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Foliar application of amino acids and bio fertilizer promote execution of broad bean plant (*Vicia faba* L) under newly reclaimed land conditions.

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Abstract : Two experiments were achieved through winter season of 2012/2013 and 2013/2014 at the experimental station of the National Research Centre at Nubaria zone, (North Egypt) to search the echo of broad bean plants to foliar application of different concentration of amino acid (Amino mix) at 1%, 2% and foliar spraying with water together with pollination by N-fixers bacteria (piogen) at 1kg/fed, 2kg/fed. and without bio-fertilizer and interaction effect for leverage plant growth, total pods yield and its components as well as seeds feeding value of broad bean plants c.v. Koprosay. These treatments were laid out in split plot styling configuration with three replications. The concise results obtained from this field search that:
1- Foliar application by high concentration of amino mix (2%) significantly improved the most plant growth characters, total yield and its components as well as the seeds contents of the percentage of N, protein, P and K followed in descending order by that plants spraying by 1 % followed with the control treatment (foliar spraying with water).
2- Inoculated broad bean plants by highest level of N-fixing bacteria (piogen) (2 kg/fed.) significantly exceed vaccinated by low level (1 kg/fed.) and without inoculated (control) in plant length, number of shoots and leaves/plant, fresh and dry weight of plant and pod characters (length and wide), number of pods/plant, total yield (ton/fed.) and weight of 100-seeds as well as the content of N %, protein %, P % and K% in seeds tissues.
3- The interaction among bio-fertilizer and foliar application of amino mix generated no significant variance except plant length, number of leaves plant and total pods yield as well as K% in seeds tissues in both seasons and fresh weight of stems, N% and protein% in first season only.
Key words: broad bean plants- impregnation by N-fixing- amino mix concentration- growth-yield- nutritional status.

Introduction

In most improve region, broad bean are often an complete part of agricultural ecosystems. Broad bean (*Vicia faba* L.) c.v. Koprosay is one of the most substantial legumes in Mediterranean agricultural zone. In Egypt it is consumed in great amount as human food.

Amino acids are participatory in the compilation of other organic compounds, such as amines, alkaloids, vitamins, enzymes and protein[1]. It is the essential active ingredients for the fashion of protein compilation and exceedingly employs for the biosynthesis of vitamins, coenzymes, pigments, purine and pyrimidine ground[2]. Concerning to the advantageous belongings foliar spraying of amino acids, many investigator have notify that, the valuable effects of amino acids to improved growth and yield for all crops.

Concerning 20 serious amino acids are contributory in the mode of each action[3]. Some researchers indicate the interest of amino acids in increasing growth, yield and chemical synthesis of some frugal plants. [4] splash garlic plants with a mishmash of glycine, alanine, cysteine and arginine (each at 100 ppm) or with 100 ppm of cysteine alone gave significant increases total yield overhead the control by (13.96 % and 13.66 %) and (14.40 % and 16.65 %) in the first and second seasons, respectively. Commercially ready amino acid stimulus can increase fertilizer absorption, improve uptake of nutrients and water, promote the photosynthetic average and dry matter fractionate, and for this reason increase crop yield. Many Studies have been confirm that amino acids can directly or indirectly affect the physiological performance in plant growth and expansion. In addition, [4] on garlic [3] on potato, [5] on squash and [6] on onion reported that foliar purpose of amino acids occasion an increase in plant growth, fruit yield and ingredient. In the same respect, [7] inform that, foliar spraying of pea plants with mishmash of amino acid at 100 ppm significantly improved plant growth characters, total pods yield and pods goodness.

Piogen has high amounts of symbiotic and non-symbiotic bacteria, which were responsible for fixation of N by atmosphere. The application of N fixing bacteria (Piogen) produced the following advantage as reported by [8]: (a) decrease the value of mineral N by 25%. (b) Increasing the accessibility of all nutrients by plant. (c) enhance the opposition of plant to root diseases and decrease the environment pollution created by the application of chemical fertilizers. The effect of inoculation of broad bean seeds with these bacteria for improving plant growth, total yield and enrichment. (Piogen) increased the nutrients crowd microorganisms which help in accessibility of metals and increased levels of extractable minerals [9]. Also, they added that, fixation of N bacteria crowd the efficiency to bring insoluble N in soluble forms filtrate organic acid. Such acid reduce the pH and fetch about the degradation of chains forms of N and play then ready for growing plants. However, [10] found that inoculated Lupin plants by N fixing bacteria significantly exceed un inoculated ones in, plant height, number of branches and pods/plant, seed yield /plant,100-seed weight and seed yield/fed as well as pods weight/plant, number of seed/pod, seed N content % but seed protein content % were not affected by inoculation. The inoculation of legumes seeds crops with N-fixing bacteria led to variation and develop plant growth and yield[11,12,13,14,15,16,17.]

Materials and Methods

This study was carried out at the experimental station of the National Research Centre, Beheira Governorate (north of Egypt), during the two winter seasons of 2013 and 2014 to investigate the effect of inoculation with N-fixers bacteria (Piogen) with foliar application of different level of amino acid (Amino- mix) for influence plant growth, total yield and its components as well as nutrition value of seeds in broad bean plants (*Vicia faba* L) c.v. Koprosay.

Piogen produced by Ministry of Agriculture. The chemical constituents of Amino-mix were shown in Table (1).

Table (1): The chemical composition of amino acid (Amino- mix).

Elements ($g/100cm^3$)	Value	Amino acid	Value	Amino acid	Value	Vitamin ($mg/100cm^3$)	Value
Zn	2	Aspartic	249	Methionine	180	B1	0.8
Fe	1.5	Thiamine	45	Isolucine	52	B2	2.4
Mn	0.50	Serine	56	Therionine	38	B6	1.2
Mg	0.004	Glutamic	55	Lalanine	22	B12	0.82
Cu	0.004	Glysine	50	Histidine	12	Folic	4.2
Ca	0.025	Alanin	100	Lucine	40	Pantothinic	0.52
Br	0.056	Praline	38	Arginine	20	Niacine	0.14
S	0.010	Valine	68	Tryptophan	20	Ascorbic	1.00
Co	0.03	cystein	44	-	-	-	-

The experimental trails were conducted in sandy soil using drip irrigation system. Chemical analysis and physical properties of experimental soil are shown in Table (2).

Table (2): The physical and chemical properties of the experimental soil.

Physical properties							
Sand		**Clay**	**Silt**	**Texture**	**F.C. %**	**W.P. %**	
90.08		9.26	0.66	Sandy	16.57	5.25	
Chemical analysis							
E.c. M/m	**pH**	**Meq/ L**					
		Ca	**Mg**	**Na**	**K**	**Hco_3**	**Cl**
1.7	2.8	7.02	0.527	0.982	0.31	1.30	0.566

Every experiment included 9 treatments which were the combinations between two levels of N-fixers (Piogen) at rate of (1 kg/fed and 2 kg/fed.) plus control treatment without bio-fertilizer with foliar spray of two levels of amino acid (Amino-mix) at rate of (1 % and 2 %) plus control treatment (foliar spraying with water). broad bean seeds were sown on 15 and 22 of October in 2013 and 2014 seasons respectively. The experimental design was split plot with 3 replications, where the amino acid treatments were assigned in the main plots and bio fertilizer treatments were devoted within the subplots. The experimental plot area was 10.5 m2 and included 5 rows (each was 3.5m length and 60 cm width) and the distance between plants was 10 cm. The normal cultural practices i.e. irrigation, fertilizer and pest control for the broad bean plant productions were followed. The inoculation by bio fertilizer Piogen was added at sowing date. However, foliar spraying of amino-mix was achieved after 20 days from sowing date, every 10 days intervals for three times. Plant samples were taken 60 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 and shoots 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 (cm), width (cm), weight (g), number of pods/ plant, number of seeds/pod and 100 seeds weight (g) were recorded. At the same time, chemical analysis i.e. the percentage of N, P and k contents in dry seeds were determined according to the methods of [18,19,20] respectively. But the percentage of crude protein was determined according to [21].

All obtained data were subjected to the statistical analysis and means were compared according to LSD at 5% level test described by [22.]

Results and Discussion

Growth characters:

1- Effect of amino mix levels:

The results in Table (3) predominately specific that, foliar sprinkle with amino mix for all concentration confer the maximum significant growing in plant growth individuality expressed as plant height (cm), number of leaves and stems as well as fresh and dry weight of plant compared without amino mix sprinkle (water). However, foliar sprinkle of amino mix at high concentration (2%) significantly increasing plant growth characters of broad bean plants followed in descending order by that plants sprinkle by amino mix at (1%) followed by foliar spraying with water (control). Moreover, most of plant growth characters except number of stem plant and dry weight of plant significantly improved between high and low concentration of amino mix. These preceding data were right in both empirical seasons. It could be concluded that, amino mix can directly or indirectly leverage the physiographic activities of the plant. Also, amino mix have action as chelating action on micronutrients, while utilized with each other with micronutrients, the assimilation and transportation of micronutrients internal the plant is easy[1]. Also amino acids are basis active ingredients in the operation of protein structure [6]. Identical conclusion record by [23,24,25] found that, amino acid mix reflected the highest values for plant growth of legume plants.

2- Effect of bio fertilization:

The results explain in Table (3) for effect of the calculated bio-fertilizer treating on broad bean plant growth characters i.e., plant height (cm), number of leaves and stems as well as fresh and dry weight of whole plant. However, increase the concentration of bio-fertilizer significantly increased all plant growth characters of

broad bean plants compared without bio fertilizer. These results were correct in both seasons. Lately, using high level of bio fertilizer significantly improved broad bean plant growth characters except dry weight of stem in tow experiments and number of stem on the first season only compared low level. These notability may be refer to the microorganisms inoculation, in the first place, fortified the rhizosphere with these bacteria. Furthermore, the microbial inoculation catalyze plant growth each directly, by output plant hormones and ameliorative nutrient uptake, or indirectly, by inconstant the microbial equation in rhizosphere in advocacy of the profitable microorganisms [26]. Otherwise, N bio-fertilizer bacteria (Piogen) promote the plant growth by N-fixing in the plowed soil and participate some growth hormone reseed as gibberellins, auxins and cytokinins[27]. Recently, this useful action was convenient with those obtained with [8,10,11,12].

Table (2): Effect of amino tic levels and nucleation of bio fertilizer foliar spraying on growth characters of broad bean plant during 2013 and 2014 seasons.

Amino acid levels %	Bio fertilizer levels (kg\fed)	2013 season							2014 season						
		Plant length (cm)	No. of plant		Fresh weight (g)		Dry weight (g)		Plant length (cm)	No. of plant		Fresh weight (g)		Dry weight (g)	
			leaves	stem	leaves	stem	leaves	stem		leaves	stem	leaves	stem	leaves	stem
0	0	15.67	7.33	2.00	23.48	10.00	3.35	1.42	14.33	7.00	2.00	22.58	12.00	3.14	1.71
	1	16.00	8.33	3.00	25.22	16.00	3.60	2.34	16.33	8.00	2.67	24.60	13.00	3.53	1.85
	2	16.67	9.67	3.00	26.04	16.50	3.72	2.41	17.33	9.33	3.33	26.17	13.33	3.74	1.90
mean		**16.11**	**8.44**	**2.67**	**24.92**	**14.17**	**3.56**	**2.05**	**16.00**	**8.11**	**2.68**	**24.45**	**12.78**	**3.47**	**1.82**
1 %	0	17.67	9.00	3.00	25.56	13.00	3.65	1.86	18.67	8.67	4.00	26.83	14.33	3.83	2.05
	1	23.33	12.67	4.00	27.14	17.60	3.87	2.51	21.33	12.33	4.17	27.60	15.33	4.18	2.17
	2	24.00	16.00	4.17	29.30	18.00	4.19	2.57	23.67	15.67	4.50	28.70	16.33	4.09	2.32
mean		**21.67***	**12.56***	**3.72***	**27.33***	**16.20***	**3.90***	**2.31***	**21.22***	**12.22***	**4.22***	**27.71***	**15.33***	**4.03***	**2.18***
2 %	0	19.33	18.33	3.33	27.17	14.00	3.88	2.00	24.33	18.00	4.00	29.52	18.00	4.24	2.27
	1	23.87	20.67	3.67	29.25	22.27	4.01	3.18	25.67	20.33	4.33	30.83	19.33	4.41	2.74
	2	24.90	23.67	4.17	30.08	22.68	4.30	3.45	27.00	23.33	4.83	32.05	22.33	4.58	2.79
mean		**22.70****	**20.89****	**3.72***	**28.83****	**19.65****	**4.06***	**2.88****	**25.67****	**20.56****	**4.39***	**30.80****	**19.89****	**4.41***	**2.60****
Average	0	17.56	11.56	2.78	25.40	12.33	3.63	1.76	19.11	11.22	3.33	26.31	14.78	3.74	2.01
	1	21.07*	13.89*	3.56*	27.20*	18.62*	3.83*	2.68*	21.11*	13.56*	3.72*	27.68*	15.89*	4.04*	2.25*
	2	21.86**	16.44**	3.78*	28.48**	19.06**	4.07**	2.81*	22.67**	16.11**	4.22**	28.97**	17.33**	4.14**	2.34*
LSD at 5% levels	Amino.	**0.58**	**0.97**	**0.21**	**1.28**	**0.65**	**0.24**	**0.09**	**1.32**	**0.96**	**0.28**	**1.03**	**1.86**	**0.24**	**0.15**
	Bio-fert.	**0.55**	**0.59**	**0.23**	**0.50**	**0.69**	**0.10**	**0.14**	**0.41**	**0.58**	**0.32**	**0.33**	**0.36**	**0.09**	**0.18**
	Interact.	**0.95**	**1.02**	**NS**	**NS**	**1.20**	**NS**	**NS**	**0.71**	**1.03**	**NS**	**NS**	**0.62**	**NS**	**NS**

3- Effect of the interaction:

The result on Table (3) reflected that the application of high level of amino mix (2%) and high level of bio fertilizer (2kg/fed.) produced the high broad bean plant growth characters compared other treatments in both seasons. Moreover, the statistical analysis of the obtained data discoverd that the divergence within different concentrations of bio-fertilizer with foliar spraying of amino mix treatments were not suitable to reach the 5% level of significant on plant growth individuality except plant length, number of leaves/plant and fresh weight of stems on both seasons.

Total yield and its composition:

1- Effect of amino mix levels:

Data registered in Table (4) private that total pods yield (ton/fed.) of broad bean plants are affected by different amino acid mix treatments. Whereas, the biggest total pods yield (ton/fed.) of broad bean plants and its component expressed as (pod length, pod wide, pod weight, number of pods\plant and weight of 100 seeds) were acquired significantly excess with high concentration of amino mix at (2%) pursue in downhill order by that plant spraying low level (1%) pursue by control treatment. These returns were correct in jointly experiential seasons. Furthermore, distinction in total pods yield/fed. amount to 54.73 % and 29.36 % respectively in first and second seasons compared control treatment. The statistical analysis during various treatments was big suitable to reach the 5% level, except weight of 100 seeds in the first season. However, using the highest level of amino mix (2%) significantly increased most characters of physical pod of broad bean plants compared low level (1%). On the other hand, physical pods characters e.i. (pod length, wide and weight as well as number of pods/plant) were also influenced by different level of amino mix concentrations and showed the same trend of total yield as aforementioned before. These increases might be imputing to increase the vegetative growth (Table 2). Also, might be due to providing easily exporter of growing material which forms the model of protein in the living tissues [7] on pea plants. Our conclusion are in conformity with those aforesaid by [28], reported that, foliar application of amino acid mix at 36% significantly increased the number of seeds/pod, number of pods/plant, seed weight, seed yield and biological yield of bean plants.

Table (3): Effect of amino tic levels and nucleation of bio fertilizer foliar spraying on total yield of broad bean plant during 2013 and 2014 seasons.

Amino acid levels %	Bio fertilizer levels (kg\fed)	2013 season							2014 season						
		Pod characters			No. of pods/plant	No. of seeds/pod	Weight of 100 seeds (g)	Total yield (ton/fed)	Pod characters			No. of pods/plant	No. of seeds/pod	Weight of 100 seeds (g)	Total yield (ton/fed)
		Length (cm)	Wide (cm)	Weight (g)					Length (cm)	Wide (cm)	Weight (g)				
0	0	13.83	5.33	10.43	6.00	4.33	105.46	0.818	12.73	5.03	10.53	5.33	4.00	111.33	0.801
	1	14.17	5.83	10.70	6.67	4.67	108.07	0.853	13.50	5.60	10.67	5.00	4.50	109.13	0.817
	2	14.33	6.00	11.20	6.67	5.00	109.79	0.867	14.30	6.30	11.27	6.33	5.00	109.77	0.824
mean		**14.11**	**5.72**	**10.78**	**6.44**	**4.76**	**107.77**	**0.846**	**13.51**	**5.64**	**10.82**	**5.56**	**4.50**	**110.08**	**0.814**
1 %	0	14.67	5.67	10.80	7.00	4.67	107.18	0.887	14.33	6.50	11.57	6.33	4.67	109.77	0.834
	1	16.33	6.00	11.90	7.67	5.17	110.96	0.960	16.00	6.63	12.10	7.00	5.00	111.87	0.859
	2	17.33	6.33	12.20	8.67	5.33	112.27	1.023	18.33	6.47	12.50	7.50	5.33	120.12	0.875
mean		**16.11***	**6.00***	**11.63***	**7.78***	**5.06***	**110.14**	**0.975***	**16.22***	**6.53***	**12.06***	**6.94***	**5.00***	**113.92***	**0.856**
2 %	0	15.67	5.67	10.97	7.67	5.33	113.35	1.182	19.67	6.57	12.50	6.90	4.67	128.41	0.933
	1	16.67	6.17	11.67	9.00	5.33	132.90	1.247	20.67	6.90	12.73	7.00	5.17	143.37	1.000
	2	17.00	6.37	12.13	9.50	5.83	143.13	1.500	21.00	6.97	13.30	7.90	6.00	149.67	1.225
mean		**16.44***	**6.07***	**11.59***	**8.72****	**5.50****	**129.79**	**1.309****	**20.44****	**6.81***	**12.84****	**7.27***	**5.28***	**140.48****	**1.053****
Average	0	14.72	5.56	10.73	6.89	4.78	108.66	0.962	15.58	6.03	11.53	6.19	4.44	116.50	0.856
	1	15.72*	6.00*	11.42*	7.78*	5.06*	117.31*	1.020*	16.72*	6.38*	11.83*	6.33	4.89*	121.46	0.892
	2	16.22*	6.23*	11.84**	8.28**	5.39**	121.73*	1.130**	17.88**	6.58*	12.36**	7.24**	5.44**	126.52*	0.975**
LSD at 5% levels	Amino.	**0.72**	**0.16**	**0.36**	**0.36**	**0.30**	**NS**	**0.032**	**01.3**	**0.31**	**0.49**	**0.57**	**0.40**	**2.50**	**0.090**
	Bio-fert.	**0.56**	**0.15**	**0.20**	**0.35**	**0.25**	**6.22**	**0.025**	**0.56**	**0.28**	**0.20**	**0.56**	**0.32**	**5.08**	**0.044**
	Interact.	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**0.043**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**0.077**

2- Effect of bio fertilization:

The effect given in Table (4) reported that the inoculation bio-fertilizer (Piogen) which was already had high significant refreshing effects on broad bean plant growth had a comparable favorable action on its total yield and give rise to declared increases as compare with non pollination of bio-fertilizers. The application of bio fertilizer treatments grant the big total pods yield (ton/fed.) and number of pods per plant as well as the best physical properties of pod (length, width, weight, number of seeds/pod and weight of 100 seeds) in the two calculated seasons. However, the pollination with high level of bio-fertilizer (piogen) at 2 kg/fed. significantly improved total yield and its ingredient liken low level (1 kg/fed.). The excellence in total pods yield per fed. reached 17.46 % and 13.90 % respectively in the first and the second seasons respectively. Commonly, the inoculation with bio-fertilizer (*Piogen*) promote total yield of broad bean pods. This influence could be attributed to the function of bio-fertilizer that transform organic N form to mineral N shape, which is more impress by plants. In this solicitude, [9] notify that the significant effect of bio-fertilizers may be due to the effect of different progeny collection such as nitrogen fixers, nutrients actuate microorganisms which help in availability of minerals and increased the concentration of extractable N, P, K, Fe, Zn and Mn. The conclusion of [8,9,10,11,12] supported existent results.

3- Effect of the interaction:

The interaction between foliar applications of amino mix treatments and the inoculations of different levels of bio-fertilizer (piogen) and are presented in (Table 4). However, no significant interaction action was acquired on total yield and its synthesis except, total pod yield as (ton\fed.) in both seasons. Ordinarily, the inoculations of highest concentration of bio-fertilizer (piogen) (2 kg/fed.) with high level of foliar spraying amino mix (2%) produced the highest total pods yield and its components of broad bean plants. On the contrary, foliar spraying with water and without bio fertilizer produced less total yield and physical pod characters.

Nutrition value:

1- Effect of amino mix levels:

Data respect in Table (5) notify that, foliar application of amino mix treatments significantly improved the nutritional amount of dry seeds of broad bean e.i. (percentage of N, Protein, P and K) in the two experimental seasons. Regarding in Table (5) reported that, increasing the concentration of amino mix significantly

Table (4): Effect of amino tic levels and nucleation of bio fertilizer foliar spraying on seeds quality of broad bean plant during 2013 and 2014 seasons.

Amino acid levels %	Bio fertilizer levels (kg/fed)	2013 season				2014 season			
		%				%			
		N	Protein	p	k	N	Protein	p	k
0	0	3.90	24.40	0.51	2.13	3.55	22.52	0.55	2.03
	1	4.19	26.21	0.54	2.21	3.70	23.46	0.56	2.28
	2	4.46	27.88	0.56	2.29	3.83	23.96	0.58	2.37
mean		**4.19**	**26.16**	**0.54**	**2.21**	**3.69**	**23.32**	**0.56**	**2.23**
1 %	0	4.61	28.81	0.55	2.35	4.07	25.42	0.60	2.44
	1	4.70	29.40	0.58	2.38	4.22	26.36	0.64	2.48
	2	4.81	30.06	0.61	2.40	4.38	27.40	0.66	2.57
mean		**4.71**	**29.43**	**0.58**	**2.38**	**4.22**	**26.39**	**0.63**	**2.49**
2 %	0	4.85	30.29	0.63	2.43	4.50	28.13	0.69	2.59
	1	4.89	30.58	0.66	2.45	4.77	29.79	0.71	2.61
	2	4.91	30.71	0.69	2.47	4.83	30.21	0.73	2.62
mean		**4.88**	**30.53**	**0.66**	**2.45**	**4.70**	**29.38**	**0.71**	**2.61**
Average	0	4.45	27.83	0.56	2.30	4.04	25.36	0.61	2.36
	1	4.60	28.73	0.59	2.35	4.23	26.54	0.64	2.46
	2	4.73	29.55	0.62	2.39	4.35	27.19	0.66	2.52
LSD at 5% levels	Amino.	**0.03**	**0.22**	**0.02**	**0.02**	**0.09**	**0.69**	**0.02**	**0.06**
	Bio-fert.	**0.01**	**0.08**	**0.01**	**0.01**	**0.06**	**0.37**	**0.01**	**0.01**
	Interact.	**0.02**	**0.14**	**NS**	**0.01**	**NS**	**NS**	**NS**	**0.02**

Increased nutrition value of seeds tissues of broad bean. On the other hand, the superiority nutritional value of dry seeds gained with the application of high levels of amino mix at (2%) compared low level (1%). Conversely, the lowest value of nutrition gained with application of water. In addition, amino mix have business as chelating impact on micronutrients, while used jointly with micronutrients, the assimilation and transmission of micronutrients internal the plant is easier [1].The acquired conclusion are bring to the himself derivation with [3,5,6,7,28] on legume crops.

2- Effect of bio fertilization:

All inoculation of bio-fertilizer (piogen) application give rise to an increasing nutritional values of dry broad bean seeds compare without application of bio-fertilizer as shown up in Table (5). However, application of highest concentration of bio-fertilizer (2kg/fed) acquired the better nutritional values, i.e. (percentage of N, protein, P and K) pursue in descending order inoculation by (1 kg/fed.) pursue without bio-fertilizer through the experimental seasons of 2013 and 2014. It could be concluded that, the inoculation by bio-fertilizers play a master key function for eclectic adsorption of stationary (P, Zn, Cu) and moveable (C, S, Ca, K, Mn, Cl, Br, and N) elements to plants [29]. These returns are in good conformity by notify before by other interrogator [8,9,10,11,12].

3- Effect of the interaction:

The interaction treatment between various inoculation levels of bio-fertilizer and foliar application of the distinct levels of amino mix given in Table (5). Generally, the statistically analysis of the gained data reported that, the differences within various treatments were no great enough to extent the 5% level of significant except the content of K% in both seasons and percentage of nitrogen and total protein in first season only. These findings were totally comparable in both seasons of 2013 and 2014.

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