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EFFECT OF NITROGEN, HUMIC ACID AND BIO-FERTILIZATION ON PRODUCTIVITY AND QUALITY OF FABA BEAN UNDER SALINE CONDITION

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ABSTRACT

Two field experiments were conducted during 2010/2011and 2011/2012 seasons in saline soil in Galbana Village, Sahl- El Tina (North Sinai), Egypt to study the efficiency of nitrogen, (N) fertilizers or Humic acid either separately or in combination with (N) as well as humic acid associated with Bio- and N fertilization on yield and yield components of two Egyptian faba bean (*Vicia faba L.*) varieties namely Giza 716 and Sakha 3. Chemical composition, seed quality and some chemical properties of soil were also investigated. The results show that the characters of faba bean plants such as, plant height (cm), 100–seed weight (g), seed yield/plant (g), seed yield (ardab/ fed) and germination %, shoot and radical length (cm), fresh and dry weight of seedling (g), electrical conductivity for seeds (EC) and chemical composition of seeds (Protein and carbohydrate content as %) were significantly by application of the different treatments compared to the control treatment. The Macro elements (N, P and K %) and micro elements concentration (Fe, Mn, Zn and Cu) in seeds and stem were significant increased due to application of the different treatment when compared to the control treatment. Also, the results showed that the treatment of (Humic acid + Bio + N) gave the higher value of seed yield/ plant (62.0 g) compared to control (39.1 g) as well as germination percentage were improved also by application of (Humic acid + Bio + N) (81.0% and 76.7%) compared to treatment control (62% and 59%) in Giza 716 and Sakha 3, respectively. Concerning some chemical properties, the results show that the values of pH of the soil was decreased (8.0 ppm) deu to application of humic acid + N. While the available manganese was increase in soil when this treatment was Also , Application of different treatments enhanced the availability of macro elements such as (N, P and k), maicro elements (Fe, Zn, Mn and Cu) under studied soil.

Keywords: Faba bean, NPK fertilizers, humic acid and Bioferilizatio

INTRODUCTION

Faba bean (*Vicia faba L.*) is one of the major winter legume crops in Egypt. It has considerable importance as it rich in proteins and carbohydrates (Spetoghu 2002). Nitrogen (N) is required by plants in comparatively larger amounts than other elements (Marschner, 1995). Deficiency of N generally results in a stunted growth and chlorotic leaves caused by poor assimilate formation that leads to premature flowering and shortening of the growth cycle. The presence of N in amount excess promotes development of the above ground organs with abundant dark green (high chlorophyll) tissues of soft consistency and relatively poor root growth this increases the risk of lodging and reduces the resistance to harsh climatic condition and foliar disease (Lincoin and Edvardo 2006). N fertilizer use has played a significant role in increases of crop yield (Modhej *et al* 2008). Excessive application of chemical nitrogen fertilizers could results in a high soil nitrate concentration after crop harvest (Jokela and Randail 1989). The best way to solve those problems is usage of biological nitrogen fixation. The utilization of biological nitrogen fixation method could decrease the use of the chemical nitrogen fertilizer. Persist the depletion of soil organic matter and reduced environmental pollution to a considerable extent (Choudhmiry and Kennedy 2004). Several bacteria that are associated with the roots of crop plants could induce beneficial effects on their hosts and often are collectively referred to plant growth promoting Rhizobacteria (PGPR) (WHO, 2002). Mahdi *et al* (2010) recorded N_2 Fixation in faba bean in the range of 165 – 240 kg N/ha with nitrogen to the system of 84 kg N/ha when only grain was removed. Seed inoculation with nitrogen fixers could improve growth, yield and yield attributes of faba bean (Abu–Zekry, 2000 and El- Kholy et al, 2010). They also reported that seed inoculation with biofertilization significantly improved most of the studied yield and yield attributes. Growing faba bean in sandy soil usually need integration between the bacterial inoculation and mineral fertilization for producing high quality and quantity yield. Humic acid could absorptive surface through an ordered remodeling of the root morphology (Schmidth *et al* 2007). Seed quality has direct influence on the success of crop which significantly contributes to productivity levels (Bewely and Black 1994). The aim of the study is to investigate the influences of mineral nitrogen, humic acid and bio-fertilization on yield, yield component and quality of faba bean under saline condition. To clear the efficiency of N fertilizers or Humic acid either separately or in combination with N as well as humic acid association with Bio- and N fertilization on yield and yield components of two Egyptian faba bean varieties namely Giza 716 and Sakha 3 , chemical composition, seed quality and physical and chemical properties of soil.

MATERIALS AND METHODS

Two field experiments were conducted during 2010/2011and 2011/2012 seasons in saline soil of a private farm in Galbana Village, Sahl-El Tina (North Sinai), Egypt. The experiment was laid out in a split plot design with three replications. The varieties were distribution in the main plots, while the fertilization treatments were allocated in sub plots. Representative surface soil samples (0-30 cm) were taken before and after the performance of the experiment, where some physical and chemical properties were determined using the standard methods according to Black (1965) and Jackson (1973). The sowing dates were on November 26 and 29 in the first and second seasons, respectively. Faba bean was planted as two seeds were in hill and 20 cm spacing, after emergency the plants were thinned to one plant per hill. The area of each experimental unit was 3 ×3.5 m. The treatments were as follow: 1- N fertilizer (control); 2- Humic acid 3- Humic acid + Bio fertilizer (Bio); 4- Humic acid + N, 5- Bio+ N, 6- Humic acid + Bio +N . Phosphorus was added as calcium superphosphate (15% P_2O_5) at rate of 150 kg/fed before sowing. Potassium sulphate (48% K_2O) applied at a rate of 50 kg/fed, as recommended rate after 35 days from sowing. Basic application of nitrogen at the rate of 20kg/fad was added before the first irrigation (after thinning). Mechanical and chemical properties of the experimental soil before planting were presented in Table (1).

Table (1): Mechanical and chemical properties of the experimental soil before planting [mean of the two growing seasons].

Coarse sand (%)	Fine sand (%)	Silt (%)	Clay (%)	Texture class	O.M (%)	$CaCO_3$ (%)	pH 1 : 2.5 soil water suspension
10.92	56.10	12.01	16.20	Lomy sand	0.63	7.35	8.0
EC (dS/m)	cations (m.e./L) Soluble				Soluble anions(m.e./L)		
7.5	Ca++	Mg++	Na+	K+	HCO^-_3	Cl-	SO¨ 4
	42.25	17.851	22.45	2.81	2.94	23.23	54.19
Available macronutrients (mg/kg)							
N			P			K	
11.21			6.515			122.32	

The form of N–fertilizer was ammonium nitrate (33.5%N) as an activating dose. The seeds were coating with Azotobacter as bio fertilizer at rate 40 kg/fed before sowing, and addition humic acid (coating of seeds) at rate of 5% before sowing. Humic acid composition was determined by using BaCl2 precipitation methods as described by Fataftah *et al* (2001). The different constituents of the applied humic acid were determined and illustrated in Table (2).

Table (2): Main characteristics of the used humic acid.

Components and units	Values
Humic acid %	3.1
Organic matter/ total solid (%)	40.81
Total humic acid/ total solid (gm/l)	174.11
Organic carbon (%)	25.13
C/N ratio	2.96
pH	7.55
EC(dS/m)	5.8

At maturity random samples of ten guarded faba bean plants from each plot were taken stage to stimulate the following characters. 1- Plant height (cm), 2 -100–seed weight (g) 3- Seed yield/plant (g) 4 – Seed yield (ardab/fed). Laboratory experiments were carried out at Seed Technology Dept, FCRI, ARC to assess seed quality from the field experiments were similar land experiment. Germination percentage was expressed by the percentage of normal seedlings at the end of testing period according to the International Seed Testing Association (I.S.T.A, 1985). Three replication of 50 seeds for two varieties were planted in boxes of (40x20x20 cm) dimension containing sterilized sandy soil. The boxes were watered and incubated at

20°c in germination chamber for (10 days). Normal seedlings were count and expressed as the germination percentage at the final count. Ten normal seedlings from each replicate were taken to measure shoot and radical length (cm). The seedling dry weight according to Kirshnasamy and Seshu (1990). For Electrical conductivity (µscm-1g-1) Twenty five seeds for two varieties per replicate were weighted and soaking a 250 ml of deionizer water at 20°c for 24 hours .Electrical conductivity of seed leachiest was estimated according to (I.S.T.A.1985). For chemical analysis, after harvest plants were air-dried, oven-dried at 70°c for 48 hrs and weighted. The dried plants were separated from items into seeds while stem was detriment at vegetable stage. The fine powder was wet digested according to Chapman and Pratt (1961). Nitrogen content (%) was determined in digestions by microkjeldahl methods. Phosphorus percent, potassium percent, crude protein percent as well as Fe, Cu, Zn, and Mn concentrations in seeds and stems and total carbohydrate percentage in seeds were determined according to A.O.A.C. (1990).

Data were statistical analysis according to Sendecor and Cochran (1982), where least significant differences at 0.05 level of significant were used to compare means.

RESULTS AND DISCUSSION

Data in Table (3) indicate that plant height (cm), 100–seed weight (g), seed yield /plant (g) and seed yield ardab/fad were significantly affected by the studied treatments interaction between treatments and varieties. Presence of humic substances is important during all stage of plants, development but particularly vital in the early stage, that is why the pre planting treatment of seeds is very important. Even before germination begins, vital forces are awakened and the immune system is stimulated (Levinsky, 2009) the tallest plants (110 and 116 cm) were obtained by Giza 716 and Sakha 3 when humic acid+ Bio+ N compared with control (85 and 95 cm) respectively for two the varieties. Sakha 3 was taller than Giza 716 (95 and 85 cm), respectively. Taha *et al* (1999) reported that the concentration of 300 ppm humic acid produced the highest dry matter in broad bean and effective on plant growth , root development and nutrients up take (El- Gamal and Tantawy 2010) . Application of humic acid in combination with Bio+ N resulted in were significant increments in 100–seed weight (g) and yield of plant (81.2 and 78.4) and (73.7 and 50.3 g/plant) for Giza 716 and Sakha 3, respectively. Zeidan *et al* (2001) reported that application of biofertilizer + chemical fertilizer resulted in the highest increase in seeds per plant, Gomaa *et al* (2002) and Hewedy *et al* (2006) who cleared that the biofertilizers were used to simulate plant growth by producing plant growth regulators. Result show that yield ardab/ fad were affect by treatment Giza 716 was higher than Sakha 3 at all treatment. Application of humic acid in combination with Bio+ NPK increased yield the values were 7.0 and 6.7 than control 5.5 and 5.3 ardab/ fad, respectively. Followed by 6.5 and 6.7 ardab/ fed when Bio+ N application compared to control, respectively. Studies of the positive effect and humic substances on plant growth have demonstrated the importance of optimum mineral supply, independent of nitration (Yildirim, 2007). Ayman *et al* (2009) found that spraying faba bean plants with humic acid (2000 ppm) + Amino acid (2000 ppm) significantly improving 100 – seed weight.

Table 3: Averages of plant height, 100-seed weight, seed yield/ plant and yield ardab/fed as affected by Nitrogen, Humic acid and Biofertlizer in 2010/2011and 2011/2012 seasons.

No.	Treatments		Plant height (cm)		Mean	Weight 100 seeds (g)		Mean	Seed yield/ plant (g)		Mean	Yield Ardab/ fad		Mean
			Giza 716	Sakha 3		Giza 716	Sakha 3		Giza 716	Sakha 3		Giza 716	Sakha 3	
1	**N (control)**		85	95	**90**	77.6	75.5	**76.6**	46.0	32.2	**39.1**	5.5	5.3	**5.4**
2	**Humic acid**		90	97	**94**	78.4	76.1	**77.3**	54.4	33.8	**44.1**	5.7	5.4	**5.5**
3	**Humic acid + Biofertilizer**		98	103	**101**	78.6	76.6	**77.6**	60.1	35.5	**47.8**	6.0	5.7	**5.9**
4	**Humic acid+ N**		103	110	**107**	79.6	77.3	**78.5**	65.6	39.0	**52.3**	6.3	6.0	**6.2**
5	**Biofertilizer+ N**		106	112	**109**	80.3	77.8	**79.1**	67.0	41.7	**45.3**	6.5	6.7	**6.4**
6	**Humic acid + Bio + N**		110	116	**113**	81.2	78.4	**79.8**	73.7	50.3	**62.0**	7.0	6.7	**6.9**
Mean			**99**	**106**	**102**	**79.3**	**76.9**	**78.1**	61	39	**49.9**	**6.2**	**6.0**	**6.1**
L.S.D 5%		**T**	**0.724**			**0.339**			**0.019**			**0.230**		
		V	**0.633**			**0.292**			**0.314**			**0.120**		
		T × V	**1.506**			**N.S**			**0.045**			**0.260**		
CV %			**0.589**			**0.43**			**0.033**			**13.5**		

Ardab = 155 kg seeds*

Vigor test

Results in Table (4) indicate that the seedling vigor tests of faba bean: germination%, shoot and radical length (cm) and fresh and dry weight of seedling were significantly affected by humic acid, Bio+ N and humic acid+ N+ biofertilizer. Applications of humic acid were improved germination of faba bean. The highest value of germination% were obtained for Giza 716 and Sakha 3 under humic acid+ N+ bio (81.0% and 76.7%) compared to control (62.0% and 59.0%), respectively. The highest values of shoot and radical length, dry and fresh weight of seedling were obtained with applying humic acid+ NPK+ bio (treatment no. 6) in both varieties. Islam *et al* (2005) found that farmers use hamates to accelerate seed germination and improve rhizome growth. These materials are able stimulate oxygen transport. Accelerate respiration and promote efficient utilization of nutrient by plant. Tisdole *et al* (1997) reported that humic acid application caused highly root system growth and this might have resulted an increase in surface area, which would have led to more nutrients up take by providing better means for greater absorption. humic acid in proper concentration can enhance plant and root growth (Bacilio *et al* 2003) and enhancing root length (Sener, *et al* 2009). The highest value in dry weight of seedling was (0.3 g), which occurred under humic acid with biofertilizer, NPK and Bio+ NPK and biofertilizer with NPK for Giza 716.

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Sakha 3 was not affected by applied treatments. Results in Table (5) revealed that dry weight of seedling (g), crude protein, carbohydrate% and electrical conductivity (EC) for seeds showed significant differences between varieties, treatment and treatments × varieties.

Table 5: Chemical composition of seeds of Giza 716 and Sakha 3 from field for two seasons (2010/1011 – 2011/2012).

No.	Treatments		Crude protein in seeds%		Mean	Total carbohydrates in seeds %		Mean	EC μ_{scg}-1		Mean
			Giza 716	Sakha 3		Giza 716	Sakha 3		Giza 716	Sakha 3	
1	N (control)		17.8	15.1	**16.5**	72.5	70.6	**71.6**	16.8	17.2	**17.0**
2	Humic acid		22.8	17.7	**20.2**	73.9	71.3	**72.6**	13.6	15.6	**14.6**
3	Humic acid + Biofertilizer		23.3	17.0	**20.2**	74.1	71.6	**72.9**	17.5	15.1	**16.3**
4	Humic acid + N		24.4	18.1	**21.2**	76.8	72.8	**74.8**	17.0	16.8	**16.9**
5	Biofertilizer+ NPK		24.4	17.7	**21.1**	77.2	73.4	**75.3**	15.2	17.6	**16.4**
6	Humic acid + Bio + N		24.8	17.8	**21.3**	79.4	74.2	**76.8**	16.5	17.5	**17.0**
Mean			**22.9**	**17.2**	**20.1**	**75.7**	**72.3**	**74.0**	**16.1**	**16.6**	**16.4**
L.S.D 5%		**T**	**0.579**			**0.186**			**0.007**		
		V	**0.490**			**0.272**			**0.008**		
		T × V	**1.202**			**0.421**			**0.015**		
CV %			**2.399**			**0.210**			**0.035**		

For field seeds crude protein, the highest value was obtained for Giza 716 (24.8 %) by humic acid + bio + N application compared to control (17.8%), while for Sakha 3 the highest value (18.1%) was recorded by humic acid+ NPK application compared to control (15.1 %). Zeidan *et al* (2001) found that application of biofertilizer and chemical fertilizer gave the highest seed protein content in faba bean. For carbohydrate content, the highest values were (79.4 and 74.2 %) under humic acid + N+ bio for the two varieties, respectively. Meha (2011) found that the combination of chicaneries with biofertilizer used gave the highest protein and carbohydrates content in faba bean. For electrical conductivity (EC), the lowest value was (13.6) under humic acid for Giza 716, while the lowest value was recorded with application of humic acid + biofertilizer for Sakha 3 compared to control (16.8 and 17.2) for the two tested varieties, respectively. Results in Tables (6 and 7) show that macronutrients N, P and K % in seeds and stems were significantly varied for varieties, treatments and interaction between varieties and treatments. The highest values in N % for seeds and stems (3.95, 2.85 and 0.80, 0.90) were obtained under humic acid + N + bio for both varieties, respectively compared to the control (2.96, 2.41 and 0.69, 0.89). For P % in seeds (Table 6) and stems (Table7) humic acid + N + bio application gave the highest values (0.59, 0.45%) in seeds compared to the control (0.41, 0.34) for both varieties, respectively, while P % decreased in stems under where this treatment application. humic acid gave higher (P) values (0.10, 0.13) is stems compared to control (0.11, 0.13) for both varieties, respectively

(Table7). Deb and Datta (1967) found that in the presence of hamates, the plants could use phosphate fertilizer fully at the humic molecules and the phosphate anion competes on an almost equal basis. Sener *et al* (2009) found that humic acid increased the content of K significantly. K content in seeds and stems recorded the highest values (0.99 and 0.74) under humic acid + N + bio application compared to the control (0.77 and 0.61) for both varieties, respectively, while the corresponding values were decreased in stems under the same treatments. Results in Table (8 and 9) show that the microelements concentration of Fe, Mn, Zn and Cu (ppm) in seeds and stems were significantly varied for treatments, varieties and interaction between varieties and treatments except Cu (ppm) element in seed. For seeds, the highest obtained values were (576, 402, 48.0, 31.0, 50 and 30 (ppm)) under humic acid + N + bio treatment compared to control (247, 216, 25.0, 20.0, 24 and 18) for the two varieties, respectively. While in stems, each of humic acid alone and humic acid+ bio treatment increased the Fe, Mn and Zn concentration in stem with the following values: (257, 241, 285, 280, 23, 22, 36, 33, 17, 15, 20, 19) for the two varieties, respectively. Dekock (1995) reported that humic acid substances prevented immobilization of Fe, P and facilitate their translocation on roots and stems. For Mn (ppm) in stems the highest values were (23 and 36) obtained by applied humic acid alone followed by (22and 33 ppm) under humic acid+ Biofertilizer for both varieties, respectively. Cu (ppm) the highest values of Cu (6 and 9 (ppm)) were obtained under humic acid alone followed by (5 and 9 (ppm)) humic acid+ N treatment for both varieties, respectively.

Table 6:Macro elements (N, P and K) in seeds from field for two varieties (2010/1011 – 2011/2012).

No.	Treatments		N in Seed (%)		Mean	P in Seed (%)		Mean	K in Seeds (%)		Mean
			Giza 716	Sakha 3		Giza 716	Sakha 3		Giza 716	Sakha 3	
1	NPK (control)		2.96	2.41	**2.69**	0.41	0.34	**0.48**	0.77	0.61	**0.69**
2	Humic acid		3.64	2.80	**3.22**	0.48	0.38	**0.43**	0.88	0.65	**0.77**
3	Humic acid + Biofertilizer		3.73	2.72	**3.23**	0.50	0.35	**0.45**	0.90	0.67	**0.79**
4	Humic acid + NPK		3.85	2.89	**3.37**	0.58	0.42	**0.50**	0.90	0.70	**0.80**
5	Biofertilizer + NPK		3.90	2.79	**3.35**	0.59	0.43	**0.51**	0.92	0.71	**0.82**
6	Humic acid + Bio + NPK		3.95	2.85	**3.40**	0.59	0.45	**0.52**	0.99	0.74	**0.87**
Mean			**3.67**	**2.74**	**3.21**	**0.76**	**0.52**	**0.46**	**0.89**	**0.68**	**0.79**
L.S.D 5%		**T**	**0.041**			**0.001**			**0.010**		
		V	**0.059**			**0.008**			**0.004**		
		T × V	**0.091**			**0.002**			**0.020**		
CV %			**1.048**			**0.209**			**1.076**		

Table 7: Macro elements (N, P and K) in stems from field for two varieties (2010/1011 – 2011/2012).

No.	Treatments	N in Stems(%)		Mean	P in Stems(%)		Mean	K in Stems(%)		Mean
		Giza 716	Sakha 3		Giza 716	Sakha 3		Giza 716	Sakha 3	
1	NPK (control)	0.69	0.89	**0.79**	0.11	0.13	**0.12**	1.80	1.89	**1.85**
2	Humic acid	0.79	0.91	**0.85**	0.10	0.13	**0.12**	1.75	1.88	**1.82**
3	Humic acid + Biofertilizer	0.78	0.91	**0.85**	0.08	0.13	**0.10**	1.70	1.89	**1.80**
4	Humic acid + NPK	0.76	0.90	**0.83**	0.06	0.11	**0.08**	1.64	1.80	**1.72**
5	Biofertilizer + NPK	0.71	0.89	**0.80**	0.06	0.11	**0.08**	1.60	1.79	**1.70**
6	Humic acid + Bio + NPK	0.80	0.90	**0.85**	0.07	0.10	**0.09**	1.56	1.79	**1.68**
	Mean	**0.76**	**0.90**	**0.83**	**0.08**	**0.12**	**0.10**	**1.68**	**1.84**	**1.76**
L.S.D 5%	T	**0.010**			**0.001**			**0.009**		
	V	**0.011**			**0.003**			**0.017**		
	T × V	**0.022**			**0.003**			**0.021**		
CV %		**1.035**			**0.954**			**0.415**		

Table 8: Micro elements in seeds (2010/1011 – 2011/2012).

No.	Treatments	Fe (ppm) in Seeds		Mean	Mn(ppm) in Seeds		Mean	Zn(ppm) inSeeds		Mean	CU (ppm) in Seeds		Mean
		Giza 716	Sakha 3		Giza 716	Sakha 3		Giza 716	Sakha 3		Giza 716	Sakha 3	
1	NPK (control)	247	216	**232**	25.0	20.0	**22.5**	24	18	**21**	15	12	**14**
2	Humic acid	300	255	**278**	30.0	22.0	**26.0**	30	20	**25**	16	12	**14**
3	Humic acid + Biofertilizer	386	287	**337**	31.3	24.0	**27.7**	32	18	**25**	17	13	**15**
4	Humic acid + NPK	403	360	**382**	36.7	26.7	**31.7**	38	26	**32**	18	14	**16**
5	Biofertilizer + NPK	484	374	**429**	45.0	30.3	**37.7**	40	28	**34**	19	15	**17**
6	Humic acid + Bio + NPK	576	402	**489**	48.0	31.0	**39.5**	50	30	**40**	19	16	**18**
Mean		**399**	**316**	**358**	**36.0**	**25.7**	**30.8**	**36**	**23**	**30**	**17**	**14**	**16**
L.S.D 5%	T	**0.777**			**1.833**			**0.879**			**N.S**		
	V	**0.717**			**1.805**			**1.656**			**N.S**		
	T × V	**1.627**			**3.864**			**2.129**			**N.S**		
CV %		**0.181**			**4.936**			2.476			**3.725**		

Table 9: Micro elements in stems (2010/1011 – 2011/2012).

No.	Treatments	Fe (ppm) in Stems		Mean	Mn (ppm) in Stems		Mean	Zn(ppm) in Stems		Mean	CU (ppm) in Stems		Mean
		Giza 716	Sakha 3		Giza 716	Sakha 3		Giza 716	Sakha 3		Giza 716	Sakha 3	
1	N (control)	266	285	**276**	30	36	**33**	17	20	**19**	7	9	**8**
2	Humic acid	267	285	**271**	23	36	**30**	15	20	**18**	6	8	**7**
3	Humic acid + Biofertlizer	251	284	**267**	22	33	**28**	15	19	**17**	5	8	**7**
4	Humic acid + N	231	274	**253**	18	30	**24**	12	18	**15**	5	9	**7**
5	Biofertilizer + N	234	276	**255**	17	30	**24**	11	18	**15**	4	9	**7**
6	Humic acid + Bio + N	231	270	**250**	16	30	**23**	10	17	**14**	3	9	**6**
Mean		**245**	**279**	**262**	**21**	**33**	**27**	**13**	**19**	**16**	**5**	**9**	**7**
L.S.D 5%	**T**	**2.141**			**1.194**			**0.879**			**0.879**		
	V	**3.472**			**0.414**			**1.656**			**1.656**		
	T × V	**4.956**			**2.381**			**2.129**			**2.129**		
CV %		**0.679**			**3.707**			**4.564**			**10.19**		

Soil salinity (EC)

Data of soil salinity as affected by different treatments are shown in Table (10). The results revealed that the soluble salts determined as soil EC were significantly reduced with different treatment compared with the control treatment. The EC values ranged between 3.06 – 4.80 ds/m average o the two seasons. The lowest value of EC (3.06) was obtained by application of humic acid + Biofertilizer. There results may be due to the application of humic acid was improving leashing process. These results were harmony with those obtained by Porass, *et al* (2010).

Soil pH

Data in Table (10) represented the soil pH parameter which reflects the change in soil chemical properties. The data showed that the decreased in values of soil pH were non significantly due to application of different treatments. However the pH values around 8.1 to 7.98. Data showed that the soil pH tended to decrease slightly due to application of humic + nitrogen fertilizer. On the other hand, the soil pH after the two season tended to decreasing slightly with humic + biofertilizer, biofertilizer + N and humic + bio + N. These results are agreement with those reported by Shaban and Omer (2006) who found that the formation of hydrocarbonic acids in the rhizoshere of maize root, due to biofertilizer treatment, led to decreasing in the soil pH. Kwaled et al. (2012) how found that application of humic acid individually or combined with N fertilizers decreased pH.

Organic matter

The highest value for organic matter OM % (1.61) was obtained by humic acid + N treatment. It worth to mentioned that the humic acid was responsibility of reduction of both Ec and pH on the other hand increased the organic matter. These results harmony with results obtained by Abd et al. (2005) and Erik et al. (2000), on onion plant and Hafez (2003), on squash reported that humic acid applications led to a significant increase in soil organic matter which in turn improves plant growth and crop production.

Table (10): Mechanical and chemical properties of the experimental soil after planting (Mean of two growing seasons).

No.	Treatments	EC	pH	OM %
1	N (control)	4.80	8.10	1.10
2	Humic acid	4.61	8.01	1.20
3	Humic acid + Biofertilizer	3.06	8.00	1.38
4	Humic acid + N	4.27	8.03	1.61
5	Biofertilizer + N	4.59	8.00	1.40
6	Humic acid + Bio + N	4.21	7.98	1.28
L.S.D 5%		0.210	N.S	0.088

Table (11): Microelements and macro elements concentration after planting in the soil (Mean of two growing seasons).

No.	Treatments	Microelements ppm				Macro elements ppm			
		Zn	Mn	Fe	Cu	NH_4	NO_3	P	K
1	N (control)	2.08	4.6	6.6	1.1	6.7	16.3	5.73	131.0
2	Humic acid	3.14	6.4	8.2	1.5	6.3	19.0	7.47	234.0
3	Humic acid + Biofertilizer	3.54	7.6	9.2	1.4	5.6	24.0	9.71	231.0
4	Humic acid+ N	2.60	6.6	6.8	1.8	7.0	25.8	8.45	190.0
5	Biofertilizer+ N	2.56	6.6	6.2	2.4	8.4	25.9	9.66	154.0
6	Humic acid + Bio + N	4.34	8.0	11.0	2.28	10.0	27.0	10.34	254.0

Available of microelements (Zn, Mn, Fe and Cu) in soil:

Data are present in Table (11) shown that increases in soil available content of micronutrients due to application of all treatments. While, the availability of micronutrients were more pronounced affected by application of humic acid combined with biofertilizers. This is may be due to addition of bio-fertilizer on

surface ied to increase the microorganism activities in top soil which in turn enhancing the decomposition of organic matter and positively affecting the availability of these elements in soil. Also, humic acid are especially beneficial in

ferring up nutrients in the soil so that they are made available to the plant as needed, also, humic acid are important because of their ability to chelate micronutrients, thus increasing their availability . (Hussein and Hassan, 2011).

Available of macronutrients (N, P and K) in soil:

Data in table (11) revealed that the values of some available macronutrients in soil after faba bean harvest were affected by application of different treatments. The highest values of available N (NH4&NO3), P and K in soil were (10.0 &27), 10.34 and 254 mg kg-1 soil respectively. These results were harmony with those obtained by Abdel Aal et al. (2003) who found that application of organic materials caused a substantial increase in total N, available P, and K. Also, Vessey (2003) reported that PGPR as a bio-fertilizer helps in fixing N2, solubilizing mineral phosphates and other nutrients as well as enhancing tolerance to stress.

Conclusion

This research investigated revealed the important of humic acid and bio- fertilizer application in salt affected soil which enhanced the faba bean production (quality and quality) and improvement some chemical proprtyies and fertility of these soils.

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تـأثير التسـميد النتروچينـى وحـامض الهيوميـك مـع التلقيـح البكتيـرى علـى إنتاجيـة وجودة الفول البلدى تحت ظروف الأراضى الملحية

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أقيمـت تجربتـان حقليتـان فـى موسـمين زراعيـين2011/2010 –2012/2011 بقريـة جلبانـة بمنطقـة سـهل الطينـة فـى شـمال سيناء - مصـر وتهدف التجـارب الـى دراسـة كفـاءة التسميد النتروچينى والهيوميك أسيد منفردين أو بمصاحبة التسميد الحيوي وذلك على محصـول الفـول البلدى والمحتوى من العناصـر لصـنفين من الفول البلـدي وهمـا (جيـزة 716 وسـخا 3) أيضـاً تـم دراسـة المحتـوي الكيمـاوي وجـودة الحبـوب وبعـض الخـواص الكيماويـة لـلأرض التـى تمـت الدراسـة بهـا وأوضحت النتائج ما يلى

يوجد زيادة معنوية في بعض الصفات للفول البلدي مثل طول النبات وزن الـ 100 حبـة ومحصول البذور لكل نبات والمحصول الكلي (أردب / فدان) وأيضاً بعض الصفات الأخـرى مثـل نسبة الإنبات ووزن النبات طازج وجاف ومقدار الـ EC فـي البـذور والمحتـوي الحيـوي للنيتـروجين (بروتين – كربوهيدرات كنسبة مئوية) وذلك مقارنة بالكنترول.

أدت إضافة المعاملة (حمض والهيوميك – والتسميد الحيوي- والنيتـروجين) أعطـت أعلـى القيم بالنسبة لمحصول البذور للنباتات مقارنة بالكنترول وأيضاً هذه المعاملة قد حسنت نسبة الإنبـات في كل من صنفى الفول البلدي (جيزة 716 – وسخا 3)

بالنسـبة لـبعض الخـواص الكيميائيـة لـلأرض فقد أوضـحت النتـائج أن قيم الـ PH نقصـت نتيجة إضـافة معاملة حمض والهيوميك مع التسميد النيتروجيني . أيضـاً هذه المعاملات قد حسنت مـن تيسر العناصـر الكبرى مثل N (CH4,NO3) والفوسفور والبوتاسيوم وأيضـاً العناصـر الصـغرى مثـل الحديـد والزنـك والنحـاس والمنجنيز مقارنـة بـالكنترول ويمكن التوصـية بأنـه تحـت مثـل هـذه الظـروف للأراضـى المتـأثرة بـالأملاح يمكـن أن نسـتخدم حمـض والهيوميـك والأسـمدة النيتروجينيـة الحيوية للحصول على محصول عالي في كلا من (الكم والجودة) لكل من صـنفي الفـول البلـدي مـع تحسين في بعض الخواص الكيماوية وأيضاً خصوبة هذه الأراضي

قام بتحكيم البحث

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Table 4: Germination (%) and seedling characteristics of Giza716 and Sakha 3 from laboratory as affected by the studied treatments in 2010/2011 and 2011/2012

No.	Treatments	Germination %		Mean	Shoot length(cm)		Mean	Radical length(cm)		Mean	Freshweight of seedling (g)		Mean	Dry weight of seedling (g)		Mean
		Giza 716	Sakha 3		Giza 716	Sakha 3		Giza 716	Sakha 3		Giza 716	Sakha 3		Giza 716	Sakha 3	
1	N(control)	62.0	59.0	**56.0**	22.2	18.4	**20.3**	11.6	9.8	**10.7**	3.1	2.2	**2.6**	**0.2**	**0.2**	**0.2**
2	Humic acid	68.0	60.0	**64.0**	24.9	19.4	**22.2**	12.3	10.2	**11.3**	3.2	2.3	**2.7**	**0.2**	**0.2**	**0.2**
3	Humic acid+ Biofertilizer	67.0	65.0	**66.0**	28.5	23.2	**25.9**	14.5	13.5	**14.0**	3.5	3.5	**3.5**	**0.3**	**0.2**	**0.3**
4	Humic acid+ N	75.0	70.0	**72.5**	24.2	24.5	**24.4**	13.8	11.6	**12.7**	4.9	3.1	**4.0**	**0.3**	**0.2**	**0.3**
5	Biofertilizer+ N	79.0	73.5	**76.3**	29.3	25.2	**27.2**	14.6	12.2	**13.4**	4.3	3.4	**3.9**	**0.3**	**0.2**	**0.3**
6	Humic acid +Bio + N	81.0	76.7	**78.9**	30.6	26.1	**28.4**	15.9	13.3	**14.6**	5.2	4.2	**4.7**	**0.3**	**0.2**	**0.3**
Mean		**70.5**	**67.4**	**69.0**	**26.6**	**22.8**	**24.7**	**13.8**	**11.8**	**12.8**	**4.0**	**3.1**	**3.6**	**0.3**	**0.2**	**0.2**
L.S.D 5%	T	**11.389**			**0.032**			**0.080**			**0.035**			**0.023**		
	V	**13.333**			**0.037**			**0.008**			**0.029**			**0.035**		
	T × V	**24.597**			**0.068**			**0.158**			**0.072**			**0.054**		
CV %		**6.278**			**0.106**			**0.520**			**0.810**			**8.565**		