

4. RESULTS AND DISCUSSION

4-1- Plant growth:

4-1-1-Plant length:

Results of plant length (Bean and Pea) are presented in Table (1). The obtained results indicated that there were significant differences between cultivars in both season. S1 and Nebraska cvs. were tallest than Diacol cv.

Regarding to pea cvs. Little Marvel cv. and Wever Top cv. were the tallest significantly in both seasons. In this respect, Srivastava and Singh(1990) found great differences among three pea cultivars (cvs.). Also, EL-Asdoudi and Ouf (1994) and Mohamed and EL- Kabbany (1999) mentioned that the studied cvs. differed significantly in plant length

Concerning the influence of biofertilizers treatments data indicated that test treatments did not significantly affect on the plant length in the first season. In addition, Phosphorine, Nitrobien and the half recommended of N, P, K treatments increased significantly plant length in the second season.

Similar results were obtained by Barsoum and Abdel-Gawad (1990) on soybean and Moussa and Barsoum (1993) on faba bean they found that Rhizobium inoculation significantly increased plant length. On other side, El-Gizy et al. (1999) on snapbean observed that the plant length significantly increased

Table (1): Effect of different biofertilizers treatments on plant length (in cm/plant) of bean and pea plants in two growing seasons: 1999, 2000 and 2000, 2001 seasons.

			Σ	68.17 62.03 79.17 69.79		72.84		64.89		71.48		71.98	-	
		2001	W.T	79.17		76.67 60.17 81.67 72.84		76.50 57.50 60.67		76.17		73.67		14.02
		7	Lin	62.03		60.17		57.50		75.27 63.00		69.00		77 63
Pea			L.M			76.67		76.50		75.27		73.27		74.00
Α.			Z	49.64		50.44		53.72		46.64		50.48		
	1	2000	W.T	51.20		42.73		50.87		45.73		46.63		47.43
		7	Ľį	34.80		35.80		43.80		39.10		40.00		
			ΓX	46.50 38.57 40.50 41.86 62.93 34.80 51.20 49.64		72.67 35.80 42.73 50.44		66.50 43.80 50.87 53.72		65.50 39.10 45.73		64.80 40.00 46.63 50.48		66.38 38.73
			Σ	41.86				43.57		40.27 41.35		41.03	1	
1	2000		Sel	40.50		41.30		46.53		40.27		40.56 41.03		41.83
	20	Ë	5	38.57		36.63		40.10		28.97		35.93		45.75 36.04 41.83
Bean		Ü	5	46.50		36.76		44.07 40.10 46.53		54.80		46.60		45.75
ă		Σ		33.92		32.45								
	1999	Neb		39.67		36.13		38.20 34.62		44.03		37.27	30.02	33.00
	19	Di		34.23 27.87 39.67 33.92		36.20 25.03 36.13 32.45 36.76 36.63 41.30 38.23		36.80 28.87		34.83 29.57 44.03 36.14		34.77 28.93 37.27 33.66	3537 7805 3000	£0.05
		SI	i	34.23		36.20		36.80		34.83		34.77	35.37	, 0.0
Treatments	CHICATION		Phoenhorine	(Ph)	Rhizobacterien	(Rh)	Nitrohian	(Nitro)	Halfdose	(Half)	Full dose	(Control)	Mean	11111111

6.65 N.S 16.42
1.28 1.15 2.00
2.08 2.54 4.79 Interaction (inter.,)
Treatments (treat.,)
5.83 N.S 7.79 (cv.)
L.S.D cv.,: 5. L.S.D Treat.,: N. L.S.D inter.,: 7. Cultivars (cv.)

by inoculation with Azospirillium + 50% or 75% nitrogen fertilizer.

Also, results in Table (1) show that there was significant interaction between bean plant and biofertilizers treatments, the best result was Nebraska cv. with Nitrobien which their plant length significantly increased in the two growing seasons. On the other hand, the highest pea significant increase was obtained when Wever Top cv. seeds inoculated by Phosphorine and Rhizobacterien treatments in the second season.

These results agree with the results of Rao et al. (1985) on chick pea, Bopaiah and Khader (1989) on pepper plants, Shahaby and Agwah (1993) on spinach plants, Gad El-Hak et al. (1993-a) and Patel et al. (1998) on pea. They reported that seed inoculation with any kind of biofertilizers increased plant length.

Respecting the improving effect of biofertilizers on the growth of inoculated plants different proposals were discussed. These include stimulated root growth, resulting in changes in root morphology (Gamo and Ahn, 1991), enhanced uptake of minerals as reported by (Turner and Backman,1991 and Ashour, 1997) or due to its possible involvement in phytohormone production (Brown, 1974; Nieto and Frankeaberger, 1990 and Noel et al., 1996) or improved utilization of soil water (Ruiz-Lozano et al., 1995). Moreover,

Pandy and Kumar (1989) related its promotive effects on growth with or without N.P.K application, not only to their N-fixing proficiency but also to their ability to produce antibacterial, antifungal compounds and growth regulators.

4-1-2-Number of branches per plant:

Data in Table (2) presented that the number of branches per plant of bean plants which showed insignificant effect between cultivars in both seasons. On the other hand, pea showed a significant increase of number of branches in Lincoln and Wever Top cvs. in the two growing seasons. These results are in harmony with those obtained by Srivastava and Singh (1990), Mohamed and Qandil (1998), Chandra and Polisetty (1998), and Mohamed and EL-Kabbany (1999) on pea that there were significant differences between pea cvs.

Data indicated the effect of biofertilizers treatments on number of branches/plant on bean showed no- significant differences in the two seasons, but on pea plants there were significant increase on number of branches /plant in first season only. These results are in harmony with those obtained by *Hassan (1981)*, *Dadson and Aquaah (1984)* on soybean they reported that the inoculation with *Rhizobium* had no significant effect on number of branches per plants. On the other hand, *Moussa and Barsoum (1993)* on faba bean, *Feng Yang et al.*

Table (2): Effect of different biofertilizers treatments on number of branches of bean and pea its in two growing seasons: 1999, 2000 and 2000, 2001 seasons.

L.S.D cv.,: L.S.D Treat.,: L.S.D inter.,: Cultivars	Mean	(Control)	Full dose	Half dose (Half)		(Nitro)	Nitrobien	(Rh)	Rhizobacterien	(Ph)	Phosphorine		Treatments		<u></u>	<u> </u>
(cv.)	2.84		2.80	2.70		2,90	3	2.80	2		3	Sl		ŀ	A CALLE	onto i
N N N	3.19		3.10	3.10	, ;	2.90 3.20 2.70	ာ ၁	1.10	10	0,40	بر <u>م</u>	D.	19		11.11	3 1 W C
Treat	3.10		2.80 3.10 3.00	2.70 3.10 3.30	د د	2.70	3 70	2.80 3.10 3.30	د د د	•	3 43 3 20	Neb	1999		5.	OTOV
nents			2.97	0.00	د 2		၁ ၀၁	١	3 N7	1	3.21	3		Bean	ָ ס	ving s
Treatments (treat.,)	2.62		2.77	1.,70	ა 8		2 77		2.10 2.00 2.57		2.57 2.20 2.43 2.40	2	?	1		eason
N.S. N.S. N.S.	2.48		2.63 2.33 2.58		200 257 277		3.00		2.00		2.20	2		3		15: 17:
	7.47	,	2.33				3.00 2.23		2.57		2.43	Neo	1 5	3		77, 40
0. 0 0 Interaction (inter.,)			2.58		2.75		2.67		2.22			3	\$		Jian in the Brownia	00 411
n (inte	1.0	- 	2.07		2.00		1.43		1.67		1.90		- 			
0.13 0.12 0.20 9r.,)	١	100	3.30		2,00 3.57 2.67		3.20		3.10		3.33			2000		
		218	1.87		2.67		3.20 2.00		1.80		2.57		×	3		
			2.75		2.41		2.21		2.19		2.60	\perp	×		Pea	
		1.27	1.33		1.17		1.33		1.50		1.00		ΣĽ		ŭ	
0.34 N.S N.S	1	2.00	2.50		1.33		1.67		2.17		1.00 2.17		Lin	2001		
		1.30	1.33		1.33		1.00		1.33		1.50 1.56		W.T	01		
			1.28		1.72		1,33	;	1.67		1.56		×			

M: mean

(1997) on pea, Abou EL-Salehein and Ahmed (1998) on bean and EL-Mansi et al. (2000) found that inoculation with Rhizobium or V.A. mycorrhiza significantly increased number of branches per plant.

In addition the interaction between the tested cultivars and the biofertilizers treatments on bean plants showed an significant interaction during the two growing seasons. However, pea cvs. in the first season showed significant increase on number of branches /plant in most cases but in the second season it was insignificant these results agreed with the results of Hassan (1981), Dadson and Acquaah (1984), and Salwau (1989) that inoculation with Rhizobium increased number of branches per plant of soybean than the uninoculated plants without any significant differences. On another side, Hammam (1986), Barsoum and Abdel- Gawad (1990) on soybean, Moussa and Barsoum (1993), on fababean Abou EL- Salehein and Ahmed (1998) on bean and EL-Mansi et al. (2000) indicated that number of branches per plant significantly increased with inoculation over than uninoculated plants.

These results may be due to that biofertilizers could be completely substituted for the recommended NPK fertilizers.

4-1-3- Dry matter percentage:

Data in Table (3) showed that there was no significant effect on bean dry matter in the first season but in the second season S1 cv. had a significant increased on dry matter. While, on pea the cultivars had in-significant effect in the both seasons.

In this respect, *Chandra and Polisetty (1998)* reported that the late cultivars recorded high dry weight among pea varieties. The evidence fact is that the plant growth is affected by genotype therefore the studied cultivars differed significantly in most plant growth characters.

Regarding the effect of biofertilizers treatments on bean plants the Phosphorine and the half recommended significantly increased the dry matter in the first season. In the second season the Phosphorine and Nitrobien treatments had a significant increase on the dry matter percentage. With respect of pea cvs. the Rhizobacterien had a significant effect on dry matter in both seasons but the half- recommended treatment and Nitrobien treatment caused significantly increase on the plants dry matter in the first and the second seasons respectively. These results are in harmony with those of Leidi and Gomez (1980) on bean, EL-Neklawy et al. (1985), Sarig et al. (1986), Jakobsen (1987) on pea, Silveira and Cardoso (1987), Abou- EL Salehein and Ahmed (1998) on bean.

Table (3): Effect of different biofertilizers treatments on dry matter content of bean and pea plants in two growing seasons: 1999, 2000 and 2000, 2001 seasons.

F				ă	Bean							0	Pod Dod			
I rearments		2	666		 	7	2000			8		4	25			
	ō	 c			_	77	3			2000	00			2001	01	
,	5	5	Neo	Σ	2	ā	Di Neb	Σ	L.M	Lin	W.T	≥	≥	L.M Lin W.T M I.M I.in W.T	± /#	
Phosphorine (Ph)	18.53	18.53 24.27	24.13	22.31	38.45	23.13	24.58	28.72	14.42	12.06	14.21	13.56	35.07	24.13 22.31 38.45 23.13 24.58 28.72 14.42 12.06 14.21 13.56 35.07 18.91 16.34 23.44	16.34	23.44
Rhizobacterien																
(Rh)	15.69	15.69 15.70	20.98	17.46	27.75	22.98	16.31	22.35	11.73	13.89	17.82	14.48	26.49	20.98 17.46 27.75 22.98 16.31 22.35 11.73 13.89 17.82 14.48 26.49 26.39 29.72 27.53	29.72	27.53
Nitrobien															i i	}
(Nitro)	16.41	16.41 17.67	18.02	17.37	26.35	23.19	19.61	23.07	13.65	13.32	13.73	13.57	32.54	18.02 17.37 26.35 23.19 19.67 23.07 13.65 13.32 13.73 13.57 32.54 25.16 22.54 25.16	22 53	26 74
Half dose																5
(Half)	23.37	23.37 23.95	20.39	22.57	20.70	21.91	20.64	21.08	14.89	13.13	15.90	14.64	25.23	20.39 22.57 20.70 21.91 20.64 21.08 14.89 13.13 15.90 14.64 25.23 19.84 25.29 22.45	25.20	22.45
Full dose										1					/4:/-	47.43
(Control)	17.60 26.65	26.65	22.52	22.26	16.31	23.85	24.15	21.44	15.36	13.99	9.61	12.99	25.83	22.52 22.26 16.31 23.85 24.15 21.44 15.36 13.99 9.61 12.99 25.83 24.41 21.18 23.81	21.18	23.81
Mean	18 22 21 65	21.65	21.71) !	·
1	70:07	CD:12	17:17		12.57	25.91 23.01 21.07	21.07		14.01	14.01 13.28 14.25	14.25		29.03	29.03 22.94 23.01	23.01	
													1		-	

N.S 0.91 1.35	
N.S 0.93 1.39	
1.32 1.32 1.96 Interaction (inter)	(6
N.S 3.02 4.50 Treatments (treat.,)	
L.S.D cv.,: L.S.D Treat.,: L.S.D inter.,: Cultivars (cv.)	M: mean

Concerning the interaction between bean, pea cv. and biofertilizers treatments on bean Nebraska cv. with Phosphorine was the higher dry matter in the first season but in the second season it was Phosphorine and Rhizobacterien treatments with S1 cv. However, the pea cvs. had a significant with all biofertilizers treatments in both seasons except, Wever Top cv. with the Phosphorine treatment in the second season.

In the same line, Sorwli and Mytton (1986) on field bean, Kaur and Singh (1988) on rice bean and Lentil and EL-Mansi et al. (2000) on pea found that inoculation with biofertilizers increased the plant dry matter. The increase in dry matter contributed to increase in plant growth due to the biofertilizers application which may be referred to the physiological process in the plant roots, such increase in root depth and the secondary roots greater than untreated plant, moreover increase the nutrients selectivity (Turner and Back man, 1991).

4-2- Yield and its parameters:

4-2-1- Number of pods per plant:

The results presented in Table (4) and Fig. 1, 2 show clearly that there were significant differences between cultivars on number of pods per plant of bean cvs. S1 cv. which was significant in both seasons but Nebraska cv. gave a significantly increase in the first season only. Also, pea cvs. Little Marvel cv.

Table (4): Effect of different biofertilizers treatments on number of pods per plant of bean and pea plants in two growing seasons: 1999, 2000 and 2000, 2001 seasons.

				Σ	17.55	CC:/1	18.80			13.76	3	17.61	15.95	00.01	
			2001	W.T	17 23	رن. ۱۱	16.00		i	17.67	12.42	13.43	11 97	1	15.28
				Lin	L.M 20.00		17.90		200	10.27	11 25	11:/0	18.00		18.79 14.64 15.28
	rea.	Ĺ		L.M			22.50		12 23	13.33	20.50	2	17.60		18.79
	L			M	16.79		18.51	_	12.70	13.77	15 49		16.56		
		2000	3	W.T	17.93		17.90		17.00	20:71	13.30		12.10		15.65
		20		E	17.93		18.13		12.03		11.80		17.57		17.54 15.49 15.65
				Ę.	14.50 17.93 17.93 16.79		19.50 18.13 17.90 18.51 22.50 17.90 16.00 18.80		12.33 12.03 17.00 13.20 13.23 10.23		21.37 11.80 13.30 15.49 20.50 11.70 12.42		20.00 17.57 12.10 16.56 17.60 18.00 11.97 15.86		17.54
			>	٤	10.78		9.17		23.50 10.33 7.67 13.83		9.74	1	68.6		
	3	7000	No.N		9.00		6.67		7.67		7.00		7.33		7.53
	ľ	77	Ċ	5	7.67		8.33	į	10.33		10.83		6.33		15.81 8.70 7.53
Bean			V.	L	15.65 7.67		12.50 8.33		23.50		11.40 10.83 7.00		16.00		15.81
ΔĎ			Σ		11.82		10.97		8.45	7	8.68		7.98		
	1000		Neb		14.90		12.50		6.67		10.43		5.25	2.0	10.55
	-		ລັ		12.5 / 8.00		12.37 8.03		8.20 7.47		7.77 10.43				- 1
		į	Į,	7,000	12.57		12.37		8.20	7.07	7.63	:	12.40	10.67 7.51	10.07
Treatments	Teamining			Phosphorine	(Ph)	Rhizobacterion	(Rh)	Nitrobien	(Nitro)	Half dose	(Half)	Full dose	(Control)	Mean	

0.43 1.24 2.33
0.41 0.28 0.53
2.08 2.13 4.02 Interaction (inter.,)
2.08 2.13 4.02 Treatments (treat.,)
1.35 1.07 2.05 (cv.)
L.S.D cv.,: L.S.D Treat.,: L.S.D inter.,: Cultivars M: mean

had significant increase number of pods /plant in the two season but the Wever Top cv. had the same significant effect just in the second season.

In this respect, Nassar et al. (1981), Heath and Hebblethwait (1987), Heenan (1994), Singh (1995), Glazal et al. (1996), Alfouns (1996) Mohamed and Qandil (1998) and Mohamed and EL- Kabbany (1999) pointed out that pea cvs. differed significantly among each other in their number of pods per plant.

Concerning the effect of tested treatments data on bean showed that the Phosphorine and Rhizobacterien treatments increased number of pods /plant in the first season but in the second season only the Nitrobien caused significant increase on number of pods /plant.

In addition, all treatments with pea cvs. gave significant increase number of pods /plant except the Nitrobien in both seasons.

The obtained data are coincided with those of Dadson and Acquaah (1984) on soybean, Sorwli and Mytton (1986) on field bean, Ahiabor and Hirata (1995) on cow pea, FengYang et al. (1997) on pea and Shivakumar (1998) on chick pea. They found that number of pods per plant significantly increased by using the biofertilizers inoculation.

All the interaction effects among the studied treatments and cultivars on number of pods /plant on bean had a significant effects in first season and there was a significant increase with S1 cv. only in the second season. However on pea the tested treatment caused significant increase on number of pods per plant in two growing seasons and higest values were the Little Marvel cv. with Rhizobacterien in second season. Similar results were obtained by Essa et al. (1985) on soybean, Ahiabor and Hirata (1995) on cow pea, Abou- EL- Salehein and Ahmed (1998) on bean, Patel et al. (1998) and EL- Mansi et al. (2000) on pea.

4-2-2- Number of seeds per pod:

Data illustrated in Table (5) clearly showed that the S1 cv. gave the highest number of seeds per bean pod on both seasons and Nebraska cv. was significant only in first season. But on pea Little Marvel and Wever Top cvs. were significantly increased in the two seasons over than Lincolin cv. In this regard, Nassar et al. (1981), Kotecki (1991), Ghazal et al. (1996), Mohamed and EL-Kabbany (1999) and Shokr (2000) on pea pointed that pea cultivars differed significantly among each other on number of seeds /pod.

Regarding the effect of biofertilizers treatments did not affect the number of seeds /pod in the first season but in the

Table (5): Effect of different biofertilizers treatments on number of seeds per pod of bean and pea plants in two growing seasons: 1999, 2000 and 2000, 2001 seasons.

L.S.D cv.,: L.S.D Treat.,: L.S.D inter.,: Cultivars M: mean	Mean	Full dose (Control)	Half dose (Half)	Nitrobien (Nitro)	Rhizobacterien (Rh)	Phosphorine (Ph)		1 reauments)
(cv.)	6.14	6.03	6.60	6.03	a 5.73	6.33	SI	Γ	Bean
0.39 N.S 0.90	3.74	3.73	3.70	3.90	3.23	4.13	Di	_	
) Treatn	4.53	4.50	4.57	4.57	4.63	4.37	Neb	1999	
) } Treatments (treat.,)		4.75	4.96	4.83	4.53	4.94	×		
reat.,)	6.23	6.07	5.83	6.80	6.17	6.30	SI		
0.46 0.34 0.63 I	3.85	4.00	3.63	3.67	3.87	4.07	D:	2(
interaci	3.67	2.37	3.87	4.07	4.27	3.77	Neb	2000	
Interaction (inter.,)		4.15	4.44	4.85	4.77	4.71	М		
ter.,)	6.85	6.77	6.10	7.07	7.07	7.23	L.M		Pea
0.35 0.16 0.30	6.45	6.35	6.70	6.93	6.20	6.07	Lin	2(
	6.78	6.81	7.13	6.53	6.87	6.57	W.T	2000	
		6.64	6.64	6.84	6.71	6.62	Z		
	6.76	6.78	6.60	6.30	6.97	7.17	Z		
0.23 0.54 1.02	6.45	6,44	5.97	6.67	6.30	6.87	E	20	
	7.53	7.43	7.37	7.10	8.77	7.00	¥.⊤	2001	
		6.88	6.65	6.69	7.35	7.01	Z		

second season Nitrobien, rhizobacterien and Phosphorine had a significant increase on number of seeds per pod on bean plants.

The pea with all treatments showed significant increase in number of seeds per pod in first season and the Rhizobacterien treatment gave the same results in the second season.

Many investigators came to similar results, *Srivastava and Ahlawat (1995)* on pea, *Shivakumar (1998)* on chick pea demonstrated that the highest number of seeds per pod were obtained by *Rhizobium* or by Phosphat solubilizing microorganisms (PSM) compared with the chemical fertilizers (control).

On the other hand, the interaction between bean and pea cvs. and biofertilizers treatments showed significant effect on bean cultivars (cvs.) in the two growing seasons except Diacol cv. in the first season. While pea cvs. showed a significant increase in number of seeds per pod just in first season but in the second season the Wever Top cv. with tested treatment and Little Marvel cv. with Phosphorine showed significant increase in number of seeds per pod.

These results are in harmony with those obtained by Srivastava and Ahlawat (1995), Patel et al. (1998), Mansour (2000) on pea. They concluded that inoculation with biofertilizers with or without P,N fertilizers had a significant increase on number of seeds per pod.

4-2-3- Seeds weight per pod:

Data in Table (6) reveals that bean cvs. i.e. Diacol, Nebraska cvs. produced significantly higher seeds weight per pod in both seasons.

On the other hand pea cv. the Little Marvel had significantly increased seeds weight/pod in the two seasons and Lincolin cv. was significant in the first season only but Wever Top cv. gave the lowest seeds weight/pod with slightly differences with Lincolin cv.

These results are in agreement with those obtained by Ferrari et al. (1992), Pirani and Tiberi (1992), Warkentin et al. (1997), Ahmed (1999) and Shokr (2000) on pea. They found that seed weight was depended on cultivars. The differences in seeds weight between cultivars could be due to hereditary factors.

With respect to influence of different treatments all of them significantly increased seeds weight per pod of bean plants in the first season only except the half dose of NPK fertilizers. In the second season there was no significant increse at all treatments.

In addition pea seeds weight per pod increased with biofertilizers treatments in the two seasons but did not reach significance increase.

The obtained results are in confirmity with those reported by Abdalla (1983) and Hassanein (1987) on soybean. They

Table (6): Effect of different biofertilizers treatments on seeds weight (gram per pod) of bean and pea plants in two growing seasons: 1999, 2000 and 2000, 2001 seasons.

				Be	Bean							٦	Pea			
Treatments		19	666			20	2000			20	2000	1		2001	01	
	SI	Ö	Neb	Neb M	SI	ä	Di Neb M I M I in WT M I M I in WT	Σ	Z	į.i.	L M	≥	\Z	ı.	N T	>
Phosphorine (Ph)	1.27	1.27 1.73	2.10	1.70	1.27	1.60	2.03	1.63	3.43	2.20	1.97	2.53	2.80	3.37	2.10 1.70 1.27 1.60 2.03 1.63 3.43 2.20 1.97 2.53 2.80 3.37 3.03 3.07	3.07
Rhizobacterien (Rh)	1.23	1.23 1.40	2.17	1.60	1.27	1.57	2.07	1.64	3.07	2.27	2.20	2.51	3.00	2.10	2.17 1.60 1.27 1.57 2.07 1.64 3.07 2.27 2.20 2.51 3.00 2.10 2.87 2.66	2.66
Nitrobien (Nitro)	1.47	1.47 1.50	2.03	1.67	1.20	1.63	2.13	1.65	2.83	2.50	2.00	2.44	3.23	2.90	2.03 1.67 1.20 1.63 2.13 1.65 2.83 2.50 2.00 2.44 3.23 2.90 2.47 2.87	2.87
Haif dose (Haif)	1.03	1.03 1.40	1.93	1.45	1.13	1.57	1.93	1.54	3.20	2.57	1.83	2.53	3.00	2.67	1.93 1.45 1.13 1.57 1.93 1.54 3.20 2.57 1.83 2.53 3.00 2.67 2.20 2.62	2.62
Full dose (Control)	1.10 1.57	1.57	2.03	1.57	1.40	1.47	1.77	1.55	3.20	2.57	1.83	2.53	3.00	2.67	2.03 1.57 1.40 1.47 1.77 1.55 3.20 2.57 1.83 2.53 3.00 2.67 2.20 2.62	2.62
Mean	1.22	1.22 1.52	2.05		1.25	1.25 1.57 1,99	1,99		3.14 2.33 2.05	2.33	2.05		2.95	2.95 2.71 2.69	2.69	

0.22	0.32	0.60		
0.20	N.S.	0.50	Interaction (inter)	
0.16	N.S	0.43	Treatments (treat.,)	
0.10	0.11	0.21	(cv.)	
L.S.D cv.,:	L.S.D Treat.,:	L.S.D inter.,:	Cultivars	M: mean

concluded that inoculation treatments revealed non significant effect on weight of seeds. On the other hand, *Salwau* (1989) on soybean stated that inoculated plants gave insignificant increase seeds weight per plant than uninoculated plants in the two seasons.

With regared to the effect of cultivars and biofertilizers interaction on seeds weight most treatments showed significant effect in both seasons on bean cvs. with exception SI cv.

However, on pea Little Marvel cv. showed the best results with all biofertilizers treatments in the first and second seasons it gave the higher seeds weight compared with the two other cultivars (Lincolin and Wever Top cvs.) in both seasons.

In this respect, Essa et al.(1985) on soybean, Kaur and Singh (1988) on ricebean, Hussein et al.(1991) on faba bean, Abou El-Salehein and Nasr (1994) on pea and Shivakumar (1998) on chick pea pointed that using biofertilizers inoculation the seeds weight was identified as one of the most important yield contributing characters.

4-2-4- Seeds index (100-seed weight):

Data in Table (7) and Fig. (1,2) reveal that seed index differed significantly among the studied cultivars in the two seasons on bean cvs. the Diacol cv. and Nebraska cv. had a significant differences for 100-seed weight in both seasons.

Table (7): Effect of different biofertilizers treatments on seed Index of bean and pea seeds (on dry matter base) in two growing seasons: 1999, 2000 and 2000, 2001 seasons.

<u> </u>				Be	Bean							Pea	ža			
Treatments		199	660			2000	00			2000	8			2001	10	
	SI	Ğ	Neb	Neb M		ij	Neb	SI Di Neb M L.M Lin W.T M L.M Lin W.T	LM	Lin	T.W	Σ	LM	Lin	T.W	Z
Phosphorine (Ph)	15.60	15.60 40.90	43.57	33.36	26.23	52.67	49.97	43.57 33.36 26.23 52.67 49.97 42.96 13.03 15.77 13.40 14.07 14.73 17.17 14.60 15.50	13.03	15.77	13.40	14.07	14.73	17.17	14.60	15.50
Rhizobacterien (Rh)	17.30 39.23	39.23	44.73	33.75	24.77	49.60	49.90	44.73 33.75 24.77 49.60 49.90 41.42 15.13 16.53 14.87 15.51 15.20 16.57 14.03 15.27	15.13	16.53	14.87	15.51	15.20	16.57	14.03	15.27
Nitrobien (Nitro)	16.57	16.57 39.97	45.30	33.95	24.80	51.20	47.33	45.30 33.95 24.80 51.20 47.33 41.11 13.70 15.80 14.70 14.73 14.63 14.80 14.93 14.79	13.70	15.80	14.70	14.73	14.63	14.80	14.93	14.79
Half dose (Half)	17.17	17.17 41.80	41.13	33.37	25.03	48.17	46.80	41.13 33.37 25.03 48.17 46.80 40.00 12.77 14.77 13.83 13.79 14.80 18.73 14.13 15.89	12.77	14.77	13.83	13.79	14.80	18.73	14.13	15.89
Full dose (Control)	17.13	17.13 40.23	43.03	33.46	25.43	50.03	50.27	43.03 33.46 25.43 50.03 50.27 41.91 14.67 15.67 14.33 14.89 15.00 14.93 14.07 14.67	14.67	15.67	14.33	14.89	15.00	14.93	14.07	14.67
Mean	16.75	16.75 40.43	43.55		25.25	25.25 50.33 48.85	48.85		13.86	13.86 15.71 14.23	14.23		14.87	14.87 16.44 14.35	14.35	

0.27	0.42	08'0		
0.19	0.21	1.04	(,	
3.12	N.S	6.95	Interaction (inter.	
			Treatments (treat.,)	
	N.S		(cv.)	
L.S.D cv.,:	L.S.D Treat.,:	L.S.D inter.,:	Cultivars	M: mean

However in pea cvs. Lincolin cv. and Wever Top cv. significantly increased on seed index in first season but in second season the Little Marvel and Lincolin cvs. gave a significant effect.

These results are in agreement with those obtained by Acciarri et al. (1992), Pirani and Tiberi (1992), Warkentin et al. (1997) and Ahmed (1999) on pea. They resulted that the seed weight was dependent largely on the cultivars.

Respecting the effect of biofertilizers treatments there was insignificant increase in seeds weight with Rhizobacterien and Nitrobien in the first season and Phosphorine in second season on bean.

However on pea it is clear from the data that the Phosphorine, Rhizobacterien and Nitrobien had significant effect in first season but in second season the Phosphorine, Rhizobacterien and half recommended treatments were significantly increased 100-seed weight. These results agree with those obtained by Sorwli and Mytton (1986) on field bean, Singh et al. (1995), Hegazy et al. (1997) on soybean and Negmet al. (1998) on pea. They showed that 100-seedsweight increased significantly with Rhizobium inoculation compared to uninoculated plots.

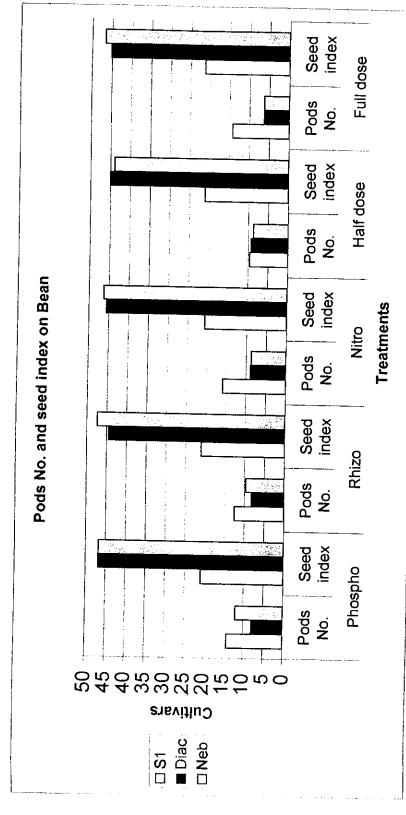
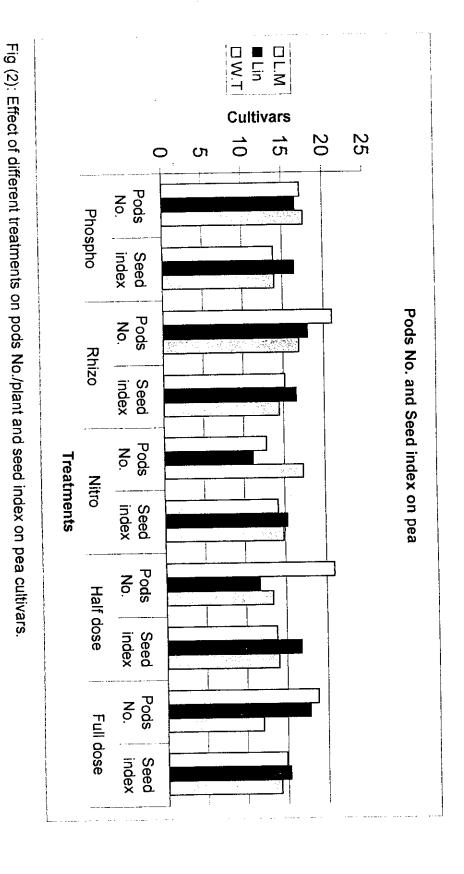


Fig (1): Effect of different treatments on pods No./plant and seed index on common bean cultivars.



- 58 -

However in pea cvs. Lincolin cv. and Wever Top cv. significantly increased on seed index in first season but in second season the Little Marvel and Lincolin cvs. gave a significant effect.

These results are in agreement with those obtained by Acciarri et al. (1992), Pirani and Tiberi (1992), Warkentin et al. (1997) and Ahmed (1999) on pea. They resulted that the seed weight was dependent largely on the cultivars.

Respecting the effect of biofertilizers treatments there was insignificant increase in seeds weight with Rhizobacterien and Nitrobien in the first season and Phosphorine in second season on bean.

However on pea it is clear from the data that the Phosphorine, Rhizobacterien and Nitrobien had significant effect in first season but in second season the Phosphorine, Rhizobacterien and half recommended treatments were significantly increased 100-seed weight. These results agree with those obtained by Sorwli and Mytton (1986) on field bean, Singh et al. (1995), Hegazy et al. (1997) on soybean and Negm et al. (1998) on pea. They showed that 100-seedsweight increased significantly with Rhizobium inoculation compared to uninoculated plots.

On the other hand, *Dunigan et al.* (1983) and *Abdalla* (1983) on soybean concluded that inoculation treatment with *Rhizobium* had no significant on 100-seed weight.

With regard to the interaction effect between the tested cultivars and the biofertilizers treatments the bean cv. Diacol gave the highest 100-seed weight with the tested treatments with slightly differences than Nebraska cv. in second season.

Whereas on pea the best result recorded by the Lincolin cv. with all biofertilizers treatments and this result was true in both seasons except the Nitrobien treatment in the second season only.

These results are correspondence with those of Hammam (1986), Salwau (1989), Barsoum and Abdel- Gawad (1990), Sharaf and Salwau (1992) on soybean and Shivakumar (1998) on chickpea. They stated that the highest 100-seed weight was obtained by Rhizobium or phosphobacterial seeds inoculation.

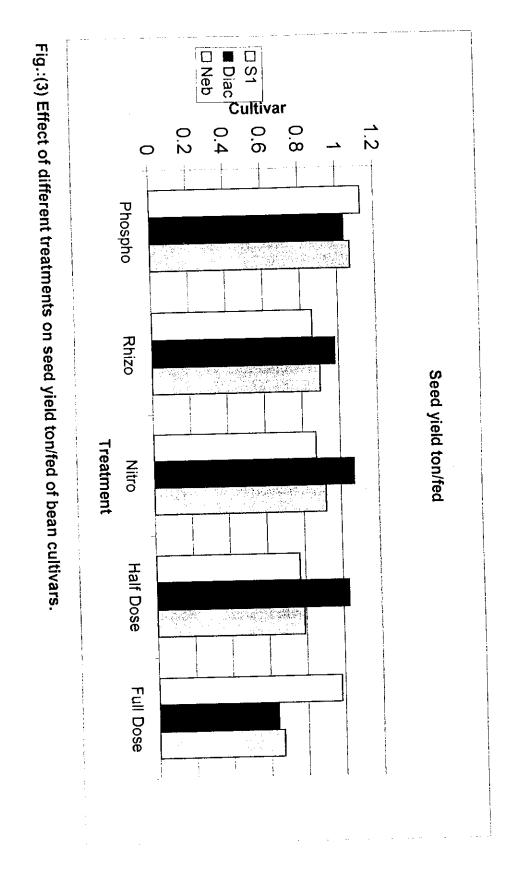
4-2-5- Seeds yield:

The yield of dry seed (ton/feddan) for the studied cvs. are presented in Table (8) and Fig. (3,4). Data reveal that bean cvs. Diacol and Nebraska cvs. produced the highest yield with significant differences in first season, while in the second season only SI cv. was significant. On the other side the pea Lincolin and Wever Top had a significant increase on dry seed yield in

Table (8): Effect of different biofertilizers treatments on seeds yield (Ton /fed) of bean and pea seeds (on dry matter base) in two growing seasons: 1999, 2000 and 2000, 2001 seasons.

													i			
				B	Bean							4	Рея			
Treatments		19	666			20	2000			20	2000			,	[5	
×	SI	Ö	Neb	Neb M	S	حَ	O.	2	7	1	F .			₹	1007	
Phoenhorine						2	3	M. L.M. Lin W. I M. L.M. Lin W.T.	 - -		- ≥	Ξ	L.M	Lin	W.T	Σ
(Ph)	0.822 1.043	1.043	1.120	0.995	1.437	1.044	1.021	1.120 0.995 1.437 1.044 1.021 1.167 0.700 0.673 0.700 0.691 0.843 1.009 0.848 0.900	0.700	0.673	0.700	0.691	0.843	1.009	0.848	0.900
Rhizobacterien	0.709 1.006	1 006	797 0	0.837	1 013	0.050	1 000	000	6							
(Kh)				, 55.	1.01	0.22.0	000.1	0.500 1.000 0.550 1.000 0.550 0.660 0.910 0.751 1.113 1.074 0.902 1.030	0.083	0.000	0.910	0.751	1.113	1.074	0.902	1.030
Nitrobien	0.545	000	0													
(Nitro)	0.040 1.050	1.038	0.979	0.801	1.202	1.089	0.856	0.373 0.301 1.202 1.089 0.856 1.049 0.710 1.090 0.823 0.874 0.786 0.827 0.861 0.825	0.710	1.090	0.823	0.874	0.786	0.827	0.861	0.825
Half dose	, , ,															
(Half)	0.416 0.992	0.992	0.712	0.707	1.120	1.061	0.861	0.712 0.707 1.120 1.061 0.861 1.014 0.757 1.750 0.823 1.110 1.144 0.841 0.707 0.897	0.757	1.750	0.823	1.110	1.144	0.841	0.707	0.897
Full dose	00,0	,														
(Control)	0.022 0.655	0.655	0.581	0.619	1.307	0.620	0.757	0.581 0.619 1.307 0.620 0.757 0.895 0.717 0.860 0.793 0.790 0.912 0.883 0.754 0.850	0.717	0.860	0.793	0.790	0.912	0.883	0.754	0.850
Mean	0.623 0.951	0.951	0.838		1 216	1 216 0 052 0 001	100		1,10	100	6		,			
		1,7,7,	5		1.210	0.733	7.70		0./13	0.713 1.007 0.810	0.810		0.960	0.960 0.927 0.814	0.814	

0.070 0.081 0.139 0.056 0.049 0.084 Interaction (inter.,) 0.065 0.071 0.123 Treatments (treat.,) 0.049 0.055 0.094 (cv.) L.S.D cv.; L.S.D Treat.; L.S.D inter.; Cultivars M: mean



-62-

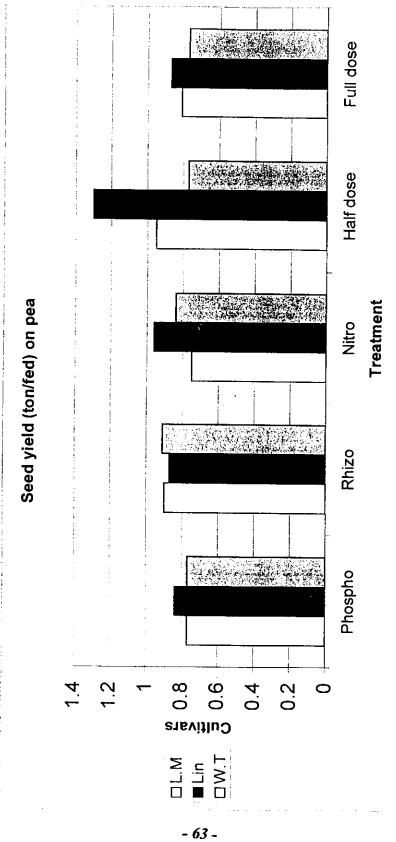


Fig.:(4) Effect of different treatments on seed yield ton/fed of pea cultivars.

the first season but the Little Marvel and Lincolin cvs. were increased with significant effect in the second season. These results are in agreement with those obtained by Kotecki (1991), Acciarri et al. (1992), Pirani and Tiberi (1992), Warkentin et al. (1997-a) and Ahmed (1999). They resulted that seed yield were dependent largely on the cultivars. and could be due to hereditary factors.

Respecting the effect of biofertilizers treatments all the tested treatments gave a significant increase on bean dry seeds yield. This result was true in both seasons. But in pea there was a significant increase on dry seeds yield by using the Rhizobacterien, Nitrobien, and half recommended treatments in first season, while in second season only Rhizobacterien recorded significant effect on seed yield. These results agree with those obtained by Abdalla et al. (1984) on soybean, Sangakhara and Marambe (1989) on bean and cowpea, Abdel-Aziz et al. (1996) on faba bean, Jain et al. (1999) on chickpea and El-Mansi et al. (2000) on pea. They reported that dry seeds yield increased by inoculation with Rhizobium or V.A. mycorrhiza or Bacillus megathirum.

The increase in total seeds yield might be due to the increase of pod number per plant (Table 4) and also this might be due to the favourable effect of biofertilizers inoculation on plant growth and fixation of atmospheric nitrogen (Rai et al., 1977).

Regarding to the interaction between biofertilizers and cultivars on bean there was significant increase on dry seeds yield in all treatments with the three cvs. in both seasons except SI cv. with half recommended in first season only.

In addition, pea cvs. in first season the Lincolin cv. with Nitrobien and half recommended treatments had the highest seeds yield while in the second season the best values on seeds yield were the Little Marvel cv. with Rhizobacterien and half recommended treatments. These results are in harmony with those of Salem and Massri (1986) on faba bean, Gad El-Hak et al.(1993 a) on pea, Dubey (1997) on soybean, El-Gizy et al.(1999) on bean, Mansour (2000) on pea and El-Shamma (2000) on bean. They mentioned that inoculation with biofertilizers increased dry seed yield.

4-3- The effect of different treatments on the chemical composition of seeds:

4-3-1-Protien content:

Data presented in Table (9) show clearly that cultivars had a significant differences in their protein content of their dry seeds: Bean cvs. S1 cv. seeds contains higher protein content than Diacol and /or Nebraska cvs. seeds in the first season but in the second season the S1 and Nebraska cvs. were significant compared with Diacol cv. on seeds protein content.

Table (9): Effect of different biofertilizers treatments on protein content of bean and pea seeds (on dry matter base) in two growing seasons: 1999, 2000 and 2000, 2001 seasons.

L.S.D cv.,: L.S.D Treat.,: L.S.D inter.,: Cultivars M: mean	Mean	Full dose (Control)	Half dose (Half)	Nitrobien (Nitro)	Rhizobacterien (Rh)	Phosphorine (Ph)		Treatments		
(cv.)	22.44	22.35	22.31	20.22	22.10	25.23	SI			
1.191 N.S 2.255	18.49		19.70		16.88	25.23 18.14 19.48	ַ	15		
reatme	19.49	18.35 18.35	22.31 19.70 20.02 20.68	19.39 20.02	19.60		Neb	999		
1 5 Treatments (treat.,)		19.68	20.68	19.88	22.10 16.88 19.60 19.53	20.95	М		Ве	
	23.01	19.99	24.53	25.06		24.19	IS		Bean	
0.630 0.621 1.075 Ii	23.01 19.21 20.29	18.52	24.53 16.34	21.53	21.27 19.74 19.77 20.26	19.93	Ď.	2000		
nteracti	20.29	18.67	20.69	20.32	19.77	22.01 22.04	Neb	00		
Interaction (inter.,)		18.52 18.67 19.06	20.52	25.06 21.53 20.32 22.30	20.26	22.04	×			
	24.57	24.74	22.51			25.33	L.M			
0.841 N.S 3.076	23.96	24.74 23.13	22.51 25.43 21.54	24.10 27.01 19.97	26.16 22.52	25.33 21.69 25.20	Lin	20		
	21.87	22.43	21.54	19.97	20.22	25.20	W.1	2000		
		23.43	23.16	23.69	22.97	24.07	Z		P	
	20.00	29.61			24.44				Pea	
0.640 1.154 1.999	23.03 23.23	29.61 25.06 24.81	26.44 28.51 21.18	24.02 23.47 25.45	24.44 23.01 24.64	26.04	LILL	I≿	3	
9 4 0		24.81	21.18	25.45	24.64	23.86	W. I	1007	2	
		26.49	25.38	24.31	24.03	24.67	1			

However on pea: there were significant increse among the cultivars i.e. Little Marvel and Lincolin cvs. in their seeds protein content in both seasons.

These results coincided with those reported by Kotecki (1991); Alfouns (1996); Warkentin et al. (1997); AL Khatib et al. (1997) and Shokr (2000). They found that the different cultivars of pea showed significant differences in protein content of their dry seeds.

Such differences in protein content among the tested cultivars might be attributed to the genetically differences.

Concerning seed protein on bean seeds there were insignificant effect as a result of biofertilizers treatments in first season but all biofertilizers treatments were significant in the second season.

On the other hand, pea treatments caused insignificant effect in the two growing seasons except the Nitrobien treatment in the second season. The obtained results are in confirmity with those of Essa et al. (1985) on soybean, Pacovesky and Fuller (1991) on bean, Igbasan et al. (1996), Negm et al. (1998) on pea and EL- Gizy et al. (1999) on bean. They concluded that the inoculation with biofertilizers raised protein percentage in dry seeds.

On the other side, Kamel et al. (1983), and Salwau (1989) observed that inoculation with Rhizobium had no significant effect on seeds protein content of soybean seeds.

The insignificant differences between the effect of NPK-fertilizers and the effect of biofertilizers inoculation on protein content may be means that seeds inoculation with biofertilizers could be completely substituted for the NPK- fertilization without reducing protein content. Many investigators reported that seed inoculation with either Azotobacter or Azospirillum saved 50% of the recommended N- fertilizers. (KumaraSwamy and Madalageri (1990) and Subbiah (1990) on tomatoes and Subbiah (1991) and Sankaranaraynan et al. (1995) on okra).

The interaction between biofertilizers and tested cultivars showed that the S1 cv. and the Nebraska cv. had significant increase in their protein content with all treatments in the first and the second season. Diacol cv. was significant with Rhizobacterien and Nitrobien treatments in first season only and with all treatments except Nitrobien in the second season.

In addition, on pea the highest value of of protein content recorded by the Rhizobacterien treatment with Lincolin cv. in the first season but in the second season it was by the Nitrobien treatment also with Lincolin cv.

These results are in according with those obtained by Ciafardini and Barbieri (1987) on soybean Nwachukwu and

Umechurubo (1997) on African yam bean, Mansour (2000) on pea and EL- Shamma (2000) on bean. They stated that inoculation with the biofertilizers significantly increased the protein percentage.

4-3-2- Total sugars percentage:

Data illustrated in Table (10) show the effect of different treatments on bean, and pea cvs. total sugars content. The bean cultivars had no significant in the first season but Diacol cv. was significant in the second season compared with the other cvs. However the pea Lincolin and Wever Top cvs. significantly increased their total sugars content in the first season only.

With respect of total sugars content of bean cvs. Phosphorine treatment was significant in the first season but in the second season the Rhizobacterien and the Nitrobien treatments gave a significant effect on total sugar content.

While pea cvs. treatments gave significant effect in the first season and in the second season just half recommended treatment significantly increased their total sugars. In this direction, Abd El-Fattah and Sorial (2000) showed that total sugars and total carbohydrates were significantly enhanced when squash seeds inoculated with bacteria of genera Azospirillum, Azotobacter and Klebsilla. Moreover, Hanafy et al.(2000-a) working on lettuce mentioned that, total sugars concentration

Table (10): Effect of different biofertilizers treatments on total sugar content of bean and pea seeds (on dry matter base) in 1999, 2000 and 2000, 2001 seasons.

L.S.D cv.,: L.S.D Treat.,: L.S.D inter.,: Cultivars M: mean	Mean	Full dose (Control) Mean		(Half)	Half dose			Rhizobacterien (Rh)		(Ph)	Phosphorine		Treatments		
(cv.)	3.73	1,	4 17	0.40	,	3.46		3.53		7.00	4 06	S			
N.S 0.192 0.332 Ti	3.82		36	3.57	7 (7	3.95			3 68	1.00	477	<u>D</u> .	19		
reatmei	3.96		4	0.01	ده د	3,82	200		3 90	1	4 17	Neb	1999		
S 92 32 Treatments (treat.,)			3.96		ر د د	J. /#	1 1		3.7		4.19	Z		bean	2
at.,)	3.53		3.68		3 57	0.90	3		3.57		2.96	SI		an	;
0.261 0.234 0. 406 Int	5.85	3	3.79		3.79	0.00	× 7×		4.00		3.90	וַט	2000	3	
61 .34 .06 Interaction (inter.,)	3.39	3	3.27		3.41	1	., 00	3.90		3.49		Neb	ح ارک اح	3	
on (inte			3.58		3.59		3 82		3.82		3.45	14	\$		
1 ,	0.27	3 7/	2.77		3.02		3.16		3.63		3.60	T.1744	<u>-</u>		
0.314 0.217 0.376	1,7	375	3.53		3.95	4.06			3.90				1 500	2000	
674		3 77	3.46		3.90		4 17		4.20		3.13		T W	ŏ	
			3.19		3.62		3.80		3.91		3.43		≾		Pea
		3.75	4.28		4.11		3.02		3.16	3.16		MT		}	ģ
N.S 0.133 0.231		3.86	3,18		4.22		4.17		4.06		3,68		Lin	2001	
31	-	3.75	3.84		3.79	;	3.79	;	4.11		3.24	2	W.T	01	
			3.77		4.04		3.66	,	5.78	7 70	2.09	, 1	M		

was pronounced increase by using different biofertilizers treatments (Nitrobien, Biogien, Rhizobacterien and Microbien).

The interaction effects of biofertilizers treatments with the tested cultivars on total sugars content. Data on bean reveal that the Phosphorine treatment with S1 and Diacol cvs. and Nitrobien with Diacol cv. were significant increased. On the other hand Nebraska cv. was significantly increased in their total sugars with all treatments in first season only. The three bean cvs. gave significant effect with the tested treatments in the second season except the Phosphorine with S1 cv..

In addition, on pea the Lincolin cv. was significant with the studied treatments in both seasons. But the best treatment was the Phosphorine which gave significant increase in their total sugars content in the two growing seasons.

The obtained results are in confirmity with those of *Pacovesky (1989)* on soybean who reported that the quality and quantity of carbohydrates vary in response to the physiological changes resulting from infection by N₂ fixing bacteria. Also, *Igbasan et al. (1996)* on pea, *Hegazy et al. (1997)* on soybean and *Rajender-Singh et al. (1998)* on chick pea found that the total sugar in dry seeds increased as a results of *Rhizobium* inoculation. Moreover *Sorial and Abd EL-Fattah (1998)* demonstrated that the effect of NPK fertilizers and /or biofertilizers i.e : *Azospirillum, Azotobacter and Klebsiella*

significantly increased the total carbohydrates in turnip.

Mansour (2000) on pea stated that seeds inoculation with mycorrhiza with P and N fertilizers gave a significant increase in their total sugars.

4-3-3- Seeeds oils content:

Data in Table (11) show that there were no significant differences among the bean cultivars in the first season on seeds oil content. While in the second season the Diacol and Nebraska cvs. were significantly increased their seeds oil content. However, on pea cvs. the Wever Top cv. significantly increased their seeds oil content in both seasons.

According to the tested treatments on bean there was no significant in the first season but the Phosphorine and the half recommended treatments significantly increased their oil content of bean and pea seeds in the second season.

The bean cvs. in first season had insignificant effect between the cvs. and the biofertilizers treatments and in the second season the Nebraska cv. had a significant with all treatments, the SI cv. was significant with Phosphorine, Nitrobien and half recommended, while Diacol cv. gave a significant with Nitrobien and half recommended treatments. The highest value was SI cv. with Phosphorine treatment.

Table (11): Effect of different biofertilizers treatments on oil content of bean and pea seeds (on dry matter base) in 1999, 2000 and 2000, 2001 seasons.

				ć								Pea	ű			
				Беап	an an			+		100				2001	=	
Treatments		61	1999			2000	8			7007	2	1				>
	V.	Ö	Neb	Veb M	SI	Ö	Di Neb	M	L.M. Lin W.T	Lin	W.T	Z	Z.	L.M Lin W.1	× ×	2
Phosphorine	0.12	0.11	0.10	0.11	0.24	0.10	0.12 0.11 0.10 0.11 0.24 0.10 0.15 0.16	0.16	0.03	0.04	0.03 0.04 0.20 0.09		0.02 0.05		0.16	0.08
(Fn) Rhizobacterien	0.16	0.16 0.12	0	0.13	0.10	0.06	11 0.13 0.10 0.06 0.12 0.09	60.0	0.02	0.03	0.02 0.03 0.11 0.05	0.05	0.04 0.04	0.04	0.08	0.05
(Rh)																1
Nitrobien	0.20	0.20 0.09	0.12	0.14	0.11	0.11	0.12 0.14 0.11 0.11 0.12 0.11	0.11	0.04	60.0	0.04 0.09 0.10 0.08	0.08	0.03	0.03 0.02 0.15	0.15	0.07
(Nitro)															,	
Half dose	0.15	0.15 0.13	0.14	0.14	0.15	0.12	0.14 0.14 0.15 0.12 0.19 0.15	0.15	0.03	0.03	0.03 0.03 0.12 0.06	90.0	0.01	0.01 0.03 0.13	0.13	0.00
(Half)																1
Full dose	0.08	0.08 0.13		0.10	0.14	0.09	0.10 0.10 0.14 0.09 0.18 0.14 0.04 0.06 0.11 0.07	0.14	0.04	90.0	0.11	0.07	0.02	0.02 0.04	015	0.07
(Control)			1							3	5			0.00 0.00	0.13	
Mean	0.14	0.14 0.12	0.11		0.15	0.15 00.10 0.15	0.15		0.03	0.03 0.03 0.13	CI.)		70.0			

0.028 0.012 0.021 0.034 0.020 0.034 Interaction (inter.,) 0.028 0.027 0.046 N.S N.S N.S Treatments (treat.,) (cv.) L.S.D cv.,: L.S.D Treat.,: L.S.D inter.,: Cultivars M: mean Respecting the effect between pea cvs. and the studied treatments the Wever Top cv. was significantly increased their seeds oil content with the tested treatments and the Lincolin cv. had a significant effect with all treatments except the Nitrobien in first season. In the second season the three pea cvs. were significant with all biofertilizers treatments except Lincolin cv. with Nitrobien and Little Marvel cv. with Rhizobacterien.

In this respect, the highest values of oil content in both seasons was the Wever Top cv. with the Phosphorine treatment. However, Abdalla (1983), Bassiem (1983) and Hassanein (1987) on soybean. They indicated that the Rhizobium inoculation resulted insignificant decrease in the oil percentage in soybean seeds. On the other hand Ruschel et al. (1975), Essa et al. (1985), Sharaf and Salwau (1992) on soybean and Nwachukwu and Umechurubo (1997) on African yambean. They concluded that inoculation with Rhizobium japonicum increased seeds oil content.

4-3-4- Ash content:

The obtained results (Table:12) showed that all cultivars differed significantly in their ash content. Bean, Nebraska cv. had a significant in first season but in the second season SI and Diacol cvs. were significantly increased their ash cotent.

Table (12): Effect of different biofertilizers treatments on ash content of bean and pea seeds (on dry matter base) in 1999, 2000 and 2000, 2001 seasons.

Treatments		19	1999	Bean	an	2000	8			20	2000	D.	Pea	70	2001	
	SI	Ö	Neb	M	SI	Di	Di Neb M	M	L.M	Lin	W.T	Σ	L.M Lin W.T M L.M Lin W.T	Ŀ	W.T	Σ
	6.21	6.21 7.09	7.72	7.01	8.09	8.12	7.63	7.95	5.99	4.78	7.72 7.01 8.09 8.12, 7.63 7.95 5.99 4.78 5.75 5.51	5.51	5.44	5.44 4.48 5.11	5.11	5.01
Rhizobacterien (Rh)	10.52 7.97	7.97	8.96	9.15	9.55	8.57	7.21	8.44	6.26	4.23	8.96 9.15 9.55 8.57 7.21 8.44 6.26 4.23 6.38	5.62	5.11 4.91	4.91	5.42	5.15
	6.76	6.76 8.90	9.21	8.29	7.35	7.02	7.06	7.14	5.92	4.42	9.21 8.29 7.35 7.02 7.06 7.14 5.92 4.42 6.14	5.49	5.23	5.23 5.26	4.09	4.86
	09.6	9.60 7.46	7.49	8.18	89.6	7.40	6.84	7.97	6.48	5.00	6.43	5.97	5.27	5.49	7.49 8.18 9.68 7.40 6.84 7.97 6.48 5.00 6.43 5.97 5.27 5.49 3.19	4.65
	8.05	8.05 7.74	10.31 8.70 7.73 7.05 7.83 7.54 5.79 4.71 6.33 5.61 5.70 5.37	8.70	7.73	7.05	7.83	7.54	5.79	4.71	6.33	5.61	5.70	5.37	5.43	5.50
	8.23 7.99	7.99	8.74		8.48	8.48 7.63 7.31	7.31		60.9	6.09 4.63 6.21	6.21		5.32	5.32 5.10 4.65	4.65	

0.343	0.518		
0.332 N.S.	Z Z S S		
0.253	0.915	Interaction (inter.,)	
0.506	0.834	Treatments (treat.,)	
L.S.D cv.,:		Cultivars (cv.)	M: mean

Also, pea cvs. the Little Marvel cv. was significant in both seasons but Wever Top cv. gave a significant effect in first season only and Lincolin had a significant increase in their ash content in the second season.

However, it is clear from data in Table (12) that the Rhizobacterien, Nitrobien, half recommended treatments had significant increase in their ash content of bean seeds in the first season. And the Phosphorine, Rhizobacterien and half recommended showed the same result in the second season. On the other hand, pea cv. showed insignificant with all tested treatments in the first season but in the second season Phosphorine and Rhizobacterien treatments were significantly increased their ash content.

In generally all studied treatments had a significant differences with the bean cvs. in first season except Phosphorine with S1 cv. On the other hand, only the S1 cv. was a significant with all treatments in the second season. The highest ash content resulted by the S1 cv. with Rhizobacterien and half recommended treatments while pea cvs. showed no significant among cvs. and biofertilizers treatments in the first season but in the second season all cvs. had significantly increased their ash content with all treatments except the half recommended treatments with Wever Top cv.

This result is in harmony with those of *EL-Sayed et al.* (1990) on faba bean and *Nwachukwu and Umechurubo* (1997) on African yambean. They found that inoculation with *Rhizobium* or Nitrogen fixing fungi significantly increased the ash content of dry seeds.

4-3-5- N, P and K content:

a) Nitrogen content:

The results obtained in Table (13) and Fig. 5, 6 (a. b.) indicated that cultivars differed significantly in their contents of total N percentage. The bean cvs. showed that S1 cv. significant in both seasons but Nebraska cv. significantly increased only in the second season. The pea cvs. showed that the Little Marvel and Lincolin had a significant increase in the first season, while in second season there was no significant differences between cvs. Such results are in harmony with that reported by Beringer et al. (1992); Warkentin et al. (1997); and Chandra and Polisetty (1998). They reported that pea cvs. differed significantly in their N contents. The results did not show any significant among treatments on bean seeds in the first season and in the second season all tested treatments were significantly increased. The highest values recorded by Rhizobacterien and half recommended treatments compared with control.

With regard on pea all biofertilizers treatments were insignificant of their N concentration in the first and the second seasons. The results obtained by Rao et al. (1985) on chick pea, Sarig et al. (1986) on pea, Bedrous et al. (1990) on bean, Abdel Ghaffar et al. (1994) on bean, Doubey (1997) on soybean EL-Shamma (2000) on bean illustrated that N contents of seeds were significantly increased as a result of seeds inoculation with any biofertilizers. On the other hand, Hassanein (1987) concluded that the nodulation treatment showed insignificant increase in nitrogen percentages of soybean.

With respect to the interaction effect between cultivars and treatments. Bean cvs. with all treatments had significantly increased in both sesons with SI and Nebraska cvs. Moreover the interaction between pea cultivars and biofertilizers treatments gave a significant in most cases and the best treatment was Rhizobacterien, Nitrobien and Phosphorine respectively. In this respect, Hanafy et al. (1997) suggested that, addition of biofertilizers increase the ability to convert N₂ to NH₄ ion and thus make it available to plant. Moreover, Lin et al. (1983) and Sarig et al. (1984) found that application of biofertilizers increased the water and mineral uptake by plants due to increases in root surface area, root hairs and root elongation as affected by Azotobacter (Sundaravelu and Muthukrishinan, 1993) as well as Hanafy et al. (1997).

Table (13): Effect of different biofertilizers treatments on nitrogen content of bean and pea seeds (on dry matter base) in 1999, 2000 and 2000, 2001 seasons.

1				B	Bean							Ъ	Pea			
Treatments		19	1999			2000	8			2000	8			2001	[0	
	SI	Ö	Neb	Σ	SI	Ä	Neb	Σ	L.M	Veb M SI Di Neb M L.M Lin W.T M L.M Lin W.T	W.T	Σ	LM	Lin	X T	Σ
Phosphorine (Ph)	3.536	3.536 2.701 3.	3.136	3.124	3.404	3.158	3.163	3.242	4.185	.136 3.124 3.404 3.158 3.163 3.242 4.185 3.603 3.236 3.675 3.910 3.681 3.943 3.845	3.236	3.675	3.910	3.681	3.943	3.845
Rhizobacterien (Rh)	3.235	3.107	3.235 3.107 3.203 3.180 4.010 3.444 3.251 3.568 3.856 4.322 3.195 3.791 3.844 3.756 4.070 3.890	3.180	4.010	3.444	3.251	3.568	3.856	4.322	3,195	3.791	3.844	3.756	4.070	3.890
Nitrobien (Nitro)	3.570	3.570 3.151 3.	3.202	3.308	3.925	2.615	3.310	3.283	3.602	202 3.308 3.925 2.615 3.310 3.283 3.602 4.069 3.447 3.706 4.230 4.562 3.389 4.060	3.447	3.706	4.230	4.562	3.389	4.060
Half dose (Half)	4.054	2.903	4.054 2.903 3.116 3.358 3.870 3.188 3.522 3.527 4.052 3.470 4.032 3.851 3.802 4.225 3.818 3.948	3.358	3.870	3.188	3.522	3.527	4.052	3.470	4.032	3.851	3.802	4.225	3.818	3.948
Full dose (Control)	3.571	2.936	3.571 2.936 2.936 3.148 3.198 2.963 2.987 3.049 3.958 3.701 3.589 3.749 4.738 4.009 3.970 4.239	3.148	3.198	2.963	2.987	3.049	3.958	3.701	3.589	3.749	4.738	4.009	3.970	4.239
Mean	3.593	3.593 2.959 3	3.119		3.681	3.681 3.074 3.247	3.247		3.931	3.931 3.833 3.500	3.500		4.105	4.105 4.047 3.838	3.838	

L.S.D cv.,:	0.191	0.100	0,132	S.N.
L.S.D Treat.,:	N.S	0.072	N.S	0.217
L.S.D inter.,:	0.383	0.124	0.493	0.356
Cultivars (cv.)	Treatments (treat.,)	Interaction (inter.,)		

The enhancing effect of Phosphorine or Rhizobacterien or Nitrobien as a biofertilizers on some seeds chemical composition may be attributed to many factors such as:

- (1) Its ability to release plant promoting substances, mainly IAA, gibberellic and cytokinin-like substances which might be stimulate plant growth (Tien et al., 1979; Reyndets and Vlassak, 1982 and Fayez et al., 1985).
- (2) Synthesis of some vitamins, e.g., B_{12} (Mishustin and Shilnikova, 1969 and Okon, Labandera-Gonzalez, 1984).
- (3) Increasing the water and mineral uptake from the soil (Lin et al., 1983 and Sarig et al., 1984) which could be ascribed to increase in root surface area, root hairs and root elongation as affected by Azotobacter as mentioned by Sundaravelu Muthukrishinan (1993).
- (4) Increasing the ability to convert N₂ to NH₄ ion and thus make it available to plant.
- (5) Enhancing the production of biologically active fungistatical substances which may change the microflora in the rhizosphere and affect the balance between harmful and beneficial organisms (Apte and Shende 1981).

b) Phosphours content:

Results obtained in Table (14) and Fig. 5, 6 (a. b.) showed that bean cv. S1 seeds P content was significant in both seasons but Diacol and Nebraska cvs. were significantly increased only in the second season.

The effect on pea showed that Little Marvel and Lincolin cvs. was significant in P seeds content in both seasons. Such results are in harmony with that reported by *Beringer et al.* (1992), Chandra and Polisetty (1998) and Shokr (2000). They found that pea cvs. showed significant differences in their P contents.

These differences among the studied cvs. may be attributed to their genetically differences.

Recpecting the effect of biofertilizers on bean seeds P content, the results showed a significant effect in the first and the second seasons. Also, Phosphorine treatment was the best one at all.

However, treatment of pea seeds with Phosphorine, Rhizobacterien and half dose gave significant increase in the first season. The second season showed significant increase in seed P content by Phosphorine, Rhizobacterien and Nitrobien compared with control.

Such result is similar to those obtained by Radwan (1983) on tomato, Dubey (1997) and Ashour (1998) on potato tubers

Table (14): Effect of different biofertilizers treatments on the content of phosphorus of bean and pea seeds (on dry matter base) in 1999, 2000 and 2000, 2001 seasons.

L.S.D cv., L.S.D Treat., L.S.D inter., Cultivars M: mean	Mean	Full dose (Control)	Half dose (Half)	Nitrobien (Nitro)	(Rh)	Rhizobacterien	Phosphorine		Treatments		
(cv.)	0.564	0.541	0.470	0.563	0.5/3	;	0.675	IS			
0.006 0.017 0.029 Tr		0.524	0.529	0.519	0.332		0.675 0.515 0.546	Ď:	19		
)6 7 19 Treatments (treat.,)	0.524 0.503	0.541 0.524 0.472 0.512	0.470 0.529 0.490 0.496	0.563 0.519 0.524 0.535	0.5/3 0.532 0.461 0.525	0 40 1	0.546	Neb	1999		į
nis (tre:		0.512	0.496	0.535	0.523	0 620	.579	Z		Bean	,
at.,)	0.525		0.506 0418				0.551	IS		an	
0.010 0.015 0.027 Int	i i	0.504		0.540 0.420 0.512 0.491	6.13	0.403 0.490 0.524	0.551 0.550 0.543 0.548	ַם	2000		
) iteracti	0476 0.514	0.488	0.505	0.512	1	0 524	0.543	Neb	5		
10 15 27 Interaction (inter.,)		0.534 0.504 0.488 0.509	0.505 0.476	0.491		0.502	0.548	Z			
97.,)	0.575		0.573 0.484 0.545 0.534	0.578 0.497 0.442 0.300		0.543	0.584 0.493 0.537 0.538	L.M			
0.003 0.005 0.008	0.525	0.596	0.484	0.49/		0.543 0.546	0.493	LII	٠.	2000	
∞ V₁ W	0.40	0.457 0.	0.545	0.442		0.443 0.511	0.537	W. I		3	
		0.550	0.554	0.500	2	0.511	0.538	ī	5		Pea
	0.00	0.585			0 533	0.567	0.511	7.14	<u>-</u>		200
0.005 0.005 0.009	0.00	0.585 0.540 0.555	0.339 0.367 0.723	0.697	0 604	0.560	0.536		<u>"</u>	2001	
9 3 3	0.00	0.585 0.540 0.555 0.560	0.745		0.522 0.604 0.507 0.578	0.567 0.560 0555	0.511 0.536 0.575 0.541		¥ 7	2	ļ
		0.560		0.523	0 578	0.561	0.541		Z		

seeds. They indicated that using phosphorus solubilizing bacteria or Phosphorine gave the maximum value of P content.

The enhancing effect of biofertilizers on increasing P concentration in plant tissues was recorded by several investigators. They suggested that biofertilizers reducing soil pH by secreating organic acids such as acetic, propionic, fumaric and succinic acids which bring about the dissolution of bonds forms of P and render it available for growing plants (Ibrahim and AbdEL- Aziz 1977). Similar results were obtained by (Kabesh and Saber 1988) on soybean and Saber and Kabesh (1990) on lentel.

In addition, the highest value of seeds P content caused by Phosphorine treatment with S1 cv. in the two seasons. The same results were recorded on pea in the two growing seasons in which the highest values of all studied treatments was Phosphorine with Little Marvel cv. in the first season. In the same line Kabesh and Saber (1988) on soybean, Saber and Kabesh (1990) on lentel; Abd EL- Ati et al. (1996) on potato; Hewedy (1999-a) and Ouda (2000) on tomato showed that the biofertilizers increasing P concentration.

c) Potassium content:

It is obvious from data in Table (15) and Fig. 5, 6 (a. b.) showed that bean and pea cultivars differed significantly in their

Table (15): Effect of different biofertilizers treatments on the potassium content of bean and pea seeds (on dry matter base) in 1999, 2000 and 2000, 2001 seasons.

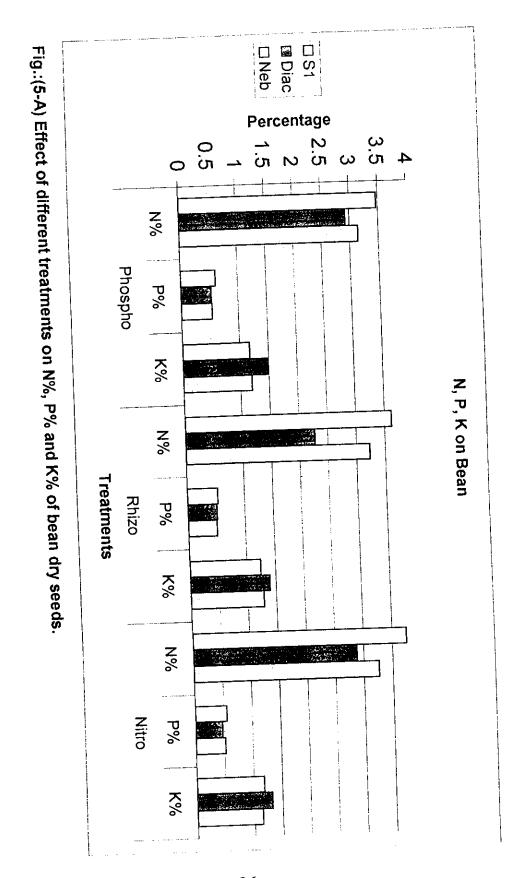
Cultivars (cv.) M: mean	L.S.D cv., L.S.D treat., L.S.D inter.,	Mean	(Control)	Full dose	(Half)	Half dose	(Nitro)	Nitrobien	(Rh)	Rhizobacterien	(Ph)	Phosphorine		Treatments			
O		1.235		1 363	1.12,	1 127	1.172	1 152	.,=.,	1 285	1 0	1 246	SI				
	0.029 0.031 0.053	1.235 1.356 1.202		1.347		1 379	1.000	1 065		1.332		1 657	Di	61			
Treatr		1.202		1 363 1.347 1.349 1.353		1 127 1 379 1 058 1 188	:	1152 1065 1144 1.120 1.199 1.575 1.152 1.309		1.332 1.333 1.317 1.187 1.457 1.222		1 246 1 657 1 128 1 128	Neb	1999			
Treatments (treat.,)				1.353		1.188		1.120		1.317		1.128	3			Bean	
treat.,)		1.20/	. T	1.332				1.199		1.187		1.097	10	2		an	
	0.014 0.032 0.055	1.440	- 1	1.363		1.519		1.575		1.457		1.324	ולו		2000		
_		1.67.1		1.293		1.318		1.152		1.222		1.269	1460		3		
Interaction (inter.,)				1.332 1.363 1.293 1.329		1.222 1.519 1.318 1.353		1.309		1.289		1.097 1.324 1.269 1.230 1.175 1.199 0.974 1.116	1	≤			
ion (int		1.10	1 167			1.105		1.191 1.065		1.144 1.063 1.097 1.101		1.175		 			
ter.,)	N.S 0.062 0.107		1 167 1 137 1 118	1.218 1.152 1.097 1		1.105 1.206 1.081		1.065		1.063		1.199		Ę.	2000		
			1118	1.097		1.081		1.340 1.		1.097		0.974		T.W	8		
				1.156		1.131	' i	1.199		1.101		1.116		X.		rea	J .
	000		1.212	1.097						1.377		1.128		Z			,
	0.032 0.030 0.052			1.081		1.246		1.034	.	1.097	.	1.347		Lin W.T	2001		
			1.161 1.213	.156 1.097 1.081 1.316 1.165		1.191 1.246 1.246 1.228	1 7 4 6	1.269 1.034 1.130 1.144		1.377 1.097 1.175 1.216		1.128 1.34/ 1.199 1.223		W.T	10	:	
				1,165		977.1	1 220	1.144	1 1 4 4	1.216		277.1	2	Z			

K content. The results of the bean different cvs. showed that S1 cv. was significant in the first season and Nebraska cv. in the second season but the Diacol cv. gave significant increase in seeds K content in both seasons.

With regard to pea the cvs. were non significant in the first season but in the second season Little Marvel and Wever Top cvs. were significant in K content. These results coincided with those of Beringer et al. (1992), Warkentin et al. (1997) and Mohamed and EL- Kabbany (1999). Concerning the effect of biofertilizers on K content of bean all treatments gave significant increase on K content in both seasons except the Nitrobien treatment in the first season and Phosphorine in the second season. These results are in harmony with those of Silveira and Cardoso (1987), and EL- Shamma (2000). They observed that biofertilizers inoculation of bean showed significant increase in K content. On the other hand, Rodelas et al. (1999) indicated that the K concentration (%) was significantly lower with Azotobacter and Azosopirillum inoculation.

The interaction between cultivars and biofertilizers on bean showed significant increase in K content when seeds inoculated by the studied treatments.

These results are true with the three cultivars in both seasons except the half recommended with Nebraska cv. in the first season and Phosphorine with S1 cv. in the second season.



-86-

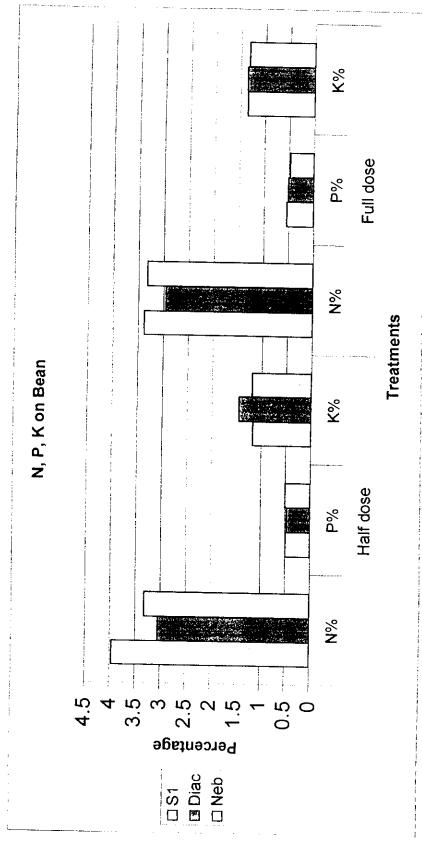
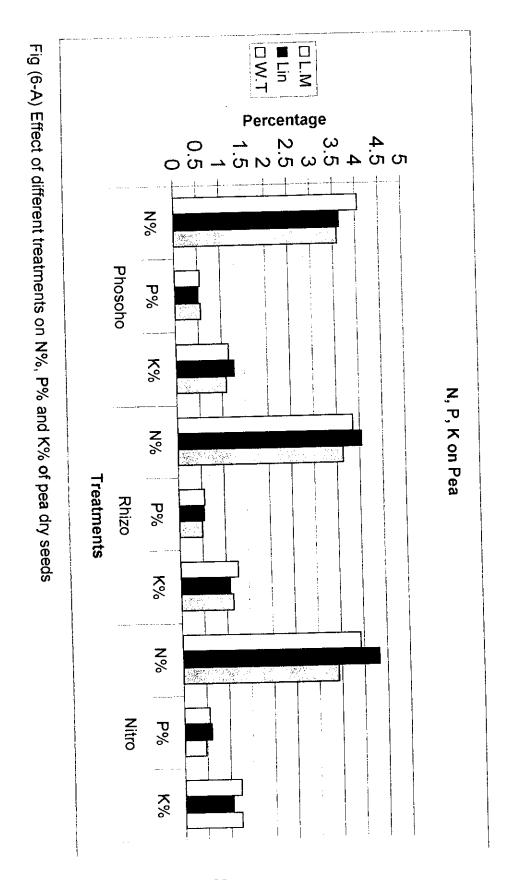


Fig.:(5-B) Effect of different treatments on N%, P% and K% of bean dry seeds.



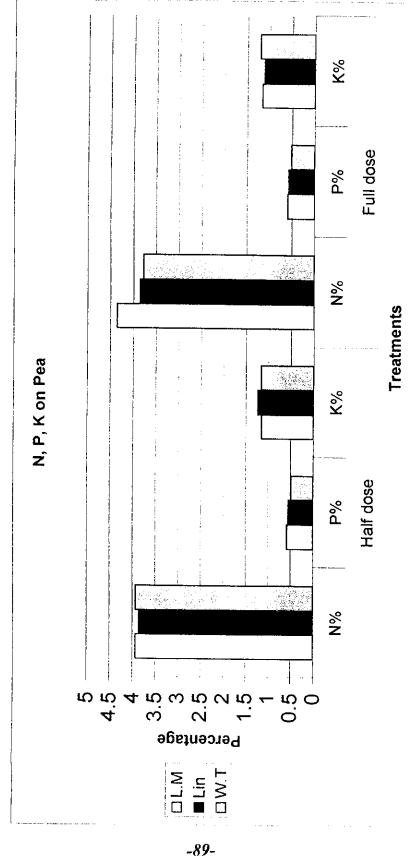


Fig (6-B) Effect of different treatments on N%, P% and K% of pea dry seeds

However on pea the Little Marvel cv. had a significant with all treatments in the two seasons but the highest significant increase in K content obtained by Rhizobacterien with Little Marvel cv. in the second season. These results are in agreement with those obtained by Silveira and Caradoso (1987) and EL-Shamma (2000) on bean. They reported that the K content of bean seeds significantly increased with Rhizobium, Mycorrhiza and Phosphorine inoculation.

4-3-6- Free amino acids and Total phenolic compounds: a) Free amino acids:

Data in Table (16) indicated that the S1 cv. and Nebraska cv. of bean were more responsive to the biofertilizers for free amino acids percentage in both seasons. However both Little Marvel and Lincolin cvs. of pea had a significant effect in the first and the second seasons.

With respect to the biofertilizers the results showed a significant effect on free amino acids content in the two seasons. The results on bean showed that the Phosphorine and Rhizobacterien were significant in the first season only, while the Nitrobien significantly increase the total free amino acids in both seasons. On the other side, results on pea showed that Phosphorine, and Rhizobacterien treatments gave a significant

Table (16): Effect of different biofertilizers treatments on free amino acids (%) of bean and pea seeds (on dry matter base) in 1999, 2000 and 2000, 2001 seasons.

					Rean											
Treatments			0.00	3	Call							Ω,	Pea			
		15	1990			7	2000			۲	2000					
	SI	Ä	Neb	Σ	SI	ā	Seg.	Σ	2	1 :	F				7007	
Phosphorine	4.879	9.244	4.527	6.217	6.515	1 432	3.830	1 933	201.9		W . I	Z.	Ξ	rın	W.T	Σ
(f.11)									0.7.20	0.774	5,6,5	6.65.0	6.356	6.884	5.496	6.245
Knizobacterien (Rh)	3.102	¥80'§	7.345	5.177	2.998	6.308	8.289	5.865	2.318	1.485	5.531	====	4.076	3.238	5.523	4.279
Nitrobien	8 129	3 168	1551	5 393	121 01	1 2 2			- 1							
(Nitro)		000	CCC:	5.00	10.47	5.311	4.933	6.905	5.248	0/9.41	5,469	8.462	4.543	7.519	5,485	5.849
Half dose (Half)	3.382	3 210	4.859	3.817	5.978	6.262	4,427	5.556	2.526	9.311	3.055	4.964	1.527	3.051	3.012	3.530
Full dose (Control)	2.557	3.169	5.649	3.792	11.785	6.148	8.000	8.641	13.692	6.327	8 070	9 366	701 2 113 21	101.7	1	
Mexica												20	16.0.	0.107	1.9.1	9.210
Mean	1.410	4.201	5.387		7.549	5.696	5.896		6.116	8.357	5.602		6.623	5.360	5,485	
L.S.D cv., L.S.D treat., L.S.D inter.,		0.654 0.898 1.556			1 27 27	1.188 1.056 1.829			0.996 0.861 1.491	96 51 71			0.510 0.727 1.259	0 7 0		
Cultivars (cv.) M: mean		H	Treatmen	ents (treat.,)	at.,)		Inte	Interaction (inter.,)	ı (inter.	÷						

differences in the two growing seasons, but the Nitrobien gave the same results in the second season.

Data reveal that the studied cultivars differ significantly in their total free amino acids content due to biofertilizers treatments. The bean cv. Nebraska with Rhizobacterien treatment had the higheast value of total free amino acids content and S1 cv. with Nitrobien in the first and the second seasons.

In addition, on pea the highest concentrations of free amino acids recorded by Lincolin cv. with the Nitrobien treatment in the two seasons respectively the obtained results are confirmed with those of *Pacovesky (1989)* on soybean and *Pacovesky and Fuller (1991)* on bean, they indicated that the inoculation with nitrogen fixing bacteria or endomycorrhizal fungi significantly increased the total free amino acids content in dry seeds.

b) Total phenolic content:

Data in Table (17) demonstrated that there were insignificant differences in total phenolic content of bean seeds in the first and the second seasons. However, pea cv. Wever Top gave a significant with slightly differences than Lincolin cv. and Little Marvel cv. in the first season only.

With regard to the inoculation with the tested biofertilizers treatments they did not differ significantly from control

Table (17): Effect of different biofertilizers treatments on total phenolic content (%) of bean and pea seeds (on dry matter base) in 1999, 2000 and 2000, 2001 seasons.

			0.71	0.70	0.70	0.70	0.69		
	2001	10	0.70	0.71	0.72	0.70	0.67	0.70	
),	1	0.72	0.68 0.71	0.68 0.70	0.69 0.71	0.69	0.71	
Pea		1	0.70	0.68	99.0	0.69	0.71	0.69 0.71	0.1%
		2	0.69 0.69	99.0	0.70	0.69	69.0		
	2000	F ≥	1	0.70 0.68	0.70	0.71 0.69	0.71	0.70	
	20	-	1 -	0.67 0.67	0.69 0.70 0.70 0.70	0.68	0.67	0.68	0.013
		Z	0.70	0.67	69.0	69.0	0.68	69.0	C
		Z	0.67	0.66	0.66	0.67	99.0		
	2000	Seb	0.68	0.67	0.66 0.63 0.66	0.71	1	0.67	
	20	ā	0.65	0.66 0.67 0.66	99.0	0.65 0.66 0.71 0.67	0.65 0.67 0.67	99.0	S.
Bean		IS	99.0	99.0	99'0	0.65	0.65	99.0	Z
Ä		M	69.0	69.0 29	0.68	0.68	0.70		
	1999	Neb	0.71	0.67	99.0	0.71	0.71	0.70	
	15	Ğ	0.70 0.67	0.71 0.68	0.69 0.66 0.68 0.68	89'0 99'0	0.70 0.70 0.70	0.69 0.68 0.70	S
		SI	0.70	0.71	69.0	0.66	0.70	69.0	
!	Treatments		Phosphorine (Ph)	Rhizobacterien (Rh)	Nitrobien (Nitro)	Half dose (Half)	Full dose (Control)	Mean	L.S.D cv.,

N.S N.S 0.029	
0.013 N.S N.S	Interaction (inter.,)
N.S N.S N.S N.S N.S	Treatments (treat.,)
L.S.D cv., L.S.D treat., L.S.D inter.,	Cultivars (cv.) M: mean

- *93* -

treatment. These findings were true in both seasons of experimentation on bean and pea.

The interaction effect between bean cvs. and the studied treatments was non-significant in the two seasons.

On the other hand the pea cvs. Lincolin and Wever Top gave a significant increase in total phenolic content with all treatments but the Little Marvel cv. was significant with Phosphorine treatment only.

This result was true just in first season, while in the second season there was no-significant at all.

4-3-7- The determination of protein subunits molecular weight by using SDS-PAGE:

Polyacrylamide gel electrophoresis in the presence of detergent sodium dodecyl sulphate (SDS-PAGE) was used for determining the subunit molecular weight of the protein extracted by NaOH alkali solutions from both varieties.

The pharmacia low molecular weight (LMW) calibration kit provides six protein standards covering subunits M.W. ranging from 14.4 to 94 KD was used for constructing the calibration curve. The relative mobility (Rm) of each protein standard calculated from Fig (7) and its molecular weight are shown in Table (18).

The SDS- PAGE polypeptide patterns of the over all polypeptides in seed varieties together with standards are shown in Fig (8, 9) and Table (19, 20).

Data in Fig (8) and Table (19) showed that bean proteins dissociate into 12 subunits with molecular weights (M.W) ranging from 79 to 14 KD.

In addition all subunit with MW 27 KD was detected in seeds of the Phospho., Rhizo., Nitro. inoculated, but the inoculated seeds in Rhizo and Nitro showed more strong intensity band than other treatments.

Data in fig (9) and table (20) showed that pea protein dissociate 11 subunits with molecular weights (M.W) ranging from 82 to 15 KD. An additional subunit with MW of 25 KD was detected in seeds Rhizo and Nitro inoculated, also both treatments showed more strong intensity band than other treatments. These results are in agreement with those reported by *EL-Sayed et al.* (1990).

Table (18) The molecular weights of the standard protein and their relative mobilities:

	Molecular		Relative
Standard proteins	weight	Log M.W.	mobility
_	M. W.		(Rm)
Phosphorylase b	94000	4.973	0.18
Albumine	67000	4.826	0.26
PV albumine	43000	4.633	0.45
Carbonic	30000	4.477	0.56
anhydrase	20100	4.303	0.74
Trypsin inhibitor	14400	4.158	0.84
Lact albumine			

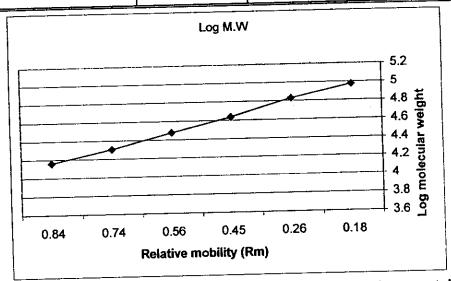
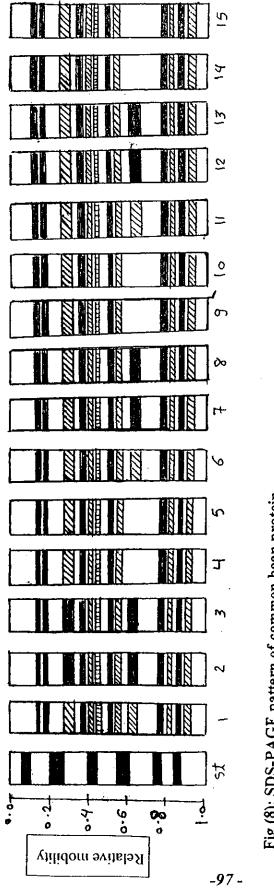


Fig (7): Calibration curve for M.W determination protein subunits of by SDS-PAGE.



7 1 S (0): 0	1-50	18 (9): SDS-1 AGE pattern of common bean protein
SI	٠.	S
Diacol		6-10
Nebraska	٠.	11-15

Phospho: Rhizo Nitro Half Full

Table (19): Molecular weights of bean protein subunits

13	12	<u></u>		10	9)	∞	7	6	ć	л	4	ζ	N.	2	_		Band	1	
14	- 15		16	17	17	3	ယ 1	33	43	. ;	<u>۲</u>	59	. 6	y V	77	/9	3	-		
14	Ü	'n	16	17	1.7	7	31	33	43	, (53	59	, (ر د	77	19	3	2		
14	: :	1	16	1 /	. ^	7	31	33	£	֓֞֞֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓	53	59	3 3	65	77		70	ω	Si	
14	: :	-1 -5	16	1/	រំ '	ı	31	<u> </u>	ť	້	53	9	3	දු	77	1 3	70	4		
14	: ;	<u>~</u>	16		1	•	3	33	3 5	<u>ئ</u>	53	7	20	65	//	; ;	79	cr		
1.1		<u>~</u>	10	; ;	17	27	3	33	3 6	43	53	7	ò	65	: 7	;	79	6		
1	1 7	5	10	; :	17	27	31	2		43	5	3 6	Š	65	` -	1	79	7		
1	14	5	. *	፲ :	17	27	31	ָ נ	بر نا	43	ű) (5 9	g	` `	7	79	°	9 5	<u> </u>
:	14	5	: 7	ָה ה	17	•	10	ي ر - ر	بر ند	43	Ü	h !	59	9	, .	77	79			
	14	Ü		5	17	1	٠	3 !	ယ ယ	43		<u>۲</u>	<u>59</u>	5	γ.	77	79	3 2	5	_
	14	Ü	16	16	17	17) t	<u></u>	33	43	, ,	<u>ئ</u>	59		λ Λ	77	79	3	=	
	14	נ	1.5	16	17	1.7) (L	<u>.,</u>	33	4	; ;	53	59	; ;	Ç,	77	14	3	12	
	14	į	بر 	16	17	•	77	31	33	45	້ວ	53	9	3	65	77	77	20	디	Neb
	14		<u>,</u>	16	17	ì	•	<u>5</u>	33	ť	3	5 3	37	'n	65	77	1	70	14	
ļ	14	: ;	15	16	-	i 	·	31	33	: d	Δ.	53	77	6	65	77	; 	79	15	

Treatments:
Phospho : 1, 6, 11
Rhizo : 2, 7, 12
Nitro : 3, 8, 13
Half dose : 4, 9, 14
Full dose : 5, 10, 15

-98-

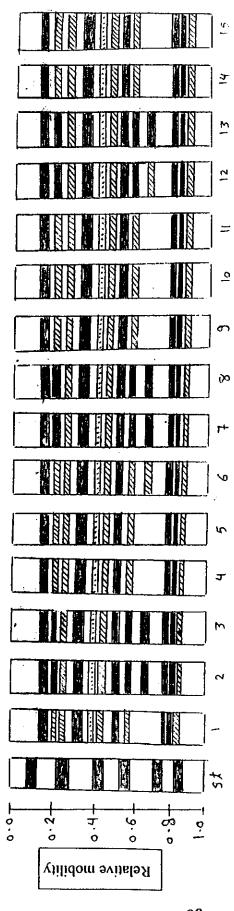


Fig (9): SDS-PAGE pattern of pea protein

1-5	6-10 11-15	
Little Marvel:	Lincolin : Wever Top :	

Phospho: 1, 6, 11
Rhizo: 2, 7, 12
Nitro: 3, 8, 13
Half: 4, 9, 14
Full: 5, 10, 15

Table (20): Molecular weights of Pea protein subunits

12	. 1		10	9		 >>	-	0	`	S	4	1	رب د	2	-			Rand		
U		17	- 18	,		30	34	ť	<u>.</u>	59	0		73	77	10	0)	1			
15	1 -	1	8	72) h	30	34	. t	ລ	59	5	77	73	11	1 6	83	2	11177		
-	7 .	17	×	, ,	'n	30	34	, i	Δ 3	59	5 6	y	73	//	3 6	3	ر	Titlic Ivini	Mar	
[<u>ገ</u> ነ	7	ĭ	.	•	30) (43	99	3 6	<u>ک</u>	73		70	83	1		ر <u>ک</u>	
;	<u>→</u>	17	10	10	•	30	, t	ن حد	43	9	5 5	65	73		11	82 	0	^		
		<u>.</u>	1 /	1		٥) (بر 4	43	77	6	8	13	3 -	77	82	١	\^		
	15	17		×	25	Ö		بر 4	43	; ;	70	65	73	3 :	77	20	3	7	_	
	15	1/	<u>,</u>	18	25	, 0	3 ·	3 4	43	; ;	40	65	ì	73	77	20	3	∞	incolin	
	15	1/	<u>.</u>	 ∞	•	Ç	ب 10	3 4	43	֓֞֞֝֞֝֓֞֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓	5 9	9	ì	72	77	20	S	9		
	15	1	1	18		ţ	٥	34	ť	3	59	8	6	73	77	7	3	10		
	15		1,7	18	1	,	30	34	ţ	<u>~</u>	59	ç	7,	73	77	6	8	11		
	15		17	18	63)	30	34		43	59		Y.	73	77	1	8	12		Wa
	5		17	18		7	30	34		4 3	59	5 6	25	73	77	2	82	13	3	ver 1
	15	<u>,</u>	17	×			30	34	. ·	43	9	3 5	65	73	11	ĭ	82 22	14		ð
	5						30													

Treatments:

Phospho : 1, 6, 11

Rhizo : 2, 7, 12

Nitro : 3, 8, 13

Half dose : 4, 9, 14

Full dose : 5, 10, 15

4.3.8. Effect of inoculation seeds on trypsin inhibitor activity and protien digestibilty Index:

The results concerning the effect of different inoculation on the trypsin inhibitor activity and protein digestibilty index are presented in Table (21, 22) and Fig. 10, 11, 12, 13. The results indicated that the inoculation of seeds with Rhizo and Nitro increased the trypsin inhibitor activity than the other treatments consequently decreased the protien digestibilty Index.

Common bean is one of the dry legumes which their trypsin inhibitor activity (TIA) is high. The bean TIA range between 7.10 mg/g in Diacol cv. and 10.64 mg/g in S1 cv. Fig (10). Although the first had the highest digestibility index 75.96% and the second had the lowest digestibility index 74.00% Fig (11) and Table (21).

On the other hand, the effect of different treatments on TIA and digestibility index on common bean dry seeds is different and phospho treatment showed the lowest TIA and the highest digestibility index in different bean cultivars.

On the other hand, pea cvs. showed that their trypsine inhibitor ranging between 2.23 mg/g in Wever Top cv. and 2.96 mg/g in the Lincolin cv. fig (12) and Table (22). Due to the reverse relation between trypsin inhibitor activity and protein digestibility. The results indicated that Wever Top cv. with lower trypsin inhibitor activity had the higher protein digestibility

index 77.6% while the other (Lincolin cv.) had the lower one (75.12%) Fig (13) and Table (22).

Although the effect of different treatments on TIA and digestibility index on pea dry seeds is not pronounced.

Table (21): Effect of inoculation on trypsin inhibitor (TI) and protein digestbility index of bean dry seeds.

Seeds	Common bean										
		S1	I	Diac	Neb						
_ \	TI mg	digestibility	TI mg	digestibility	TI mg	digestibility					
Treatments	/g	%	/g	%	/g	%					
Phospho	9.49	74.68	7.10	75.96	8.14	75.50					
Rhizo	9.72	74.64	8.18	75.50	8.45	75.40					
Nitro	9.75	74.62	8.40	75.40	8.41	75.40					
Half dose	10.64 74.00		7.68	75.80	8.13	75.50					
Full dose	9.51	74.80	7.78	75.70	7.82	75.00					

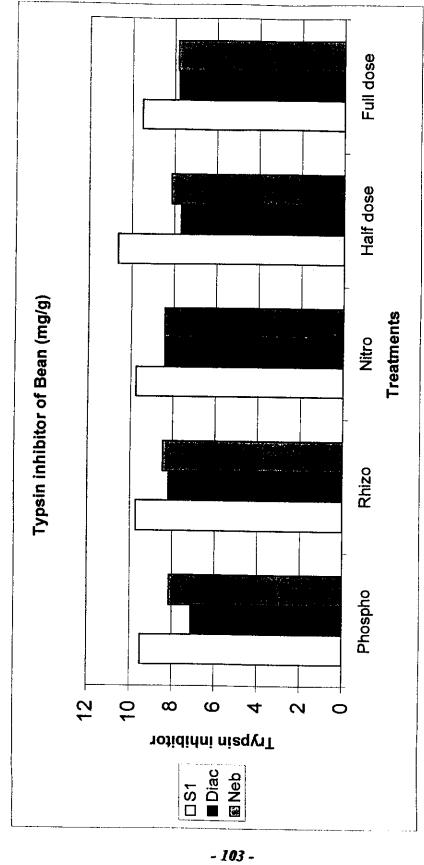
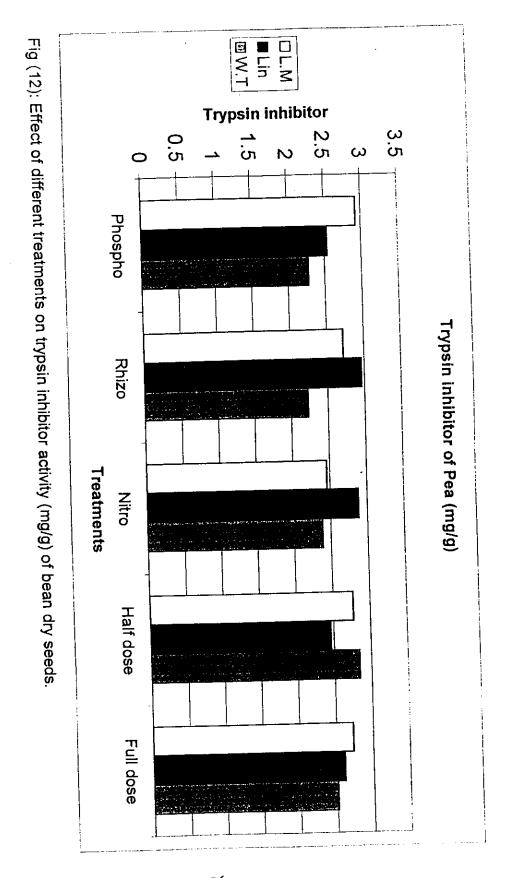


Fig (10): Effect of different treatments on trypsin inhibitor activity (mg/g) of bean dry seeds.

Neb □S1 ■Diac Fig (11): Effect of different treatments on digestability index of bean dry seeds. Digestibilty 76.5 73.5 75.5 73 Phospho Digestability % of Bean Rhizo e removale vis Treatments Nitro Half dose Full dose

Table (22): Effect of inoculation on trypsin inhibitor (TI) and protein digestability index of pea dry seeds.

Seeds	Pea										
	<u> </u>	L.M		Lin	W.T						
Treatments	TI mg	digestibility	TI mg	digestibility	TI mg	digestibility					
Treatments	/g	%	/g	%	/g	%					
Phospho	2.93	75.3	2.54	76.8	2.28	77.5					
Rhizo	2.72	75.9	2.96	75.12	2.23	77.6					
Nitro	2.46	76.9	2.88	75.18	2.39	77.3					
Half dose	2.77	75.5	2.46	76.9	2.48	75.9					
Full dose	2.73	75.8	2.61	76.50	2.51	76.8					



-106-

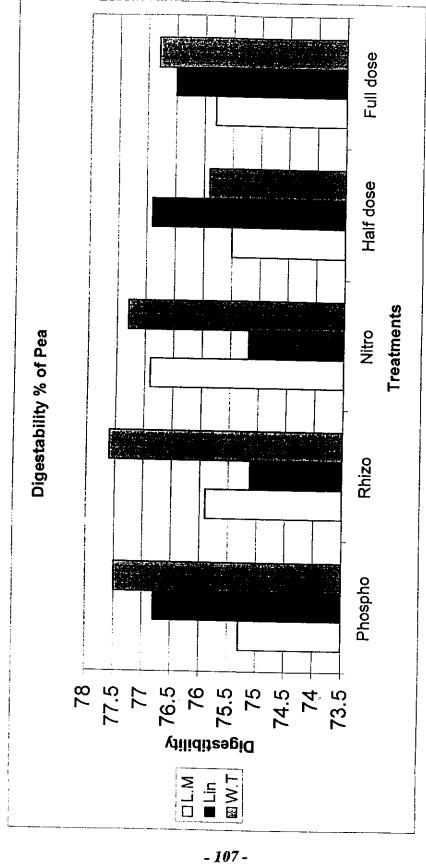


Fig (13); Effect of different treatments on digestability index of pea dry seeds