Effect of Plant Density and Biofertilization on The Productivity and Technological Traits of Some Faba Bean Cultivars (*Vicia Faba*, L.).

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ABSTRACT

Two field experiments were carried out at the Experimental Station Farm of Faculty of Agriculture (Saba Basha). Alexandria University, Egypt during 2005/06 and 2006/07 growing seasons,to investigate the effect of three plant densities (70000, 105000 and 140000 plant / fed) and Biofertilization treatments (without biofertilization as control + 90 kg superphosphate /fed., phosphorine + 30 kg superphosphate /fed , VA-mycorrhizae and mixed phosphorine + VA- mycorrhizae) on yield and yield components of two faba bean cultivars (Giza 461 and Sakha 1) A split, split plot design with three replications was used in this study Increasing plant density (70000. 105000 and 140000 plant / fed) caused a significant decrease in plant height , number of branches plant . number of pods / plant , seed yield (ardab / fed),seed yield / plant (gm), straw yield (ton / fed) and some chemical contents of seeds.However, most traits under study increased significantly due to inoculation treatment with VA-mycorrhizae which more effective in increasing seed yield and its attributes as well as chemical constituents. The highest mean values of all studied characters were observed with inoculation treatment with VA-mycorrhizae+ 30 kg superphosphate /fed Technological traits and cultivars in seeds during the first season The highest values of these traits were obtained from Giza 461 cultivar concerning T.S.S% and Imbibitions%, except cooking % as compared to Sakha 1 cultivar . It can be stated that inoculation of faba bean seed before planting with VA-mycorrhizae+ 30 kg superphosphate /fed, phosphorine+ 30 kg superphosphate /fed or phosphorine + VA- mycorrhizae + 30 kg superphosphate /fed may be recommended for raising faba bean productivity and reducing the environmental pollution under the conditions of the present study .

INTRODUCTION

Faba bean (*Vicia faba*, L.) is the most important food legume, which has the potential to provide the Egyptians with food. It is contains between 20-41% protein, B complex vitamins and minerals, so it is considered a good source of protein as has been reported **(Chavan *et al.* 1989).** To satisfy the national requirement of that important legume, either the area could be increased or the high yielding cultivars should be grown. Since the cultivated area is limited in Egypt, thus the increase in yield could be the more effective way by a combination of improved varieties with recommended treatments such as plant densities and bio-mineral fertilization. Plant population is considered to be an important factor for final seed yield . Plants with a more extensive and well distributed root system could exploit a larger soil volume, there by making more effective use of soil water and nutrients **(El-Shazly and El-Rassas, 1989).** Therefore faba bean growth, yield as well as yield components were affected significantly by plant density **(Selim and El-Seessy, 1991).**

Phosphorus is the second most commonly soil limited nutrient element after nitrogen. It is present in all the soils of the world in varying quantities, but is usually higher in areas of low or moderate rain fall. This element is required to plants in quantities that are approximately one-tenth as great as those of nitrogen and potassium. The majority of agricultural soils contain large reserves of total phosphorus which, partly, has been accumulated as a consequences of regular application of phosphorus fertilizer and the amount of phosphorus available to plants is not necessarily well correlated with the total phosphorus content of the soil **(Saad and Hammed, 1998 and Makail *et al.*2005b).**

Plant nutrients are essential for plant life and yield, therefore biofertilization is very important for legumes as well as for faba bean because it supplies plants with a part of the requirements from essential nutrients, saves a great amount of mineral fertilizers and reduces environmental pollution and costs of crop production. Moreover, biofertilizers are not expensive compared to mineral ones. Faba bean seed or soil treatment with microbial inoculates such as specific *Rhizobium* strains could supply the plants with a part of nitrogen required during different growth stages and increase seed yield and its components as well as seed protein content **(Monib *et al.* 1994).** Mycorrhizal fungi and phosphate dissolving bacteria are considered as biological fertilizers which have an important role in the solubility of phosphorus and enhancing, it's absorption by plants **(Koreish *et al.* 2001).**

The objectives of the present work was to study the effect of plant density and biofertilization on the productivity and technological traits of some faba bean cultivars.

MATERIALS AND METHODS

Two field experiments were carried out at the Experimental Farm, Faculty of Agriculture (Saba Bacha), Alexandria University, during the two successive seasons 2005/06 and 2006/07, to study the effect of plant density and biofertilization on the productivity and technological traits of some faba bean cultivars .

Each experiment included 24 treatments,which were the combination of two faba bean cultivars, three plant denisties and four biofertilizers treatments, which arranged in a split-split plot design with three replicates. The main plots were assigned, at random, to cultivars (Giza 461 and Sakha 1), the three plant populations were distributed, at random, within the sub plots on a ridge width of 60 cm and hills 20 cm a part at a rate of :

1- 70000 plants / fed (one plant / hill on both sides of ridge) **2-**105000 plant / fed (one plants / hill on one side and two plants / hill on the other side of the ridge) **3-** 140000 plants / fed. (two plants / hill on both sides of the ridge).

The sub-sub plots were assigned, at random, to four biofertilization rates:

1- Uninoculation (control) + 90 kg superphosphate /fed. **2-** Phosphorine + 30 kg superphosphate /fed. **3-** VA-mycorrhizae inoculation +30 kg superphosphate /fed.

4- Phosphorine + VA-mycorrhizae + 30 kg superphosphate /fed.

The phosphorine is a phosphate–solubilizing bacteria (PSB), (*Bacillus megathrrium*). Such product is produced by the General Organization for Agricultural Equalization Fund, Ministry of Agricultural, Egypt **(Abo El-Naga, 1993)**.The inoculation was performed by coating faba bean seeds using a sticking substance (Arabic gum 5%) at the rate of 0.90 kg/fed. just before sowing. The root system of different plants was washed with tap water after harvest to remove the soil particles. The technique described by **(Phillips and Hayman 1970)** was used. Roots were cut into pieces of (1-1.5cm) in length, mixed and then cleaned with 10% potassium hydroxide (KOH) at 80-90°C for 20-30 minutes in test tubes. Thereafter, the root segments were washed with tap water, followed by 1.0 NHCL and stained with trypan blue (0.05%) in lactic acid. Inoculation with strains VA-mycorrhizae fungi (AMF) (*Glomus macrocarpium*) obtained from Gottingen University, Germany at the rate of 250 spores for each seed which were mixed with the soil decanting technique as described by **(Armanios *et al.* 1996) and (Radwan 1997).** The spores were added with the seeds at sowing time, phosphorus fertilization levels were used in the form of superphosphate fertilizer (15.5% P_2O_5). The preceeding crop was rice and cotton in the first and second seasons, respectively. Each sub sub-plot included five ridges, each 3.5 meter long and 60 cm in width. Seeds of faba bean cultivars (Giza 461 and Sakha 1) were sown on Nov. 1st in the first and second growing seasons. Nitrogen fertilizer (Urea 46.5%) at the rate of 20 kg N/fed. was applied before the first irrigation. The other cultural practices were applied as recommend for the commercial production of faba bean in the area. Plants were harvested on May 6th 2006 and 3rd 2007 .The measred characters included.

A) Growth attributes

Plant height (cm) - Number of branches / plant- Number of leaves / plant. - Photosynthetic pigments. (chlorophyll a and b) - Dry weight / plant (g) - Crop growth rate (C.G.R.) - Relative growth rate (R.G.R.).

B) Yield and its components

Pod length (cm).- Number of pods / plant.- Number of seeds / plant.- 100-seed weight (gm). - Seed yield (ardab / fed). - Seed yield / plant (gm).- Straw yield (ton / fed)

C) Chemical contents in seeds:

Protein , Nitrogen, phosphorus and potassium contents in seeds. **(Chapman and Pratt, 1961).**

D). Protein content in seeds :

Seed protein content was calculated by multiplying the total nitrogen in field bean seeds by 6.25.

E). Technological traits:

Faba bean (the whole an dehulled seeds)were prepared according to **(Dostalova 1997).** for using in feeding experiment as follows:

1- Cooking percentage:

calculated from sensory analysis conducted by selected, trained panelists, over 5 sessions, using unstructured graphical scales for both affective and intensity ratings of 11 descriptors. by method according to **(Dostalova *et al.* 1999).**

2- Total soluble solids percentage (T.S.S.%). measured by refractometer .

3- Imbibition percentage : calculated by method according to **(Dostalova 1997).**

I . P .= $(W_1) / (W_2) \times 100$ where: (W_1) weight of seed after cooking, (W_2) weight seed before cooking .

All data were subjected to statistical analysis according to the procedures outlined by **(Gomez and Gomez, 1984).**

RESULTS AND DISCUSSION

1. Effect of cultivars:

There were a significant differences between the two cultivars in most characters under study in both seasons. The results indicated that Giza 461 gave the highest values of plant height, straw yield / plant and straw yield (ton / fed) in the second season and number of pods / plant, seed yield / plant and seed yield (ardab/fed) in the first season only

(Table 1). While Sakha 1 had the highest values in number of branches / plant in the second season only, as well as protein content in the second season and nitrogen, phosphorus contents in the both seasons **(Table 2).** These results are in agreement with those reported by **(Edris 1994), (Radwan 1997), (Abdel-Aziz *et al* 1999).**

2. Effect of plant density:

The plant height was significantly increased by increasing plant density from (70000 to 140000 plants / fed) in the both seasons number of branches / plant, number of pods / plant, seed yield / plant, straw yield / plant and straw yield (ton / fed) in the first season only while the highest seed yield (ardab / fed) was obtained at plant density (140000 plants / fed.) in both seasons **(Table 1).**

The highest phosphorus content was produced at plant density (105000 plants / fed). in the second season only, and the same plant density gave the highest nitrogen content in the first season only in **(Table 2).**

Protein, nitrogen contents in the first season, phosphorus content in the second season and Potassium content in the seasons, were significantly increased by increasing plant density up to 105000 plant / fed **(Table 2).** Similar results were obtained by **(Rehab 1999) and (Mohamed and El-Abbas 2005)** .

3. Effect of biofertilization :

Application of VA-mycorrhizal inoculation +30 kg superphosphate / fed resulted in the highest values for number of pods / plant, , straw yield / plant, seed yield (ardab / fed) and straw yield (ton / fed) in both seasons and seed yield / plant in the first season. The highest protein, nitrogen, phosphorus and potassium contents were recorded from application of VA-mycorrhizal + 30 kg superphosphate / fed. in both seasons. These results are in agreement with these reported by **(Edris 1994), (Radwan 1997).**While Application of phosphorine + mycorrhizal +30 kg superphosphate / fed resulted in the highest values for plant height and number of branches / plant in both season .

4. Interactions:

- The interaction between cultivars and plant density had significant effects on number of branches/ plant and number of pods / plant in the first season and seed yield / plant in the both seasons in **(Table 4),** and on nitrogen content in the second season **(Table 4).**
- The interaction between cultivars and biofertilization had significant effects on number of branches/ plant , straw yield / plant and straw yield (ton / fed) in the first season and seed yield / plant in the both seasons **(Table 5),** and phosphorus content in the second season **(Table 5).**

- The interaction between plant density and biofertilization was significant regarding number of branches/ plant in the second season and seed yield / plant, straw yield / plant and straw yield (ton / fed) in the both seasons **(Table 6)**, and protein content in the second seasons and nitrogen content in the frist season **(Table 6)**.
- The interaction between cultivars, plant density and biofertilization was significant regarding seed yield / plant in the both seasons and straw yield / plant and straw yield (ton / fed) in the second season **(Table 7)**, and Protein content and potassium in the frist seasons and nitrogen content in the second season **(Table 7)**.

Technological traits in seeds:

The result presented in **(Table 3)**, illustrate that technological traits of seeds of two cultivars in the two seasons. In the first season, Giza 461 gave the highest values for T.S.S% and Imbibions%, while Sakha 1 had significantly higher values for cooking % . On the other hand, Sakha 1 cultivar gave higher valu. s for the three traits, compared to Giza 461 cultivar, in the second season. The result of technological traits were similarto those obtained by **(Hernandez *et al* 1998), (Vidal- Valverde *et al* 1998), (Amarowicz 1999), (Dostalova *et al* 1999), (Fahmy *et al* 1999)** .

Table (1): Faba bean characteristics as affected by cultivars, plant density and biofertilization during 2005/06 and 2006/07 seasons.

Treatments	Plant hieght (cm)		No of branches/ plant		No of pods / plant		seed yield /plant(g)		Straw yield /plant(g)		Seed yield (ardab/fed)		Straw yield (ton / fed)	
	2005/06	2006/07	2005/06	2006/07	2005/06	2006/07	2005/06	2006/07	2005/06	2006/07	2005/06	2006/07	2005/06	2006/07
A- Cultivars:														
Giza 461	84.64	125.42 a	4.75	6.14 b	13.28 a	17 95	23 65 a	18 41	133 43	147.44a	10.51a	14 73	1 43	1 56a
Sakha 1	83.61	121.81 b	4.58	6 36 a	11.39 b	17 40	18 56 b	18 54	133 49	113 45 b	8 62b	14 83	1 49	1 45b
L.S.D.(0.05)	N.S.	1.80	N.S	0.14	0.88	N.S	2.40	N.S.	N.S.	18.86	1.45	N.S.	N.S.	0.08
B- Plant density:														
70 000 plant/fed	85.25 a	125.42 a	5 49 a	6.20	14.07 a	17 70	24 04 a	19 15	134.59a	121 88	9 17b	14.02b	1 59a	1 54
105 000 plant/fed	84.04 b	125.21 a	4.63 b	6.22	11 83 b	17 04	19 70 b	18 72	134 50 a	138 66	8 57b	15 00ab	1 50a	1 52
140 000 plant/fed	83.06 c	121.04 b	4.05 c	6 33	11 00 c	18 28	19 43 b	19 15	133.29 b	131.00	10 96a	15 32a	1 29b	1 46
L.S.D. (0.05)	0.70	1.60	0.54	N.S	0.76	N.S.	2.38	N.S.	0.18	N.S.	1.34	1.16	0.18	N.S.
C- Biofertilization:														
Uninoculation(control)+90kgP/fed	82.67 c	117.78 d	4 67	5 44 c	11 22 b	14 65 b	19 17 b	17 75	133 26 c	132.29 b	8 99a	14 20b	1 26c	1 29c
Phosphorine+30kg P/fed	83.33 b	122.78cd	4.39	6.14 b	13.12 a	15.71 b	20 7 ab	17 89	133.49 b	132.38 b	9 47b	14 30b	1 49b	1 36b
Mycorrhizae+30kg P/fed	84 78 a	124.44bc	4.88	6 33 b	13.78 a	22.54 a	22 37 a	19.79	135.70 a	134.71 a	11 21a	15.83a	1 70a	1 71a
Phosphorine + Mycorrhizae+30kgP/fed	85 72 a	130.5 a	4 72	7 08 a	11 22 b	11 80 b	19 80ab	18 47	133 38 bc	134 66 a	8 40b	14 38ab	1 38bc	1 66a
L.S.D.(0.05)	1.04	5.42	N.S.	0.44	1 08	4 20	2 75	N.S.	0.20	0.18	1.44	1.35	0.20	0 16
Interaction;														
A x B	N.S.	N.S.	*	N.S	*	N.S.	*	*	N.S.	N.S.	N.S.	N.S.	N.S	N.S.
A x C	N.S.	N.S.	*	N.S.	N.S.	N.S.	*	*	*	N.S.	N.S.	N.S.	*	N.S.
B x C	N.S.	N.S.	N.S.	*	N.S.	N.S.	*	*	*	*	N.S.	N.S.	*	*
A x B x C	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	*	*	N.S.	*	N.S.	N.S.	N.S.	*

Means followed by same letters within each column are not significantly different at 0 05 level of probability

* : Significant at 0 05 level of probability

N.S. : Not significant.

P :Superphosphate

Table (2): Chemical content in seeds of faba bean as affected by cultivars, plant density and biofertilization during 2005/06 and 2006/07 seasons.

Treatments	Protein content		Nitrogen content		Phosphorous content		Potassium content	
	2005/06	2006/07	2005/06	2006/07	2005/06	2006/07	2005/06	2006/07
A- Cultivars								
Giza 461	21 16	30 49 b	4 10 b	5.20 b	4 70 b	4 66 b	3 29	3 24
Sakha 1	21 07	33 41 a	4 80 a	5.83 a	5.23 a	5 10 a	3.20	3 18
L.S.D.(0.05)	N.S.	2.30	0.54	0.42	0.58	0.55	N.S.	N.S.
B- Plant density:								
70 000 plant/fed	16 56 b	34 76	3.72 b	5.25	5 11	5 54 a	3 46 a	3.35 a
105 000 plant/fed	29 49 a	30 23	5 05 a	5.60	4 84	4 39 b	3.00 b	2 99 b
140 000 plant/fed	17 30 b	30 76	4 58 ab	5 70	4 93	4 80 b	3.28 ab	3 22 ab
L.S.D. (0.05)	6.98	N.S.	1.04	N.S.	N.S.	0.64	0.30	0.28
C- Biofertilization:								
Uninoculation(control)+90kg P/fed	19.76 b	32 49 bc	4.37 b	4.97 b	4.44 b	4.23 b	2.91 b	2 91 b
Phosphorine+30kg P/fed	20.88 ab	29 13 c	4 23 b	5.93 a	5.18 ab	4.89 b	3 18 ab	3.20 ab
Mycorrhizae+30kg P/fed	24.57 a	37 78 a	6 03 a	6.06 a	5.57 a	5 74 a	3 54 a	3 44 a
Phosphorine + Mycorrhizae+30kg P/fe	19 26 b	28.39 c	3 28 b	5.11 ab	4.60 b	4.66 b	3 30 ab	3 25 ab
L.S.D.(0.05)	4.03	4.20	1.20	0.96	0.92	0.72	0.45	0.38
Interaction:								
A x B	N.S.	N.S.	N.S.	*	N.S.	N.S.	N.S.	N.S.
A x C	N.S.	N.S.	N.S.	N.S.	N.S.	*	N.S.	N.S.
B x C	N.S.	*	*	N.S.	N.S.	N.S.	N.S.	N.S.
A x B x C	*	N.S.	N.S.	*	N.S.	N.S.	*	N.S.

Means followed by same letters within each column are not significantly different at 0.05 level of probability
* : Significant at 0.05 level of probability.
N.S. : Not significant.
P :Superphosphate

Table(3): Technological traits in seeds of faba bean during 2005/06 and 2006/07 seasons.

Technological traits	Cultivars	2005/06	2006/07
T.S.S%	Giza 461	48.00	46.33
	Sakha 1	47.70	46.70
L.S.D. (0.05)		N.S	N.S
Imbibitions%	Giza 461	124.00	120.30
	Sakha 1	118.90	126.00
L.S.D. (0.05)		5.20	6.20
Cooking%	Giza 461	88.30	91.70
	Sakha 1	96.70	96.70
L.S.D. (0.05)		6.60	4.00

Means followed by same letters within each column are not significantly different at 0.05 level of probability
* : Significant at 0.05 level of probability.
N.S. : Not significant.
T.S.S% : Total soluble solids percentage .

Table (4): Interaction between faba bean cultivars and plant density for some traits.

Treatments		No of branches/ plant	No of pods/plant	seed yield /plant(g)		N content
Cultivars	Plant density	2005/06	2005/06	2005/06	2006/07	2006/07
Giza 461	70000plant/fed	5 67	16 33	27.52	25 54	4 77
	105000 plant/fed	4 75	11 17	22 13	20 25	5 87
	140000 plant/fed	3 83	12.33	21.02	19 02	4 97
Sakha 1	70000plant/fed	4 83	12 00	20 56	19 75	6 63
	105000 plant/fed	4 50	10 85	18.37	18.7 3	5 33
	140000 plant/fed	4 42	11 33	16 74	15 54	5 54
L.S.D.(0.05)		0.76	0.76	3.37	2. 73	1.16

Table (5): Interaction between faba bean cultivars and biofertilization for some traits.

Treatments		No of branches/ plant	seed yield /plant(g)		Strawyield /plant(g)	Straw yield (ton / fed)	P content
Cultivars	Biofertilization	2005/06	2005/06	2006/07	2005/06	2005/06	2006/07
Giza 461	Uninoculation(control)+90kg P/fed	4.22	24.38	26. 83	133.18	1 18	3.68
	Phosphorine+30kg P/fed	4.67	20.54	21.61	133.35	1.35	4.79
	Mycorrhizae+30kg P/fed	5.11	24.80	26.80	134..56	1.43	4.86
	Phosphorine + Mycorrhizae+30kg P/fed	4 11	17.07	18.07	132.43	1.56	4.93
Sakha 1	Uninoculation(control)+90kg P/fed	4 78	21.50	23.45	133.21	1.21	3.94
	Phosphorine+30kg P/fed	5.00	22.96	23.96	133.66	1.66	5.04
	Mycorrhizae+30kg P/fed	5.11	23.55	25.75	134.73	1 73	6.43
	Phosphorine + Mycorrhizae+30kg P/fed	4.33	18.10	19.30	132.56	1.56	5.37
L.S.D.(0.05)		0.86	3.89	3 76	0.28	0.18	1.02

Table (6): The interaction between plant density and biofertilization on some studied traits of faba bean.

Treatments		No of branches/ plant	seed yield /plant(g)		Strawyield plant(g)/		Straw yield (ton / fed)		Protein content	N content
Plant density	Biofertilization	2006/07	2005/06	2006/07	2005/06	2006/07	2005/06	2006/07	2006/07	2005/06
	Uninoculation(control)+90kg P/fed	5 22	21 65	20 65	133 28	132 19	1 22	1 37	29 67	2 32
70000plant/fed	Phosphorine+30kg P/fed	5 95	23 00	22 05	132 35	133.39	1 59	1 39	29 15	3 42
	Mycorrhizae+30kg P/fed	6 20	26 55	26 46	133 56	134 65	2 07	1 80	37 85	10 08
	Phosphorine + Mycorrhizae+30kg P/fed	7.50	24 96	25 55	132 43	130. 34	1 48	1 72	26 37	2 52
	Uninoculation(control)+90kg P/fed	5 97	21.29	20 34	132 21	132.26	1 41	1 29	37 58	5 12
105000 plant/fed	Phosphorine+30kg P/fed	6 75	17 04	19 40	129 46	130 66	1 44	1 39	31 78	4 98
	Mycorrhizae+30kg P/fed	5 92	23 40	22 62	133 18	133.80	1 70	1 77	38 15	5 45
	Phosphorine + Mycorrhizae+30kg P/fed	6 70	16 01	17 20	131 35	134.11	1 46	1 60	24 53	4.65
	Uninoculation(control)+90kg P/fed	5 15	16 29	17 29	132 .56	131 93	1 11	1 32	31 48	2.68
140000 plant/fed	Phosphorine+30kg P/fed	5 72	21 93	20.93	13128	129 43	1.33	1 32	29 80	3 83
	Mycorrhizae+30kg P/fed	6.88	22 13	22 13	134..54	133.21	1 45	1 60	31 08	5 68
	Phosphorine + Mycorrhizae+30kg P/fed	7 05	18.43	19 43	132.86	133.66	1.27	1 59	34.28	2 67
L.S.D.(0.05)		0.76	4.77	3.65	0.87	0.72	0.36	0.28	13.80	3.18

Table (7): The Interaction between faba bean cultivars, plant density and biofertilization on some studied traits

Treatments			seed yield /plant(g)		Strawyield /plant(g)	Straw yield (ton / fed)	Protein content	N content	k content
Cultivars	Plant density	Biofertilization	2005/06	2006/07	2006/07	2006/07	2005/06	2006/07	2005/06
Giza 461	70000plant/fed	Uninoculation(control)+90kg P/fed	12.88	13.33	131.33	1.33	14.60	2.47	3.10
		Phosphorine+30kg P/fed	17.83	16.53	129.21	1.55	17.50	4.53	3.40
		Mycorrhizae+30kg P/fed	21.12	20.21	133.59	1.89	24.00	6.40	3.70
		Phosphorine + Mycorrhizae+30kg P/fed	17.95	18.59	130.67	1.76	12.30	5.67	3.30
	105000 plant/fed	Uninoculation(control)+90kg P/fed	16.00	15.00	129.31	1.33	19.50	5.23	2.40
		Phosphorine+30kg P/fed	17.83	19.53	129.49	1.49	23.30	6.40	3.60
		Mycorrhizae+30kg P/fed	25.83	25.38	134.85	1.89	38.90	6.40	3.70
		Phosphorine + Mycorrhizae+30kg P/fe	13.50	14.50	133.52	1.52	36.20	5.43	4.00
	140000 plant/fed	Uninoculation(control)+90kg P/fed	23.00	22.06	130.36	1.36	25.00	5.41	2.70
		Phosphorine+30kg P/fed	23.50	24.50	131.63	1.36	18.80	4.90	2.70
		Mycorrhizae+30kg P/fed	22.80	24.80	131.66	1.66	28.00	4.00	3.60
		Phosphorine + Mycorrhizae+30kg P/fed	21.90	20.97	130.57	1.55	19.50	5.57	3.20
Sakha 1	70000plant/fed	Uninoculation(control)+90kg P/fed	14.12	15.14	128.28	1.28	19.60	6.53	2.50
		Phosphorine+30kg P/fed	15.62	16.65	130.23	1.23	14.20	7.50	3.00
		Mycorrhizae+30kg P/fed	18.60	19.06	131.89	1.79	32.60	7.60	3.90
		Phosphorine + Mycorrhizae+30kg P/fed	12.50	13.50	130.56	1.55	17.50	4.87	3.20
	105000 plant/fed	Uninoculation(control)+90kg P/fed	12.88	14.88	130.25	1.25	24.70	5.63	2.80
		Phosphorine+30kg P/fed	12.17	13.57	131.28	1.28	34.90	6.30	3.70
		Mycorrhizae+30kg P/fed	17.45	18.42	133.73	1.73	39.97	6.40	3.80
		Phosphorine + Mycorrhizae+30kg P/fed	12.95	11.95	132.60	1.68	18.20	2.97	3.70
	140000 plant/fed	Uninoculation(control)+90kg P/fed	12.95	13.59	129.20	1.20	16.70	5.30	1.50
		Phosphorine+30kg P/fed	14.62	15.26	130.29	1.28	11.00	4.10	3.20
		Mycorrhizae+30kg P/fed	21.00	22.20	133.94	1.49	17.50	6.63	3.20
		Phosphorine + Mycorrhizae+30kg P/fed	19.50	19.50	132.86	1.68	24.80	6.17	3.80
L.S.D.(0.05)			6.74	7.47	1.40	0.40	19.76	2.34	1.24

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الملخص العربي

تأثير الكثافة النباتية والتسميد الحيوي علي الإنتاجية والصفات التكنولوجية لبعض أصناف الفول البلدي

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* قسم الإنتاج النباتي - كلية الزراعة سابا باشا - جامعة الإسكندرية ** قسم بحوث تكنولوجيا المحاصيل الحقلية - مركز بحوث تكنولوجيا الأغذية

أجريت تجربتان حقليتان بالمزرعة البحثية بكلية الزراعة (سابا باشا) جامعة الإسكندرية خلال موسمي الزراعة ٢٠٠٦/٥، ٢٠٠٧/٦ بهدف دراسة تأثير الكثافة النباتية والتسميد الحيوي علي الإنتاجية والصفات التكنولوجية لبعض أصناف الفول البلدي *(Vicia faba, L.)*.

نفذت التجربة في تصميم القطع المنشقة مرتين في ثلاث مكررات. تضمنت التجربة ٢٤ معاملة عبارة عن صنفان من الفول البلدي (جيزة ٤٦١ وسخا ١) وزعت عشوائيا في القطع الرئيسية وثلاث الكثافات نباتية هي (٧٠ألف , ١٠٥ألف , ١٤٠ألف نبات / فدان) وزعت عشوائيا في القطع الشقية الأولي . وأربع معاملات سمادية وزعت عشوائيا في القطع تحت الشقية :

- ٩٠ كجم /فدان سوبر فوسفات (كنترول).
- ٣٠ كجم / فدان سوبر فوسفات + معاملة البذور" بالفوسفورين - بالميكوريزا - الخلط ما بينهم".

<u>ويمكن تلخيص أهم النتائج المتحصل عليها من هذا البحث في الآتي:</u>

- أدت الزيادة في الكثافة النباتية من (٧٠ألف , ١٠٥ألف , ١٤٠ألف نبات / فدان) إلي نقص معنوي في كلا من صفات ارتفاع النبات عند الحصاد , عدد الأفرع / نبات , وعدد القرون / نبات , ومحصول البذور / نبات, ومحصول القش / نبات ولبعض التحليل الكيماوي .
- سجلت معاملات التلقيح زيادة معنوية في معظم الصفات المدروسة , وبصفة عامة أن التلقيح بفطر الميكوريزا كان له التأثير الفعال الواضح علي زيادة محصول البذور ومكوناته وكذلك المحتوي الكيماوي وقد تم الحصول علي أعلي القيم من كل الصفات المدروسة عندما تم التلقيح بفطر الميكوريزا + ٣٠كجم سوبر فوسفات / فدان .

- سجل صنف جيزة ٤٦١ أعلي القيم في الصفات التكنولوجية في موسم الزراعة الأول ما عدا نسبة الطهي.
- ويمكن أن نستخلص من النتائج أن استخدام صنف جيزة ٤٦١ وتلقيح بذور الفول البلدي بكل من الميكوريزا - الفوسفورين - أو الخليط بين الميكوريزا +الفوسفورين مع إضافة ٣٠ كجم سوبر فوسفات/فدان يمكن أن يؤدي لزيادة إنتاجية الفول البلدي .