Effect of Phosphatic and Potassium Fertilization Rates on Some Faba Bean Cultivars

EmanY.Abd AlKader., S.Sh. El-Tabbakh., A.I. Nawar and H. M.Ibrahim
Crop Science Department, Faculty of Agriculture- Alexandria University

ABSTRACT: The present study was carried out during the winter seasons of 2013/2014 and 2014/2015 at the Agricultural Research Station, Abbis, Alexandria University, Alexandria, Egypt. The objectives ware to investigate the influence of effect of phosphorus fertilization rate (0,37 and 74 kg P_2O_5/ha) potassium fertilization rate (0,57 and 114 kg K_2O/ha) and faba bean variety (Libyan landrace, Giza 843, Nubariah3, Giza716 and Sakha1) on growth, yield and yield components. The experimental design was split split plot design with four replications. Leaf area index(LAI), crop growth rate(CGR), 100-seed weight, Number of pods/plant, Number of seeds/plant, seed yield/ha(SY) and harvest index(H.I)were characters studied. Phosphorus fertilization levels had significant effect on LAI, and number. of pods /plant in both seasons, and CGR, 100-seed weight and number. of seeds/plant in second season. Concerning the studied potassium fertilization rates, they had significant effect on CGR, 100-seed weight, number. of pods/plant in first season. Cultivars varied significantly in all studied characters, in the two seasons, except SY/ha in the second season. The interaction between phosphorus and potassium had significant effect on LAI, No. of pods/plant, Number. of seeds/plant and SY/ha in second season, and CGR, 100-seed weight and H.I in both seasons, also phosphorus*cultivars interaction had significant effect on LAI, CGR, 100-seed weight, number. of pods/plant in both seasons except number.of seeds/plant in first season and H.I in second season. Potassium*cultivars interaction was significant for the LAI, number. of seeds/plant and SY/ha in first season and CGR,100-seed weight and number.of pods/plant in both seasons. The significant three interactions, in the two seasons on all parameters except H.I in second season and LAI in both seasons. The results indicated that CGR mainfe station was a result for the combined effects of three studied factors.

Keywords: Faba bean, phosphorus, potassium, Cultivars, Seed yield.

INTRODUCTION

Grain legumes, belonging to the family Fabaceae, are an important component of the food production systems in tropical agriculture for their mature seeds or immature green pods because of their protein content (20–26%)(Carangal *et al*.,1997and Metwally *et al*.,2011). These crops are very adaptable and fix atmospheric nitrogen through symbiosis (Wood and Myers, 1997).

Faba bean (*Vicia faba*L.) is the most important legume crop in Egypt and many parts of the world (Metwally *et al*., 2011), where it is used for human consumption as a good source of vegetarian protein (Saad and El-Kholy, 2001 and Nawar *et al*.,2010) and animals (El-Gizawy and Mehasen,2009). Its seeds exhibit high levels of protein (28-36 % of seed dry matter). It is popular breakfast food which is also used as a green vegetable or fresh canned vegetable (Metwally *et al*., 2011). It is, also an important crop for soil improvement and used as a break crop in cereal rotation to keep the soil fertile and productive through nitrogen fixation (Metwally *et al*., 2011). Depending on the plant density and the field management, this plant is able to fix nitrogen up to 40kg ha^{-1} annually (Hashemabadi, 2003).

The production of faba bean in Egypt is still limited and fails to face the increasing local consumption. Therefore, increasing crop productivity is one of the major targets of the agricultural policy and can be fulfilled through-increasing the cultivated area, using high productive varieties, and Supply of appropriate and balanced levels of essential plant nutrients and weed control (Ismail and Hagag, 2005 and El Habbasha *et al.*,2007). Faba bean productivity is low due to technological gaps in adoption of balanced fertilization (Rezk *et al.*, 2013).

Phosphorus is a very important nutrient for crop growth and ensures high yield with good quality. It plays a key role in metabolic processes such as the conversion of sugar into starch and cellulose. As a result, phosphorus deficiency causes stunting, delayed maturity and shriveled seeds (Abou Hussien *et al.*,2002 and El Douby and Mouhamed, 2002). Several researchers reported that plant height, number of pods and seeds/plant as well as weight of pods and seeds/plant, straw and biological yield/feddan and seed protein content were increased due to phosphorus fertilizer applications (Mokhtar,2001 and Abdalla,2002).

Potassium is an essential element for all living organisms. In plants, it is an important cation involved in physiological pathways (Duke and Collins, 1995 and Sangakkara *et al.*,1996). In particular, the ability of ATPases in membranes to maintain active transport is highly dependent on adequate K supply. Thus efficient cell development and growth of plant tissues, translocation, storage of assimilates and other internal functions, which are based upon many physiological, biochemical and biophysical interactions, require adequate K in the cell sap (Marschner, 1995 and Lindhauer,1999). Potassium is an important nutrient for several physiological processes directly related to nodulation and N_2 fixation (Abdel Wahab and Abd-Alla, 1995 and People and Koch, 1999).The influence of K on growth and yield of food legumes has been demonstrated, to improve plant's resistance against environmental stress (Sangakkara,1990 and Hanway and Johnson,1995).

The present investigation aimed to evaluate some local and introduced faba bean varieties under varying levels of phosphorus and potassium fertilization to determine the appropriate level of the two macronutrients that would realize optimal growth and productivity of those varieties.

MATERIALS AND METHODS

The present study was carried out during the two successive winter seasons of 2013/2014 and 2014/2015 at Agriculture Research Station and Laboratories of Crop Science Department, Faculty of Agriculture, Alexandria University. This investigation aimed to evaluate some faba bean cultivars and determine the suitable phosphorus and potassium fertilizers levels to maximize plant growth and productivity of the studied varieties.

The soil of the experimental fields was silty loam and approximately homogenous. Soil of the experimental sites were analyzed in the two seasons as shown in Table (1).

Table (1). Some Physical and chemical properties of the experimental soil in 2013/2014 and 2014/2015 seasons

Soil character	Seasons	
	2013-2014	**2014-2015**
Physical properties		
Sand %	1.4	75
Silt %	72.6	17.5
Clay %	25.9	7.5
Texture	Silty Loam	Sandy Loam
Chemical properties		
Av N mg/kg	0.11	0.02
Av P mg/kg	12.00	9.60
Av K mg/kg	1.24	1.37
O.M %	1.15	1.68
pH	8.25	8.23
EC (dS/m)	2.04	5.01
Ca^{+2} meq/L	7.5	16.00
Mg^{+2} meq/L	2.5	17.00
Na+ meq/L	25.26	60.61
Cl^{-} meq/L	10.00	0.45
CO_3^{-2} meq/L	4.8	0.0
H CO_3^{-1} meq/L	4.00	4.00
$CaCO_3$ (%)	18.39	8.20
SAR	7.99	13.13

The experimental design was split-split plot with four replications, Phosphorus fertilization (as calcium monophosphate 15.5% P_2O_5)levels (0, 37 and 74 kg P_2O_5/ha) were randomly distributed in main plots, the potassium fertilization(as potassium sulphate 48% k_2O) levels(0, 57 and 114 kg k_2O/ha) occupied the sub-plots, whereas the cultivars(Libyan,Giza843,Nubariah3, Giza716 and Sakha1) were allocated to the sub-sub plots.

The sub-sub plot size was 6.3m^2(3 ridges, 3m long and 70 cm apart). Seeds were sown on one side of ridge in hills 20 cm apart and thinned to two plants per hill. Seeds were obtained from the Agricultural Research Center in Giza, Department of Legume Crops, except for seeds of Libyan variety which were obtained from the Agricultural Research Center in Tripoli. seeding rate for all varieties was 144kg/ha. Planting dates were November 1^{st} and 10^{th} in 2013/2014 and 2014/ 2015 seasons, respectively. All other agricultural practices were carried out according to the recommended practices of this crop in the region.

Weed control was carried out using Stomp, as pre-emergence herbicide at the rate of 3.57 liter/ha. Fusilade super was applied at the rate of 3.57 liter/ha after germination of weeds, in the stage of four leaves, for weed control of narrow-leaved weeds. In both seasons, a 0.42 m^2 area, from each experimental unit, wastaken on I^{st} on February and March, to calculate the leaf area and dry weight of plant. The leaf area was calculated using leaf area meter, model no. Li 3000c.andleaf area index for the March sample was calculated according to Gardner *et al*.(1985), as the following equation: leaf area index (LAI) = leaf area/feeding area.

Plants were oven-dried at $70C^0$ until constant weight and crop growth rate (CGR) was calculated according to Gardner *et al*.(1985) , for the period from I^{st} February to I^{st} March. At harvest, the following measurements were determined:

1- Number of pods/plant, as an average of five plants.
2- Number of seeds/plant, as an average of five plants.
3- 100-seed weight (g), as an average of three samples.
4- Seed yield (ton/ha), as the weight of seed obtained from a guarded area of 1.75 m^2 and transformed to ton/ ha.
5- Harvest index(%), was calculated as seed yield/biological yield X100.

Where P levels occupied the main plots, K levels were allocated to the sub-plots and faba bean verities were randomly assigned to the sub sub-plots.

Statistical analysis

Statistical analysis of the experimental data, in each season, was performed according to Gomez and Gomez (1984), using SAS (Statistical Analysis System) version: 9.1. Comparison between treatment means was carried out using least significant differences at 0.05 probability level ($L.S.D_{0.05}$).

RESULTS AND DISCUSSION

The present study aimed to investigate the effect of fertilization with varying levels of phosphorus and potassium on growth and yield characters of five faba bean cultivars. The obtained results are presented as follows:

A. Growth characters

These included leaf area index (LAI) and crop growth rate (CGR) measured at first of March for LAI and the period from February 1^{st} to March 1^{st} for CGR.

Phosphorus (P levels) affected both characters in the second season and LAI only in the first season, whereas potassium (K) levels had no significant effect on LAI but significantly affected CGR in the two seasons. Moreover, cultivars (C) and significant effect on both characters in the two seasons. LAI was significantly influenced by P×K interaction (2^{nd} season), P×C interaction (in the two seasons) and K×C interaction (2^{nd} season). On the other hand, CGR was affected by 2–factor and 3–factor interactions in the two seasons; hence the effect of P×K×C interaction will be discussed (Tables 2 and 3). Increasing P application level from 0 to 37 kg P_2O_5/ ha significantly increased LAI in the two seasons, whereas further increase to 74 kg P_2O_5/ha level resulted in insignificant increase in that character. Concerning CGR, increasing P level from 0 to 37 or 74 kg P_2O_5/ha showed progressive increase in CGR that was significant in the second season only. Phosphorus is an important macronutrient that plays an important role in biochemical processes in plants through its contribution in energy transformations. Agegnehu and Tsige (2006) reported that leaves dry weight of faba bean plants was positively influenced by increased P applications. Similarly, Saad and El-Kholy (2001) and Ahmed and El-Abagy (2007) concluded that the highest P application rate produced the most significant values of growth characters including LAI and CGR.

Potassium had insignificant effect on LAI, in the two seasons, but showed a trend of progressive increase in that character with increasing K level up to 114 kg K_2O/ha. On the other hand, K levels had significant influence on CGR in the two seasons. Increasing K level resulted in significant progressive increment in CGR up to 114 kg K_2O/ha.

The P×K interaction, in the second season, showed that increasing P application to 37 kg P_2O_5/ ha and K fertilization rate to 57 kg K_2O/ha resulted in a significant increase in LAI. Further increase of P to 74 kg P_2O_5/ha and K to 114 kg K_2O/ha gave insignificant increase in LAI compared to the two intermediate levels. Hence, the value of P×K interaction for intermediate levels (4.52) wastatistically similar to that of the highest levels of both macronutrients (4.74). Ebrahem and Abd El-Mohsen (2010) reported that growth parameters of faba bean plants, including LAI, increased with balanced applications of both phosphorus and potassium fertilizers. Significant differences between cultivars and P× cultivars interaction in the two seasons, and K×cultivars in the second season, may be explained by the differences in genetic constitution of cultivars and the response of genetic makeup to the applied levels of P and K. Means in (Table 2) revealed that Libyanl, Nubariah 3 and Giza 716 had significantly higher LAI values compared to Giza 843 and Sakha 1. The data, also, showed that Libyan 1 with 74.0 kg P_2O_5/ha, or 114 kg K_2O/ha, gave the highest values for LAI, whereas Sakha 1 with P or K fertilization gave the lowest values for LAI. Application of phosphorus, or potassium, enhances plant growth through activation of various biochemical processes, uptake N_2 fixation and nodules activity and increases nutrients uptake from the soil, leading to more vigorous plant growth and higher leaf area. Similar findings were reported by El-Hadidy and Sweelam (2000), Abdallah (2002), Weldua *et al*. (2012) and Mohammad (2014), who confirmed the positive effect of increasing P and/or K levels on faba bean growth, and the variation of cultivars response to applied P and/or K fertilization levels.

The significant three-factor interaction, in the two seasons, indicated that CGR manifestation was a result for the combined effects of the three studied factors (Table 3). The highest values for CGR were obtained for Giza 843 with

74 kg P_2O_5/ha and 114 kg K_2O/ha in the first season (6.55 g/m^2/day), whereas in the second season, both LibyanI and Nubariah 3 exhibited the highest values for CGR (6.33 g/m^2/day for both genotypes) at the same levels of P and K. On the other hand, Sakha 1 gave the lowest values for CGR when neither phosphorus nor potassium were applied (1.25and 0.08 g/m^2/day in the first and second season, respectively). These results emphasize the importance of application of both P and K fertilizers, in balanced proportion, for proper growth of faba bean plants. El-Habbasha *et al*. (2007), Osman and Elaziz (2010) and Farhan (2012) reported positive influence of P and K application on dry matter production, leading to increased dry weights of both shoots and roots, in faba bean plants and differential varietal response to applied levels of both macronutrients. It should be noted that faba bean varieties with higher LAI values produced higher CGR values, in the two season. That implies a close relationship between functional leaf area and accumulation of dry matter in plants. Kurdali *et al*. (2002) and Abd El-Latif and Moursi (2006) reported a positive relationship between the two growth parameters.

B. Yield characters

This group of characters included number of pods/ plant, number of seeds/ plant, 100-seed weight, seed yield/ ha and harvest index P levels significantly affected number of pods/ plant in the two seasons, number of seeds/ plant and 100-seed weight in the second season. K fertilization levels significantly influenced all studied characters, in the two seasons, except number of pods/plant in the second season. Cultivars varied significantly in all studied characters, in the two seasons, except seed yield/ ha in the second season. The 3– factors interaction had significant effect on all studied characters, in the two seasons, except harvest index in the second season (Tables 4 to 8).

Increasing P application from 0 to 37 then 74 kg P_2O_5/ha resulted in significant increase in number of pods/ plant in the two seasons,number of seeds/ pod and 100-seeds weight in the second season. Seed yield/ ha and HI showed the same trend but did not reach the level of significance in the two seasons. Bolland *et al.* (2001) concluded that P is a major nutrient element for seed production of faba bean in neutral and alkaline soils. Ahmed *et al.* (2005) and Agegnehu and Fessehaie (2006) reported that the highest P level resulted in highest number of pods and seeds/ plant. Similarly, Ahmed and El-Abagy (2007) found that seed yield and yield components increased with foliar application of P.

Concerning K levels, increasing application from 0 to 57 then to 114 K_2O/ ha significantly increased number of pod/ plant in the first season, number of seeds/ plant and 100-seed weight in the two seasons, seed yield/ha and HI up to 57 kg K_2O/ha in the first season and up to 114 kg K_2O/ ha in the second season. Several researchers reported the beneficial effects of increasing K application level on seed yield and yield components of faba bean (Metwally *et al*., 2011, Shaban *et al*., 2012, Jasimand Obaid, 2014 and Sadeghi *et al*., (2014). They all concluded that the enhancement effect of K, as a major nutrient, on growth, dry matter production and translation positively affected yield components and finally increased seed yield.

Cultivars varied significantly for yield components and harvest index, in the two seasons, and in seed yield in the first season only. LibyanI exhibited the highest values for number of pods/ plant, 100-seed weight and harvest index in the two seasons, while SakhaI gave the lowest value for the same characters in the two seasons. Concerning number of seeds/plant, Giza 843 gave the highest values, whereas Giza 716 exhibited the lowest values in the two seasons. Regarding seed yield/ ha, Nubariah 3 gave the significantly highest value (2.54 t/ha) while SakhaI gave the lowest value (2.18 t/ ha) in the first season. The same trend was obtained in the second season but did not reach the statistical level of significance. Similar variations between yield and yield components of faba bean cultivars were reported by Saad and El-Kholy (2001) and Talaat and Abdallah (2008), who concluded that these variations may be attributed to differences in genetic constitution of the varieties which affects their response to environment. Its worth mentioning the noticeable variation in seed yield and yield components between the two seasons, where the recorded values for those characters varied from one season to another. That variation is a natural phenomenon in faba bean and is, principally, influenced by the percentage of flower shedding caused by environmental conditions such as win and amount of rainfall druing flowering stage. Similar findings were reported by Masri (2001) and Khalil *et al.* (2004).

The three factor interaction revealed that varieties differed in their performance, under the influence of applied phosphorus and potassium levels, for seed yield and yield components characters. Application of the highest levels of P (74 kg P_2O_5/ ha) and K (114 kg K_2O/ ha) gave the highest values in the two seasons, for number of pods/ plant with LibyanI, for number of seeds/ plant with SakhaI, for 100-seed weight with LibyanI, for seed yield/ ha with Giza 716 in the first season and Giza 843 in the second season, and for harvest index with Giza 843 in the first season. On the other hand, the lowest values were obtained with zero application of both macronutrients with SakhaI for number of pods/ plant, 100-seed weight, seed yield/ha and harvest index in the two seasons, and number of seeds/ plant in the second season, whereas Nubariah 3 gave the lowest number of seeds/ plant in the first season. Interaction between cultivars and P and/or K level were reported by Khalil *et al.* (2004), Ahmed and El-Abagy (2007), Ahmed *et al.* (2010) and El-Aal(2015).

The present investigation revealed the importance of appropriate fertilization with phosphorus and potassium for obtaining enhanced vegetative growth, higher seed yield and yield components. Fertilization with 74 kg P_2O_5 and 114kg K_2O /ha gave the highest seed yield indicating the importance of both macronutrients in acheiving high seed yield from faba bean. The results also indicated the importance of growing of faba been variety that performs well under the applied phosphorus and potassium levels, in addition to its stable response to changing seasonal environmental conditions.

Table (2). Leaf area index as affected by phosphorus, potassium fertilization levels and faba bean cultivars during 2013-2014 and 2014-2015 seasons.

Phosphorus Levels (kg P_2O_5/ha)	Potassium Levels (kg K_2O/ha)	leaf area index											
		2013-2014						2014-2015					
		Cultivars						Cultivars					
		Libyan1	Giza843	Nubariah3	Giza716	Sakha1	Mean	Libyan1	Giza843	Nubariah3	Giza716	Sakha1	Mean
0	0	5.1	4.25	4.54	4.36	4.05	4.46	4.31	3.72	4.38	4.06	2.97	3.89
	57	5.24	4.49	5.11	4.61	4.59	4.81	4.47	4.36	4.39	4.2	4.28	4.34
	114	5.38	4.66	5.12	5.02	4.64	4.96	4.48	4.41	4.44	4.28	4.43	4.41
	Average	5.24	4.74	4.92	4.66	4.43	4.8	4.42	4.16	4.4	4.18	3.89	4.21
37	0	5.41	4.72	5.25	5.2	4.56	5.03	4.58	4.47	4.53	4.48	4.43	4.5
	57	5.42	4.73	5.35	5.32	4.83	5.13	4.59	4.47	4.53	4.53	4.47	4.52
	114	5.43	5.01	5.36	5.33	4.84	5.19	4.59	4.46	4.6	4.6	4.48	4.55
	Average	5.42	4.82	5.32	5.28	4.74	5.12	4.59	4.47	4.55	4.54	4.46	4.52
74	0	5.52	5.09	5.48	5.39	4.85	5.27	4.74	4.63	4.6	4.53	4.53	4.61
	57	5.54	5.16	5.5	5.5	5.09	5.36	4.77	4.63	4.61	4.68	4.52	4.64
	114	5.55	5.26	5.52	5.52	5.18	5.41	4.91	4.64	4.76	4.7	4.67	4.74
	Average	5.54	5.17	5.5	5.47	5.04	5.34	4.81	4.63	4.66	4.64	4.57	4.66
Potassium Levels (kg k_2O/ha)	0	5.34	4.69	5.09	4.98	4.49	4.92	4.54	4.27	4.5	4.36	3.98	4.33
	57	5.4	4.79	5.32	5.14	4.84	5.10	4.61	4.49	4.51	4.47	4.42	4.5
	114	5.45	4.98	5.33	5.29	4.89	5.19	4.66	4.5	4.6	4.53	4.53	4.56
Average for Cultivars		5.4	4.82	5.25	5.14	4.74	5.07	4.6	4.42	4.54	4.45	4.31	4.46

Means followed by the same letters are not significantly different at 0.05 level of probability.

LSD at 5% level for:

Phosphorus=	0.355	0.173
Potassium=	n.s	n.s
Phosphorus x Potassium =	n.s	0.220
Cultivars=	0.313	0.208
Phosphorus x Cultivars =	0.542	0.360
Potassium x Cultivars=	n.s	0.360
Phosphorus x Potassium x Cultivars=	n.s	n.s

Table (3). Crop Growth Rate as affected by phosphorus, potassium fertilization levels and faba bean cultivars during 2013-2014 and 2014-2015 seasons.

phosphorus Levels (kg P_2O_5/ha)	Potassium Levels (kg K_2O/ha)	Crop Growth Rate (g/m^2/day)											
		2013-2014						2014-2015					
		Cultivars						Cultivars					
		Libyan1	Giza843	Nubariah3	Giza716	Sakha1	Mean	Libyan1	Giza843	Nubariah3	Giza716	Sakha1	Mean
0	0	2.85	0.52	1.27	2.09	1.25	1.6	0.95	0.25	0.56	0.29	0.08	0.43
	57	3.27	2.66	1.84	2.20	1.68	2.33	2.31	0.54	1.93	0.80	0.27	1.17
	114	4.04	2.74	2.17	2.28	1.71	2.59	3.18	1.54	2.66	1.16	0.88	1.88
	Average	3.39	1.97	1.76	2.19	1.55	2.17	2.15	0.78	1.72	0.75	0.41	1.16^c
37	0	4.24	2.87	2.41	2.75	2.39	2.93	3.20	1.82	3.37	1.84	1.55	2.36
	57	4.80	3.83	4.14	3.92	2.92	3.92	3.48	2.77	3.74	2.35	2.82	3.03
	114	5.06	3.14	4.19	4.73	2.99	4.02	3.73	2.81	4.53	3.45	3.17	3.54
	Average	4.7	3.28	3.58	3.8	2.77	3.63	3.47	2.47	3.88	2.55	2.51	2.98
74	0	4.8	3.93	4.25	4.02	3.66	4.13	4.03	2.99	3.89	3.51	3.51	3.59
	57	5.25	4.34	5.42	4.83	4.13	4.79	4.44	4.61	3.97	4.33	3.58	4.19
	114	5.91	6.55	6.49	6.24	5.24	6.09	6.33	4.92	6.33	5.59	5.75	5.78
	Average	5.32	4.94	5.39	5.03	4.34	5.00	4.93	4.17	4.73	4.48	4.28	4.52^a
Potassium Levels (kg k_2O/ha)	0	3.96	2.44	2.64	2.95	2.43	3.18	2.73	1.69	2.61	1.88	1.71b	2.2
	57	4.44	3.61	3.8	3.65	2.91	4.14	3.41	2.64	3.21	2.49	2.22a	3.23
	114	5.00	4.14	4.28	4.42	3.31	4.62	4.41	3.09	4.51	3.40	3.27a	4.4
Average for Cultivars		4.47	3.40	3.57	3.67	2.88	3.60	3.52	2.47	3.44	2.59	2.4	2.88

Means followed by the same letters are not significantiydifferent at 0.05 level of probability.

LSD at 5% level for:

	2013-2014	2014-2015
Phosphorus =	n.s	1.01
Potassium =	0.470	0.866
Phosphorus x Potassium =	0.813	1.500
Cultivars =	0.553	0.767
Phosphorus x Cultivars =	0.956	1.328
Potassium x Cultivars=	0.956	1.328
Phosphorus x Potassium x Cultivars =	1.657	2.301

Table (4). 100-seed weight (g) as affected by phosphorus, potassium fertilization levels and faba bean cultivars during 2013-2014 and 2014-2015 seasons.

phosphorus Levels (kg P_2O_5/ha)	Potassium Levels (kg K_2O/ha)	100-seed weight (g)											
		2013-2014						2014-2015					
		Cultivars						Cultivars					
		Libyan1	Giza843	Nubariah3	Giza716	Sakha1	Mean	Libyan1	Giza843	Nubariah3	Giza716	Sakha1	Mean
0	0	87.59	91.63	79.97	76.65	68.79	80.93	83.39	78.70	80.62	81.83	74.50	79.81
	57	90.19	80.34	81.57	81.23	69.24	80.51	84.53	82.27	81.14	83.48	77.77	81.84
	114	93.18	82.57	81.75	83.05	71.96	82.5	89.46	82.35	83.50	84.81	79.55	83.93
	Average	90.32	84.85	81.1	80.31	70	81.31	85.79	81.11	81.75	83.37	77.27	81.86
37	0	99.20	83.79	83.75	84.61	73.65	85	92.14	83.04	84.89	85.77	80.95	85.36
	57	102.47	85.72	86.56	85.01	75.10	86.97	93.80	83.23	89.70	86.34	81.01	86.82
	114	107.01	86.87	86.86	87.11	73.66	88.3	97.64	84.57	90.18	89.95	81.96	88.86
	Average	102.89	85.46	85.72	85.58	74.14	86.76	94.53	83.61	88.26	87.35	81.31	87.01
74	0	107.54	90.13	89.66	88.44	77.63	90.68	98.10	94.85	93.66	90.06	82.17	91.77
	57	121.50	92.47	92.91	94.07	77.63	95.72	98.43	95.26	96.46	90.74	85.94	93.37
	114	140.71	95.29	95.88	97.68	81.33	102.2	107.31	98.67	102.38	91.58	86.65	97.32
	Average	123.25	92.63	92.82	93.4	78.86	96.19	101.3	96.26	97.5	90.79	84.92	94.15
Potassium Levels (kg k_2O/ha)	0	98.11	88.52	84.46	83.2	73.36	85.54	91.21	85.53	86.39	85.89	79.21	85.64
	57	104.72	86.18	87.01	86.77	73.99	87.73	92.25	86.92	89.1	86.85	81.57	87.34
	114	113.63	88.24	88.16	89.28	75.65	90.99	98.14	88.53	92.02	88.78	82.72	90.04
Average for Cultivars		105.49	87.65	86.54	86.42	74.33	88.09	93.87	86.99	89.17	87.17	81.17	87.67

Means followed by the same letters are not significantly different at 0.05 level of probability.

LSD at 5% level for:

	2013-2014	2014-2015
Phosphorus =	n.s	2.394
Potassium =	1.400	1.473
Phosphorus x Potassium =	2.424	2.550
Cultivars =	1.070	1. 681
Phosphorus x Cultivars =	1.854	2.912
Potassium x Cultivars =	1.854	2.912
Phosphorus x Potassium x Cultivars =	3.211	5.044

Table (5).No. of pods/Plant as affected by phosphorus, potassium fertilization levels and faba bean cultivars during 2013-2014 and 2014-2015 seasons.

phosphorus Levels (kg P_2O_5/ha)	Potassium Levels (kg K_2O/ha)	No. of pods/Plant											
		2013-2014						2014-2015					
		Cultivars						Cultivars					
		Libyan1	Giza843	Nubariah3	Giza716	Sakha1	Mean	Libyan1	Giza843	Nubariah3	Giza716	Sakha1	Mean
0	0	15.09	12.52	12.90	11.02	10.38	12.38	19.40	19.90	20.65	19.85	18.70	19.7
	57	15.50	13.46	14.68	13.11	10.81	13.51	23.75	21.15	21.25	19.85	20.55	21.31
	114	16.80	14.06	15.10	13.56	12.09	14.32	23.90	22.10	25.45	21.50	22.20	23.03
	Average	15.8	13.35	14.23	12.56	11.09	13.41	22.35	21.05	22.45	20.4	20.48	21.35
37	0	16.89	14.69	16.24	13.59	12.44	14.77	26.93	22.25	26.00	21.85	22.20	23.85
	57	16.98	14.83	18.12	14.19	12.94	15.41	28.35	25.25	27.05	22.90	23.00	25.31
	114	17.41	15.96	18.48	15.23	13.24	16.06	29.50	27.05	28.20	24.35	23.60	26.54
	Average	17.09	15.16	17.61	14.34	12.87	15.42	28.26	24.85	27.08	23.03	22.93	25.23
74	0	17.95	17.35	18.72	15.99	16.22	17.25	35.00	27.90	31.95	24.95	25.15	28.99
	57	20.50	18.84	22.75	16.87	16.41	19.07	38.10	29.05	32.05	26.70	25.80	30.34
	114	25.70	22.11	23.02	18.28	20.71	21.96	42.60	33.05	36.85	34.58	27.00	34.82
	Average	21.38	19.43	21.5	17.05	17.78	19.43	38.57	30.00	33.62	28.74	25.98	31.38
Potassium Levels (kg k_2O/ha)	0	16.64	14.85	15.95	13.53	13.01	14.8	27.11	23.35	26.2	22.22	22.02	24.18
	57	17.66	15.71	18.52	14.72	13.39	16	30.07	25.15	26.78	23.15	23.12	25.65
	114	19.97	17.38	18.87	15.69	15.35	17.45	32	27.4	30.17	26.81	24.27	28.13
Average for Cultivars		18.09	15.98	17.78	14.65	13.92	16.08	29.73	25.3	27.72	24.06	23.14	25.99

Means followed by the same letters are not significantiy different at 0.05 level of probability.

LSD at 5% level for:

Phosphorus =	0.134	0.300
Potassium =	0.148	n.s
PhosphorusxPotassium =	n.s	0.465
Cultivars =	0.089	0.177
PhosphorusxCultivars =	0.166	0.313
PotassiumxCultivars =	0.166	0.313
Phosphorus x Potassium x Cultivars =	0.280	0.542

Table (6). No. of seeds/ plant as affected by phosphorus, potassium fertilization levels and faba bean cultivars during 2013-2014 and 2014-2015 seasons.

phosphorus Levels (kgP_2O_5/ha)	Potassium Levels (kg K_2O/ha)	No. of seeds/ plant											
		2013-2014						2014-2015					
		Cultivars						Cultivars					
		Libyan1	Giza843	Nubariah3	Giza716	Sakha1	Mean	Libyan1	Giza843	Nubariah3	Giza716	Sakha1	Mean
0	0	46.09	48.88	38.73	23.35	50.19	41.45	58.45	60.70	55.40	54.35	52.00	56.18
	57	50.17	49.73	46.76	30.34	52.49	45.90	58.50	63.68	58.35	56.45	56.70	58.74
	114	50.39	55.88	58.32	33.58	55.14	50.66	62.23	75.85	61.50	57.28	67.85	64.94
	Average	48.88	51.5	47.94	29.09	52.61	46.00	59.73	66.74	58.4	56.03	58.58	59.95
37	0	52.64	59.08	51.37	38.52	58.19	52	66.90	76.30	66.08	61.55	70.23	68.21
	57	53.55	62.79	52.34	39.53	59.13	53.5	79.50	77.73	68.20	66.25	71.90	72.72
	114	60.97	64.75	60.40	43.96	60.18	58.1	80.30	82.10	70.65	67.10	86.25	77.28
	Average	55.72	62.2	54.7	40.67	59.17	54.49	75.57	78.71	68.3	64.97	76.13	72.74
74	0	63.34	68.61	63.32	44.92	62.30	60.5	80.63	88.60	72.35	69.33	89.18	80.02
	57	66.76	80.31	63.51	55.15	73.49	67.8	82.70	99.00	86.85	71.80	92.60	86.59
	114	76.28	87.85	65.35	67.25	88.16	77	83.00	103.55	95.90	87.28	108.11	95.57
	Average	68.79	78.9	64.06	55.77	74.65	68.44	82.11	97.05	85.03	76.137	96.63	87.39
Potassium Levels (kg k_2O/ha)	0	54.02	58.86	51.14	35.6	56.89	51.3	68.66	75.2	64.61	61.74	70.47	68.14
	57	56.83	64.28	54.2	41.67	61.7	55.74	73.57	80.14	71.13	64.83	73.73	72.68
	114	62.55	69.49	61.36	48.26	67.83	61.9	75.18	87.17	76.02	70.55	87.4	79.26
Average for Cultivars		57.8	64.21	55.57	41.84	62.14	56.31	72.47	80.84	70.59	65.71	77.2	73.36

Means followed by the same letters are not significantly different at 0.05 level of probability.

LSD at 5% level for:

	2013-2014	2014-2015
Phosphorus =	n.s	0.403
Potassium =	0.376	0.404
Phosphorus x Potassium =	n.s	0.703
Cultivars =	0.319	0.485
Phosphorus x Cultivars =	0.549	n.s
Potassium x Cultivars =	0.549	n.s
Phosphorus x Potassium x Cultivars =	0.950	1.459

Table (7). Seed yield (ton/ha) as affected by phosphorus, potassium fertilization levels and faba bean cultivars during 2013-2014 and 2014-2015 seasons.

phosphorus Levels (kg P_2O_5/ha)	Potassium Levels (kg K_2O/ha)	Seed yield(ton/ha)											
		2013-2014						2014-2015					
		Cultivars						Cultivars					
		Libyan1	Giza843	Nubariah3	Giza716	Sakha1	Mean	Libyan1	Giza843	Nubariah3	Giza716	Sakha1	Mean
0	0	1.86	1.87	2	1.41	1.38	1.7	1.75	1.77	1.77	1.56	1.58	1.69
	57	2.24	2.06	2.19	1.93	2.02	2.09	2.00	1.89	1.84	1.59	1.67	1.8
	114	2.24	2.14	2.49	2.05	2.05	2.19	2.00	1.91	2.01	2.04	2.03	2
	Average	2.11	2.02	2.23	1.80	1.82	2.00	1.92	1.86	1.87	1.73	1.76	1.83
37	0	2.25	2.40	2.51	2.30	2.06	2.3	2.13	2.03	2.11	2.08	2.07	2.08
	57	2.43	2.42	2.57	2.40	2.21	2.41	2.17	2.19	2.30	2.17	2.09	2.18
	114	2.50	2.54	2.57	2.56	2.25	2.48	2.31	2.29	2.38	2.18	2.12	2.26
	Average	2.39	2.45	2.55	2.42	2.17	2.40	2.20	2.17	2.26	2.14	2.09	2.17
74	0	2.64	2.73	2.66	2.65	2.40	2.62	2.34	2.34	2.64	2.21	2.25	2.36
	57	2.80	2.75	2.88	3.12	2.43	2.8	2.53	2.39	2.64	2.45	2.26	2.45
	114	2.88	2.87	2.98	3.30	2.77	2.96	2.71	2.96	2.92	2.58	2.60	2.75
	Average	2.77	2.78	2.84	3.02	2.53	2.79	2.53	2.56	2.73	2.41	2.37	2.52
Potassium Levels (kg k_2O/ha)	0	2.25	2.33	2.39	2.12	1.95	2.21	2.07	2.05	2.17	1.95	1.97	2.04
	57	2.49	2.41	2.55	2.48	2.22	2.43	2.23	2.16	2.26	2.07	2.01	2.15
	114	2.54	2.52	2.68	2.64	2.36	2.55	2.34	2.39	2.44	2.27	2.25	2.34
Average for Cultivars		2.43	2.42	2.54	2.41	2.18	2.4	2.21	2.2	2.29	2.1	2.08	2.18

Means followed by the same letters are not significantly different at 0.05 level of probability.

LSD at 5% level for:

	2013-2014	2014-2015
Phosphorus=	n.s	n.s
Potassium=	0.21	0.188
Phosphorusx Potassium =	n.s	0.325
Cultivars =	0.250	n.s
PhosphorusxCultivars =	n.s	n.s
PotassiumxCultivars =	0.434	n.s
Phosphorus x Potassium x Cultivars =	0.749	0.524

Table (8).harvest index (%) as affected by phosphorus, potassium fertilization levels and faba bean cultivars during 2013-2014 and 2014-2015 seasons.

Phosphorus Levels (kg P_2O_5/ha)	Potassium Levels (kg K_2O/ha)	Harvest index(%)											
		2013-2014						2014-2015					
		Cultivars						Cultivars					
		Libyan1	Giza843	Nubariah3	Giza716	Sakha1	Mean	Libyan1	Giza843	Nubariah3	Giza716	Sakha1	Mean
0	0	31.70	26.39	30.74	22.47	19.08	26.08	27.39	19.87	26.33	15.44	19.78	21.76
	57	33.71	33.09	32.71	24.36	24.79	29.73	27.89	25.26	29.29	25.57	21.2	25.84
	114	34.30	33.36	33.29	28.79	27.22	31.39	29.54	27.09	29.7	27.84	27.44	28.32
	Average	33.24	30.95	32.25	25.20	23.70	29.07	28.27	24.07	28.44	22.95	22.87	35.31
37	0	36.69	35.44	38.23	33.77	28.35	34.5	30.49	30.06	29.75	28.47	27.74	29.3
	57	37.68	35.86	41.42	34.75	34.13	36.77	30.89	30.41	32.25	29.82	28.84	30.44
	114	38.21	36.12	41.68	36.19	35.84	37.61	31.84	31.82	33.92	33.57	29.04	32.04
	Average	37.53	35.81	40.44	34.90	32.77	36.29	31.07	30.76	31.97	30.62	28.54	30.59
74	0	38.71	37.07	42.12	40.09	38.72	39.34	34.49	34.5	35.14	32.33	30.65	33.42
	57	41.58	40.13	42.86	41.05	39.90	41.1	38.07	36.66	35.93	36.07	34.82	36.31
	114	42.02	45.38	42.91	43.86	42.44	43.32	38.24	37.83	44.98	38.92	34.93	38.98
	Average	40.8	40.9	42.63	41.7	40.4	41.26	36.93	36.33	38.68	35.77	33.47	36.24
Potassium Levels (kg k_2O/ha)	0	35.7	32.97	37.03	32.11	28.72	33.3	30.79	28.14	30.41	25.41	26.06	28.16
	57	37.66	36.36	39	33.39	32.94	35.87	32.28	30.78	32.49	30.49	28.29	30.86
	114	38.18	38.29	39.29	36.28	35.17	37.44	33.21	32.25	36.2	33.44	30.47	33.11
Average for Cultivars		37.18	35.87	38.44	33.93	32.28	35.54	32.09	30.39	33.03	29.78	28.27	30.71

Means followed by the same letters are not significantly different at 0.05 level of probability.

LSD at 5% level for:

Phosphorus =	n.s	n.s
Potassium =	1.888	2.856
Phosphorus x Potassium =	3.269	4.947
Cultivars =	2.423	2.886
Phosphorus x Cultivars =	n.s	4.999
Potassium x Cultivars =	n.s	4.999
Phosphorus x Potassium x Cultivar =	7.268	n.s

REFERENCES

Abdalla, A.M. (2002). Effect of bio- and mineral phosphorus fertilizer on the growth,productivity and nutritional value of Faba bean. Egyptian Journal of Hort., 29(2):187-203.

Abd El-Latif, A.A. and M.A. Moursi (2006). Effect oF potassium and foliar spraying With molybdenum on broad bean plants grown on a sandy soil. Egypt. J. AppL. Sci., 21(8):309– 330.

Abdel Wahab, A.M. and M.H. Abd-Alla (1995). The role of potassium fertilizer in nodulation and nitrogen fixation of fababean(*Vicafaba L.*)plants under drought stress. BiolFertil Soils, 20:147-150.

AbouHussien, E.A., M.A.Abou EL Fadi.; S.A. Radwan and H.Khalil (2002). Response of wheat and broad bean plants to phosphorus under different soil conditions.Egypt.j.Agric.Res.,80(1):41-55.

Agegnehu, G. and R.Fessehaie(2006). Response of faba bean to phosphate fertilizer and weed control on Nitisols of Ethiopian highlands. Italian J. Agron, 1(2): 281-290.

Agegnehu,G. and A. Tsige (2006). The role of phosphorus fertilization on growth and yield of faba bean on acidic Nitisol of central highland of Ethiopia.Sinet, Ethiopian J. Sci., 29(2):177-182.

Ahmed,A.M.; H.A. Hassan and B.A. Hassouna (2005). Effect of nitrogen and phosphorus fertilization and inoculation with rhizobium leguminosarum on fababean.Minia J. Agric. Res. &Develop., 25(3): 587- 616.

Ahmed.M.A., G.A. Abd El-Hafez and A.M. Gabra(2010). Effect of phosphorus, potassium and sulphur fertilization on yield and yield components of faba bean grown on silty clay loam soil. Minia J. Agric. Res. &Develop.,30 (1): 67-86.

Ahmed, M.A and H.M.H. El-Abagy(2007). Fffect of bio- and mineral phosphorus fertilizer on the growth, productivity and nutritional value of some faba bean (*Viciafaba L.*) cultivars in newly cultivated land. J. Appl. Sci. Res,22(4):408-420.

Bolland, M.D.A., G.P. Riethmuller., K.H.M. Siddique and S.P. Loss (2001). Method of phosphorus fertiliser application and row spacing on grain yield of fababean(*Viciafaba L.*). Aust. J. of Exp. Agric., 41(2):227-234.

Carangal, J., M.V. Rao, and B.R. Siwi(1997). Limits imposed by management in irrigated farming systems. In Food Legume Improvement for Asian Farming Systems. Eds.E.S Wallis and D E Bythe.pp64-71.ACIAR,Canberra Australia.

Duke, S.H and M. M. Collins (1995). Role of potassium in legume dinitrogen fixation. In Potassium in Agriculture.Ed.R Munns.PP443-466. Am. Soc. Agron., Madison,USA.

Ebrahem, M.R.A. and A.M.A. Abd EL-Mohsen (2010). Interaction Effect between P and K fertilization on Faba Bean plant (*Vicia faba* L.) yield under salt affected soils. Molecular Environmental soil science at the interfaces in the Earth is critical zone. Session 2 Biogeochemical Interfacial Reactions and the Transformation,Transport and Fate of Vital and Toxic Elements.pp115-117.Springer.com.EUphytica.

El-Aal, H.A.A. (2015). Effects of intercropping and different fertilizer forms on yield and quality of broad bean and table beet at arid lands. Alex. J. Agric. Res., 55(2):65-75.

El-Douby, K.A. and S.G.A. Mouhamed (2002). Effect of tillage,phosphorus fertilization and weed control on faba bean and estimation the contributions of yield component statistically. Egypt. J. Agric. Res., 80(1):253-274.

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

El-Hadidy,S. F. and M.E. Sweelam (2000). Effect of organic manures and potassium fertilizer on growth and nutrient uptake by faba bean plants grown in infested soil with root-knot nematode. Annals Agric. Sci.(Cairo). 1(Special): 315-329.

El-Gizawy, N.Kh.B. and S.A.S. Mehasen (2009). Response of faba bean to bio, mineral phosphorus fertilizers and foliar application with zinc. World Appl. Sci. J., 6(10):1359-1365.

Farhan,L.D. (2012). The effect of organic matter and potassium fertilizers on growth and yield of broad bean (*Viciafaba* L.).Diyala Agric. Sci. J., 4(1): 50-61.

Gardner, F.P.A., R.B.Pearce and R.L. mitchell(1985). Physiology of Crop Plant. P.202. Iowa State Univ. Press, Ames, Iowa, USA.

Gomez, K.A. and A.A. Gomez (1984). Statistical Procedures for Agricultural Research.2nd ed., John Wiley & Sons, New York, U.S.A.

Hanway, J J and J W. Johnson (1995). Potassium Nutrition of Soybean.In Potassium in Agriculture.Ed. R Munns.pp754-764.Am.Soc.Agron., Madison,USA.

Hashemabadi,D. (2003). Reaction of *ViciaFaba* plants to soil and foliar N application and K nutrition. 3rdIranian congress of horticultural science P:275-276. Karaj,Iran.

Ismail, K.M. and A.A. Hagag (2005). RESPONSE of fababean(*Viciafaba*L.) yield to phosphorus and potassium under different methods of application in sandy soils. J.Agric.Sci.Mansoura univ.,30(2):1601–1610.

Jasim, A.H. and A.S.Obaid (2014). Effect of foliar fertilizers spray, boron and their interaction on broad bean(*Viciafaba* L.)yield. Scientific Papers-Series B, Hort.,(58):271-276.

Khalil, F.A., K.A.A. EL-Shaikh and R.E. EL-Lithy (2004). Response of two faba bean cultivars to different levels of phosphorus and sulphur applications. Assiut J. Agric. Sci., 35(2): 289-311.

Kurdali, F., F. Al–Ain and M. Al-shamma (2002). Nodulation,dry matter production, and N_2 fixation by faba bean and chickpea as affected by soil moisture and potassium fertilizer. J. of Plant Nutr., 25(2):355-368.

Lindhauer, M. (1999). Role of Potassium in cell extension,growth and storage of assimilates. In Methods of potassium Research in plants.pp161-188. International Potash Institute, Berne,Switzerland.

Marschner, H. (1995). Mineral Nutrition of Higher Plants .2nd ed. Academic Press.London,UK. 889p.

Masri, A.S. (2001). Response of yield and yield components of faba bean (*Viciafaba* L.) to increasing levels of nitrogen and phosphorus under two levels of plant stand density. Annals Agric. Sci. (Cairo), 46(1):143-154.

Metwally, A.M., M.S. Alagawadi and A.R Masood (2011). Influence of Potassium Sulfate on Faba Bean Yield and Quality. Aust. J. Basic and Appli Sci.,5(3):87-95.

Mohammad, H. A. (2014). The effect of supplemental irrigation and foliar application of potassium and boron on growth and yield for faba bean (*Viciafaba* L.). Diyala Agric. Sci. J., 6(1): 187-201.

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

Nawar, A.I., A.H. AL-Fraihat., H.EL-S.Khalil and Abou EL-ELA (2010). Response of faba bean to tillage systems different regimes of NPK fertilization and plant interspacing. Int. J, Agric.Biol.12:606-610.

Osman, A.G. and F.I.A.Elaziz, (2010). Effects of biological and mineral fertilization on nodulation,nitrogen and phosphorus content and yield of faba bean(*Viciafaba L.*) cultivar seleim. Adv. Environ. Biol., 4(1):86-94.

People, T.R. and D.W.Koch (1999). Role of potassium in carbon dioxide assimilation in *Medicage sativa* L. plant Physiol., 63:878-881.

Rezk, A.I., A.B. El-Nasharty and O.A. Nofal (2013). Development of farmers participatory integrated nutrient management technology in faba bean. World Appl. Sci. J., 25(11): 1525-1529.

Saad, A.O.M and M.A. El-Kholy (2001). Response of some faba bean cultivars to phosphorus and magnesium fertilization. Egypt. J. Agron., 22:19-38.

Sadeghi, N., T.S. Nejad and A. Imani (2014). The effect of drought stress and different levels of potash fertilizer on yield components of broad bean. Int. J. Biosci (IJB), 4(2):98-103.

Sangakkara, U.R. (1990). Effect of fertilizer potassium on growth and yield of mungbean (*vignaradiata*).J.Appl.Seed Prod.,8,33-39.

Sangakkara, U.R., U.A. Hartwig and J. Nosberger (1996). Soil moisture and potassium affect the performance of symbiotic nitrogen fixation in faba bean and common bean. Plant and Soil, 184:123-130.

SAS Institute, Inc. (2007). SAS Technical Report SAS/STAT software: Changes and Enhancements User’s Guide. Volume 2, Version 9.1.3, Fourth Edition, Cary, NC: SAS Institute, Inc.

Shaban,K.A., M.G.A. El-Kader and H.S. Siam (2012). Effect of nitrogen and potassium mixing ratios and cultural practices on faba bean productivity in saline soils. Int. J. Acad. Res., 4(6A):174-181.

Talaat, Nevin.B. and Amany.M. Abdallah (2008). Response of fababean(*Vicia faba L.*) to dual inoculation with Rhizobium and VA Mycorrhiza under different levels of N and P fertilization. J. Appl. Sci. Res.,4(9):1092-1102.

Weldua, Y., M. Haileb and K. Habtegebrielb (2012). Effect of zinc and phosphorus fertilizers application on yield and yield components of faba bean(*Vicia faba*L.) grown in calcaric cambisol of semi-arid northern Ethiopia. J. Soil Sci. Environ. Manag., 3(12):320-326.

Wood, I.M and R.J.K. Myers (1997). Food legumes in farming systems in the tropics and subtropics.In Food Legume Improvement for Asian Farming systems.Eds. E S Wallis and D E Bythe.pp34-45.ACIAR. Canberra. Australia.

الملخص العربي

تأثير معدلات التسميد الفوسفاتي والبوتاسي على بعض أصناف الفول البلدي

إيمان ياسين عبد القادر، سامي شعبان الطباخ ، على عيسى نوار، حسام محمد إبراهيم

قسم المحاصيل- كلية الزراعة (الشاطبي)-جامعة الإسكندرية

أجريت هذه الدراسة خلال الموسم الشتوي من٢٠١٣/٢٠١٤ إلى ٢٠١٤/٢٠١٥ بمحطة البحوث الزراعية بأبيس التابعة لكلية الزراعة جامعة الإسكندرية (الشاطبي). تهدف هذة الدراسة إلى دراسة تأثير معدلات التسميد الفوسفاتي(صفر،٣٧و 74كجم فو٢أ٥/ هكتار) ومعدلات التسميد البوتاسي(صفر،٥٧،١١٤كجم بو٢أ/ هكتار) على خمسة أصناف من الفول البلدي وهي (سلالة محلية ليبي، جيزة٨٤٣، نوبارية٣، جيزة٧١٦، سخا١) وتأثير ذلك على صفات النمو والصفات المحصولية ومكوناته. نفذت التجارب في التصميم الإحصائي قطع منشقة مرتين في قطاعات عشوائية كاملة بأربع مكررات، حيث وضعت معدلات التسميد الفوسفاتي في القطع الرئيسية ومعدلات التسميد البوتاسي في القطع المنشقة والأصناف في القطع الصغيرة. تمت دراسة صفات النمو والصفات المحصولية التالية:

صفة معامل المساحة الورقية و معدل النمو المحصولي و وزن ١٠٠ بذرة و عدد القرون/نبات و عدد البذور/نبات ومحصول البذرة/ هكتاروكذلك معامل الحصاد.

أوضحت النتائج أن تأثير معدلات التسميد الفوسفاتي كان معنويا لكل من معامل المساحة الورقية وعدد القرون/نبات في كلا الموسمين، و معدل النمو المحصولي و وزن ١٠٠ بذرة و عدد البذور/ نبات في الموسم الثاني. كذلك أظهرت النتائج أنه كان هناك تأثير معنوي لمعدلات البوتاسيوم لكل من معدل النمو المحصولي و وزن١٠٠ بذرة وعدد القرون/نبات في الموسم الأول. وكان هناك اختلافات معنوية بين الأصناف في معظم الصفات المدروسة في كلا الموسمين ماعدا صفة المحصول البذري في الموسم الثاني. كان هناك تفاعل معنوي بين كل من معدلات التسميد الفوسفاتي والبوتاسي على صفة معامل المساحة الورقية وعدد القرون/نبات وعدد البذور/نبات والمحصول البذري في الموسم الثانيو معدل النمو المحصولي و وزن ١٠٠ بذرة ومعامل الحصاد في كلا الموسمين. أما التفاعل بين الأصناف مع معدلات التسميد الفوسفاتي فكان معنوياً في صفة معامل المساحة الورقية و معدل النمو المحصولي و وزن ١٠٠ بذرة و عدد القرون/ نبات في كلا الموسمين ماعدا صفة عدد البذور/نبات في الموسم الأول ومعامل الحصاد في الموسم الثاني. وكان التفاعل الثلاثي معنوياً لكل الصفات المدروسة ما عدا صفة معامل المساحة الورقية في كلا الموسمين ومعامل الحصاد في الموسم الثاني.