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THE PRODUCTIVITY OF BROAD BEAN PLANT AS AFFECTED BY CHEMICAL AND/ OR NATURAL PHOSPHORUS WITH DIFFERENT BIOFERTILIZER.

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ABSTRACT

Two field experiments were carried out during the two winter successive seasons of 2002 and 2003 at the Experimental station of National Research Centre at Shalakan Kalubia Governorate to study the effect of two sources of phosphorus fertilizer, i.e. natural (Rock phosphate) and chemical (Ca super phosphate) with 4 different sources of the bio fertilizer (Microbein, phosphorein, mixture of each as 1:1 and without bio fertilizer) on broad bean plant growth, N and P uptake, yield and its pods quality. Obtained results indicated that, plants which received chemical phosphorus (Ca super phosphate) gave the vigor plant growth characters as well as increased N and P uptake, total yield and its pods characters and nutritional values of dry seeds than that plants applied by the natural phosphorus (Rock phosphate).

The inoculation of broad bean seed before sowing by the mixture of Microbein + Phosphorein at rat of 1:1 resulted a promotion in plant growth characters and enhancement the uptake of both nitrogen and phosphorus in leaves and branches tissues and increased total yield which had the best physical and nutritional values followed in descending order by that treatment of phosphorein and lastly that plants which its seeds inoculated by Microbein.

INTRODUCTION

Broad bean c. v. Koprosey is considered as one of the most important leguminous crops in Egypt to meet the increasing demand of the population for food. Recently, deficiency of P in soils is one of the major constraints for normal plant growth and crop yields. The supply of P inputs therefore, is required for sustainable crop production. In addition, the environmental pollution caused by intensive use of manufactured fertilizers.

Hence, the use of natural rock phosphate as a source of P to crops has become the subject of investigation in the recent years. Finally, ground material of this rock as a direct source of P fertilization. It can be a reasonably effective source of P supplies in acid soil condition, under neutral and alkaline soil environment the effect is almost non existent (Bolland *et al.*, 2001; Kumar *et al.*, 2001 and Akintokum *et al.*, 2003). Significant response of broad bean plant to phosphate fertilization was recorded by El-Zeiny *et al.* (1990); Hussein *et al.* (1993) ;AbdEl-Haleem (1994); Kortam (1995); Hussein *et al.* (1997) and Ahmed *et al.* (2002). However, Kumar *et al.* (2001); AboEl-Soud *et al.* (2003) and Mohammed (2004) found that mineral phosphate application increased dry weight of shoots, number of pods/plant, number of seeds/ pod, pod length and weight. Also, higher seed yield as well as NPK content of cowpea and broad bean plants as compared to those obtained by rock-phosphate. On the contrary, Kole and Hajra (1999) and Kotb *et al.* (1999) reported that no significant differences between the two sources of

phosphorus (Ca- super phosphate or rock-phosphate) on plant growth and total yield of broad bean plant.

Bio fertilization is cheaper and usually more effective for legumes supplying with nitrogen and phosphorus than chemical fertilization. This method of fertilization aims to minimize the environmental pollution of mineral fertilizers.

Microbeine has greater amounts of symbiotic and non-symbiotic bacteria, which were responsible for fixation of N by atmosphere. The application of it achieved the following merits as reported by Subbo-Ro (1988); AbdEl-Ghaffar *et al.* 1994; Fatma and Shaffek 2000 and AboEl-Soud *et al.* (2003): (a) decreasing the amount of mineral N by 25% (b) increasing the availability of various nutrients by plant (c) increasing the resistance of plant to root diseases and reducing the environment pollution produced by the application of chemical fertilizers. The effect of inoculation of broad bean seeds with such bacteria for increased growth, yield and productivity.

Soil inoculation with P-solubilizing (phosphorien) improved soil fertility and plant productivity (Dubey 2000). Furthermore, under Egyptian soil conditions, El-Awag *et al.* (1993); AboEl-Nour *et al.* (1996); El-Sheekh (1997); Abdalla (2002) and Mohammed (2004) on bean plant mentioned that utilizing of P-bio fertilizer (phosphorien) with or instead of mineral markedly increased the available P concentrations in soil and plants and hence increased plant growth and yields.

The significant effect of bio fertilizers may be due to the effect of different strain groups and nutrients mobilizing microorganisms which help in availability of metals and their forms in the composted material and increased levels of extractable minerals (El-Kramany *et al.* 2000). Also, they added that, phosphates dissolving bacteria presses the ability to bring insoluble phosphate in soluble forms secreting organic acids such as formic acetic and lactic acids. Such acids lower the pH and bring about the dissolution of bonds forms of phosphate and render then available for growing plants.

This work was conducted to study the productivity of broad bean plant c. v. Koprosey to some bio fertilizer treatments (Microbiene or phosphorien) as affected by two sources of phosphorus fertilizers (Ca- super phosphate or rock phosphate).

MATERIALS AND METHODS

Two field experiments were carried out at the Experimental Station of the National Research Centre at Shalakan (Kalubia Governorate) during the two successive seasons of 2002 and 2003 to investigate the effect of inoculation with N-fixers (Microbeine), phosphate dissolving bacteria (phosphoreine) and plus a mixture of 1:1 from them under different sources of phosphorus, i.e. chemical (Ca-super- phosphate) or natural (rock- phosphate) on growth and yield of broad bean plants c. v. Koprosey. Microbeine and phosphoreine produced by Ministry of Agriculture and were used at the rate of 750 g / 100 kg seeds with using Arabic gum solution (16%) as a sticking agent. The soil of the experimental field was clay loam in texture with EC.2.3 m mhos/cm, pH 7.80 and available N 141 meq/ L, P 4.9 meq/L and exchangeable K 0.32 meq/L.

Every experiment included 8 treatments, which were the combination between two sources of phosphor (Ca-super- phosphate 15.5 % P_2O_5 or rock- phosphate 7.5 % P_2O_5) and 4 bio fertilizer (Microbeine, phosphoreine and a mixture of 1:1 plus control treatment, i. e. without bio fertilizer. The phosphorus applications were applied at rates of 31 kg of P_2O_5/fed. Broad bean seeds c.v Koprosy were sown on 10 and 20 of October in 2002 and 2003 seasons respectively. The experimental design was split plot with 3 replications, where the sources of P application were assigned in the main plots and bio fertilizers were devoted within the subplots. The experimental plot area was 10.5 m^2 and included 5 rows (each was 3.5 m length and 60 cm width) and the distance between plants was 20 cm. The normal cultural practices i.e. irrigation, fertilization and pest control for the broad bean productions were followed.

Plant samples were taken 90 days after sowing, where five plants were chosen from each sub plot and the following data were recorded: Plant length (cm), number of shoots and leaves per plant, fresh and dry weight of leaves, shoots and whole plant as g / plant.

Yield of each sub plot was weighed and expressed as tons per feddan and for the some physical properties of broad bean pods samples of 20 pods were taken from each experimental plot and length, width, weight, number of seeds / pod and 100 seeds weight were recorded. At the same time, chemical analysis, i.e. N and P uptake (mg/ plant) in whole plant and its leaves and shoots were determined. Also N, P and K contents in dry seeds were determined according to the methods of Pregl (1945); Troug and Mayers (1939) and Brown and Lilleland (1964), respectively but the percentage of crude protein was determined according to A.O.A.C (1975). The content of Fe, Mn, Zn and Cu were determined using flam ionization atomic absorption, spectrophotometer Model 1100 B of perking Elmer and according to the method of Chapman and Pratt (1978).

The obtained data were subjected to the analysis of variance procedure and treatment means were compared to the LSD test according to Gomez and Gomez (1994).

RESULTS AND DISCUSSIONS

A- Plant growth characters:

1- Effect of phosphorus forms:

The application of phosphorus fertilizers in two forms, i.e. chemical as Ca- super phosphate and natural as rock phosphate at rate of 31kg P_2O_5/ fed. for each one influenced the criteria's of broad bean plant growth in both experiments. However, the statistical analysis of the obtained data reveals that, only dry weight of whole plant and its leaves as well as the average number of leaves/ plant recorded a significant value at 5% level. Generally, in spite of the unsignificant effect of the two phosphorus forms on the most plant growth characters but, the data in Table (1) indicated that, the plants which received the chemical phosphorus were more vigor than that plants applied by the natural one. This finding was true in the tow experimental seasons.

This superiority may be attributed to one or more of the following factors a) present calcium and sulphur in the chemical phosphorus form; b) the unknown minerals in rock phosphorus which could be inhibited plant growth and caused an inhibition in the absorption of other minerals; c) the low water solubility of rock phosphate. In the same respect, Mohammed, (2004) reported that the performance of rock phosphate on legume crops growth was significantly lower than that of super phosphate; because it could be not possibly maintain higher P concentration in soil solution due to its lower solubility. The previous investigations on the response of plant growth to phosphorus fertilization reported that, available phosphorus play a great role in plant metabolism such as photosynthesis, respiration and other metabolic processes (AbdEl-Haleem 1994; Kortam 1995; Hussein *et al.* 1997 and Ahmed *et al.* 2002).

2- Effect of bio fertilizers:

The inoculation of broad bean seed before sowing by the Microbein (M) or phosphorein (P) and or the mixture of M+P at rate of 1:1 are resulted a promotion effect in plant growth characters as shown in Table (1). Whereas, the most vigor plant growth expressed as, the heightest plants which carried the heaviest leaves and shoots were associated with inoculated seeds in the mixture of bio fertilizer (microbein + phosphorein 1:1), followed in descending order by that treatment of phosphorein and lastly, that plants which inoculated its seeds in microbein. Generally, all bio fertilizer treatments gained superiority in plant growth parameters if compared with control treatment (un treated seeds). These are true in both two seasons of 2002 and 2003.

It could be concluded that, using bio fertilizers are benefit when used as a mixture with broad bean seeds and within bio fertilizer, the application of mixture of microbein + phosphorein resulted in the plant growth characters. This superiority might be own to the role of microbein which contains the photosynthetic bacteria (fixed the atmospheric nitrogen) as well as due to the phosphorein (changed the fixed soil P to available in rooting zone). The nitrogen fixing capacity of legumes is one of natures gifts to agricultural satiability but that gift can be enhanced with a little help from man. Bio fertilizers or rhizobia bacteria which are applied as inoculants to legumes seeds before sowing are gaining an enhancement in plant growth. The using bio fertilizers are claimed to be cheap, easily used and effective. Many other workers had a similar result which supported the obtained data (El-Awag *et al.* 1993; AboEl-Nour *et al.* 1996; El-Sheekh 1997; Fatma and Shafeek 2000; Abdalla 2002 and AboEl-Soud *et al.* 2003).

3- Effect of the interaction:

Table (1) showed effect of the interaction between two forms of phosphorus and 4 treatments of bio fertilizers on the plant growth characters in the seasons of 2002 and 2003.

Table (1): Effect of different sources of phosphorus and bio fertilizers on growth characters of broad bean plant during 2002 and 2003 season.

Sources of		2002									2003								
		Plant	No. / plant		Fresh weight g / plant			Dry weight g / plant			Plant	No. / plant		Fresh weight g / plant			Dry weight g / plant		
P phosphorus	Bio fertilizers	length	leaves	shoots	leaves	shoots	Whole	leaves	shoots	Whole	length	leaves	shoots	leaves	shoots	Whole	leaves	shoots	Whole
Natural	M	97.11	50.43	2.02	355.7	375.4	731.1	103.13	145.87	249.00	76.23	54.88	2.32	326.0	373.7	699.8	91.52	120.23	211.77
	P	100.02	56.59	2.37	374.1	392.4	766.5	106.60	156.40	263.00	77.73	56.69	2.51	329.8	380.2	710.0	98.17	126.0	224.16
	M+P	117.58	58.49	2.45	387.4	401.9	789.4	108.60	159.80	268.23	80.92	58.96	2.54	335.2	387.7	722.9	102.46	130.42	232.90
	W	92.09	41.53	1.79	335.6	364.5	700.0	94.13	129.96	224.10	68.27	52.80	2.12	309.6	351.8	661.4	91.97	121.2	213.17
Mean		104.20	51.76	2.16	363.2	383.6	746.8	103.11	147.97	251.08	75.79	55.83	2.37	325.2	373.4	698.5	96.03	124.47	220.50
Chemical	M	102.30	54.08	2.21	356.7	385.4	742.0	109.83	142.33	252.17	76.00	63.15	2.55	333.4	380.7	714.1	101.86	129.05	230.90
	P	109.30	57.83	2.43	382.8	403.6	786.4	109.23	152.20	261.43	80.12	66.35	2.62	337.8	389	726.8	105.20	130.17	235.36
	M+P	118.83	61.12	2.53	394.5	410.0	804.5	114.80	165.63	280.42	86.72	67.78	2.71	340.5	392	732.5	106.32	130.36	236.70
	W	95.95	48.50	1.89	336.9	375.0	711.9	109.17	137.07	246.24	74.26	59.07	2.15	316.2	362.1	678.3	95.73	121.52	217.27
Mean		106.60	55.38	2.27	367.7	393.5	761.2	110.76	149.31	260.07	79.28	64.09	2.51	331.9	380.9	712.9	102.28	127.78	231.06
Average	M	99.71	52.26	2.11	356.2	380.4	736.6	106.48	144.10	250.58	76.12	59.01	2.44	329.7	377.2	706.9	96.70	124.63	221.33
	P	109.66	57.21	2.40	378.5	397.9	776.5	107.92	154.30	262.22	78.93	61.52	2.57	333.8	384.6	718.4	101.68	128.08	229.76
	M+P	118.21	59.81	2.49	390.9	406.0	796.9	111.70	162.62	274.32	83.82	63.37	2.62	337.9	389.9	727.7	104.40	130.40	234.80
	W	94.02	45.02	1.84	336.2	369.7	705.9	101.65	133.51	235.16	71.27	55.94	2.14	312.9	356.9	669.8	93.85	121.37	215.22
LSD at 5% levels	Source	N.S	0.98	N.S	N.S	N.S	N.S	7.41	N.S	8.77	N.S	3.46	N.S	N.S	N.S	N.S	2.71	N.S	10.31
	Bio	4.28	3.43	0.12	11.1	12.4	12.9	5.84	9.16	9.04	3.79	2.04	0.11	3.7	6.54	7.5	5.28	4.31	7.26
	S*B	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S

Where: M = 750g/100 kg seeds microbein, P = 750g /100kg seeds phosphorein and W = without bio fertilizer

The statistical analysis of the resulted data showed that there were no great variations with different interaction treatments to be significant at 5% level. These results were true for, length of plant, average leaves and shoots numbers and fresh or dry weight in both two experiments. Generally in spite, the non significant response, but the present data of Table (1) reveals that, the plants which received Ca super phosphate and its seeds treated by the mixture of phosphorein + microbein were the best for highest plant vigor. It could be constructed that, the no significant effect of the two factors of interaction treatments on plant growth properties, it means that each factor of the interaction act independtly.

B- Nitrogen and phosphorus uptakes:

1- Effect of phosphorus forms:

The presented data in Table (2) shows the uptake N and P by broad bean plant as affected by the chemical and or natural phosphorus in the two seasons of 2002 and 2003. Whereas, using Ca super phosphate as phosphorus fertilizer caused an enhancement in the uptake of both nitrogen and phosphorus in leaves and branches tissues compared to that plants which supplied rock phosphorus. The differences within the two forms of phosphorus were great enough to reach the 5% level. These results were similar in both experiments of 2002 and 2003. It could be concluded that, the higher nitrogen and phosphorus uptakes which recorded with using chemical phosphorus might be own to the more solubility and availability of Ca super phosphate compared to the natural phosphate, hence root system can absorb more nutrient usability, consequently increasing their content in plant tissues. The previous obtained data are in good accordance with that written in this script (Masthan, *et al.* 1998; Sharma and Nambeo, 1999 and Dubey, 2000).

2- Effect of bio fertilizers:

Table (2) presented the data of N and P uptakes as affected by the inoculation by different bio fertilizers in seasons of 2002 and 2003. Whereas, the mixture of microbein + phosphorein caused an increase in N and P uptakes in tissues of shoots and leaves of broad bean plants. On the contrary, within the 3 bio fertilizers which applied, using microbein as individual gained the lowest uptake values. Generally, the applying bio fertilizer with broad bean seeds before sowing resulted in higher N and P uptakes if compared with the un bio fertilize treatment (control). The statistical analysis of the obtained data reveals that, the differences within different treatments were significant at 5% level. These findings are true in 2002 and 2003 seasons. The superiority of plants which treated with bio fertilizer may be attributed to its roles in N fixation bacteria or increasing the beneficial microorganism in soil as wheel, or its roles in increasing the solubility and availability of minerals for plant absorption. The results of other investigator are good supported that obtained here (AbdEl-Gaffar *et al.* 1994; AboEl-Nour *et al.* 1996; El-Sheekh, 1997; El-Kramany *et al.* 2000 ; Abdalla (2002) and AboEl-Soud *et al.* 2003).

Table (2): Effect of different sources of phosphorus and bio fertilizers on N and P uptake of broad bean plant during 2002 and 2003 seasons.

Sources of		2002						2003					
		N- uptake (mg / plant)			P – uptake (mg / plant)			N- uptake (mg / plant)			P – uptake (mg / plant)		
P phosphorus	Bio fertilizers	Leaves	Shoots	Whole	Leaves	Shoots	Whole	Leaves	Shoots	Whole	Leaves	Shoots	Whole
Natural	M	340.29	142.84	483.13	52.20	23.25	75.45	309.72	136.40	446.13	41.40	19.23	60.62
	P	357.68	157.50	515.18	60.48	26.91	87.40	338.53	141.13	479.66	49.52	20.13	69.67
	M+P	369.84	164.92	534.76	65.44	27.22	92.66	334.83	142.77	477.60	55.13	20.57	75.70
	W	323.54	131.79	455.33	47.85	18.86	66.71	303.30	120.66	423.96	32.10	13.16	45.26
Mean		**347.84**	**149.26**	**497.10**	**56.49**	**24.06**	**80.55**	**321.60**	**135.24**	**456.84**	**44.54**	**18.28**	**62.82**
Chemical	M	358.59	166.59	525.18	63.58	23.88	87.46	344.00	158.20	502.20	52.87	20.53	73.40
	P	385.12	175.77	560.89	73.88	28.29	102.17	354.30	164.07	518.37	62.46	21.52	84.0
	M+P	398.22	179.52	577.75	79.54	28.77	108.31	364.60	167.30	531.90	66.17	22.03	88.20
	W	328.49	153.18	481.67	48.54	20.97	69.51	323.20	147.56	470.77	35.93	15.90	51.83
Mean		**367.61**	**168.77**	**536.37**	**66.39**	**25.48**	**91.86**	**346.53**	**159.28**	**505.81**	**54.36**	**20.00**	**74.36**
Average	M	349.44	154.71	504.16	57.89	23.57	81.46	326.87	147.30	474.17	47.13	19.88	67.02
	P	371.40	166.64	538.04	67.18	27.60	94.78	346.42	152.60	499.02	56.00	20.83	76.83
	M+P	384.03	172.22	556.25	72.49	28.00	100.49	349.72	155.03	504.75	60.65	21.30	81.95
	W	326.01	142.49	468.50	48.19	19.92	68.11	313.25	134.11	447.36	34.02	14.53	48.55
LSD at 5% level	P source	**12.30**	**5.62**	**17.49**	**2.34**	**0.34**	**2.58**	**18.77**	**19.34**	**34.28**	**3.03**	**1.32**	**2.97**
	Bio	**13.84**	**12.02**	**20.50**	**5.64**	**1.60**	**6.33**	**8.68**	**8.46**	**12.17**	**3.37**	**1.79**	**3.89**
	S*B	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S

Where: M = 750g/100 kg seeds microbein, P = 750g/100 kg seeds phosphorein and W = without bio fertilizer

3- Effect of the interaction:

The interaction treatment of different sources of phosphorus and bio fertilizer had no significant effect on the uptake of N and P in tissues of leaves and / or shoots in both two experiments. These results mean that, each factor of the interaction treatments act independently.

C- Total pods yield and its some physical properties:

1- Effect of phosphorus forms:

The data presented in Table (3) shows clearly that, the heaviest pods yield as tons/ fed. (1.012 and 0.958 in 1st and 2nd seasons respectively) were weighted with that bean plants which received phosphorus fertilizer in the chemical form. Whereas, that superiority amounted by 4.9 and 2.5 % respectively for 2002 and 2003 seasons. The response of average weight of 100 dry seed, number of pods/ plant and or seeds/ pod as well as the average length, width and or weight of pod (g/ pod), all of these parameters followed the same pattern of change like that previous mentioned in both two experimental season. Moreover, the statistical analysis of the resulted data reveals that, the differences within the two forms of phosphorus were great enough to be significant at 5% level. These were true for average pod weight (g/ pod), number / plant, weight of 100 dry seeds (g) and total pods yield (tons/ fed.) in both two seasons.

It could be concluded that, the Ca super phosphate (15.5 % P_2O_5) as a chemical phosphorus form has the heaviest and best pods yield. This might be attributed to the better plant growth and the higher N and P uptake of the chemical phosphorus compared to the natural (rock phosphorus) form and the limited solubility of rock phosphate. The data which illustrated by other investigators were in the same trend and supported that obtained in this script (Bolland *et al.* 2001; Kumar *et al.*, 2001; Akintokum *et al.*, 2003 and Mohammed, 2004).

2- Effect of bio fertilizers:

The mixture of microbein with phosphorein (1:1) are resulted the heaviest pods yield of broad bean as shown in Table (3). However, the average tonnage per fed. amounted by 1.060 and 0.984 in 1st and 2nd seasons respectively, followed in descending order by that plants applied phosphorein then that received microbein as individual for each. Generally, the bio fertilizers where applied gained an enhancement in total pods yield as compared by the un bio fertilizer treatment. These findings were similar in both seasons of 2002 and 2003. The obtained results are expected owing to the vigor plants of broad bean plants which supplied the mixture of microbein + phosphorein as shown in Table (1) , Consequently, the superiority in plant growth parameters are reflected on the pods yield of plant. The some physical properties of broad bean pods, i. e. length, width, weight (g) of pod, average numbers/ plant and or average number of seeds/ pod as well as average weight of 100 seeds, all of these measurements responded by the bio fertilizer completely similar that which mentioned above for total pods yield as ton/ fed. These results were true in both experiments of 2002 and 2003.

Table (3) : Effect of different sources of phosphorus and bio fertilizers on yield characters of broad bean plant during 2002 and 2003 season.

Sources of		2002							2003						
		Pod characters			Number of		Weight of 100 seeds (g)	Total yield (ton/fed)	Pod characters			Number of		Weight of 100 seeds (g)	Total yield (ton/fed)
P phosphorus	Bio fertilizers	Length (cm)	Width (cm)	Weight (g)	Pods / plant	Seeds / pod			Length (cm)	Width (cm	Weight (g)	Pods / plant	Seeds / pod		
Natural	M	13.00	1.370	14.27	20.57	4.20	110.50	0.791	11.80	1.267	14.93	19.23	4.12	109.67	0.841
	P	13.60	1.370	14.70	21.63	4.22	110.90	0.875	12.56	1.286	15.07	20.32	4.12	111.66	0.865
	M+P	13.47	1.373	15.43	22.30	4.22	113.13	0.861	12.73	1.283	15.32	20.63	4.14	112.32	0.896
	W	12.70	1.330	14.20	18.70	3.77	108.47	0.791	11.80	1.280	13.36	17.37	4.11	104.17	0.802
Mean		**13.19**	**1.362**	**14.65**	**20.80**	**4.10**	**110.75**	**0.830**	**12.23**	**1.280**	**14.68**	**19.50**	**4.12**	**109.45**	**0.850**
Chemical	M	12.90	1.357	16.70	22.43	4.26	114.77	0.965	12.67	1.260	15.60	20.36	4.12	110.70	0.885
	P	13.70	1.367	17.40	24.97	4.31	116.93	1.012	12.77	1.286	15.90	21.03	4.13	113.77	0.958
	M+P	13.97	1.360	18.13	25.53	4.34	118.00	1.060	13.10	1.273	16.37	22.50	4.13	114.60	0.984
	W	12.77	1.343	16.47	21.00	4.21	112.84	0.914	12.20	1.267	15.00	18.61	4.10	109.11	0.891
Mean		**13.33**	**1.357**	**17.18**	**23.48**	**4.28**	**115.63**	**0.988**	**12.68**	**1.272**	**15.72**	**20.63**	**4.12**	**112.04**	**0.930**
Average	M	12.95	1.365	15.48	21.50	4.23	112.62	0.878	12.23	1.263	15.27	19.80	4.12	110.18	0.863
	P	13.65	1.368	16.05	23.30	4.27	113.92	0.944	12.67	1.287	15.48	20.68	4.13	112.72	0.911
	M+P	13.72	1.367	16.78	23.92	4.28	115.57	0.960	12.92	1.278	15.85	21.57	4.14	113.47	0.939
	W	12.73	1.337	15.33	19.85	3.99	110.65	0.853	12.00	1.275	14.18	18.22	4.11	106.63	0.847
LSD at 5% level	Source	N.S	N.S	1.15	2.58	N.S	2.67	0.006	N.S	N.S	0.23	0.71	N.S	0.94	0.056
	Bio	0.38	N.S	0.72	2.46	N.S	3.38	0.051	0.39	N.S	0.38	0.62	N.S	2.75	0.025
	S*B	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S

Where: M = 750g/100 kg seeds microbein, P = 750g/100 kg seeds phosphorein and W = without bio fertilizer

It could be concluded that, using bio fertilizer with broad bean plant gained a superiority in total pods yield and improved the physical yield quantity. Many workers obtained results supported that reported here (Rodriguez and Herrera, 2002; Viveganandan and Jauhri, 2002; AboEl-Soud *et al.* 2003 and Mohammed, 2004).

3- Effect of the interaction:

Interaction treatments between the two forms of phosphorus (chemical and or natural) with the 4 bio fertilizers treatments (phosphorein, microbein, mixture of phosphorein with microbein, plus the control one) had no significant effect on the total pods yield of broad bean and its some physical properties as shown in Table (3). These findings are true in the two experimental seasons.

C- Nutrition value:

1- Effect of phosphorus forms:

The application of phosphorus fertilizer in the chemical form caused an increase in values of N, P and Fe in tissues of dry broad bean seeds in both seasons and values of protein and K only in 1st season and the differences within the treatments were little enough to reach 5% level of significant. However, the response of Mn, Zn and Cu were not significant in two seasons (Table 4). It could be abstracted that, the phosphorus forms (chemical and or natural) caused no great effect on the nutritional values of broad bean seeds. The results of Kole and Hajra (1999); Kotb *et al.* (1999); Dubey, (2000) and Akintokum et al. (2003) are in good accordance of the obtained data.

2- Effect of bio fertilizers:

The inoculation of bio fertilizers such as phosphorein, microbein and or a mixture of them caused an improvement in the nutritional values of dry broad bean seeds as shown in Table (4). Whereas, the mixture of phosphorein + microbein gained the best nutritional values, i. e. the highest content of N, protein, P, K, Fe, Mn, Zn and Cu during the experimental seasons of 2002 and 2003. However, the response of N, protein, P, K and Fe to the inoculation bio fertilizers treatment recorded a significant value at 5% level in both 2002 and 2003 seasons. On the contrary, the content of Mn, Zn and Cu varied no significantly. It could be concluded that, the minerals and protein content of dry seeds of broad bean slowly influenced by the treatments of bio fertilizer. These findings are in good accordance of that reported before by other investigators (Hussein *et al.* 1993 and 1997; Kumar *et al.* 2001; Ahmed *et al.* 2002; AboEl-Soud *et al.* 2003 and Mohammed, 2004).

3- Effect of the interaction:

Treatments of the interaction between phosphorus forms with different inoculation bio fertilizer had no great effect on the nutritional values, i.e. the content of protein, N, P, K, Fe, Mn, Zn and Cu in dry seeds of broad bean. These data are similar in 2002 and 2003 seasons. These findings means that, each factor the interaction act independently.

Table (4) : Effect of different sources of phosphorus and bio fertilizers on chemical content of dry seeds of broad bean plant during 2002 and 2003 season.

Sources of		2002								2003							
		%				(mg / g dry weight)				%				(mg / g dry weight)			
P phosphate	Bio fertilizers	N	protein	P	K	Fe	Mn	Zn	Cu	N	protein	P	K	Fe	Mn	Zn	Cu
Natural	M	4.447	27.793	0.653	2.380	7.553	0.231	0.219	0.211	4.363	27.271	0.550	2.286	6.667	0.221	0.209	0.201
	P	4.660	29.122	0.751	2.437	7.857	0.232	0.216	0.214	4.540	28.375	0.653	2.397	6.932	0.222	0.206	0.204
	M+P	4.743	29.647	0.790	2.432	7.956	0.235	0.218	0.215	4.612	28.832	0.680	2.426	6.953	0.224	0.208	0.205
	W	4.300	26.852	0.553	2.307	7.153	0.232	0.218	0.211	4.183	26.146	0.420	2.257	5.950	0.228	0.208	0.204
Mean		**4.537**	**28.354**	**0.687**	**2.389**	**7.630**	**0.232**	**0.218**	**0.213**	**4.425**	**27.656**	**0.576**	**2.341**	**6.625**	**0.224**	**0.208**	**0.204**
Chemical	M	4.583	28.646	0.712	2.447	7.782	0.237	0.209	0.214	4.477	27.979	0.660	2.410	7.053	0.227	0.204	0.204
	P	4.690	29.313	0.813	2.490	8.570	0.240	0.213	0.216	4.552	28.458	0.691	2.487	7.820	0.230	0.207	0.206
	M+P	4.851	30.310	0.850	2.507	8.777	0.233	0.216	0.213	4.653	29.083	0.726	2.513	7.966	0.223	0.210	0.203
	W	4.457	27.852	0.603	2.441	8.383	0.227	0.221	0.214	4.360	27.250	0.507	2.396	6.983	0.217	0.211	0.203
Mean		**4.645**	**29.030**	**0.745**	**2.471**	**8.378**	**0.234**	**0.215**	**0.214**	**4.511**	**28.193**	**0.646**	**2.452**	**7.456**	**0.224**	**0.207**	**0.204**
Average	M	4.515	28.220	0.683	2.413	7.668	0.234	0.214	0.213	4.420	27.625	0.605	2.348	6.860	0.224	0.206	0.203
	P	4.675	29.218	0.782	2.452	8.213	0.236	0.215	0.215	4.547	28.417	0.672	2.442	7.377	0.226	0.207	0.205
	M+P	4.797	29.972	0.820	2.470	8.367	0.234	0.217	0.214	4.632	28.958	0.705	2.470	7.460	0.224	0.209	0.204
	W	4.377	27.353	0.578	2.372	7.768	0.230	0.219	0.212	4.272	26.698	0.463	2.327	6.467	0.223	0.209	0.204
LSD at 5% level	Sources	0.103	0.646	0.016	0.080	0.426	N.S	N.S	N.S	0.077	N.S	0.060	N.S	0.783	N.S	N.S	N.S
	Bio	0.131	0.821	0.073	0.057	0.550	N.S	N.S	N.S	0.073	0.461	0.070	0.057	0.436	N.S	N.S	N.S
	S*B	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S

Where: M = 750g/100 kg seeds microbein, P = 750g/100 kg seeds phosphorein and W = without bio fertilizer

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تحسين أنتاجية نبات الفول الرومى بأستخدام السماد الفوسفاتى الطبيعى أو الكيماوى مع أستعمال مصادرمختلفة من السماد الحيوى .

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قسم بحوث الخضر – المركز القومى للبحوث – الدقى – القاهرة

تم أجراء تجربتان حقليتان خلال الموسم الشتوى لعامى ٢٠٠٢ و ٢٠٠٣ فى مزرعة المركز القومى للبحوث بشلقان وذلك لدراسة تأثير مصادر السماد الفوسفا تى الكيماوى (سوبر الفوسفات) او السماد الطبيعى (صخر الفوسفات) تحت تاثير التسميد الحيوى بكل من البكتريا المثبتة للنتروجين (الميكروبين) و البكتريا المثبتة للفوسفور (الفوسفورين) أو خلط الاثنين بنسبة ١:١ وتأثير ذلك على نمو و أنتاجية نبات الفول الرومى صنف قبرصى.وكانت اهم النتائج:

- أدى أستخدام السماد الكيماوى (سماد سوبر فوسفات الكالسيوم) بمعدل ٣١ كيلو جرام فوءاه للفدان الى زيادة نمو نباتات الفول الرومى وزيادة الانتاجية للفدان (طن/ فدان) وتحسين بعض الصفات الطبيعية و الكيماوية للمحصول الناتج بالمقارنة بأستخدام نفس المعدل من السماد الطبيعى (صخر الفوسفات).
- خلط بذور الفول الرومى قبل الزراعة بمخلوط من البكتريا المثبتة للنتروجين (الميكروبين) مع البكتريا المثبتة للفوسفور (الفوسفورين) أدى الى زيادة أمتصاص نباتات الفول الرومى لعنصرى النتروجين و الفوسفور مما حسن من نمو النباتات و زيادة المحصول للبذور بنسبة ١٠% تقريبا مع تحسن الصفات الطبيعية و الكيماوية للمحصول الناتج وذلك بالمقارنة مع عدم اضافة السماد الحيوى.
- لم يكن للتفاعل بين مصدر السماد الفوسفورى (طبيعى او كيماوى) و مصادر التسميد الحيوى تأثير معنوى على اى من الصفات تحت الدراسة.