahi, 2006).

The results indicated that the interaction (*A. brasilense* + Phosphate rock) Led to a significant increase in the number of spores at an added level Kg.ha⁻¹ 140 of rock phosphate, if given a treatment 256.63 (Spor.100 gm.soil⁻¹) A significant increase

compared with control, because to the role of bacteria *A.brasilense* In the production of growth promoting that help to increase the colonazation% and increased germination of spores as well as the dense root group produced due to the effect of bacteria (Trimble and Knowles, 1995). And these results are consistent with (Ishac, 2000).

The results showed intractiontriple (*Glomus mossea*+Rock phosphate) led to significant increase in the number of sporeat the level of added Kg.ha⁻¹ 140 of phosphate rock, if given treatment 368.55 (Spore.00 gm.soil⁻¹) A significant increase compared to the control because to That *Glomus mossea* Effective inoculation under moderate levels of phosphate fertilizer (Trimle and Knowles, 1995). The And gave the results of triple interaction (*A. brasilense* +*Glomus mossea*+Phosphate rock) a significant increase in the number of spores at an added level Kg.ha⁻¹140 of phosphate rock, if given treatment 396.01 (Spores 100 gm.soil⁻¹) A significant increase compared to control.

Interaction Triple (*A.braslieanse* +*G. mossea* + Rock phosphate) at the level of phosphate rock 140 Kg.ha⁻¹ gave the highest significant increase in the number of bacteria, conolozation%, number of spore (9.01×10⁻¹, 94.15%, 396.01(Spors 100 gm⁻¹ soil), And the interaction between these microorganisms was positive and the effect of living one on the other was a catalyst.

Table 4: Effect of biofertilizer and the levels of rock phosphate on the number Spores (Spore 100 gm. soil⁻¹) end of the season.

Mycorrhiza G	A. <i>brasilense</i> A	Phosphate rock levels PR Kg. ha ⁻¹ (PR)				Mean	
		0	80	140	200	G * A	G
Without adding	Without adding	72.00	76.54	83.93	67.35	74.96	86.15
	addition	89.31	97.68	117.24	85.18	97.35	
addition	Without adding	153.68	207.27	341.08	226.10	232.03	254.63
	addition	179.94	198.51	396.01	334.49	277.24	
LSD RP * A * G 30.60						LSD GA 52.03	LSD G 10.82
G * PR	Without adding	80.66	87.11	100.59	86.27	LSD G * PR 36.30	
	addition	166.81	202.89	368.55	280.29	Mean A	
A * PR	Without adding	112.84	141.91	212.51	146.72	153.49	
	addition	134.63	148.10	256.63	209.84	187.29	
LSD A * RP 122.89						LSD A 10.82	
PR		123.733	145.00	234.56	178.27	LSD PR 15.30	

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