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EFFECT OF INOCULATION WITH THE MYCORRHIZA AND THE LEVEL OF THE PHOSPHATE FERTILIZATION IN THE GROWTH AND DEVELOPMENT OF THE " OKRA " IN GYPSIFEROUS SOIL

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Abstract

This experience had been achieved in the department of the scientific research of the science of soil and water resources, Collage of Agriculture, University of Tikrit during the Agricultural season of "2018" to study the effectiveness of the vaccination with the Mycorrhiza and four levels of the Phosphate manures TSP (0, 100, 150, 200) Kg $P_2O_5.h^{-1}$ in the growth of "OKRA". The design "RCBD" has been used with three replications, the middles had been comparatively in according to supposition the scientist "Din kin" on the prospect level 5%. The resultants had shown that the vaccination with the Mycorrhiza had beenlead up to enhance the significant of the adjectives that had been studied in the compare with other non vaccinated transactions with the Mycorrhiza as if the increases in the levels of the phosphate manures had been lead up to enhance the significant in the signals of the studies. In additional of that the overlaps results had shown moral excellence in all adjective studied, whereas the vaccination transaction with the phosphate level (150) Kg had given the most highest middles in the adjectives studied and the total sum arrived to (4.148) Ton and in the ratio of the absorption nutrient elements horns of N, P, K (0.510, 4.016, 4.156)% and it does not differ morally from the operation of the vaccination in the level (200) Kg without vaccination, but with the vaccination the resolution reduced to 25% from the added phosphate manure.

Key words: Mycorrhiza, Okra, Vaccination, Phosphate.

Introduction

The new researches had used the "Bio Fertilizers" to reduce the levels of the added chemical manures and also to reduce the fees of the production and to less the environmental pollution and beginning towards cleanness agriculture, moreover it could be more cheap and secured from the environmental side (Al-Krdhany and Al-Taea 2011). From these effectual the Mycorhiza funguses is an extensive spreading in all difference agricultural environments (Badawy, 2008). And it play an important role to provision the plants with some of the nutritive elements "largest and smallest" and also it has the capacity to cover the plants from the pathogens (Smith and Read, 2008) in additional to that, the plant could be supportable to some environmental effort under some circumstances like for example dryness, salinity and some weighty elements and its efficacious for improvement the soil structure through during excretion of some of the glutinous components "Glomalin formal" and also increasing the vegetables hormone production and also it help to increase some of the enzymes practical in the plant (Mahdi and others, 2010). The element of phosphorus is from the nutritive elements and lesser movable element in the soil where its components are lesser fusible after all the phosphorus provide is lesser for the plant and almost the phosphorus remain prepared in the subsoil for a limited while because of the velocity of its union with the soil components and its transformation into lesser dissolution composites and more stability (Awwad, 1987). The results of many researches had shown that the faculty of the phosphate manures do not accelerate from 25-30% because the added phosphor to the soil will turning into composites and being not ready for absorption because of the (adsorption and precipitation) in the soil solution, so the ready quantitative of the phosphor in all the types of the soil especially the gypsum subsoil is limited and not enough to equipment the plant requirements, which requires to add high levels from that element to roll up the soil capability production

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(Salimpour and others, 2010). The gypsum subsoil is taking more than 20% from the superficial of Iraq and there are a lot of problems in these soils like less its content of the clay and organic matter and non stabilization of the food stuff in the soil solution because the growing of Calcium, Sulfate ions and also its effectuation in the growth and roots diffusion (Al-taea, 2011). Okra plant (*Abelmosechus esculentus* L.) is from Summer green crops and desirable in Iraq which its belong to the Malvaceae family and its cultivate for its horns which it's eaten after boil it and it considered a source for some nutritive elements like phosphor and calcium and carbohydrate and proteins and some vitamins, the gelatinous substance from the horns and legs and roots used to plating the leaves and filtering the sugar juice and the total quantity of Okra in Iraq under the bared circumstances is dropped with the measure of the world production (Matlob and others, 2989). To increase the production of that crop and also to plug the requirement of the increasing local consumption and because the lack of the researches that related with the "Bio Fertilization". This study had been achieved to know the influence of vaccination with the Mycorhiza and difference levels of the phosphate manures and overlap between each other in some adjective of the total and the growth of Okra in gypsum subsoil.

Materials and Method

The operation had been executed in the fields of Collage of Agriculture, University of Tikrit during the summer season in 2017 to know the impact of the vaccination with the Mycorhiza "Glomus mosseae" and four levels of the Phosphate fertilization (0, 100, 150, 200) Kg $P_2O_5.h^{-1}$ from the source of "Tri Super Phosphate" that symbolized (P1, P2, P3, P4) and two levels of the vaccination that vaccinated and non vaccinated that symbolized (M1, M2) upon succeeding. The vaccine had been taken from the public enterprise of agricultural researches, Ministry of Iraqi agriculture, that formative from (Spores + effected roots + dry soil) also the vaccine had been multiplicity previously using sandy mixture subsoil after sift it by a sifter the diameter of its slots was 2mm after the sterilization by the autoclave on temperature 121°C and pressure 1.5 $Kg.Cm^{-2}$ for about one hour and the operation had been repeated twice to make sure to dispose of the habitation bacteria and funguses. 6Kg had been put from the sterilized soil in every pot and 2 of the pots had been isolated to comparison before the vaccination and other pots had been vaccinated by putting 60g from the vaccine which is named injury units "Propagles" in each pots then 60g from the vaccine had been added as a cover and mixed it with the surface layer of the soil and moist it with water then the Onion shoot (*Oleua cepa* L.) had been planting first in non vaccinated pots to not incur to any pollution then in the vaccinated pots, the process of the plants service had been executed for three months, then cutting the verdant part of the plants and raze the surface layer and the soil had been overthrow then make sure to injure the roots after washing it by usual water to clearance from the rubbles of the soil then the distilled water in according to (Kormannik and others, 1980) and dyeing it with red dye "acid fuchin" and test it by photo microscope. As for recognition of the spores existence in the soil had done by wet sieving and decanting in according to (Gerdman and Nicolson, 1963) the vaccine percentage for the spores was (8650) spore for each 100g soil. After getting enough quantity from the vaccine, the test earth had been cultivated a rectangular plowing and equalization it and looseness it also some of the samples had taken to execute the physics and chemical and biotic analysis that explaining in table 1, then the earth had been split to three blocks and left a distance about 2m between each block and another and each block had been split to 8 experiential units in a measure 2.8×3m and a distance had left 0.75m between each experiential units and another. The phosphate fertilizer had been added on deep of 10cm and beside the cavern in a distance of 5cm during the agricultural, as for the nitrogenous and potassium fertilizer had added on the level of 200kg N and 120$kg.h^{-2}$ for each experiential units with the first three installment during the planting and the additional had been repeated in the beginning of the blossom and the beginning of the fructification. The seeds had been planting after slake it in the water for about 24 hour in cavern of the distance between it 30cm on a form lines the distance between each line and another is 70cm. The Mycorhiza vaccine had been added with quantity

Table 1: Some of the Physics and Chemical and Biotic adjective for the study soil before the planting.

Adjective	Unit	Value	Adjective	Unit	Value
Sand	g.Kg-1 Soil	550	Available N	$mg.kg^{-1}$ Soil	16.57
Silt		260	Available P		4.59
Clay		190	Available K		85.26
Soil Texture	Sandy Mixture		CEC	Centimol $.kg^{-1}$	10.72
Organic Matter	$g.kg^{-1}$ Soil	8.25	Electric Conductive	$ds.m^{-1}$	2.28
Gypsum		66.58	Total Bacteria	$Cell.g^{-1}$ Soil	4.2×10^6
Ph	-	7.42	Total Fungus		7.3×10^3

Table 2: The effectiveness of the vaccination with the micorhiza and the levels of the phosphate fertilization in the greener growth adjectives.

Biotic. / Chem.	The high of the plant (cm)			The leaves area ($ds^2.plant^{-1}$)			The leaves number ($leaves.plant^{-1}$)		
	M1	M2	Phosphor Effective	M1	M2	Phosphor Effective	M1	M2	Phosphor Effective
P1	86.24 f	102.71 C	94.47 C	145.25 e	182.27 c	163.76 D	101.59 f	124.56 c	113.07 D
P2	88.66 f	105.53 C	97.09 B	148.60 e	193.42 b	171.01 C	105.91 e	127.03 b	116.47 C
P3	95.39 e	117.99 A	105.69 A	169.15 d	200.97 a	185.06 B	113.95 d	130.32 a	112.13 B
P4	113.4 b	114.97 b	114.21 A	199.14 a	199.75 a	199.44 A	128.11 a	129.30 a	128.70 A
Mycorhiza Effective	95.39 B	110.30 A		165.53 B	194.10 A		112.39 B	127.80 A	

of (0.75) $kg.tablet^{-1}$ which is an Onion plants roots that effected with the circumference soil in the roots that container the fungus spores to the transactions that defined previously under the seeds that contain 2 seed in every cavern then added 0.25kg and mixed it with the surface layer, dripping irrigation system had been set up and one spotted had put beside each plant to lift up the soil moisture to 50% from the field capacity with watching the spotted during the irrigation and execute the periodical maintenance for the lattice. Muffle plant to one plant after 7 days from the germination and the serving operations had been execute like removing the bushes manually and irrigation, the total and growth adjectives had been studied whereas the plant high had been measured (cm) and the leaves area $ds^2.plant^{-1}$ and the leaves number in the plant and the horns number and the subtotal $Ton.Donem^{-1}$ and the horn weight and the total of the dry matter and the concentration of absorption nutrient elements in the seeds "N, P, K" % after digestion the samples in the wet digestion by concentrated Sulphonic acid and perucloric acid as the described methods in the opinion of (Page and another, 1982). The results had been analyzed statistically using the SAS program to statement best blend fertilization and the gradation on the moral of level 5% (Al-Rawey and Khalaf Allah, 2000).

Results and Discussion

In the table 2, the results had shown moral increasing in the high of the plant and the leaves area and the leaves number during the vaccination with the micorhiza and the ratio of the increasing sum arrived (30.80%, 23.38%, 17.82%) respectively. This increase might be come back to improvement the metabolic operations and encouragement sucking the nutrient elements especially the phosphor which is played an important role to improvement the plant growth and its functional performance during the vaccination and encourage absorbed the water and the nutrient from the soil. (Al-Hadithy and Al-Azawy, 2014) had getting a similar results in the wheat plant. As for the phosphate fertilizer effectives was moral by increasing the additional levels and had given the highest middles, the fertilize transaction P4 sum arrived 114.21cm and 199.44++++ and 128.70 $leaves.plant^{-1}$ and the reason is because the phosphor role and increase its operational in the soil which is gave rise to increase the absorption the plant to it and to the other nutrient and these results agreed with what Khaifa had found and others, 2018.

The interfere between the vaccination with the Mycorihza and the Phosphor levels had been lead up to lessening the high addition of the Phosphor levels and gave the Phosphate level "P3" with vaccination the highest middles and sum arrived to 117.99cm for the high of the plant and 200.97 $ds^2.plant^{-1}$ and 130.32 $leaves.plant^{-1}$ and these middles did not differ morally from the fertilize transaction "P4" without vaccination beyond the high plant adjective, also increase the Phosphor levels into "P4" had been decrease the effective of the mycorhiza to these adjectives and the reason might be back to the Mycorhiza fungi has the ability to preparation the

Table 3: The effectiveness of the mycorhiza vaccination and the Phosphate fertilization in some of "Okra" adjectives.

Biotic. / Chem.	Plant branch number ($branch.plant^{-1}$)			Horns number ($horn.plant^{-1}$)			Horn weight (g)		
	M1	M2	Phosphor Effect	M1	M2	Phosphor Effect	M1	M2	Phosphor Effect
P1	4.036 f	5.170 D	4.603 D	149.52 f	160.40 d	154.96 D	2.193 f	2.856 e	2.524 D
P2	4.223 e	6.626 B	5.424 C	152.77 e	175.43 b	164.10 C	2.773 d	3.540 c	3.156 C
P3	5.136 d	7.153 a	6.144 B	163.66 c	180.31 a	171.98 B	3.173 e	3.883 a	3.528 B
P4	7.093 a	6.610 A	7.101 A	179.15 a	179.49 a	179.32 A	3.880 a	3.882 a	3.981 A
Mycorhiza Effect	5.122 B	6.514 A		161.27 B	173.91 A		3.004 B	3.540 A	

Table 4: The effective of the vaccination with Mycorhiza and the fertilizer level in the sub total.

Biotic. / Chem.	The total of the dry matter (g.plant^{-1})			The sub total (ton.donem^{-1})		
	M1	M2	Phosphor Effective	M1	M2	Phosphor Effective
P1	138.43 e	158.45 c	148.44 D	1.949 e	2.851 D	2.400 D
P2	143.53 d	168.78 b	156.15 C	2.080 d	2.893 D	2.486 C
P3	168.40 c	176.12 a	168.26 B	3.059 c	4.148 a	3.603 B
P4	175.06 a	175.39 a	175.22 A	3.751 b	3.794 b	3.772 A
Mycorhiza Effective	154.35 B	169.68 A		2.709 B	3.421 A	

Phosphor from another non prepared source and this is a good pointer to employment these organisms to improvement the production and to lessening the environmental pollution. The results indicates in the table 3 that there's a moral differs in the branches number for each plant and horns number and the weight of each horn between the vaccinate and non vaccinate transactions and it gave the highest middles of the vaccination transactions with the micorhiza and it sum arrived 6.514 branch.plant^{-1} and 173.91 horn.plant^{-1} and 3.540g for each horn. This increasing might be consoled to the ability of the mycorhiza fungi to increase the nutrient elements preparation and to increase the plant absorption to these elements through during the diffusion of the fungi h++ in the soil for more area than the diffusion of the plant roots moreover the efficiency of improvement the soil texture during secretion a sticky composite and it has a "Glomalin" and its activities to produce the plant harmony and some enzymes and increase the middle of the photo immobilization (Mahdi and Others, 2010) and Sabea and Others, 2013, had get a similar results in the Tomato plant. As for the effectiveness of the Phosphate fertilizer, the table 3, had shown that the increasing in the levels of the fertilization had been lead to moral increase in the middles and this soil is ownerless of the prepare Phosphor and increase its levels had been lead to increase absorbed it by the plant and had been sheared that to support the important role of the Phosphor in the alimentation and the roots growth and might be increased from the absorbed Nitrogen quantity by the plant and that part had been increase the greener growth.

"Muttar" had got a similar results (2010) in Okra plant. As for the interfere, the transaction of the vaccination with mycorhiza and the Phosphate fertilization level "P3" had given the highest middles and it not differ morally from the transaction of "P4" and above all of that it had lessen the level of the Phosphate fertilizer and it given a moral increase with the measure of the compare transaction and its sum arrived to 77.22% for the adjective of the branch number and 20.59% for the adjective of the horns number for each plant and 77.01% in the horn's weight (g) and "Khalifa" had got a similar results (2017) in the plant of yellow corn. Table 4, had shown a moral excellence for the Bio fertilization transactions with the mycorhiza fungi in the total of the dry matter and the subtotal in a middles had been sum arrived to 169.68 g.plant^{-1} and 3.421 ton.donem^{-1} respectively whilst the minimum middles in non vaccinate transactions recorded 154.35 and 2.709 respectively and the reason might be back to the important role of the micorhiza to increase the capability of the productive systems for the vaccinated plants especially in the ownerless soil for the nutrient elements positively from the fruitful soils because the increasing of the roots area and the capability of the mycorhiza roots to transmit the elements from the soil solution which its estimated with three double of the non effected roots (Sabea and others, 2013). As for the effective of the Phosphate fertilizer, table 4, had shown that increasing the additional levels had been lead to a moral increase in these two adjectives and the highest middles of the fertilize transaction "P4" had been sum arrived to 175.22 g.plant^{-1} in the total of the dry matter and 3.77 ton.donem^{-1} for the subtotal and a percentile increasing (18.04%, 57.16%) respectively with the compare of the non Phosphate

Table 5: The effectiveness of the vaccination with the Mycorhiza and the Phosphate fertilizing in the ratio of the nutrient elements of N, P, K (%).

Biotic. / Chem.	Nitrogen concentrate (%)			Phosphor concentrate (%)			Potassium concentrate (%)		
	M1	M2	Phosphor Effect	M1	M2	Phosphor Effect	M1	M2	Phosphor Effect
P1	2.626 e	3.083 c	2.855 D	0.296 d	0.420 B	0.358 D	2.440 f	3.073 c	2.756 D
P2	2.910 d	3.176 c	3.043 C	0.336 cd	0.440 B	0.388 C	2.726 e	3.973 b	3.349 C
P3	3.640 b	4.016 a	3.828 B	0.360 c	0.510 A	0.435 B	3.546 d	4.156 a	3.851 B
P4	3.926 a	3.940 a	3.933 A	0.499 a	0.503 A	0.501 A	4.076 a	4.076 a	4.076 A
Mycorhiza Effect	3.275 B	3.553 A		0.372 B	0.468 A		3.197 B	3.819 A	

fertilization transaction and surpass the total and it's components had been came from increasing the horns number and the weight of each horn in the plant and it coupled with increasing the leaves area of the plant which it's lead to increase the photo immobilization results. As for the interfere between the vaccination with mycorhiza and the levels of the Phosphor was a moral effective in these adjectives and the vaccination with the Phosphate level "P3" had given the highest middles and it's sum arrived 176.12 g.plant^{-1} and 4.148 ton.donem^{-1} and it does not differ morally from the Phosphate level "P4" without vaccinate and that shows the Mycorhiza role to lessen the level of the additional Phosphor to the soil and to reduce the fees of the product and to less the Environmental pollution. These results agreed with what Khalifa had said (2017) and he found that the vaccination with Mycorhiza had lead to less the fertilize potion for the TSP to 25% of yellow corn.

In the table 5, the results had shown that there's a moral effective of the vaccination with Mycorhiza fungi which was lead to increase the concentration of N,P,K in the horns percentage increasing such as 8.48%, 25.80%, 19.45% presently with the measure of non vaccinate transaction. The reason might be back to the vaccinate role with Mycorhiza fungi to increase the preparation of the Phosphor and increase absorption also increase absorbed of the Nitrogen and Potassium in soil solution, these results is reconcile with what Algartany and Al-taee had found (2010) they were mentioned that the vaccination with Mycorhiza had been lead to increase the Nitrogen and Phosphor and Potassium concentration in yellow corn seeds. As for the effectiveness of the Phosphate fertilizer, table 5 shown that there's a moral increasing in the Nitrogen concentrate with increasing the additional levels and the reason might be back to increase the preparation of the Phosphor which it's lead to increase the absorption of the Nitrogen and increase its concentrate in the plant so that mean that there's an encouragement for absorb Nitrogen during the absorption of Phosphor. As for the Phosphor and Potassium concentration, the table shown that increase the additional levels of the Phosphor in the soil had been redound to increase its concentrates which is indicates on the quantity of the additional Phosphor to the soil and it conduct to increase the concentrate of these two elements and this soil in need to fertilizing. These results is agreed for what Abd Al-rahman had found (1992), he mentioned that the increasing of the additional Phosphor and Nitrogen levels had been induct to increase its concentrations in the Okra plant. As for the interfere, the vaccinate with mycorhiza transaction and the Phosphate level "P3" had given the highest middles and with a moral increasing from the compare transaction and it's sum arrived to 52.93% and 72.29% and 67.04% presently in the concentration of N,P,K. We concludes that the vaccination with the Mycorhiza had been lead to less the additional Phosphate level and the level was 150kg P_2O_4. h^{-1} with the vaccinate gave the best results in the studied adjectives.

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