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STUDIES ON FERTILIZER REQUIREMENTS OF FABA BEAN

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ABSTRACT

The present investigation was carried out during 2006/07 and 2007/08 seasons, in Agric. Exp. Res. Station, Fac. Agric., Cairo University, Giza, Egypt. The research work aimed to study the influence of different levels of chemical fertilization on yield and yield attributes on faba bean *(Vicia faba, L*.). The examined fertilizer rates were 0, 15 and 30 kg N/fad. , 0, 12and 24 kg K_2O/fad. and 0, 500 and 1000 g/fad as edit micronutrients compound called (Composite Voliavid).

There were progressive augmentations in seed yield/fad due to increasing the level of nitrogen fertilization from 15 to 30 kg N/fad.

Potassium fertilization application had a significant effect on seed yield /fad. Data also showed that seed yield / fad were significantly increased with increasing the level of K fertilization, where 24 kg K_2O/fad Level surpassed 12 kg K_2O/fad.

It is also obvious that the high dose of micronutrients compound (1000g /fad) significantly increased seed yield of faba bean /fad as compared with the lower one (500g/fad).

In conclusion the data showed that the best production of faba bean was achieved by 30kg N, 24 kg K_2O with spraying plants by micronutrients (Compound Voliaved) in 1000 g / fad dose.

Keywords: Faba bean, *Vicia faba l*., Fertilization, Nitrogen, Potassium and Micronutrients.

INTRODUCTION

Faba bean (*Vicia faba, l*.) is the most important leguminous crops used for human nutrition in Egypt. The seeds are high in protein, vitamins, and minerals. Faba bean plants fix nitrogen into the soil, enhancing its richness. Bozorgi *et al* (2011) studied the effect of 6 nitrogen fertilization levels and 3 levels of foliar zinc spraying .The result showed that the effects of nitrogen fertilization and foliar zinc spraying on all studied traits were highly significant. on the other hand , there was a strong relationship among them and the yield indicators such as the straw yield , biological yield , harvest index , 100 seed weight , number of pods per plant and number of seeds per pod and seed yield /plant . El Fouly *et al* (2010) found that spraying micronutrients could restore the negative effect of salinity on dry weight and nutrients uptake, when sprayed either befor or after the salinity treatments it is suggested that micronutrient floir sprays could be used to improve plant tolerance to salinity . El-Gizawy and Mehasen (2009) Adding 30kg p_20_5 mixed with Phosphate dissolving bacteria(PDB) markedly increased plant hight , No. of branches and pod/plant , 100 –seed weight , seed yield / plant , seed and straw yields/ fed, protein%, N% , P%, N and P uptake. The interaction between phosphorus and zinc treatments were significantly affected plant height, No. of branches/plant, seed yield/fed, P%, N and P uptake in the combined analysis. Generally, it can be concluded that adding 30 kg P_2O_5

mixed with Phosphate Dissolving Bacteria(PDB) under sprayed of 0.04% Zn EDTA (14% Zn) may be the recommended treatment for improving the productivity of faba bean crop under the conditions of the present study. Szpunar-Krok, *et al*. (2009) exhibited that the ratio of K/ (Ca+Mg) in the grains of naked oats as well as in seeds of faba beans from single-species cultivations and their mixtures never exceeded the critical value of 2.2. The proportional values of Ca/P and K/Na were rather insufficient with respect to the nutritional requirements of animals. Cultivating cultivars in mixtures widened the proportions of K/ (Ca+Mg), Fe/Mn and K/Mg ratios, which in the case of naked oats were too narrow in pure sowing. Mahmoud *et al*, (2006) found that seeds and straw yields were significantly correlated with the Zn, Mn and Fe contents of seeds and straw. Abou El- Nour (2002) found that applying 36 kg K_2o supplemented with foliar potassium feed gave the highest marked increase in 100-seed weight , number of pods and seed yield .Applying the recorded soil potassium fertilizer (48 kg k_2o) gave the highest increase in straw yield . Supplemented with foliar potassium feeding showed the highest marked increase in leaf P concentration . No significant effect on leaf Mg, Mn and Zn due to potassium treatments were recorded. Wanas, (2002) Study that sprayed faba bean (*Vicia faba* L.) plants with some nutrients showed that K and Mg were more effective in increasing pod and seed yields per plant as well as the seed index compared with the control plants especially at 200 ppm. Seed contents of N, P, K, crude protein, reducing sugars and total sugars were also increased with different applied nutrients. Treating faba bean plants with Zn, K and Mg as foliar application is recommended due to its high effectiveness in reducing abscission of flowers and pods. Nassar (2002) and El-Ghandour *et al.* (2001) Stated that addition of Zn or Co increased N and K concentrations, while decreased P and Cu. Increasing additions of Zn decreased Fe and Mn concentrations .Thalooth (2001) showed that sprayed broad bean plants with fe , Mo and Zn produced heavier pods, seeds. Spraying the plants with the different micronutrients or their mixture soil P application increased seed weight. Weight of pods/whole plant was increased due to foliar spraying with micronutrient elements. Shelling percentage was not affected neither spraying with different micronutrients nor different methods of P application . the highest seed yield was obtained by foliaring with Fe or Mo when P was either foliar or soil applied. Dahdoh and Moussa (2000) deduced that seed contents of N, P, K, crude protein, reducing sugar and total sugars were also increased with different applied nutrients. Treating faba bean plants with Zn, K and Mg as foliar application is recommended due to its high effectiveness in reducing abscission of flowers and pods. Khalifa (1998) found that application of micronutrient fertilizers to faba bean plants has a great effect on faba been growth and yield under sandy and clay soils conditions. Abd El Hadi (1984) showed that chelate – mix gave the best result , the compound foliar fertilizers with the formula N –Zn- Mn Fe and N – P –K –Mn –Fe (Wuxeal suspensions and Wuxal liquid) produced the highest yields. The compound foliar fertilizers showed markedly better result than the pure chelates , chelate –mix-tures and foliar fertilizer without addition marcronutrient content.

MATERIALS AND METHODS

The current experiment was carried out in Agric. Exp. Res. Station Fac. Agric., Cairo University, Giza Egypt, during 2006/2007 and 2007/2008 seasons .The experimental design was randomized block design in each plantation with three replicates .The experiment included 27 treatments which were all combinations of N, K and micronutrients doses. Faba bean (*Vicia* faba *L*.), Cairo 375 cultivar, was used in this study. The soil of experiments was plowed followed by leveling then ridged and divided into experimental units , each contained 5 ridges with total area of 10.5m^2. Seeds were sown on both sides of ridge in hills contained 2 seeds/hill and the distance between hills was 20 cm. The seeding time was November 22th and November 25th in 2006/2007and 2007/2008 seasons ,respectively . After sowing, weeds were controlled by hoeing. Both of (N) and (K) fertilizers were added prior to 1st irrigation, while micronutrients (Mic) foliar sprays were applied at 45 and 60 days after sowing.

The experimental treatments were

1-Nitrogen: The examined nitrogen rates were 0, 15 and 30 kg N/fad. (One faddan = 4200m^2)

2-Potassium: The examined potassium rates were 0,12and 24kg K_2O/fad.

3- Micronutrients (Mic): The examined micronutrients compound doses were 0, 500 and 1000 g/ fad. as edit micronutrients compound called " (Composite Voliavid) " which contained 6.5%zn , 2.2%Fe , 4.5%Mn, 0.5%Cu . It was formulated upon results of soil testing and plant analysis by the project "Micronutrient and Plant nutrition Problems in Egypt"

Studied characters

Five plants were randomly taken from each plot at harvest to determine the following characters:

1. Plant height
2. Number of branches per plant
3. Number of pods per plant
4. Seed yield per plant
5. Seed yield per faddan :was determined from the two middle ridges of each plot and converted to seed yield, in ardab per faddan. (ardab = 155 Kg)
6. Harvest index (HI): expressed as following formula:

$$HI\ (\%) = \text{Seed yield} / \text{Biological yield} \times 100$$

Data analysis was done using ANOVA statistical analysis. The LSD test at 0.05 levels according to Snedicor and Cochran (1980) was used.

RESULTS AND DISCUSSION

Effect of N, K and Mic Application as well as their interactions on growth of faba bean:

1. Plant height (cm):

Data in table (1) indicated that nitrogen application had a significant effect on plant height at harvest in both seasons. It was also observed that

there were significant differences in plant height as a result of increasing fertilizer level from 15 to 30 kg N/fad.

Regarding the effects of potassium on plant height, the results in table (1) clearly show that potassium fertilization had a significant effect on such character in both seasons. However, the high level of potassium fertilization (24 kg K_2O/fad) improved such parameter when compared with low level (12 kg K_2O /fad). The positive effect of K on plant hight is in harmony with those obtained by Abd el-Reheem *et al,* (1992) and Ibrahim and El-Halawany (1993).

In respect of micronutrients effect, the data in table (1) reveal that foliar spray of micronutrients had a significant effect on plant height of faba bean as compared with the control. Using 1000g/fad gave the tallest plants.

With regards to the interaction effects, data in table (1) show that the interaction between nitrogen and potassium, nitrogen and micronutrients as well as potassium and micronutrients revealed significant effect on plants height of faba bean plants in both seasons .Since, 24 kg K_2O and 1000 g/fad from micronutrients gave the tallest plants .The tallest plant was obtained by using 30kg N, 12 or 24kg K_2O and 1000g Voliaved. The beneficial effect of these nutrients, i.e. N,K and Mic on plant height may be due to the important function of these nutrients in plant metabolism, especially chlorophyll synthesis, photosynthesis , activation of different enzymes and finally in phytohormone regulation.These findings are in agreement with those obtained by khalifa (1998)

2. Number of branches / plant:

Concerning the effect of nitrogen fertilization, it is clear from the data in table (2) that N fertilization significantly affected number of branches/ plant in 2007/2008 only. Increasing N level in the second season caused a significant reduction in the number of branches/plant.

Regarding potassium fertilizer effect, the data in table (2) show that there was insignificant effect on number of branches/ plant due to potassium application in both seasons. Regarding to the effect of micronutrients, it is obvious from table (2) that foliar nutrition with micronutrients had insignificant effect on number of branches /plant in the two seasons.

With respect to interaction effect, results in table (2) show that all interactions had insignificant effects on number of branches/ plant in the two seasons, except the interaction between N and K in the second season and the second order interaction between N, K, M which were significant in both seasons. These findings are in harmony with those obtained by Abd El-Hadi *et al* (1984) who found that compound foliar fertilizers showed markedly better result than the pure .

Table (1): Effect of different chemical fertilization on plant height in 2006/2007and 2007/2008seasons:

Nitrogen level (A) kg N/f	Potassium level (B) kg K_2O/f	2006/2007 season				2007/2008 season			
		Micronutrients level (C) g/f			Mean	Micronutrients level (C) g/f			Mean
		0	500	1000		0	500	1000	
0	0	73.67	78.00	83.33	**78.33**	85.00	91.33	95.00	**90.44**
	12	80.33	84.00	88.00	**84.11**	83.33	88.33	95.00	**88.89**
	24	83.67	89.33	90.33	**87.78**	88.33	94.00	101.67	**94.67**
	Mean	**79.22**	**83.78**	**87.22**	**83.41**	**85.56**	**91.22**	**97.22**	**91.33**
15	0	82.00	85.67	85.67	**84.44**	86.67	100.00	113.33	**100.00**
	12	88.67	92.67	97.00	**92.78**	88.33	91.67	106.67	**95.56**
	24	82.33	89.33	94.33	**88.67**	98.33	103.33	108.33	**103.33**
	Mean	**84.33**	**89.22**	**92.33**	**88.63**	**91.11**	**98.33**	**109.44**	**99.63**
30	0	81.33	85.00	89.00	**85.11**	100.00	108.33	115.00	**107.78**
	12	93.67	101.67	105.33	**100.22**	96.67	106.67	128.33	**110.56**
	24	92.33	97.33	121.00	**103.56**	105.00	111.67	118.33	**111.67**
	Mean	**89.11**	**94.67**	**105.11**	**96.30**	**100.56**	**108.89**	**120.56**	**110.00**
	0	78.33	84.11	87.78	**83.41**	90.44	88.89	94.67	**91.33**
	12	84.44	92.78	88.67	**88.63**	100.00	95.56	103.33	**99.63**
	24	85.11	100.22	103.56	**96.30**	107.78	110.56	111.67	**110.00**
	Mean	**82.63**	**92.37**	**93.33**	**89.45**	**99.41**	**98.33**	**103.22**	**100.32**

LSD 0.05 for
A: 5.85 , B: 5.85 , C: 5.85 A : 4.56 , B: 4.56 , C: 4.56
AB:10.125,AC:10.13,BC:10.13,ABC:17.54
AB: 7.90 , AC: 7.90 , BC: 4.56 , ABC: 13.67

Table (2): Effect of different chemical fertilization on number of branches per plant(2006/2007and 2007/2008 seasons)

Nitrogen level (A) kg N/f	Potassium level (B) kg K_2O/f	2006/2007 season				2007/2008 season			
		Micronutrients level (C) g/f			Mean	Micronutrients level (C) g/f			Mean
		0	500	1000		0	500	1000	
O	0	3.00	3.33	3.33	**3.22**	2.67	2.67	3.33	**2.89**
	12	2.67	2.67	3.00	**2.78**	2.67	2.67	2.33	**2.56**
	24	3.67	2.67	2.67	**3.00**	3.00	2.67	2.67	**2.78**
	Mean	**3.11**	**2.89**	**3.00**	**3.00**	**2.78**	**2.67**	**2.78**	**2.74**
15	0	2.67	2.67	3.33	**2.89**	3.33	3.00	2.67	**3.00**
	12	3.00	3.67	2.67	**3.11**	2.33	2.33	3.00	**2.56**
	24	2.67	3.00	3.33	**3.00**	2.00	2.67	2.67	**2.44**
	Mean	**2.78**	**3.11**	**3.11**	**3.00**	**2.56**	**2.67**	**2.78**	**2.67**
30	0	2.67	2.67	3.00	**2.78**	2.67	3.00	2.33	**2.67**
	12	3.00	2.67	3.00	**2.89**	2.67	3.33	2.67	**2.89**
	24	2.33	3.00	3.00	**2.78**	2.33	2.00	2.67	**2.33**
	Mean	**2.67**	**2.78**	**3.00**	**2.81**	**2.56**	**2.78**	**2.56**	**2.63**
	0	3.22	2.78	3.00	**3.00**	2.89	2.56	2.78	**2.74**
	12	2.89	3.11	3.00	**3.00**	3.00	2.56	2.44	**2.67**
	24	2.78	2.89	2.78	**2.82**	2.67	2.89	2.33	**2.63**
	Mean	**2.96**	**2.93**	**2.93**	**2.94**	**2.85**	**2.67**	**2.52**	**2.68**

LSD 0.05 for
A: ns , B: ns , C: ns
A: 0.32 , B: ns , C: ns
AB: ns, AC: ns , BC: ns ,ABC:0.98
AB: 0.56 , AC: ns ,BC: ns , ABC: 0.97

3. Number of pods/plant:

The result given in table (3) cleared that there were progressively significant increases in number of pods per plant due to increase in the N level fertilizer. The highest nitrogen level (30 kg N/fad.) gave the highest number of pods/plant .

Data in table (3) indicated that potassium application had a significant effect on number of pods/ plant of faba bean but the differences were not enough to reach the level of significance. The increase in number of pods/plant due to K application may be attributed to K effect on increasing pod set of faba bean.

Concerning the effect of micronutrient on number of pods/plant of faba bean, evident that there were remarkable differences among the level of micronutrients application .Where the low level (500 g /fad.) surpassed the high level (1000g /fad.) in both seasons. Those findings are in agreement with those obtained by khalifa (1998).

With respect to interaction effects, results in table (3) show that all interactions had significant effects on number of pods/plant. The highest number of pods/plant was achieved by application of 30%N, 24%K_2o and 500g micronutrient/faddan

The increase in number of pods/ plant may be due to that N,k and Mic. Caused increases in the number of flowers, fruit setting percentage and increased amounts of metabolites synthesized by the plant , these results are in agreement with those obtained by Abd El Hadi *et al* (1984) who stated that the compound foliar fertilizers showed markedly better result than the pure.

4. Weight of 100- seeds (g):

Data in table (4) show that there was a significant effect on weight of 100-seeds of faba bean due to nitrogen application in both seasons, as compared with the untreated plants (control). However in the first season, no considerable differences between the high N-level (30 kg /fad.) and the low one(15 kg/ fad.) was noticed.

With regard to k fertilizer effect, data presented in table (4) revealed that 100-seed weight was significantly increased with increasing K fertilizer rate up to 24 kg K_2O/fad as compared with the rate of 12 kg K_2O/fad or control(0 k_2o/fad). Those findings are in agreement with those obtained by **El-Abagy and Ahmed (2003)**

In respect to micronutrients effect, data tabulated in table (4) assured that spraying faba bean plants with micronutrients significantly increased 100-seed weight. Thus, spraying faba bean with micronutrient dose of 500 g/fad was enough to give the highest 100-seed weight in the first season.

The increase in 100 –seed weight as a result of N, K and Mic application may be due to the fact that these nutrients may exert its effect by increasing seed size and consequently seed weight, by increasing the translocation of more metabolites required for seed development during their formation. These findings are in agreement with those obtained by Khalifa (1998)

It is obvious from table (4) that second order interactions between N, k and Mic had a significant effect, The highest levels of fertilization (30 kg N+ 24 kg K_2O + 1000 g Mic/fad.) gave the highest seed index in both seasons

5. Seed yield

Data in table (5) exhibited that there were progressive augmentations in seed yield / fad due to increasing the level of nitrogen fertilization from 15 to 30 kg N / faddan in the two growing seasons.

In respect to the effect of potassium fertilization, the data in table (5) cleared that seed yield of faba bean/ fad significantly increased with increasing the level of k fertilization, where 24 kg K_2O/ fad. surpassed 12 kg K_2O/ fad Level. These findings are in agreement with those obtained by Khalifa (1998)

With regard to the effect of micronutrients on seed yield /fad, data in table (5) indicated the high dose of micronutrients compound (1000 g/ fad)gave the highest seed yield /fad in the first season but in the second season ,500g/fad was enough to give the highest seed yield /fad. These findings are in harmony with those obtained by El-Abagy and Ahmed (2003)، and El-Gizawy and Mehasen (2009).

Regarding the interaction effect, it was found that all interactions between N, K and Mic. had significant effect on seed yield per faddan in both seasons as compared with the control treatment. The highest seed yield /fad. was attained by the combination of three factors, i .e N, K and Mic at rate of 30kg N+ 12 KG K_2O+ 0g Mic /fad and 30 kg N , 0 K_2O and 500g/fad in the first and second season, respectively .That means N is the limiting factor in increasing seed yield/fad.

The increase of seed yield /fad due to N, K and Mic. application may be brought by the favorable effect of these nutrients on plant growth expressed as plant height and number of branches/ plant, which in turn increased number of pods and seeds /plant, 100-seed weight and seed yield/ plant. These finding are in harmony with those obtained by Mahmoud *et al,* (2006) who found that seeds and straw yields were significantly correlated with the Zn, Mn and Fe contents of seeds and straw.

6. Harvest index:

Harvest index of faba bean as affected by N, K and Mic .application as well as their interactions in 2006/2007 and2007/2008 seasons are presented in table (6).

Regarding nitrogen fertilizer effect,data indicated that the high level of N fertilization (30 kg/fed.) caused more significant increases of harvest index compared with that of the low level (15 kg N/fad.) or no N application.

In respect to potassium effect, the results show that harvest index significantly increased by K application. Applying 24 kg K_2O/fad caused higher significant increases in harvest index than 12 kg K_2O/fad level in both seasons.

Regarding micronutrient effect, the results in table (6) show that sprayed 1000 g of micronutrients g/fad. significantly increased harvest index in first season only as compared with control. The harvest index increases due to micronutrients application can be ascribed mainly to promoting growth through its role in activation of the enzymatic reaction related to plant metabolism. These findings are in agreement with those obtained by Khalifa (1998)

With respect to the interaction effect, the results in table (6) show that all interactions between N, K and Mic. had significant effect on harvest index of faba bean. The highest harvest index was resulted from the second order interaction at the highest level of each factor .These findings were in agreement with those obtained by Wanas (2002) who found that spraying faba bean plants with Zn, K and Mg, significantly enhanced plant height, number of branches, number of leaves per plant, stem and leaf dry weights per plant and total leaf area per plant and crude protein contents. Moreover, K and Mg were more effective in increasing pod and seed yields per plant, seed contents of N, P, K, crude protein, reducing sugars and total sugars were also increased with different applied nutrients. Treating faba bean plants with Zn, K and Mg as foliar application is recommended due to its high effectiveness in reducing abscission of flowers and pods .

Table (3): Effect of different chemical fertilization on number of pods/plant (2006/2007and 2007/2008seasons):

Nitrogen level (A) kg N/f	Potassium level (B) kg K_2O/f	2006/2007 season				2007/2008 season			
		Micronutrients level (C) g/f			Mean	Micronutrients level (C) g/f			Mean
		0	500	1000		0	500	1000	
0	0	13.00	15.67	16.33	**15.00**	19.33	21.00	26.00	**22.11**
	12	14.00	17.00	20.67	**17.22**	16.00	20.33	26.67	**21.00**
	24	12.00	15.33	17.67	**15.00**	18.67	22.00	27.67	**22.78**
	Mean	**13.00**	**16.00**	**18.22**	**15.74**	**18.00**	**21.11**	**26.78**	**21.96**
15	0	13.00	14.33	23.67	**17.00**	19.00	24.67	35.00	**26.22**
	12	15.00	16.00	25.33	**18.78**	18.00	23.33	30.67	**24.00**
	24	12.33	16.67	22.33	**17.11**	16.33	20.00	27.00	**21.11**
	Mean	**13.44**	**15.67**	**23.78**	**17.63**	**17.78**	**22.67**	**30.89**	**23.78**
30	0	13.33	17.67	28.00	**19.67**	17.67	31.67	40.33	**29.89**
	12	15.67	21.33	29.67	**22.22**	27.67	33.33	40.33	**33.78**
	24	15.00	17.00	26.33	**19.44**	25.33	29.33	35.00	**29.89**
	Mean	**14.67**	**18.67**	**28.00**	**20.44**	**23.56**	**31.44**	**38.56**	**31.19**
	0	15.00	17.22	15.00	**15.74**	22.11	21.00	22.78	**21.96**
	12	17.00	18.78	17.11	**17.63**	26.22	24.00	21.11	**23.78**
	24	19.67	22.22	19.44	**20.44**	29.89	33.78	29.89	**31.19**
	Mean	**17.22**	**19.41**	**17.19**	**17.94**	**26.07**	**26.26**	**24.59**	**25.64**

LSD 0.05 for
A: 2.51 , B: ns, C: 2.51
A: 3.69 , B: ns , C: 3.69
AB: 4.35 AC: 4.35 BC: 4.35 ABC: 7.53
AB: 6.39 AC: 6.39 BC: 6.39 ABC: 11.06

Table (4): Effect of different chemical fertilization on weight of 100 seeds(g) (2006/2007and 2007/2008seasons):

Nitrogen level (A) kg N/f	Potassium level (B) kg K_2O/f	2006/2007 season				2007/2008 season			
		Micronutrients level (C) g/f			Mean	Micronutrients level (C) g/f			Mean
		0	500	1000		0	500	1000	
0	0	51.67	58.33	63.33	**57.78**	65.00	75.00	70.00	**70.00**
	12	53.33	61.67	68.33	**61.11**	63.33	73.33	63.33	**66.67**
	24	56.67	61.67	71.67	**63.33**	58.33	65.00	70.00	**64.44**
	Mean	**53.89**	**60.56**	**67.78**	**60.74**	**62.22**	**71.11**	**67.78**	**67.04**
15	0	55.00	58.33	65.00	**59.44**	60.00	75.00	76.67	**70.56**
	12	61.67	69.00	76.67	**69.11**	56.67	66.67	75.00	**66.11**
	24	63.33	65.00	75.00	**67.78**	63.33	68.33	80.00	**70.56**
	Mean	**60.00**	**64.11**	**72.22**	**65.44**	**60.00**	**70.00**	**77.22**	**69.07**
30	0	51.67	60.00	70.00	**60.56**	63.33	78.33	88.33	**76.67**
	12	65.00	76.67	76.67	**72.78**	65.00	75.00	83.33	**74.44**
	24	63.33	70.00	73.33	**68.89**	66.67	73.33	85.00	**75.00**
	Mean	**60.00**	**68.89**	**73.33**	**67.41**	**65.00**	**75.56**	**85.56**	**75.37**
	0	57.78	61.11	63.33	**60.74**	70.00	66.67	64.44	**67.04**
	12	59.44	69.11	67.78	**65.44**	70.56	66.11	70.56	**69.07**
	24	60.56	72.78	68.89	**67.41**	76.67	74.44	75.00	**75.37**
	Mean	**59.26**	**67.67**	**66.67**	**64.53**	**72.41**	**69.07**	**70.00**	**70.49**

LSD 0.05 for
A: 4.15 , B: 4.15 ,C:4.15
A: 4.91 , B: ns , C: 4.91
AB: 7.19 AC: 7.19 BC: 7.19 ABC: 12.45 AB: 8.51 AC: 8.51 BC: 8.51 ABC: 14.74

Table (5): Effect of different chemical fertilization on seed yield/faddan (ardab)in (2006/2007and 2007/2008seasons):

Nitrogen level (A) kg N/f	Potassium level (B) kg K_2O/f	2006/2007 season				2007/2008 season			
		Micronutrients level (C) g/f			Mean	Micronutrients level (C) g/f			Mean
		0	500	1000		0	500	1000	
0	0	4.13	3.89	4.27	**4.09**	5.06	4.88	5.23	**5.06**
	12	2.75	4.13	5.34	**4.07**	2.65	7.91	5.88	**5.48**
	24	3.92	3.96	4.16	**4.01**	4.58	3.80	4.51	**4.30**
	Mean	**3.60**	**3.99**	**4.59**	**4.06**	**4.10**	**5.53**	**5.21**	**4.95**
15	0	4.47	4.70	4.51	**4.56**	2.94	8.57	4.17	**5.23**
	12	3.99	2.65	5.57	**4.07**	3.61	5.43	5.88	**4.98**
	24	5.44	4.47	4.37	**4.76**	5.68	8.22	6.85	**6.92**
	Mean	**4.63**	**3.94**	**4.82**	**4.46**	**4.08**	**7.41**	**5.63**	**5.71**
30	0	4.78	6.30	5.23	**5.44**	9.49	11.01	5.47	**8.66**
	12	8.43	5.68	5.51	**6.54**	8.46	6.12	5.50	**6.70**
	24	6.37	4.51	7.60	**6.16**	6.40	7.81	7.50	**7.24**
	Mean	**6.53**	**5.50**	**6.11**	**6.05**	**8.12**	**8.32**	**6.16**	**7.53**
	0	4.09	4.07	4.01	**4.06**	5.06	5.48	4.30	**4.95**
	12	4.56	4.07	4.76	**4.46**	5.23	4.98	6.92	**5.71**
	24	5.44	6.54	6.16	**6.05**	8.66	6.70	7.24	**7.53**
	Mean	**4.70**	**4.89**	**4.98**	**4.86**	**6.31**	**5.72**	**6.15**	**6.06**

LSD value at 0.05
A: 0.89 , B: ns ,(C:ns A: 1.84 , B: ns , C: ns
AB:1.54,AC:1.54,BC:ns,ABC:2.67 AB: 3.19, AC: 3.19 , BC: 3.19 , ABC: 5.51

Table (6): Effect of different chemical fertilization on Harvest index(%) in (2006/2007and 2007/2008)seasons:

Nitrogen level (A) kg N/f	Potassium level (B) kg K_2O/f	2006/2007 season				2007/2008 season			
		Micronutrients level (C) g/f			Mean	Micronutrients level (C) g/f			Mean
		0	500	1000		0	500	1000	
0	1	35.22	33.25	35.60	**34.69**	52.61	46.14	39.71	**46.15**
	2	41.85	53.78	45.57	**47.07**	37.91	50.64	38.97	**42.51**
	3	40.08	39.58	36.96	**38.87**	60.72	43.63	49.63	**51.33**
	Mean	**39.05**	**42.20**	**39.38**	**40.21**	**50.41**	**46.80**	**42.77**	**46.66**
15	1	37.87	37.34	27.12	**34.11**	42.76	58.93	35.04	**45.58**
	2	37.45	24.78	35.23	**32.49**	50.34	53.27	50.82	**51.48**
	3	39.65	37.27	28.98	**35.30**	55.53	59.73	49.41	**54.89**
	Mean	**38.32**	**33.13**	**30.44**	**33.96**	**49.54**	**57.31**	**45.09**	**50.65**
30	1	53.59	43.41	29.28	**42.09**	59.95	63.75	38.86	**54.19**
	2	47.81	36.64	33.99	**39.48**	70.01	56.91	49.25	**58.72**
		44.10	32.34	43.09	**39.84**	55.09	56.52	49.17	**53.59**
	Mean	**48.50**	**37.46**	**35.45**	**40.47**	**61.68**	**59.06**	**45.76**	**55.50**
	0	34.69	47.07	38.87	**40.21**	46.15	42.51	51.33	**46.66**
	12	34.11	32.49	35.30	**33.97**	45.58	51.48	54.89	**50.65**
	24	42.09	39.48	39.84	**40.47**	54.19	58.72	53.59	**55.50**
	Mean	**36.96**	**39.68**	**38.01**	**38.22**	**48.64**	**50.90**	**53.27**	**50.94**

LSD 0.05 for
A: ns , B: 4.84, C:4.84
A: 36.38 , B:ns , C: ns
AB: 8.3837 , AC: 8.3837 , BC: 8.3837 , ABC: 14.52
AB: 63.01 , AC: 63.01, BC: 63.01, ABC: 109.13

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دراسات على الاحتياجات السمادية للفول البلدى

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اجريت تجربتان حقليتان فى موسمي ٢٠٠٦/٢٠٠٧و ٢٠٠٧/٢٠٠٨ بمحطة التجارب والبحوث الزراعية بكلية الزراعة جامعة القاهرة لدراسة اثر مستويات مختلفة من الاسمدة الكيماوية على المحصول و مكوناته فى الفول البلدى .

وكانت المعاملات السمادية المستخدمة هى صفر , ١٥ , ٣٠ كجم ن/فدان , صفر , ١٢ و ٢٤ كجم بو٢ا /فدان و صفر , ٥٠٠ و ١٠٠٠ جم / فدان من السماد الورقى (فوليافيد) .

وقد اظهرت الدراسة ان اعلى النتائج المتحصل عليها للصفات تحت الدراسة قد تم الحصول عليها باستخدام اعلى معدل من الاسمدة المضافة.

- و اتضح من النتائج وجود زيادة معنوية فى محصول البذور للفدان بزيادة السماد النتروجينى من ١٥ الى ٣٠ كجم ن /فدان فى كلا الموسمين
- كان هناك اثر معنوى لاضافة السماد البوتاسى على محصول البذور للفدان فى كلا الموسمين حيث تفوقت معنويا المعاملة ٢٤كجم بو٢ا /فدان على المعاملة ١٢ كجم بو ٢ا/ فدان فى كلا الموسمين
- ادت اضافة الجرعة الاعلى من الاسمدة بالعناصر الصغرى (فوليافيد) و هى ١٠٠٠ جم / فدان للحصول على اعلى محصول من البذور للفدان بفرق معنوى عن الجرعة الاقل (٢٤ كجم بو٢ا/فدان)
- يمكن تلخيص اهم نتائج البحث بأن تسميد نباتات الفول بـ ٣٠ كجم ن ,٢٤ كجم بو٢ا و ١٠٠٠ جم من السماد الورقى فوليافيد يعطى اعلى انتاجيه من البذور للفدان تحت ظروف البحث .

قام بتحكيم البحث

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