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EFFECT OF DISTANCES, SOWING METHODS AND MINERAL FERTILIZATION RATES ON SEEDS YIELD AND QUALITY OF FABA BEAN UNDER IRRIGATION DRIP SYSTEM

Hoda M. G. El-Shaboury and S.B. Ragheb
Food Legumes Dep. Field Crop Res. Inst., Agric. Rese. Center, Giza – Egypt

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ABSTRACT: *A two growing seasons in field were conducted during winter seasons of 2011/2012 and 2012/ 2013 at El-Gharga , El-Wady El-Gded Governorate , Egypt for the evaluating planting methods (on one ridge and two ridge) , planting distances (15, 20 and 25 cm) and mineral fertilizers rate (15 kg N + 30 Kg P_2O_5 and 24 K_2O) and (10 kg N + 20 kg P_2O_5 and 16 kg K_2O) on faba bean (Vicia faba L) Giza 40 cultivar productivity and quality. Randomized complete block design, in split-split plot arrangement, with three replications was applied.*

The obtained results revealed that spacing 20 cm of planting space, one ridge planting methods of sowing and mineral fertilizers rate of (15 kg N+ 20 kg P_2O_5 + 16 kg K_2O) were associated by increased plant height (128 cm), No. branches (3.48), No. of pods / plant 16.41 and No. of seeds/plant (30.25) compared with other treatments. The highest seed weight / plant (71 g/plant), 100 seed (69.53 g) and seed weight yield (1.63 ton /fed) were recorded from the interaction of mineral fertilizers (15 kg N + 30 kg P_2O_5 + 24 kg K_2O) ; planting spacing 25 cm and one ridge planting. Where indicated that N, P and K concentration in seeds faba bean plants were increased with increase mineral fertilizers at rate (15 kg N + 30 kg P and 24 kg K /fed), one ridge planting and 25 cm plant spacing compared with other treatments. Seed protein (%) content was increased with increasing spacing plant, mineral fertilizers rate and one ridge planting. On the other hand seed carbohydrate content in second season was found to be no significantly as affect by all treatments , while it was significantly as affected by the charges methods of sowing + spacing plant + rate of mineral fertilizer in both seasons. The effect of all treatments on chlorophyll content in faba bean plants was found to be significant in both season, the interaction between method planting and plant spacing was not significant in the second season. Finely, from the results obtained the faba bean Giza 40 Varity produced high biological and quality yield per fed when they sown at the highest plant spacing, rate of mineral fertilizer and planting on one ridge method.

Key words: *Sowing methods, spacing, Mineral fertilizers rate, faba bean productivity and quality and sandy soil.*

INTRODUCTION

Faba beans play a key role in crop rotation due to their ability to fix nitrogen, and the beans are able to provide a significant level of nitrogen from the soil air using a symbiotic relationship with Rhizobium bacteria. Faba bean (*Vicia faba* L.) is the fourth most important pulse crop in the world with 4.316.371 tons produced and widely used in the Mediterranean region as a source of protein in both human and animal nutrition, either fresh or dried (Larralde, 1982). Also , production faba bean in Egypt is still limited and falls to face the increasing local consumption of crop, this is related to cultivated area by faba bean in Egypt is relatively small and decteased dramatically in last decade, (Osman *et al* 2010). It contains a large amount of proteins, carbohydrates, B-group vitamins and minerals. The protein content (29.57- 31.83%), carbohydrate (52.96-54.60%), ash (3.37-3.47%), fat (0.81-1.24%) and fibre (10.88-11.96%) of faba beans depends on the variety (Sarah *et al.,* 2009).

Plant density is a major determinant of proper plant development, growth and dry matter accumulation (Hassan and Khaliq, 2008). Mokhtar, 2001) indicated that the

dense planting results in decreases seeds/ pod, seeds/plant, seed weight / plant and seed index. On the other hand, seed yield was increased by increasing plant density up to 26.7 plant /m^2, Abou-Salama and Dwood, (1994), up 31.7 plant/m^2, (Mokhtar, 2001). Sharaan *et al* (2002) found that the seed protein content (%) decreased by increasing plant spacing towards high plant density. Turk and Tawaha (2002) reveled that increasing seed yield as raw spacing decreased. Thalji (2006) pointed that seed, pods and straw per plant were increased by increasing raw spacing. Bakry *et al* (2011) reported that the No. of pods/plant and seed yields per plant were gradually increased by increasing raw spacing from 20 to 40 or 60 cm. Shaban *et al* (2012) indicated that the concentration of P, K and N in faba bean seeds increased with increasing N + K fertilizers rates in both seasons. Yasin *et al.* (2008) indicated that the uptake of phosphorus, potassium and nitrogen was significantly influenced by the application of N and K fertilizers rate. Abd El-Hameed (2002) found that the Fe, Mn and Zn uptake responded positively to N application with an average value of 34.2 %, 22.1 % and 70.0 %, respectively. El-Habbasha *et al.* (2007) found that significant increases achieved in faba bean yield and it's attributed by increasing phosphours fertilization rate up to 30. 31 kg P_2O_5/ fed. Mahmoud (2011) showed that marked increases in the concentration and uptake of Fe, Mn and Zn for seeds plant, with a more pronounced increase with increasing the potassium sulphate rate compared with un treated.

This study was carried out to evaluate the effect of mineral fertilizers rate, plant density and sowing methods on faba bean yield and quality characters under drip of irrigation water system.

MATERIALS AND METHODS

A field experiment was carried out during the two winter successive seasons of 2011/2012 and 2012/2013 to study to the effect of sown method; spacing planting and different rate of mineral fertilizer on faba bean Giza 40 (*Vicia faba* L.), productivity and quality in sandy soil. Representative, surface soil samples (0 -30 cm) were collected and prepared for some physical and chemical analysis as using the methods described by Page *et al.* (1982) and Cottonie *et al.* (1982). The obtained data are presented in Table (1).

Faba bean of Giza 40 (*Vicia faba* L.), the tested cultivar was which obtained from Crop Instiute Agriculture Research Center, Giza, Egypt.

The experiment was conducted in a split split plot design with three replicates. The sowing methods were (one side ridge and two side ridges), the main plots Rates of mineral fertilizer (15 kg N + 30 Kg P_2O_5 + 24 K_2O / fed and 10 kg N + 20 kg P_2O_5 + 16 kg K_2O/ fed) , were distributied in sub plot. Hill spacing (15, 20 and 25 cm), respectively the sub sub plots. The experiment plot unit area was 10.5 m^2 (3m long X 3.5 m width) = 1/400 fed, one feddan = 4200 m^2) , which formed of 7 rows from 40 cm between rows .Faba bean seeds were sown on the 15th at October 2011 and 2012 and harvested on 25th at April 2012 and 2013. Seeds of faba bean were sown in hills on one side of ridge and two side of ridge at rate of 3 seeds per hill with 15, 20 and 25 cm between hills. One plant per hill was maintained by thinning at 31 days after sowing.

Urea (46 % N) was added at the rates 15 and 10 kg N / fed in the two equal portions at 21 and 45 days after sowing. Calcium super phosphate (15.5 % P_2O_5) was added during soil preparation at two rates 30 and 20 kg P_2O_5 /fed). Potassium sulphate (48 % K2O) was added at two rates 24 and 16 kg K_2O /fed at 31 and 45 days after sowing.

At harvest the following characters were recorded on a random sample of ten guarded plants from each plot:

1- Plant height (cm).
2- Number of branches/ plant
3- Number of pods/ plant
4- No. of seeds/ plant
5- Seed yield (g)/ plant
6- Weight of 100 seeds (g)
7- Seed yield (Ton /fed)

Table (1): Some physical and chemical properties of the soil used.

Sand (%)		Silt (%)	Clay (%)	Texture		O.M (%)		$CaCO_3$ (%)
92.55		1.82	5.63	Sandy		0.65		2.51
pH (1:2.5) (Soil :water suspension)	EC (dS/m)	Soluble Cations (mmolc L^{-1})				Soluble Anions (mmolc L^{-1})		
		Ca^{+2}	Mg^{+2}	Na^{+}	K^{+}	HCO^{-}_3	Cl^{-}	SO^{-2}_4
8.02	1.04	2.78	1.63	5.24	0.75	2.20	3.92	4.28
Available macronutrients (mg kg^{-1})			Available micronutrients (mg kg^{-1})					
N	P	K	Fe			Mn	Zn	
38	4.25	183	2.77			3.59	0. 67	

Plant analysis:-

From each sample 0.5 g was digested using mixture of sulfuric (H_2SO_4) and perchloric (HClO) acids (1:3) as described by Cottenie *et al.*, (1982). Nitrogen was determined by micro Keldahl, according to Jackson (1967). Phosphorus was determined Spectrophotometrcally using ammonium molybdate/ stannus chloride method according to Chapman and Pratt (1961). Potassium was determined by a flame photometer, according to Page *et al.* (1982). Protein content was estimated by conversion of nitrogen percentage to protein (Kang *et al*., 2012). Protein % = N % X Conversion factor (6.25). Total chlorophyll (chlorophyll a + chlorophyll b) was determined using spectrophotometric method described by Metzner *et al.,* (1965).

Total carbohydrates were determined in dry leaves using the method described by Dubois *et al*. (1956).

All date were subjected to statistical analysis according to Snedecor and Cochran (1990).

RESULTS AND DISCUSSION

Effect of the study treatments on faba bean productivity.

The data presented in Table (2) show that plant height (cm) and No. of branches/ plant were increased significantly in second season , where these increases in the first season were no significant. Also, the No. of pods/plant and No. of seeds / plant were no significant in both seasons as affected with the treatments of mineral fertilizers. The effect of sowing methods (one side ridge and two side ridge) on plant height, No. of pods/ plant and No. of branch /plant were increased significant in both seasons, while No. of seeds /plant was insignificant affected in both seasons and No. of branches/ plant show was increased significant in the second season. On the other hand the effect of spacing between plants (15, 20 and 25 cm) on plant height and No. of branches/ plant were significant increased in both seasons, while the No. of pods/ plant show not significant increase in both seasons. In addition No. of seeds /plant was no significant in first season. Concerning the interaction between both sowing methods and spacing between plant were significantly for plant height, No. of branches/ plant, No. of pods/ plant and No. of seeds /plant in both seasons.

The interaction between spacing between plant and different rates of fertilizers for No. of pods/ plant and No. of seeds /plant in both seasons did not reach the significant level. In contrary, there is significant in created for plant height in both seasons and No. of branches/ plant in the second season. All growth parameters order

study were affected by the combined treatments of sowing methods X spacing X fertilizers rates , where this affect was no significant for No. of pods/ plant and No. of seeds /plant in both seasons. In contrast there is increased significant for plant height in both seasons and No. of branches/ plant in second season. The highest mean values of height plant (cm) was 119 cm, 3.38 for No. of branch/plant, 14.22 for No. of pods/plant and 27.13 for No. of seeds/plant where bean were treated by different rates of mineral nitrogen (15 kg N + 30 kg P + 24 kg K /fed) and one side ridge for method sowing, respectively compared with other all treatments.

Table (2). The effect of mineral fertilizer, sowing methods and spacing on plant morphology.

Treatments (kg fed^{-1})	Method of planting on ridge	Density of plant (cm)	Plant height (cm)		No. of branch/ plant		No. of Pods/ plant		No. of seeds/ plant	
			1st	2nd	1st	2nd	1st	2nd	1st	2nd
15 N+ 30 P+ 24 K	One side ridge	15	115	118	3.25	3.28	11.60	12.41	22.81	22.82
		20	120	124	3.40	3.45	12.00	14.09	25.01	26.40
		25	110	115	3.30	3.40	14.00	16.16	29.24	32.17
Mean			115	119	3.32	3.38	12.53	14.22	25.69	27.13
15 N+ 30 P+ 24 K	Two side ridge	15	95	100	2.60	2.68	10.25	11.37	20.47	22.47
		20	105	110	3.05	3.08	11.82	12.88	23.60	25.63
		25	93	98	3.00	3.04	12.22	13.25	26.00	27.82
Man			98	103	2.88	2.93	11.43	12.50	23.36	25.31
10 N+ 20 P+ 16 K	One side ridge	15	115	119	2.89	2.96	11.75	12.56	22.21	24.95
		20	125	128	3.45	3.48	15.00	16.41	30.25	29.31
		25	102	106	3.25	3.30	11.66	13.37	25.14	26.14
Mean			114	118	3.20	3.25	12.80	14.11	25.87	26.80
10 N+ 20 P+ 16 K	Two side ridge	15	105	108	2.66	2.70	10.47	11.10	19.00	21.93
		20	110	115	3.10	3.14	12.66	13.25	25.22	29.62
		25	105	110	3.05	3.08	11.10	12.41	22.20	25.14
Mean			107	111	2.94	2.97	11.41	12.25	22.14	25.56
LSD. 5% Fertilizer			ns	1.24	ns	0.046	ns	ns	ns	ns
Spacing			2.28	2.89	0.11	0.079	ns	ns	ns	1.38
Methods			2.31	2.19	ns	0.044	0.66	0.81	ns	ns
Space X fertilizer			**	**	ns	**	ns	ns	ns	ns
Methods Fertilizer			*	**	ns	**	ns	ns	ns	ns
Methods X Spacing			***	**	*	**	***	**	**	**
Meth. X fert. X Space			**	**	ns	**	ns	ns	ns	ns

1st = the first season and 2nd

The highest values of plant height 128 cm and No. of branch per plant 3.48, while the No. of pods per plant was 16.41 and No. of seeds per plant 30.25 as affected by mineral fertilizers at rate 10 kg N; 30 kg P_2O_5 and 24 K_2O per fed for planting one ridge and spacing 20 cm between plants. Theses results are in agreement with Bakry *et al.* (2011) who found that No. of pods /plant was increased by increasing spacing from 20 to 40 cm. Mahmoud *et al* (2011) showed that the addition of K_2SO_4 increase plant height , No. of branches /plant No. of pods per plant and No. of seeds/ plant. Shaban *et al* (2013) reported that the interaction between application of N + K led to increase of No. of pod /plant and No. branches /plant with increase of N + K fertilizers rates.

Concerning the result presented in Table (3) show that the highest values of weight of seed yield / plant (g), 100 seeds (g) and weight seed yield (ton/fed) as affected with mineral N, P and K at rate (15 kg N; 30 kg P and 24 kg K /fed) + one side ridge of method sowing + plant a spacing 25 cm in both seasons respectively, while the same parameters as affected with mineral fertilization at rate (10 kg N + 20 kg P and 16 kg K /fed) + two side ridge of method sowing + spacing plant of 25 cm. On the other hand, the highest values of 100 seeds(g) and seed yield ton/fed were soil treated with mineral fertilizers rates + two side ridge methods planting + spacing 25 cm, while , the highest value weight seed yield / plant (g) was soil treated by mineral fertilizers rates + two side ridge methods planting + spacing 20 cm, respectively. Also, the effect of mineral fertilizers at different rates; spacing between plant and two methods planting (one or two side ridge) on weight seed /plant and weight seed yield /fed were found to be significant, while 100 seeds (g) did not reach to the significant level. The interaction between plant spacing and mineral fertilization gave a significant increase for seed /plant (g) and weight seed yield ton /fed. As well as, the interaction between plant sowing methods and mineral fertilizer increase of significantly in seed /plant (g) and seed yield ton /fed. The interaction between mineral fertilization and methods of planting + spacing planting were significant increase in seed /plant (g) and weight seed yield ton /fed, in both seasons. These results are in agreement with those obtained by Abdalla (2006) how found that the interaction between sowing method and spacing between hill plant gave a significant increase for all vegetative growth and yield parameters of faba bean. Rugheim and Abdelgani (2012) found that, the application of chemical fertilizers increased significantly yield by using both doses (25 N + 21 kg P ha^{-1} and 50 kg N + 42 Kg P ha^{-1}) in the second season, and by using 50 kg N + 42 Kg P ha^{-1} in the first season. Shaban *et al* (2013) indicated that the significantly increasing the rate of N + K up to 40 N and 100 K_2O (kg fed^{-1}) increased seed yield (ton/fed) and seed weight $plant^{-1}$ in both seasons, respectively.

Macronutrients concentration in seeds faba bean plants.

Data presented in Table (4). It could be noticed that there were no significantly different rates of mineral fertilizers on N, P and K concentration (%) in both seasons. Results indicated that N, P and K concentration in seeds faba bean plants were increased with increase mineral fertilizers at rate (15 kg N + 30 kg P_2O_5 and 24 kg K_2O /fed) in all treatments. Concerning, that the effect of spacing between plants on N concentration in seeds was significant increase in second season, P concentration was significant in both seasons while the K was no significant effect in both season.

Table (3). The effect of mineral fertilizer, sowing methods and spacing on yield of faba bean.

Treatments (kg fed^{-1})	Method of planting on ridge	Density of plant (cm)	Seed yield g/ plant		100- seed weight (g)		Seed yield (ton/fed)	
			1st	2nd	1st	2nd	1st	2nd
15 N+ 30 P+ 24 K	One side ridge	15	43.53	41.85	65.27	66.91	1.48	1.45
		20	68.31	55.60	68.35	68.91	1.59	1.55
		25	71.92	59.39	69.30	69.53	1.66	1.63
Mean			61.25	52.28	67.64	68.21	1.58	1.54
15 N+ 30 P+ 24 K	Two side ridge	15	47.67	35.70	66.07	65.70	1.46	1.42
		20	51.00	37.43	67.00	66.05	1.52	1.49
		25	44.67	36.33	68.70	66.54	1.63	1.60
Man			47.78	36.49	67.26	66.10	1.54	1.50
10 N+ 20 P+ 16 K	One side ridge	15	38.00	34.29	65.92	63.90	1.46	1.44
		20	40.68	36.71	65.81	67.34	1.36	1.32
		25	44.70	37.96	67.24	69.34	1.48	1.45
Mean			41.13	36.32	66.32	66.86	1.43	1.40
10 N+ 20 P+ 16 K	Two side ridge	15	33.47	32.58	62.48	65.09	1.33	1.30
		20	36.88	33.17	63.49	67.80	1.42	1.40
		25	31.59	31.22	67.39	68.28	1.46	1.45
Mean			33.98	32.32	64.45	67.06	1.40	1.38
LSD. 5% Fertilizer			1.20	0.88	ns	ns	0.026	0.046
Spacing			0.98	0.86	ns	ns	0.030	0.016
Methods			1.18	1.39	ns	ns	0.013	0.024
Space X fertilizer			**	*	ns	ns	**	**
Methods Fertilizer			**	**	ns	ns	***	**
Methods X Spacing			***	***	ns	*	***	ns
Meth. X fert. X Space			***	**	ns	**	***	***

1st = the first season and 2nd

Table (4). Effect of mineral fertilizer, sowing methods and spacing on micronutrients concentration in seeds of faba bean.

Treatments (kg fed^{-1})	Method of planting on ridge	Density of plant (cm)	N (%)		P (%)		K (%)	
			1st	2nd	1st	2nd	1st	2nd
15 N+ 30 P+ 24 K	One side ridge	15	3.14	3.10	0.45	0.47	2.58	2.61
		20	3.58	3.52	0.59	0.61	2.63	2.66
		25	3.69	3.64	0.63	0.65	2.87	2.89
Mean			3.47	3.42	0.56	0.58	2.69	2.72
15 N+ 30 P+ 24 K	Two side ridge	15	3.10	3.07	0.42	0.44	2.54	2.57
		20	3.25	3.20	0.49	0.51	2.55	2.59
		25	3.30	3.27	0.54	0.55	2.59	2.63
Man			3.22	3.18	0.48	0.50	2.56	2.60
10 N+ 20 P+ 16 K	One side ridge	15	3.12	3.10	0.43	0.44	2.57	2.60
		20	3.44	3.39	0.55	0.57	2.60	2.64
		25	3.55	3.48	0.59	0.62	2..64	2.67
Mean			3.37	3.32	0.52	0.54	2.59	2.64
10 N+ 20 P+ 16 K	Two side ridge	15	3.04	3.02	0.40	0.44	2.50	2.55
		20	3.12	3.07	0.45	0.49	2.53	2.57
		25	3.18	3.14	0.49	0.52	2.57	2.59
Mean			3.11	3.08	0.45	0.48	2.53	2.57
LSD. 5% Fertilizer			ns	ns	ns	ns	ns	ns
Spacing			ns	0.091	0.017	0.009	ns	ns
Methods			ns	ns	0.014	ns	ns	ns
Space X fertilizer			**	**	ns	ns	ns	ns
Methods Fertilizer			ns	**	**	**	ns	ns
Methods X Spacing			ns	*	ns	ns	ns	ns
Meth. X fert. X Space			ns	***	***	***	ns	ns

1st = the first season and 2nd

Also, the obtained data showed that, the effect of sowing methods (one side ridge and two side ridge) on N and K concentration in seeds were did not reach the significant level in both season , while the increase of P concentration in seeds were significant in first season. The interaction between planting spacing and sowing methods on N concentration in seeds were significantly in both seasons while, the increase of both P and K concentration were no significant. The interaction between mineral fertilizers rate and sowing methods on P and K were no significant in both seasons. The interaction between mineral fertilizers different rate and methods planting + plant spacing were significant in second seasons of N and significant for P in both seasons, while the K content in seeds was no significant in both seasons. These results are in agreement with those obtained by Alderfasi and Alghamdi (2010) they showed that, the increasing K fertilizer up to 200 kg / ha tented to increase the uptake all macronutrients in faba bean plants. Hossain *et al* (2007) found that the application of nitrogen and potassium increased the accumulation of N and K in the leaves of A. indica. Yasin *et al.* (2008) indicated that the uptake of phosphorus, potassium and nitrogen was significantly influenced by the application of N and K fertilizers rate. Shaban *et al* (2012) indicated that addition, the combined N + K and hill spacing treatments led to positive effect on N, P and K concentration in faba bean seeds.

Protein, carbohydrate and total chlorophyll content in faba bean plants.

The statistical analysis presented in Table (5) show that the effect of mineral fertilizers (N, P and K) at rates application was found to be significant for carbohydrate (%) and total chlorophyll (mg/g. f. w.) in first season, while the same treatments for protein (%) was not significant in both seasons. Data further indicated the significant response of protein (%) in first season and total chlorophyll in both seasons, while the carbohydrate (%) was no significant in both seasons for spacing plant. On the other hand, the effect of two sowing methods were increased significant for protein (%) in first season and total chlorophyll significant in both seasons, but no significantly for carbohydrate in both seasons. Concerning that the effect of interactions planting methods and plant spacing were significant in first season for protein (%) and significant for total chlorophyll in both seasons. The interaction between mineral fertilizers rates and planting spacing were no significant in both seasons for protein in both seasons, while significantly effect on carbohydrate (%) in the first season and chlorophyll in both seasons. Over all, the interaction between all treatments was significant for carbohydrate and chlorophyll in both seasons, while protein was significant in first season. Application of 15 kg N + 30 kg P2O5 + 24 kg K2O /fed fertilization , one ridge side and planting spacing 25 cm led to the highest values 23.06 (%) for protein ; 52.88(%) for carbohydrate and 11.00 (mg/g. f.w.) for chlorophyll content in faba bean plants, respectively compared of other treatments.

These results are in agreement with those obtained Abdel-Aziz and Shalaby (1999) they found that seed carbohydrate (%) and protein (%) was increased by using high density. Alderfasi and Alghmdi (2010) suggested that the photosynthesis contents total chlorophyll gave increased with increasing phosphors and potassium rates. Shaban *et al* (2013) found that the highest values of protein (%) content (22.06 %) was for plot treated with 20 kg N fed^{-1} + 75 kg K_2O fed^{-1}.

Table (5). Effect of mineral fertilizer, sowing methods and spacing on Protein, Carbohydrate and total chlorophyll content in faba bean plants.

Treatments (kg fed^{-1})	Method of planting on ridge	Density of plant (cm)	Protein (%)		Carbohydrate (%)		Total Chlorophyll (mg/g f.w.)	
			1st	2nd	1st	2nd	1st	2nd
15 N+ 30 P+ 24 K	One side ridge	15	19.63	19.38	45.22	47.36	8.55	9.31
		20	22.38	22.00	46.93	48.30	9.72	10.21
		25	23.06	22.75	52.88	50.29	10.75	11.00
Mean			21.69	21.38	48.34	48.65	9.67	10.17
15 N+ 30 P+ 24 K	Two side ridge	15	19.38	19.19	44.35	44.90	6.63	9.46
		20	20.31	20.00	45.43	46.93	8.44	9.90
		25	20.63	20.44	49.50	47.52	9.88	10.44
Man			20.10	19.88	46.43	46.45	8.32	9.93
10 N+ 20 P+ 16 K	One side ridge	15	19.50	19.38	42.19	45.88	7.60	8.11
		20	21.50	21.19	44.39	47.24	8.30	8.86
		25	22.19	21.75	50.77	49.15	9.45	10.14
Mean			21.06	20.77	45.78	47.42	8.45	9.04
10 N+ 20 P+ 16 K	Two side ridge	15	19.00	18.88	40.63	42.17	7.20	7.69
		20	19.50	19.19	42.97	43.22	7.96	8.13
		25	19.88	19.63	44.82	46.08	8.11	8.47
Mean			19.46	19.23	42.81	43.82	7.76	8.10
LSD. 5% Fertilizer			ns	ns	1.39	ns	0.24	ns
Spacing			1.43	ns	ns	ns	0.44	0.64
Methods			0.30	ns	ns	ns	0.27	0.41
Space X fertilizer			ns	ns	***	ns	*	**
Methods Fertilizer			***	ns	ns	ns	**	*
Methods X Spacing			***	ns	ns	ns	**	ns
Meth. X fert. X Space			***	ns	***	**	**	***

Conclusions

From the obtained results it could be concluded that, increasing the application of rates 15 kg N + 30 Kg P_2O5 + 24 kg K_2O /fed is important to the productivity increase in faba bean and quality and increase of macronutrients concentration in seeds plants. However, the one ridge sides of sowing method and spacing 20 or 25 cm between plants were better for growing plant grown and quality.

REFERENCES

Abdalla, A. A. (2006). Effect of plant spacing, plants number per hill and their interaction on growth and yield of broad bean in desert region of south Iraq. Basrah J. of Agric. Sci. 19 (2): 61- 72.

Abd El-Hameed, A.H. (2002). Plant growth and uptake of N, Fe, Mn and Zn in response to N- fertilizers (Soluble and slow release) under conditions of chelated and mineral (sulphate) forms of applied Fe, Mn and Zn.Annal of Agric. Sci. Moshtohor. 40 (3): 1949 – 1962.

Abd El Aziz, A. E. and F. H. Shalaby (1999). Physiological studies on response of new released faba bean varieties to different plant populations. Zagazig J. Agric. Res 26 (5): 1229-1244.

Abou – Salama, A.M. and R.A. Dawood (1994). Yield response of faba bean (*Vicia faba,* L.) to planting density and phosphorus fertilization. Assiut J. Agric. Sci. 25 (2): 83-91.

Alderfasi, A. A. and S. S. Alghamdi (2010). Integrated water supply with nutrient requirements on growth, photosynthesis productivity, chemical status and seed yield of faba bean. Amier. Euras. J. of Agron. 3 (1): 8- 17.

Bakry, B. A., T. A. Elewa, M. F. El-Karamany, M. S. Zedan and M.M. Tawfik (2011). Effect of raw spacing on yield and its components of some faba bean varieties under newly reclaimed sandy soil condition. World J. of Agricu. Sci. 7 (1): 68- 72.

Chapman, H.D. and P.F. Pratt (1961). Methods of Analysis for Soils, Plants and Water." Agric. Publ. Univ., of California, Reverside.

Cottenie, A., M. Verloo, G. Velghe and R. Camerlynch (1982). Chemical Analysis of Plants and Soil. Laboratory of Analytical and Chemistry. State of Univ. Gent, Belgium.

Dubois, M., A. Gilles, J.K. Hamelton, P.A. Robers and P.A. Smith (1956). A colorimetric method for determination of sugar and related substances. Annal. Chem., 28: 350- 356.

El-Habbasha, S.F., M. Hozayn and M. A. Khalfallah (2007). Integration effect between phosphorus levels and bi-fertilizers on quality and yield faba bean n (Vicia faba, L) in newly cultivated sandy soils. Res. J. of Agric. And Bio. Sci. 3 (6): 966- 971.

Hassan, S.E. and I. Khaliq (2008). Quantitative inheritance of some physiological traits for spring wheat under two different population densities. *Pak. J. Bot.*, 40(2): 581-587.

Hossain, K.L., M.D. Abdul Wadud, M.D. Abul Kashem, S. Edi and Sh.M. Ali (2007). Effect of Different Nitrogen and Potassium Rates on Agronomic Characters of *Aloe indica*. J. Bul. Agron. 35 (1): 58- 62.

Jackson, M.L. (1967). Soil chemical analysis. Constable and Co. L.T.P., London, England.

Kang, S.M., A.L. Khan, M. Hamayun, Z.K. Shinwari, Y.H. Kim, G.J. Joo and I.J. Lee (2012). Acinetobacter calcoaceticus ameliorated plant growth and influenced gibberellins and functional biochemicals. *Pak. J. Bot.*, 44(1): 365-372.

Larralde, J. (1982). Estudio de algunos trastornos que se presentan en los animales tras la ingestión de semillas de *Vicia faba. Rev. Esp. Fisiol.,* 38: 345-351.

Mahmoud, A.A. (2011). Impact of some sulphure sources on ameliorating soil characters, wheat yield and grain quality under newly reclaimed saline soil conditions. Fayoum, J. Agric. Res. & Dev., 25 (1): 36-48.

Metzner, H., H. Rau and H. Senger (1965). Determination of photosynthetic

pigment. Mangel Mutanten von Chorella. Planta, (65): 186-191.

Mokhtar, A. (2001). Response of yield and yield components of faba bean (*Vicia faba*L.) to increasing level of nitrogen and phosphorus under two levels of plant stand density. Ann. Agric. Sci., Ain Shams Univ., 46 (1) : 143-154.

Osman, A.A.M., S.O. Yagoub and O.A. Tut (2010). Performance of faba beans (*Vicia faba* L.) cultivars grown in new agro-ecological regions of Sudan (South Sudan). Australian J. Basic and Appl. Sci., 4(11): 5516-5521.

Page, A. L., R.H. Miller and D. R. Keeney (1982). Methods of soil analysis .II., Chemical and Microbiogical properties 2nd Ed. Madison, Wisconsim . U.S.A.

Rugheim, A. M.E. and M.E. Abdelgani (2012). Effect of microbial and chemical fertilization on yield and seed quality of faba bean (Vicia faba). Inter. Food. Res. J. 19 (2): 417 – 422.

Sarah, A., E. Abusin, A.B. Hassan and E.E. Babiker (2009). Nutritional evaluation of cooked faba bean (*Vicia Faba* L.) and white bean (*Phaseolus Vulgaris* L.) cultivars. Australian J. of Bas. and App. Sci., 3(3): 2484-2490.

Shaban, Kh. A., M. G. AbdEl-Kader and H.S. Siam (2012). Effect of nitrogen and potassium mixing ratios and cultural practices on faba bean productivity in saline soils. Inter. J. of Academic Res. 4 (6): 181 – 188.

Shaban, Kh. A., A. A. Khalil and Amira A. Mohamed (2013). Effect of sowing date and nitrogen, potassium fertilization on faba bean productivity in newly reclaimed saline soil of north Sinai. J. Soil Sci. and Agric. Eng. Mansoura. Univ. 4 (9): 893 – 904.

Shaban, Kh. A., M. G. AbdEl-Kader and H. S. Siam (2012). Effect of nitrogen and potassium mixing ratios and cultural practices on faba bean productivity in saline soils. Inter. J. Acade. Res. 4 (6): 181 -188.

Sharaan, A. N., A. M. Ekram, H. A. Saber and Z. A. Hemida (2002). Seed yield , yield components and quality characters as affected by cultivars , sowing dates and planting distances in faba bean. Bull. Agric. Econ., Min. Agric., Egypt.

Sndecor, G.W. and W. G. Cochran (1990). Statistical Methods 7th ed . IOWA, State Univ. U.S.A.

Thalji, T. (2006). Impact of row spacing on faba bean growth under Mediterranean rainfed conditions Journal of Agronomy 5(3):527-532.

Turk, M. A. and A. M. Tawaha (2002). Impact of seeding rate, seeding date and method of phosphorus application in faba bean (*Vicia faba* L. minor) in the absence of moisture stress. Biotechnol. Agron. Soc. Environ. (6): 171- 178.

Yasin, A., H. Faqir, A. Javed, G. Attya, R. Marcuss and E. Georg (2008). Effect of different sources and rates of nitrogen and supra optimal level of potassium fertilization on growth, yield and nutrient uptake by sugarcane gfurrown under saline conditions. Pak. J. Bot., 40 (4): 1521 – 1531.

تأثير طرق ومسافات الزراعة ومعدلات من التسميد المعدني على إنتاجية وجودة الفول البلدي تحت ظروف الري بالتنقيط

هدى محمد جمال الشابورى ، صموئيل برتى راغب

قسم المحاصيل البقولية – معهد بحوث الحقلية – مركز البحوث الزراعية– مصر

الملخص العربي

اجريت تجربة حقلية خلال موسمين شتوين ٢٠١٢/٢٠١١ و ٢٠١٢/ ٢٠١٣ فى مزرعة بمنطقة الخارجة – الوادى الجديد – مصر– لدراسة طريقتين من طرق الزراعة (الزراعة فى اتجاه واحد وفى اتجاهين) و مسافات الزراعة (١٥ ، ٢٠ ، ٢٥ سم) ومعدل التسميد المعدنى (١٥ كجم نيتروجين + ٣٠ كجم P_2O_5 و ٢٤ كجم K_2O) و (١٠ كجم نيتروجين + ٢٠ كجم P_2O_5 و ١٦ كجم K_2O) على الانتاجية والجودة لصنف الفول البلدى جيزة ٤٠ . كان تصميم التجربة فى قطاعات منشقة مرتين وعدد المكررات ٣ .

اظهرت النتائج المتحصل عليها :

* ان الزراعة على مسافة ٢٠ سم والزراعة فى اتجاه واحد والتسميد (١٠ كجم نيتروجين + ٢٠ كجم P_2O_5 و ١٦ كجم K_2O) اعطت زيادة في ارتفاع النبات (١٢٨ سم)، وعدد الفروع (٣.٤٨)، وعدد القرون / نبات ١٦.٤١ وعدد البذور / نبات (٣٠.٢٥). تحصل على اعلى محصول البذور جم للنبات الواحد (٧١ جم للنبات الواحد) ووزن ١٠٠ بذرة (٦٩.٥٣ جم) ووزن البذور للفدان ١.٦٣ طن للفدان للمعاملة المضاف لها ١٥ كجم نيتروجين + ٣٠ كجم P_2O_5 و ٢٤ كجم K_2O) والزراعة فى اتجاه واحد والمسافة بين النباتات ٢٥ سم .
* زاد تركيز العناصر الكبرى النتروجين والفوسفور والبوتاسيوم فى بذور الفول المعاملة بمعدل التسميد المعدنى ١٥ كجم نتروجين و ٣٠ كجم فو٢ا٥ و ٢٤ كجم بو٢ا والمسافات بين الناتات (٢٥سم) والزراعة فى اتجاة واحد.
* زاد تركيز المحتوى من البروتين فى بذور الفول بزياه المسافات بين النباتات ومعدل التسميد والزراعة فى اتجاه واحدز وجد ان محتوى البذور من الكربوهيدرات زاد فى الموسم الثانى تحت ظروف جميع المعاملات. تاثر محتوى الكلوروفيل فى نبات الفول بكل المعاملات تحت الدراسة وكان تاثيرهم معنوى فى كلا الموسمين باستثناء التداخل بين طريقة الزراعة والمسافات بين النباتات كانت غير معنوية فى الموسم الثانى.
* من النتائج المتحصل عليها وجد ان اعلى انتاجية وافضل جودة لمحصول الفول صنف جيزة ٤٠ تحصل عليها باستخدام اعلي معدل من الاسمدة والمسافات بين النباتات والزراعة على اتجاه واحد.